



12d Model Reference Manual

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12D SOLUTIONS PTY LTD

ACN 101 351 991

PO Box 351 Narrabeen NSW Australia 2101

Australia Telephone (02) 9970 7117 Fax (02) 9970 7118

International Telephone 61 2 9970 7117 Fax 61 2 9970 7118

email support@12d.com web page www.12d.com.

12d Model Reference Manual

This book is the reference manual for the software product 12d Model.

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Preface

Introduction

12d Model is an object oriented, interactive graphics program designed to process survey data, quickly build terrain, conceptual and detail design models. It is used in constructing the design, doing quality check and collecting as-constructed data.

So **12d Model** is used in all stages of the civil planning, design and construction.

Data is easily read in, triangulated and contoured to build an initial terrain model. Roads, platforms, channels or other design features can be added interactively and a merged model containing the initial terrain and the new design features formed to produce conceptual design models.

All Models can be examined in plan, section or perspective views. The number and type of views displayed on the screen is totally user defined.

By using a mouse and flexible on-screen menus, **12d Model** is easy to use and requires a minimum of training.

This document is the **12d Model Reference** manual.

Reference Manual in PDF Form

12d Model 10 has a Help available from within **12d Model** for most panels and menus.

However, because Microsoft's Help system only allows individual topics to be printed, the entire **12d Model Reference** manual has also been supplied as a PDF file. The PDF file can be used to print out large sections of the manual. Adobe's PDF format can be read by Adobe Acrobat or the free Acrobat Reader

The PDF file for the **12d Model Reference** manual is called

12dm_ref.pdf

and is in the folder on the **12d Model Installation** DVD called

Documentation\Reference_Manual

If you do not have an *Acrobat* Reader installed, it is available on the **12d Model Installation** DVD under **Install**.

Getting Started Manuals and Data

12d Model is supplied with a very comprehensive on-line Reference manual which describes the function of each menu option in detail. However it is a Reference manual and makes no attempt to describe how to use 12d for production surveying and civil engineering work.

The *12d Model installation* DVD also contains two (2) Training manuals:

Getting Started for Design manual

Getting Started for Surveying manual

The **Getting Started for Design** manual is available as a printed manual and as a PDF file on the *12d Model Installation* DVD.

The **Getting Started for Surveying** has the first seven chapters in common with the *Getting Started for Design* manual (installing 12d Model, on-line help and basic modelling) but then diverts to cover topics from the direction of a Surveying whereas the *Getting Started for Design* manual continues on with alignment design techniques.

The *Getting Started for Surveying* manual is available as a printed manual and as a PDF file on the *12d Model Installation* DVD.

As well as the **Getting Started** manuals, there are videos on a DVD which also work through all the material in the **Getting Started** manuals.

The **Getting Started** tutorials assumes that a series of files are already on your hard disk. These tutorial files are automatically installed from the DVD during installation of the 12d Model software

Training Courses

There is a wide range of *12d Model Training* Courses given by official 12d Model training centres.

Each training course usually has its own set of training files, manual in pdf form and videos going through the training course. This material is distributed on DVD's.

Using the Practise and Small Versions of 12d Model

The Practise version of 12d Model is limited to a maximum of 5,000 points. Following the procedures as stated in the training manuals may create projects with more than 5,000 points.

Where appropriate, the text will suggest how to vary the input for each instruction so that the example feature can be completed within the limits of the 12d Model Practise version.

The number of points used at any time in the Practise and small release versions can be displayed by the option

Projects => Check points

The easiest way to reduce the current point count is to delete any unwanted models with

Models => Delete

The installed icon on your desktop for running the practise version of 12d with these training files is labelled **12d 10 Practise Training**.

Please Note: Projects created by Practise versions of 12d Model cannot be accessed by Release versions of 12d Model and vice-versa.

1 12d Model 10 - 32 bit or 64 bit Version ?

Microsoft now has a 32 bit Windows and a 64 bit Windows operating system.

So when installing **12d Model 10**, you need to select either the 64 bit 12d installation or the 32 bit installation.

In 64 bit Windows, Microsoft have allowed for both 32 bit and 64 bit versions of the same software to coexist on the same computer so you could install both the 32 bit and the 64 bit version of **12d Model 10**.

However unlike **12d Model 9**, the 64 bit **12d.exe** for **12d Model 10** can be any of the **12d Model** point sizes from 5K right through to 5M and 250M.

So with **12d Model 10**, you normally only install the 64 bit **12d Model 10** on 64 bit Windows and 32 bit **12d Model 10** on 32-bit Windows.

2 Installation of 12d Model 10 Release Version

The *12d Model 10 Installation DVD* can be used to install the *Release* and *Practise* versions of **12d Model 10**.

The *Practise* version is limited to a maximum of 5,000 points and creates projects that cannot be accessed by the *Release* versions of *12d Model* and vice-versa. However the *Practise* version can be used free of charge by *12d Solutions* customers and registered *Practise* Users.

These notes are for installing the **Release** version of *12d Model 10*. There are separate notes for installing the *Practise* version.

For a new installation of the *Release* version of *12d Model 10*, the user is provided with

- one *12d Model* dongle

- one *12d Model 10 Installation DVD*

- an email with the *12d Model 10* authorization file *nodes.12d10n* attached, or a folder with the *12d Model 10* authorization file *nodes.12d10n* or *nodes.4d* in it.

Please check that you have all three items before commencing the installation.

For existing *12d Model 10* users, the user is provided with

- one *12d Model 10 Installation DVD*

- an email with the *12d Model 10* authorization file *nodes.12d10n* attached, or a folder with the *12d Model 10* authorization file *nodes.12d10n* or *nodes.4d* in it.

For existing users, the dongle you already have for *12d Model 10* will work with the new version of *12d Model 10* once you have the new *nodes* file for *12d Model 10*. If *12d Model 10* is **already** running on your computer, please **uninstall** it before installing a new version of *12d Model 10*.

Important Note on *Nodes.12d10n* and *Nodes.4d*

The *12d Model 10 nodes.12d10n* file will normally be emailed to you.

During the installation of *12d Model 10*, an association is created for files ending in **.12d10n** so after the installation, opening the **nodes.12d10n** will automatically copy it to the required area (normally C:\12d\10.00) and rename it to **nodes.4d**.

If you do not have the **nodes.12d10n** attached to an email but instead have it in a folder, clicking on the **nodes.12d10n** file after installing *12d Model 10* will also automatically copy it to the required area (normally C:\12d\10.00) and rename it to **nodes.4d**. Or if the *12d Model 10* icon is clicked on, the **Project Selection** panel will be brought up and clicking on the **Nodes** button will allow the **nodes.12d10n** or **nodes.4d** file to be selected and then processed.

Please **do not change** the **name** of the created **nodes.4d** file. *12d Model* will only search for an authorization file called *nodes.4d*.

Extra Notes for All Installations

1. A three-button mouse is essential.
2. The *12d Model Installation DVD* contains extra information other than just the installation version of 12d Model. For example, documentation, source to macros and plot parameter files.

The extra data can be copied from the *12d Model Installation DVD* but the copied files may only have a “read only” attribute set. This means that the files can not be edited or modified in any way.

To change the attribute so that a file can be modified, select the file in Explorer, bring up the *Properties* sheet and under the *General* tab sheet change the “read only” box so that it is not ticked on.

Selecting **OK** or **Apply** will then modify the attribute of the file.

Installing the Release Version of 12d Model 10

These notes are for installing the Release version of *12d Model 10*. There are separate notes for installing the Practise version.

A. Disk Space required for installing 12d Model 10

Approximately 900 megabytes of disc space will be required for the installation to succeed. After installation this can be reduced to a minimum of 100 megabytes.

B. Before installing from the DVD

For Windows 2000, XP, Vista, Windows 7:

It is usually best to reboot the PC **before** installing **12d Model** from the DVD and have no other applications running.

Your login must have Administrator privileges.

C. Do not attach the 12d dongle before installing dongle drivers

USB dongles must not be attached to the computer before the dongle drivers are installed.

D. Using the email with the *nodes.12d10n* file attached to it

The *12d Model 10 nodes.12d10n* file will normally be emailed to you.

During the installation of *12d Model 10*, an association is created for files ending in **.12d10n** so after the installation, opening the **nodes.12d10n** will automatically copy it to the required area (normally C:\12d\10.00) and rename it to **nodes.4d**.

If you do not have the **nodes.12d10n** attached to an email but instead have it in a folder, clicking on the **nodes.12d10n** file after installing *12d Model 10* will also automatically copy it to the required area (normally C:\12d\10.00) and rename it to **nodes.4d**. Or if the *12d Model 10* icon is clicked on, the **Project Selection** panel will be brought up and clicking on the **Nodes** button will allow the **nodes.12d10n** or **nodes.4d** file to be selected and then processed.

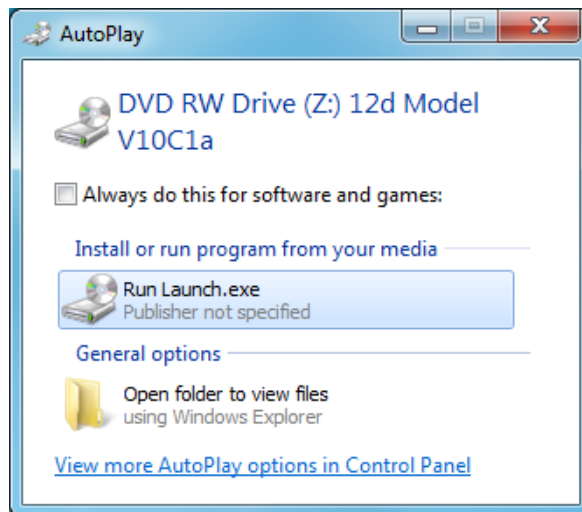
E. Starting the Installation of 12d Model 10

Insert the **12d Model 10 Installation DVD** into the DVD drive.

On inserting the DVD, the **12d Model Installation** program automatically begins.

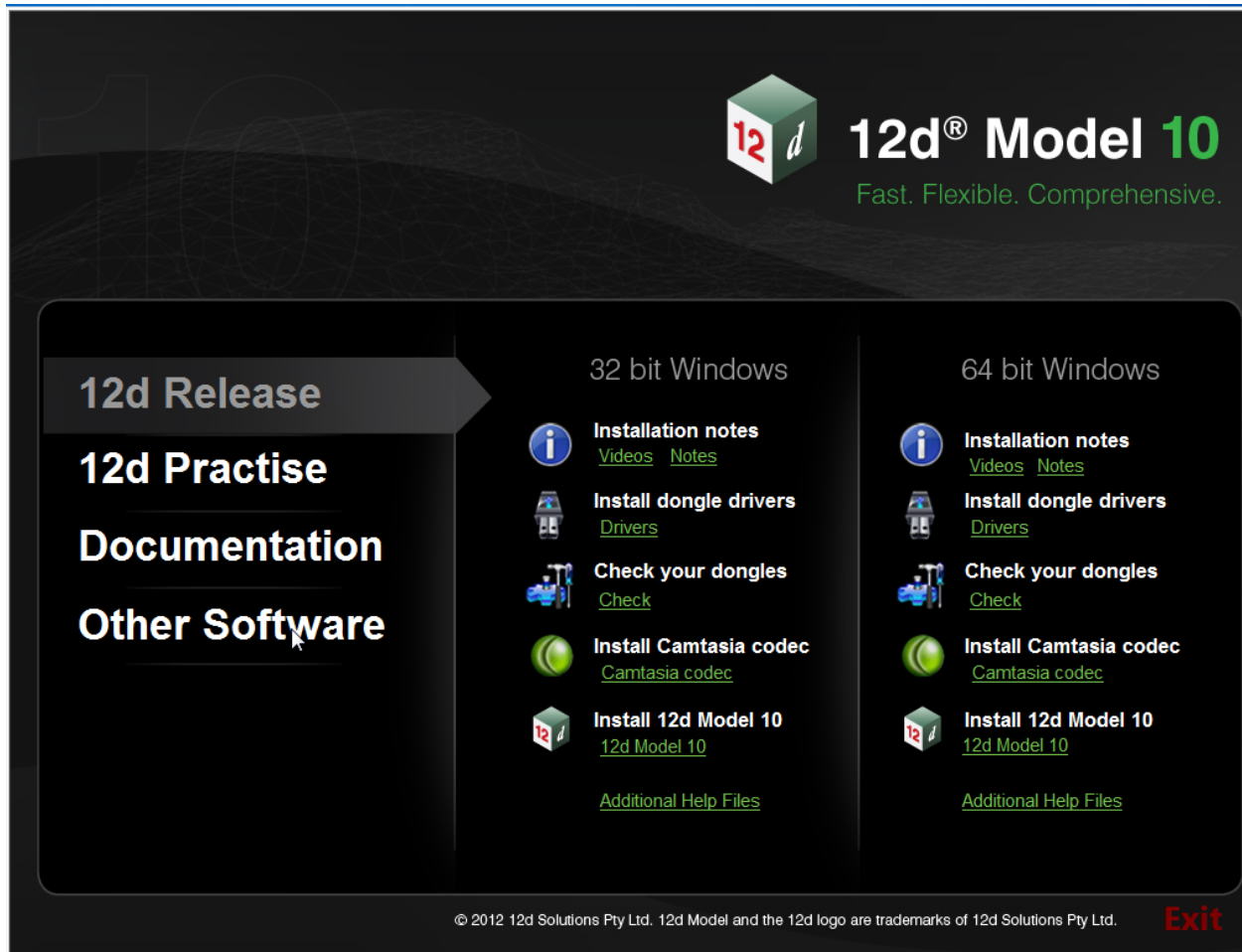
If it doesn't, simply double click on the program **Launch.exe** on the DVD.

Depending on the Windows operating system and your settings, you may be asked to allow **Launch.exe** to run. If so, click on **Run Launch.exe**.



F. Installing

The *12d Model Release* screen will appear.



The Steps on the **12d Release** tab of the *12d Model Installation DVD* will lead you through the installation of the Release version of *12d Model*. The sequence on the left is for installing on 32 bit Windows, and the sequence on the right is for installing on 64 bit Windows.

For running 12d Model 10 on 32 bit Windows:

If you are running 12d Model on 32 bit Windows, then you need to install the *12d Model* 32 bit 12d.exe and 32 bit dongle drivers. So go down the options on the left hand side of the screen.

Note- the 32 bit 12d.exe will run point versions **up to 5M**. The 250M version of *12d Model* is only available as the 64 bit *12d Model* and it only runs on a Windows 64 bit operating system.

For running 12d Model 10 on 64 bit Windows:

If you are running 12d Model on 64 bit Windows, then you need to install the *12d Model* 64 bit 12d.exe and 64 bit dongle drivers. So go down the options on the right hand side of the screen.

The 64 bit 12d.exe runs all point versions up to and including 250M.

For each installation, **Installation Notes** in pdf format can be viewed by clicking on **Notes** under the **Installation notes** heading. If **Videos** also appears then a video to guide you through the installation process can be viewed by clicking on **Videos** under the **Installation notes** heading.

NOTE - If the correct dongle drivers and the Camtasia codec are already installed on your computer then you can proceed to [Installing 12d Model 10 Release Program files](#)

Step 1. Install the Wibu or Hardlock Dongle Drivers

You need to have System Administrator rights to install the dongle drivers.

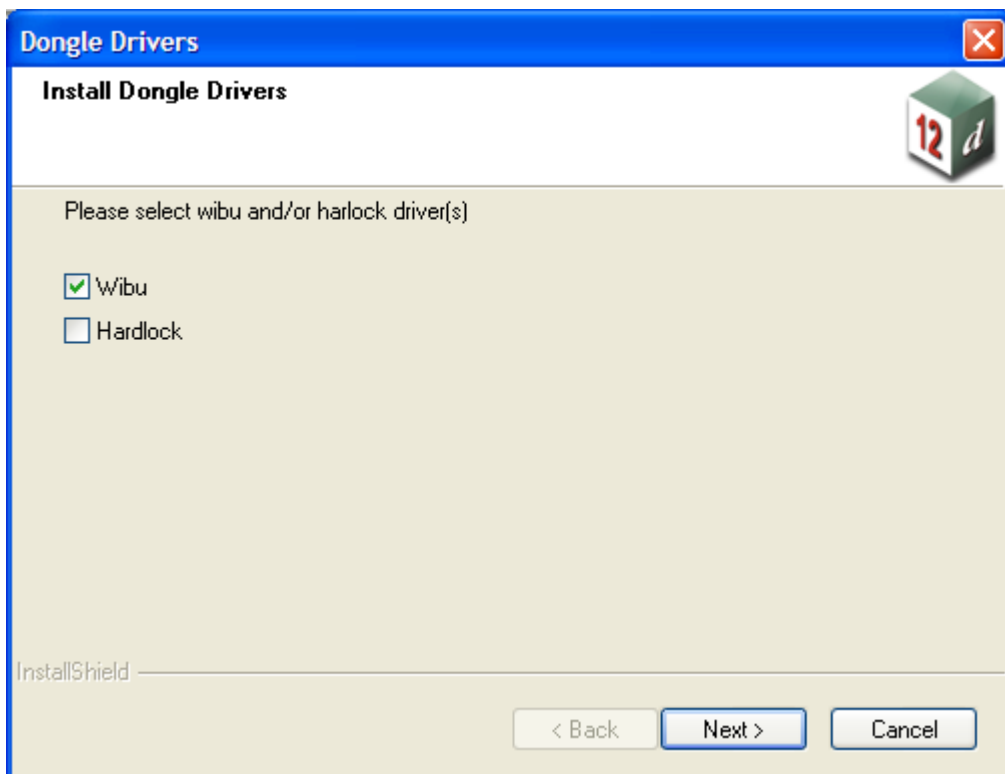
Installing Wibu Drivers:

On the *12d Model Release* screen, under *Install Dongle Drivers*, click on **Drivers** to bring up the **Dongle Drivers** panel:

Depending on the Windows operating system and your privileges (you need Administrator rights to install the drivers), the **User Account Control** panel may appear and you will be asked

*Do you want the following program to make changes to your computer? If so, click on **Yes**.*

The **Dongle Drivers** panel will then appear.



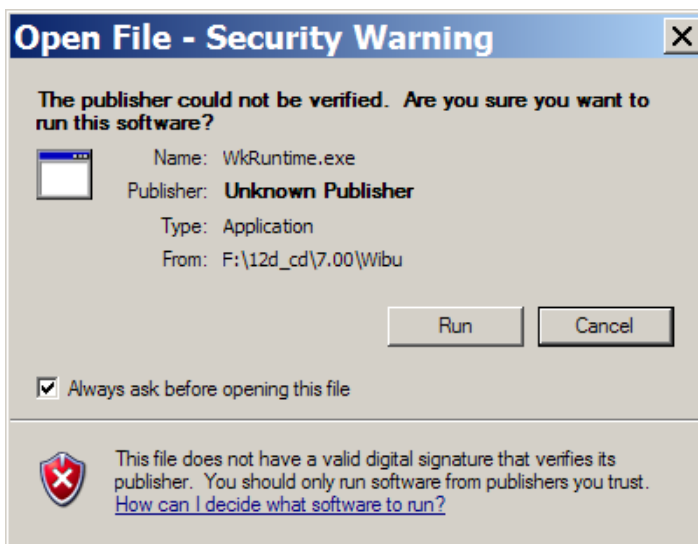
If you only have one type of dongle Wibu (green USB, translucent green USB) or Hardlock (black parallel, blue USB) then you only need to install the drivers for those dongles.

If you have both *Hardlock* and *Wibu* dongles then both sets of drivers **must** be installed.

If you have a Wibu dongle, tick on *Wibu* and then click Next:

The script to install the Wibu dongle drivers begins.

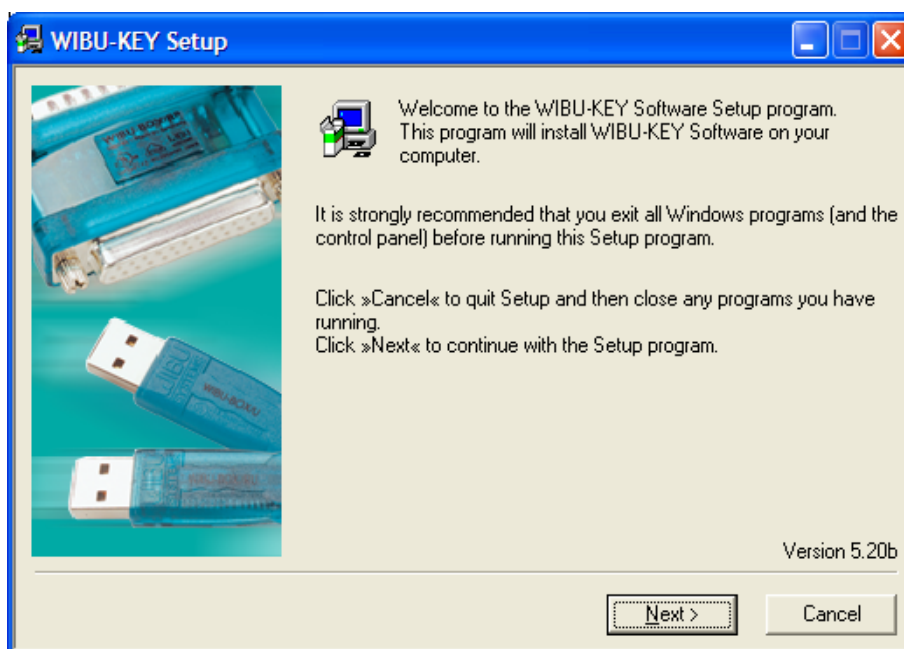
Under Windows XP you may get an *Open File - Security Warning*



select **Run** to continue

WIBU-KEY Setup

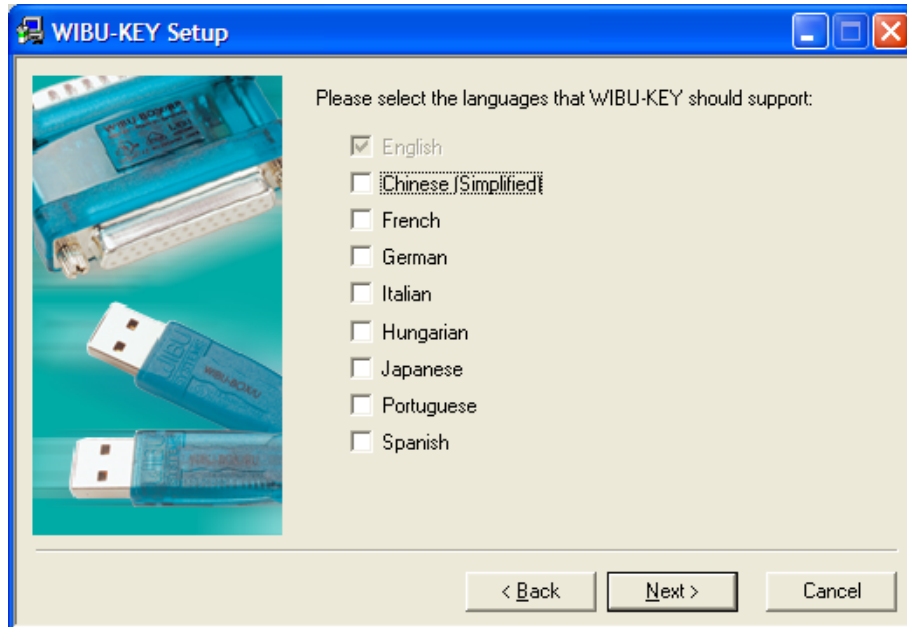
Welcome to WIBU-KEY Software Setup



select **Next** to continue

WIBU-KEY Setup

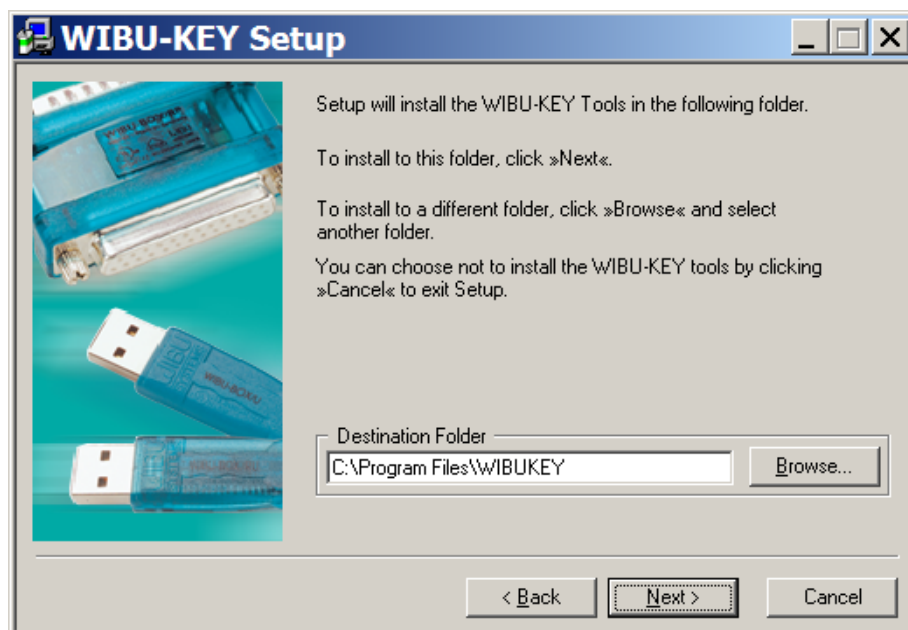
Language Selection



tick your language and then select **Next** to continue

WIBU-KEY Setup

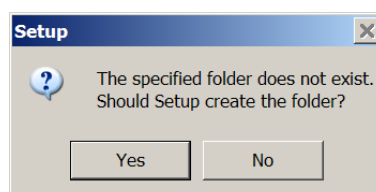
Installation folder



select **Next** to continue

WIBU-KEY Setup

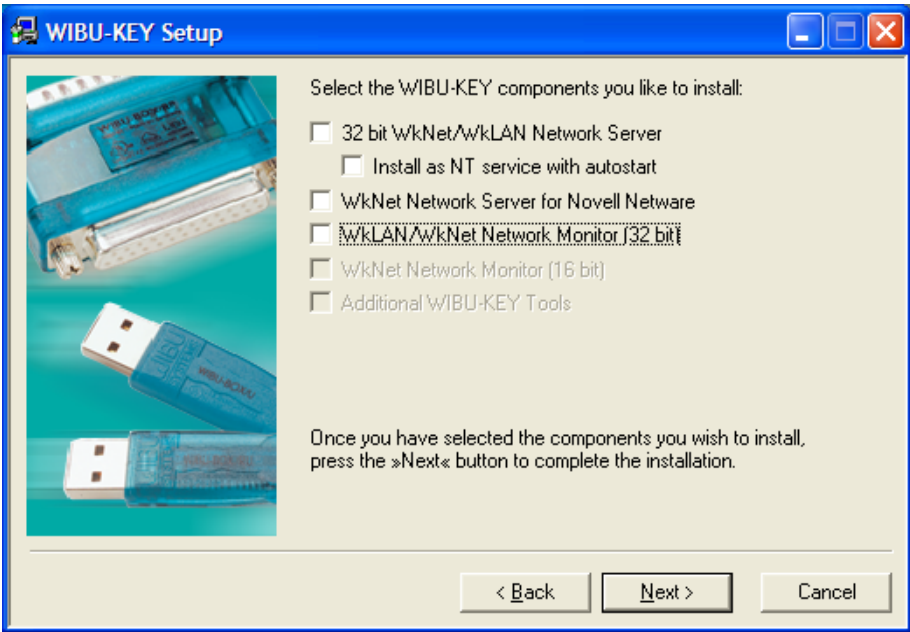
Installation folder doesn't exist



click Yes to continue

WIBU-KEY Setup

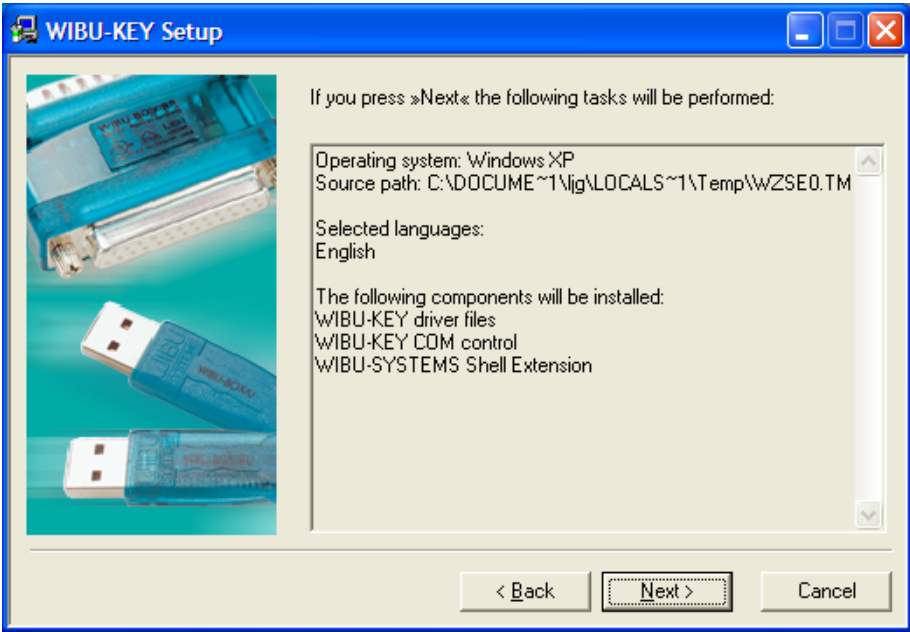
Component Selection



make sure nothing is ticked and then select **Next** to continue

WIBU-KEY Setup

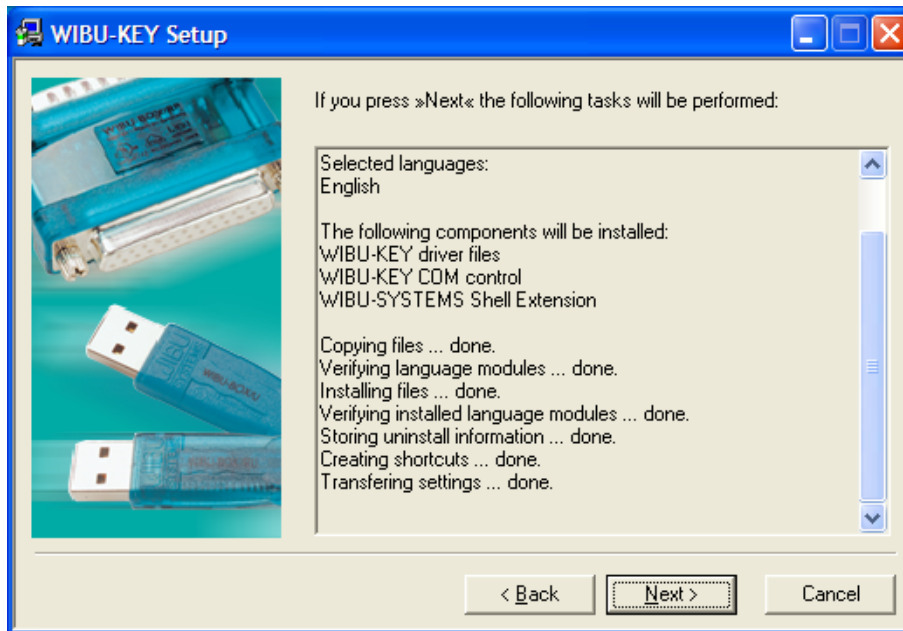
Tasks to be Performed



select **Next** to continue

WIBU-KEY Setup

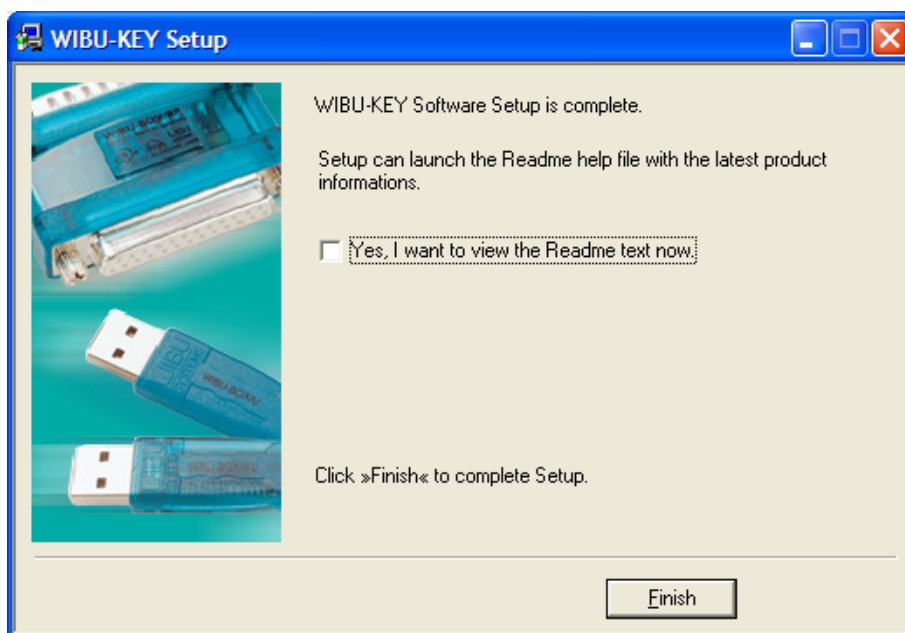
Tasks done



select **Next** to continue

WIBU-KEY Setup

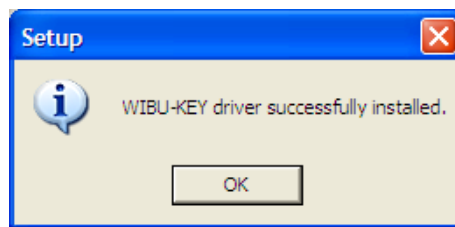
Setup Complete



leave **Yes, I want to view the Readme text now** unticked and select **Finish**

Setup OK

Setup OK



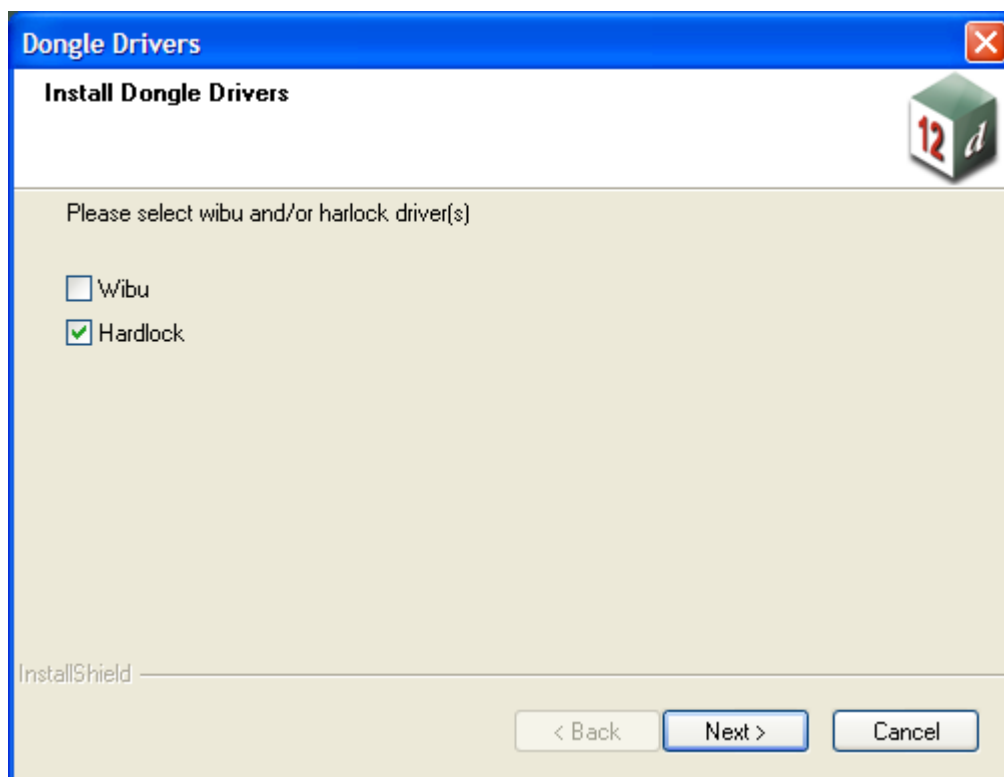
click **OK**

The WIBU dongle drivers have now been installed.

The *12d Model Release* screen will then appear.

Installing Hardlock Drivers:

If you have a Hardlock dongle, on the *12d Model Release* screen, under *Install Dongle Drivers*, click on **Drivers** to bring up the **Dongle Drivers** panel:

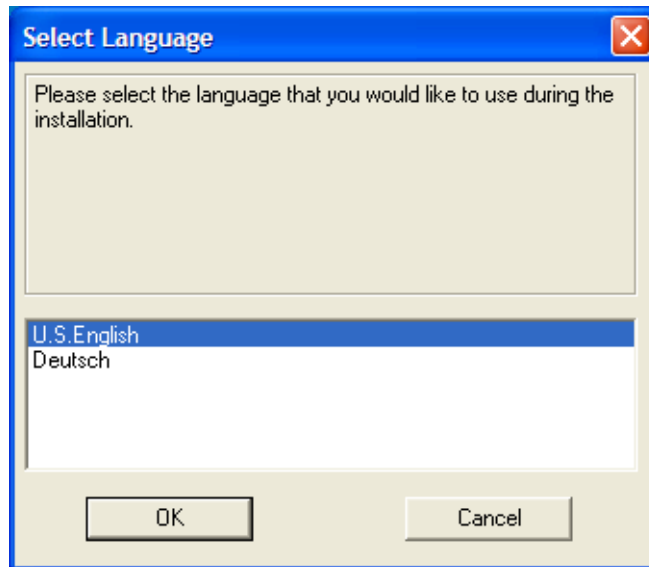


Tick on *Hardlock* and then click Next:

The script to install the hardlock dongle drivers begins.

Select language

Language for hardlock installation



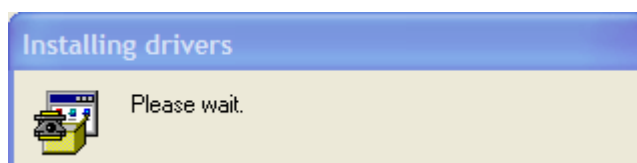
select U.S. English and then **OK** to continue

Hardlock Device Driver Installation

Installing dongle drivers



select **Next** to continue



Hardlock Device Driver Installation

Finish installing dongle drivers



select **Finish** to continue

The Hardlock dongle drivers have now been installed.

The *12d Model Release* screen will then appear.

Step 2. Check the dongle

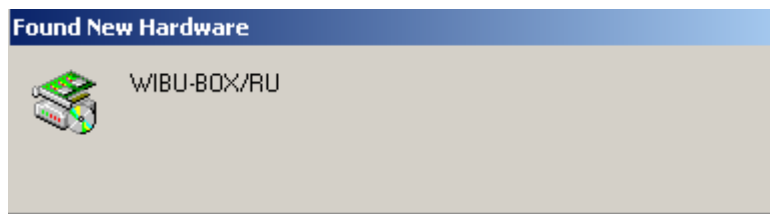
The 12d Model dongle (Hardlock or Wibu) can now be attached to the computer.

For USB dongles:

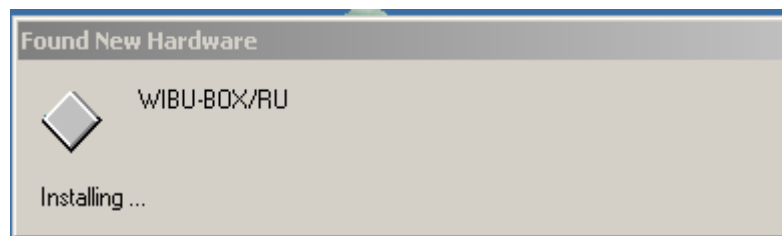
Warning: you must have System Administrations rights the first time you attach a USB dongle to any USB port:

When a USB dongle is attached for the first time to any USB port, Windows will detect that it is new hardware and needs to load the dongle drivers for that USB port - this will require System Administration rights.

Since the dongle drivers have already been loaded onto your computer, when the USB dongle is attached to a new USB port, it will be recognised as new hardware



and Windows should automatically install the correct dongle driver.



IMPORTANT NOTE IF THE WIBU DONGLE IS NOT RECOGNISED:

If the WIBU dongle is not recognised and you get the **Found New Hardware** screen



please go to the section [Wibu XP SP2 Problems](#) on how to find the Wibu drivers

NOTE - even though your dongle is working on one USB port, if you try and attach the dongle to a new USB port, the dongle drivers will need to be installed for the new USB port. You will need System Administration rights to install the dongle drivers on the **new** USB port.

The dongle must be attached to the USB port at all times, otherwise 12d Model will stop running.

For Parallel dongles:

Attach the dongle to the printer port. The dongle must be attached to the printer port at all times, otherwise 12d Model will stop running.

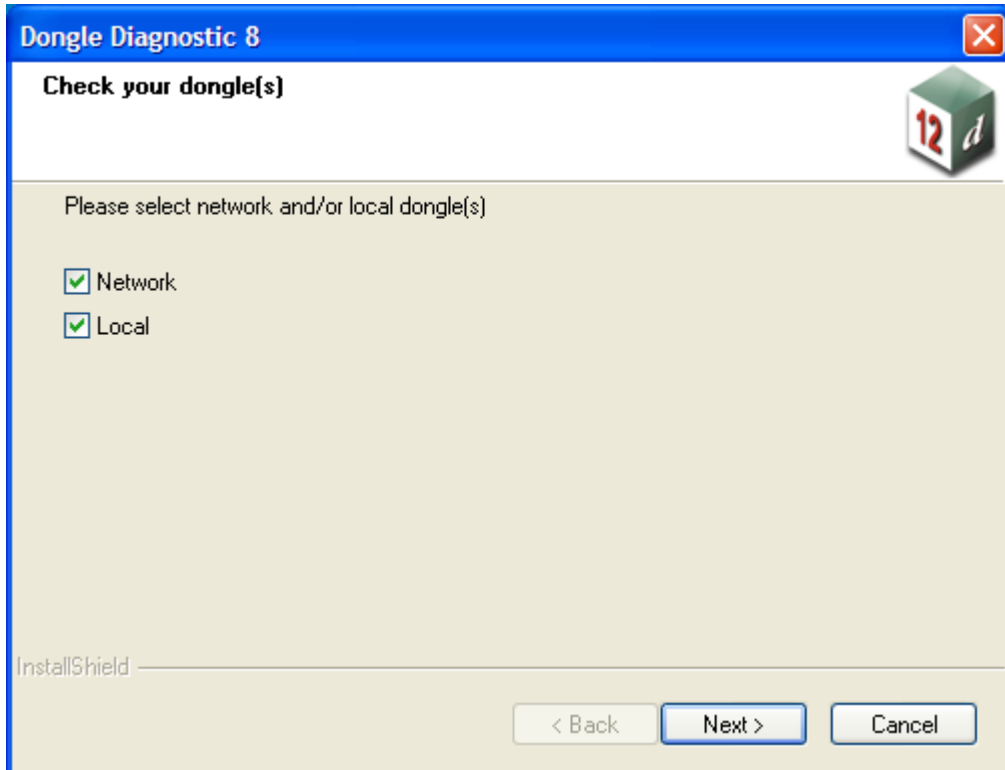
Important Note - the 12d parallel dongle must be **before** any Rainbow dongles (e.g. AutoCad).

On the *12d Model Release* screen, click on *Check*:

The dongle checking program begins.

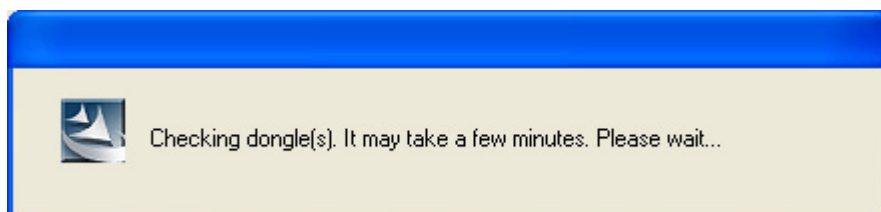
Installation

Installation message

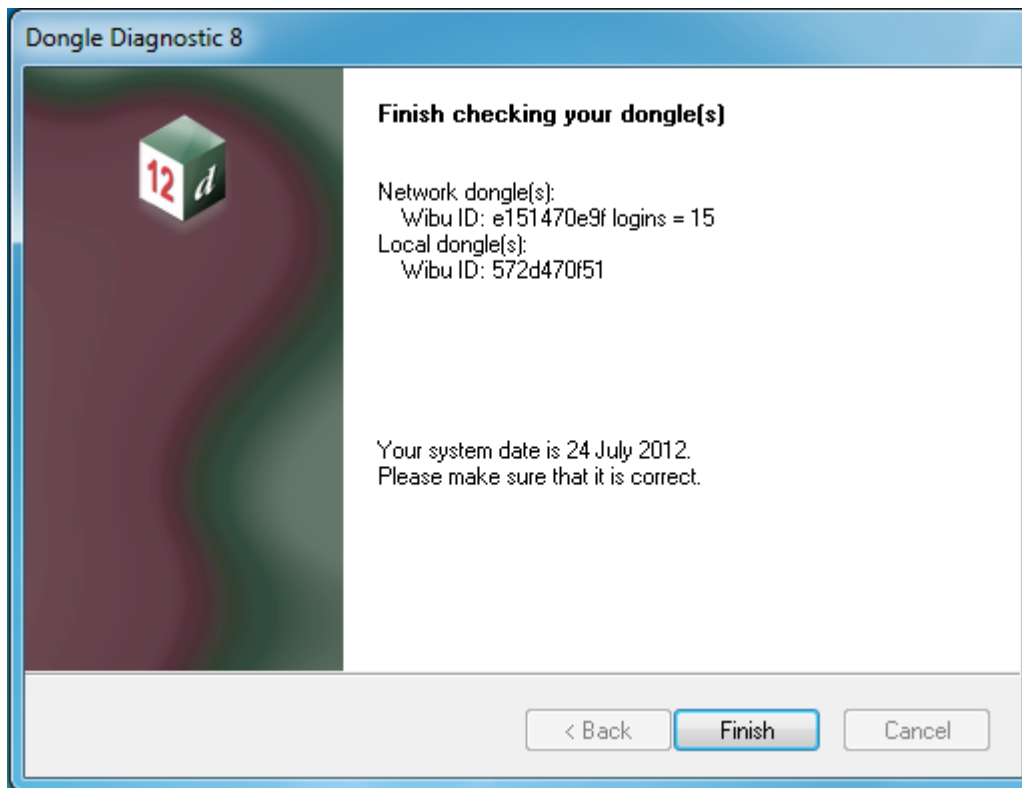


Tick **Local** and select **Next**

The computer/network will be checked for *12d dongles* and also for your *System Date*.



Check Report



The correct dongle number should be displayed and also a check on the date in the computer is correct.

select **Finish**

This completes the dongle *Check*.

The *12d Model Release* screen will then appear.

Step 3. Install Camtasia Codec

The Camtasia Codec is used for displaying the images on the *12d Model Training* CDs and DVDs.

You need to have System Administrator rights to install the Camtasia Codec.

On the *12d Model Release* screen, under *Install Camtasia codec*, click on *Camtasia Codec*:

The Camtasia Codec installation begins.

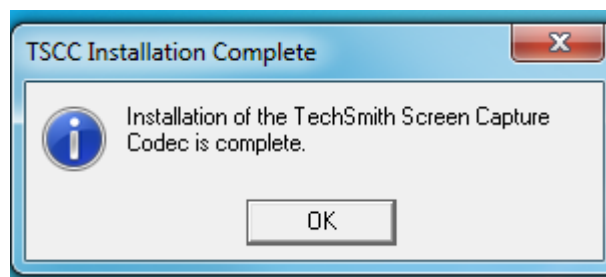
Installation

Installation message



Select **Install** to continue with the installation

Installation Complete

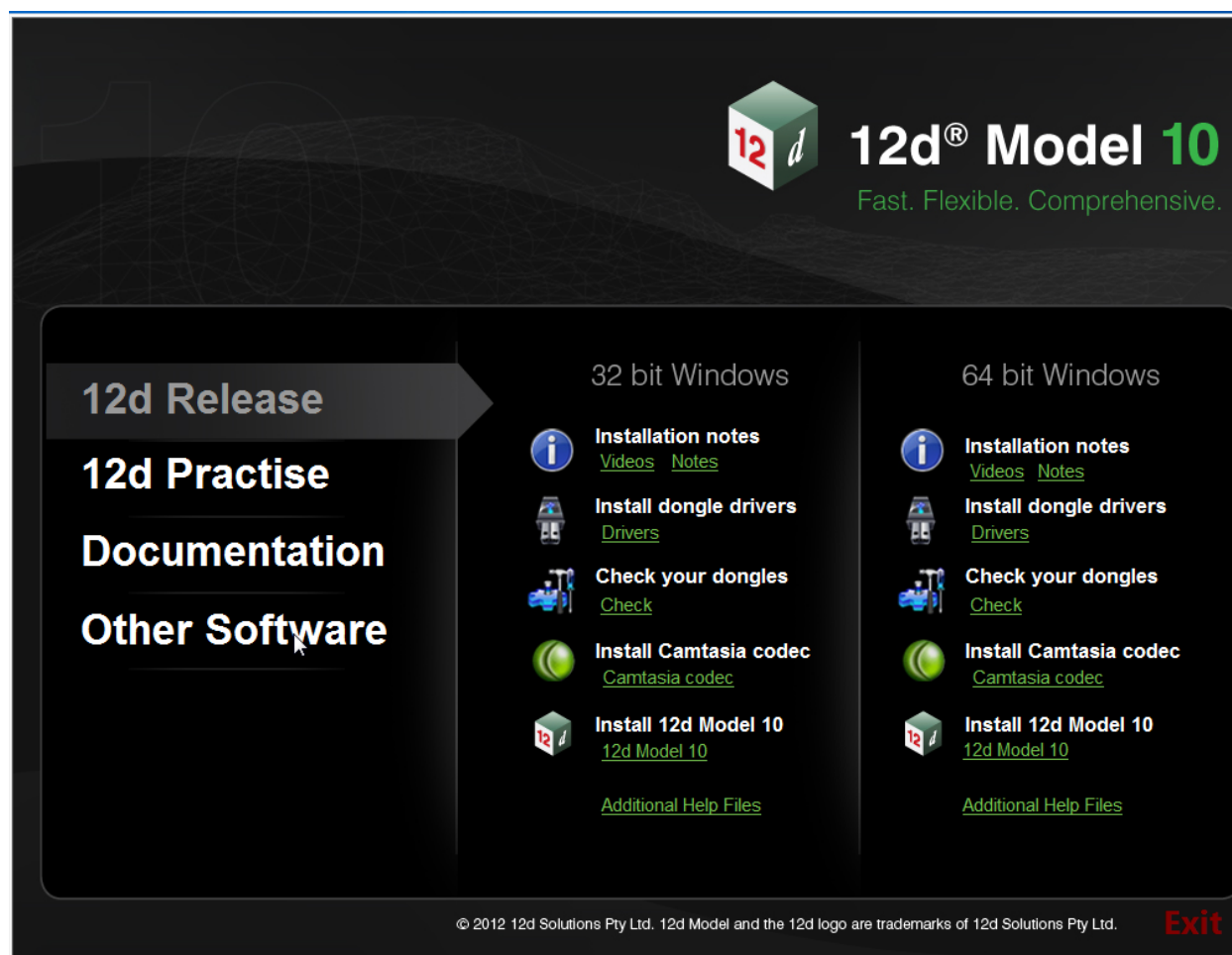


Select **OK**.

This completes the installation of the *Camtasia Codec*.

The *12d Model Release* screen will then appear.

Step 4. Installing 12d Model 10 Release Program files

**For running 12d Model 10 on 32 bit Windows:**

If you are running 12d Model on 32 bit Windows, then you need to install the *12d Model* 32 bit 12d.exe and 32 bit dongle drivers. So go down the options on the left hand side of the screen.

Note- the 32 bit 12d.exe will run point versions **up to 5M**. The 250M version of *12d Model* is only available as the 64 bit *12d Model* and it only runs on a Windows 64 bit operating system.

For running 12d Model 10 on 64 bit Windows:

If you are running 12d Model on 64 bit Windows, then you need to install the *12d Model* 64 bit 12d.exe and 64 bit dongle drivers. So go down the options on the right hand side of the screen. The 64 bit 12d.exe runs all point versions up to and including 250M.

So if you are installing on 32 bit Windows, then select the **12d Model 10** under **Installing 12d Model 10** under the **left** hand column.

If you are installing on 64 bit Windows, then select the **12d Model 10** under **Installing 12d Model 10** under the **right** hand column.

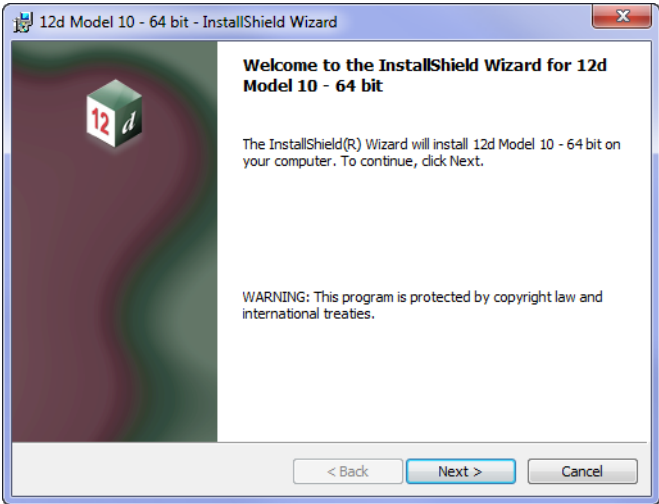


The **12d Model 10** installation begins.

Note - the following screens are for the 64 bit install but the 32 bit install is identical except the words **64 bit** are replaced by **32 bit**.

Welcome

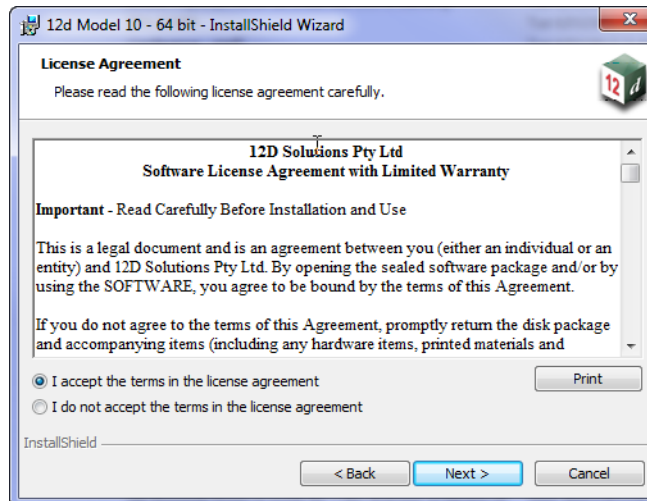
Welcome message



Select **Next** to continue with the installation

Software License Agreement

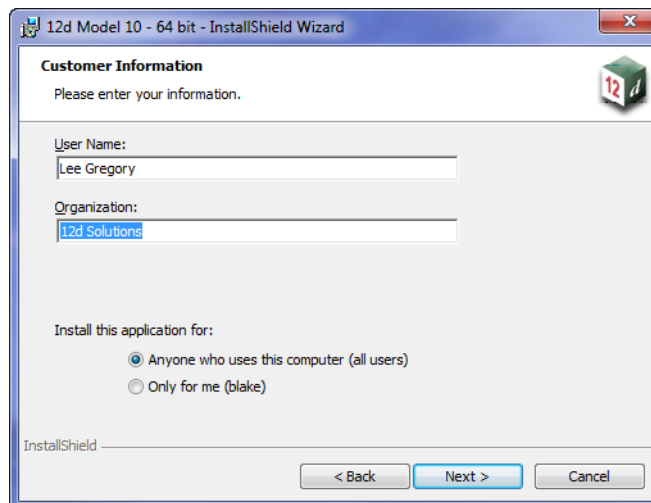
12D Solutions license agreement



If you agree with the License conditions, click on *I accept the terms in the license agreement*.

Select **Next** to continue with the installation

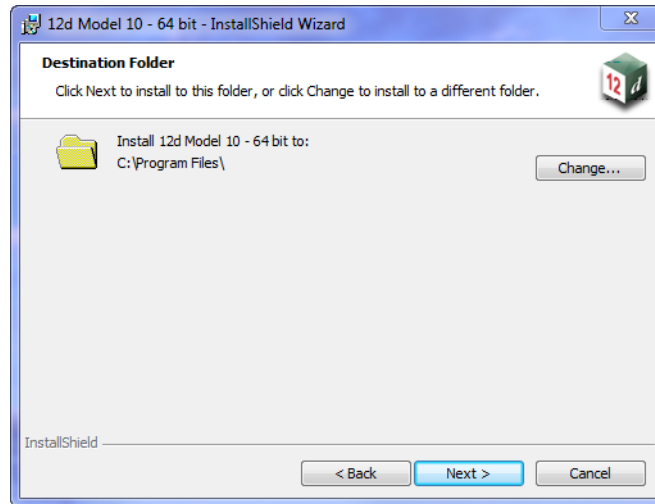
Customer Information



fill in *User Name* and *Organisation*, tick who can use the computer

select **Next** to continue with the installation

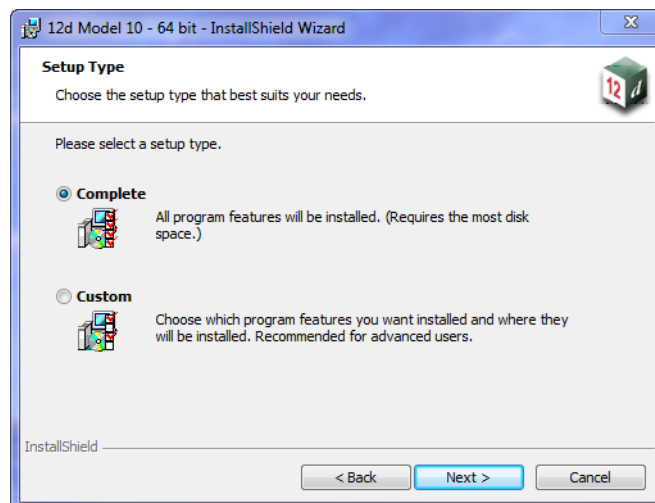
Destination Folder



continue with the default installation area for the software *c:\Program Files* or click on *Change* to browse to another area for installation

select **Next** to continue with the installation

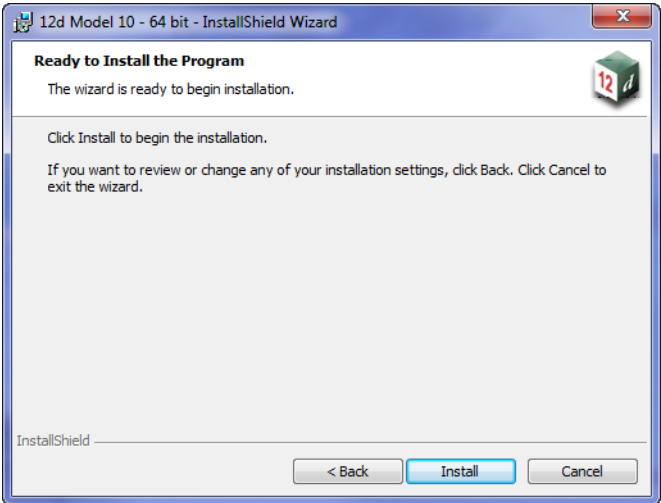
Setup Type



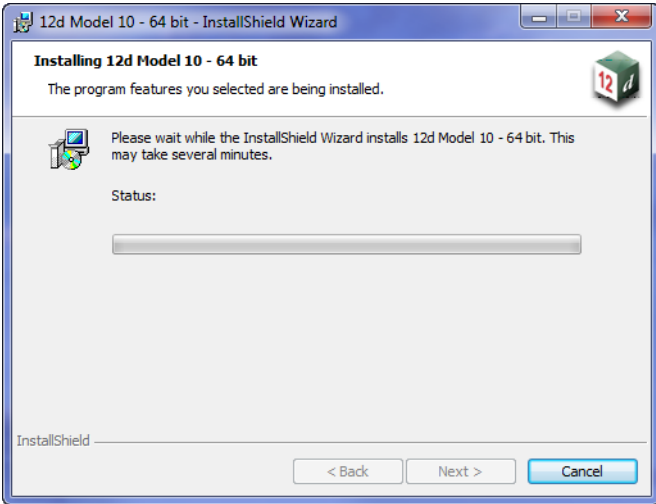
select **Complete**

select **Next** to continue with the installation

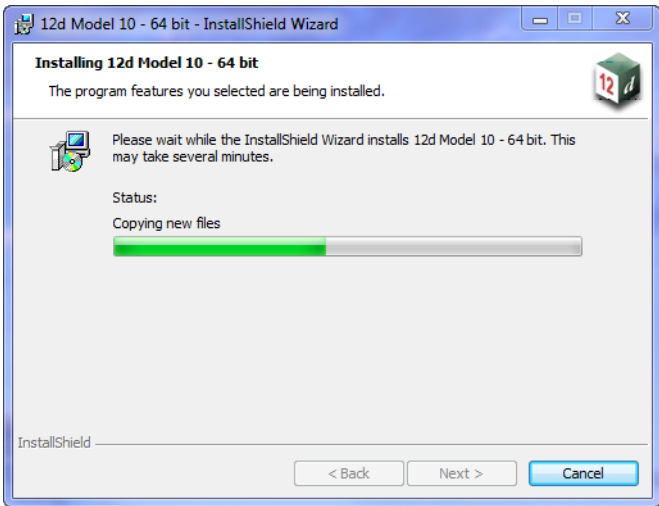
Ready to Install



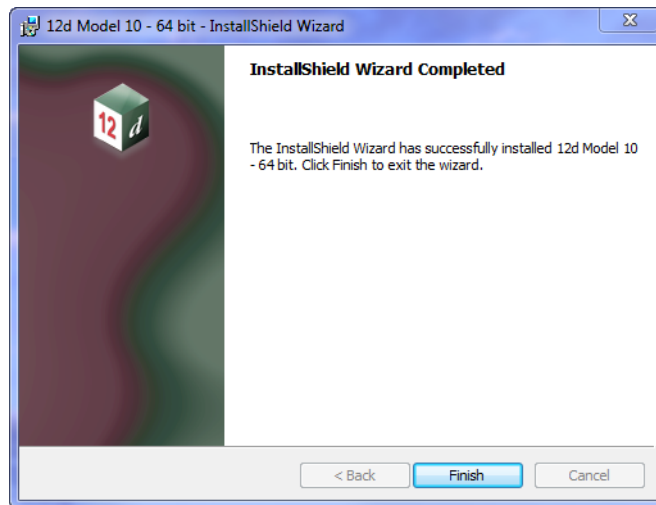
select **Next** to begin the actual installation



The software will be copied and installed onto the computer.



Setup Complete



End of installation.

Select **Finish** to complete the installation

The *12d Model Release* screen will then appear.



Select **Exit** at the bottom right hand corner of the screen to end the installation.

This completes the installation of the **12d Model** software.

12d Model will not function without an authorisation file called **nodes.4d**.

So the next step is to install and test the **nodes** file.

Folders Created by the Installation

(a) For *12d Model* on Windows 32 bit operating systems, or the 64 bit *12d Model (Bigfoot)* on Windows 64 bit operating systems:

the *12d Model* installation loads the **12d Model software** into the folder

C:\Program Files\12d\12dmodel\10.00

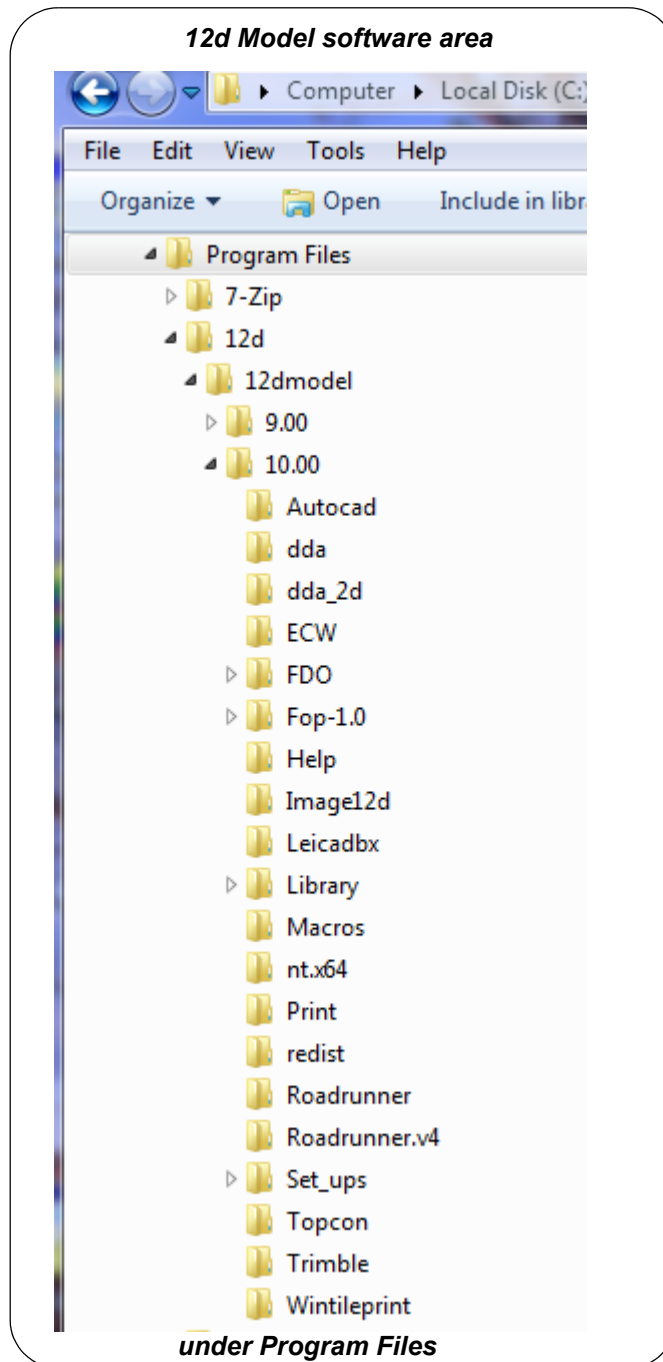
OR

(b) For the *12d Model* 32 bit exe (for versions up to 5M) on Windows 64 bit operating systems:

the *12d Model* installation loads the **12d Model software** into the folder

C:\Program Files (x86)\12d\12dmodel\10.00

12d Model users normally only have **read** access to the *Program Files* and/or *Program Files (x86)* areas.

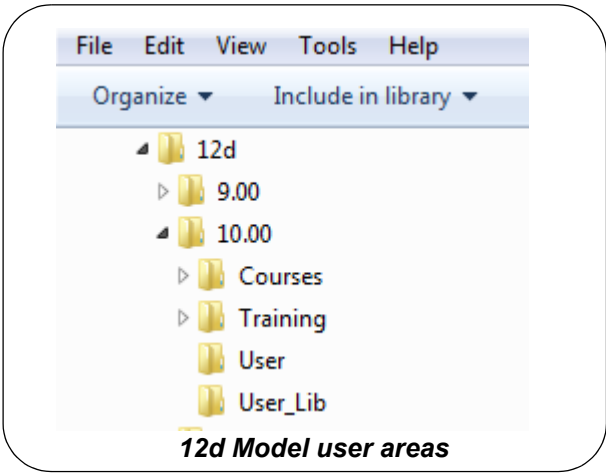


The *12d Model* installation on either 32 bit or 64 bit WIndows, also creates an area

C:\12d\10.00

which during the installation is given read/write access for the user.

The folder 12d\10.00 contains the training data used with the *Getting Started for Design and Getting Started for Surveying* manuals and the subfolders **User** and **User_Lib** are created for future user customisations of *12d Model*

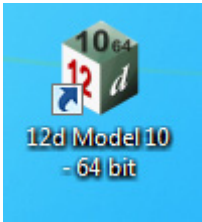


Icons Created by the Installation

The installation loads the appropriate components and creates the **12d Model 10** icon



icon for 12d Model 32 bit exe



icon for 12d Model 64 bit exe

The **12d Model 10 - 32** and **12d Model 10 - 64** icons fire up **12d Model** and attach to the folder 12d\10.00.

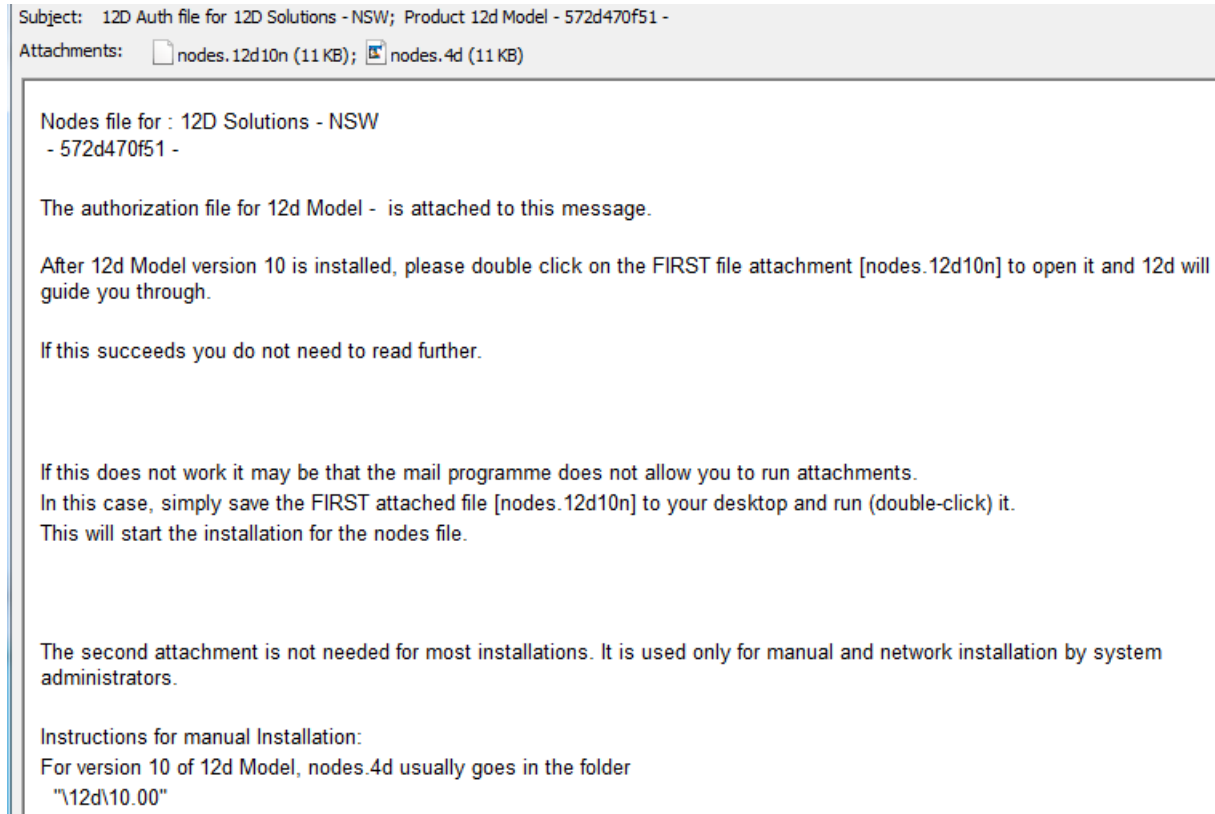
Step 5. Installing the **Nodes.4d** file

12d Model will not function without an authorisation file called **nodes.4d**.

The information inside **nodes.4d** controls

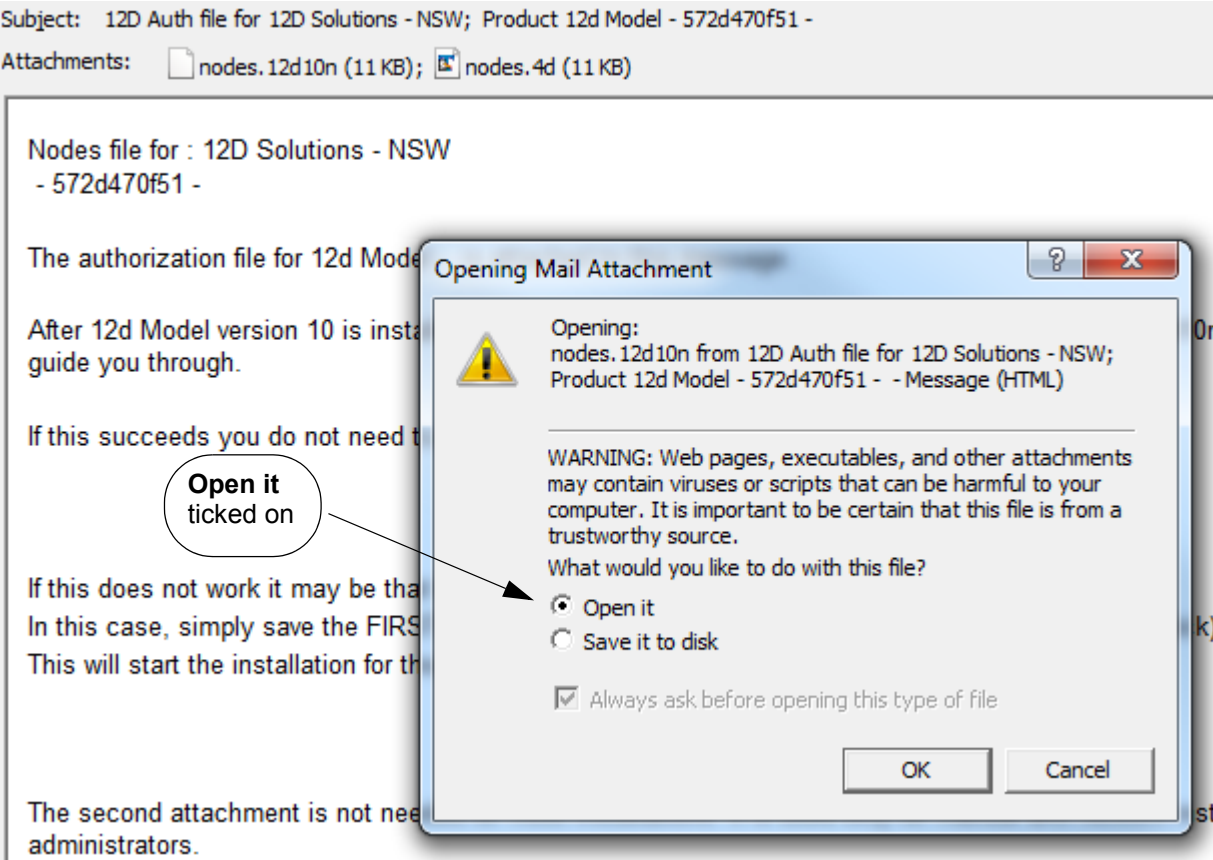
- (a) **which dongles** are authorised to run **12d Model**
- (b) what **version** of **12d Model** will run for a dongle
- (c) what **modules** are authorised to run for a dongle

To authorise your **12d Model**, two files **nodes.12d10n** and **nodes.4d** will have been emailed to you by your local **12d Model** Distributor.

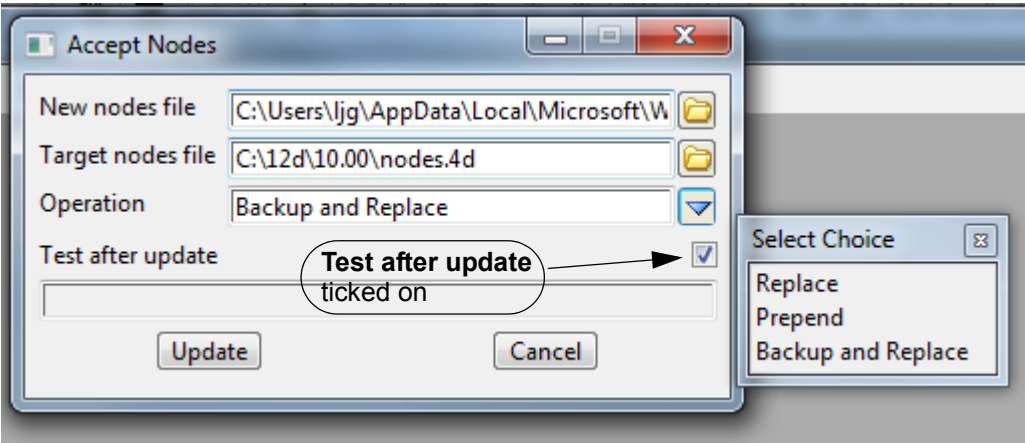


Installing **12d Model** sets up a *Windows* file association so that a **nodes.12d10n** file is recognised by **12d Model** and automatically installs a **nodes.4d** file in the correct location.

In the email, double click on the files **nodes.12d10n**, click on **Open it** and then click on **OK**



The **Accept Nodes** panel then appears

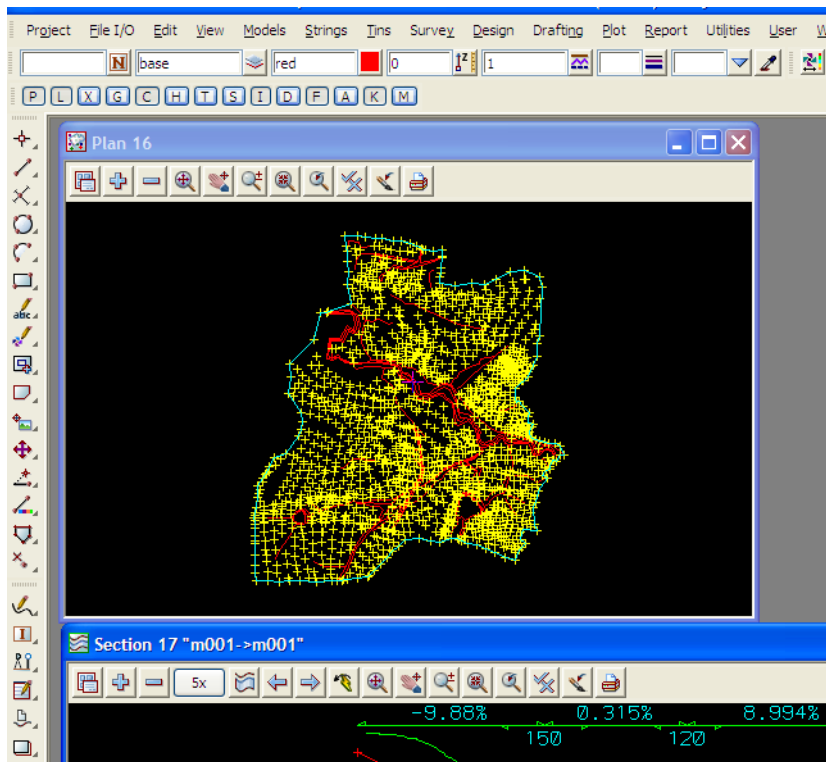


Select **Back up and Replace** for Operation, tick on **Test after update**, and then click **Update**.
12d Model saves the **nodes.4d** file to the folder **C:\12d\10.00** and then loads the project **Dam**.

Note - if you don't have one or both of the files **nodes.4d** or **nodes.12d10n** attached to an email but instead have either of the files in a folder accessible from your computer, then you can do the following:

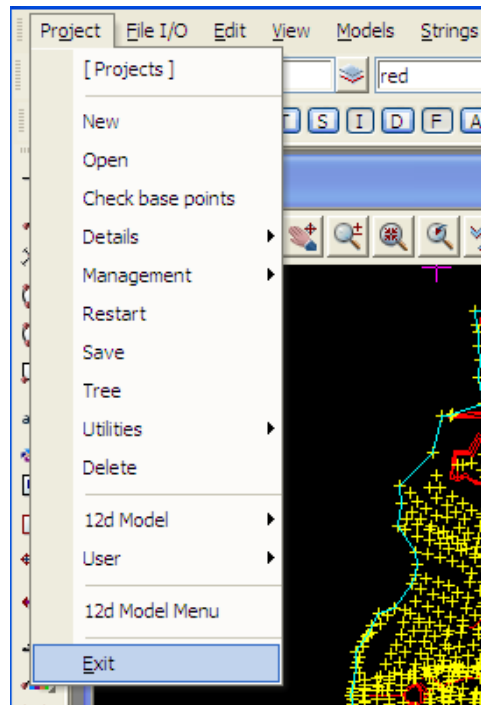
If there is a **nodes.12d10n** file, double click on that file and the **Accept Nodes** panel should appear and you continue with the instructions above.

If that doesn't work or you only have a **nodes.4d** file, start up **12d Model** and click on the **Nodes** button at the bottom of the **Project Selection** panel. This will also bring up the **Accept Nodes** panel and you can browse for the **nodes.4d** or **nodes.12d10n** file in the New nodes file panel field. You can then continue with the instructions above.



12d Model starting up and displaying the dam project shows that:

- (a) the dongle drivers have been successfully installed
- (b) **12d Model** has been successfully installed
- (c) the **12d Model** dongle is accessible
- (d) the **nodes.4d** file has been successfully installed and matches the dongle.



Click on **Project** and then **Exit** to shut down **12d Model**.

Step 6. Installing 12d Model Context Sensitive Help for Vista and Win 7

12d Model has a context sensitive reference help system which can be accessed directly from most menus and panels:

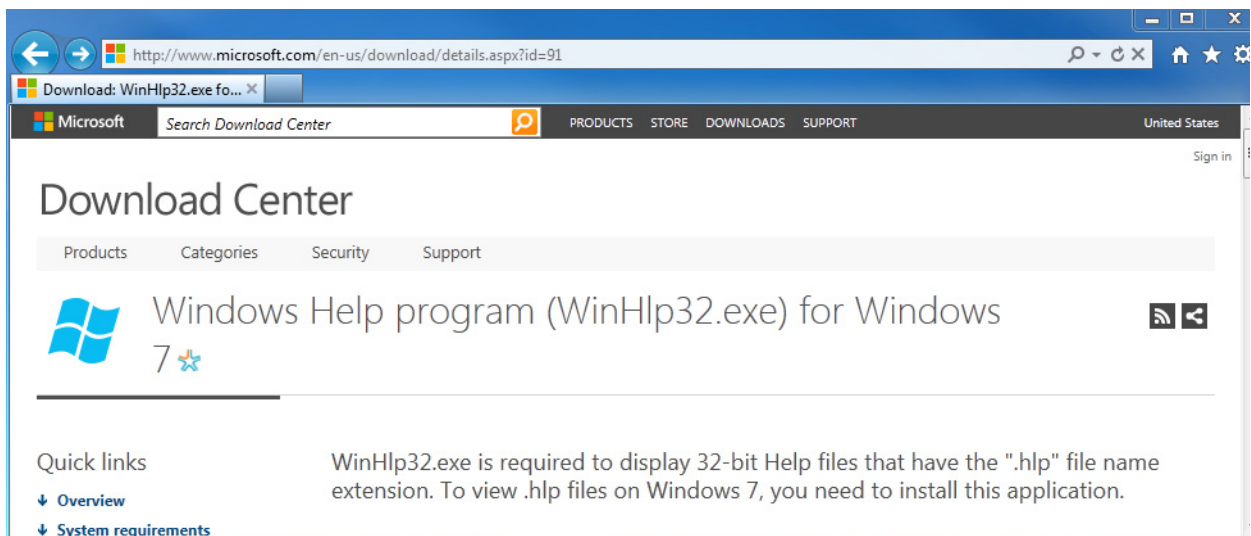
- For most menus in **12d Model**, when the menu is on the screen and has the Windows focus, simply press F1 and the **12d Help** will open automatically at that menu
- For most panels in **12d Model**, when the panel is on the screen and has the Windows focus, simply press F1 and the **12d Help** will open automatically at that panel
- Most panels in **12d Model** have a **Help** button on them and clicking on the **Help** button opens the **12d Help** at that panel
- By clicking on the option **Help =>12d Model**

The **12d Model** context sensitive help uses Microsoft's **WinHlp**.

For *Vista* and *Win 7*, Microsoft no longer ships the WinHlp.exe executable and Microsoft will no longer allow it to be installed by the 12d Model installation DVD.

So if you are running Vista or Win 7, you need to download and install WinHlp.exe from Microsoft's website to access the **12d Model Help** files. The link to the area for the download is

www.microsoft.com/en-us/download/details.aspx?id=91



Or if you have 12d Model up and running, the link is available on the menu

Help =>Microsoft 7

Note: the entire **12d Model Reference** manual is available in pdf format on the **Documentation** tab of the **12d Model 10 Installation** DVD.

CONGRATULATIONS - 12d Model has now been successfully installed and you have finished with these notes.

If **12d Model** did **not** install correctly, please continue to the next section, [12d Model 10 Not Authorising](#), of these notes.

12d Model 10 Not Authorising

If there is an **error** with the installation, then the **Error Authorizing Release Version** panel appears with possibly error message in the panel message area.

Error Authorizing Release Version

Environment Information

HOME_4D: C:\Program Files (x86)\12d\12dmodel

authorization: C:\12d\10.00\nodes.4d

Client: 12D Solutions - NSW

Aladin/Hardlock

HARDLOCK_4D:

DONGLE_4D:

HLS_IPADDR:

Wibu Key

WIBU_4D:

WIBU_DONGLE_4D:

WIBU_IPADDR:

System Information

Operating System: 7 Ultimate Edition Service Pack 1 (build 7601), 64-bit

12d Model: 32 bit 12d

Version: 10.0C1e DONGLE MISSING - Not For Production

Client: 12D Solution - NSW

Dongle: **NO DONGLE FOUND**

Current date: 07, October 2012

using DISPLAY = :0.0
using Registry Key "SOFTWARE\Microsoft\Windows\CurrentVersion\App Paths\12d.exe\10\l
Nodes file found <C:\12d\10.00\nodes.4d>
nodes.4d: error -206: cpu line is missing for matching dongle
nodes.4d: error -206: cpu line is missing for matching dongle

Installation messages and error messages area

Wibu CPL Wibu Netmon Diagnotix Aksmon

Select Nodes Env.4d Projects

Finish Help

If there is no error message on the panel or it is still not obvious what the problem is, please check the list of possible errors in the next section [Possible Problems When Authorizing the Release Version](#).

For example, in the above panel, the NO DONGLE FOUND shows that no **12d** dongle has been detected.

Possible Problems When Authorizing the Release Version

1. The **12d dongle number** does not come up in the **Dongle** field of the **Error Authorizing Release Version** panel.

Error Authorizing Release Version

Environment Information

HOME_4D: C:\Program Files (x86)\12d\12dmodel

authorization: C:\12d\10.00\nodes.4d

Client: 12D Solutions - NSW

Aladin/Hardlock

HARDLOCK_4D:

DONGLE_4D:

HLS_IPADDR:

Wibu Key

WIBU_4D:

WIBU_DONGLE_4D:

WIBU_IPADDR:

System Information

Operating System: 7 Ultimate Edition Service Pack 1 (build 7601), 64-bit

12d Model: 32 bit/12d

Version: 10.0C1e DONGLE MISSING - Not For Production

Client

Client: 12D Solutions - NSW

Dongle: NO DONGLE FOUND

Current date: 07, October 2012

If no dongle has been detected then the NO DONGLE FOUND message is displayed. Otherwise the detected dongle number is displayed in this field

Please check that

- (a) the **12d** dongle is firmly attached to the computer.
If not, please attach the dongle and retry starting up **12d Model** and accessing a project.
- (b) if it is a parallel dongle, the dongle is before any Rainbow dongles. For example, before any AutoCAD dongle.
- (c) your computer has the latest dongle drivers installed. These can be obtained from *Updates* section of the web site www.12d.com.

If the dongle number still does not come up in the **Error Authorizing Release Version** panel, please click on the **Email info** button to bring up the **Email Information on 12d Model to 12D Solutions** panel. Fill in the panel and click on **Email** to send the information to 12D Solutions and then contact 12d Solutions or your local distributor.

Special Note If Using a Network Dongle

If you are using a network dongle, then your **env.4d** needs to be modified so that **12d Model** will correctly **search** for the Network dongle. In that case there will be information in the **Wibu Key** section of the **Error Authorizing Release Version** panel.

Aladin/Hardlock
HARDLOCK_4D
DONGLE_4D
HLS_IPADDR

Wibu Key
WIBU_4D
WIBU_DONGLE_4D
WIBU_IPADDR

Accessing a 12d Network Dongle requires additional information in the env.4d file and this will appear in the Wibu Key section of the panel

If the Wibu Key section is blank then a network dongle can not be accessed.

-local -network_last

If the Wibu Key section is blank then a network dongle will not be searched for and so cannot be accessed.

Please see the notes on *Installing a Network Dongle* under the **Documentation** tab of the **12d Model 10 Installation** DVD on how to set up the env.4d file correctly for accessing a network dongle.

- 2. Check if there is a recent **nodes.4d** or **nodes.12d10n** file in the correct area on your computer, which by default is in the folder C:\12d\10.00.

The nodes.4d file found is displayed in the **Authorization** field.

Error Authorizing Release Version

Environment Information
HOME_4D
authorization
Client

C:\Program Files (x86)\12d\12dmodel

C:\12d\10.00\nodes.4d

12D Solutions - NSW

if not blank, it shows where the **nodes.4d** file is coming from

If it is blank then no nodes.4d has been found.
If you do not have a **nodes.4d** or **nodes.12d10n** file, contact your local distributor.

- 3. The **Client** field in the **Error Authorizing Release Version** panel has NO CLIENT FOUND.

Client: NO CLIENT FOUND
Dongle: 572d470f51
Current date: 08, October 2012

If no valid client has been found in the nodes.4d file then the NO CLIENT FOUND message is displayed.
Otherwise the detected client name is displayed in this field

Client: 12D Solutions - NSW
Dongle: 572d470f51
Current date: 08, October 2012

If the **Client** field has a valid *Client Name* in it then that indicates that a **12d Model 10 nodes.4d** file is being read and has a valid Client line in it.

4. Client and Dongle fields look correct but you now get an **error -206**

Client: 12D Solutions - NSW
Dongle: 572d470f51
Current date: 08, October 2012

using DISPLAY = :0.0
using Registry Key "SOFTWARE\Microsoft\Windows\CurrentVersion\App Paths\12d.exe\10\\
Nodes file found <C:\12d\10.00\nodes.4d>
nodes.4d: error -206: cpu line is missing for matching dongle

There is no valid line for the dongle in the nodes.4d file

This error now indicates that there is **no** line, or no valid line, in the **nodes.4d** file for the dongle number given in the **Dongle** field.

If you do not have the correct **nodes.4d** file, contact your local distributor.

5. Check that the date on your computer is correct.

Client: 12D Solutions - NSW
Dongle: 572d470f51
Current date: 08, October 2012

Is this todays date?
Having the incorrect date can corrupt files.

If the date is not correct then be very careful. Having an incorrect date in your computer can

corrupt computer files and **12d Model** projects.

- 6. If the date on your computer is correct then you need to check that it is between the *start* and *end dates* given in the line in the *nodes.4d* file for your dongle.

Client	12D Solutions - NSW
Dongle	572d470f51
Current date	08, October 2012

If there is no valid date line in your *nodes.4d* file for your dongle, then contact your local distributor for a new *nodes.4d* file.

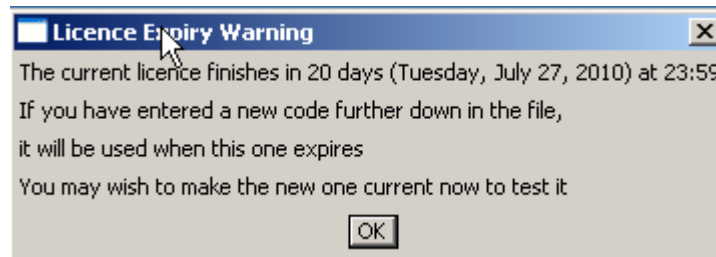
- 7. **12d Model** still can't access a project.
Please contact your local distributor.



Licence Expiry Warning

The **nodes.4d** file that controls *12d Model*, only validates *12d Model* to run for a certain period of time.

If when running **12d Model**, the **Licence Expiry Warning** panel appears:

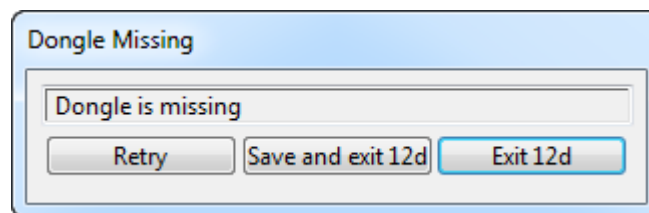


it simply means that the **nodes.4d** file needs to be updated.

Please contract your **12d Model Distributor** to obtain a new **nodes.4d**.

Dongle Missing

If when running **12d Model**, the **Dongle Missing** panel appears:



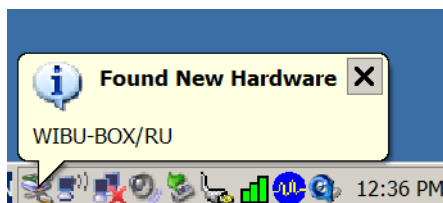
it simply means that the **12d** dongle can no longer be seen by **12d Model**.

Please check that your **12d** dongle is still attached to your computer, or if you are using a network dongle, that your network is still active.

Even if you can not see the dongle, **12d Model** will allow to save your current work do nothing is lost.

Wibu XP SP2 Problems

Once the WIBU drivers been successfully installed and the WIBU USB dongle is attached to the USB port, **Windows XP** realises new hardware has been attached to the USB port and the *Found New Hardware (WIBU-BOX/RU)* message is displayed

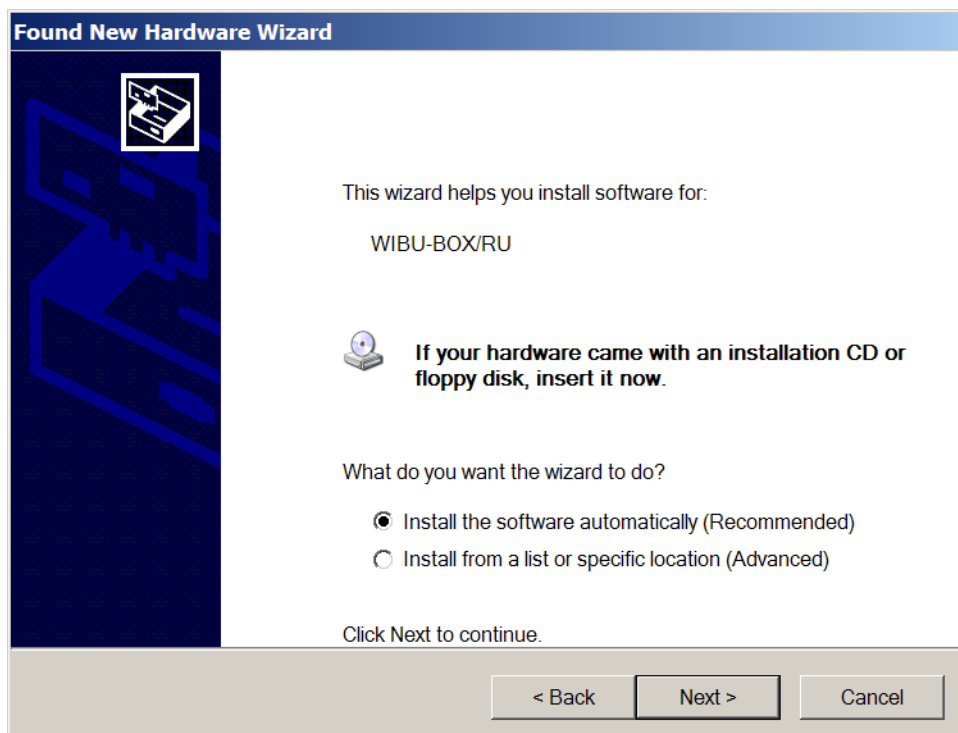


Unfortunately, XP SP2 does not find the WIBU-BOX/RU drivers and automatically install them and you get the Found New Hardware Wizard instead:

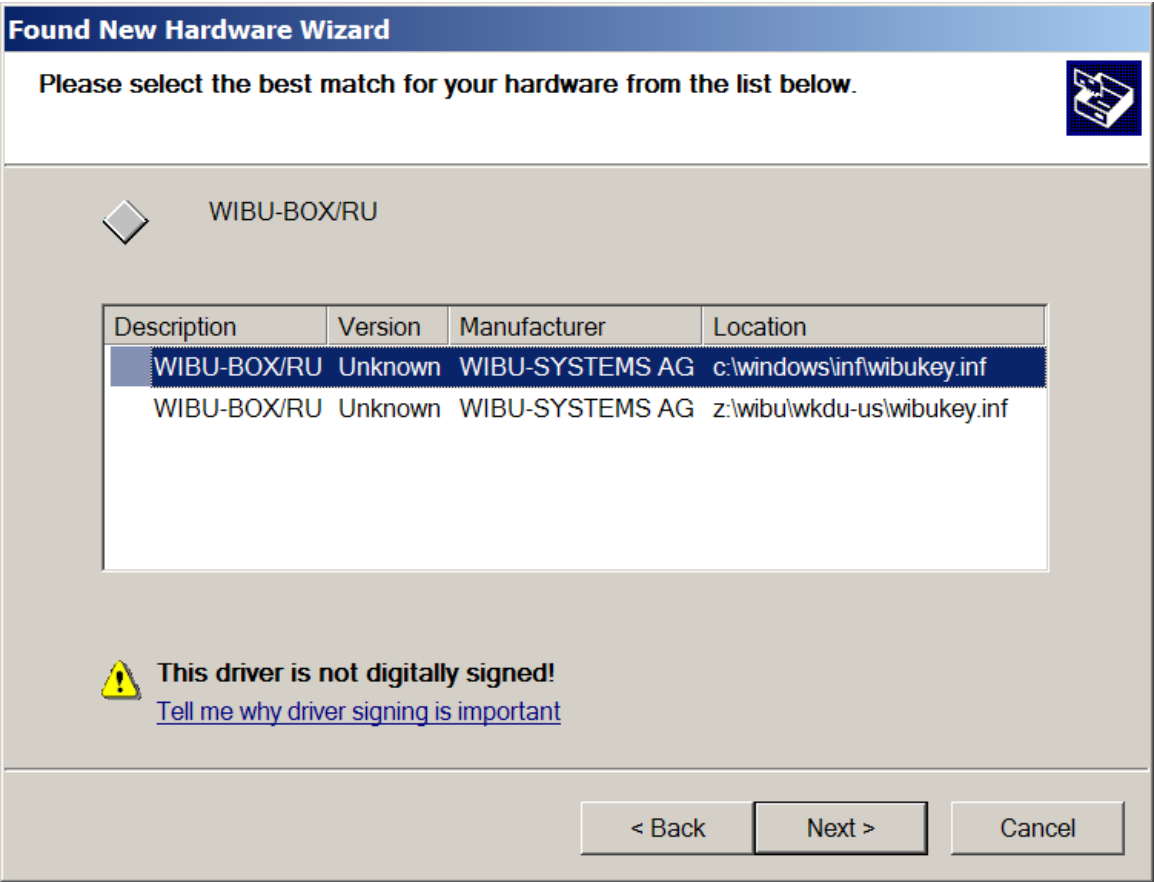




Click on **No, not this time** and select **Next** to continue



tick **Install the software automatically** and select **Next** to continue

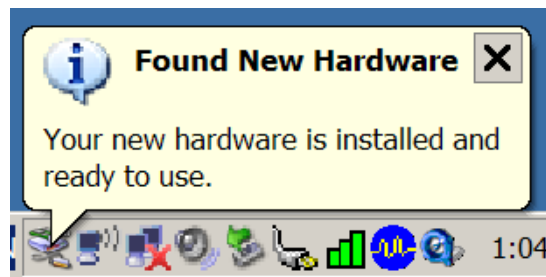


NOTE: XP now finds **C:\windows\inf** but for some reason can't when it first detects the new hardware (as it used to do in earlier XP's and Win 2000).

choose either location and select **Next** to continue



select **Finish**



The new hardware has now been installed

2 Installation of 12d Model 10 Practice Version

The *Practise* version is limited to a maximum of 5,000 points and creates projects that cannot be accessed by the *Release* versions of **12d Model** and vice-versa. However the *Practise* version can be used free of charge by 12d Solutions customers and registered *Practise* Users.

These notes are for installing the ***Practise version*** of **12d Model 10**. There are separate notes for installing the *Release* version.

The *Practise* version must be Registered with 12d Solutions once it is installed on a computer. A new Registration is required for each computer that the *Practise* version is run on.

The *12d Model 10 Installation CD* can be used to install the *Practise* versions of **12d Model 10**.

Or

The file *12dModel 10 Practise.exe* can be down loaded from the web site www.12d.com. The file *12dModel 10 Practise.exe* is a self-extracting file for installing the *Practise* version of **12d Model**.

Extra Notes for All Installations

1. A three-button mouse is essential.
2. The *12d Model Installation CD* contains extra information other than just the installation version of *12d Model*. For example, extra documentation, course notes and source code to macros.

The extra data can be copied from the *12d Model Installation CD* but the copied files may only have a “read only” attribute set. This means that the files can not be edited or modified in any way.

To change the attribute so that a file can be modified, select the file in Explorer, bring up the Properties sheet and under the General tab sheet change the “read only” box so that it is not ticked on.

Selecting **OK** or **Apply** will then modify the attribute of the file.

Installing the Practise Version of 12d Model 10

These notes are for installing the **Practise** version of 12d Model 10. There are separate notes for installing the **Release** version.

A. Disk Space required for installing 12d Model 10

Approximately 200 megabytes of disc space will be required for the installation to succeed. After installation this can be reduced to a minimum of 60 megabytes.

B. Before installing from the DVD or the Web

For Windows 2000, XP, Vista, [Windows 7](#):

Reboot the PC **before** installing 12d Model from the DVD or the Web.

Your login must have Administrator privileges.

C. Installing 12d Model from the Web

The self-extracting file *12dModel 10 Practise.exe* can be down loaded from the web site www.12d.com and used to install the *Practise* version of *12d Model*.

After down loading *12dModel 10 Practise.exe*, double-click on *12dModel 10 Practise.exe* and the installation software will be automatically extracted from the file and fires up the **Install 12d Model Practise** screen.

Please go to section [Dialogues from the 12d Model 10 Practise InstallShield Wizard](#):

D. Installing Using the 12d Model 10 Installation DVD

Insert the **12d Model 10 Installation DVD** into the CD drive.

On inserting the CD, the **12d Model** Setup program automatically begins.

If it doesn't, simply double click on the program **Launch.exe** from the DVD.

The **12d Model Release** front screen will appear.



Click on the **12d Practise** tab

The **12d Model Practise** screen will appear.

E. 12d Model Practise Screen

The **12d Model Practise** screen:

Note - when installing from the web, the *tabs* with *12d Release*, *12d Practise*, *Other Software* and *Documentation* will not appear. The extra tabs only appear if you are installing from the *12d Model Installation DVD*.



The Steps on the **12d Practise** tab of the *12d Model Installation DVD* will lead you through the installation of the *Practise* version of *12d Model*.

A **video** to guide you through the installation process can be viewed by clicking on **Videos** under the **Installation notes** heading. Or the **Installation Notes** in pdf format can be viewed by clicking on **Notes** under the **Installation notes** heading.

NOTE - If the *Camtasia* codec is already installed on your computer then you can proceed to **Install 12d Model 10 Practise**.

Step 1. Install Camtasia Codec

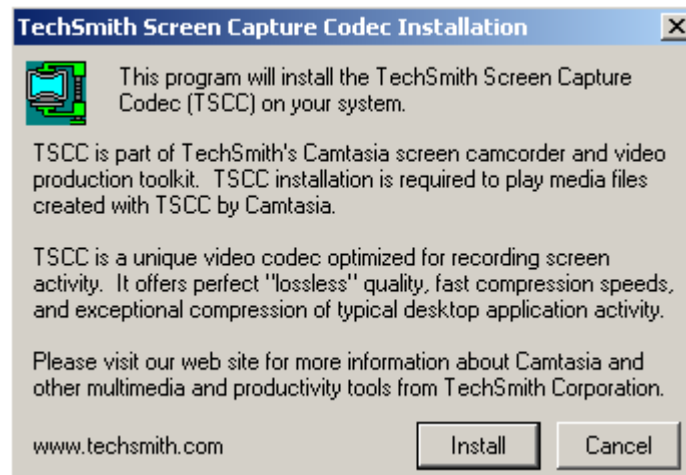
Install the Camtasia Codec that is used for displaying some of the videos on the **12d Model Training CDs** and DVDs.

Note - you need Administrator rights to install the Camtasia Codec.

Click on *Camtasia codec*:

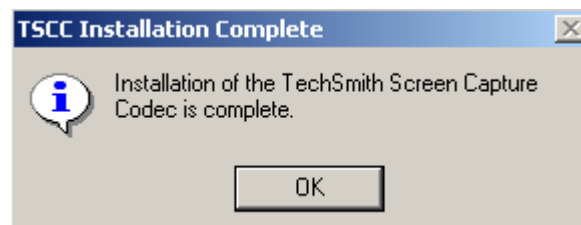
Installation

Installation message



Select **Install** to continue with the installation

Installation Complete



Select **OK**.

This completes the installation of the *Camtasia Codec*.

The **12d Model Practise** screen will then appear.

Step 2. Install 12d Model 10 Practise From DVD



Installing the 12d Model Practise software and Training area:

Note - you need Administrator rights to install **12d Model 10 Practise**.

Click on **12d Model 10 Practise**:

The installation will then start.

Step 3. Dialogues from the 12d Model 10 Practise InstallShield Wizard:

Welcome

Welcome message



Select **Next** to continue with the installation

Warning for commercial competitors

12d Solutions warning



The **12d Model Practise** version and all documentation are supplied by *12d Solutions Pty Limited* for the use of **12d Model** Customers and genuine prospects only. The use of the **12d Model** practise versions by commercial competitors to **12d Model** is strictly prohibited.

Select **Next** to continue if you are a **12d Model** Customers or a genuine prospect

Software License Agreement

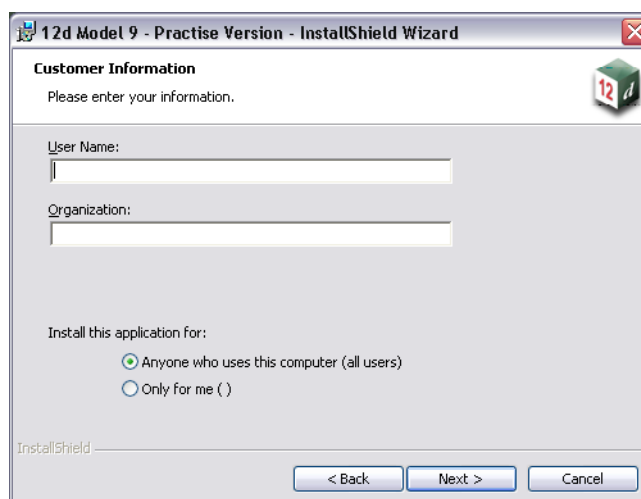
12d Solutions license agreement



If you agree with the License conditions, click on *I accept the terms in the license agreement*

Select **Next** to continue with the installation

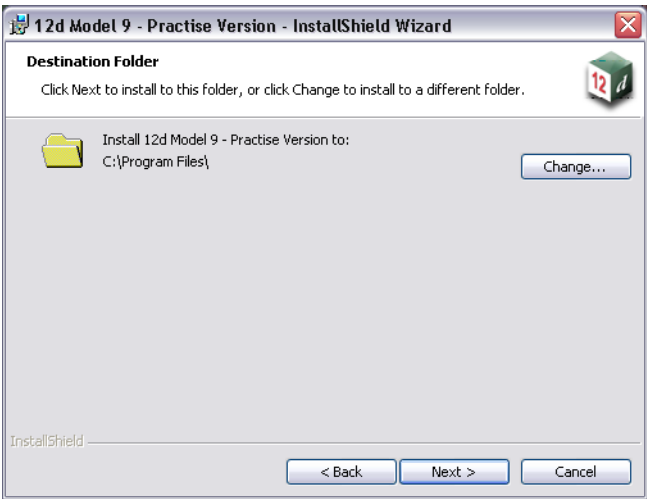
Customer Information



fill in *User Name* and *Organisation*, tick who can use the computer

select **Next** to continue with the installation

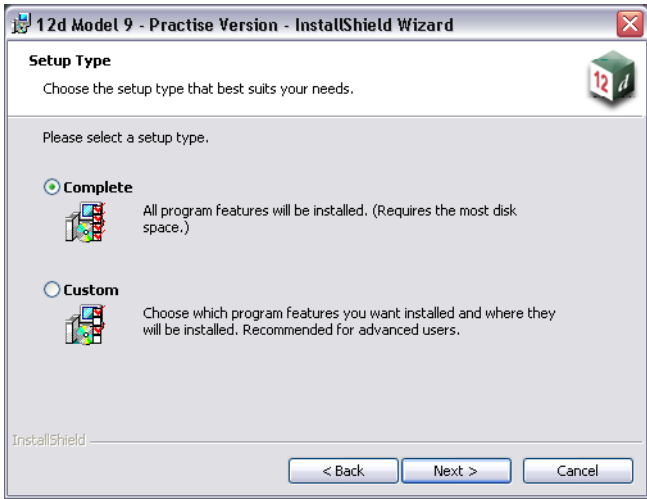
Destination Folder



continue with the default installation area for the software *c:\Program Files* or click on *Change* to browse to another area for installation

select **Next** to continue with the installation

Setup Type

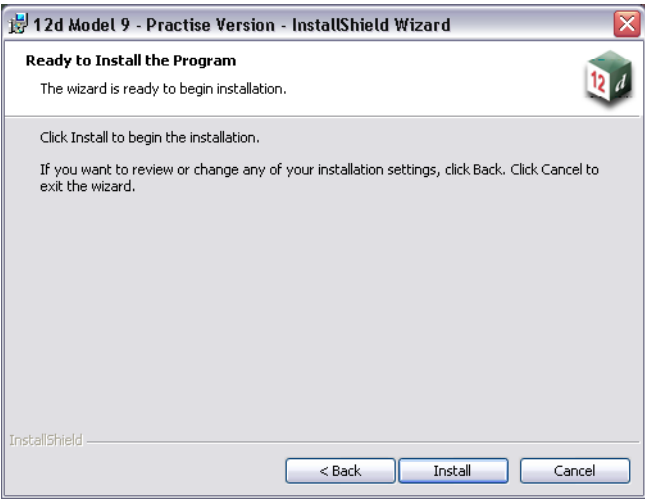


select **Complete**

select **Next** to continue with the installation

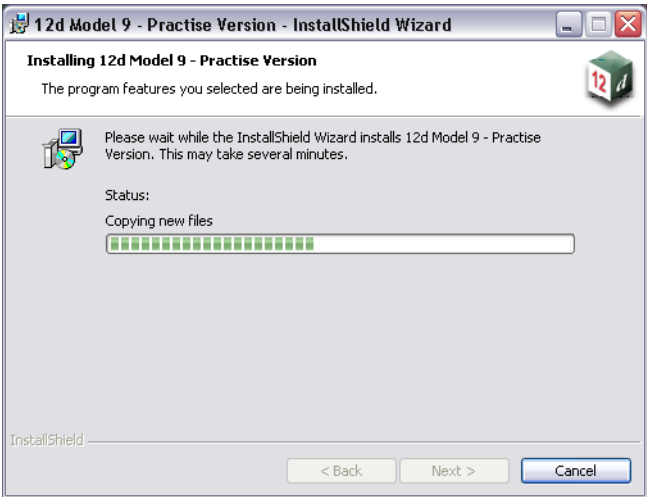
Ready to Install

Begin the installation



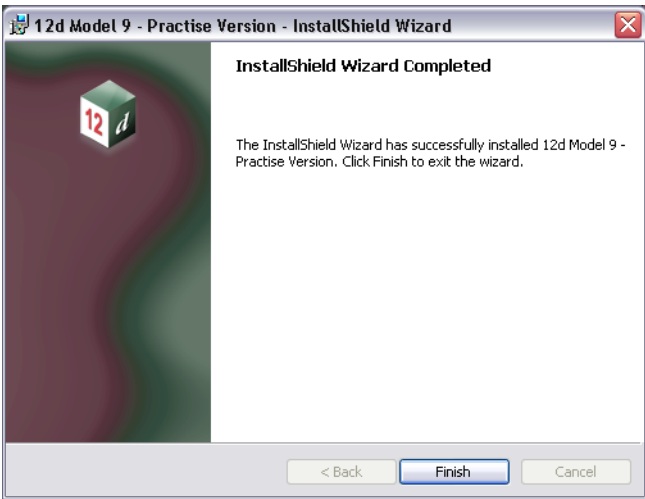
select **Install** to continue the installation

The software will be copied onto the computer and installed.



Setup Complete

End of installation



Select **Finish** to complete the installation

The **12d Model Practise** screen will then appear.



Select **Exit** at the bottom right hand corner of the screen to end the installation.

For **Practise** versions, the software needs to be authorised by emailing information about your computer to 12d Solutions.

The form for the required information is automatically created when an unauthorised *12d Model Practise version* is **started up**. The form can be emailed to *12d Solutions* from the *12d Model Practise* software.

Folders and Icons Created by Installing 12d Model Practise

Folders Created by the Installation

(a) For *12d Model Practise* on Windows 32-bit operating systems:

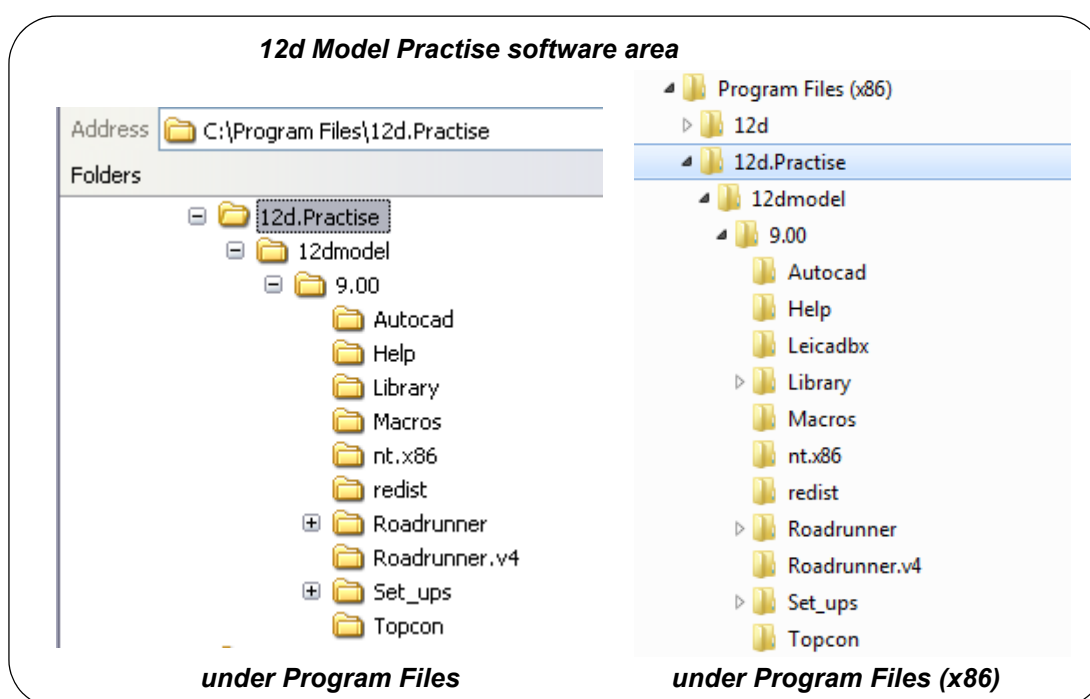
the *12d Model Practise* installation loads the **12d Model Practise software** into the folder
C:\Program Files\12d Practise\12dmodel\10.00

OR

(b) For *12d Model Practise* on Windows 64-bit operating systems:

the *12d Model Practise* installation loads the **12d Model Practise software** into the folder
C:\Program Files (x86)\12d Practise\12dmodel\10.00

12d Model Practise users normally only have **read** access to the *Program Files* and/or *Program Files (x86)* areas.

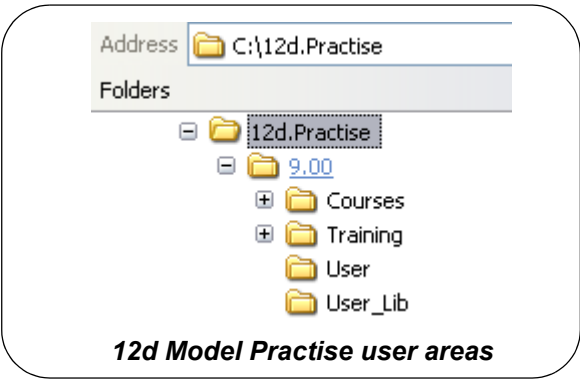


The *12d Model* installation also creates an area

C:\12d Practise\10.00

which during the installation is given read/write access for the user.

The folder 12d Practise\10.00 contains the training data used with the *Getting Started for Design* and *Getting Started for Surveying* manuals and the subfolders **User** and **User_Lib** are created for future user customisations of *12d Model*



Icon Created by the Installation

The installation loads the appropriate components and creates the **12d Model 10 Practise** icon



The *12d Model 10 Practise* icon fires up **12d Model Practise** and attaches to the folder *12d Practise\10.00*.

Authorizing the Practise Version of 12d Model 10

Warning

The *12d Model Practise* version and all documentation is supplied by *12d Solutions Pty Ltd* for the use of 12d Model Customers and genuine prospects only. The use of the *12d Model Practise* version by commercial competitors to **12d Model** is strictly prohibited.

The Practise version is limited to a maximum of 5,000 points and creates projects that cannot be accessed by the Release versions of 12d Model and vice-versa. However the Practise version can be used free of charge by *12d Solutions* customers and registered Practise Users.

The Practise version needs to be Registered with *12d Solutions* once it is installed on a computer and a new Registration is required for each computer the Practise version is run on.

The installation creates the **12d Model 10 Practise** icon:



Next fire up **12d Model Practise** by double clicking on the *12d Model 10 Practise* icon.

*This will bring up the Project Selection panel with an **Authorize** button it.*

Click on **Authorize** to display the **Authorize Request Form** panel.

Authorization Request Form

WARNING!

The 12d Model practise version and all documentation is supplied by 12d Solutions Pty Ltd for the use of 12d Model customers and genuine prospects only. The use of 12d Model practise version by commercial competitors to 12d Model is strictly prohibited. The Requester hereby acknowledges that they are not using 12d Model for competitive purposes or passing any information on to a third party that is using the information for competitive purposes. The Requester hereby acknowledges 12d Solutions copyright in the 12d Model software and documentation whether or not it has been filed with the copyright office.

Press F1 for help.

First Name Family Name

Company Name

Address

Town/City Post/Zip Code

State Country

Phone Fax

Email Address

Email System

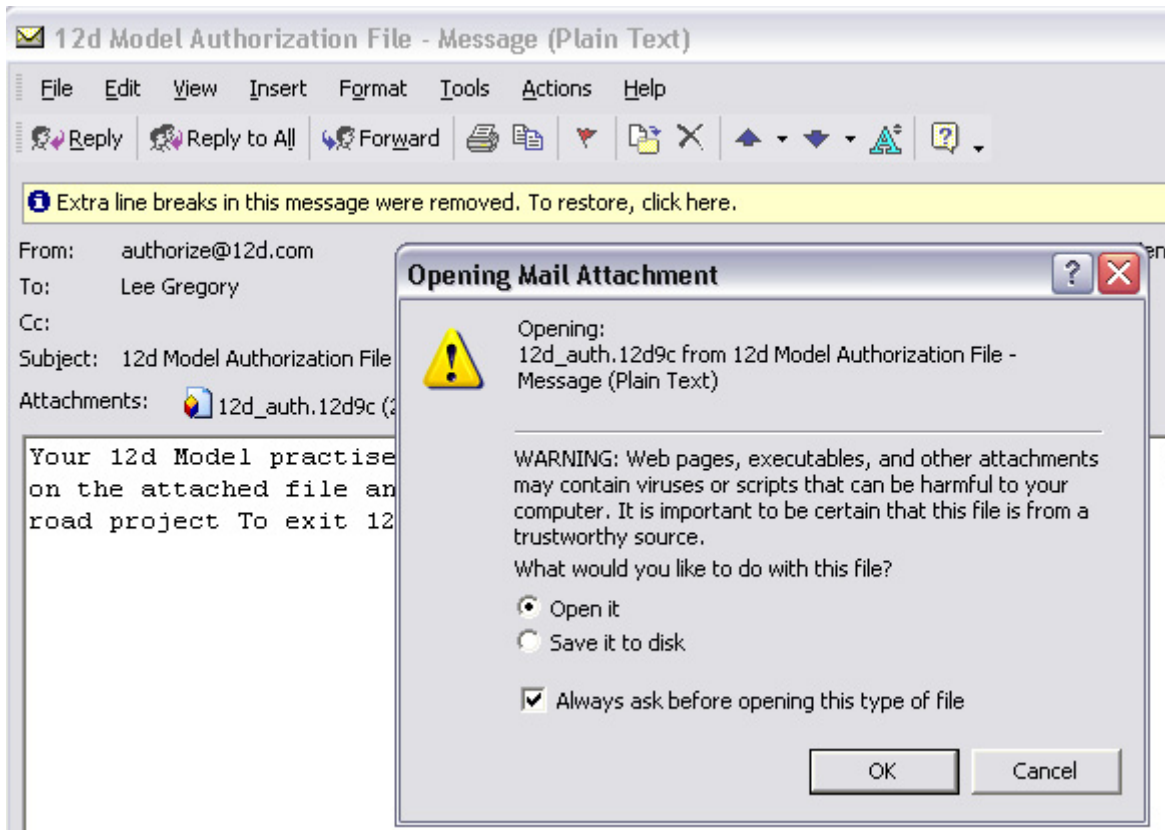
practise.4d: error 0:

Fill in the details (all those in black type must be filled in) and then either

- (a) click on the **Email** button to send the information to 12d Solutions Pty Ltd or if this fails
 - (b) click on the **Save** button. A file called *12d_auth.12d10r* is then written out to the folder **My Documents**. Please email this file (as an attachment) to authorize@12d.com
- Then click on the **Finish** to exit *12d Model*.

On receiving your request, 12d Solutions will generate an authorization code and send an email back to you with an attachment called **12d_auth.12d10c**

When you receive the email with the file *12d_auth.12d10c* attached to it, double click on the attached file *12d_auth.12d10c*, click on **Open it** and finally click on **OK**.



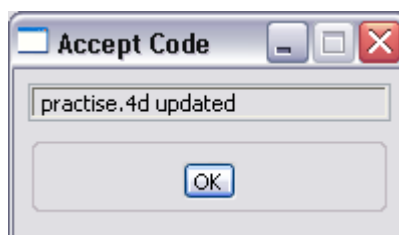
12d Model Practise will then start up and

validate the *12d_auth.12d10c* file, and if it is valid

save the authorization code away as the file *practise.4d* in the folder

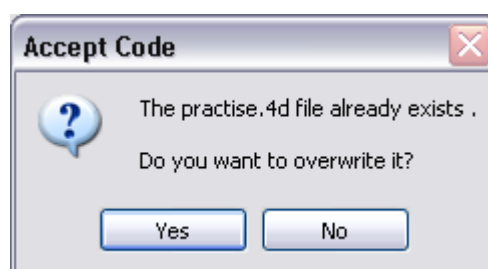
c:\12d Practise\10.00

and then bring up the *Accept Code* panel with the *practise.4d updated* message.



Click on **OK** and 12d Model Practise will open and display the project Road.

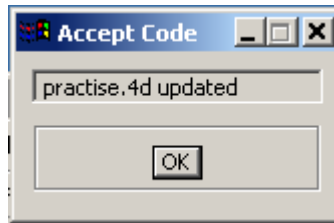
*Note: if you already have a *pratis.4d* file in the folder then the **Accept Code** panel will be brought up, stating that the *practise.4d* file already exists, and asking to overwrite it.*



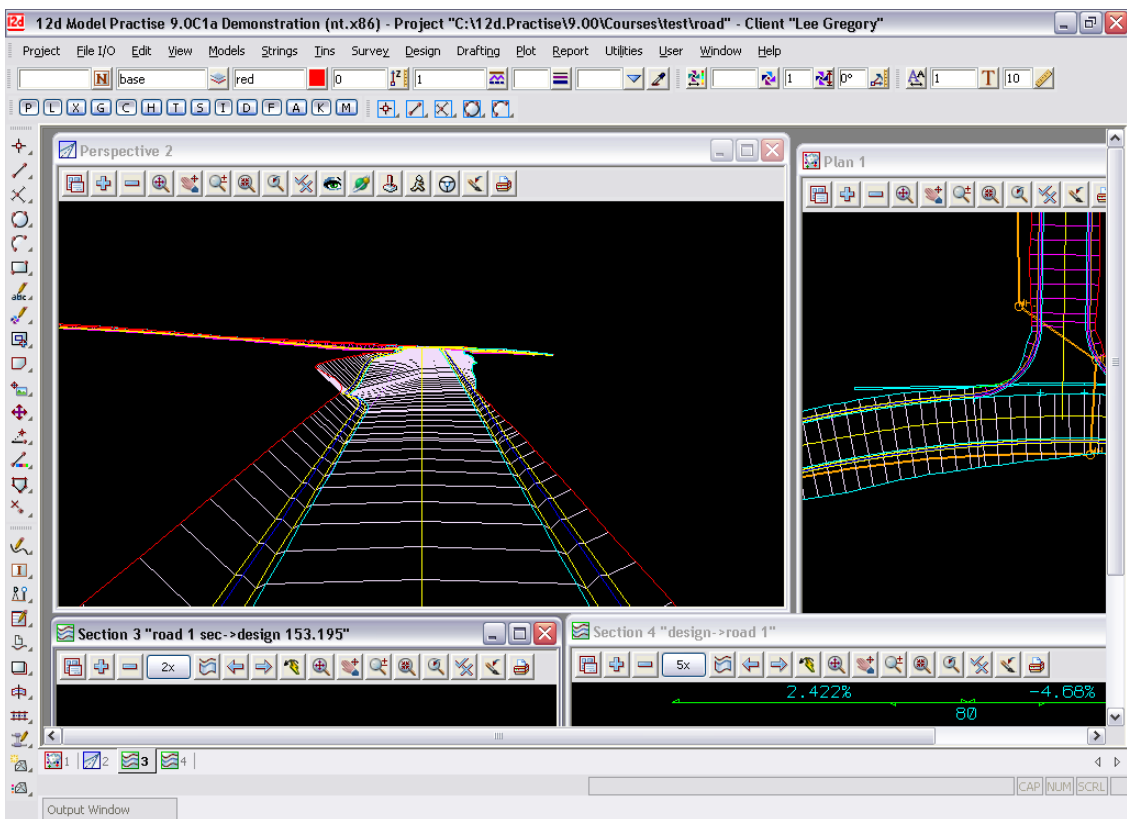
Click on **Yes** and the new authorization code will be saved away as the file **practise.4d** in the folder

c:\12d Practise\10.00

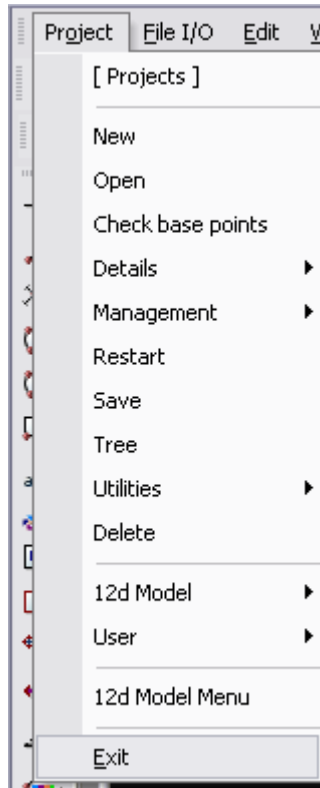
The **Accept Code** panel then comes up with the *practise.4d updated* message.



Click on **OK** and *12d Model Practise* will open and display the project *Road*.



To exit *12d Model Practise*, click on **Project =>Exit**



If *12d Model Practise* does not start up correctly, please go to the next section [Possible Problems When Authorizing the Practise Version](#)

Possible Problems When Authorizing the Practise Version

1. The date on your computer is not the correct date.
2. The computer your are authorizing is not the same one that the *Authorisation Request Form* was generated for.

The **12d_auth.12d10c** and the generated **practise.4d** file are only valid for the computer that the *Authorisation Request Form* was generated on. If you want the Practise version to run on another computer, you need to generate a new *Authorisation Request Form* on that computer and send it to 12d Solutions.
3. If you change your network card after generating the *Authorisation Request Form* then the authorization will stop working. A new *Authorisation Request Form* needs to sent to 12d Solutions.
4. If the file **12d_auth.12d10c** does not appear as an attachment then your email system can't handle MIME attachment. Please contact 12d Solutions at authorize@12d.com

4 Tools and Concepts

The **Tools and Concepts** chapter contains information about the definitions and behaviour of general items used in **12d Model** such use of the mouse, keyboard, how information is displayed on the screen, picking items *etc.*

Go to

- [The Mouse](#)
- [The Keyboard](#)
- [Screen Layout](#)
- [Ascii, Ansi and Unicode](#)
- [Data Types](#)
- [Text Definitions](#)
- [Symbol Definitions](#)
- [Tick Box](#)
- [Picking Strings](#)
- [X Y Z and Ch Ht Typed Input Box](#)
- [Tentative Typed Inputs](#)
- [Picking Point Ids \(Point Numbers, Vertex ids\)](#)
- [Snaps](#)
- [Text Grips](#)
- [Symbol Grips](#)
- [Expressions in Panel Fields](#)
- [Special Panel Fields](#)
- [Measures](#)
- [Last Expression](#)
- [Bearings and Angles](#)
- [Precision](#)
- [Colours](#)
- [Range Files](#)
- [Defaults](#)
- [Plotters](#)
- [Miscellaneous Panels](#)
- [No Option Available](#)
- [No Information Available](#)
- [Options on Toolbars](#)

For documentation on the first item, continue to the next section [The Mouse](#).

The Mouse

The mouse is used extensively in **12d Model**.

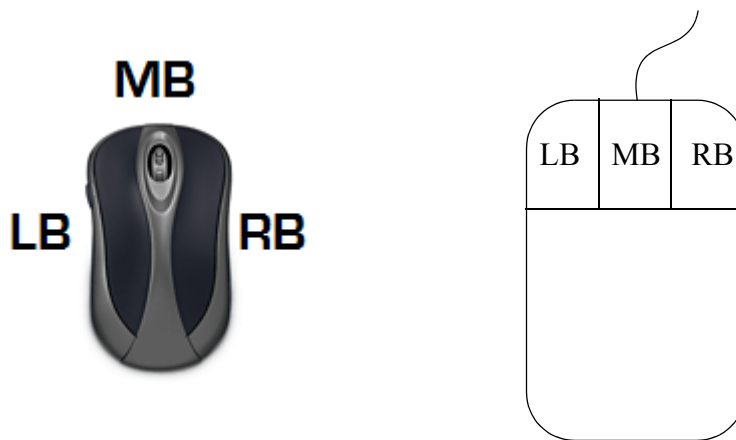
12d Model can be operated with either a two or a three button mouse but a three button mouse is preferred.

In this manual the buttons will be denoted by

LB = the left button

MB = the middle button

RB = the right-button



12d Model monitors the mouse being pushed down and when it is subsequently released as separate events. Unless otherwise specified in the manual, **clicking** a button will mean **pressing the button down and releasing it again**. The **position of the mouse** is normally taken as being when the **button is released**.

In screen messages, the effect of pressing each button on the mouse is shown by enclosing the effect for each button in square brackets ([]) in left-to-right button order. That is

[left button effect] [middle button effect] [right button effect]

Empty brackets, [], indicate that pressing the button has no effect at that time.

NOTE: If the Middle button is also a wheel, then the wheel can be used in some **12d Model** operations such as zoom.

Please continue to the next section [The Keyboard](#).

The Keyboard

For clarity, the characters and special keys on the keyboard will be enclosed in the angle brackets < >. For example, the delete key is .

When two or more keys are to be pressed down together, they will be shown in angle brackets separated by a plus sign (+). For example, <ctrl> + <d> means that the control key and d are pressed down together.

In **12d Model**, the *escape* key (normally labelled **Esc** on the keyboard and denoted by <esc> in this manual) is used to **stop drawing** in a view or to **break out** of computer intensive options (*escape* or *abort* the option) but still remain in **12d Model**. Options which can be terminated by <esc> are noted in the manual.

Please continue to the next section [Screen Layout](#).

Screen Layout

Inside the **12d Model** screen are six distinct areas (main menu, top tool bar area, side tool bar area, view area, output window and status bar) which create and control nine associated objects (panels, tool bars, control bars, floating menus, plan views, section views, perspective views, hidden perspective views and OpenGL perspective views) displayed on the screen.

The main areas and their purposes are:

(a) Main Menu

The **Main Menu** is at the top of the **12d Model** screen and is a standard Microsoft type menu. Options are selected in the standard Microsoft way and bring up **12d Model panels** and **floating menus**.

(b) Views Area

The **Views Area** displays the **12d Model** drawing views for seeing and examining the data. There is no limit to the number of **plan**, **section** or **perspective** and **hidden perspective views** that can be created, overlapped or iconized.

(c) Output Window

The **Output Window** displays **12d Model** system and error messages, and intelligent log lines. The Output Window can be turned on/off from the Main menu.

(d) Status Bar

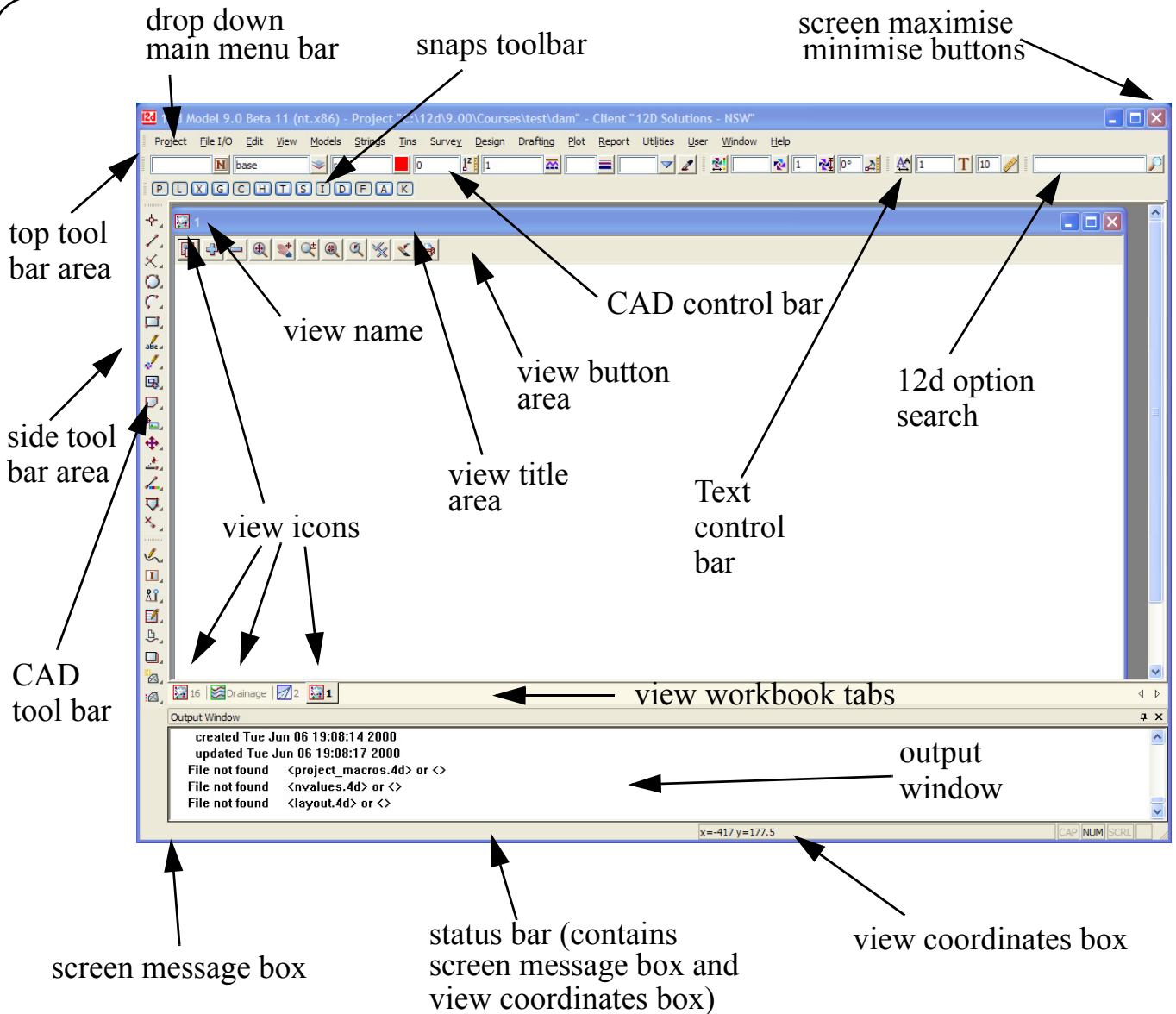
The **Status Bar** displays message prompts and the x, y and z co-ordinates of the cursor when it is in a drawing view. The Status Bar can be turned on/off from the Main menu.

(e) Top Tool Bar area

The **Top Tool bar area** is below the Main Menu and contains the CAD control bar, Text control bar and the snaps toolbar.

(f) Side Tool Bar area

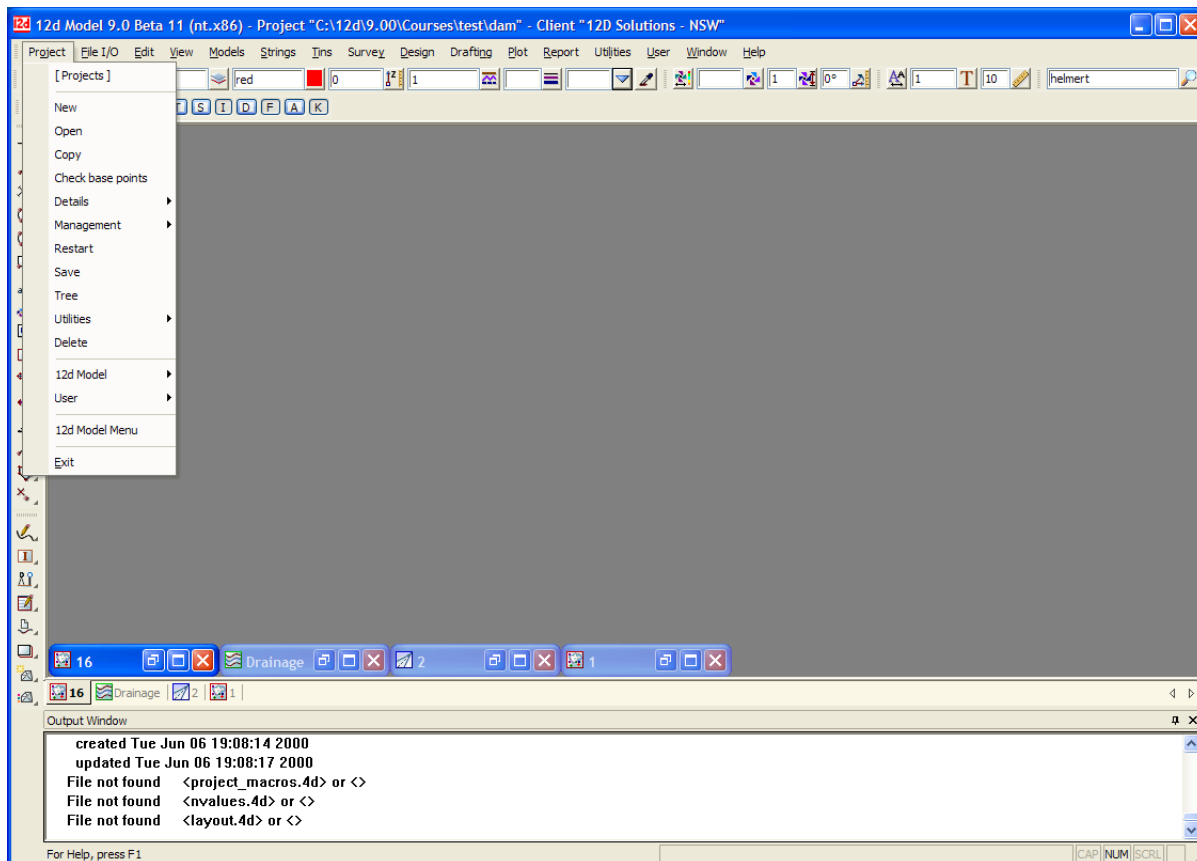
The **Side Tool bar area** is on the far left side and the CAD tool bar and other tool bars defined in *Toolbars.4d*



Please continue to the next section [Main Menu](#).

Main Menu

At the top of the **12d Model** window is the **Main** menu, a standard Microsoft type menu.



Options can be selected in the standard Microsoft way and bring up **12d Model** panels (dialogues) or create floating menus.

The **Main** menu can be moved around, or docked on any of the four sides of the window.

If the window is not wide enough, the **Main** menu will automatically wrap around onto two or more lines.

Please continue to the next section [Floating Menus](#).

Floating Menus

As well as the standard Microsoft type menu, **12d Model** has the concept of **floating (tear away) menus**.

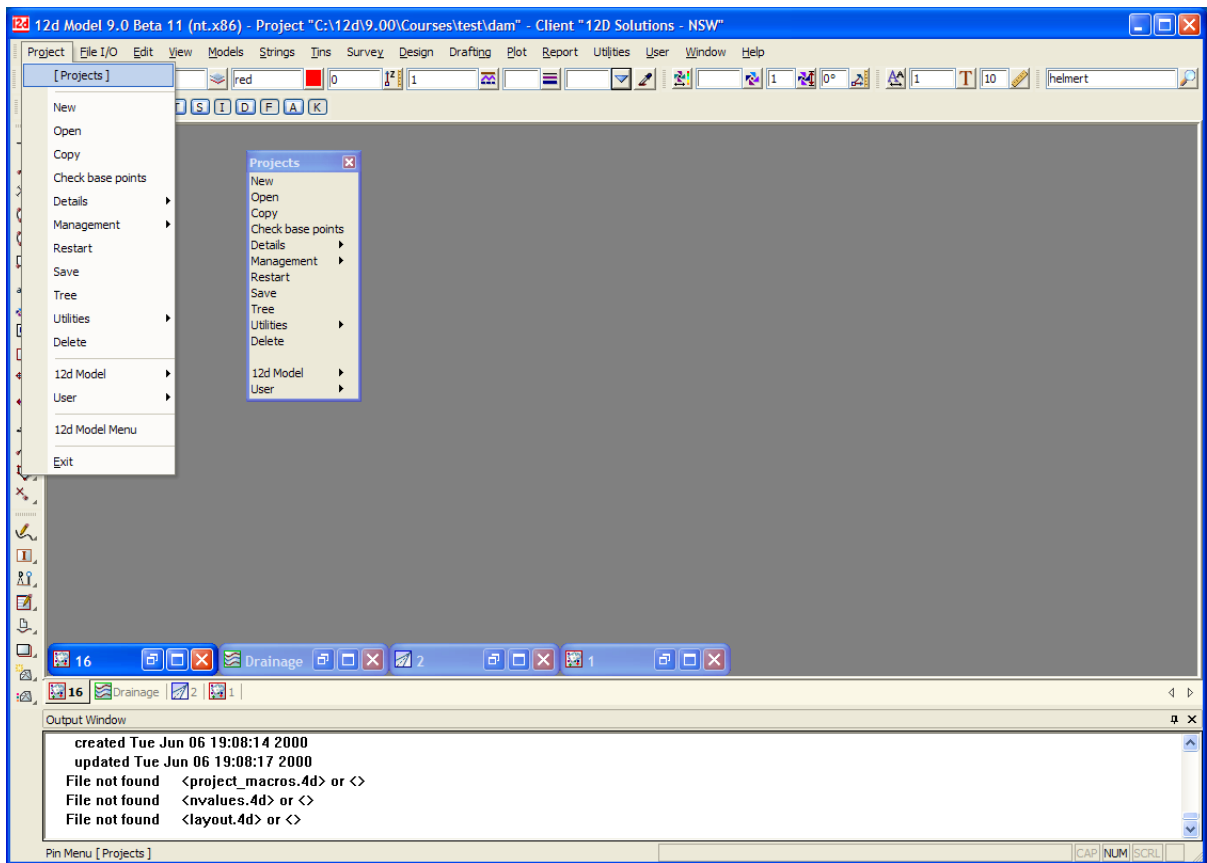
The presence of a floating menu on the Main menu is indicated by a menu item enclosed in square brackets []. Selecting a menu item in square brackets will create a floating menu of that name.

For example, selecting [Project] from the top menu Project creates the floating menu called **Projects**.

A floating menu can be moved around the screen, even outside the **12d Model** window, and will stay up until the [X] button is selected on the top right hand side of the floating menu.

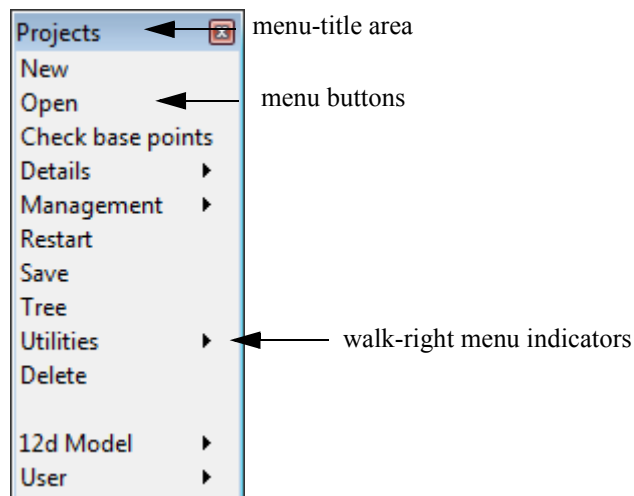
A floating menu created from the Main menu usually contains the same items and walk-right menus as the Main menu but has the distinct advantage that it doesn't disappear when the

cursor is moved to select other menus from the Main menu.



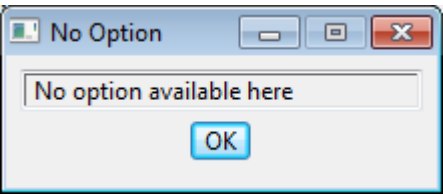
Floating menus or just Menus, consist of a menu title area and a series of options, called menu buttons, lined up under the menu title.

For example, the Projects menu looks like



An option on the menu is invoked (or selected) by clicking LB whilst over the option.

If no option exists, a **No Option** panel is placed on the screen. The panel will remain until the **OK** or **[X]** button is selected.



A ">" on a menu-option indicates that there is a **walk-right** menu attached to that button.

The walk-right menu only appears as the cursor **moves over** the >.

The walk-right menu can consist of further menu options and walk-rights.

If a walk-right menu is showing and the user wanders back into the menu where the walk-right originated, the walk-right menu will collapse back to the >.

Moving a Menu

A menu can be moved (dragged) by **holding down LB** anywhere in the menu title area (except on the [X] button) and then moving the cursor with the LB still depressed. A menu outline appears and moves with the cursor to indicate where the new menu position will be. The menu is finally positioned when LB is released.

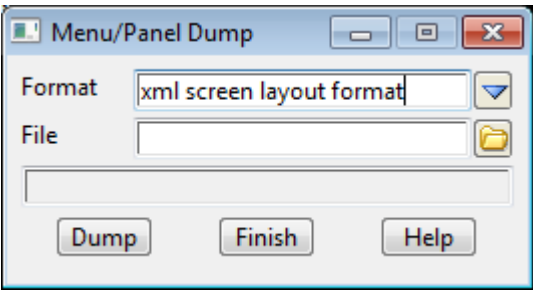
When an expanded walk-right menu is moved, a **copy** of the walk-right menu will be moved and placed on the screen as a new floating menu. The original menu still contains the walk-right menu.

Dumping a Menu or Panel

The menu or panel can be written out to disk in a variety of images formats, as a screen layout file, and for a panel, as a defaults file. This is called dumping the menu or panel.

The **dump** option is invoked by clicking the middle mouse button (MB) anywhere in the menu/panel title area. The **Menu/Panel Dump** panel is then displayed.

Note: If a screen layout file is created and added to the *layout.4d* file (by selecting *layout.4d* as the file name and selecting **Append**), then the menu/panel will appear whenever a project is opened. See [layout.4d](#)



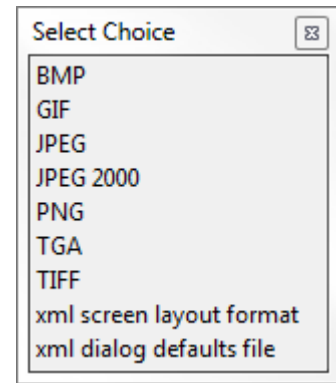
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Format

choice box

screen layout file



format for writing the menu/panel to disk.

File

file box

disk file to write the image or screen layout information to.

Dump

button

dump the menu information to disk.

Deleting a Menu

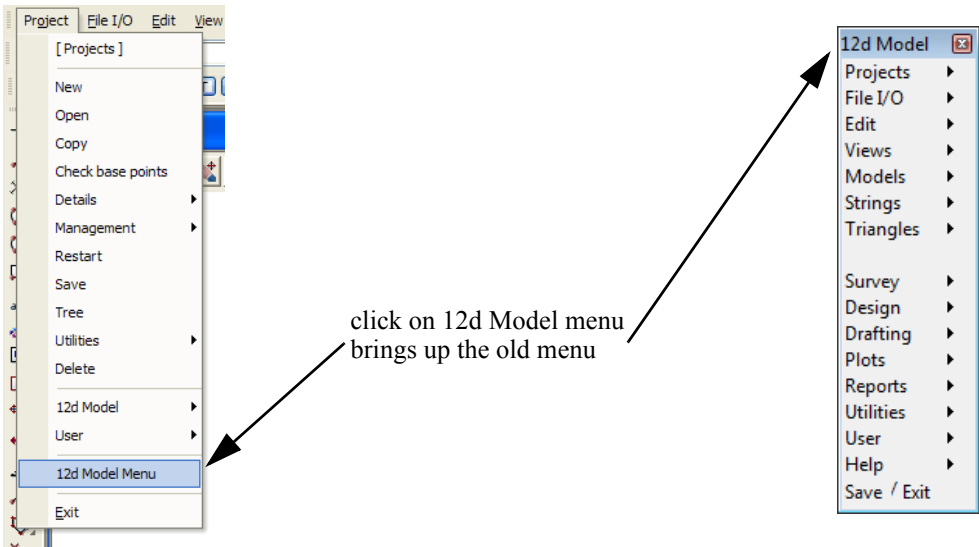
A floating menu is deleted by selecting the **[X]** button in the menu-title area.

Please continue to the next section [12d Model Menu](#).

12d Model Menu

The **12d Model** menu familiar from **12d Model** version 3.20 is available by selected **12d Model Menu** on the **Projects** menu.

Selecting **12d Model Menu** again will *remove* the **12d Model** menu.



All of the options down the **12d Model** menu are also available in the same order going across the **Main** menu.

Please continue to the next section [Toolbars and Controlbars](#).

Toolbars and Controlbars

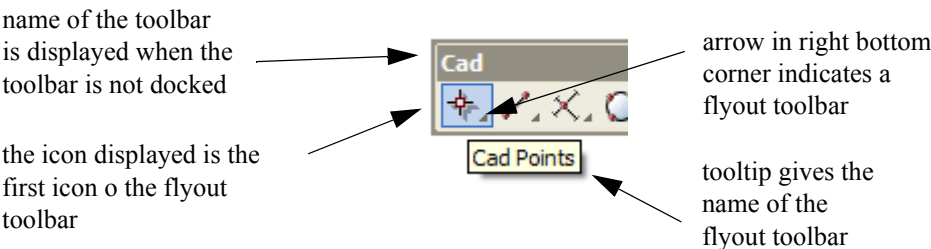
Toolbars

Options can be grouped together on *toolbars*. *Toolbars* are made up entirely of *icons* and each icon can have a **12d Model** option attached to it.

Toolbars have unique names which are displayed on the top of the toolbar when it is not docked.

Toolbars can also have one level of **Flyouts** of other toolbars and when a flyout exists, there is a small arrow on the bottom right of the icon to indicate a flyout exist. The *tool tip* for the icon gives the *name* of the flyout toolbar. The actual icon itself is the icon of the *first item* on the *flyout* toolbar.

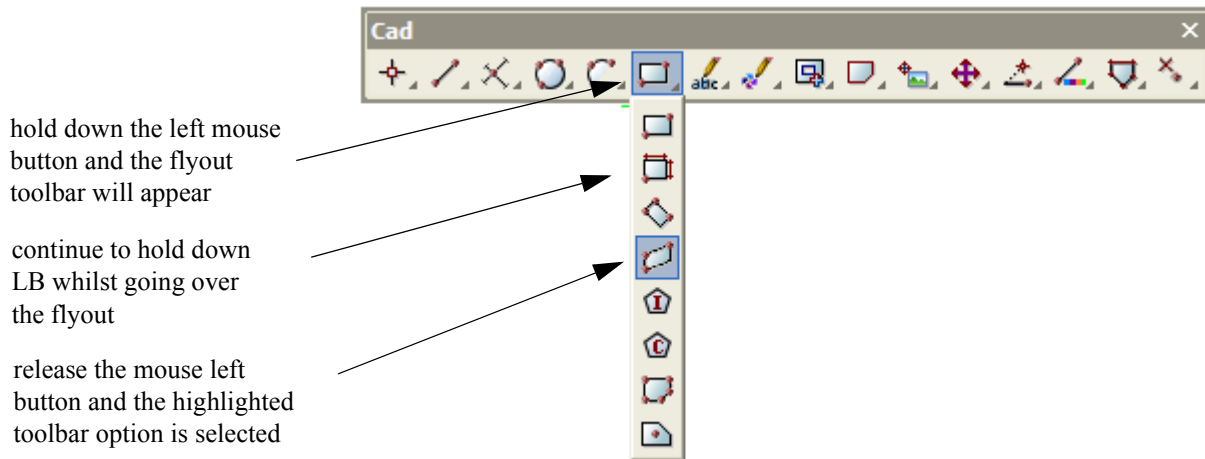
For example, the *CAD toolbar* is entirely made up of flyout toolbars.



To display and select from a flyout toolbar, hold down LB whilst over the icon on a toolbar with a

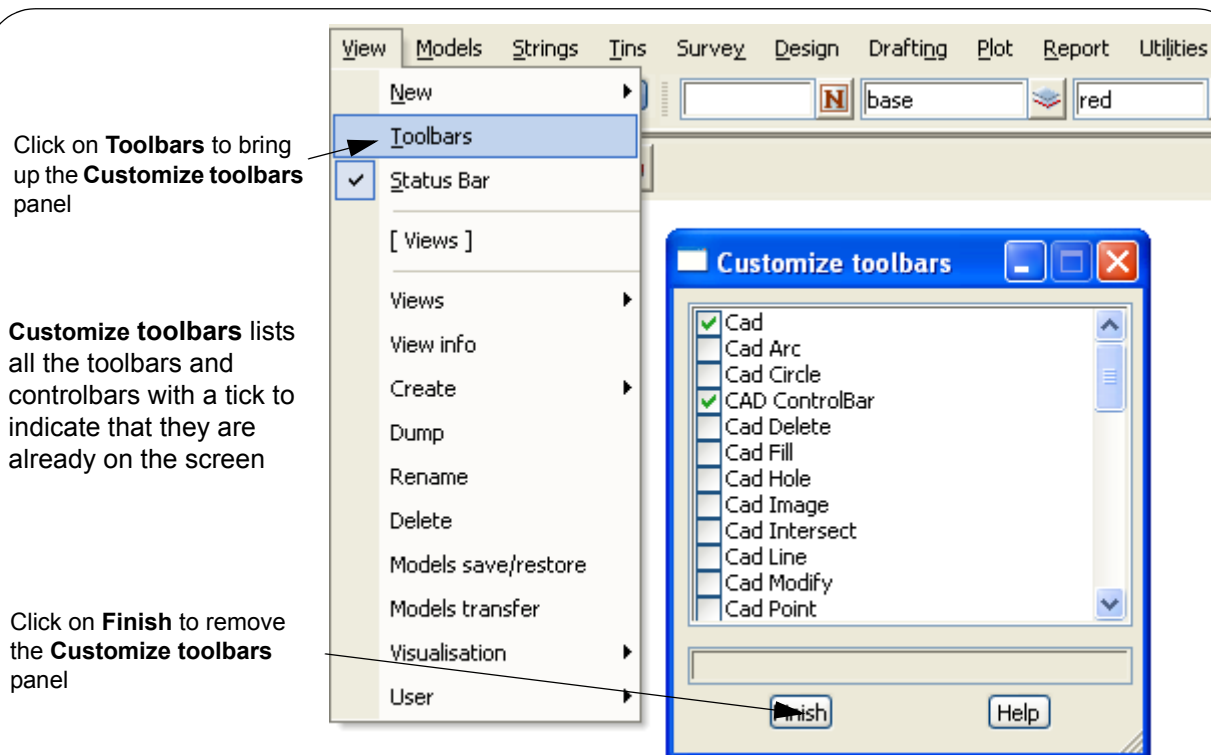
flyout menu and the flyout menu will appear. Whilst still holding down LB, move along the flyout toolbar to the appropriate option and then release LB. The option attached to the highlighted icon will then be selected.

Note - if LB is released whilst a icon with a flyout toolbar is highlighted, the first option on the flyout tool bar is selected.



All the toolbars in **12d Model** are defined in a file with the default name *toolbars.4d* (for the definition of toolbars, see the section [User Defined Toolbars](#) in the Appendix [Functions Keys, Menus, Toolbars](#)).

The list of all defined toolbars is given by selecting **View => Toolbars** from the main menu which brings up the **Customize toolbars** panel. A toolbar is shown with a tick if it is already on the screen.



Ticking **on** a toolbar in the list brings up the toolbar in the top left hand corner of the screen. The toolbar can then be moved or docked.

Ticking **off** a toolbar in the list removes the toolbar from the screen.

Important Note - the toolbars are not active whilst the **Customize toolbars** panel is on the screen. Close the

Customize toolbars panel as soon as you finished with it.

What toolbars are on the screen and their position is recorded with the project so that when a project is existed and later started again, the final position of the toolbars is restored.

Also at any time, a workspace file can be read in and define a new setup and position of toolbars. For more information on using workspace files, please go to the section [Project Workspace](#) in the chapter [Projects](#).

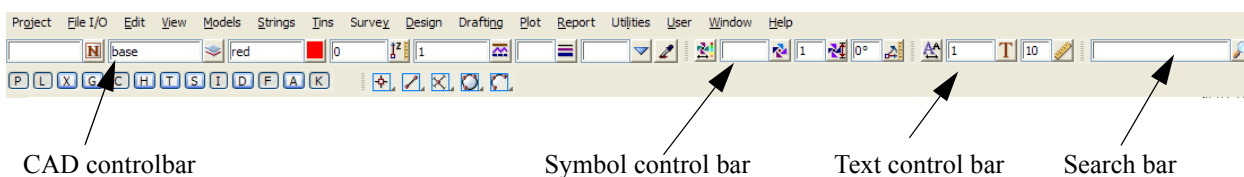
For links to the options on each *Toolbar*, go to [Options on Toolbars](#)

Controlbars

Controlbars can have icons on them but they also have controls such as a model box on them.

Controlbars are not user defined and there are only four of them in **12d Model** - the **Cad Controlbar**, **Symbol Controlbar**, **Text Controlbar** and **Search bar**.

This default position of the *controlbars* is on the top left hand side of the screen under the main menu.



Although not toolbars, the *Controlbars* do appear in the *Toolbars* list in the **Customize** panel and can be turned on/off and docked just like toolbars.

Important Note - the toolbars are not active whilst the **Customize** panel is on the screen. Close the **Customize** panel as soon as you finished with it.

The *controlbars* CAD, Symbol and Text are used by *CAD toolbars* and the *Strings Create* options. *Strings* created by the *CAD toolbars* and *Strings Create* options use values in the *controlbars* to define string properties such as name, model and colour.

Like toolbars, the type and position on the screen of controlbars is recorded with the project so that when a project is exited and then started later, the final position of the *controlbars* is restored.

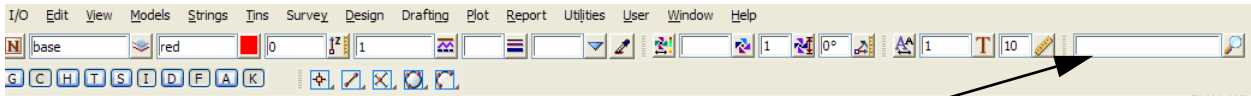
Also at any time, a workspace file can be read in and define a new setup and position of the *controlbars*. For more information on using workspace files, please go to the section [Project Workspace](#) in the chapter [Projects](#).

The three *Controlbars* CAD, Symbol and Text will be described in detail in the section [CAD, Symbol and Text Controlbars](#) in the chapter [Strings](#):

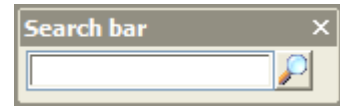
The special **Search bar** will be described in the next section [12d Options Search Bar](#)

12d Options Search Bar

The **Search Bar** allows quick access to any option in **12d Model**.

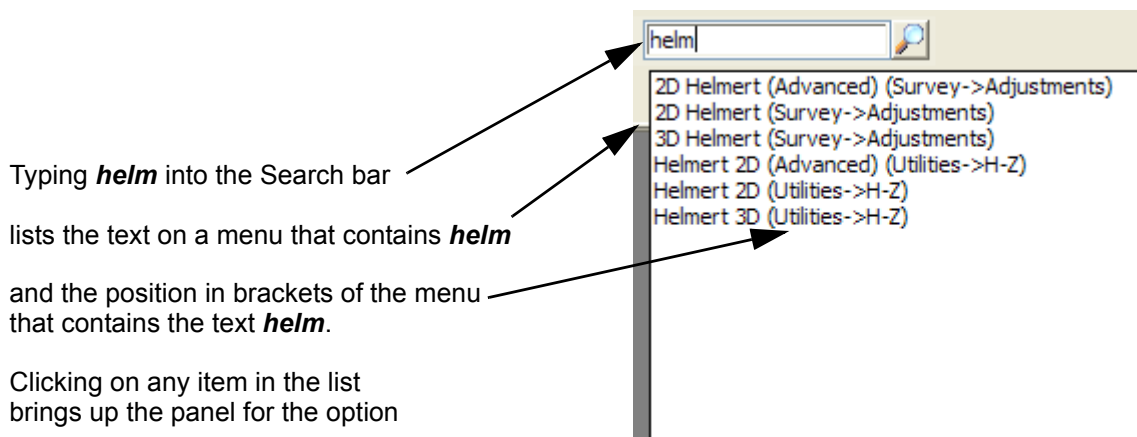


Search bar



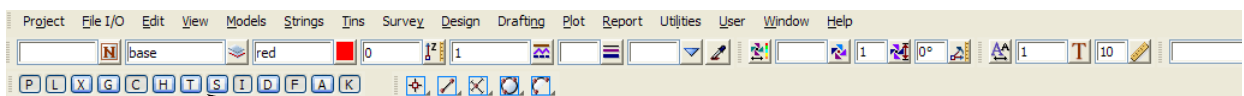
By simply typing text into the **Search Bar**, the option finds all menus containing the text and lists the menu items and the position of the menu that contains the menu item.

Clicking on an item in the list brings up the panel for that item.



Snap Toolbar

The **Snaps (Horiz)** menu has been replaced by the **Snaps Toolbar** which has the default position at the top left hand side of the **12d Model** screen, under the controlbars.



snaps toolbar



Snaps are documented in the section [Snaps](#).

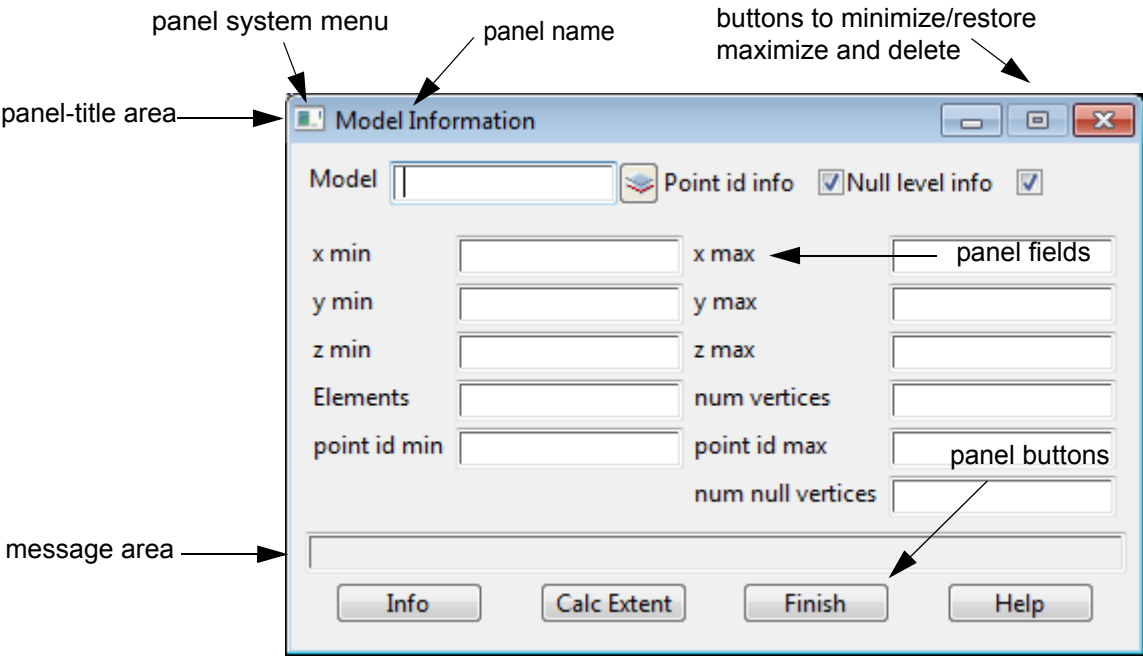
Panels

After a menu option has been selected, extra information is often required before the operation represented by the menu option can begin.

For example, before the contour option can proceed, the required contour interval must be supplied.

In **12d Model**, an object called a **panel** is used to collect and validate any extra information required to run the option.

For example, the **Model Information** panel is



A Panel consists of four types of areas.

Panel title area

Contains the title (name) of the panel, the buttons to minimize and restore the panel, and the [X] button. In the example above, the panel title is **model information**.

Panel fields

These are both input and output areas for the panel. The user can type answers into some fields (input and output fields) or the program may display special information in the fields (output only fields). In the example, Model is an input/output field, xmin is only an output field.

If the panel field is *optional*, then the description text is greyed out - entering data into the field will cause the text to be redrawn in black.

If there are choices available to select from for the panel field, a + is displayed at the right hand side of the field. Selecting the + brings up a panel field pop-up (documented below).

Message area

Each panel has its own area where **12d Model** displays messages for the option.

Messages are used for a variety of purposes including

- s indicating the **next step** in a complex option
- s reporting **errors**

- s giving **progress** in time consuming operations
- s informing that an option has **completed** successfully.

Most messages are sent to the panel message area but a few are displayed in the Status Bar.

Panel buttons

Buttons are used on the panel to select things or control the processing of the panel. Almost every panel has minimize and restore button, and a **Finish** and **[X]** buttons which when selected will end the option and remove the panel from the screen. All panels also has a **Help** button which brings up on-line help about the panel.

The minimize, restore, **Finish**, **[X]** and **Help** buttons will not be documented for each panel.

Data Entry in a Panel

To help save the user time, many panel fields have default answers.

However, any panel field value can be replaced by typing in new information (**typed input**) or when available, by selecting an answer from the **panel field pop-up** or using special name completion characters.

All panel fields are validated before the option runs and any error messages displayed in the panel message area.

Typed input

To type information into a panel field, move the cursor to the position for the information, left click to get focus in the panel field and then start typing. The information will go into the field starting at the input-position indicator (a upright bar in the panel field).

The input-position indicator can be moved by

- s clicking LB when the cursor is at the new position for input
- s using the keys `->`, `<-`, home and end

The **backspace** key, `<backspace>`, will delete one character before the input-position indicator and the **delete** key, ``, will delete one character after the input-position indicator.

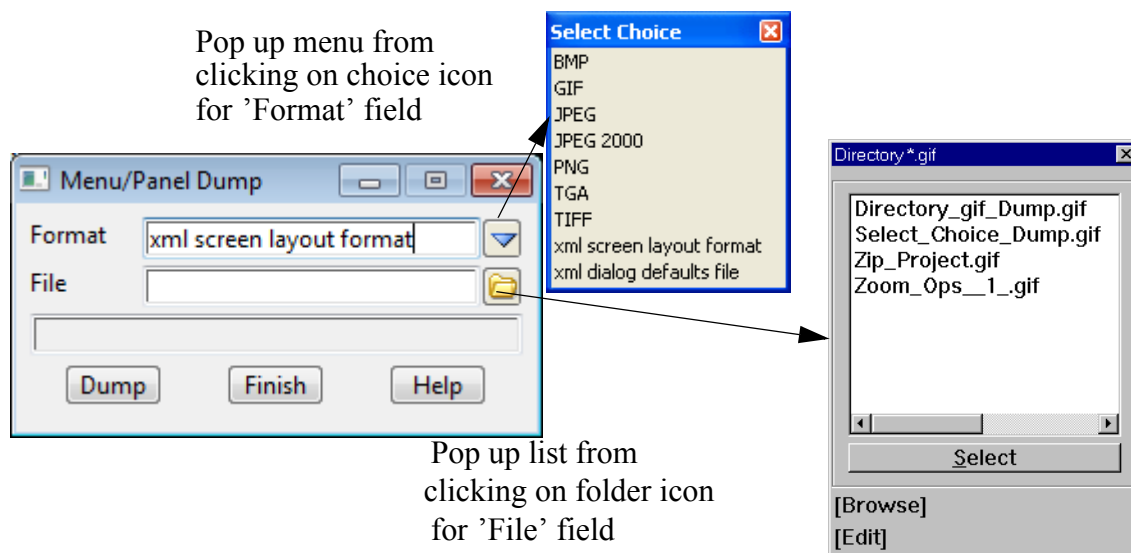
The user can move to any field in the panel by using the mouse. The `<tab>` key will move the cursor to the next panel field or button and `<shift>+<tab>` will move the cursor to the previous panel field or button.

Note - the entire field is used as the answer, not just up to the input-position indicator. The input-position indicator indicates where the characters will go when typing, not the end of the data.

Pop-Up Lists and Menus

The **panel field pop-up list** or **menu**, or panel field pop-up, is raised by clicking LB on the **[+]** or other choice icons at the right of the panel field.

A panel field pop-up consists of a list of choices which may be displayed as either a *menu* or a *list*.



For a pop-up list, an answer is chosen from the list by **double** clicking LB over the required answer. This answer is then displayed in the panel field and the pop-up list disappears.

For a pop-up menu, an answer is chosen from the pop-up menu by clicking LB over the required answer. This answer is then displayed in the panel field and the pop-up menu disappears.

The pop-up list or menu can also be removed without a selection by clicking LB on the **[X]** on the pop-up list or menu, by clicking LB again on the icon or **[+]** for the panel field, or by simply typing into any visible part of the panel field that the pop-up is for (some of the field may be obscured by the pop-up itself).

The pop-up lists and menus and the choice icons are described in more detail in the section on *Special Panel Fields*.

Name completion

To help speed data entry a process called **name completion** is available in most panel fields.

<ctrl> + <d> is the special key combination used for name completion and how it works will now be described.

If one or more characters have been typed into a panel field and the **<ctrl> + <d>** combination is pressed, then **12d Model** checks to see how many answers in the available pop-up start with the same typed characters. If a unique match exists, then it will be placed into the panel field. If more than one match exists, a pop-up menu with all the matches will be presented for the user to select from.

Name mapping

When typing a string name into a panel field, a **name mapping file** can be specified and is used to fill out information such as colour, model *etc.* for given string names.

The name mapping works in two ways. After typing part or all of a string name,

- if **<enter>** is entered, the name map file is searched for a match in the first column (the key). If a match is found, the name, colour, model, style *etc.* from the other columns in the name mapping file are used to fill out the panel fields. The key can contain wild cards and/or characters.
- if **<ctrl> + <d>** is entered, the **second** column of the name mapping file is searched for a list of completions which is written to the field if it is unique or displayed in a pop-up if there is more than one match. If a ***** is found in the second column, the first column is used for matching. When an entry is selected from the completion list, the name, colour, model, style

etc. from the columns in the name mapping file are used to fill out the panel fields.

If a name mapping file exists, then the **[+]** for the *name* panel field will include the entries from the first column of the name mapping file. If an item is selected from the list, then the name, colour, model, style *etc.* from the columns in the name mapping file are used to fill out the panel fields

The name mapping file is pointed to by the environment variable

NAME_MAPPINGS_4D

or is if the environment variable is not set, the default name is **names.4d**.

During a **12d Model** session, the name mapping file can be changed by the *Name Settings* tab on the option **Utilities=>Defaults**. Note that this new name mapping file is not saved with the project.

Validation

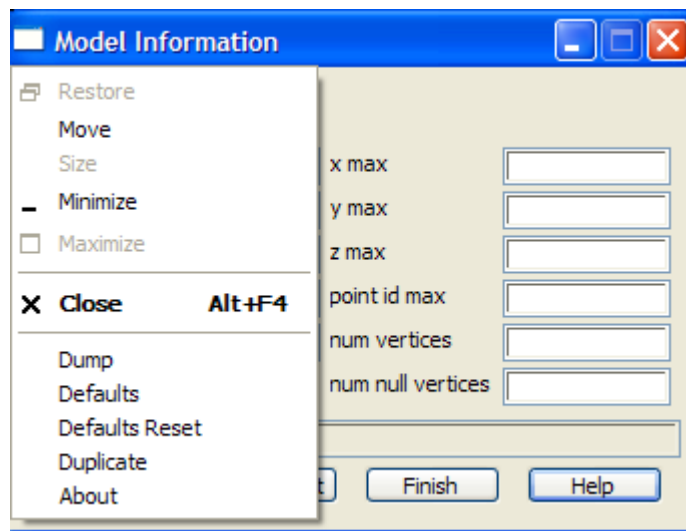
After the panel field information is entered, an <enter> key requests that the panel field information be validated. Any error message will be displayed in the panel's message area. If there is no error, the cursor will move onto the next panel field. If an error occurs, the cursor will remain in the invalid panel field.

New panels or menus can be fired up before completing panels or menus already on the screen. This gives the user full control over the work flow, rather than being locked in by fixed sequences in a program.

Panel System Menu

The **Panel System** menu is brought up by clicking LB on the windows icon on the left hand corner of the panel title area.

The **Panel System** menu has options to move, minimize, close, dump (write out an image of the panel), create ddf file, reset a ddf file and duplicate the panel.



For the option *Move*, go to
Minimize/Maximize
Dump

Default File

Close
Defaults
Defaults Reset

[Moving a Panel](#)

[Minimizing and Maximizing a Panel](#)

[Dumping a Panel, Creating a Screen Layout File or](#)

[Deleting a Panel](#)

[Panel Defaults - ddx Files](#)

[Defaults Reset - Deleting a ddx File](#)

	<i>Duplicate</i>	Duplicating a Panel
Also for	<i>Special panel fields</i>	Special Panel Fields
	<i>Expressions in panel fields</i>	Expressions in Panel Fields
	<i>Resizing a panel</i>	Resizing Some Panels
	<i>OK panel</i>	OK Panel
	<i>Yes-No panel</i>	Yes-No Panel
	<i>Yes-No-cancel panel</i>	Yes-No-Cancel Panel
	<i>Yes-No-All-cancel panel</i>	Yes-No-All-Cancel Panel

TODO: Replace-Cancel
TODO: Append-Replace-Cancel

Moving a Panel

A panel can be moved (dragged) by **holding down LB** anywhere in the menu title area (except over the windows icon on the left and the minimize, restore and [X] buttons on the right) and then moving the cursor with the LB still depressed.

The panel (or panel outline) moves with the cursor to indicate where the new panel position will be, and the panel is finally positioned when LB is released.

Move can also be started by selecting **Move** from the **Panel System** menu and then holding down LB in the menu title area and continuing as described above,

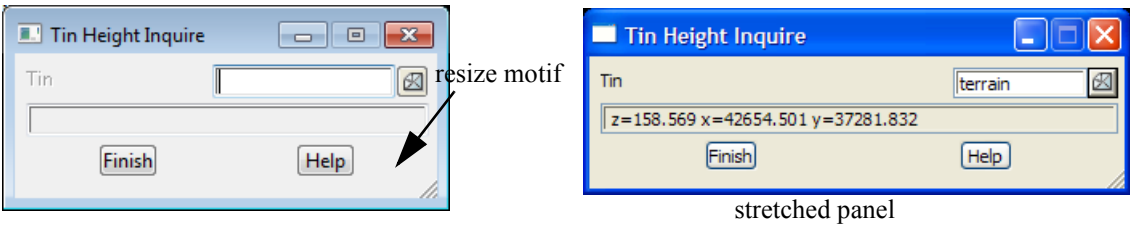
Minimizing and Maximizing a Panel

The **panel** can be minimized (iconized)/restored and maximized using the standard Windows minimize/restore and maximize buttons on the top right hand corner of the panel.

A panel can also be minimized by selecting **Minimize** from the **Panel System** menu.

Resizing Some Panels

Some panels can be resized in *width* and have a *Resize motif* on the bottom right hand corner. For example



Dumping a Panel, Creating a Screen Layout File or Default File

The panel can be written out to disk in a variety of images formats, or as a screen layout file or a default file. This is called dumping the panel.

The **Dump** option is selected by clicking MB in the panel title area, or by selecting **Dump** from the **Panel System** menu which is invoked by clicking the left mouse button (LB) on the Windows icon on the left of the panel title area.

The **Menu/Panel Dump** panel is then displayed and for its description, go to [Dumping a Menu or](#)

Panel.

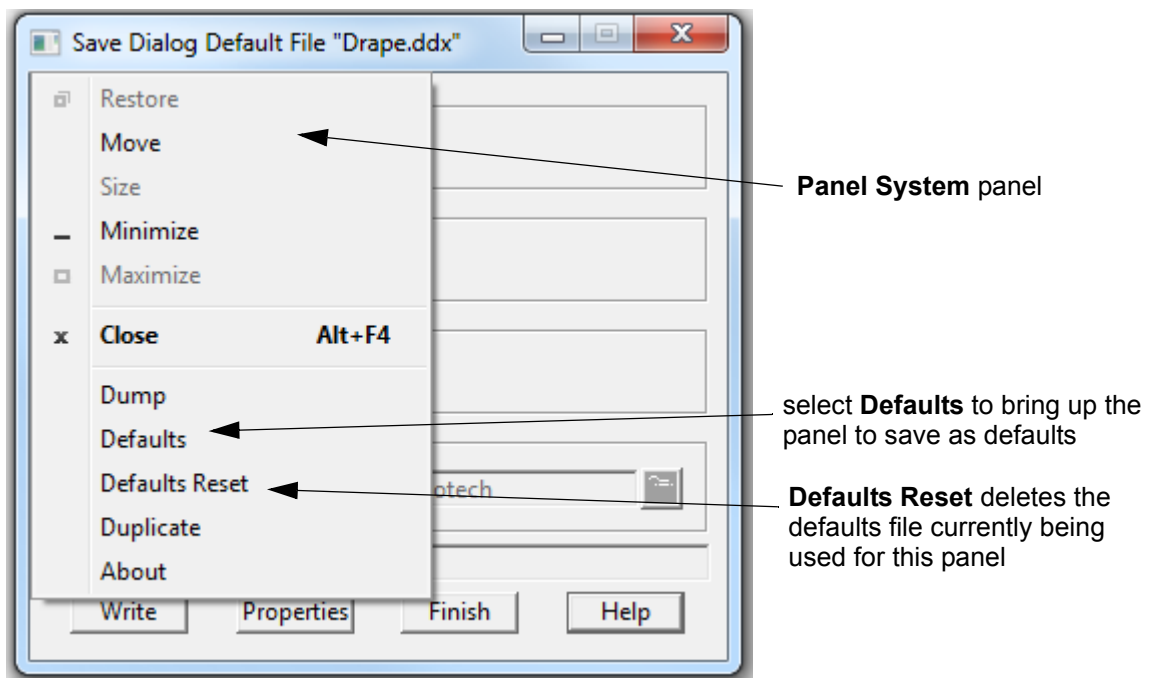
Panel Defaults - ddx Files

When a panel is opened, **12d Model** may set some default values.

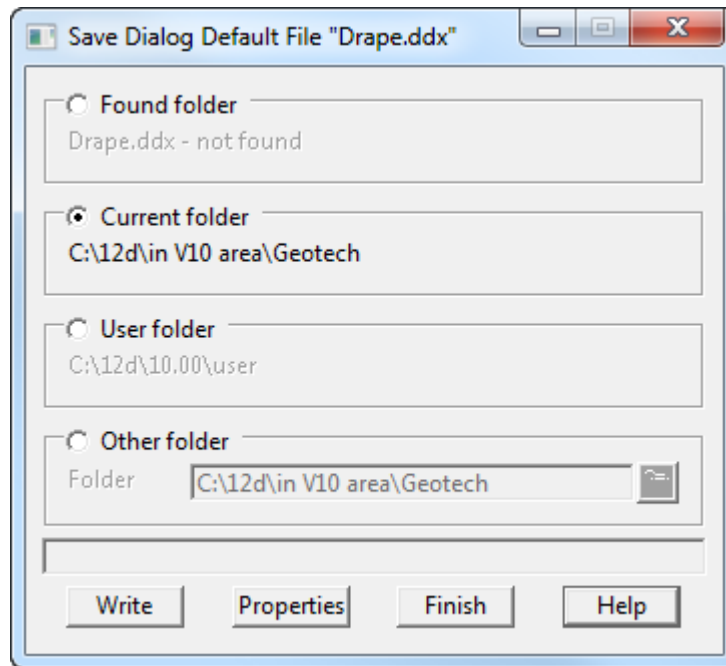
However for most panels **the user can supply the values** to be used **for** all the **panel fields** each time a panel is opened. This information is stored in a defaults file for a panel. The defaults file has the file ending .ddx (or a pre- **12d Model** 10 format, .ddf).

If no defaults file exists for a panel, then the **12d Model** defaults are used for the panel.

To set user defined defaults for a panel, simply open the panel, fill in the default values that are required, and then bring up the **Panel System** menu (by clicking LB in the top left had corner of the panel) and select **Defaults**.



A panel comes up asking what folder to write the **ddx** file for the panel to.



Clicking on **Write** writes out the ddx file for the panel.

When a **12d Model** panel starts up, the standard paths are searched for a defaults file to use to set the default values for the panel fields.

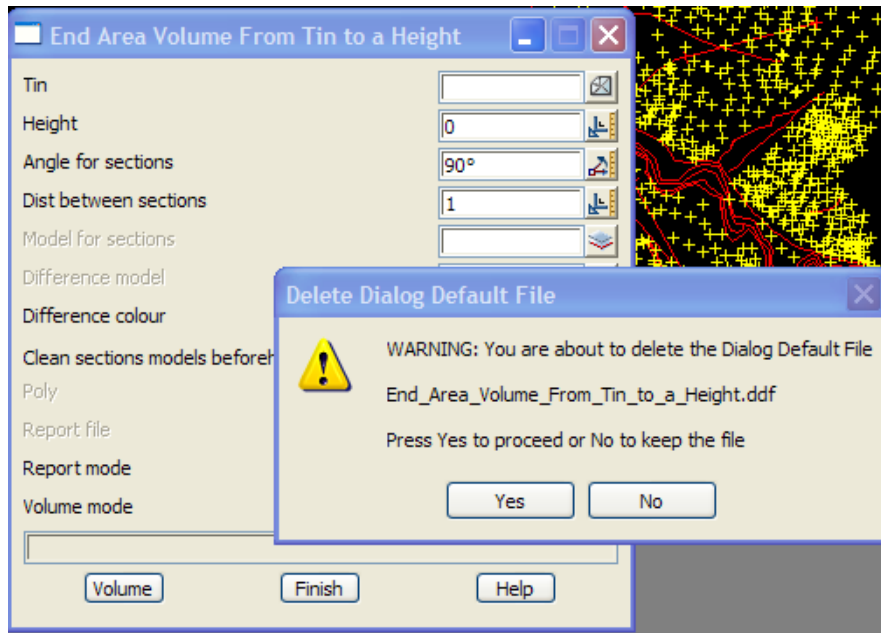
If no defaults file is found for the panel, the **12d Model** system defaults are used.

Note - for **12d Model 10** and above, the defaults file has an xml structure and is written to a file ending in **.ddx**. An earlier format ended in **.ddf**. If both a **.ddx** and a **.ddf** file exists for the panel, then the **.ddx** file is used.

Defaults Reset - Deleting a ddx File

If user defined defaults are no longer required for a panel, simply bring up the panel and then the **Panel System** menu by clicking LB in the top left had corner of the panel.

Select **Defaults Reset** and the default **ddx** file for the panel is deleted.

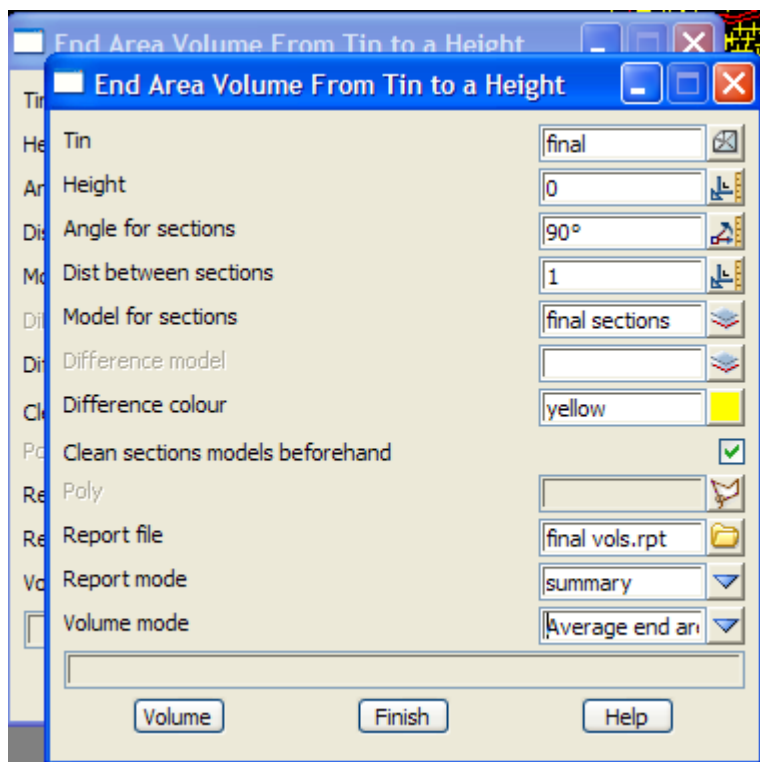


Duplicating a Panel

After filling in all the fields of a panel, it is often useful to have a copy of the panel with almost all the same panel field values.

For example, when calculating the volume from a tin to a height using end area, it is normal to run the option with a number of different angles for the sections, and maybe different distances between the sections.

To create a new panel with all the same values in the panel fields, bring up the **Panel System** menu for the panel and select **Duplicate**.



Deleting a Panel

There are three methods available for deleting a panel. Picking the **[X]** button in the panel title area, using the **finish** button or by selecting **close** from the **Panel System** menu.

OK Panel

The **OK** panel requires the selecting of the button **OK**.

Yes-No Panel

The **yes no** panel requires the selecting of the button **yes** or **no**.

Yes-No-Cancel Panel

The **yes no cancel** panel requires the selecting of the button **yes**, **no** or **cancel**.

Yes-No-All-Cancel Panel

The **yes no all cancel** panel requires the selecting of the button **yes**, **no**, **all** or **cancel**.

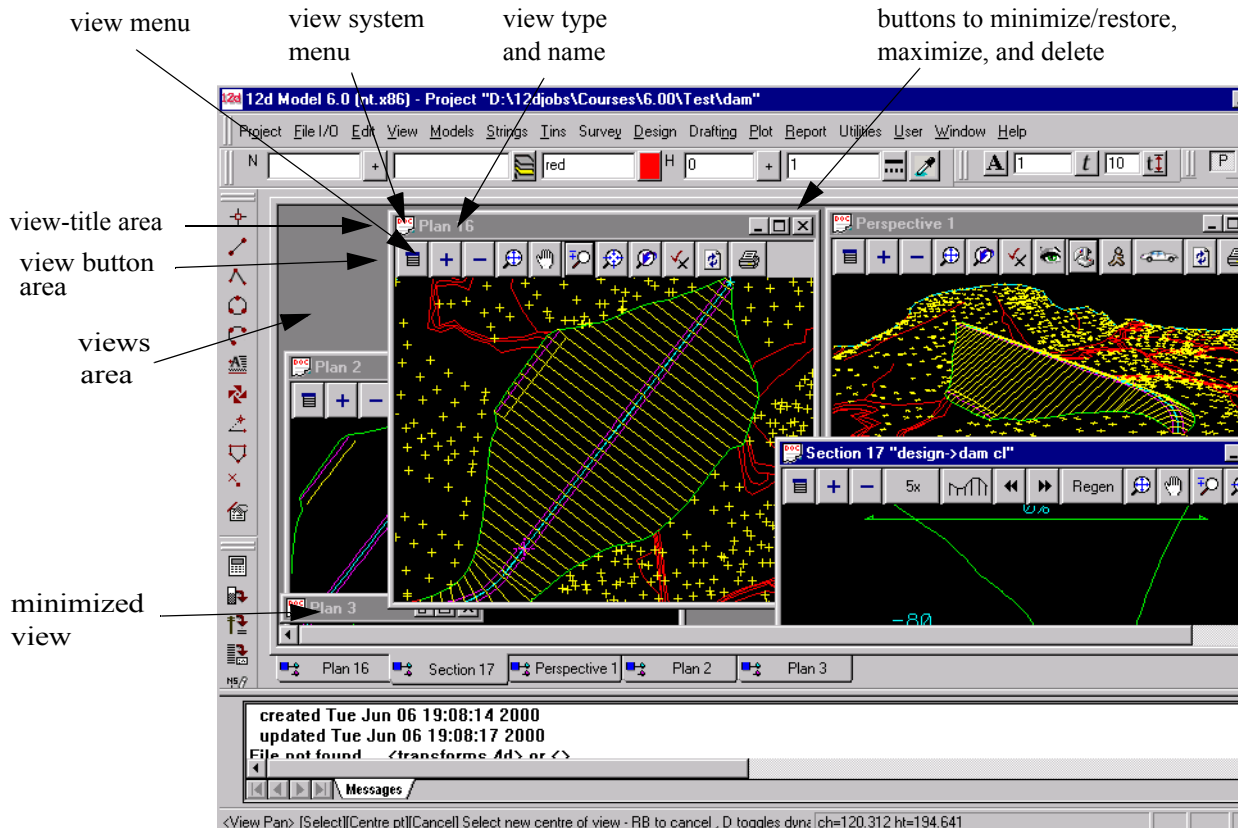
The next section is [Views](#).

Views

Views are the screen drawing areas for **12d Model** and come in four flavours - plan, section, perspective and opengl perspective.

Views can be created and deleted as required by the user and there is no limit to the number of views on the screen. Views can be overlapped and minimized.

Each view has a unique name of up to two hundred characters. The **view type** and **name** are displayed on the top left corner of the view in what is called the **view-title area**.



For information on *View buttons*, go to

View menu

View system menu

View dump

Moving a view

Resizing a view

Minimising/maximizing a view

Deleting a view

[View Buttons](#)

[Plan/Section/Perspective View Menu](#)

[View System Menu](#)

[Dumping a View](#)

[Moving a View](#)

[Resizing View](#)

[Minimizing and Maximizing a View](#)

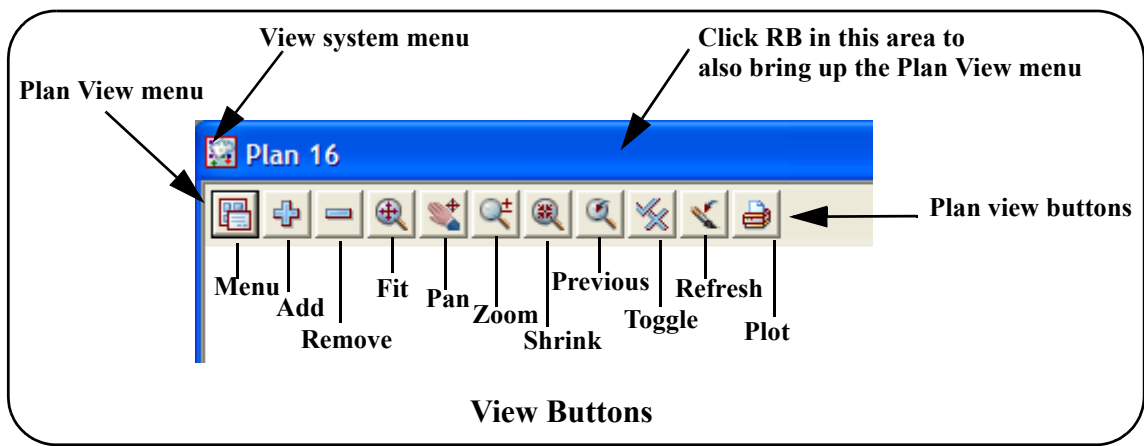
[Deleting a View](#)

View Buttons

On the row under the view type and name, are a number of options called **view buttons**.

The view buttons act like menu items and are activated by clicking LB when the cursor is above the button.

The function of each view button will be described elsewhere in this manual.

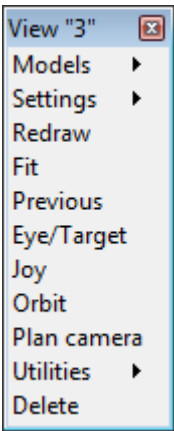


Plan/Section/Perspective View Menu

If LB is clicked on the **Menu** icon in the view buttons area, or RB is clicked in the *View Title area* or the *View Buttons area*, a new menu called the **Plan/Section/Perspective View menu** appears (or just **View menu** for short).

To remove the **Plan/Section/Perspective View menu**, select **[X]** on the **View menu** or click RB again in the *View Title area* or the *View Button area*.

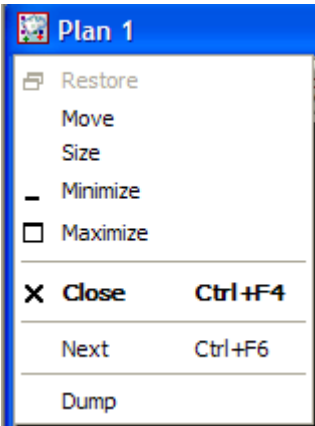
Because of the differences between plan, perspective and section views, the options on the **View menu** vary for each view type. For example, the perspective **View menu** is



The **View menus** will be discussed in the chapter [View Menus](#).

View System Menu

The **view system menu** is brought up by clicking LB on the windows icon on the left hand corner of the *view title area*.



The **View system** menu has options to move, resize, minimize, maximize, close (delete) and dump the view.

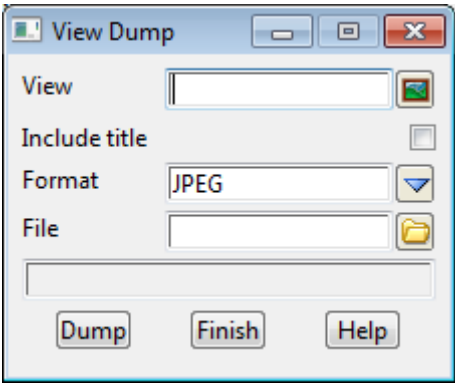
For information on *Moving a view*, go to
Resizing a view
Minimizing/maximizing a view
Closing a view
Dumping a view image

[Moving a View](#)
[Resizing View](#)
[Minimizing and Maximizing a View](#)
[Deleting a View](#)
[Dumping a View](#)

Dumping a View

An image of the view can be written out to disk in either bmp, tif, postscript format or as a screen layout file. This is called dumping the view.

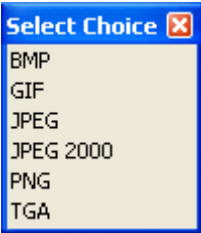
The **Dump** option is selected from the **View System** menu which is invoked by clicking the left mouse button (LB) on the Windows icon on the left of the view-title area. The **View Dump** panel is then displayed



The fields and buttons have the following functions.

Field Description	Type	Defaults	Pop-Up
View	input	view option is picked from	available views
<i>the view to dump out in the specified format.</i>			
Include title	tick box		
<i>if ticked, the view title area is included in the dump.</i>			

Format	input	GIF	BMP, GIF, JPEG, JPEG 2000, PNG, TGA
--------	-------	-----	----------------------------------------



the format to dump the view out in.

File	input	*.gif
------	-------	-------

the file to dump the view images out to

Dump	button
------	--------

dump in the given format the image of the view given in the view field to the file given in the file field.

Moving a View

A view can be moved (dragged) by **holding down LB** anywhere in the view-title area (except over the windows icon on the left and the minimize, restore and **[X]** buttons on the right) and then moving the cursor with the LB still depressed. Or **Move** can be selected from the **View System** menu.

The view (or a view outline) moves with the cursor to indicate where the new view position will be. The view is finally positioned when LB is released.

Resizing View

A view can be resized using the standard Windows resize methods of holding down LB on the view border and moving the mouse to the new position for the view border. and then releasing LB.

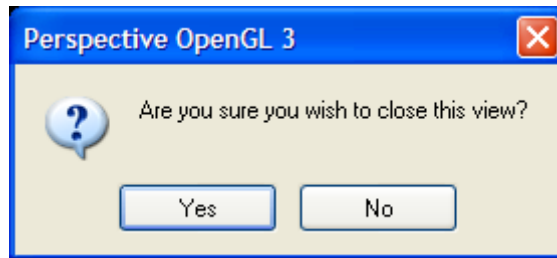
Minimizing and Maximizing a View

A view can be minimized (iconised), restored and maximized using the standard Windows minimize/restore and maximize buttons on the top right hand corner of the view, or by selecting **Minimize** or **Maximize** from the **View System** menu

Deleting a View

Picking the **[X]** button in the *view-title area* or selecting **Close** from the **View System** menu will delete the view.

If the environment variable **Prompt on close** is set on, then a prompt will be displayed to confirm that the view is to be closed./deleted



Please continue to the next section [Status Bar](#).

Status Bar

The Status Bar is used to display many of the messages generated by **12d Model** options (each panel also has its own special message area) and the dynamic coordinate position of the cursor as it moves around in any view on the screen.

The co-ordinate values displayed depends on the view type. For example, the world co-ordinate (x,y) position of the cursor is displayed when inside plan views, and a (chainage,height) position when in a section view.

The messages are displayed on the left hand side of the Status Bar and the view co-ordinates on the right hand side of the Status Bar.

The Status Bar is toggled on/off by the option **View => Status Bar** on the Main menu.

Please continue to the next section [Output Window](#).

Output Window

The **Output Window** displays **12d Model** system and error messages.

The Output Window is toggled on/off by the option **Window => Output Window** on the Main menu.

If an error message is sent to the Output Window and the Output Window is turned off, then the Output Window is automatically toggled on to indicate an error has occurred.

Hence the Output Window can be left turned off and it will reappear when an error message occurs.

Message lines which are intelligent log lines are begun with a green exclamation mark!

Please continue to the next section [Ascii, Ansi and Unicode](#).

Ascii, Ansi and Unicode

From **12d Model 10** onwards, text is stored in the **12d Model** database as Unicode (UTF-16 Unicode) and the default format for all output files produced by **12d Model** is for them to be Unicode files.

But what does that mean?

Computers can only understand numbers (only zeros and ones actually), so a common code is needed for the numerical representation of characters such as 'a' or '1' or some action such as TAB and a number of common codes have evolved over time.

The common code is not only needed for text in a file or text on a Web page, but also for the names of the files and folders on a computer disc or an internet site.

See [ASCII Character Set](#)
[ANSI Character Set](#)
[Unicode Character Set](#)
[Unicode Encoding: UTF-8](#)
[Unicode Encoding: UTF-16](#)
[Endian and BOM](#)
[Writing out Files from 12d Model](#)

ASCII Character Set

The ASCII (American Standard Code for Information Exchange) was first published in 1963 and was adopted by the American National Standards Institute (ANSI) during the 1960s and has been in common use since then.

The ASCII definition used 7 bits to define characters and some non character codes such as tab, back space and line feed (new line). The seven bits means that only a maximum of 127 codes are allowed.

An examples of the ASCII codes are:

2 is the ASCII code for start of text (STX)
8 is the ASCII code for back space (BS)
9 is the ASCII code for horizontal tab (TAB)
10 is the ASCII code for line feed, new line (NL)
27 is the ASCII code for escape (ESC)
32 is the ASCII code for a space (" ")
36 is the ASCII code for a dollar sign \$
40 is the ASCII code for a left parenthesis (
41 is the ASCII code for a right parenthesis)
48 is the ASCII code for the digit zero 0
49 is the ASCII code for the digit zero 1
65 is the ASCII code for the Latin capital letter A A
97 is the ASCII code for the Latin small letter a a
126 is the ASCII code for a tilde ~
127 is not used

Even with the newer standards, the 7-bit ASCII table continues to be the backbone of modern computing and data storage. Is is so ubiquitous that the terms "text file" and "ascii file" have come to mean the same thing for most computer users.

The ASCII standard was good, as long as you were only working in US English.

Go to the next section [ANSI Character Set](#) or back to [Ascii, Ansi and Unicode](#).

ANSI Character Set

The ANSI standard extended the ASCII character set. In the ANSI standard, the first 128 characters were the same as for ASCII but from character 128 onwards, there were different ways depending on where you lived. These different ways were called **code pages**.

For example, in Israel DOS used a codepage called 862 while Greek users used code page 737.

The ANSI set of 218 characters (also known as Windows-1252) was the standard for core fonts supplied with US versions of Microsoft Windows up to and including Windows 95 and Windows NT 4 (character 218 was the euro currency symbol was added during this time).

ANSI characters 32 to 127 correspond to those in the 7-bit ASCII character set.

Some of the extra ANSI codes are:

163 is the ANSI code for a currency Pound sign

165 is the ANSI code for a currency Yen sign

If you use a version of Windows that is designed for a non-Latin alphabet such as Arabic, Cyrillic, Greek or Thai to view a document that has been typed using the ANSI character set, then in the codepage for the characters from these languages may replace some of those in the 128-255 range and so the document will look different.

There are similar problems when transferring ANSI documents to DOS or Macintosh computers, because DOS and MacRoman arrange characters differently in the 128-255 range.

Go to the next section [Unicode Character Set](#) or back to [Ascii, Ansi and Unicode](#).

Unicode Character Set

Today people want to transfer information around the world in emails and on Web sites but the ASCII and ANSI character sets can not work with a variety of Latin and non-Latin alphabets in the one document.

The solution is to move to a system that assigns a unique number to each character in each of the major languages of the world. Such a system has been developed and is known as **Unicode** and it is intended to be used on all computer systems, not just Windows.

The Unicode Standard covers more than 110,000 characters covering 100 scripts, a set of code charts for visual reference, an encoding methodology and set of standard character encodings, an enumeration of character properties such as upper and lower case, a set of reference data computer files, and a number of related items such as character properties, rules for normalisation, decomposition, collation rendering and bidirectional display order (for the correct display of text containing both right-to-left scripts such as Arabic and Hebrew and left-to-right scripts such as English). As of 2012, the most recent version is **Unicode 6.1**

Unicode's success at unifying character sets has led to its widespread use in computer software and the standard has been implemented in XML, Java, Microsoft .NET Framework and modern operating systems.

To make it Unicode compatible with ASCII, the first 128 characters were the same as for ASCII but from character 128 onwards they are totally different.

All the Unicode characters can be covered with 32 bits but to use a 32-bit representation in a file means that a standard ASCII file would be four times as large when written out in Unicode.

So to save on disk space, and the size of files for emailing etc, there are a number of different mapping methods, or character encodings, for writing Unicode characters to a file.

The Unicode standard defines two mapping methods: the Unicode Transformation Format (UTF) encodings, and the Universal Characters Set (UCS) encodings. An encoding maps the range of Unicode characters (or possibly a subset) to sequences of values in some fixed-size range.

Note: Even though software stores Unicode characters, the computer system still needs the graphics for the character sets to be able to correctly display the Unicode characters.

Go to the next section [Unicode Encoding: UTF-8](#) or back to [Ascii, Ansi and Unicode](#).

Unicode Encoding: UTF-8

One of the most common character encodings is UTF-8.

In UTF-8 encoding, only 8-bits are used for any ASCII characters from 0 to 127. For characters 128 and above, it uses between 16, 24 and up to 48 bits.

And because the representation of the first 128 characters are the same in Unicode and ASCII, US English text looks exactly the same in UTF-8 as it did in ASCII.

So why can't a standard ASCII text editor, or a program requiring plain ASCII text have problems with a Unicode file just containing ASCII characters?

The main reason is that in many Unicode files, a special character called a BOM (see [Endian and BOM](#)) is often placed at the beginning of the file, and the BOM would not be recognised by a program only expecting ASCII and would generate an error, or show up as blank spaces or strange-looking characters.

Go to the next section [Unicode Encoding: UTF-16](#) or back to [Ascii, Ansi and Unicode](#).

Unicode Encoding: UTF-16

In UTF-16 encoding, 16-bits are the basic unit and depending on the Unicode character, UTF-16 encoding may require one or two 16-bit code units. Using the two 16-bit code units, UTF-16 is capable of encoding up to 1,112,064 numbers.

The basic unit of computers is a byte which consists of 8-bits. Because the UTF-16 encoding uses 16-bit and so is made up of two bytes and the order of the bytes may depend on the endianness (byte order) of the computer architecture.

To assist in recognizing the byte order of code units, UTF-16 allows a Byte Order Mark (BOM - see [Endian and BOM](#)), a code with a special value to precede the first actual coded value.

Because the fundamental unit in UTF-16 is 16 bits, storing a text file only containing ASCII text will take twice as much disk space as the ASCII version.

Microsoft has used UTF-16 for internal storage for Windows NT and its descendants including Windows 2000, Windows XP, Windows Vista and Windows 7.

Go to the next section [Endian and BOM](#) or back to [Ascii, Ansi and Unicode](#).

Endian and BOM

From early computing, the fundamental unit of storage was a byte consisting of 8-bits (a bit is a one or a zero). When computers started using 16-bits, this could be stored as two bytes but there was a choice of the order of storing the two bytes. Two different approaches arose and are referred to the endian or endianness.

Big endian stores the most significant byte first and the least significant byte second. Similar to a number written on paper. **Little endian** stores the least significant byte first and the most significant byte second.

The **byte order mark** (BOM) is a Unicode character used to signal endianness (byte order) of a text file or character stream.

A BOM is essential when the basic unit of an encoding consists of two bytes such as in UTF-16.

Beyond its specific use as a byte-order indicator, the BOM character may also indicate which of the Unicode encoding has been used because the values of the bits in the BOM will be different for the different Unicode encodings.

So although a BOM is not strictly necessary for UTF-8 when it only contains ASCII data, it still alerts the software that it is UTF-8.

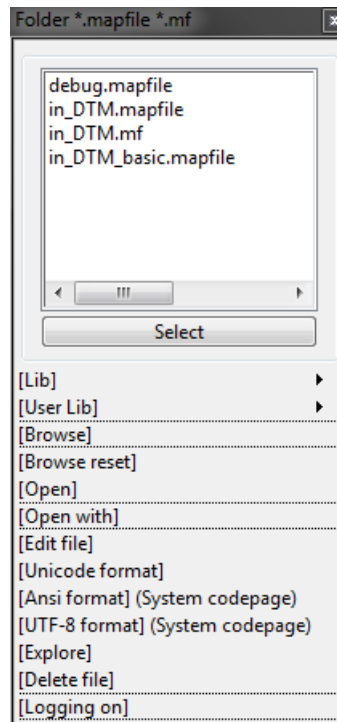
Some common programs from Microsoft, such as Notepad and Visual C++, add BOMs to UTF-8 files by Default. Google Docs adds a BOM when a Microsoft Word document is downloaded as a .txt file.

When a BOM is used, it should appear at the **start** of the text.

Go to the next section [Writing out Files from 12d Model](#) or back to [Ascii, Ansi and Unicode](#).

Writing out Files from 12d Model

When a file box is used in a **12d Model** panel, clicking **LB** of the **Folder** icon will bring up the folder pop-up and on the pop-up is the choice for writing out the file in ANSI, or UTF-8 rather than the default of Unicode (UTF-16).



File Box Pop Up List

For more information on the **File Box**, see [File Box](#).

Please continue to the next section [Data Types](#) (or back to [Ascii, Ansi and Unicode](#)).

Data Types

12d Model was designed from the ground up as an object based system and programmed in C++, the most widely used Object Oriented programming language.

As objects, strings know what type of string they are and behave accordingly without user intervention. As a simple example, when selecting a string for editing, the string knows what type of string it is and brings up the appropriate editor.

A more complicated example is a super alignment with computations. Such a string can be constructed from references to other string, automatic fillets, automatic draping on tins *etc.* and if any of this auxiliary information changes, the super alignment will change as well.

See [Strings](#)

See [General String Properties](#)

See [Models](#)

See [Tins](#)

See [Templates](#)

See [Projects](#)

See [Attributes or Meta Data](#)

Strings

12d Model uses the string object as one of its basic modelling elements.

In its simplest form, a **12d Model** string is an *ordered* series of vertices or points, joined by a segment.

However a **12d Model** string can also be much more complex including referencing to other objects and complicated construction methods. The string object can also have an almost unlimited number of user defined attributes for the whole string, for each vertex and for each segment joining vertices.

However, as an object, the **12d Model** string shields the user from its full complexity and only displays the relevant information and properties as required for a particular context.

So starting with the basics, a **12d Model** string is an *ordered* series of vertices or points.

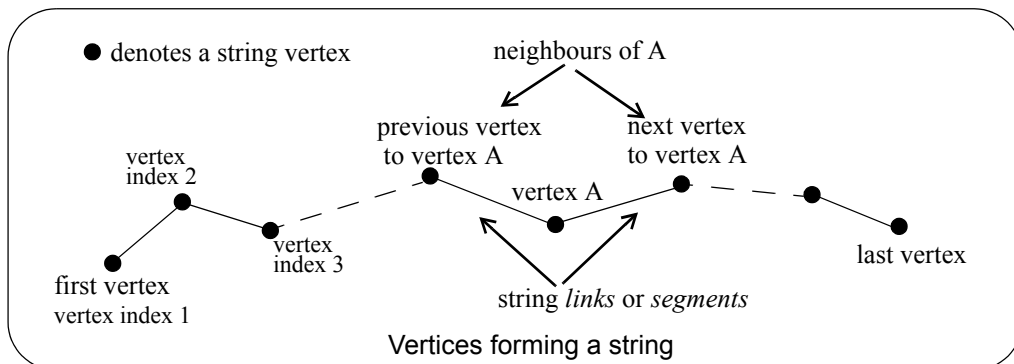
Apart from the first and last vertex in a string, each vertex in a string has a unique **previous vertex** (predecessor) and a unique **next vertex** (successor). The previous and next vertices for a vertex are called its **string neighbours**.

The objects joining a vertex with its neighbours are called string links or **segments**. Segments may be straight lines or plan arcs, or transition elements such as spirals. The segments can be *visible* or *invisible*.

The string has an implied **direction** starting from the first vertex of the string and then proceeding to the successor vertices in the string.

The ordering along a strings allows each vertex to be given a **vertex index** where the first vertex has vertex index **1**. Note that if additional vertices are inserted or vertices deleted then the vertex indices will change. Also note that for super strings, a vertex may have a **point id** (also called a **vertex id** and sometimes a **point number**) which is **not** the same thing as the **vertex index**.

A string which has the same first and last vertex is called a **closed** string otherwise a string is said to be **open**.



Strings are very useful in the modelling of terrain and design surfaces and when using strings, for some applications they need to a particular properties.

For example, a **contour** displayed on maps is actually a string with the special property that all the vertices have exactly the same height (z value). And if the height of one vertex of the contour is modified, then all the vertices of the contour string must also be modified to have exactly the same height or the string is no longer a contour. So a **contour** string is a special type of string that **knows** how to behave when the z-value of the string is modified. This is why strings are **objects** - they intrinsically know how to behave.

To make it easier to refer to particular sets of properties that some strings must have, **12d Model** defines a number of different **types** of strings. Using the string **type** is a convenient short hand for saying the string has certain well defined properties.

See [super string](#)
[2d or contour super string](#)
[3d super string](#)
[4d super string](#)
[alignment string](#)
[super alignment string](#)
[arc string](#)
[circle string](#)
[control station](#)
[drainage and sewer string](#)
[feature string](#)
[interface string](#)
[pipe super string](#)
[pipeline string](#)
[polyline super string](#)
[text string](#)
[General String Properties](#)

super string

A super string is a general purpose string.

Each vertex can have tinability, a symbol with its own size and rotation, z-value, text and an unlimited number of user definable attributes.

Segments can be lines, arcs or transitions (for example spirals). Each segment (link) has visibility, colour and breakline flags (segment tinability) and values for diameter or width and height (box culvert), radius, text and an unlimited number of user definable attributes.

2d, 3d, 4d, polyline and pipe strings are special cases of the super string.

2d or contour super string

The z-value of a 2d super string is the same at every vertex in the string.

Consequently the entire string has a height (the **string height**) rather than having to refer to the height at each vertex. By changing the string height, the heights of all the vertices are modified. The height of a single vertex of a 2d string **can not** be changed to a height that is different to the string height.

So if a **2d** string is selected by the string editor, as an object the **2d** string can signal the object editor that it has a **string height** and that the editors height command can only work on the string height and won't allow the individual vertex heights to be modified.

3d super string

The z-value can vary for each vertex in the string.

So if a **3d** super string is selected by the string editor, as an object the **3d** string can signal the object editor that each vertex has an individual height, and that the editors height command must select an individual vertex and modify that vertex's height.

4d super string

A **4d** super string has (x,y,z) values at each vertex **plus** vertex text defined at each string vertex. Useful when a description is needed at each vertex. For example, design sections are created as 4d strings and the vertex text records the name of the string that goes through that vertex.

alignment string

An **alignment** string is a more complicated string object which defines the string by specifying the horizontal and the vertical geometry for the string.

The horizontal geometry of the string is a series of horizontal intersection points (HIP's) with plan arcs and leading (left) and trailing (right) transitions defined for each HIP. This defines the plan geometry of the alignment string.

The vertical geometry of the alignment string is defined as a series of vertical intersection points (VIP's) defined by horizontal chainage along the string and height. Each VIP can have a parabolic or circular curve on it.

Alignment strings are used for defining entities such as the centre line or a simple road or railway.

The alignment string has been superseded by the super alignment string which not only has IP methods but also fixed and floating definitions of elements.

super alignment string

A **super alignment** string is also specified by defining the horizontal and the vertical geometry for the string but neither of the geometries is restricted to just intersection (IP) points. The horizontal geometry can be made up of almost any combination of straights, arcs, transitions, partial transitions, horizontal IP's. Similarly the vertical geometry is made up of combinations of straights, arcs and parabolas.

In the super alignment object, the elements of the horizontal and vertical geometries can be defined by referencing to other strings, offsets, intersections *etc.* and if these items change, the super alignment object knows how to re-calculate itself.

arc string

An arc string is an arc in a plan projection but with a linearly varying z-value on the circumference. So the arc string is actually a 3d helix. The centre point of the arc is for display purposes only.

circle string

A circle string is a plan circle a constant z-value around the circumference. Hence the circle string is always parallel to the (x,y) plane. The centre point of the circle is for display purposes only.

control station

control stations are used in the survey reduction option where a name of a station can be given in the 12d survey field file and the coordinates of the station can given by the control station of that name in the specified model of control points. In **12d Model**, a Control station is represented by a one vertex 4d or super string and the name of the control station is the name of the one vertex string. Usually the point id for the vertex of the super string, or the text for the 4d string, is also the Control station name.

drainage and sewer string

Special string made up of straights, arcs and manholes.

feature string

A feature string is a plan circle with a z-value at the centre point but only null values on the circumference.

If a feature string is given a **world** line style, then the style is centred on the centre point of the feature string and scaled up to the radius of the feature string.

If a feature string is given a **screen** or **paper** line style, then the style is wrapped around the circumference of the feature string.

interface string

An interface string is a special string constructed from a string and a surface. Each vertex of the interface string records whether the corresponding vertex on the original string was above or below the surface.

pipe super string

A pipe string is a 3d string with a diameter.

pipeline string

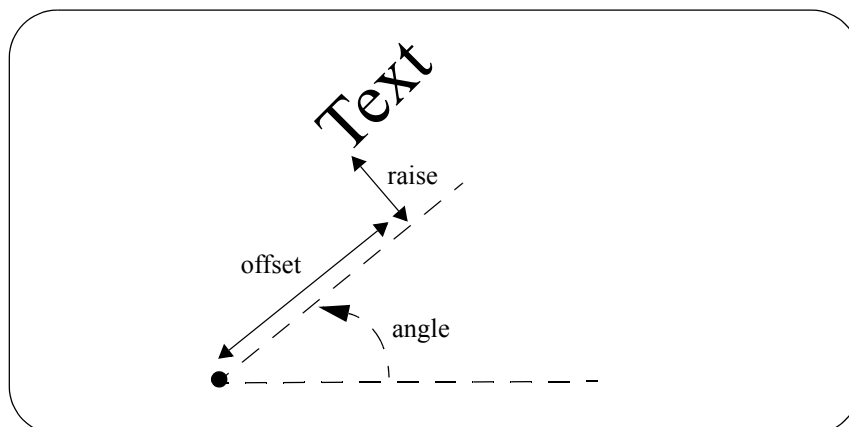
A pipeline string is an alignment string with a diameter.

polyline super string

A polyline string is similar to a 3d string except that there can be straights or arcs joining the string vertices.

text string

a text string has an (x,y) position and contains characters and information about how the characters are displayed (textstyle, units, height, offset, raise, justification, angle, slant and x factor). For more information on angle, offset and raise, go to the section [Text Definitions](#).



Super strings can also have text defined on its vertices and segments, and 4d strings can have text defined on each vertex,

Go to the next section [General String Properties](#) or back to [Data Types](#).

General String Properties

See [Name and Model](#)
[Breakline Type](#)
[Tinable](#)
[Linestyle and Colour](#)
[String Chainage](#)

Name and Model

Strings have a text name of up to two hundred alphanumeric characters, spaces and dots (.). The string name does not have to be unique and can be blank. When strings are created, they are stored in **models**. A string is in one and only one model. Models are discussed in the next section.

Breakline Type

When triangulating data, if all the vertices and all the segments of a string are to be preserved as the sides of triangles and hence are part of the triangulation the string is called a **breakline** or **line** string. **Note** - all the segments of all the breaklines can only be preserved with there are no crossing segments amongst any of the breakline strings

If all the vertices are included in the triangulation but none of the segments are, then the string is called a point string.

For triangulation purposes, each of the super string types 2d, 3d, 4d and polyline can be used as **either** breaklines (line strings) or point strings.

Line strings are useful in describing terrain features such as ridge lines and creek beds or design features such as the edge of a building platform. Point strings can represent information such as spot heights.

Alignments, arcs, circles, pipelines, interfaces, drainage and sewer strings can only be breakline strings. Feature strings can only be point strings with a z-value at the centre of the circle.

Tinable

For a **super string**, the concept of breakline has been **extended** to a property called **tinable** which can be set *independently* for each vertex and each segment of the super string.

If a **vertex** is tinable, then the vertex is included in triangulations. If the vertex is not tinable, then the vertex is ignored when triangulating.

If a **segment** is tinable, then the segment is used as a side of a triangle during triangulation. That is, the segment is used as a breakline. This may not be possible if there are *crossing* tinable segments.

Note that for a segment to be used as a side of a triangle, then its end vertices must also be tinable.

So a **breakline string** is one where all the vertices and all the segments are tinable.

A **point** string is one where all the vertices are tinable and all the segments are not tinable.

Linestyle and Colour

All strings (except text) can be given a user defined **linestyle** or simply **style**. The style describes how the string is drawn on the screen and on plots. The default style is 1.

A style can also be continuous or just at the vertices of a string, regardless of the breakline type

of the string. A breakline string (line string) with default style **1** will be drawn with solid lines between the nodes, and a non breakline string (point string) with default style will be drawn with crosses at the string nodes with no visible lines between the nodes.

Strings have a default colour but how that colour is used depends on the breakline type and style of the string. For example, a line string with default style **1** is drawn with the string's links in the string colour and for a point string with default style **1**, crosses are drawn at each string point in the string colour. However, styles can have their own colours which override the default colour of the string. Interface strings have two colours (red and green) which are used to represent cut and fill information.

Hence super strings with **default styles** appear on the screen as

point string (non breakline string)

each string link is considered to be an **invisible** line. String values are not defined along the invisible string links.

line string (breakline string)

each string link is considered to be a **solid** line. String values are defined along the string links by linear interpolation between the end points of the string link.

String Chainage

Every vertex along a string has a unique **chainage** value. This chainage is calculated by taking the start chainage defined for the first vertex of the string, and adding to it the **plan** distance along the string from the start vertex to the selected vertex on the string.

Go to the next section [Models](#) or back to [Data Types](#).

Models

Within a **12d Model** project, information is collected in units called **MODELS**. Models contain strings and tins (see the next section).

Each model has a unique user-defined text name of up to two hundred alphanumeric characters and spaces.

For convenience, model names should reflect the nature of the information in the model. For example, a model containing terrain data could be called **terrain**. **design** could be another model containing design data.

Each model has minimum and maximum x, y and z values which define a bounding box which encloses all the data in the model (the model bounding box). The size of the model bounding box is automatically updated as new data is added to the model, but not adjusted as data is deleted. A re-calculation of the model bounding box is performed by the **calc extents** buttons on the model and view information panels.

There is an option to list all the models available in a **12d Model** session (the model list). The model list is also used in various pop-ups and walk-right menus.

Displaying Models

The screen display areas in **12d Model** are the views. Models are displayed in views by “adding” the model to the view. Similarly, when a model is “removed” from a view, it is no longer displayed in that view.

There are options in the **12d Model** menu and on each view to add and remove models from views.

Go to the next section [Tins](#) or back to [Data Types](#).

Tins

To form a continuous surface representing the data in a model, a process called triangulation is used. Triangulation creates a web of non-overlapping triangles whose nodes are the model data points. Because the data points are normally irregularly spaced, the triangulation is referred to as a **TIN** - a Triangulated Irregular Network.

For 2d, 3d, 4d and interface strings, all non null points are included in the triangulation. For super strings, only vertices that are tinable are included in a triangulation.

To allow the triangulation to accurately represent features such as ridge lines and creek beds, the links of breakline strings (line strings) are preserved as edges of triangles in the tin.

For a super string, only segments that are tinable and whose end vertices are also tinable, are included as break lines.

Each tin is given a unique user-defined name of up to two hundred alphanumeric characters and spaces.

Unlike strings, tins can be in more than one model, or even no model at all. However, to be **displayed** in a view or used for **profiling** on a section view, tins need to be in at least one model. It is suggested that each tin be in its own model called "tin **tin_name**". This makes it easy to know the model a tin is in, and also to see which models contain tins and obtain lists of all tins when using <ctrl> + <d> for name completion.

There is an option to list all the tins available in a **12d Model** session (the tin list) which also displays the models the tin is in as a walk-right. The tin list is also used in various pop-ups and walk-right menus.

Tins can be "added" and "removed" from models with options in the **triangles** option in the **12d Model** menu. If a tin is to be displayed in a view, it must be "added" to a model that is being displayed in that view.

Tins can only be **deleted** by using the **Triangles=>Delete** options - for safety, they are **not** deleted when any model containing them is cleaned or deleted.

WARNING

Tins are stored with **copies** of the points that were triangulated. If the original points are then modified, the triangulation will not reflect this change.

Go to the next section [Templates](#) or back to [Data Types](#).

Templates

Templates are used as a quick and easy method for defining design details along a string for use in conceptual and detail designs, and visualizations. Templates are stored with each project but can be written out and read in using a readable file format.

Go to the next section [Projects](#) or back to [Data Types](#).

Projects

In **12d Model**, information is organised into **projects**.

When **12d Model** begins, the user specifies the name of the project to work on. A project name can be up to two hundred alphanumeric characters and spaces.

All the information created for that project is kept together in a special folder called the **project area**.

The project area contains all the models, templates and tins associated with the project. Copies of models and tins created in other projects can be added to another project from within **12d Model**.

External data files can be read into the project (imported) using special input options. Similarly, output options are provided to write data out for use in other software packages (exported).

Go to the next section [Attributes or Meta Data](#) or back to [Data Types](#).

Attributes or Meta Data

Extra data can be attached to the Project, Models, Strings, Tins and other Elements as **attributes**, including **user defined attributes**. Attributes are also called **meta data**.

Super strings can not only have attributes defined for the entire string (**string attributes**) but can also have attributes defined for each vertex (**vertex attributes**) and also for each segment (**segment attributes**).

An attribute has a **name** and can store either an **integer** (32 bit), a **real** (64-bit double precision), a **text**, a **64-bit integer**, an **uid** (which is just a number), or it can be a special attribute called a **group** attribute that can store other attributes.

Hence attributes in **12d Model** can be grouped into a **hierarchy** or **tree**.

That is, there are attributes at the **Top** level (the first level), and amongst the top level attributes can be group attributes that contain zero or more other attributes. Attributes in a first level group attribute are said to be in the **second** level.

Similarly an attribute in the second level can be a group attribute and hence contain other attributes which are said to be in the **third** level.

So attributes form a tree structure much like a folder structure for files.

Within a group, all the attributes must have unique names.

See [Attribute Pathname](#)
 [Accessing Attribute Values](#)
 [Attribute Data Panel](#)
 [Comparing Attribute Data](#)
 [Accessing Attribute Values](#)

Attribute Pathname

The **pathname** of an attribute is the list of attribute names that you must go through, starting at the top level, until you get to the attribute. That is, the path name is the path through the attribute structure that you must go through until you reach the attribute.

The attribute names that you pass through at each level are unique so the pathname to an attribute is unique and is written by listing the attribute names you pass through at each level separating each name by a */*:

first_level_att_name / second_level_att_name/ .../attribute_name

For example, if the first level contains the attributes

sun, moon and earth top or first level

and **earth** is a group attribute containing the attributes

asia, africa, lee, america europe and australia second level

and **australia** is a group attribute containing the attributes

brisbane, melbourne, perth and sydney third level

and **sydney** is a group attribute containing

fred, joe, mary, sam and lee fourth level

then the path name to **lee** in the group **sydney** is

earth/australia/sydney/lee

Note that there is also a **lee** in the second level but there is only one **lee** at each level so there is no problem. The pathname to the first **lee** is:

earth/lee

In **12d Model** options where attribute names are required in an input field, the full **pathname** of the attribute must be given to uniquely identify the attribute.

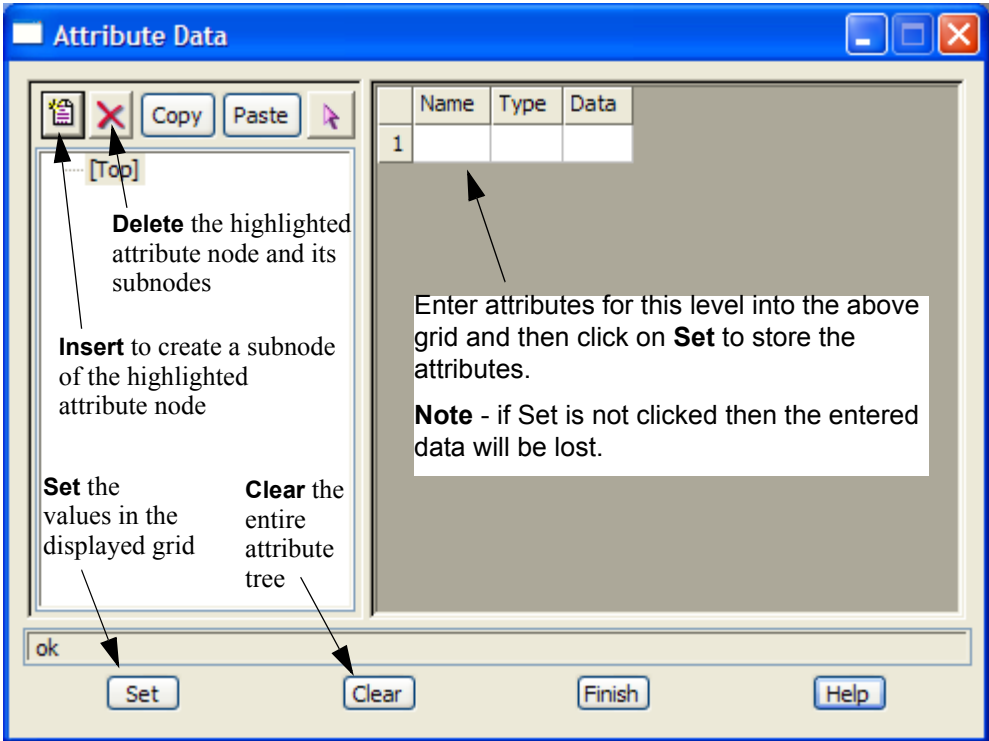
Attribute Data Panel

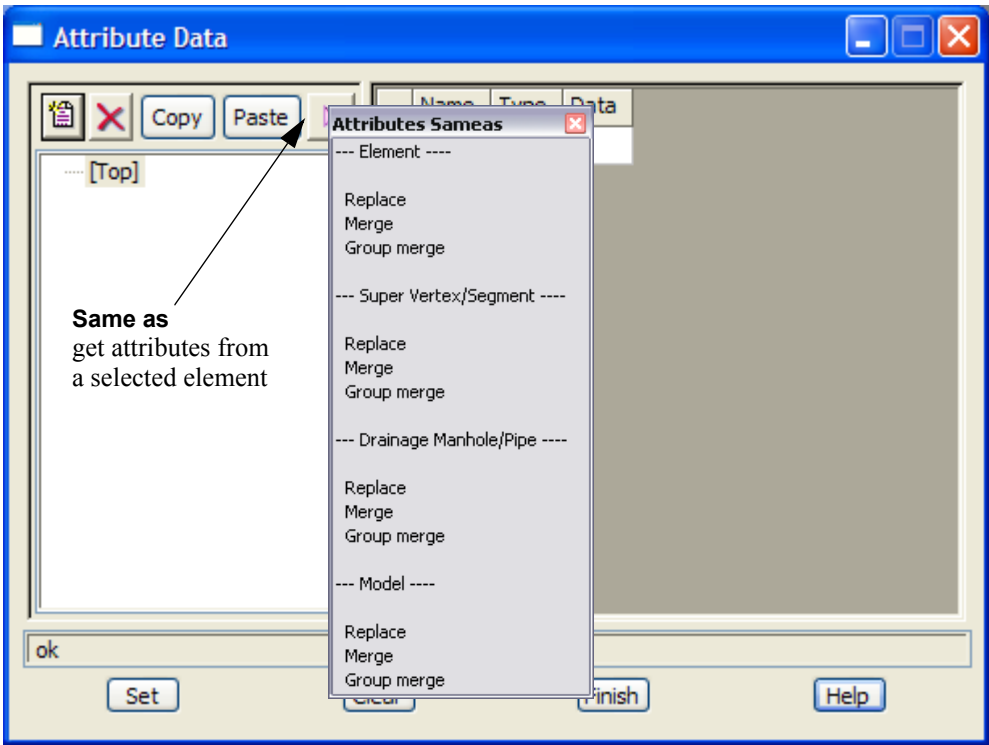
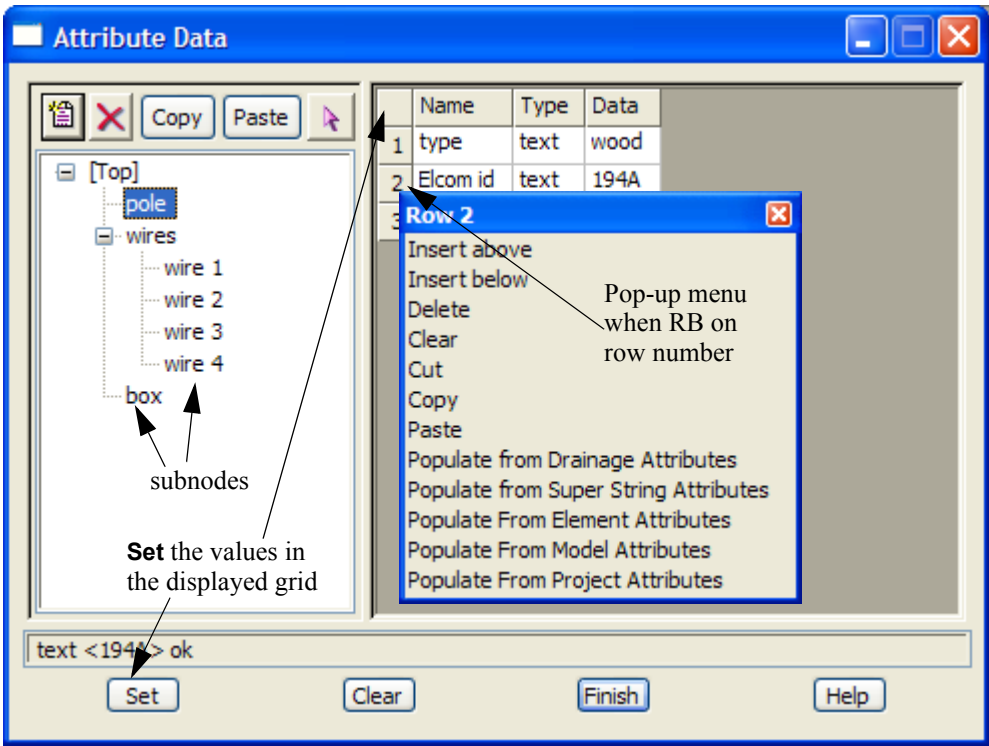
In many options when attributes are to be defined, the **Attribute Data** panel is displayed.

The **Attribute Data** panel can create and edit attributes.

When no attributes exist for an object, the **Attribute Data** panel just shows the **Top** of the attribute tree. New attributes for the top level can be added in the right hand side grid.

Sub nodes (the lower levels of the attribute tree) of an attribute node are created by simply highlighting the attribute node and then clicking on the **Insert** icon. Attributes for the subnode are then entered into the right hand grid and the **Set** button clicked to save the subnode and its attributes.





The buttons used in this panel have the following functions.

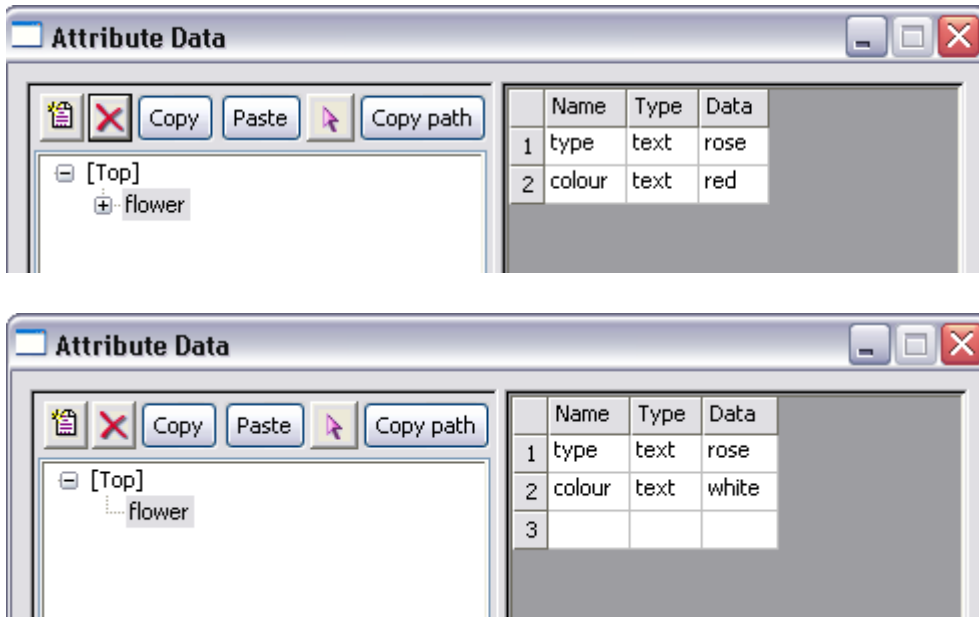
Field Description	Type	Defaults	Pop-Up
Insert	button		

create a new attribute node (subnode) beneath the highlighted attribute node

- Delete** button
delete the highlighted attribute node
- Copy** button
copy the highlighted attribute node into the attribute buffer
- Paste** button
paste the attribute buffer to the highlighted attribute node
- Same As** button
paste the attribute buffer to the highlighted attribute node
- Set** button
set the values given in the current grid in the attribute tree
- Clear** button
clears out the entire attribute tree

Comparing Attribute Data

Two Attribute Datas are the same if each Attribute Data has exactly the same groups, and each group has exactly the same attributes in them, and each identical attribute has **exactly the same value**.



For example, the two attribute data shown above have exactly the same attribute group "flower" and the group "flower" has exactly the same attributes "type" and "colour", the attribute data are not the same because the value of "colour" is "red" for one attribute data, and "white" for the other attribute data.

Accessing Attribute Values

In some options, in particular in the Map File, the actual **value** of a given attribute (the column called Data in the **Attribute Data** panel), is specified by putting a \$ in front of the attribute path name.

That is

\$earth/australia/sydney/lee

refers to the actual value of the attribute given by the path name *earth/australia/sydney/lee*.

For example, see [Map File Substitution by Attributes](#).

Please continue to the next section [Text Definitions](#).

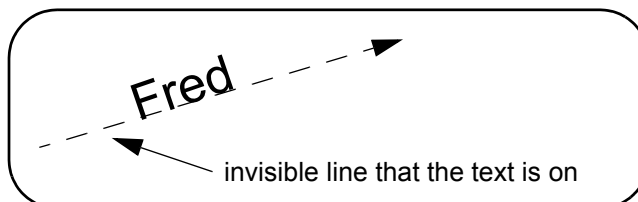
Text Definitions

Text can occur as a text string, or on vertices and segments of a super string.

The Text itself consists of one or more lines of text but the display position of the text is not as straight forward as simply placing a vertex.

The **text display position** of is defined by

- (a) an initial start position - usually a vertex or a segment
- (b) the **direction** for the text - the invisible line that the text runs along



- (c) the **text justification point** and the **offset**, **raise** and **angle** defined with respect to the justification point. Note that the definition of the justification point and the offset, raise and angle depend on whether the text is vertex text or segment text.
- (d) the justification (top left etc) for the text about the justification point

Apart from text display positioning, text also has a

- (e) textstyle
- (f) text units for text height, offset and raise value
- (g) height (size)
- (h) width factor (x factor)
- (i) slant
- (j) colour
- (k) weight
- (l) underline, strikeout and italic
- (m) whiteout, border and border type

There are also special ways of defining characters which are not available on the keyboard. For example the degree character and the squared and cube characters.

Instead of having separate variables on each panel for all of these text definition values, a **Textstyle Data** has been introduced to hold all the Text variables.

Apart from saving a massive amount of room on panels, another major benefit of the **Textstyle Data** is that in the future, extra variables can be added to the **Textstyle Data** structure and the variables are then available everywhere a **Textstyle Data** is used.

The **Textstyle Data** or **Textstyle Info** panels are usually brought up to enter Text setup data. For information on those panels, see [Textstyle Data and Textstyle Info](#).

For definitions on textstyle data values, see

[Justification Point and Offset, Raise, Angle](#)

[Text Justification](#)

[Textstyle](#)

[Text Units](#)

[Text Height](#)

[Text Width Factor or X Factor](#)

[Text Slant](#)

[Weight, Underline, Strikeout, Italic, Outline](#)

[Whiteout, Border and Border Style](#)

[Special Text Characters](#)

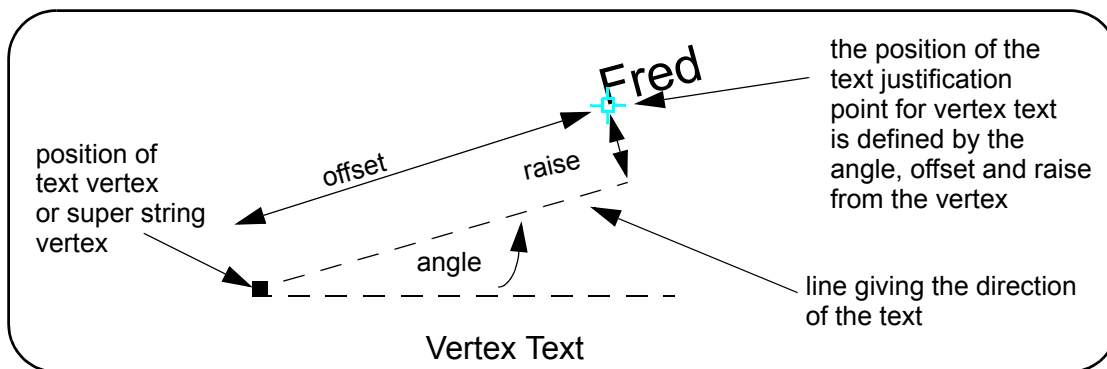
Justification Point and Offset, Raise, Angle

Vertex Text

Vertex text refers to the text of a *text string* or text at a super string vertex (vertices are displayed by toggling on **Vertices** for a plan view).

For vertex text, the text **justification point** and the **direction of the text** are defined by:

- (a) the *direction of the text* is given as a *counter clockwise angle of rotation* (measured from the x-axis) about the vertex
- (b) the *justification point* is given as an **offset** from the vertex *along the line through the vertex with the direction of the text*, and a perpendicular distance (called the **raise**) from that offset point to the justification point.



The vertex and justification point only coincide if the offset and raise values are both zero.

All text on a 4d string must have the same height, colour, angle, offset and raise.

What parts of the text on a super string vertex can be independently modified depends on the settings for the super string.

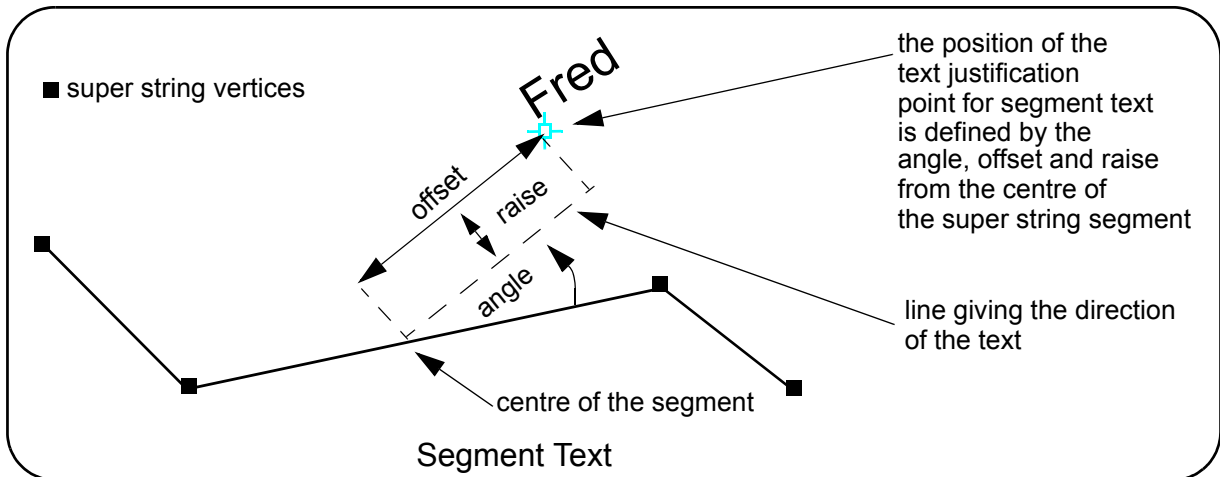
Note that these definitions are relative to the vertex and if the vertex moves, then the text moves with it.

Segment Text

Segment text is a special type of text that can only be placed on the *segment* of a super string. Unlike text at a vertex, the segment for segment text has a direction and mostly the text is required to be parallel, or related to the segment direction.

For segment text, the text **justification point** and the **direction of the text** are defined by:

- (a) the *direction of the text* is given as a *counter clockwise angle of rotation*, measured from the segment, about the centre of the segment
- (b) the *justification point* is given as an **offset** from the centre of the segment *along the line through the centre of the segment with the direction of the text*, and a perpendicular distance (called the **raise**) from that offset point to the justification point.



The direction of the text is parallel to the segment if the angle is zero.

Note that these definitions are relative to the segment and if the vertex segment in any way, then the text also moves with it.

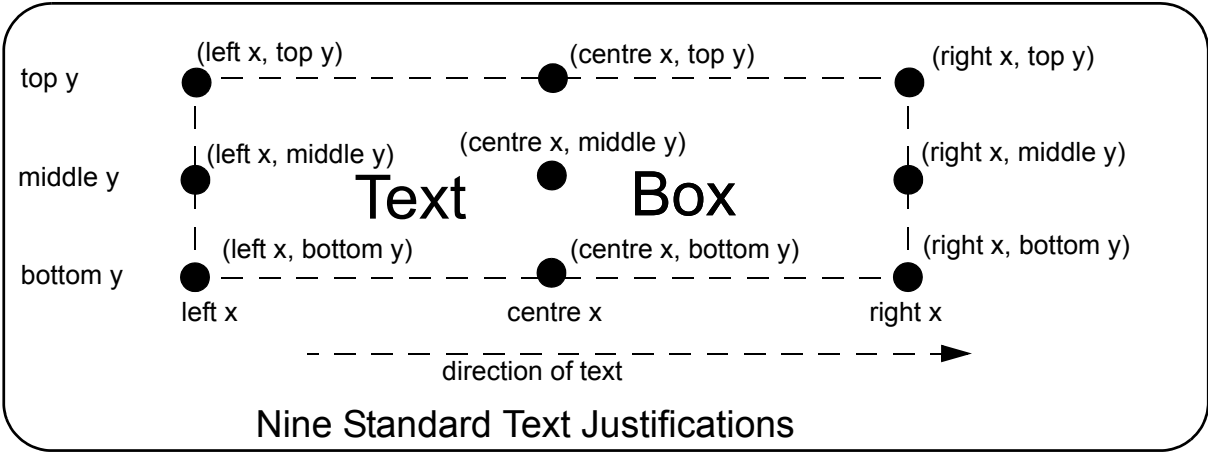
Please continue to the next section [Text Justification](#) or return to [Text Definitions](#).

Text Justification

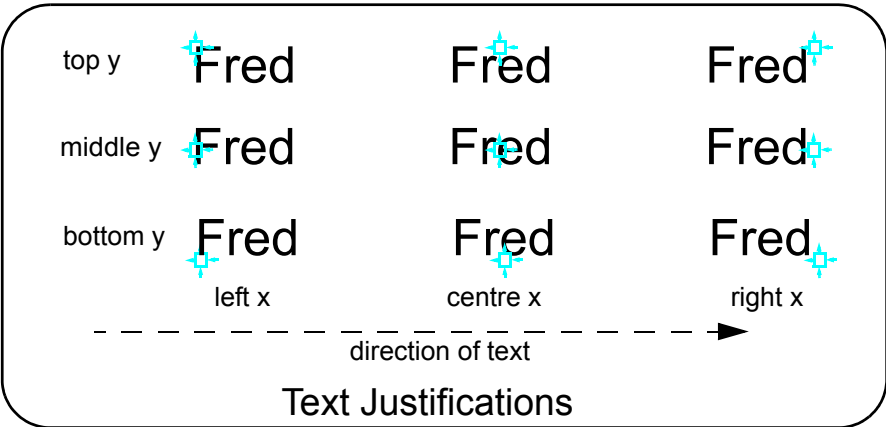
There are nine ways that any text can be positioned relative to the *justification point*, and sixteen ways for numbers with a decimal point.

For standard text, the justification is defined in terms of the rectangular box surrounding the text, and this box depends on the height of the text, the text font, and the actual characters in the text (especially for proportional fonts).

In term of the text box, the nine justifications are formed by dividing the bottom and sides of the box in half and calling bottom points left x, centre x and right x, and the side points bottom y, middle y and top y. The nine justifications are

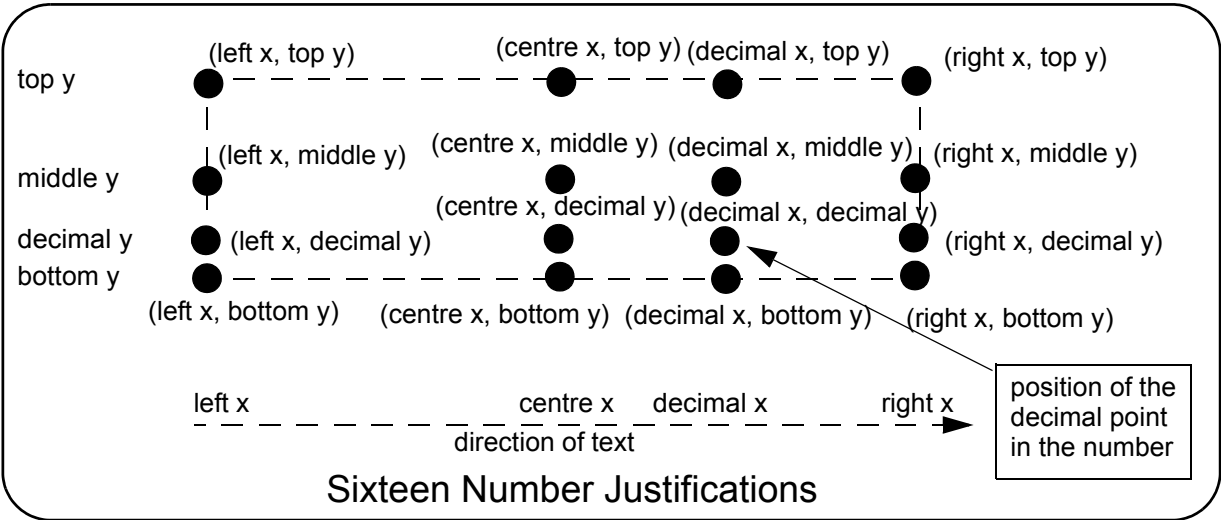


As an example, for the text **Fred**



For numbers with a decimal point, the position of the decimal point gives an addition point on the bottom called decimal x and on the side called decimal y.

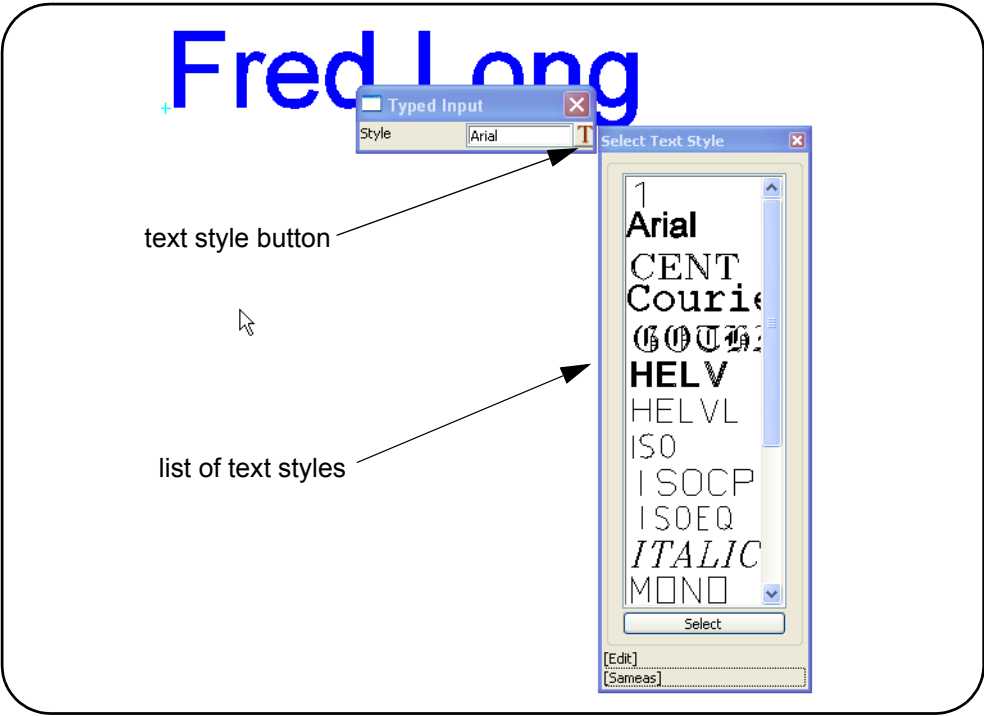
So there are sixteen possible justification for numbers.



Please continue to the next section [Textstyle](#) or return to [Text Definitions](#).

Textstyle

The available text styles for a **12d Model** project are defined by textstyles definition file (see the section [Textstyles and Fonts](#) in the Appendix [Line styles, Symbols and Textstyles](#)).
The text style is selected from the pop-up list displayed when clicking on the **Text style** button.



Please continue to the next section [Text Units](#) or return to [Text Definitions](#).

Text Units

Text occurs in **12d** Model in three ways -

- s user defined **text strings**
- s automatic text such as grid values, x-section and long-section plot annotation.
- s text within linestyles.

The most difficult thing about text is that because of the different uses of text, there needs to be more than one systems of **units** to define text heights.

The height of text for a given textstyle is defined to be the height of a capital A. However, in **12d** Model, there are three methods of defining the units for measuring this height.

- s world units - the units used for data
- s screen units - pixels (the screen is 1000 pixels wide)
- s plot paper units - millimetres.

World Units

World units are the units of user data. For most users, the base unit for user data is metres. However **12d** Model is a dimensionless system and the base unit is totally dependent on the user.

The height of world text when displayed in a view depends upon on the text height and the scale of the view.

When plotted, the height that world text appears on a plot sheet is the same as for any data defined in world units - the height depends on the **scale** used for the plot.

Text heights that are only given in world units have (**w**) after them.

For some text, the choice of units is either world or pixels. The text parameters then have a (**u**) after them.

Screen Units - pixels

When screen units (pixels) are used, the text is a fixed height on the screen. If the user zooms in on text given in pixels, the text remains the same height.

To have a height on a plot, screen unit text needs a height defined in millimetres.

For some screen text, both a pixel and a millimetre height is supplied when the text is defined.

For text with only a pixel height, there is a plotting multiplication parameter called **pixels-to-millimetres** which is used to convert pixel heights to plot paper heights. The value of pixels-to-millimetres is set using the **plots=>pixels to mm** option and is stored for the project.

Text heights that are only given in pixels have a (**pix**) or (**p**) after them.

For some text, the choice of units is either world or pixels. These text parameters then have a (**u**) after them.

Plot Paper Units - millimetres

Text defined in plot paper units (millimetres) has a well defined height on a plot sheet. When a view scale is set for a plan view, then paper text will draw at the correct size for that scale.

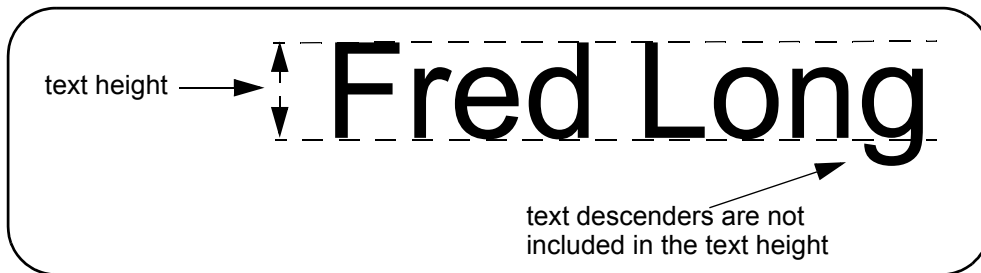
Text heights that are only given in millimetres have (**mm**) after them.

Please continue to the next section [Text Height](#) or return to [Text Definitions](#).

Text Height

The height of text is defined to be the height measured from the line that the text sits on to the top of the upper case characters such as F.

Text descenders are not included in the definition of height.



Please continue to the next section [Text Width Factor or X Factor](#) or return to [Text Definitions](#).

Text Width Factor or X Factor

In a text font, each character has a defined width which may depend on the character.

For a **non-proportional font** such as `Courier New`, all the characters in the font have the same width.

For a **proportional font** such as `Arial`, the width varies for each character.

The character width is actually defined as part of the font and is not available to 12d text but the character widths are multiplied by a *width factor* (*x factor*) which is set for each text string.

Proportion Font - Arial

x factor = 1 Fred Long

x factor = 2 Fred Long

Non-Proportion Font - Courier New

x factor = 1 Fred Long

x factor = 2 Fred Long

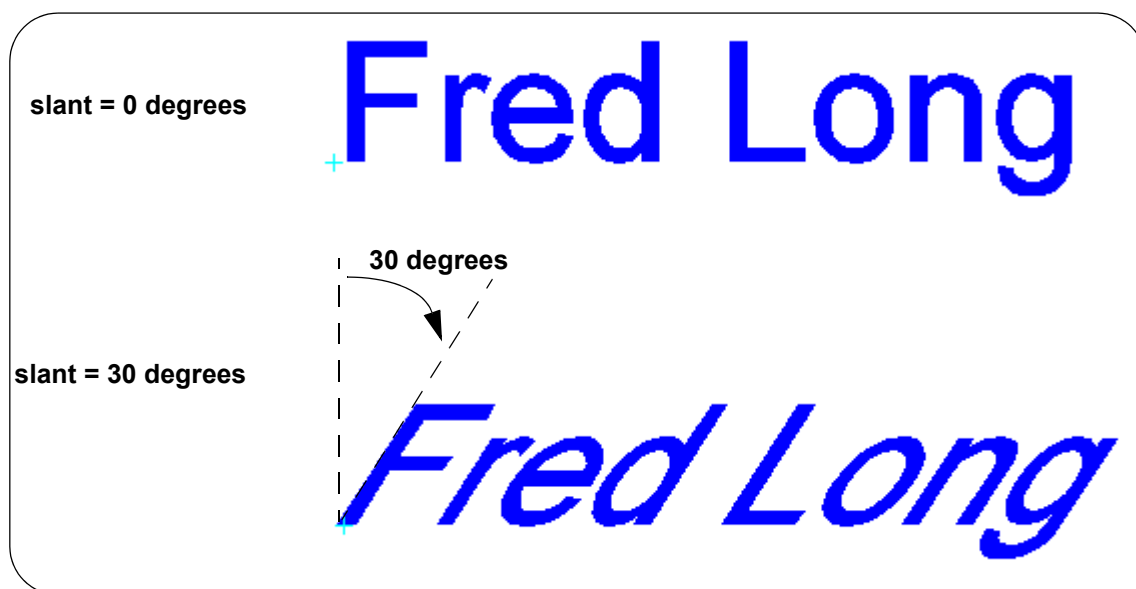
Please continue to the next section [Text Slant](#) or return to [Text Definitions](#).

Text Slant

A **slant** angle of between 0 and 45 degrees can be defined for a text string.

For non-zero slant angles, the text characters are slanted by the given angle measured in a clockwise direction from the vertical (a bearing).

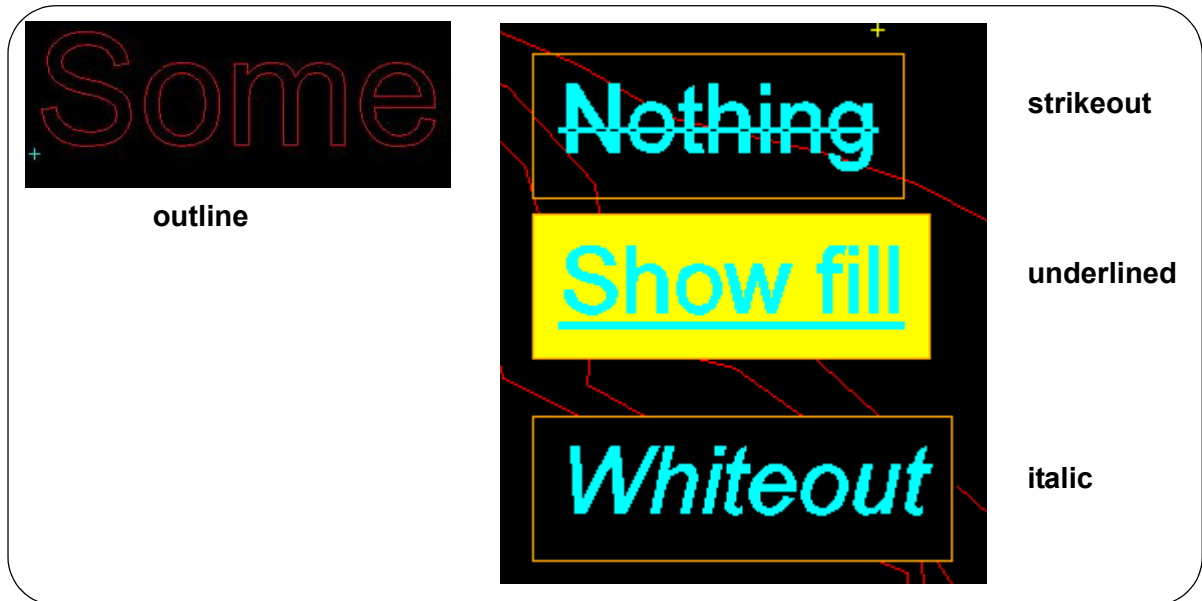
Currently the text *slant* angle can only be set by the **Slant** field in the Textstyle Data panel field. The value is in degrees in the format ddd.mmssfff.



Please continue to the next section [Weight, Underline, Strikeout, Italic, Outline](#) or return to [Text Definitions](#).

Weight, Underline, Strikeout, Italic, Outline

For *True Type Fonts* only:



Please continue to the next section [Whiteout, Border and Border Style](#) or return to [Text Definitions](#).


Whiteout, Border and Border Style

Note: Border Style is for V11 only. Rectangle is the only Border Style in V10.

text with no fill and no border

text with a yellow fill and an orange border

text with "view colour" fill and an orange border



strikeout

underlined

italic

black view colour





white view colour

off yellow view colour

Please continue to the next section [Special Text Characters](#) or return to [Text Definitions](#).

Special Text Characters

There are special text characters that do not appear on the standard keyboard but can still be entered into text strings, vertex text and segment text with textstyles using **true type fonts**.

The special characters are entered by holding down the Alt key and typing in certain numbers on the *number pad* whilst the Alt key is still being held down). The character will appear when the Alt key is released.

Some commonly used special characters and their Alt codes are

Squared character	²	Alt 0178
Cubed character	³	Alt 0179
Middle dot character	·	Alt 0183
Large diameter character	∅	Alt 0216
Small diameter character	ø	Alt 0248
Degree character	°	Alt 0176
Copyright character	©	Alt 0169
Registered character	®	Alt 0174
British Pound character	£	Alt 0163
Japanese Yen character	¥	Alt 0165

The Alt values come from the character map for Windows. This can be quickly viewed by
run charmap.

NOTE - these values may depend on the true typed font used in the textstyle.

Please continue to the next section [Textstyle Data and Textstyle Info](#) or return to [Text Definitions](#).

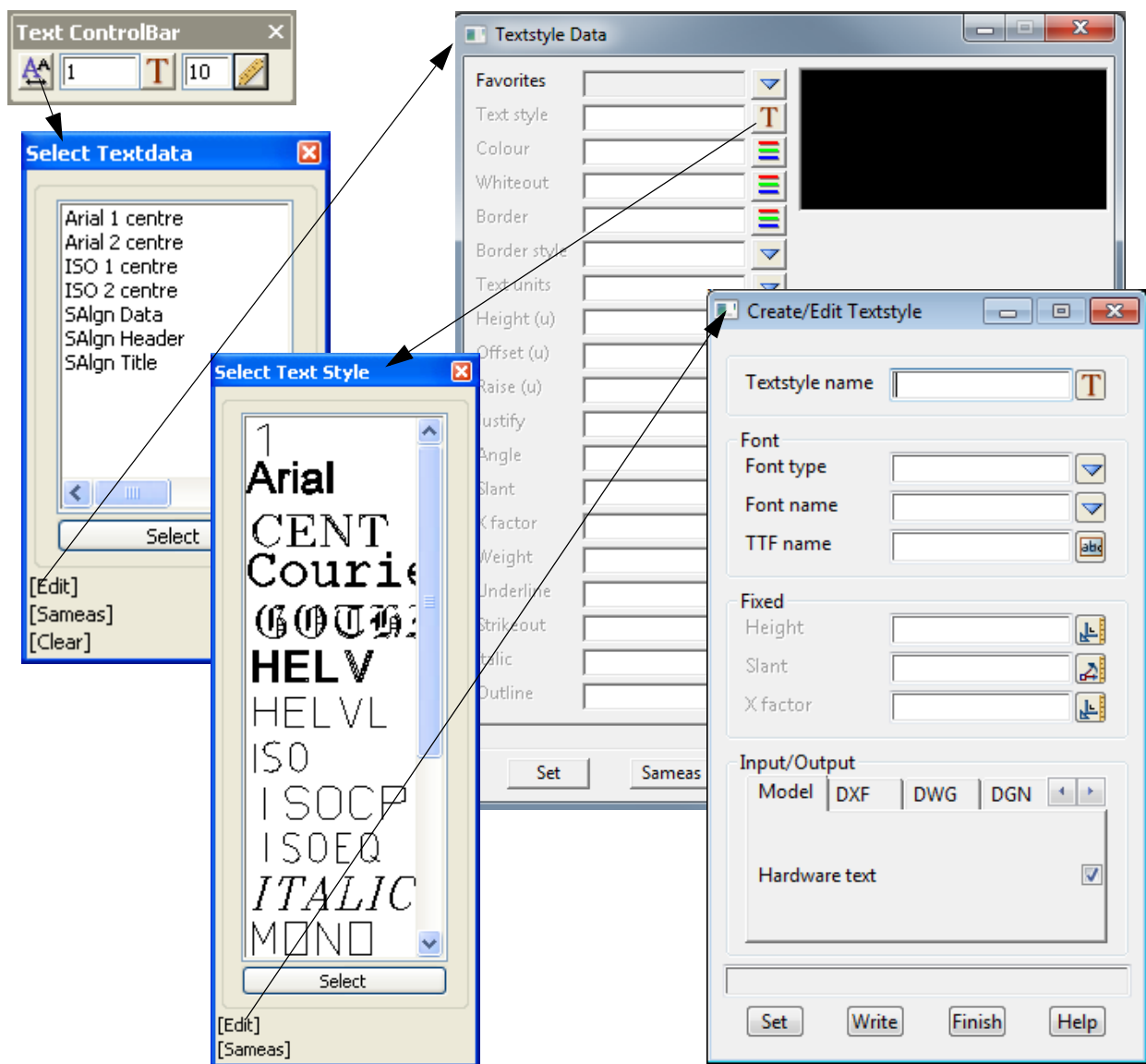
Textstyle Data and Textstyle Info

Text_info

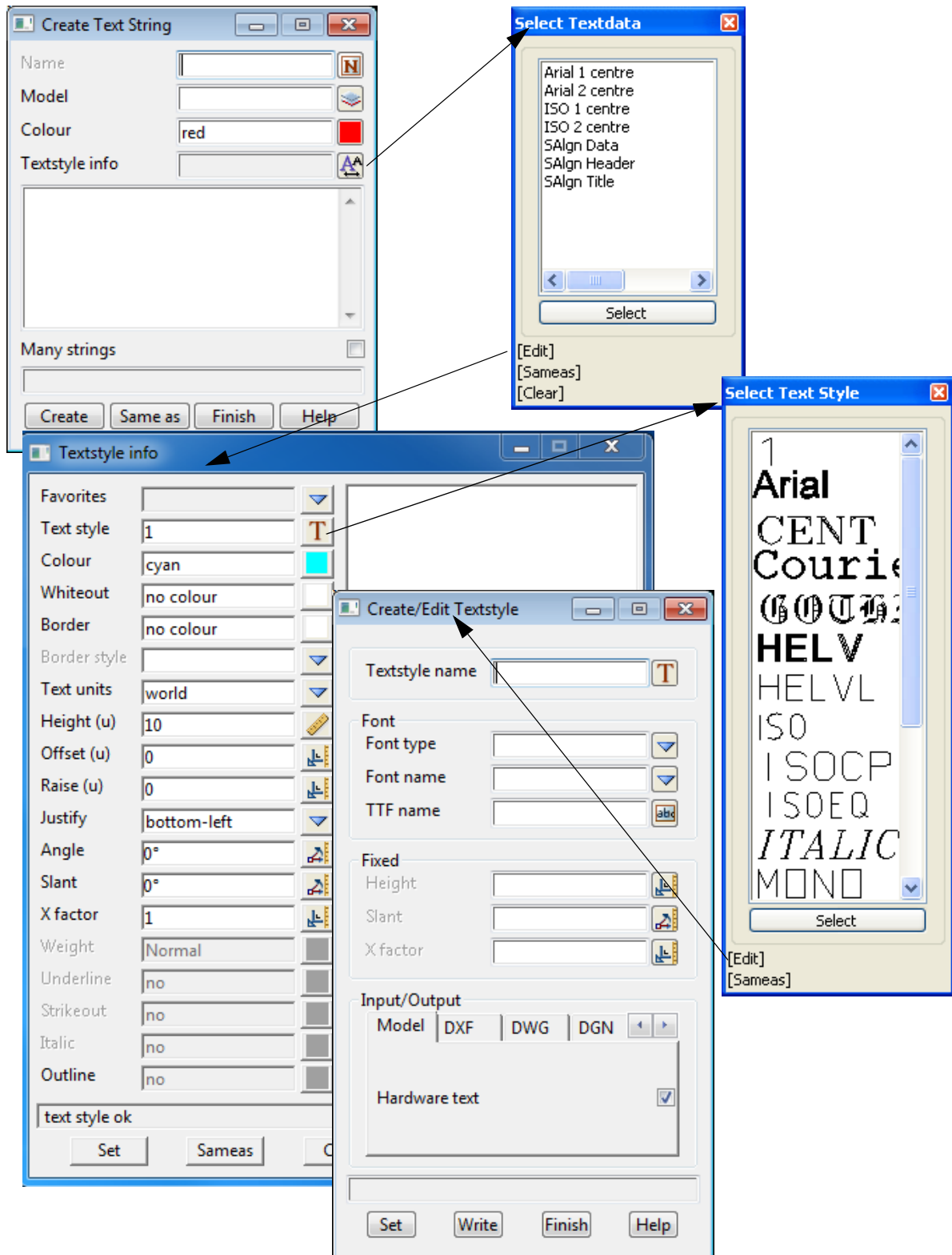
There is a textstyle info panel field for defining the text parameters. Clicking on the textstyle info icon on the Text Controlbar or on a panel, brings up the Select Textdata pop-up menu which lists the textstyle favourites. By clicking on [Edit], the **Textstyle Info** panel is brought up and all the definitions for the text style can be modified and written to the textstyle info panel field by clicking on **Set**.

Textstyle favourites are defined in the Browse option **Projects=>Browse=>Textstyle data favourites** and documented in the section [Textstyle Data Favourites](#) in the chapter [Projects](#).

Note that there is a **Textstyle Data** panel that is identical to the **Textstyle Info** panel except that it doesn't have the Colour field. The Textstyle Data panel is brought up by clicking on the A on the Text Controlbar.



For information about the **Create/Edit Textstyle** panel, see [Textstyles](#).



For information about the **Create/Edit Textstyle** panel, see [Textstyles](#).

For information on the definitions of the fields in the **Textstyle Data** and **Textstyle Info** panels, go to the section [Text Definitions](#)

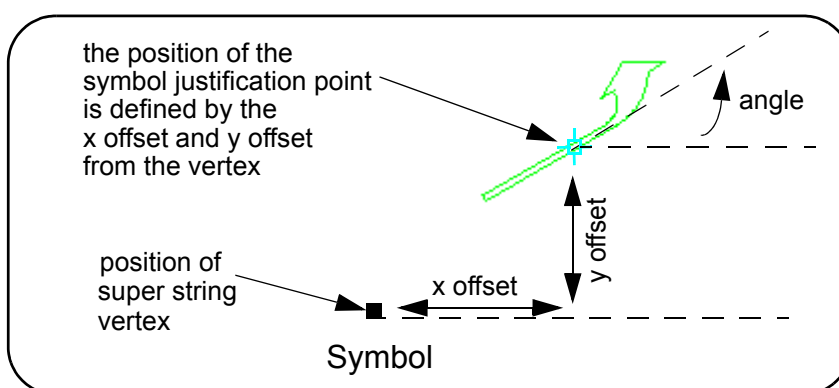
Please continue to the next section [Symbol Definitions](#).

Symbol Definitions

Symbols are often on a one vertex super string but they can be placed on any vertex of a super string.

The displayed symbol is defined by

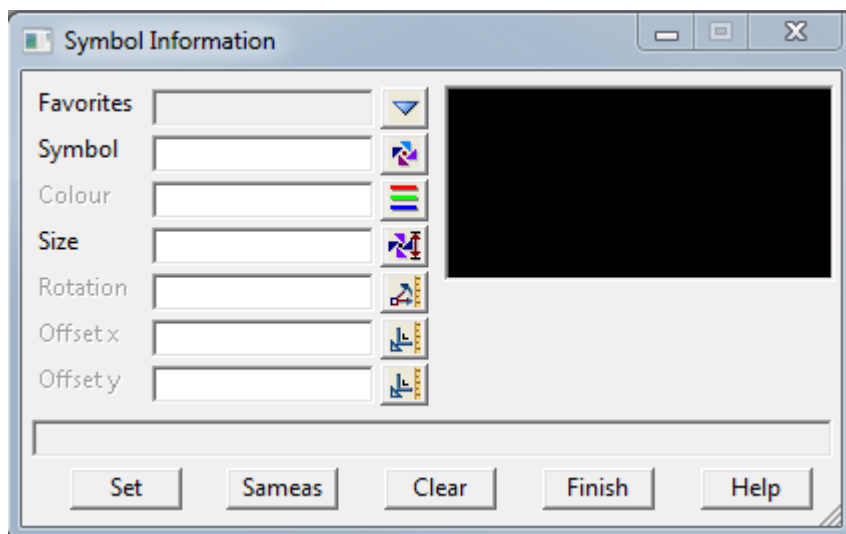
- (a) an initial start position
- (b) the actual symbol
- (c) the **x offset** and **y offset** of the **symbol justification point** from coordinates of the vertex. The vertex and justification point only coincide if the x offset and y offset values are both zero.
- (d) the rotation *angle of the symbol* is given as a *counter clockwise angle of rotation* (measured from the positive x-axis) about the symbol justification point.



Note that these definitions are relative to the vertex and if the vertex moves, then the symbol moves with it.

What parts of the symbols on the vertices of the same super string can be independently modified depends on the settings for the super string. For example, all symbol angles may have to be the same.

The **Symbol Information** panel is usually brought up to enter symbol information (see [Symbol Data](#)).



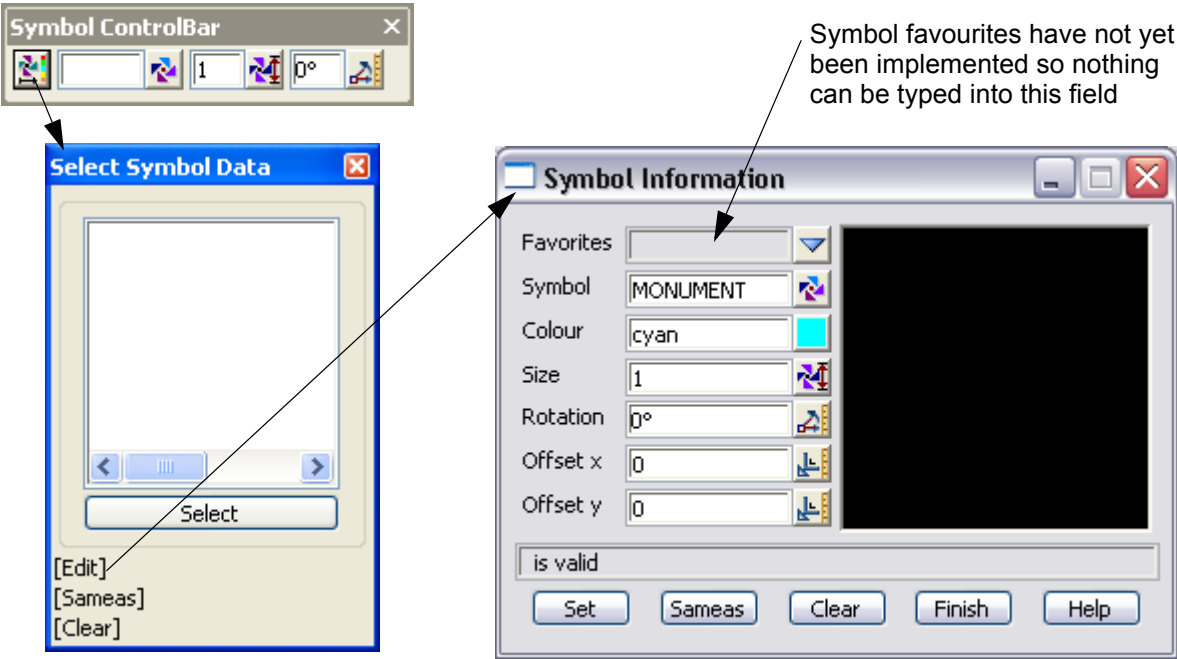
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Favourites			
<i>not yet implemented.</i>			
Symbol	Symbol box		available symbols
<i>the name of the symbol. This field can not be blank.</i>			
Colour			select colour menu
<i>the colour of the symbol</i>			
Size			measures menu
<i>the size of the symbol. This field can not be blank.</i>			
Rotation			measures menu
<i>the angle of rotation of the symbol. The angle is measured in a counterclockwise direction from the positive x-axis. The units for angle are degrees minutes and seconds and it is entered in HP Notation. If blank then the rotation is 0.</i>			
Offset x/y			measures menu
<i>the x/y-distance to offset the symbol from each vertex of the string. If blank the value is 0.</i>			
Set	button		
<i>set the values to be those in the panel.</i>			
Sameas	button		
<i>another string can be selected and the information about it automatically put in the panel fields.</i>			
Clear	button		
<i>clear all the values in the panel fields.</i>			

Symbol Data

There is a Symbol Information panel for defining symbol parameters.

Clicking on the **Symbol info** icon on the **Symbol Controlbar** or on a panel, brings up the **Select Symbol Data** pop-up menu. By clicking on [Edit], the **Symbol Information** panel is brought up and all the definitions for the symbol can be modified and written to the Symbol Info panel field by clicking on **Set**.



For information on the **Symbol Information** panel and the definitions for *symbols*. go to [Symbol Definitions](#)

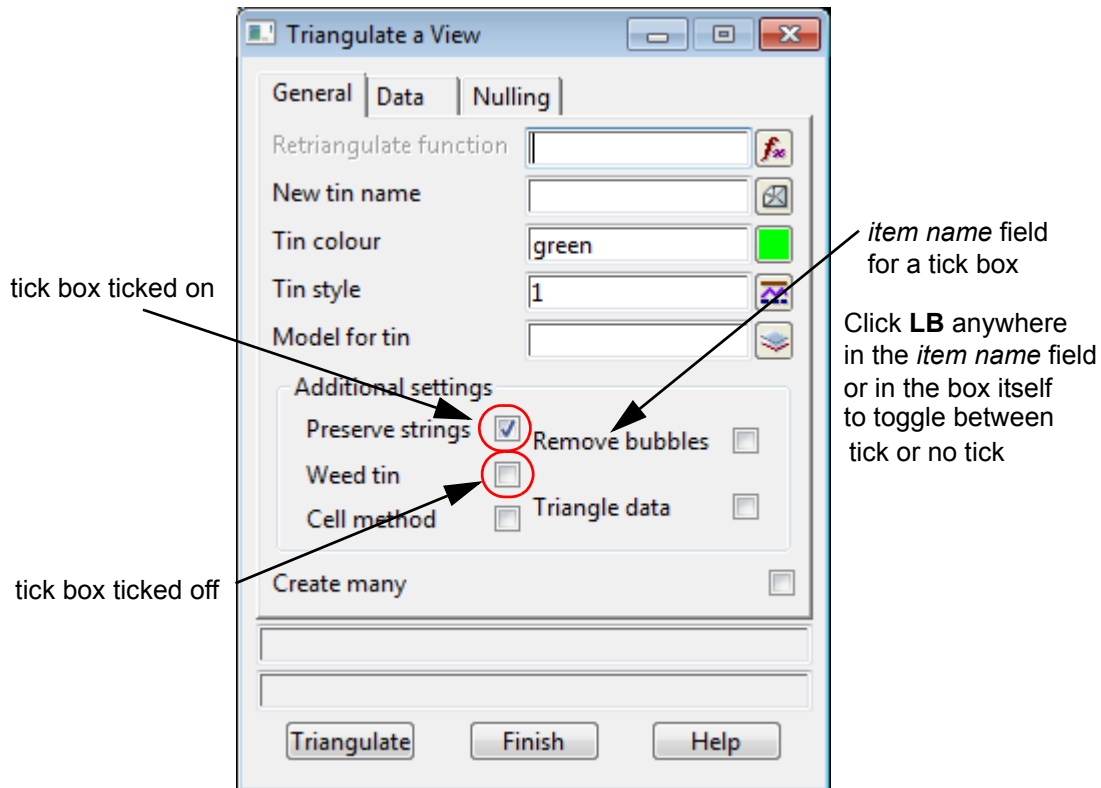
Please continue to the next section [Tick Box](#).

Tick Box

Many items require a mode to be either on or off.

In **12d Model**, there is a special box with a **tick** to indicate that the setting is **on** and **nothing** to indicate that the setting is **off**.

In a **tick** box, the tick is changed to the nothing state by clicking LB in the box surrounding the tick or clicking LB on the **item name** field for the tick box.



Please continue to the next section [Picking Strings](#).

Picking Strings

In many **12d Model** options, the user is required to “pick” the string to be used in the option, or to get information about a string.

After any option requiring a pick is selected, a message regarding the function of the mouse buttons is written to the screen message area.

<option> [picks][fast][menu]

There are three picking method available in **12d Model**:

- (a) fast pick where the pick and the accept occur as one operation
- (b) fast accept where the if there is only one item satisfying the snap conditions then it is automatically accepted but if there is more than one, the tentative pick mechanism is used and
- (c) tentative picks with a separate pick and accept mechanism

Fast pick will be documented first, followed by **fast accept** and **tentative pick** (pick and accept).

Go to the next section [Fast Pick](#) or back to [Picking Strings](#).

Fast Pick

To **fast pick** a string, simply move the cursor near the string and **click MB** or type <Enter>. The nearest string to the cursor satisfying the snap conditions is selected.

Fast pick is used when the **F** snap is on.

Various snap modes can be set for the fast pick. The available snaps are point (vertex), line, grid, tin and cursor. One or more snaps can be set simultaneously. The snaps are described in more detail in the section [Snaps](#).

Go to the next section [Fast Accept](#) or back to [Picking Strings](#).

Fast Accept

To **fast accept** a string, simply move the cursor near the string and **click LB** or type <Enter>. If there is only one string satisfying the snap conditions, then it is automatically accepted.

If there is more than one string satisfying the snap conditions, the nearest string to the cursor satisfying the snap conditions highlighted and an information menu containing information about the selected string is displayed.

If the correct string has been tentatively picked, **click MB** or **type <enter>** accepts the string. If the incorrect string is tentatively picked, click LB and the next closest string satisfying the snap conditions will be highlighted. See the section [Tentative Pick](#) for more information on tentative picking.

Fast accept is used when the **A** snap is on.

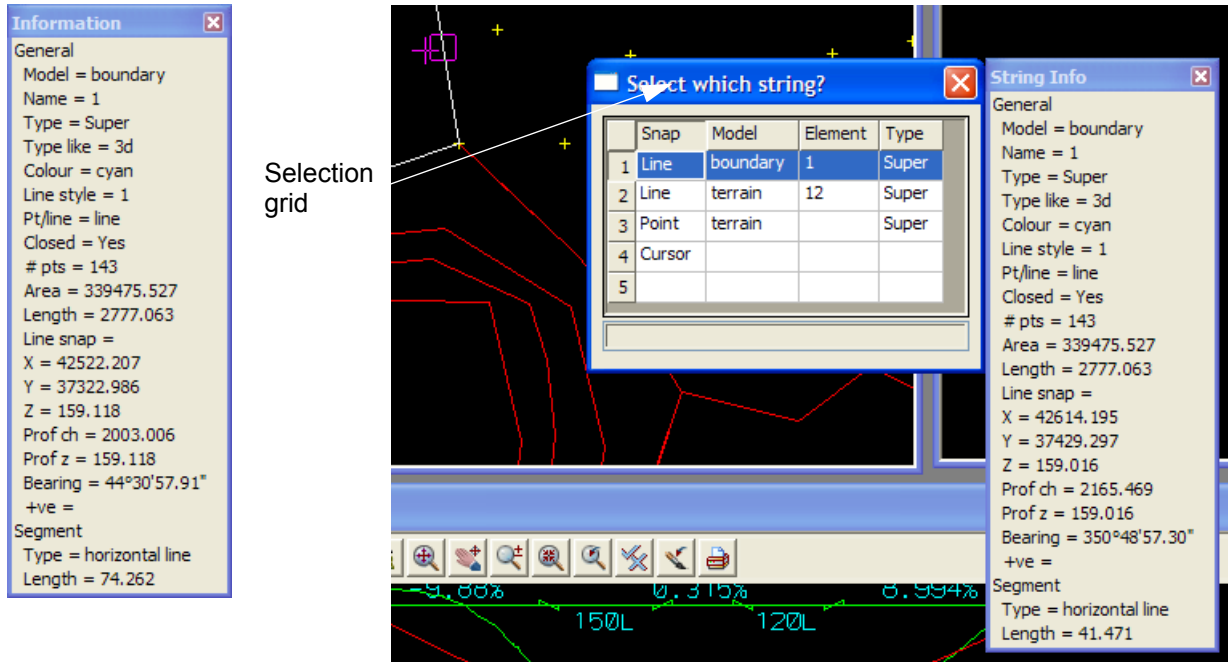
Various snap modes can be set for the fast pick. The available snaps are point (vertex), line, grid, tin and cursor. One or more snaps can be set simultaneously. The snaps are described in more detail in the next major section [Snaps](#).

Go to the next section [Tentative Pick](#) or back to [Picking Strings](#).

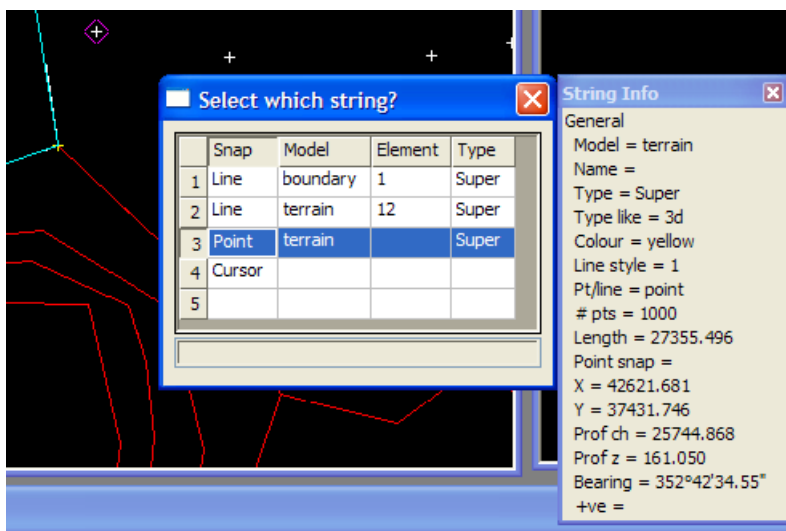
Tentative Pick

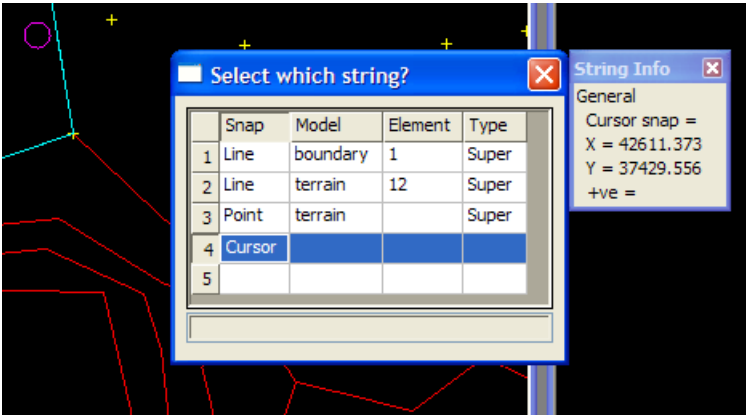
To **tentatively pick** (or tentatively select) a string, move the cursor near the string and **click LB**. The nearest string to the cursor satisfying the snap conditions (see the next section on Snaps) is highlighted and an information menu containing information about the selected string is displayed (the information varies for each string type- see the section [String Information](#) in the chapter [Strings](#)).

If **M** snap is on, all the strings satisfying the search criteria are listed in a grid (the selection grid) as well as the Information panel.



When the selection grid is displayed, any other string in the grid can be made the considered string by simply clicking on the row containing the string in the grid. The new string will highlight and the snap position displayed.





The information menu disappears if the cursor is moved slightly.

The string name, the string model and the mouse button functions are also displayed in the Status Bar when the picked string is highlighted:

```
<option> [selects][accepts][menu] "model->string name"
```

If the correct string has been tentatively picked, **click MB** or **type <enter>** to accept the string. If the information menu was still up, it disappears when the string is accepted.

Note - if the information menu does not appear when a string is highlighted, then the *information snap* may be set to off. See the section [Snaps](#).

Tentative Picking and Repicking

If **M** snap is **off**, and one string is tentatively picked (and highlighted) but another string was intended to be picked, click **LB** again without moving the cursor and the next nearest string to the current cursor position will be selected, highlighted and an information menu put up for it. Any strings already rejected during the pick will be ignored. Continuing to click **LB** again without moving the cursor will sequentially pick the next nearest string and ignore the earlier rejected strings.

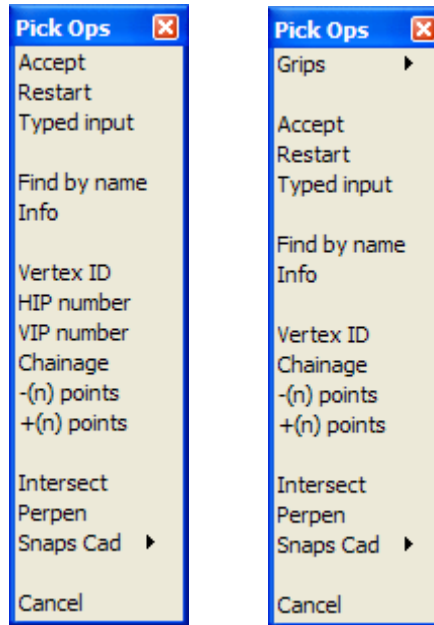
To allow **all** strings to be eligible for picking again, simply move the cursor a small distance (the reset distance - default five pixels) and start picking again. This will automatically **reset** the rejection list.

When **M** snap is **on**, all strings are shown in the selection grid and any one can be picked without the need to keep clicking **LB**.

Pick Ops Menu

Options to allow all strings to be eligible for picking again, to cancel the pick operation and to accept a picked string are all available from the **Pick Ops** menu.

The **Pick Ops** menu appears whenever RB is clicked whilst in the pick option. The **Pick Ops** menu is

Alignment and
Pipeline stringsFor most other
string types

To allow all strings to be eligible for picking again, select **Restart** from the **Pick Ops** menu. This has the same effect as moving the cursor the reset distance.

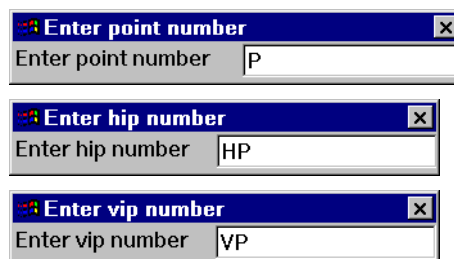
To cancel the pick without selecting any string, select **Cancel** from the **Pick Ops** menu.

Selecting **Accept** from the **Pick Ops** menu, accepts the current picked string. This is the same as clicking MB without calling up the **Pick Ops** menu.

The **Find by name** option allows the user to specify a string name to restrict the pick by. This options is also available in the snap option and will be described there.

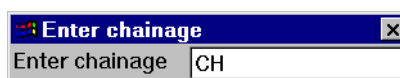
Selecting **Info** will redisplay the information menu for the string.

If **Vertex/HIP/VIP number**, is selected, the **enter vertex/hip/vip number** box is displayed.



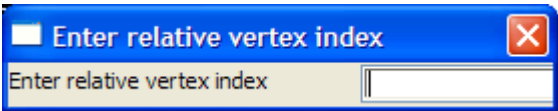
Typing the number into the box terminated by <enter> will move the pick position to that vertex or IP point.

If **Chainage** is selected, the **Enter Chainage** box is displayed.



Typing a chainage into the box terminated by <enter> will move the pick position to that chainage on the tentatively selected string.

If **-(n)** vertices or **+(n)** vertices is selected, the **Enter relative vertex index** box is displayed.



Typing a positive/negative number into the box terminated by <enter> will move the pick vertex to that many vertices after/before the selected position on the tentatively selected string.

The left and right arrow keys (<-, ->) can also be used to move the pick position to the previous or following vertex respectively.

When selecting **Snaps Cad**, the **Snaps Cad Menu** appears on the screen. The **Snaps Cad Menu** can also be accessed by walking right on **Snaps Cad**. For more information please go to [Snaps Cad](#)

To remove the **Pick Ops** menu without selecting an option, either select the **[X]** button from the **Pick Ops** menu title area or simply click RB again whilst the cursor is in a view.

Various snap modes can be set for the pick. The available snaps are point, line, grid, tin and cursor. One or more snaps can be set simultaneously. The snaps are described in more detail in the next section.

Go to the next section [Picking with Direction](#) or back to [Picking Strings](#).

Picking with Direction

Picking a string is one operation where **12d Model** is monitoring the cursor position when button LB (or MB for fast pick) is pushed down and also the cursor position when button LB (MB) is subsequently **released**.

The **pick position** is taken as the cursor position when button LB (MB) is released, but the difference between the down and up positions for button LB (MB) defines a **direction** vector or **sense** to the pick. This direction is called the **picking direction** or **picking sense**.

The **picking direction** is used in a number of **12d Model** options.

For example, in the information panel displayed for any picking operation, if the picking direction is the same as the string direction, a **+ve** is displayed at the bottom of the panel. If the directions are opposite, then a **-ve** is displayed in the panel.

Important Note

If a string was picked with direction, then to automatically reset the rejection list, the cursor must be move fifty (50) pixels rather than the five required for a non-directional pick.

Go to the next section [Summarising the 12d Model Picking Mechanisms](#) or back to [Picking Strings](#).

Summarising the 12d Model Picking Mechanisms

Tentative picking - pick and accept as separate operations

- | | |
|-------------------------|-----------------------------------------------------------------------------------------------|
| LB - left button | select the next nearest string. |
| | moving the cursor more than five pixels resets the rejection list for a non-directional pick. |
| | moving the cursor more than fifty (50) pixels resets the rejection |

list for a directional pick.

MB - middle button

accept the current selected (highlighted) string - ends the pick.

RB - right button

brings up the **Pick Ops** menu.

Typing **<Enter>**
ends

same as MB: accepts the current selected (highlighted) string -
the pick

Fast accepting - pick and accept in one operation if there is only one item satisfies the snap conditions or a tentative pick if more than one item.

LB - left button

select the next nearest string. If there is only one item possible then it is automatically accepted. Otherwise it is the same as for a tentative pick.

moving the cursor more than five pixels resets the rejection list for a non-directional pick.

moving the cursor more than fifty (50) pixels resets the rejection list for a directional pick.

MB - middle button

accept the current selected (highlighted) string - ends the pick.

RB - right button

brings up the **Pick Ops** menu.

Typing **<Enter>**
ends

same as MB: accepts the current selected (highlighted) string -
the pick

Fast picking - pick and accept in one operation

MB - middle button
or

pick and accepts the nearest string.

Typing **<Enter>**

same as MB: pick and accepts the nearest string - ends
the pick.

Please continue to the next section [X Y Z and Ch Ht Typed Input Box](#) (or back to [Picking Strings](#)).

	ddd	whole degrees	
	.	separator between degrees and minutes	
	mm	whole minutes	
	ss	whole seconds	
	fff	fractions of seconds (as many as required)	
s	bearing in decimal degrees	distance	actual z
	dbd	ddd.dd	distance z
s	angle in degrees-minutes-seconds	distance	actual z
	ad	ddd.mmss	distance z
s	angle in decimal degrees	distance	actual z
	dad	ddd.dd	distance z

The default mode for the **Enter Ch Ht** box is to receive *chainage* and *height* values.

However, by typing special character codes before the values, the **Enter Ch Ht** box can be used to enter data in a variety of formats including grade distance and slope distance.

The full list of typed input codes now follows (the text will be given in lower case, but it can be typed in either upper or lower case).

s	actual <i>chainage</i>	actual <i>height</i>	
		<i>chainage height</i>	
	or		
	a	<i>chainage height</i>	
s	relative <i>chainage</i>	relative <i>height</i>	
	r	<i>chainage height</i>	
s	<i>slope</i> and <i>distance</i>		
	sd	<i>slope distance</i>	
		where slope is 1 vertical in slope horizontal units	
s	<i>grade</i> and <i>distance</i>		
	gd	<i>grade distance</i>	
		where grade is 1/slope as a percentage	

Please continue to the next section [Tentative Typed Inputs](#).

Tentative Typed Inputs

If the string has been **tentatively** selected (by clicking LB and highlighting the string but not yet accepting it), then further typed inputs are available which then work for the **highlighted** string only.

The **Tentative typed inputs** are:

CH <i>chainage</i>	go to the given chainage
V <i>vertex-index</i>	go to the vertex number <i>vertex-index</i>
P <i>point-id</i>	go to vertex with the given point-id (vertex-id)
+	go to the next vertex
-> (right arrow)	go to the next vertex
+number	go forward <i>number</i> vertices
-	go back to the previous vertex
<- (left arrow)	go back to the previous vertex
-number	go backward <i>number</i> vertices
HP <i>number</i>	go to horizontal IP number number
VP <i>number</i>	go to vertical IP number number

When a string is *tentatively* selected, the above *typed input* options are also available as *menu items* from the **Pick-Ops** menu. This has been documented in the section [Pick Ops Menu](#) in this chapter.

Warning - If **M** snap is on and the selection grid is displayed, the tentative typed inputs will not work. Either turn **M** snap off, or move the cursor so the selection grid disappears before typing, or use **RB** to bring up the **Pick Ops** menu and select the required command from there.

Please continue to the next section [Picking Point Ids \(Point Numbers, Vertex ids\)](#).

Picking Point Ids (Point Numbers, Vertex ids)

When a **12d Model** option uses a *cursor select* (picking) in a plan view to pick strings, then *typed input* can be used to select a point id (point number, vertex id) which exists in any model on the view (note that a point id can be numeric or alphanumeric).

When over the plan view, instead of clicking **LB** to select a string, simply type:

number to select a *numeric* point id

or

P*text* to select an *alphanumeric* point id of name *text*.

This will bring up the **Enter X Y Z** box and the typed information will go into the box. Type <enter> and the view will then be searched for the given point number.

If the **point id** exists, then a large cross will be drawn over the vertex on the view and the string containing the point id will be highlighted.

Note that if a string is *tentatively* selected (i.e. highlight but not yet accepted), then

Vn will select the nth vertex of the tentatively selected string (vertex index of n)

Please continue to the next section [Snaps](#).

Snaps

In most **12d Model** options, the mouse is used to pick data from a string displayed on the screen.

Unfortunately different options usually require different data so an easy method is needed to help select from all the strings on the screen, a specific string or part of a string.

In **12d Model**, **Snaps** are used as part of the string picking mechanism (discussed in the previous sections) to help filter out what data is interactively selected on a view.

Using the **12d snaps** it is possible to

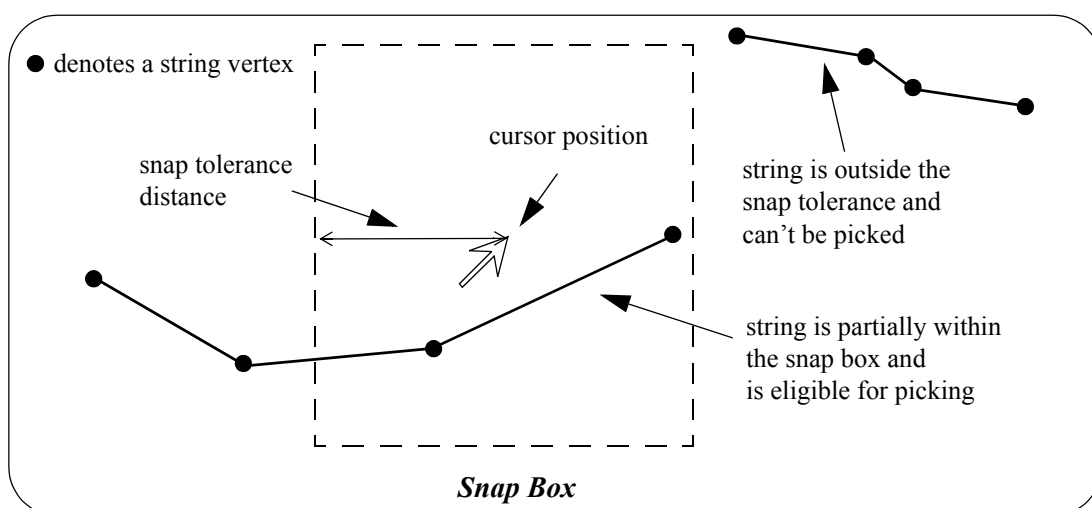
- s restrict any string picks to selected string names and/or models
- s set modes which are used to determine what parts of strings are used for picking
- s set the search distance for picking vertices (point snap tolerance)
- s set the search distance for picking (snap tolerance)
- s give the name of a tin to be used to set z-values at a (x,y) position
- s set whether the user is prompted for a new height (z-value) after every point edit
- s turn on/off the information menu when picking
- s turn on/off the *selection* grid when picking
- s

Go to the next section [Point and Line Snaps](#) or back to [Snaps](#).

Point and Line Snaps

When trying to interactively pick a string in **12d Model**, the user moves the cursor near the string in a view and clicks LB (or the MB for a fast pick). **12d Model** then makes a search of all the strings on the view to make a selection.

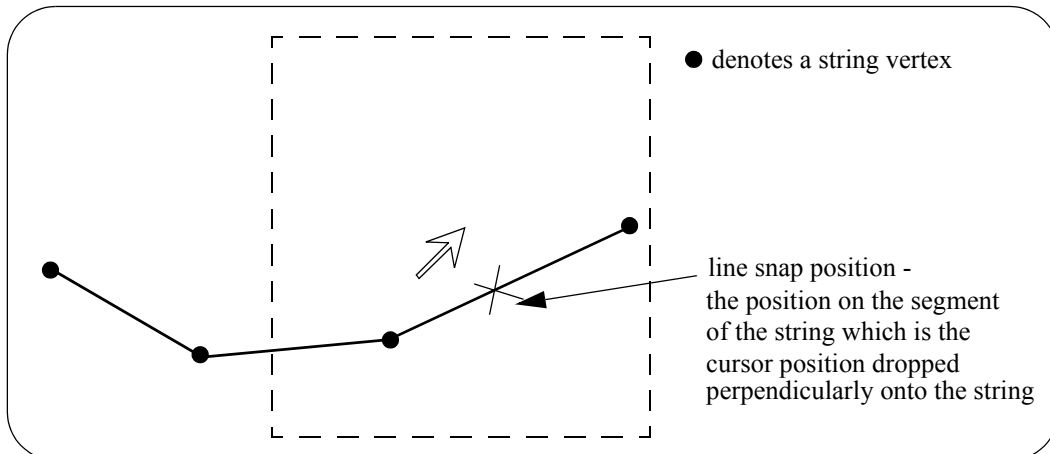
The help restrict the search, only strings that are partially or totally within an x and y distance called the **snap tolerance** of the cursor are eligible for picking. That is, only strings that have part, or all, of them within the *snap box* can be selected.



For strings inside the snap box, **12d Model** has two snap modes, *point* and *line*, to specify which parts of the strings can be selected.

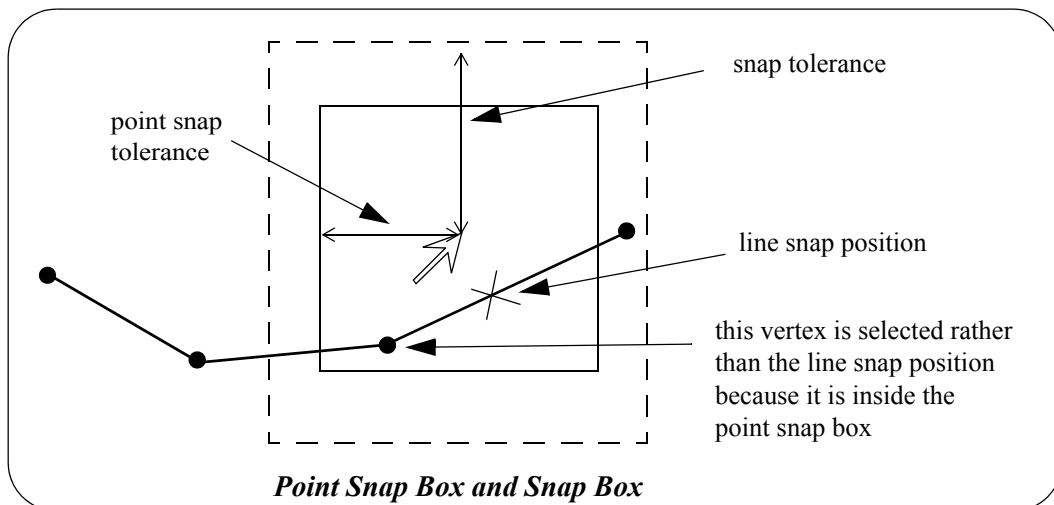
If **point** snap is set on, the vertices (points) of a string can be selected. If only *point* snap is on, then the string containing the **closest vertex** to the cursor is selected.

If **line** snap is set on, then the position on the string that is determined by dropping the cursor perpendicularly onto the string, can be selected. Note that there is usually no string vertex at the perpendicular position (line snap position). If only **line** snap is on, then the string containing the closest perpendicular position to the cursor is selected.



Since in general it is rare for a vertex of a string to be closer to the cursor than the line snap position, then with only the above definitions and **point** and **line** snap both on, the line snap position usually wins. Hence to pick a vertex, line snap would have to be turned off. Since this can lead to line snap being regularly toggled on and off, another distance called the **point snap tolerance** has been introduced to give vertices **priority** over line snaps when both snaps are on.

When **point snap** is set on, any vertex of a string that is within an x and y distance called the **point snap tolerance** of the cursor when LB is clicked, is considered for selection **before** any other type of snap is considered. That is, any vertices in the **point snap box** are selected before any line snap positions.



Point Snap Box and Snap Box

In the area between the point snap box and the snap box, vertices and line snap positions are treated equally and the closest one to the cursor is selected.

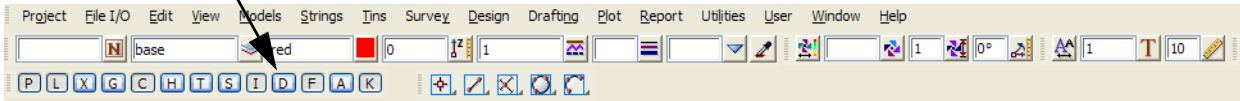
The other types of snaps are not as complicated and will be discussed in the following sections.

Go to the next section [Setting Snaps](#) or back to [Snaps](#).

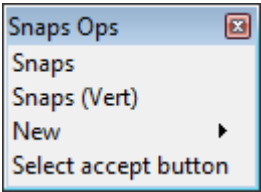
Setting Snaps

Snaps can be toggled on and off from the snaps tool bar, or the snap settings can be set from the **Snaps** menu under *Utilities* on the Main menu.

snaps toolbar



The menu **Utilities => Snaps** is:

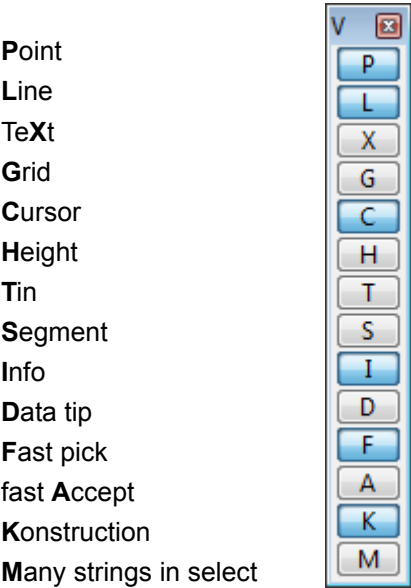


The *Snaps (Vert)* option brings up a Snaps toggle menu similar to the *Snaps* toolbar except that the *Snaps (Vert)* runs vertically rather than horizontally. Either can be used to toggle the snaps on and off.

Snaps toolbar



The Snaps (Vertical) menu



The option **Utilities=> Snaps=>Snaps** option brings up a menu that provides tick boxes to turn the various snap modes on or off plus it is used to set the snap tolerance value, the point snap tolerance value, the tin for tin snaps and string and/or model names for restricting the snaps.

Any combination of snap modes and names can be set.

The **Snaps** menu is

Snaps		
Point	<input checked="" type="checkbox"/>	point snap on/off
Line	<input checked="" type="checkbox"/>	line snap on/off
Text	<input type="checkbox"/>	text snap on/off
Grid	<input type="checkbox"/>	grid snap on/off
Cursor	<input checked="" type="checkbox"/>	allow cursor point on/off
Height	<input type="checkbox"/>	ask for z value at each point in edits
Tin ""		name of tin to snap to
Tin	<input type="checkbox"/>	tin snap on/off
Segment	<input type="checkbox"/>	turn segment snap on/off
Name ""		restriction on string names
Model ""		restriction on model names
Tolerance 50		set snap tolerance
Pt tolerance 10		set point snap tolerance
Info	<input checked="" type="checkbox"/>	bring up info panel on/off
Data tip	<input type="checkbox"/>	turns data tips on/off
Fast pick	<input checked="" type="checkbox"/>	turns fast pick snap on/off
Fast accept	<input type="checkbox"/>	turns fast accept snap on/off
Fast cad	<input checked="" type="checkbox"/>	turns fast construction snap on/off
Display many	<input type="checkbox"/>	display the selection grid (many strings)

The snaps point, line, grid, cursor, tin and info are all set on or off using the tick boxes.

The *snap tolerance* is displayed on the **Tolerance** line of the menu.

The *point snap tolerance* is displayed on the **Pt tolerance** line of the menu.

When a select with snap is made, the type of snap is given in the **Information** panel and also graphically displayed by **changing** the **shape** of the snap cursor. The shape of the snap cursor is

a **diamond** for a **point** snap
square for a **line** snap
circle for a **cursor** snap
circle for a **grid** snap
squiggles under a line for a **tin** snap.

Each of these snaps/settings will now be discussed.

Point Snap - diamond

When point snap is set on, any vertex of a string within the point snap box around the cursor when LB is clicked, is considered for selection before any other type of snap is considered. Centres of circles, centres of arcs and arc end points are considered to be vertices.

Note that if there are no vertices within the point snap box then any vertices within the snap box of the cursor are considered for selecting

Line Snap - square

When line snap is set on, the cursor only needs to be within the tolerance distance of any visible segment of a string when LB is clicked, and that string is considered for selection. Also arcs and circles are considered for selection.

Note that if a non-zero point snap tolerance is given and point snap is set on, then any vertices that are closer than the point snap tolerance to the cursor will be considered for snapping before any line snap is considered.

Grid Snap - circle

When grid snap is set on, the cursor will snap to the intersection of any grid lines that are displayed in a view.

Cursor Snap - circle

If cursor snap is set on and the other snaps are either not set on or have failed, the cursor position is used for the (x,y) and possibly the z value of the pick.

Tin Snap - squiggles under a line

Tin snap means that when an (x,y) point is selected, the z-value for the point is taken to be the z-value on the tin at the same (x,y) position.

To use tin snap, the name of the tin to snap to must first be given. Then, snapping to that tin is controlled by the state of the tin snap tick box.

If the tick box is **on** (a tick), snapping to the tin is used. If the tick box is **off**, no tin snaps are used.

The name of the tin to snap to is set by selecting the **Tin " "** item on the **Snaps** menu to bring up the **Snap Tin** panel.

Model

The user can restrict the snap to only strings from a specific model. The name of the model to restrict the snap to is set by selecting the **Model " "** item on the **Snaps** menu to bring up the **Snap Model** panel.

Name

The user can restrict the snap to only strings of a specific name. The name of the strings to restrict the snap to is set by selecting the **Name " "** item on the **Snaps** menu to bring up the **Snap Name** panel.

When **12d Model** creates a new project, **line** and **point** snap are set to **on** and all other snaps set off.

Point Snap Tolerance

Point snap tolerance is not a tick box but a menu item. The point snap tolerance value is the distance to be used for considering vertices over anything else when point snap is on.

The point snap tolerance distance is given in screen units (pixels). There are one thousand pixels per screen width, hence a point snap tolerance of say 10 means that the point snap distance about a vertex is one hundredth of the screen width.

The *point snap tolerance* is given in terms of screen units rather than world units because it is a distance on the screen, independent of any co-ordinate system being used in a view.

The current point snap tolerance value is displayed as **Pt tolerance** on the **Snap** menu.

The *Point snap tolerance* is modified by selecting the **Pt tolerance** item on the **Snaps** menu to bring up the **Point Snap Tolerance** panel.

Snap Tolerance

Snap tolerance is not a tick box but a menu item. The snap tolerance value is the distance to be used for considering data when snaps are on.

The snap tolerance distance is given in screen units (pixels). There are one thousand pixels per screen width, hence a snap tolerance of say 50 means that the snap distance about a point, line *etc.* is one twentieth of the screen width.

Snap tolerance is given in terms of screen units rather than world units because it is a distance on the screen, independent of any co-ordinate system being used in a view.

The current snap tolerance value is displayed as **Tolerance** on the **Snap** menu.

The *Snap tolerance* is modified by selecting the **Tolerance** item on the **Snap** menu to bring up the **Snap Tolerance** panel.

Height

If *height* is set, then when creating and/or editing strings, the z-value for a vertex is displayed.

Info

If *info* is set, then the information panel comes up whenever a string is picked.

Data Tip

If *data tip* is set, then data tipping for strings occurs.

Fast Snap

If *fast snap* is set, then fast picking is allowed.

M Snap

If *M snap* is set, when selecting a string, all the strings satisfying the search criteria are listed in a grid (the selection grid - **Many** strings listed, not just the one). If not set, the selection grid is not displayed.

NOTE: The **Text** snap (**X**) and **Segment** snap (**S**) are currently under development.

Summarising, the available snap modes are

- s point - diamond cursor
- s line - square
- s grid - circle
- s cursor - circle
- s tin - squiggles under a line
- s name
- s model

On starting up a new project, point and line snap are on, all others off, point tolerance is set to 10 and tolerance is set to 50.

When an existing project is saved, the snap settings, point snap tolerance, snap tolerance and positions of any **snaps** menus on the screen, are also saved.

Please continue to the next section [Text Grips](#) (or back to [Snaps](#)).

Text Grips

When text is selected for editing, **grips** are displayed for quick editing. Vertex text has four grips and segment text three grips.

Note - see the section [Text Definitions](#) for the definitions of vertex and segment text, text justification point, text height, text angle, text offset and text raise.

Go to the next section [Vertex Text](#) or back to [Text Grips](#).

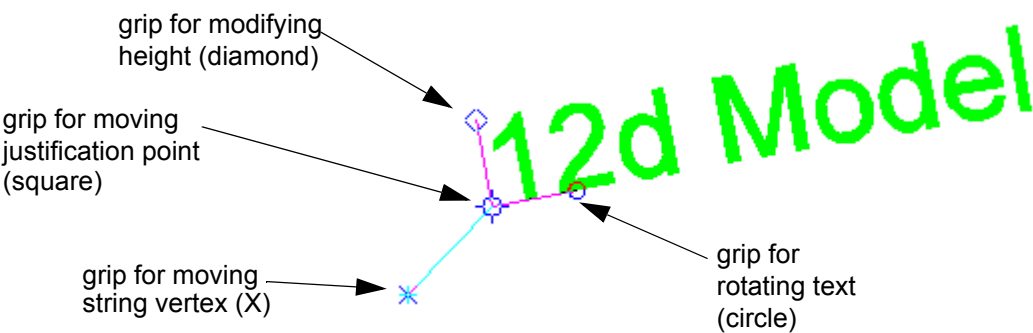
Vertex Text

When vertex text is selected for editing, four **grips** are displayed for

- (a) modifying the text height (diamond)
- (b) rotating the text around the text justification point (circle)
- (c) moving the text justification point (square)
- (d) moving the string vertex (X)

There are two modes for the grips:

The grips for modifying text height (diamond) and rotating the text (circle) are joined to the justification point to form a right angle (J mode).



Screen Message Area

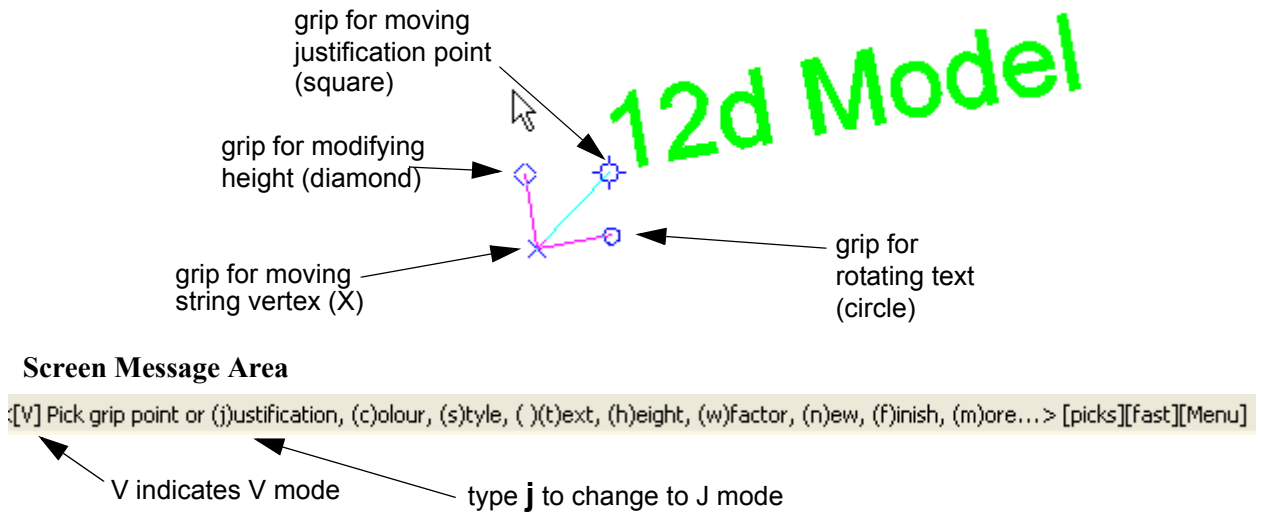
<[J] Pick grip point or (v)ertex, (c)olour, (s)tyle, () (t)ext, (h)eight, (w)factor, (n)ew, (f)inish, (m)ore...> [picks][fast][Menu]

J indicates J mode type **v** to change to V mode

Grips on the Justification Point for Vertex Text - J Mode

OR

The grips for modifying text height (diamond) and rotating the text (circle) are joined to the text vertex to form a right angle (V mode).



Grips on the Vertex for Vertex Text - V Mode

The main difference between the J and the M modes is that in J mode, the rotation is about the text justification point, and in V mode the rotation is about the text vertex.

The appropriate grip is then selected for quick editing.

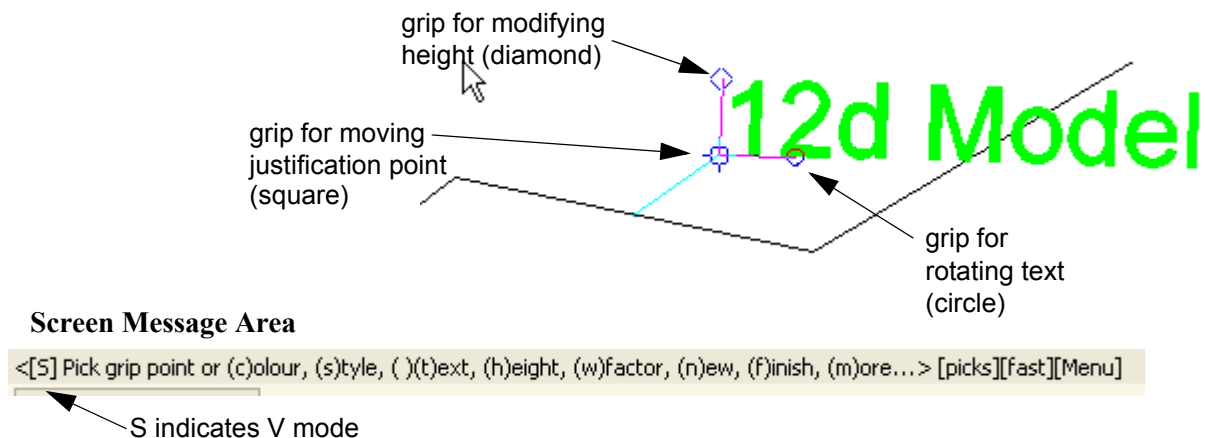
Go to the next section [Segment Text](#) or back to [Text Grips](#).

Segment Text

When segment text is selected for editing, three ***grips*** are displayed for

- (a) modifying the text height (diamond)
- (b) rotating the text around the text justification point (circle)
- (c) moving the text justification point (square)

For segment text, the grips for modifying text height (diamond) and rotating the text (circle) are joined to the justification point to form a right angle (S mode).



Grips on the Justification Point for Segment Text - S Mode

The appropriate grip is then selected for quick editing.

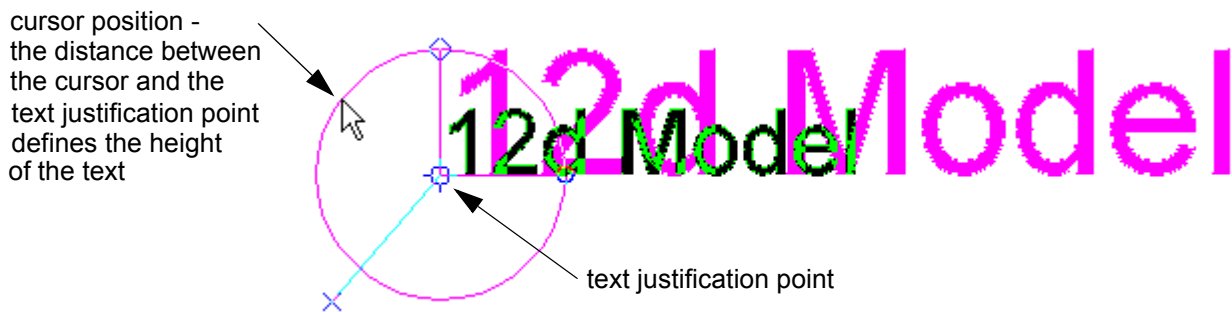
Note - there is no equivalent of the Vertex grip for segment text because the segment text is locked to the centre point of the segment rather than a vertex.

See the section [Text Definitions](#) for the definitions of vertex and segment text, text justification point, text height, text angle, text offset and text raise.

Height or Size Grip (diamond):

J Mode

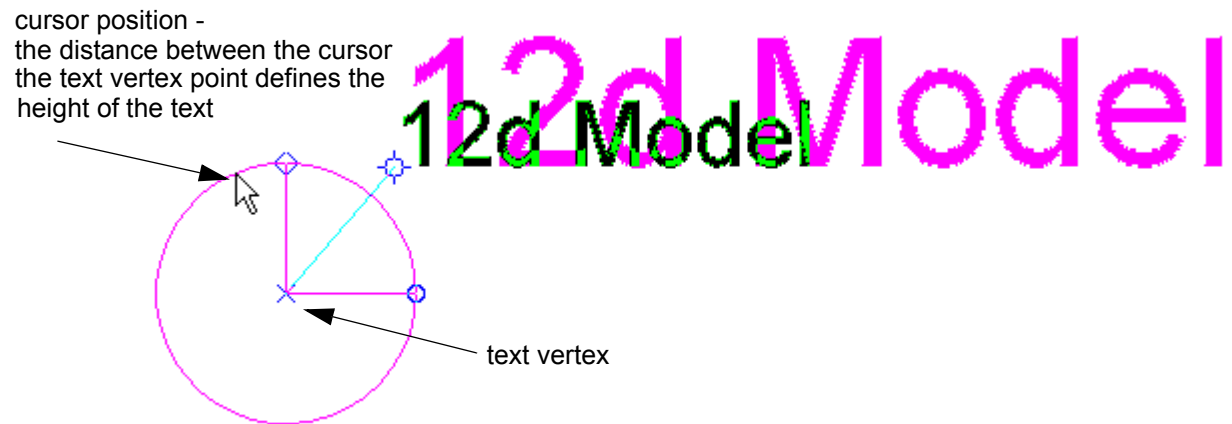
In J mode: if the **Height grip** is selected, a circle is drawn from the text justification point to the Height grip and this represents the height of the text. As the cursor is moved, the distance from the cursor to the text justification point is taken as the circle radius and the text height.



Modifying Height - J Mode

V Mode

In V mode: if the **Height grip** is selected, a circle is drawn from the text vertex to the Height grip and this represents the height of the text. As the cursor is moved, the distance from the cursor to the text vertex is taken as the circle radius and the text height.

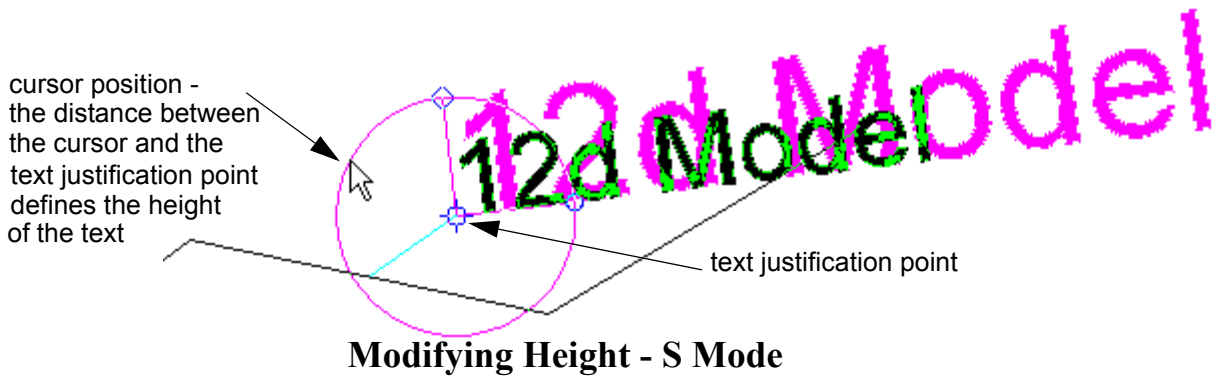


Modifying Height - V Mode

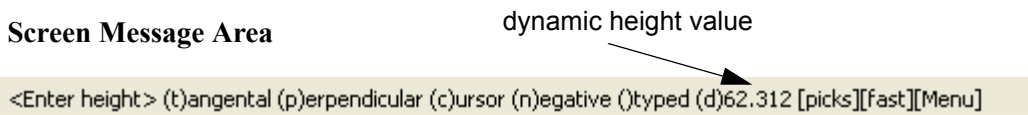
S Mode

In S mode: if the **Height grip** is selected, a circle is drawn from the text justification point to the Height grip and this represents the height of the text. As the cursor is moved, the distance from

the cursor to the text justification point is taken as the circle radius and the text height.

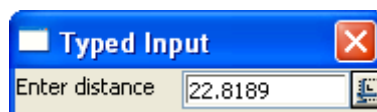


In J, V and S mode, the text height is dynamically displayed as part of the *Enter height* prompt in the screen message area



The text height is set when the cursor position is accepted.

When the text is being dynamically sized, pressing the **d** key brings up the **Enter distance** typed input box with the current **dynamic** text height in it.



An **exact** text height can be typed into the **Enter distance Typed Input** box and accepted by pressing <Enter>.

If instead of typing **d**, the <space bar> is pressed, the **Enter distance Typed Input** box is displayed with a space in it. The required height can be typed into the box and accepted by pressing <Enter>.

If instead of typing **d**, any character other than **t**, **p**, **c** or **n** is typed (for example the beginning of the exact height required), the **Enter distance Typed Input** box is displayed with the typed characters in it. The height is accepted by pressing <Enter>.

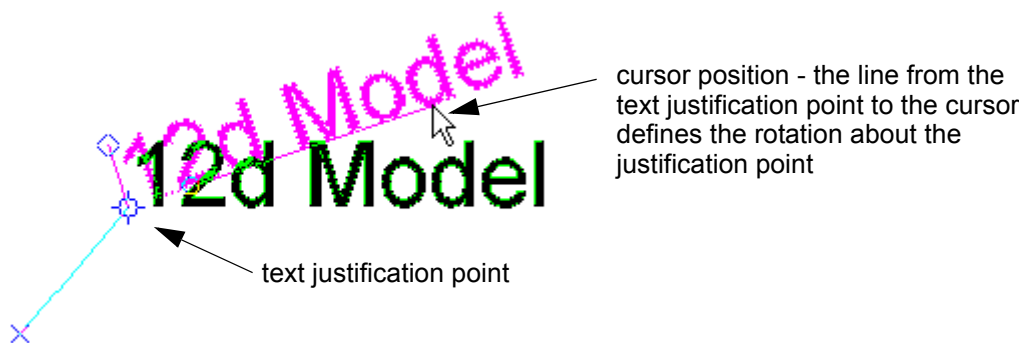
For more information on typing **t**, **p**, **c** or **n**, go to the section [Typing t, p, c or n](#)

To return to dynamic sizing without entering a distance into the **Enter distance** input box, simply select the **X** on the top of the input box. The box will disappear and dynamic sizing will resume.

Rotate Grip (circle):

J Mode

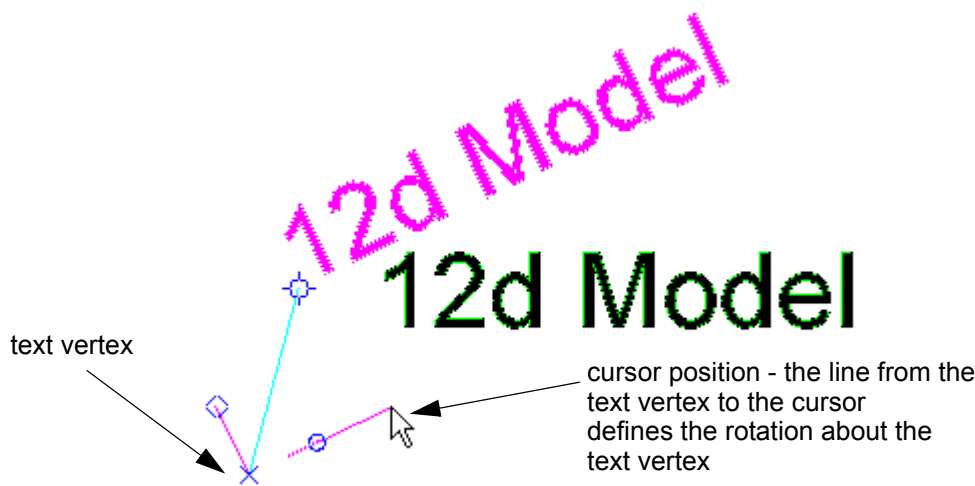
In J mode: if the **Rotate grip** is selected, a line from the text justification point to the cursor position is taken as the text angle. As the cursor is moved, the angle from the cursor to the text justification point defines the text angle.



Modifying Angle - J Mode

V Mode

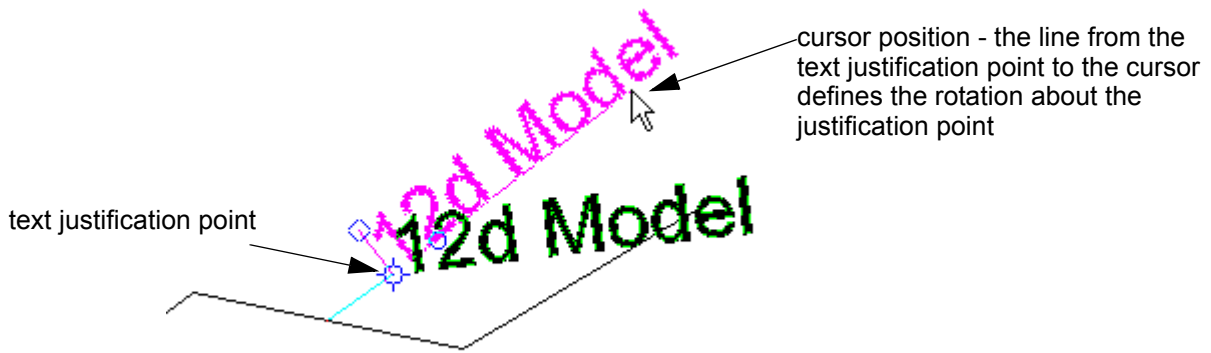
In V mode: if the **Rotate grip** is selected, a line from the text vertex to the cursor position is taken as the text angle. As the cursor is moved, the angle from the cursor to the text vertex defines the text angle.



Modifying Angle - V Mode

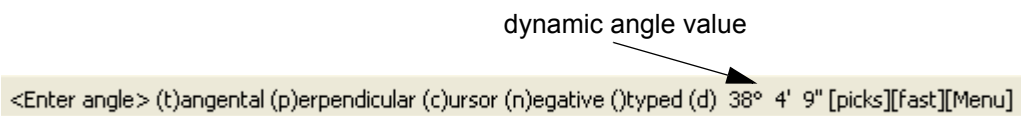
S Mode

In S mode: if the **Rotate grip** is selected, a line from the text justification point to the cursor position is taken as the text angle. As the cursor is moved, the angle from the cursor to the text justification point defines the text angle.



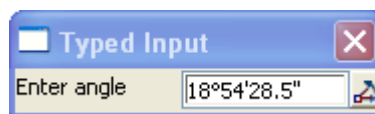
Modifying Angle - S Mode

In J, V and S mode, the angle of the text is displayed as part of the *Enter angle* prompt in the screen message area.



The text angle is set when the cursor position is accepted.

When the angle is being dynamically changed, pressing the **d** key brings up the **Enter angle** typed input box with the current **dynamic** text angle in it.



An **exact** text angle can be typed into the **Enter angle Typed Input** box and accepted by pressing the <enter key>.

If instead of typing **d**, the <space bar> is pressed (shown as **()**), the **Enter angle Typed Input** box is displayed with a space in it. The required angle can be typed into the box and accepted by pressing the <enter key>.

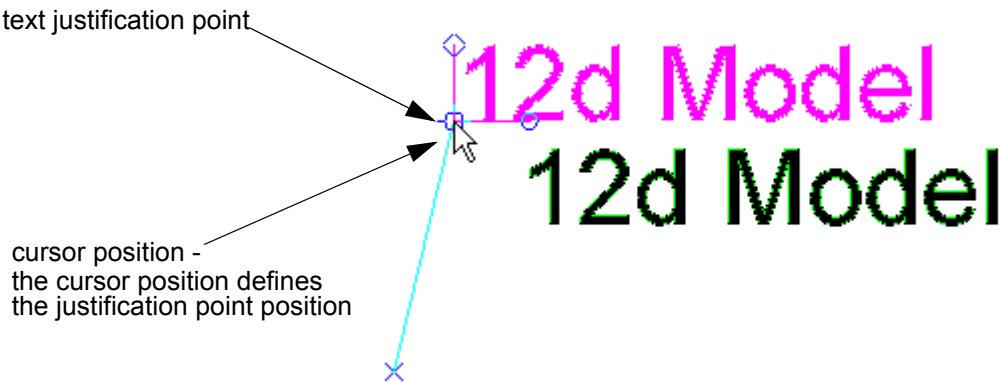
If instead of typing **d**, any character other than **t**, **p**, **c** or **n** is typed (for example the beginning of the exact angle required), the **Enter angle Typed Input** box is displayed with the typed characters in it. The angle is accepted by pressing the <enter key>.

For more information on typing **t**, **p**, **c** or **n**, go to the section [Typing t, p, c or n](#)

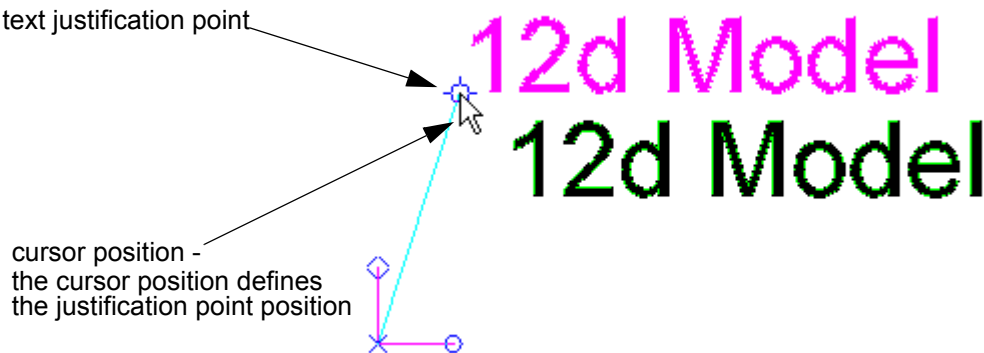
To return to dynamic angling without entering an angle into the **Enter angle** input box, simply select the **X** on the top of the input box. The box will disappear and dynamic angling will resume.

Justification Grip (square):

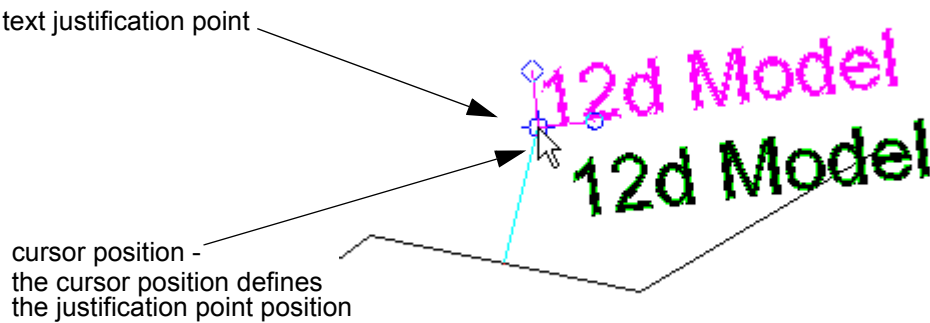
In J, V and S Mode: if the **Justification grip** is selected, the cursor position is taken as the text justification point. As the cursor is moved, the text justification point moves with it.



Moving Text Justification Point - J Mode

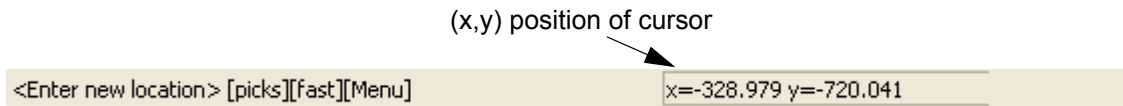


Moving Text Justification Point - V Mode



Moving Text Justification Point - S Mode

In J, V and S mode, the (x,y) position of the text is displayed in the screen message area.



The text justification point is set when the cursor position is accepted.

An **exact** coordinate can be entered by hitting the <space bar> or by starting to type a coordinate. This brings up the **Enter X Y Z** typed input box. The *x* and *y* coordinates are typed in, separated by a space, and the <enter> key pressed.



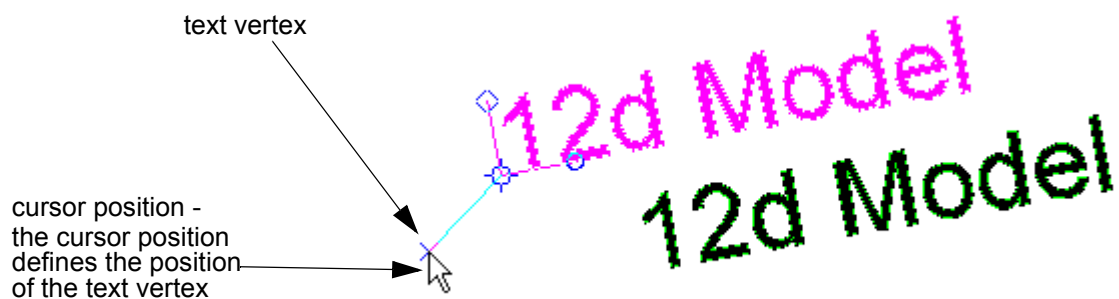
To return to dynamic moving without entering a coordinate, simply select the **X** on the top of the input box. The box will disappear and dynamic moving will resume.

Go to the next section [Vertex Grip \(X\): - for Vertex Text Only](#) or back to [Text Grips](#).

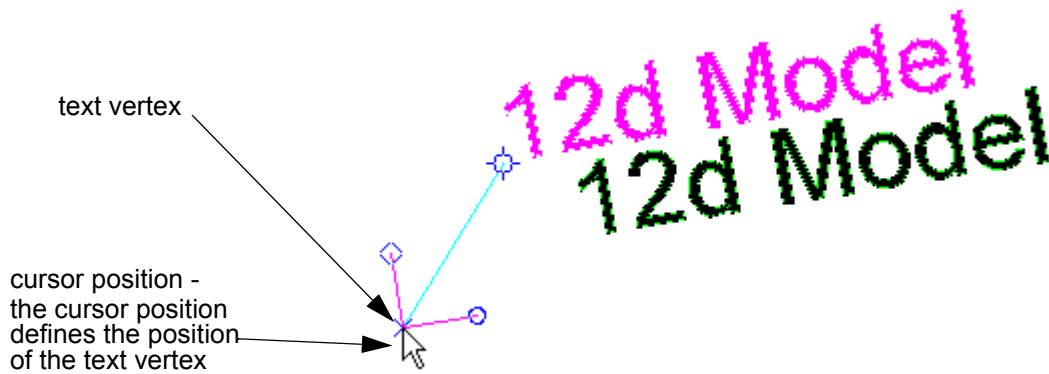
Vertex Grip (X): - for Vertex Text Only

In J and V mode: if the **Vertex grip** is selected, the cursor position is taken as the text vertex, As the cursor is moved, the text vertex moves with it.

Note - the Vertex can not be selected when it is in **locked** mode.

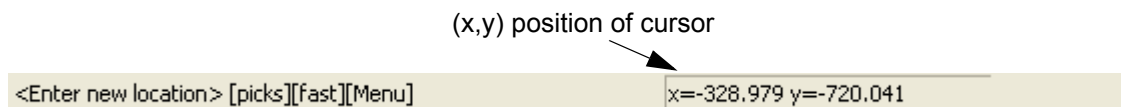


Moving Text Vertex - J Mode



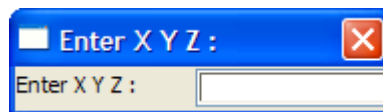
Moving Text Vertex - V Mode

In both J and V mode, the (x,y) position of the text is displayed in the screen message area.



The text vertex is set when the cursor position is accepted.

An **exact** coordinate can be entered by hitting the <space bar> or by starting to type a coordinate. This brings up the **Enter X Y Z** typed input box. The *x* and *y* coordinates are typed in, separated by a space, and the <enter> key pressed.



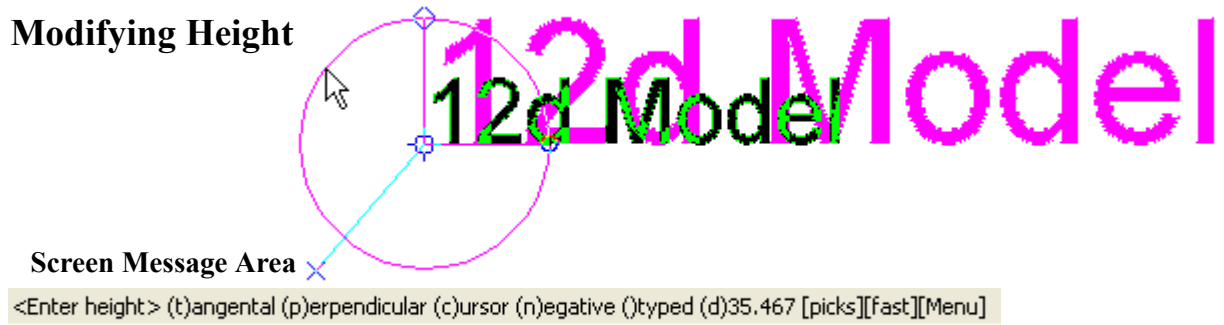
To return to dynamic moving without entering a coordinate, simply select the **X** on the top of the input box. The box will disappear and dynamic moving will resume.

Go to the next section [Typing t, p, c or n](#) or back to [Text Grips](#).

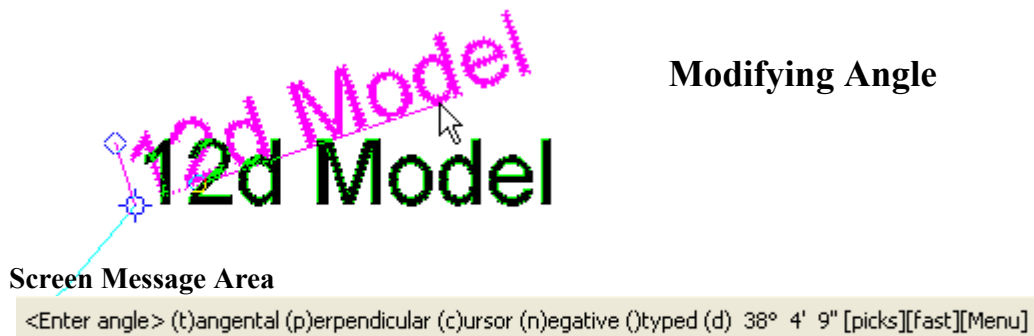
Typing t, p, c or n

After selecting the **Height** grip (diamond) or the **Rotate** grip (circle), the screen message area shows that there are the typed option **t, p, c, n, ()** and **d** available.

Modifying Height



Modifying Angle



Type **t**: snap cursor tangential to a selected string - go to [Snap Tangential - Typing t](#)

Type **p**: snap cursor perpendicular to a selected string - go to [Snap Perpendicular - Typing p](#)

Type **c**: return to cursor movement - go to [Cursor Mode - Typing c](#)

Type **n**: return to cursor movement - go to [Negative Angle - Typing n](#)

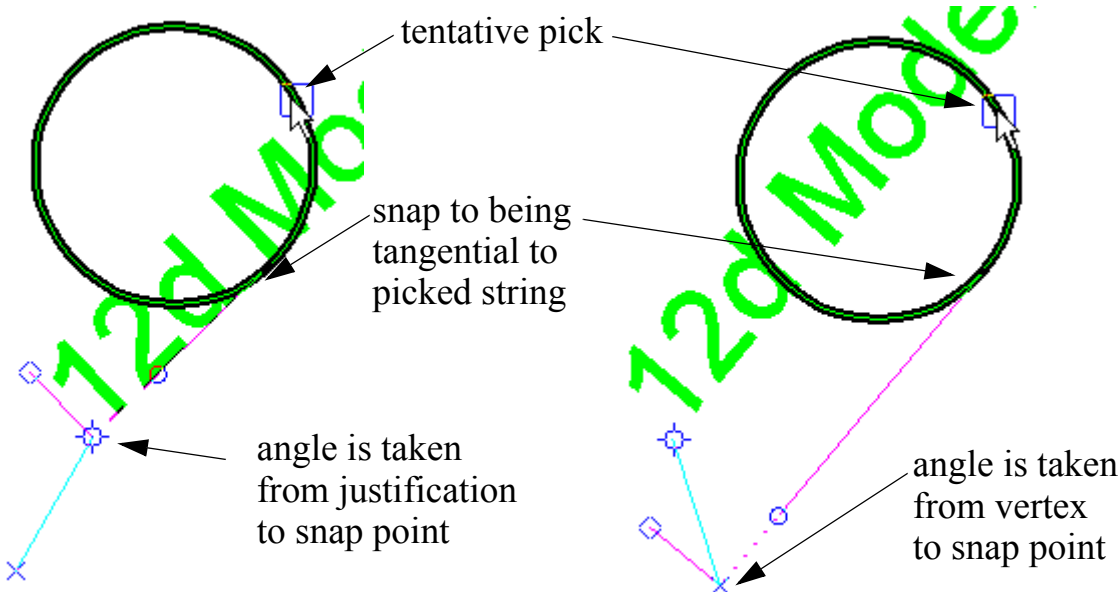
Type **<space bar>**: bring up typed input box for value - go to [Hitting Space Bar](#)

Type **d**: bring up dynamic value - go to [Display Dynamic Value - Typing d](#)

Snap Tangential - Typing t

Snap Tangential - Rotation Grip (Circle)

After selecting the **Rotation** grip (circle), typing **t** puts the string select into tangential mode and when a string is tentatively picked, the snap point moves to make the line from the snap point to the text justification point in J mode (or vertex in V-mode) tangential to the selected string.

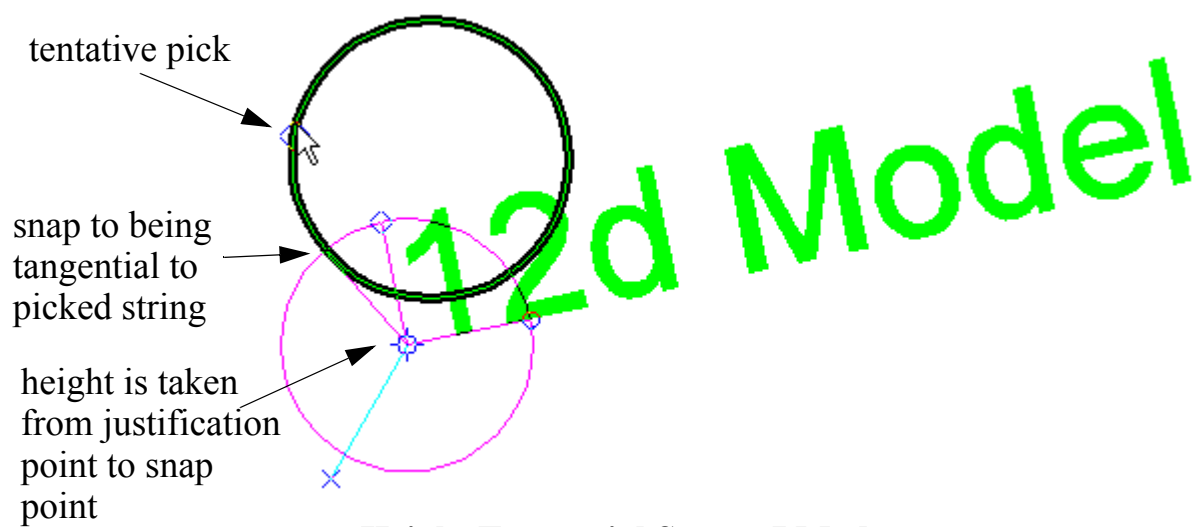


Rotation Tangential Snap - J Mode

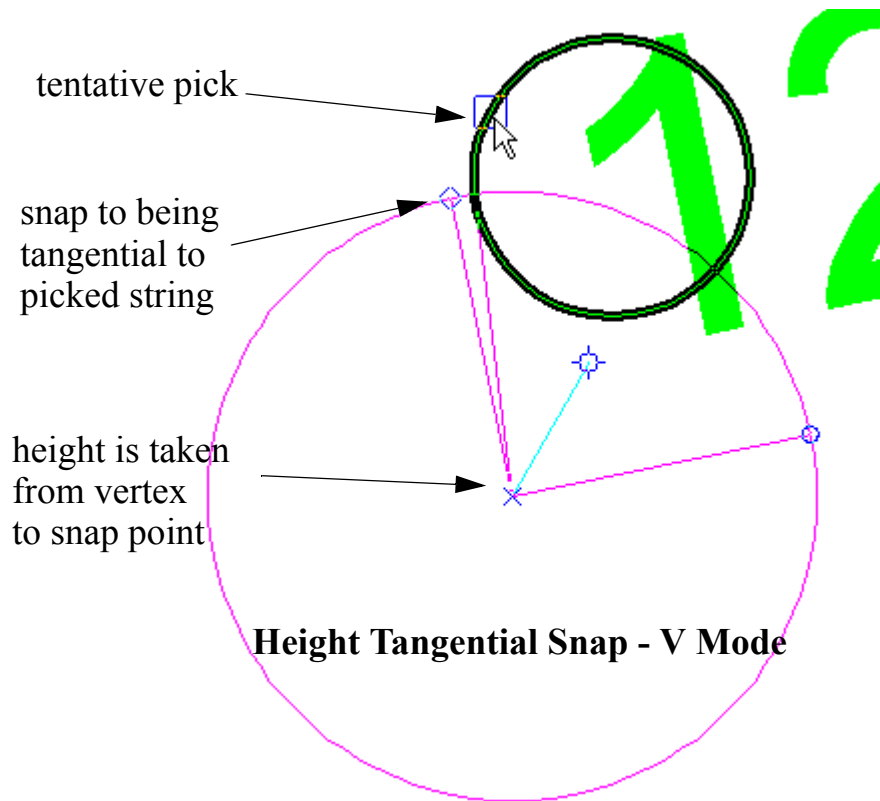
Rotation Tangential Snap - V Mode

Snap Tangential - Height Grip (Square)

After selecting the **Height** grip (diamond), typing **t** puts the string select into tangential mode and when a string is tentatively picked, the snap point moves to make the line from the snap point to the text justification point in J mode (or vertex in V-mode) tangential to the selected string.



Height Tangential Snap - J Mode

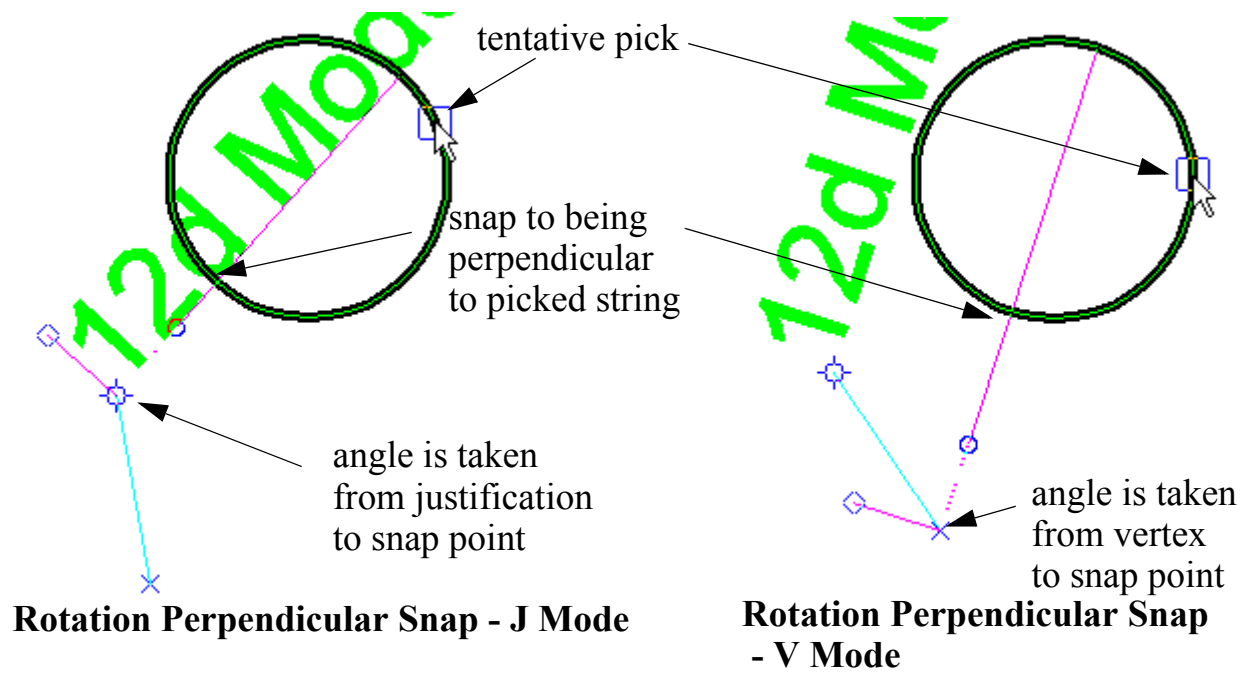


Before the accept button is selected, **p** can be typed to toggle to perpendicular snap mode, **c** to return to using the cursor position or **d** to bring up the dynamic value.

Snap Perpendicular - Typing p

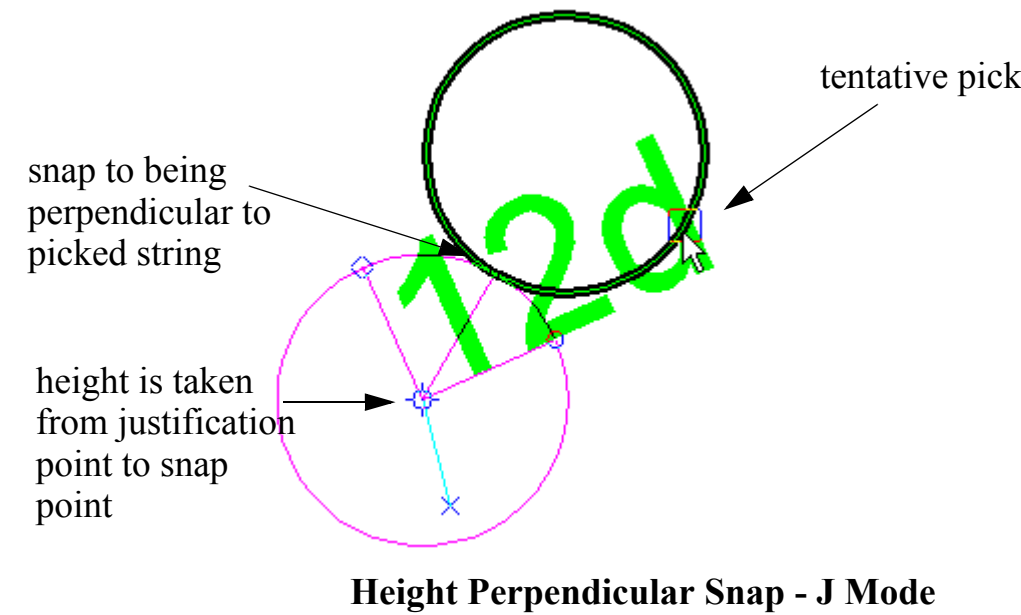
Snap Perpendicular - Rotation grip (Circle)

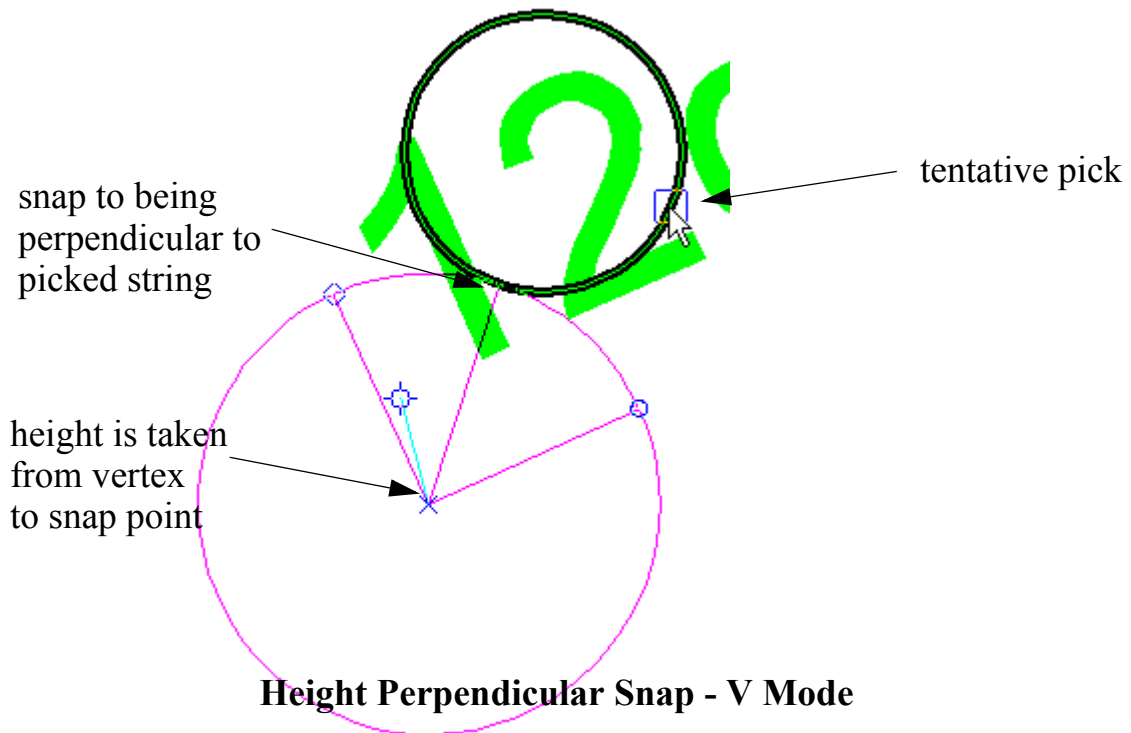
After selecting the **Rotation** grip (circle), typing **p** puts the string select into perpendicular mode and when a string is tentatively picked, the snap point moves to make the line from the snap point to the text justification point in J mode (or vertex in V-mode) perpendicular to the selected string.



Snap Perpendicular - Height grip (Square)

After selecting the **Height** grip (diamond), typing **p** puts the string select into perpendicular mode and when a string is tentatively picked, the snap point moves to make the line from the snap point to the text justification point in J mode (or vertex in V-mode) perpendicular to the selected string.





Before the accept button is selected, **t** can be typed to toggle to tangential snap mode, **c** to return to using the cursor position or **d** to bring up the dynamic value.

Cursor Mode - Typing c

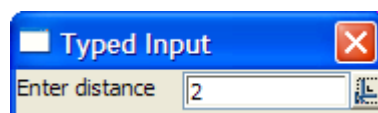
If in either Tangential or Perpendicular mode, typing **c** return to cursor mode.n

Negative Angle - Typing n

Adds 180 degrees to the current angle.

Hitting Space Bar

Brings up the **Enter angle** (modifying angle) or **Enter distance** (modifying height) Typed input box with no value in it.



Display Dynamic Value - Typing d

Brings up the **Enter angle** (modifying angle) or **Enter distance** (modifying height) Typed input box with the *dynamic* value in it.



Please continue to the next section [Symbol Grips](#).

Symbol Grips

When a symbol is selected for editing, four ***grips*** are displayed for quick editing.

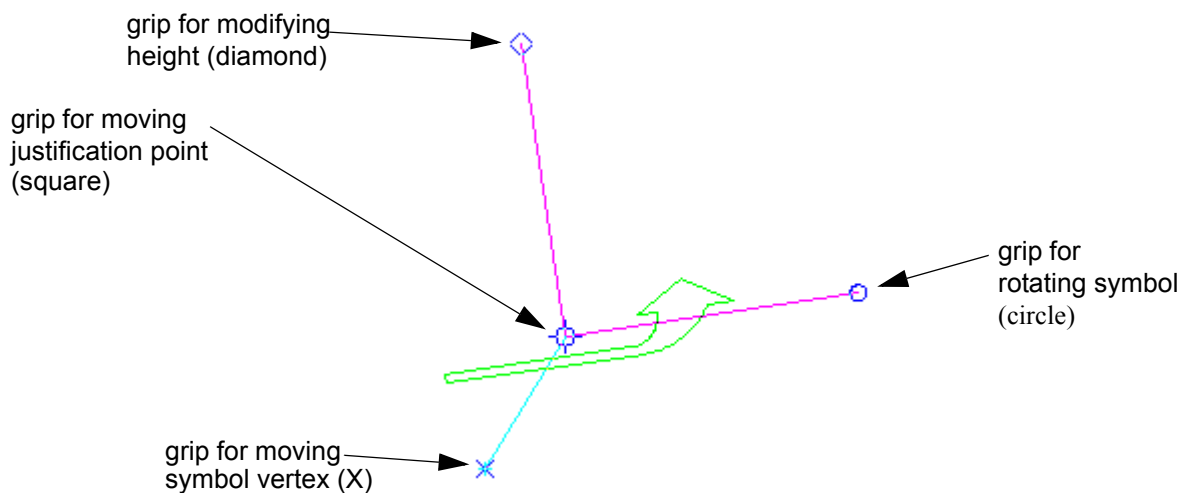
Note - see the section [Symbol Definitions](#) for the definitions of symbol justification point, symbol angle, x offset and y offset.

When a symbol is selected for editing, four ***grips*** are displayed for

- (a) modifying the symbol height (diamond)
- (b) rotating the symbol around the symbol justification point (circle)
- (c) moving the symbol justification point (square)
- (d) moving the string vertex (X)

There are two modes for the grips:

The grips for modifying symbol height (diamond) and rotating the symbol (circle) are joined to the justification point to form a right angle (J mode).



Screen Message Area

```
<[J] Pick grip point or (v)ertex, (c)olour, (s)ymbol, (h)eight, (n)ew, (f)inish, (m)ore...> [picks][Fast][Menu]
```

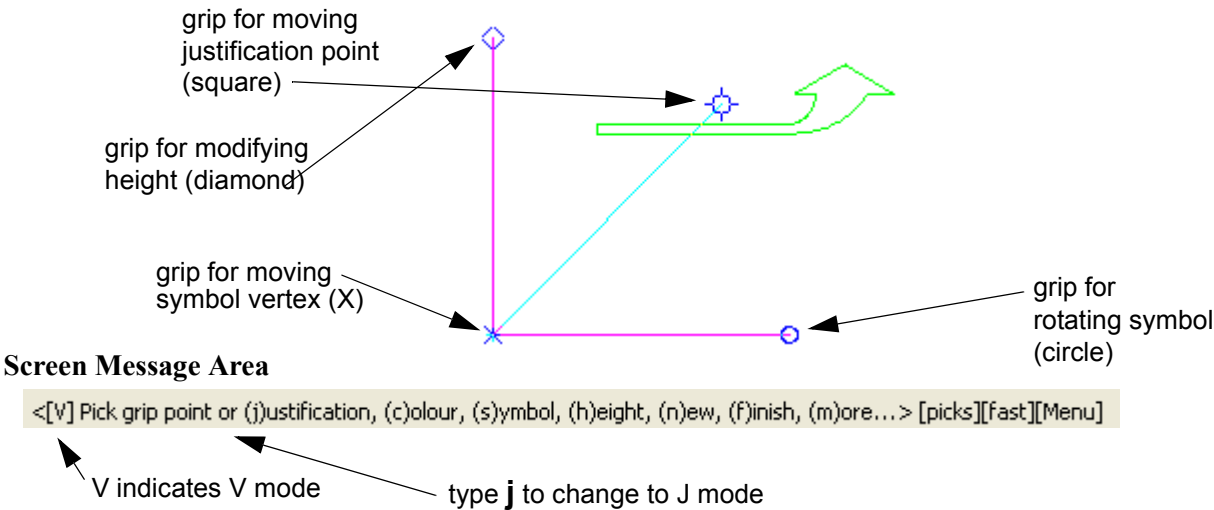
J indicates J mode

type **v** to change to V mode

Grips on the Justification Point for a Symbol- J Mode

OR

The grips for modifying symbol height (diamond) and rotating the symbol (circle) are joined to the symbol vertex to form a right angle (V mode).



Grips on the Vertex for a Symbol - V Mode

The appropriate grip is then selected for quick editing.

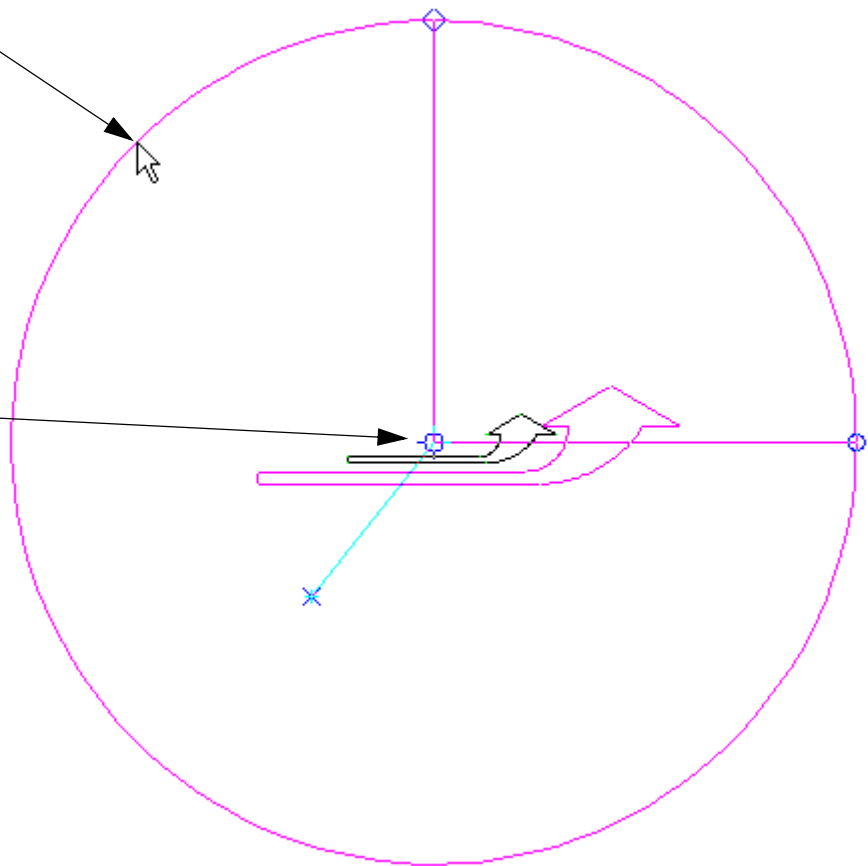
Height or Size Grip (diamond):

J Mode

In J mode: if the **Height grip** is selected, a circle is drawn from the symbol justification point to the Height grip and this represents the height of the symbol. As the cursor is moved, the distance from the cursor to the symbol justification point is taken as the circle radius and the symbol height.

cursor position -
the distance between
the cursor and the
symbol justification point
defines the height
of the symbol

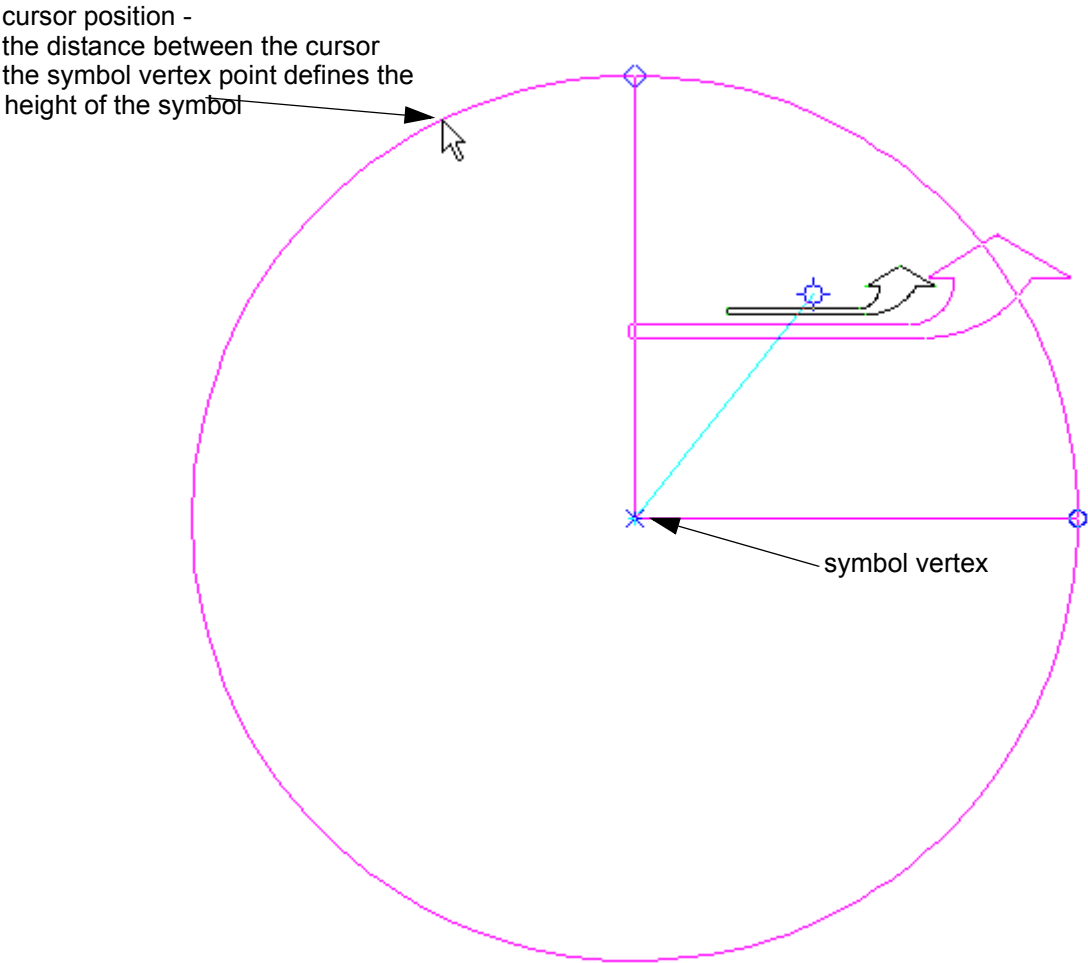
symbol justification point



Modifying Height - J Mode

V Mode

In V mode: if the *Height* grip is selected, a circle is drawn from the symbol vertex to the Height grip and this represents the height of the symbol. As the cursor is moved, the distance from the cursor to the symbol vertex is taken as the circle radius and the symbol height.



Modifying Height - V Mode

In J and V mode, the symbol height is dynamically displayed as part of the *Enter height* prompt in the screen message area

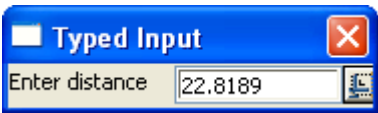
Screen Message Area

dynamic height value

<Enter height> (t)angental (p)erpendicular (c)ursor (n)egative (i)typed (d)62.312 [picks][fast][Menu]

The symbol height is set when the cursor position is accepted.

When the symbol is being dynamically sized, pressing the **d** key brings up the **Enter distance** typed input box with the current **dynamic** symbol height in it.



An **exact** symbol height can be typed into the **Enter distance Typed Input** box and accepted by pressing the <enter key>.

If instead of typing **d**, the <space bar> is pressed, the **Enter distance Typed Input** box is displayed with a space in it. The required height can be typed into the box and accepted by pressing the <enter key>.

If instead of typing **d**, any character other than **t**, **p**, **c** or **n** is typed (for example the beginning of the exact height required), the **Enter distance Typed Input** box is displayed with the typed characters in it. The height is accepted by pressing the <enter key>.

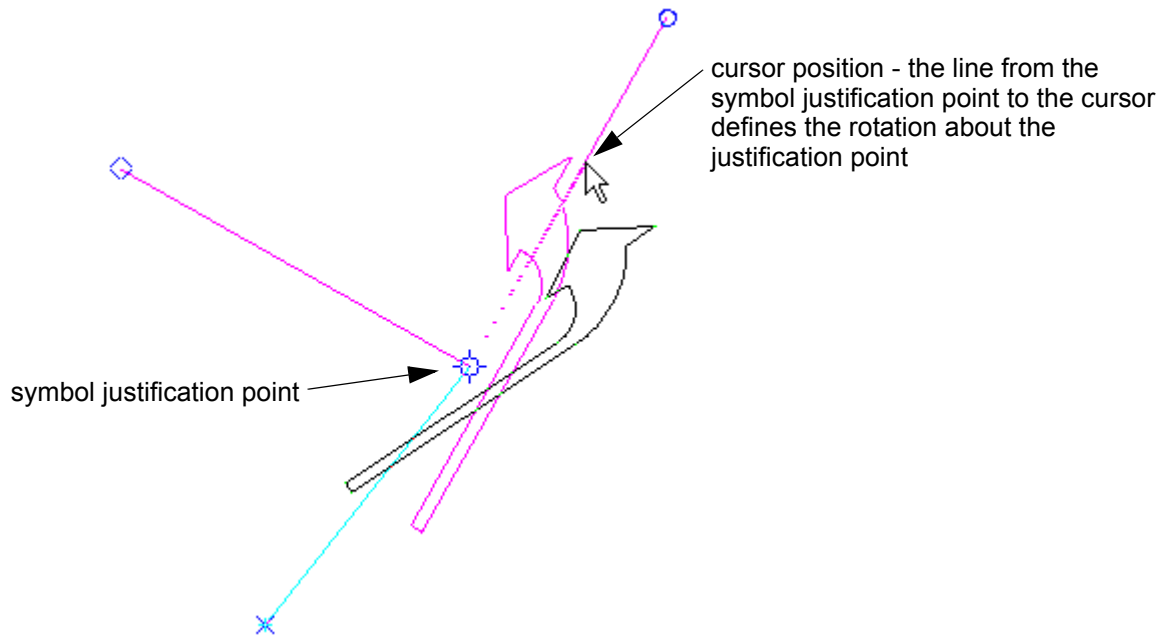
For more information on typing **t**, **p**, **c** or **n**, go to the section [Typing t, p, c or n](#)

To return to dynamic sizing without entering a distance into the **Enter distance** input box, simply select the **X** on the top of the input box. The box will disappear and dynamic sizing will resume.

Rotate Grip (circle):

J Mode

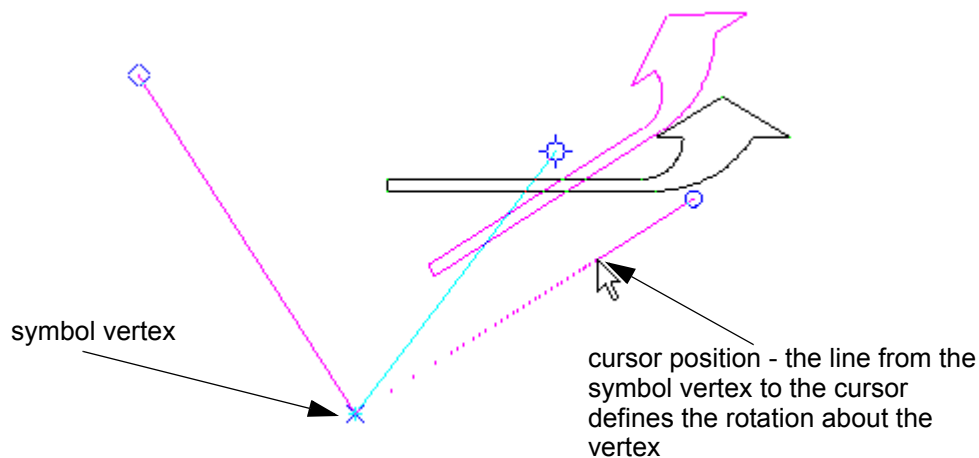
In J mode: if the **Rotate grip** is selected, a line from the symbol justification point to the cursor position is taken as the symbol angle. As the cursor is moved, the angle from the cursor to the symbol justification point defines the symbol angle.



Modifying Angle - J Mode

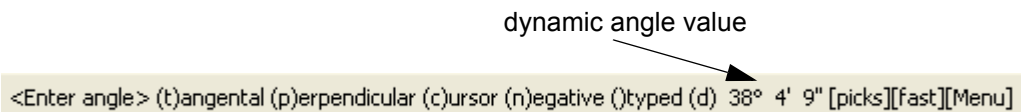
V Mode

In V mode: if the **Rotate grip** is selected, a line from the symbol vertex to the cursor position is taken as the symbol angle. As the cursor is moved, the angle from the cursor to the symbol vertex defines the symbol angle.



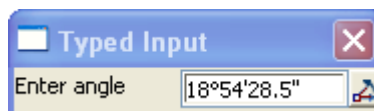
Modifying Angle - V Mode

In J and V mode, the angle of the symbol is displayed as part of the *Enter angle* prompt in the screen message area.



The symbol angle is set when the cursor position is accepted.

When the angle is being dynamically changed, pressing the **d** key brings up the **Enter angle** typed input box with the current **dynamic** symbol angle in it.



An **exact** symbol angle can be typed into the **Enter angle Typed Input** box and accepted by pressing the <enter key>.

If instead of typing **d**, the <space bar> is pressed (shown as **()**), the **Enter angle Typed Input** box is displayed with a space in it. The required angle can be typed into the box and accepted by pressing the <enter key>.

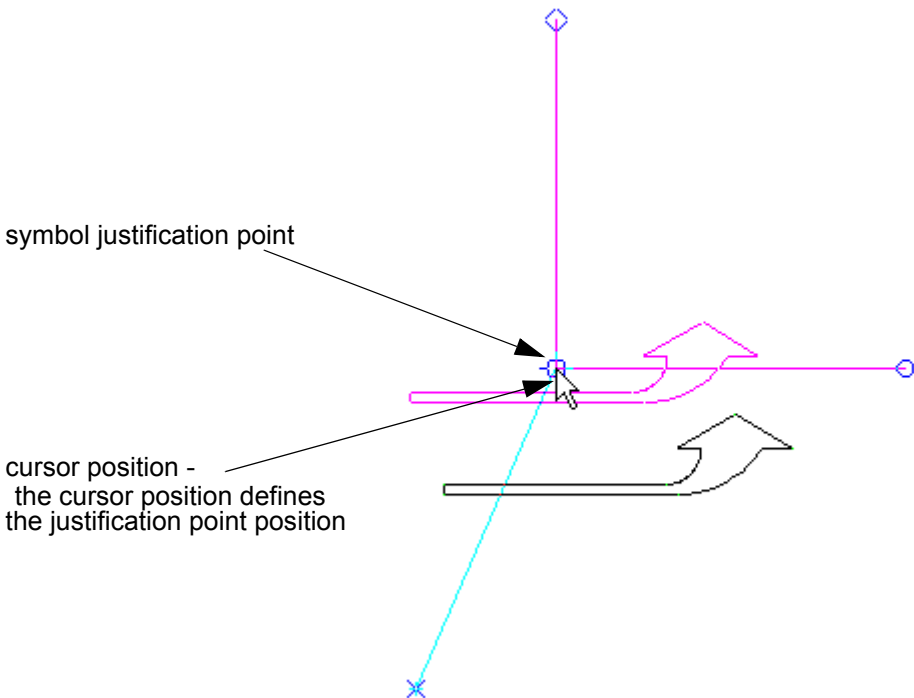
If instead of typing **d**, any character other than **t**, **p**, **c** or **n** is typed (for example the beginning of the exact angle required), the **Enter angle Typed Input** box is displayed with the typed characters in it. The angle is accepted by pressing the <enter key>.

For more information on typing **t**, **p**, **c** or **n**, go to the section [Typing t, p, c or n](#)

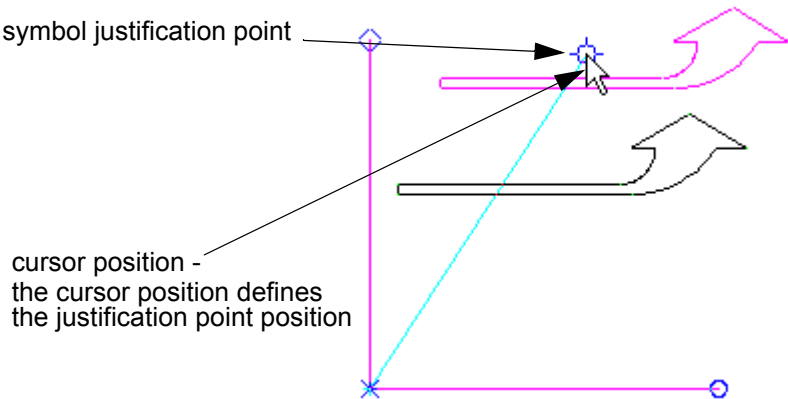
To return to dynamic angling without entering an angle into the **Enter angle** input box, simply select the **X** on the top of the input box. The box will disappear and dynamic angling will resume.

Justification Grip (square):

In J and V Mode: if the **Justification grip** is selected, the cursor position is taken as the symbol justification point. As the cursor is moved, the symbol justification point moves with it.

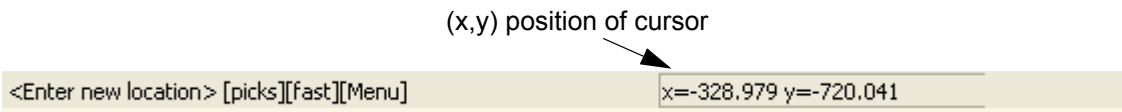


Moving Symbol Justification Point - J Mode



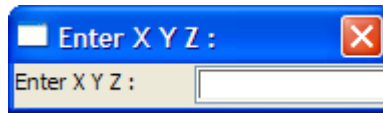
Moving Symbol Justification Point - V Mode

In J and V mode, the (x,y) position of the symbol is displayed in the screen message area.



The symbol justification point is set when the cursor position is accepted.

An **exact** coordinate can be entered by hitting the <space bar> or by starting to type a coordinate. This brings up the **Enter X Y Z** typed input box. The *x and y coordinates* are typed in, separated by a space, and the <enter> key pressed.

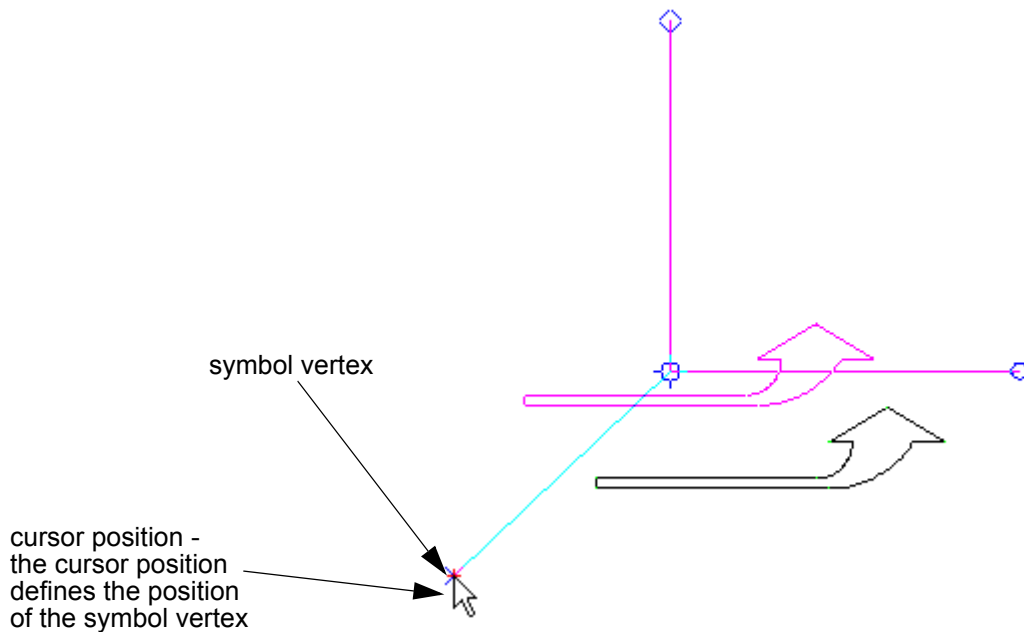


To return to dynamic moving without entering a coordinate, simply select the **X** on the top of the input box. The box will disappear and dynamic moving will resume.

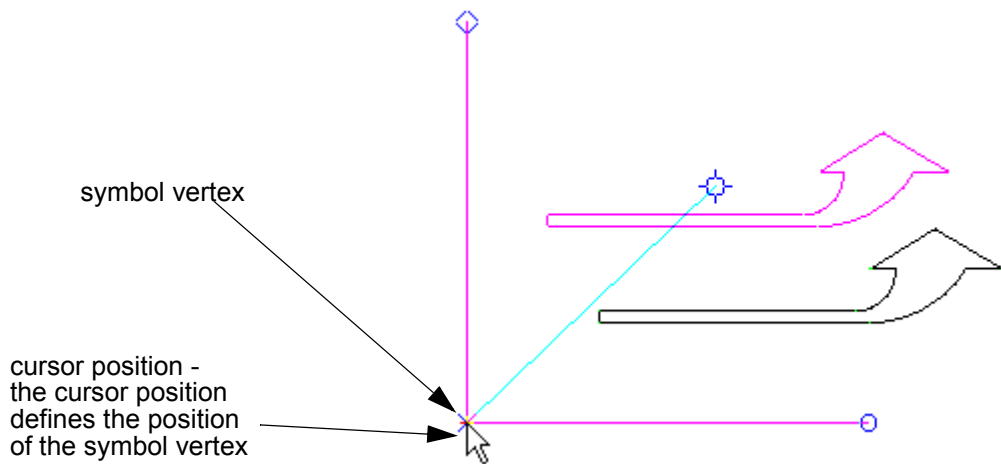
Vertex Grip (X):

In J and V mode: if the **Vertex grip** is selected, the cursor position is taken as the symbol vertex. As the cursor is moved, the symbol vertex moves with it.

Note - the Vertex can **not** be selected when it is in **locked** mode.

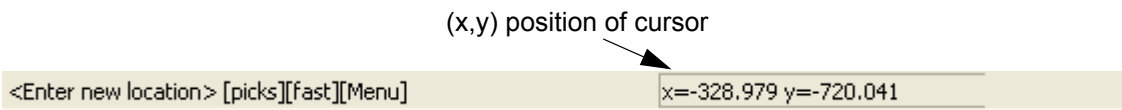


Moving Symbol Vertex - J Mode



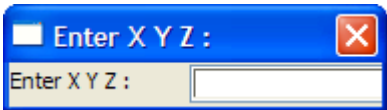
Moving Symbol Vertex - V Mode

In both J and V mode, the (x,y) position of the symbol is displayed in the screen message area.



The symbol vertex is set when the cursor position is accepted.

An **exact** coordinate can be entered by hitting the <space bar> or by starting to type a coordinate. This brings up the **Enter X Y Z** typed input box. The *x and y coordinates* are typed in, separated by a space, and the <enter> key pressed.

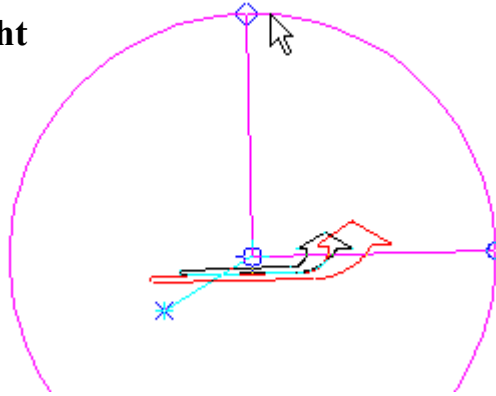


To return to dynamic moving without entering a coordinate, simply select the **X** on the top of the input box. The box will disappear and dynamic moving will resume.

Typing t, p, c or n

After selecting the **Height** grip (diamond) or the **Rotate** grip (circle), the screen message area shows that there are the typed option **t, p, c, n, ()** and **d** available.

Modifying Height



Screen Message Area

<Enter height> (t)angental (p)erpendicular (c)ursor (n)egative ()typed (d)35.467 [picks][fast][Menu]



Modifying Angle

Screen Message Area

<Enter angle> (t)angental (p)erpendicular (c)ursor (n)egative ()typed (d) 38° 4' 9" [picks][fast][Menu]

Type **t**: snap cursor tangential to a selected string - go to [Snap Tangential - Typing t](#)

Type **p**: snap cursor perpendicular to a selected string - go to [Snap Perpendicular - Typing p](#)

Type **C**: return to cursor movement - go to [Cursor Mode - Typing c](#)

Type **n**: return to cursor movement - go to [Negative Angle - Typing n](#)

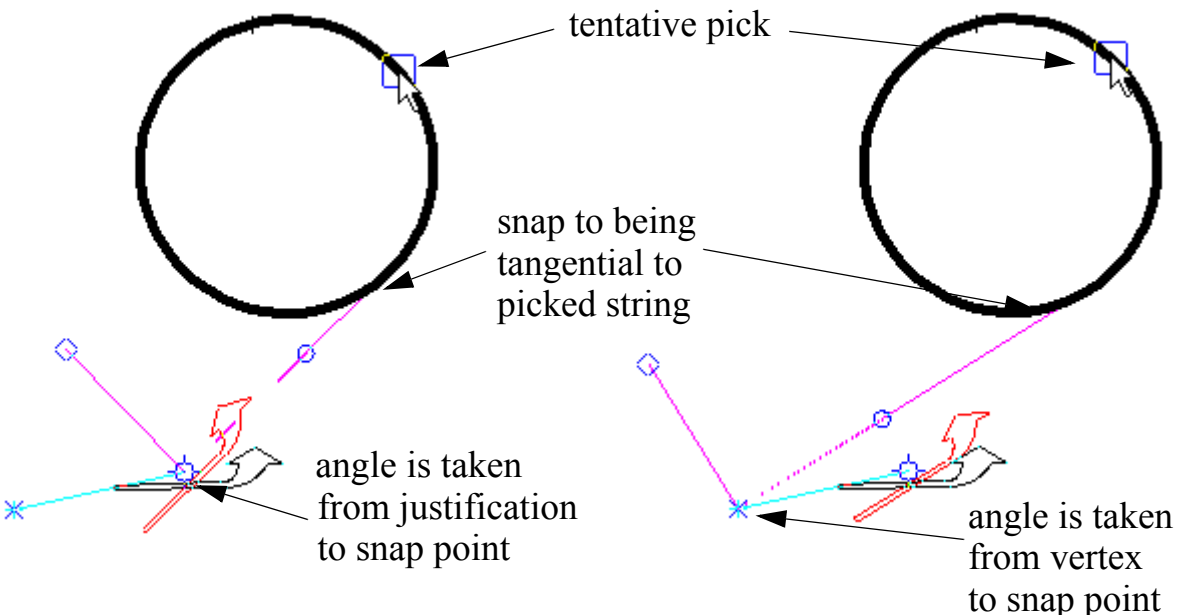
Type **<space bar>**: bring up typed input box for value - go to [Hitting Space Bar](#)

Type **d**: bring up dynamic value - go to [Display Dynamic Value - Typing d](#)

Snap Tangential - Typing t

Snap Tangential - Rotation Grip (Circle)

After selecting the **Rotation** grip (circle), typing **t** puts the string select into tangential mode and when a string is tentatively picked, the snap point moves to make the line from the snap point to the symbol justification point in J mode (or to the vertex in V-mode) **tangential** to the selected string.

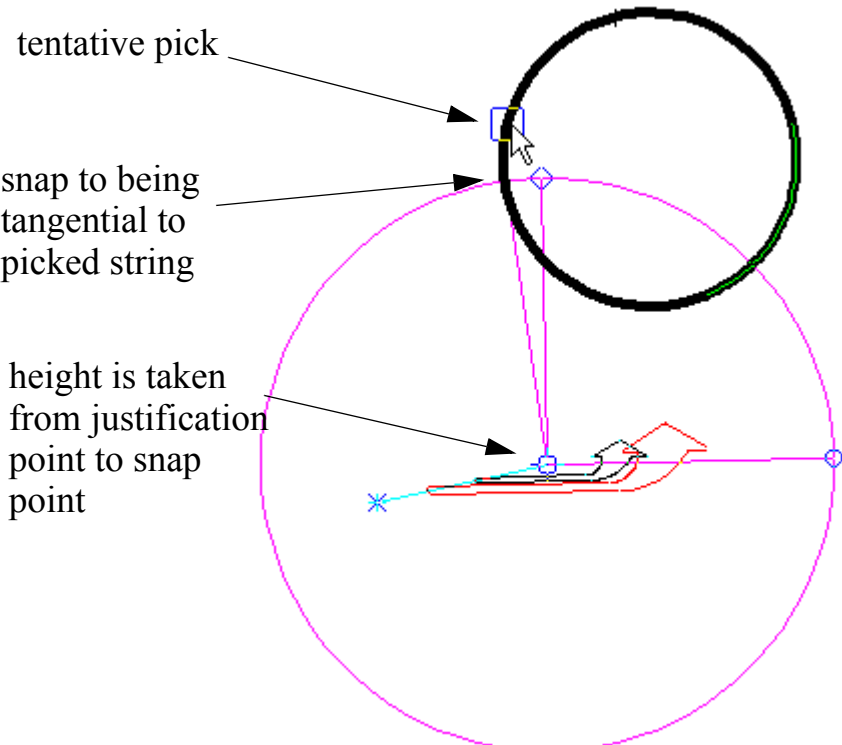


Rotation Tangential Snap - J Mode

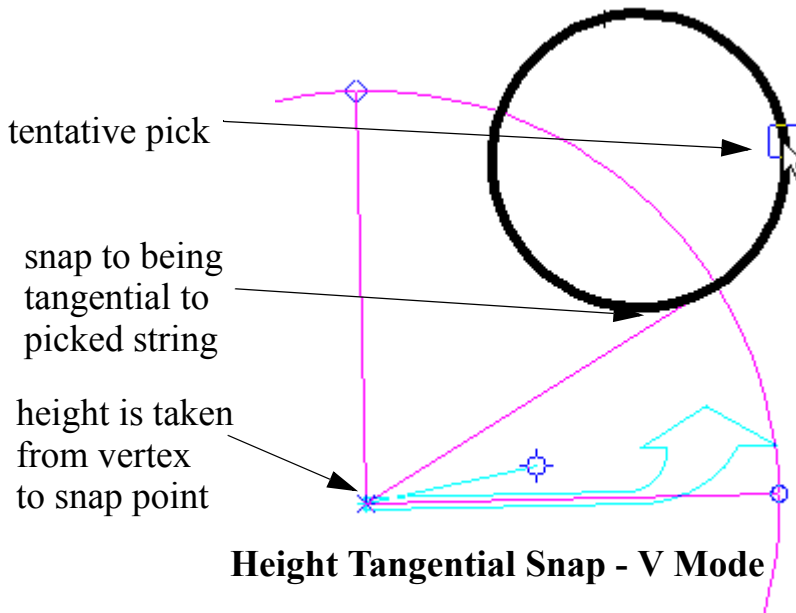
Rotation Tangential Snap - V Mode

Snap Tangential - Height Grip (Square)

After selecting the **Height** grip (diamond), typing **t** puts the string select into tangential mode and when a string is tentatively picked, the snap point moves to make the line from the snap point to the symbol justification point (J mode)/vertex (V-mode) tangential to the selected string.



Height Tangential Snap - J Mode

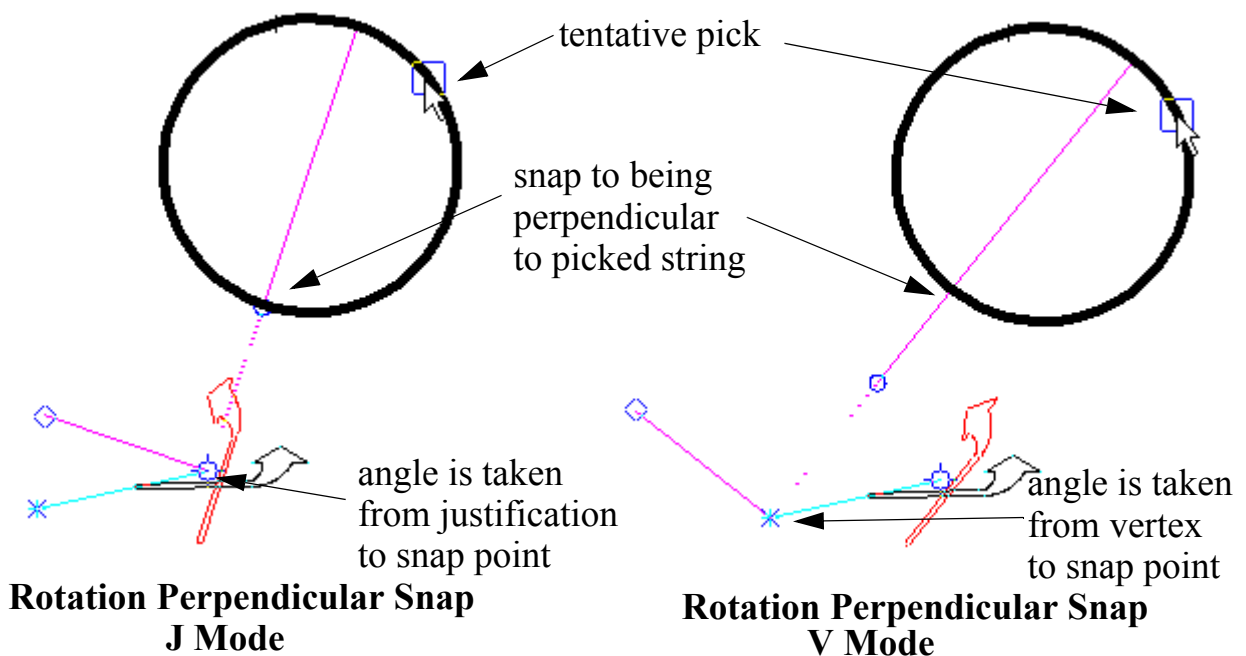


Before the accept button is selected, **p** can be typed to toggle to perpendicular snap mode, **c** to return to using the cursor position or **d** to bring up the dynamic value.

Snap Perpendicular - Typing p

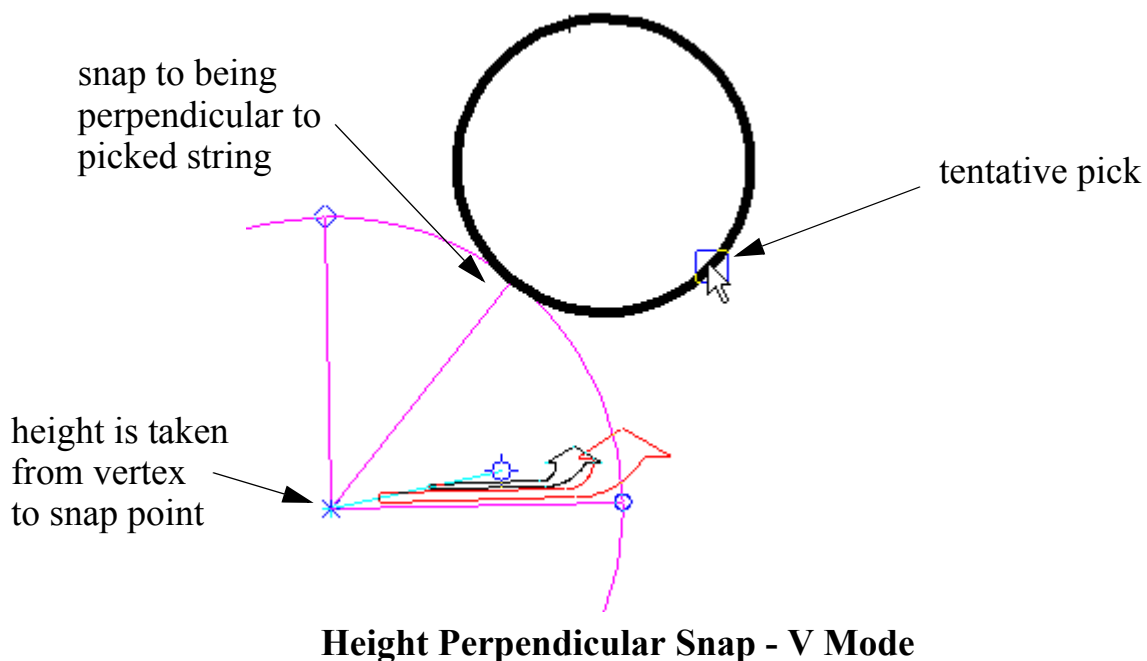
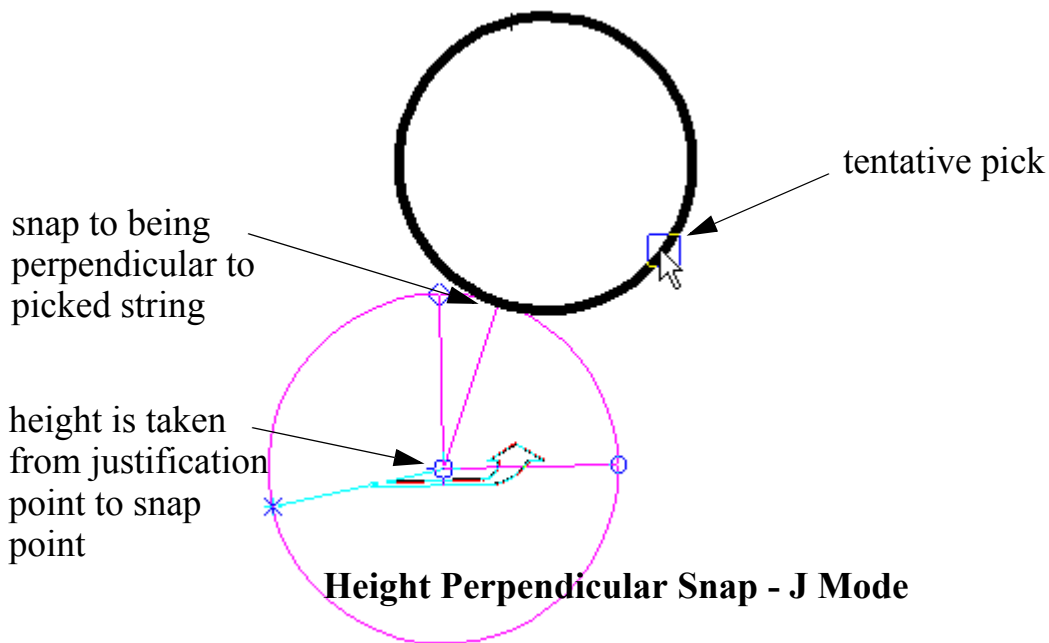
Snap Perpendicular - Rotation grip (Circle)

After selecting the **Rotation** grip (circle), typing **p** puts the string select into perpendicular mode and when a string is tentatively picked, the snap point moves to make the line from the snap point to the symbol justification point in J mode (or the vertex in V-mode) perpendicular to the selected string.



Snap Perpendicular - Height Grip (Square)

After selecting the **Height** grip (diamond), typing **p** puts the string select into perpendicular mode and when a string is tentatively picked, the snap point moves to make the line from the snap point to the symbol justification point in J mode (or vertex in V-mode) perpendicular to the selected string.



Before the accept button is selected, **t** can be typed to toggle to tangential snap mode, **c** to return to using the cursor position or **d** to bring up the dynamic value.

Cursor Mode - Typing c

If in either Tangential or Perpendicular mode, typing **C** return to cursor mode.

Negative Angle - Typing n

Adds 180 degrees to the current angle.

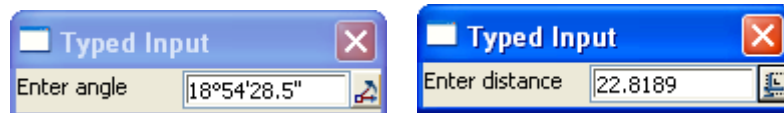
Hitting Space Bar

Brings up the **Enter angle** (modifying angle) or **Enter distance** (modifying height) **Typed input** box with no value in it.



Display Dynamic Value - Typing d

Brings up the **Enter angle** (modifying angle) or **Enter distance** (modifying height) **Typed input** box with the *dynamic* value in it.



Please continue to the next section [Expressions in Panel Fields](#).

Expressions in Panel Fields

Non Bearing/Angle Panel Fields

Whenever a **real value** such as height or width is required in a box (other than an angle or bearing panel field), mathematical expressions can be typed in and then evaluated by **12d Model** when <enter> is pressed. See the section [Expressions in Bearing, Angle Panel Fields](#) for what is allowed in angle/bearing panel fields.

Expressions can be made up from the operators

*	multiply
/	divide
+	addition
-	subtraction

where * and / take precedence over + and -.

Nested brackets "(" and ")" are supported to any level.

The following functions are also supported

sin
cos
tan
sqrt
square
null

Note that for the trigonometric functions, the angle is in **degrees, minutes and seconds** (see section on Angles and Bearings) and is either a cartesian angle or a bearing depending on the setting of the Angle mode in the *System Settings* tab of *Utilities=>Defaults*.

For example, cos(90) is 0 for a Cartesian angle of 90 or 1 for a bearing of 90 degrees.

Examples of expressions are:

10.0 + 19.7
sin(90.30)
(10 + sin(45))/3.0

After the expression has been evaluated, it is still possible to bring back the last expressions, make modifications to the expression and then re-evaluate it.

To get the last expression, simply click on the **[+]** button at the end of the field to bring up the **measures** menu and select **Last expression** from it. The last expression is then returned to the panel field ready for modifications.

Warning

Only limited expressions are supported for bearing/angle boxes. See the section [Expressions in Bearing, Angle Panel Fields](#) for what is allowed in the angle/bearing panel fields.

Please continue to the next section [Special Panel Fields](#).

Special Panel Fields

For information on *Pre* Postfix* Panel Fields, go to

Data Source

Data Target

Pop-Up Lists and Menus

Textstyle Info and Textstyle Data

Scrolling Panel Tables

File Box

Model Panel Field

String Select Panel Field

Same As for Panel Fields

[Pre*Postfix Panel Fields](#)

[Data Source](#)

[Data Target](#)

[Pop-Up Lists and Menus](#)

[Textstyle Data and Textstyle Info](#)

[Scrolling Panel Tables](#)

[File Box](#)

[Model Panel Field](#)

[String Select Panel Field](#)

[Same As for Panel Fields](#)

Pre*Postfix Panel Fields

In many options in **12d Model**, text needs to be added to the beginning (prefix) of a name and also added to the end (postfix) of a name. For example, the

Instead of needing a panel field for the prefixed text and another for the postfixed text, **12d Model** often uses a special shorthand notation called pre*postfix to combine the two into one text field.

When the word **pre*postfix** is used on a panel field, it has the special meaning that for any text type into the panel field, any text before the * is considered to be text for prefixing, and any text after the * is taken to be text for postfixing. Note that spaces are significant.

Hence "E * m" means that "E " is prefix text and " m" is postfix text.

If prefix text only is required, just give the text since the * is not required at the end of the text. For example "E " or "E *" will prefix the text "E ".

If postfix text only is required then the text must be preceded by a *. For example "*" m" will postfix the text " m".

For example, if a panel field had

Pre*postfix for models

new * data

then "new " would be added to the beginning of the model names and " data" would be added to the end of the model names.

Click on [Data Source](#) to go to the next section.

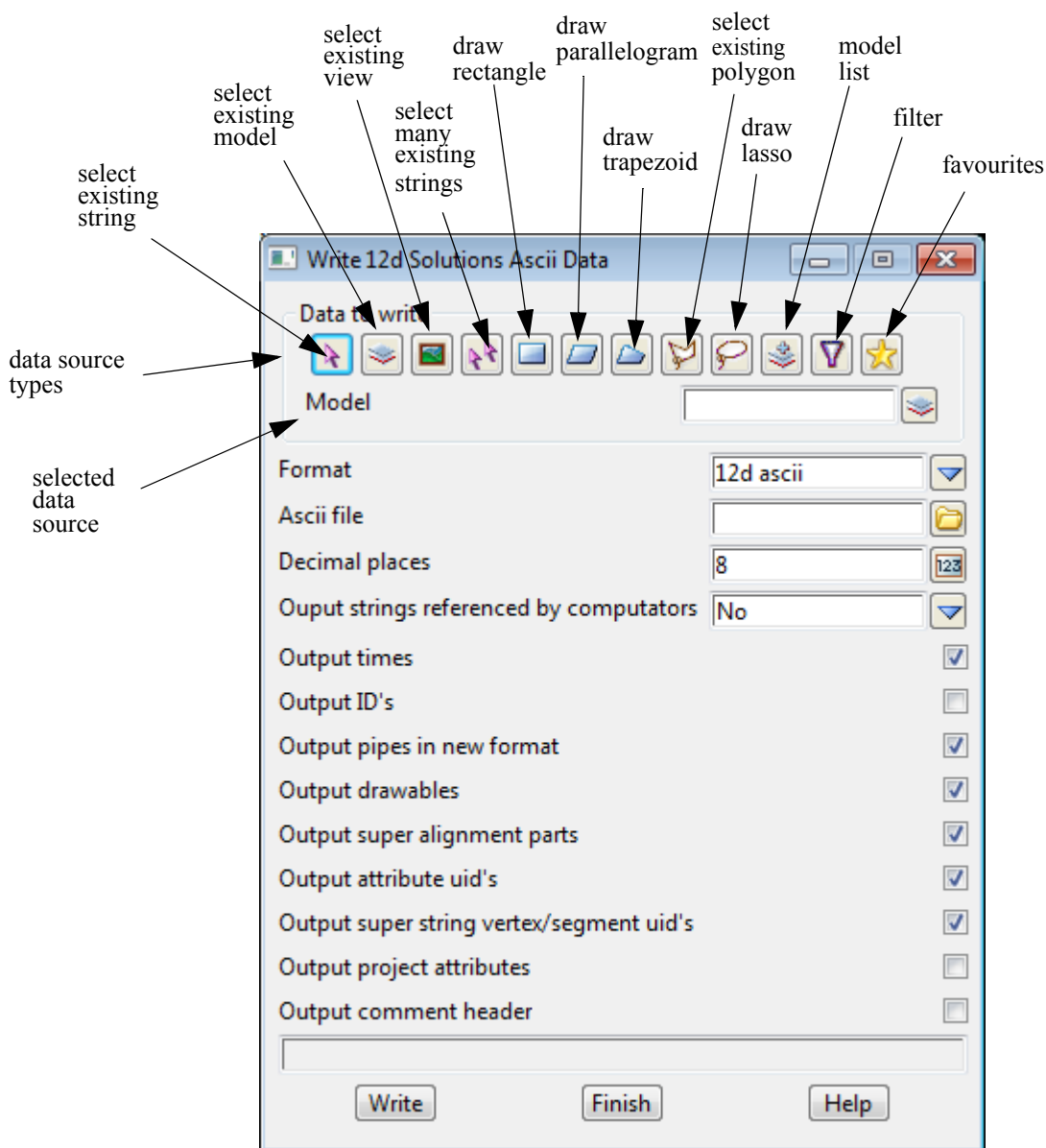
Data Source

Many options contain the panel field **Data source** which may have one or more of the selection choices:

string, model, view, multi-pick strings, rectangle, parallelogram, polygon, lasso, model list, filter, favourites

Depending on the Data Source choice, the panel fields after the Data Source icons will be changed to suite the Data Source choice.

For example, for the choice **Model**, the next field will be Model.



See [Select Existing String](#)

See [Select Existing Model](#)

See [Select Existing View](#)

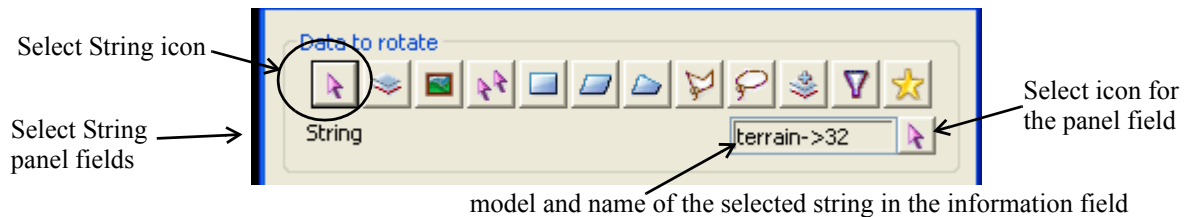
See [Select Many Strings](#)

See [Select Using a User Drawn Rectangle](#)

See [Select Using a User Drawn Parallelogram](#)

See [Select Using a User Drawn Trapezoid](#)
 See [Select an Existing Polygon](#)
 See [Select Using a User Drawn Lasso](#)
 See [Select many models](#)
 See [Select Filter](#)
 See [Favourites](#)

Select Existing String



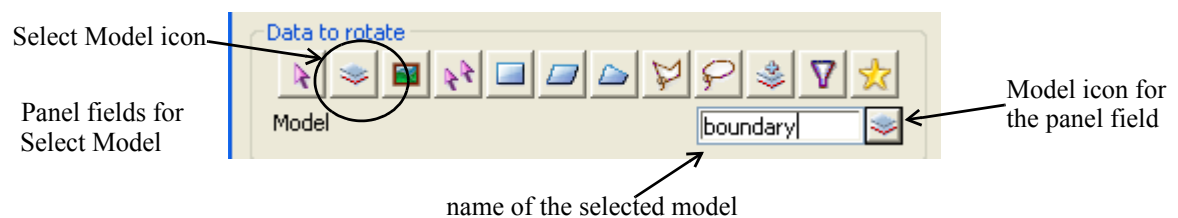
After clicking on the **Select String** icon, a String Select is started and the Select String panel field called **String** is placed under the Data Source icons.

When a string is selected, its model and name of the string is displayed in the String Select information field.

To selected a different string, the Select icon for the String Select panel field (to the right of the string name field) must be used as the Data Source Select String icon is now inactive.

Continue to [Select Existing Model](#) or return to [Data Source](#)

Select Existing Model



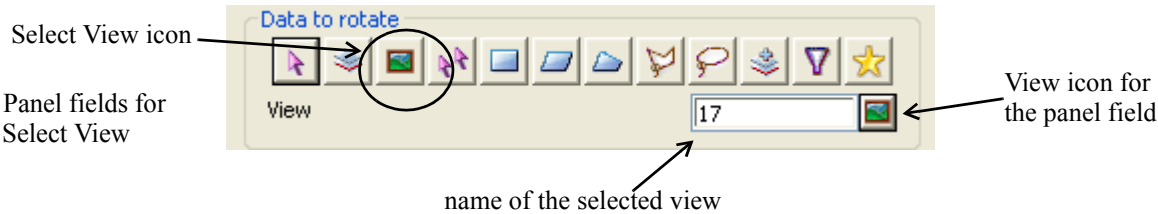
After clicking on the **Select Model** icon, a Model panel field is placed under the Data Source icons.

A model name can be typed into the panel field or a model selected from the Model icon from the Model panel field (to the right of the model name field).

To select a different model, the Model icon for the Model panel field must be used as the Data Source Select Model icon is now inactive.

Continue to [Select Existing View](#) or return to [Data Source](#)

Select Existing View



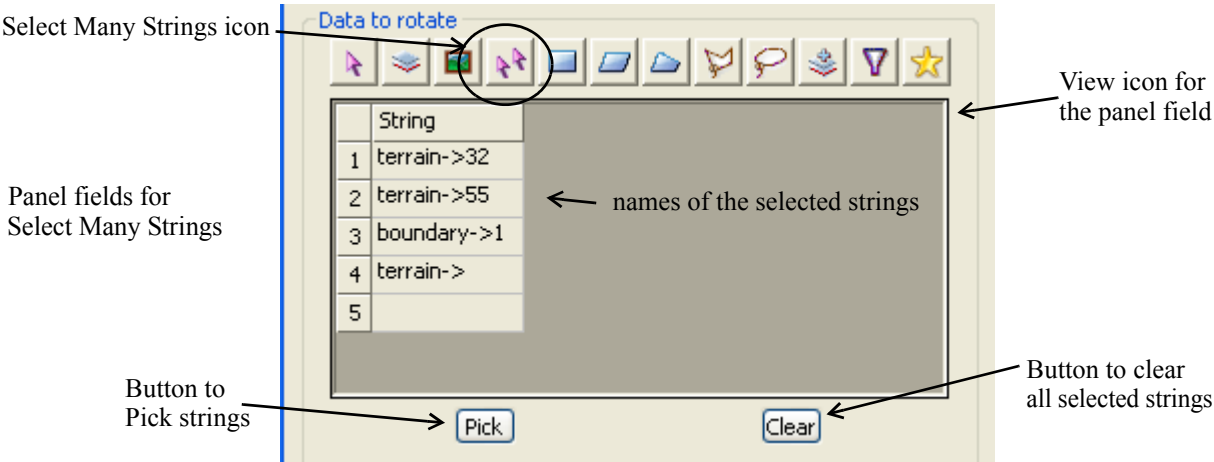
After clicking on the **Select View** icon, a View panel field is placed under the Data Source icons.

A view name can be typed into the panel field or a view selected from the View icon from the View panel field (to the right of the view name field).

To select a different view, the View icon for the View panel field must be used as the Data Source Select View icon is now inactive.

Continue to [Select Many Strings](#) or return to [Data Source](#)

Select Many Strings



After clicking on the **Select Many Strings** icon, the panel fields for the Select Many Strings are placed under the Data Source icons.

The Select Many Strings panel fields consists of a grid to display the model and string name of selected strings, a Pick button to start selecting strings and a Clear button to deselect the currently selected strings.

To begin selecting strings, click on the **Pick** button. Strings are then selected and accepted and this continues until RB is pushed and **Cancel** selected from the **Pick Ops** menu. As each string is selected it is highlighted and the selected strings stay highlighted after they are selected.

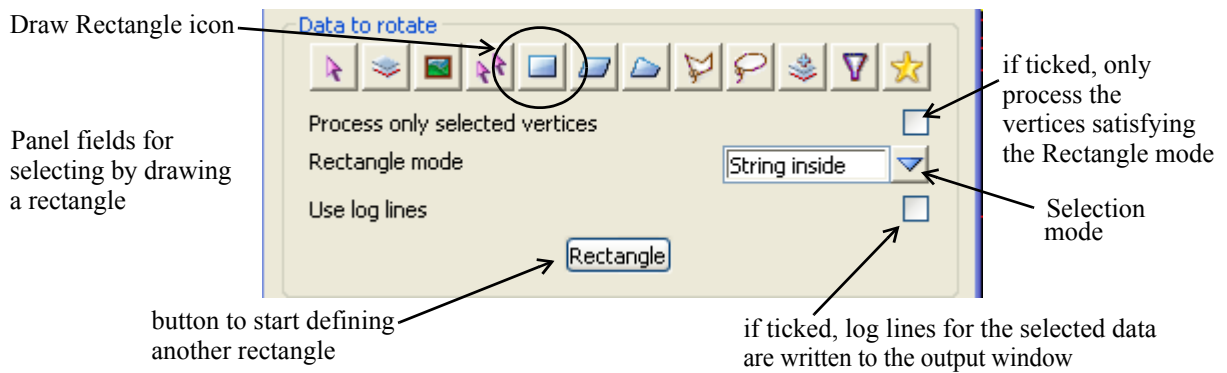
To pick **more** strings, simply click on **Pick** and start selecting again. The new strings are added to the bottom of the String name grid and all the new strings also remain highlighted.

To clear all the selected string, simply click on **Clear**.

The Data Source Select Many Strings icon is made inactive after the option is first selected.

Continue to [Select Using a User Drawn Rectangle](#) or return to [Data Source](#)

Select Using a User Drawn Rectangle



After clicking on the **Draw Rectangle** icon, the panels fields for selecting by drawing a rectangle are placed under the Data Source icons and the rectangle drawing process is automatically started.

First the position of one corner of the rectangle is selected by clicking LB on a plan view and then a rectangle parallel to the x and y axis is drawn to the current cursor position. The rectangle is completed by clicking LB at a second position.

Strings are selected by using the rectangle and the **Rectangle mode** which is:

if **Process only selected vertices** is ticked on, **Rectangle mode** choices are:

Vertices inside or Vertices outside

if **Process only selected vertices** is not ticked, **Rectangle mode** choices are:

String inside, String outside, String crossing, String inside/crossing, String outside/crossing

Any strings/vertices satisfying the **Rectangle mode** will be highlighted when the rectangle is completed.

If **Process only selected vertices** or **Rectangle mode** is modified, the new strings/vertices satisfying the new parameters are highlighted.

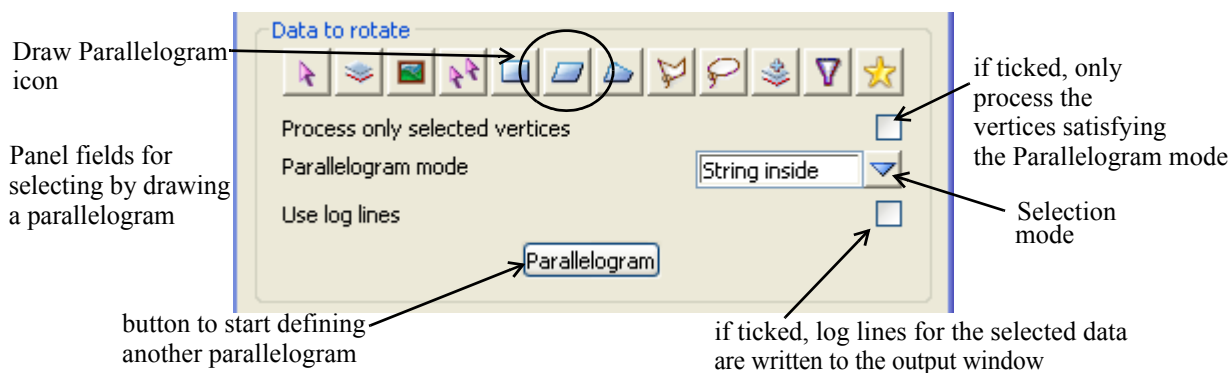
If **Use log lines** is ticked, log lines for the selected data are written to the output window.

To draw a new rectangle, click on the **Rectangle** button and draw a new rectangle.

The Data Source Draw Rectangle icon is made inactive after the option is first selected.

Continue to [Select Using a User Drawn Parallelogram](#) or return to [Data Source](#)

Select Using a User Drawn Parallelogram



After clicking on the **Draw Parallelogram** icon, the panel's fields for selecting by drawing a parallelogram are placed under the Data Source icons and the parallelogram drawing process is automatically started.

First two positions defining one side of the parallelogram by clicking LB at each position. A parallelogram is then drawn to the current cursor position. The parallelogram is completed by clicking LB at a third position.

Strings are selected by using the parallelogram and the **Parallelogram mode** which is:

if **Process only selected vertices** is ticked on, **Parallelogram mode** choices are:

Vertices inside or Vertices outside

if **Process only selected vertices** is not ticked, **Parallelogram mode** choices are:

String inside, String outside, String crossing, String inside/crossing, String outside/crossing

Any strings/vertices satisfying the **Parallelogram mode** will be highlighted when the parallelogram is completed.

If **Process only selected vertices** or **Parallelogram mode** is modified, the new strings/vertices satisfying the new parameters are highlighted.

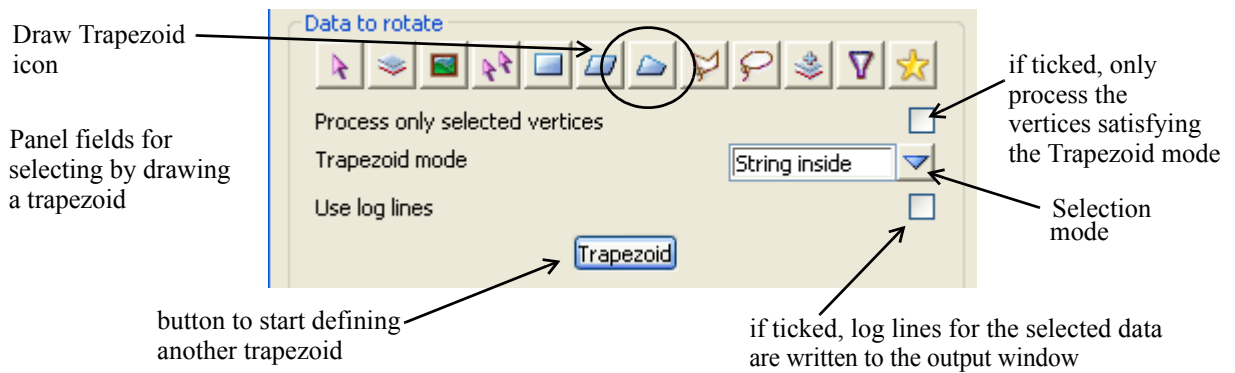
If **Use log lines** is ticked, log lines for the selected data are written to the output window.

To draw a new parallelogram, click on the **Parallelogram** button and draw a new parallelogram.

The Data Source Draw Parallelogram icon is made inactive after the option is first selected.

Continue to [Select Using a User Drawn Trapezoid](#) or return to [Data Source](#)

Select Using a User Drawn Trapezoid



After clicking on the **Draw Trapezoid** icon, the panel fields for selecting by drawing a trapezoid are placed under the Data Source icons and the trapezoid drawing process is automatically started.

Four positions representing the four vertices of the trapezoid by clicking LB at each of the positions. The trapezoid is completed after the fourth position is selected.

Strings are selected by using the trapezoid and the Trapezoid mode which is:

if **Process only selected vertices** is ticked on, **Trapezoid mode** choices are:

Vertices inside or Vertices outside

if **Process only selected vertices** is not ticked, **Trapezoid mode** choices are:

String inside, String outside, String crossing, String inside/crossing, String outside/crossing

Any strings/vertices satisfying the **Trapezoid mode** will be highlighted when the trapezoid is completed.

If **Process only selected vertices** or **Trapezoid mode** is modified, the new strings/vertices satisfying the new parameters are highlighted.

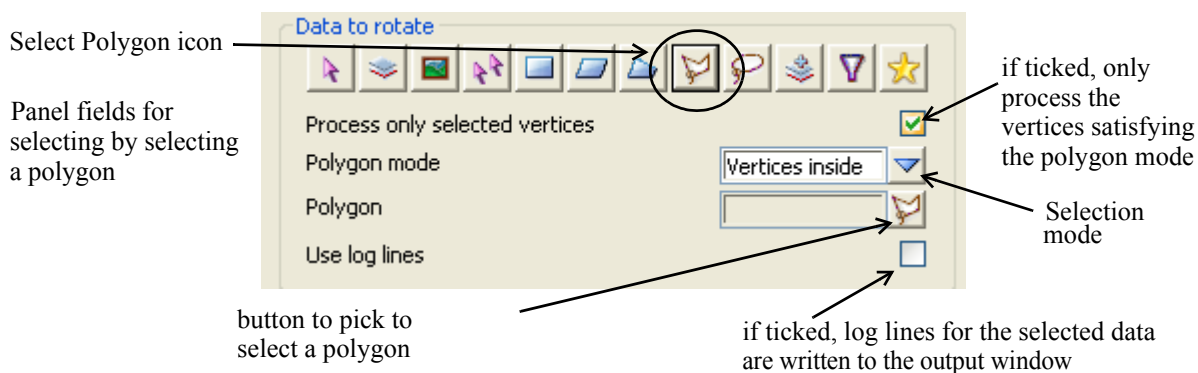
If **Use log lines** is ticked, log lines for the selected data are written to the output window.

To draw a new trapezoid, click on the **Trapezoid** button and draw a new trapezoid.

The Data Source Draw Trapezoid icon is made inactive after the option is first selected.

Continue to [Select an Existing Polygon](#) or return to [Data Source](#)

Select an Existing Polygon



After clicking on the **Select Polygon** icon, the panel fields for selecting by selecting a polygon are placed under the Data Source icons.

A polygon is then selected by clicking on the Select polygon button on the right of the Polygon panel field, and then selecting a polygon.

Note: a polygon is just a closed string. If an open string is selected then a closed string is automatically created by joining the first and the last vertices of the string.

if **Process only selected vertices** is ticked on, **Polygon mode** choices are:

Vertices inside or Vertices outside

if **Process only selected vertices** is not ticked, **Polygon mode** choices are:

String inside, String outside, String crossing, String inside/crossing, String outside/crossing

Any strings/vertices satisfying the **Polygon mode** will be highlighted when the polygon is selected.

If **Process only selected vertices** or **Polygon mode** is modified, the new strings/vertices satisfying the new parameters are highlighted.

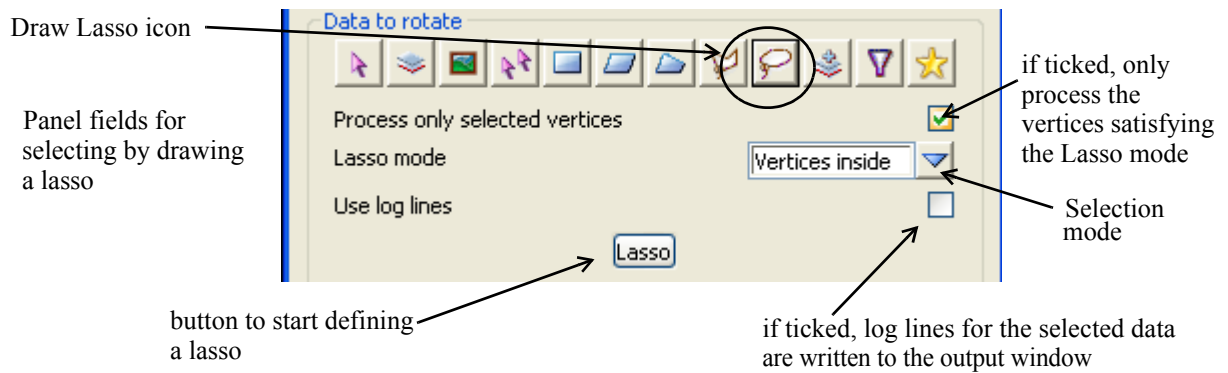
If **Use log lines** is ticked, log lines for the selected data are written to the output window.

To select a new polygon, click on the Select polygon button on the right of the Polygon panel field and select a new polygon.

The Data Source Select Polygon icon is made inactive after the option is first selected.

Continue to [Select Using a User Drawn Lasso](#) or return to [Data Source](#)

Select Using a User Drawn Lasso



After clicking on the **Draw Lasso** icon, the panel fields for selecting by drawing a lasso are placed under the Data Source icons.

The lasso drawing process is started by clicking on the **Lasso** button.

A lasso is then defined by clicking down on the LB and whilst holding the LB down, moving the cursor around to define a freehand lasso. The lasso is completed by letting the LB up and then clicking and releasing MB.

Strings are selected by using the lasso and the Lasso mode which is:

if **Process only selected vertices** is ticked on, **Lasso mode** choices are:

Vertices inside or Vertices outside

if **Process only selected vertices** is not ticked, **Lasso mode** choices are:

String inside, String outside, String crossing, String inside/crossing, String outside/crossing

Any strings/vertices satisfying the **Lasso mode** will be highlighted when the lasso is completed.

If **Process only selected vertices** or **Lasso mode** is modified, the new strings/vertices satisfying the new parameters are highlighted.

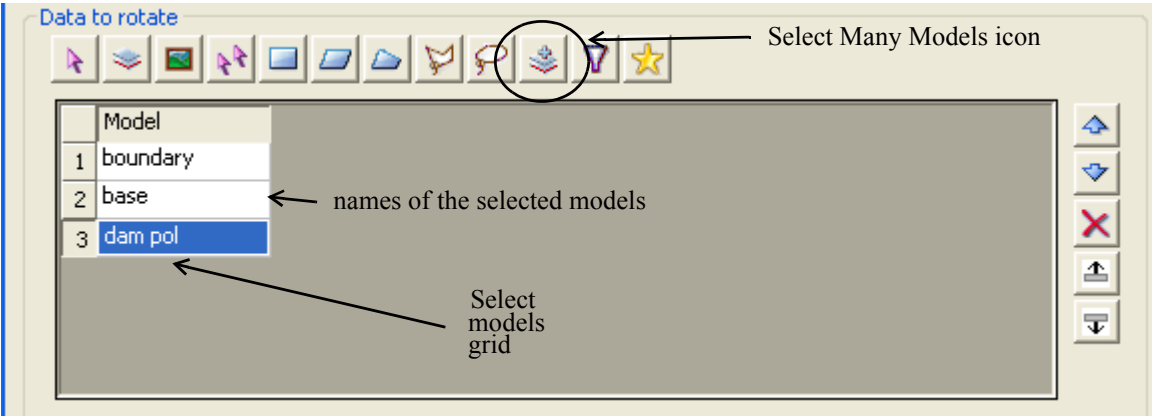
If **Use log lines** is ticked, log lines for the selected data are written to the output window.

To draw a new lasso, click on the **Lasso** button and draw a new lasso.

The Data Source Draw Lasso icon is made inactive after the option is first selected.

Continue to [Select many models](#) or return to [Data Source](#)

Select many models



After clicking on the **Select Many Models** icon, the Select Many Models grid is placed under the Data Source icons.

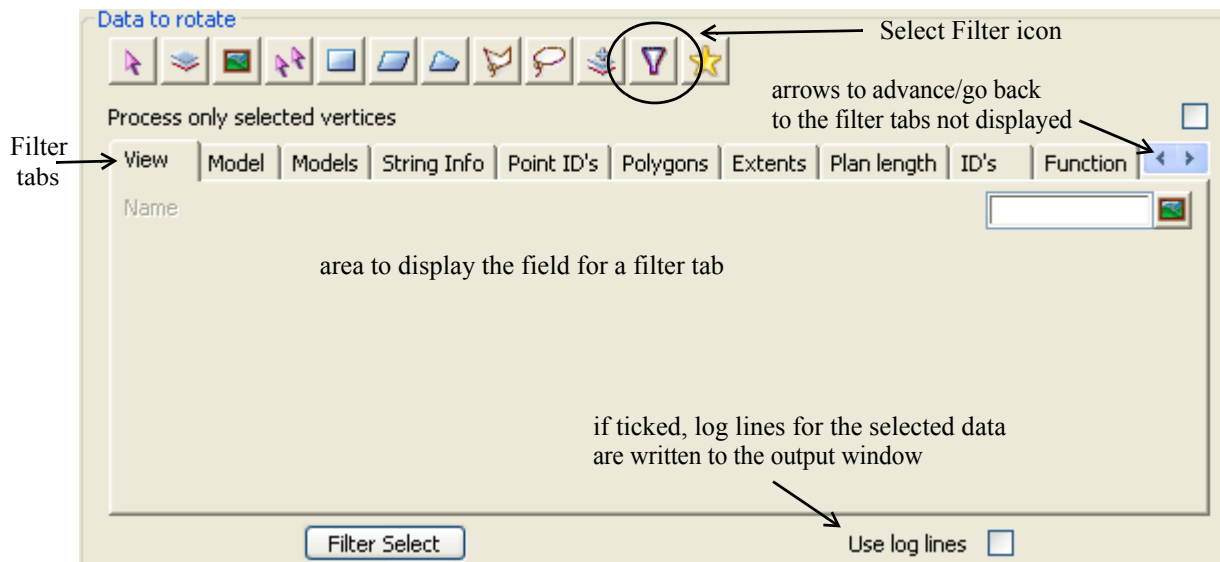
To begin selecting models, type the model name into the a field of the grid, or click RB in the grid and select from the Select Model pop-up (if a pop-up with Browse comes up, select Browse to bring up the Select Model pop-up).

Pressing the <Enter> key will add another blank row to the grid. Or clicking RB on the numbers on the left of the grid will bring up a menu to insert, delete, clear, cut, copy and paste rows. The buttons on the right hand side of the grid will also allow for rows to be moved up or down, delete rows and insert blank rows.

The Data Source Select Many Model icon is made inactive after the option is first selected.

Continue to [Select Filter](#) or return to [Data Source](#)

Select Filter



After clicking on the **Select Filter** icon, the **Process only selected vertices** tick box, the **Select Filter** tabs, **Filter Select** button and **User log lines** tick box are placed under the Data Source icons.

The option works by selecting the data that satisfies EVERY filter tab. That is, the data satisfies ALL the values in ALL the filter tabs.

So **all** the filter tabs work together to define the selected data.

For each filter tab required, the user clicks on the tab and fills in the required fields in the filter tabs that are to be satisfied by the selected strings.

When all the required filter tabs filled in, click on the **Filter Select** button to select the data that satisfies all the filter tabs.

If **Process only selected vertices** is ticked, only the vertices of the strings that satisfy the filters are used. are selected are

If **Use log lines** is ticked, log lines for the selected data are written to the output window.

The full set of filter tabs are:

See View Filter	Model Filter	String Info Filter
See Point ID's Filter	Polygons Filter	Extents Filter
See Extents Filter	Plan Length Filter	String ID's Filter
See Function Filter	Time Filter	Model Attributes Filter
See Element Attributes Filter	Vertex Attributes Filter	Segment Attributes Filter
See Vertex Count Filter	Tags Filter	Name Masks Filter
See Vertex UID's Filter	Segment UID's Filter	

View Filter

ViewModelModelsString InfoPoint ID'sPolygonsExtentsPlan lengthID'sFunction

Name16

View Tab

A view name can be typed into the panel field or a view selected from the View icon from the View panel field (to the right of the view name field).

Continue to [Model Filter](#) or return to [Select Filter](#) or [Data Source](#)

Model Filter

ViewModelModelsString InfoPoint ID'sPolygonsExtentsPlan lengthID'sFunction

Name

Start ID

End ID

ID

ID

Model Tab

A model name can be typed into the panel field or a model selected from the Model icon from the Model panel field (to the right of the model name field).

Continue to [Models Filter](#) or return to [Select Filter](#) or [Data Source](#)

Models Filter

ViewModelModelsString InfoPoint ID'sPolygonsExtentsPlan lengthID'sFunction

Model

1

Models Tab

The names of one or models can be typed into the **Model** grid, or by clicking RB in the grid and selecting from the Select Model pop-up (if a pop-up with Browse comes up, select Browse to bring up the Select Model pop-up).

Continue to [String Info Filter](#) or return to [Select Filter](#) or [Data Source](#)

String Info Filter

String Info Tab

Strings can be selected by setting on or more properties in the String Info tab.

Type - the type of string

Select Choice

- any string
- 2d
- 3d
- 4d
- Arc
- Circle
- Text
- Pipe
- Sewer
- Face
- Feature
- Polyline
- Super
- Pipeline
- Drainage
- Old Drainage (invisible)
- Interface
- Alignment
- Super Alignment

Types

Name - the name of the string

Colour - the colour of the string

Pt-line - the breakline type of the string

Style - the linestyle of the string

Weight - the weight of the string

If a field is left blank, then it is not used in the selection process.

Continue to [Point ID's Filter](#) or return to [Select Filter](#) or [Data Source](#)

Point ID's Filter

ViewModelModelsString InfoPoint ID'sPolygonsExtentsPlan lengthID'sFunction

Minimum

Maximum

+

+

Point Id's Tab

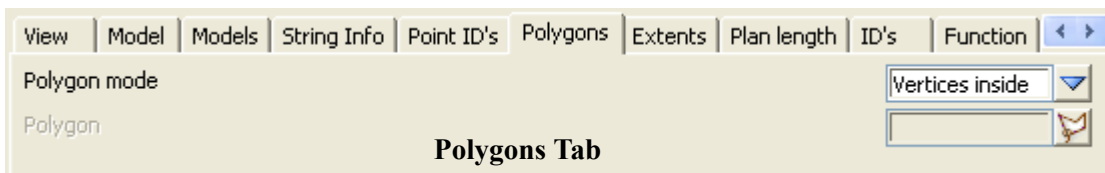
Minimum - if non-blank, then if a string vertex has a Point Id, then this is the minimum value that it can be. The Point id can be text so the ascii sort sequence is used for comparisons.

Maximum - if non-blank, then if a string vertex has a Point Id, then this is the maximum value that it can be. The Point id can be text so the ascii sort sequence is used to comparisons.

If a field is left blank, then it is not used in the selection process.

Continue to [Polygons Filter](#) or return to [Select Filter](#) or [Data Source](#)

Polygons Filter



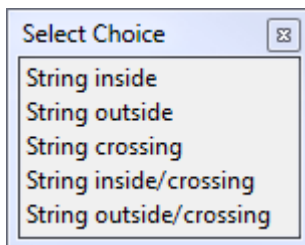
A polygon is selected/created to restrict the selection of strings by the choice given in the Polygon mode field.

Clicking LB on the Select Polygon icon on the right hand side of the Polygon field allows the user to select a polygon.

Clicking RB on the Select Polygon icon on the right hand side of the Polygon field brings up the Polygon Choice Box for the user to select a method of creating/selecting a polygon.

Clicking MB does nothing.

The strings selected are then restricted to those using the polygon and satisfying the **Polygon mode**:



String inside - strings totally inside the polygon

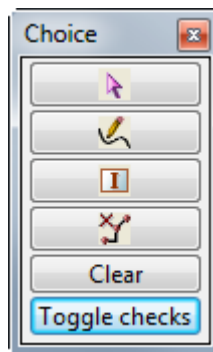
String outside - strings totally outside the polygon

String crossing - strings crossing the polygon

String inside/crossing - strings totally inside or crossing the polygon

String outside/crossing - strings totally outside or crossing the polygon

Polygon Modes



Clicking MB does nothing.

Continue to [Extents Filter](#) or return to [Select Filter](#) or [Data Source](#)

Extents Filter

View

Model

Models

String Info

Point ID's

Polygons

Extents

Plan length

ID's

Function

<

>

Minimum

X

X

Y

Y

Z

Z

Extents Tab

Maximum

X

X

Y

Y

Z

Z

Minimum X - if non-blank, all the string's X coordinates must be at least this value.
Minimum Y - if non-blank, all the string's Y coordinates must be at least this value.
Minimum Z - if non-blank, all the string's Z coordinates must be at least this value.

Maximum X - if non-blank, none of the string's X coordinates can be greater than this value.
Maximum Y - if non-blank, none of the string's Y coordinates can be greater than this value.
Maximum Z - if non-blank, none of the string's Z coordinates can be greater than this value.

If a field is left blank, then it is not used in the selection process.

Continue to [Plan Length Filter](#) or return to [Select Filter](#) or [Data Source](#)

Plan Length Filter

Extents

Plan length

ID's

Function

Time

Model Attributes

Element Attributes

Vertex Attribu

<

>

Minimum

Maximum

Plan Length Tab

Minimum - if non-blank, the string's plan length (2d length) must be at least this value.
Maximum - if non-blank, the string's plan length (2d length) can't be greater than this value.

If a field is left blank, then it is not used in the selection process.

Continue to [String ID's Filter](#) or return to [Select Filter](#) or [Data Source](#)

String ID's Filter

Extents

Plan length

ID's

Function

Time

Model Attributes

Element Attributes

Vertex Attribu

<

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Start ID

ID

End ID

ID




ID's Tab

Start ID - if non-blank, the string's ID must be at least this value.
End ID - if non-blank, the string's ID can't be greater than this value.

If a field is left blank, then it is not used in the selection process.

Continue to [Function Filter](#) or return to [Select Filter](#) or [Data Source](#)

Function Filter

Extents	Plan length	ID's	Function	Time	Model Attributes	Element Attributes	Vertex Attribu	<	>
Name								<input type="text"/>	
Start ID								<input type="text"/>	
End ID								<input type="text"/>	
Function Tab									

Name - if non-blank, the string must be part of a function with this name.





Start ID - if non-blank, the string's ID must be at least this value.

End ID - if non-blank, the string's ID can't be greater than this value.

If a field is left blank, then it is not used in the selection process.

Continue to [Time Filter](#) or return to [Select Filter](#) or [Data Source](#)

Time Filter

Extents	Plan length	ID's	Function	Time	Model Attributes	Element Attributes	Vertex Attribu	<	>	
Start create time								<input checked="" type="checkbox"/>	05/Dec/1992 19:07:37	
End create time								<input type="checkbox"/>	01/Jan/1970 00:00:00	
Start update time								<input type="checkbox"/>	01/Jan/1970 00:00:00	
End update time								<input type="checkbox"/>	01/Jan/1970 00:00:00	
Time Tab										

Start create time - if non-blank, the string's time of creation must be at least this time.

End create time - if non-blank, the string's time of creation can't be greater than this time.

Start update time - if non-blank, the time the string was last updated must be at least this time.

End update time - if non-blank, the time the string was last updated can't be greater than this time.

If a field is left blank, then it is not used in the selection process.

Continue to [Model Attributes Filter](#) or return to [Select Filter](#) or [Data Source](#)

Model Attributes Filter

Extents

Plan length

ID's

Function

Time

Model Attributes

Element Attributes

Vertex Attribu

<

>

	Name	Type	Data
1			

Model Attributes Tab

Continue to [Element Attributes Filter](#) or return to [Select Filter](#) or [Data Source](#)

Element Attributes Filter

Time

Model Attributes

Element Attributes

Vertex Attributes

Segment Attributes

Vertex Count

<

>

	Name	Type	Data
1			

Element Attributes Tab

Continue to [Vertex Attributes Filter](#) or return to [Select Filter](#) or [Data Source](#)

Vertex Attributes Filter

Time

Model Attributes

Element Attributes

Vertex Attributes

Segment Attributes

Vertex Count

<

>

	Name	Type	Data
1			

Vertex Attributes Tab

Continue to [Segment Attributes Filter](#) or return to [Select Filter](#) or [Data Source](#)

Segment Attributes Filter

Element Attributes	Vertex Attributes	Segment Attributes	Vertex Count	Tags	Name masks	Vert
	Name	Type	Data			
1						

Segment Attributes Tab

Continue to [Vertex Count Filter](#) or return to [Select Filter](#) or [Data Source](#)

Vertex Count Filter

Element Attributes	Vertex Attributes	Segment Attributes	Vertex Count	Tags	Name masks	Vert
Minimum			<input type="text"/>	+		
Maximum			<input type="text"/>	+		

Vertex Count Tab

Minimum - if non-blank and the string have vertices, then the number of vertices must be at least this value.

Maximum - if non-blank and the string have vertices, then the number of vertices can't be greater than this value.

Continue to [Tags Filter](#) or return to [Select Filter](#) or [Data Source](#)

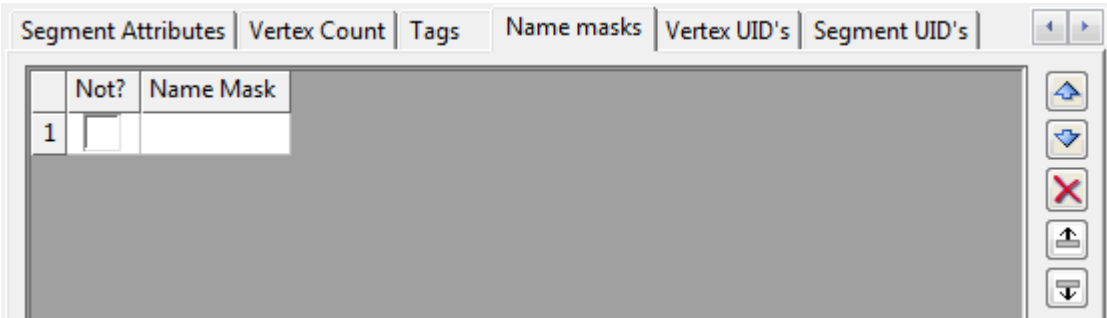
Tags Filter

Segment Attributes	Vertex Count	Tags	Name masks	Vertex UID's	Segment UID's	
Tag		<input type="text"/>	abc			
Search mode		String and mode		▼		

Tags Tab

Continue to [Name Masks Filter](#) or return to [Select Filter](#) or [Data Source](#)

Name Masks Filter



Name Masks Tab

The Name Masks are used to restrict the strings by comparing the string name with the masks in the Name Mask column.

The order of the Names Masks is important.

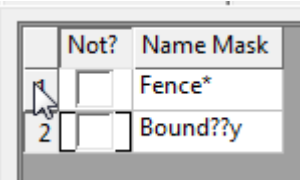
The string name is first compared to the first Name Mask and if the string satisfies the Name Mask, then the string satisfies the Name Masks Tab and no more tests are done for that string.

If the string does not satisfy the first Name Mask, then the string is then compared to the second Name Mask.

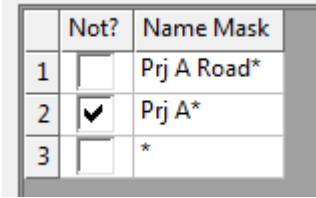
This process is repeated until either the string matches a Name Mask and is selected, or the string matches no Name Mask and so is not selected.

The Name Masks can include the wild card character "*" which stands for zero or characters, and the wild character "?" which stands for just one character.

If **Not** is ticked, then strings are selected if they **don't satisfy** that Name Mask.



include all strings starting with "Fence"
include all strings starting with "Bound" then any two characters and then "y"
So only include the "Fence" strings and "Bound??y" strings



include all strings starting with "Prj A Road"
exclude all other strings starting with "Prj A"
include all other strings
So only include the "Prj A Road*" strings from "Prj A",
and all other strings not starting with "Prj A"

Continue to [Vertex UID's Filter](#) or return to [Select Filter](#) or [Data Source](#)

Vertex UID's Filter

Segment Attributes	Vertex Count	Tags	Name masks	Vertex UID's	Segment UID's	<div>◀ ▶</div>
Minimum				<input type="text"/>	<div>123</div>	
Maximum				<input type="text"/>	<div>123</div>	

Vertex UIDS's Tab

Minimum - if non-blank, then if a string has vertices, then this is the minimum value that the UID of the vertex can be.

Maximum - if non-blank, then if a string has vertices, then this is the maximum value that the UID of the vertex can be.

If a field is left blank, then it is not used in the selection process.

Continue to [Segment UID's Filter](#) or return to [Select Filter](#) or [Data Source](#)

Segment UID's Filter

Segment Attributes	Vertex Count	Tags	Name masks	Vertex UID's	Segment UID's	<div>◀ ▶</div>
Minimum				<input type="text"/>	<div>123</div>	
Maximum				<input type="text"/>	<div>123</div>	

Segment UIDS's Tab

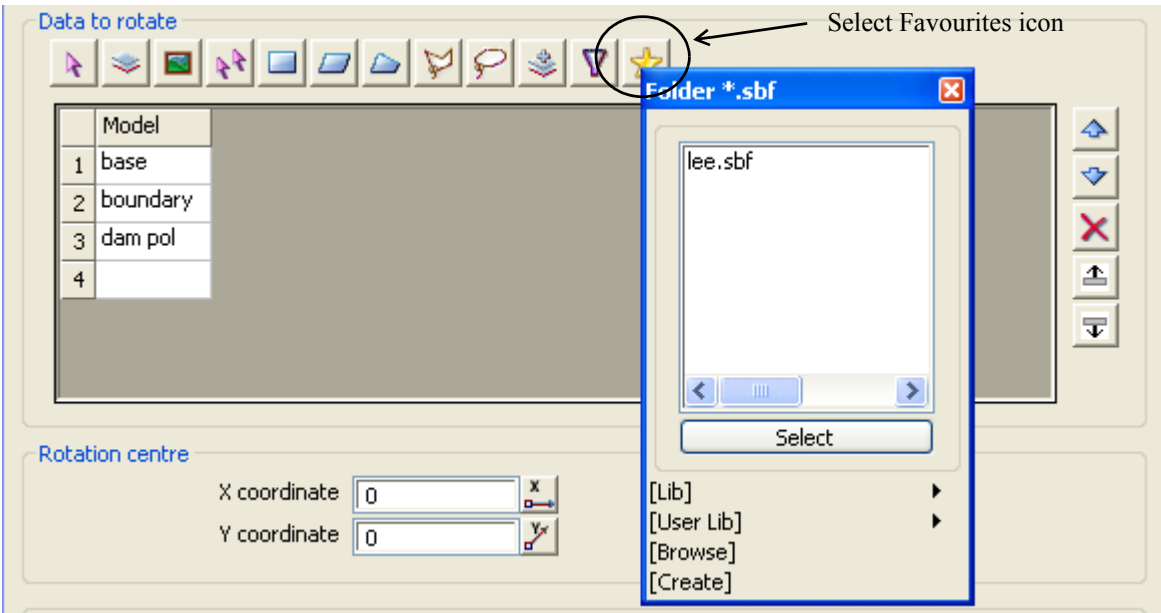
Minimum - if non-blank, then if a string has segments, then this is the minimum value that the UID of the segment can be.

Maximum - if non-blank, then if a string has segments, then this is the maximum value that the UID of the segment can be.

If a field is left blank, then it is not used in the selection process.

Continue to [Favourites](#) or return to [Select Filter](#) or [Data Source](#)

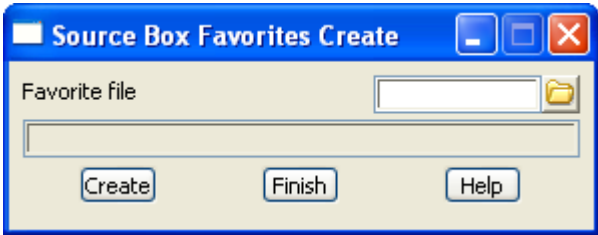
Favourites



After clicking on the **Select Favourites** icon, the **Folder *.sbf** pop-up is raised showing any local source box favourites files (*.sbf) and with options to look in Lib, User Lib, Customer Lib (if it exists) or to Browse for a sbf file.

If a sbf file is selected, then the values in it will be used to set up the Data Source Selection.

To write out an sbf file that saves all the parameters for the current Source Box Selection, click on [Create]. This will bring up the Source Box Favourites Create panel.



To create a sbf file, simply type the name for the sbf file into the Favourite file panel field and then click on **Create**.

In the documentation for a panel with a data source, only the panel for **Data Source type Model** will be shown.

Click on [Data Target](#) to go to the next section or return to [Data Source](#).

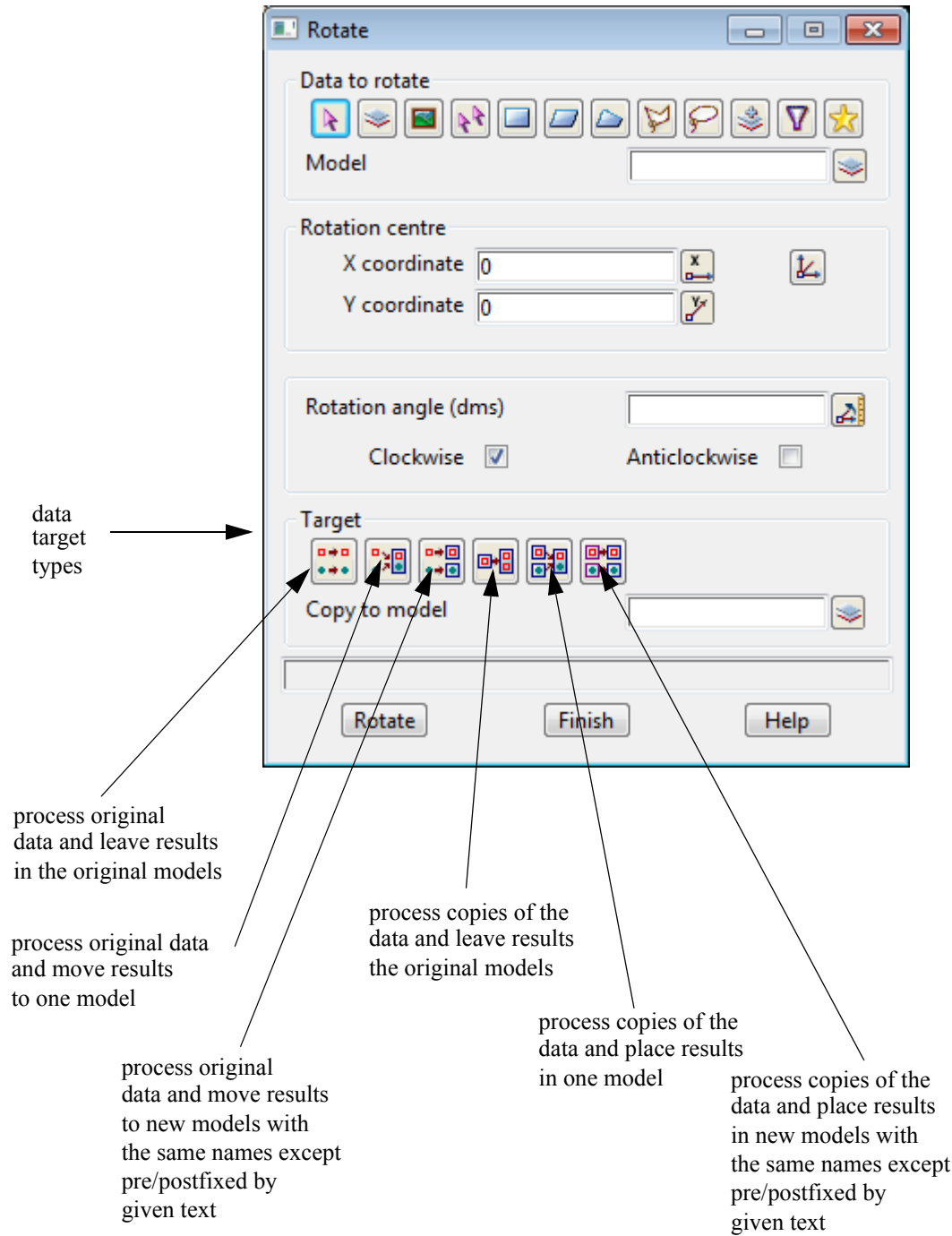
Data Target

Many options contain the panel field **Data target** which may have one or more of the selection choices:

move to original model(s)/replace	// process the original data and leave in models
move to one model	// move the processed data to one model
move to many models	// move processed data to models with the same // names as the original models except the model // names are pre/postfixed by given text.
copy to original model(s)/replace	// process copies of the data and leave in models
copy to one model	// process copies of the data and place in one model
copy to many models	// process copies of the data and place in models with // the same names as the original models except the // model names are pre/postfixed by given text.

Depending on the choice, the next panel field will be changed to suite the choice of target.

For example, for the choice **Copy to one model**, the next field will be Copy to model.






























In the documentation for a panel with a data target, only the panel for **Data Target type Copy to Model** will be shown.

Click on [Pop-Up Lists and Menus](#) to go to the next section.

Pop-Up Lists and Menus

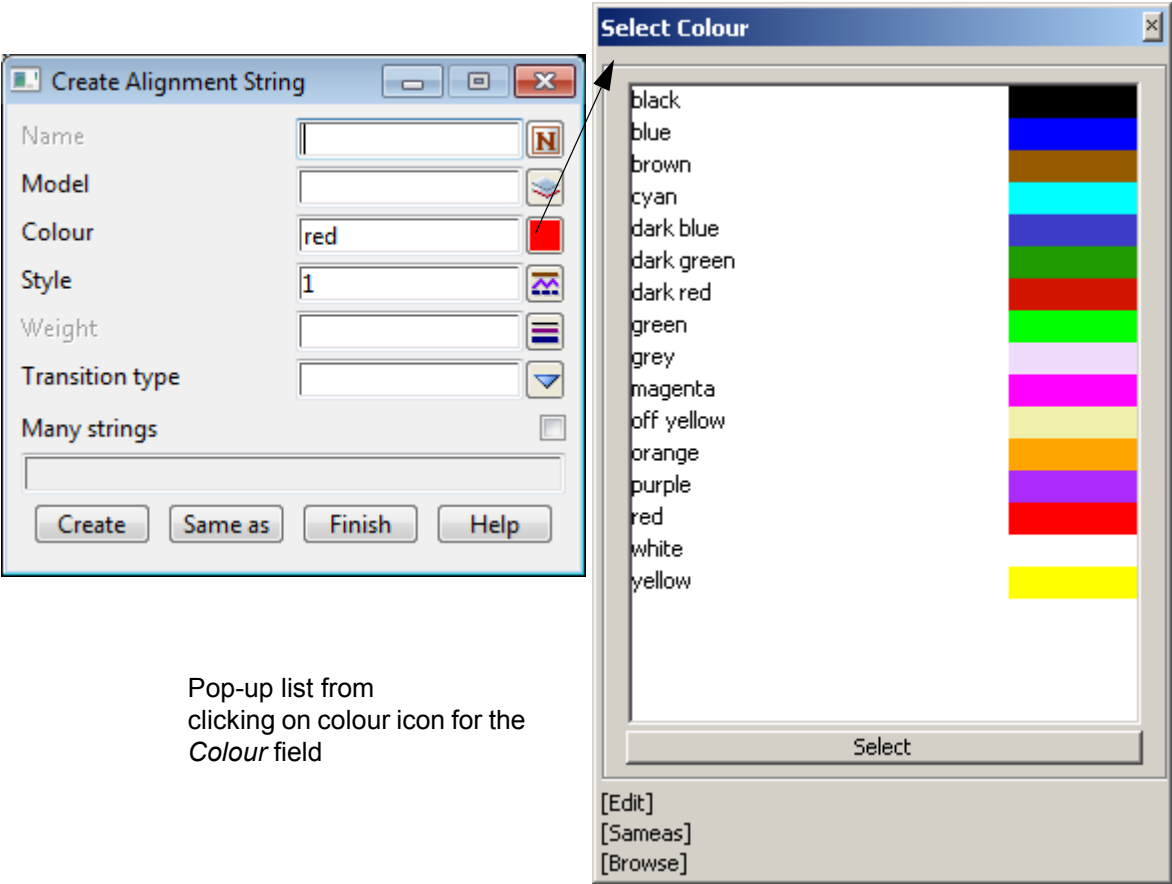
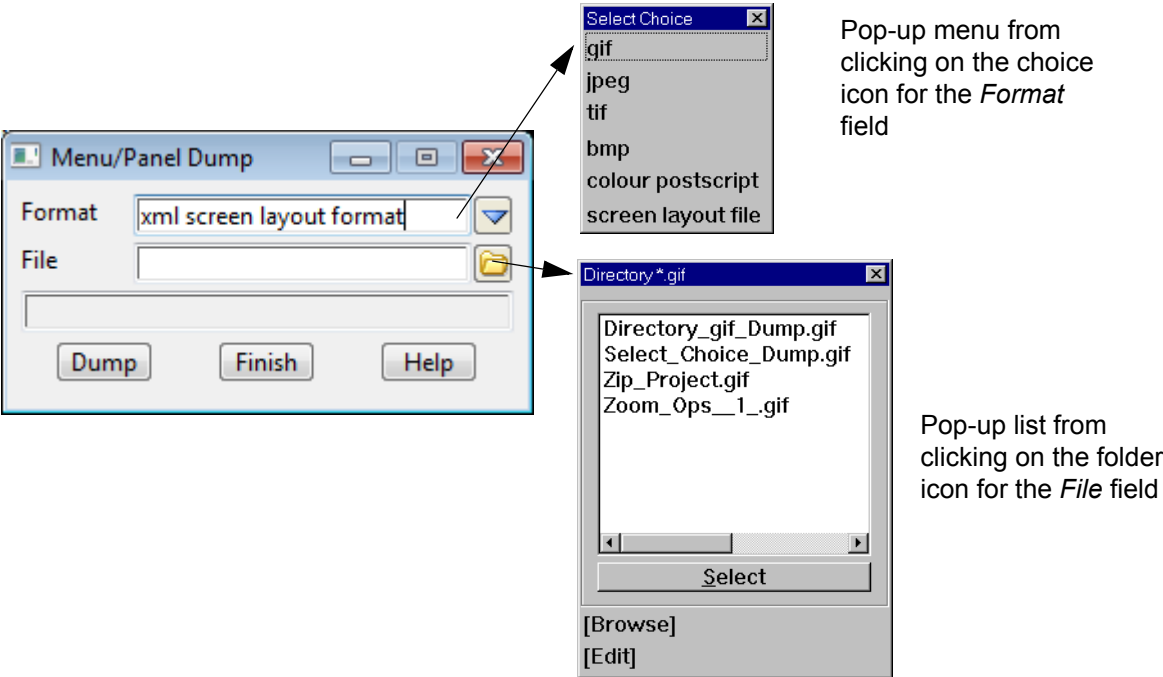
If there are choices available to select from for the panel field, there is a [+] or another special icon displayed at the right hand side of the panel field.

For example, icons that may be used in place of the + are:

	file		tin		textstyle info
	model		choice		line weight
	colour when none selected		selected colour		view
	line style		polygon		symbol
	project		XYZ		X
	Y		Z		chainage
	string name		select		angle
	date/time		function		typed input
	ID		plotter/printer		same as

Clicking LB on the one of the above icons or a [+] brings up a the **panel field pop-up list** or **pop up menu**.

A panel field pop-up consists of a list of choices which may be displayed as either a *menu* or a *list*



For a *pop-up list*, an answer is chosen from the list by **double** clicking LB over the required answer. This answer is then displayed in the panel field and the pop-up list disappears.

At the bottom of some *pop-up lists* is a [Sameas] button. If [Sameas] is selected then an object with

the require property is selected using the mouse and the value from the selected item is written to the panel field.

For some options, more than one selection from a list can be made. In that case, simply use the standard Microsoft methods for multiple selections and then click on **Select**.

For a *pop-up menu*, an answer is chosen from the pop-up menu by clicking LB over the required answer. This answer is then displayed in the panel field and the pop-up menu disappears.

If there are more than twenty five choices to be displayed in a pop-up menu (or the number Popup length in the panel **Defaults**), the list of choices will be split up alphabetically into sub-lists with walk-rights to access each of the sub-lists, A pop-up list has scroll bars on the list if it is longer than the pip-up length.

The pop-up list or menu can also be removed without a selection by clicking LB on the **[X]** on the pop-up list or menu, by clicking LB again on the choice icon or **[+]** for the panel field, or by simply typing into any visible part of the panel field that the pop-up is for (some of the field may be obscured by the pop-up itself).

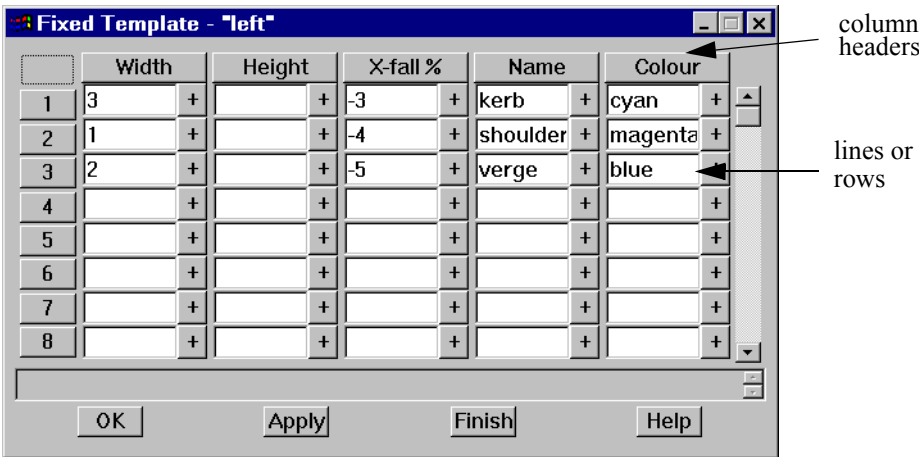
Click on [Textstyle Data and Textstyle Info](#) to go to the next section.

Scrolling Panel Tables

Many **12d Model** panels include tables or lists of information which hold an unlimited number of lines or **rows**. The tables may have more than one **column** but the number of columns is fixed for that table.

Such tables are displayed and edited in a **scrolling panel table**.

For example, the **Fixed Template** panel can contain an unlimited number of lines (rows) defining fixed links for the template.



Normally a set number of lines of the table are displayed in the **scrolling panel table** and once the number of lines exceeds the set number, the up and down arrows on the right hand side of the scrolling panel table are needed to scroll the lines up or down to see the extra information.

Each column of the panel table normally has a **column header** such as **width** and **height** in the above example of the **Fixed Template** scrolling panel table.

The **numbers** on the left hand side of the scrolling panel table indicate the line (row) numbers of the information being displayed and the line numbers are also buttons which when selected, bring up the **Edit Line n** panels. For example



The options on the **Edit Line n** panel have the following functions:

- clear** clear the current line
- copy** copy the current line into the next line; all following lines are pushed down
- delete** delete the current line
- insert** insert a blank line; the current line and all following lines are pushed down
- up** swap the current line with the preceding line
- down** swap the current line with the following line

Also, when the **number** on the left is selected, typing will **delete** the line
<insert> will **insert** a line.

Click on [File Box](#) to go to the next section.

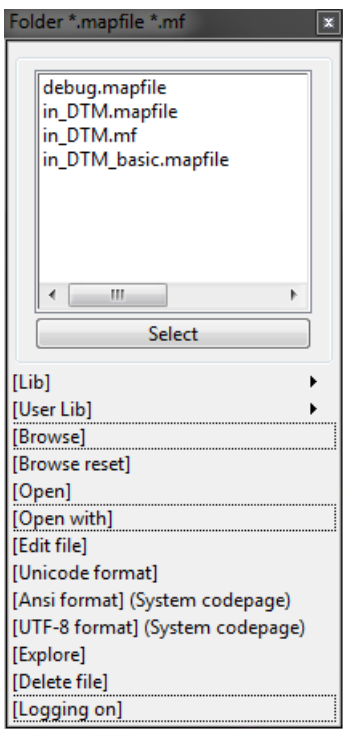
File Box

12d Model panels frequently include a field for entering a **file** name. This type of panel field is called a **file panel** field or box, or simply **file box**.

When RB is clicked on the **[+]** at the right of the panel field to bring up the list of available files, the pop-up menu can contain several different types of items:

- (a) list of **local** files satisfying the file ending for the file box
- (b) [Lib] button
- (c) [User lib] button
- (d) [Browse] button
- (e) [Open] button for some special files which have an internal 12d Model editor
- (f) [Open file]
- (g) [Edit file]
- (h) [Unicode format]
- (i) [Ansi format]
- (j) [UTF-8 format]
- (k) [Explore]
- (l) [Delete file]

For example,



local files satisfying the selection criteria

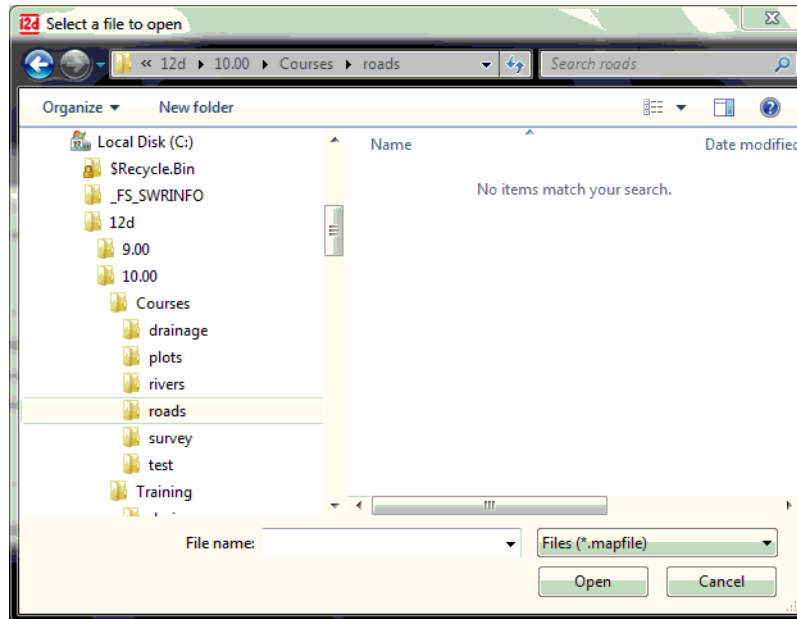
pop up list

The special menu items under the list of local files satisfying the selection criteria (usually file endings) have the following meanings:

[Lib] the walk-right lists all files satisfying the file box ending, in the library pointed to by the environment variable LIB_4D (see Appendix A)

[User Lib] the walk-right lists all the files satisfying the file box ending, in the user library pointed to by the environment variable USER_LIB_4D (see Appendix A)

[Browse] selecting **browse** brings up the **Microsoft File Browser** which can be used to search for a file with a specified ending in the local or other directories. Note that the appearance of the Browser dialog depends on the version of Windows you are using.



[Browse reset] selecting **browse reset** sets the 'browsing' directory back to the working directory of the project, and then starts [Browse].

[Open] selecting **Open** will bring up the special **12d Model** editor for the file. If not a special **12d Model** file, the standard Windows File Associations will be used to open the file. So if the file is an Adobe PDF file, and a PDF 'Viewer' is installed, then the PDF file will be opened in that viewer. Note that in earlier versions of **12d Model**, this was known as [Edit].

[Open with] selecting **Open with** will bring up the Windows Open with program selector to allow the user to choose which program to open the selected file with. If there is one or more than one program associated with a file type, the dialog gives you the choice. Note that the appearance of the Open dialog depends on the version of Windows you are using.

[Edit file] selecting **edit file** when there is a file name already in the file box, will edit the file using the editor pointed to by the EDITOR_4D environment variable.

[Unicode format]

selecting **Unicode format** sets the output format of currently selected file to the **Unicode** format with UTF-16 encoding.

Unicode allows for most languages of the world to be used concurrently. The resulting file will be marked with the Unicode BOM (byte order mark - see [Endian and BOM](#)) so that other programs know this file is in Unicode format with UTF-16 encoding (see [Ascii, Ansi and Unicode](#) and [Unicode Encoding: UTF-16](#)).

Note **12d Model** is Unicode enabled to the UTF-16 level and allows the use of non-Latin alphabets supported by UTF-16. Not all programs can work with Unicode files so if the file being outputted is to be used by another program, you need to check if

UTF-16 files can be read by the intended software.

[Ansi format]

selecting **Ansi format** sets the output format of currently selected file to the 'Ansi' format (see [Ascii, Ansi and Unicode](#)). The resulting file will not be marked with any BOM (byte order mark - see [Endian and BOM](#)). Writing Unicode information to an Ansi file may result in the loss of information.

[UTF-8 format]

selecting **UTF-8 format** sets the output format of currently selected file to the 'UTF-8' format which is a special Unicode format (see [Ascii, Ansi and Unicode](#) and [Unicode Encoding: UTF-8](#)). The resulting file will also be marked with the UTF-8 BOM (byte order mark - see [Endian and BOM](#)) so that other programs know this file is in UTF-8 format.

Note **12d Model** is Unicode enabled to the UTF-16 level and allows the use of non-Latin alphabets supported by UTF-16. Not all programs can work with Unicode files so if the file being outputted is to be used by another program, you need to check if UTF-8 files can be read by the intended software.

[Explore]

selecting **Explore** opens a new Windows Explorer window to the currently 'browsed' folder.

[Delete file]

selecting **Delete file** will prompt the user to send the currently file to the Windows Recycle Bin if it exists for the drive that the file is on. Note this depends on which drive the file resides. Many network drives do not support Recycle Bins and so a deleted file is lost. It is up to the user to implement good backup procedures to avoid permanent loss of files.

[Logging off/on]

Toggle between *Logging on* and *Logging off*. This is only used for Map files and when **Logging on** is set, then entries are made as log lines in the Output Window that show what tabs in the Map File were used in creating and attributing the string.

Note that certain 'types' of File Box many have additional [...] fields.

Click on [Model Panel Field](#) to go to the next section.

Model Panel Field

12d Model panels frequently include a field for entering the name of a model. These fields are called **model panel** fields or simply model fields.

Because models are often required to be displayed on views and hence, need to be **added** to a view, there is a short-hand method for adding models to views when using a model field.

After the model name is entered into the model field, the name of the view that the model is to be added to is typed in, preceded by a comma. If the model is to be added to more than one view, simply type in each of the view names separated by commas.

For example, to add the model **fred** to the views **1**, **3**, and **5**, type

fred,1,3,5

into the model field.

Alternatively, the view names can be enclosed in round brackets.

For example,

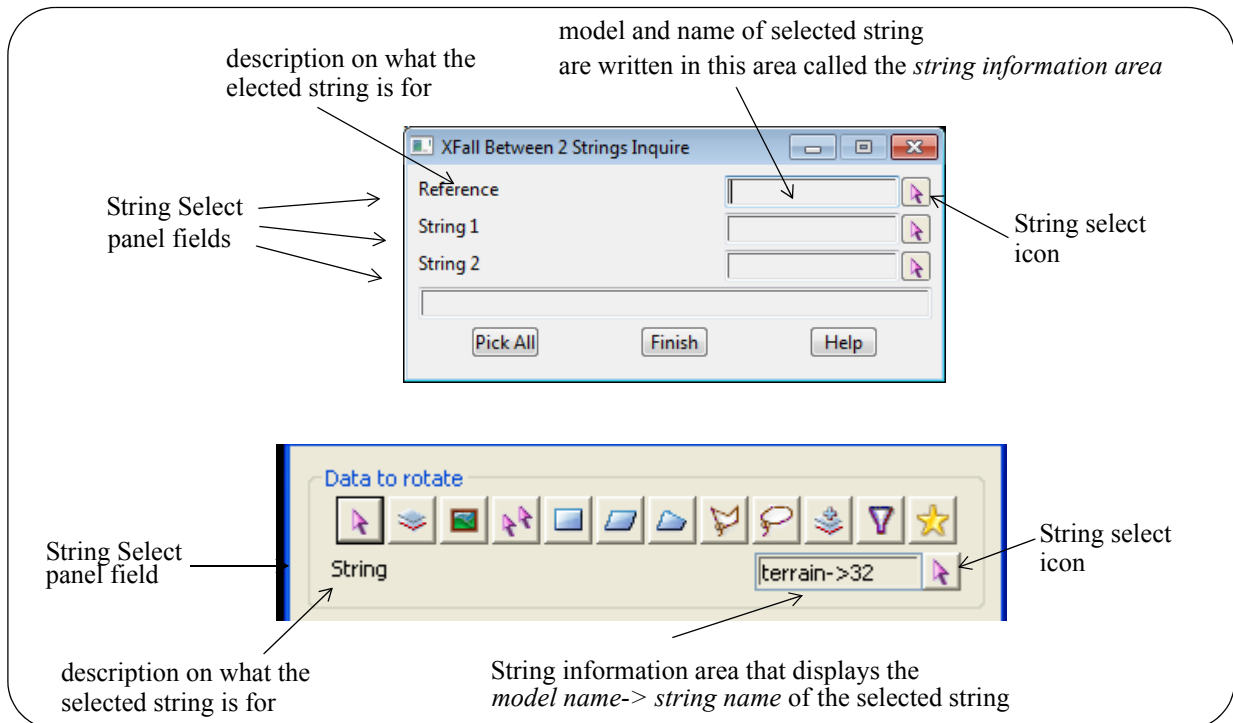
fred (1,3,5)

Click on [String Select Panel Field](#) to go to the next section.

String Select Panel Field

There is a special panel field called a **string select** panel field which is used for **selecting** a string and **recording** the string and model name in the panel field. The string select panel field consists of

- a description of what the field is for
- n string information area where the model and string name of a selected string are displayed and
- the **string select** icon which is clicked on to start selecting a string.

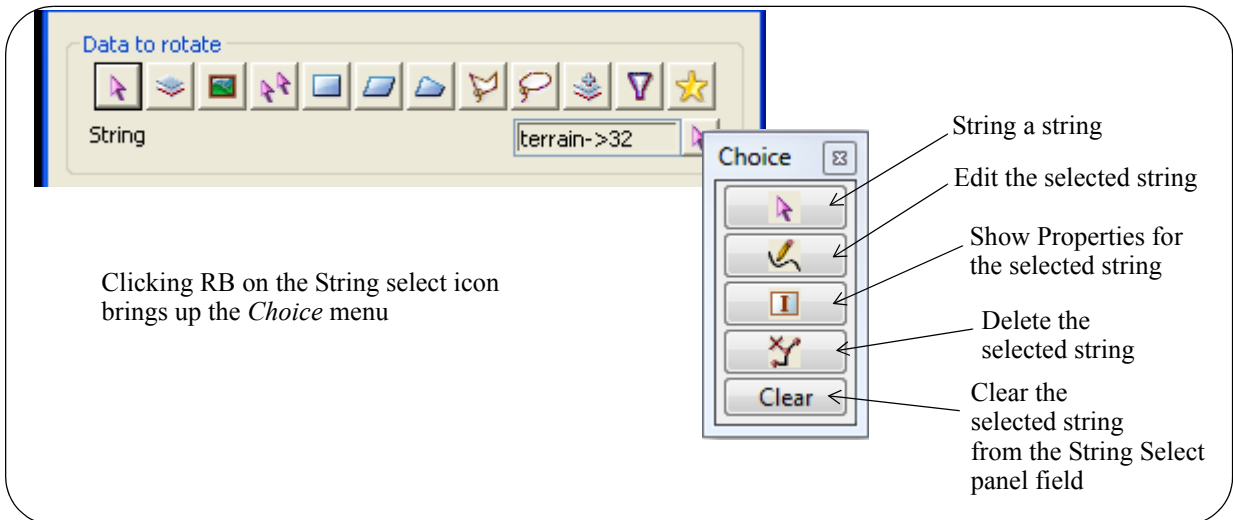


Clicking LB on the *String Select* icon will start the string selection process.

Clicking MB on the *String Select* icon does nothing.

Clicking RB on the *String Select* icon brings up the Choice menu which has options to

- Select a string (same as clicking LB on the *String Select* icon)
- Edit the string that has already been selected for the String Select field. The string to be edited will have its model name and string name shown in the string information area.
- Show the Properties panel for the string that has already been selected for the String Select field.
- Delete the string that has already been selected for the String Select field. The string to be deleted will have its model name and string name shown in the string information area.
- Clear the String Select panel of the string that had already been selected.



If a *String Select* operation has been started, it can be cancelled by clicking *RB* to bring up the *Pick Ops* menu and selecting *Cancel* from the menu.

Click on [Same As for Panel Fields](#) to go to the next section.

Same As for Panel Fields

For most panel fields/input boxes, clicking the middle mouse button (MB) in the field will activate a **same as** pick which allows the user to get information from other objects.

After clicking MB, simply select a string, plot frame *etc.* from a view and the appropriate value will be extracted from the selected item and piped into the panel field.

At present **same as** picks works for

- models
- colours
- justify
- text styles
- text units
- names
- plotter (from plot frames)
- sheet size (from plot frames)
- line styles

Please continue to the next section [Measures](#).

Measures

Whenever a real value is required in a box (e.g. height, width), the pop-up menu on the **[+]** button includes a **measures** menu.

The **Measures** menu allows the user to pick a selected measure value from existing strings, and the picked value is displayed and piped into the panel field.

For example, the x, y, or z coordinate of a point or the plan distance between two points.

If default values already exist for the pop-up menu, the options on the **measures** menu will be added to the bottom of the default list.

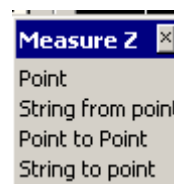
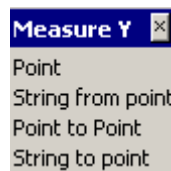
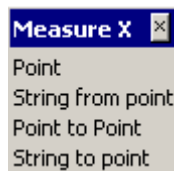
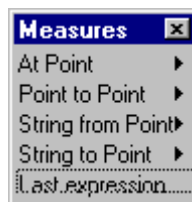
The measures functions support dynamic measures to give the user more visual feedback. This includes the drawing of a rubber line in the case of **Point Point** and **String to Point** measures, or a cross in the case of **At Point**.

The measures and their dynamic aspect can be easily explored via the option

Utilities=>Measure=>Value

The walk-right **Measure** menus are documented in the next four sections.

The stand alone **Measures** menus is



For the option At point, go to
 Point to point
 String from point
 String to point
 Last expression

[Measure At Point](#)
[Measure Point to Point](#)
[Measure String from Point](#)
[Measure String to Point](#)
[Last Expression](#)

If information on measures is not required, please continue to the next section [Last Expression](#).

Measure At Point



- get x co-ordinate of selected point
- y co-ordinate
- z co-ordinate
- chainage at the point
- instantaneous angle
- instantaneous bearing
- cross-fall of selected point
- slope at the point
- radius (0 if no curve)

The **At Point** measures calculate and display the picked measure at a selected point.

For example, **X** gets the x-coordinate of a selected point.
Bearing gets the instantaneous bearing of a selected point.

The dynamic aspect of the **at point** measures is as follows:

after the desired **at point** option is picked and the string for the **at point** measure is tentatively selected but not yet accepted, and if the cursor is moved around, then the cursor position is dynamically dropped perpendicularly onto the highlighted string and a cross displayed on the string at the dropped point, and the picked measure value is dynamically displayed in the panel field.

For example, if the **x** measure was picked from the **Measure Point** menu and a string highlighted but not yet accepted, then as the cursor is moved around the screen, the cursor position is dropped perpendicularly onto the highlighted string and displayed as a cross and the **x**-coordinate of the cross is displayed in the panel field.

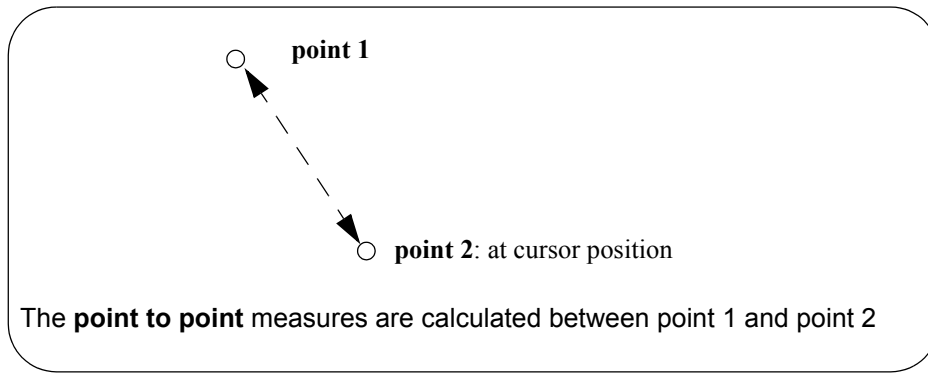
Measure Point to Point



- get 2d length between selected points
- 3d length
- delta x
- delta y
- delta z
- delta chainage
- angle of line joining selected points
- bearing of line
- cross-fall of line
- slope of line

The **Point to Point** measures calculate and displayed the picked measure between two selected points.

For example, **Length** gets the plan distance between two selected points.
X-fall % gets the % cross fall of the line joining two selected points.



The dynamic aspect of the **point to point** measures is as follows:

after the desired **point to point** measure is picked, and the first point for the **point to point** measure is selected, then a rubber line is dynamically drawn between the selected point and the current cursor position and the picked measure value is dynamically displayed in the panel field.

Further, if the selected string for the **second** point is tentatively selected but not yet accepted, and if the cursor is moved around, then the cursor position is dynamically dropped perpendicularly onto the highlighted string and the picked measure value to the second string is dynamically displayed in the panel field.

For example, if the **length** measure was picked from the **Measure Point to Point** menu and the first point selected, then a rubber line is dynamically drawn between the selected point and the cursor position and the plan length from the selected point to the current cursor position is dynamically displayed in the panel field.

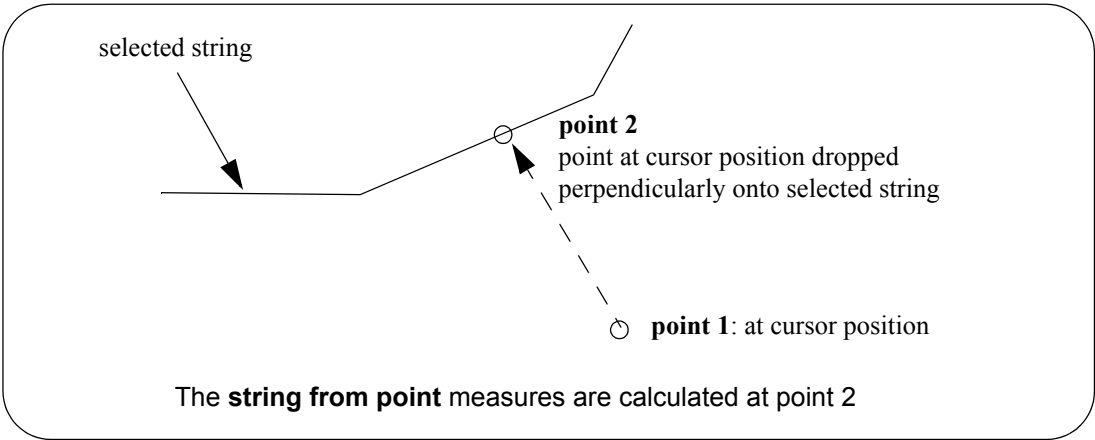
If a string is selected for the second point but not yet accepted, the cursor position is dynamically dropped onto the highlighted string and the plan distance from the first point to the dropped point is dynamically displayed in the panel field.

Measure String from Point

Measure String from Point	
X	get x co-ordinate of point dropped onto string
Y	y co-ordinate
Z	z co-ordinate
Chainage	chainage at the point
Angle	instantaneous angle
Bearing	instantaneous bearing
X-fall %	cross-fall of selected point
Slope 1v in	slope at the point
Radius	radius (0 if no curve)

The **String from Point** measures calculate the picked measure *from the selected string* by taking the current cursor position and dropping it perpendicularly onto the selected string and using the dropped point on the string to get the measure value.

- For example, **X** gets the x-coordinate from the string of the cursor dropped onto the selected string.
- Z** gets the z-coordinate from the string of the cursor dropped onto the selected string
- Bearing** gets the instantaneous bearing from the string of the cursor dropped onto the selected string.



The dynamic aspect of the **string from point** measures is as follows:

after the desired **string from point** measure is picked and the string for the **string from point** measure is selected, then as the cursor is moved around, a rubber line is dynamically drawn between the cursor and the cursor position dropped perpendicularly onto the selected string, and the picked measure value of the dropped cursor position is dynamically displayed in the panel field.

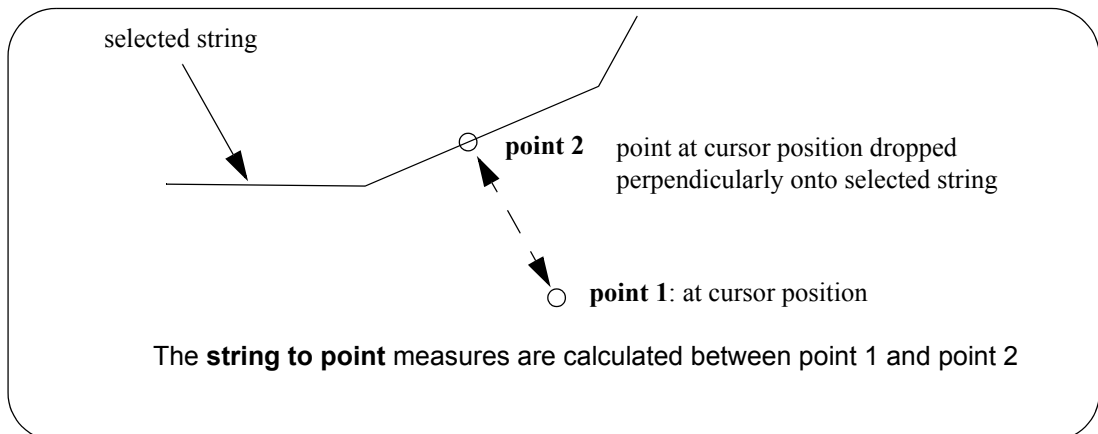
For example, if the z measure was picked from the **Measure String from Point** menu and a string selected, then as the cursor is moved around the screen, the cursor position is dropped perpendicularly onto the selected string. The perpendicular line is dynamically redrawn and the z-coordinate of the dropped point on the string is dynamically displayed in the panel field.

Measure String to Point

Measure String to Point	
Length	get 2d length between selected points
Length(3d)	3d length
DX	delta x
DY	delta y
DZ	delta z
Chainage	delta chainage
Angle	angle of line joining selected points
Bearing	bearing of line
X-fall %	cross-fall of line
Slope 1v in	slope of line

The **String to Point** measures are similar to the *point to point* measures and calculate the picked measure from a point and the point **dropped perpendicularly** onto the selected string.

For example, **Length** gets the plan distance between the point and the point dropped perpendicular on a selected string.
Bearing gets the bearing of line joining the point and the point dropped perpendicularly onto a selected string

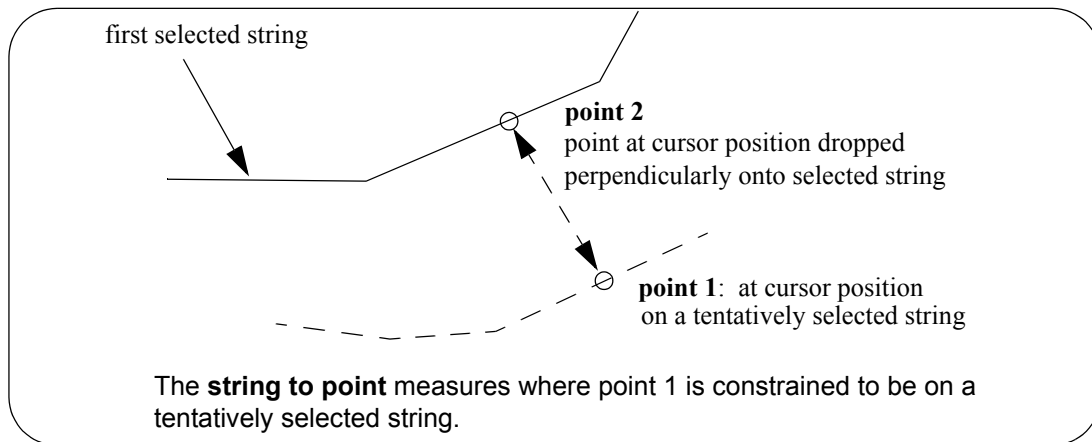


The dynamic aspect of the **string to point** measures is as follows:

after the desired **string to point** measure is picked, and a *string* selected, then a line is dynamically drawn between the cursor position and the cursor position *dropped perpendicularly* onto the selected string. The **string to point** value is dynamically displayed in the panel field as the cursor is moved around.

Further, if the cursor position is on a string which has been selected but not accepted and the cursor is moved around, then the cursor is *constrained* to remain on the tentatively selected string. It is dynamically dropped perpendicularly onto the original string and the measure value to the dropped point displayed in the panel field.

Hence the selected point is **constrained** to remain on the tentatively picked string and the measure dynamically calculated and displayed.



For example, if the **length** measure was picked from the **Measure String to Point** menu and the first string selected, then a line is dynamically drawn perpendicularly between the selected string and the current cursor position and the plan length from the string to the current cursor position is dynamically displayed in the panel field.

If a string is tentatively selected (picked but not yet accepted), the cursor position is dynamically dropped onto the first string and the plan distance measured perpendicularly from the point to the first string is dynamically displayed in the panel field.

Please continue to the next section [Last Expression](#).

Last Expression

Brings up the last expression or real value typed into the box. For example, if 3*4 is typed and <Enter> pressed, 12 will be displayed. The **Last Expression** pop-up will bring back the 3*4.

Please continue to the next section [Bearings and Angles](#).

Bearings and Angles

HP Notation

Many panels and options take angles or bearings as input. The **12d** Model default for most angles or bearings is in degrees, minutes and second (dms).

To save typing, this is written in **HP Notation** in the form

ddd.mmssfff

where **ddd.mmssfff** is the angle or bearing expressed in degrees, minutes and seconds as

ddd	whole degrees
.	separator between degrees and minutes
mm	whole minutes
ss	whole seconds
fff	fractions of seconds (as many as required)

Notes

1. The decimal point . indicates where the degrees stops and the minutes begin.
2. If there is only whole degrees, the .**mmssfff** can be omitted. However, if there are any minutes, seconds or fractions of seconds, there must be **two digits** of whole minutes.
3. If there are no seconds or fractions of seconds, then the **ssfff** can be omitted. However, if there are any seconds or fractions of seconds, there must be **two digits** of whole seconds.
4. There are as many digits of fractions of seconds as required (possibly none).

For example

35	is 35 degrees
35.09	is 35 degrees and nine minutes
35.0901	is 35 degrees, nine minutes and one second
35.090107	is 35 degrees, nine minutes and 1.07 seconds

Decimal Degrees for Angles

At times, angles or bearings are given as decimal degrees rather than in [HP Notation](#).

For decimal degrees, positions after the decimal point represent decimal degrees.

Go to the next section [Expressions in Bearing, Angle Panel Fields](#) or return to [Bearings and Angles](#).

Expressions in Bearing, Angle Panel Fields

Because bearings (angles) and numbers **can not** be used interchangeably in mathematical expressions, only a limited number of expressions can be supported in a bearing or angle panel field.

Bearings (angles) can be added or subtracted from other bearings (angles) but a number can not be added or subtracted from a bearing (angle). So the addition and subtraction of bearings (angles) is supported but addition/subtraction of a bearing (angle) and a number is invalid.

Bearings (angles) can not be multiplied or divided by another bearing (angle) but a bearing (angle) can be multiplied or divided by a number. However because the input of a bearing (angle) in degrees, minutes and seconds looks like a decimal number (see the previous section [Bearings and Angles](#)), a rule must be made to distinguish between bearings (angles) and numbers for multiplication and division. In **12d Model**, the bearing (angle) is on the left of the number it is being multiple or divided by.

So in a bearing (angle) panel field and grid, the following is supported:

- (a) add or subtract bearings (angles) i.e. bearing + bearing or bearing - bearing is allowed
- (b) type bearing*number + bearing *number - note that the number is on the right of the *
- (c) type bearing *number - bearing *number - note that the number is on the right of the *
- (d) type bearing /number + bearing *number - note that the number is on the right side of the /
- (e) type bearing /number + bearing *number - note that the number is on the right side of the /

Because a user often wishes to add or subtract 90 degrees from a bearing or angle, the Page Down/Page Up keys have a special meaning when the focus in on the bearing (angle) panel field. For a bearing (or angle) panel field (but **not for a grid**):

- | | |
|------------------------------|---------------------------------------------|
| (f) Page up | - subtracts 90 degrees to the bearing/angle |
| (g) Ctrl + page up | - subtracts 15 degrees to the bearing/angle |
| (h) Shift + page up | - subtracts 10 degrees to the bearing/angle |
| (i) Shift + Ctrl + page up | - subtracts 6 degrees to the bearing/angle |
| | |
| (j) Page down | - adds 90 degrees to the bearing/angle |
| (k) Ctrl + page down | - adds 15 degrees to the bearing/angle |
| (l) Shift + page down | - adds 10 degrees to the bearing/angle |
| (m) Shift + Ctrl + page down | - adds 6 degrees to the bearing/angle |

Please continue to the next section [Precision](#).

Precision

Double precision variables are used throughout **12d Model** for all coordinate values and calculations.

Although this increases the time taken for calculations, it is more than offset by the increase in the accuracy of the data and the results of any calculations.

Because of the accuracy of double precision variables (fourteen significant figures), there is no practical restriction on the co- ordinate area covered by projects.

The default number of decimal places for displaying values in the *information menu* is three (3).

This number of decimal places is controlled by the display precision field in the **System Settings** tab of the **Defaults** panel (option **Utilities=>Defaults**).

The default number of decimal places for displaying values in *boxes* and *panels* is four(4).

This number of decimal places is controlled by the box precision field in the **System Settings** tab of the **Defaults** panel (option **Utilities=>Defaults**).

Please continue to the next section [Colours](#).

Colours

The palette of colours available for elements drawn in a view depends on the **12d** colour definition file, colours.4d (see section [Colours File](#) in Appendix [Setting Up and Configuring 12d](#)). A default file is distributed with **12d Model** and resides in the *set_ups* folder. Up to 10,240 colours can be defined.

In this manual, colours will be referred to by names. However, **12d Model** stores colours by the **colour number**. This is independent of the colour names and if a different *colours.4d* is used, the colours on the screen may change.

Note: colour numbers can be used instead of a colour name in any panel fields.

Please check your colours.4d file if your screen colours do not match those mentioned in this manual.

The colour names are used (sorted into alphabetical order) in colour pop-ups. When a large number of colours have been defined, the pop-up list can get unwieldy so there is a default parameter, display colours (in the panel brought up by **Project=>Management=>Defaults (System Settings) Display Colours**), which gives the number of colours to use in a pop-up.

The order that the colours are taken from the colour file for the pop-up is **not** the colour number but the *pop-up number order* which can be completely different. This means that the user can add extra colours after the standard 2000 **12d Model** colours number and easily have the new colours come up in the colours pop-up.

Hence it is possible to have thousands of defined colours for shades and plots, but still have only a selected sixteen displayed in colour pop-ups.

WARNING

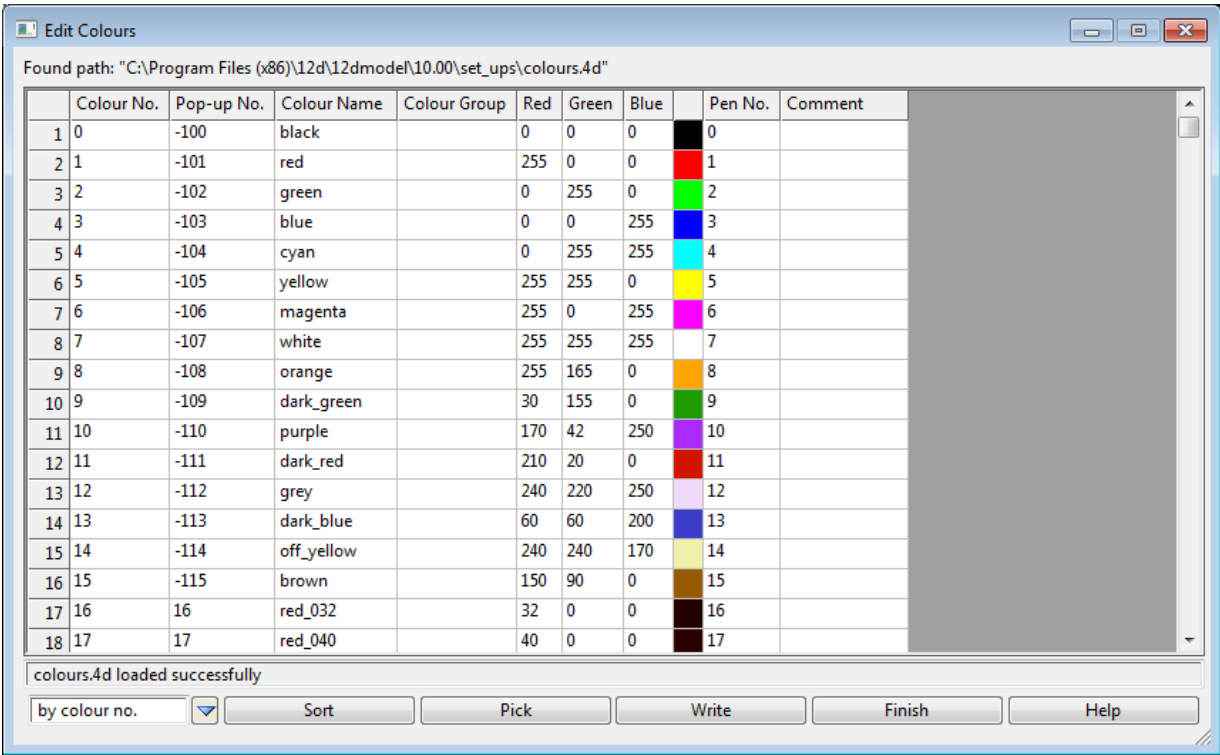
Do not change the colour numbers and definitions for colour numbers 0 to 2000 - they are restricted for 12D Solutions use only.

In the **12d Model** database, only the colour number is saved so if any of the first 2000 colour numbers are changed then the display of colours in existing projects may change.

Go to the next section [Editing Colours](#) or return to [Colours](#).

Editing Colours

To add/modify colours to the **12d Model** colours.4d file, bring up the **Edit Colours** panel by clicking on the [Edit] section of the Select Colours pop-up.



The fields and buttons used in this panel have the following functions.

Field Description Type Defaults Pop-Up

Grid Cells

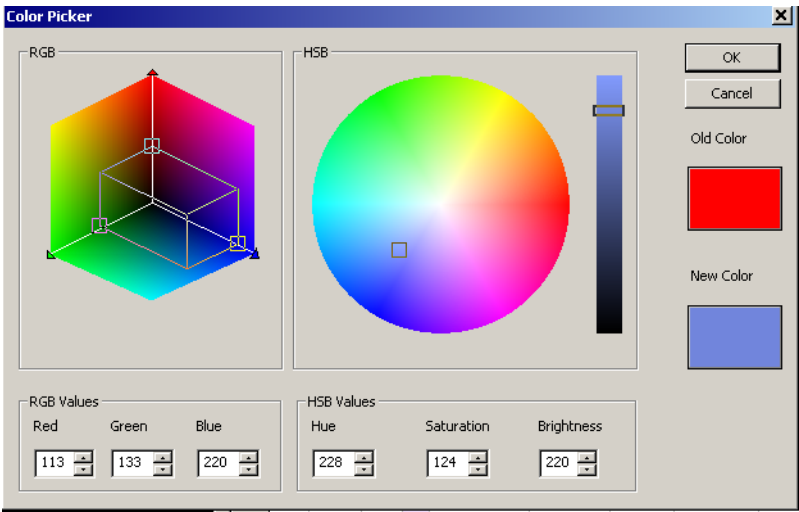
- Colour No.** integer
number of the colour. A unique integer value between 0 and 10,239.
- Pop-up No.** integer
the colours are selected for the pop-up by this number. It is a unique integer - positive, 0 or negative.
- Colour name** text
text name for the colour.
- Colour Group** text
group for the colour.
- Red/Green/Blue** integer
amount of red/green/blue in the colour. Value is between 0 and 255.
- Pen No.** text box
pen number to map the colour to.
- Comment** text box
optional comment.

Buttons

- Sort** button
sort the table with respect to the column given in the adjacent field.

Picker button

*if a row of the table is highlighted, selecting **Picker** brings up the **Color Picker** to interactive define the RGB for new colours.*



Write button

write the table out to a colours.4d file.

Please continue to the next section [Range Files](#).

Range Files

Range files consist of a list of ranges and colours, one set per line

lower_value upper_value range_colour

where this line represents all values satisfying

lower_value < value <= upper_value.

See

[Percent Slope Range File](#)

[Degrees Slope Range File](#)

['1v in' Slope Range File](#)

[Depth Range File](#)

[Aspect Range File](#)

[Height Range File](#)

[Creating Ranges in a Range File](#)

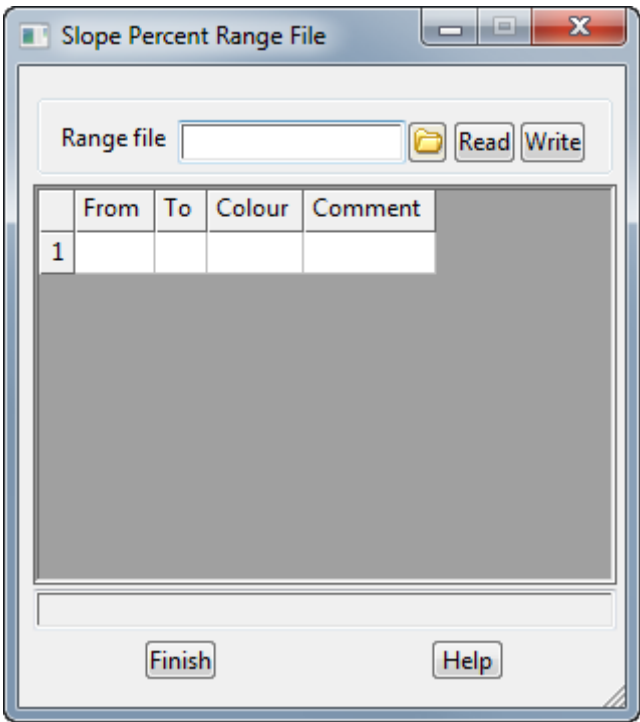
Percent Slope Range File

For **Percent slope colouring**, the range file consists of a list of ranges of percent crossfall of the slopes, and colours, one set per line, in the grid

lower_value upper_value range_colour

where this line represents all percentage slopes satisfying

lower_value < value <= upper_value.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Range file <i>the name of the percent slope range file</i>	file box		available *.srf files
Read <i>read in the file in the Range file field</i>	button		
Write <i>write out the file in the Range file field</i>	button		

Grid Cells

for **Percent slope colouring**, the range file consists of a grid of ranges and colours, one set per line, in the grid

lower_value upper_value range_colour

where this line represents all percentage slopes satisfying

lower_value < value <= upper_value

See [Creating Ranges in a Range File](#) for quickly creating numbers of range file lines with colours.

From <i>the lower value for this line of the range file</i>	real
To	real

the upper value for this line of the range file

Colour

colour box

available colours

colour for the range

Comment

text

a comment for this line of the grid

Go to the next section [Degrees Slope Range File](#) or return to [Range Files](#).

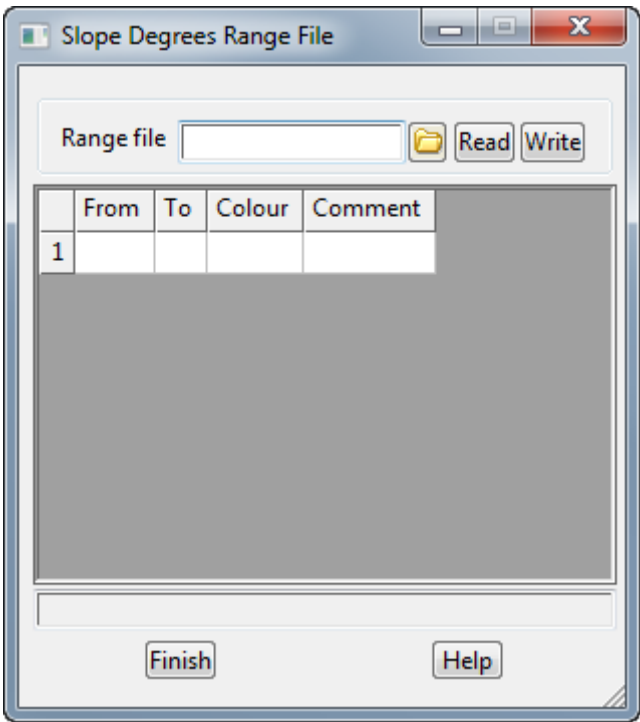
Degrees Slope Range File

For **Degrees slope colouring**, the range file consists of a list of ranges of angles of the slopes (in degrees in [HP Notation](#)), and colours, one set per line, in the grid

lower_value upper_value range_colour

where this line represents all degrees satisfying

lower_value < value <= upper_value.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Range file	file box		available *.srf files
<i>the name of the angles of the slope (in degrees) range file</i>			
Read	button		
<i>read in the file in the Range file field</i>			
Write	button		
<i>write out the file in the Range file field</i>			

Grid Cells

for **Degrees slope colouring**, the range file consists of a grid of ranges and colours, one set per line, in the grid

lower_value upper_value range_colour

where this line represents all angles (in degrees in [HP Notation](#)) of slopes satisfying

lower_value < value <= upper_value

See [Creating Ranges in a Range File](#) for quickly creating numbers of range file lines with colours.

From	real
<i>the lower value for this line of the range file</i>	
To	real

the upper value for this line of the range file

Colour

colour box

available colours

colour for the range

Comment

text

a comment for this line of the grid

Go to the next section '[1v in' Slope Range File](#) or return to [Range Files](#).

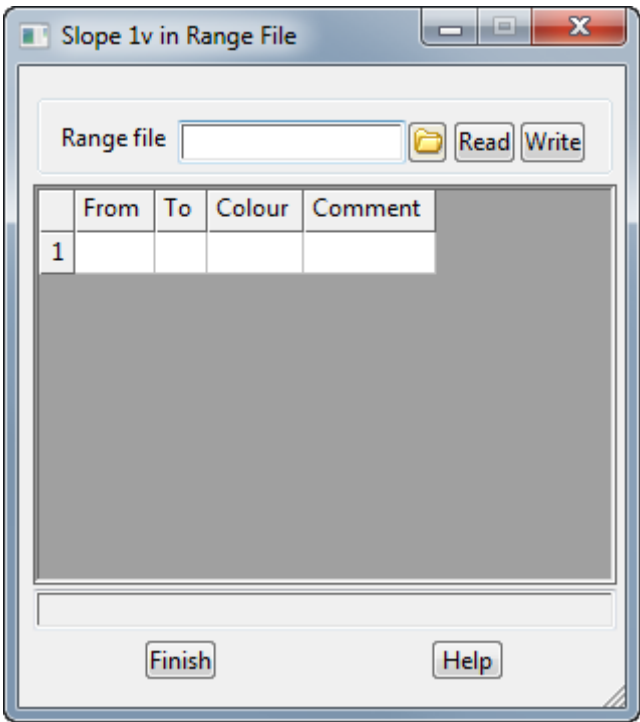
' 1v in' Slope Range File

For 1v in slope colouring, the range file consists of a list of ranges of slopes (in "1 in" values) and colours, one set per line, in the grid

lower_value upper_value range_colour

where this line represents all "1 in" slopes satisfying

lower_value < value <= upper_value.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Range file <i>the name of the 1v in slope range file</i>	file box		available *.srf files
Read <i>read in the file in the Range file field</i>	button		
Write <i>write out the file in the Range file field</i>	button		

Grid Cells

for 1v in slope colouring, the range file consists of a grid of ranges and colours, one set per line, in the grid

lower_value upper_value range_colour

where this line represents all "1 in" slopes satisfying

lower_value < value <= upper_value

See [Creating Ranges in a Range File](#) for quickly creating numbers of range file lines with colours.

From <i>the lower value for this line of the range file</i>	real
To	real

the upper value for this line of the range file

Colour

colour box

available colours

colour for the range

Comment

text

a comment for this line of the grid

Go to the next section [Depth Range File](#) or return to [Range Files](#).

Depth Range File

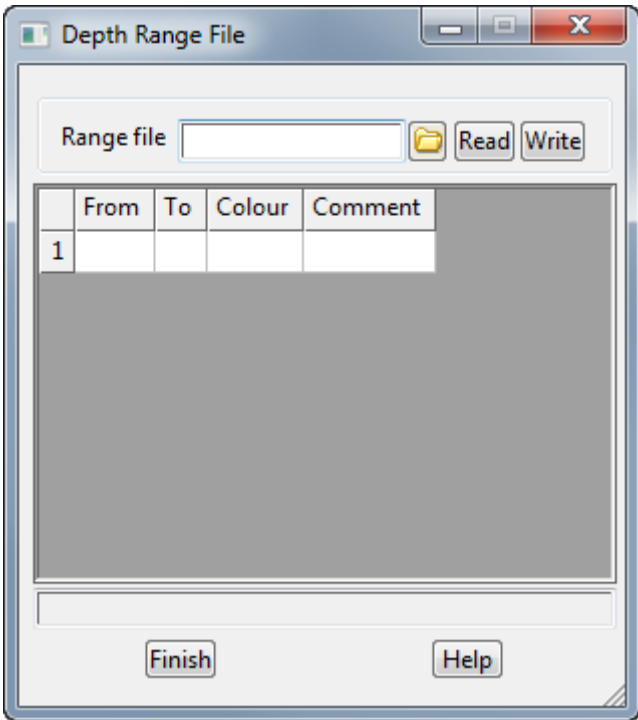
For **Depth colouring**, the range file consists of a list of ranges of depths and colours, one set per line, in the grid

lower_value upper_value range_colour

where this line represents all depths satisfying

lower_value < value <= upper_value.

Note: depths are measured with down being the positive direction.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Range file <i>the name of the depth range file</i>	file box		available *.drf files
Read <i>read in the file in the Range file field</i>	button		
Write <i>write out the file in the Range file field</i>	button		

Grid Cells

for **Depth colouring**, the range file consists of a grid of depth ranges and colours, one set per line, in the grid

lower_value upper_value range_colour

where this line represents all depths satisfying

lower_value < value <= upper_value

See [Creating Ranges in a Range File](#) for quickly creating numbers of range file lines with colours.

From <i>the lower value for this line of the range file</i>	real
-----------------------------------------------------------------------	------

To real
the upper value for this line of the range file

Colour colour box available colours
colour for the range

Comment text
a comment for this line of the grid

Go to the next section [Aspect Range File](#) or return to [Range Files](#).

Aspect Range File

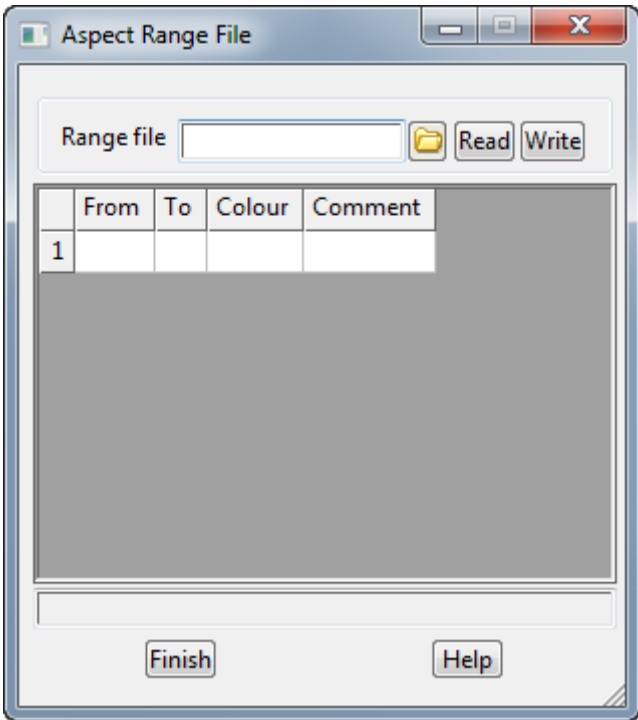
For **Aspect colouring**, the range file consists of a list of aspect ranges and colours, one set per line, in the grid

lower_value upper_value range_colour

where this line represents all aspect values satisfying

lower_value < value <= upper_value.

aspect is in degrees in [HP Notation](#) measured clockwise from North.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Range file <i>the name of the aspect range file</i>	file box		available *.arf files
Read <i>read in the file in the Range file field</i>	button		
Write <i>write out the file in the Range file field</i>	button		

Grid Cells

for **Aspect colouring**, the range file consists of a grid of ranges of aspect and colours, one set per line, in the grid

lower_value upper_value range_colour

where this line represents all aspect values satisfying

lower_value < value <= upper_value

See [Creating Ranges in a Range File](#) for quickly creating numbers of range file lines with colours.

From real
the lower value for this line of the range file

To real
the upper value for this line of the range file

Colour colour box available colours
colour for the range

Comment text
a comment for this line of the grid

Go to the next section [Height Range File](#) or return to [Range Files](#).

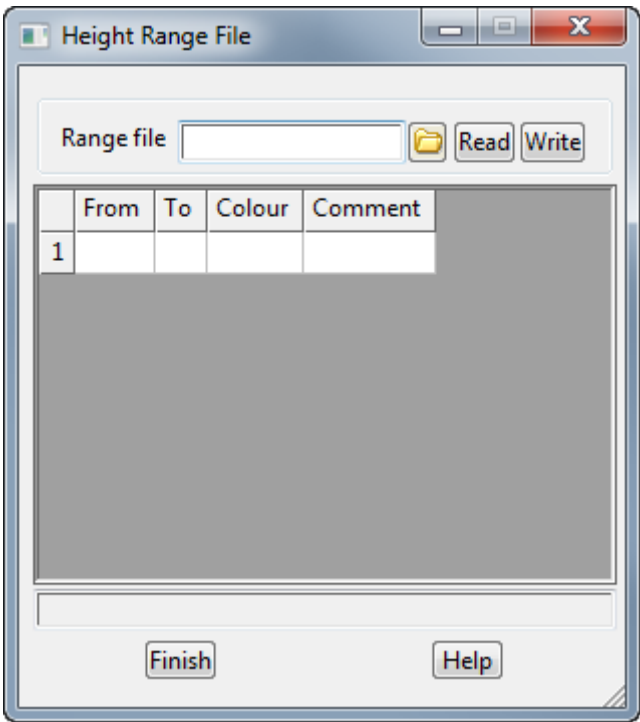
Height Range File

For **Height colouring**, the range file consists of a list of height ranges and colours, one set per line, in the grid

lower_value upper_value range_colour

where this line represents all percentage slopes satisfying

lower_value < value <= upper_value



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Range file <i>the name of the height range file</i>	file box		available *.hrf files
Read <i>read in the file in the Range file field</i>	button		
Write <i>write out the file in the Range file field</i>	button		

Grid Cells

for **Height colouring**, the range file consists of a grid of height ranges and colours, one set per line, in the grid

lower_value upper_value range_colour

where this line represents all heights satisfying

lower_value < value <= upper_value

See [Creating Ranges in a Range File](#) for quickly creating numbers of range file lines with colours.

From <i>the lower value for this line of the range file</i>	real
To	real

the upper value for this line of the range file

Colour

colour box

available colours

colour for the range

Comment

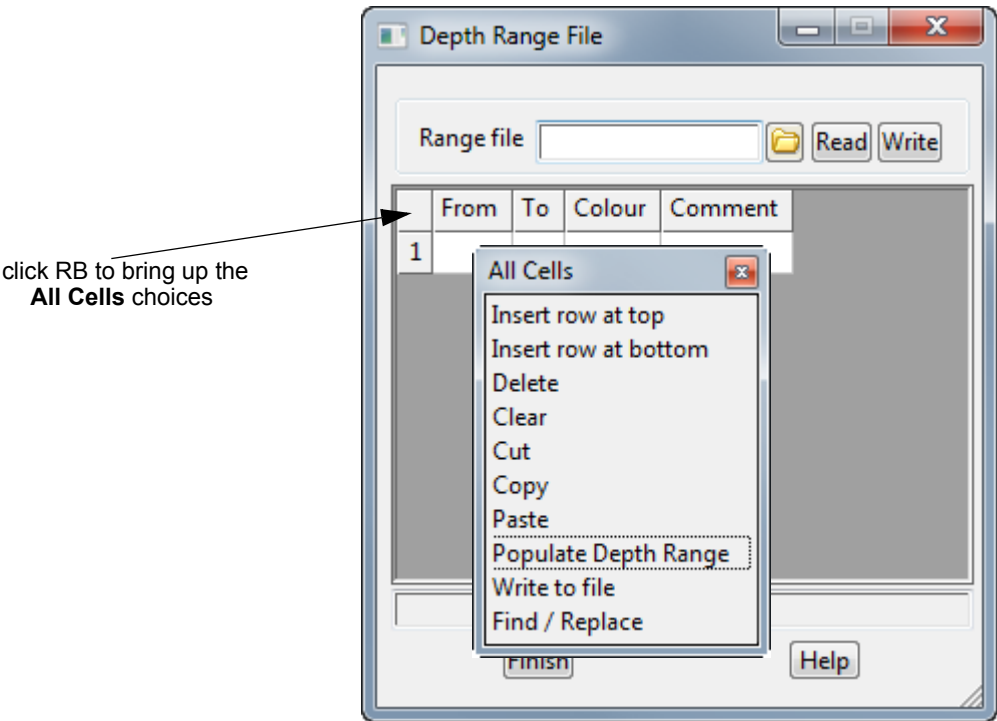
text

a comment for this line of the grid

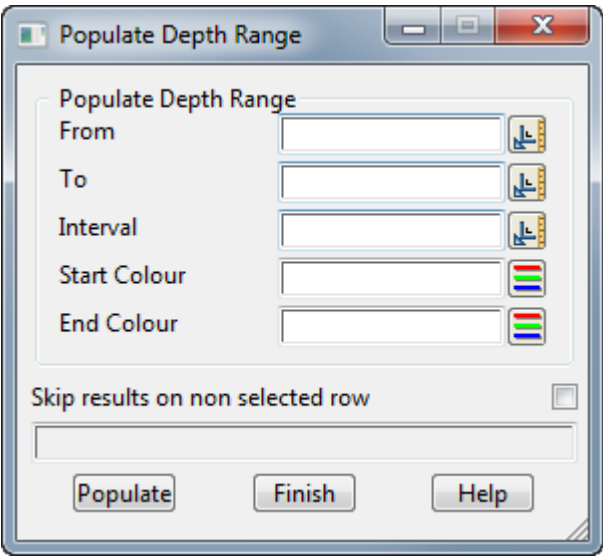
Go to the next section [Creating Ranges in a Range File](#) or return to [Range Files](#).

Creating Ranges in a Range File

To quickly create a number of lines of ranges in a Range file, when a **Range File** panel is displayed, click RB in the blank cell at the top left hand corner of the grid title area (to the left of the **From** text) to bring up the All Cells choices and select **Populate Range**.



Selecting **Populate Range** brings up the **Populate Range** panel which is used to insert a number of range lines into the grid of the **Range File** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
From	real		
<i>the lower value for the generated range</i>			

To	real	
	<i>the upper value for the generated range</i>	
Interval	measure box	
	<i>the interval between values for the generated range</i>	
Start colour	colour box	available colours
	<i>the start colour for the generated range. The colours are interpolated in RGB between the Start colour and the End colour.</i>	
End colour	colour box	available colours
	<i>the end colour for the generated range. The colours are interpolated in RGB between the Start colour and the End colour.</i>	
Skip results on non selected row	tick box	not ticked
Populate	button	
	<i>generate the defined grid lines and insert them into the grid. The new lines will be inserted at the highlighted grid lines and can replace any highlighted lines in the grid.</i>	

The **Populate Range** panel can be used a number of times to generate range lines in various colours.

Return to [Range Files](#) or continue to the next section [Defaults](#).

Defaults

Defaults

Many options in **12d Model** require settings which are almost always the same. To save repetitious typing, **12d Model** provides a number of user defined defaults that are used throughout **12d Model**.

For example, the chord to arc tolerance, point cross size and highlight cross size and colour.

Certain default values are read in from a file when a new project is created. These defaults can also be modified inside **12d Model** using the **Defaults** panels.

The lay out of the file used to define the default values for a new project is given in the appendix **Set Ups**.

User defaults can also be set for entire panels - see the section [Panel Defaults - ddx Files](#).

Go to the next section [Default Panel Values](#) or return to [Defaults](#).

Default Panel Values

When a panel is opened, **12d Model** may set some default values.

However for most panels **the user can supply the values** to be used **for** all the **panel fields** each time a panel is opened. This information is stored in a defaults file for a panel.

For more information on the panel default files and how to create them, go to the section [Panel Defaults - ddx Files](#).

Go to the next section [Default File Ending](#) or return to [Defaults](#).

Default File Ending

In any panel pop-up requiring a file name, default file endings are used to restrict the names of the files selected from the current folder to be displayed in the pop-up.

The list of special file endings is given in the section [Default File Ending](#) in the appendix [Special File Formats](#).

Return to [Defaults](#) or continue to the next section [Plotters](#).

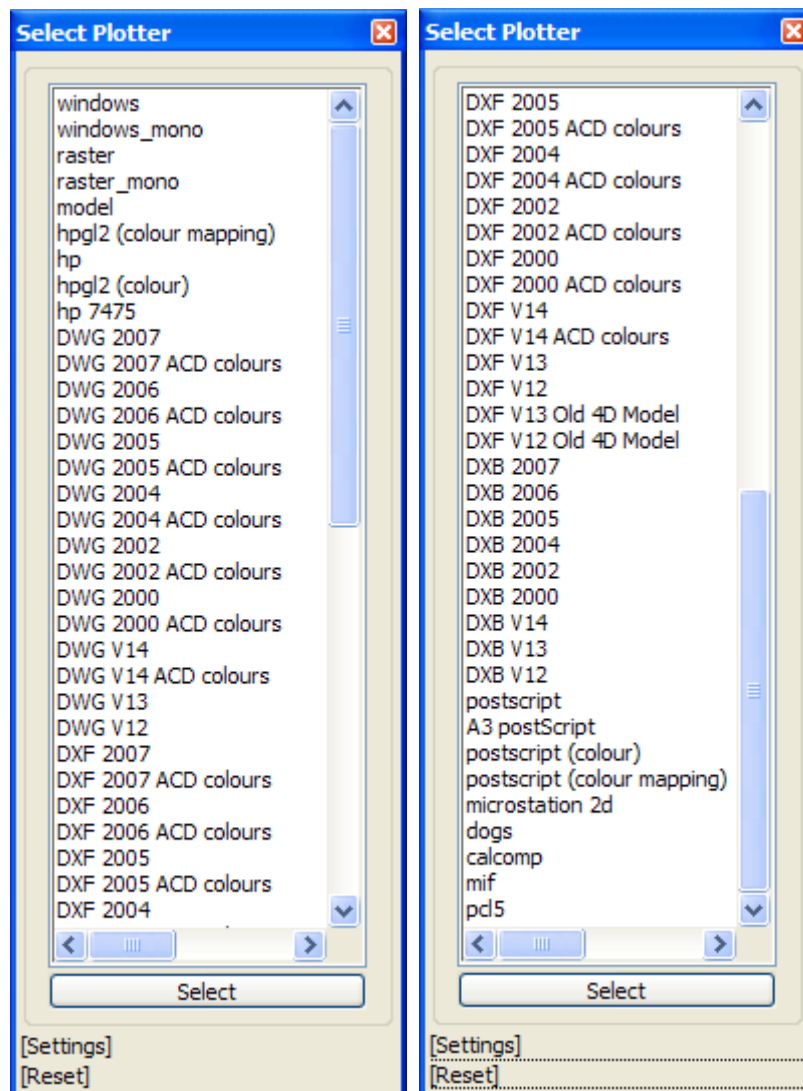
Plotters

When creating a plot, 12d Model can either drive the plotter directly using Windows printer drivers, raster plotter drivers if the plot includes rasters (pictures), or plot indirectly by creating a computer disk file (the plot file) containing the relevant plotter instructions for producing the plot, or in the case of the plotter type **model**, a 12d Model model is created.

If a plot file is created then there is a variety of formats available, each with its own special file ending.

In the plotting options, the choice of plotters that is available through the pop-up menu can be the default 12d Model list or a user defined list of plotters.

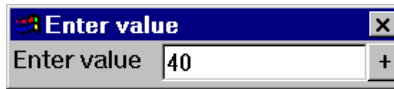
The default 12d Model list is



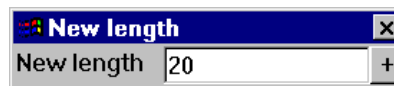
When the plot file is created, it can be passed to a user specified program or batch file which can automatically direct the plot file to a plotter.

See the appendices [Setting Up and Configuring 12d](#) and [Plotters and Plotting](#) for more information on plotters and defining plotters.

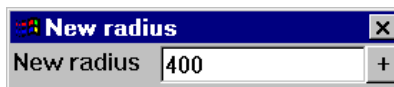
Miscellaneous Panels



The value is entered into the typed-input box, terminated with <enter>.
The **Enter Value** typed-input box then disappears.



The length is entered into the typed-input box, terminated with <enter>.
The **New Length** typed-input box then disappears.



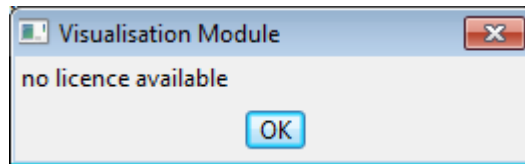
The radius is entered into the typed-input box, terminated with <enter>.
The **New Radius** typed-input box then disappears.

No Option Available

12d Model consists of a base module of varying point sizes and optional modules.

If a module has not been purchased and any options included in that option are selected then a **No licence available** message will be displayed.

The missing module can be purchased by contacting your **12d Model** distributor or **12d Solutions Pty Ltd**.



No Information Available

There is no information available on this panel or menu.

Options on Toolbars

For general information *Toolbars* and *Controlbars*, go to [Toolbars and Controlbars](#)

Each *Toolbars* is described in detail in:

<i>Cad</i>	CAD Options
<i>Cad Arcs</i>	CAD Arc
<i>Cad Circles</i>	CAD Circle
<i>Cad Controlbar</i>	CAD, Symbol and Text Controlbars
<i>Cad Delete</i>	CAD Delete
<i>Cad Fills</i>	CAD Fill
<i>Cad Holes</i>	CAD Hole
<i>Cad Images</i>	CAD Image
<i>Cad Intersect</i>	CAD Intersection
<i>Cad Lines</i>	CAD Line
<i>Cad Modify</i>	CAD Modify
<i>Cad Points</i>	CAD Point
<i>Cad Polygons</i>	CAD Polygon
<i>Cad Segment</i>	CAD Segment
<i>Cad String</i>	CAD Edit Strings
<i>Cad Symbols</i>	CAD Symbol
<i>Cad Text</i>	CAD Text
<i>Design</i>	Design Toolbar
<i>Cad Vertex</i>	CAD Vertex
<i>H</i>	Snap Toolbar
<i>Measure edits</i>	Measure Edits Toolbar
<i>Menu Bar</i>	can't be turned off - all the options in 12d Model
<i>Options</i>	turns off the area for docking toolbars on left hand side of 12d Model window
<i>Road</i>	Road Toolbar
<i>Search bar</i>	12d Options Search Bar
<i>Snaps Cad</i>	Snaps Cad
<i>Snaps Cad Arcs</i>	Snaps Cad Arc
<i>Snaps Cad Circles</i>	Snaps Cad Circle
<i>Snaps Cad Intersect</i>	Snaps Cad Intersection
<i>Snaps Cad Lines</i>	Snaps Cad Line
<i>Snaps Cad Points</i>	Snaps Cad Point
<i>Strings Edits</i>	String Edits Toolbar
<i>Super alignment tools</i>	Super Alignment Tools Toolbar
<i>Survey reductions</i>	Survey Reductions Toolbar
<i>Symbol Controlbar</i>	CAD, Symbol and Text Controlbars
<i>Text Controlbar</i>	CAD, Symbol and Text Controlbars
<i>Tin Utility</i>	Tin Utility Toolbar
<i>Tin Utility</i>	Tin Utility Toolbar
<i>Track</i>	Track Toolbar
<i>Visualisation</i>	Visualisation Toolbar

Design Toolbar

Position of option on menu: various

The Design Toolbar is:



Options on Toolbar	
	template create/edit
	create mtf file
	apply templates function
	apply kerb return function
	interface function
	create boxing file
	boxing many
	apply templates defaults
	create/edit chain
	chain parameters editor
	tag tree

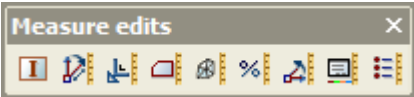
For Template Create/Edit, go to
 Create MTF File
 Apply Templates Function
 Apply Kerb Return Function
 Interface Function
 Create Boxing File
 Boxing Many
 Apply Templates Defaults
 Create / Edit Chain
 Boxing Many
 Chain Parameters Editor
 Tag Tree

[Create/Edit](#)
[Create MTF](#)
[Apply Many](#)
[Kerb Return](#)
[Interface](#)
[Create Boxing Definitions](#)
[Boxing Many Function](#)
[Apply and Apply Many Defaults](#)
[Create/Edit a Chain](#)
[Boxing Many Function](#)
[Creating/Editing Parameter Value Files](#)
[Tags](#)

Measure Edits Toolbar

Position of option on menu: various

The Measure Edits toolbar is:



Options on Toolbar	
	string inquire
	measure bearing/distance
	measure value
	measure plan area
	measure surface area
	measure xfall
	measure angle by 3 points
	match properties
	measure menu

For *String inquire*, go to
 Measure bearing/distance
 Measure value
 Measure plan area
 Measure surface area
 Measure xfall
 Measure angle
 Match properties
 Measure menu

[Inquire](#)
[Bearing and Distance](#)
[Value](#)
[Plan Area](#)
[Surface Area](#)
[X Fall by Strings](#)
[Angle by 3 Points](#)
[Match](#)
[Measure](#)



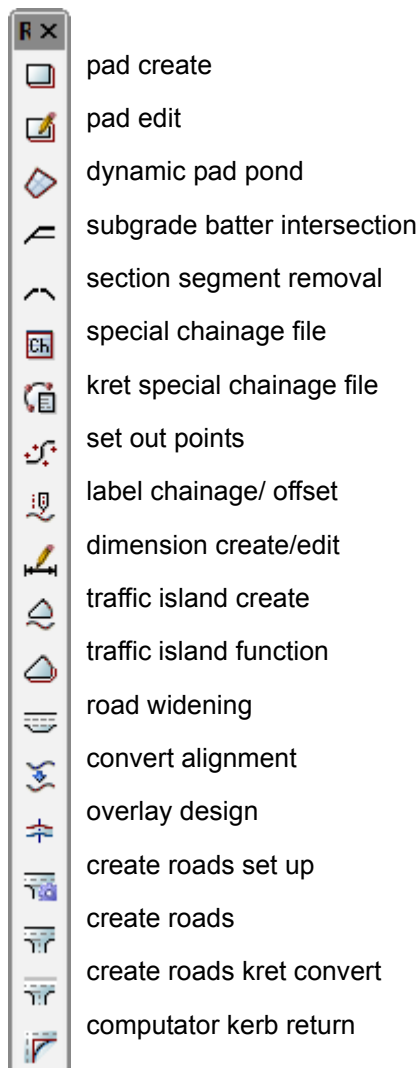
Road Toolbar

Position of option on menu: various

The Road toolbar is:



Options on Toolbar



For *Pad Create*, go to

Pad Edit

Dynamic Pad Pond

Subgrade Batter Intersection

Section Segment Removal

Special Chainage File

Kret Special Chainage File

Setout Points

Label chainage / offset

Dimension Create/edit

[Allotment Pad Create](#)

[Allotment Pad Edit](#)

[Dynamic Pad/Pond Interface](#)

[Subgrade Intersect Function](#)

[X Segment function](#)

[Special Chainage File](#)

[Kerb Special Chainage File](#)

[Create Setout Points Using Super String](#)

[Chainage/Offset Label Inquire](#)

[Create/Edit Dimensions](#)

Traffic Island Create	<u>Create Traffic Island</u>
Traffic Island Function	<u>New Island Create (Function)</u>
Road Widening	<u>Road Widening with Minimum and Maximum Crossfall</u>
Convert Alignment	<u>Super to SA Element Convert</u>
Overlay Design	<u>Overlay Design</u>
Create Roads Setup	<u>Create Roads - Setup</u>
Create Roads	<u>Create Roads - Manager</u>
Create Roads Kret Convert	<u>Create Roads - Kreturns Convert</u>
Computator Kerb Return	<u>Kret Convert to Computators</u>

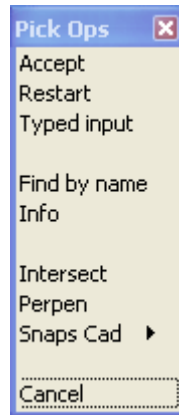


Snaps Cad

Position of option on menu: various

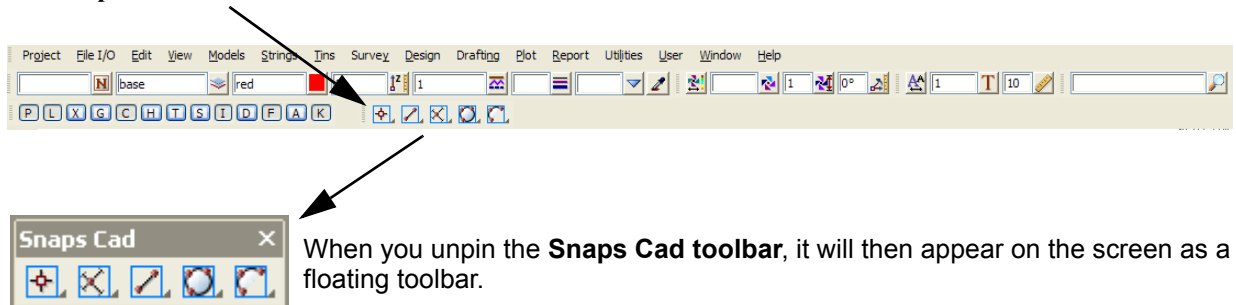
The Snaps Cad Menu can be accessed the following ways:

- by selecting **Snaps Cad** from the **Pick Ops** menu
- by walking right on **Snaps Cad** on the **Pick Ops** menu



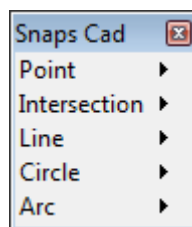
- From the toolbar, as long as **Snaps Cad** is ticked in the **Customize toolbars** panel (View => Toolbars).

snaps cad toolbar



When you unpin the **Snaps Cad toolbar**, it will then appear on the screen as a floating toolbar.

The **Snaps Cad Menu** walk- right menu is:



For the option <i>Point</i> , go to	Snaps Cad Point
<i>Intersection</i>	Snaps Cad Intersection
<i>Line</i>	Snaps Cad Line
<i>Circle</i>	Snaps Cad Circle
<i>Arc</i>	Snaps Cad Arc

Note: Snap Cads work in a very similar pattern to the normal Cad options. However, they create virtual points and segments which can be used by either **Cad** or **Snap Cad** options. **Snap Cad**

options don't create any points or strings.

Snaps Cad Point

This section of documentation is a work in progress and will be updated in subsequent releases.

Snaps Cad Point

Snaps Cad Point

Point

Mid-segment

Centre

Mid-point

Chainage

Bearing and distance

Offset

Chainage offset

Chainage offset extended

Deflection

Drop perpendicular

Angle

Projection

Between points

Between points 3d

at a user selected position

at middle of a selected segment

at the centre point of an arc

at the middle of the two selected points

at the position of a chainage along a selected string

a given bearing and distance from a selected position

at the offset position of a point on a selected string

at the offset position of a chainage along a selected string

at the offset position of a chainage along a selected string which can be extended

a given distance at right angles to a selected string

dropped perpendicularly onto a selected string

a given distance at a given angle to a selected string

projected a chainage distance along a selected string

distance between two selected positions

distance between two selected positions with interpolated z

For the option <i>Point</i> , go to	Point
<i>Mid- segment</i>	Mid- segment
<i>Centre</i>	Centre
<i>Mid-point</i>	Mid point
<i>Chainage</i>	Chainage
<i>Bearing and distance</i>	Bearing and distance
<i>Offset</i>	Offset
<i>Chainage offset</i>	Chainage offset
<i>Chainage offset extended</i>	Chainage offset extended
<i>Deflection</i>	Deflection
<i>Drop perpendicular</i>	Drop perpendicular
<i>Angle</i>	Angle
<i>Projection</i>	Projection
<i>Between points</i>	Between Points
<i>Between points 3d</i>	Between points 3d

Point

On selecting **Point**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

The user can select a position with the mouse and on accepting that point (Middle mouse button or enter) the virtual point is created at the selected position and ready to be used by the calling option.

The snap mode will influence the mouse selection. For example if cursor snap is on, the user can choose a position not yet defined. If point snap is on and the selection snaps to an existing point, the option will place another point at that location.

The user can also activate the selection menu used with the mouse (right button) that allows various positioning options.

Mid- segment

This option creates a virtual point in the middle of a selected line or arc segment.

On selecting **Mid- segment**, the user is prompted to select a segment and a virtual point is created at the mid point of the segment.

Centre

This option creates a virtual point at the centre of a selected segment.

On selecting **Centre** the user is prompted to select a segment and a virtual point is created at the centre of the segment.

Mid point

This option creates a virtual point in the middle of two selected positions.

On selecting **Mid point**, the user is prompted to select the first position and then the second position. A virtual point is created at the mid point of the two selected positions.

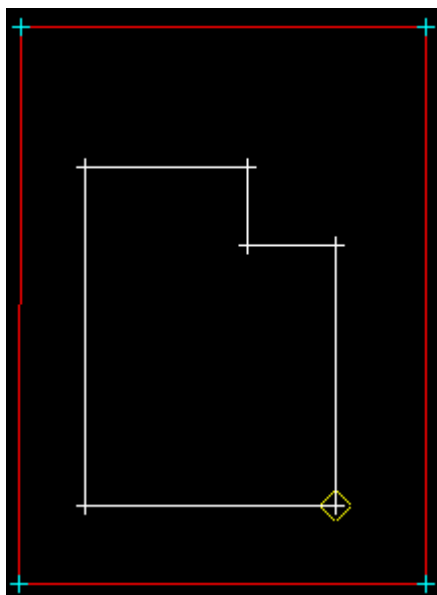
Chainage

This option creates a virtual point at the position of a user specified chainage of an existing string.

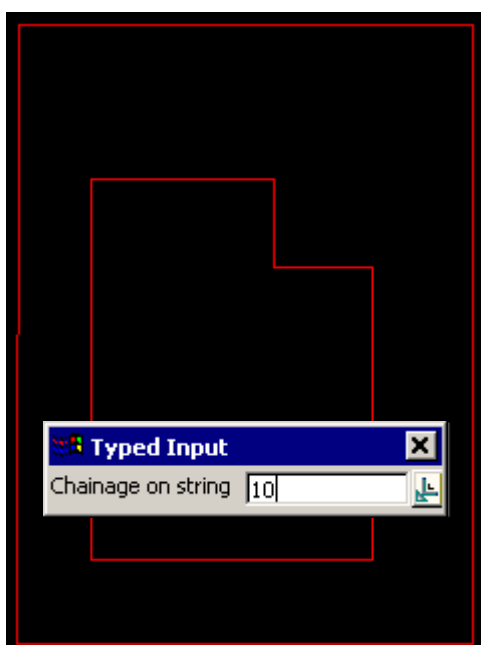
On selecting **Chainage**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

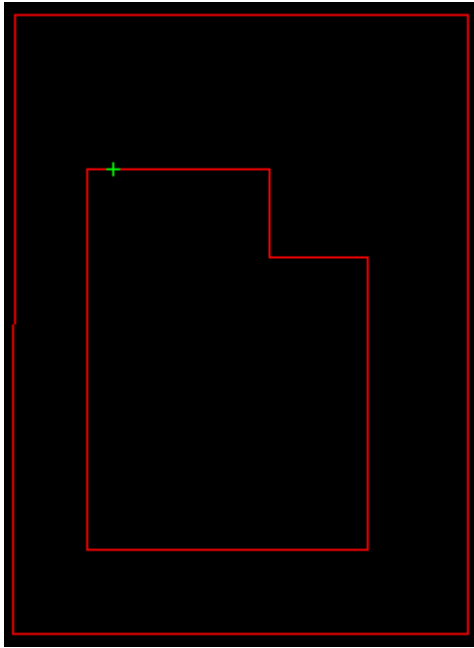
The user selects a valid string (left mouse button) and accepts that string (Middle mouse button or enter).

**STEP 2:**

The user enters a chainage value where a point should be placed followed by the enter key. This chainage is with respect to the selected string.

**STEP 3:**

A virtual point is created at the positioned on the string at the given chainage.



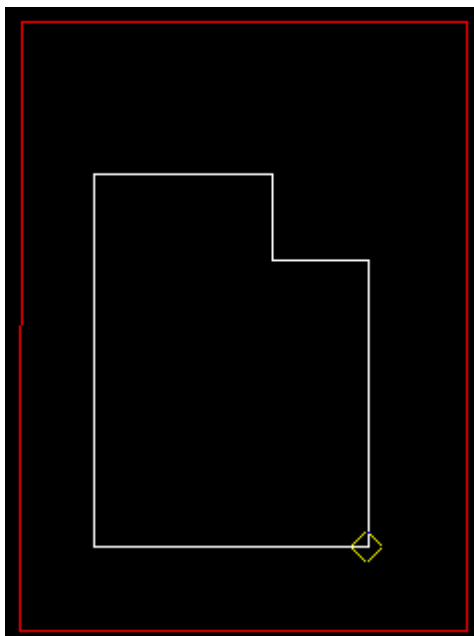
Bearing and distance

This option calculates a virtual point that is located at a given bearing and distance from a start position.

On selecting **Bearing and distance**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

A start position is selected and accepted.



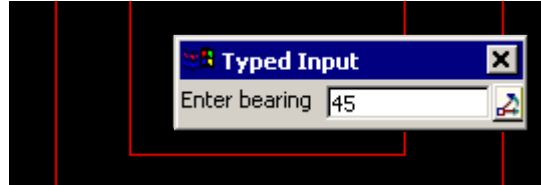
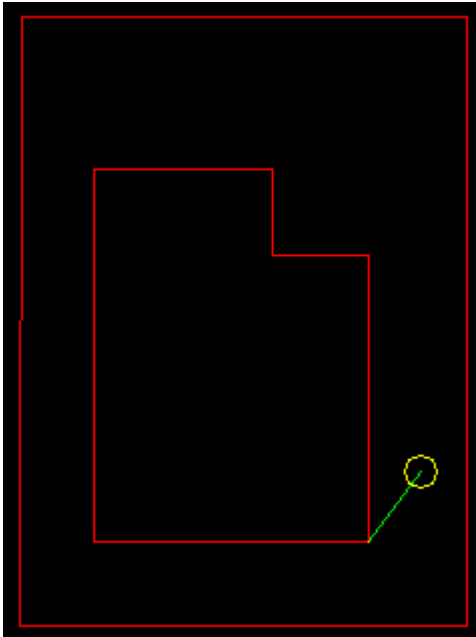
STEP 2:

A bearing is selected with the mouse or entered in via the keyboard. For typed entry, simply start

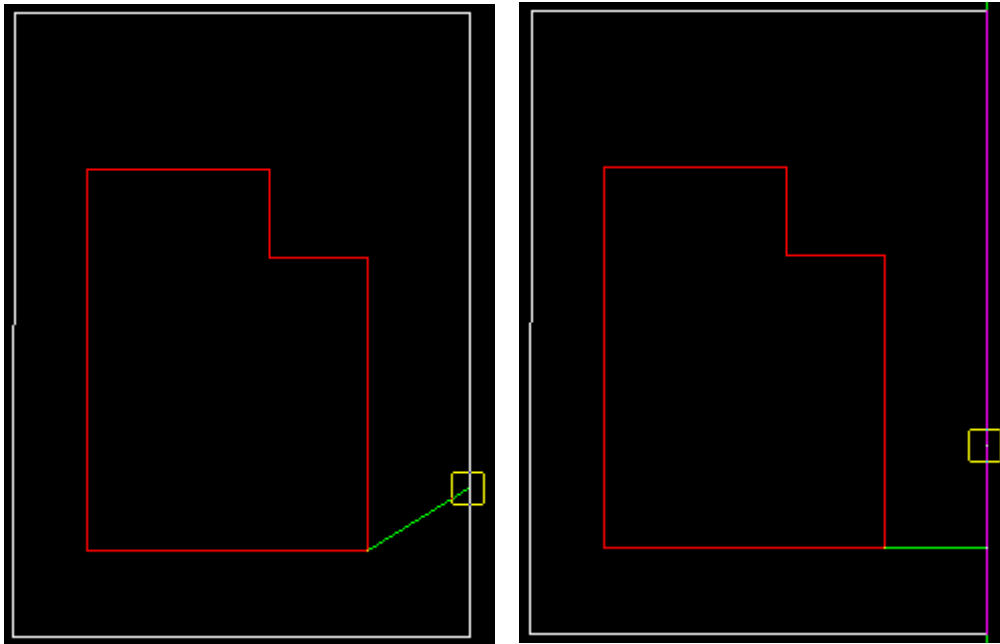
typing or press the space bar to bring up the bearing entry box. The value is entered into the input box followed by the Enter key.

The line drawn represents the bearing value and changes with movement of the mouse. If the user wants to see what the current value of the bearing is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to create the point or the input box can be closed and the rubber banding (graphically changing) of the bearing continued.

Note: The Page up and page down keys can be used when the input angle box comes up to add or subtract intervals of 90 degrees.

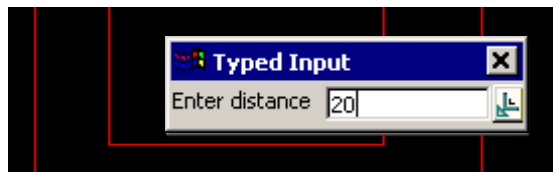
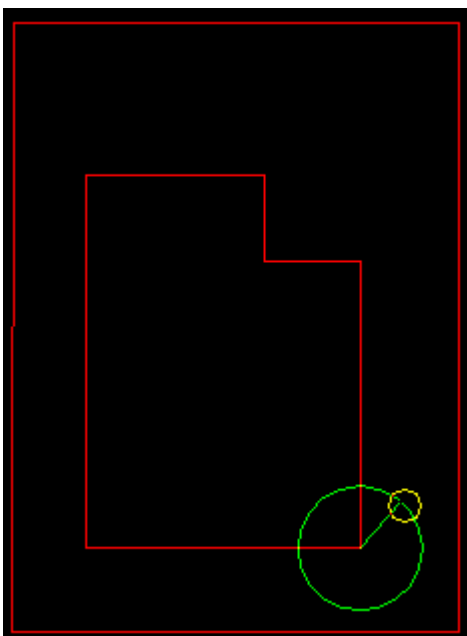


This option also allows the definition of the bearing by the selection of the 2nd point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next. The example shown below is the perpendicular case.

**STEP 3:**

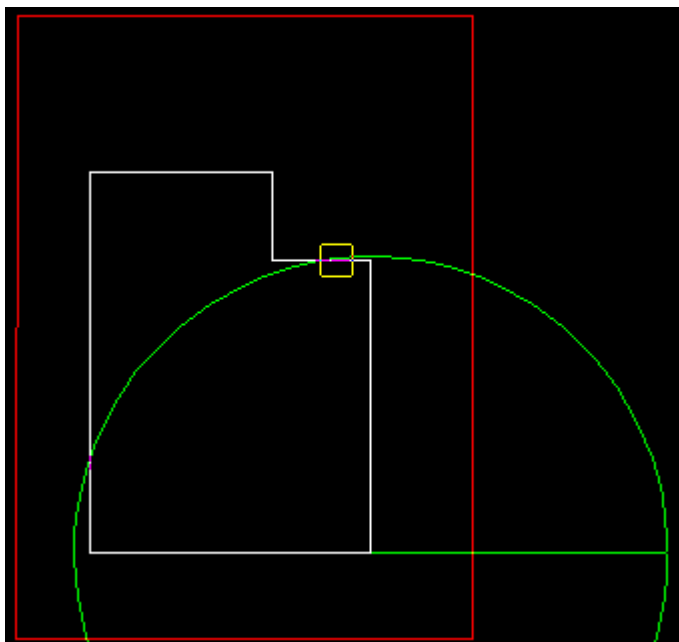
A distance is selected and accepted with the mouse or entered in via the keyboard. For typed entry, simply start typing or press the space bar to bring up the distance entry box. The value is entered into the input box followed by the enter key.

The circle drawn represents the distance value and changes with movement of the mouse. If the user wants to see what the current value of the distance is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to create the point or the input box can be closed and the rubber banding (graphically changing) of the circle continued.

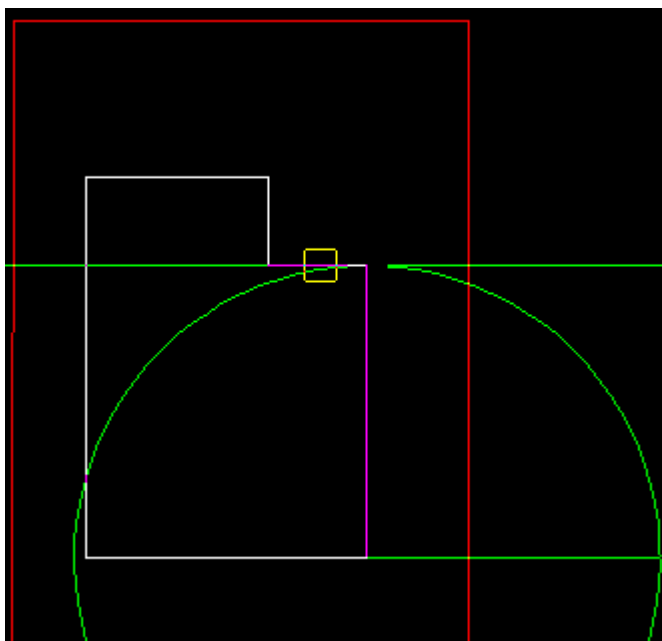


This option also allows the definition of the distance by the selection of the 2nd point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the

mouse to change from one solution to the next. The example shown below is the perpendicular case.

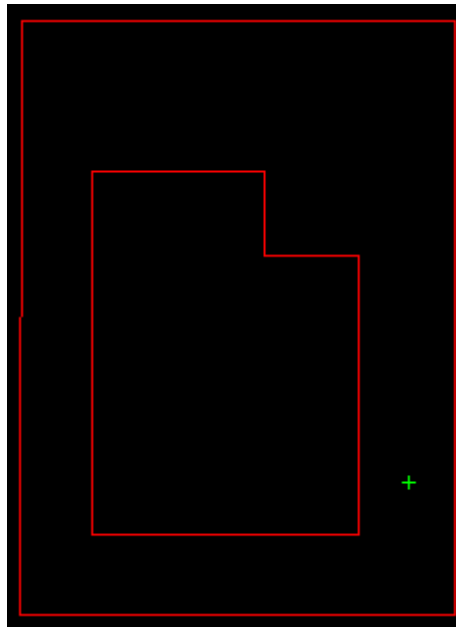


The perpendicular distance shown below by the purple line will be use at the defined bearing to create the point.

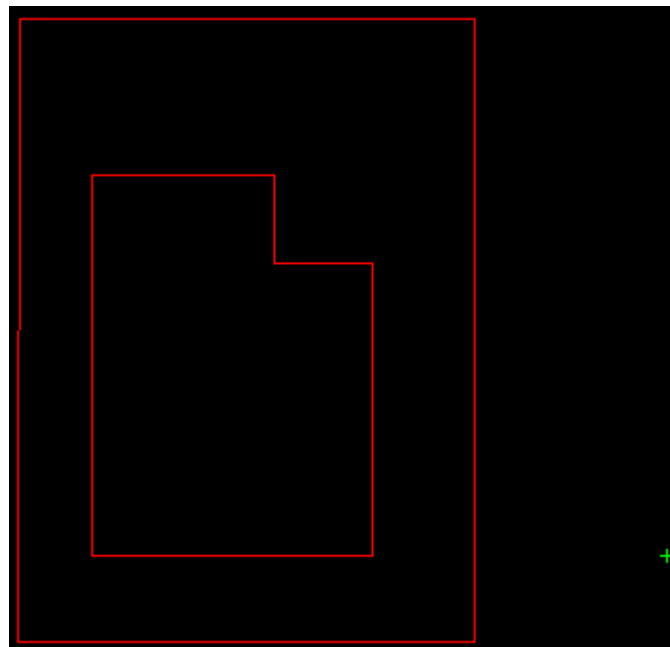


STEP 4:

A virtual point is created using created using the information supplied. By entry into the input boxes:



Or by using the perpendicular/tangential tools:



Offset

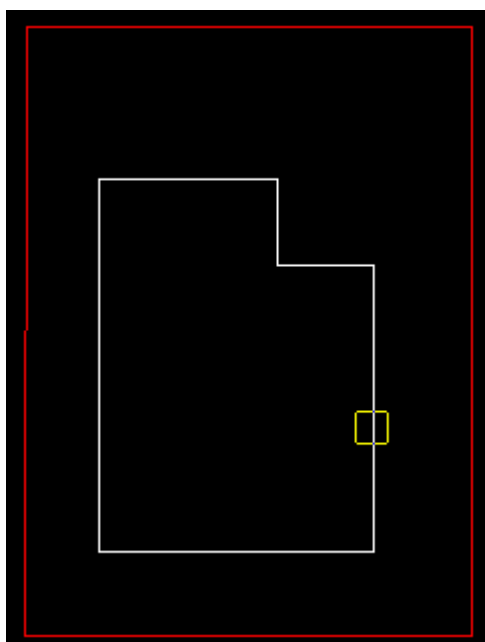
This option creates a virtual point that is located by reference to a string, a control point, a chainage distance along the string from the control point and an offset to the selected string.

After selection and acceptance of a string, a control point is selected and accepted. This point is dropped perpendicular onto the string. The distance along the string is measured from this dropped point. Positive distances are in the direction that the string was picked. Finally a offset to the string can be specified for the placement of the new virtual point.

On selecting **Offset**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

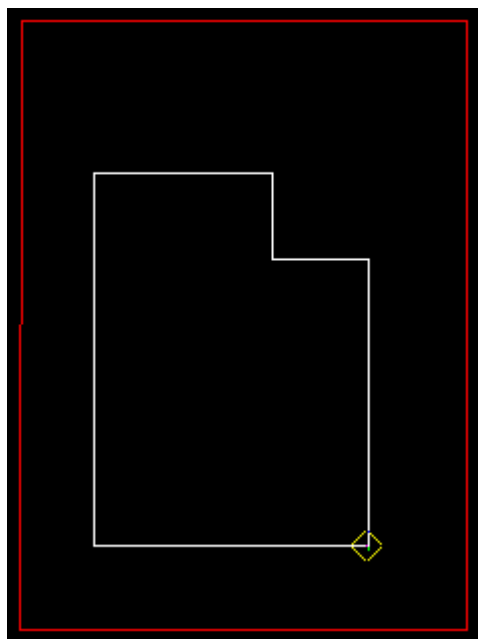
STEP 1:

The user selects and accepts a string with direction. This defines what side the offset applies to.



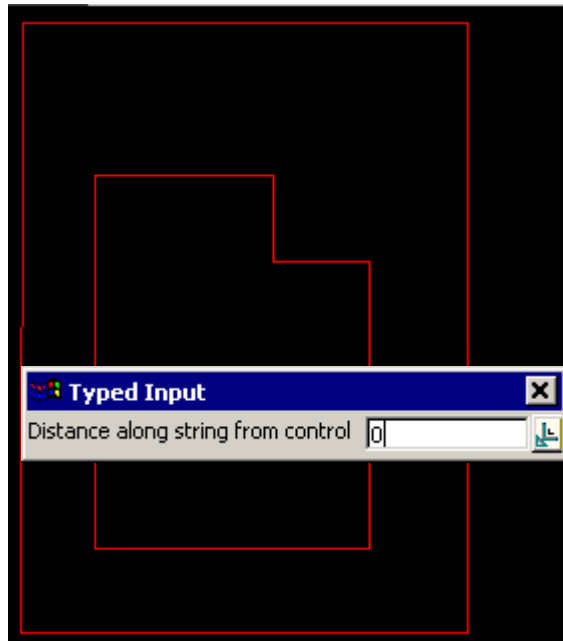
STEP 2:

The user picks and accepts a control point to be dropped onto the selected string.

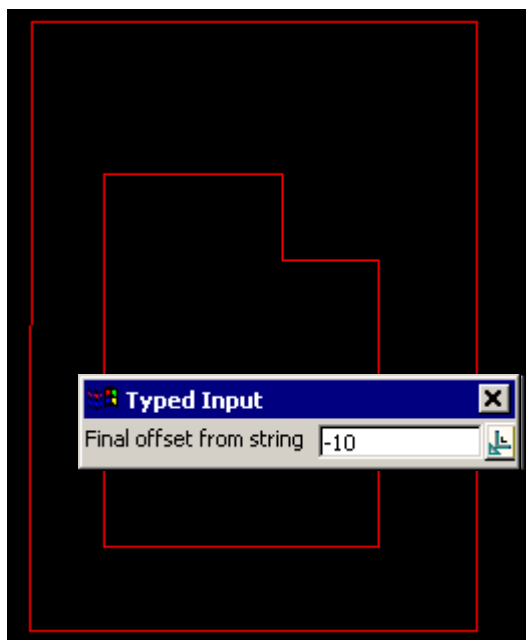


STEP 3:

A distance along from the dropped point is specified. Positive distances are in the direction of the string selection pick. The value is entered into the input box followed by the Enter key.

**STEP 4:**

An offset relative to the selected string (and direction) is specified in the input box followed by the Enter key.

**STEP 5:**

A virtual point is created using the information supplied.

Chainage offset

This option creates a virtual point that is located perpendicular to the reference string with a defined offset.

STEP 1:

The user selects the reference string with direction.

STEP 2:

The user specifies a chainage on the reference string.

STEP 3:

The user specifies an offset distance from the reference string.

A virtual point is created using the information supplied.

Chainage offset extended

Is similar to chainage offset except the specified chainage can be extended beyond the start and end chainages of the selected string.

Deflection

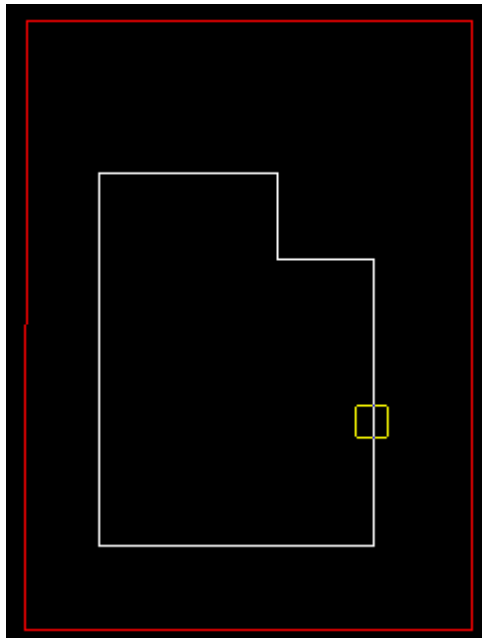
This option creates a virtual point that is located by reference to a string, a control point, a distance along the string from the control point, a deflection angle and deflection distance.

After selection of a string, a control point is selected. This point is dropped perpendicular onto the string. A distance along the string can be entered to move the measure point. Positive distances are in the direction that the string was picked. A deflection angle is specified which is a clockwise angle from the measure point. The deflection distance is the distance from the measure point to the point which is to be created.

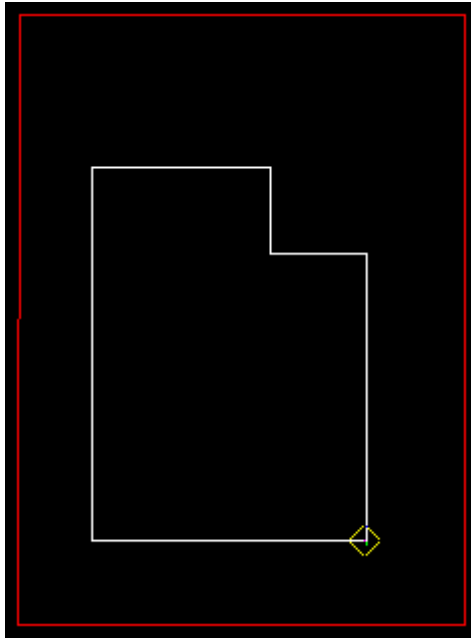
On selecting **Deflection**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

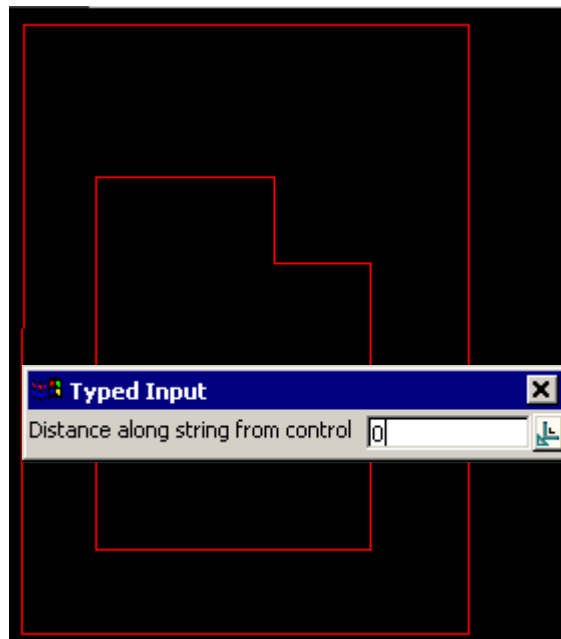
The user selects and accepts a string with direction.

**STEP 2:**

The user picks and accepts a control point to be dropped onto the selected string.

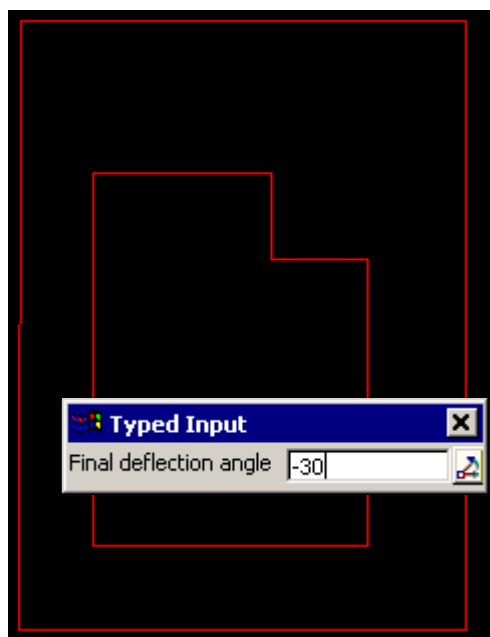
**STEP 3:**

A distance along from the dropped point is specified. Positive distances are in the direction of the string selection pick. The value is entered into the input box followed by the Enter key.

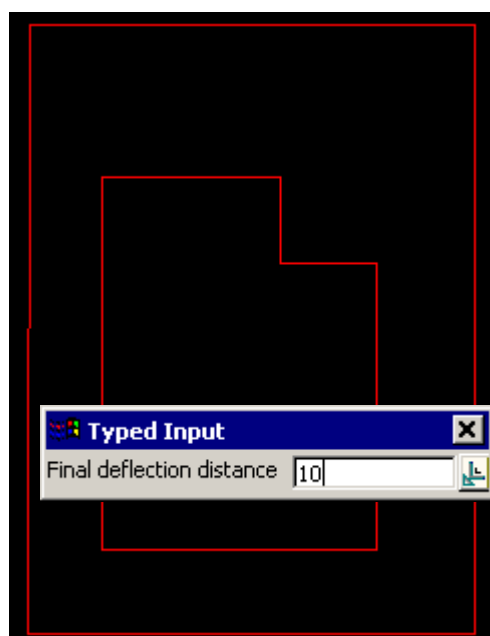
**STEP 4:**

A deflection angle is specified. This angle is clockwise, relative to the direction of the string selection pick. The value is entered into the input box followed by the enter key.

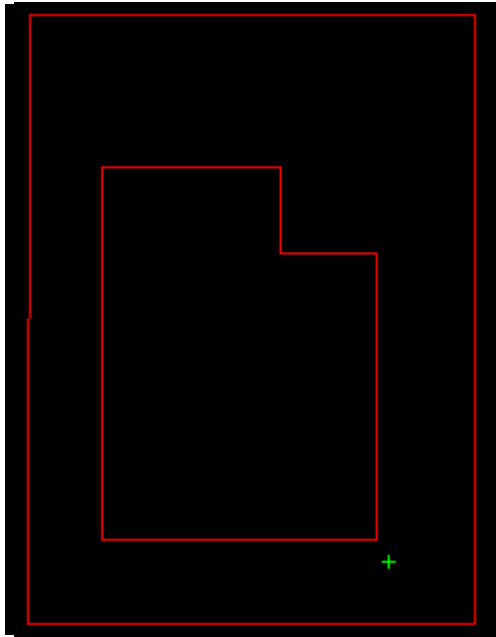
Note: The Page up and page down keys can be used when the input angle box comes up to add or subtract intervals of 90 degrees.

**STEP 5:**

A deflection distance is supplied. Positive is in the direction of the string selection pick. The value is entered into the input box followed by the Enter key.

**STEP 6:**

A virtual point is created using the information supplied.



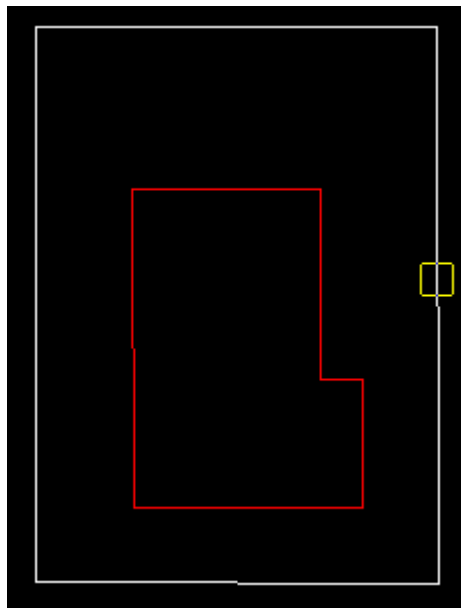
Drop perpendicular

This option creates a virtual point by dropping from a user selected position perpendicularly onto a user selected string.

On selecting **Drop perpendicular**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

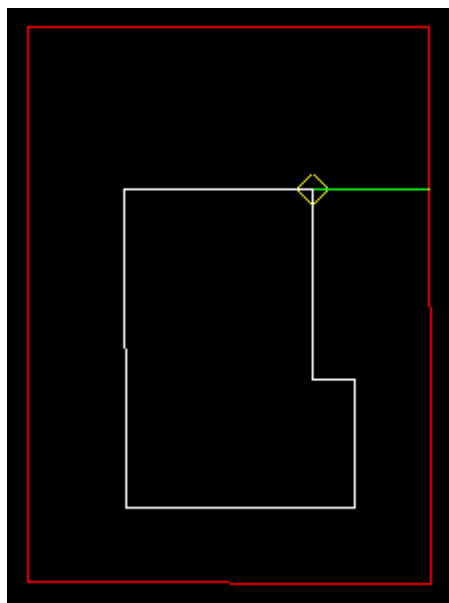
STEP 1:

The user selects a string and accepts (with direction) to have the point dropped onto.

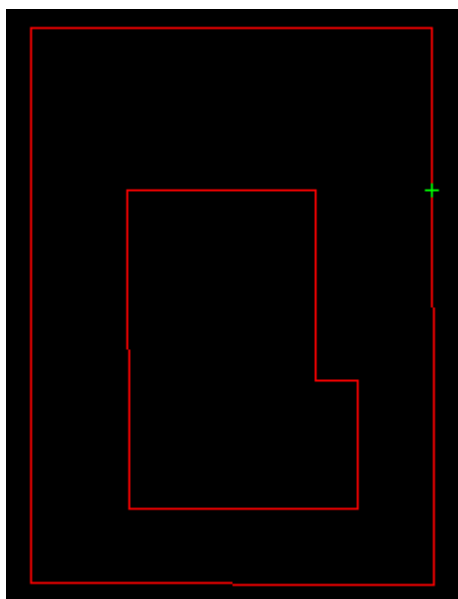


STEP 2:

The user picks and accepts a position to drop onto the nominated string

**STEP 3:**

A virtual point is created at the perpendicular drop point.

**Angle**

This option creates a virtual point that is located by projecting a selected position back to a string by a specified angle.

STEP 1:

User selects and accepts a string to have the point projected onto.

STEP 2:

User specifies an angle for the projection.

STEP 3:

User selects a position on the screen to be projected back to the string.

STEP 4:

A virtual point is created, which form the nominated angle with the selected position on **STEP 3**.

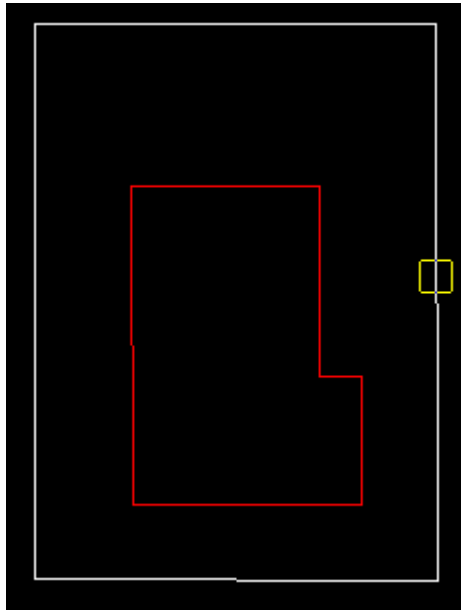
Projection

This option creates a virtual point that is located by firstly dropping a point onto a string and then giving a distance along the string from the dropped point.

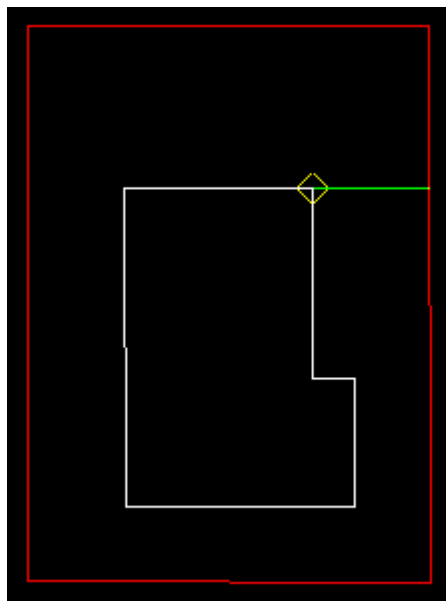
On selecting **Projection**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

The user selects and accepts a string (with direction) to have the point dropped onto

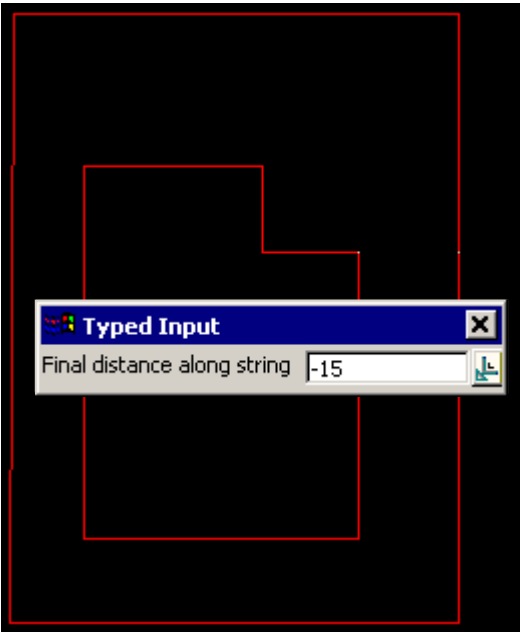
**STEP 2:**

The user picks and accepts a position to drop onto the nominated string



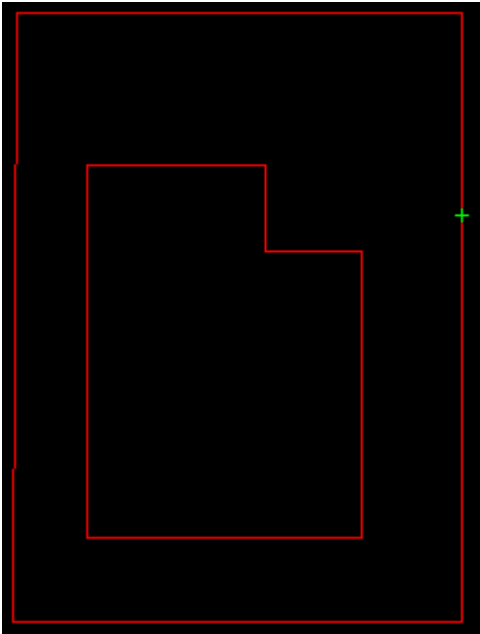
STEP 3:

The user is prompted for the distance along the string. Positive distances are in the direction that the string was picked. A value is entered into the input box followed by the Enter key.



STEP 4:

The virtual point is created the nominated distance along the string from the dropped point.



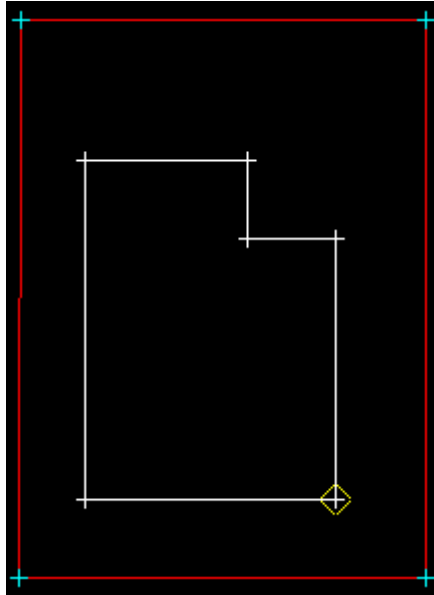
Between Points

This option creates a virtual point that is on the line between two selected positions and a given distance from the first point.

On selecting **Between points**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

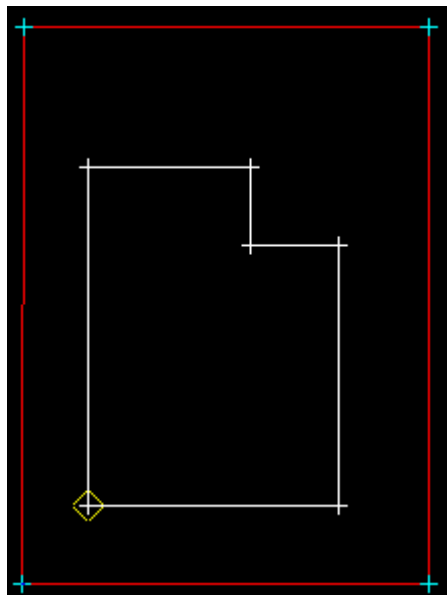
STEP 1:

The user selects a start point. Specification of a position can be done by the direct input of the xyz coordinate of the point by pressing the space bar to bring up the enter XYZ panel or by typing of the value to bring up the XYZ panel. The user can also select a point with the mouse and accepts that point (Middle mouse button or enter).



STEP 2:

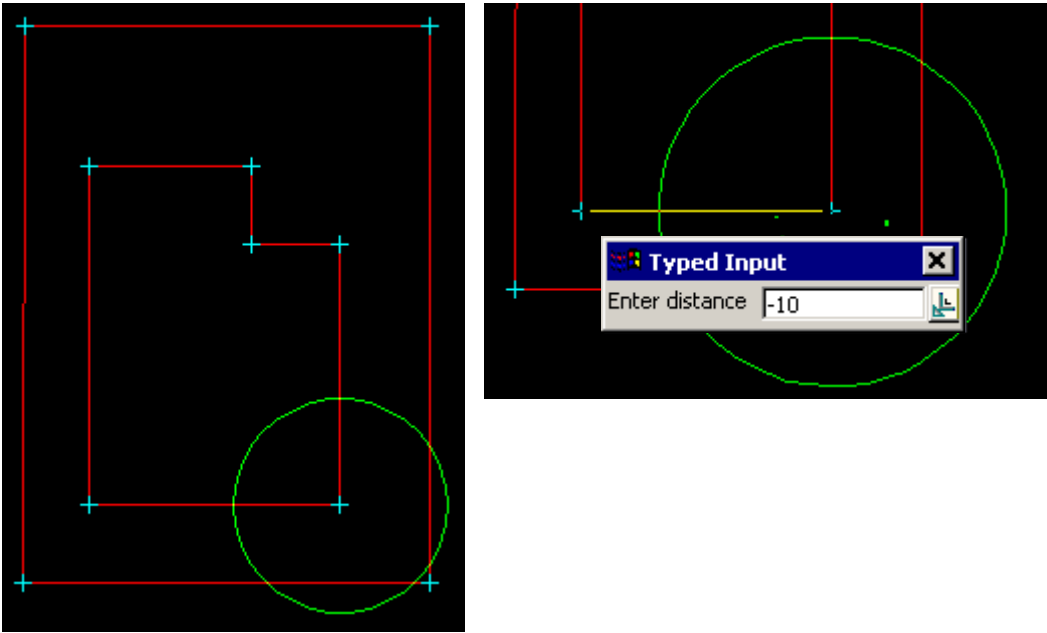
The user picks a 2nd point and accepts that point (Middle mouse button or enter) to define the reference line.



STEP 3:

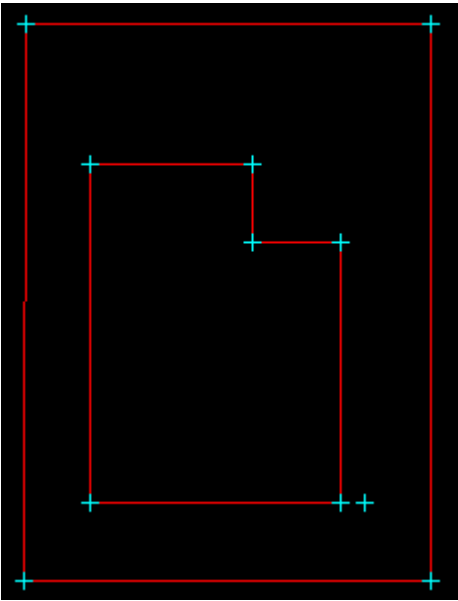
A distance from the 1st point to create the point is given either by selection with the mouse or by typing a value. To type a value, simply start typing and the input box for the distance will appear. Alternatively you can press the space bar to bring up the input box. Enter the value and then the enter key.

The circle drawn represents the distance value and changes with movement of the mouse. If the user wants to see what the current value of the distance is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to create the point or the input box can be closed and the rubber banding (graphically changing) of the circle continued.



STEP 4:

A virtual point is created on the segment specified by the selection of the 1st and 2nd points, at the nominated distance. Negative distances can be entered as in this example.



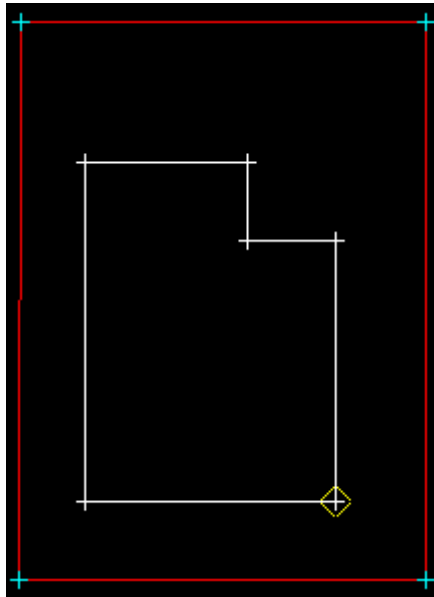
Between points 3d

This option creates a virtual point that is on the line between two selected positions and a given distance from the first point. The z-value of the string is interpolated from the two selected positions.

On selecting **Between points 3d**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

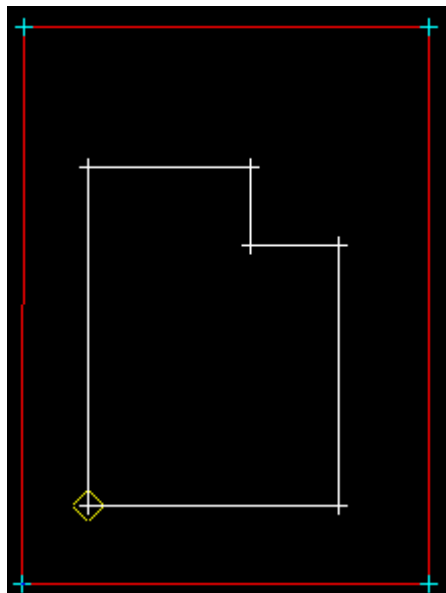
STEP 1:

The user selects a start point. Specification of a position can be done by the direct input of the xyz coordinate of the point by pressing the space bar to bring up the enter XYZ panel or by typing of the value to bring up the XYZ panel. The user can also select a point with the mouse and accepts that point (Middle mouse button or Enter).



STEP 2:

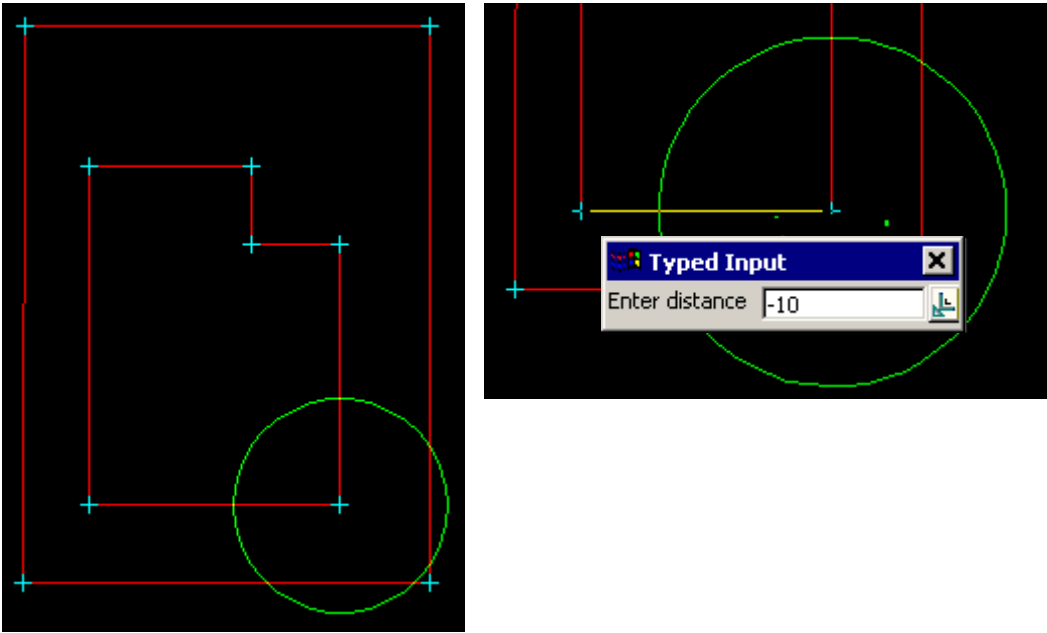
The user picks a 2nd point and accepts that point (Middle mouse button or <Enter>) to define the reference line.



STEP 3:

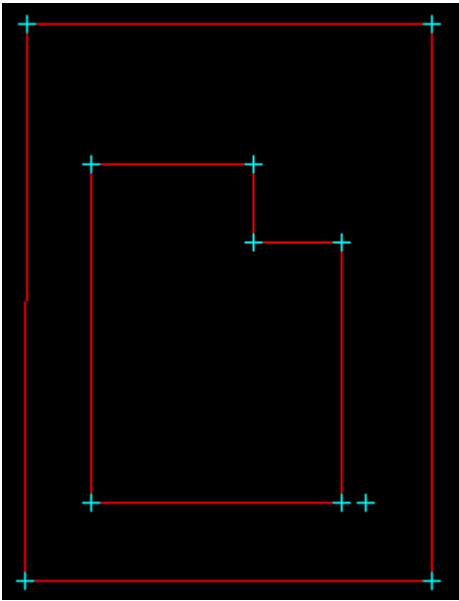
A distance from the 1st point to create the point is given either by selection with the mouse or by typing a value. To type a value, simply start typing and the input box for the distance will appear. Alternatively you can press the space bar to bring up the input box. Enter the value and then the enter key.

The circle drawn represents the distance value and changes with movement of the mouse. If the user wants to see what the current value of the distance is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to create the point or the input box can be closed and the rubber banding (graphically changing) of the circle continued.



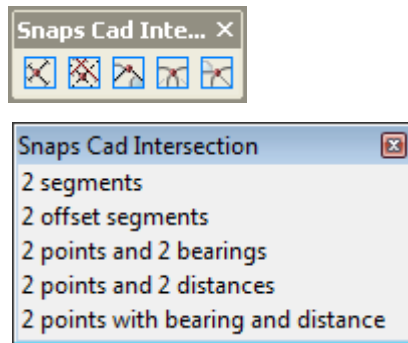
STEP 4:

A virtual point is created on the segment specified by the selection of the 1st and 2nd points, at the nominated distance. Negative distances can be entered as in this example.



Snaps Cad Intersection

This section of documentation is a work in progress and will be updated in subsequent releases.



for the option 2 segments, go to the section

2 offset segments

2 points and 2 bearings

2 points and 2 distances

2 points with bearing and distance

[2 segments](#)

[2 offset segments](#)

[2 points and 2 bearings](#)

[2 points and 2 distances](#)

[2 points with bearing and distance](#)

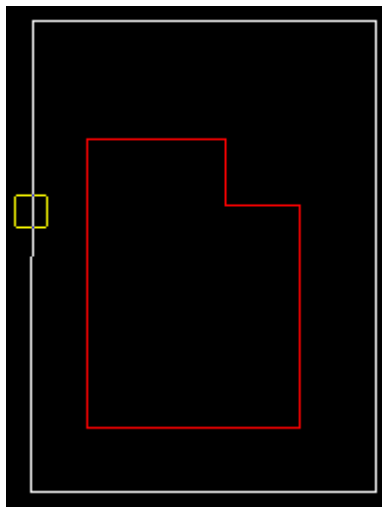
2 segments

This option creates a virtual point at the intersection of the projections of two line or arc segments.

On selecting 2 segments, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

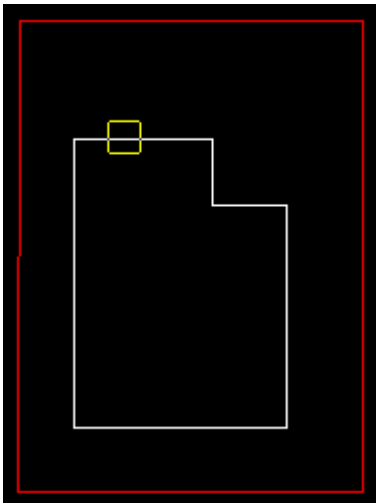
STEP 1:

The 1st segment is selected and accepted.



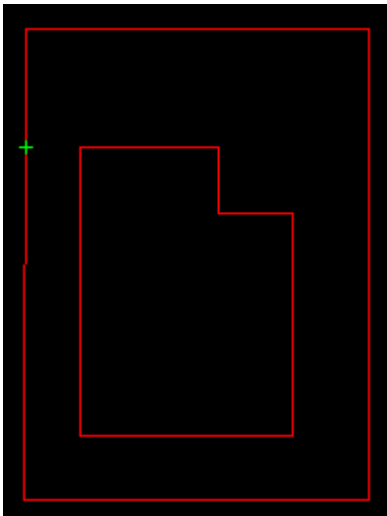
STEP 2:

The 2nd segment is selected and accepted.



STEP 3:

A virtual point is created at the intersection of the two segments (if a solution exists). Note that the 2nd segment in this case has been projected to enable a solution to be calculated.



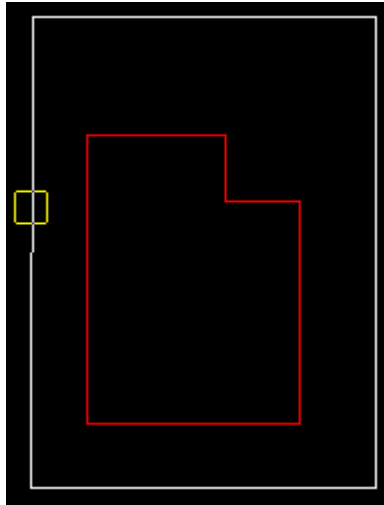
2 offset segments

This option creates a virtual point at the intersection of the offsets of two selected segments.

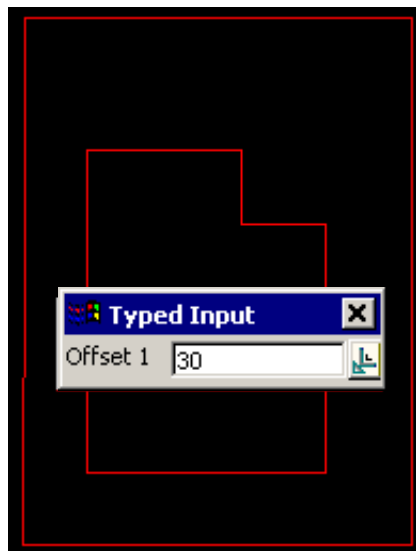
On selecting **2 offset segments**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

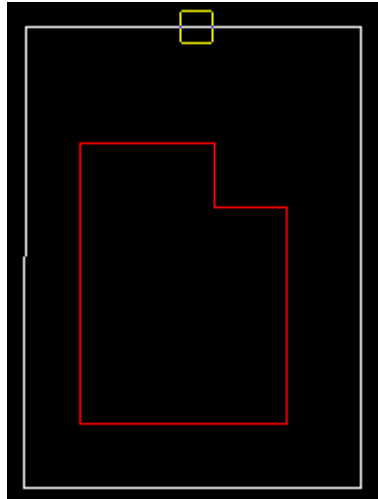
The 1st segment is selected and accepted with direction. This sets the positive direction of the offset to the right of the direction of pick.

**STEP 2:**

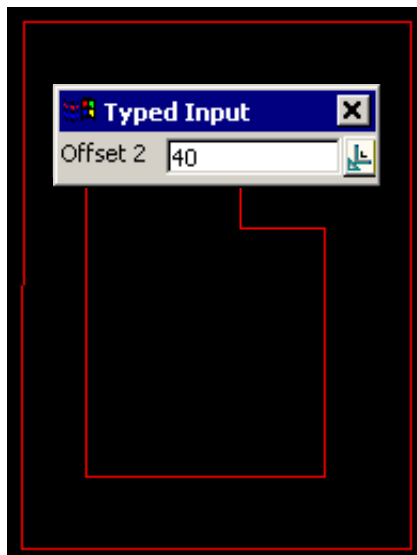
The offset is given by into an offset input box. The positive direction is at 90 degrees to the direction of pick for the segment. The value is entered into the input box followed by the Enter key.

**STEP 3:**

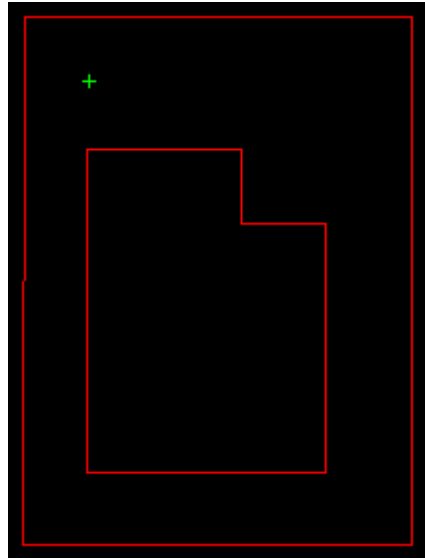
The 2nd segment is selected with direction and accepted. This sets the positive direction of the offset to the right of the direction of pick.

**STEP 4:**

The offset is given by into an offset input box. The positive direction is at 90 degrees to the direction of pick for the segment. The value is entered into the input box followed by the Enter key.

**STEP 5:**

A virtual point is created at the intersection of the projected lines offset to the segments (if a solution exists).



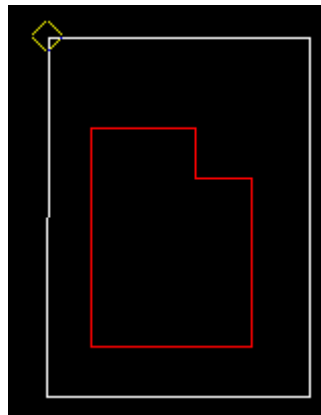
2 points and 2 bearings

This option creates a virtual point by using two points and two bearings.

On selecting **2 points and 2 bearings**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

The 1st point is selected and accepted.

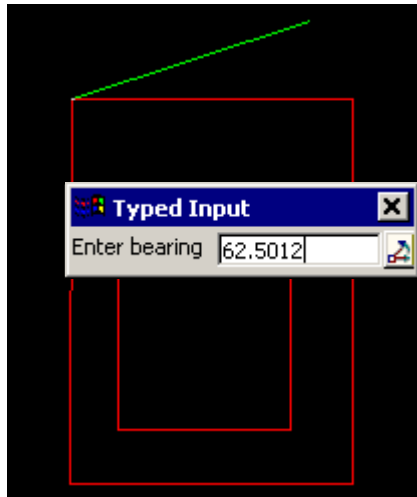


STEP 2:

A bearing from the 1st point to create the point is given either by selection with the mouse or by typing a value. To type a value, simply start typing and the input box for the bearing will appear. Alternatively you can press the space bar to bring up the input box. The value is entered into the input box followed by the Enter key.

The line drawn represents the bearing value and changes with movement of the mouse. If the user wants to see what the current value of the bearing is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to create the point or the input box can be closed and the rubber banding (graphically changing) of the line continued.

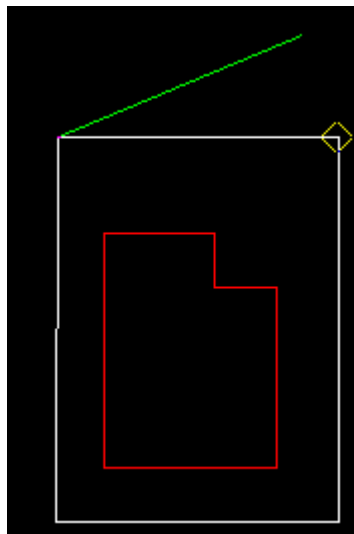
Note: The Page up and page down keys can be used when the input angle box comes up to add or subtract intervals of 90 degrees.



This option also allows the definition of the bearing by the selection of the 2nd point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next.

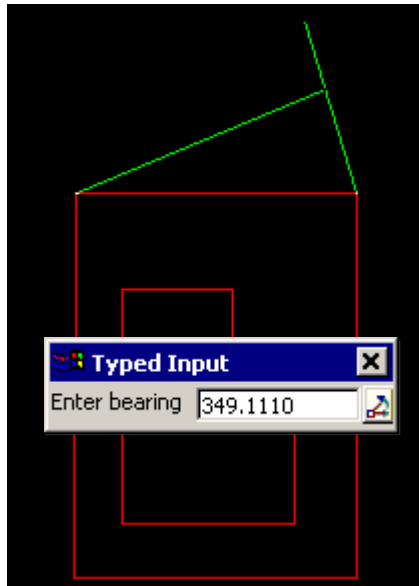
STEP 3:

The 2nd point to create the point from is selected and accepted.

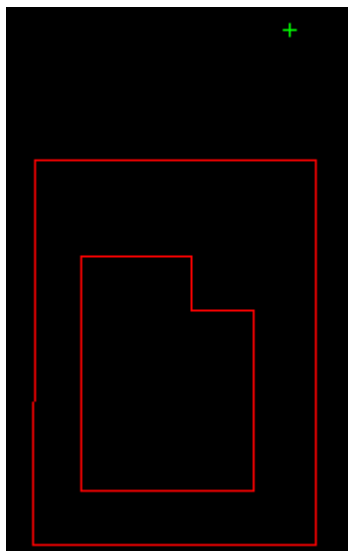


STEP 4:

A bearing from the 2nd point to create the point is given using the optional outlined in **STEP 2** above.

**STEP 5:**

The virtual point created if there is a valid solution.

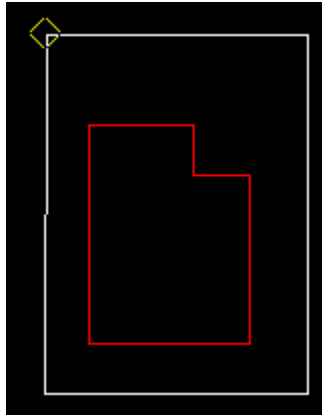
**2 points and 2 distances**

This option creates a virtual point using two points and two distances.

On selecting **2 points and 2 distances**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

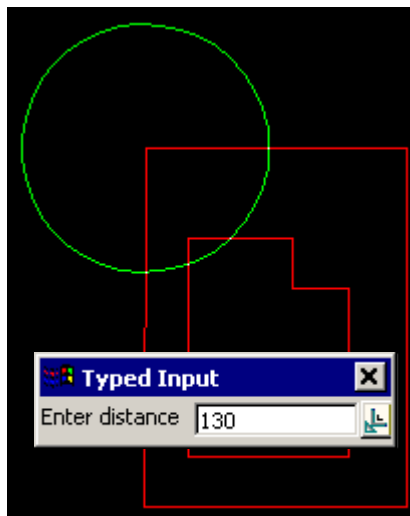
STEP 1:

The 1st point is selected and accepted.

**STEP 2:**

A distance from the 1st point to create the point is given either by selection with the mouse or by typing a value. To type a value, simply start typing and the input box for the distance will appear. Alternatively you can press the space bar to bring up the input box. The value is entered into the input box followed by the enter key.

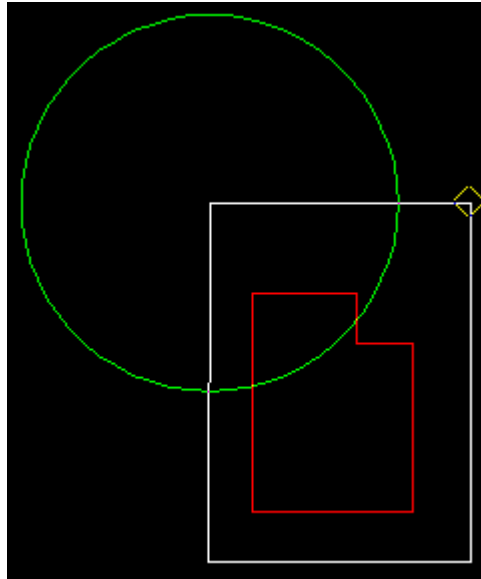
The circle drawn represents the distance value and changes with movement of the mouse. If the user wants to see what the current value of the distance is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to create the point or the input box can be closed and the rubber banding (graphically changing) of the circle continued.



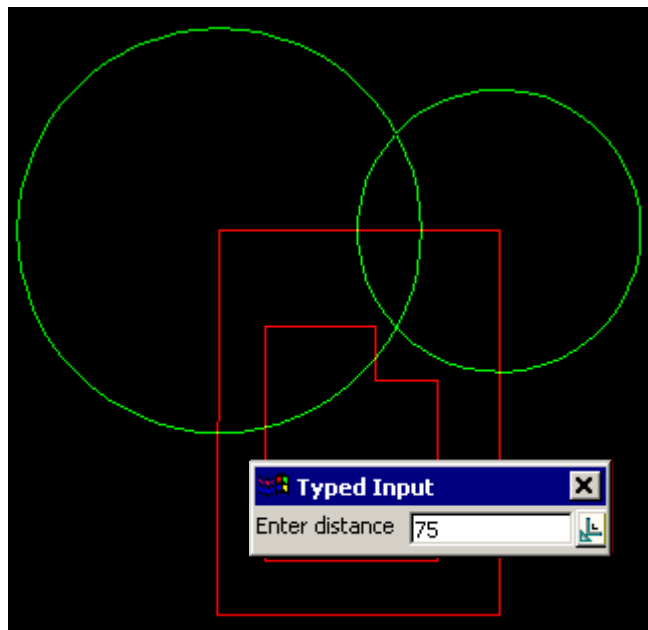
This option also allows the definition of the distance by the selection of the 2nd point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next. The example shown below is the perpendicular case.

STEP 3:

The 2nd point to create the point from is selected.

**STEP 4:**

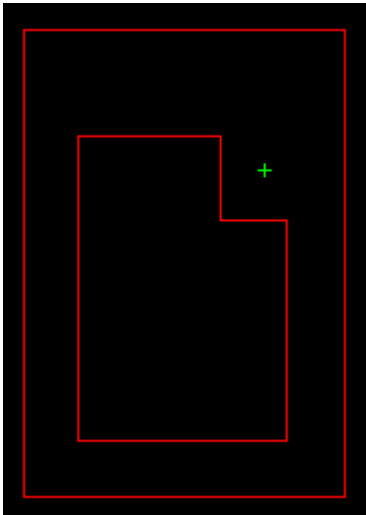
A distance from the 2nd point to create the point is given using the optional outlined in **STEP 2** above.

**STEP 5:**

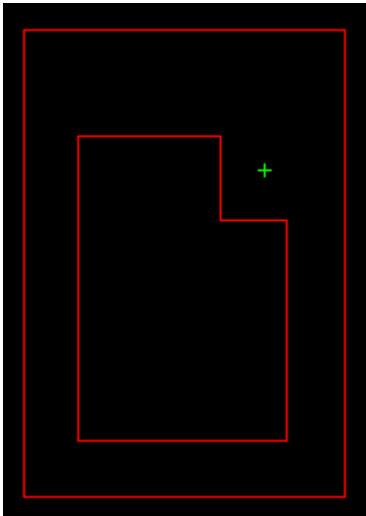
As there is two solutions, the user can select the correct one depending on the method of construction. This can be done by the direct entry of distances or by use of the mouse.

1. Distance entry. After the entry of the 1st distance, the 2nd point is selected. Following the selection of the 2nd point, the 2nd radius is shown (rubber banding). The user can select one of the two solutions by choosing with a **LB** mouse click over the approximate position of the required solution. The solution chosen is the closest solution to the selected point. The final radius can then be entered via the keyboard by simply starting typing which brings up the radius entry panel automatically. This panel can also be activated by pressing the space bar.
2. Use of the mouse. The 1st point is selected and the radius entered by using the mouse or by direct entry from the keyboard. The 2nd point is then selected and the 2nd radius is displayed (rubber banding). A

solution can be chosen by selecting with a **LB** mouse click over the required solution. The final solution will be the closest one to the selection. **MB** to accept the intersection and create the point.



STEP 6:
The virtual point is created if there is a valid solution.



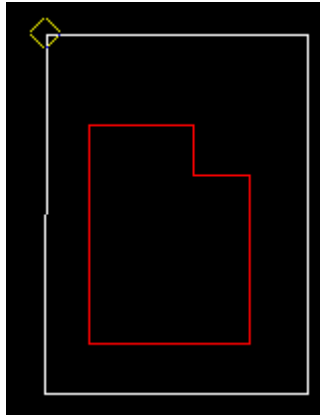
2 points with bearing and distance

This option creates a virtual point from a given point and a bearing, and a second point and a distance.

On selecting **2 points with bearing and distance**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:
The 1st point is selected and accepted.

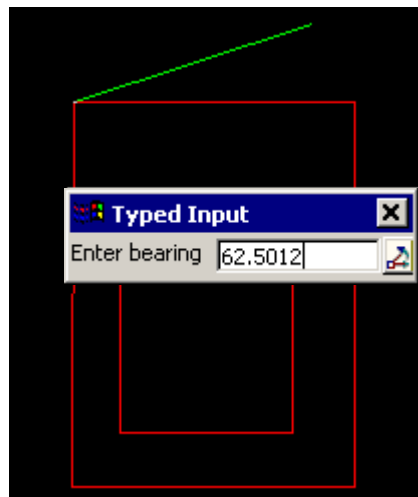


**STEP 2:**

A bearing from the 1st point to create the point is given either by selection with the mouse or by typing a value. To type a value, simply start typing and the input box for the bearing will appear. Alternatively you can press the space bar to bring up the input box. The value is entered into the input box followed by the Enter key.

The line drawn represents the bearing value and changes with movement of the mouse. If the user wants to see what the current value of the bearing is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to create the point or the input box can be closed and the rubber banding (graphically changing) of the line continued.

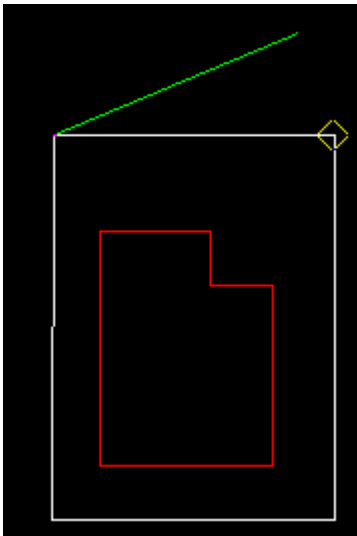
Note: The Page up and page down keys can be used when the input angle box comes up to add or subtract intervals of 90 degrees.



This option also allows the definition of the bearing by the selection of the 2nd point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next.

STEP 3:

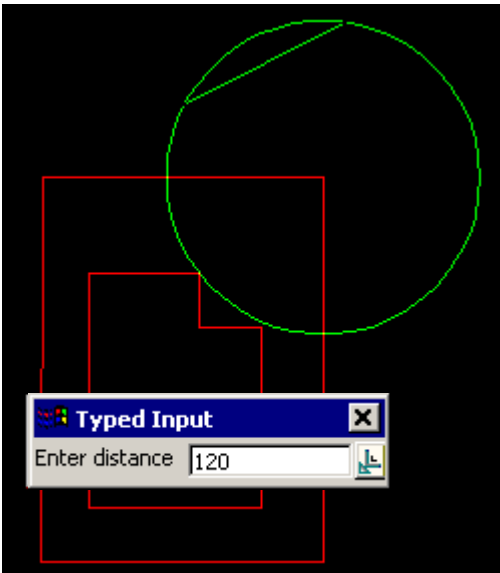
The 2nd point to create the point from is selected and accepted.



STEP 4:

A distance from the 2nd point to create the point is given either by selection with the mouse or by typing a value. To type a value, simply start typing and the input box for the distance will appear. Alternatively you can press the space bar to bring up the input box. The value is entered into the input box followed by the Enter key.

The circle drawn represents the distance value and changes with movement of the mouse. If the user wants to see what the current value of the distance is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to create the point or the input box can be closed and the rubber banding (graphically changing) of the circle continued.

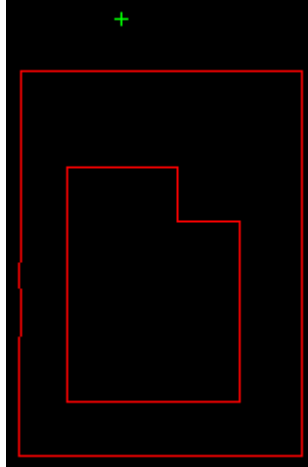


This option also allows the definition of the distance by the selection of the 2nd point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next. The example shown below is the perpendicular case.

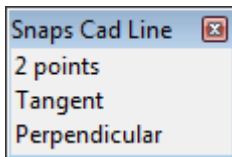
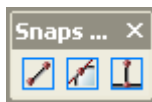
A line is drawn between the two possible solutions.

STEP 5:

As there is two solutions, the user can select the correct one with the mouse.

**Snaps Cad Line**

This section of documentation is a work in progress and will be updated in subsequent releases.



For the option, 2 Points go to
Tangent
Perpendicular

[2 Points](#)
[Tangent](#)
[Perpendicular](#)

2 Points

This option creates a virtual line segment.

On selecting **2 points**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

The user can select a position with the mouse and on accepting that point (Middle mouse button or enter) the point is created at the selected position.

The snap mode will influence the mouse selection. For example if cursor snap is on, the user can choose a position not yet defined. If point snap is on and the selection snaps to an existing point, the option will place another point at that location.

The user can also activate the selection menu used with the mouse (right button) that allows various positioning options.

Specification of a position can also be done by the direct input of the xyz coordinate of the point by pressing the space bar to bring up the enter XYZ panel. **NOTE:** The z value will default to the value entered into the **Cad Control Bar** whether or not it is specified in the XYZ box. If no height value exists in the **Cad Control Bar**

The 2nd virtual point is selected in the same way as the 1st virtual point. The line is created after successful selection and acceptance of the 2nd virtual point.

Tangent

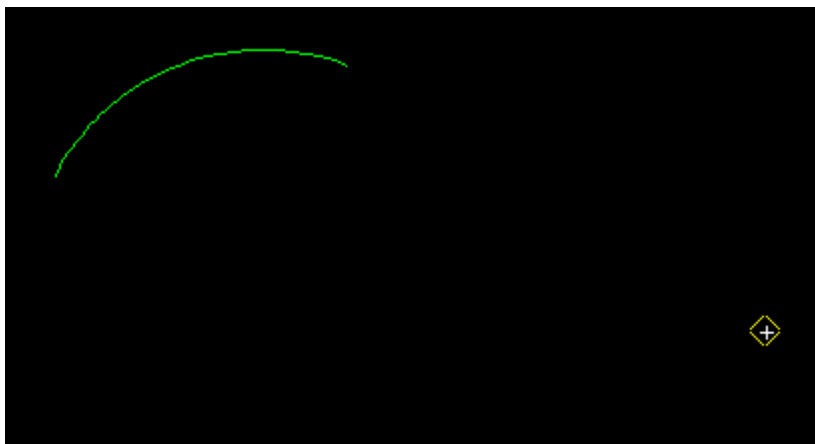
This option creates the virtual tangential line between two elements.

NOTE: When Selecting an arc or circle, the selection must be a line snap with direction. If a point is selected on the arc/circle the line will be draw between the selected points and not the tangent.

On selecting **Tangent**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

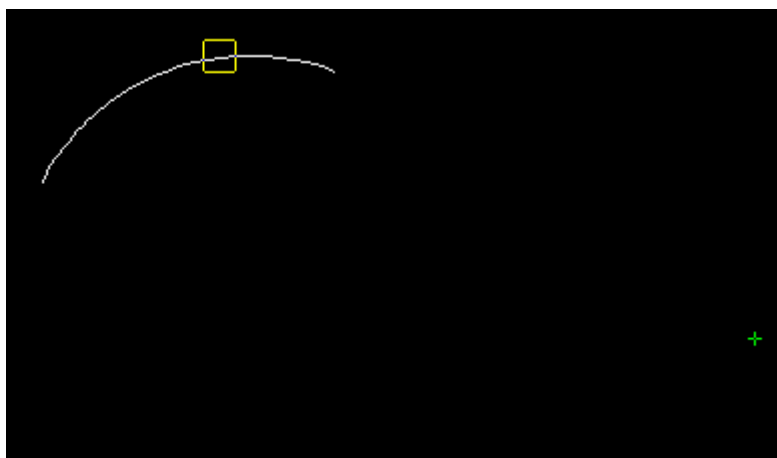
STEP 1:

A start position of the reference line is selected and accepted.



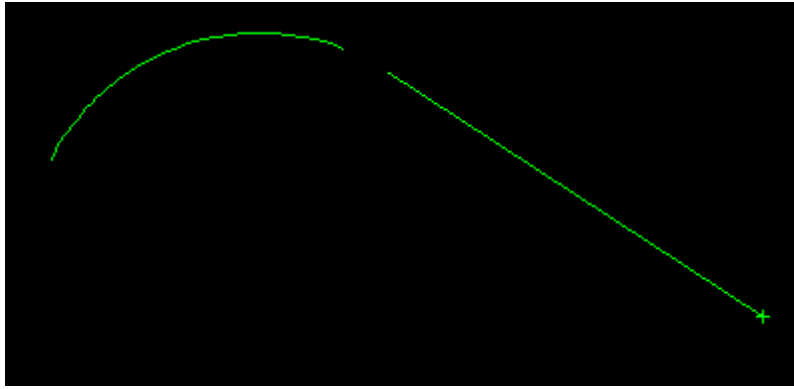
STEP 2:

The user selects and accepts the arc/circle segment with direction. The direction is required because there are two possible solutions. In this case, the direction was anti clockwise.



STEP 3:

After accepting the segment, a line is draw from the 1st selected point to the tangent point. Note that in this example, the arc is produced around so that a solution can be found.



Perpendicular

This option creates a virtual line by selecting a reference string and a reference point the create a line from the reference point perpendicular to the reference string.

On selecting **Perpendicular**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

A reference string is selected and accepted.

STEP 2:

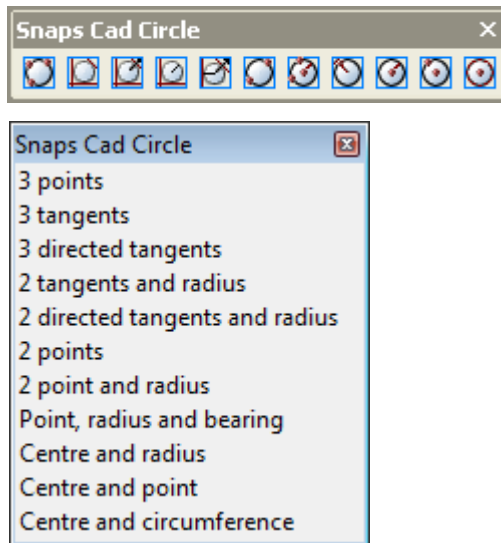
A line is drawn from the current mouse position perpendicular to the reference string

STEP 3:

After the final position is accepted, a virtual line is created which start from the selected position and perpendicular to the reference string.

Snaps Cad Circle

This section of documentation is a work in progress and will be updated in subsequent releases.



For the option *3 points*, go to

3 tangents
3 directed tangents
2 tangents and radius
2 directed tangents and radius
2 points
2 point and radius
Point, radius and bearing
Centre and radius
Centre and point
Centre and circumference

[3 points](#)
[3 tangents](#)
[3 directed tangents](#)
[2 tangents and radius](#)
[2 directed tangents and radius](#)
[2 points](#)
[2 point and radius](#)
[Point, radius and bearing](#)
[Centre and radius](#)
[Centre and point](#)
[Centre and circumference](#)

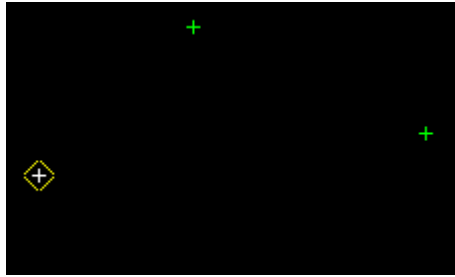
3 points

This option creates a virtual circle through three selected points.

On selecting **3 points**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

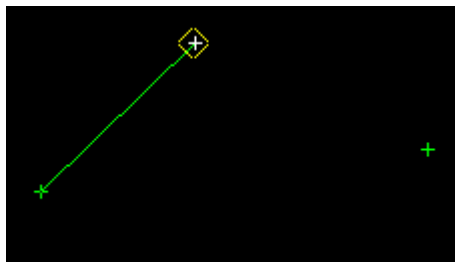
STEP 1:

The 1st point is selected with the mouse or entered in via the keyboard. To specify the 1st point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter the 1st point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the Enter key.

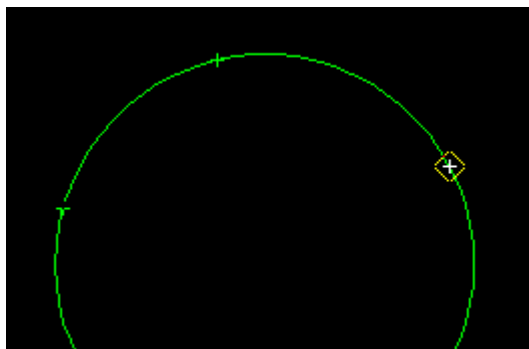
**STEP 2:**

The 2nd point is selected and accepted.

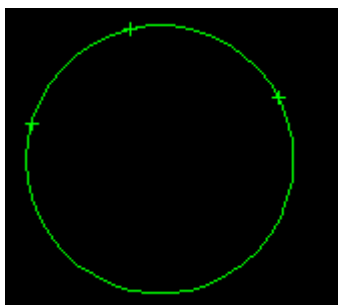
After the 2nd point is accepted a circle will be displayed 'rubber banding' to the various solutions according to the position of the cursor. This will continue until the 3rd point is selected and accepted.

**STEP 3:**

The 3rd point is selected and accepted.

**STEP 4:**

A virtual circle is constructed through the three selected points



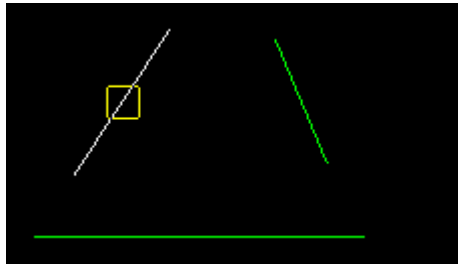
3 tangents

This option creates a virtual circle that is tangential to three selected segments.

On selecting **3 tangents**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

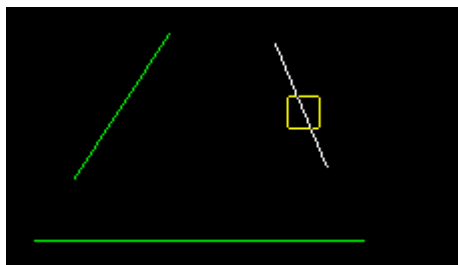
STEP 1:

The 1st tangent is selected with the mouse (Left Button) and accepted (Middle Button).



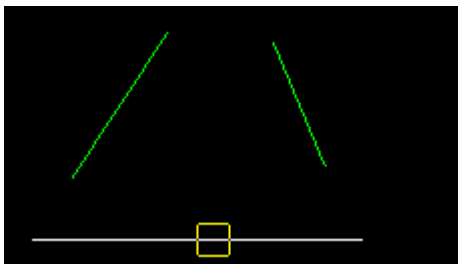
STEP 2:

The 2nd tangent is selected and accepted.



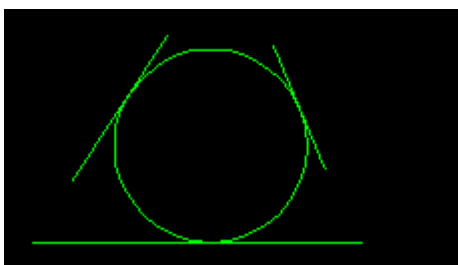
STEP 3:

The 3rd tangent is selected and accepted.



STEP 4:

A virtual circle is constructed that touches each of the three selected tangents.



3 directed tangents

This option creates a virtual circle that is tangential to three selected segments. The segments are selected in order and with direction and the circle is to the right of the direction of the selected segments.

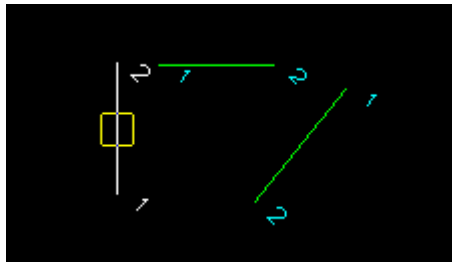
On selecting **3 directed tangents** the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

Select and accept the 1st tangent.

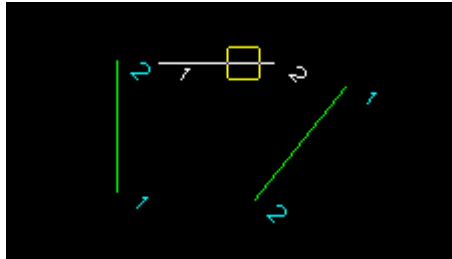
Note: For this option the direction of the selected tangents is important. The circle will be constructed to the right of a tangent. A user may reverse the direction of a tangent by selecting the tangent *with direction*. For further notes on picking tangents with direction, see [Picking with Direction](#).

Note: The Vertex indices can be displayed by toggling the option on the Toggle Menu.



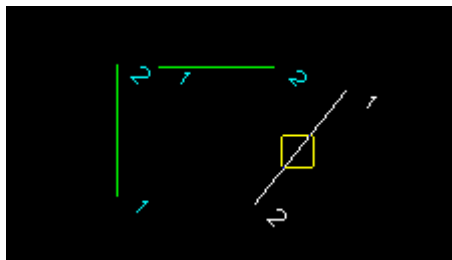
STEP 2:

The 2nd tangent is selected and accepted.



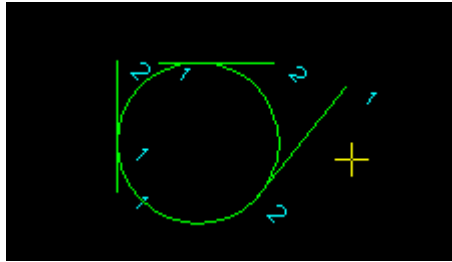
STEP 3:

The 3rd tangent is selected and accepted.



STEP 4:

If a solution exists, a virtual circle is constructed using the given information.



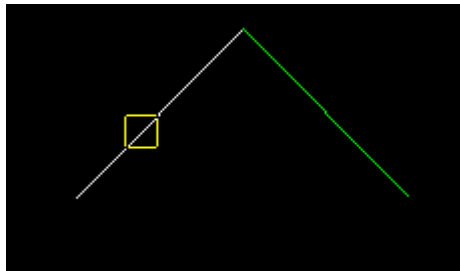
2 tangents and radius

This option creates a virtual circle with a given radius that is tangential to two selecting segments.

On selecting **2 tangents and radius**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

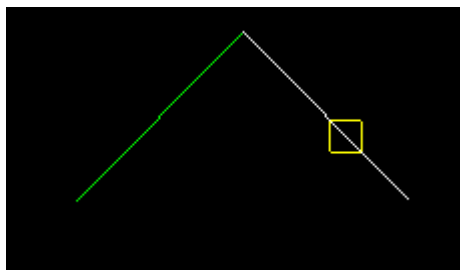
STEP 1:

Select the 1st tangent with the mouse (Left Button) and accept it (Middle Button).




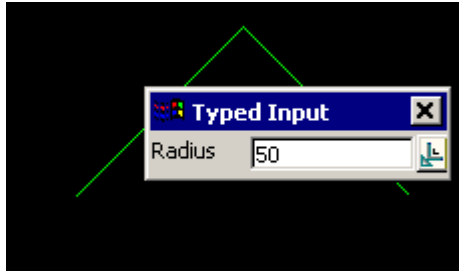
STEP 2:

Select the 2nd tangent and accept it.

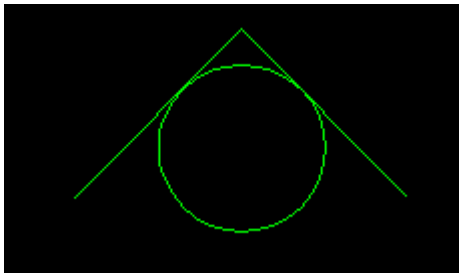


STEP 3:

After the 2nd tangent is accepted, the Radius Input box will appear. Type the radius value into the Input box and press the Enter key. The browse button  on the Input box can be used to define the radius by measuring existing elements.

**STEP 4:**

If a solution exists, a virtual circle is fitted touching the two selected tangents using the given radius.

**2 directed tangents and radius**

This option creates a virtual circle with a given radius that is tangential to two selected segments that are picked with direction.

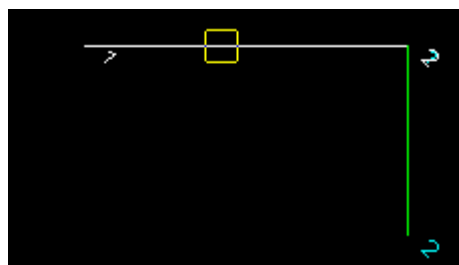
On selecting **2 directed tangents and radius**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

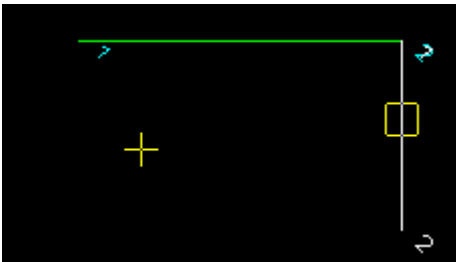
Select and accept the 1st tangent.

Note: For this option the direction of the selected tangents is important. The circle will be constructed to the right of a tangent. A user may reverse the direction of a tangent by selecting the tangent *with direction*. For further notes on picking tangents with direction, see [Picking with Direction](#).


Note: The Vertex indices can be displayed by toggling the option on the Toggle Menu.

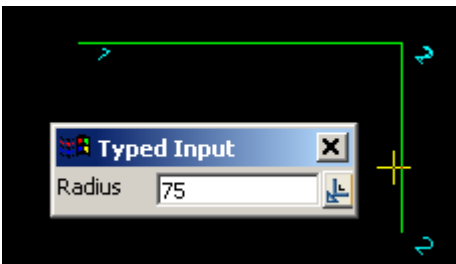
**STEP 2:**

The 2nd tangent is selected and accepted.



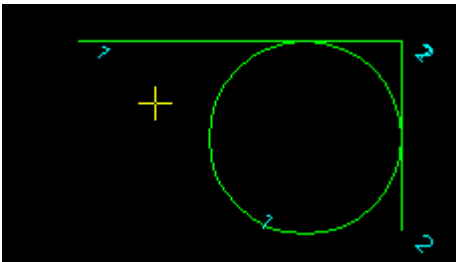
STEP 3:

After the 2nd tangent is accepted, the Radius Input box will appear. Type the radius value into the Input box and press the enter key. The browse button  on the Input box can be used to define the arc radius by measuring existing elements.



STEP 4:

If a solution exists, a virtual circle is constructed using the given information.



2 points

This option creates a virtual circle by selecting two points that define the diameter of the circle.

On selecting **2 points**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

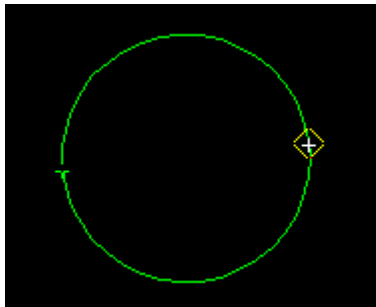
STEP 1:

The 1st point is selected with the mouse or entered in via the keyboard. To specify the 1st point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter the 1st point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.

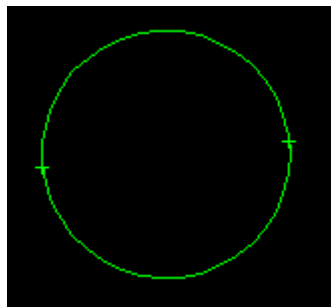
After the 1st point is accepted a circle will be displayed 'rubber banding' to the various solutions according to the position of the cursor (cursor position taken as the other end of a diameter). This will continue until the 2nd point is selected and accepted.

**STEP 2:**

The 2nd point is selected and accepted.

**STEP 3:**

The virtual circle is constructed through the two selected points. The two points define the diameter.



2 point and radius

This option creates a virtual circle of a given radius that goes through two selected points.

On selecting **2 point and radius**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

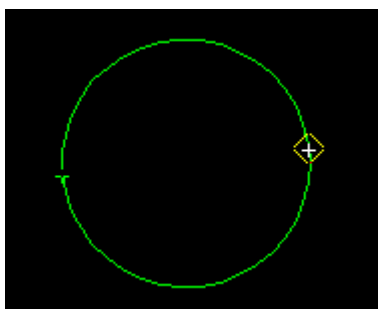
STEP 1:

The 1st point is selected with the mouse or entered in via the keyboard. To specify the 1st point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter the 1st point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.

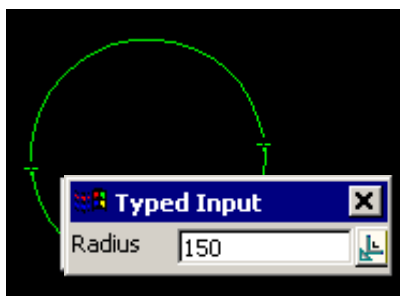
After the 1st point is accepted a circle will be displayed 'rubber banding' to the various solutions according to the position of the cursor. This will continue until the 2nd point is selected and accepted.

**STEP 2:**

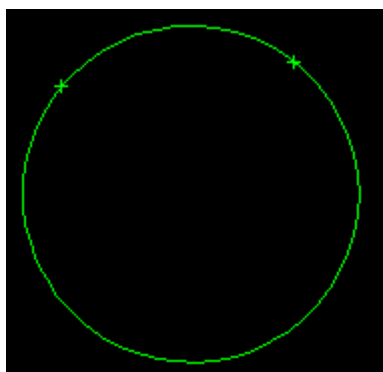
The 2nd point is selected and accepted.

**STEP 3:**

After the 2nd point is accepted, the Radius Input box will appear. The radius value is entered into the input box followed by the Enter key.

**STEP 4:**

If a solution exists, the virtual circle is fitted through the two selected points using the given radius.



Point, radius and bearing

This option creates a virtual circle of a given radius, a selected point on the circle and the bearing of the tangent to the circle at that point.


On selecting **Point, radius and bearing**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

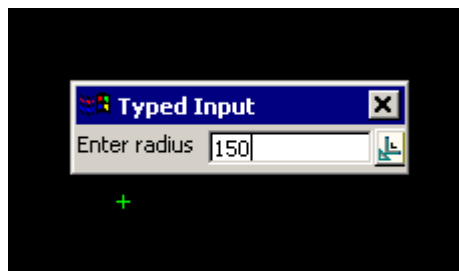
STEP 1:

The 1st point is selected with the mouse or entered in via the keyboard. To specify the 1st point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter a 1st point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the Enter key.




STEP 2:

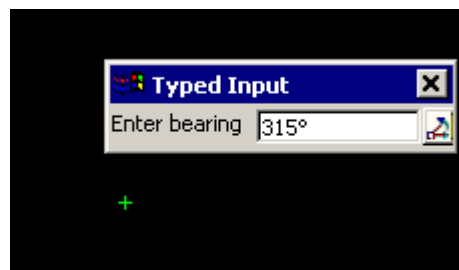
After the 1st point is accepted, the **Enter radius** input box will appear. Type the radius value into the Input box and press the enter key. The browse button  on the Input box can be used to define the arc radius by measuring existing elements.



STEP 3:

After the radius has been entered, the **Enter bearing** input box will appear. Type the bearing into the Input box and press the enter key. The browse button  on the Input box can be used to define the bearing by measuring existing elements.

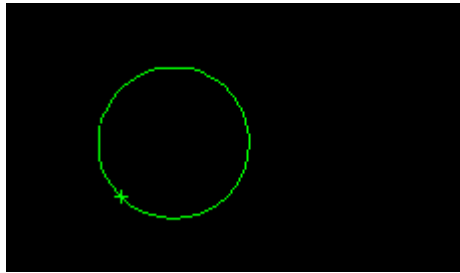
Note: The **Page Up** and **Page Down** keys can be used when the **Enter Bearing** input box comes up to add or subtract intervals of 90 degrees.



STEP 4:

If a solution exists, a virtual circle is fitted from the given bearing at the selected point using the

selected radius.



Centre and radius

This option creates a virtual circle of a given radius and a selected centre point

On selecting **Centre and radius**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

A centre point is selected with the mouse or entered in via the keyboard. To specify a centre point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter a centre point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the Enter key.




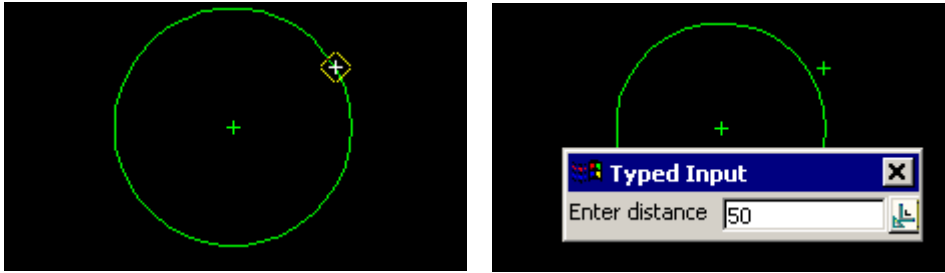
STEP 2:

After the centre point is accepted a circle will be displayed 'rubber banding' to the various solutions according to the position of the cursor. This will continue until a radius value is entered.

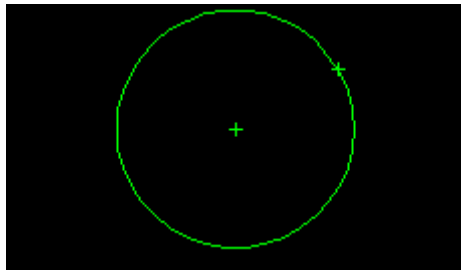
A radius value is selected with the mouse or entered in via the keyboard.

To specify a radius value with the mouse, a point must be selected (Left Button) and accepted (Middle Button). This option also allows the definition of the radius by the selection of the 2nd point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next.

To enter a radius value with the keyboard, simply start typing or press the space bar to bring up the Radius Input box. Type the radius value into the Radius Input box and press the enter key. The browse button  on the Input box can be used to define the arc radius by measuring existing elements.

**STEP 3:**

The virtual circle is constructed through the centre point using the specified radius.



Centre and point

This option creates a virtual circle by selecting a centre point and then using the cursor to select a second point that is on the circle.

On selecting **Centre and point**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

A centre point is selected with the mouse or entered in via the keyboard. To specify a centre point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter a centre point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the Enter key.

**STEP 2:**

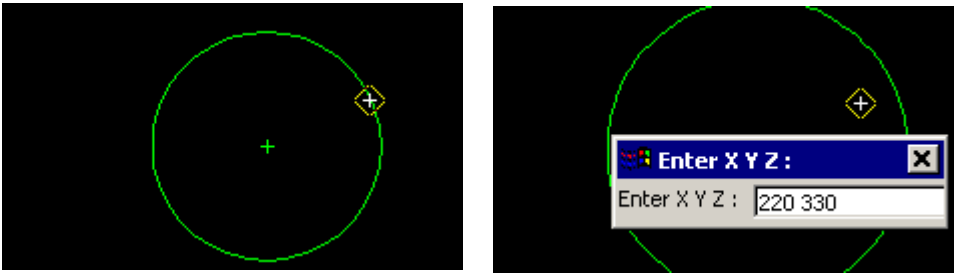
After the centre point is accepted a circle will be displayed 'rubber banding' to the various solutions according to the position of the cursor. This will continue until a radius value is entered.

A radius value is selected with the mouse or entered in via the keyboard.

To specify a radius value with the mouse, a point must be selected (Left Button) and accepted (Middle Button). This option also allows the definition of the radius by the selection of the 2nd point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the

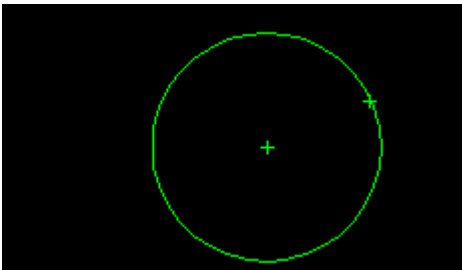
mouse to change from one solution to the next.

To enter a radius value with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the point into the Input box and press the Enter key.



STEP 3:

A virtual circle is constructed using the two points defined by the user.



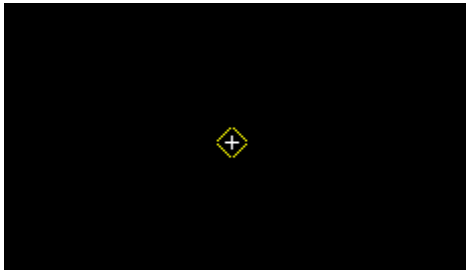
Centre and circumference

This option creates a virtual circle by selecting the centre point and giving a circumference value.


On selecting **Centre and circumference**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

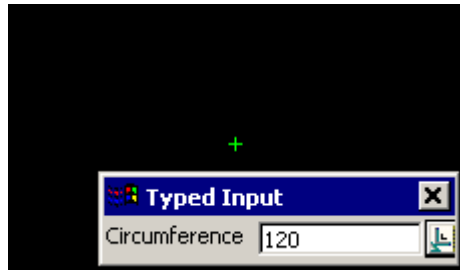
STEP 1:

A centre point is selected with the mouse or entered in via the keyboard. To specify a centre point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter a centre point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the Enter key.

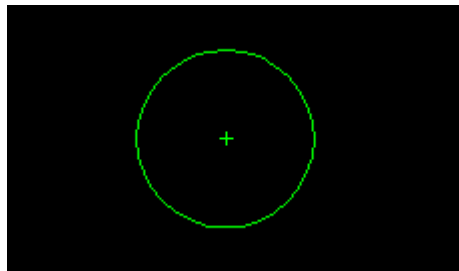


STEP 2:

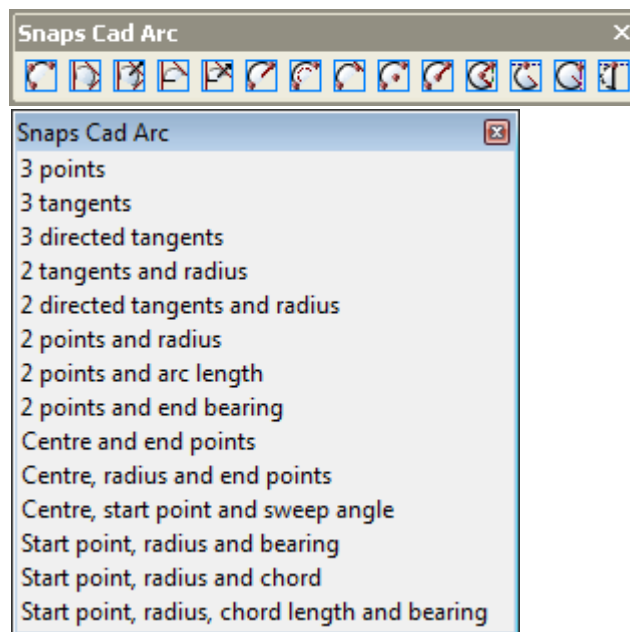
After the centre point is accepted, the **Circumference** Input box will appear. Type the circumference length into the Input box and press the enter key. The browse button  on the Input box can be used to define the arc radius by measuring existing elements.

**STEP 3:**

A virtual circle is constructed using the centre point and the given circumference.

**Snaps Cad Arc**

This section of documentation is a work in progress and will be updated in subsequent releases.



For the option *3 points*, go to

3 tangents

3 directed tangents

2 tangents and radius

2 directed tangents and radius

2 points and radius

[3 Points](#)

[3 Tangents](#)

[3 directed tangents](#)

[2 tangents and radius](#)

[2 directed tangents and radius](#)

[2 points and radius](#)

2 points and arc length	2 points and arc length
2 points and end bearing	2 points and end bearing
Centre and end points	Centre and end points
Centre, radius and end points	Centre, radius and end points
Centre, start point and sweep angle	Centre, start point and sweep angle
Start point, radius and bearing	Start point, radius and bearing
Start point, radius and chord	Start point, radius and chord
Start point, radius, chord length and bearing	Start point, radius, chord length and bearing

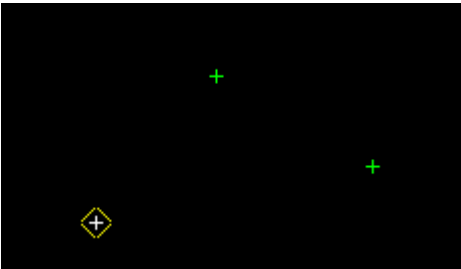
3 Points

This option creates a virtual arc through three selected points and the first and third points are the start and end of the arc.

On selecting 3 points, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

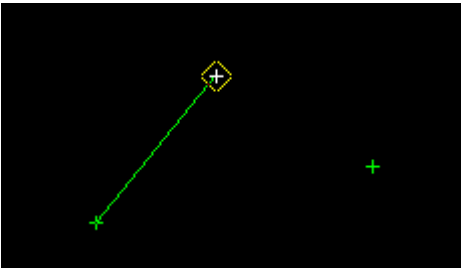
The 1st point is selected with the mouse or entered in via the keyboard. To specify the 1st point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter the 1st point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the Enter key.



STEP 2:

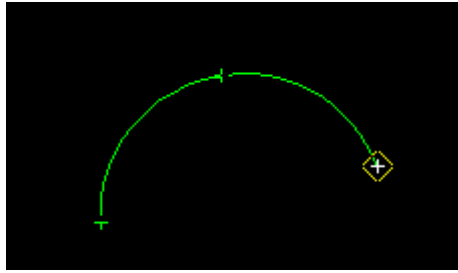
The 2nd point is selected and accepted.

After the 2nd point is accepted an arc will be displayed 'rubber banding' to the various solutions according to the position of the cursor. This will continue until the 3rd point is selected and accepted.

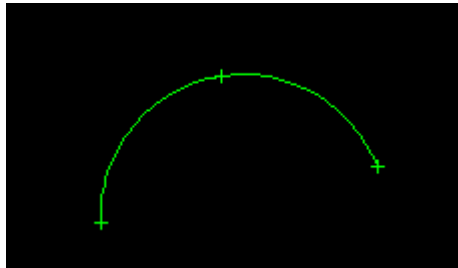


STEP 3:

The 3rd point is selected and accepted.

**STEP 4:**

A virtual arc is constructed through the three selected points.

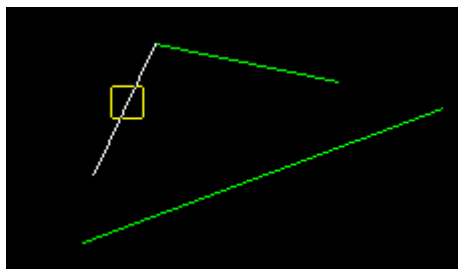
**3 Tangents**

This option creates a virtual arc that is tangential to three selected segments. The first and third segments are the start and end of the arc.

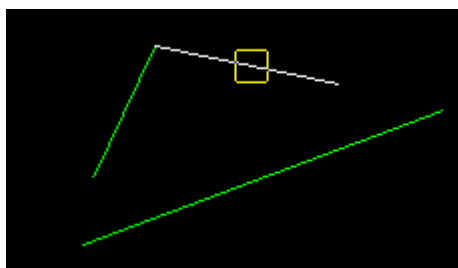
On selecting **3 tangents**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

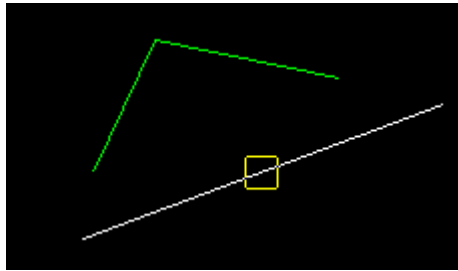
The 1st tangent is selected with the mouse (Left Button) and accepted (Middle Button).

**STEP 2:**

The 2nd tangent is selected and accepted.

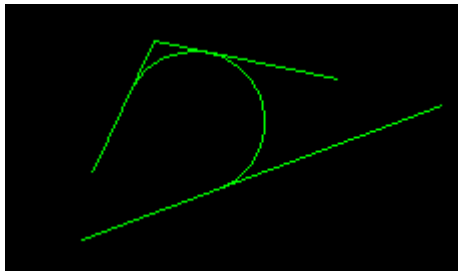
**STEP 3:**

The 3rd tangent is selected and accepted.



STEP 4:

The virtual arc is constructed touching the three selected tangents.



3 directed tangents

This option creates a virtual arc that is tangential to three selected segments. The segments are selected in order and with direction and the arc is to the right of the direction of the selected segments. The first and third segments are the start and end of the arc.

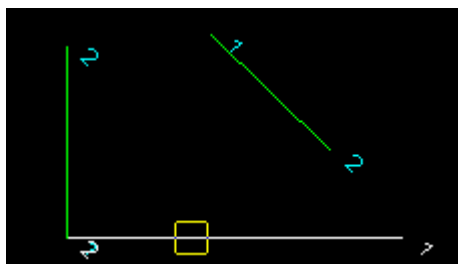
On selecting **3 directed tangents**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

Select and accept the 1st tangent.

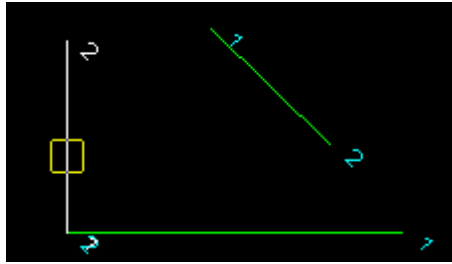
Note: For this option the direction of the selected tangents is important. The arc will be constructed to the right of the tangent. A user may reverse the direction of the tangent by selecting a tangent *with direction*. For further notes on picking tangents with direction, see [Picking with Direction](#).

Note: The Vertex indices can be displayed by toggling the option on the Toggle Menu.

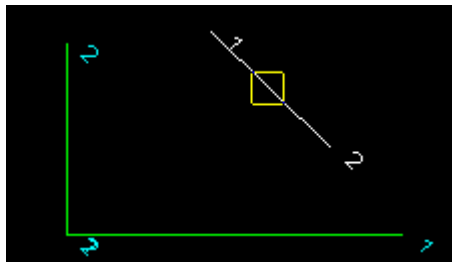


STEP 2:

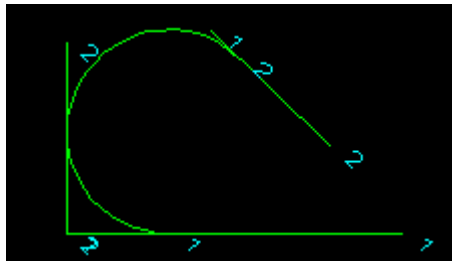
The 2nd tangent is selected and accepted.

**STEP 3:**

The 3rd tangent is selected and accepted.

**STEP 4:**

If a solution exists, a virtual arc is constructed using the given information.



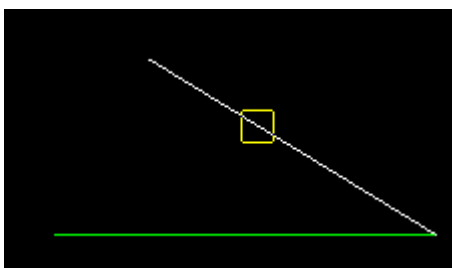
2 tangents and radius

This option creates a virtual arc with a given radius that is tangential to two selecting segments. This is the same as a fillet.

On selecting **2 tangents and radius**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

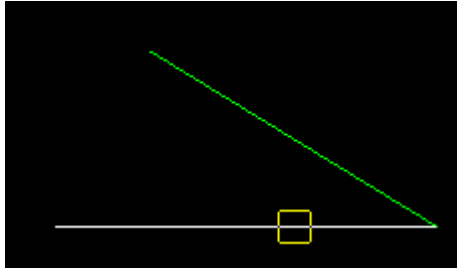
STEP 1:


The 1st tangent is selected with the mouse (Left Button) and accepted (Middle Button).

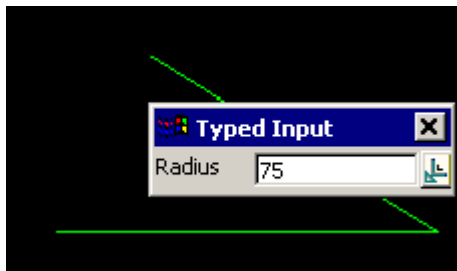


STEP 2:

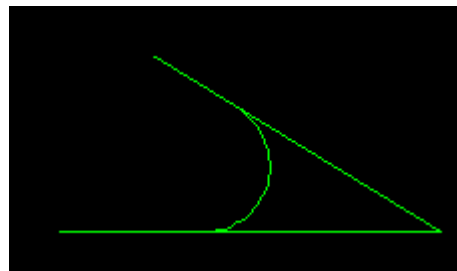
The 2nd tangent is selected and accepted.

**STEP 3:**

After the start point is accepted, the Radius Input box will appear. Type the radius value into the Input box and press the enter key. The browse button  on the Input box can be used to define the arc radius by measuring existing elements.

**STEP 4:**

If a solution exists, the virtual arc is fitted through the two selected tangents using the given radius.



2 directed tangents and radius

This option creates a virtual arc with a given radius that is tangential to two selected segments that are picked with direction.

On selecting **2 directed tangents and radius**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

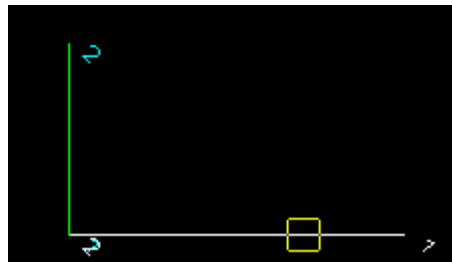
Select and accept the 1st tangent.


Note: For this option the direction of the selected tangents is important. The arc will be constructed to the right of a tangent. A user may reverse the direction of a tangent by selecting the tangent *with direction*. For further notes on picking tangents with direction, see [Picking with Direction](#).

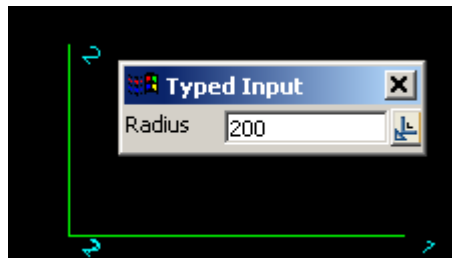
Note: The Vertex indices can be displayed by toggling the option on the Toggle Menu.

**STEP 2:**

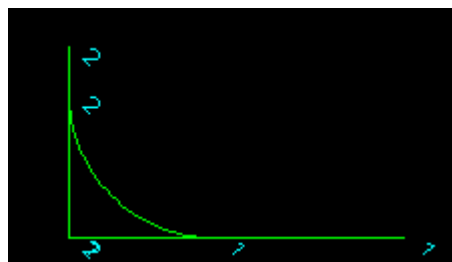
The 2nd tangent is selected and accepted.

**STEP 3:**

After the start point is accepted, the Radius Input box will appear. Type the radius value into the Input box and press the Enter key. The browse button  on the Input box can be used to define the arc radius by measuring existing elements.

**STEP 4:**

If a solution exists, the virtual arc is fitted through the two selected tangents using the given radius.



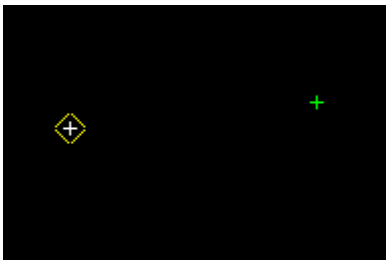
2 points and radius

This option creates a virtual arc of a given radius that starts and ends on two selected points.


On selecting **2 points and radius**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

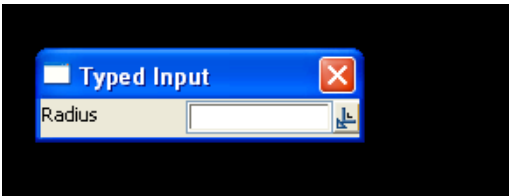
STEP 1:

The 1st point is selected with the mouse or entered in via the keyboard. To specify the 1st point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter the 1st point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the Enter key.



STEP 2:

After the start point is accepted, the Radius Input box will appear. Type the radius value into the Input box and press the enter key. The browse button  on the Input box can be used to define the arc radius by measuring existing elements.

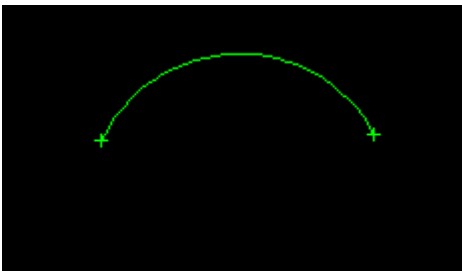


STEP 3:

The 2nd point is selected and accepted.

STEP 4:

If a solution exists, an arc is constructed using the given information.



2 points and arc length

This option creates a virtual arc of a given arc length that starts and ends on two selected points. On selecting **2 points and arc length**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.


STEP 1:

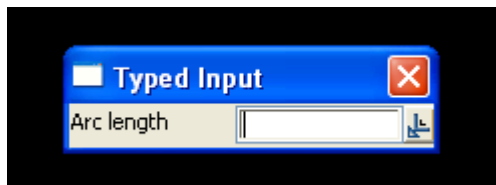
The 1st point is selected with the mouse or entered in via the keyboard. To specify the 1st point

with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter the 1st point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the Enter key.



STEP 2:

After the start point is accepted, the Arc length Input box will appear. Type the arc length value into the Input box and press the enter key. The browse button  on the Input box can be used to define the arc length by measuring existing elements.

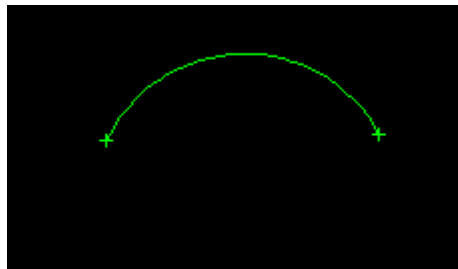


STEP 3:

The 2nd point is selected and accepted.

STEP 4:

If a solution exists, an arc is constructed using the given information.



2 points and end bearing

This option creates a virtual arc that starts and end on two selected points and has a given bearing of the tangent at the end point (the end bearing).

On selecting **2 points and end bearing**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

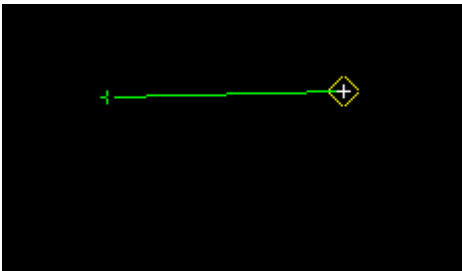
STEP 1:

The 1st point is selected with the mouse or entered in via the keyboard. To specify the 1st point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter the 1st point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the Enter key.




STEP 2:

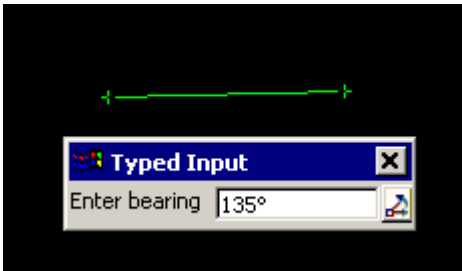
The 2nd point is selected and accepted.



STEP 3:

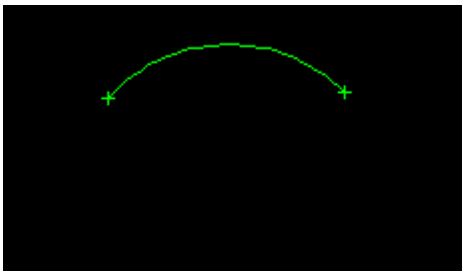
After the 2nd point is accepted, the Enter bearing input box will appear. Type the bearing into the Input box and press the enter key. The browse button  on the input box can be used to define the bearing by measuring existing elements.

Note: The Page Up and Page Down keys can be used when the Enter Bearing input box comes up to add or subtract intervals of 90 degrees.



STEP 4:

If a solution exists, the arc is fitted through the two selected points with the end point of the given bearing.



Centre and end points

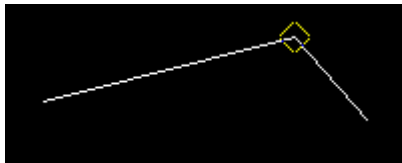
This option creates a virtual arc by selecting in order, the centre point and the start and end points. The radius of the arc is the distance between the centre and the start point.

On selecting **Centre and end points**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

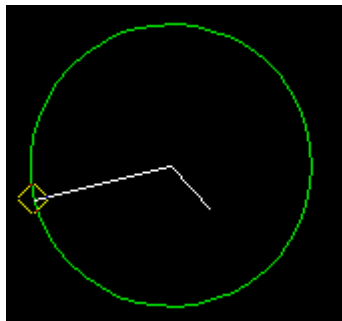
A centre point is selected with the mouse or entered in via the keyboard. To specify a centre point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter a centre point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the Enter key.

After the centre point is accepted a circle will be displayed 'rubber banding' to the various solutions according to the position of the cursor. This will continue until the start point is selected and accepted.



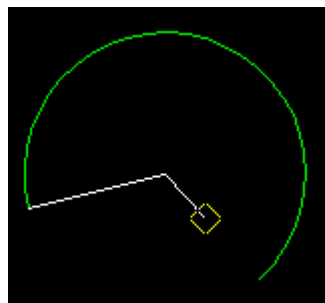
STEP 2:

Select and accept the start point. This point defines the radius and the start of the arc.



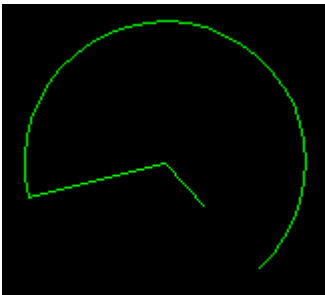
STEP 3:

The end point of the arc is specified.



STEP 4:

The virtual arc is constructed using the given information.



Centre, radius and end points

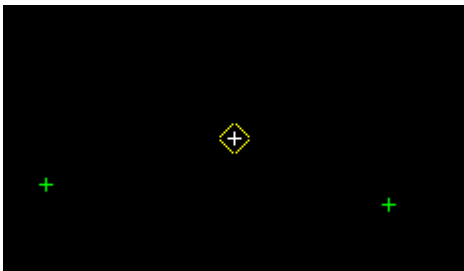
This option allows the creation of a virtual arc given a centre point, radius, start and end points. This option creates an arc of a given radius by selecting in the centre point and the start and end positions.

On selecting **Centre, radius and end points** the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.


STEP 1:

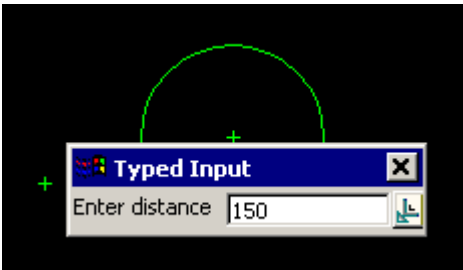
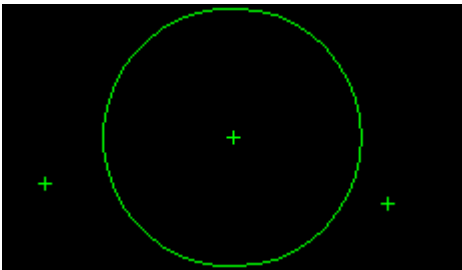
A centre point is selected with the mouse or entered in via the keyboard. To specify a centre point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter a centre point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the Enter key.

After the centre point is accepted a circle will be displayed 'rubber banding' to the various solutions according to the position of the cursor. This will continue until the start point is selected and accepted.



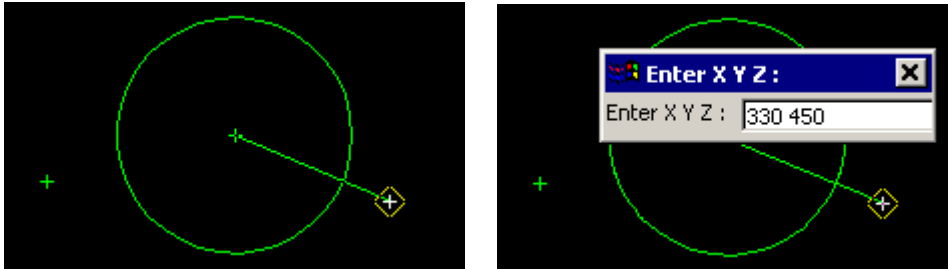
STEP 2:

A radius value is selected with the mouse or entered in via the keyboard. To specify a radius value with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter radius value with the keyboard, simply start typing or press the space bar to bring up the Radius Input box. Type the radius value into the Radius Input box and press the Enter key. The browse button  on the Input box can be used to define the arc distance by measuring existing elements.



STEP 3:

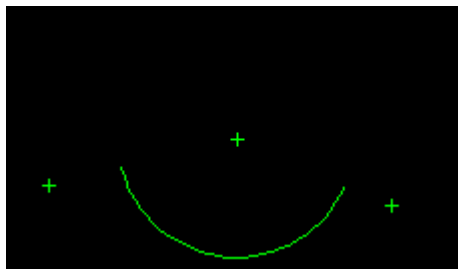
A start point defines the start of the sweep angle to define where to start the arc. It can be selected with the mouse or entered in via the keyboard. To specify a start point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter a start point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the Enter key.

**STEP 4:**

The end point of the arc is specified. The start and end points define the sweep angle to define the arc. The rubber banding of the arc will use the cursor position as the end position until a end point is selected and accepted. It can be selected with the mouse or entered in via the keyboard. To specify a start point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter a start point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key. The end point does not have to be on the arc itself. It is used to define the sweep angle.

**STEP 5:**

The arc is constructed using the given information.

**Centre, start point and sweep angle**

This option creates a virtual arc by selecting a centre point and a start points and giving a sweep angle. The radius of the arc is the distance between the centre and start point.

On selecting **Centre, start point and sweep angle**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

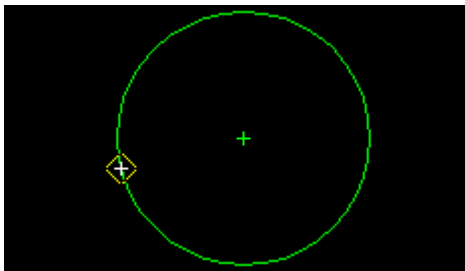
A centre point is selected with the mouse or entered in via the keyboard. To specify a centre point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter a centre point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the Enter key.

After the 1st point is accepted a circle will be displayed 'rubber banding' to the various solutions according to the position of the cursor. This will continue until the 2nd point is selected and accepted.




STEP 2:

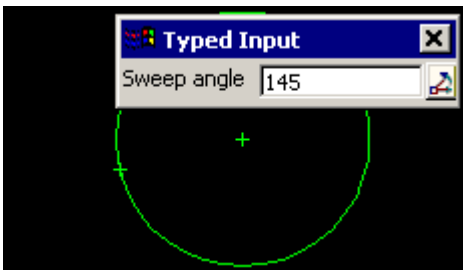
The 2nd point is selected with the mouse or entered in via the keyboard. This point defines the radius as well as the start point of the arc. To specify the 2nd point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter the 2nd point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the Enter key.



STEP 3:

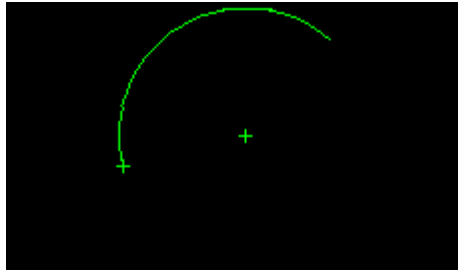
After the 2nd point is accepted, the **Sweep Angle** input box will appear. Type the sweep angle value into the input box and press the enter key. The browse button  on the Input box can be used to define the arc radius by measuring existing elements.

Note: The Page up and page down keys can be used when the input angle box comes up to add or subtract intervals of 90 degrees.



STEP 4:

The virtual arc is created using the information supplied



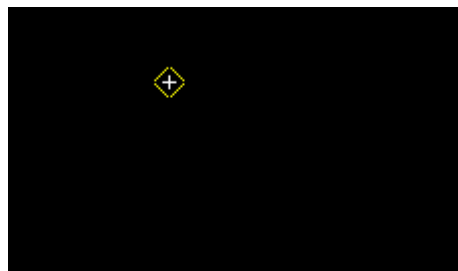
Start point, radius and bearing

This option creates a virtual arc of a given radius, starting at a selected point and bearing of the tangent at the start point and going for a given arc length.


On selecting the **Start point, radius and bearing** option, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

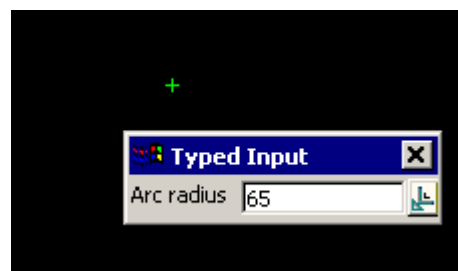
STEP 1:

A start point is selected with the mouse or entered in via the keyboard. To specify a start point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter a start point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the Enter key.




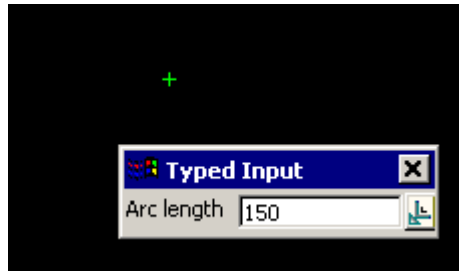
STEP 2:


After the start point is accepted, the Arc Radius Input box will appear. Type the radius value into the Input box and press the enter key. The browse button  on the Input box can be used to define the arc radius by measuring existing elements.



STEP 3:

After the radius has been entered, the **Arc Length** Input box will appear. Type the arc length into the Input box and press the enter key. The browse button  on the Input box can be used to define the arc distance by measuring existing elements.

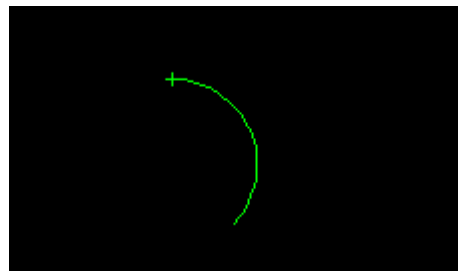
**STEP 4:**

After the arc length is accepted, the Bearing Input box will appear. Type the bearing into the Input box and press the enter key. The browse button  on the Input box can be used to define the bearing by measuring existing elements.

Note: The Page Up and Page Down keys can be used when the Bearing Input box comes up to add or subtract intervals of 90 degrees.

**STEP5:**

The virtual arc is created with the given information.

**Start point, radius and chord**


This option creates a virtual arc of a given radius, starting from a selected point and with a given chord bearing at the start point and a given arc length.

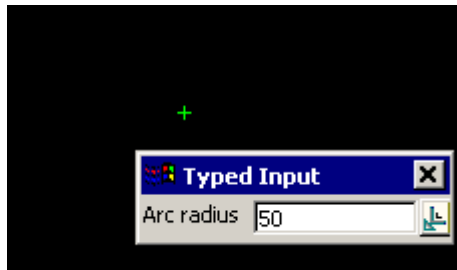
On selecting **Start point, radius and chord**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.


STEP 1:

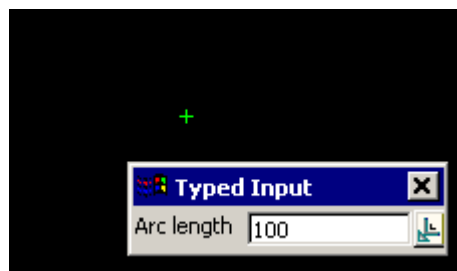
The start point is selected with the mouse or entered in via the keyboard. To specify the start point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter the start point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the Enter key.


**STEP 2:**

After the start point is accepted, the **Arc Radius** Input box will appear. Type the radius value into the Input box and press the enter key. The browse button  on the Input box can be used to define the arc radius by measuring existing elements.

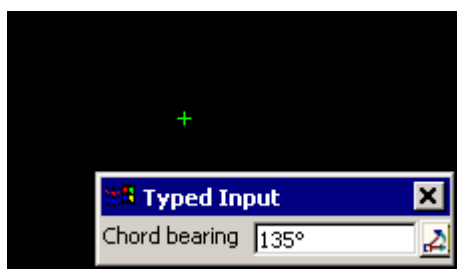
**STEP 3:**

After the arc radius is entered, the **Arc Length** Input box will appear. Type the arc length into the Input box and press the enter key. The browse button  on the Input box can be used to define the arc distance by measuring existing elements.

**STEP 4:**

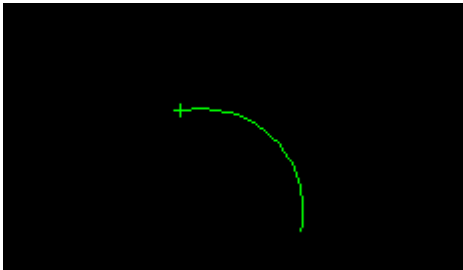
After the arc length is entered, the **Chord Bearing** Input box will appear. Type the bearing into the Input box and press the enter key. The browse button  on the Input box can be used to define the bearing by measuring existing elements.

Note: The **Page Up** and **Page Down** keys can be used when the **Chord Bearing** Input box comes up to add or subtract intervals of 90 degrees.



STEP 5:

A virtual arc is created with the given information.



Start point, radius, chord length and bearing

This option creates a virtual arc of a given radius, starting from a selected point, with a given bearing of the tangent at the start point and a given chord length from the start point.


On selecting **Start point, radius, chord length and bearing**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

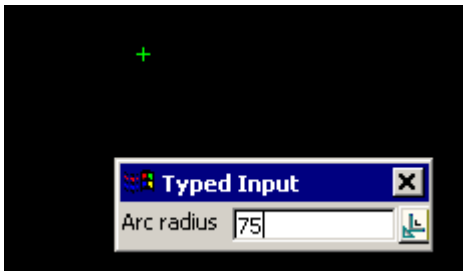
STEP 1:

A start point is selected with the mouse or entered in via the keyboard. To specify a start point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter a start point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.




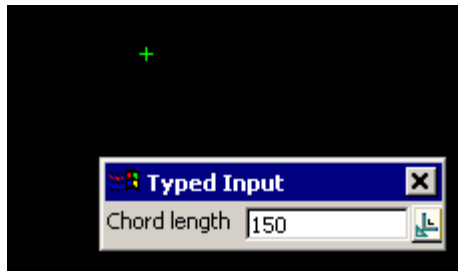
STEP 2:


After the start point is accepted, the **Arc Radius** Input box will appear. Type the radius value into the Input box and press the enter key. The browse button  on the Input box can be used to define the arc radius by measuring existing elements.



STEP 3:

After the radius has been entered, the **Chord Length** Input box will appear. Type the chord length into the Input box and press the enter key. The browse button  on the Input box can be used to define the chord length by measuring existing elements.

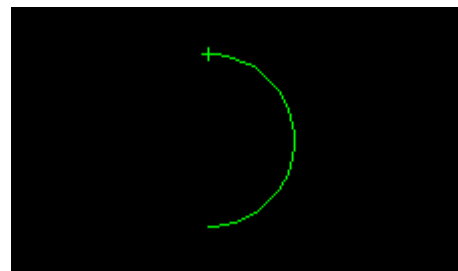
**STEP 4:**

After the chord length has been entered, the **Bearing** Input box will appear. Type the bearing of the start tangent into the Input box and press the enter key. The browse button  on the Input box can be used to define the bearing by measuring existing elements.

Note: The Page Up and Page Down keys can be used when the Bearing Input box comes up to add or subtract intervals of 90 degrees.

**STEP 5:**

The virtual arc is created with the given information.








String Edits Toolbar

Position of option on menu: various

The String edits toolbar is:



Options on Toolbar

- | | |
|-----------------------------------------------------------------------------------|-------------------------|
|  | edit string |
|  | edit vertex |
|  | edit segment properties |
|  | edit vertex properties |
|  | change strings |

For the option *Edit string*, go to
 Edit vertex
 Edit segment properties
 Edit vertex properties
 Change string

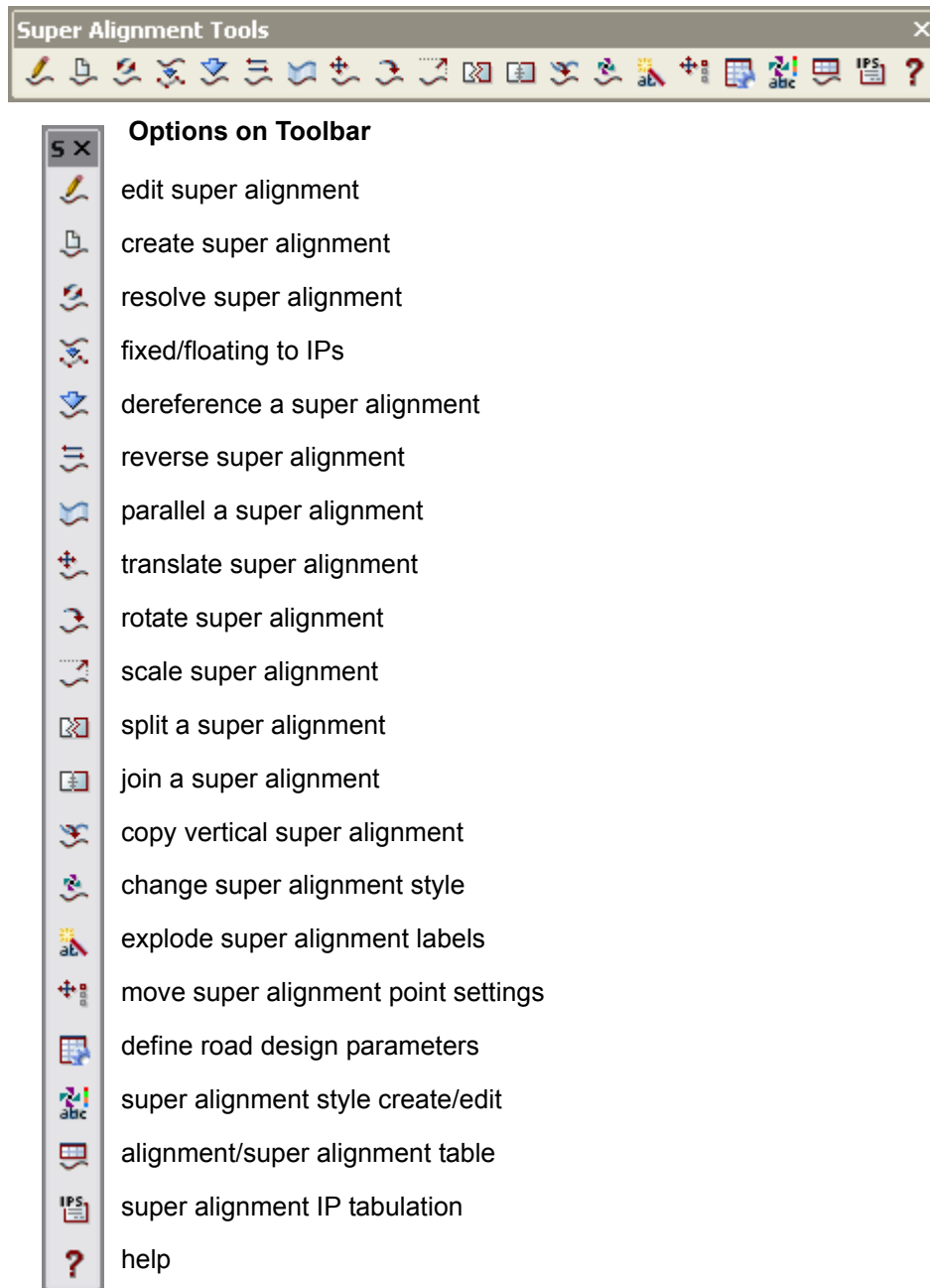
- [Editor](#)
- [Edit Vertex](#)
- [Segment](#)
- [Vertex](#)
- [Change](#)



Super Alignment Tools Toolbar

Position of option on menu: various

The Super Alignment Tool toolbar is:



For edit super alignment go to

create super alignment
 resolve super alignment
 fixed/floating to IP's
 dereference a super alignment
 reverse super alignment
 parallel a super alignment
 translate super alignment
 rotate super alignment

[Edit Super Alignment](#)

[Create - Super Alignment](#)

[Resolve a Super Alignment](#)

[Convert Fixed/Floating Elements to IPs](#)

[Dereference Super Alignments](#)

[Reverse Super Alignment](#)

[Parallel a Super Alignment](#)

[Translate Super Alignment](#)

[Rotate Super Alignment](#)

scale super alignment
split a super alignment
join a super alignment
copy vertical super alignment
change super alignment style
explode super alignment labels
move super alignment point settings
define road design parameters
super alignment style create/edit
alignment/super alignment table
super alignment IP tabulation
help

[Scale Super Alignment](#)
[Split a Super Alignment](#)
[Joining Two Super Alignments](#)
[Copy Vertical Geometry](#)
[Change the Styles for Selected Super Alignments](#)
[Explode the Super Alignments Labelling](#)
[Constrain the Movement of Super Alignment Points](#)
[Define Design Parameters - from V9](#)
[Super Alignment Style](#)
[Alignment & Super Alignment Table](#)
[Super Alignment IP Tabulation](#)
[SA Element Parts Viewer](#)
























Survey Reductions Toolbar

Position of option on menu: various

The Survey Reductions toolbar is:



S X	Options on Toolbar
	survey menu
	create control stations
	bearing/distance entry
	traverse adjustment
	horizontal least squares adjustment
	level nets adjustment
	set up data collector
	download survey data
	convert raw survey file to 12d field file
	survey data reduction function
	quick change code
	join surveyed strings
	insert target height
	start new survey strings
	auto order survey shots
	order by survey point ids
	reset order to original order
	edit survey data
	edit survey field data by string
	lock a function
	edit a text file

For the option *Survey menu*, go to

Create control stations

Bearing/distance entry

Traverse adjustment

Horizontal least squares

Level network adjustment

Set default data collector

Download from data collector

[Survey](#)

[Create - Control Stations](#)

[Plane Bearing/Distance Entry](#)

[Traverse Adjustment](#)

[Least Squares Network](#)

[Level Network](#)

[Setup](#)

[Download Raw](#)








<i>Convert data collector file to field file</i>	<u>Convert Raw</u>
<i>Create survey data reduction function</i>	<u>Create Survey Function</u>
<i>Survey code change</i>	<u>Quick Change</u>
<i>Join strings</i>	<u>Join Two Strings of Same Feature Code</u>
<i>Insert target height</i>	<u>Insert Target Height</u>
<i>Start new string</i>	<u>New String</u>
<i>Auto order string points</i>	<u>Auto Order</u>
<i>Order by points</i>	<u>By Points</u>
<i>Remove ordering</i>	<u>Remove Order</u>
<i>Edit survey data</i>	<u>Field Data</u>
<i>Edit field data by picking a string</i>	<u>Field Data by String</u>
<i>Lock a function</i>	<u>Lock</u>
<i>Edit a report file</i>	<u>Edit</u>

Tin Utility Toolbar

Position of option on menu: various

The Tin Utility toolbar is:



T X	Options on Toolbar
	create a tin
	quick triangulation selection
	null a tin by angle and length
	tin to tin depth polygons
	contour, smooth and label a tin
	intersect two tins
	translate/copy a tin

For the option *Create a tin*, go to

Quick triangulation selection

Null by angle and length

Tin to tin depth polygons

Contour, smooth and label

Intersect two tins

Translate/copy a tin

[Triangulate Data](#)

[Quick Tin](#)

[Null by Angle and Length](#)

[Depth Range Polygons](#)

[Contour, Smooth and Label](#)

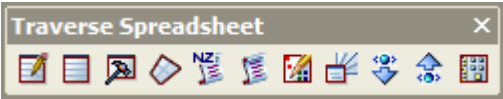
[Intersection](#)

[Translate/Copy](#)












Traverse Spreadsheet Toolbar

Position of option on menu: various

The Traverse spreadsheet toolbar is:



Options on Toolbar

	edit traverse spreadsheet
	create a traverse spreadsheet
	traverse spreadsheet utilities
	lot check for tss
	New Zealand traverse spreadsheet report
	standard traverse spreadsheet report
	drafting of traverse spreadsheet
	drafting of radiation tables
	read a Landonline XML file
	write a Landonline XML file
	set up parameters for traverse spreadsheet

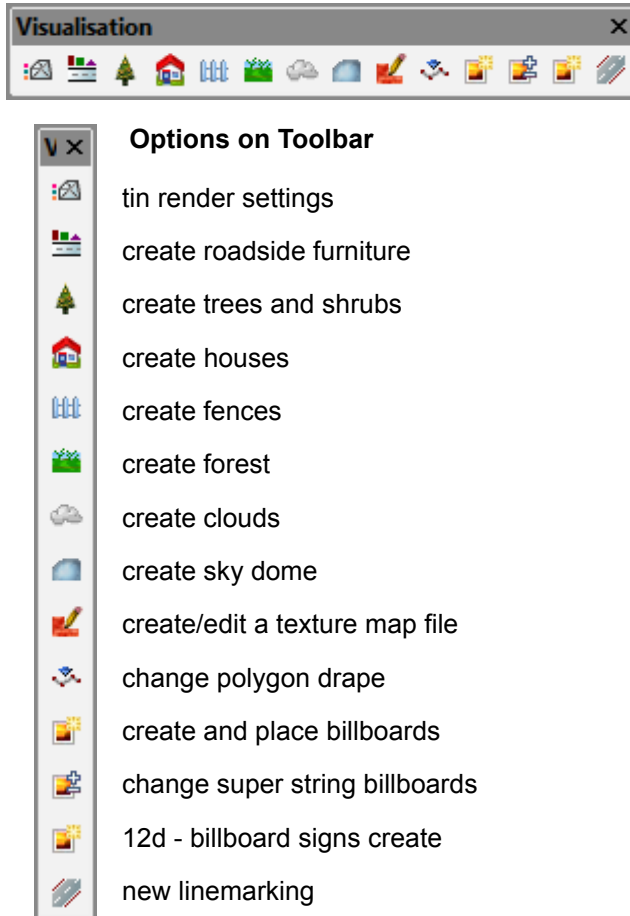
For the option *Edit traverse spreadsheet*, go to
 Create a traverse spreadsheet
 Traverse spreadsheet utilities
 Lot check for traverse spreadsheet
 NZ traverse spreadsheet report
 Traverse spreadsheet report
 Traverse spreadsheet drafting
 TSS radiation tables drafting
 Read Landonline XML
 Write Landonline XML
 Set up tss parameters

[TSS Edit](#)
[TSS Create](#)
[TSS Utilities](#)
[Lot Check](#)
[NZ TSS Report](#)
[Standard TSS Report](#)
[TSS Drafting](#)
[TSS Radiation Table Drafting](#)
[Landonline XML Read](#)
[Landonline XML Write](#)
[TSS Parameters](#)

Visualisation Toolbar

Position of option on menu: various

The Visualisation spreadsheet toolbar is:



For the option *Tin render settings*, go to

Create roadside furniture

Create trees and shrubs

Create houses

Create fences

Create forest

Create clouds

Create sky dome

Create/edit texture map file

Change polygon drape

Create and place billboards

Change super string billboards

12d - billboard signs create

New linemarking

[Render Settings](#)

[Roadside Furniture](#)

[Trees/Shrubs as Faces and Billboards](#)

[Houses](#)

[Fences](#)

[Create Forest](#)

[Clouds](#)

[Sky dome](#)

[Texture Map Edit](#)

[Render Drape](#)

[Create and Place Billboard](#)

[Add and Remove Billboard from Super String](#)

[12D - Billboard Signs Create](#)

[Line Marking \(New\)](#)

Track Toolbar

Position of option on menu: various

The Track toolbar is:



T	×	Options on Toolbar
		calc cl panel
		read turnouts
		write turnouts file
		turnouts create/edit
		turnout place
		copy vc
		rail slew calculator
		cant panel
		plot rails panel

For the option calc cl, go to	Calc CL Panel
read turnouts	Read Turnouts
write turnouts file	Write Turnouts File
turnouts create/edit	Turnouts Create/ Edit
turnout place	Turnout Place
copy vc	Copy VC
rail slew calculator	Rail Slew Calculator
calculate cant	Calculate Cant
plot rails panel	Plot Rails Panel

To return to the beginning of this chapter, click on [Tools and Concepts](#).

5 Starting Up

The **Starting Up** chapter contains information about how to start **12d Model**, organising **12d Model** error logging and how to run chains and macros when starting up **12d Model**.

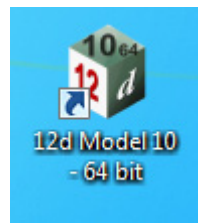
Go to [Initial Screens](#)
[Organizing Working Areas](#)
[Error Logging File](#)
[Running Macros and Chains on Start Up](#)

Initial Screens

When **12d Model** is installed from the **12d** Installation CD, the **12d** icon **12d Model 10** is created.



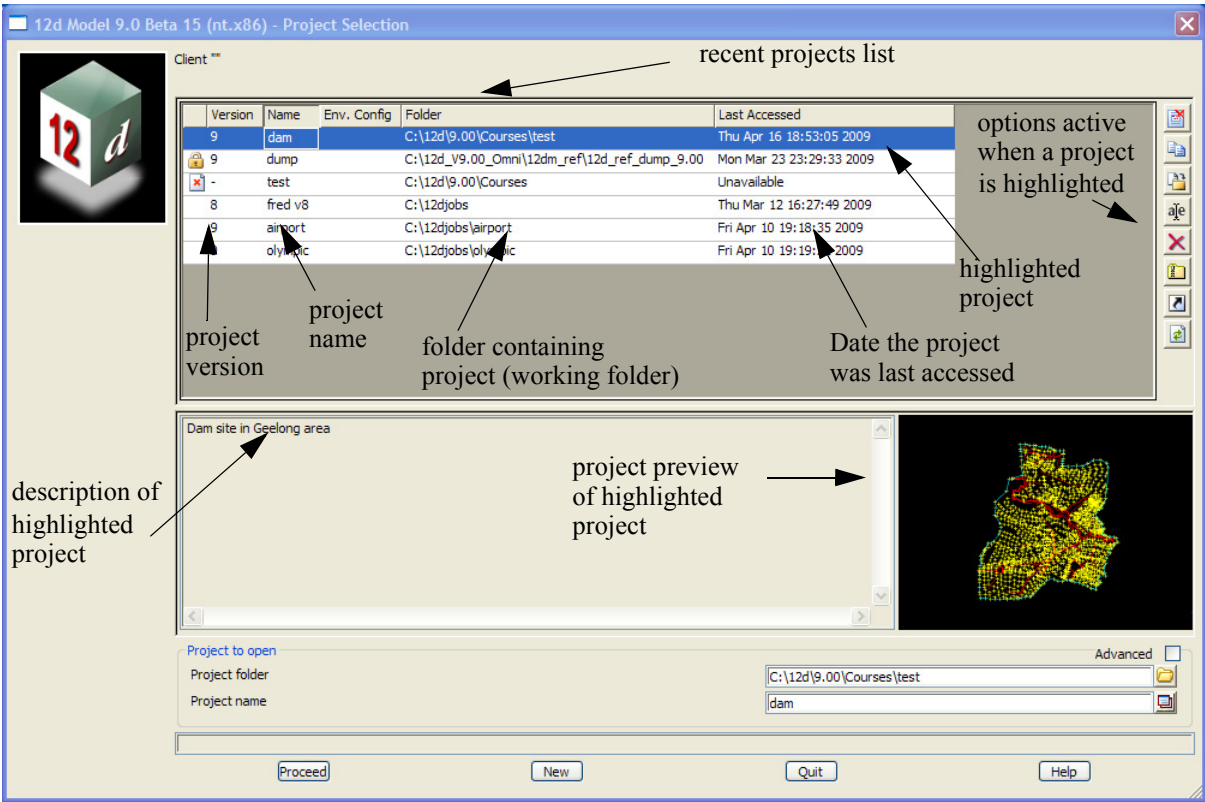
icon for 12d Model 32 bit exe



icon for 12d Model 64 bit exe

The **12d Model** icon is a **shortcut** to start **12d Model** and then attach to the folder C:\12d\10.00.

Clicking the **12d Model** icon starts **12d Model**. First the **12d Model** splash screen will appear and then the initial **12d Model** screen with the **Project Selection** panel.



Note

If this does not work, please contact your 12d Model administrator to check the procedure to be used on your system. For a detailed description on how to install 12d Model, please refer to the *Installing 12d Model* chapter in the *Getting Started* manuals.

To select a project is the **Recent projects list**, simply double click on the entry in the list and 12d Model will open the project up.

Alternatively, the Project folder and Project name fields can be used to select another project.

To open an existing project not on the *recent projects list*, simply provide

- (a) the name of the folder that the project is in (working folder)
- (b) the name of the project inside the working folder (working project).

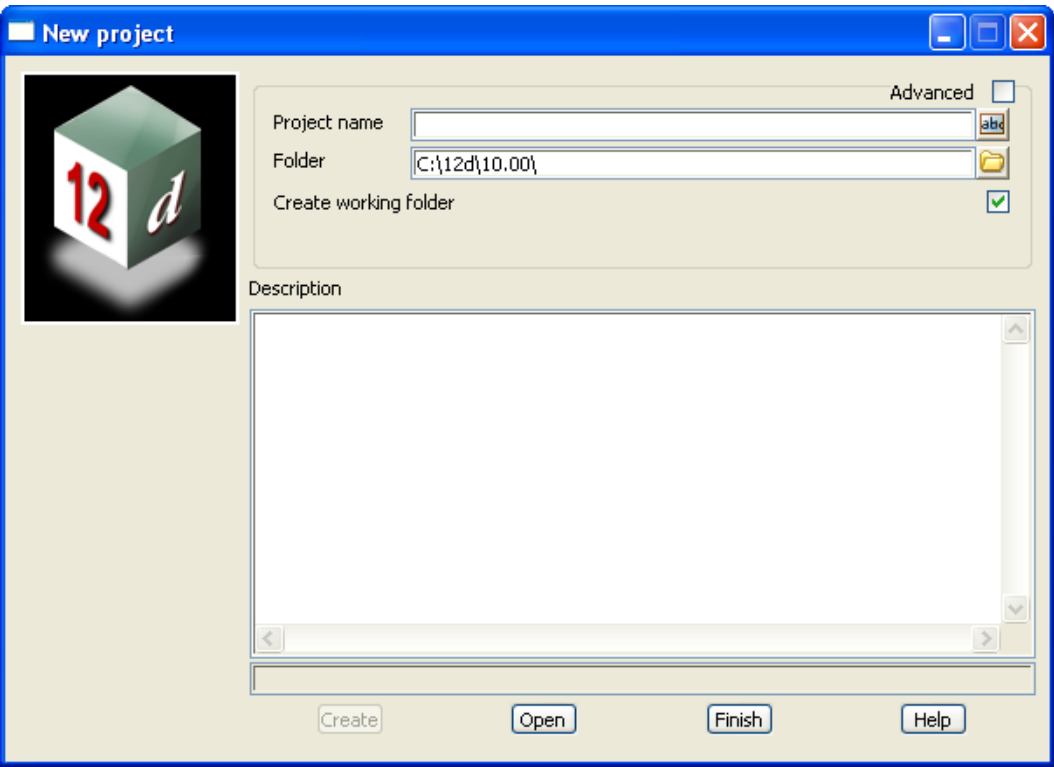
If no folder is given, the project is assumed to be in the folder the user is currently in.

If the project does not exist, a new project is created.

The description of the functions of the fields and buttons in the **Project Selection** panel are:

Field Description	Type	Defaults	Pop-Up
Recent projects list	output	recent projects	
<i>names and folders of project recently select. Single clicking on an entry in the list displays the projects description in the Project description area. Double clicking on an entry in the list changes to this project</i>			
Project description	output		
<i>description of the project highlighted in the Recent projects list.</i>			

To create a **new** project, click on the **New** button which brings up the **Create New Project** panel.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Advanced				
		tick box		
<i>if tick, environment configurations can be assigned to the project and extra panel fields are displayed to allow for this. For more information, please go to the section New Project Panel with Advanced Ticked in the chapter Projects.</i>				
<i>If not tick, no extra panel fields are displayed.</i>				
Project name		typed input		
<i>name of the new project to be created.</i>				
Folder		folder box	current folder	select folder panel
<i>if Create working folder is ticked, a folder with the same name as the project is created in the folder given in this panel field, and the project will be created inside this folder with the same name as the project. This is to encourage the habit of creating a folder of the same name of the project and then creating the project inside the folder.</i>				
<i>If Create working folder is not ticked, the project is created in the folder given in this panel field.</i>				
Create working folder		tick box		
<i>if tick, a folder of the same name as the project is created in the folder Folder, and the project is created inside this folder. The folder with the same name as the project is then the working folder.</i>				
<i>If not tick, the project is created in the folder Folder and this folder is the working folder.</i>				
Description		typed input		
<i>a description of the project can be typed into this field. This is stored with the project.</i>				
Create		button		
<i>after selecting this button, the new project created in either the Folder or if Create working folder</i>				

is ticked, inside a folder created in the **Folder** of the same name as the project.

12d Model then opens the newly created project.

Open button

goes back to the **Project Selection** panel for opening an existing project (see the section [Initial Screens](#)).

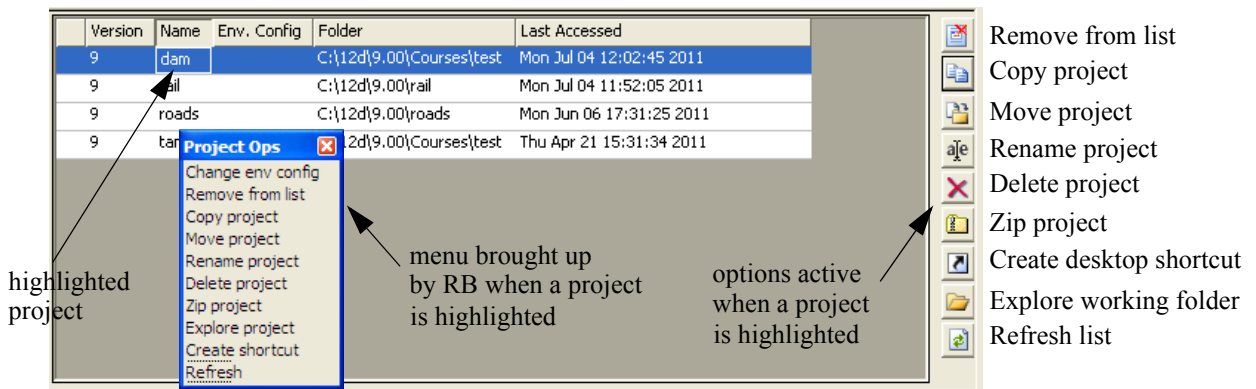
Quit button

exit out of **12d Model**.

For information on options when a project is highlighted, go to the next section [Options on Highlighted Project in Selection Panel](#)

Options on Highlighted Project in Selection Panel

When a project is highlighted in the list of recent projects, icons for options are activated on the right hand side of the **Project Selection** panel, and a **Project Ops** menu (which contains the same options), can be brought up by clicking **RB** anywhere in the recent projects list area.



Remove from list - remove the project from the *recent projects* list

Copy project - copy the project and the working folder

Move project - move the project and working folder to a new folder

Rename project - rename the project and the working folder

Delete project - delete the project and the working folder

Zip project - zip up the project and the working folder

Create desktop shortcut - create a shortcut on the desktop that starts **12d Model** and opens the project - see [Project Shortcuts](#)

Explore working folder - open Windows Explorer and show the contents of the working folder

Refresh list - refresh the *recent projects* list

Change env configuration - change the environment configuration. This is only available on the **Project Ops** menu.

These options are documented in the section [Options Active When Project Highlighted](#) in the chapter [Projects](#).

Go to the next section [Organizing Working Areas](#)

Organizing Working Areas

For each project, 12d Model creates a unique sub-folder of the working folder with the name consisting of the project_name followed by **.project**. For example, for the project **Olympic**, and folder called **Olympic.project** is created.

This sub-folder (Olympic.project) is called the **project area**. All the internal 12d Model information for that project is kept inside the project area.

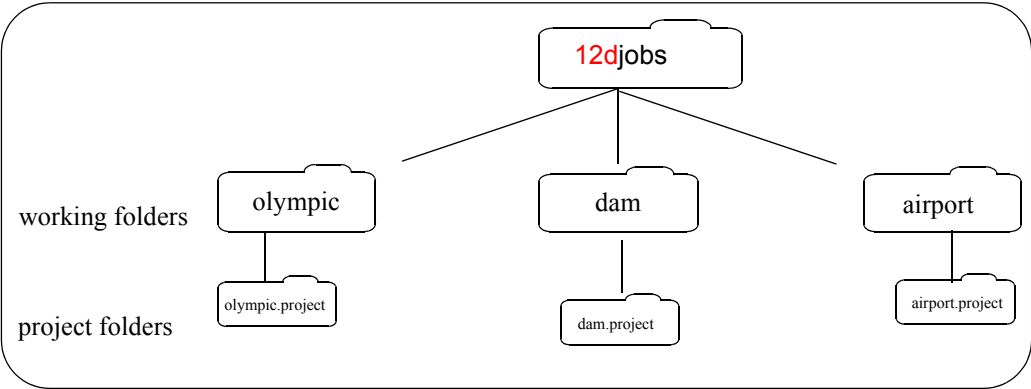
All outputs, reports and plots are written to the working folder (the folder containing the project) and are **not** held inside the project area.

Hence to get a complete backup of the project and all associated information, it is best to **backup the entire working folder**.

The project name, which can be up to 256 alphanumeric characters and can include spaces, must be unique within the working folder but other folders may include 12d Model projects with the same name - these projects are distinct and are not related in any way.

There is no limit to the number of projects in a particular working folder but because all the outputs, reports and plots for each project in the same working folder would be mixed in together, **it is recommended to have each project in its own working folder**. That way the inputs files, output files, plots, reports etc. from the separate projects do not end up in the same working folder. Each separate working folder can then be easily backed up.

As an example, if three unrelated projects - olympics, airport, and dam - are to be created in a folder called 12djobs, it is suggested that the project **olympic** is created in a **sub folders** of 12djobs called **olympic**, **dam** is created in a **sub folders** of 12djobs called **dam** and **airport** is created in a **sub folders** of 12djobs called **airport**.



To help users adhere to this convention, when creating new projects, there is a Create working folder tick box which if ticked, will first create a folder of the same name as the project being created and then create the project in that folder.

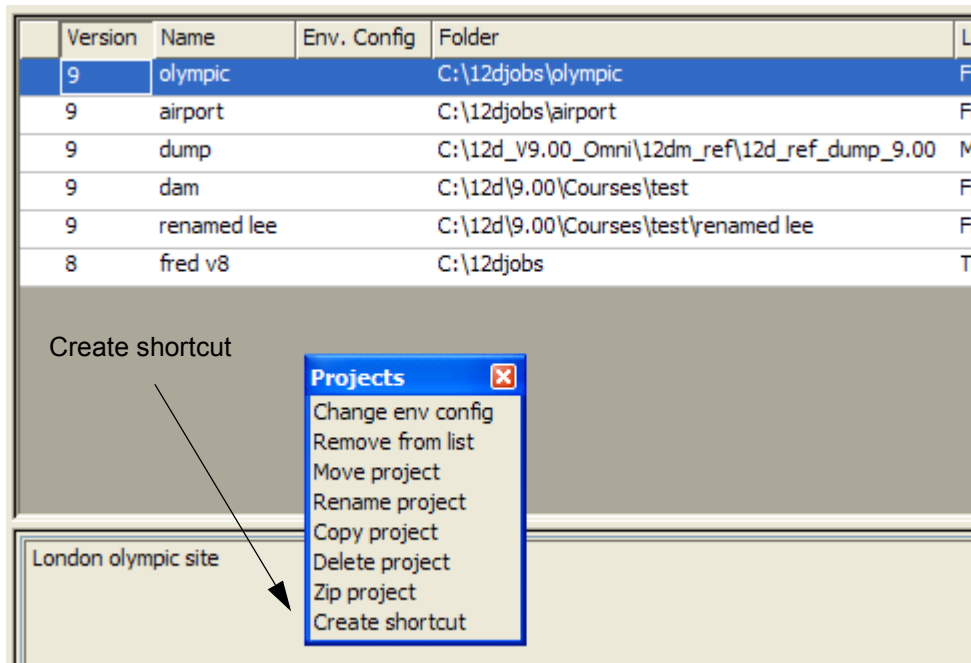
Project Shortcuts

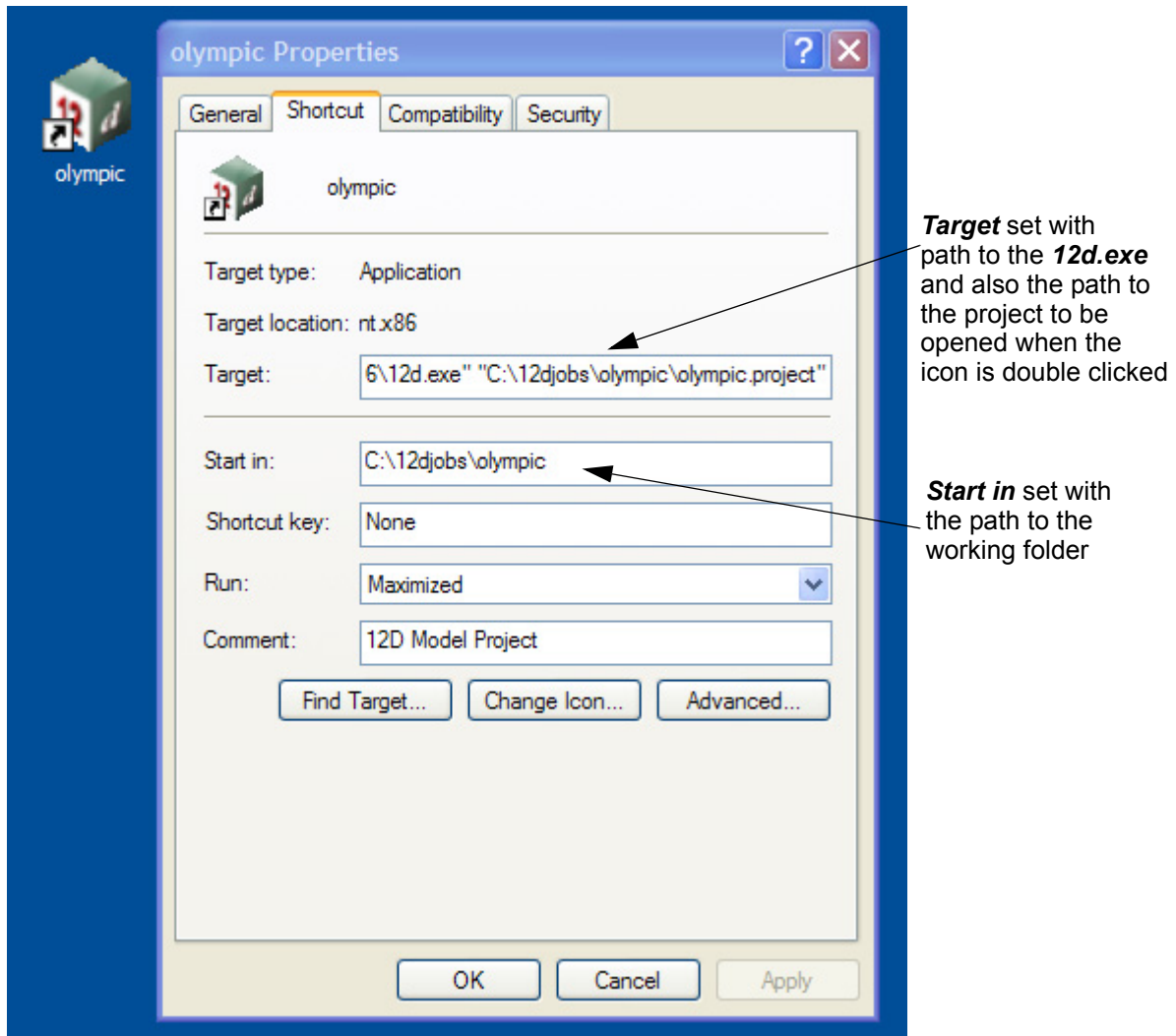
The list of most recent projects makes it very easy for 12d operators to get into their projects.

However if there is a folder of projects, or even a particular project, that a user wants to get into by simply double clicking on an Icon on the screen, then a Windows shortcut can be used to do it.

The easiest way to create the shortcut is to first make sure that the project is in the recent projects list. To do this, just open up the project and then exit **12d Model**.

Then start up **12d Model** again by clicking on the **12d Model 9** icon on the desktop, highlight the project in the **recent projects list** and then click RB to bring up the Projects menu and select **Create shortcut**. This will create an shortcut on the desktop with the name of the project, and the shortcut set to open up the project when it is double clicked.



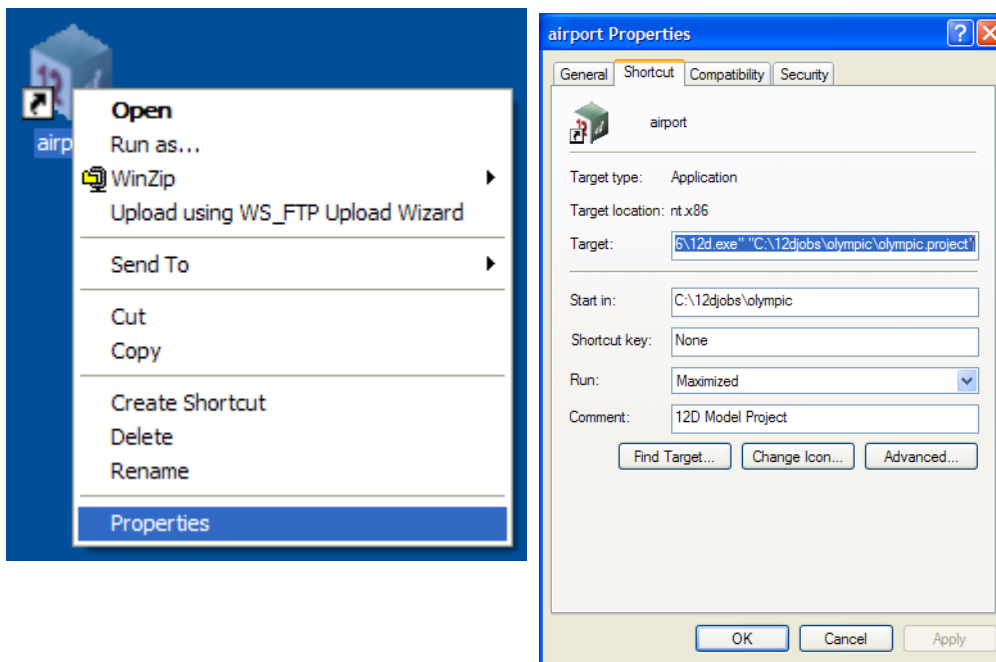


This can also be done by hand by copying a **12d Model 9** icon that is already on the screen, rename the copied icon to the name of the project (say *airport*).

The Properties for the icon *airport* must now be modified to point to the project *airport*

To display and modify the properties of an icon, click RB over the icon and select *Properties* from the menu.

Click on the *Shortcut* tab



The Properties for the icon *airport* can now be modified.

If an icon is to start in a given folder, then the **Start in** field is set to the desired folder.

For example, if the **12d Model** project *airport* was in the folder "12djobs\airport", set the **Start in** for the icon *airport* to:

"C:\12djobs\airport"

The icon *airport* would then automatically start in the folder **C:\12djobs\airport**

Note that if the pathname for **Start in** contain spaces, then it must be enclosed in double quotes ("").

If the *airport* icon was double clicked on, it would now attach to the working folder *airport*

Only the appropriate project would then need to be selected from the project field of the **12d Model Project Selection** panel

Further, if a project such as *airport* already exists in the folder, then by setting the **Target** field, the icon can be set so that **12d Model** starts up in that existing project.

If the **Target** for the shortcut has the **project_name** added after the path to 12d.exe, then **12d Model** will actually start up with that project opened. The project_name can be a path name.

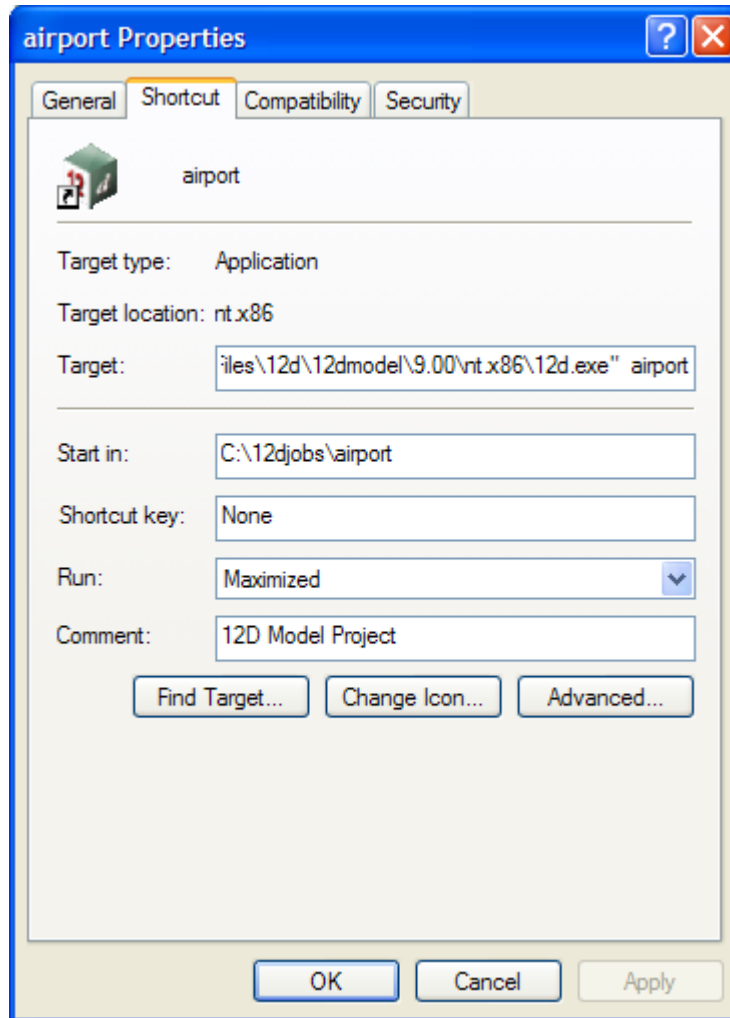
For example, the **Target**:

"C:\12d\12dmodel\10.00\nt.x86\12d.exe" airport

would automatically open the project *airport* in the **Start in** folder of the shortcut.

Note that if either the pathname for the Target or the project_name contain spaces, then they must be enclosed in double quotes ("").

The following picture shows the Properties setting for **Target** and **Start in** for the *airport* icon so that double clicking on *airport* would automatically start **12d Model** with the project *airport* in the folder **C:\12djobs\airport**



Environment Variables Shortcut

If a file of 12d Model environment variables has been set up by the user (see section [Environment Variables](#) in Appendix [Setting Up and Configuring 12d](#)), then instead of setting the environment variable ENVIRONMENT_4D to point to the file or setting it up with the default name, env.4d, the environment file can be passed to **12d Model** using the **Target** of the icon properties.

For example, the **Target**:

```
C:\12d\12dmodel\10.00\nt.x86\12d.exe -env F:\12d\env.4d
```

would fire up 12d using the file of environment variables called F:\12d\env.4d

The **Target**:

```
C:\12d\12dmodel\10.00\nt.x86\12d.exe -env F:\12d\env.4d airport
```

would fire up 12d using the file of environment variables called F:\12d\env.4d **and** also automatically open the project **airport** in the **Start in** folder of the shortcut.

Again if any of the pathnames contain spaces, then they must be enclosed in double quotes ("").

Please continue to the next section [Error Logging File](#).

Error Logging File

When **12d** Model starts up, it tries to create an **error logging file**, called

log?????.4de

where **?????** is a hashed number using your login name, process id & the current time.

When **12d** Model terminates, the error log file is deleted if no errors were logged.

The **folder** that the error log file is created in is given by the environment variable LOG_DIR_4D

If LOG_DIR_4D is not used, **12d** Model tries to create the log file in the current folder, the HOME folder, the TMP folder and the TEMP folder.

If creating a **error log file** fails in all these areas, **12d** Model will not start up. This should never happen.

Please continue to the next section [Running Macros and Chains on Start Up](#).

Running Macros and Chains on Start Up

To allow for tailoring *12d Model* when a new project is created or an existing project opened, *12d Model* runs user supplied files of macros and/or chains.

For **new** projects, the default name of the file is

macros.4d

This can be changed to a different file by setting the environment variable

`RUN_MACROS_FILE_4D` *file_of_macros_to_run_for_new_projects*

For **existing** projects, the default name of the file is

project_macros.4d

This can be changed to a different file by setting the environment variable

`RUN_PROJECT_MACROS_FILE_4D` *file_of_macros_to_run_for_existing_projects*

(the environment variables can be set on the **Extra A** tab of the env.4d editor - see [env.4d](#))

The files consist of macros and/or chains, one per line, where

for macros, just the *name of the macro* is needed on the line

and for chains, the command **run_chain** *name_of_the_chain* is needed on the line.

The macros and chains are run in the order that they occur in the file.

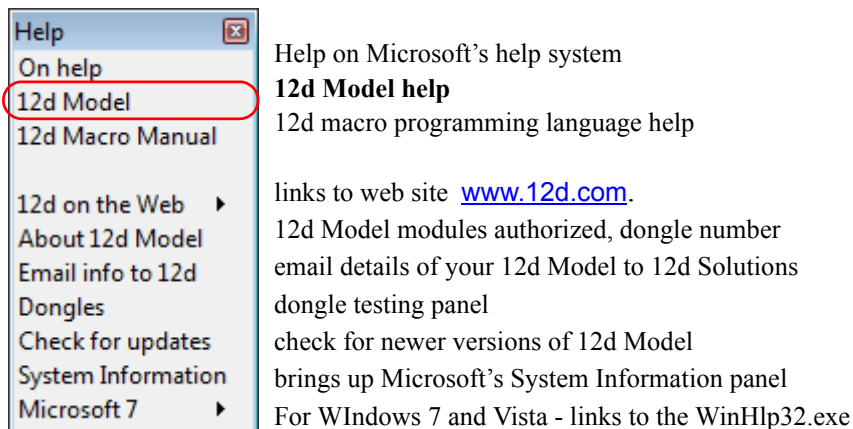
To return to the beginning of this chapter, click on [Starting Up](#).

6 12d Model Help

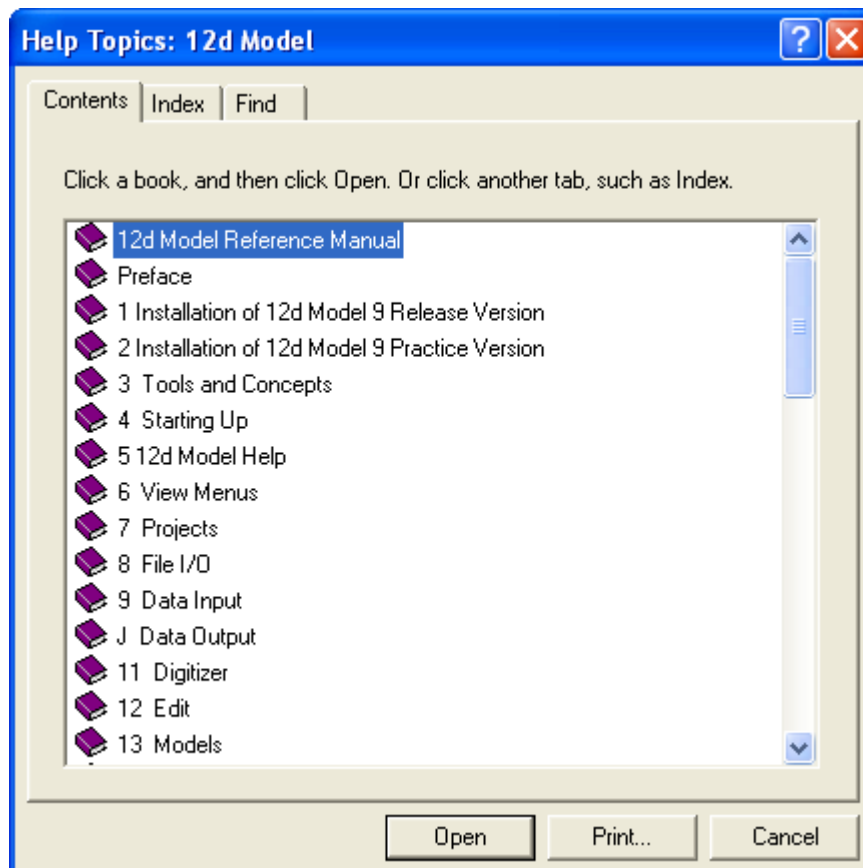
Position of option on menu: Help =>12d Model

From *12d Model V5.0* onwards, the 12d Model Reference manual has been supplemented by electronic **Help** accessed from within *12d Model* (also know as the **12d Model** context sensitive Help).

The entire *12d Model Help* manual can be accessed by selecting *12d Model* on the **Help** menu item on the main *12d Model* menu.



Clicking on 12d Model brings up **Help Topics: 12d**



The panel **Help Topics: 12d** is actually using Microsoft's **WinHlp** system and it allows you to look

at the overall structure of the *12d Model Help* and access any part of it. More information on using the tabs **Contents**, **Index** and **Find** will follow in the next section.

Alternatively, individual topics for a panel or menu can be invoked by pressing the F1 key whenever the focus is on the menu or panel, or by clicking on the *Help* button on any *12d Model* panel (see [F1 Key](#)). This is the *context sensitive* nature of the **12d Model Help**.

For some options, there is also additional help files and videos. This is denoted by a * after **Help** on the **Help** button. That is **Help*** (see [Extra Help](#)).

It is also possible to have a **Help** button and **F1** key available for **12d Model** macro programs written by 12d Solutions or by Users. Please see the *12d Model Macro Language Programming* manual for more information on this feature.

Note: The *12d Model Reference* manual is available in pdf on the *12d Model* installation DVD, or on the 12d web site www.12d.com.

More information on the **Help** system will now be given in the next section [Contents](#).

and the following sections

[Index](#)

[Find](#)

[Panel Help Button](#)

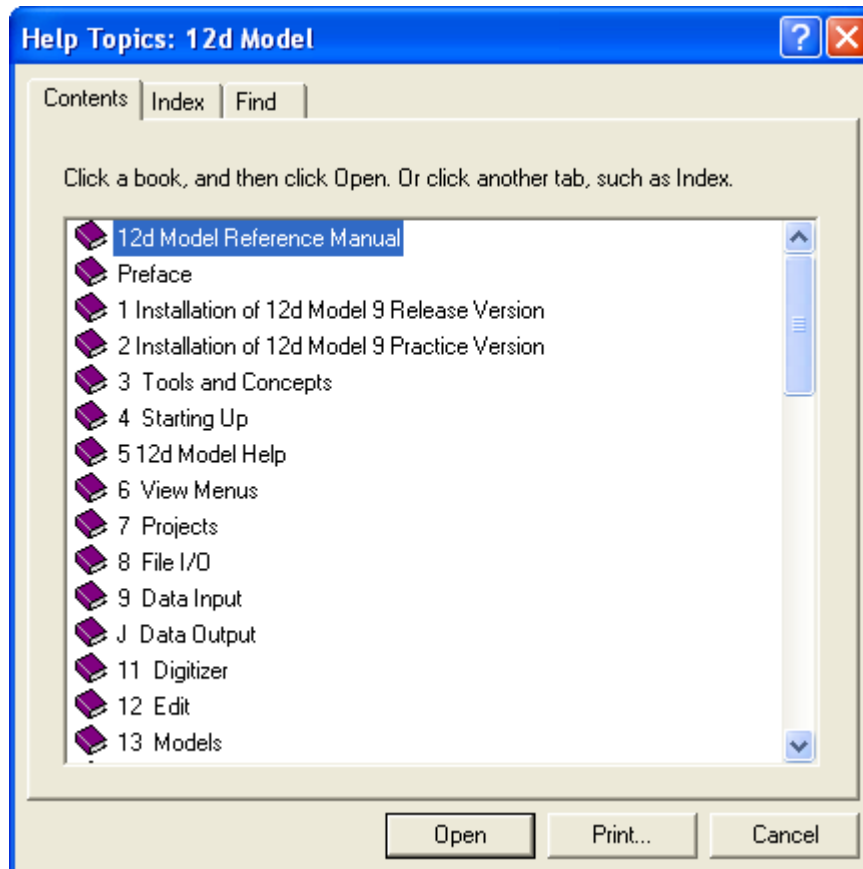
[F1 Key](#)

[Navigating in Help](#)

[Extra Help](#)

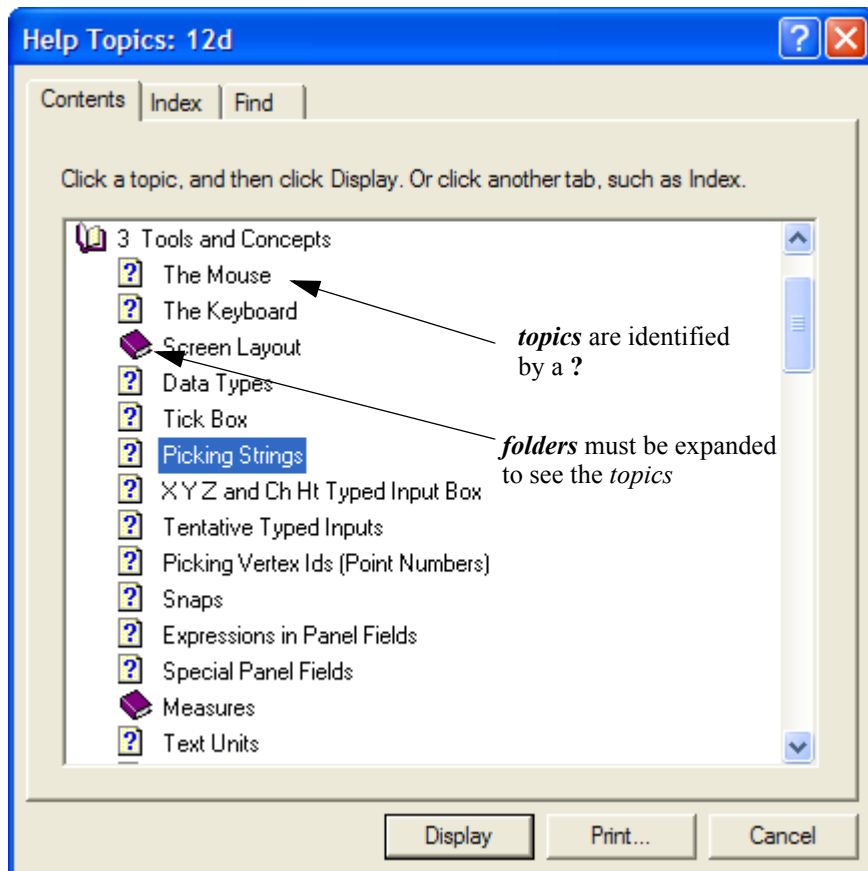
Contents

The **Contents** tab allows you to look at the overall structure of the *12d Model Help* and access any part of it.



Warning - only *topics* in the *Contents* can be viewed in *Help* so any folders in *Contents* folders must be expanded until *topics* are displayed. *Topics* can be easily identified because they have a question mark beside them indicating that *Help* is available and can be viewed.

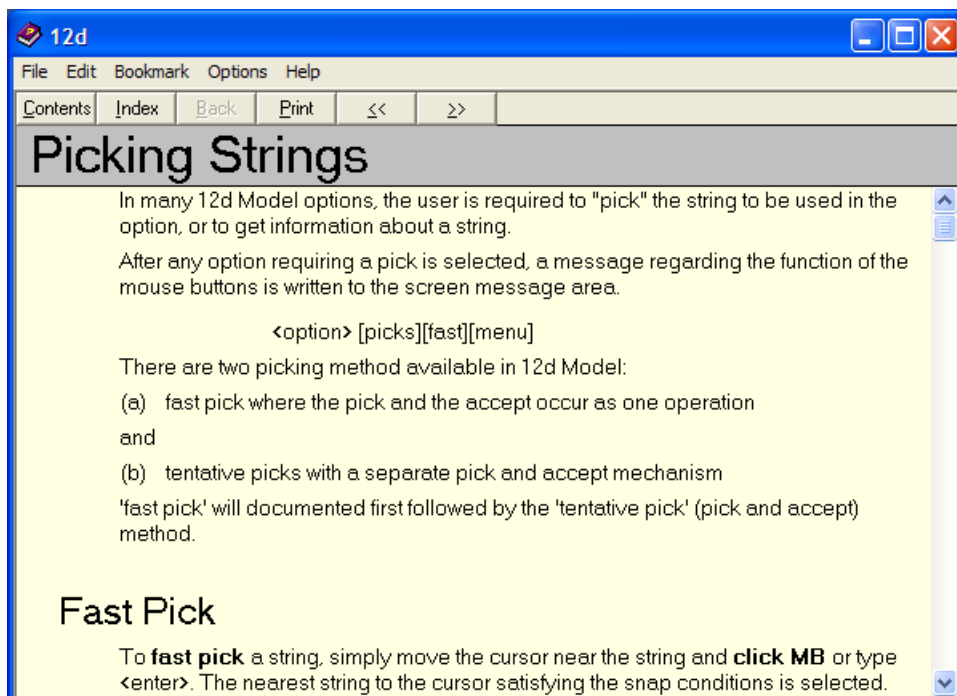
For example, double clicking on ***Tools and Concepts*** expands the next level of ***Tools and Contents***.



and topics are *The Mouse*, *The Keyboard* etc.

Double clicking on the topic **Picking Strings** will then display the topic.

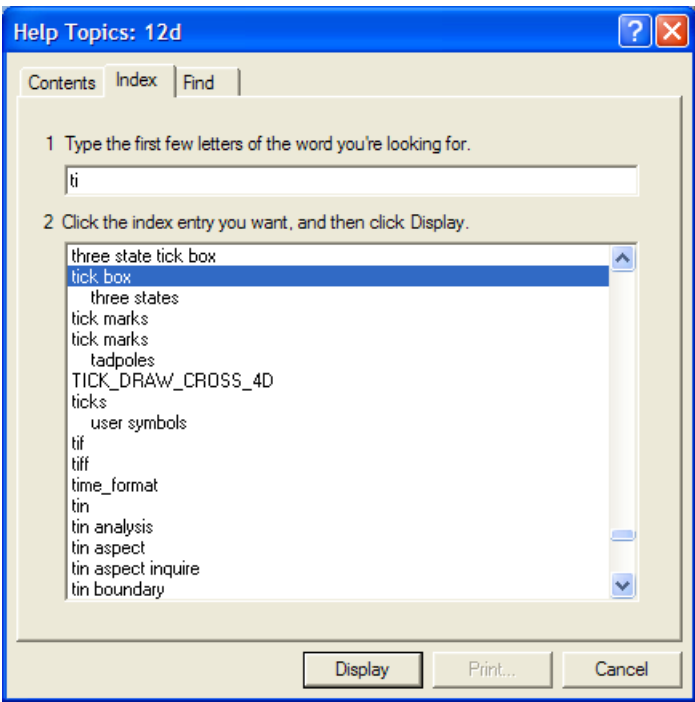
The **Contents** then disappear leaving *Help* open at the selected topic.



Double clicking on **Contents** on the top of the *Help* will bring the Contents listing back up.
More information on the **Help** system will now be given in the next section [Index](#).

Index

The *Index* tab searches through all entries in the Index of the Help. As the first few characters of the required entry are typed in, the matching index entries are displayed.



Double clicking on the displayed entries will go to the topic in the Help containing the selected index entry. If more than one topic includes the index entry, then the list of topics is displayed.

If the index has sub-indices, they can be searched by first typing in the main index followed by a comma, then a space and the first few characters of the sub-index.

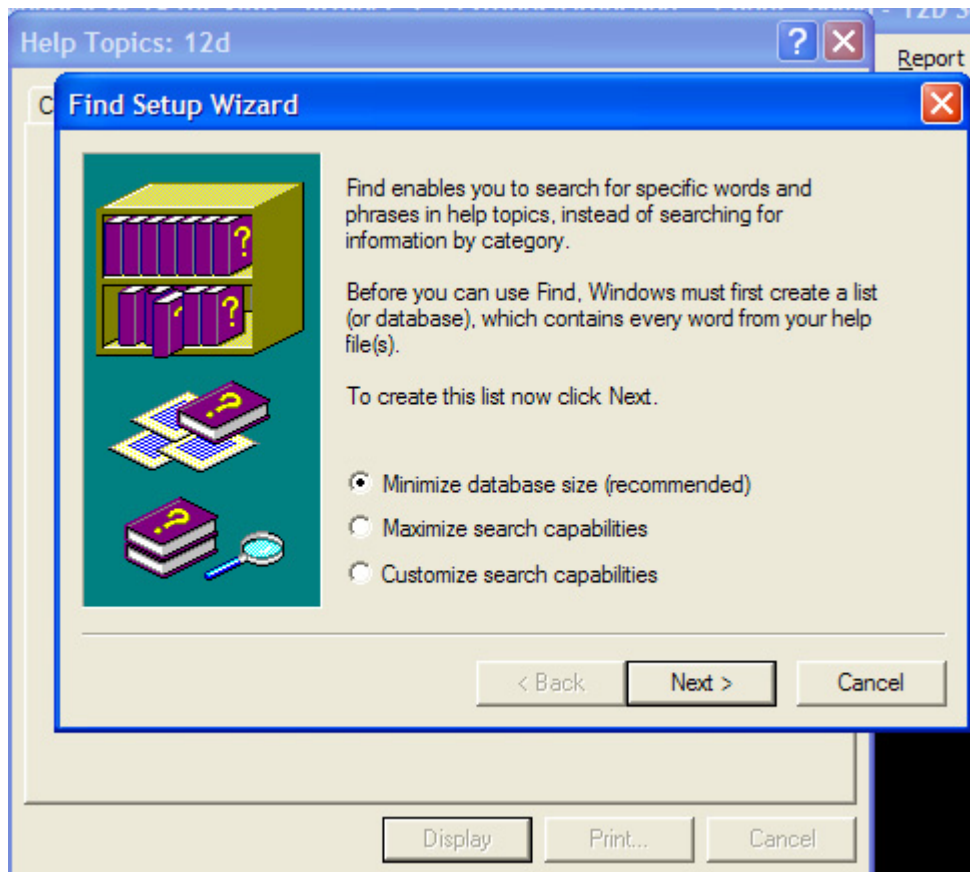
More information on the **Help** system will now be given in the next section [Find](#).

Find

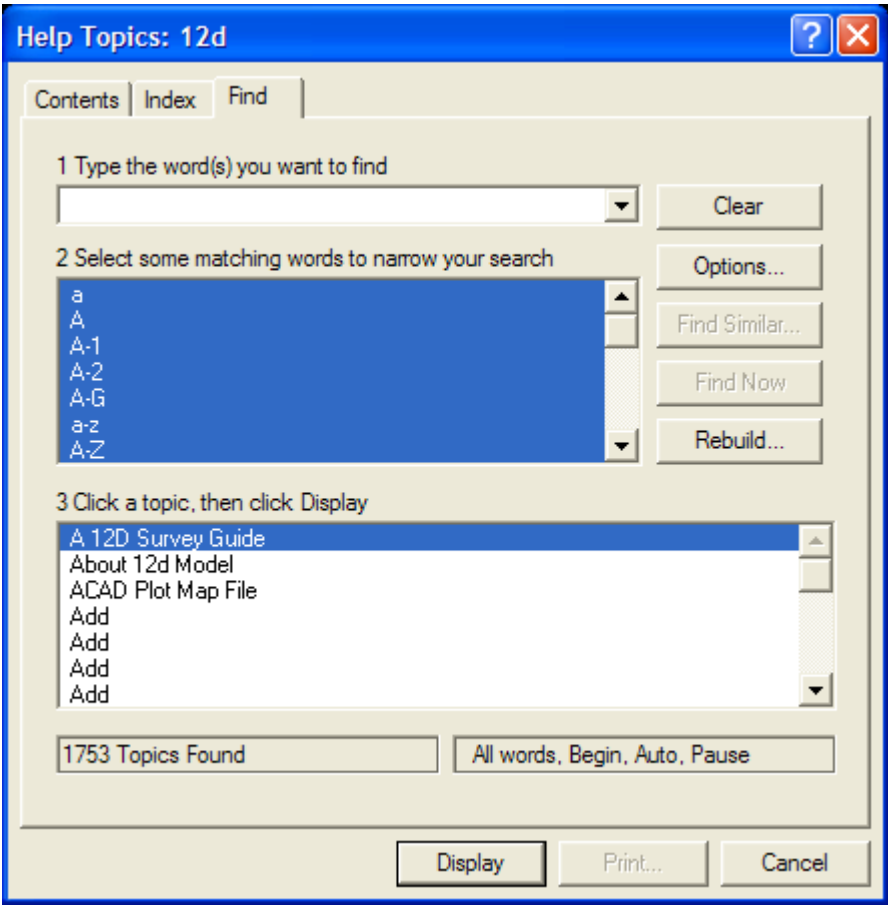
The most powerful searching method for the *Help* system is *Find*.

Simply click on the *Find* tab to search for words or phrases that may be contained in a Help topic.

If *Find* is being invoked for the first time, the **Find Setup Wizard** runs to create an index of every word in the Help.



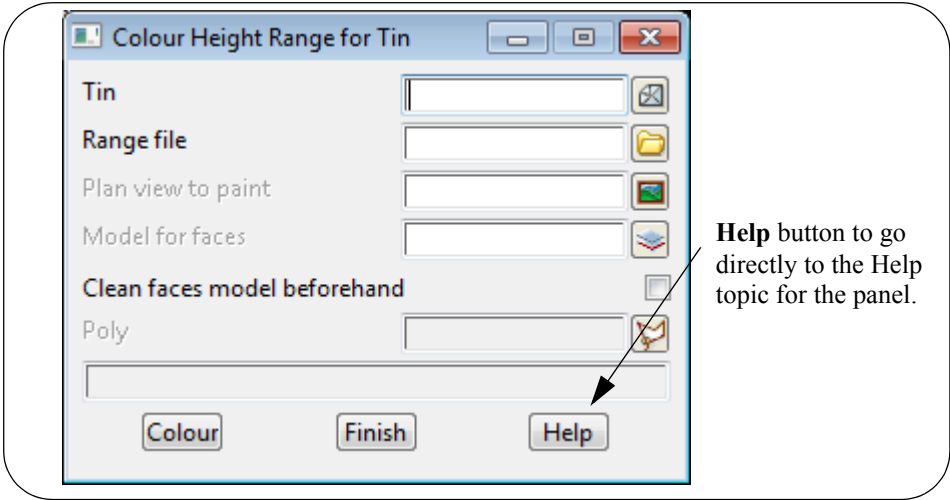
From then on, selecting the *Find* tab goes straight to the *Find* screen.



More information on the **Help** system will now be given in the next section [Panel Help Button](#).

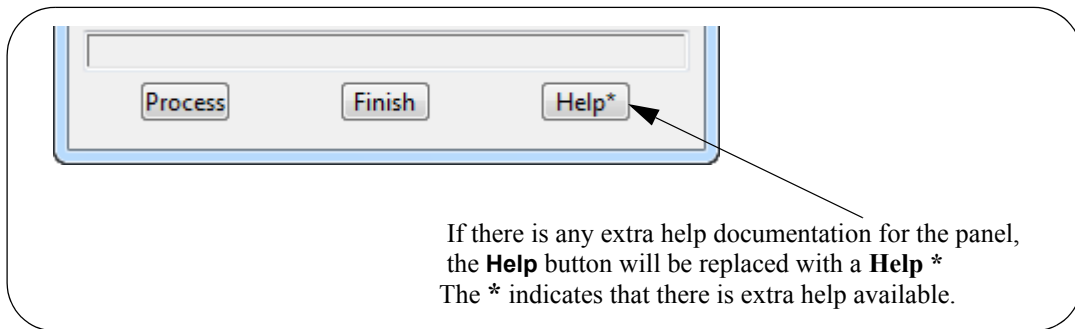
Panel Help Button

Every panel has a **Help** button which when selected goes to the *topic* describing that panel.



The default *12d Model Help* is all in one *Winhlp* file but a method for displaying additional help information exists so 12d Solutions, 12d Distributors and Users can supply additional (extra) **Help** information.

If there is extra help available for an option, then **Help*** will appear instead of **Help** on the panel button.



Information on how the extra help is set up is given in the section [Extra Help](#).

More information on the **Help** system will now be given in the next section [F1 Key](#).

F1 Key

Another method of invoking **Help** is by using the **F1** key as follows:

when a **menu** or **panel** is on the screen and has focus (the menu or panel title area will be highlighted), or the cursor is over an item on a **toolbar**, pressing **F1** will bring up the *help* for that menu, panel or toolbar item.

Warning - some of the items on the *Strings* menu automatically start up a string select and change the focus from the panel to a View. This means that pressing F1 will bring up the Help for the View and not the Help for the panel.

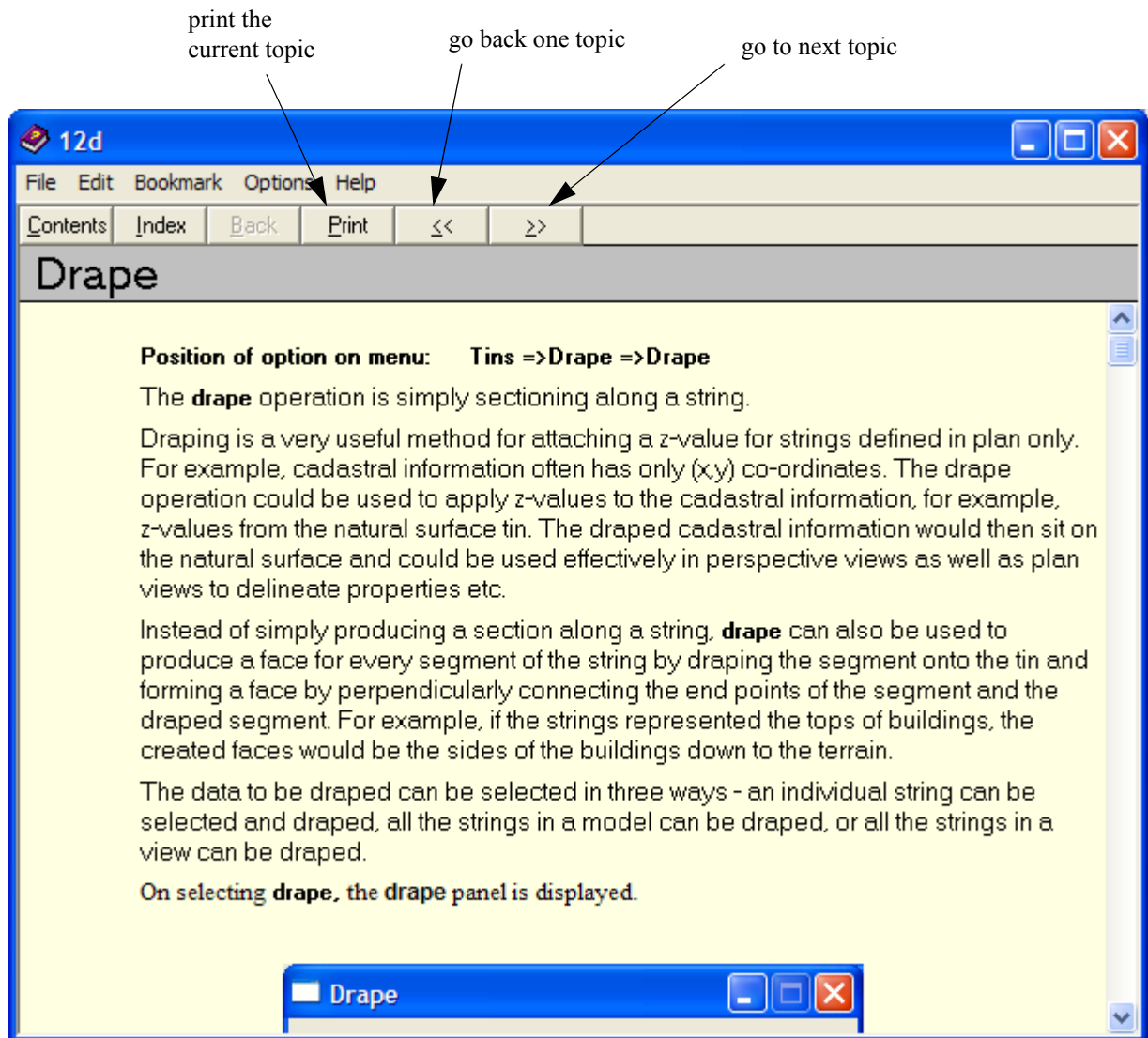
To get **Help** for such a panel, click on the panel to bring the focus back to the panel before pressing F1. The top of the panel will highlight showing that it has focus.

More information on the **Help** system will now be given in the next section [Navigating in Help](#).

Navigating in Help

Once at a *topic* in the Help, the << and >> buttons at the top of the Help topic will go to the previous and next Help topics respectively.

Individual Help topics can be printed by clicking **Print** at the top of the Help page.



Because it is difficult to print large sections of Microsoft's Help system, a PDF file of the entire **12d Model Reference** Manual has been created and can be used to print out large sections of the manual.

The **12d Model Reference** Manual PDF file is on the *12d Model 9 Installation DVD* in the folder Documentation\Reference_Manual.

More information on the **Help** system will now be given in the next section [Extra Help](#).

Extra Help

The default context sensitive **12d Model Help** is all in one help file supplied by **12d Solutions** but a method for displaying additional help information exists so **12d Solutions**, **12d Distributors** and **Users** can supply additional (extra) **Help** information. This extra information can also be supplied by **12d Model** macros written by **12d Solutions** or **Users**.

How to Set Up Extra Help

Any extra help for an inbuilt panel (that is, one not created by a macro) is placed in a folder with the same name as the dump name for the panel without the ending after the "." (to get the dump

name, see [Dumping a Panel, Creating a Screen Layout File or Default File](#) in the chapter [Tools and Concepts](#) in *12d Help* or the *12d Model Reference manual*).

For macros, created by Users or 12d Solutions, there can only be the same Help button for any panels created by the macro and the extra help for the macro is placed in a folder with the same name as the macro without the ending "4do" after the "." **and** with any blanks or non alphanumeric characters replaced by a underscore ("_"). For example, the extra help files for the macro called "testing help (3) system.4do" go in a folder called testing_help__3__system. Note there is an underscore for the blanks and the "(" and ")" in the macro name.

The extra help files for an inbuilt panel or macro can have *any name* and can be a pdf, wmv, avi, txt etc.

For example, for the panel **Project Tree** brought up by selecting **Project =>Tree**, the extra documentation would be in a folder called **Project_Tree**.

The folder of extra help for a panel, is then placed in any one of the three places:

- (a) in the *Help* folder in the 12d Model installation area: For example, for version 10

c:\Program Files\12d\12d Model\10.00\Help

- (b) in a folder called *Help* inside the *Set_ups* folder in the 12d Model installation area. For example

c:\Program Files\12d\12d Model\10.00\Set_ups\Help

or

- (c) in a folder called *Help* inside the *User* folder in the 12d User area. For example

c:\12d\10.00\User\Help

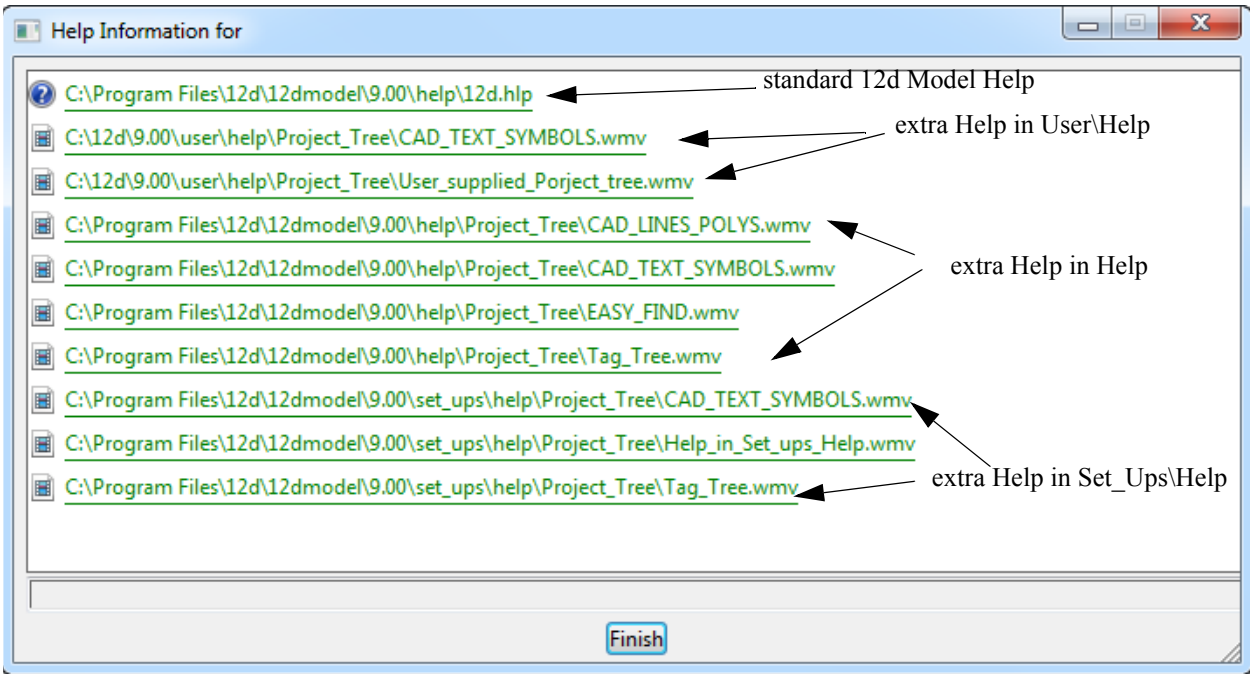
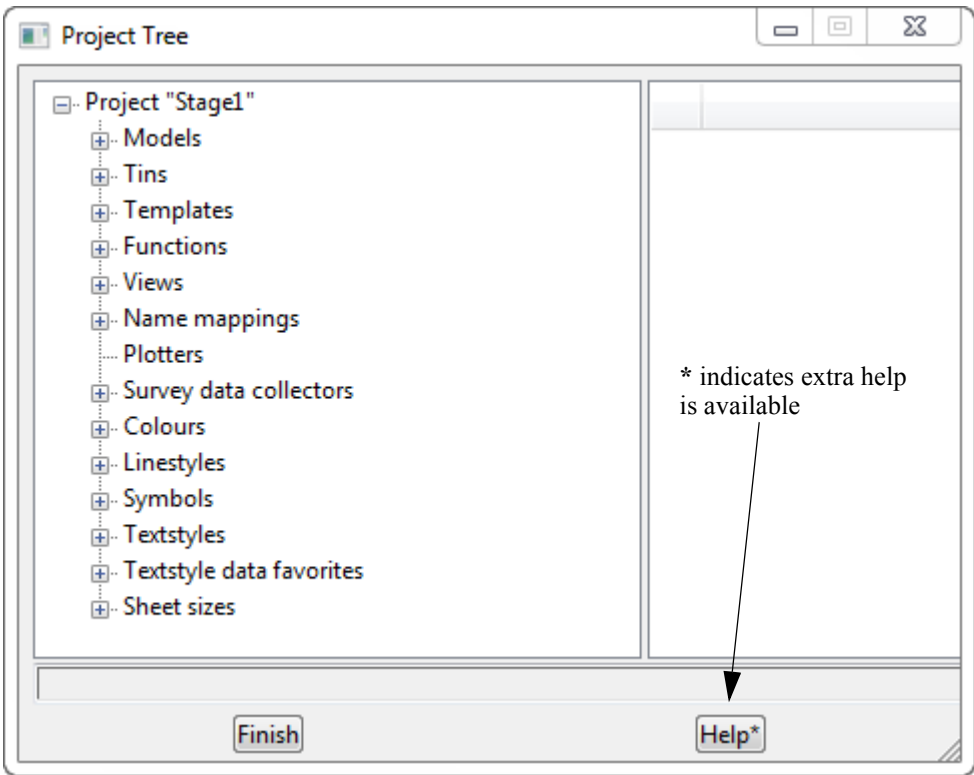
For an inbuilt panel an macro, each of these areas is searched and if any extra help is found, it is listed with the full path to each extra help file.

If there is any extra help for a inbuilt panel or macro, the **Help** button on the panel will be replaced with a **Help *** button. The * indicates that there is extra help available.



When you click on the **Help *** button, you will get a list of all the extra help files for that inbuilt panel or macro with the full pathname to the extra help. Clicking on the file name will bring up that extra help.

For example,



Users Own Extra Help Files

Note that users can also have their own extra help files and the files are simply placed in the correctly named folder under User\Help.

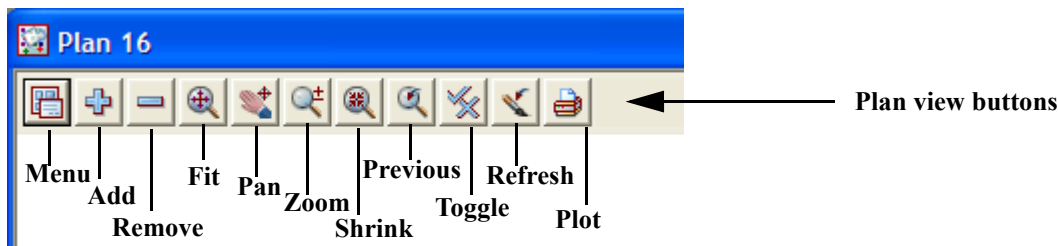
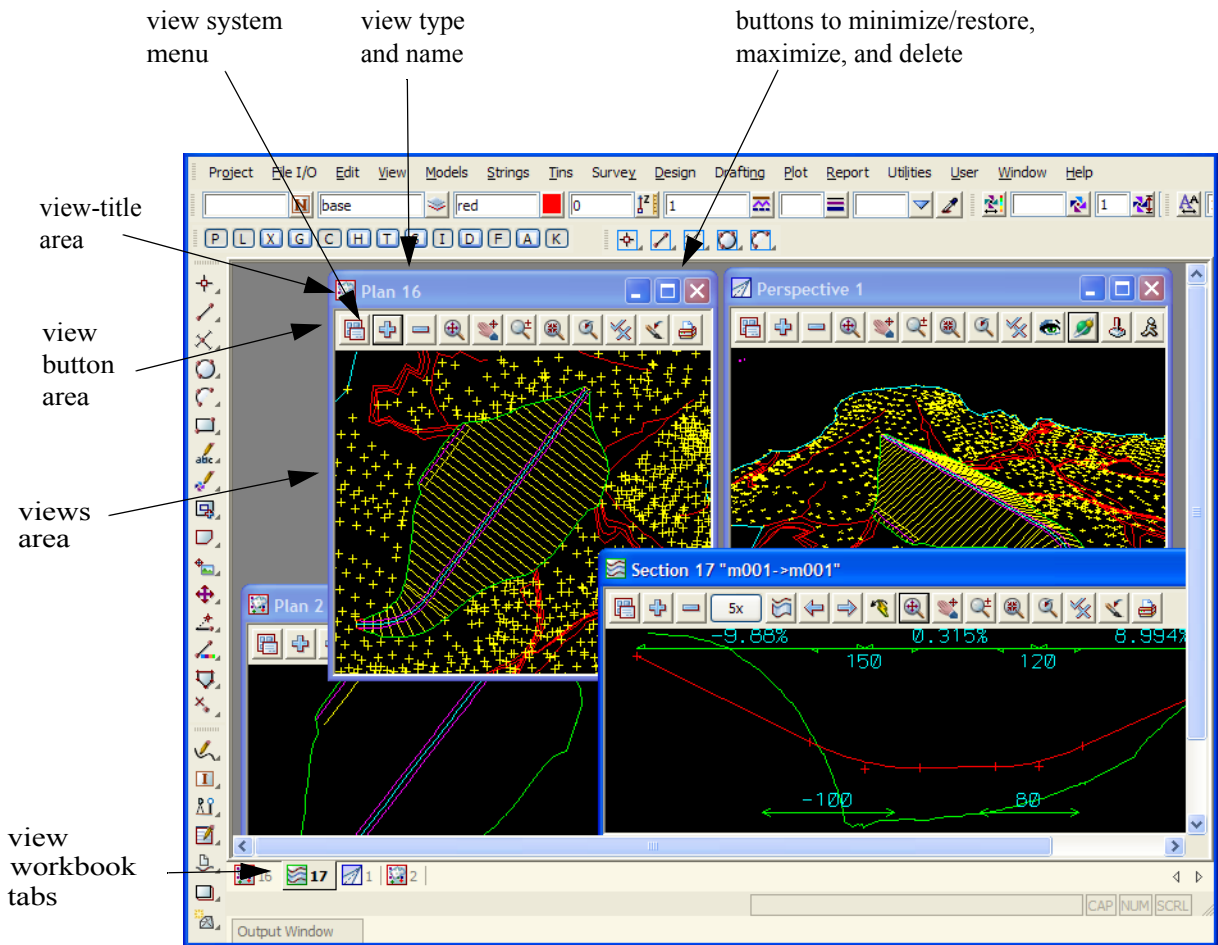


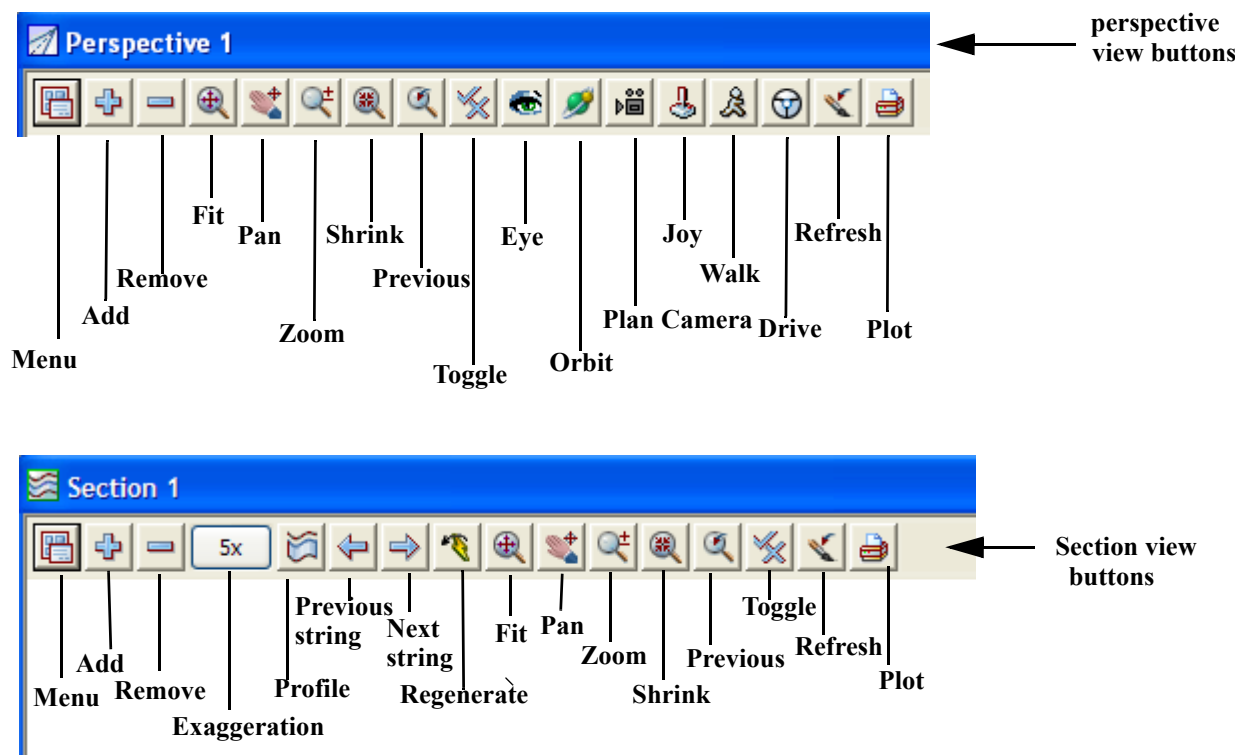
7 View Menus

Views are the screen drawing areas for **12d Model** and come in three flavours - plan, perspective and section. Views can be created and deleted as required by the user and there is no limit to the number of views on the screen. The views can overlap and be minimized.

Each view has a unique name of up to two hundred characters.

Each view has a *view title area* which is used to display the view name and a *view button area* which displays the view buttons.



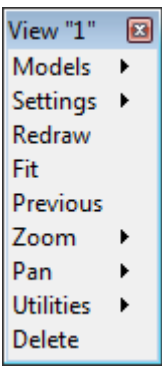


The *View Buttons* are documented in the section [View Buttons](#)

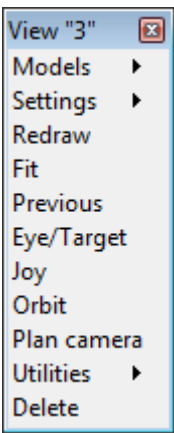
If the **Menu** button is selected in the *view button area* of any view, or if **RB** is clicked in the *view-title area* or in the *view-button area*, a new menu called the View menu appears.

Because of the differences between plan, perspective and section views, the options on the View menu vary for each view type. The plan, perspective and section View menus are

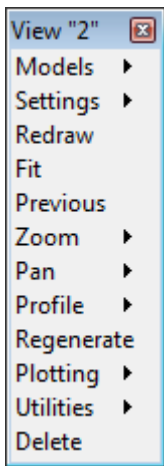
Plan View Menu



Perspective View Menu



Section View Menu



The View menu is removed by selecting the **[X]** button or if the View menu hasn't been moved, by simply clicking **RB** again in the *view-title* or *view button* area. If the View menu has been moved, clicking **RB** will warp the cursor to the moved View menu.

For further documentation on the options on the View menus, please see:

for the option *Models*, go to [Model Ops](#)

<i>Settings</i>	Plan View Settings or Perspective View Settings or Section View Settings
<i>Redraw</i>	Redraw
<i>Fit</i>	Fit
<i>Previous</i>	Previous
<i>Zoom</i>	Zoom
<i>Joy</i>	Joy View
<i>Profile</i>	Profile
<i>Regenerate</i>	Regenerate
<i>Pan</i>	Pan
<i>Utilities</i>	Plan Utilities or Perspective Utilities or Section Utilities
<i>Delete</i>	Delete

The option **Models** which is common to each menu will be discussed first, followed by the special options for each of the view menus.

Please continue to the next section [Model Ops](#).

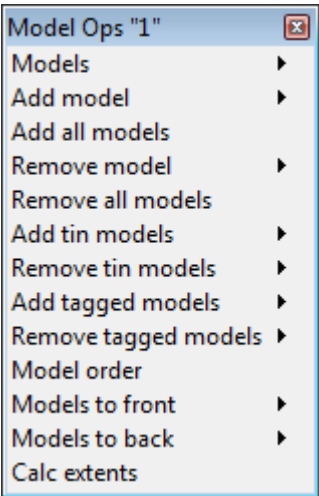
Model Ops

- Position of menu:** Plan View Menu View =>Models
- Position of menu:** Section View Menu View =>Models
- Position of menu:** Perspective View Menu View =>Models

Walking right on **Models** brings up the **Model Ops** walk-right menu which is used to add and remove models from the view.

These options are the same for Plan, Perspective and Section views.

The **Model Ops** walk-right is



For the option *Models*, go to [Models](#)

Add model [Add Model](#)

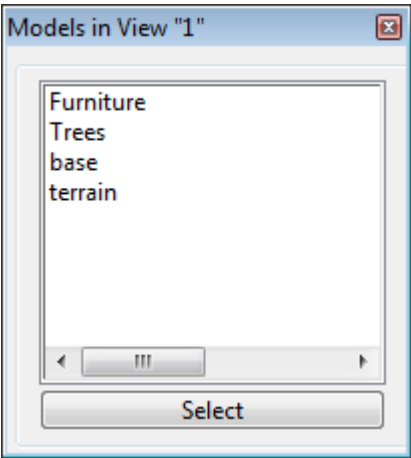
<i>Add all models</i>	Add All Models
<i>Remove model</i>	Remove Model
<i>Remove all models</i>	Remove All Models
<i>Add tin models</i>	Add Tin Models
<i>Remove tin models</i>	Remove Tin Models
<i>Add tagged models</i>	Add Tagged Models
<i>Remove tagged models</i>	Remove Tagged Models
<i>Model order</i>	Model Order
<i>Models to front</i>	Models to Front
<i>Models to back</i>	Models to Back
<i>Calc extents</i>	Calc Extents

Models

Position of menu:	Plan View Menu	View => Models =>Models
Position of menu:	Section View Menu	View => Models =>Models
Position of menu:	Perspective View Menu	View => Models =>Models

Models is a walk-right option which lists the models currently attached to that view.

If a model is selected from the displayed list, the model will be redrawn on the view. It will also be brought to the top of the display list, i.e., it is in the foreground and all the other models on the view are drawn before it.

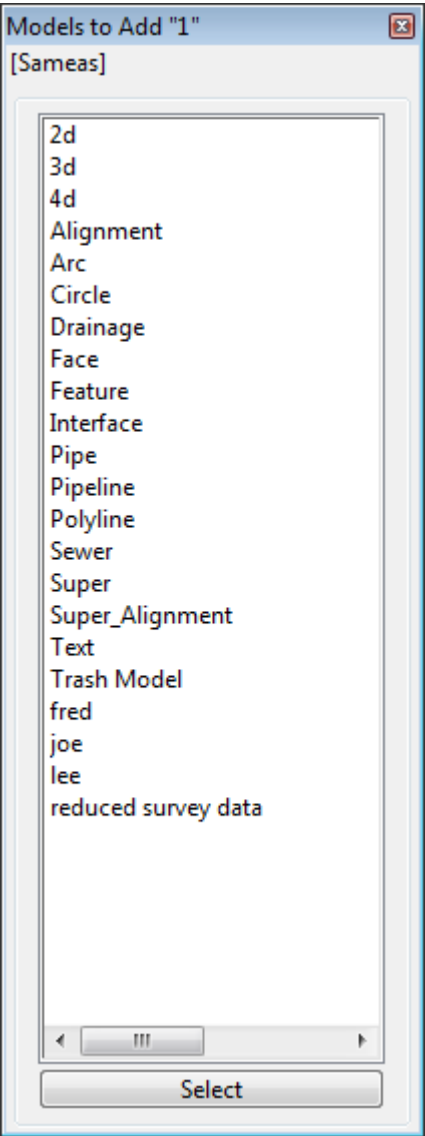


Add Model

Position of menu:	Plan View Menu	View => Models =>Add model
Position of menu:	Section View Menu	View => Models =>Add model
Position of menu:	Perspective View Menu	View => Models =>Add model

The **Add model** menu item operates two ways.

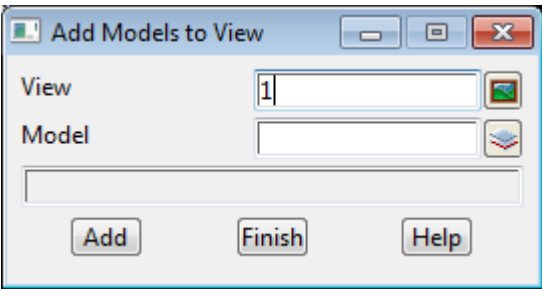
The **Add model** walk-right brings up the **Models to Add** list which is a list of all the models not currently added to the view.



By double clicking on one of the models from the **Models to Add** list, it is added to the view. The list is then removed. To add a number of models from the list to the view, select the models in the list in the standard Microsoft way and then click on **Select**.

If the **Models to Add** list has been moved or pinned, models can be selected from the list and added to the view and the **Models to Add** list will remain with the selected models removed from the list. When all the required models have been added, delete the list using the **[X]** button.

If **Add model** itself is activated (by clicking LB when **Add model** is highlighted), the **Add Model to a View** panel appears. The **Add Model to a View** panel can be used to create new models as well as add existing models to any view. Wild cards and characters are allowed for adding models.



Any models added to a view are immediately drawn on the view.

Add All Models

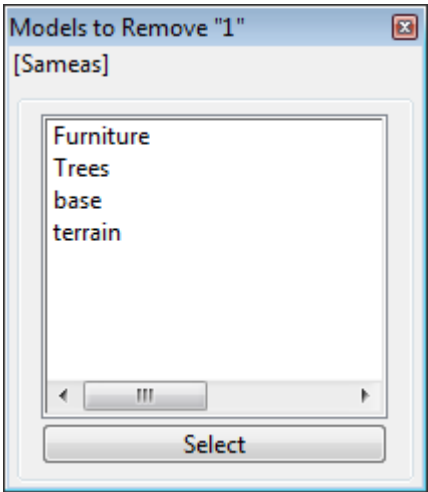
- Position of option on menu: Plan View Menu View => Models =>Add all models
- Position of option on menu: Section View Menu View => Models =>Add all models
- Position of option on menu: Perspective View Menu View => Models =>Add all models

The **Add all models** option adds all the models to the view.

Remove Model

- Position of menu: Plan View Menu View => Models =>Remove model
- Position of menu: Section View Menu View => Models =>Remove model
- Position of menu: Perspective View Menu View => Models =>Remove model

The **Remove model** menu item also operates in two ways. The **Remove model** walk-right brings up the **Models to Remove** list which is a list of all the models currently added to the view.

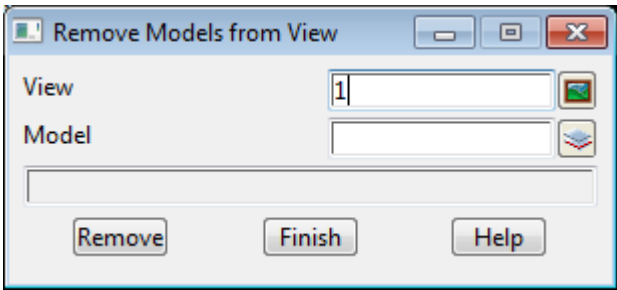


By double clicking on one of the models from the **Models to Remove** list, it is removed from the view. The list is then removed. To remove a number of models on the list from the view, select the models in the list and then click on **Select**.

If the **Models to Remove** list has been moved or pinned, models can be selected from the list and removed from the view and the **Models to Remove** list will remain with the selected models removed from the list. When all the required models have been removed, delete the list using the

[X] button.

If **Remove model** itself is activated, the **Remove Model from a View** panel appears. The **Remove Model from a View** panel can be used to remove any models from any view. Wild cards and characters are allowed for removing models.



NOTE
Models still exist after they are removed from a view. Models can only be deleted from **12d Model** by using the **Models=>Delete** option.

Remove All Models

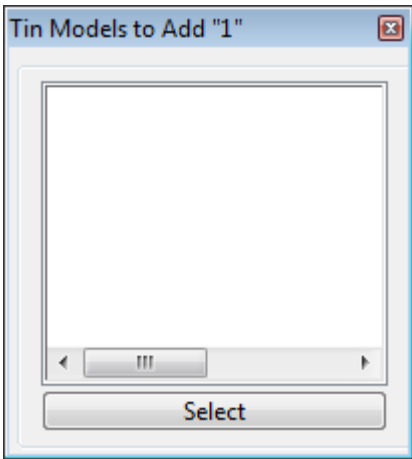
- | | | |
|------------------------------------|------------------------------|-------------------------------------------------|
| Position of option on menu: | Plan View Menu | View => Models =>Remove all models |
| Position of option on menu: | Section View Menu | View => Models =>Remove all models |
| Position of option on menu: | Perspective View Menu | View => Models =>Remove all models |

The **Remove all models** option removes all the models from the view and clears the view.

Add Tin Models

- | | | |
|--------------------------|------------------------------|----------------------------------------------|
| Position of menu: | Plan View Menu | View => Models =>Add tin models |
| Position of menu: | Section View Menu | View => Models =>Add tin models |
| Position of menu: | Perspective View Menu | View => Models =>Add tin models |

The **Add tin models** walk-right brings up the **Tin Models to Add** list of all tins in the project whose models have not been added to the view



By double clicking on one of the tins from the **Tin Models to Add** list, all the models in the tin are

added to the view. The list is then removed. To add the models from a number of tins from the list to the view, select the tins in the list in the standard Microsoft way and then click on **Select**.

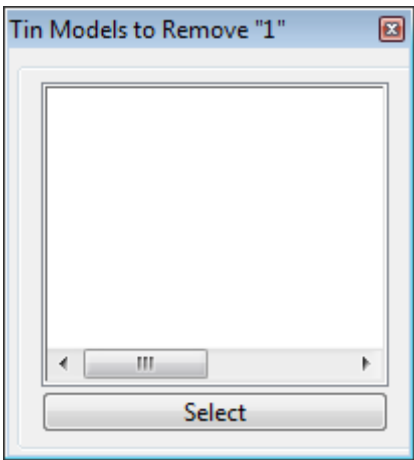
If the **Tin Models to Add** list has been moved or pinned, tins can be selected from the list and their models added to the view and the **Tin Models to Add** list will remain with the selected tins removed from the list. When all the required tins have been added, delete the list using the **[X]** button.

Any models added to a view are immediately drawn on the view.

Remove Tin Models

- | | | |
|--------------------------|------------------------------|-------------------------------------------------|
| Position of menu: | Plan View Menu | View => Models =>Remove tin models |
| Position of menu: | Section View Menu | View => Models =>Remove tin models |
| Position of menu: | Perspective View Menu | View => Models =>Remove tin models |

The **Remove tin models** walk-right brings up the **Tin Models to Remove** list of all tins whose models are currently added to the view.



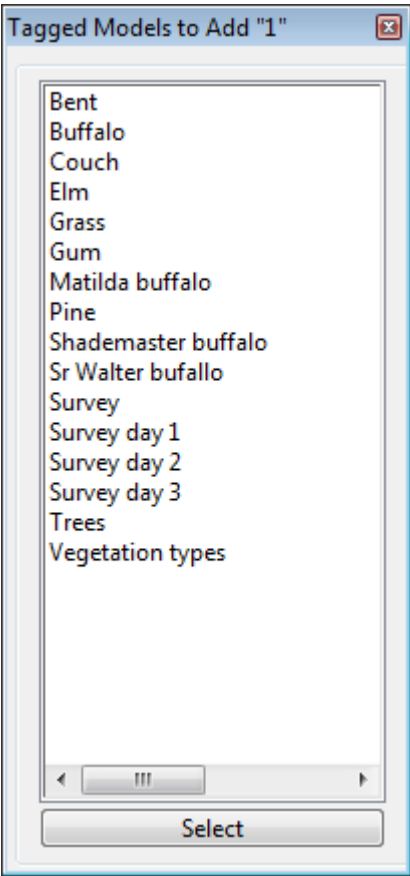
By double clicking on one of the tins from the **Tin Models to Remove** list, all the models in the tin are removed from the view. The list is then removed. To remove the models from a number of tins on the list from the view, select the tins in the list and then click on **Select**.

If the **Tin Models to Remove** list has been moved or pinned, tins can be selected from the list and removed from the view and the **Tin Models to Remove** list will remain with the selected tins removed from the list. When all the required tins have been removed, delete the list using the **[X]** button.

Add Tagged Models

- | | | |
|--------------------------|------------------------------|-------------------------------------------------|
| Position of menu: | Plan View Menu | View => Models =>Add tagged models |
| Position of menu: | Section View Menu | View => Models =>Add tagged models |
| Position of menu: | Perspective View Menu | View => Models =>Add tagged models |

The **Add tagged models** walk-right brings up the **Tagged Models to Add** list of all the tags (first level and subtags) defined in the project.



By double clicking on one of the tag names from the **Tagged Models to Add** list, all the models with that tag name, or models whose tag is a subtag of the tag name, are added to the view. The list is then removed. To select a number of tags from the list, select the tags in the standard Microsoft way and then click on **Select**.

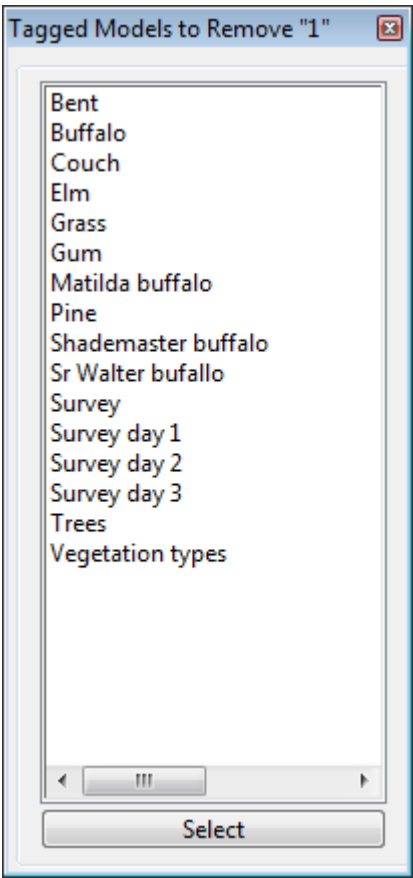
If the **Tagged Models to Add** list has been moved or pinned, tags can be selected from the list and their models added to the view and the **Tagged Models to Add** list will remain with the selected tags removed from the list. When all the required tags have been added, delete the list using the **[X]** button.

Any models added to a view are immediately drawn on the view.

Remove Tagged Models

- | | | |
|--------------------------|------------------------------|----------------------------------------------------|
| Position of menu: | Plan View Menu | View => Models =>Remove tagged models |
| Position of menu: | Section View Menu | View => Models =>Remove tagged models |
| Position of menu: | Perspective View Menu | View => Models =>Remove tagged models |

The **Remove tagged models** walk-right brings up the **Tagged Models to Remove** list of all tins whose models are currently added to the view.



By double clicking on one of the tag name from the **Tagged Models to Remove** list, all the models with that tag name, or models whose tag is a subtag of the tag name, are removed from the view. The list is then removed. To select a number of tags from the list, select the tags in the standard Microsoft way and then click on **Select**.

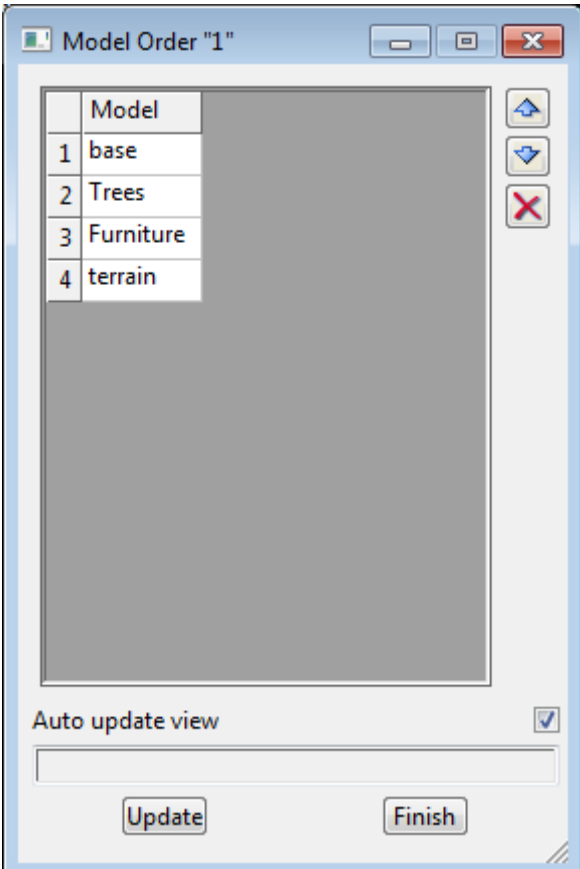
If the **Tagged Models to Remove** list has been moved or pinned, tags can be selected from the list and removed from the view and the **Tagged Models to Remove** list will remain with the selected tags removed from the list. When all the required tags have been removed, delete the list using the [X] button.

Model Order

- Position of menu:** Plan View Menu **View => Models =>Model order**
- Position of menu:** Section View Menu **View => Models =>Model order**
- Position of menu:** Perspective View Menu **View => Models =>Model order**

The **Model order** options displays the list of all models on a view in the reverse model drawing order. That is, the first model on the list is the last model drawn and hence the most visible model.

Selecting **Model order** brings up the **Model Order** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Model

list of models on the view in the reverse drawing order. That is, the first model on the list is drawn last and so is the most visible.



Up Arrow, Down Arrow

when a model name is highlighted, clicking the Up/Down arrow will change the order of the model.



Delete

when a model name is highlighted, clicking the Delete icon will remove the model from the view.
when a model name is highlighted, clicking on the Cross will remove the model from the view.

Auto update view	tick box	tick
-------------------------	----------	------

if ticked then the view is redrawn each time a model is moved in the list or added/removed from the list.

Update	button
---------------	--------

redraws the view using the new model order.

Models to Front

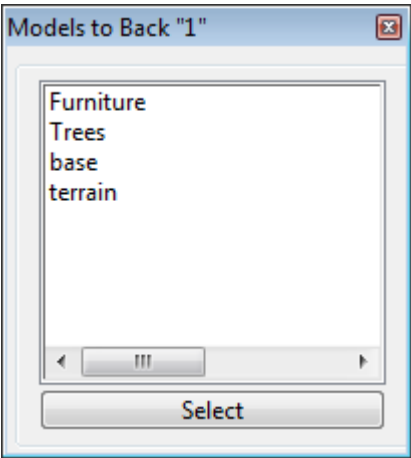
Position of menu:	Plan View Menu	View => Models =>Models to front
Position of menu:	Section View Menu	View => Models =>Models to front
Position of menu:	Perspective View Menu	View => Models =>Models to front

Models to front is a walk-right option. When the walk-right is chosen, the list of models currently attached to that view is displayed.

If a model is selected from the displayed list, the model will be the last to be drawn on the view. Hence, it is in the foreground and all the other models on the view are drawn before it.

Models to Back

- Position of menu:** Plan View Menu **View => Models =>Models to back**
- Position of menu:** Section View Menu **View => Models =>Models to back**
- Position of menu:** Perspective View Menu **View => Models =>Models to back**



Models to back is a walk-right option. When the walk-right is chosen, the list of models currently attached to that view is displayed.

If a model is selected from the displayed list, the model will be the first to be drawn on the view. Hence, it is in the background and all the other models on the view are drawn after it.

Calc Extents

- Position of option on menu:** Plan View Menu **View => Models =>Calc extents**
- Position of option on menu:** Section View Menu **View => Models =>Calc extents**
- Position of option on menu:** Perspective View Menu **View => Models =>Calc extents**

For each model on the view, the size of the x, y, z box required to enclose the data in the model is calculated. That is, the option calculates the model bounding box for each model on the view.



Redraw

Position of option on menu:	Plan View Menu	View => Models =>Redraw
Position of option on menu:	Section View Menu	View => Models =>Redraw
Position of option on menu:	Perspective View Menu	View => Models =>Redraw

As its name implies, this option redraws all the models on the view using the current drawing parameters. This is the same as clicking MB in the view title area.

NOTES

- 1. When a model is removed from a view, it is “undrawn”, that is, drawn in black. This may also black out important details of other models still attached to the view. If this happens, use the **redraw** option to refresh the view.
- 2. Clicking MB in the view-title area is the easiest method of redrawing a view.

Fit

Position of option on menu:	Plan View Menu	View => Models =>Fit
Position of option on menu:	Section View Menu	View => Models =>Fit
Position of option on menu:	Perspective View Menu	View => Models =>Fit

When the **Fit** option is chosen, **12d Model** calculates viewing parameters which will allow all the models attached to the view to be fully displayed. The view is then redrawn using these new drawing parameters.

Note if the data does not fill the view after a fit, then a **Calc Extents** may be needed to re-calculate the model bounding boxes.

Previous

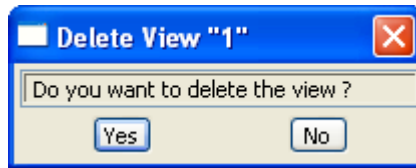
Position of option on menu:	Plan View Menu	View => Models =>Previous
Position of option on menu:	Section View Menu	View => Models =>Previous
Position of option on menu:	Perspective View Menu	View => Models =>Previous

Each time a view has its viewing parameters changed, the old set is recorded as the previous parameter set. The previous option sets the viewing parameters back to this previous parameter set.

The view is then redrawn using those settings. The last set then becomes the old set.

Delete

Position of option on menu:	Plan View Menu	View =>Delete
Position of option on menu:	Section View Menu	View =>Delete
Position of option on menu:	Perspective View Menu	View =>Delete

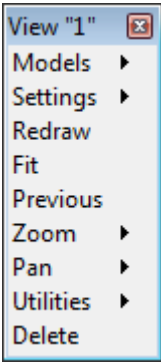


This option is used to delete the view and remove it from the screen. After selecting the **Delete** option, a **Delete View** yes-no panel appears. If **Yes** is selected, the view is deleted and removed from the screen. Selecting **No** removes the **Yes-No** pop-up and leaves the view as it is.

Plan View Menu

Position of menu: Plan View Menu View

The **Plan** view menu is



For the option *Models*, go to

- Settings*
- Redraw*
- Fit*
- Previous*
- Zoom*
- Pan*
- Utilities*
- Delete*

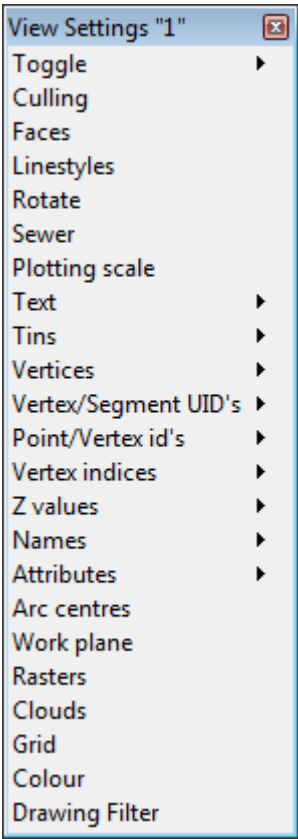
- [Model Ops](#)
- [Plan View Settings](#)
- [Redraw](#)
- [Fit](#)
- [Previous](#)
- [Zoom](#)
- [Pan](#)
- [Plan Utilities](#)
- [Delete](#)

Plan View Settings

Position of menu: Plan View Menu View => Settings

If the Settings option is picked rather than moving onto the walking right, then the toggle menu from the Toggle walk-right menu is displayed on the screen. The Toggle menu will be described in the next section.

The View Settings walk-right menu for the plan view is



For the option *Toggle*, go to

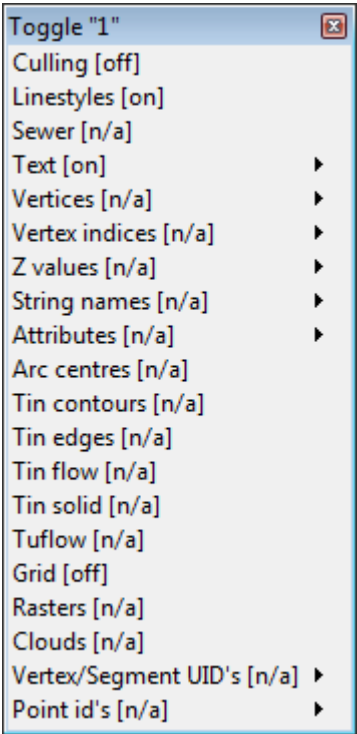
<i>Culling</i>	Plan Toggle
<i>Faces</i>	Culling Plan View
<i>Linestyles</i>	Face Flags for View
<i>Rotate</i>	Linestyles for Plan View
<i>Sewer</i>	Rotate Plan View
<i>Plotting scale</i>	Sewer Annotations for Plan View
<i>Text</i>	Plan Plotting Scale
<i>Tins</i>	Text
<i>Vertices</i>	Tins
<i>Vertex/Segment UID's</i>	Vertices
<i>Point/vertex id's</i>	Vertex/Segment UIDs
<i>Vertex indices</i>	Point/Vertex IDs
<i>Z values</i>	Vertex Indices
<i>Names</i>	Z Values
<i>Attributes</i>	Names
<i>Arc centres</i>	Attributes for Plan View
<i>Work plane</i>	Arc Centres for Plan View
	Work Plane

<i>Rasters</i>	<u>Draw Rasters for Plan View</u>
<i>Clouds</i>	<u>Clouds</u>
<i>Grid</i>	<u>Grid on View</u>
<i>Colour</i>	<u>View Background Colour</u>
<i>Drawing filter</i>	<u>View Drawing Filter</u>



Plan Toggle

Position of menu: Plan View Menu View => Settings =>Toggle
The Toggle walk right brings up the **Toggle** plan view menu.



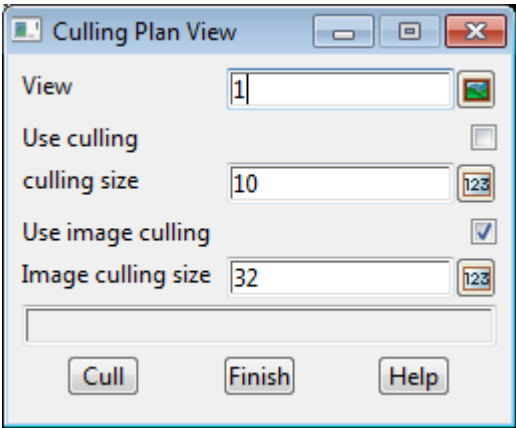
Selecting any options from this menu will toggle the option on/off.

Culling Plan View

Position of option on menu: Plan View Menu View =>Settings => Culling

The Culling option is used to suppress the drawing of strings whose on-screen extent is less than a user defined pixel size.

Selecting Culling raises the Culling Plan View panel.



The fields and buttons used in this panel have the following functions.

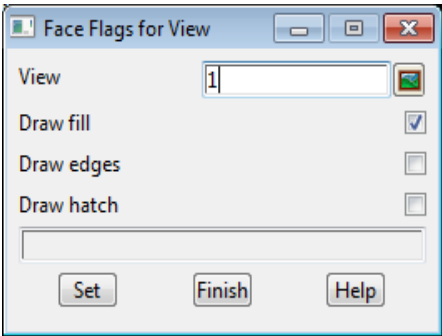
Field Description	Type	Defaults	Pop-Up
View <i>name of the view to set cutting for.</i>	input/output	current view	available views
Use culling <i>if ticked, a string is not drawn on the plan view whenever the string's extent box when drawn on the view would be smaller than the culling size given in the culling size field.</i>	tick box		
Culling size <i>pixel size used for culling</i>	input	10	
Use image culling	tick box		
Image culling size			
Cull <i>record the culling size given in the culling field. If the use culling field is set to tick, the recorded culling size will be used whenever the plan view is redrawn.</i>	button		

Face Flags for View

Position of option on menu: Plan View Menu View =>Settings => Faces

The **Faces** option allows the user to specify how faces are displayed in the plan view and on any plan view plots.

Selecting **Faces** fires up the **Face Flags for View** panel.



The fields and buttons have the following functions.

Field	Description	Type	Defaults	Pop-Up
View	<i>name of the view to set for drawing faces.</i>	input/output	current view	available views
Draw fill	<i>if ticked, all faces in the view are drawn in their fill colour.</i>	tick box	tick	
Draw edges	<i>if ticked, all face edges in the view are drawn.</i>	tick box		
Draw hatch	<i>if ticked, all faces in the view are drawn in their hatch pattern.</i>	tick box		
Set	<i>set the draw fill/edges/hatch fields to the value in the panel fields. The plan view is then redrawn using this value.</i>	button		

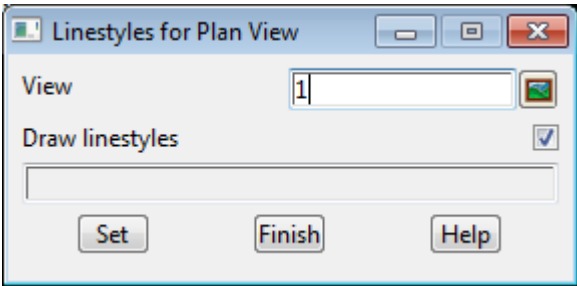
Linestyles for Plan View

Position of option on menu: Plan View Menu View => Settings => Linestyles

The **Linestyles** option allows the user to specify how linestyles (**styles**) are displayed in the plan view and on any plan view plots.

If linestyles are not used for drawing in a view then all strings are drawn according to their breakline type. That is, line strings are drawn with solid lines for each line in the string and point strings with only crosses at the string points. This style is the default style, 1.

Selecting **Linestyles** fires up the **Linestyles for View** panel.



The fields and buttons used in this panel have the following functions.

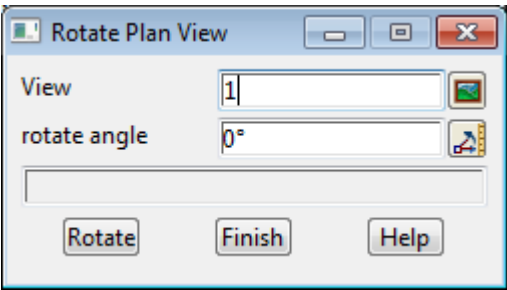
Field Description	Type	Defaults	Pop-Up
View <i>name of the view to modify draw linestyle flag for.</i>	input/output	current view	available views
Draw linestyles <i>if ticked, all strings in the view are drawn with linestyles. If not ticked, all lines strings are drawn as solid lines and point strings with crosses at their vertices.</i>	tick box	tick	
Set <i>set the draw linestyles field to the value in the panel field. The plan view is then redrawn using this value.</i>	button		

Rotate Plan View

Position of option on menu: Plan View Menu View => Settings => Rotate

The **rotate** option is used to rotate a plan view through a user supplied angle about the centre point of the plan view.

After selecting the **Rotate** option, the **Rotate Plan View** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>name of the view to set rotation angle for.</i>	input/output	current view	available views
Rotate angle <i>angle (in degrees) to rotate the view to.</i>	input	0	angles
Rotate	button	<i>rotate the view about the view centre point until the angle the view makes with the positive x axis is the angle given in the rotate angle field.</i>	

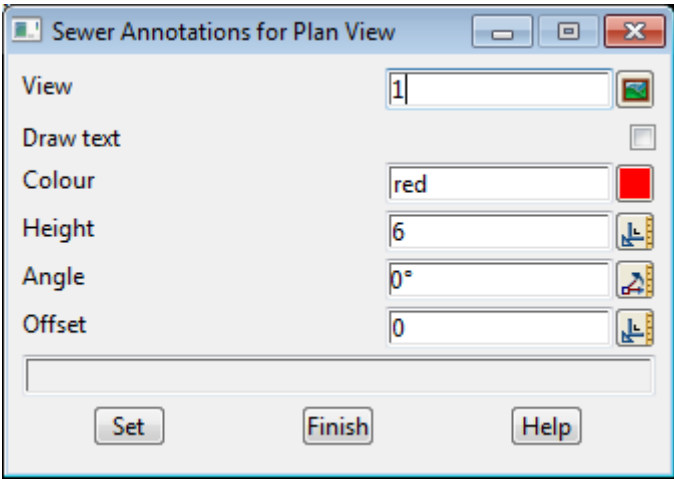
Sewer Annotations for Plan View

Position of option on menu: Plan View Menu View => Settings => Sewer

This is part of the optional sewer module.

The Sewer option allows the user to specify how sewer text is displayed in the plan view and on any plan view plots.

Selecting sewer fires up the **Sewer Annotations for Plan View** panel.



The fields and buttons have the following functions.

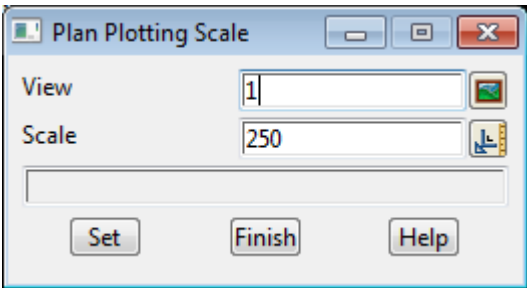
Field Description	Type	Defaults	Pop-Up
View	input/output	current view	available views
<i>name of the view to set sewer annotation information for.</i>			
Draw text	tick box		
<i>if ticked, sewer text annotation will be drawn for any sewer strings in the plan view.</i>			
Colour	input	red	available colours
<i>the colour for any sewer text annotation.</i>			
Height	input	default text height	
<i>the height for any sewer text annotation.</i>			
Angle	input	0	
<i>the angle for any sewer text annotation.</i>			
Offset	input	0	
<i>the offset for any sewer text annotation.</i>			
Set	button		
<i>set the values in the panel fields and then redraw the view.</i>			

Plan Plotting Scale

Position of option on menu: Plan View Menu View => Settings => Plotting scale

The **Plotting scale** option is used to set a scale for the plan view which is used to determine the size to draw any *paper* text on the plan view.

After selecting **Plotting scale**, the **Plan Plotting Scale** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>name of the view to set the scale for.</i>	input/output	current view	available views
Scale <i>"1 in" to use to calculate a drawing size for any paper text on the view.</i>	input	250	
Set <i>set the plotting scale for the view.</i>	button		

Text

Position of menu: Plan View Menu View => Settings =>Text

The **Text** option allows the user to specify whether the text from any strings (text strings, 4d strings and survey strings) in models on the plan view is

- (a) not drawn at all
- or
- (b) if drawn and the text is defined in world units, then the text can be drawn in full, quick mode or not at all depending on the display size of the text on the screen. This stops the drawing of *world* text when its display size is **small** on the screen (e.g. when zooming out).
- (c) if drawn and the text is defined in pixel units, then when the screen scale is such that the height of the text in world units is too large, then the text is not drawn. This stops the drawing of *pixel* text when its displaying world size is large in proportion to other world units (e.g. when zooming out).

Hence the **text** option tries to control the drawing of *both* pixel and world text in models on the view so that the text stops displaying in the view as the user *zooms out*

The choice of drawing text in full, quick mode or not at all also applies to the Vertex ids and Z values text turned on by view settings (view text).

Depending on whether the environment variable *plan_table_settings_4d* is zero or not, the Text option draws/doesn't draw text for *any* model on the view, or the drawing of text can be set for individual models.

If the environment variable *plan_table_settings_4d* is set to 0:

The options in the **Text** walk-right are used to display/not display text for **all** models on the plan view and the walk-right menu only contains the two options, **Text** and **Single**.

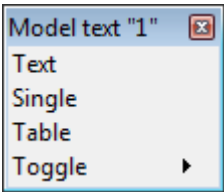
Selecting **Single** brings up the **Model Text for Plan View** panel, without the Model field and is only used to set a maximum height, not parameters for individual models.

If *plan_table_settings_4d* is non-zero:

The options in the **Text** walk-right can be used to specify for *individual* models if the text in the model is display/not display text on the plan view.

For any setting *plan_table_settings_4d*, if **Text** is selected without walking right, then the **Plan Text** panel is brought up (documented in the next section).

The **text** walk-right menu is



For more information on Text go to
 Single
 Table
 Toggle

[Plan Text](#)
[Model Text for Plan View](#)
[Model Text Table for Plan View](#)
[Toggle](#)

Plan Text

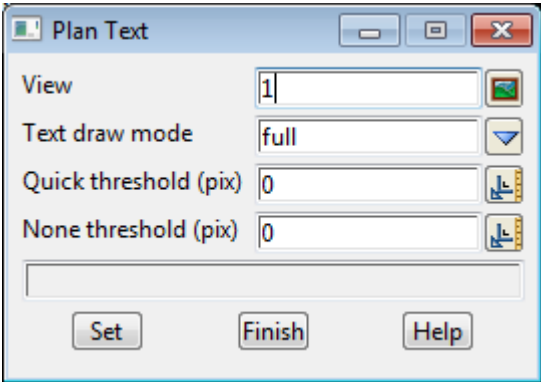
Position of option on menu: **Plan View Menu** **View => Settings => Text => Text**

The **Text** option allows the user to specify how text is displayed in the plan view and on any plan view plots. Text can be drawn in **full**, **quick mode** consisting of the bottom half of a rectangle indicating the height and the length of the text, or **not drawn at all**.

This setting also applies to the z-values and vertex ids controlled by view settings.

There are also two text threshold values (quick and none) designed for use with world text. When the *screen* size of text drops below the thresholds, the mode of display is automatically adjusted. Hence when the *screen* size of **world** text gets small, the text can be drawn as quick text or even not displayed at all.

Selecting **Text** fires up the **Plan Text** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>name of the view to modify text drawing flags for.</i>	input/output	current view	available views
Text draw mode <i>if full, any text in the plan view will drawn as expected. If quick, the text will not be drawn but replaced by a three sided box to indicate where the text is. If none, nothing is displayed where the text would have been.</i>	input	full	full, quick, none
Quick threshold (pix) <i>if the screen size of text displayed on the plan view goes below this pixel size, then the text is automatically drawn in quick mode.</i>	input	4.5	
None threshold (pix) <i>if the screen size of text displayed on the plan view goes below this pixel size, then the text is not drawn.</i>	input	2	
Set <i>set the text draw mode and thresholds to the values given in the panel fields. The plan view is then redrawn using the new values.</i>	button		

Note

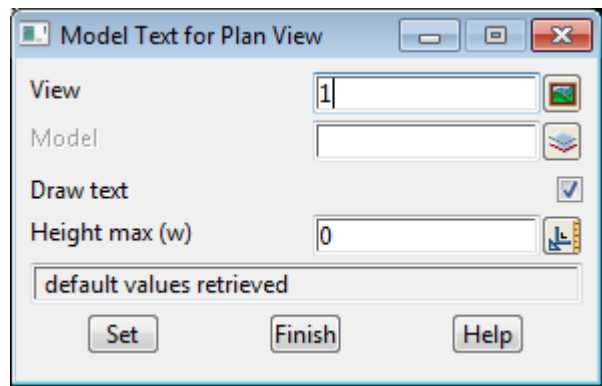
The **Text=>Text** option applies to *all* text on the view. That is, for any text from strings in models on the view, or for the z-values and vertex ids text controlled by view settings (view text). The **Single** and **Table** options of **Text** are *only* for text in models. There are **Single** and **Table** options for view text under the **Vertex no.s** and **Z values Settings** options.

Model Text for Plan View

Position of option on menu: Plan View Menu View => Settings => Text => Single

The **Single** option allows the user to stop drawing any text from models on the view (world or pixel), or if text is drawn, set a maximum equivalent world size that is used as an upper limit for drawing *pixel* text in the model.

Selecting **Single** fires up the **Model Text for Plan View** panel.



The fields and buttons used in this panel have the following functions.

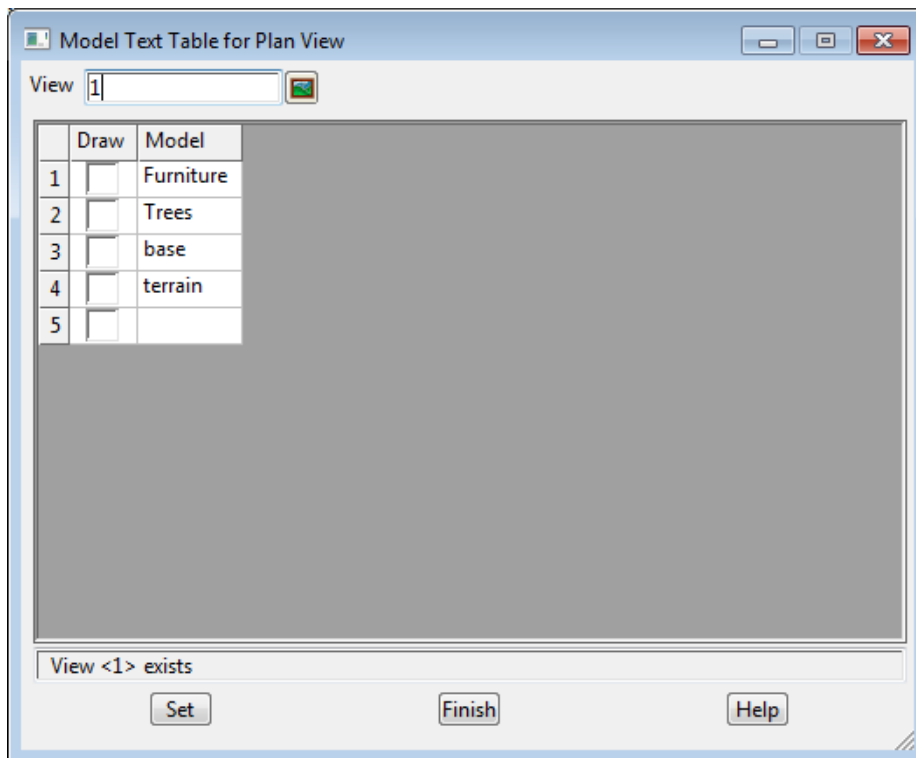
Field Description	Type	Defaults	Pop-Up
View <i>name of the view to modify model text drawing flags for.</i>	input/output	current view	available views
Model <i>the model to set the Draw text and Height max parameters for.</i>	input		
Draw text <i>If not ticked, then no text from strings in models (text, 4d and survey strings) is drawn. if ticked, any text from strings in models (text, 4d and survey strings) will then be checked against the height max for pixel text, or text drawn mode for world text, to see if it is drawn.</i>	tick box	tick	
Height max (w) <i>if non-zero, then when the screen scale is such that the height of any string text defined in pixels converted to a world size is greater than height max (w), then the text is not drawn. Hence on zooming out, any pixel text in the models will eventually stop drawing.</i>	input	0	
Set <i>set the text draw mode and thresholds to the values given in the panel fields. The plan view is then redrawn using the new values.</i>	button		

Model Text Table for Plan View

Position of option on menu: Plan View Menu View => Settings => Text => Table

The **Table** option displays a list a models on the view with their draw flag. The draw flag can be toggled to allow the drawing/stop drawing text from the model on the view (world or pixel).

Selecting **Table** fires up the **Model Text Table for Plan View** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View	input/output	current view	available views
<i>name of the view to modify model text table drawing flags for:</i>			

Draw ☐ tick box

If **not ticked**, then **no** text from strings in models (text, 4d and survey strings) is drawn.
if **ticked**, any text from strings in models (text, 4d and survey strings) will then be checked against the height max for pixel text, or text drawn mode for world text, to see if it is drawn.

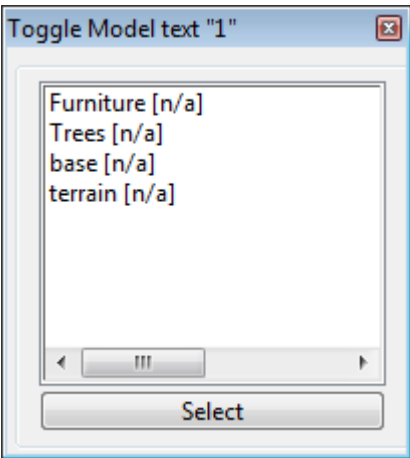
Model	input
	<i>the model to set the Draw flag for.</i>

Set **button**
set the text draw flags for the models in the table.

Toggle

Position of menu: **Plan View Menu** **View => Settings => Text => Toggle**

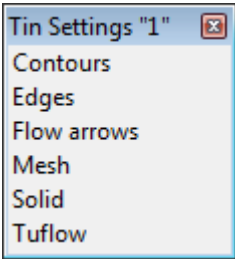
Walking-right on the **Toggle** option displays a list a models on the view with their text draw flag. The text draw flag can be toggled on/off by selecting the model on the list. Note that [n/a] means that the model has *not* been individually set on or off and the general **Text** toggle is used for the model.



Tins

Position of menu: Plan View Menu View => Settings => Tins

The options on the Tins walk-right menu control the display of tins on the view. The Tins walk-right menu is



For the option Contours go to
Edges
Flow arrows
Mesh
Solid
Tuflow

- [Tin Draw Contours for View](#)
- [Tin Draw Edges for View](#)
- [Tin Draw Flow Arrows for View](#)
- [Tin Draw Mesh for View](#)
- [Tin Draw Solid for View](#)

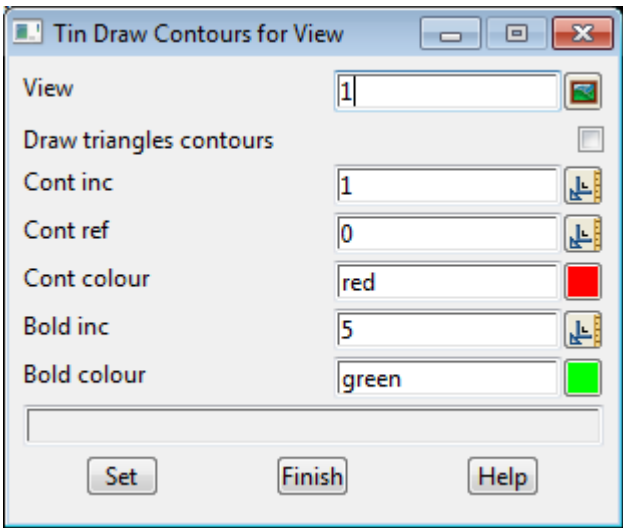
Tin Draw Contours for View

Position of option on menu: Plan View Menu View => Settings => Tins => Contours

Position of option on menu: Perspective View Menu View => Settings => Tins => Contours

The Contours option defines contour and bold increments and colours, and also whether these contours are displayed for the triangles from any tins on the view. Because the contours are just drawn separately for each triangle, they are know as **quick** or **fast contours**.

Selecting Contours fires up the Tin Draw Contours for View panel.



The fields and buttons used in this panel have the following functions.

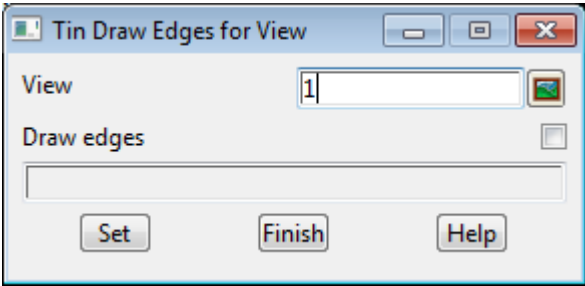
Field Description	Type	Defaults	Pop-Up
View	input/output	current view	available views
<i>name of the view to modify fast contour drawing parameters for:</i>			

Draw triangles contours	tick box		
<i>if ticked, the contours for any triangles in any tins on the view are displayed.</i>			
Cont inc	input	1.0	
<i>increment between contoured values.</i>			
Cont ref	input	0.0	
<i>reference value for the contour increments.</i>			
Cont colour	input	cyan	available colours
<i>colour of the contours</i>			
Bold inc	input	5.0	
<i>increment for the bold contours. If the bold increment is blank or zero, then no bold contours are drawn. If the bold increment is non-zero, it must be an integer multiple of the contour increment</i>			
Bold colour	input	magenta	available colours
<i>colour of the bold contours</i>			
Set	button		
<i>set the value in the panel and then redraw the plan view.</i>			

Tin Draw Edges for View

Position of option on menu:	Plan View Menu	View => Settings => Tins => Edges
Position of option on menu:	Perspectives View Menu	View => Settings => Tins => Edges

The Edges option allows the user to specify whether the edges of triangles from any tins on the view are displayed. Selecting Edges fires up the **Tin Draw Edges for View** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View	input/output	current view	available views
<i>name of the view to modify tin edge drawing flag for.</i>			

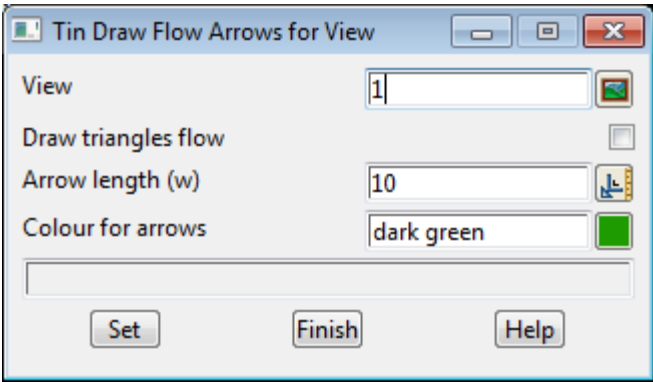
Draw triangles edges	tick box
<i>if ticked, the edges of any triangles in any tins on the view are displayed.</i>	
Set	button
<i>set the value and then redraw the plan view.</i>	

Tin Draw Flow Arrows for View

Position of option on menu:	Plan View Menu	View =>Settings =>Tins =>Flow arrows
Position of option on menu:	Perspective View Menu	View =>Settings =>Tins =>Flow arrows

The **Flow arrows** option defines the colour and length of flow arrows, and also whether the flow

arrows are displayed for the triangles from any tins on the view. Selecting **Flow arrows** fires up the **Tin Draw Flow Arrows for View** panel.



The fields and buttons used in this panel have the following functions.

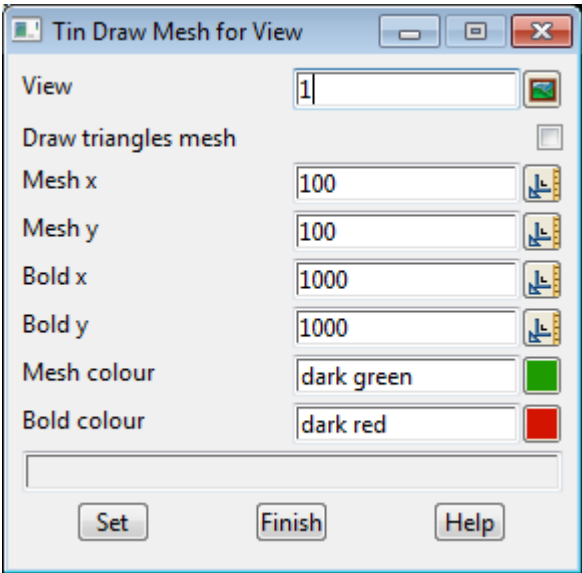
Field	Description	Type	Defaults	Pop-Up
View	<i>name of the view to modify tin arrow drawing flag for.</i>	input/output	current view	available views
Draw triangles flow arrows	<i>if ticked, the flow arrows for any triangles in any tins on the view are displayed.</i>	tick box		
Arrow length (w)	<i>length in world units to draw flow arrows.</i>	input		
Colour for arrows	<i>colour for the arrows.</i>	input	cyan	available colours
Set	<i>set the value in the panel and then redraw the plan view.</i>	button		

Tin Draw Mesh for View

Position of option on menu: Plan View Menu View => Settings => Tins => Mesh

Position of option on menu: Perspective View Menu View => Settings => Tins => Mesh

The `mesh` option defines a rectangular mesh, and also whether the mesh is displayed for the triangles from any tins on the view. Selecting **Mesh** fires up the **Tin Draw Mesh for View** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>name of the view to modify tin mesh drawing flag for.</i>	input/output	current view	available views

Draw triangles mesh <i>if ticked, a rectangular mesh for any triangles in any tins on the view are displayed.</i>	tick box		
-----------------------------------------------------------------------------------------------------------------------------	----------	--	--

Mesh x <i>the distance between the x mesh lines. If this value is zero, the x mesh lines will not be drawn.</i>	input	100	
---------------------------------------------------------------------------------------------------------------------------	-------	-----	--

Mesh y <i>the distance between the y mesh lines. If this value is zero, the y mesh lines will not be drawn.</i>	input	100	
---------------------------------------------------------------------------------------------------------------------------	-------	-----	--

Bold x <i>the distance between the bold x mesh lines. If this value is zero, the bold x mesh lines will not be drawn.</i>	input	100	
-------------------------------------------------------------------------------------------------------------------------------------	-------	-----	--

Bold y <i>the distance between the bold y mesh lines. If this value is zero, the bold y mesh lines will not be drawn.</i>	input	100	
-------------------------------------------------------------------------------------------------------------------------------------	-------	-----	--

Mesh colour <i>colour that the mesh is drawn in.</i>	input	dark green	available colours
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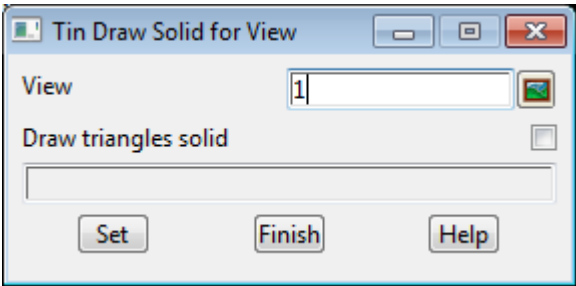
Bold colour <i>colour that the bold mesh is drawn in.</i>	input	dark green	available colours
---------------------------------------------------------------------	-------	------------	-------------------

Set <i>set the value in the panel and then redraw the plan view.</i>	button		
--------------------------------------------------------------------------------	--------	--	--

Tin Draw Solid for View

Position of option on menu: Plan View Menu View => Settings => Tins => Solid

The **solid** option allows the user to specify whether the triangles from any tins on the view are displayed as solid colour. Selecting **Solid** fires up the **Tin Draw Solid for View** panel.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
View	<i>name of the view to modify tin solid drawing flag for.</i>	input/output	current view	available views
Draw triangles solid	<i>if ticked, any triangles in any tins on the view are displayed in solid colour.</i>	tick box		
Set	<i>set the value and then redraw the plan view.</i>	button		

Vertices

Position of menu: Plan View Menu View => Settings => Vertices

The Vertices option allows the user to specify whether crosses at the vertices of strings are

- (a) not drawn at all
- or
- (b) if set to draw, then only drawn if equivalent world size is not too large. This stops the drawing of *crosses* when the displaying world size is large in proportion to other world units (e.g. when zooming out).

Hence the Vertices option tries to control the drawing of vertex crosses on the view so that the crosses stop displaying as the user *zooms out*

Depending on whether the environment variable *plan_table_settings_4d* is zero or not, the Vertices option draws crosses for string vertices for *any* model on the view, or the drawing of crosses can be set for individual models.

If the environment variable *plan_table_settings_4d* is set to 0:

the Vertices option is used to display/not display crosses at the vertices of strings in **all** models on the plan view. For a text string, a cross is placed at the text justification position.

Selecting Vertices brings up the **Crosses at String Vertices for Plan View** panel, without the Model field.

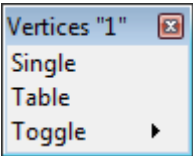
If *plan_table_settings_4d* is non-zero:

the Vertices option then has a walk-right menu with options to specify for *each* model on the plan view whether crosses at the vertices of strings in the model are

- (a) not drawn at all
- or
- (b) if set to draw, then the crosses are only drawn if equivalent world size is not too large. This stops the drawing of *crosses* when its displaying world size is large in proportion to other world units (e.g. when zooming out).

If Vertices is selected without walking right, the **Crosses at String Vertices for Plan View** panel is brought up (documented in the next section).

The Vertices walk-right menu is



For the option *Single* go to
Table
Toggle

[Crosses at String Vertices for Plan View](#)
[Crosses at String Vertices Table for Plan View](#)
[Toggle](#)

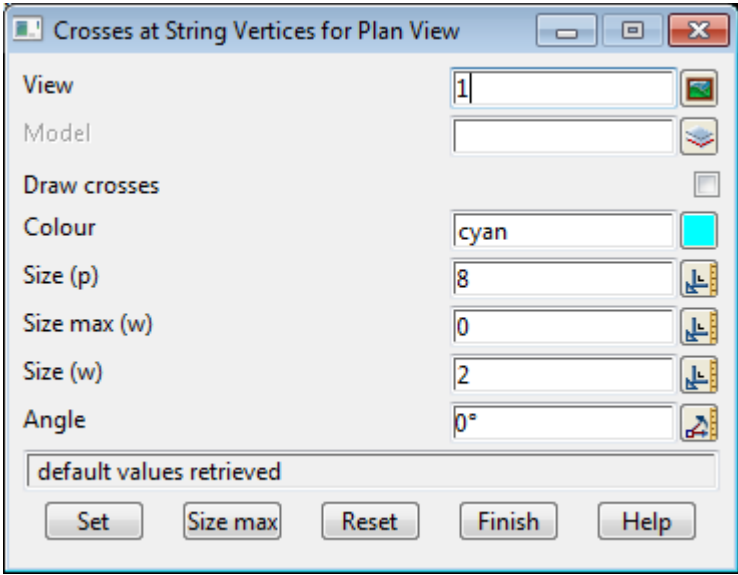
Crosses at String Vertices for Plan View

Position of option on menu: Plan View Menu View => Settings => Vertices => Single

The *Single* option is used to set parameters for drawing crosses at vertices of strings for all models not defined in the *Table* option or for a single model on the plan view. For a text string, a

cross is placed at the text justification position.

After selecting the **Single** option, the **Crosses at String Vertices for Plan View** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>name of the view to modify string vertices drawing parameters for.</i>	input/output	current view	available views
Model <i>if blank, then all models not mentioned in the Table option use these parameters for drawing crosses on a view. If non blank, then this model only will be set to draw crosses with the parameters on this panel.</i>	input		
Draw crosses <i>If ticked, vertex crosses for the model will be checked against the Size max (w) before being drawn. If not ticked, then no vertex crosses for strings in the given model are drawn on the plan view.</i>	tick box		
Colour <i>colour of the crosses</i>	input	default pt colour	available colours
Size (p) <i>size in pixels that the crosses are drawn on a plan view</i>	input	default text height	
Size max (w) <i>if non-zero: when the cross is displayed on a plan view then there is an equivalent size of the cross in world units that matches the display size. If Size max (w) has a non-zero value, then if the equivalent world size of the cross on the plan view is greater than Size max (w), then the cross is not drawn. Hence zooming out will eventually stop the crosses from drawing.</i>	input	0	
Size (w) <i>size in world units of the cross when plotted or output.</i>	input	0	
Angle <i>angle in degrees that the cross is rotated about the (x,y) position of the string vertices.</i>	input	0	
Set <i>set the values in the panel and then redraw the plan view.</i>	button		

Size max (w) button
*sets Size max (w) to be the world size of crosses as they are currently displayed on the given plan view. Hence if any further zoom out is done, the crosses will stop drawing. The **set** button must then be clicked to set the values for the view.*

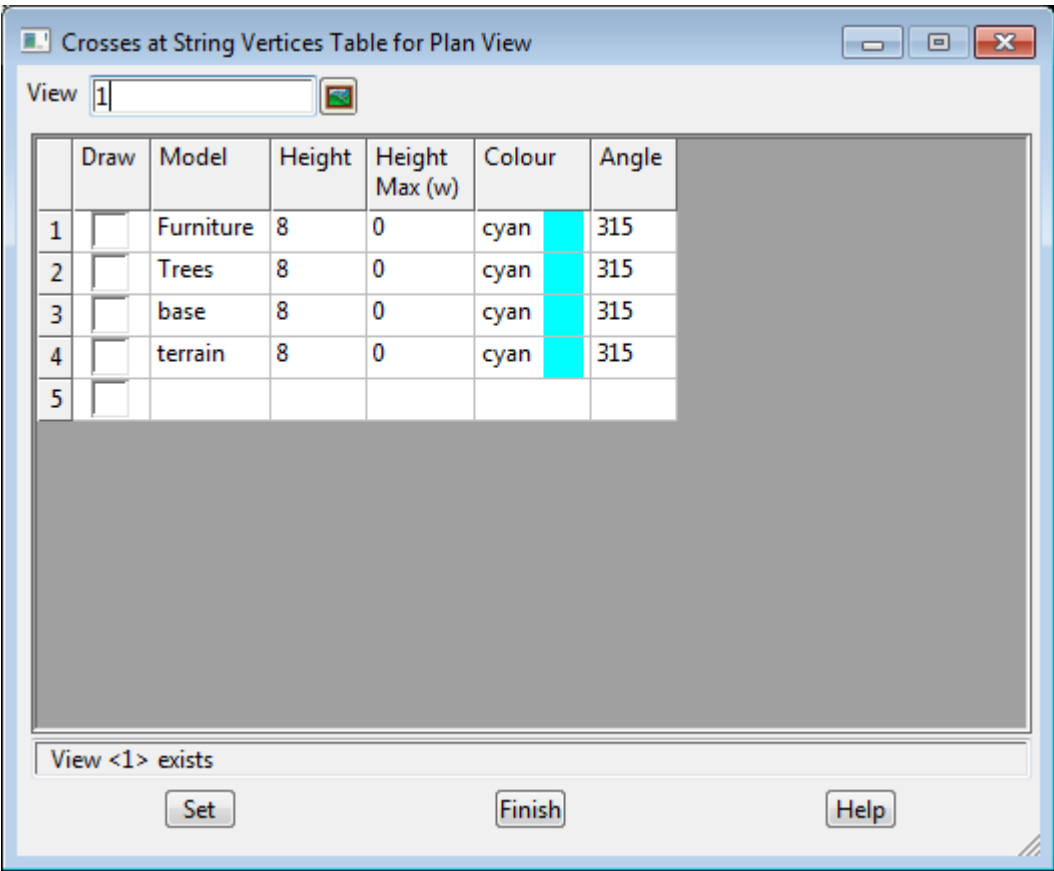
Reset button
reset all the parameters so no models are individually set for the view.

Crosses at String Vertices Table for Plan View

Position of option on menu: Plan View Menu View => Settings => Vertices => Table

The **Table** option displays a list of models on the view with their vertex drawing parameters which can then be modified from the table.

Selecting **Table** fires up the **Crosses at String Vertices Table for Plan View** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View	input/output	current view	available views

name of the view to modify string vertices drawing parameters for.

Draw tick box
*If **not** ticked, then **no** vertex crosses from strings in the given model are drawn on the plan view. if **ticked**, any cross for vertices in the model will be checked against the Sz max (w) to see if it is drawn.*

Model input
the model to set the parameters for:

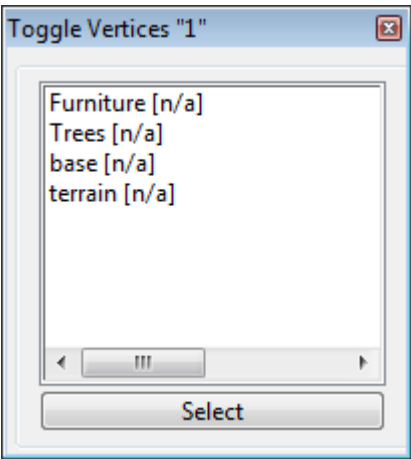
Colour	input	default pt colour	available colours
<i>colour of the crosses at the vertices</i>			
Size	input	default text height	
<i>size in pixels that the crosses are drawn on a plan view.</i>			
Sz max (w)	input	0	
<i>if non-zero: the size of the crosses in world units is greater than Sz max (w), then the crosses are not drawn. Hence zooming out will eventually stop the crosses from drawing.</i>			
Angle	input	0	
<i>angle in degrees that the cross is rotated about the (x,y) position of the string vertices.</i>			
Set	button		
<i>set the vertex cross drawing parameters for the models in the table.</i>			

Toggle

Position of option on menu: Plan View Menu View => Settings => Vertices => Toggle

Walking-right on the **Toggle** option displays a list of models on the view with their vertex cross draw flag. The vertex cross draw flag can be toggled on/off for the model by selecting the model on the list.

Note that [n/a] means that the model has *not* been individually set on or off and the general **Vertex** toggle is used for the model.



Vertex/Segment UIDs

Plan_View_Vertex_Segment_UIDs_Settings_MenuPosition of menu: Plan View Menu View => Settings => Vertex/Segment UID's

The Vertex/Segment UID's option allows the user to specify whether the vertex/segment UIDs for any super string vertex/segment are:

- (a) not drawn at all
- or
- (b) if set to draw, then only drawn if the equivalent world size is not too large. This stops the drawing of *vertex/segment UIDs* when the displaying world size is large in proportion to other world units (e.g. when zooming out).

Hence the Vertex/Segment UID's option tries to control the drawing of vertex/segment UIDs on the view so that the UIDs stop displaying as the user *zooms out*.

Depending on whether the environment variable *plan_table_settings_4d* is zero or not, the Vertex/Segment UID's option draws vertex/segment UIDs for string vertices for *any* model on the view, or the drawing of Vertex/Segment UIDs can be set for individual models.

If the environment variable *plan_table_settings_4d* is set to 0:
the Vertex/Segment UID's option is used to display/not display vertex/segment UIDs at the vertices/segments of strings in **all** models on the plan view.

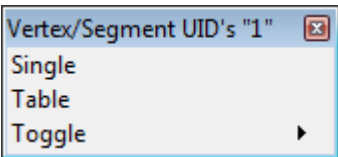
Selecting Vertex/Segment UID's brings up the **Vertex/Segment UID's for Plan View** panel, without the Model field.

If *plan_table_settings_4d* is non-zero:
the Vertex/Segment UID's option then has a walk-right menu with options to specify for *each* model on the plan view whether vertex/segment UIDs for strings in the model are

- (a) not drawn at all
- or
- (b) if set to draw, then the vertex/segment UIDs are only drawn if the equivalent world size is not too large. This stops the drawing of vertex/segment UIDs when the displaying world size is large in proportion to other world units (e.g. when zooming out).

If Vertex/Segment UID's is selected without walking right, the **Vertex/Segment UID's for Plan View** panel is brought up (documented in the next section).

The Vertex/Segment UID's walk-right menu is



For the option *Single*, go to
Table
Toggle

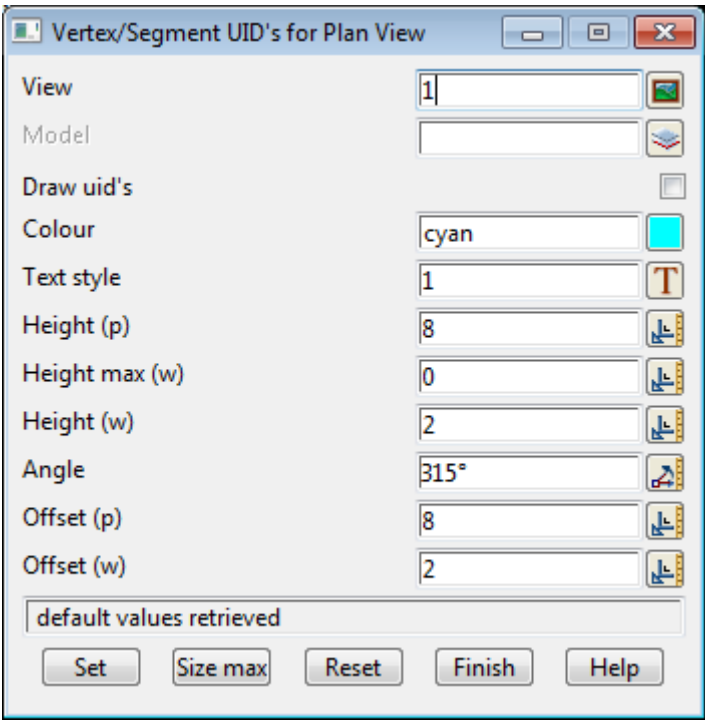
[Vertex/Segment UIDs for Plan View](#)
[Vertex/Segment UIDs Table for Plan View](#)
[Toggle Vertex/Segment UIDs](#)

Vertex/Segment UUIDs for Plan View

Vertex_Segment_UUID_s_for_Plan_ViewPosition of option on menu: Plan View Menu View =>Settings
=>Vertex/Segment UID's => Single

The Single option is used to set parameters for drawing vertex/segment UUIDs of strings for all models not mentioned in the Table or set the parameters for an individual model on the plan view.

After selecting the Single option, the Vertex/Segment UUIDs for Plan View panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View	view box	current view	available views
<i>name of the view to modify vertex/segment UUIDs drawing parameters for.</i>			
Model	model box		available models
<i>if blank, then all models not mentioned in the Table option use these parameters for drawing vertex/segment UUIDs on a view.</i>			
<i>If non blank, then this model only will be set to draw vertex/segment UUIDs with the parameters on this panel.</i>			
Draw UUIDs	tick box	not ticked	
<i>if ticked, vertex/segment UUIDs will be checked against the Height max (w) before being drawn.</i>			
<i>If not ticked, then no vertex/segment UUIDs for strings are drawn on the plan view.</i>			
Colour	colour box	default pt colour	available colours
<i>colour of the vertex/segment UUIDs</i>			
Text style	text style box	1	available text styles
<i>text style of the vertex/segment UUIDs</i>			

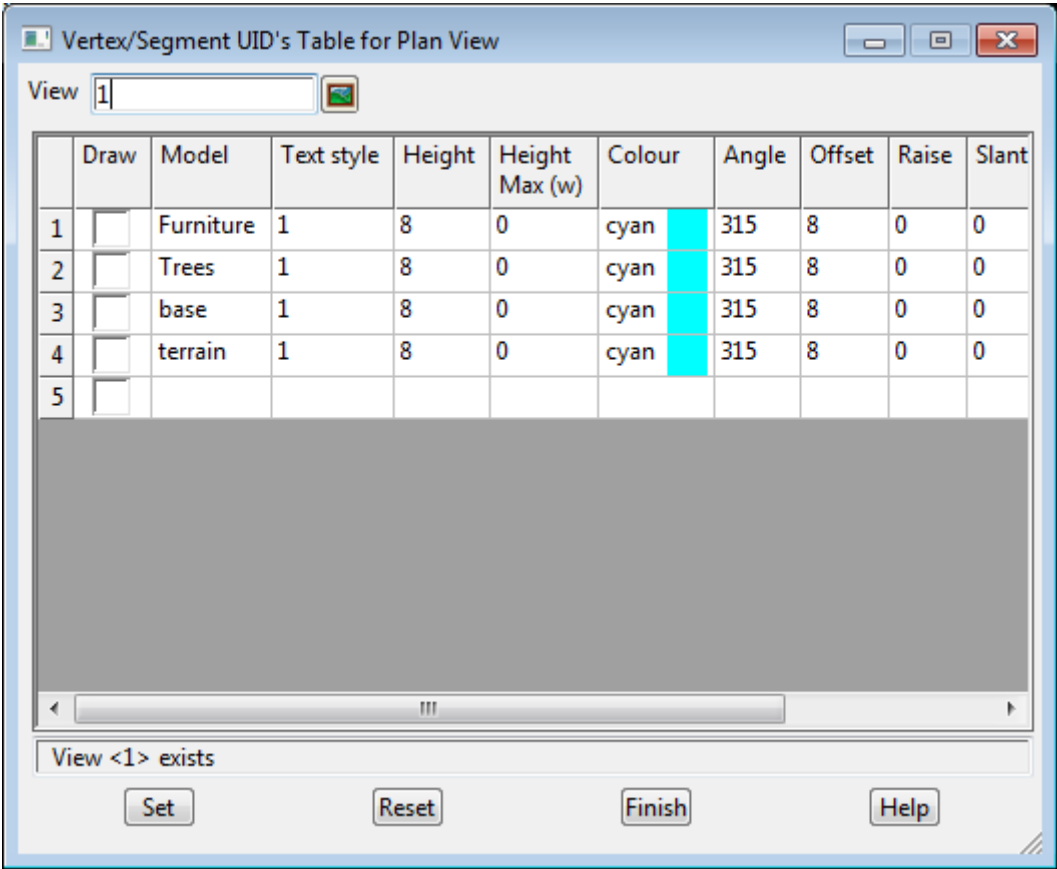
Height (p)	measure box	8	At Point, Point to Point, String from Point, String to point
<i>height in pixels that the vertex/segment UIDs are drawn on a plan view.</i>			
Height max (w)	measure box	0	At Point, Point to Point, String from Point, String to point
<i>if non-zero: when the vertex/segment UIDs is displayed on a plan view then there is an equivalent height of the id's in world units that matches the display size. If Size max (w) has a non-zero value, then if the equivalent world size of the id's on the plan view is greater than Size max (w), then the UID is not drawn. Hence zooming out will eventually stop the vertex/segment UIDs from drawing.</i>			
Height (w)	measure box	2	At Point, Point to Point, String from Point, String to point
<i>height in world units of the vertex/segment UIDs when plotted or output.</i>			
Angle	angle box	315°	
<i>angle in degrees that the text is rotated about the (x,y) position of the string vertices.</i>			
Offset (p)	measure box	default text height	At Point, Point to Point, String from Point, String to point
<i>distance in pixels that the text is drawn from the (x,y) position of the string vertices.</i>			
Offset (w)	measure box	default text height	At Point, Point to Point, String from Point, String to point
<i>distance in world units that the text is drawn from the (x,y) position of the string points when plotted</i>			
Set	button		
<i>set the values in the panel and then redraw the plan view.</i>			
Size max	button		
<i>when clicked, size max is set to be the world size of vertex/segment UIDs displayed on the given plan view. Hence if any further zoom out is done, the vertex/segment UIDs will stop drawing. The set button must then be clicked to set the values for the view.</i>			
Reset	button		
<i>reset all the parameters so no models are individually set for the view.</i>			

Vertex/Segment UUIDs Table for Plan View

Vertex_Segment_UUID_s_Table_for_Plan_ViewPosition of option on menu: Plan View Menu View
=> Settings => Vertex/Segment UID's => Table

The Table option displays a list of models on the view with their vertex/segment UUIDs drawing parameters which can then be modified from the table.

Selecting Table fires up the Vertex/Segment UUIDs Table for Plan View panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View	input/output	current view	available views
<i>name of the view to modify vertex/segment UUIDs drawing parameters for.</i>			

Draw	tick box
<i>If not ticked, then no vertex/segment UUIDs for strings in the given model are drawn on the plan view.</i>	
<i>if ticked, vertex/segment UUIDs for strings in the model will be checked against the Ht max (w) to see if they are drawn.</i>	

Model	input
<i>the model to set the parameters for.</i>	

Colour	input	default pt colour	available colours
<i>colour of the vertex/segment UUIDs</i>			

Text style	input	1	available text styles
<i>textstyle of the vertex/segment UUIDs</i>			

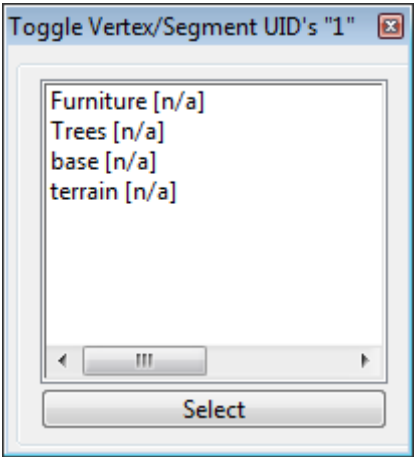
Height	input	8
<i>height in pixels of the vertex/segment UUIDs</i>		

Ht max (w)	input	0
<i>if non-zero: when the plan view is such that the height of the point id's in world units is greater than Height max (w), then the vertex/segment UIDs are not drawn. Hence as one zooms out, the vertex/segment UIDs will eventually stop drawing.</i>		
Angle	input	-45
<i>angle in degrees that the text is rotated about the (x,y) position of the string vertices.</i>		
Offset	input	default text height
<i>distance in pixels that the text is drawn from the (x,y) position of the string vertices.</i>		
Set	button	
<i>set the values in the panel and then redraw the plan view.</i>		

Toggle Vertex/Segment UIDs

Plan_View_Toggle_Vertex_Segment_UID_sPosition of menu: **Plan View Menu** **View => Settings => Vertex/Segment UID's => Toggle**

Walking-right on the **Toggle** option displays a list of models on the view with their point/vertex id's draw flag. The vertex/segment UIDs draw flag can be toggled on/off for the model by selecting the model on the list. Note that [n/a] means that the model has *not* been individually set on or off and the general **Vertex/Segment UIDs** toggle is used for the model.



Point/Vertex IDs

Position of menu: Plan View Menu View => Settings => Point/Vertex id's

The **Point/Vertex IDs** option allows the user to specify whether the point/vertex ID (a point ID recorded for a vertex) for any super string vertex are

- (a) not drawn at all
- or
- (b) if set to draw, then only drawn if the equivalent world size is not too large. This stops the drawing of *point/vertex IDs* when the displaying world size is large in proportion to other world units (e.g. when zooming out).

Hence the **Point/Vertex IDs** option tries to control the drawing of point ids on the view so that the ids stop displaying as the user *zooms out*

Note - Point/Vertex IDs are not to be confused with *vertex indices* which are simply the position of the vertex in the string.

Depending on whether the environment variable *plan_table_settings_4d* is zero or not, the Point/Vertex IDs option draws point/vertex IDs for string vertices for *any* model on the view, or the drawing of vertex IDs can be set for individual models.

If the environment variable *plan_table_settings_4d* is set to 0:

the **Point/Vertex IDs** option is used to display/not display vertex ids at the vertices of strings in **all** models on the plan view.

Selecting **Point/Vertex IDs** brings up the **Vertex IDs for Plan View** panel, without the Model field.

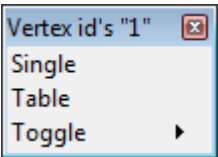
If *plan_table_settings_4d* is non-zero:

the **Point/Vertex IDs** option then has a walk-right menu with options to specify for *each* model on the plan view whether point ids for strings in the model are

- (a) not drawn at all
- or
- (b) if set to draw, then the point ids are only drawn if the equivalent world size is not too large. This stops the drawing of point *ids* when the displaying world size is large in proportion to other world units (e.g. when zooming out).

If **Point/Vertex IDs** is selected without walking right, the **Vertex IDs for Plan View** panel is brought up (documented in the next section).

The **Point/Vertex IDs** walk-right menu is



For the option Single, go to
Table
Toggle

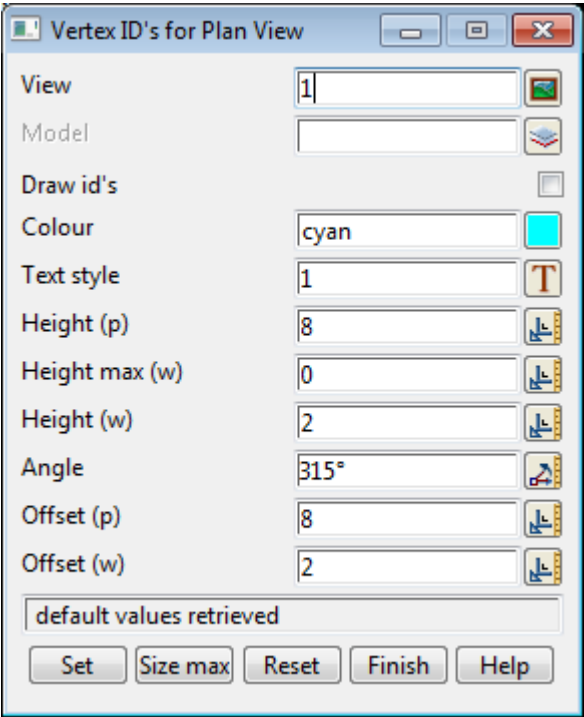
[Vertex IDs for Plan View](#)
[Vertex IDs Table for Plan View](#)
[Toggle Vertex IDs](#)

Vertex IDs for Plan View

Position of option on menu: Plan View Menu View =>Settings =>Point/Vertex id's=> Single

The **Single** option is used to set parameters for drawing point/vertex id's of strings for all models not mentioned in the *Table* or set the parameters for an individual model on the plan view.

After selecting the **Single** option, the **Vertex IDs for Plan View** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
View	<i>name of the view to modify point/vertex id's drawing parameters for.</i>	input/output	current view	available views
Model	<i>if blank, then all models not mentioned in the Table option use these parameters for drawing point IDs on a view. If non blank, then this model only will be set to draw point/vertex IDs with the parameters on this panel.</i>	input		
Draw IDs	<i>If ticked, point/vertex id's will be checked against the Height max (w) before being drawn. If not ticked, then no point/vertex id's for strings are drawn on the plan view.</i>	tick box		
Colour	<i>colour of the point/vertex id's</i>	input	default pt colour	available colours
Text style	<i>textstyle of the point/vertex id's</i>	input	1	available text styles
Height (p)	<i>height in pixels that the point/vertex id's are drawn on a plan view.</i>	input	8	
Height max (w)	<i>if non-zero: when the point/vertex id's is displayed on a plan view then there is an equivalent height of the id's in world units that matches the display size. If Size max (w) has a non-zero value, then if the equivalent world size of the id's on the plan view is greater than Size max (w), then the id's is not drawn. Hence zooming out will eventually stop the point/vertex id's from drawing.</i>	input	0	

- Height (w)

input

2

height in world units of the point/vertex id's when plotted or output.
- Angle

input

-45

angle in degrees that the text is rotated about the (x,y) position of the string vertices.
- Offset (p)

input

default text height

distance in pixels that the text is drawn from the (x,y) position of the string vertices.
- Offset (w)

input

default text height

distance in world units that the text is drawn from the (x,y) position of the string points when plotted
- Set

button

set the values in the panel and then redraw the plan view.
- Size max (w)

button

when clicked, size max (w) is set to be the world size of point IDs displayed on the given plan view. Hence if any further zoom out is done, the point IDs will stop drawing. The **set** button must then be clicked to set the values for the view.
- Reset

button

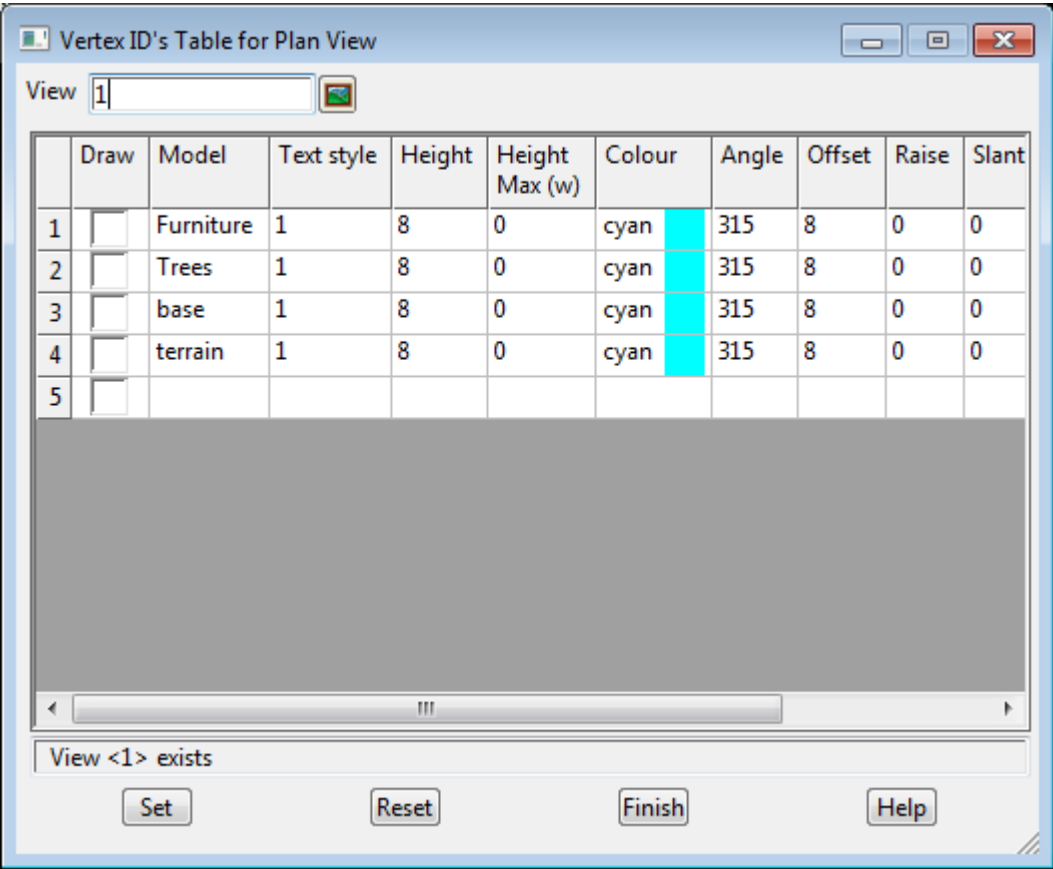
reset all the parameters so no models are individually set for the view.

Vertex IDs Table for Plan View

Position of option on menu: Plan View Menu View => Settings => Point/Vertex IDs => Table

The **Table** option displays a list of models on the view with their point id's drawing parameters which can then be modified from the table.

Selecting **Table** fires up the **Vertex IDs Table for Plan View** panel.



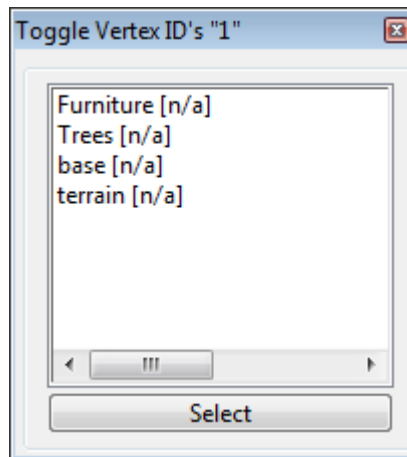
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>name of the view to modify point IDs drawing parameters for.</i>	input/output	current view	available views
Draw <i>If not ticked, then no point IDs for strings in the given model are drawn on the plan view. if ticked, point IDs for strings in the model will be checked against the Ht max (w) to see if they are drawn.</i>	tick box		
Model <i>the model to set the parameters for.</i>	input		
Colour <i>colour of the point IDs</i>	input	default pt colour	available colours
Text style <i>textstyle of the point IDs</i>	input	1	available text styles
Height <i>height in pixels of the point IDs.</i>	input	8	
Ht max (w) <i>if non-zero: when the plan view is such that the height of the point id's in world units is greater than Height max (w), then the point IDs are not drawn. Hence as one zooms out, the point IDs will eventually stop drawing.</i>	input	0	
Angle <i>angle in degrees that the text is rotated about the (x,y) position of the string vertices.</i>	input	-45	
Offset <i>distance in pixels that the text is drawn from the (x,y) position of the string vertices.</i>	input	default text height	
Set <i>set the values in the panel and then redraw the plan view.</i>	button		

Toggle Vertex IDs

Position of menu: Plan View Menu View => Settings => Point/Vertex IDs => Toggle

Walking-right on the **Toggle** option displays a list of models on the view with their point/vertex id's draw flag. The point/vertex id's draw flag can be toggled on/off for the model by selecting the model on the list. Note that [n/a] means that the model has *not* been individually set on or off and the general **Point/vertex IDs** toggle is used for the model.



Vertex Indices

Position of menu: Plan View Menu View => Settings => **Vertex Indices**

The **Vertex Indices** option allows the user to specify whether the vertex indices (position of the vertex in the string) for all vertices of strings are

(a) not drawn at all

or

(b) if set to draw, then only drawn if the equivalent world size is not too large. This stops the drawing of *vertex indices* when the displaying world size is large in proportion to other world units (e.g. when zooming out).

Hence the **Vertex Indices** option tries to control the drawing of vertex indices on the view so that the indices stop displaying as the user *zooms out*

Note - vertex indices are not to be confused with *point/vertex IDs* which may not be defined for a vertex in the string.

Depending on whether the environment variable *plan_table_settings_4d* is zero or not, the Vertex indices option draws vertex indices for string vertices for *any* model on the view, or the drawing of vertex indices can be set for individual models.

If the environment variable *plan_table_settings_4d* is set to 0:

the **Vertex Indices** option is used to display/not display vertex indices at the vertices of strings in **all** models on the plan view.

Selecting **Vertex Indices** brings up the **Vertex Indices for Plan View** panel, without the Model field.

If *plan_table_settings_4d* is non-zero:

the **Vertex Indices** option then has a walk-right menu with options to specify for *each* model on the plan view whether vertex indices for strings in the model are

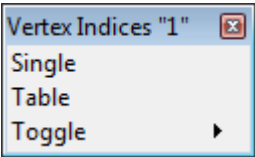
(a) not drawn at all

or

(b) if set to draw, then the vertex indices are only drawn if the equivalent world size is not too large. This stops the drawing of *indices* when the displaying world size is large in proportion to other world units (e.g. when zooming out).

If **Vertex Indices** is selected without walking right, the **Vertex Indices for Plan View** panel is brought up (documented in the next section).

The **Vertex Indices** walk-right menu is



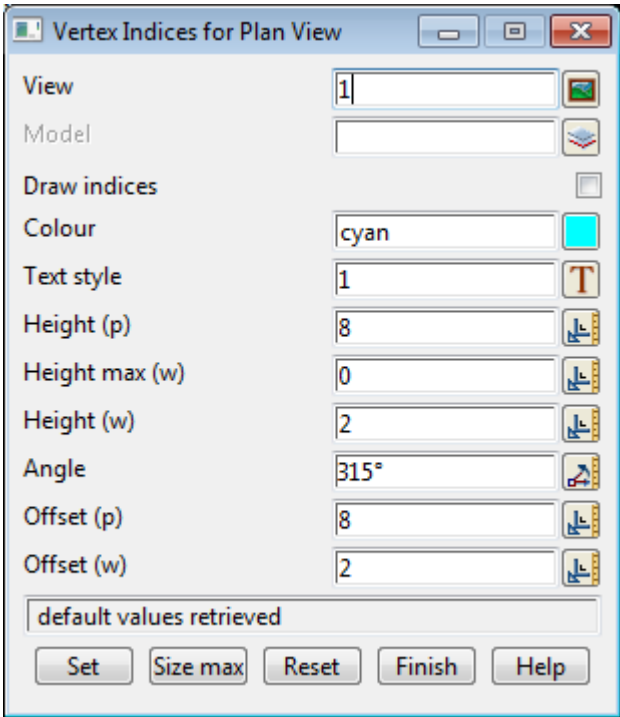
For the option Single, go to
Table
Toggle

[Vertex Indices for Plan View](#)
[Vertex Indices Table for Plan View](#)
[Toggle Vertex indices](#)

Vertex Indices for Plan View

Position of option on menu: Plan View Menu View => Settings => Vertex indices => Single

The **Single** option is used to set parameters for drawing vertex indices of strings for all models not mentioned in the *Table* or set the parameters for an individual model on the plan view.
After selecting the **Single** option, the **Vertex Indices for Plan View** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>name of the view to modify vertex indices drawing parameters for.</i>	input/output	current view	available views
Model <i>if blank, then all models not mentioned in the Table option use these parameters for drawing vertex indices on a view. If non blank, then this model only will be set to draw vertex indices with the parameters on this panel.</i>	input		

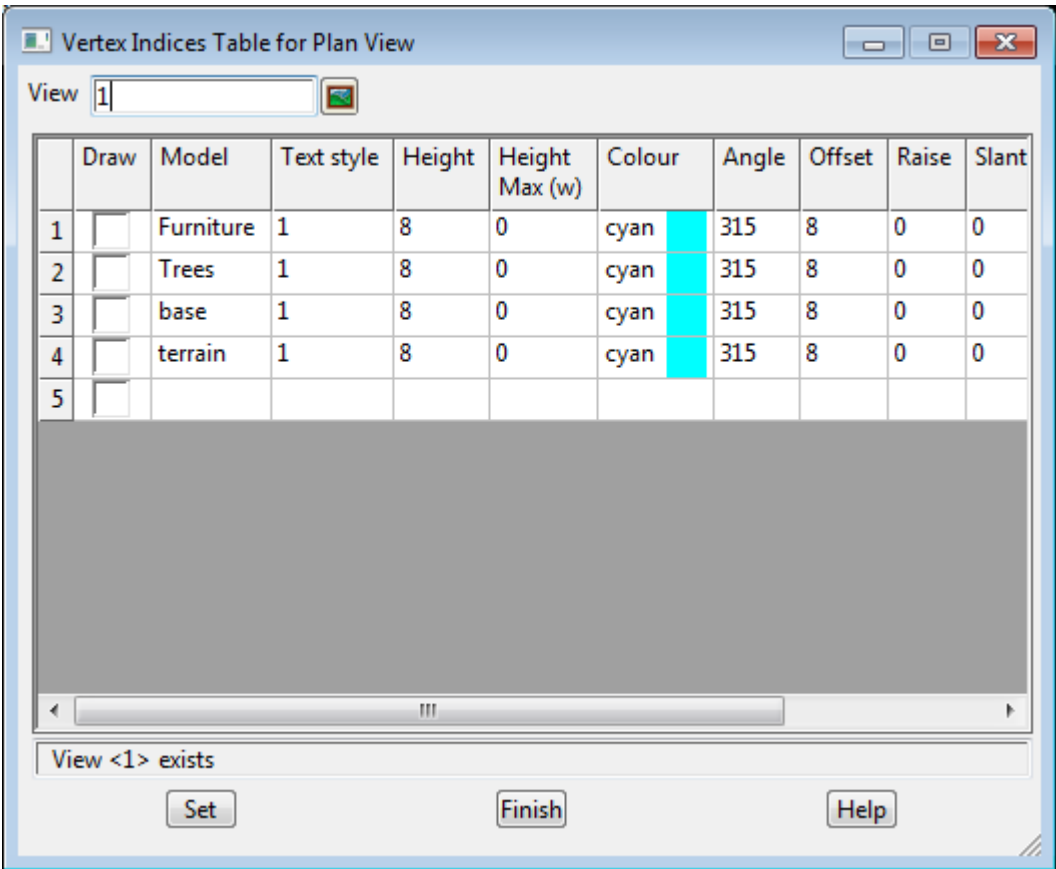
Draw indices	tick box		
<i>If ticked, vertex indices will be checked against the Height max (w) before being drawn. If not ticked, then no vertex indices for strings are drawn on the plan view.</i>			
Colour	input	default pt colour	available colours
<i>colour of the vertex indices</i>			
Text style	input	1	available text styles
<i>textstyle of the vertex indices</i>			
Height (p)	input	8	
<i>height in pixels that the vertex indices are drawn on a plan view.</i>			
Height max (w)	input	0	
<i>if non-zero: when the plan view is such that the height of the vertex indices in world units is greater than Height max (w), then the vertex indices are not drawn. Hence as one zooms out, the vertex indices will eventually stop drawing. if non-zero: when the vertex indices are displayed on a plan view then there is an equivalent height of the number in world units that matches the display size. If Size max (w) has a non-zero value, then if the equivalent world size of the number on the plan view is greater than Size max (w), then the number is not drawn. Hence zooming out will eventually stop the vertex indices from drawing.</i>			
Height (w)	input	2	
<i>height in world units of the vertex indices when plotted or output.</i>			
Angle	input	-45	
<i>angle in degrees that the text is rotated about the (x,y) position of the string vertices.</i>			
Offset (p)	input	default text height	
<i>distance in pixels that the text is drawn from the (x,y) position of the string vertices.</i>			
Offset (w)	input	default text height	
<i>distance in world units that the text is drawn from the (x,y) position of the string points when plotted</i>			
Set	button		
<i>set the values in the panel and then redraw the plan view.</i>			
Size max (w)	button		
<i>when clicked, size max (w) is set to be the world size of vertex indices displayed on the given plan view. Hence if any further zoom out is done, the vertex indices will stop drawing. The set button must then be clicked to set the values for the view.</i>			
Reset	button		
<i>reset all the parameters so no models are individually set for the view.</i>			

Vertex Indices Table for Plan View

Position of option on menu: Plan View Menu View => Settings => Vertex indices => Table

The Table option displays a list of models on the view with their vertex indices drawing parameters which can then be modified from the table.

Selecting Table fires up the Vertex Indices Table for Plan View panel.



The fields and buttons used in this panel have the following functions.

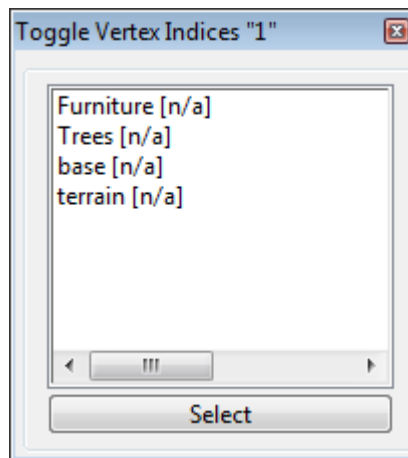
Field	Description	Type	Defaults	Pop-Up
View	<i>name of the view to modify vertex indices drawing parameters for.</i>	input/output	current view	available views
Draw		tick box		
	<i>If not ticked, then no vertex indices for strings in the given model are drawn on the plan view. if ticked, vertex indices for strings in the model will be checked against the Ht max (w) to see if it is drawn.</i>			
Model	<i>the model to set the parameters for.</i>	input		
Colour	<i>colour of the vertex indices</i>	input	default pt colour	available colours
Text style	<i>textstyle of the vertex indices</i>	input	1	available text styles
Height	<i>height in pixels of the vertex indices.</i>	input	8	
Ht max (w)	<i>if non-zero: when the plan view is such that the height of the vertex indices in world units is greater than Height max (w), then the vertex indices are not drawn. Hence as one zooms out, the vertex indices will eventually stop drawing.</i>	input	0	
Angle	<i>angle in degrees that the text is rotated about the (x,y) position of the string vertices.</i>	input	-45	

Offset	input	default text height
	<i>distance in pixels that the text is drawn from the (x,y) position of the string vertices.</i>	
Set	button	
	<i>set the values in the panel and then redraw the plan view.</i>	

Toggle Vertex indices

Position of menu: Plan View Menu View => Settings => Vertex Indices => Toggle

Walking-right on the **Toggle** option displays a list of models on the view with their vertex indices draw flag. The vertex indices draw flag can be toggled on/off for the model by selecting the model on the list. Note that [n/a] means that the model has *not* been individually set on or off and the general **Vertex Indices** toggle is used for the model.



Z Values

Position of menu: Plan View Menu View => Settings => Z values

The **Z values** option allows the user to specify whether the z co-ordinate for all vertices of strings are

(a) not drawn at all

or

(b) if set to draw, then only drawn if the equivalent world size is not too large. This stops the drawing of *z values* when the displaying world size is large in proportion to other world units (e.g. when zooming out).

Hence the **Z values** option tries to control the drawing of vertex z values on the view so that the numbers stop displaying as the user *zooms out*

Depending on whether the environment variable *plan_table_settings_4d* is zero or not, the **Z values** option draws z values for string vertices for *any* model on the view, or the drawing of vertex z values can be set for individual models.

If the environment variable *plan_table_settings_4d* is set to 0:

the **Z values** option is used to display/not display vertex z values at the vertices of strings in **all** models on the plan view.

Selecting **Z values** brings up the **Z Values for Plan View** panel, without the Model field.

If *plan_table_settings_4d* is non-zero:

the **Z values** option then has a walk-right menu with options to specify for *each* model on the plan view whether vertex z values for strings in the model are

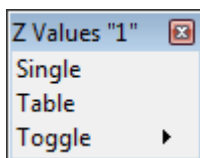
(a) not drawn at all

or

(b) if set to draw, then the z values are only drawn if the equivalent world size is not too large. This stops the drawing of *numbers* when the displaying world size is large in proportion to other world units (e.g. when zooming out).

If **Z values** is selected without walking right, the **Z Values for Plan View** panel is brought up (documented in the next section).

The **Z values** walk-right menu is



For the option Single, go to

Table

Toggle

[Z Values for Plan View](#)

[Z Values Table for Plan View](#)

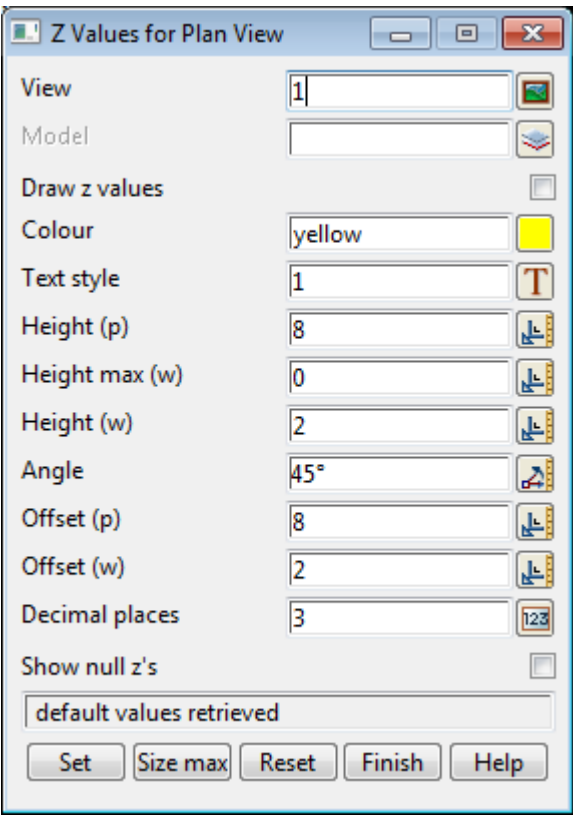
[Toggle Z Values](#)

Z Values for Plan View

Position of option on menu: Plan View Menu View => Settings => Z values => Single

The **Single** option is used to set parameters for drawing vertex z values of strings for all models not mentioned in the *Table* or for an individual model on the plan view.

After selecting the Single option, the **Z Values for Plan View** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>name of the view to modify vertices z values drawing parameters for.</i>	input/output	current view	available views
Model <i>if blank, then all models not mentioned in the Table option use these parameters for drawing vertex z-values on a view. If non blank, then this model only will be set to draw vertex z-values with the parameters on this panel.</i>	input		
Draw z values <i>If ticked, vertex z values will be checked against the Height max (w) before being drawn. If not ticked, then no vertex z values for strings are drawn on the plan view.</i>	tick box		
Colour <i>colour of the z values</i>	input	default pt colour	available colours
Text style <i>textstyle of the z values</i>	input	1	available text styles
Height (p) <i>height in pixels of the z values.</i>	input	8	
Height max (w) <i>if non-zero: when the plan view is such that the height of the z values in world units is greater than Height max (w), then the z values are not drawn. Hence as one zooms out, the z values will eventually stop drawing.</i>	input	0	

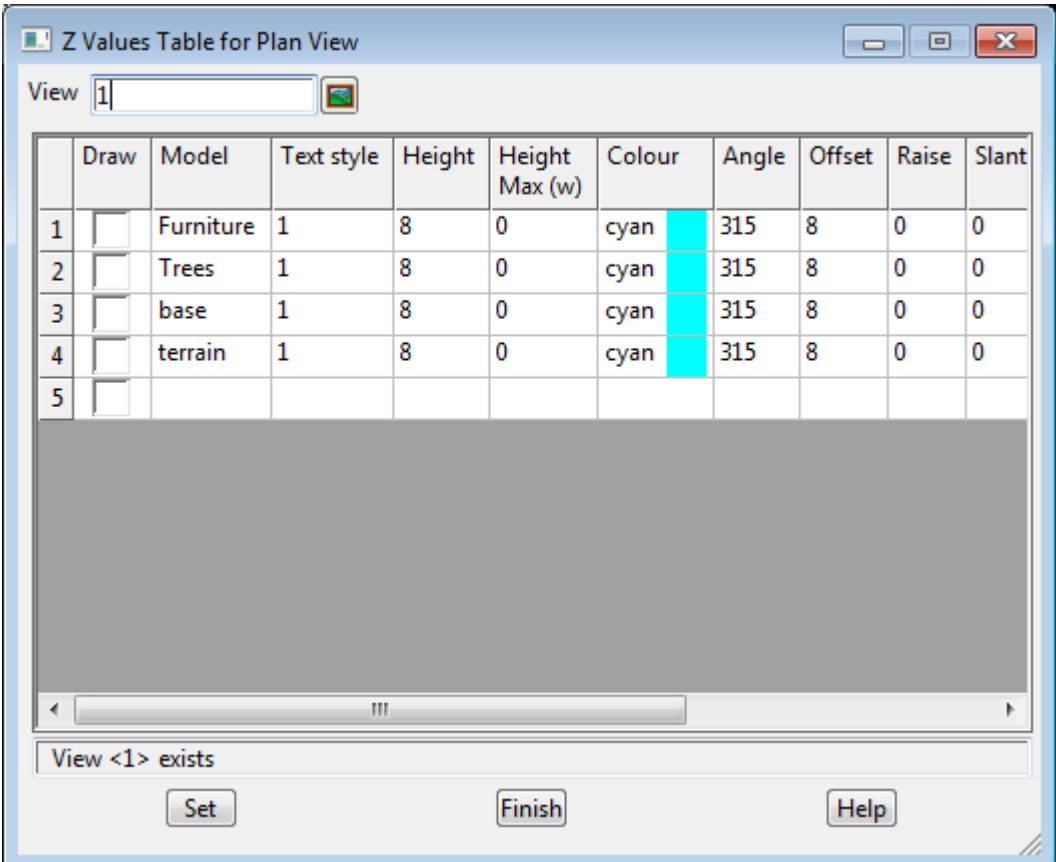
Height (w)	input	2	<i>height in world units of the z values when plotted or output.</i>
Angle	input	-45	<i>angle in degrees that the text is rotated about the (x,y) position of the string vertices.</i>
Offset (p)	input	default text height	<i>distance in pixels that the text is drawn from the (x,y) position of the string vertices.</i>
Offset (w)	input	default text height	<i>distance in world units that the text is drawn from the (x,y) position of the string points when plotted or output.</i>
Decimal places	input	3	<i>number of decimal places when displaying the z value</i>
Show null z's	tick box		<i>if ticked, null z values are displayed as null. If not ticked, no z value is displayed at null z-values.</i>
Set	button		<i>set the values in the panel and then redraw the plan view.</i>
Size max (w)	button		<i>when clicked, size max (w) is set to be the world size of vertex z-values displayed on the given plan view. Hence if any further zoom out is done, the vertex z-values will stop drawing. The set button must then be clicked to set the values for the view.</i>
Reset	button		<i>reset all the parameters so no models are individually set for the view.</i>

Z Values Table for Plan View

Position of option on menu: **Plan View Menu** **View => Settings => Z values => Table**

The **Table** option displays a list of models on the view with their vertex z value drawing parameters which can then be modified from the table.

Selecting **Table** fires up the **Z Values Table for Plan View** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View	input/output	current view	available views
<i>name of the view to modify vertices z values drawing parameters for.</i>			

Draw tick box
*If **not** ticked, then **no** vertex z values for strings in the given model are drawn on the plan view.
if **ticked**, z values for strings in the model will be checked against the Ht max (w) to see if it is drawn.*

Model input
the model to set the parameters for.

Colour input default pt colour available colours
colour of the z values

Text style input 1 available text styles
textstyle of the z values

Height input 8
height in pixels of the z values.

Ht max (w) input 0
if non-zero: when the plan view is such that the height of the z values in world units is greater than Ht max (w), then the z values are not drawn. Hence as one zooms out, the z values will eventually stop drawing.

Angle input -45
angle in degrees that the text is rotated about the (x,y) position of the string points.

Offset	input	default text height	
	<i>distance in pixels that the text is drawn from the (x,y) position of the string points</i>		
Decimal places	input	3	
	<i>number of decimal places when displaying the z value</i>		
Nulls	yes-no	no	yes, no
	<i>if tick, null z values are displayed as null. If not tick, no z value is displayed at null z-values.</i>		
Set	button		
	<i>set the values in the panel and then redraw the plan view.</i>		

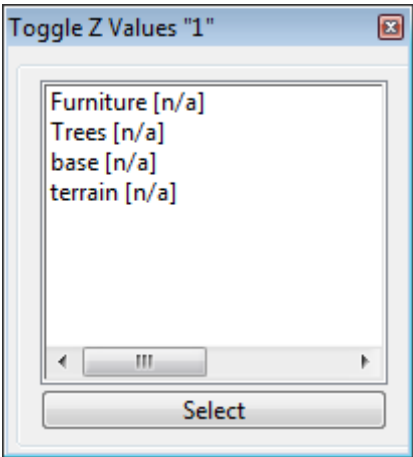


Toggle Z Values

Position of menu: Plan View Menu View => Settings => Z values => Toggle

Walking-right on the **Toggle** option displays a list of models on the view with their vertex z values draw flag. The vertex z value draw flag can be toggled on/off for the model by selecting the model on the list.

Note that [n/a] means that the model has *not* been individually set on or off and the general Z values toggle is used for the model.



Names

Position of menu: Plan View Menu View => Settings => Names

The **names** option allows the user to specify whether the string name is drawn at each string vertex. The string names can be

(a) not drawn at all

or

(b) if set to draw, then only drawn if the equivalent world size is not too large. This stops the drawing of *string names* when the displaying world size is large in proportion to other world units (e.g. when zooming out).

Hence the **Names** option tries to control the drawing of string names on the view so that the numbers stop displaying as the user *zooms out*

Depending on whether the environment variable *plan_table_settings_4d* is zero or not, the **names** option draws string names for string vertices for *any* model on the view, or the drawing of string names at vertices can be set for individual models.

If the environment variable *plan_table_settings_4d* is set to 0:

the **names** option is used to display/not display the string name at the vertices of strings in ***all*** models on the plan view.

Selecting **Names** brings up the **Plan String Names for Plan View** panel, without the Model field.

If *plan_table_settings_4d* is non-zero:

the **Names** option then has a walk-right menu with options to specify for *each* model on the plan view whether string names are drawn at vertices for strings in the model are

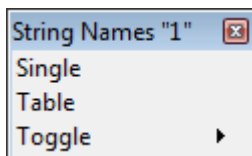
(a) not drawn at all

or

(b) if set to draw, then the string names are only drawn if the equivalent world size is not too large. This stops the drawing of *names* when the displaying world size is large in proportion to other world units (e.g. when zooming out).

If **Names** is selected without walking right, the **Plan String Names for Plan View** panel is brought up (documented in the next section).

The **Names** walk-right menu is



For the option Single, go to
Table
Toggle

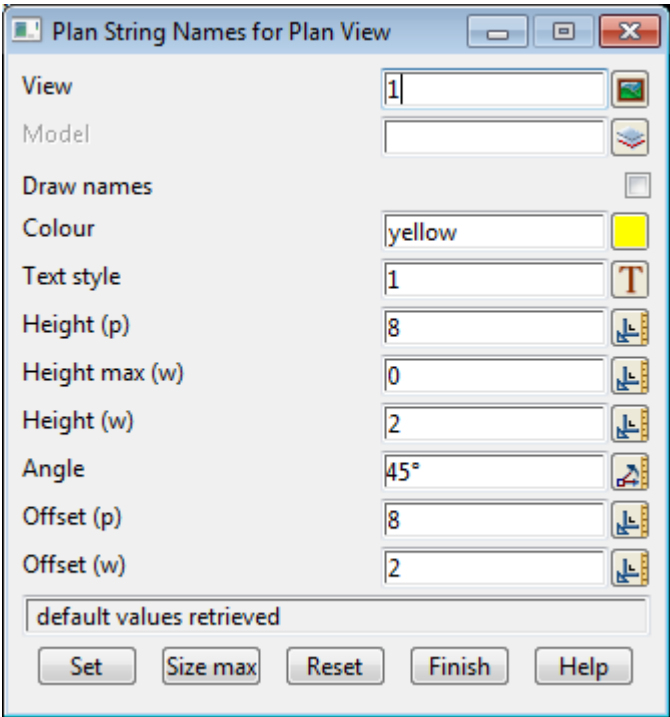
[Plan String Names for Plan View](#)
[String Names Table for Plan View](#)
[Toggle String Names](#)

Plan String Names for Plan View

Position of option on menu: Plan View Menu View => Settings => Names => Single

The **Single** option is used to set parameters for drawing the string name at each vertex of strings for any models not mentioned in the *Table*, or for an individual model on the plan view.

After selecting **Single**, the **Plan String Names for Plan View** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
View	<i>name of the view to modify string name drawing parameters for.</i>	input/output	current view	available views
Model	<i>if blank, then all models not mentioned in the Table option use these parameters for drawing the string name at each vertex on a view. If non blank, then this model only will be set to draw the string name at each vertex with the parameters on this panel.</i>	input		
Draw names	<i>If ticked, string names for the model will be checked against the Height max (w) before being drawn. If not ticked, then no string names for strings in the given model are drawn on the plan view.</i>	tick box		
Colour	<i>colour of the string names.</i>	input	default pt colour	available colours
Text style	<i>textstyle of the string names.</i>	input	1	available text styles
Height (p)	<i>height in pixels of the string names.</i>	input	8	
Height max (w)	<i>if non-zero: when the plan view is such that the height of the string names in world units is greater than Height max (w), then the string names are not drawn. Hence as one zooms out, the string names will eventually stop drawing.</i>	input	0	

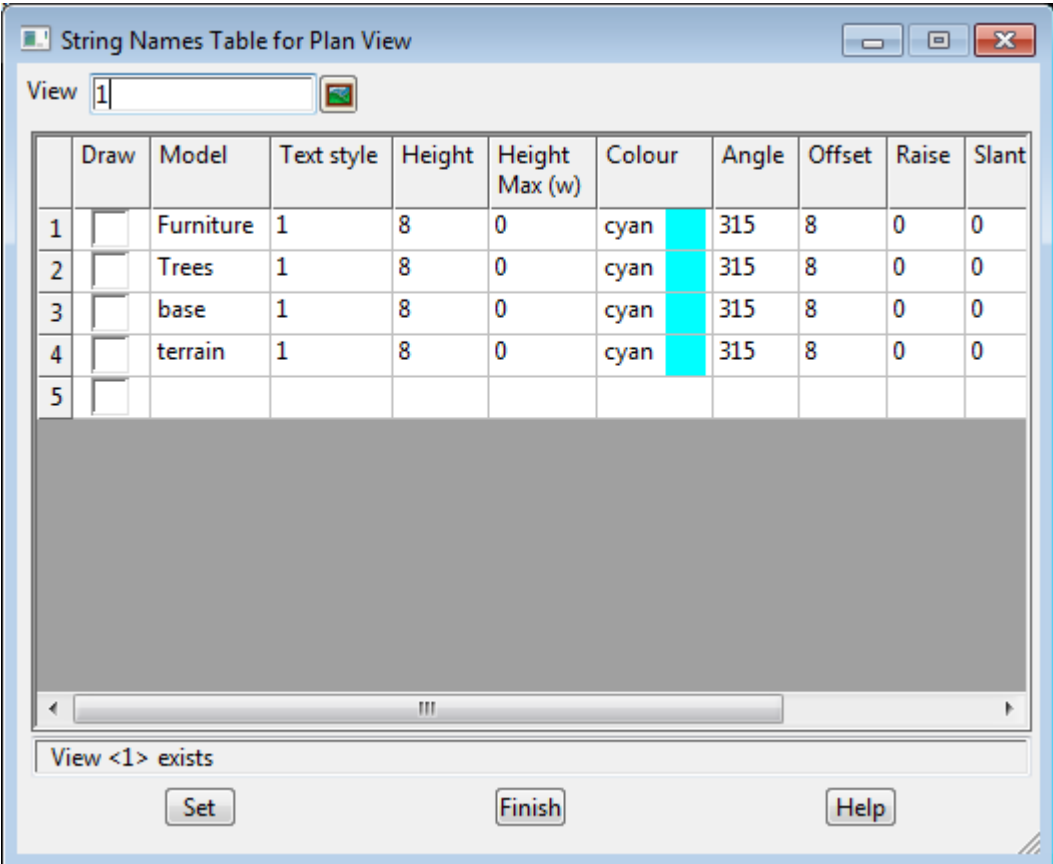
Height (w)	input	2
<i>height in world units of the string names when plotted or output.</i>		
Angle	input	-45
<i>angle in degrees that the text is rotated about the (x,y) position of the string vertices.</i>		
Offset (p)	input	default text height
<i>distance in pixels that the text is drawn from the (x,y) position of the string vertices.</i>		
Offset (w)	input	default text height
<i>distance in world units that the text is drawn from the (x,y) position of the string vertices when plotted or output.</i>		
Set	button	
<i>set the values in the panel and then redraw the plan view.</i>		
Size max (w)	button	
<i>when clicked, size max (w) is set to be the world size of string names as displayed on the given plan view. Hence if any further zoom out is done, the vertex string names will stop drawing. The set button must then be clicked to set the values for the view.</i>		
Reset	button	
<i>reset all the parameters so no models are individually set for the view.</i>		

String Names Table for Plan View

Position of option on menu: **Plan View Menu** **View => Settings => Names => Table**

The **Table** option displays a list of models on the view with their string names drawing parameters which can then be modified from the table.

Selecting **Table** fires up the **String Names Table for Plan View** panel.



Field Description	Type	Defaults	Pop-Up
View	input/output	current view	available views

name of the view to modify string names drawing parameters for.

Draw ☐ tick box

*If **not ticked**, then **no** string names for strings in the given model are drawn on the plan view.
if **ticked**, string names for strings in the model will be checked against the $H_t \max(w)$ to see if it is drawn.*

Model

the model to set the parameters for.

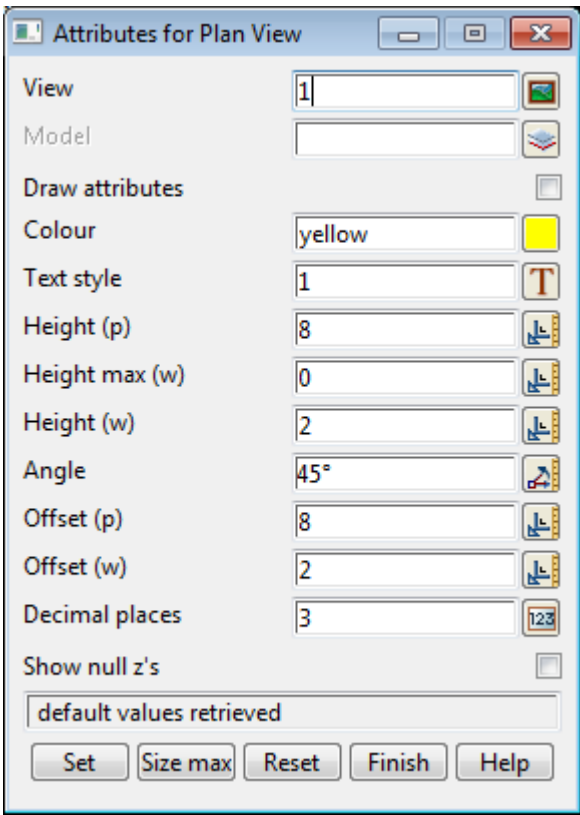
Colour	input	default pt colour	available colours
<i>colour of the string names</i>			

Text style	input	1	available text styles
<i>textstyle of the string names</i>			

Height input
height in pixels of the string names.

Ht max (w)	input	0
<i>if non-zero: when the plan view is such that the height of the string names in world units is greater than Ht max (w), then the string names are not drawn. Hence as one zooms out, the string names will eventually stop drawing.</i>		

Angle	input	-45
	<i>angle in degrees that the text is rotated about the (x,y) position of the string vertices.</i>	

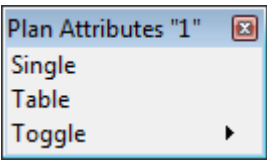


If *plan_table_settings_4d* is non-zero:
the **Attributes** option then has a walk-right menu with options to specify for *each* model on the plan view whether attributes are drawn at vertices for strings in the model are

- (a) not drawn at all
- or
- (b) if set to draw, then the attributes are only drawn if the equivalent world size is not too large. This stops the drawing of *attributes* when the displaying world size is large in proportion to other world units (e.g. when zooming out).

If **Attributes** is selected without walking right, the **Attributes for Plan View** panel is brought up (documented in the next section).

The **Attributes** walk-right menu is



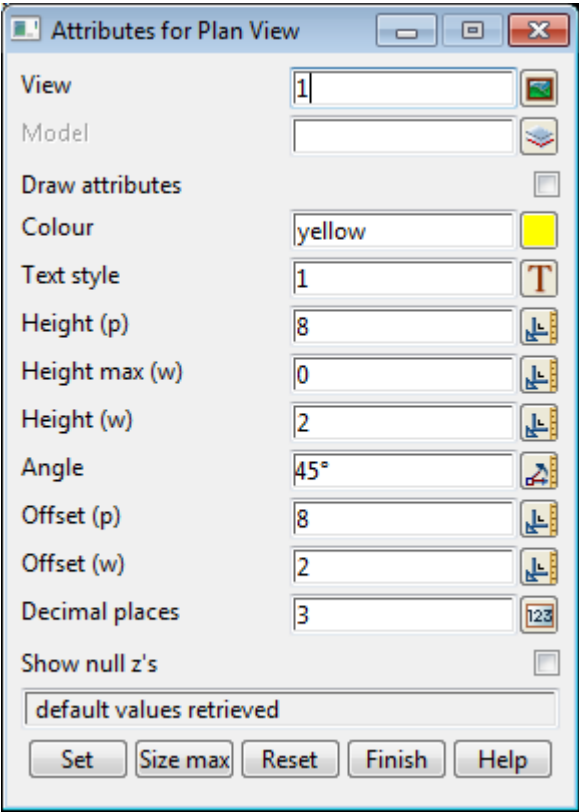
For the option Single, go to [Attributes for Plan View](#)
Table [Attributes Table for Plan View](#)
Toggle [Toggle Attributes](#)

Attributes for Plan View

Position of option on menu: Plan View Menu View => Settings => Attributes => Single

The **Single** option is used to set parameters for drawing the attributes at each vertex of strings for

any models not mentioned in the *Table*, or for an individual model on the plan view.
After selecting the **Single** option, the **Attributes for Plan View** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
View	<i>name of the view to modify attribute drawing parameters for.</i>	input/output	current view	available views
Model	<i>if blank, then all models not mentioned in the Table option use these parameters for drawing the attributes at each vertex on a view. If non blank, then this model only will be set to draw the attributes at each vertex with the parameters on this panel.</i>	input		
Draw attributes	<i>If ticked, attributes for the model will be checked against the Height max (w) before being drawn. If not ticked, then no attributes for strings in the given model are drawn on the plan view.</i>	tick box		
Colour	<i>colour of the attributes.</i>	input	default pt colour	available colours
Text style	<i>textstyle of the attributes.</i>	input	1	available text styles
Height (p)	<i>height in pixels of the attributes</i>	input	8	
Height max (w)	<i>if non-zero: when the plan view is such that the height of the attributes in world units is greater than Height max (w), then the attributes are not drawn. Hence as one zooms out, the attributes will</i>	input	0	

eventually stop drawing.

Height (w) input 2

height in world units of the attributes when plotted or output.

Angle input -45

angle in degrees that the text is rotated about the (x,y) position of the string vertices.

Offset (p) input default text height

distance in pixels that the text is drawn from the (x,y) position of the string vertices.

Offset (w) input default text height

distance in world units that the text is drawn from the (x,y) position of the string vertices when plotted or output.

Decimal places input 3

number of decimal places to use for real attributes.

Show null z's tick box

*if **ticked**, real attributes that are null z values are displayed as null. If **not tick**, no real attribute is displayed when it has a null z-value.*

Set button

set the values in the panel and then redraw the plan view.

Size max (w) button

*when clicked, size max (w) is set to be the world size of attributes as displayed on the given plan view. Hence if any further zoom out is done, the vertex attributes will stop drawing. The **set** button must then be clicked to set the values for the view.*

Reset button

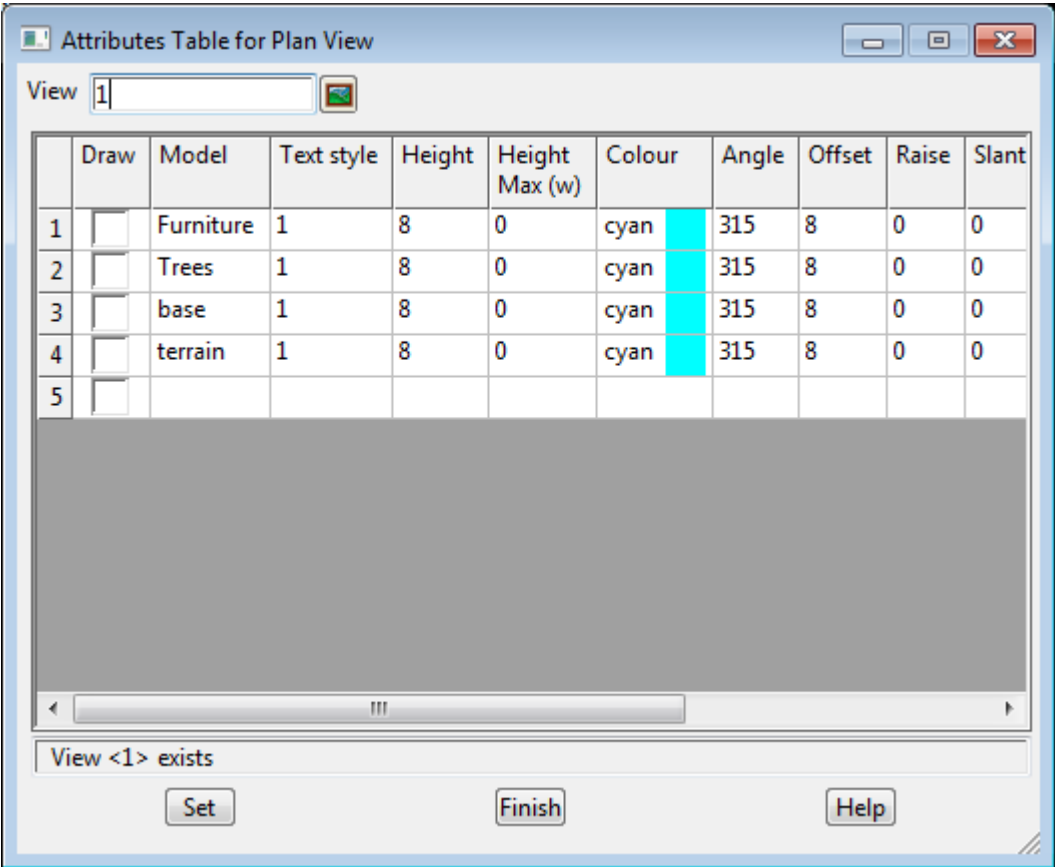
reset all the parameters so no models are individually set for the view.

Attributes Table for Plan View

Position of option on menu: Plan View Menu View => Settings => Attributes => Table

The Table option displays a list of models on the view with their attributes drawing parameters which can then be modified from the table.

Selecting Table fires up the Attributes Table for Plan View panel.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
View	<i>name of the view to modify vertex attribute drawing parameters for.</i>	input/output	current view	available views
Draw		tick box		
	<i>If not ticked, then no attributes for strings in the given model are drawn on the plan view. if ticked, vertex attributes for strings in the model will be checked against the Ht max (w) to see if it is drawn.</i>			
Model	<i>the model to set the parameters for.</i>	input		
Colour	<i>colour of the vertex attributes</i>	input	default pt colour	available colours
Text style	<i>textstyle of the vertex attributes</i>	input	1	available text styles
Height	<i>height in pixels of the vertex attributes</i>	input	8	

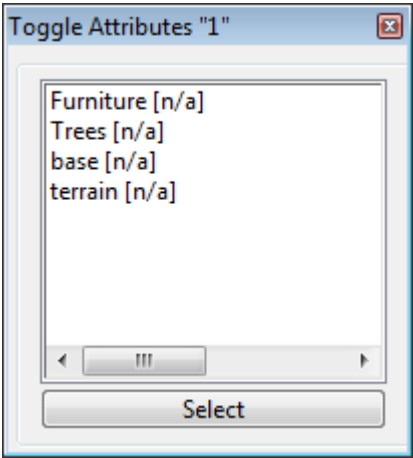
Ht max (w)	input	0
<i>if non-zero: when the plan view is such that the height of the vertex attributes in world units is greater than Ht max (w), then the vertex attributes are not drawn. Hence as one zooms out, the vertex attributes will eventually stop drawing.</i>		
Angle	input	-45
<i>angle in degrees that the text is rotated about the (x,y) position of the vertex attributes.</i>		
Offset	input	default text height
<i>distance in pixels that the text is drawn from the (x,y) position of the string vertices</i>		
Precision	input	3
<i>number of decimal places to use for any real attributes</i>		
Null	tick box	
<i>if ticked, real attributes that are null z values are displayed as null. If not tick, no real attribute is displayed when it has a null z-value.</i>		
Set	button	
<i>set the values in the panel and then redraw the plan view.</i>		

Toggle Attributes

Position of menu: Plan View Menu View => Settings => Names => Toggle

Walking-right on the **Toggle** option displays a list of models on the view with their vertex attribute draw flag. The vertex attribute flag can be toggled on/off for the model by selecting the model on the list.

Note that [n/a] means that the model has *not* been individually set on or off and the general **attributes** toggle is used for the model.

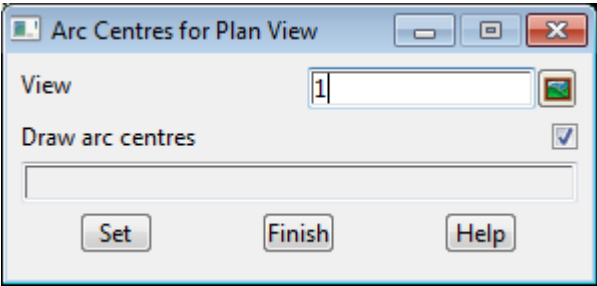


Arc Centres for Plan View

Position of option on menu: Plan View Menu View => Settings => Arc centres

The **arc centres** option allows the user to specify whether the centres of arcs and circles are displayed on the view.

Selecting **Arc centres** fires up the **Arc Centres for Plan View** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>name of the view to modify arc centres flag for.</i>	input/output	current view	available views
Draw arc centres <i>if ticked is selected, any arcs or circles on the view will also have their centres drawn. Otherwise the centres are not displayed.</i>	tick box	tick	
Set <i>set the draw arc centres mode to the value in the draw arc centre tick box panel box. The plan view is then redrawn using the mode.</i>	button		

Work Plane

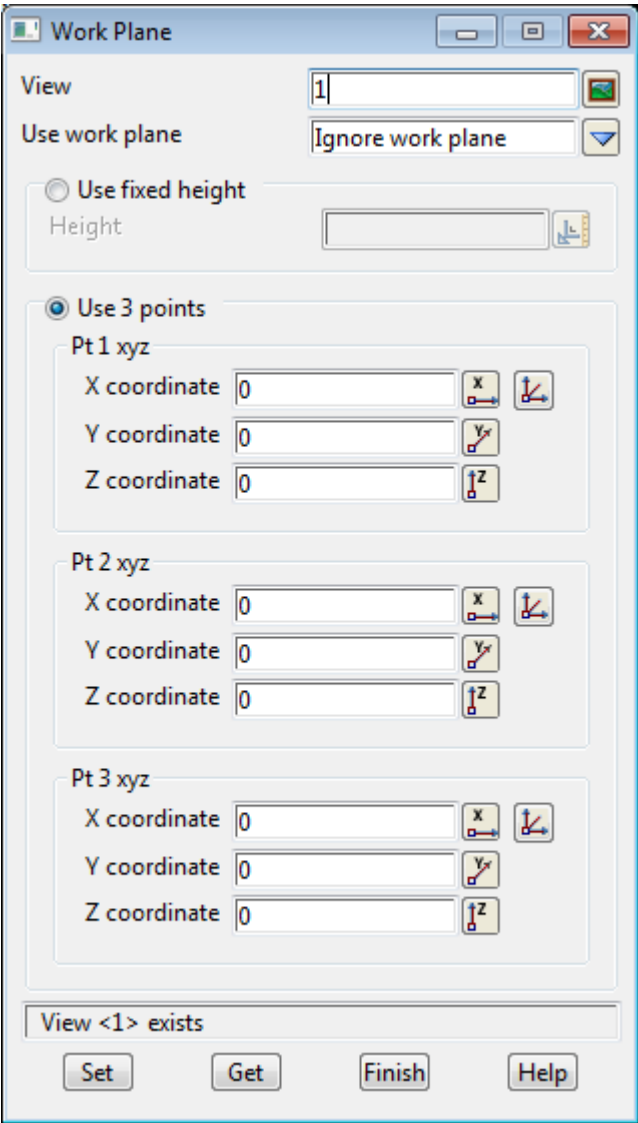
Position of option on menu: Plan View Menu View => Settings => Work plane

A plane not perpendicular to the (x,y) plane, can be used to define a unique z-value for any (x,y) co-ordinate pair. This fact is often invaluable when trying to defined three dimensional points using two-dimensional views.

In **12d Model**, a **work plane** can be defined by giving three non-colinear points. If the work-plane is used in a plan or perspective view, then the (x,y,z) values are restricted to lie in the defined work plane.

The **Work plane** option is used to define and set work planes.

After selecting the **Work Plane** option, the **Work Plane** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>name of the view to get or set the work plane in.</i>	view box		available views
User work plane	choice box	ignore work plane	ignore work plane

use work plane

the work plane is used or not depending on this field value.

Use fixed height tick box
if ticked, all the created points are given the height from the Height panel field, instead of the z-value from the plane.

Height Real value
if User fixed height is ticked, this is the height to use for all the created points instead of the z-value from the plane.

Pt 1/2/3 xyz input/output 0 0 0
points in the work plane

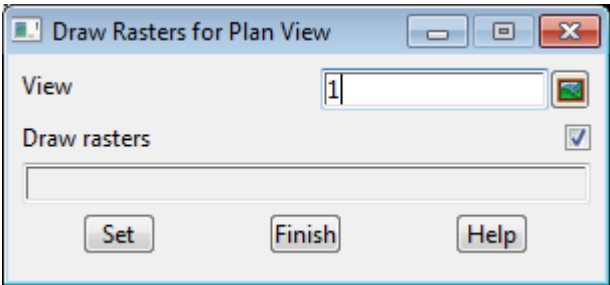
Set button
*A plane is defined by the three points given in the Pt xyz fields. This plane is set as the work plane for the view given by the view field. Although the work plane is set, it is not active unless the use work plane field is set to **use work plane**.*

Get button
get the three points of the defined work plane for the view given in the view field. The points are displayed in the Pt xyz fields of the panel.

Draw Rasters for Plan View

Position of option on menu: Plan View Menu View => Settings => Rasters

The **Rasters** option is used to turn on or off the drawing of any rasters in models on the view.
After selecting the **Rasters** option, the **Draw Rasters for Plan View** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>name of the view to toggle the drawing of rasters on or off.</i>	view box	current view	available views
Draw rasters <i>if ticked, draw any rasters in any models on the view.</i>	tick box	ticked	
Set <i>set the draw rasters mode.</i>	button		

Clouds

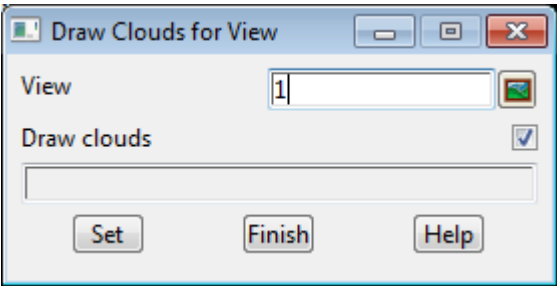
Draw_Clouds_for_ViewPosition of option on menu: Plan View Menu View => Settings => Clouds

Point clouds can consist of millions, or even billions, of individual points. The drawing of them on

a plan view may slow things considerably.

The **Clouds** option is used to optionally draw point clouds in any models on the view.

After selecting the **Clouds** option, the **Draw Clouds for View** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>name of the view to toggle the drawing of point clouds on or off.</i>	view box	current view	available views
Draw clouds <i>if ticked, draw any point clouds in any models on the view.</i> <i>if not ticked, don't draw any point clouds in any models on the view.</i>	tick box	ticked	
Set <i>sets the draw clouds mode.</i>	button		

Grid on View

Position of option on menu:	Plan View Menu	View => Settings => Grid
	Section View Menu	View => Settings => Grid
	Perspective View Menu	View => Settings => Grid

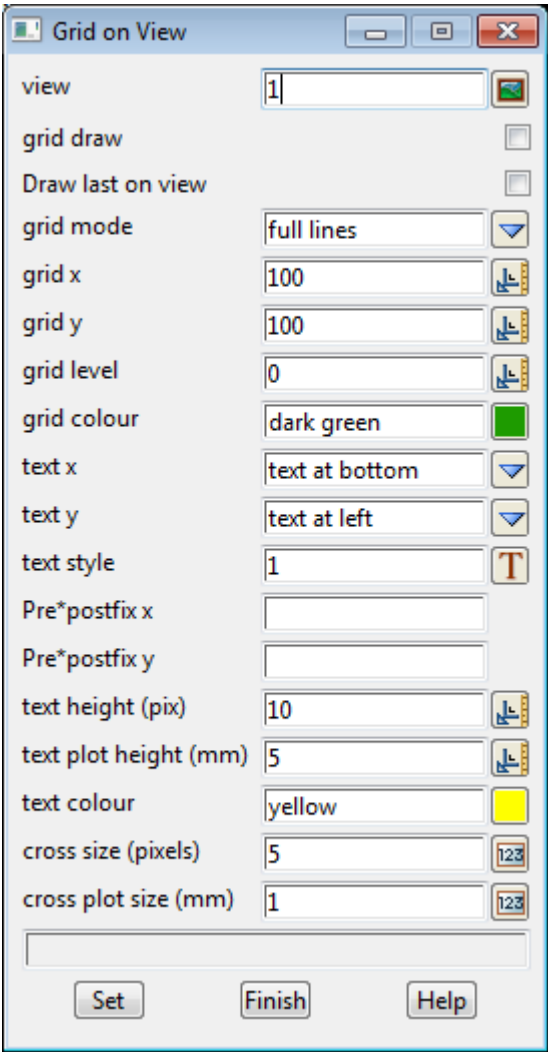
A regular grid of x (East) and/or y (North) lines can be displayed in a view. The grid is set in a plane of constant z (the level of the grid). The x and y spacing for the grid lines can be set and labelled independently.

For a plan or section view, the grid covers the entire view. However, for a perspective view, the grid only covers the maximum extents of the models in the view.

If the grid mode is set to

full lines	solid lines are drawn at the grid x (East) and y (North) spacing
crosses	crosses are drawn at the intersection of the grid x and y spacing
marks	lines are drawn at the beginning/end of the grid at x and y spacing
marks and crosses	marks and crosses are drawn

On selecting the option, the **Grid on View** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>the name of the view to define a grid for.</i>	input/output	current view	available views
Grid draw <i>if ticked, the grid is drawn according to parameters in the rest of the panel.</i>	tick box		
Grid mode <i>the style of the grid being drawn - full lines, crosses or marks. If full lines, then solid lines are drawn at the grid x and y spacing. If crosses, then crosses of size cross size are drawn at the intersection of the grid x and y spacing. If marks, then solid lines size cross size are drawn at the beginning/end of the grid at the x and y spacing. If marks and crosses, then marks at the beginning/end of the grid at the x and y spacing, and crosses are drawn.</i>	input	full lines	full lines, crosses, marks marks and crosses
Grid x <i>the distance between the x (East) grid lines. If this value is zero, the x grid lines will not be drawn.</i>	input	100	
Grid y	input	100	

grid level	input	0
<i>the (x,y) grid is set in a plane of constant z. The grid level is the value of the constant z. This will only be used for a perspective view.</i>		

Text x	input	text at bottom	text off, text at top, text at bottom, text at top and bottom
---------------	-------	----------------	------------------------------------------------------------------------

Text y	input	text at left	text off, text at left, text at right, text at left and right
---------------	-------	--------------	------------------------------------------------------------------------

Text style	input	1
<i>the text style of any grid labels.</i>		

Pre*postfix y input

*prefix/postfix (pre*post) to be applied to the value of y (North). If pretext only, just give the text. If post text is required, precede it by a *. For example N*m will place N before the y value and m after the number.*

Text plot height (mm)	input	10.0
<i>height in millimetres of any grid labels in a plot.</i>		

Text colour	input	yellow	available colours
	<i>colour that any grid labels are drawn in.</i>		

Cross size (pixels)	input	5.0
<i>size in screen pixels of grid crosses.</i>		

Cross plot size (mm)	input	1.0
<i>size in millimetres of grid crosses in a plot.</i>		

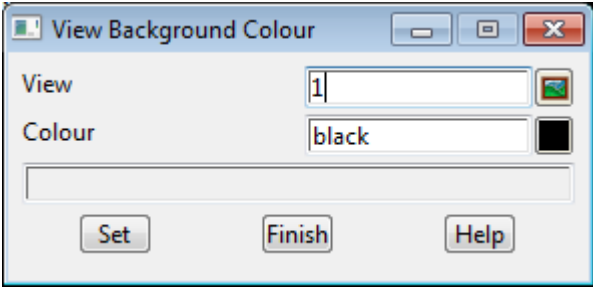
Set button

the grid parameters are set to the values given in the panel. The grid is then redrawn in the view.

Note - If the view name is selected from the pop-up, or a <enter> is done after the view name is entered into the view field, the data for the grid on the named view is placed in the panel fields.

Position of option on menu: Plan View Menu View => Settings => Colour

The **Colour** option is used to set the background colour for the view.
After selecting the **Colour** option, the **View Background Colour** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>name of the view to set the background colour for.</i>	input/output	current view	available views
Colour <i>if ticked, draw any rasters in any models on the view.</i>	colour box	black	available colours
Set <i>set the background colour.</i>	button		

View Drawing Filter

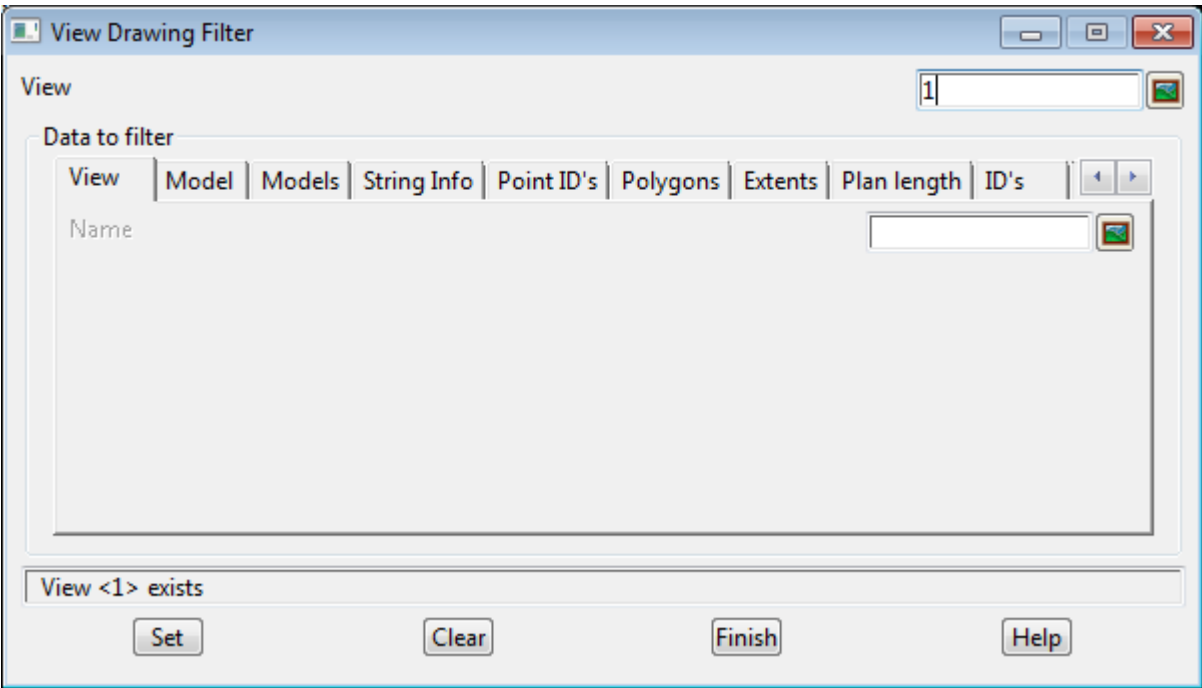
Position of option on menu: Plan View Menu View => Settings => Drawing filter

Position of option on menu: Perspective View Menu View => Settings => Drawing filter

The Drawing filter option is used to set a filter on the view so that only the data satisfying the filter is drawn.

NOTE: the filter is not saved with the project.

After selecting the Drawing filter option, the **View Drawing Filter** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>name of the view to apply the drawing filter to.</i>	view box	current view	available views
Data filter <i>only the data satisfying the drawing filter is drawn on the view.</i>	view box	current view	available views
Set <i>apply the drawing filter to the view.</i>	button		
Clear <i>clear the drawing filter being applied to the view.</i>	button		

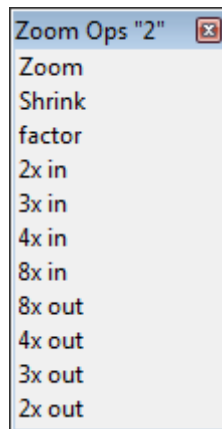
Zoom

Position of menu: Plan View Menu View => Settings => Zoom

Position of menu: Section View Menu View => Settings => Zoom

The zoom option operators in the same way for Plan and Section views.

The **zoom** option can be selected in three ways. By clicking LB on **zoom** on a view button area, selecting the **zoom option** itself by clicking LB when the zoom option is highlighted on the zoom menu, or by activating the zoom option's walk-right menu, **Zoom Ops**.



The zoom uses either a *dynamics zoom* or a *zoom box*

For more information on **zoom ops** go to [Zoom Ops menu](#)

Dynamic Zoom

After selecting the **Zoom** option, *dynamic zoom* is selected by clicking MB or by typing **d**.

Then press LB at the point that is to stay put during the dynamic zoom and then move the mouse up to zoom in or move the mouse down to zoom out. Another point can be selected to dynamically zoom in or out about.

The dynamic zoom continues until either RB is clicked, or MB is clicked (or **d** typed) to place the zoom option into *zoom box* mode.

Zoom Box

Position of option on menu: Plan View Menu View => Settings => Zoom =>Zoom

After selecting the **zoom** option, the user can define the zoom box by

- (a) pressing down LB at one corner of the box and dragging the mouse and releasing LB when at the other corner of the zoom box

or

- (b) picking two points from any plan views (by clicking LB in a plan view for each point) to define the diagonally opposite points of the zoom box. Note that the two points **do not** have to be from the same plan view.

Next the user selects the view (by clicking LB in the view) which is to be redrawn using this rectangle as the new drawing limits.

Often the same view is chosen for both defining the rectangle and redrawing. However, the power of the option is that the area to be “zoomed in” or “blown up” can be selected from one view and the zoomed area displayed in another view. The other view may not only be different to the views used to defined the zoom box, but may also have different models attached to it.

It is a useful technique to have a master view displaying the entire area of interest in one view, and use it to define zoom-rectangles for use in viewing smaller regions of data in other plan views.

To cancel the zoom after the zoom operation has been selected, click RB.

Next step messages - sent to the screen message area

- <View Zoom> [Select][] select 1st corner of box - RB to cancel
- <View Zoom> [Select][] select 2nd corner of box - RB to cancel
- <View Zoom> [Select][] select destination view - RB to cancel

WARNING - this option can not be applied to a perspective view.

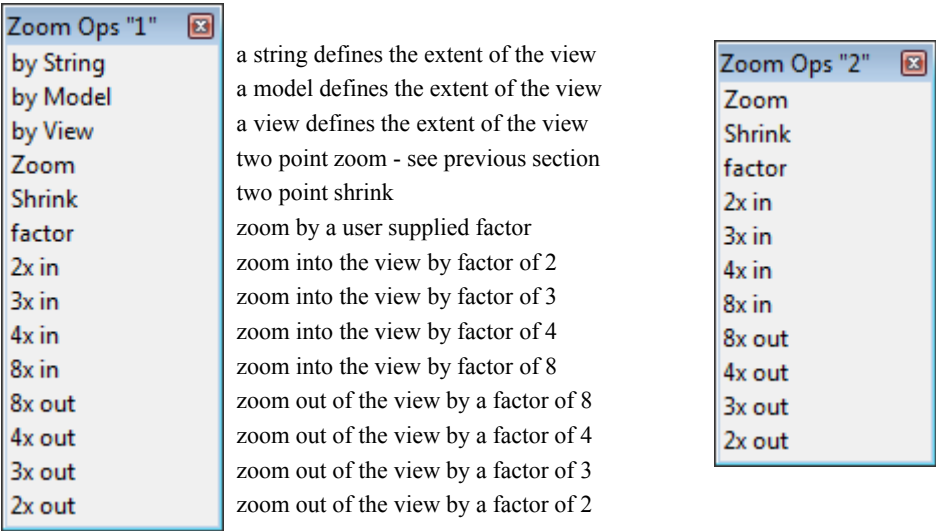
Please continue to the next section [Zoom Ops menu](#).

Zoom Ops menu

Position of menu: Plan View Menu View => Settings => Zoom

Position of menu: Section View Menu View => Settings => Zoom

The Zoom walk-right menu is



The **by String**, **by Model** and **by View** options use the x and y extents of the String, Model or View to define the display area for the view. These options will be described in more detail.

The option **zoom** is the same operation as the option just discussed, **factor** - to enlarge or reduce the view by a given magnification/reduction factor, and a number of preset view magnification and reduction factors.

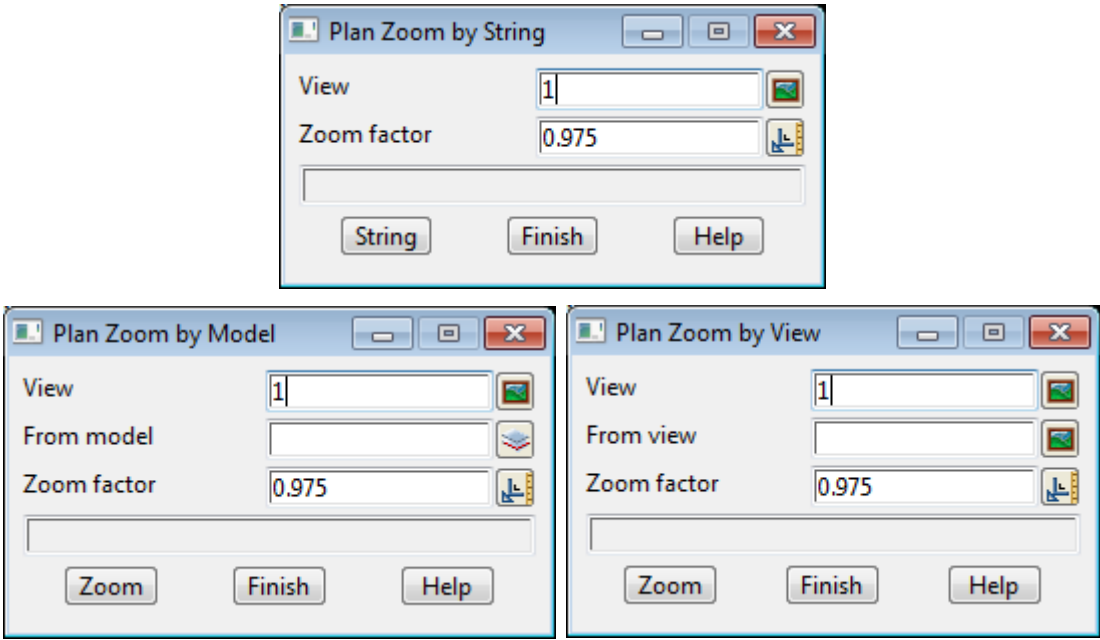
By String, by Model and by View

Position of option on menu: Plan View Menu View =>Settings =>Zoom =>by string

Position of option on menu: Plan View Menu View =>Settings =>Zoom =>by model

Position of option on menu: Plan View Menu View =>Settings =>Zoom =>by view

The three zoom options **by String**, **by Model** and **by View** work in a similar manner. After selecting the option, the **Plan Zoom by String/ Model/ View** panel is brought up.



For **by String**, the user selects a string using the **String** button and the data on the view is redrawn so the selected string is fitted to the view, adjusted by the Zoom factor given in the panel.

Note that the selected string can be from a different view.

For **by Model**, the user enters a model name into the Model field and then selects the **Zoom** button. The data on the view is redrawn so the specified model is fitted to the view, adjusted by the Zoom factor given in the panel.

Note that the specified model does not have to be on the view.

For **by View**, the user enters a view name into the View field and then selects the **Zoom** button. The data on the view is redrawn so the specified view is fitted to the current view, adjusted by the Zoom factor given in the panel.

Note that the specified view does not have to be on the current view.

Shrink

Position of option on menu: Plan View Menu View =>Settings =>Zoom =>Shrink

Shrink is the opposite of zoom: instead of the information in the view box being expanded to fill the view, the information in the view is shrunk to fit into the zoom box.

After selecting the shrink option, the user picks two points from any plan views (by clicking LB in a plan view for each point) to define the diagonally opposite points of a rectangle. Note that the two points **do not** have to be from the same plan view.

Next the user selects the view (by clicking LB in the view) which is to be redrawn by shrinking the data on the view to fit into this rectangle.

To cancel the zoom after the zoom operation has been selected, click RB.

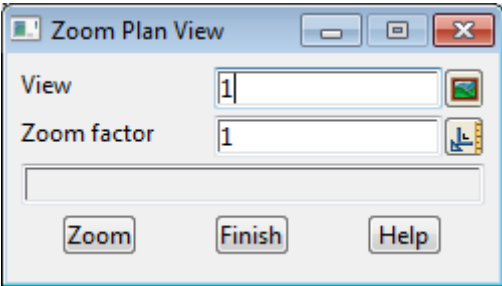
WARNING - this option can not be applied to a perspective view.

Factor

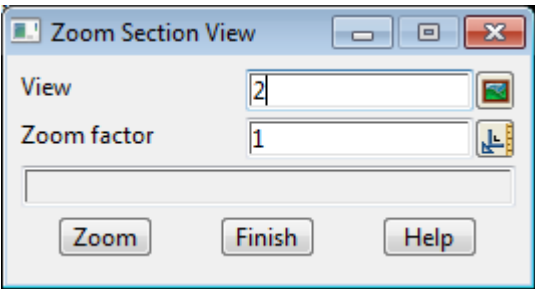
Position of option on menu: Plan View Menu View => Settings => Zoom => Factor

Position of option on menu: Section View Menu View => Settings => Zoom => Factor

In Plan View, when selecting the Factor option, the **Zoom Plan View** panel is displayed.



In Section View, when selecting the Factor option, the **Zoom Section View** panel is displayed.



This option is used to magnify or reduce the information in the view by a user given amount.

The field and buttons in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>name of the view to set zoom factor for.</i>	input/output	current view	available views
Zoom factor <i>factor to magnify/reduce the information inside the view by. The value can be greater than 1.0 (zoom</i>	input	1.0	

in) or less than 1.0 (zoom out).

Zoom button

the information displayed in the view is magnified/reduced by the factor given in the zoom factor field.

WARNING - this option can not be applied to a perspective view.

Pre-set Zoom Factors

Upon selecting a particular zoom factor (e.g. 4 x in), the user is asked to indicate a point in a view which is to become the new view-centre. The user then indicates (by clicking LB in the view) which view is to be redrawn with this point as the new centre and with the selected zoom factor applied to that view.

To cancel the zoom after the zoom operation has been selected, click RB.

Next step messages - sent to the screen message area

<View Magnify> [Select] select new centre of view - RB to cancel
<View Magnify> [Select] select destination view - RB to cancel

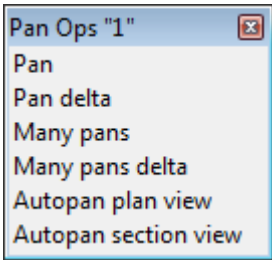
Pan

Position of menu: Plan View Menu View => Settings => Pan

Position of menu: Section View Menu View => Settings => Pan

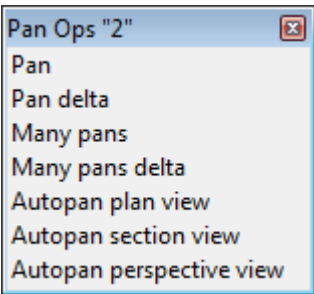
The Pan walk-right menu for Plan and Section views are

Plan View Pan Menu



make selected point the new view centre
pick a point and the place it is to be moved to on the screen
repeated pan
repeated pan delta
autopan for plan locked to plan view
autopan for plan locked to section view

Section View Pan Menu



make selected point the new view centre
pick a point and the place it is to be moved to on the screen
repeated pan
repeated pan delta
autopan for plan locked to section view
autopan for section locked to section view
autopan for perspective locked to section view

Pan operates the same way for Plan and Section views.

The pan option can be selected in four ways:

- (a) by clicking LB on Pan on a view button area
- (b) by clicking on <Control> LB whilst in the view

- (c) selecting the **Pan option** itself by clicking LB when the **Pan** option is highlighted on the **Pan** menu
 - (d) by activating the Pan option's walk-right menu, **Pan OpS**.
- The *pan* uses either a *dynamics pan* or two point mode.

Dynamic Pan

After selecting the **pan** option, *dynamic pan* is selected by clicking MB or by typing **d**.

Then press LB at the point that is to be dragged across the view during the dynamic pan and then move the mouse to the new position for the point. Another point can then be selected to dynamically pan.

The *dynamic pan* continues until either RB is clicked, or MB is clicked (or **d** typed) to place the pan option into *two point* mode.

After activating the **Pan** walk-right menu, the user is presented with the option **Pan** (which is the same operation as the option just discussed), **Pan delta**, and **Many pans** and **Many pans delta**.

Pan

Position of option on menu: **Plan View Menu** **View => Settings => Pan => Pan**

Position of option on menu: **Section View Menu** **View => Settings => Pan => Pan**

After selecting **Pan**, the user is asked to indicate a point in a view which is to become the new view-centre. The user then indicates (by clicking LB in the view) which view is to be redrawn with this point as the new centre.

To cancel the **Pan** after the *pan* operation has been selected, click **RB**.

Next step messages - sent to the screen message area

<View Pan> [Select][][] select new centre of view - RB to cancel
<View Pan> [Select][][] select destination view - RB to cancel

Pan Delta

Position of option on menu: **Plan View Menu** **View => Settings => Pan => Pan delta**

Position of option on menu: **Section View Menu** **View => Settings => Pan => Pan delta**

After selecting the **Pan delta** option, the user is asked to indicate a point in a view and the point on a view where the first point will be moved to. The user then indicates (by clicking LB in the view) which view is to be redrawn with the new position of the point on the view.

To cancel the **Pan delta** after the *pan delta* operation has been selected, click RB.

Next step messages - sent to the screen message area

<View Pan> [Select][][] select 1st position of pan - RB to cancel
<View Pan> [Select][][] select 2nd position of pan - RB to cancel
<View Pan> [Select][][] select destination view - RB to cancel

Many Pans

Position of option on menu: **Plan View Menu** **View => Settings => Pan => Many pans**

Position of option on menu: **Section View Menu** **View => Settings => Pan => Many pans**

The **Many pans** option is simply one *pan* operation followed by another.

After one *pan* operation has been performed, a new *pan* operation is begun.

The sequence is terminated by clicking RB.

Many Pans Delta

Position of option on menu: Plan View Menu View => Settings => Pan => Many pans delta

Position of option on menu: Section View Menu View => Settings => Pan => Many pans delta

The **Many pans delta** option is simply one *pan delta* operation followed by another.

After one *pan delta* operation has been performed, a new *pan delta* operation is begun.

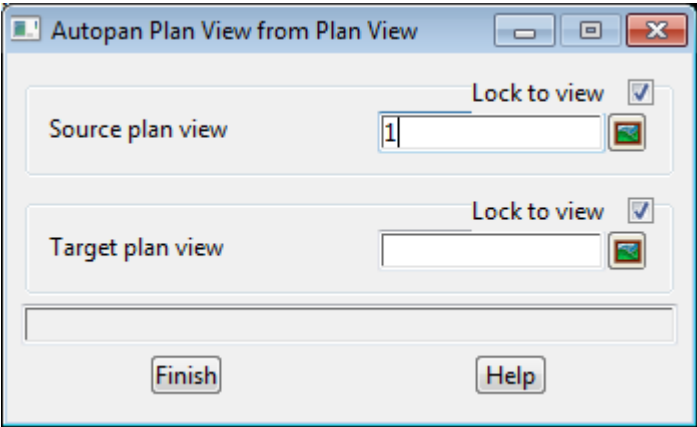
The sequence is terminated by clicking RB.

Autopan Plan View Locked to a Plan View

Position of option on menu: Plan View Menu View =>Settings =>Pan =>Autopan plan view

The Autopan plan view option locks a target plan view to a source plan view. As the cursor is moved in the source plan view, the target plan view is automatically panned to keep the cursor in the middle of it. The target plan view keeps its scale.

Selecting Autopan plan view brings up the Autopan Plan View from Plan View panel.



The fields and buttons used in this panel have the following functions.

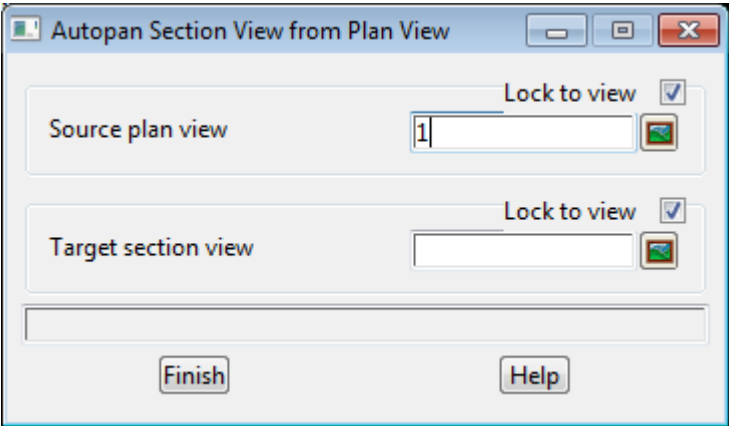
Field Description	Type	Defaults	Pop-Up
Lock to view	tick box	tick	
Source plan view <i>plan view to lock the target plan view to.</i>	view box	current view	available plan views
Lock to view	tick box	tick	
Target plan view <i>plan view to lock the source plan view. As the cursor moves in the source plan view, the target view is automatically panned so that the cursor is in the centre of the target plan view.</i>	view box		available plan views

Autopan Section View Locked to a Plan View

Position of option on menu: Plan View Menu View =>Settings =>Pan =>Autopan section view

The Autopan section view option locks a target section view to a source plan view. As the cursor is moved in the source plan view, the cursor position is dropped onto the profiled string in the target section view and the target section view is automatically panned to keep the dropped cursor in the middle of it. The target section view keeps its scale.

Selecting Autopan section view brings up the Autopan Section View from Plan View panel.



The fields and buttons used in this panel have the following functions.

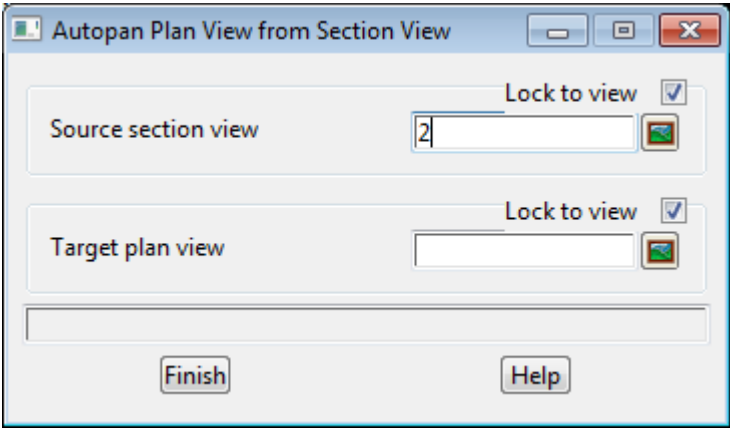
Field Description	Type	Defaults	Pop-Up
Lock to view	tick box	tick	
Source plan view <i>plan view to lock the section view to.</i>	view box	current view	available plan views
Lock to view	tick box	tick	
Target section view <i>section view to lock the source plan view. As the cursor is moved in the source plan view, the cursor position is dropped onto the profiled string in the target section view and the target section view is automatically panned to keep the dropped cursor in the middle of it. The target section view keeps its scale.</i>	view box		available section views

Autopan Plan View Locked to a Section View

Position of option on menu: Section View Menu View => Settings => Pan => Autopan plan view

The Autopan plan view option locks a target plan view to a source section view. As the cursor is moved in the source section view, the target plan view is automatically panned to keep the cursor in the middle of it. The target plan view keeps its scale.

Selecting Autopan plan view brings up the Autopan Plan View from Section View panel.



The fields and buttons used in this panel have the following functions.

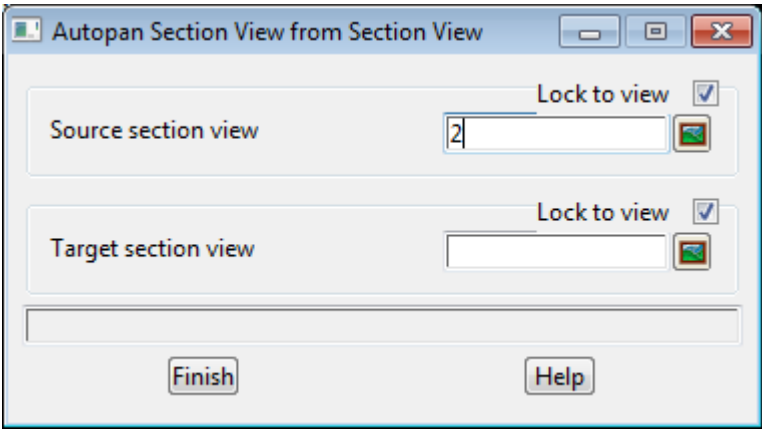
Field Description	Type	Defaults	Pop-Up
Lock to view	tick box	tick	
Source section view <i>section view to lock the target plan view to.</i>	view box	current view	available plan views
Lock to view	tick box	tick	
Target plan view <i>plan view to lock the source section view. As the cursor moves in the source section view, the target view is automatically panned so that the cursor is in the centre of the target plan view.</i>	view box		available plan views

Autopan Section View Locked to a Section View

Position of option on menu: Section View Menu View =>Settings =>Pan =>Autopan section view

The Autopan section view option locks a target section view to a source plan view. As the cursor is moved in the source section view, the cursor position is dropped onto the profiled string in the target section view and the target section view is automatically panned to keep the dropped cursor in the middle of it. The target section view keeps its scale.

Selecting Autopan section view brings up the Autopan Section View from Section View panel.



The fields and buttons used in this panel have the following functions.

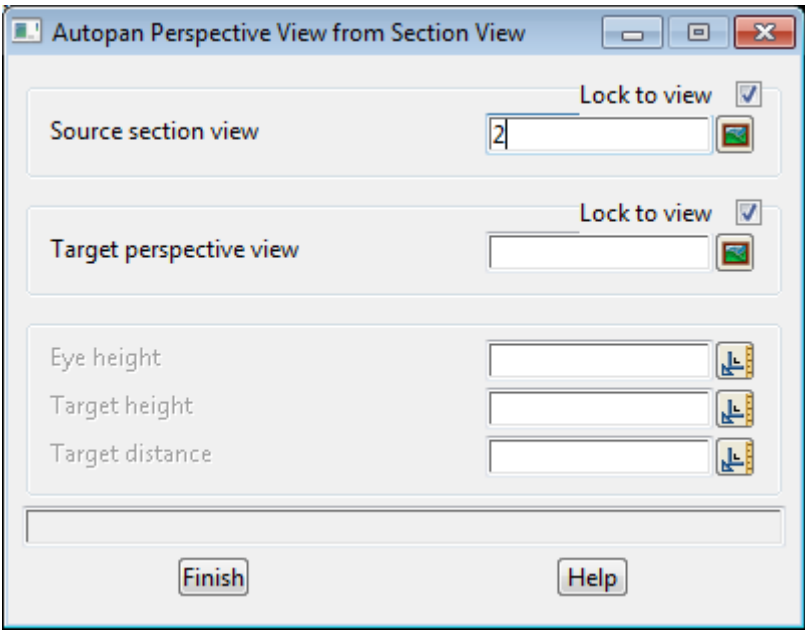
Field Description	Type	Defaults	Pop-Up
Lock to view	tick box	tick	
Source section view <i>section view to lock the target section view to.</i>	view box	current view	available section views
Lock to view	tick box	tick	
Target section view <i>section view to lock the source section view. As the cursor is moved in the source section view, the cursor position is dropped onto the profiled string in the target section view and the target section view is automatically panned to keep the dropped cursor in the middle of it. The target section view keeps its scale.</i>	view box		available section views

Autopan Perspective View Locked to a Section View

Position on menu: Section View Menu View => Settings => Pan => Autopan perspective view

The Autopan perspective view option locks a target perspective view to a source section view. As the cursor is moved in the source section view, the eye and target for the perspective view is automatically changed. Only the eye and target positions are modified for the target perspective view.

Selecting Autopan perspective view brings up the Autopan Perspective View from Section View panel.



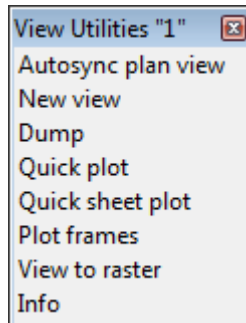
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Lock to view	tick box	tick	
<i>if ticked, the source view is used.</i>			
Source section view	view box	current view	available section views
<i>section view to lock the target perspective view to.</i>			
Lock to view	tick box	tick	
<i>if ticked, the target view is used.</i>			
Target perspective view	view box		available perspective views
<i>perspective view to lock to the source section view. As the cursor moves in the source section view, the eye and target position for the target perspective view is calculated from the (x,y,z) of the profiled string in the section view, and the eye and target information in the panel.</i>			

Plan Utilities

Position of menu: **Plan View Menu** **View => Settings => Utilities**

The **Utilities** menu contains miscellaneous options involving the plan view. The **Utilities** walk-right menu is



For the option *Autosync plan view*, go to [Autosync Plan View Locked to a Plan View](#)

New View Settings

Dump [View Dump](#)

Quick *plot* Quick Plan Plot

Quick sheet *plot* Quick Sheet Plot

Plot frames

[View to raster](#) [Create Raster from Plan View](#)

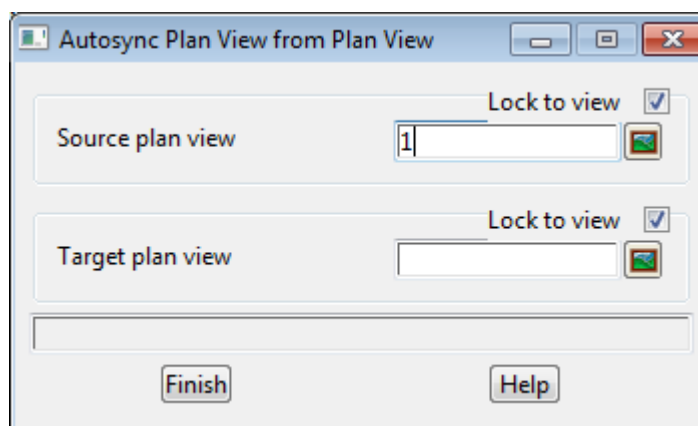
[View Info](#)

Autosync Plan View Locked to a Plan View

Position of option on menu: Plan View Menu View =>Utilities =>Autosync plan view

The **Autosync plan view** option locks a target plan view to a source plan view. As the cursor is moved in the source plan view, the same movement is made in the target plan view.

Selecting **Autosync plan view** brings up the **Autosync Plan View from Plan View** panel.



The fields and buttons used in this panel have the following functions.

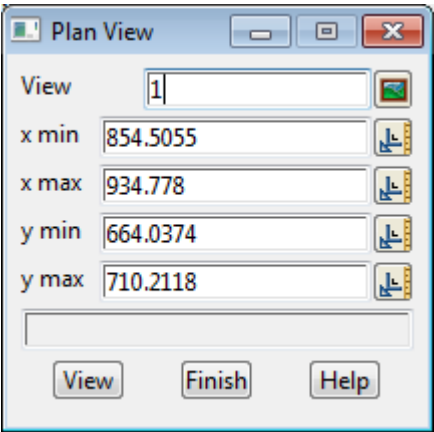
Field Description	Type	Defaults	Pop-Up
Lock to view	tick box	tick	
Source plan view <i>plan view to lock the target plan view to.</i>	view box	current view	available plan views
Lock to view	tick box	tick	
Target plan view <i>plan view to lock to the source plan view. As the cursor is moved in the source plan view, the same movement is made in the target plan view.</i>	view box		available plan views

New View Settings

Position of option on menu: Plan View Menu View =>Settings =>Utilities =>New view settings

The **new view settings** option displays the current view setting and permits the user to specify new x and y minimum and maximum values as the viewing parameters.

Selecting **New view settings** fires up the **Plan View** panel.



Because the aspect ratio of the view may be different from the aspect ratio defined by the user supplied x and y minimums and maximums, slightly more data than the specified range may need to be drawn in the view. However, the view will always **include** the user given range.

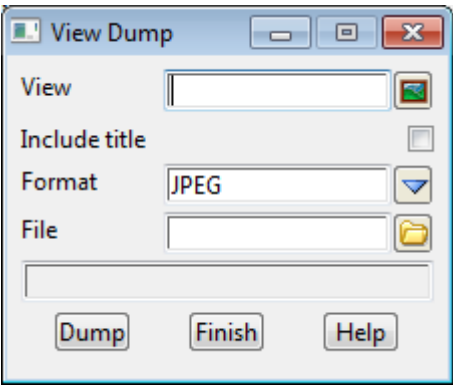
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>view to set min and max for.</i>	input/output	current view	available views
x min/max <i>minimum/maximum x co-ordinate for the view</i>	input/output	current x min/max	
y min/max <i>minimum/maximum y co-ordinate for the view</i>	input/output	current y min/max	
View <i>define the view parameters according to the information in the panel. If the box given by the x and y values in the panel is not the same shape as the view itself (that is, has the same aspect ratio), the x and y values will be modified so that the x and y values match the view shape. The final x and y values are displayed in the panel.</i>	button		

View Dump

Position of option on menu: Plan View Menu View => Settings => Utilities => Dump

This option is used to write the image of the view out to disk in a user selected format.
Selecting **Dump** brings up the **View Dump** panel.



The fields and buttons have the following functions.

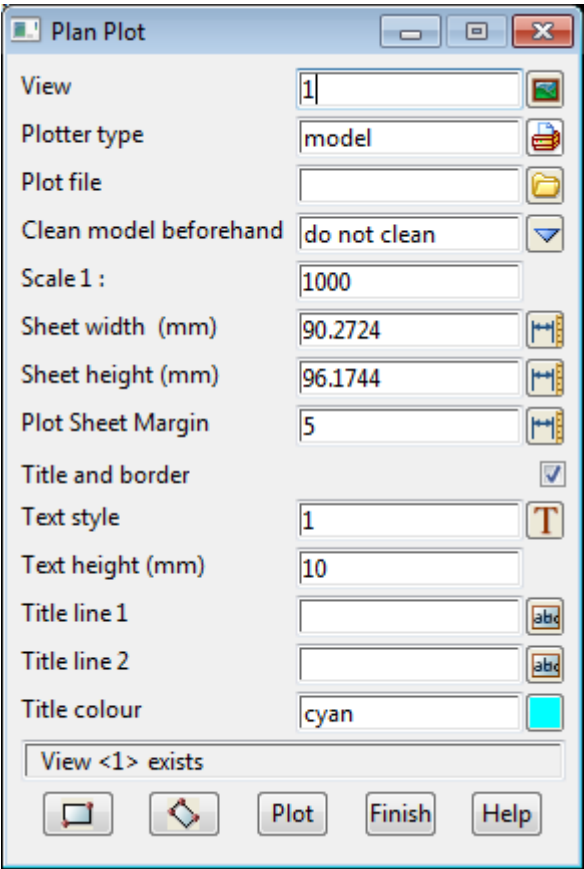
Field Description	Type	Defaults	Pop-Up
View <i>view to dump out in the specified format.</i>	input	view option picked from	available views
Include title <i>if ticked, the view title area is included in the dump.</i>	tick box		
Format <i>the format to dump the view out in.</i>	input	gif	gif, xwd, colour postscript
File <i>the file to dump the view images out to</i>	input	*.gif	
Dump <i>dump in the given format the image of the view given in the view field to the file given in the file field.</i>	button		

Quick Plan Plot

Position of option on menu: Plan View Menu View =>Settings =>Utilities =>Quick plot

The Quick plot option writes out all the information displayed in the plan view to either a plot file (in a user selected format) or to a 12d Model model. The user selects a scale for the plot and the sheet width and height are calculated by 12d Model.

Selecting Quick plot brings up the Plan Plot panel.



The fields and buttons have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>view to plot.</i>	view box	current view	available views
Plotter type <i>format for the plot information.</i>	input	hp	hp, dxf, postscript etc.
Plot file <i>stem of the name of the file to write the plot of the view to. The name ending is added automatically and depends on the plotter type.</i>	input	depends on plotter type	
Clean model beforehand <i>only applicable if plotting to a model.</i> <i>if always clean, the model is cleaned before the plot is created.</i> <i>If prompt for clean, the user is prompted that the model will be cleaned before the plot is created.</i> <i>If do not clean, the model is not cleaned before the plot is created.</i>	choice box		do not clean prompt for clean always clean
Scale 1:	input		

if a value is entered by the user and an <enter> given, the sheet width and height required by the plot are calculated and displayed in the sheet width and sheet height fields.

Sheet width (mm) output

*if a value is entered by the user and an <enter> given, the scale and height required by the plot are calculated and displayed in the scale and sheet height fields. The units for sheet width are **millimetres**.*

Sheet height (mm) output

*if a value is entered by the user and an <enter> given, the scale and width required by the plot are calculated and displayed in the scale and sheet width fields. The units for sheet height are **millimetres***

Title and border tick box

*if **ticked**, a border and two lines of title are placed on the bottom of the plot.*

Title line 1/2 input

first/second line of title information.

Title height (mm) input 10

*height (in **millimetres**) to draw the two lines of title information.*

Title colour input cyan available colours

colour used for the border and the title information.

Rectangle button

create a rectangle (parallel to the x,y axis) that the plot is restricted to.

Rotated Rectangle button

create a rotated rectangle that the plot is restricted to.

Plot button

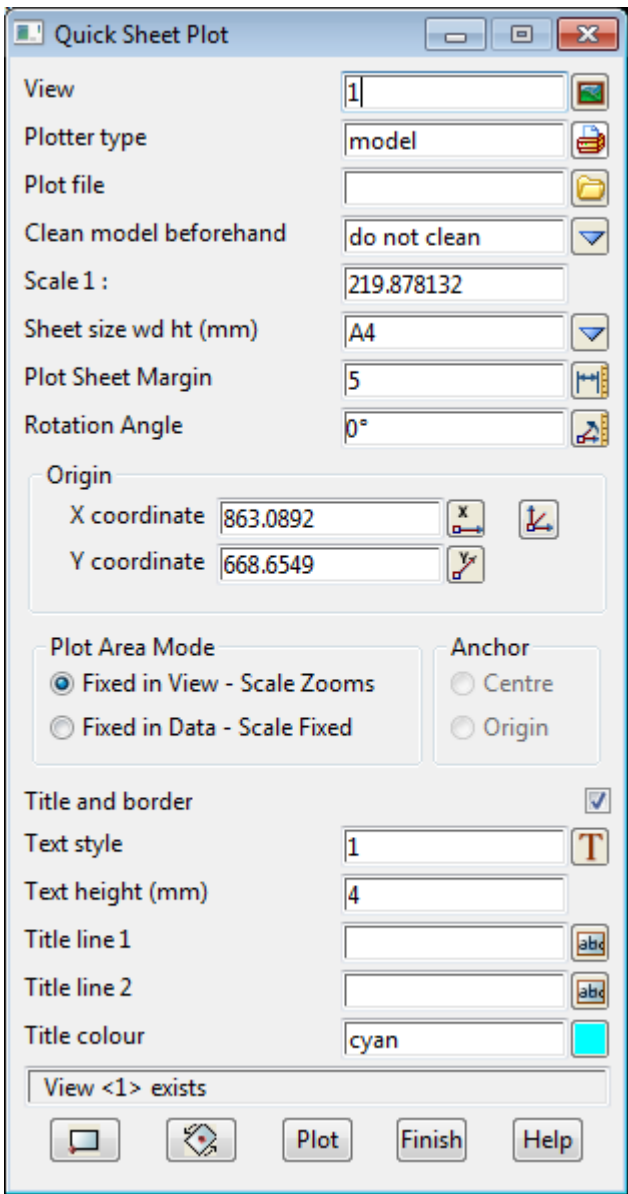
write out the plot of the information displayed in the view to the file given in the plot file field. The format of the file is given by the plotter type.

Quick Sheet Plot

Position of option on menu: Plan View Menu View =>Settings =>Utilities =>Quick sheet plot

The Quick sheet plot option takes a user selected plot sheet and writes out all the information displayed in the plan view in the sheet to either a plot file (in a user selected format) or to a 12d Model model. The user selects the plot sheet and a scale for the plot.

Selecting Quick sheet plot displays the Quick Sheet Plot panel.



The fields and buttons have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>view to plot.</i>	view box	current view	available views
Plotter type <i>format for the plot information.</i>	choice box	hp	hp, dxf, postscript etc.

Plot file	input	depends on plotter type
<i>stem of the name of the file to write the plot of the view to. The name ending is added automatically and depends on the plotter type.</i>		
Clean model beforehand	choice box	do not clean prompt for clean always clean
<i>only applicable if plotting to a model.</i>		
<i>if always clean, the model is cleaned before the plot is created.</i>		
<i>If prompt for clean, the user is prompted that the model will be cleaned before the plot is created.</i>		
<i>If do not clean, the model is not cleaned before the plot is created.</i>		
Scale 1:	real value	
<i>the plot scale.</i>		
Sheet size wd ht (mm)	sheet box	defined sheet sizes
<i>a sheet is selected from the pop-up or the width and height (in mm) are entered, separated by a space.</i>		
Rotation angle	dms value	
<i>the anti-clockwise rotation (in dms) for the plot sheet.</i>		
Origin		
<i>select or type in the position of the bottom left hand corner of the plot region.</i>		
View controlled/ Data controlled	radio buttons	
<i>if Data controlled, the plot sheet maintains its size and position with respect to the data in the view. That is, the plot sheet origin is locked to the selected data co-ordinates, and the plot scale is fixed so that the plot sheet then has a set size in world (data) units. If pans and zooms are made to the data in the view, the plot sheet will then move/zoom with data.</i>		
<i>if View controlled, the plot sheet maintains its size and position with respect to the view itself. That is, the plot sheet is locked in size and position with respect to the view itself. If pans and zooms are made to the data in the view, the sheet scale and origin are automatically modified to keep the plot frame in exactly the same position and size in the view.</i>		
Title and border	tick box	
<i>if ticked, a border and two lines of title are placed on the bottom of the plot.</i>		
Title line 1/2	input	
<i>first/second line of title information.</i>		
Title height (mm)	input	10
<i>height (in millimetres) to draw the two lines of title information.</i>		
Title colour	input	cyan available colours
<i>colour used for the border and the title information.</i>		
Rectangle	button	
<i>if selected, the plot frame is placed by selecting a cursor position from a view. This defines the Origin of the plot sheet. The sheet size, plot sheet scale and sheet rotation are taken from the panel fields.</i>		
Centre and Rotate	button	
<i>if selected, a centre of for the plot sheet is selected and then an second point to define the rotation of the plot sheet. This defines the Origin and Rotation of the plot sheet. The sheet size and scale are taken from the panel fields.</i>		
Plot	button	
<i>write out the plot of the information displayed in the plot sheet to the file given in the plot file field. The format of the file is given by the plotter type.</i>		

Plot Frames

Position of option on menu: **Plan View Menu** **View => Settings => Utilities => Plot frames**

To create plan plots of an arbitrary size, rotation and scale, 12d Model uses **plot frames**.

Basically a plot frame consists of a sheet size (in mm), margins within the sheet and a scale for the plot. This will define a plotting area in world co-ordinates (the plot frame).

The plot frame can be arbitrarily positioned and rotated on a plan view.

This option is documented in the section [Plotting Old Plot Frames](#) in the chapter [Plots](#)

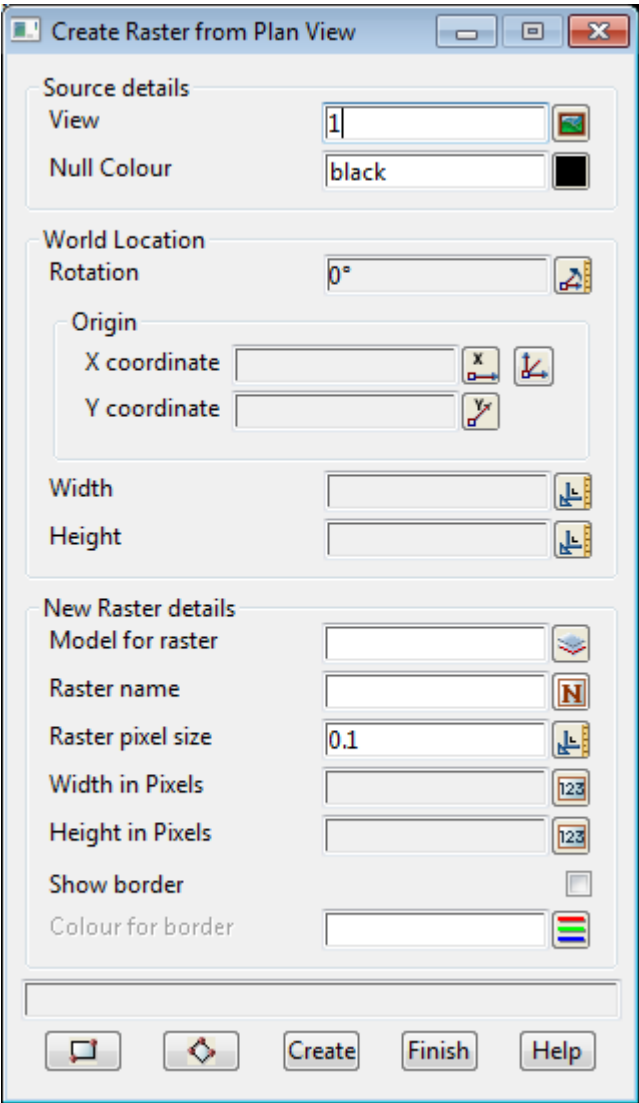
Create Raster from Plan View

Position of option on menu: Plan View Menu View => Settings => Utilities => View to raster

Position of option on menu: Strings =>Raster => Plan to raster

This option creates a 12d raster of a user specified pixel size, for the image on a plan view. This is useful for creating a 12d raster from an ECW file to use in draping on a tin in visualisations.

On selecting the View to Raster option, the **Create Raster from Plan View** panel is displayed.



The fields and buttons have the following functions.

Field Description	Type	Defaults	Pop-Up
Source Details			
View <i>view to create raster from.</i>	view box	current view	available views
Null colour <i>colour to set to no pixel in the raster</i>	colour box		available colours

World Location

- Anticlockwise rotation

angle box

the world rotation of the selected rectangle.
- X/Y co-ordinate

real box

the world x/y co-ordinate of the corner of the bottom left corner of the rectangle.
- Width/height

real box

the width/height in world units of the rectangle.

New Raster Details

- Model for raster

model box

available models

name of the model for the raster element.
- Raster name

text box

the name for the raster.
- Raster pixel size

input

the size (in world units) for each pixel in the created raster.
- Width/Height in pixels

output only

the width/height in pixels of the created raster.
- Show border

tick box

tick

if ticked then the border of the created raster element is displayed.
- Colour for border

input

default colour

available colours

the colour of the border for the created raster.
- Rectangle

button

create a rectangle (parallel to the x,y axis) that the created raster is restricted to.
- Rotated Rectangle

button

create a rotated rectangle that the created raster is restricted to.
- Create

button

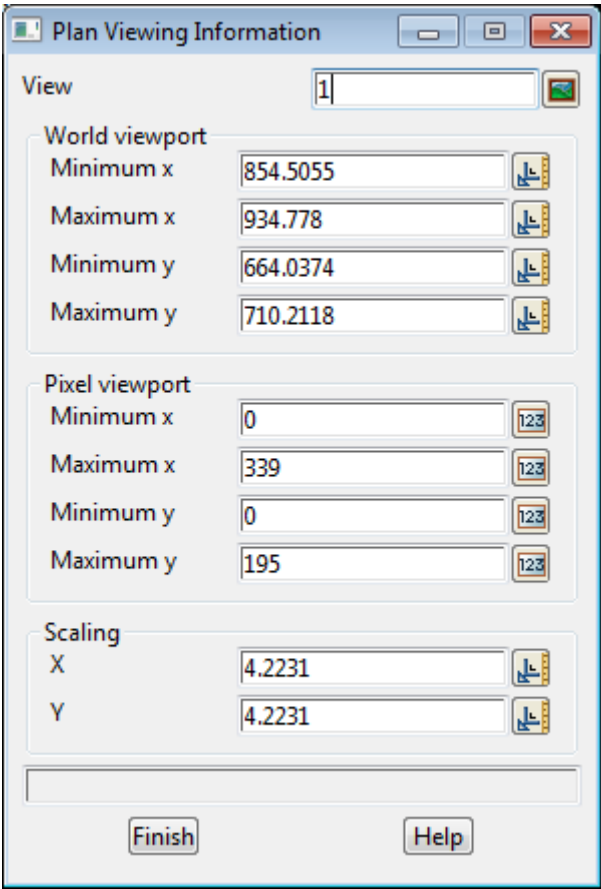
create a 12d raster from the image on the plan view.

View Info

Position of option on menu: Plan View Menu View => Utilities => Info

This option displays information about the world and pixel size of a plan view.

On selecting the Info option, the Plan Viewing Information panel is displayed.



The fields and buttons have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>when activated from the Plan View menu, the name of the view is placed into this field and the information about this view is displayed in the panel fields.</i> <i>Once the panel is up, a different Plan View name can be selected and the information will be displayed for that view.</i>	view box	current view	available plan views

World viewport

- Minimum, Maximum x** display only
display the world minimum and maximum x coordinates for the view.
- Minimum, Maximum y** display only
display the world minimum and maximum y coordinates for the view.

Pixel viewport

- Minimum, Maximum x** display only
display the minimum and maximum x pixels coordinates for the view.

Minimum, Maximum y display only

display the world minimum and maximum y pixels coordinates for the view.

Note - for pixels coordinates, (0,0) is at the top left hand corner of the view and positive x goes to the right, and positive y goes down the view.

Scaling

X display only

the ratio of x pixel length of the view to the x world unit length of the view. That is,

(maximum x pixels - minimum x pixels)/ (maximum x world units - minimum x world units)

Y display only

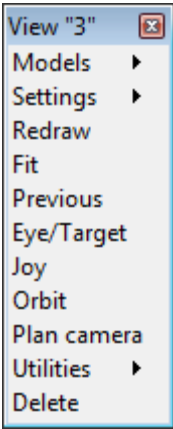
the ratio of y pixel length of the view to the y world unit length of the view. That is,

(maximum y pixels - minimum y pixels)/ (maximum y world units - minimum y world units)

Perspective View Menu

Position of menu: Perspective View Menu View

The perspective view menu is



For the option *Models*, go to the section

- Settings*
- Redraw*
- Fit*
- Previous*
- Eye/Target*
- Joy*
- Orbit*
- Plan Camera*
- Utilities*
- Delete*

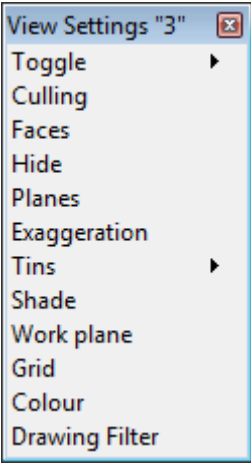
- [Model Ops](#)
- [Perspective View Settings](#)
- [Redraw](#)
- [Fit](#)
- [Previous](#)
- [Eye/Target](#)
- [Joy View](#)
- [Orbit](#)
- [Plan Camera](#)
- [Perspective Utilities](#)
- [Delete](#)

Perspective View Settings

Position of menu: Perspective View Menu View =>Settings

If the **Settings** option is picked rather than moving onto the walking right, then the **Toggle** menu from the **Toggle** walk-right menu is displayed on the screen. The **Toggle** menu will be described in the next section.

The **Settings** walk-right menu for the perspective view is

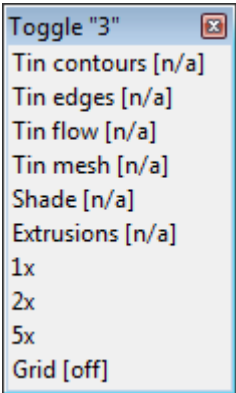


For the option <i>Toggle</i> , go to	Perspective Toggle
<i>Culling</i>	Culling
<i>Faces</i>	Face Flags for View
<i>Hide</i>	Hide View
<i>Planes</i>	Clipping Planes for View
<i>Exaggeration</i>	Perspective View Exaggeration
<i>Tins</i>	Tins
<i>Shade</i>	Shade
<i>Work Plane</i>	Work Plane
<i>Grid</i>	Grid on View
<i>Colour</i>	View Background Colour
<i>Drawing filter</i>	View Drawing Filter

Perspective Toggle

Position of menu: Perspective View Menu View =>Settings =>Toggle

The **Toggle** walk right brings up the **Toggle** perspective view menu.



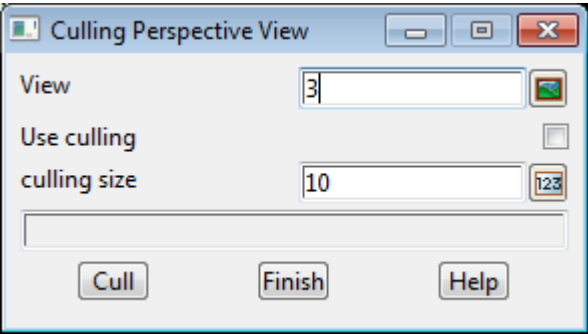
Selecting any options from this menu will toggle the option on/off.

Culling

Position of option on menu: Perspective View Menu View =>Settings =>Culling

The **Culling** option is used to suppress the drawing of strings whose on-screen extent is less than a user defined pixel size.

Selecting **Culling** raises the **Culling Perspective View** panel.



The fields and buttons used in this panel have the following functions.

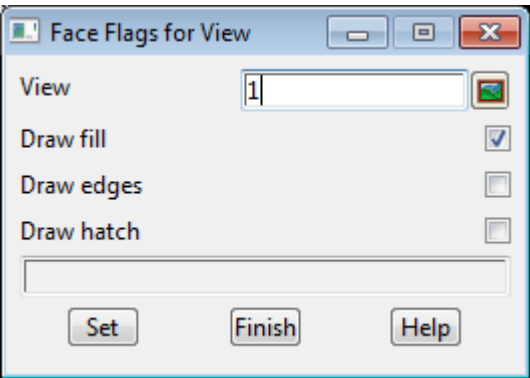
Field Description	Type	Defaults	Pop-Up
View <i>view to set culling parameters for.</i>	input/output	current view	available views
Use culling <i>if ticked, a string is not drawn on the perspective view whenever the string's extent box when drawn on the view would be smaller the culling size given in the culling size field.</i>	tick box		
Culling size <i>pixel size used for culling</i>	input	10	
Cull <i>record the culling size given in the culling field. If the use culling field and redraw the view.</i>	button		

Face Flags for View

Position of option on menu: Perspective View Menu View =>Settings =>Faces

The **faces** option allows the user to specify how faces are displayed in the perspective view and on any perspective view plots.

Selecting **Faces** fires up the **Face Flags for View** panel.



The fields and buttons have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>view to face flags for.</i>	input/output	current view	available views
Draw fill <i>if ticked, all faces in the view are drawn in their fill colour.</i>	tick box	tick	
Draw edges <i>if ticked, all face edges in the view are drawn.</i>	tick box		
Draw hatch <i>if ticked, all faces in the view are drawn in their hatch pattern.</i>	tick box		
Set <i>set the draw fill/edges/hatch fields to the value in the panel fields. The plan view is then redrawn.</i>	button		

Hide View

Position of option on menu: Perspective View Menu View =>Settings =>Hide

When looking across a landscape, part of the terrain is often hidden by other parts of the terrain. For example hills in the foreground will hide hills behind them.

In **12d Model**, a landscape is represented by a triangulated surface (a tin) and a tin can be used by a hidden line algorithm to determining what is visible is a scene.

The **hide** option in **12d Model** uses a tin to define a surface and processes any strings on the perspective against the tin to determine what is visible or hidden.

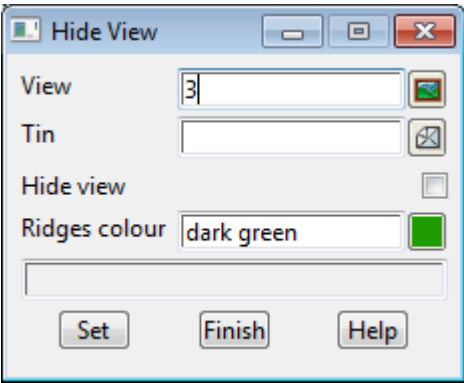
Only strings that lie on the tin can be sensibly processed. For example, contours, meshes, draped strings and any of the data that was used to create the tin.

When viewing a terrain from an eye point, the **ridge lines** are the edges of transition between visible and invisible areas. The **hide** option displays the ridge lines to delineate the hidden regions.

Once the **hide** option is set on, a hide will be done on the view whenever the view parameters are changed. If a model is added to the view when hide is set on, the strings in the model are processed and only the visible sections displayed in the view.

Note - strings can still be selected in a hidden view.

Selecting **Hide** raises the **Hide View** panel.



The fields and buttons used in this panel have the following functions.

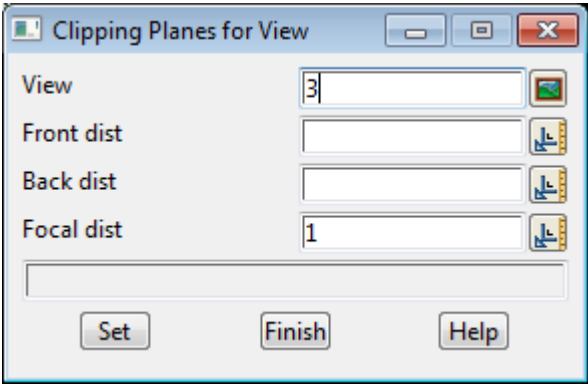
Field Description	Type	Defaults	Pop-Up
View <i>view to set hide parameters for.</i>	input/output	current view	available views
Tin <i>the name of the triangulated surface (tin) to be used for determining what is visible or not.</i>	input		available tins
Hide view <i>if ticked, then the view is processed when the set button is selected.</i>	tick box		
Ridges colour <i>the colour for the ridge lines.</i>	input		available colours
Set <i>record the answers for the hide view, tin and ridges colour fields and then process the perspective view using the new parameters. The view type will be changed to hidden.</i>	button		

WARNING - a hide can be very slow for large tins and/or large data sets.

Clipping Planes for View

Position of option on menu: Perspective View Menu View =>Settings =>Planes

The perspective viewing direction is defined by specifying an eye and target point. The three dimensional view is then projected onto a plane at right angles to the eye-target line, and at a user defined distance from the eye-point. This plane is called the focal plane and the distance from the eye-point to the focal plane is the focal distance. The projection of all the data onto the focal plane is what is seen on the screen in a perspective view. Moving the focal plane has the same effect as varying the telephoto lens on a camera - it gives the impression of zooming into and out of the view. It is not always desirable to include all the data in the perspective view. For example, data behind the viewer is not normally required to be seen. The user can specify the position of two planes (called the front and back clipping planes) parallel to the focal plane. Only data lying between the clipping planes will be seen. Thus the view is “clipped” using the front and back clipping planes. The distance to the clipping planes is measured from the eye point along the line joining the eye and target points (the eye-target line). Selecting **Planes** fires up the **Clipping Planes for View** panel. This panel allows the user to set the focal distance and the front and back clipping plane distances.



The fields and buttons used in this panel have the following functions.

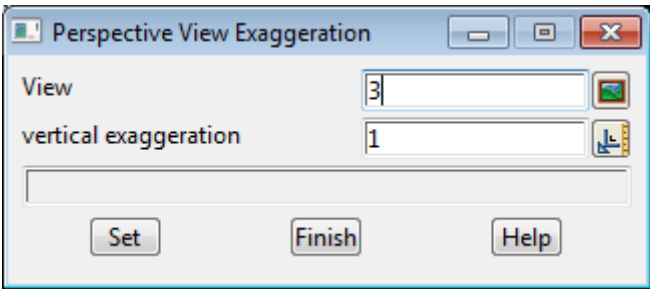
Field Description	Type	Defaults	Pop-Up
View <i>view to set clipping plane for:</i>	input/output	current view	available views
Front dist <i>distance from the eye point to the front clipping plane. If this field is blank, no front clipping plane is used.</i>	input/output		
Back dist <i>distance from the eye point to the back clipping plane. If this field is blank, no back clipping plane is use.</i>	input/output		
Focal dist <i>distance from the eye point to the focal plane. This distance must be non-zero.</i>	input/output		
Set <i>set the distances to the front and back clipping planes and the focal plane. If the front or back clipping distance is blank, that plane is not set. After the set button is chosen, the view is redrawn using the new parameters,</i>	button		

Perspective View Exaggeration

Position of option on menu: Perspective View Menu View =>Settings =>Exaggeration

The exaggeration option allows the user to specify the vertical exaggeration in the perspective view. The heights (z values) are multiplied by the vertical exaggeration value before drawing on the perspective view.

Selecting **Exaggeration** fires up the **Perspective View Exaggeration** panel.



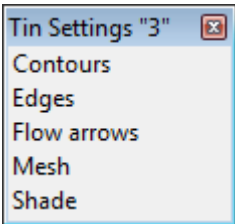
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>view to set exaggeration for.</i>	input/output	current view	available views
Vertical exaggeration <i>value to multiply the heights (z values) by before drawing in the perspective view.</i>	input	10	1,5,10
Set <i>set the vertical exaggeration to the value in the vertical exaggeration field.</i>	button		

Tins

Position of menu: Perspective View Menu View =>Settings =>Tins

The options on the **Tins** walk-right menu control the display of tins on the view. The **Tins** walk-right menu is



For the option **Contours**, go to

Edges	Contours
Flow arrows	Edges
Mesh	Flow Arrows
Shade	Mesh
	Shade

Contours

Position of option on menu: Perspective View Menu View =>Settings =>Tins =>Contours

The **contours** option defines contour and bold increments and colours, and also whether these contours are displayed for the triangles from any tins on the view. The panel is the same as for the plan view option. If **Shade** is set on, the triangles will be drawn in back to front order.

Edges

Position of menu: Perspective View Menu View =>Settings =>Tins =>Edges

The **Edges** option allows the user to specify whether the edges of triangles from any tins on the view are displayed. The panel is the same as for the plan view option. If **Shade** is set on, the triangles will be drawn in back to front order.

Flow Arrows

Position of option on menu: Perspective View Menu View =>Settings =>Tins =>Flow arrows

The **Flow arrows** option defines the colour and length of flow arrows, and also whether the flow arrows are displayed for the triangles from any tins on the view. The panel is the same as for the plan view option. If **Shade** is set on, the triangles will be drawn in back to front order.

Mesh

Position of option on menu: Perspective View Menu View =>Settings =>Tins =>Mesh

The **Mesh** option defines a rectangular mesh, and also whether the mesh is displayed for the triangles from any tins on the view. The panel is the same as for the plan view option. If **Shade** is set on, the triangles will be drawn in back to front order.

Shade

Position of option on menu: Perspective View Menu View =>Settings =>Tins =>Shade

Position of option on menu: Perspective View Menu View =>Settings =>Shade

In **12d Model**, a landscape is represented by a triangulated surface - a tin. Each triangle in the tin is a part of a plane and has its own colour.

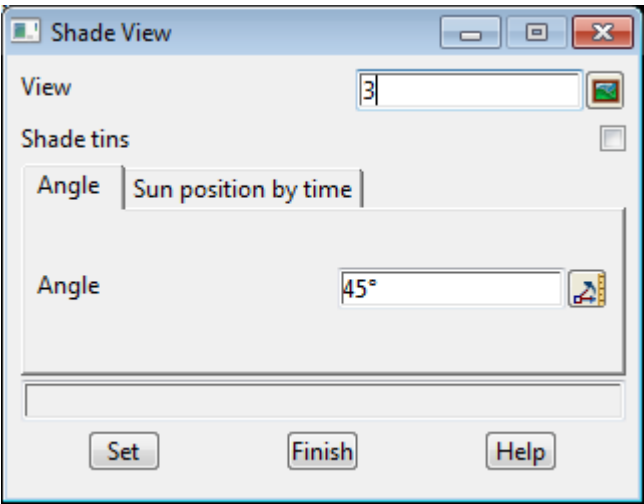
In a perspective view, each triangle can be drawn with a colour that is modified depending on the angle that the triangle makes with the sun (a point light source at infinity). This is called a **flat shade**.

If the triangles are drawn in a back to front order, then when the shaded landscape is drawn, any triangles in the foreground obscure triangles in the background and it looks like a hidden view.

If **shade** is set for a view, all the triangles in all the tins on the view are drawn as shaded triangles and the triangles are drawn in a back to front order.

Once the **Shade** is set on, a shade will be done on the view whenever the view parameters are changed. A plot of the shaded view can be made using the **dump** option on the view.

Selecting **Shade** fires up the **Shade View** panel:



The fields and buttons used in this panel have the functions.

Field Description	Type	Defaults	Pop-Up
View <i>view to set shade parameters for.</i>	input/output	current view	available views
Shade tins <i>if ticked, draw all the tins on the perspective view in shade mode.</i>	tick box		
Angle <i>angle of the sun (measured from the horizon).</i>	input	45	
Set <i>record and redraw the view using the current parameters.</i>	button		

Shade

Position of option on menu: Perspective View Menu View =>Settings =>Shade

This is exactly the same option as the Shade described in the previous section [Shade](#).

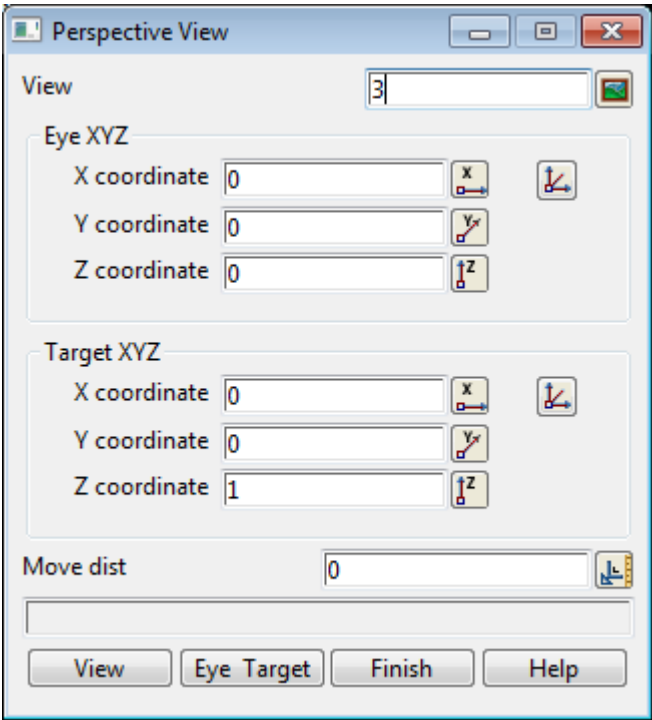
Eye/Target

Position of option on menu: **Perspective View Menu** View =>Eye/Target

The **Eye/Target** option displays the current eye and target co-ordinates and also allows the user to specify new eye and target points. The points can be chosen from any plan view using the cursor or by typed-input.

The view is projected onto a focal plane using a perspective transformation, and clipped using front and back clipping planes. The focal distance and the front and back clipping plane distances are set and modified in the **planes** option.

Selecting **Eye/Target** fires up the **Perspective View** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>view to set perspective parameters for.</i>	view box	current view	available views
Eye X Y Z <i>co-ordinates of the eye viewing point. New values can be typed, or a point selected using the xyz ops pop-up menu.</i>	XYZ select	current eye position	xyz ops menu
Target X Y Z <i>co-ordinates of the target viewing point. New values can be typed, or a point selected using the xyz ops pop-up menu.</i>	XYZ select	current target position	xyz ops menu
Move dist <i>distance to move the eye point along the eye-target line in the direction of the target point. The target point is also moved the same distance along the eye-target line so that the eye-target distance is kept constant.</i>	input/output		
View <i>define the perspective parameters according to the information in the panel. If the move distance is</i>	button		

non-zero, then the eye and target points are both moved along the eye-target line by the distance given in the Move field. In this case, the new eye and target positions will be written to the eye and target fields.

Eye Target button

allows the user to define the (x, y) position of the eye and target points using the cursor and views.

After selection the button, the user is asked to select the eye position from a view by clicking LB in a view. A level input box is then displayed on the screen for the user to enter the level (z value) for the eye point. The level is recorded and the level box removed after a <enter> is entered in the level input box.

The user is then asked to select the target point from any view by clicking LB at the position of the target point. A level input box is then displayed for the user to enter the level (z value) for the target point.

After the target point is defined, the view is redrawn using the new eye and target positions.

How to Use the Panel and Panel Messages

- (a) The eye and target points are set by using typed-input, or by selection in either the eye XYZ or target XYZ fields, or the **Eye Target** button.
- (b) When the **View** button is selected, the perspective viewing parameters are calculated according to the information in the panel. If a non-zero move distance is given, the eye and target points are both moved along the eye-target line through the move distance. The new values for the eye and target points are written into the panel. If no errors are detected in calculating the new viewing parameter, the view is redrawn using the new parameters.

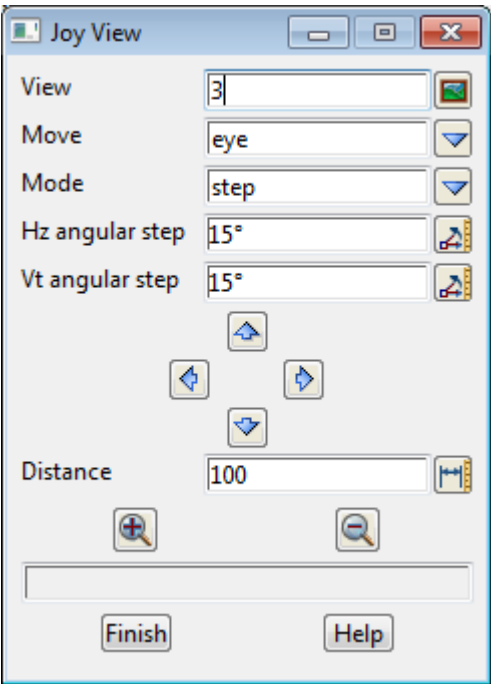
Joy View

Position of option on menu: Perspective View Menu View =>Joy

The hardest thing in a perspective view is finding a good viewing position. The joy option makes it easy to construct a new perspective viewing position relative to the existing position.

The panel can be used to move the eye or target point by rotating them through a given angle to the left, right, up or down, or to move one towards or away from the other. It is also possible to move the eye and target points keeping the distance between them the same.

Selecting Joy fires up the Joy view panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>view to set joy parameters for.</i>	input/output	current view	available views
Move <i>move the eye point, the target point or both.</i>	input	eye	eye, target, eye & target
Mode <i>in step mode, the view is modified each time an appropriate button is picked. In continuous mode, after the view is redrawn, the picked joy option is continually re-applied until either a new joy button is picked, button LB is clicked anywhere else in the joy panel.</i>	input	step	step, continuous
Hz angular step <i>angle in degrees (in HP Notation) that is used with the joy buttons left and right when moving just the eye or target point.</i>	angle box	15	
Vt angular step <i>angle in degrees (in HP Notation) that is used with the joy buttons up and down when moving just the eye or target point.</i>	angle box	15	
Distance <i>distance used to move the eye or target point.</i>	input	100	

Joy buttons up, down, left, right, in, out

The joy buttons are used to modify the perspective parameters and then redraw the view with the new parameters.

The effect of each joy button depends on whether the move field is set to *eye*, *target* or *eye & target*.

move **field set to eye**

up/down button

rotate the eye-target line about the target point up/down by the angle given in the angle step field. That is, the eye point is moved upwards/downwards, the target point kept fixed.

left/right button

rotate the eye-target line about the target point to the left/right by the angle given in the angle step field. The target point kept fixed.

in/out button

move the eye point towards/away the target point along the eye-target line by the distance given in the distance field. The target point kept fixed.

move **field set to target**

similar to the movements when the move field is set to *eye* except the eye point is kept fixed and the target point is moved.

move **field set to eye & target**

up/down/left/right button

the eye and target points are both moved up/down/left/right by the distance given in the distance field. That is, the entire eye-target line is moved up/down/left/right and neither the eye or target point is kept fixed.

in/out button

move the eye and target points along the eye-target line by the distance given in the distance field. The direction is towards/away the target point.

How to Use the Panel

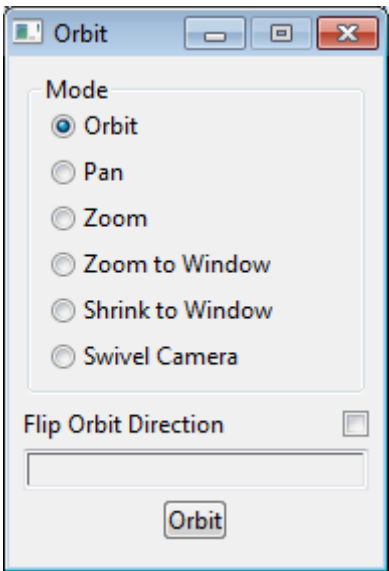
- (a) The move, mode, angular step and distance field are given the desired values and then one of the joy buttons (up, down, left, right, in or out) is selected. The perspective view is then redrawn
- (b) If the mode is set to continuous, once drawing is completed, the selected joy option will be re-applied. This sequence is repeated until either a new joy button is picked, button LB is clicked anywhere else in the joy panel or a *c* key is typed.

Orbit

Position of option on menu: Perspective View Menu View =>Orbit

The orbit option quickly rotates the data around in the perspective view.

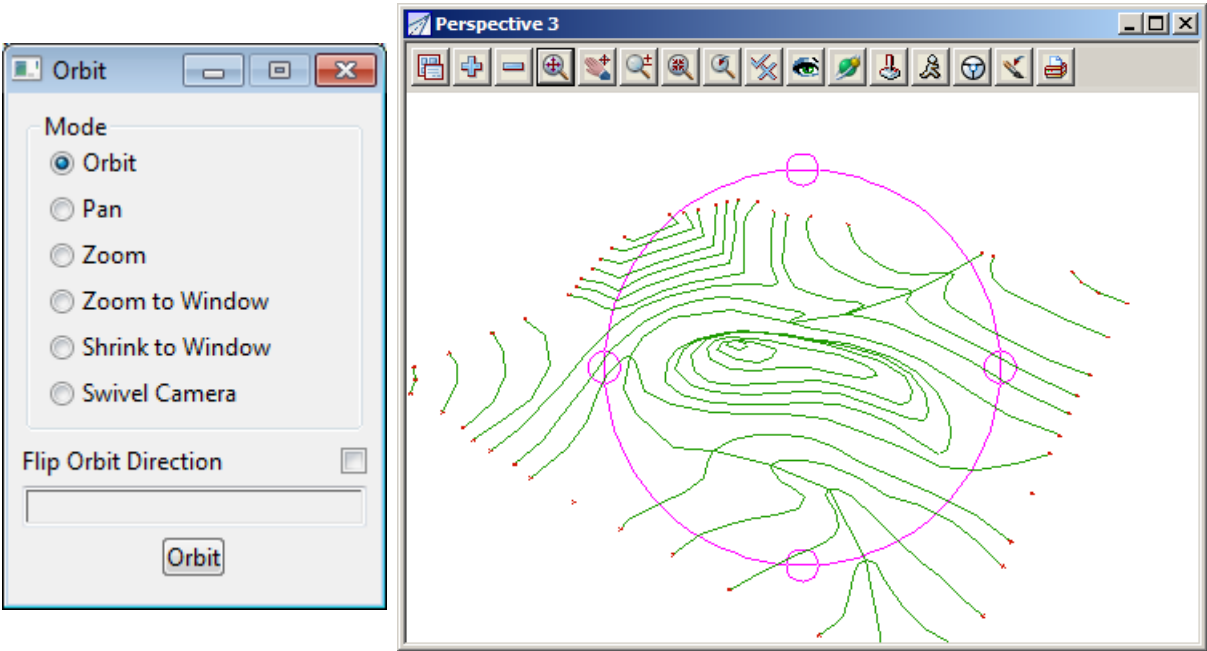
Selecting **Orbit** fires up the **Orbit** panel.



To use Orbit:

Orbit radio button **on:** **Flip orbit direction** radio button **off:**

*when the left button is clicked in the perspective view, the orbit circle appears and
holding LB down and **moving up** in the orbit circle tilts the **object up**
holding LB down and **moving down** in the orbit circle tilts the **object down**
holding LB down and **moving left** rotates the **object to the left**
holding LB down and **moving right** rotates the **object to the right***



Orbit radio button **on:** **Flip orbit direction** radio button **on:** the movement is reversed

Pan radio button on:

*holding LB down and **moving up** in the view **raises the object***

*holding LB down and **moving down** in the view **lowers the object***

*holding LB down and **moving left** in the view **pans the object to the left***

*holding LB down and **moving right** in the view **pans the object to the right***

Zoom radio button on:

*holding LB down and **moving up** in the view **zooms into** the object*

*holding LB down and **moving down** in the view **zooms out** from the object*

Zoom to window radio button on:

when a zoom box is drawn on the view, the perspective is modified so that the contents of the zoom box fill the entire view.

Shrink to window radio button on:

when a zoom box is drawn on the view, the perspective is modified so that the contents of the window are shrunk to fit into the zoom box.


Swivel camera radio button on:

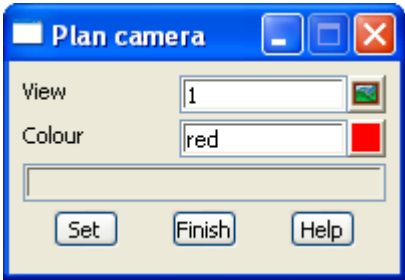
holding LB down moves the target point.

Plan Camera

Position of option on menu: Perspective View Menu View =>Plan Camera

This creates a camera for the current perspective OpenGL view, which can be controlled from a plan view. This allows you to see where a camera is and where it is looking and move those points together or independently.

Selecting **Plan Camera**  brings up the **Plan Camera** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>the view to control</i>	view box		select view
Colour <i>the colour to draw the plan camera and target symbol in</i>	colour box		
Set <i>Create the plan camera</i>	button		

Setting the plan camera will create two symbols on your plan view, as shown below:



Camera / Eye



The target

To move the camera, simply click on one of these images and drag it. The perspective OpenGL view will move with it. If you wish to lift or lower the selected component, use the scroll wheel on your mouse. The distance you move is proportional to the zoom level on your plan view.

Key Strokes

There are a number of key strokes available when running the plan camera.

(S)et
sets a component (x, y, z) coordinate of the camera to be equal to the target or vice versa

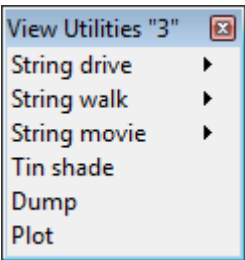
(L)ock
locks the camera and target together, so they will maintain the same distance from each other when either one or the other is moved.

Perspective Utilities

Position of option on menu: Perspective View Menu View => Utilities

The **Utilities** menu contains miscellaneous options involving the perspective view.

The **Utilities** walk-right menu is



For the option *String drive*, go to

String walk

String movie

Tin shade

Dump

Plot

[String Drive](#)

[String Walk](#)

[String Movie](#)

[Tin Shade](#)

[Dump](#)

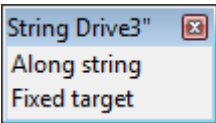
[Perspective Plot](#)

String Drive

Position of menu: Perspective View Menu View => Utilities =>String drive

The string drive option makes it easy to construct the perspective view one gets when moving along a string (for example, driving along a road centre line).

The two options on the **String drive** walk-right menu are



and they specify the positioning of eye and target points by:

along string - the eye and target points are automatically moved along the selected string

fixed target - the eye point automatically moves along the selected string but the target point is a selected fixed point.

Note - the **string drive** option can be aborted by pressing the **<esc>** key or clicking RB.

For the option *Along string*, go to

Fixed target

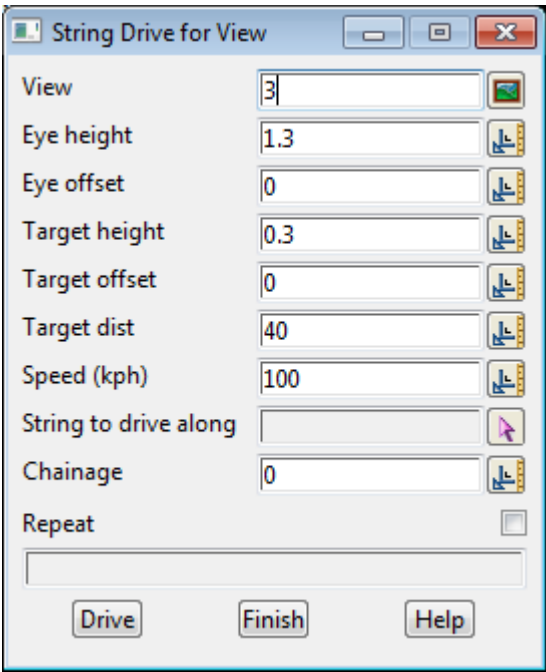
[String Drive - Along String](#)

[String Drive - Fixed Target](#)

String Drive - Along String

Position of option on menu: Perspective View Menu View => Utilities =>String drive =>Along string

Selecting *Along string* fires up the **String Drive for View** panel.



For **string drive along a string**, a selected string is used to provide the (x, y, z) positions for the eye and target points.

The z-values can be adjusted by typing in a non-zero value for the eye and target heights in the **string drive** panel. These heights are relative to the z-values of the points on the string and are **added** to the z-values.

Like the new view option, the view is projected onto a focal plane and “clipped” using front and back clipping planes.

The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
View		view box	current view	available views
<i>view to set drive parameters for</i>				
Eye height		input	1.3	
<i>height of the eye viewing point above the picked string</i>				
Eye offset		input	0	
<i>offset of the eye viewing point from the picked string</i>				
Target height		input	0.3	
<i>height of the target viewing point above the picked string</i>				
Target offset		input	0	
<i>offset of the target viewing point from the picked string</i>				
Target distance		input	40	
<i>distance (in string chainage) from the eye point to the target point.</i>				
Speed (kph)		input	100	
<i>speed in kilometres per hour (that is, one thousand base units per hour) that the eye-target points move along the string.</i>				

String to drive along string select box

a string to drive along is selected from any view. The string must have z-values.

Chainage input/output 0

*the chainage that the eye point is at on the string. The chainage is updated as the eye and target points are automatically moved along the string. The drive can be set to start at a specific start chainage by simply entering the start chainage into the chainage field and then selecting the **Drive** button.*

Repeat tick box

*if **ticked**, the drive starts again at the beginning of the string.*

Drive button

*When the **drive** button is selected, the eye and target points are placed above the string as specified in the panel fields, and the view redrawn. The eye and target points are then moved along the string at the given speed until either reaches the end of the string. The chainage of the eye point is continually updated.*

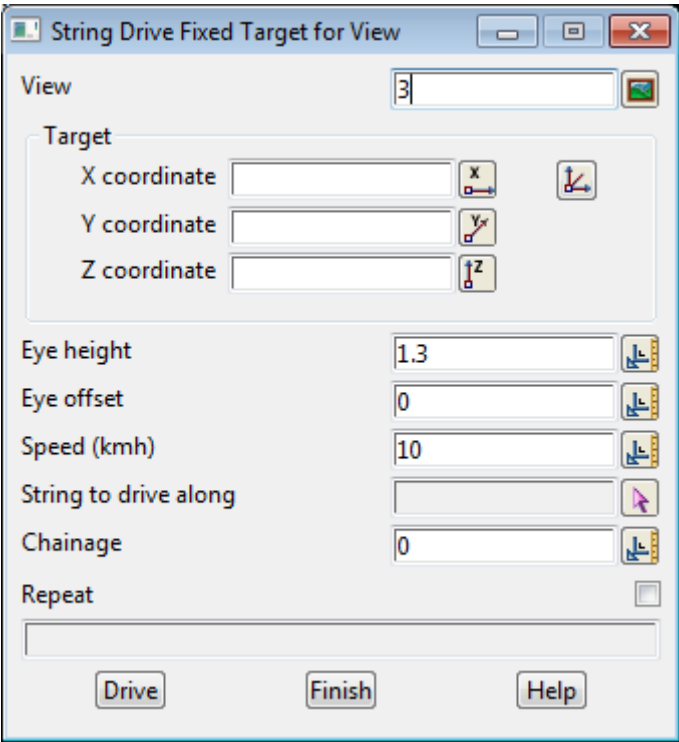
Notes

- s the target distance and speed can be positive or negative.
- s the eye and target points are shown on any view displaying the string being driven along. The eye point is drawn as a red cross, the target point, a green cross.
- s if the front distance for the clipping plane of the perspective view is set to zero by the user, it is automatically reset to 2 so that the red cross drawn at the eye point is not visible in the perspective view.

String Drive - Fixed Target

Position of option on menu: Perspective View Menu View => Utilities =>String drive =>Fixed target

Selecting **Fixed target** fires up the **String Drive Fixed Target for View** panel.



For **string drive fixed target**, a selected string is used to provide the (x, y, z) positions for the eye point, and the target is a selected fixed point. The z-value for the eye is adjusted by adding to it the eye height in the eye height field in the **String Drive Fixed Target fro View** panel.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>view to set drive parameters for.</i>	view box	current view	available views
Target <i>a fixed target point is selected from any view. The point's co-ordinates are displayed in the X, Y, Z coordinates panel fields.</i>	xyz select box		
Eye height <i>height of the eye viewing point above the picked string</i>	input	1.3	
Eye offset <i>offset of the eye viewing point from the picked string</i>	input	0	
Speed (kph) <i>speed in kilometres per hour (that is, in one thousand of the base units per hour that the eye point moves along the string.</i>	input	100	
String to drive along <i>a string to drive along is selected from any view. The string must have z-values.</i>	string select box		
Chainage <i>the chainage that the eye point is at on the string. The chainage is updated as the eye point</i>	input/output	0	

automatically moves along the string. The drive can be set to start at a specific start chainage by simply entering the start chainage into the chainage field and then selecting the **Drive** button.

Target button

a fixed target point is selected from any view. The point's co-ordinates are displayed in the target panel field.

Repeat tick box

if **ticked**, the drive starts again at the beginning of the string.

Drive button

When the **drive** button is selected, the eye point is placed above the string at the chainage given in the chainage field, and the view redrawn. The eye point is then moved along the string at the given speed until it reaches the end of the string. The chainage of the eye point is continually updated.

Notes

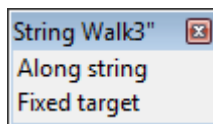
- s the speed can be positive or negative.
- s the eye point is shown on any view displaying the string being driven along. The eye point is drawn as a red cross, the target point, a green cross.
- s if the front distance for the clipping plane of the perspective view is set to zero by the user, it is automatically reset to 2 so that the red cross drawn at the eye point is not visible in the perspective view

String Walk

Position of menu: Perspective View Menu View => Utilities =>String walk

The *string walk* option makes it easy to construct the perspective view one gets when walking along a string (for example, walking along a road centre line).

The two options on the **String Walk** walk-right menu are



and they specify the positioning of eye and target points by:

along string - the eye and target points are automatically moved along the selected string

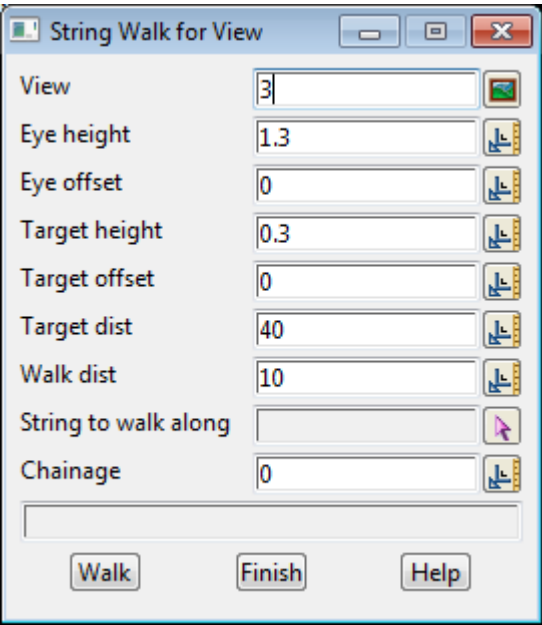
fixed target - the eye point automatically moves along the selected string but the target point is a selected fixed point.

For the option Along string, go to [String Walk - Along String](#)
 Fixed target [String Walk - Fixed Target](#)

String Walk - Along String

Position of option on menu: Perspective View Menu View => Utilities =>String walk =>Along string

Selecting along string fires up the **string walk for view** panel



For **string walk along a string**, a selected string is used to provide the (x, y, z) positions for the eye and target points.

The z-values can be adjusted by typing in a non-zero value for the eye and target heights in the **string walk** panel. These heights are relative to the z-values of the points on the string and are **added** to the z-values.

Like the new view option, the view is projected onto a focal plane and “clipped” using front and back clipping planes.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>view to set walk parameters for.</i>	view box	current view	available views
Eye height <i>height of the eye viewing point above the picked string</i>	input	1.3	
Eye offset <i>offset of the eye viewing point from the picked string</i>	input	0	
Target height <i>height of the target viewing point above the picked string</i>	input	0.3	
Target offset <i>offset of the target viewing point from the picked string</i>	input	0	
Target distance <i>distance (in string chainage) from the eye point to the target point.</i>	input	40	
String to walk along <i>a string to walk along is selected from any view. The string must have z-values.</i>	string select box		
Walk dist <i>distance to move the eye point along string from the previous eye point chainage. The target point is also moved the same distance along the eye-target line so that the eye-target distance is kept constant.</i>	input	10	

Field Description	Type	Defaults	Pop-Up
View <i>view to set walk parameters for.</i>	view box	current view	available views
Target <i>a fixed target point is selected from any view. The point's co-ordinates are displayed in the X, Y, Z coordinates panel fields.</i>	xyz box		
Eye height <i>height of the eye viewing point above the picked string</i>	input	1.3	
Eye offset <i>offset of the eye viewing point from the picked string</i>	input	0	
Walk dist <i>distance to move the eye point along string from the previous eye point chainage.</i>	input	10	
String to walk along <i>a string to walk along is selected from any view. The string must have z-values.</i>	string select		
Chainage <i>the chainage that the eye point is at on the string. The chainage is updated as the eye point automatically moves along the string. The walk can be set to start at a specific start chainage by simply entering the start chainage into the chainage field and then selecting the Walk button.</i>	input/output	0	
Walk <i>the perspective parameters are defined according to the information in the panel. The first time the Walk button is selected, the eye point is placed above the string at the chainage given in the chainage field. For subsequent selections of the Walk button, the eye point is moved along the string by the chainage distance given in the walk dist field.</i> <i>The view is redrawn with the new view parameters and the new eye-chainage displayed in the panel message area and the chainage field.</i>	button		

Notes

- s the walk distance can be positive or negative.
- s the eye point is shown on any view displaying the string being walked along. The eye point is drawn as a red cross, the target point, a green cross.
- s if the front distance for the clipping plane of the perspective view is set to zero by the user, it is automatically reset to 2 so that the red cross drawn at the eye point is not visible in the perspective view

String Movie

Position of menu: Perspective View Menu View => Utilities =>String movie

The **String movie** option makes it easy to construct and save to disk the sequence of perspective views one gets when walking along a string (for example, walking along a road centre line).

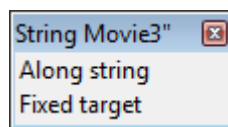
The screen images are automatically written out to disk in gif format so that they can be replayed at a later time.

This is especially useful when it takes a while to construct each view, for example, when hidden line is turned on.

Under NT/95, the screen images are written to an **avi** file.

Under Unix, the screen images are written to a **gif** file and there can be up to 99,999 of them in the one movie.

The two options on the **String movie** walk-right menu are



and they specify the positioning of eye and target points by:

along string - the eye and target points are automatically moved along the selected string

fixed target - the eye point automatically moves along the selected string but the target point is a fixed selected point.

Note - the **string movie** option can be aborted by pressing the <esc> key or clicking RB.

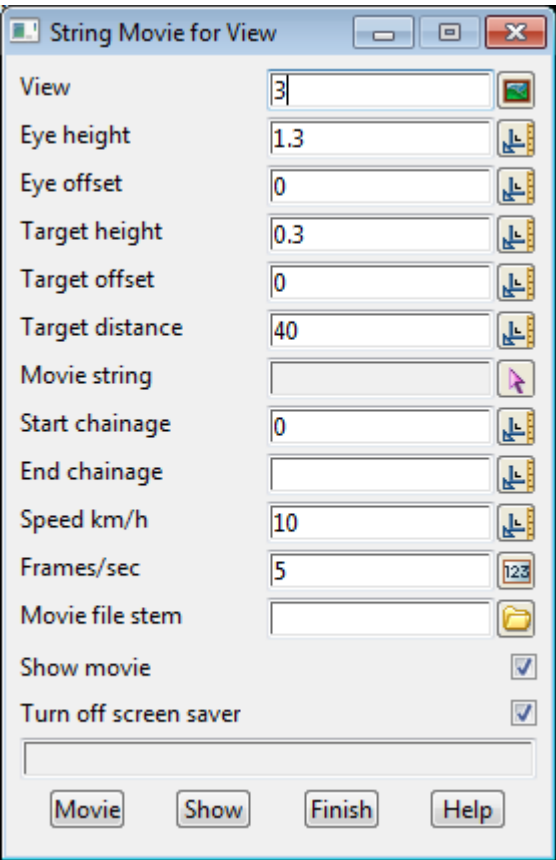
For the option Along string, go to [String Movie - Along String](#)

Fixed target [String Movie - Fixed Target](#)

String Movie - Along String

Position of option on menu: Perspective View Menu View => Utilities =>String movie =>Along string

Selecting **Along string** fires up the **String Movie for View** panel



For **string movie along a string**, a selected string is used to provide the (x, y, z) positions for the eye and target points.

The z-values can be adjusted by typing in a non-zero value for the eye and target heights in the **string movie** panel. These heights are relative to the z-values of the points on the string and are **added** to the z-values.

Like the new view option, the view is projected onto a focal plane and “clipped” using front and back clipping planes

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>view to set movie parameters for.</i>	view box	current view	available views
Eye height <i>height of the eye viewing point above the picked string</i>	input	1.3	
Eye offset <i>offset of the eye viewing point from the picked string</i>	input	0	
Target height <i>height of the target viewing point above the picked string</i>	input	0.3	
Target offset <i>offset of the target viewing point from the picked string</i>	input	0	
Target distance <i>distance (in string chainage) from the eye point to the target point.</i>	input	40	

Movie string	string select	
<i>a string to drive along is selected from any view. The string must have z-values.</i>		
Start chainage	input/output	0
<i>the chainage that the eye point starts on the string for the movie.</i>		
End chainage	input/output	0
<i>the chainage to stop the movie at.</i>		
Speed (kph)	input	10
<i>speed in kilometres per hour (that is, one thousand base units per hour) that the eye-target points move along the string.</i>		
Frames/sec)	input	5
<i>number of frames per second to produce for the movie.</i>		
Movie file stem	input	4d-
<i>each frame of the drive in the view is written to disk in avi format using the movie file stem plus the ending .avi as the file name.</i>		
Show movie	tick box	tick
<i>if ticked, after all the views along the string are written to disk, a new window, the same size as the perspective view, will be created and movie then run.</i>		
Turn off screen saver	tick box	tick
<i>if ticked, the screen saver is disabled so it doesn't come on whilst creating the movie.</i>		
Movie	button	
<i>the perspective parameters are defined according to the information in the panel. When the Movie button is selected, the eye point is placed above the string at the chainage given in the chainage field. The view is drawn with these view parameters. After that view is processed and written to disk, the eye and target points are moved along the eye-target line and frames written out to simulate the given speed.</i>		
Show	button	
<i>This button is used to display a previously created movie. If selected, the movie created with the stem given in the movie file stem field is displayed. If Unix, there is a pause between each frame by the number of seconds given in the delay field.</i>		

Displaying the Movie

If a movie has just been created and the show movie field is set to tick, or an existing movie name is given in the movie file stem field and the **show** button is selected, then a new window will be created and the movie will be displayed frame by frame. Outside of **12d Model**, the movie can be displayed by simply double clicking on the **avi** file.

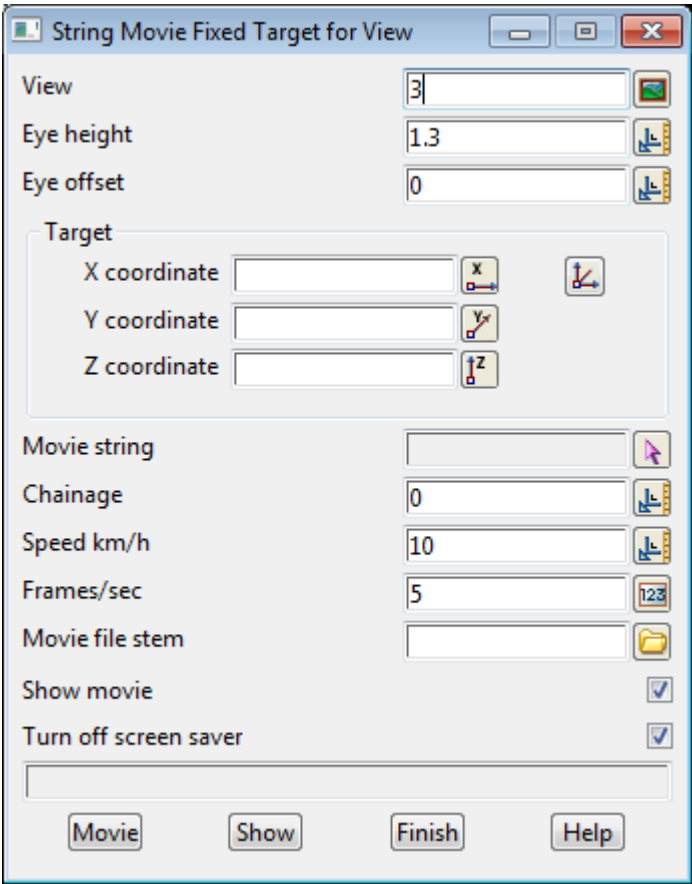
Notes

- s the target and move distances can be positive or negative.
- s the eye and target points are shown on any view displaying the string being walked along. The eye point is drawn as a red cross, the target point, a green cross.
- s if the front distance for the clipping plane of the perspective view is set to zero by the user, it is automatically reset to 2 so that the red cross drawn at the eye point is not visible in the perspective view.
- s the movie can also be displayed from outside **12d Model** by simply double clicking on the avi file
movie-file-stem.avi

String Movie - Fixed Target

Position of option on menu: Perspective View Menu View => Utilities =>String movie =>Fixed target

Selecting Fixed target fires up the **String Movie Fixed Target for View** panel.



For **string movie fixed target**, a selected string is used to provide the (x, y, z) positions for the eye point, and the target is a selected fixed point. The z-value for the eye is adjusted by adding to it the eye height in the eye height field in the **String Movie Fixed Target for View** panel.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>view to set movie parameters for.</i>	view box	current view	available views
Eye height <i>height of the eye viewing point above the picked string</i>	input	1.3	
Eye offset <i>offset of the eye viewing point from the picked string</i>	input	0	
Target <i>a fixed target point is selected from any view. The point's co-ordinates are displayed in the X, Y, Z coordinates panel fields.</i>	xyz box		
Movie string <i>a string to drive along is selected from any view. The string must have z-values.</i>	string select		

Chainage	input/output	0	<i>the chainage that the eye point starts on the string for the movie.</i>
Speed (kph)	input	10	<i>speed in kilometres per hour (that is, one thousand base units per hour) that the eye-target points move along the string.</i>
Frames/sec)	input	5	<i>number of frames per second to produce for the movie.</i>
Movie file stem	input	4d-	<i>each frame of the drive in the view is written to disk in avi format using the movie file stem plus the ending .avi as the file name.</i>
Show movie	tick box	tick	<i>if ticked, after all the views along the string are written to disk, the movie is then run.</i>
Turn off screen saver	tick box	tick	<i>if ticked, the screen saver is disabled so it doesn't come on whilst creating the movie.</i>
Movie	button		<i>the perspective parameters are defined according to the information in the panel. When the Movie button is selected, the eye point is placed above the string at the chainage given in the chainage field. The view is drawn with these view parameters. After that view is processed and written to disk, the eye and target points are moved along the eye-target line by the chainage distance given in the step distance field and the new view drawn and processed.</i> <i>This sequence is repeated until the end of the string is reached or the c key is pressed.</i>
Show	button		<i>This button is used to display a previously created movie. If selected, the movie created with the stem given in the movie file stem field is displayed.</i>

Tin Shade

Position of option on menu: Perspective View Menu View => Utilities => Tin shade

In **12d Model**, a landscape is represented by a triangulated surface - a tin. Each triangle in the tin is a part of a plane and has its own colour.

In a perspective view, each triangle can be drawn with a colour that is modified depending on the angle that the triangle makes with the sun (a point light source at infinity). This is called a **flat shade**.

If the triangles are drawn in a back to front order, then when the shaded landscape is drawn, any triangles in the foreground obscure triangles in the background and it looks like a hidden view.

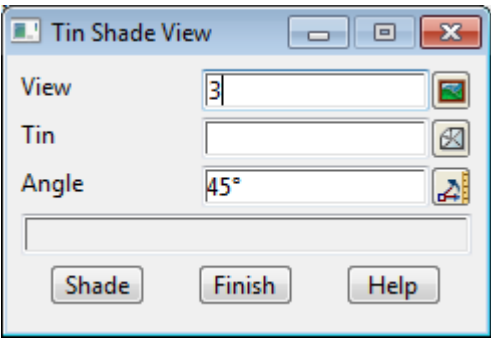
If **Shade** is set for a view, all the triangles in all the tins on the view are drawn as shaded triangles and the triangles are drawn in a back to front order.

Once the **Shade** is set on, a shade will be done on the view whenever the view parameters are changed. A plot of the shaded view can be made using the **Dump** option on the view.

The **Tin shade** option draws the selected tin over the perspective view as a shade. The selected tin does not have to be on the view for the shade to function.

When the view is refreshed, the shade is lost (the **Shade** option under settings is used for setting a shade permanently on). A plot of the shaded view can be made using the **Dump** option on the view.

Selecting **Tin shade** fires up the **Tin Shade View** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>view to set shade parameters for.</i>	view box	current view	available views
Tin <i>name of the tin to be used for the shade.</i>	input		available tins
Angle <i>angle of the sun.</i>	input	45	
Shade <i>draw the given tin on the view as a shaded tin.</i>	button		

Dump

Position of option on menu: Perspective View Menu View => Utilities =>Dump

This option is used to write the view image out to disk in a user selected format. It is the same as the **Dump** option for a plan view.

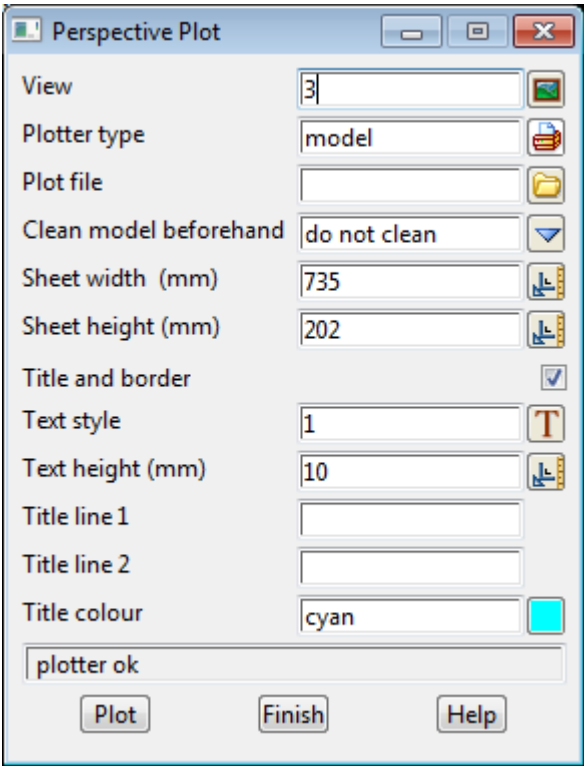
Perspective Plot

Position of option on menu: Perspective View Menu View => Utilities =>Perspective plot

The **Perspective plot** option is used to make a plot file of all the information displayed in the perspective view.

The user simply gives a sheet width and height and **12d Model** calculates the scaling factor required to best fit the plot of the view to the sheet.

Selecting **Plot** displays the **Perspective Plot** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>view to set perspective plot parameters for.</i>	view box	current view	available views
Plotter type <i>file format for the plot information.</i>	input	hp	hp, dxf, postscript etc.
Plot file <i>stem of the name of the file to write the plot of the view to. The name ending is added automatically and depends on the plotter type.</i>	input	depends on plotter type	
Clean model beforehand <i>only applicable if plotting to a model. if always clean, the model is cleaned before the plot is created. If prompt for clean, the user is prompted that the model will be cleaned before the plot is created. If do not clean, the model is not cleaned before the plot is created.</i>	choice box		do not clean prompt for clean always clean
Sheet width/height (mm) <i>if a value is entered by the user and an <enter> given, the height/width required by the plot is calculated and displayed in the sheet height/width field. The units for sheet width and height are millimetres. If both Sheet width and height are given with no <enter>, then a scaling factor is calculated by 12d Model to best fit the plot of the view to a rectangle of size given by the sheet width and height.</i>	input		
Title and border <i>if ticked, a border and two lines of title are placed on the bottom of the plot</i>	tick box		

Title line 1/2	input		
	<i>first/second line of title information</i>		
Title height (mm)	input	10	
	<i>height (in millimetres) to draw the two lines of title information</i>		
Title colour	input	cyan	available colours
	<i>colour used for the border and the title information</i>		
Plot	button		
	<i>write out the plot of the information displayed in the view to the file given in the plot file field. The format of the file is given by the plotter type</i>		

Section View Menu

Position of menu: Section View Menu View

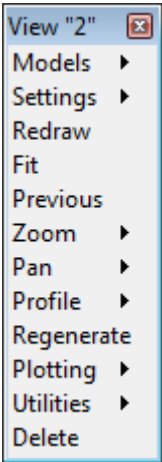
The section view is used to display string profiles and sections through tins and service items. The horizontal units are taken to be the **chainage** along a particular string called the **primary string** for the view. The z-values (heights) are the vertical units for the section. Hence, the section view is a (chainage, z-value) diagram with respect to the primary string on the view. The primary string's model and name is displayed in the view title area of the section view.

Since a tin represents a two dimension continuous surface, sectioning through a tin along a string appears as a continuous line string in a section view. For example, the natural surface on a road long-section is the section of the road centre-line through the natural surface tin.

When a corridor is set, any strings in models added to the section view (service items) will be drawn on the section view wherever they are inside the corridor.

A section view has a **vertical exaggeration** and whenever a string is profiled on the view, the vertical exaggeration is displayed inside square brackets after the view name in the view title area. For example **[10x]** is a vertical exaggeration of 10.

The Section views menu is



For the option *Models*, go to

Settings

Redraw

Fit

Previous

Pan

Profile

Regenerate

Plotting

Utilities

Delete

[Model Ops](#)

[Section View Settings](#)

[Redraw](#)

[Fit](#)

[Previous](#)

[Pan](#)

[Profile](#)

[Regenerate.](#)

[Section Plotting](#)

[Section Utilities](#)

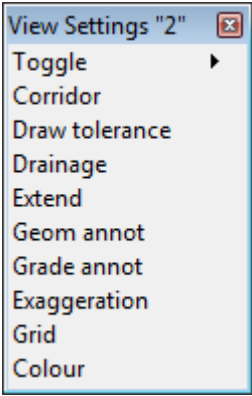
[Delete](#)

Section View Settings

Position of menu: Section View Menu View => Settings

If the **Settings** option is picked rather than moving onto the walking right, then the **Toggle** menu from the **Toggle** walk-right menu is displayed on the screen. The **Toggle** menu will be described in the next section.

The **Settings** walk-right menu for the section view is



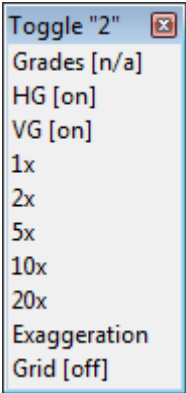
For the option *Toggle* go to
 Corridor
 Draw tolerance
 Drainage
 Extend
 Geom annot
 Grade annot
 Exaggeration
 Grid
 Colour

[Section Toggle](#)
[Corridor](#)
[Draw Tolerance](#)
[Drainage HGL](#)
[Extend](#)
[Geometry Annotation](#)
[Grade Annotation](#)
[Exaggeration](#)
[Grid on View](#)
[View Background Colour](#)

Section Toggle

Position of menu: Section View Menu View => Settings =>Toggle

The **Toggle** walk right brings up the **Toggle** section view menu.



Selecting any options from this menu will toggle the option on/off.

Corridor

Position of option on menu: Section View Menu View => Settings =>Corridor

The standard section view is designed to profile any selected string and create and display sections along the profiled string through any tins in any models added to the section view.

Hence the section view is like a vertical ribbon tracing out the path of the primary string.

The **Corridor** option extends the ribbon to the left and right and projects any strings in any models added to the section view back onto the section view.

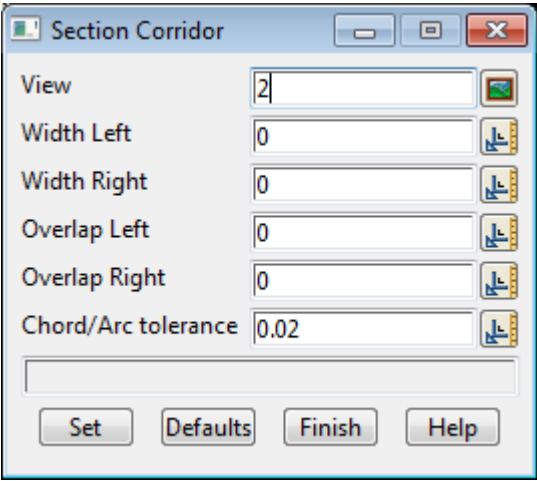
Consequently, the section view will display any strings or parts of strings that cross the corridor, run parallel to the primary string but stay within the corridor as well as displaying the standard sections through any tins in any models added to the section view.

The corridor is particularly useful for examining any **clashes** of strings with the primary string.

For example, services such as telephone cables, water and gas pipes and electricity cables could be modelled as 3d or pipe strings and added to the section view.

The section view with non-zero corridor widths would then display any of the services that lie within the corridor about the chosen primary string.

Selecting **Corridor** fires up the **Section Corridor** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	
View <i>view to set corridor parameters for:</i>	view box	current view	available views
Width left/right <i>width of the corridor to the left/right of the primary string.</i>	input	0.01	
Overlap left/right <i>for each straight/arc in the primary string, extend the straight/arc to the left/right by the value of the overlap left/right field before drawing the straight/arc. Section through the extended string.</i>	input	0.01	
Chord/Arc tolerance <i>value of the chord to arc ratio to be used when approximating circles in alignments, arcs and pipeline strings.</i>	input	0.02	
Set <i>define the corridor parameters according to the information in the panel. The section view for the new corridor will then be calculated and displayed.</i>	button		
Defaults <i>reset the corridor settings to the default values.</i>	button		

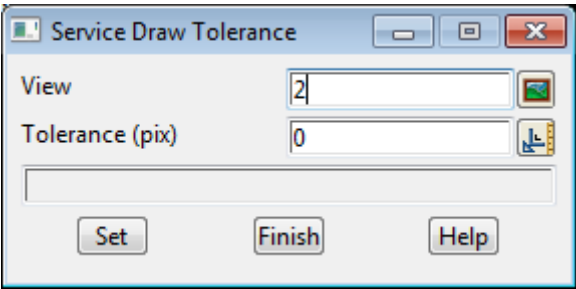
Draw Tolerance

Position of option on menu: Section View Menu View => Settings =>Draw tolerance

It is possible for the bits of services displayed on a section view to be very small and possibly too small to be easily seen. This is often the case for strings that are perpendicular to the corridor.

To overcome this visualization difficulty, a tolerance can be defined for the section view and when the size of any piece of a service is below the tolerance, it will be drawn as a cross.

Selecting Draw tolerance fires up the **Service Draw Tolerance** panel.



The fields and buttons used in this panel have the following functions.

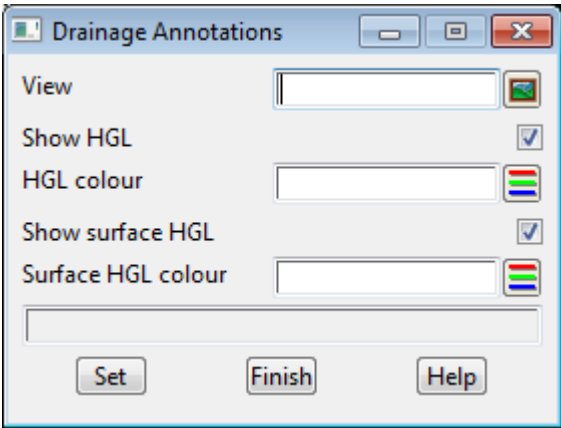
Field Description	Type	Defaults	
View	view box	current view	available views
<i>view to set service parameters for.</i>			
Tolerance (pix)	input	4	
<i>if the size of any piece of a service is below this tolerance, it will be drawn as a cross.</i>			
Set	button		
<i>set the service draw tolerance.</i>			

Drainage HGL

Position of option on menu: Section View Menu View => Settings =>Drainage

If the data exists in the drainage string, the HGL line can be drawn when profiling a drainage string.

Selecting **Drainage** fires up the **Drainage Annotations** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	
View	input/output	current view	available views
<i>view to set HGL parameters for.</i>			
Show HGL	tick box	tick	
<i>if ticked then the HGL line is drawn for any drainage strings that are profiled (and have HGL data)</i>			
HGL colour	colour box		available colours
<i>colour to draw the HGL line</i>			

- Show surface HGL

tick box

if ticked then the surface HGL (the HGL of any bypass channels) will be shown on the long section

Note: not available for the Rational Method
- Surface HGL colour

colour box

available colours

colour to draw the HGL surface
- Set

button

set the HGL drawing parameters

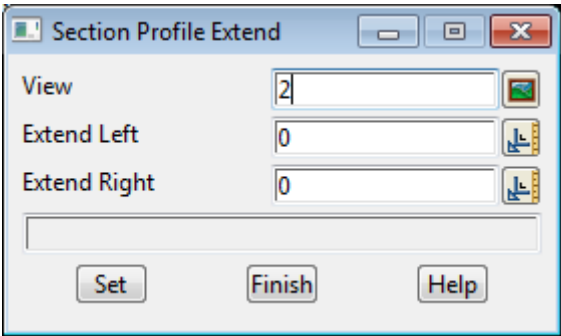
Extend

Position of option on menu: Section View Menu View => Settings =>Extend

When displaying the profile of a string on a section view, the user often wishes to see sections through the information before the string begins and after the string ends. This is particularly useful if it is intended to extend the string in either direction.

The **Extend** option allows the user to extend the profile length.

Selecting **Extend** fires up the **Section Profile Extend** panel.



The fields and buttons used in this panel have the following functions.

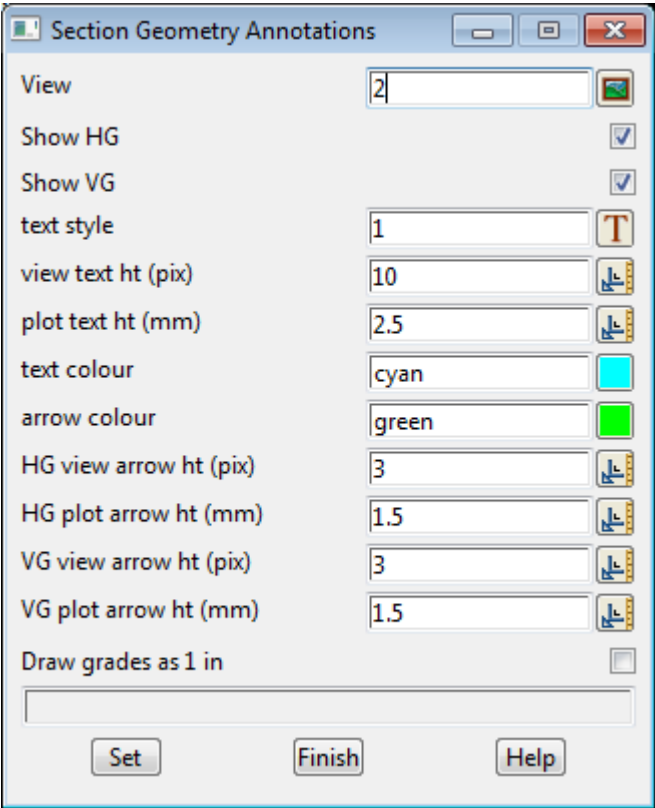
- | Field Description | Type | Defaults |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|--------------|
| View | view box | current view |
| view to set extension parameters for. | | |
| Extend left | input | 0 |
| pre-extend the profile by this distance before sectioning through any tins or models on the view. | | |
| Extend right | input | 0 |
| post-extend the profile by this distance before sectioning through any tins or models on the view. | | |
| Set | button | |
| define the profile length according to the length of the primary string plus the two extend lengths. The section view for the new length will then be calculated and displayed. | | |

Geometry Annotation

Position of option on menu: Section View Menu View => Settings =>Geom annot

The **Geom annot** option allows the user to specify whether horizontal geometry and/or vertical geometry is displayed for any alignment and pipeline strings profiled in the section view and hence on any section view plots.

Selecting **Geom annot** fires up the **Section Geometry Annotations** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View	view box	current view	available views

view to set alignment geometry parameters for.

Show HG	tick box	tick
----------------	----------	------

*if **ticked**, the value of the radii and spiral lengths for any horizontal curves selected as the primary string will be shown plus an arrow indicating the chainage extent of the radii.*
*If **no ticked**, the horizontal geometry will not be displayed in the section view or on any plots of the section view.*

Show VG	tick box	tick
----------------	----------	------

*if **ticked**, the value of the curve length for any vertical curves selected as the primary string will be shown, plus an arrow indicating the chainage extent of the curve length. The percentage grades for any vertical straights will also be displayed with an arrow indicating the chainage extent of the vertical straight.*
*If **no ticked**, the vertical curve lengths and percentage grades will not be displayed in the section view or on any plots of the section view.*

Text style	input	1
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text style to be used for all text in the geometry annotation.

View text ht (pix)	input	10
---------------------------	-------	----

height (in pixels) to draw the geometry annotation values in the section view (the screen width is approximately 1000 pixels).

Plot text ht (mm)	input	10
--------------------------	-------	----

height (in mm) to draw the geometry annotation values on any plots of the section view.

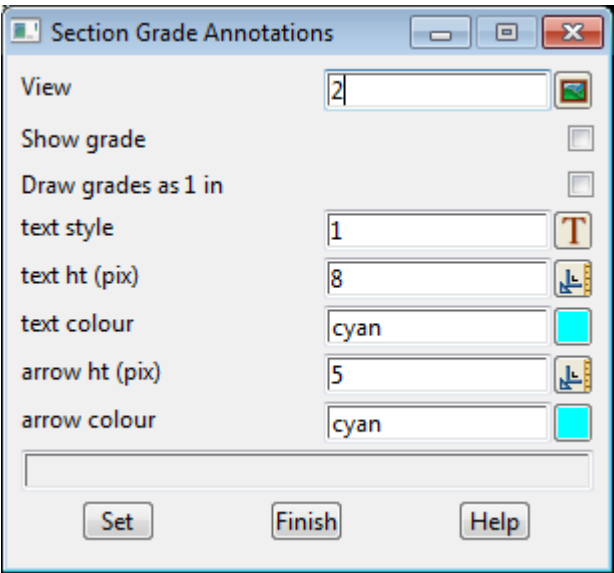
Text colour	input	cyan	available colours
<i>colour of the geometry annotation values drawn on the screen and any plots.</i>			
Arrow colour	input	green	available colours
<i>colour of the HG arrows drawn on the screen and any plots.</i>			
HG view arrow ht (pix)	input	3	
<i>height (in pixels) of the arrow head above the arrow line when drawing the HG arrows in the view.</i>			
HG plot arrow ht (mm)	input	1.5	
<i>height (in mm) of the arrow head above the arrow line when drawing the HG arrows on any plots of the section view.</i>			
VG view arrow ht (pix)	input	3	
<i>height (in pixels) of the arrow head above the arrow line when drawing the VG arrows in the view.</i>			
VG plot arrow ht (mm)	input	1.5	
<i>height (in mm) of the arrow head above the arrow line when drawing the VG arrows on any plots of the section view.</i>			
Draw grades as 1 in	tick box		
<i>if ticked, grades are drawn as 1:in values.</i>			
<i>if not ticked, grades as drawn as percent (%)</i>			
Set	button		
<i>set the section settings values to the values in the above panel fields. The section view is then redrawn using these values.</i>			

Grade Annotation

Position of option on menu: Section View Menu View => Settings =>Grade annot

The grade annot option allows the user to specify whether the grades and plan widths of string links are displaced for strings profiled in the section view.

Selecting Grade annot fires up the Section Grade Annotations panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>view to set grade annotation parameters for.</i>	view box	current view	available views
Show grade <i>if ticked, the value of the grades (in percent grade) and plan widths of string links for any strings selected as the primary string will be shown plus an arrow indicating the chainage extent of the grade. If no ticked, the grades and widths will not be displayed in the section view or on any plots of the section view.</i>	tick box	tick	
Text style <i>text style to be used for all text in the grade annotation.</i>	input	1	
Text ht (pix) <i>height (in pixels) to draw the grade annotation values in the section view (the screen width is approximately 1000 pixels).</i>	input	8	
Text colour <i>colour of the grade annotation values drawn on the screen and any plots.</i>	input	cyan	available colours
Arrow ht (pix) <i>height (in pixels) of the arrow head above the arrow line when drawing the arrows in the section view.</i>	input	3	
Arrow colour <i>colour of the arrows drawn on the screen.</i>	input	cyan	available colours
Set <i>set the section settings values to the values in the above panel fields. The section view is then redrawn using these values.</i>	button		

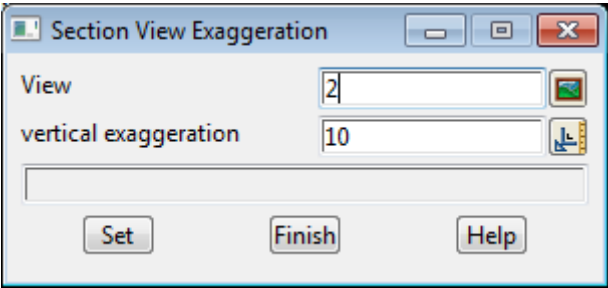
Exaggeration

Position of option on menu: Section View Menu View =>Settings =>Exaggeration

The **exaggeration** option allows the user to specify the vertical exaggeration for the section view. The heights (z values) are multiplied by the vertical exaggeration value before drawing on the section view.

Whenever a string is profiled on the section view, the **vertical exaggeration** is displayed inside square brackets after the view name in the view title area. For example **[10x]** is a vertical exaggeration of 10.

Selecting **Exaggeration** fires up the **Section View Exaggeration** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>view to set exaggeration parameters for.</i>	view box	current view	available views
Vertical exaggeration <i>value to multiply the heights (z values) by before drawing in the section view.</i>	input	10	1,5,10
Set <i>set the vertical exaggeration to the value in the vertical exaggeration field.</i>	button		

Profile

Position of menu: Section View Menu View => Profile

The **Profile** option is used to display a long-section view of a selected string. That is, the co-ordinate system for the section view is defined in terms of the chosen string by

- (a) the chainage along the selected string defines the horizontal axis for the section view
- (b) the vertical axis is the z-axis (heights).

Hence a (chainage,height) diagram of the selected string is drawn in the section view. The scale is automatically chosen so that all of the selected string fits into the section view.

The string selected to be profiled is called the **primary string** for the section view.

The model and name of the primary string is displayed in the section view's title area (after the vertical exaggeration).

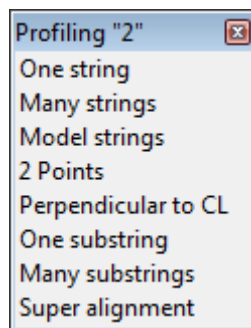
The primary string is drawn on the section view in the primary string's colour.

If the primary string is an alignment or pipeline string, the radii and chainage extent of any horizontal curves can be displayed in the section view plus any vertical curve lengths and percent-grades of vertical straights. For other strings, the grade and widths of each string link can be displayed.

For any tins in the models added to the section view, the section along the primary string through the tin will be calculated and drawn on the section view in the same colour as the tin colour. Any strings (service items) in models added to the section view, the parts of the strings in any corridor defined for the primary string will be calculated and drawn on the section view in the same colour as the strings.

Each time a new primary string is chosen with the profile option, the sections along the new primary string are calculated and displayed for all the tins and strings in the models added to the section view.

The **Profile** walk-right menu is



The **One string** option allows one string to be profiled and then the option terminates (see [One String](#)).

The **Many strings** option profiles one string and then allows the user to select another string to be profiled without leaving the profile option. The **Many strings** option is very useful when a number of strings need to be examined one after another in a section view (see [Many Strings](#)).

The **Model strings** option profiles the strings from a given model, one at a time. For example, it is used to sequentially examine each cross-section down a road when all the cross-sections are stored in one model (see [Model Strings](#)).

The **2 points** option dynamically profiles between two selected points. The profile between the first selected point and the cursor position is dynamically recalculated as the cursor is moved around the view (see [2 Points](#)).

The **Perpendicular to CL** option dynamically profiles along a cross-section which is perpendicular to a selected string. The cross section profile is dynamically recalculated as the cursor is moved

along the selected string (see [Perpendicular to CL](#)).

The **One substring** and **Many substrings** options are used to section along house connections and property controls for sewer and drainage strings (see [One String](#), [Many Strings](#)).

For the option <i>One String</i> , go to	One String
<i>Many strings</i>	Many Strings
<i>Model strings</i>	Model Strings
<i>2 points</i>	2 Points
<i>Perpendicular to CL</i>	Perpendicular to CL
<i>One substring</i>	One Substring
<i>Many substrings</i>	Many substrings
<i>Super alignment</i>	Super alignment

One String

Position of option on menu: **Section View Menu View =>Profile =>One string**

After choosing the **One string** option, the user selects the string to be profiled. The option then terminates.

To cancel the option without selecting any string, click LB to bring up the **Pick Ops** menu and select **Cancel**.

Many Strings

Position of option on menu: **Section View Menu View =>Profile =>Many strings**

The **many strings** option is designed for profiled a number of strings one after another.

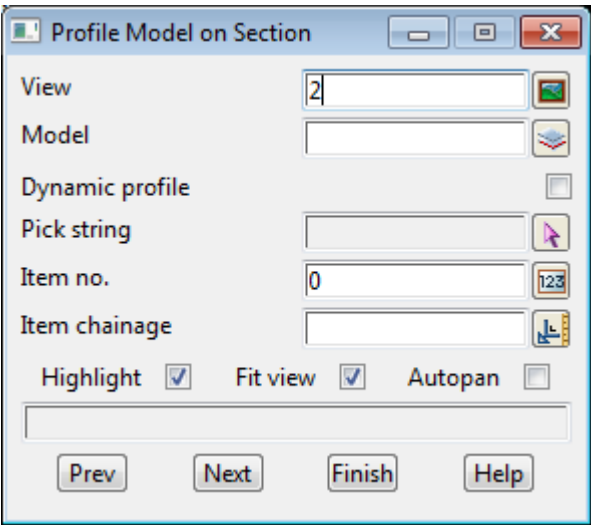
After selecting **Many strings**, a string is selected for profiling. After the string has been profiled, another string is selected for profiling.

The option will keep profiling selected strings until the option is terminated by clicking LB to get the **Pick Ops** menu and selecting **Cancel**.

Model Strings

Position of option on menu: **Section View Menu View =>Profile =>Model strings**

After selecting **Model strings**, the **Profile Model on Section** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
View	view to set profile parameters for:	view box	current view	available views
Model	name of the model containing the strings to be profiled one at a time	model box		available models
Dynamic profile	if ticked, as you move over each string in the given model in a plan or perspective view, the string under the mouse is selected and profiled on the section view.	tick box		
Item no.	number of the string in the model being profiled.	input/output		
Item chainage	only applicable if the selected strings are X-section strings The chainage of the section string in the model being profiled. Also if a chainage is typed in followed by an <Enter> then the model will be searched for a X-section of that chainage and if it exists, it will be profiled.	input/output		
Highlight	if ticked , the string being profiled in the section view is locked and highlighted on any views where it is visible.	tick box	tick	
Fit view	if ticked , the string being profiled is fitted to the section view. if not ticked , the same scale is used for the next section being profiled.	tick box	tick	
Autopan	if ticked , then if the profiled string is not visible on any plan views that the model containing the string is on, then the plan view is modified so that the profiled string is in the centre of the plan view.	tick box		
Pick	after selecting the pick button, a string is selected. The string is automatically profiled and its model becomes the model being profiled and item no. is set to the string's number in the model.	button		
Prev	the previous string given by the item no. field is profiled and the item no. field decremented by one.	button		

Next button
the next string given by the item no. field is profiled and the item no. field incremented by one.

How to Use the Panel

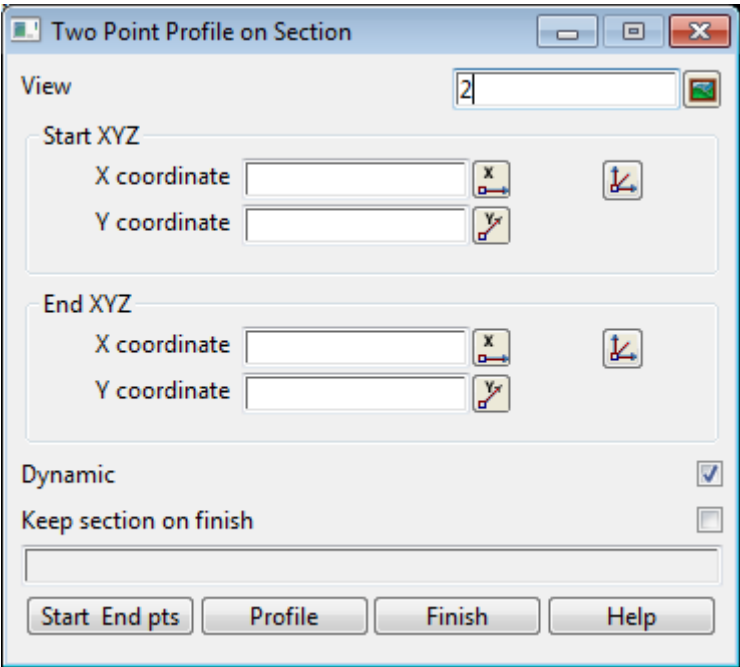
- (a) Either a string is picked after selecting the **Pick** button, or the name of the model containing the strings to be profiled is entered into the model field.
- (b) The item no. field is initially set to the picked strings item no. or 0, but can be set to the number of any string in the model.
- (c) When the **Prev** or **Next** button is selected, the string given by the number in the item no. field is decremented or incremented and the string given by the new item no. is profiled in the section view.

Hence with the **Model strings** option, a number of strings in the one model can be profiled (one after another) by simply repeatedly selecting the **Prev** or **Next** buttons.

2 Points

Position of option on menu: **Section View Menu** **View ==>Profile ==>2 points**

After selecting 2 points, the **Two Point Profile on Section** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>view to set profile parameters for.</i>	input/output	current view	available views
Start X Y Z <i>co-ordinates of the start section point. New values can be typed, or a point selected using the xyz ops pop-up menu.</i>	input/output		xyz ops menu
End X Y Z <i>co-ordinates of the end section point. New values can be typed, or a point selected using the xyz ops pop-up menu.</i>	input/output		xyz ops menu

Dynamic tick box tick

*if **ticked**, the profile will be dynamically calculated between the first selected point and the cursor position.*

Keep section on finish tick box

*if **ticked**, the two point profile will be remembered by the section view when the **Finish** button is selected.*

*if **not ticked**, the definition of the two points to profile is lost when the **Finish** button is selected.*

Start End pts button

*after selecting the **Start End pts** button, the first point of the section to be profiled is selected and its value written to the start xyz field. If dynamic is set on, then a profile from the first point to the cursor position is automatically calculated as the cursor is moved around the view. Selecting the second points finalises the section and the co-ordinates of the final point is written to end xyz field.*

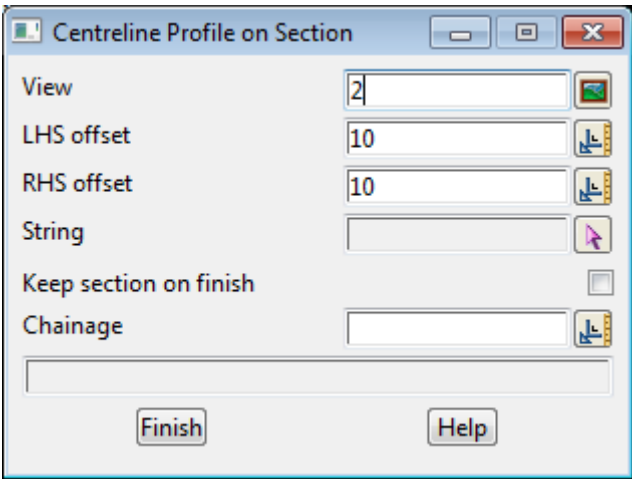
Profile button

*after selecting the **Profile** button, a section is calculated between the start xyz and end xyz points.*

Perpendicular to CL

Position of option on menu: Section View Menu View =>Profile =>Perpendicular to CL

After selecting Perpendicular to CL, the **Centreline Profile on Section** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>view to set profile parameters for.</i>	view box	current view	available views
LHS offset <i>distance (in world units) to take the section to the left of the selected string.</i>	input	10	
RHS offset <i>distance (in world units) to take the section to the right of the selected string.</i>	input	10	
String <i>the selected string is used to specify the position where a cross-section is defined. Once the string is selected, then as the cursor is moved around in a view, its position will be dynamically be dropped perpendicularly onto the selected string, and a cross-section defined at right angle to the selected string. A profile along the cross-section will then be drawn in the section view. The cross-section profile will be dynamically modified as the cursor position is modified.</i>	string-select		
Keep section on finish <i>if ticked, the final definition of the profile for the section view will be remembered by the section view when the Finish button is selected.</i> <i>if not ticked, the definition of the profile for the section view is lost when the Finish button is selected.</i>	tick box		
Chainage <i>dynamically displays the centreline chainage of the selected string</i>	output		

One Substring

Position of option on menu: Section View Menu View =>Profile =>One substring

As well as profiling strings, the **One substring** option can profile a house connection or property control (**substrings**) in a drainage or sewer string.

After choosing **One substring** from the menu, the user selects a substring for profiling. After the string or substring has been profiled, the option terminates.

Many substrings

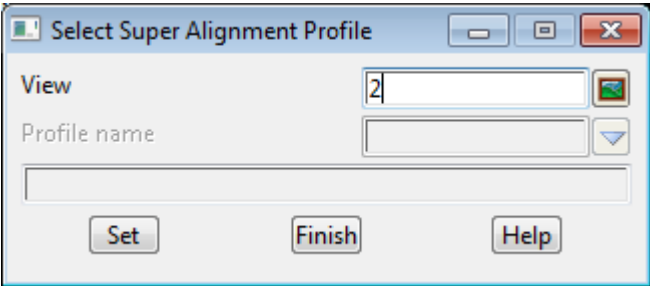
Position of option on menu: Section View Menu View =>Profile =>Many substrings

The **Many substrings** option is designed for profiled a number of substrings, one after another. After choosing **Many substring**, the user selects a substring for profiling. After the substring has been profiled, another string or substring can be chosen for profiling. The option is terminated by clicking LB to get the pick ops menu and selecting **cancel**.

Super alignment

Position of option on menu: Section View Menu View =>Profile =>Super alignment

A super alignment contains one horizontal string but can have more than one vertical dimension. For example, vertical geometry, super elevation, widening and sight distance. When a super alignment is being profiled on the section view, this option allows you to specify which of the vertical dimensions is displayed on the section view. Selecting **Super alignment** brings up the **Select Super Alignment Profile** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View	input/output	current section view	all views
Profile Name	choice box		super alignment dimensions on the profiled super alignment

If profile name is blank, all profiles are shown or the user can select an individual profile to display from the choice box.

The possible vertical dominions are Left Super Elevation, Right Super Elevation, Left Widening, Right Widening, Sight Distance and Stopping Distance.

Set

profile the super alignment with the selected vertical dimension.

Regenerate

Position of option on menu: Section View Menu View =>Regenerate

The **Regenerate** option is used to re-calculate and re-display the profile of the primary string of the section view.

This is necessary because modifications to the primary string or any strings or tins one the view may make the initial profile invalid. A **Regenerate** is a quick method of bringing the profile up to date.

Section Plotting

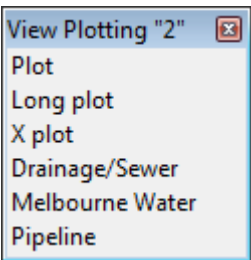
Position of menu: Section View Menu View =>Plotting

The **Plotting** walk-right menu contains the options **Plot**, **Long plot**, **X plot**, **Drainage/Sewer**, **Melbourne Water** and **Pipeline**.

The **Plot** option is used to make a plot file of all the information displayed in the section view.

The **Long plot** option is used to make a traditional long section plot with string chainages and elevations displayed for each of the strings in the section view. The form of the long plot can be finely controlled by a file of plot parameters.

The **X plot** creates the traditional stacked x-section plots for each x-section string in a given model. The form of the x-plot can be finely controlled by a file of plot parameters.



For the option *Plot*, go to

Long plot

X plot

Drainage/Sewer

Melbourne water

Pipeline

[Section Plot](#)

[Long Plot](#) in the chapter [Plots](#)

[X Plot](#) in the chapter [Plots](#)

[Drainage Longsections](#) in the chapter [Drainage and Sewer](#)

[Melbourne Water](#) in the chapter [Drainage and Sewer](#)

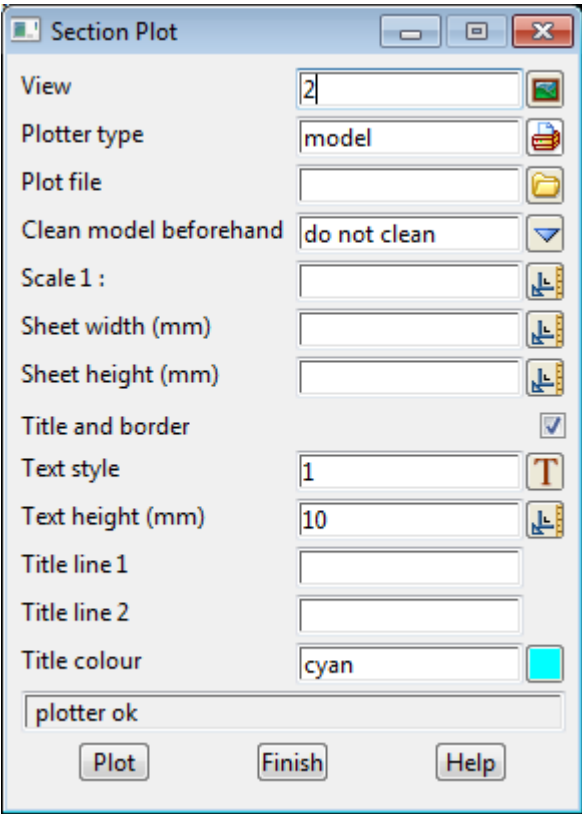
[Plots](#) in the chapter [Pipeline](#)

Section Plot

Position of option on menu: Section View Menu View =>Plotting =>Plot

The **Plot** option writes out all the information displayed in the section view to either a plot file (in a user selected format) or to a **12d Model** model. The user selects a scale for the plot and the sheet width and height are calculated by **12d Model**.

After selecting **Plot** plot, the **Section Plot** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>view to set plot parameters for.</i>	input/output	current view	available views
Plotter type <i>file format for the plot information.</i>	input	hp	hp, dxf, postscript etc.
Plot file <i>stem of the name of the file to write the plot of the view to. The name ending is added automatically and depends on the plotter type.</i>	input	depends on plotter type	
Clean model beforehand <i>only applicable if plotting to a model. if always clean, the model is cleaned before the plot is created. If prompt for clean, the user is prompted that the model will be cleaned before the plot is created. If do not clean, the model is not cleaned before the plot is created.</i>	choice box		do not clean prompt for clean always clean
Scale 1: <i>if a value is entered by the user and an <enter> given, the sheet width and height required by the plot are calculated and displayed in the sheet width and sheet height fields.</i>	input		
Sheet width (mm) <i>if a value is entered by the user and an <enter> given, the scale and height required by the plot are calculated and displayed in the scale and sheet height fields. The units for sheet width are millimetres.</i>	output		

Sheet height (mm)	output		
if a value is entered by the user and an <enter> given, the scale and width required by the plot are calculated and displayed in the scale and sheet width fields. The units for sheet height are millimetres			
Title and border	tick box	tick	
if ticked then a border and two lines of title are placed on the bottom of the plot			
Text style	input	1	
text style for the title information			
Text Height (mm)	input	10	
height (in millimetres) to draw the two lines of title information			
Title line 1/2	input		
first/second line of title information			
Title colour	input	cyan	available colours
colour used for the border and the title information			
Plot	button		
write out the plot of the information displayed in the view to the file given in the plot file field. The format of the file is given by the plotter type			

Long Plot

Position of option on menu: Section View Menu View =>Plotting =>Long plot

The option is for creating long section plots.

The Long plot option is documented in the section [Long Plot](#) in the chapter [Plots](#)

X Plot

Position of option on menu: Section View Menu View =>Plotting =>X plot

The x plot option is for creating x-section plots.

The option is documented in the section [X Plot](#) in the chapter [Plots](#)

Drainage/Sewer Plot

Position of option on menu: Section View Menu View =>Plotting =>Drainage/Sewer

The *Drainage/Sewer plot* option is used to make the long section plots for a drainage or sewer network.

This option is documented in the section [Drainage Longsections](#) in the chapter [Drainage and Sewer](#)

Melbourne Water Plot

Position of option on menu: Section View Menu View =>Plotting =>Melbourne Water

The *Melbourne Water plot* option is used to make the long section plots for a sewer network to Melbourne Water standards.

This option is documented in the section [Melbourne Water](#) in the chapter [Drainage and Sewer](#)

Pipeline Plot

Position of option on menu: Section View Menu View =>Plotting =>Pipeline

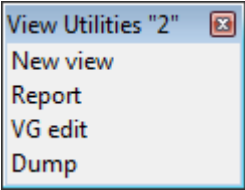
The *Pipeline plot* option is used to make the long section plots for a sewer network to Melbourne Water standards.

This option is documented in the section [Longsections](#) in the chapter [Pipeline](#)

Section Utilities

Position on menu: Section View Menu View =>Utilities

The **Utilities** menu contains miscellaneous options involving the section view. The **Utilities** walk-right menu is



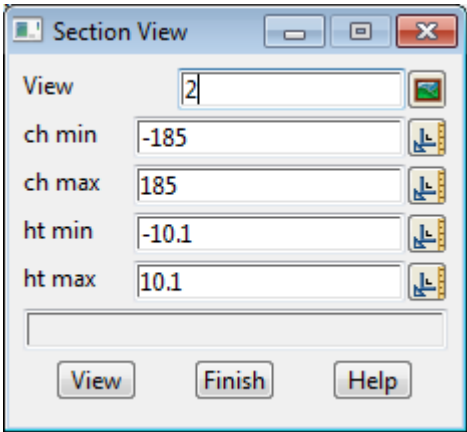
For the option *New view settings*, go to the section [New View Settings](#)
[Report](#)
[VG Edit](#)
[View Dump](#)

New View Settings

Position of option on menu: Section View Menu View =>Utilities =>New view settings

The **New view settings** option displays the current minimum and maximum chainage and height values for the view, and permits the user to specify new values as the section's viewing parameters.

Selecting **New view settings** fires up the **Section View** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults
View <i>view to set section parameters for:</i>	input/output	current view available views
chain min/max <i>minimum/maximum string chainage for the view. Chainage is used as the x-axis co-ordinates in a section view.</i>	input/output	current chainage min/max
Ht min/max <i>minimum/maximum height (z value) for the view. Height is used as the y-axis co-ordinates in a section</i>	input/output	current height min/max

view.

View button

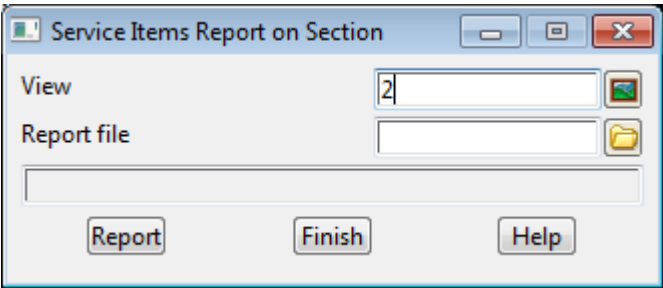
define the section view parameters according to the information in the panel. If the box given by the chainage and height values in the panel is not the same shape as the view itself, the chainage and height values will be modified so that the chainage and height values match the view shape. The final chainage and height values are displayed in the panel.

Report

Position of option on menu: Section View Menu View =>Utilities =>Report

This Report option is for producing information on all the items displayed in the section view.

After selecting Report, the **Service Items Report on Section View** panel is displayed



For the profiled string, this option generates a report which includes the

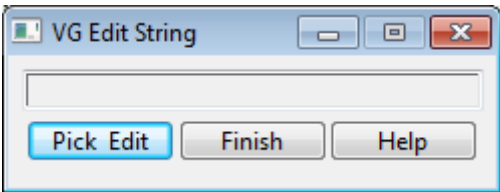
- s section through any tins on the section view
- s name and model of any services in the corridor defined by the section view
- s co-ordinates and chainages of the parts of the service in the corridor, and the chainage and offset for each of the point of the parts projected onto the profiled string.
- s clearance at the point where any service goes under or over the profiled string.

VG Edit

Position of option on menu: Section View Menu View =>Utilities =>VG Edit

The VG edit option is used to interactively create and modify the vertical geometry of a 12d Model alignment string, or the vertical information of any string that can be edited in a section view (e.g. drainage string). Vertical geometry can only be created for an existing string.

After selecting the VG edit option, the **VG edit string** panel is placed on the screen.



The option is already in **Pick** mode and the user simply picks and accepts the string whose vertical geometry is to be created and/or edited The **Pick Edit** button only needs to be used if the pick was cancelled from the **Pick Ops** menu.

Once the string has been selected, it is automatically made the primary string for the section view and a string profile created along the string.

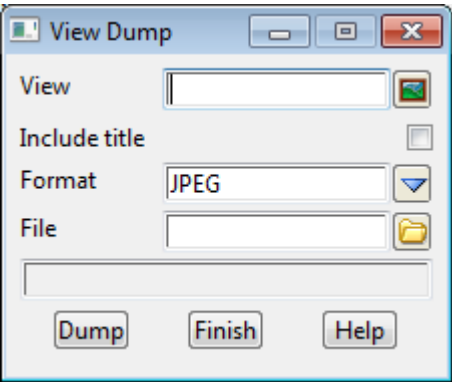
As discussed in the section view profile options, for each tin in a model added to the section view, the section through the tin along the primary string (the selected string) is calculated and displayed in the section view.

The **VG edit** option then fires up the standard string editor which is described in detail in the **string edit** options.

View Dump

Position of option on menu: **Section View Menu View =>Utilities =>Dump**

This option is used to write the view out in a user selected format. It is the same as the dump option for the plan view and is fully documented in the plan **View => Utilities** section.

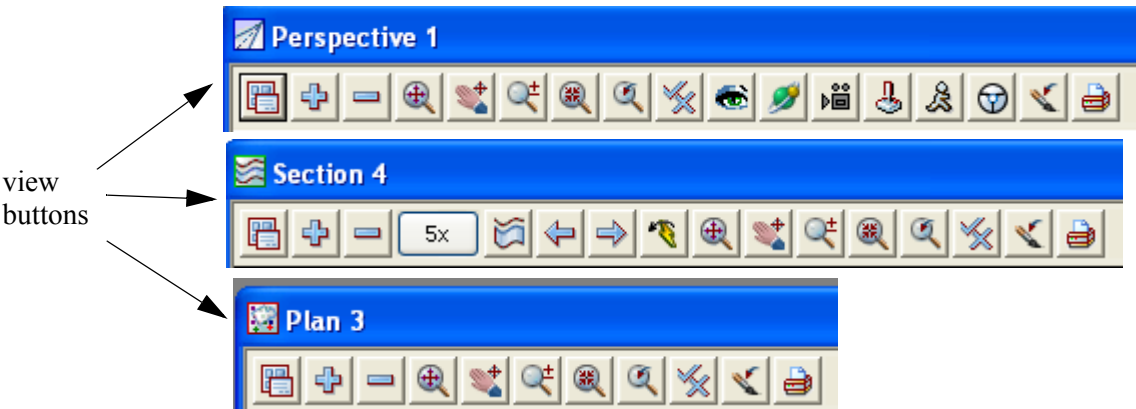


For more information please go to [Dump](#).

View Buttons

For each view type, there are a number of selected View menu options available as buttons (view buttons) in the *view title area*.

The options on each view type are



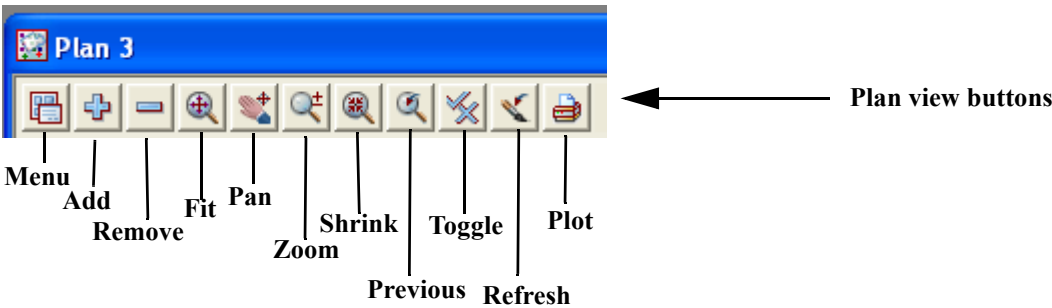
To select one of the view buttons, click LB whilst the cursor is over the button.

Note that the view buttons do not highlight when the cursor passes over them.

If RB is clicked over any view button other than **Profile** on the section view, the View menu for the view type will be displayed.

For documentation on the *Plan view buttons*, go to the section [Plan View Buttons](#).
Perspective view buttons, go to the section [Perspective View Buttons](#).
Section view buttons, go to the section [Section View Buttons](#).

Plan View Buttons

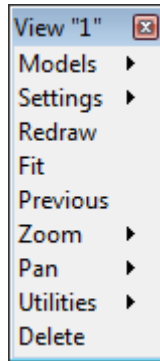


Menu

If the **Menu** button is selected in the *view button area* of any view, or if **RB** is clicked in the *view-title area* or in the *view-button area*, a new menu called the View menu appears.

Because of the differences between plan, perspective and section views, the options on the View menu vary for each view type.

The plan View menus is



The **View** menu is removed by selecting the **[X]** button or if the **View** menu hasn't been moved, by simply clicking **RB** again in the *view-title* or *view button* area. If the **View** menu has been moved, clicking **RB** will warp the cursor to the moved **View** menu.

+ or Add

The + view button works in four modes.

- s clicking LB whilst the cursor is over the + brings up the **Models to Add** list. This list contains all of the models not yet added to the view.
- s typing a keyboard character whilst the cursor is over the + brings up a **Models to Add** list containing only those models not on the view **with names beginning** with the typed character.
- s typing a * character whilst the cursor is over the + brings up a **Add Models to View** panel which can then be used with wild cards and characters.
- s clicking MB whilst the cursor is over the + brings up the **Add Models to View by Pick** panel and starts up a **same as** for a view. Models to add to the view are then selected by simply picking a string from the model. See chapter **Tools and Concepts** for further documentation on **same as**.
- s clicking RB whilst the cursor is over the + brings up the **View** panel documented earlier in this chapter.

For the **Same as** option for the + and - view buttons, please continue to the section [Same As for Views](#).

-or Remove

The - view button works in four modes.

- s clicking LB whilst the cursor is over the - brings up the **Models to Remove** list. This menu lists all of the models on the view.
- s typing a keyboard character whilst the cursor is over the - brings up a **Models to Remove** list containing only those models on the view with names beginning with the typed character.
- s typing a * character whilst the cursor is over the - brings up a **Remove Models from View** panel which can then be used with wild cards and characters.
- s clicking MB whilst the cursor is over the - brings up the **Remove Models from View by Pick** panel and starts up a **same as** for a view. Models to remove from the view are then selected by simply picking a string from the model. See the next chapter for further documentation on **same as**.
- s clicking RB whilst the cursor is over the - brings up the **View** panel documented earlier in this chapter.

For the **Same as** option for the + and - view buttons, please continue to the section [Same As for Views](#).

Fit

This is the same as **Fit** from the **view** menu.

If LB is clicked on the **Fit**, then the **Fit** option is activated.

If RB is clicked on the **Fit**, then the **View** option is activated.

Pan

This is the same as **Pan** from the **View=>Pan** menu.
If LB is clicked on the **Pan**, then the **Pan** option is activated.

Zoom

This is the same as the two point **Zoom** option from the plan **View=>Zoom** menu.
If LB is clicked on the **Zoom**, then the **zoom** option is activated.

Shrink

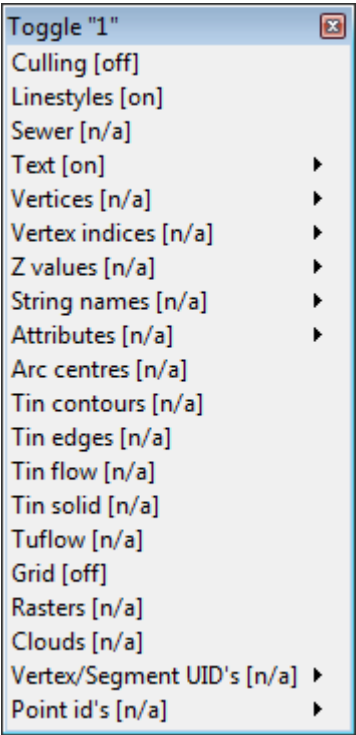
This is the same as the two point **Shrink** option from the plan **View=>Zoom** menu.
If LB is clicked on the **Shrink**, then the **Shrink** option is activated.

Previous

This is the same as **Previous** from the **view** menu.
If LB is clicked on the **Prev**, then the **Previous** option is activated.
If RB is clicked on the **Prev**, then the **View** option is activated.

Toggle

This is the same as **Toggle** from the **View=>Settings** menu.
If LB is clicked on the **Toggle**, then the **Toggle** menu is activated.
If RB is clicked on the **Toggle**, then the **View** option is activated.
The **Toggle** menu for the plan view types is:

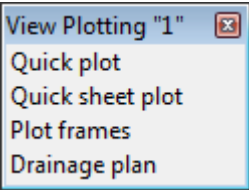


Refresh

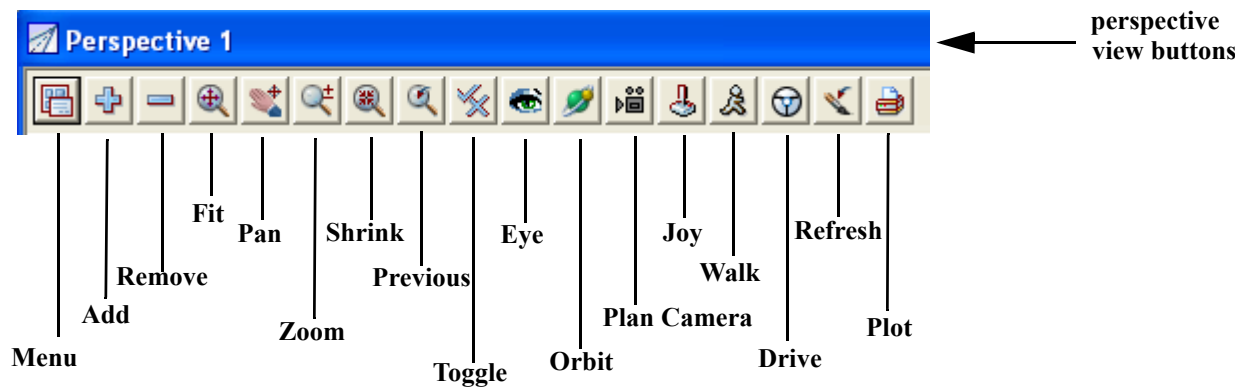
As its name implies, this option redraws all the models on the view using the current drawing parameters. This is the same as clicking MB in the view title area.

Plot

If LB is clicked on **Plot**, then the **View Plotting** menu for the plan view is activated.



Perspective View Buttons

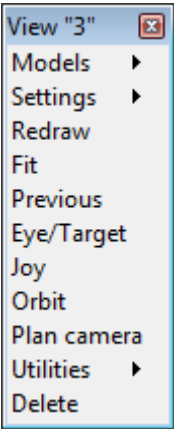


Menu

If the **Menu** button is selected in the *view button area* of any view, or if **RB** is clicked in the *view-title area* or in the *view-button area*, a new menu called the **View** menu appears.

Because of the differences between plan, perspective and section views, the options on the **View** menu vary for each view type.

The **Perspective View** menu is



The **View** menu is removed by selecting the **[X]** button or if the **View** menu hasn't been moved, by simply clicking **RB** again in the *view-title* or *view button* area. If the **View** menu has been moved, clicking **RB** will warp the cursor to the moved **View** menu.

+ or Add

The + view button works in four modes.

- s clicking LB whilst the cursor is over the + brings up the **Models to Add** list. This list contains all of the models not yet added to the view.

- s typing a keyboard character whilst the cursor is over the **+** brings up a **Models to Add** list containing only those models not on the view **with names beginning** with the typed character.
- s typing a ***** character whilst the cursor is over the **+** brings up a **Add Models to View** panel which can then be used with wild cards and characters.
- s clicking MB whilst the cursor is over the **+** brings up the **Add Models to View by Pick** panel and starts up a **Same as** for a view. Models to add to the view are then selected by simply picking a string from the model. See chapter **Tools and Concepts** for further documentation on **same as**.
- s clicking RB whilst the cursor is over the **+** brings up the **View** panel documented earlier in this chapter.

For the **Same as** option for the **+** and **-** view buttons, please continue to the section [Same As for Views](#).

- or Remove

The **-** view button works in four modes.

- s clicking LB whilst the cursor is over the **-** brings up the **Models to Remove** list. This menu lists all of the models on the view.
- s typing a keyboard character whilst the cursor is over the **-** brings up a **Models to Remove** list containing only those models on the view with names beginning with the typed character.
- s typing a ***** character whilst the cursor is over the **-** brings up a **Remove Models from View** panel which can then be used with wild cards and characters.
- s clicking MB whilst the cursor is over the **-** brings up the **Remove Models from View by Pick** panel and starts up a **Same as** for a view. Models to remove from the view are then selected by simply picking a string from the model. See the next chapter for further documentation on **Same as**.
- s clicking RB whilst the cursor is over the **-** brings up the **View** panel documented earlier in this chapter.

For the **Same as** option for the **+** and **-** view buttons, please continue to the section [Same As for Views](#).

Fit

This is the same as **Fit** from the **view** menu.

If LB is clicked on the **Fit**, then the **Fit** option is activated.

If RB is clicked on the **Fit**, then the **View** option is activated.

Previous

This is the same as **Previous** from the **View** menu.

If LB is clicked on the **Prev**, then the **Previous** option is activated.

If RB is clicked on the **Prev**, then the **View** option is activated.

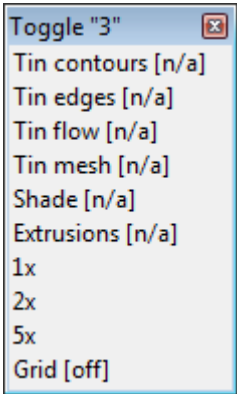
Toggle

This is the same as **Toggle** from the **View=>Settings** menu.

If LB is clicked on the **Toggle**, then the **Toggle** menu is activated.

If RB is clicked on the **Toggle**, then the **View** option is activated.

The **Toggle** menu for the perspective view is:



Eye

This is the same as **eye/target** from the **View** menu.
If LB is clicked on the **Eye**, then the **Eye-target** option is activated.
For more information please see [Eye/Target](#)

Orbit

For more information please see [Orbit](#)

Plan Camera

For more information please see [Plan Camera](#)

Joy

This is the same as **Joy** from the **View** menu.
If LB is clicked on the **Joy**, then the **Joy** option is activated.
For more information please see [Joy View](#)

Walk

This is the same as **String walk =>Along string** from the **View =>Utilities** menu.
If LB is clicked on the **Walk**, then the **Walk along string** option is activated.

Drive

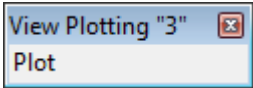
This is the same as **String drive => Along string** from the **View =>Utilities** menu.
If LB is clicked on the **Drive**, then the **Drive along string** option is activated.

Redraw

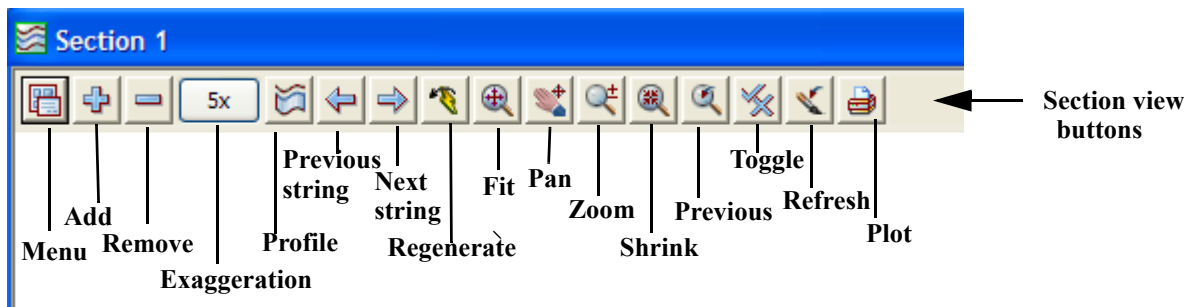
As its name implies, this option redraws all the models on the view using the current drawing parameters. This is the same as clicking MB in the view title area.

Plot

If LB is clicked on **Plot**, then the **View Plotting** menu for the perspective view is activated.



Section View Buttons

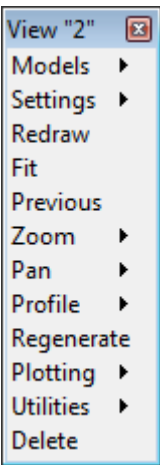


Menu

If the **Menu** button is selected in the *view button area* of any view, or if **RB** is clicked in the *view-title area* or in the *view-button area*, a new menu called the **View** menu appears.

Because of the differences between plan, perspective and section views, the options on the **View** menu vary for each view type.

The **Section View** menu is



The **View** menu is removed by selecting the **[X]** button or if the **View** menu hasn't been moved, by simply clicking **RB** again in the *view-title* or *view button* area. If the **View** menu has been moved, clicking **RB** will warp the cursor to the moved **View** menu.

+ or Add

The **+** view button works in four modes.

- s clicking LB whilst the cursor is over the **+** brings up the **Models to Add** list. This list contains all of the models not yet added to the view.
- s typing a keyboard character whilst the cursor is over the **+** brings up a **Models to Add** list containing only those models not on the view **with names beginning** with the typed character.
- s typing a ***** character whilst the cursor is over the **+** brings up a **Add Models to View** panel which can then be used with wild cards and characters.
- s clicking MB whilst the cursor is over the **+** brings up the **Add Models to View by Pick** panel and starts up a **Same As** for a view. Models to add to the view are then selected by simply picking a string from the model. See chapter **Tools and Concepts** for further documentation on **Same As**.
- s clicking RB whilst the cursor is over the **+** brings up the **View** panel documented earlier in this chapter.

For the **Same As** option for the **+** and **-** view buttons, please continue to the section [Same As](#)

[for Views.](#)

- or Remove

The - view button works in four modes.

- s clicking LB whilst the cursor is over the - brings up the **Models to Remove** list. This menu lists all of the models on the view.
- s typing a keyboard character whilst the cursor is over the - brings up a **Models to Remove** list containing only those models on the view with names beginning with the typed character.
- s typing a * character whilst the cursor is over the - brings up a **Remove Models from View** panel which can then be used with wild cards and characters.
- s clicking MB whilst the cursor is over the - brings up the **Remove Models from View by Pick** panel and starts up a **Same As** for a view. Models to remove from the view are then selected by simply picking a string from the model. See the next chapter for further documentation on **Same As**.
- s clicking RB whilst the cursor is over the - brings up the **View** panel documented earlier in this chapter.

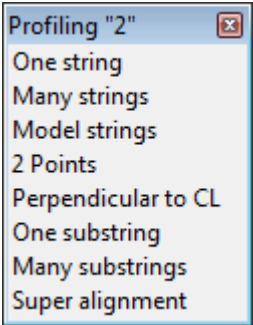
For the *Same as* option for the + and - view buttons, please continue to the section [Same As for Views.](#)

[Exagg]

This is the vertical exaggeration for the view.
If LB is clicked on the exaggeration, then the **Toggle** option for the section view is activated. This has options to quickly change the vertical exaggeration.

Profile

If LB is clicked on **Profile**, then the **Profile** option is activated. This option is the same as **View=>Profiling=>One string**. If a string is being profiled, then the string name is displayed after the Section view name.
If **RB** is clicked on **Profile**, then the **Profiling** menu is activated.



<<

Profile previous string.

>>

Profile next string.

Regen

This is the same as the option **Regenerate** option from the section **view** menu.
If LB is clicked on the **Regen**, then the **regen** option is activated.

Fit

This is the same as **Fit** from the **view** menu.

If LB is clicked on the **Fit**, then the **Fit** option is activated.
If RB is clicked on the **Fit**, then the **View** option is activated.

Pan

This is the same as **Pan** from the **View=>Pan** menu.
If LB is clicked on the **Pan**, then the **Pan** option is activated.

Zoom

This is the same as the two point **Zoom** option from the plan **View=>Zoom** menu.
If LB is clicked on the **Zoom**, then the **Zoom** option is activated.

Shrink

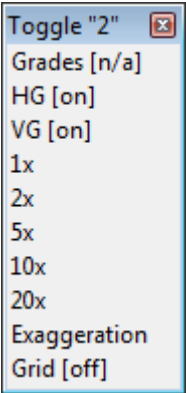
This is the same as the two point **Shrink** option from the plan **View=>Zoom** menu.
If LB is clicked on the **Shrink**, then the **Shrink** option is activated.

Previous

This is the same as **Previous** from the **View** menu.
If LB is clicked on the **Prev**, then the **Previous** option is activated.
If RB is clicked on the **Prev**, then the **View** option is activated.

Toggle

This is the same as **Toggle** from the **View=>Settings** menu.
If LB is clicked on the **Toggle**, then the **Toggle** menu is activated.
If RB is clicked on the **Toggle**, then the **View** option is activated.
The **Toggle** menu for the section view is:

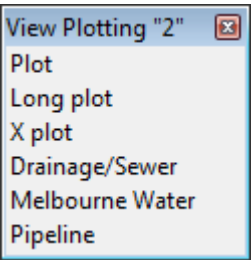


Refresh

As its name implies, this option redraws all the models on the view using the current drawing parameters. This is the same as clicking MB in the view title area.

Plot

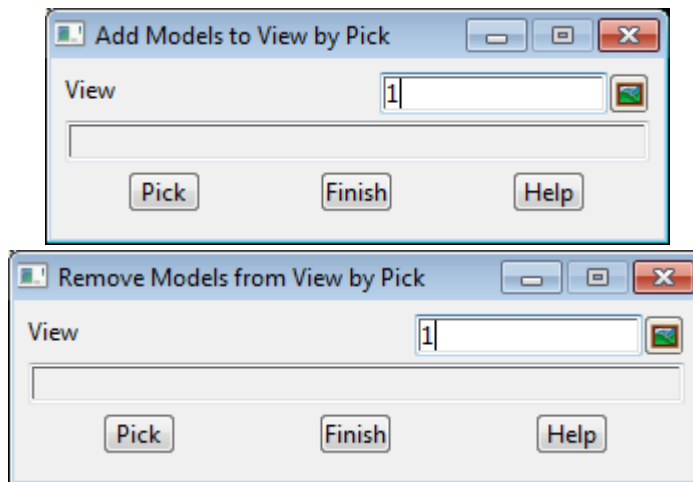
If LB is clicked on **Plot**, then the **View Plotting** menu for the section view is activated.



Same As for Views

Clicking the middle mouse button (MB) over the **+** or **-** view buttons will activate a **Same As** pick which allows the user to select the model to add to (+) or remove from (-) the view by simply picking any string from the model to be added or removed.

After clicking MB over the **+** or **-** view button, the **Add Models to View by Pick** or **Remove Models from View by Pick** panel is brought up.



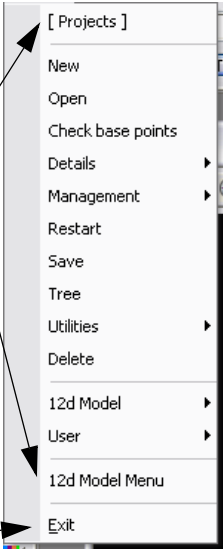
The option is already running and when a string is picked,. the model containing the string is added to/removed from the view. Further strings can then be selected to add or remove another model.

The option is terminated by selecting **[X]** or **Finish** from the panels, or **Cancel** from the **Pick Ops** menu.

8 Projects

The projects walk-right menu is:

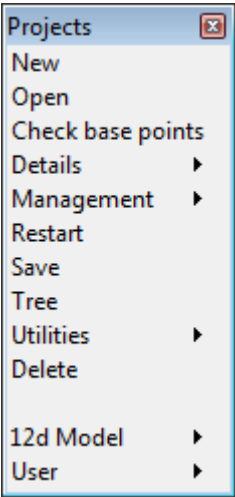
on Main menu



create floating
Projects menu

exit 12d

on **12d** Model menu and
floating Projects menu



Projects	
New	create a new project
Open	open an existing project
Check base points	number of points for base point count
Details	project description, details and diary
Management	edit project setup/management files
Restart	exit and restart in same project
Save	save the working project to disk
Tree	project data and set up files in tree form
Utilities	project utilities
Delete	delete a project from disk
12d Model	information on 12d Model
User	Projects User menu

For the option *New*, go to

Open
Check base points
Details
Management
Restart
Save
Tree
Utilities
Delete
Model
Exit

[New](#)
[Open](#)
[Check Base Points](#)
[Details](#)
[Management](#)
[Restart](#)
[Save](#)
[Tree](#)
[Utilities](#)
[Delete](#)
[12d Model](#)
[Exit](#)

Each option will now be discussed in the order that they appear on the **Projects** menu.

New

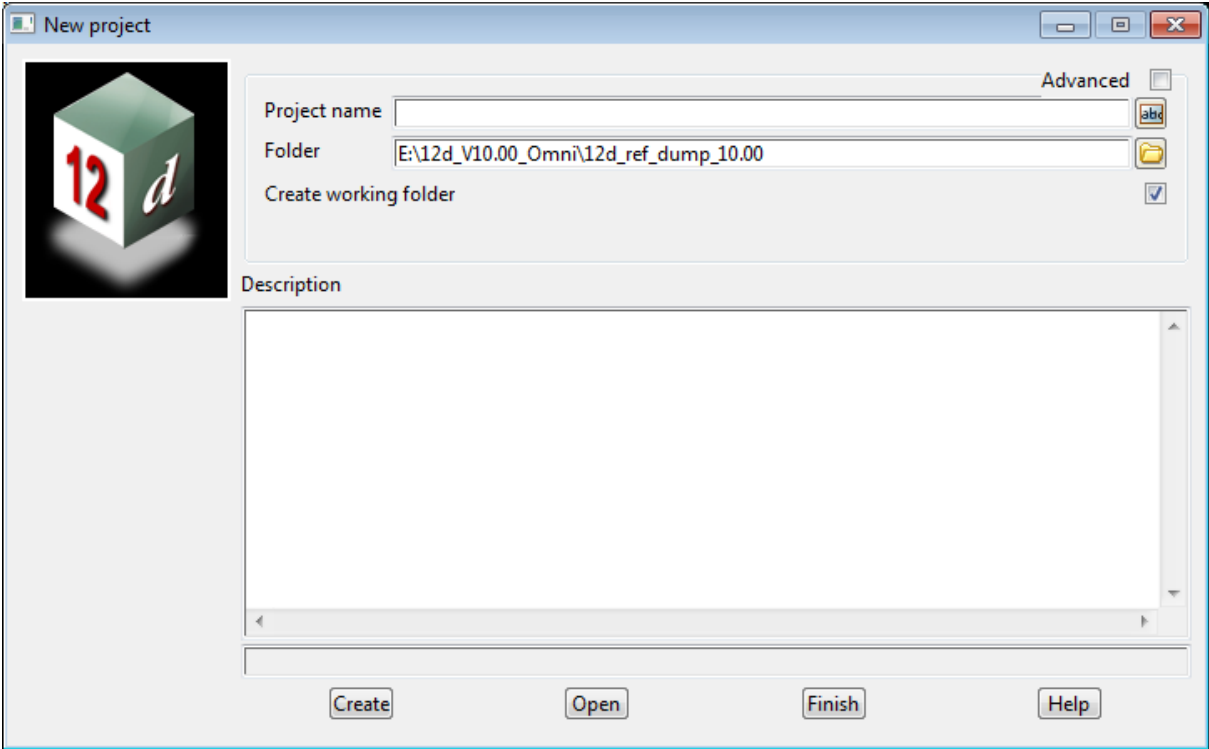
Position of option on menu: Project =>New

New creates a new **12d Model** project.

A working folder (directory) of the same as the project can also be created with the actual project created inside the folder.

The panel can be resized.

On selecting New, the **New Project** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Advanced		tick box		
	<i>if ticked, environment configurations can be assigned to the project and extra panel fields are displayed to allow for this. For more information, please go to the section New Project Panel with Advanced Ticked</i>			
	<i>If not ticked, no extra panel fields are displayed.</i>			
Project name		typed input		
	<i>name of the new project to be created.</i>			
Folder		folder box		current folder, select folder panel
	<i>if Create working folder is ticked, a folder with the same name as the project is created in the folder given in this panel field, and the project will be created inside this folder with the same name as the project. This is to encourage the habit of creating a folder of the same name of the project and then creating the project inside the folder.</i>			
	<i>If Create working folder is not ticked, the project is created in the folder given in this panel field.</i>			

Create working folder tick box

if ticked, a folder of the same name as the project is created in the folder Folder, and the project is created inside this folder. The folder with the same name as the project is then the working folder.

If not ticked, the project is created in the folder Folder and this folder is the working folder.

Description typed input

a description of the project can be typed into this field. This is stored with the project.

Create button

after selecting this button, the new project created in either the Folder or if Create working folder is ticked, inside a folder created in the Folder of the same name as the project.

12d Model then opens the newly created project.

Open button

*brings up the **Change Project** panel for opening an existing project (see the section [Open](#)).*

New Project Panel with Advanced Ticked

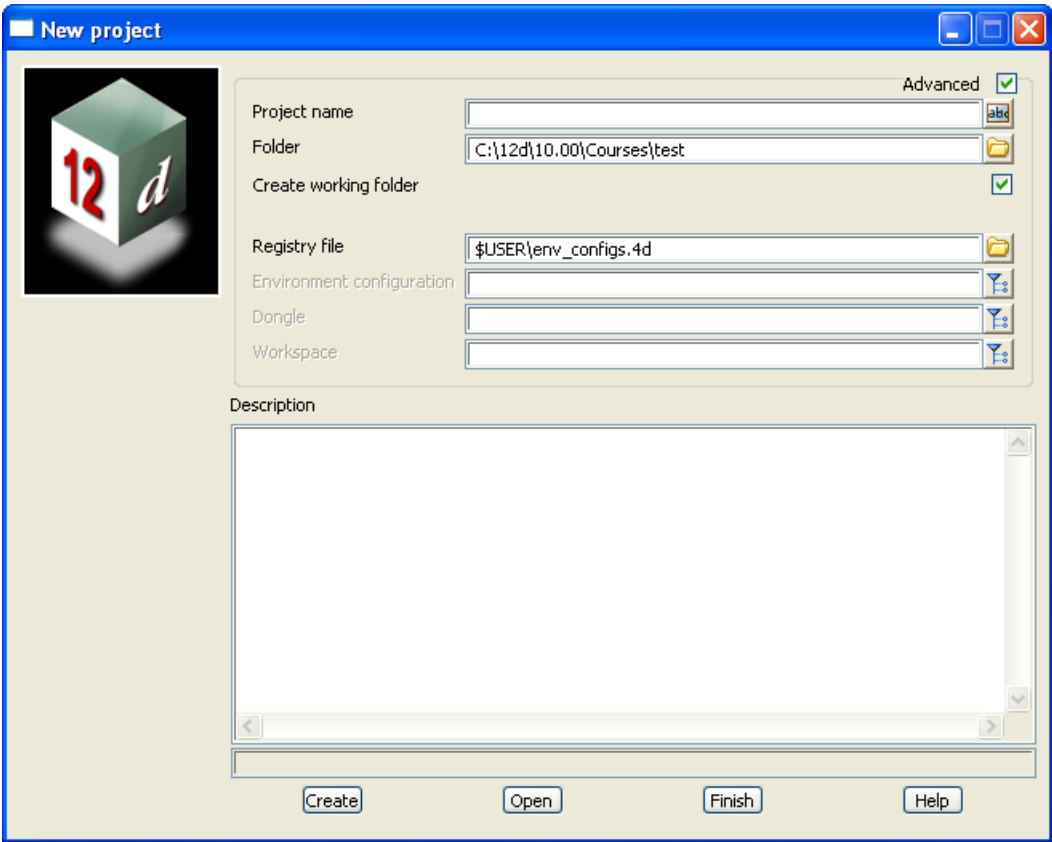
To tailor **12d Model**, there are a large number of environment variables in a file called **env.4d**. For most users, one **env.4d** file provides enough customisation for their site but for users with customers requiring very different set ups, a more flexible system is required.

For example, one project may be for a Main Roads Department which requires its own mapping files, linestyle files, ppf files etc. Another project is for a Local Authority who has totally different standards and requirements.

For this more complex situation, different **env.4d** files and environment variable overrides can be defined for each project and the Advanced tick box gives access to the advanced tailoring for a project.

For more information on the advanced tailoring, go to [Env Configuration](#).

With Advanced ticked, the **New Project** panel is:



The extra fields and buttons in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Registry file	registry box		env_configs.4d
folder browse the registry file used to define the Environments, Dongles and Workspaces definitions.			

Environment configuration

if non blank, the given Environment configuration set up is used for this project.

The choices for the Environment configuration pop-up come from the registry file. For more information on defining Registry files, go to [Env Configuration](#) and for more information on the Environmental configuration section in particular, go to [Creating/Editing an Environments Set Up](#).

Dongle

if non blank, the given Dongle set up is to be used for this project.

The choices for the Dongles pop-up come from the Registry file. For more information on defining Registry files, go to [Env Configuration](#) and for more information on the Dongles section in particular, go to [Creating/Editing a Dongles Set Up](#).

Workspace

if non blank, the given Workspace set up is used and if it includes a workspace file, then that file is used when the project is opened. However once the project is opened, the workspace file is saved locally and any changes saved with the project.

The choices for the Workspace pop-up come from the Registry file. For more information on defining Registry files, go to [Env Configuration](#) and for more information on the Workspaces section in particular, go to [Creating/Editing a Workspaces Set Up](#).

Open

Position of option on menu: Project =>Open

Position of option on menu: Project =>Utilities =>Projects

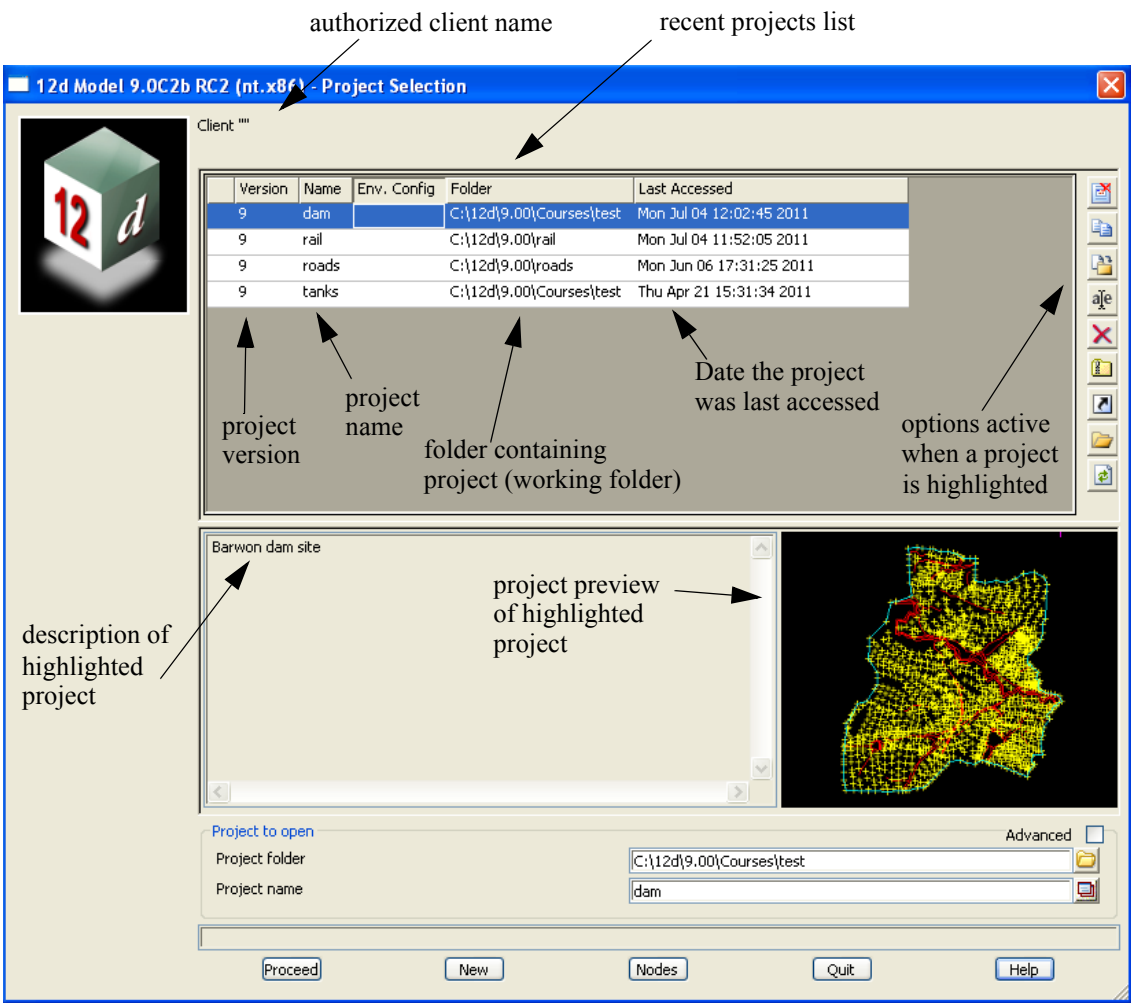
For the Project =>Utilities =>Project option, go to the section [Projects](#)

The **Open** option is used to change the working folder and the working project to an another existing project.

With **Advanced** ticked, it is also possible to set or modify one or more of the *Environment configuration*, *Dongle* or *Workspace* set ups for the projects. For more information on Environment configuration settings, go to [Env Configuration](#) or a quick discussion in the previous section [New Project Panel with Advanced Ticked](#).

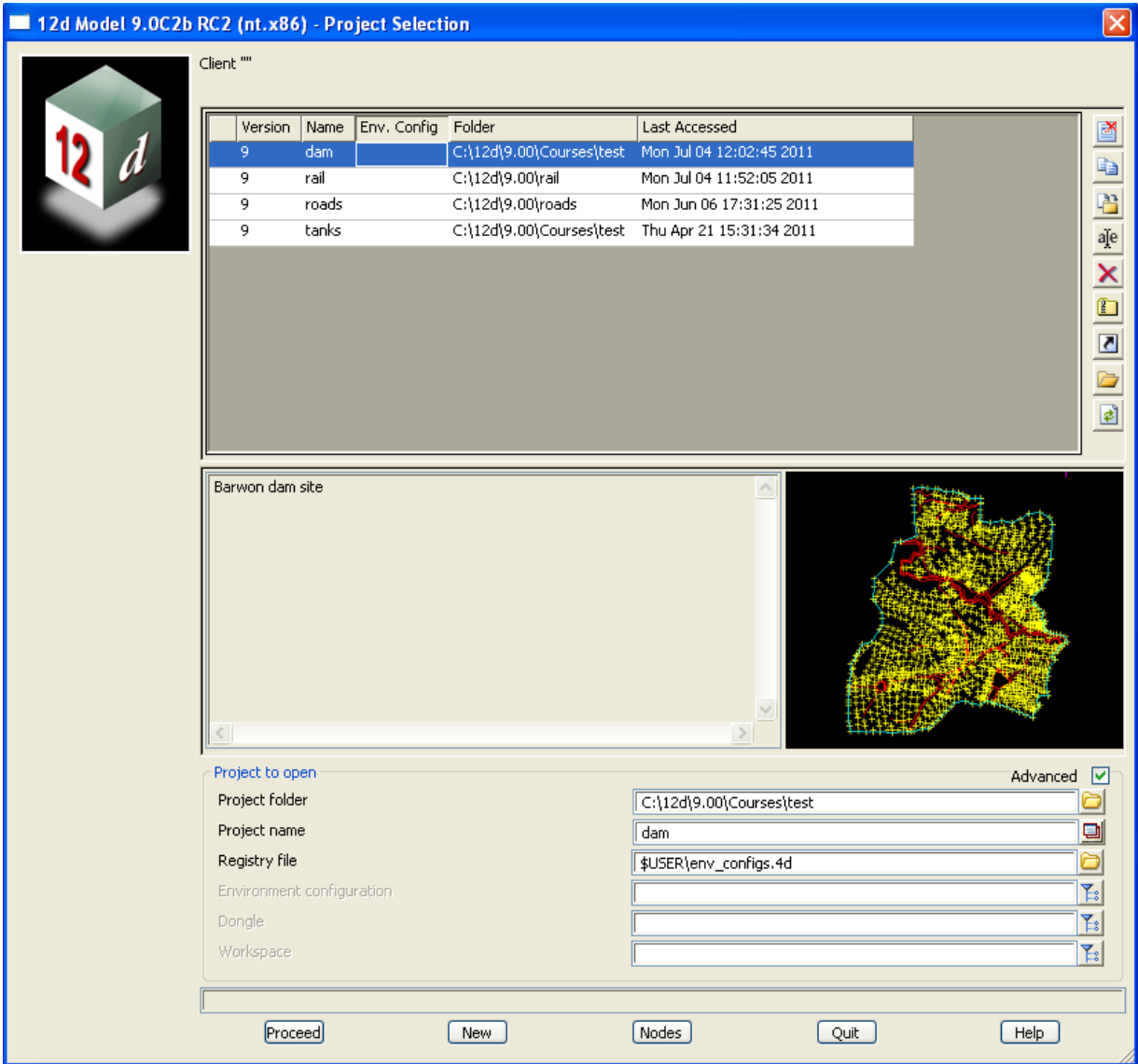
The panel can be resized.

On selecting the **Open** option, the **Change Project** panel is displayed.



NOTE: When a project is highlighted in the list of recent projects, icons for options are activated on the right hand side of the **Project Selection** panel, and a **Project Ops** menu (which contains the same options), can be brought up by clicking **RB** anywhere in the recent projects list area.

With **Advanced** ticked, the **Create Project** panel is:



Field Description	Type	Defaults	Pop-Up
Client name	display only		
<i>authorized 12d Model client.</i>			
Recent projects list	output	recent projects	
<i>names and folders of project recently select. Single clicking on an entry in the list displays the projects description and the project preview. Double clicking on an entry in the list closes the existing project and opens the selected projected.</i>			
Project description	output		
<i>description of the project highlighted in the Recent projects list.</i>			
Project preview	image		
<i>image of the active view when the project was last accessed, or a user selected image of a previous active view.</i>			
Advanced	tick box		
<i>if ticked, environment configurations can be assigned to the project and extra panel fields are displayed to allow for this.</i>			
<i>If not ticked, no extra panel fields are displayed.</i>			

Working folder	current folder	folder browse
<i>name of the folder to become the working folder (the folder that contains the project).</i>		
Project name	project box	projects in selected Working folder
<i>name of the project to open. This project become the working project.</i>		
Registry file	registry box	env_configs.4d folder browse
<i>the registry file used to define the Environments, Dongles and Workspaces definitions.</i>		

Environment configuration

if non blank, the given Environment configuration set up is used for this project.

The choices for the Environment configuration pop-up come from the registry file. For more information on defining Registry files, go to [Env Configuration](#) and for more information on the Environmental configuration section in particular, go to [Creating/Editing an Environments Set Up](#).

Dongle

if non blank, the given Dongle set up is to be used for this project.

The choices for the Dongle configuration pop-up come from the Registry file. For more information on defining Registry files, go to [Env Configuration](#) and for more information on the Dongles section in particular, go to [Creating/Editing a Dongles Set Up](#).

Workspace

if non blank, the given Workspace set up is used and if it includes a workspace file, then that file replaces the existing file of the opened project. However once the project is opened, the workspace file is saved locally again and any changes saved with the project.

The choices for the Workspace pop-up come from the Registry file. For more information on defining Registry files, go to [Env Configuration](#) and for more information on the Workspaces section in particular, go to [Creating/Editing a Workspaces Set Up](#).

Open button

after selecting this button, the current folder is closed and the selected project opened. The working folder is now the folder specified in the Working folder field.

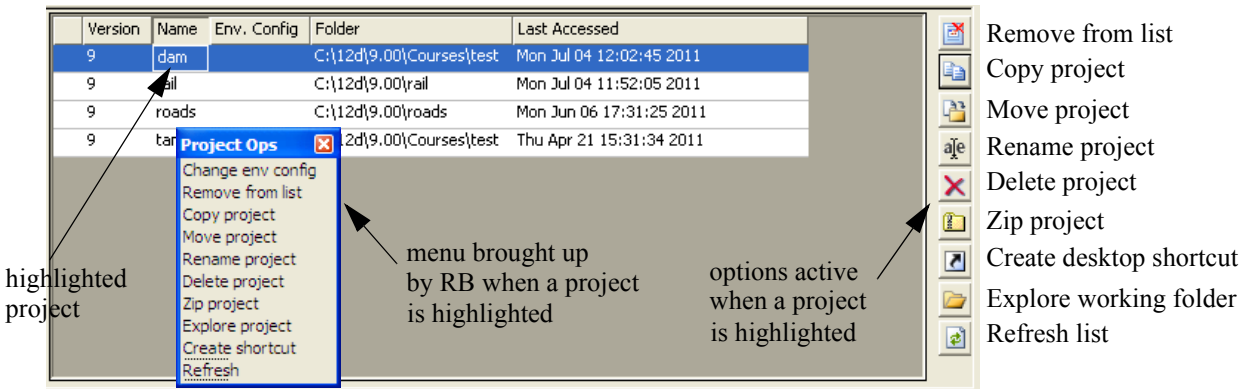
New button

*brings up the **New Project** panel.*

Note: This is a resizable panel.

Options Active When Project Highlighted

When a project is highlighted in the list of recent projects, icons for options are activated on the right hand side of the **Project Selection** panel, and a **Project Ops** menu (which contains the same options), can be brought up by clicking **RB** anywhere in the recent projects list area.




- | | |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| Remove from list | remove the project from the <i>recent projects</i> list |
| Copy Project | see Copy Project - Icon |
| Move Project | see Move Project - Icon |
| Rename Project | see Rename |
| Delete Project | see Delete Project - Icon |
| Zip Project | see Zip Project - Icon |
| Create Desktop Shortcut | create a shortcut on the desktop that starts 12d Model and opens the project - see Project Shortcuts |
| Explore | open Windows Explorer and show the contents of the working folder |
| Refresh | refresh the <i>recent projects list</i> |
| Change env configuration | change the environment configuration. This is only available on the Project Ops menu. |

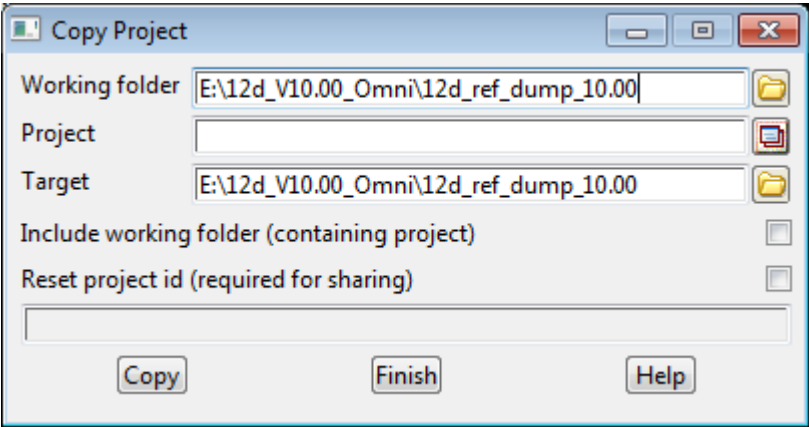
Copy Project - Icon

Position of option on menu: Project Selection =>Copy Project icon

Position of option on menu: Project =>Open=> Copy Project icon

This panel copies a project to a new location. If you are attempting to copy the project you are currently in, **12d Model** will prompt you to save and restart.

Selecting  brings up the **Copy Project** panel:



The fields and buttons used in this panels have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Working folder	file		
<i>the folder containing the project</i>			

Project			
<i>the name of the project to copy</i>			

Target	file		
<i>where the project should copied to</i>			

Include working folder (containing project)	tick box		
<i>if ticked, the folder containing the project (and all sub folders) will also be copied</i>			

Reset project id (required for sharing)	tick box		
<i>if you are intending to share the copied project, you must reset the ID - otherwise sharing will not be allowed from the copied project</i>			


Copy	button		
<i>copies the project</i>			

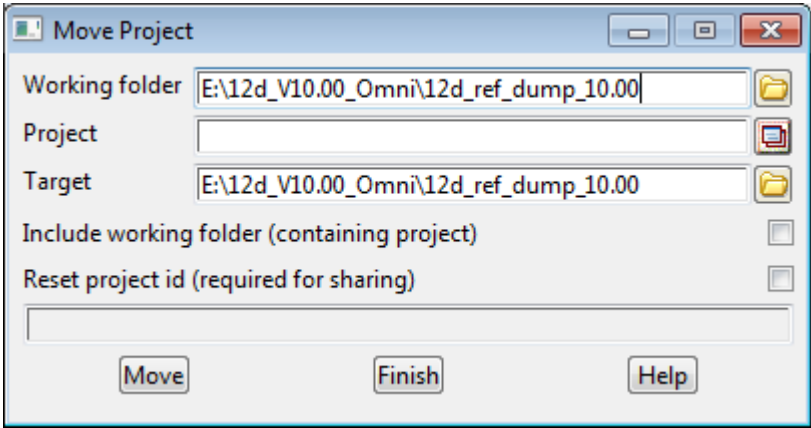
Move Project - Icon

Position of option on menu: Project Selection=> Move Project icon

Position of option on menu: Project =>Open=> Move Project icon

This panel moves a project to a new location. If you are attempting to move the project you are currently in, **12d Model** will prompt you to save and restart.

Selecting  brings up the **Move Project** panel:



The fields and buttons used in this panels have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Working folder	file		
<i>the folder containing the project</i>			

Project			
<i>the name of the project to move</i>			

Target	file		
<i>where the project should moved to</i>			

Include working folder (containing project) tick box

if ticked, the folder containing the project (and all sub folders) will also be moved

Reset project id (required for sharing) tick box

if you are intending to share the moved project, you must reset the id - otherwise sharing will not be allowed from the moved project.


Move	button		
<i>moves the project</i>			

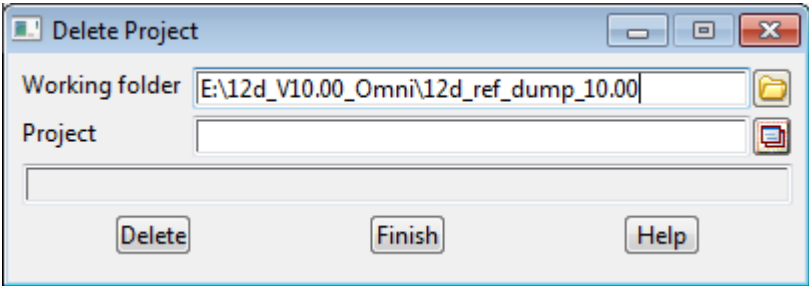
Delete Project - Icon

Position of option on menu: Project Selection=> Delete Project icon

Position of option on menu: Project =>Open=> Delete Project icon

This will delete a project. This cannot be the current open project.

Selecting  brings up the **Delete Project** panel:



The fields and buttons used in this panels have the following functions.


Field Description	Type	Defaults	Pop-Up
Working folder	file		
<i>the folder containing the project to be deleted</i>			
Project			
<i>the name of the project to delete</i>			
Delete	button		
<i>delete the project</i>			

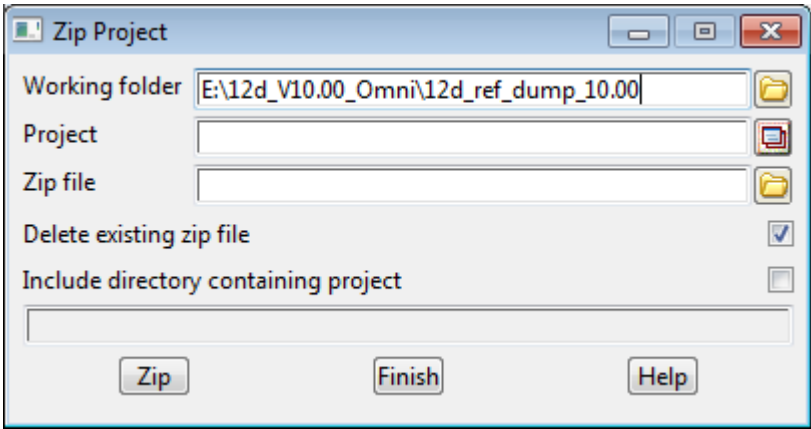
Zip Project - Icon

Position of option on menu: Project Selection=> Zip Project icon

Position of option on menu: Project =>Open=> Zip Project icon

This panel will zip a project. If you attempt to zip the current project, **12d Model** will prompt you to save and restart.

Selecting  brings up the **Zip Project** panel:



The fields and buttons used in this panels have the following functions.

Field Description	Type	Defaults	Pop-Up
Working folder <i>the folder where the project resides</i>	file box		
Project <i>the name of the project you wish to zip</i>	project box		
Zip file <i>the file to zip into</i>	file box		
Delete existing zip file <i>if ticked on, any existing zip file will be deleted</i>	tick box		
Include directory containing project <i>if ticked on, the directory containing the project (the working directory) will also be zipped, along with all sub folders</i>	tick box		
Zip <i>zips the project</i>	button		

Check Base Points

Position of option on menu: Project =>Check base points

All **12d Model** versions have a Base module that is authorised for a set number of Base Points. For example, the 50K Base allows up to 50,000 base points, the 5M version allows up to 5,000,000 base points and the 250M version allows up to 250,000,000 base points.

The **Check base points** option displays the number of base points used in the current project and the total number of base points authorised for the version of **12d Model** being used to open the project.

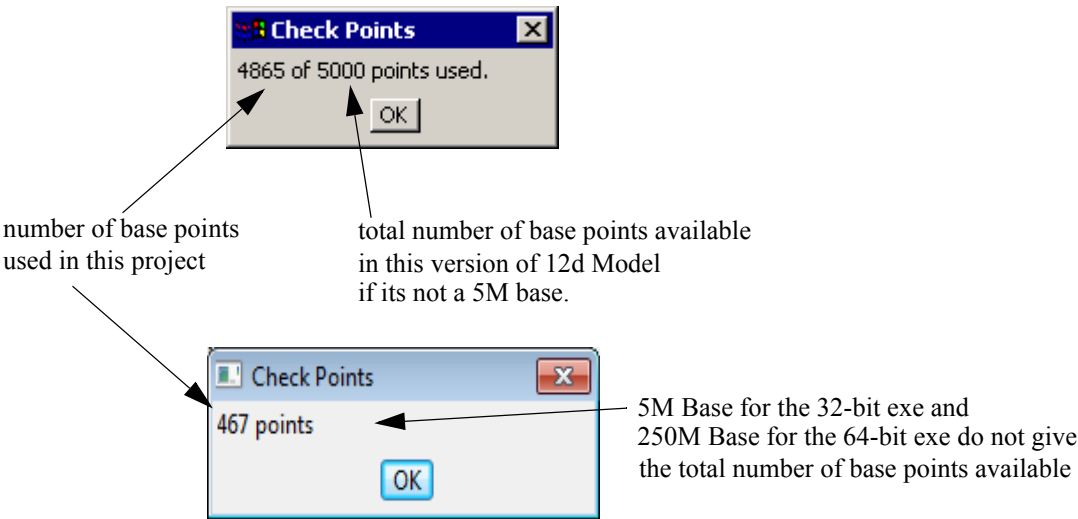
The items included in the Base Point count are:

- 1. each vertex in a string counts as a base point except
 - (a) for a project, the vertices of strings created when plotting to a model inside the project do not count as base points for that project
 - (b) for a project, contours generated by **2d Model** and written to models inside the project do not count for that project.
- 2. points in a tin count as base points
- 3. for an alignment, the number of base points is the number of HIP's plus the number of VIP's
- 4. items in models and tins shared into a project are included in the base point count.

Important Note:

If any non-counted base point data is written out as 12d Ascii and read into a project then the data read in from the 12d Ascii **will** be included in the base point count in the project that the data is read into.

Selecting **Check base points** displays the **Check Base Points** panel.

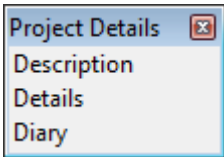


Details

Position of option on menu: Project ==>Details

A project description and project details can be defined.

The **Project details** walk-right menu contains various project items.



display/modify the project description
display/modify the project details
project diary

For the option *Description*, go to
 Details
 Diary

[Description](#)
[Details](#)
[Diary](#)

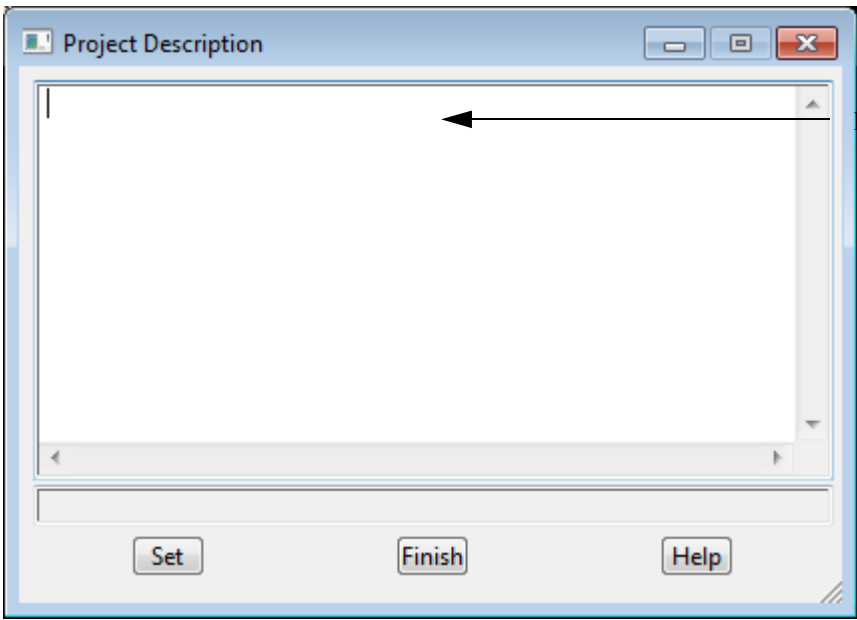
The options in the menu will now be described.

Description

Position of option on menu: Project ==>Details ==>Description

The **description** option is used to create and edit the project description.

Selecting **Description** brings up the **Project Description** panel.



← project description area

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Project description area	input		
---------------------------------	-------	--	--

the description for the project to be rebuilt. The description can be more than one line long.

Set	button		
------------	--------	--	--

set the project description.to be the text in the project description area.

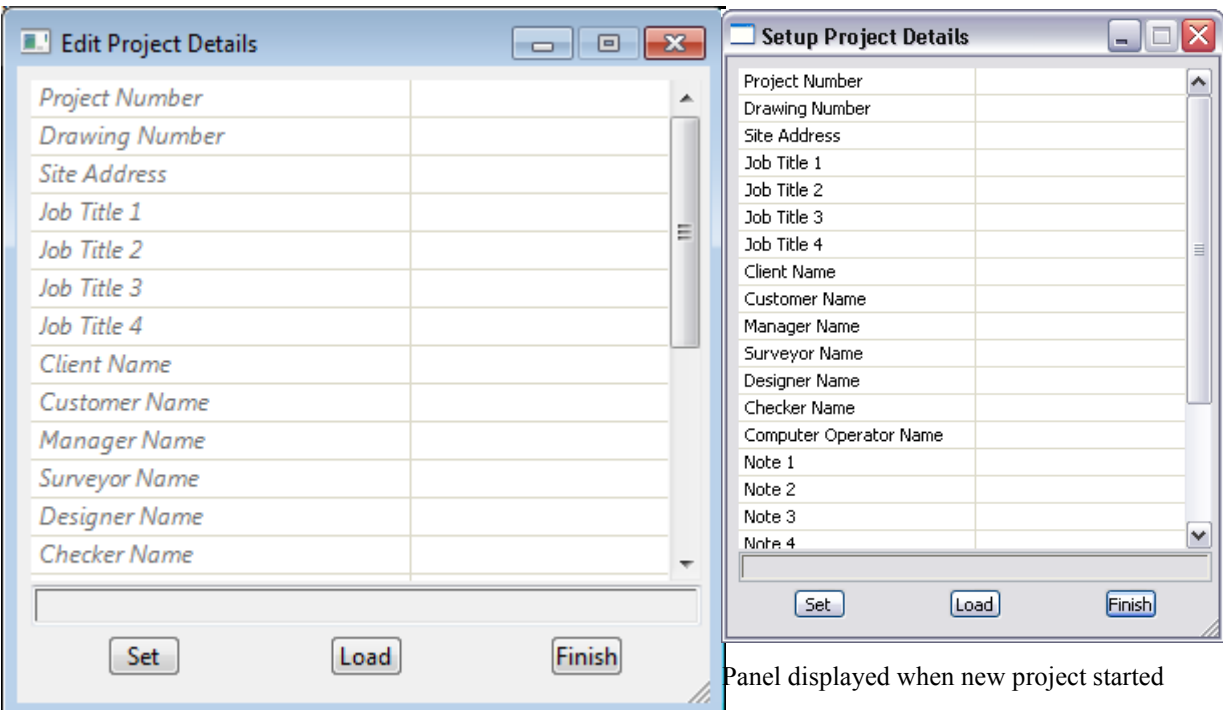
Note: This panel is a resizable panel.

Details

Position of option on menu: Project ==>Details ==>Details

The **Details** option is used to enter project details.

Selecting **Details** opens the **Edit Project Details** panel.

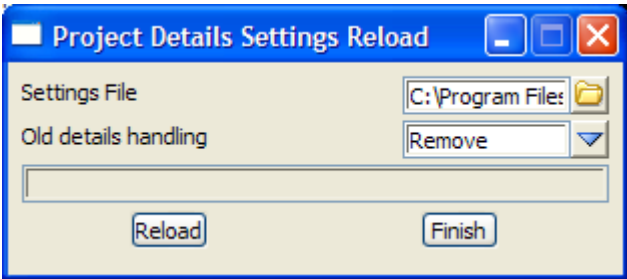


Panel displayed when new project started

What information is to be entered into the **Enter Project Details** panel is defined in the option
Project ==>Management ==>Details editor - go to [Details Editor](#)

The fields and buttons used in the **Enter Project Details** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Set	button		
<i>set the project details to the values show in the panel. The values are stored as project attributes.</i>			
Load	button		
<i>brings up the Projects Details Setting Reload panel that is used to load a new definition of project detail attributes.</i>			



A file defining a new set of project attributes of project details can be loaded. How existing project details are handled depends on the value of **Old details handling**

Old details handling

***Remove** - all existing project detail attributes are removed and totally replaced by the new set*

***Keep (no update)** - any existing project detail are kept but their values **are not** updated by the default setting if the same attribute exists in the Settings file.*

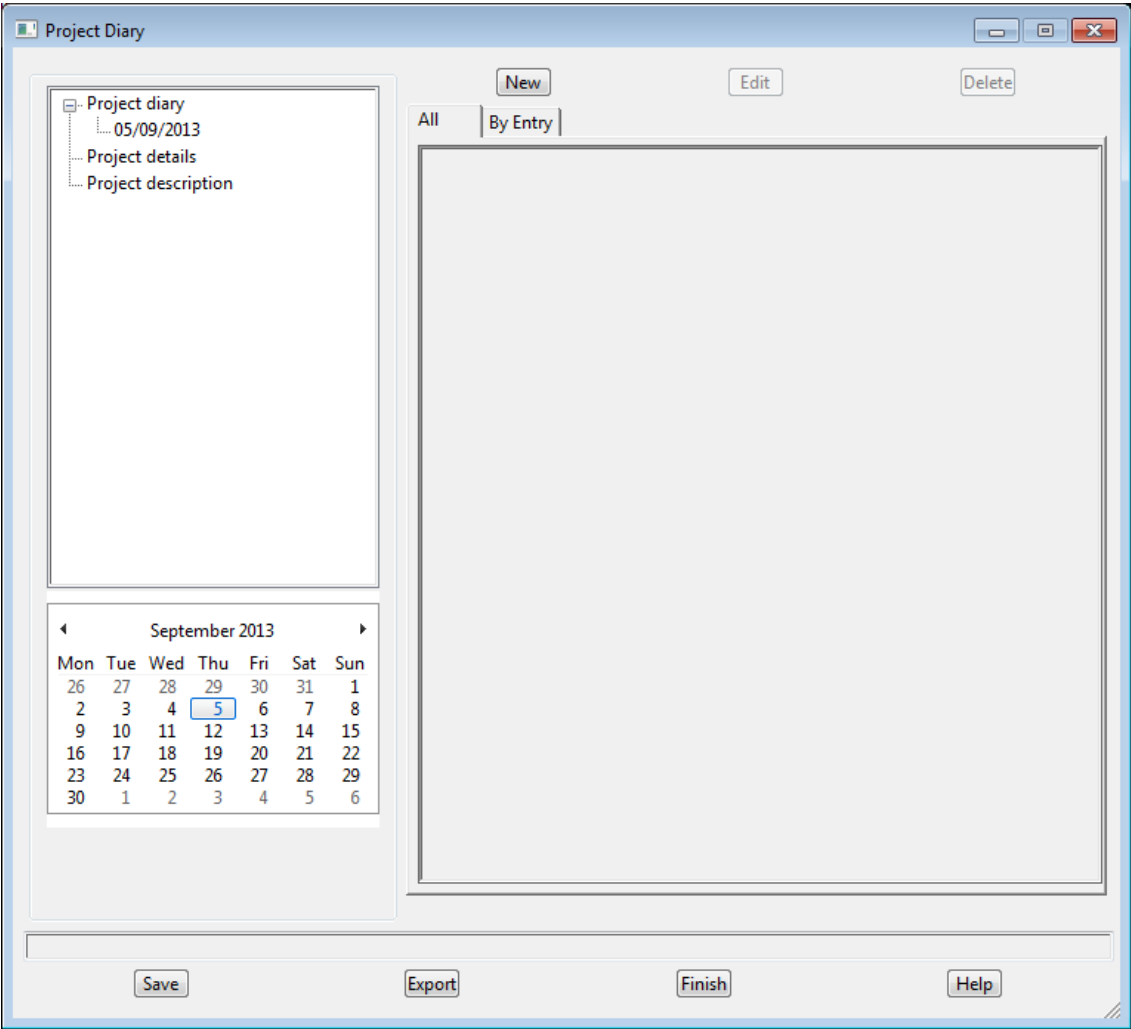
***Keep (with update)** - any existing project detail are kept and their values **are updated** by the default setting if the same attribute exists in the Settings file.*

Diary

Position of option on menu: **Project ==>Details ==>Diary**

The **Project diary** allows information to be entered for each day. It can also be used to edit project details and the project description.

Selecting **Diary** brings up the **Project Diary** panel.



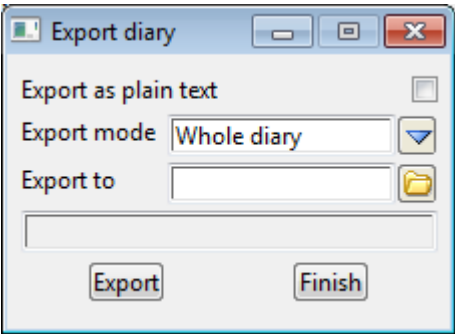
The **Project diary** panel has a grid with nodes for the Project diary, Project Details and Project description.

Clicking on the **+** on **Project diary** will expand the tree to show all the dates with diary notes as well as a position for entry at today's date. Clicking in the calendar at the bottom of the panel will allow notes to be added for earlier days that do not already have notes. Notes can not be added for future dates.

Clicking on **Project details** will display in read-only format the **Project details** information for the project with their current values. To modify any of the values, click on the **Edit** button and the **Edit Project Details** panel is displayed. The information can then be modified/saved as documented in the section [Details](#).

Clicking on **Project description** display the current description in the right hand side of the panel. The description is simply text and can be modified directly in the panel. Click on the **Write** button to save the modified description.

Clicking on **Export** display the **Export Diary** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Export as plain text <i>if ticked, exports the diary as plain text without formatting</i> <i>if not ticked, exports the diary in RTF, with all formatting retained</i>	tick box	not ticked	
Export mode <i>which data should be exported - the whole diary, the selected month or the selected day</i>	choice box	Whole diary	Whole diary, Selected month, Selected day
Export to <i>the file to export the diary to</i>	file		
Export <i>writes the current export diary settings out to the file given in the Export to field.</i>			

Management

Position of menu: Project =>Management

Options to set up the project

The **Project management** walk-right menu contains various project items.

Project Management	
Defaults	set default values for the project
Details editor	edit the details definition file
env.4d	edit the env.4d file
Env configuration	set up environments with different user, user library folders, dongles
Projections	define/use projections
N values	define/use N value parameters
7 parameters	define/use 7 value parameters
Workspace	define/use workspace setup
Tags	create tag tree
Tree	edit items on the project tree
Sharing	set share settings for this session
Forest files	look at what models and tins are in the Trash Bin
Trash bin	
Project preview	set up user defined preview rather than automatic one
Toggle density drawing	toggle density drawing - only for 250M

For the option <i>Defaults</i> , go to	Defaults
<i>Details editor</i>	Details Editor
<i>env.4d</i>	env.4d
<i>Env configuration</i>	Env Configuration
<i>Projections</i>	Projections
<i>N Values</i>	N values
<i>7 Parameters</i>	7 Parameters
<i>Workspace</i>	Project Workspace
<i>Tags</i>	Tags
<i>Tree</i>	Tree
<i>Sharing</i>	Project Sharing
<i>Forest files</i>	Forest File
<i>Trash bin</i>	Trash Bin
<i>Project preview</i>	Project Preview
<i>Toggle density drawing</i>	Toggle Density Drawing

The options in the menu will now be described.

Defaults

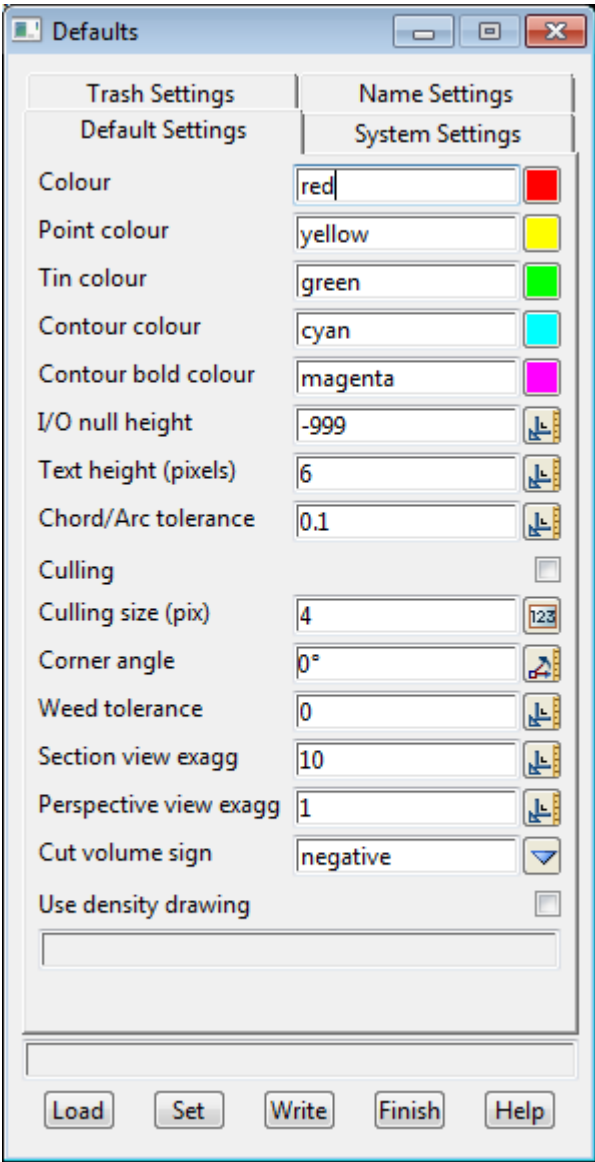
Position of option on menu: Project =>Management =>Defaults

The **Defaults** option allows the user to view and modify many of the default values used in the current 12d Model project.

NOTE - The values in the default option panels are initially set for a new project by the values in the **defaults.4d** file. For more information on the defaults.4d file, go to the section [Defaults File](#) in the Appendix [Setting Up and Configuring 12d](#)

Any changes made in the **Defaults** panel are used in the current session for the project when the **Set** button is pressed. The values are only *saved* for the project if a **Project =>Save** is done after the **Set**.

On selecting the **Default Settings** tab, the **Default Settings** are displayed.

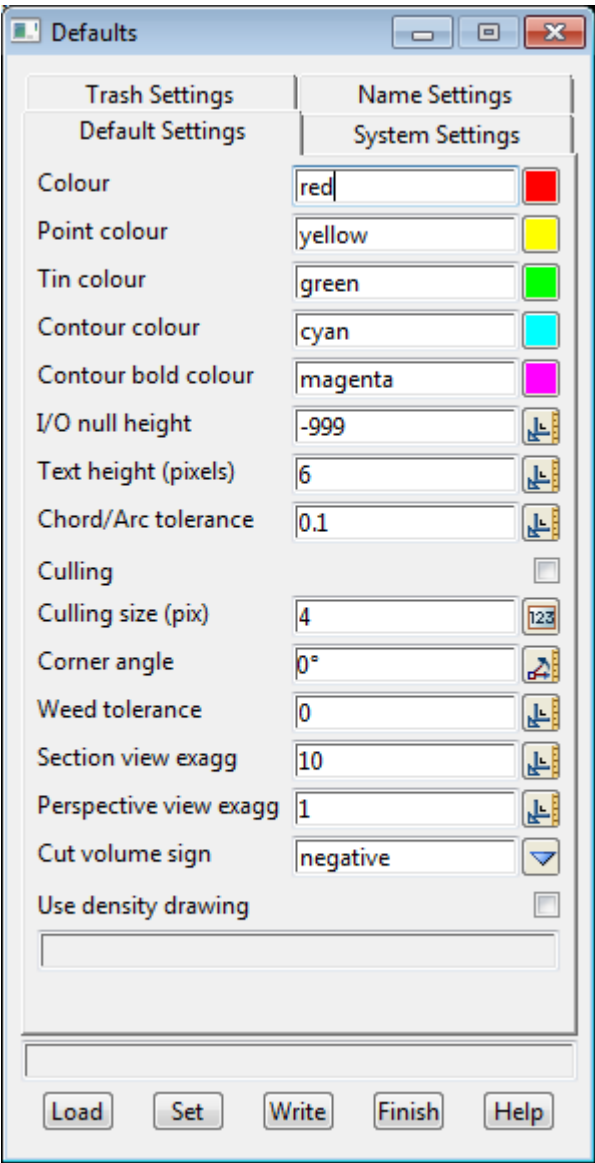


The **Defaults** panel consists of tabs for the groups of settings *Defaults*, *System*, *Trash* and *Name*.

- [Default Settings tab](#)
- [Systems Settings tab](#)
- [Trash Settings tab](#)

Names Settings tab

Default Settings tab



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Colour	colour box	default colour	available colours
<i>the name of the current default colour used for line strings.</i>			
Point colour	colour box	def point colour	available colours
<i>the current default colour used for point strings.</i>			
Tin colour	colour box	def tin colour	available colours
<i>the default tin colour used in the triangulate model and view panels.</i>			
Contour colour	colour box	default cont colour	available colours
<i>the default contour colour used in the contour panel.</i>			

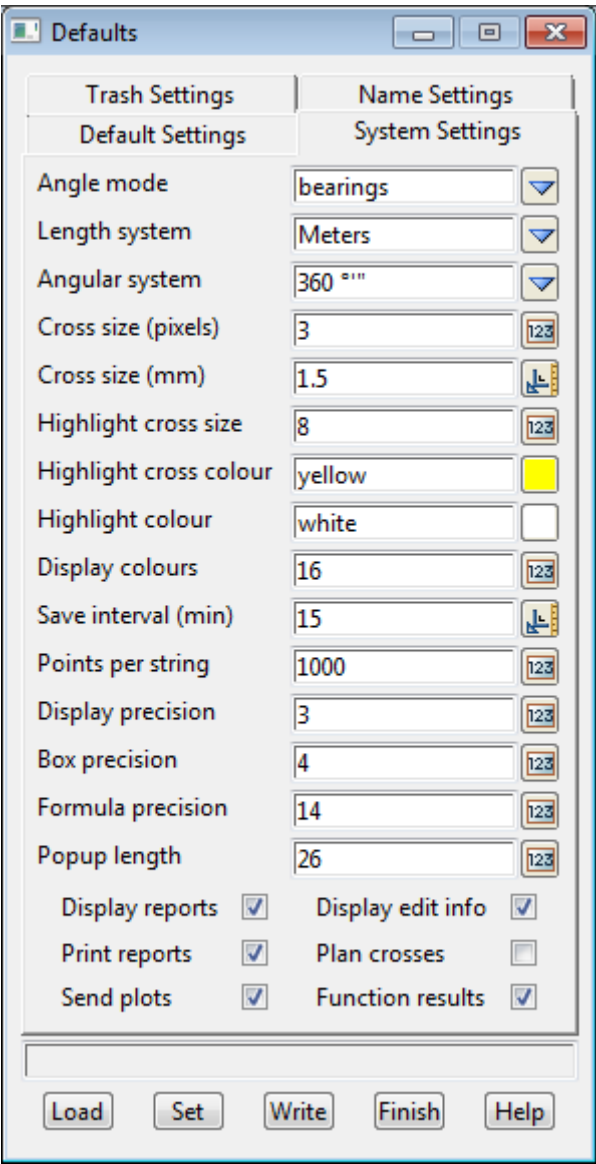
Cont bold colour	colour box	default cont index colour	available colours
<i>the default contour bold colour is used in the contour panel.</i>			
I/O null height	input	-999.0	
<i>this field contains the value of the value recognised as a null height when reading in and writing out data.</i>			
Text height (pixels)	input	8	
<i>the default text height used in the sewer option and other panels.</i>			
Chord/Arc tolerance	input	0.1	
<i>the maximum value of a chord to arc distance. If this distance is exceeded when approximating curves by chords, extra points are inserted into the curve so that the chords all have chord/arc distances less than this value. A value of zero disables the chord/arc test.</i>			
Culling	tick box		
<i>the culling setting for any new perspective or plan views.</i>			
Culling size (pix)	input	5	
<i>the culling size for any new perspective or plan views.</i>			
Corner angle	input	15	
<i>when applying templates or calculating interfaces along a string, extra sections may be required at string vertices with no horizontal curve on them. If the corner angle is non-zero, extra sections are added in at multiples of the corner angle value for the plan angle at the vertex.</i>			
Weed tolerance	input	0	
<i>if two points on a string (with the same bearing) are closer than this distance then the second point is left out. This applies to the extra points added in at chainage points in interfacing and corner angles.</i>			
Section view exagg	input	10	
<i>the vertical exaggeration used for any new section views.</i>			
Perspective view exagg	input	1	
<i>the vertical exaggeration of any new perspective.</i>			
Cut volume sign	choice box	negative	negative, positive
<i>the sign (positive or negative) used for cut volumes and areas. The sign for fill is the opposite.</i>			
Use density drawing	tick box		
<i>If Use density drawing is ticked, the data density for a model is calculated and if it is too high, a red rectangle is drawn around the model instead of the individual vertices of the strings in the model. If the data density of the model is low enough not to replace the entire model by a red rectangle, a data density is calculated for each string in the model and if the data density is too high, the string is replaced by a red rectangle.</i>			
<i>Note: This setting is only applicable to the 250M version of 12d Model.</i>			
<i>The default for a new project is given by the environment variable USE_DENSITY_CHECKS_4D.</i>			
Load	button		
<i>read the default values from the current default.4d file for the project. The values are not used for the project until the Set button is pressed. The values are not saved for the project until a Project =>Save is done after the Set.</i>			
Set	button		
<i>when set is selected, the defaults are set to the values given in the corresponding fields of this panel. These are not saved unless a Project =>Save is done after the Set.</i>			

Write button

*write the values in the panel to the defaults.4d file.
The values are not used for the project until the **Set** button is pressed. The values are not saved for the project until a **Project =>Save** is done after the **Set**. For more information on the **Write** button, go to the section [Writing Set Up Files](#) in the Appendix [Setting Up and Configuring 12d](#).*

Systems Settings tab

On selecting the System Settings tab, the **System Settings** are displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Angle mode	choice box	bearings	cartesian, bearings
<i>specifies whether bearings or cartesian angles are used in reporting the instantaneous direction of the selected string in the information menu.</i>			
Cross size (pixels)	input/output	2	
<i>the size in pixels that crosses (for points etc.) are drawn on the screen.</i>			

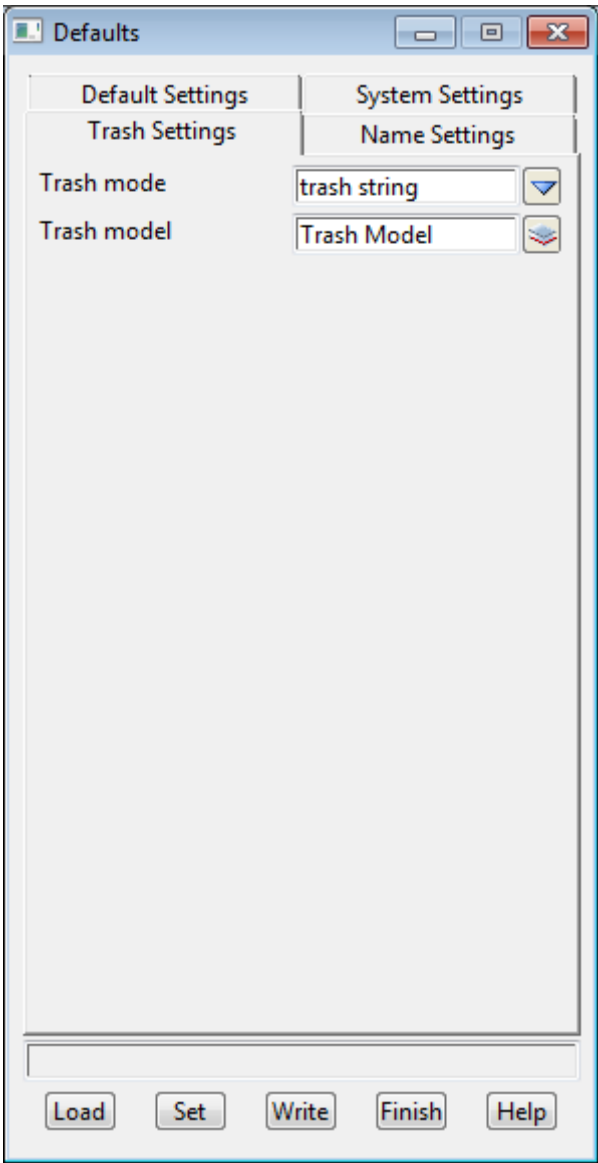
Cross size (mm)	input/output	2.5	
<i>the size in millimetres that crosses (for points etc.) are drawn on any plots.</i>			
Highlight cross size	input/output	8	
<i>the size in pixels of the cross used for highlighting objects in views.</i>			
Highlight cross colour	colour box	yellow	available colours
<i>the colour of the cross used for highlighting objects in views.</i>			
Highlight colour	colour box	white	available colours
<i>the colour used to display objects in views when they are highlighted.</i>			
Display colours	input/output	0	
<i>the number of colours from the top of the colour map file, colour_map.def, that are displayed in a colour pop-up. If 0, all colours are displayed.</i>			
Save interval (min)	input/output	5	
<i>the number of minutes that elapse after a save before the save project reminder panel comes up. If 0, the panel never comes up.</i>			
Display precision	input/output	3	
<i>the number of decimal places used for values displayed in the information menus.</i>			
Box precision	input/output	4	
<i>the number of decimal places used for values displayed in boxes and panels.</i>			
Popup length	input/output	28	
<i>the maximum number of items in a pop-up before breaking the pop-up into walk-rights.</i>			
Display reports	tick box	tick	
<i>if ticked, as soon as a report is produced, it will be displayed in the editor defined by the environment variable, EDITOR_4D.</i>			
Display edit info	tick box	tick	
<i>if ticked, the edit info panel is automatically displayed whenever a string is created or edited.</i>			
Print reports	tick box	tick	
<i>if ticked, as soon as a report is produced, it will be passed to the script/program defined by the environment variable, PRINTER_4D.</i>			
Send plots	tick box	tick	
<i>if ticked, as soon as a plot is produced, it will be passed to the script/program defined by the environment variable, PLOTTER_4D.</i>			
Plan crosses	tick box		
<i>This option is experimental - at the moment things will look messy when editing in a section view with plan crosses turned on.</i>			
<i>if ticked, when the cursor is in a plan or perspective view, it is projected onto any section views as well.</i>			
Function results	tick box	tick	
<i>if ticked, function results such as volumes will be displayed on the screen every time a recalc is done.</i>			
<i>if not ticked, no function results as displayed on a function recalc.</i>			
Load	button		
<i>read the default values from the current default.4d file for the project. The values are not used for the project until the Set button is pressed. The values are not saved for the project until a Project =>Save is done after the Set.</i>			
Set	button		
<i>when set is selected, the defaults are set to the values given in the corresponding fields of this panel. These are not saved unless a Project =>Save is done after the Set.</i>			

Write button

*write the values in the panel to the defaults.4d file.
The values are not used for the project until the **Set** button is pressed. The values are not saved for the project until a **Project =>Save** is done after the **Set**. For more information on the **Write** button, go to the section [Writing Set Up Files](#) in the Appendix [Setting Up and Configuring 12d](#)*

Trash Settings tab

On selecting the **Trash Settings** tab, the **Trash Settings** are displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Trash mode	choice box	trash string	keep string, trash string, delete string
<i>In many string options, new strings are created from existing strings. What happens to the original strings may be determined by the trash mode. If set to keep string, the original strings will not be touched trash string, the original strings will be moved to the trash model</i>			

delete string, the original strings will be deleted.

Trash model model box Trash Model available models

the model that trashed strings are put into. This model needs to be cleaned or deleted to permanently remove the strings.

Load button

*read the default values from the current default.4d file for the project. The values are not used for the project until the **Set** button is pressed. The values are not saved for the project until a **Project =>Save** is done after the **Set**.*

Set button

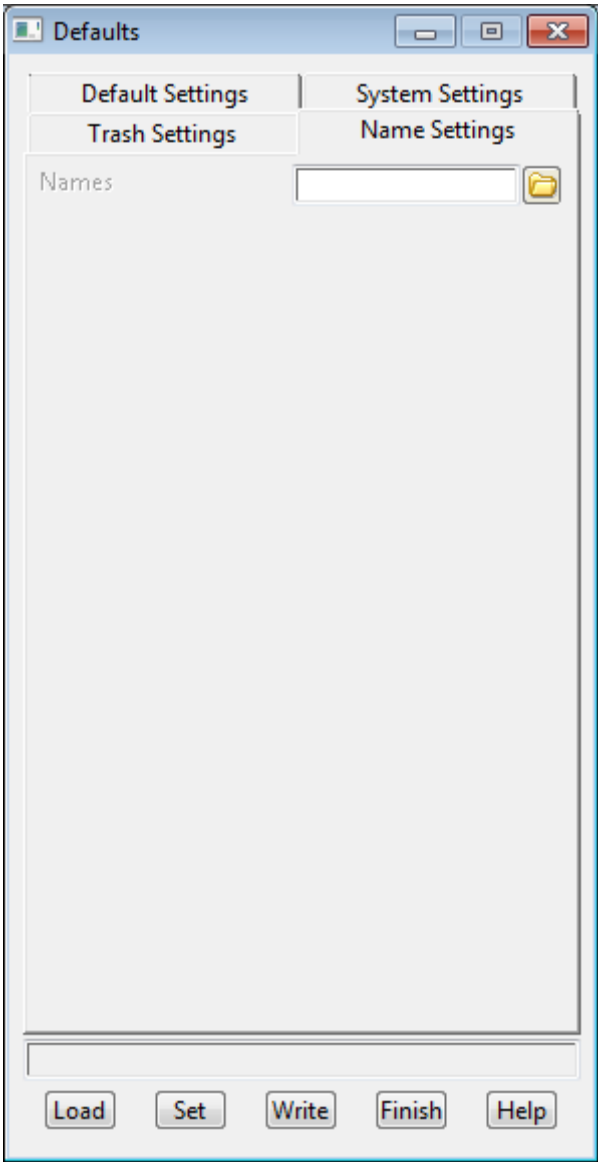
*when set is selected, the defaults are set to the values given in the corresponding fields of this panel. These are not saved unless a **Project =>Save** is done after the **Set**.*

Write button

*write the values in the panel to the defaults.4d file.
The values are not used for the project until the **Set** button is pressed. The values are not saved for the project until a **Project =>Save** is done after the **Set**. For more information on the **Write** button, go to the section [Writing Set Up Files](#) in the Appendix [Setting Up and Configuring 12d](#)*

Names Settings tab

On selecting the Name Settings tab, the **Name Settings** are displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Names <i>name of the mapping file used as the default name mapping file.</i>	input		*.mf files
Load <i>read the default values from the current default.4d file for the project. The values are not used for the project until the Set button is pressed. The values are not saved for the project until a Project => Save is done after the Set.</i>	button		
Set <i>when set is selected, the defaults are set to the values given in the corresponding fields of this panel. These are not saved unless a Project => Save is done after the Set.</i>	button		
Write <i>write the values in the panel to the defaults.4d file. The values are not used for the project until the Set button is pressed. The values are not saved for the project until a Project => Save is done after the Set. For more information on the Write button, go to the</i>	button		

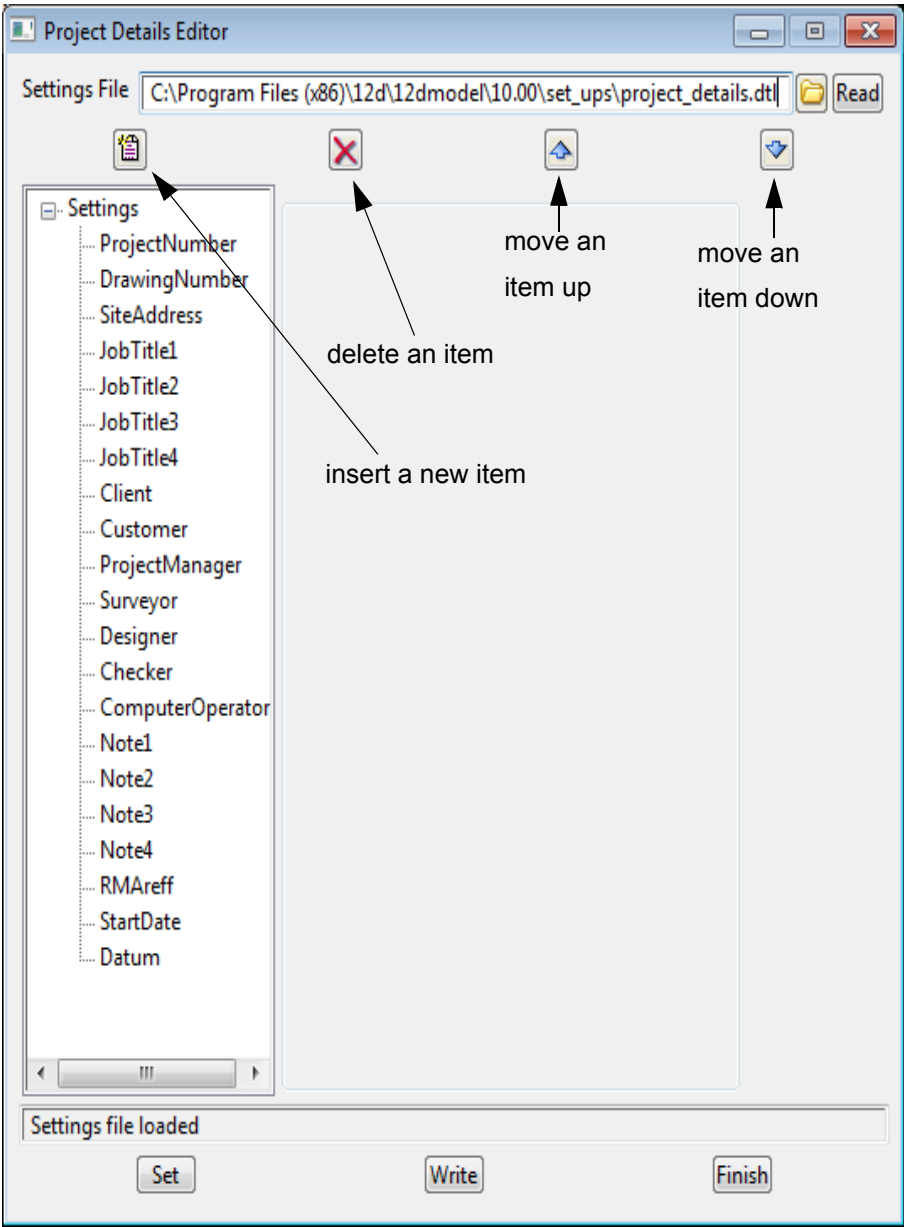
section [Writing Set Up Files](#) in the Appendix [Setting Up and Configuring 12d](#).

Details Editor

Position of option on menu: Project =>Details =>Management =>Details editor

The **Details Editor** s option creates the files used to define the project attributes displayed in the **Project Details** panel.

On selecting the **Details Editor** option, the **Project Details Editor** panel is displayed.



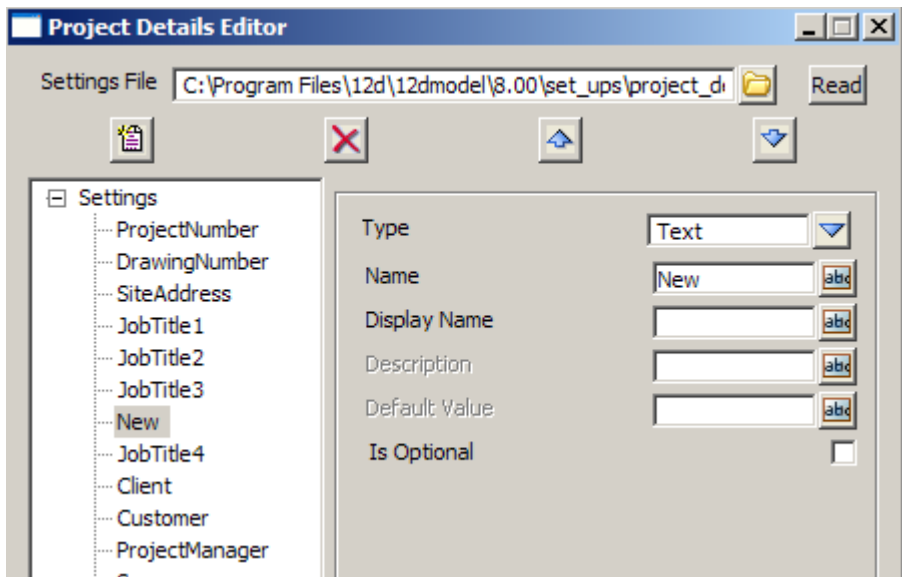
The items defined in the **Project Details Editor** panel can be of type Text (e.g. fred), Integer (e.g. 11) or Real (e.g. 23.15).

The fields and buttons used in the **Enter Project Details** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Set	button		
<i>the values in the panel are set as the project details setup</i>			
Write	button		

writes out a project details file.

When inserting a new **detail**, the following is displayed



Field Description	Type	Defaults	Pop-Up
Type <i>the detail can be text, an integer or a real value</i>	choice box		TextText, Integer, Real
Name <i>name of the project attribute used to store the detail</i>	input		
Display name <i>name to appear in the Enter Project Details panel</i>	input		
Description <i>description that appears when the Display name is clicked in the Enter Project Details panel</i>	input		
Default value <i>default value for the detail</i>	input		
Precision <i>only for Type Real - number of decimal places</i>	integer box		
Is optional <i>if ticked, then the detail does not have to be filled in. If not ticked, it is compulsory to fill in the detail in the Enter Project Details panel before leaving the panel.</i>	tick box		tick

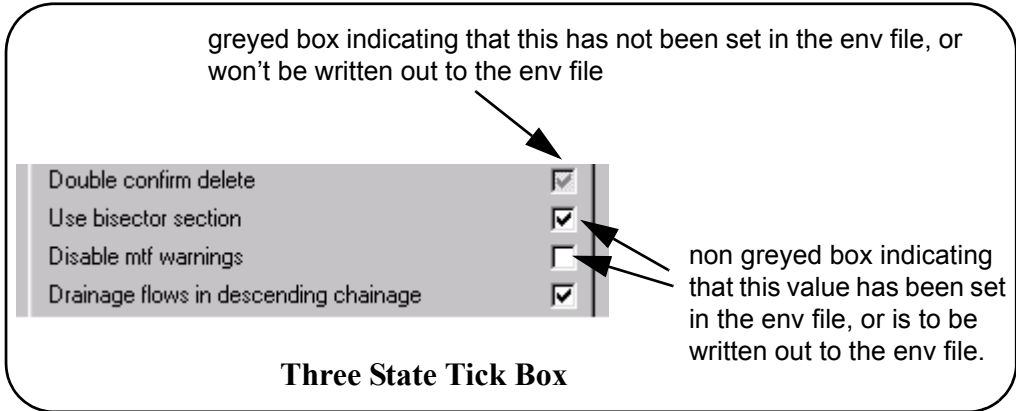
env.4d

Position of option on menu: Project =>Management =>env.4d

The env.4d option is used to create/update the *env.4d* file of environmental variables.

When the option is selected, it reads in the *current* env.4d file and displays in the panel, the values for any environment variables *in the file*. Hence the panel shows the values for the environment variables *in the file*, not those that are not in the file and have default values set by **12d Model**.

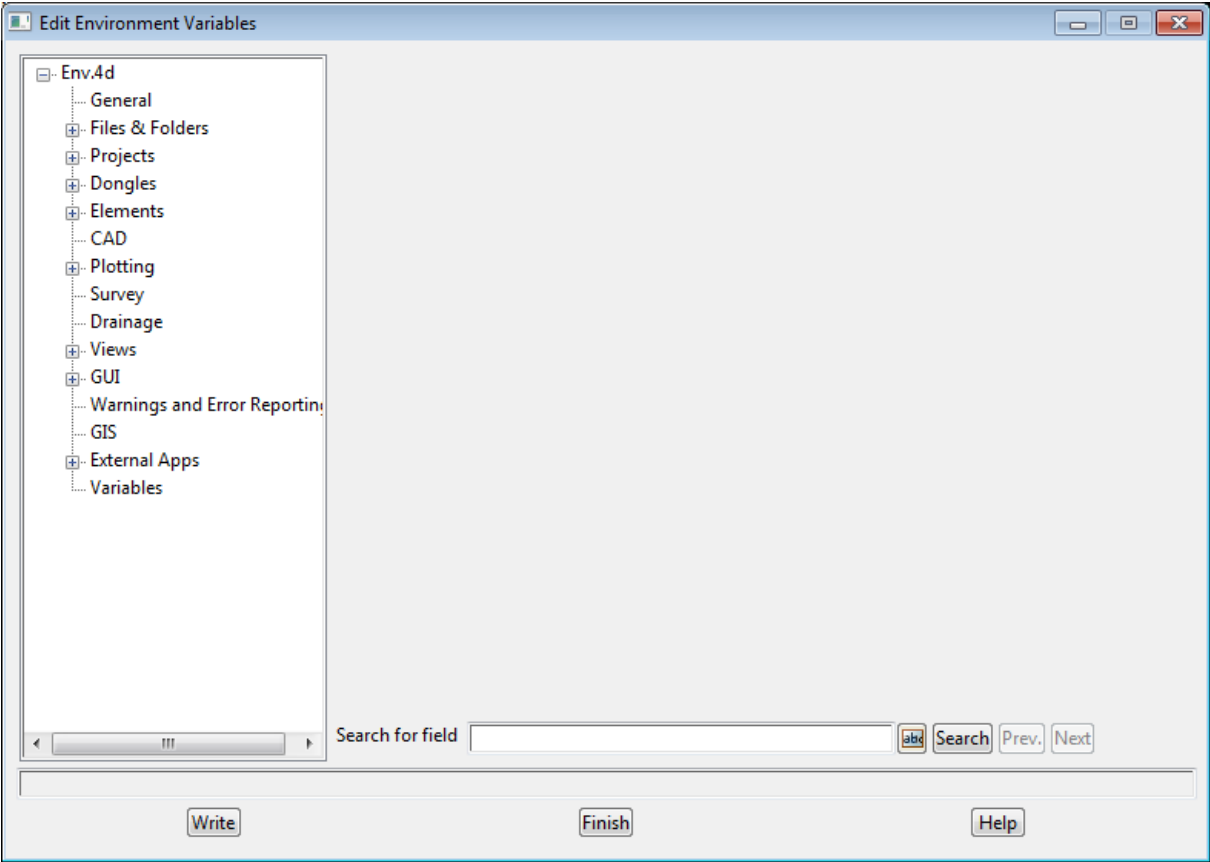
Hence the tick boxes in the *Edit Environment Variables* panel have three states rather than the standard two states. There is the standard tick or nothing to denote the value of the variable is set from the env file (or is going to be written out to the env file) or a greyed out tick or greyed out blank box to indicate that the value has *not* been set by the environment variable. Clicking on the tick box will toggle between the three states - on, off and no value.



After any modifications are made, the parameters are written out to an env.4d file.

Note that the *env.4d* file is only used when a project is loaded so the parameters written to an *env.4d* file can only take affect for the current project if a project *restart* is done.

Selecting env.4d displays the **Edit Environmental Variables** panel.



This panel has a tree on the left hand side and clicking on the + will expand the node and - will collapse the node.

The fields and buttons at the bottom of the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Search for field	typed input		

text to search for on the env.4d panel (not the env variable name).

Search button - search for the text in the Search for field. The search starts from where your cursor is in the panel fields.

Prev. button - search for the previous occurrence of the text in the Search for field.

Next button - search for the next occurrence of the text in the Search for field.

Write button

*write the values in the panel to a file. For more information on the **Write** button, go to the section [Writing Set Up Files](#) in the Appendix [Setting Up and Configuring 12d](#)*

Note - the env.4d file is only used when a project is loaded so the parameters written to the env.4d file will only take affect for the current project if a project *restart* is done.

For information on the variables in <i>General</i> , go to	General
<i>Files & Folders</i>	Files and Folders
<i>Projects</i>	Projects
<i>Dongles</i>	Dongles
<i>Elements</i>	Elements
<i>CAD</i>	CAD

Plotting	Plotting
Survey	Survey
Drainage	Drainage
Views	Views
GUI	GUI
Warnings and Error Reporting	Warnings and Error Reporting
External Apps	External Apps
Variables	Variables

The environment variables are described in more detail in the section [Environment Variables](#) of the Appendix [Setting Up and Configuring 12d](#).

Field Description	Type	Defaults	Pop-Up
General			
Show full path name	tick box		
<i>if ticked, when 12d Model fires up the actual file names defined by any environment variables are written to the output window. This is useful for debugging.</i>			
<i>Env variable and full documentation: see SHOW_PATHS_4D</i>			
Show Vista full path name	tick box		
<i>if ticked, then for Microsoft Vista, when 12d Model fires up, the actual file names defined by any environment variables are written to the output window. This is useful for debugging due to the fact that Vista may put file sin strange places.</i>			
<i>Env variable and full documentation: see SHOW_VISTA_VIRTUAL_STORE_PATHS_4D</i>			
Enable undo	tick box		
<i>if ticked, allow Undos.</i>			
<i>Env variable and full documentation: see UNDO_4D</i>			
Plan table settings	tick box		
<i>if ticked, allow the drawing of z-values, vertices etc. on the plan view to be set by individual models rather than for all models on the view.</i>			
<i>Env variable and full documentation: see PLAN_TABLE_SETTINGS_4D</i>			
MTF extra start/end	tick box		
<i>if ticked, Extra start/end is turned on by default in the MTF Editor.</i>			
<i>Env variable and full documentation: see EXTRA_START_EXTRA_END_4D</i>			
Use names.4d comment field	tick box		
<i>if ticked,.</i>			
<i>Environment variable</i>	USE_NAMES_COMMENT_4D		
Check for updates on startup	tick box		
<i>if ticked,.</i>			
<i>Environment variable</i>	CHECK_FOR_UPDATES_4D		
Show time taken for options	tick box		
<i>if ticked,.</i>			

Environment variable	SHOW_OPTIONS_EXECUTION_TIME_4D	
Text editor	file box	
<i>if non-blank, the script or program that is fired up when a report is created. It usually points to an editor.</i>		
Env variable and full documentation: see EDITOR_4D		
Typed units mode	choice box	
<i>Controls the typed input units for feet - international and/or US.</i>		
Environment variable	TYPED_UNITS_MODE_4D	
System names	Choice box	Long, Short, Short then long
<i>for file name compatibility with DOS 8.3 format, the default names for all set up files can be restricted to just short names (8.3), long names, or short and then long.</i>		
Environment variable	SYSTEM_NAMES_4D	
Web search	typed input	www.google.com
<i>Web address that is used in 12d option Help =>12d on the Web =>Search the web</i>		
Env variable and full documentation: see WEB_SEARCH_4D		
Processor affinity	typed input	
Environment variable	PROCESSOR_AFFINITY_4D	

Files and Folders

Files and Folders > Folders

User "Documents and Settings\All Users" for env.4d, users user_lib folders	tick box	
Env variable and full documentation: see USE_ALL_USERS_PROFILE_4D		
Setups folder	folder box	default set_ups
<i>if non blank, the full path name of the folder to use for the 12D Solutions supplied setup files.</i>		
Env variable and full documentation: see SET_UPS_4D		
Library folder	folder box	default library
<i>if non blank, the full path name of the folder to use for the 12D Solutions supplied library files.</i>		
Env variable and full documentation: see LIB_4D		
User folder	folder box	default user
<i>if non blank, the full path name of the folder to use for the User supplied setup files.</i>		
See User and Customer_User .		
Env variable and full documentation: see USER_4D		
User library folder	folder box	default user_lib
<i>if non blank, the full path name of the folder to use for the User supplied library files.</i>		
See User Library .		
Env variable and full documentation: see USER_LIB_4D		
Customer user folder	folder box	no default

if non blank, the full path name of the folder to use for the Customer User supplied setup files.

See [User and Customer User](#).

Env variable and full documentation: see [CUSTOMER_USER_4D](#)

Customer library folder folder box no default

if non blank, the full path name of the folder to use for the Customer supplied library files.

See [Customer Library](#).

Env variable and full documentation: see [CUSTOMER_LIB_4D](#)

Log folder folder box default working folder

*if non blank, the full path name of the folder to use for the **12d Model** log files.*

Env variable and full documentation: see [LOG_DIR_4D](#)

Help folder folder box default help

*If non blank, the full path name of the folder containing the **12d Model** help files.*

Env variable and full documentation: see [HELP_4D](#)

Files and Folders > Files

Fonts file file box default fonts.4d

if non blank, the full path name of the file to use for defining text fonts.

Env variable and full documentation: see [FONTS_4D](#)

Function keys file file box default userkeys.4d

if non blank, the full path name of the file to use for function keys definitions.

Env variable and full documentation: see [FUNCTION_KEYS_4D](#)

Linestyles file file box default linestyl.4d

if non blank, the full path name of the file to use for defining linestyles.

Env variable and full documentation: see [LINESTYLES_4D](#)

Name mappings file file box default names.4d

if non blank, the full path name of the file to use for defining the mapping of string names.

Env variable and full documentation: see [NAME_MAPPINGS_4D](#)

Textstyles file file box default textstyl.4d

if non blank, the full path name of the file to use for defining the text styles and fonts they use.

Env variable and full documentation: see [TEXTSTYLES_4D](#)

Textstyles favourite file file box default textstyle_names.4d

if non blank, the full path name of the file to use for defining the textstyles favourites.

Env variable and full documentation: see [TEXTSTYLE_MAPPINGS_4D](#)

Colours.4d file box default colours.4d

*If non blank, the full path name of the file to use as the **12d Model** colour file.*

Env variable and full documentation: see [COLOURS_4D](#)

Defaults.4d file box default defaults.4d

If non blank, the full path name of the file to use as the **12d Model** defaults file.

Env variable and full documentation: see [DEFAULTS_4D](#)

Digitizers.4d file box default digitizers.4d

If non blank, the full path name of the file to use as the **12d Model** digitizers file.

Environment variable DIGITIZERS_4D

Symbols.4d file box default symbols.4d

If non blank, the full path name of the file to use as the **12d Model** symbols file.

Env variable and full documentation: see [SYMBOLS_4D](#)

Super alignment styles file box default astyles.4d

If non blank, the full path name of the file to use for defining super alignment symbology.

Environment variable SUPER_ALIGNMENT_STYLE_4D

On duplicate toolbar choice box Do nothing, Take First, Take last

This environment variable manages what to do if toolbars with the same name are read from a toolbars.4d file.

Do nothing - accept all toolbars of the same name

Take first - accept only the first instance of the toolbar

Take last - accept only the last instance of the toolbar

Env variable and full documentation: see [TOOLBAR_DUPLICATE_MODE_4D](#)

On duplicate linestyle / symbol Do nothing, Take First, Take last

This environment variable manages what to do if symbols or linestyles with the same name are read from the symbols.4d or linestyle.4d file

Do nothing - accept all instances of symbols / linestyles of the same name

Take first - accept only the first instance of the symbol / linestyle

Take last - accept only the last instance of the symbol / linestyle

Env variable and full documentation: see [LINESTYLE_DUPLICATE_MODE_4D](#)

Files and Folders > File input

Use anonymous functions for file inputs tick box

if tick, when a file is read with a File input option, a function is automatically created and named. This function must exist to allow the data to be added to a view after it is read in, to be able to delete all the data read in at a later time, and to re-run the function to reread the data file and replace the data read in last time.

Env variable and full documentation: see [ALLOW_ANONYMOUS_FUNCTIONS_4D](#)

Add file input data to a view choice box

if anonymous function are set, the data created by the File input option can be added to a view. The choices are:

Do nothing - don't add the data read in to any view

Add to current view - add the data read in to the current view (the current view is the view that highlighted)

Add to new view - automatically create a new view and add the data read in to that view

Add to named view - add the data read in to the view given by `FILE_READ_ADD_TO_VIEW_NAME_4D` (see **Add file input data to view name**).

Env variable and full documentation: see [FILE_READ_ADD_TO_VIEW_4D](#)

Add file input data to view name text box

*name of the view to use if `FILE_READ_ADD_TO_VIEW_4D` is set to **Add to named view**. (see **Add file input data to a view** and **Use anonymous functions for file inputs**).*

If the view does not exist then it is created.

Env variable and full documentation: see [FILE_READ_ADD_TO_VIEW_NAME_4D](#)

Genio wildcard typed input *.mos

*sets the ending of the files selected for the pop-up list for the File field in the **Read Genio Data** panel.*

Env variable and full documentation: see [GENIO_WILDCARD_4D](#)

Files and Folders > File backups

Use backups.4d folder tick box default tick

if tick, backup files are placed in the folder backups.4d. in the project working folder (that is, in the folder containing the .project folder).

Env variable and full documentation: see [USE_BACKUPS_4D_FOLDER_4D](#)

Files and Folders > Usage Logs

Usage log folder folder box

if non blank, log files of the form

<log file folder>\(<dongle> <user> <computer> <time stamp> <process ID>).log)

will be created in the given folder.

Env variable and full documentation: see [USAGE_LOG_4D](#)

Usage logs folder folder box

if non blank, log files of the form

<log file folder>\<dongle>\<user>\<computer>\(<time stamp> <process ID>).log)

will be created in the given folder.

Env variable and full documentation: see [USAGE_LOGS_4D](#)

Projects

Projects > General

Short project names tick box

if ticked, use short extension names (3 characters after the .) for all internal files such as models, tins, projects.

Env variable and full documentation: see [PROJECT_NAMES_4D](#)

Setups file file box default setups.4d

if non blank, the full path name of the file to use for setting up the initial screen layout for new projects.

Env variable and full documentation: see [SETUPS_FILE_4D](#)

Recent projects positive integer box default 20

*if non blank, the maximum number of accessed projects displayed in the Project list when **12d Model** first starts up.*

Env variable and full documentation: see [RECENT_PROJECTS_4D](#)

Projects > Macros

Macro input mode tick box

controls whether or not the value passed down in the variable to receive the answer for any macro prompt, is actually placed into the console panel as the default answer so that it can be accepted by just typing <enter> into the console panel.

If ticked, put the passed down values into the console panel.

Env variable and full documentation: see [MACRO_INPUT_MODE_4D](#)

macros.4d (run on new project) file box default macros.4d

*if non blank, the full path name of the file of macros that is run when **12d Model** creates a **new** project.*

Env variable and full documentation: see [RUN_MACROS_FILE_4D](#)

project_macros.4d (run on every project) file box default project_macros.4d

*If non blank, the full path name of the file of macros that is run when **12d Model** opens an existing project.*

Env variable and full documentation: see [RUN_PROJECT_MACROS_FILE_4D](#)

Projects > Details

Show project details on new project tick box

If ticked, the Edit Project Details panel is displayed when a new project is created.

Env variable and full documentation: see [SHOW_PROJECT_DETAILS_4D](#)

Validate project details on startup tick box default tick

If ticked, the Project Details are validated when a project is opened and the user can not continue until all the details validate. See [Details](#).

Env variable and full documentation: see [ALWAYS_VALIDATE_PROJECT_DETAILS_4D](#)

New project details file file box default

If non blank, the full path name of the file of project details file to use for new projects.

Env variable and full documentation: see [PROJECT_DETAILS_4D](#)

Projects > Reports

Amount of report header choice box no header, minimal header, full header

controls the amount of header information in reports.

Env variable and full documentation: see [REPORT_HEADER_4D](#)

Printer script file box

If non blank, points to a script or program which is fired up whenever a report is generated.

Env variable and full documentation: see [PRINTER_4D](#)

Projects > Sharing

Auto sync tins tick box default off

if ticked, the server projects for any shared tins added to this project are checked to see if they have been modified (checked every SHARE_CHECK_INTERVAL seconds). If any tins have been modified, they are re-copied to this project.

Env variable and full documentation: see [AUTO_TIN_SYNC_4D](#)

Auto sync models tick box default off

if ticked, the server projects for any shared models added to this project are checked to see if they have been modified (checked every SHARE_CHECK_INTERVAL seconds). If any models have been modified, they are re-copied to this project.

Env variable and full documentation: see [AUTO_MODEL_SYNC_4D](#)

Interval to check for updates positive integer default 0

if non zero, the number of seconds between checks to see if any of the shared tins or models added to the project have been modified.

Env variable and full documentation: see [SHARE_CHECK_INTERVAL_4D](#)

Share locking folder folder box default inside project

if non blank, the full path name of the folder used to keep lock files for shares.

Env variable and full documentation: see [SHARE_LOCKS_FOLDER_4D](#)

Colour for shared elements in list boxes colour box default blue

if non blank, the colour to use for showing shared tins/models in a list of tins/models. That is, the tins/models that have been added to the project as shared tins/models are shown in this colour. Setting the colour to black will disable this feature.

Env variable and full documentation: see [SHARED_ELEMENT_COLOUR_4D](#)

Colour for sharing elements in list boxes colour boxdefault 255,165,0

if non blank, the colour to use for showing tins/models that are allowed to be shared in a list of tins/models. That is, those tins/models in the project that the user has allowed others to share are shown in this colour. Setting the colour to black will disable this feature.

Env variable and full documentation: see [SHARING_ELEMENT_COLOUR_4D](#)

Sharing map file file box default none

If non blank, the full path name of the map file to be applied to shared models.

Env variable and full documentation: see [SHARE_MAP_FILE_4D](#)

Projects > Trash bin

Use trash bin tick box default tick

if ticked, any deleted models or tins, or cleaned models, are placed in the Trash bin.

Env variable and full documentation: see [USE_TRASH_BIN_4D](#)

Days before auto purge positive integer default 0 (don't purge)

*the number of days before the Trash Bin is automatically purged of tins and models. If 0, the Trash Bin is **not** purged.*

Env variable and full documentation: see [PURGE_TRASH_DAYS_4D](#)

Maximum trash bin size (Mb) positive integer default 0 (don't limit)
*maximum number of Mb that the trash file can be.
If 0, the Trash Bin is **not** limited in size.*

Env variable and full documentation: see [MAXIMUM_TRASH_SIZE_4D](#)

On overflowing trash bin Choice box Auto manage, auto empty default Auto manage
the action to take when the trash bin exceeds the maximum trash bin size.
*If **Auto manage**, the oldest files in the trash bin are deleted until the new item can fit in the trash bin.
if **Auto empty**, files in the trash bin are deleted.*
*Note - if a large model or tin is deleted and it is bigger than the maximum trash bin size, the user is
alerted and asked to decide if they want the element to go in the trash bin anyway, or if they want to
permanently delete it.*

Env variable and full documentation: see [OVERFLOWING_TRASH_MODE_4D](#)

Projects > Workspace

New project workspace file file box default
if non blank, the full path name of the workspace file for new projects.
Env variable and full documentation: see [WORKSPACE_FILE_4D](#)

Always show new toolbars tick box default
*if ticked, when a project starts up, all the toolbars are checked to see if they are listed in the workspace
(visible or invisible) and if the toolbar does not exist, then the toolbar will be displayed. This is to allow
any new toolbars added to toolbars.4d to be automatically displayed so that the user knows that it
exists.*
Env variable and full documentation: see [NEW_TOOLBARS_VISIBLE_4D](#)

Dongles

Dongles > General

Dongle order choice box Hardlock/Wibu, Wibu/Hardlock
*the order to search for network dongles. All new dongles are Wibu so most sites now only have Wibu
dongles.*
Env variable and full documentation: see [DONGLE_ORDER_4D](#)

Time dongle access positive integer
time between searches for a dongle
Env variable and full documentation: see [DEBUG_DONGLE_ACCESS_4D](#)

Nodes file file box default nodes.4d
*if non blank, the full path name of the **12d Model** authorization file.*
Env variable and full documentation: see [AUTHORIZATION_4D](#)

Dongles > Wibu

User wibu dongle tick box
*if **ticked**, search for 12d Wibu dongles*

If **not ticked**, don't search for Wibu dongles

Env variable and full documentation: see [WIBU_4D](#)

Local choice box local, no local

if **local**, then a stand alone Wibu dongle is looked for on the computer hat the user is on.

If **no local**, then no stand alone Wibu dongle is looked for on the computer

Env variable and full documentation: see [WIBU_DONGLE_4D](#)

Network choice box no network, network first, network last

if **no network**, then no Wibu network dongle is looked for:

If **network first**, then a Wibu network dongle is looked for before a single user local dongle.

If **network last**, then a Wibu network dongle is looked for after looking for a single user local dongle.

Env variable and full documentation: see [WIBU_DONGLE_4D](#)

Login retries positive integer

number of retries to find a Wibu dongle

Env variable and full documentation: see [WIBU_DONGLE_4D](#)

Login wait positive integer

time in seconds to wait between Wibu dongle retries

Env variable and full documentation: see [WIBU_DONGLE_4D](#)

Disable dongle tick box

if **ticked**, don't search for a Wibu dongle

if **not ticked**, search for a Wibu dongle

Env variable and full documentation: see [WIBU_DONGLE_4D](#)

Wibu IP/Name addresses

if **non blank**, a list of IP addresses and/or computer names to search for a 12d Wibu network dongle.

The items in the list are separated by commas

If **blank**, search the entire network for a 12d Wibu network dongle

Env variable and full documentation: see [WIBU_IPADDR](#)

Dongles > Hardlock

User hardlock dongle tick box

if **ticked**, search for 12d Hardlock dongles

If **not ticked**, don't search for Hardlock dongles

Env variable and full documentation: see [HARDLOCK_4D](#)

Local choice box local, no local

if **local**, then a stand alone Hardlock dongle is looked for on the computer that the user is on.

If **no local**, then no stand alone Hardlock dongle is looked for on the computer

Env variable and full documentation: see [DONGLE_4D](#)

Network choice box no network, network first, network last

if **no network**, then no Hardlock network dongle is looked for:

If **network first**, then a Hardlock network dongle is looked for before a stand alone local dongle.

If **network last**, then a Hardlock network dongle is looked for after looking for a stand alone local dongle.

Env variable and full documentation: see [DONGLE_4D](#)

Login retries	positive integer	
<i>number of retries to find a Hardlock dongle</i>		
<i>Env variable and full documentation: see DONGLE_4D</i>		
Login wait	positive integer	
<i>time in seconds to wait between Hardlock dongle retries</i>		
<i>Env variable and full documentation: see DONGLE_4D</i>		
Disable dongle	tick box	
<i>if ticked, don't search for a Hardlock dongle</i>		
<i>if not ticked, search for a Hardlock dongle</i>		
<i>Env variable and full documentation: see DONGLE_4D</i>		
Debug dongle	tick box	
<i>if ticked, write out Hardlock dongle debug information</i>		
<i>Env variable and full documentation: see DONGLE_4D</i>		
Hardlock IP/Name addresses		
<i>if non blank, a list of IP addresses and/or computer names to search for a 12d Hardlock network dongle. The items in the list are separated by commas</i>		
<i>If blank, search the entire network for a 12d Hardlock network dongle</i>		
<i>Env variable and full documentation: see HLS_IPADDR</i>		

Elements

Elements > Rasters

Use image server	tick box	
<i>If ticked</i>		
<i>Environment variable</i>	USER_IMAGE_SERVER_4D	
Use ECW server	tick box	
<i>If ticked</i>		
<i>Environment variable</i>	USER_ECW_SERVER_4D	

Elements > Strings

Use new strings create	tick box	
<i>If ticked then the String Creates are for super strings.</i>		
<i>If not ticked, the String Creates are the non-super string creates.</i>		
<i>Environment variable</i>	NEW_STRING_CREATES_4D	
Super strings ?	tick box	default tick
<i>if ticked, super strings are allowed.</i>		
<i>If not ticked super strings are not allowed.</i>		
<i>Environment variable</i>	SUPER_STRINGS_4D	
Only use super string	tick box	default no tick
<i>if ticked, only super strings are created by all options.</i>		
<i>Environment variable</i>	SUPER_STRINGS_4D	
Always user Super Strings advanced mode	tick box	default no tick

if ticked, the super string editor always comes up in the Advanced mode with all options available.

Environment variable SUPER_ADVANCED_MODE_4D

Use speed tables tick box default tick

if ticked, speed tables are enabled.

If not ticked, speed tables are not allowed.

Environment variable SUPER_STRINGS_4D

Alignment VG Corridor fixup tick box default tick

if ticked, alignment corridor calculations introduced in V8 are used.

If not ticked, the V7 alignment corridor calculations are used.

Env variable and full documentation: see [ALIGNMENT_CORRIDOR_FIXUP_4D](#)

Use bisector section tick box default no tick

at a HIP with no curve on it, either two sections can be applied at the HIP point or just a single bisector section applied to the bisector of the change of angle through the HIP.

If ticked, the bisector section is used.

If not ticked, two sections will be created at the HIP.

Env variable and full documentation: see [BISECTORS_4D](#)

Weed Tolerance positive real

Used in Alignment and Super strings so that when arcs have been chord-to-arc'd, the resulting points are weeded so that no point is closer than the weed tolerance. Is also used in Apply and Apply Many so that no cross sections are closer than the weed tolerance.

Env variable and full documentation: see [WEED_TOLERANCE_4D](#)

Polyline draw choice box don't use speed ups
intermediate speed ups
faster speed ups

Different methods that speed up drawing of polylines.

Env variable and full documentation: see [POLYPOLYLINES_4D](#)

Elements > Tins

Tin viewport clip tick box shipped env.4d has this ticked

If ticked then some experimental techniques for speeding up the drawing of tins, fast contours is used.

Env variable and full documentation: see [TIN_VIEWPORT_CLIP_4D](#)

Pre*postfix for model for tin text box default is "tin "

This environment variable is used to customize the default model for the tin in the panels for creating triangulations. Text can be defined for prepending and/or appending to the tin name to create a default model name from the tin name.

*The text for prefixing and postfixing is given in a special form: **pre-text*post-text***

If pretext only, just give the text. If post text is required, precede it by a "".*

If the environment variable is not set, the default "tin " is used.

Env variable and full documentation: see [MODEL_FOR_TIN_PREFIX_4D](#)

Allow exact calculations for super tins tick box

Options using tins are split into two categories:

- (1) options that require sections through tins
- (2) options that require the triangles of the tin

if ticked, this allows super tins to be used in options where triangles are required for calculations.

if not ticked, this prevents super tins to be used in options where triangles are required for calculations.

Note: ticking this option requires super tins to be updated when a tin within the super tin changes, so there is a time, storage, and memory cost. It was found that some projects only ever required options that used sections (not triangles), so for these type of projects, there is an efficiency gain by turning off this option.

Env variable and full documentation: see [ALLOW_SUPER_TINS_EXACT_CALCS_4D](#)

Elements > Selects

Autopan on selects tick box default tick

if ticked, if you have accepted but not accepted a string and are zoomed in on the strings and type **ch** value where the position at that chainage is off the view, the view will autopan so that the new selection point (at chainage value) is on the view. This applies for all typed selects.

Env variable and full documentation: see [AUTO_PAN_SELECT_4D](#)

Auto hide panel on selects tick box default not tick

if ticked, when the string select icon is picked on a panel, the panel minimises until a string is selected and accepted.

Env variable and full documentation: see [AUTO_HIDE_PANEL_SELECTS_4D](#)

Pick only on selects tick box

if ticked,

Env variable and full documentation: see [PICK_ONLY_ON_SELECTS_4D](#)

Display all string at snap tick box

if ticked,

Env variable and full documentation: see

CAD

Fast accept tick box

If ticked, the **Fast Accept** snap (**A** snap) is turned on by default for new projects.

If Fast Accept (**A** snap) is on, when an item is picked and there is one item in the selection list, then the item is automatically accepted without clicking MB.

Env variable and full documentation: see [FAST_ACCEPT_4D](#)

Fast Construction snap tick box

If ticked, the **Fast Construction** snap (**K** snap) is turned on by default for new projects.

Env variable and full documentation: see [FAST_CONSTRUCTION_SNAP_4D](#)

Never snap to self tick box default tick

If ticked, the software tries to stop snapping to itself during editing.

Env variable and full documentation: see [NEVER_SNAP_ITSELF_4D](#)

Construction snaps model

If non blank, the model to use for objects created during construction snaps.

Env variable and full documentation: see [CONSTRUCTION_SNAP_MODEL_4D](#)

Plan height max real value box default 0

set the default value to use in Plan Settings panels that have a Height max (w) field.

Env variable and full documentation: see [HEIGHT_MAX_DEFAULT_4D](#)

Plotting

Plotting > General

Plan plot scale 1: real box default blank

if non blank, the default plot scale to be used on any new plan views.

Note that the scale is used in the plan view for displaying text, linestyles and symbols defined in paper units.

Env variable and full documentation: see [DEFAULT_PLAN_PLOT_SCALE_4D](#)

Show title variables choice box as blank
as \$variable
no substitution

*this is used for debugging the title block file. Default is **as blank**.*

*If **as blank**, any \$variable not used is left as blank.*

*If **as \$variable**, any \$variable not used is shown as \$variable.*

*If **no substitution**, all \$variable are plotted with no substitution.*

Env variable and full documentation: see [SHOW_TITLE_VARIABLES_4D](#)

Symbol file for long and x-sections file box default *plotsymb.4d*

if non blank, the full path name of the plot symbols file.

Env variable and full documentation: see [PLOT_SYMBOLS_4D](#)

Plotter script file box

If non blank, points to a script or program which is fired up whenever a plot is generated.

Env variable and full documentation: see [PLOTTER_4D](#)

User plotters file box default *plotters.4d*

if non blank, the full path name of the file containing the definitions of plotters.

Env variable and full documentation: see [PLOTTERS_4D](#)

Plotter mapping file file box default *pmf.4d*

if non blank, the full path name of the file used as the default plotter mapping file.

Env variable and full documentation: see [PLOTTER_MAPPING_4D](#)

Sheet sizes file file box default *sheets.4d*

if non blank, the full path name of the file defining the plot sheet sizes.

Env variable and full documentation: see [SHEET_SIZES_4D](#)

DGN plot seed file file box

if non blank, the full path name of the file to use as a seed file for Microstation plots.

Env variable and full documentation: see [DGN_PLOT_SEED_FILE_4D](#)

DWT plot template file file box

if non blank, the full path name of the file to use as a template file for AutoCAD plots.

Env variable and full documentation: see [DWG_PLOT_SEED_FILE_4D](#)

Acad plot unit choice box English, Metric

Env variable and full documentation: see [DWG_PLOT_UNIT_FILE_4D](#)

Use title blocks in 12a format tick box default tick

if ticked, the title block file is in 12d Ascii format.

If not ticked, the title block is in the pre V7 title block .tf format

Env variable and full documentation: see [V7_TITLE_BLOCKS_4D](#)

Use hardware arcs tick box default tick

if ticked, use computer hardware to draw arcs (rather than software).

If not ticked, draw arcs in software

Env variable and full documentation: see [HARDWARE_ARCS_4D](#)

Write all plot parameters tick box default tick

Only used in old Plot options using (ascii) ppf files which have been superseded by binary ppf files. The panels have a Plot parameters write field to write out an ascii ppf for the plot.

If ticked, when writing out an (ascii) ppf files, write out all plot parameters.

If not ticked, only write out those plot parameters that have been used in the ppf file.

Env variable and full documentation: see [WRITE_ALL_PLOT_PARAMETERS_4D](#)

Show old plotting options tick box default tick

*If ticked, then a menu **Plot =>Old plotting** is included which has all the old Ascii ppf options.*

Env variable and full documentation: see [ALLOW_OLD_PLOTTING_4D](#)

Offset chainages to output window tick box default not tick

If tick,

Environment variable SPECIAL_OFFSET_CHAINAGES_4D

Plotting > Parameter files > Binary

Binary drainage plan parameter file file box default none

*if non blank, the full path name of the file used as the default binary plot parameter file (.drainplanppf) for the plan annotation produced by the panel **Drainage Plan Plot PPF Editor**.*

Env variable and full documentation: see [NEW_DRAINAGE_PLAN_PPF_4D](#)

Binary Melbourne Water parameter file file box default none

*if non blank, the full path name of the file used as the default binary plot parameter file (.melbppf) for the long section plot produced by the panel **Sewer Plot Melbourne Water PPF Editor**.*

Env variable and full documentation: see [NEW_DRAINAGE_MELB_PPF_4D](#)

Binary drainage parameter file file box default none

*if non blank, the full path name of the file used as the default binary plot parameter file (.drainppf) for the long section plot produced by the panel **Drainage Plot PPF Editor**.*

Env variable and full documentation: see [NEW_DRAINAGE_PPF_4D](#)

Binary pipeline parameter file file box default none

if non blank, the full path name of the file used as the default binary plot parameter file (.pipelineppf)

Env variable and full documentation: see [NEW_PIPELINE_PPF_4D](#)

*if non blank, the full path name of the file used as the default binary plot parameter file (.plotframeppf) for the long section plot produced by the panel **Section Long Plot PPF Editor**.*

if non blank, the full path name of the file used as the default binary plot parameter file (.lplotppf) for the plan plot produced by the panel **Plot Frame PPF Editor**.

*if non blank, the full path name of the file used as the default binary plot parameter file (.xplotppf) for the cross section plot produced by the panel **Section X Plot PPF Editor**.*

if non blank, the full path name of the file used as the default ascii plot parameter file (.ppf) for the cross section plot produced by the panel **Cross Section Plot**.

if non blank, the full path name of the file used as the default ascii plot parameter file (.ppf) for the long section plot produced by the panel **Long Section Plot**.

*if non blank, the full path name of the file used as the default ascii plot parameter file (.ppf) for the drainage long section plot produced by the panel **New Plot Drainage Network**.*

if non blank, the full path name of the file used as the default ascii plot parameter file (.ppf) for the Melbourne Water long section plot produced by the panel **Melbourne Water Sewer Plot**.

If ticked, use Windows printers

Env variable and full documentation: see [WINDOWS_PRINTERS_4D](#)

Update document properties before printing tick box

If ticked,

Environment variable WINDOWS_PRINTER_SET_DOCUMENT_PROPERTIES_4D

Windows 2000/XP print dialog tick box

If ticked, PrintDlgEX.

If not ticked, PrintDlg

Env variable and full documentation: see [WINDOWS_PRINT_MODE_4D](#)

Use exclusive access to printer tick box

If ticked, force direct printing to the printer (the user may need Printer admin access).

Env variable and full documentation: see [WINDOWS_PRINT_MODE_4D](#)

Use intermediate print file tick box

If ticked, print to a file first and then submit the file to the printer.

Env variable and full documentation: see [WINDOWS_PRINT_MODE_4D](#)

Raster resolutions dots/inch real value box default 150.0

number of dots per inch to use for plotting rasters

Env variable and full documentation: see [DEFAULT_RASTER_DPI_4D](#)

Maximum time for Pdf995 (seconds) positive integer

the number of seconds to wait for PDF995 to finish producing the current PDF file.

Env variable and full documentation: see [PDF995_TIME_LIMIT_4D](#)

Windows printer resolution dots/mm choice box Windows 95/98/Me
Windows 2000/XP

For Windows 95, 98 and ME, the printer resolution can only be 0.04 mm when covering an A0 sheet.

Under Windows NT, 2000 and XP, no such restriction exists and the full resolution of 0.01 mm can be used so the environment variable HIMETRIC_4D allows access to the higher resolution for Windows NT, 2000 and XP.

Env variable and full documentation: see [HIMETRIC_4D](#)

Survey

Ignore extra tabs in field files tick box

If ticked, trailing tabs are not considered words in a field file. Mainly for Leica when writing a format file which can't suppress trailing tabs when writing a 12d Field file.

Env variable and full documentation: see [FLD_IGNORE_EXTERA_WORDS_4D](#)

Display commands in SDR Editor as per V8 tick box

If ticked,

Environment variable SDR_DISPLAY_V8_FORMAT_4D

Allow named point attributes tick box

If ticked,

Environment variable ALLOW_NAMED_POINT_ATTRIBUTES_4D

Data collectors file file box default survey.4d

if non blank, the full path name of the file of definitions of available data collectors.

Env variable and full documentation: see [DATA_COLLECTORS_4D](#)

Data collectors choice box data collectors in survey.4d

the data collector that is used if no data collector has been set for a project, and the default data collector that is used in the Survey Data Setup panel.

Env variable and full documentation: see [DATA_COLLECTOR_4D](#)

Station prefix text box

the Station prefix to user if no Station prefix has been set for a project, and the default Station prefix that is used in the Survey Data Setup panel.

Env variable and full documentation: see [STATION_PREFIX_4D](#)

DMS entry, treat 0.123 as 12 minutes 03 seconds tick box

if ticked, the special case of 0.mms is interpreted as mm minutes and s seconds. That is, 0.123 is interpreted as 12 minutes and 3 seconds.

If not ticked, the special case of 0.mms is interpreted as mm minutes and 10 x s seconds. That is, 0.123 is interpreted as 12 minutes and 30 seconds.

Env variable and full documentation: see [INTERPRET_DMS_INPUT_OLD_4D](#)

Drainage

Drainage flows direction same as string direction tick box

If ticked, the drainage flow direction is the same as the string direction.

If not ticked, the drainage flow direction is in the opposite direction to the string direction.

Env variable and full documentation: see [DRAINAGE_FLOW_DIR_4D](#)

Show old grading edit options tick box

If ticked, the grading options used before V8 are still in the Drainage editor.

Environment variable DRAINAGE_EDIT_GRADE_4D

Show full hydraulic report details tick box default not ticked

The rational hydraulic report contains hydrology data.

If ticked, the hydrology calculations for each catchment set (1 to 3) are written to the hydraulic report.

Env variable and full documentation: see [FULL_HYDRAULIC_REPORT_4D](#)

Label 150 and PVC pipes tick box default ticked

If ticked, the 150 PVC pipes are labelled on the drainage long section.

If not ticked, the 150 PVC pipes are not labelled on the drainage long section.

Env variable and full documentation: see [LABEL_PVC_150_PIPES_4D](#)

Drainage.4d file box default drainage.4d

*If non blank, the full path name of the file to use as the filed of **12d Model** drainage definitions.*

Env variable and full documentation: see [DRAINAGE_4D](#)

Views

Views > General

Prompt on close tick box

If ticked, when a view is closed/deleted, a prompt will ask for a confirmation of deleting/closing.

Env variable and full documentation: see [PROMPT_ON_VIEW_CLOSE_4D](#)

Default pan mode tick box default tick

If ticked, standard pan is used for pan/pans on view.
If not ticked, pane delta is used for pan/pans on view.

Env variable and full documentation: see [PAN_MODE_4D](#)

Zoom origin dynamic tick box default not tick

Controls the origin of the dynamic zoom.

If ticked, then the point selected in the view to indicate which view to dynamically zoom (and to be the zoom-in, zoom-out definition point) becomes the point to dynamically zoom about.

Whilst the dynamic zoom is running, another point can be selected to become the new zoom origin.

Env variable and full documentation: see [ZOOM_ORIGIN_DYNAMIC_4D](#)

Zoom pan dynamic tick box default not tick

*If tick then **dynamic pan** is the default for the pan options.*

Env variable and full documentation: see [ZOOM_PAN_DYNAMIC_4D](#)

Icons on views tick box default tick

If ticked then icons instead of text are used for menu items on the views.
If not ticked, text is used for menu items on the views.

Env variable and full documentation: see [VIEW_BITMAP_BUTTONS_4D](#)

Show views buttons tick box default tick

If ticked then menu items (view buttons) are displayed on the views (as icons or text).
If not ticked, menu items (view buttons) on not displayed on the views.

*Note: displaying view buttons as icons or text is controlled by **Icons on views**.*

Env variable and full documentation: see [VIEW_BUTTONS_4D](#)

Data tool tips tick box default tick

*If ticked then data tips can be displayed when the cursor moves over vertices in a plan view. The **D** snap is then operational and toggles the data tips on and off in a 12d session.*
*If not ticked, data tips will not be displayed and **D** snap has no effect.*

Env variable and full documentation: see [DATA_TIPS_4D](#)

Default view colour colour box default black

The default background colour for views. After a view is created, its background colour can then be modified and the new colour is saved for that view.

Env variable and full documentation: see [DEFAULT_VIEW_COLOUR_4D](#)

Preview view name text box default blank

if non blank, the name of the view whose image is dumped on exiting the project. The image is used as the project preview.
If blank then the last active view is used.

Env variable and full documentation: see [PREVIEW_VIEW_4D](#)

Views > OpenGL



View backing store choice box off, on

*if **on**, a backing store is used.*

*if **off**, a backing store is not used.*

For Window Vista/Windows 7, the default is on. Otherwise the default is 0.

Env variable and full documentation: see [OPENGL_VIEW_BACKING_STORE_4D](#)

Use offset tick box default tick

If ticked, the coordinates are localised for OpenGL calls. This is to work around problems with some graphics cards that can't handle large coordinates.

Env variable and full documentation: see [OPENGL_OFFSET_4D](#)

Cache tins tick box default not ticked

If ticked, tins are cached in the graphics card memory for potential speed ups. More memory in the graphics card allows more caching and usually more performance gains.

Env variable and full documentation: see [OPENGL_CACHE_TINS_4D](#)

Cache rasters and textures tick box default ticked

If ticked, rasters and textures are cached in the graphics card memory for potential speed ups. More memory in the graphics card allows more caching and usually more performance gains.

Env variable and full documentation: see [OPENGL_CACHE_4D](#)

Use mipmaps for rasters tick box default tick

If ticked, the graphics card down samples for rasters when the image is further away.

Env variable and full documentation: see [OPENGL_MIPMAP_4D](#)

Use mipmaps for billboards tick box

If ticked, the graphics card down samples for billboards when the image is further away.

Env variable and full documentation: see [OPENGL_MIPMAP_BILLBOARDS_4D](#)

Use mipmaps for plan images tick box default ticked

If ticked, the graphics card down samples plan images when draped onto a tin.

Env variable and full documentation: see [OPENGL_MIPMAP_PLAN_IMAGES_4D](#)

Use mipmaps for projector images tick box default ticked

If ticked, the graphics card down samples projector images (a projector is for the "hidden" perspective image data object of a super string).

Env variable and full documentation: see [OPENGL_MIPMAP_PROJECTOR_IMAGES_4D](#)

GUI

GUI > General

Width of edit fields (number of characters) text box default 10

if non blank, the number of characters to make the width of an Edit Box on a panel.

Env variable and full documentation: see [EDIT_BOX_WIDTH_IN_CHARACTERS_4D](#)

Show help buttons tick box

If ticked, Help buttons are added to panels.

Env variable and full documentation: see [HELP_BUTTONS_4D](#)

Use lists for popups tick box

If ticked, the popup lists are scrolling lists.

If not ticked, the popups turn into walk-right menus when too long.

Env variable and full documentation: see [LIST_POPUPS_4D](#)

Use trees for linestyles and symbols tick box default tick

If ticked, the linestyle and symbol pop-up lists are in scrolling boxes so they don't run over the bottom of the screen. The list of linestyles/symbols is displayed in a tree structure with the Groups as the nodes of the tree.

If not ticked, the linestyle and symbols lists are one long list with each Group being an item on the list. The list may get too long to fit on the screen.

Env variable and full documentation: see [USE_NEW_LINESTYLE_LIST_BOX_4D](#)

Warp cursor hide tick box default not tick

Controls whether the cursor is hidden before moving - only needed on some computers.

If ticked, don't hide the cursor before moving it.

If not ticked, hides the cursor before moving it.

Env variable and full documentation: see [WARP_CURSOR_HIDE_4D](#)

Multi-line text edits tick box default not ticked

If ticked, a Text Edit Box is used instead of the Input Box and more than one line of text can be typed.

Env variable and full documentation: see [MULTI_LINE_TEXT_4D](#)

Colour widgets with errors tick box default ticked

*If ticked, when a panel field fails to validate, the panel field is filled with the colour given in the **Colour for failed widgets**.*

Env variable and full documentation: see [USE_VALIDATION_COLOURS_4D](#)

Colour for failed widgets colour box

If non blank, the colour to fill the panel field with when there is a validation error for the field. The value is either a colour name, a colour number or RGB(x,y,z).

*This is only used if **Colour widgets with errors** is ticked (or at least not ticked since the default is ticked).*

If blank, the default colour is RGB(255,72,72),

Env variable and full documentation: see [VALIDATION_FAIL_COLOUR_4D](#)

Xtra menu file file box default xtramenu.4d

if non blank, the full path name of the 12d Solutions supplied file of definitions for some extra menus.

Env variable and full documentation: see [EXTRA_OPTIONS_4D](#)

User options file file box default usermenu.4d

if non blank, the full path name of the user supplied file of definitions for user defined menus.

Env variable and full documentation: see [USER_OPTIONS_4D](#)

Toolbars file file box default toolbars.4d

if non blank, the full path name of the toolbar definitions and names.

Env variable and full documentation: see [TOOLBARS_4D](#)

Delete walkrights distance positive integer default 32

The distance in pixels that is used to collapse the cascade of walk-right menus when the cursor moves that distance past the end of the last walk-right menu.

rag reset distance	positive integer	default 50
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Env variable and full documentation: see [AUTO RESET SELECT DRAG TOLERANCE 4D](#)

The distance in pixels to move the cursor to reset the picking rejection list for a non-directional pick. If blank then the value 5 is used.

Default table width	positive integer	default 5
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Env variable and full documentation: see [DEFAULT TABLE WIDTH 4D](#)

*if non blank, the pixel width of the linestyle and symbol scrolling pop-ups.
If blank, the default is 256.*

Linestyle/symbol box height number box

*if non blank, the pixel height of the linestyle and symbol scrolling pop-ups.
If blank, the default is 512.*

Env variable and full documentation: see [LINESIZE BOX HEIGHT 4D](#)
















On screen keyboard mode	choice box	<i>No keyboard</i> <i>Dockable keyboard</i> <i>Full screen keyboard</i>
--------------------------------	------------	-------------------------------------------------------------------------------

*if **No keyboard**, then no onscreen keyboard comes up when you double click in a panel field.*

if **Dockable keyboard**, when you double click in a panel field that takes typed input, then a dockable onscreen keyboard come up for the user to type the data for the panel field into.

*if **Full screen keyboard**, when you double click in a panel field that takes typed input, then a full screen onscreen keyboard come up for the user to type the data for the panel field into.*

Env variable and full documentation: see [ONSCREEN KEYBOARD 4D](#)

On screen keyboard layout	choice box	Full keyboard Numeric keyboard
	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>	<input type="radio"/>

if **Full keyboard**, then when there is an onscreen keyboard, it comes up with a full keyboard.

*if **Numeric keyboard**, then when there is an onscreen keyboard, it comes up with just a numeric keyboard.*

Env variable and full documentation: see [ONSCREEN KEYBOARD LAYOUT 4D](#)

if non blank, the pixel size of the font for the onscreen keyboard.

If blank, it defaults to the normal system font size.

Env variable and full documentation: see [ONSCREEN KEYBOARD FONT SIZE 4D](#)

GUI > Special characters

Large diameter symbol	<i>integer (base 10)</i>	default 216
<i>The integer (base 10) value of the character to use as the large diameter symbol.</i>		
<i>Env variable and full documentation: see DIAMETER_LARGE_CHARACTER_4D</i>		
Cubed symbol	<i>integer (base 10)</i>	default 179
<i>The integer (base 10) value of the character to use as the cubed symbol.</i>		
<i>Env variable and full documentation: see CUBED_CHARACTER_4D</i>		
Small diameter symbol	<i>integer (base 10)</i>	default 248
<i>The integer (base 10) value of the character to use as the small diameter symbol.</i>		
<i>Env variable and full documentation: see DIAMETER_SMALL_CHARACTER_4D</i>		
Middle dot	<i>integer (base 10)</i>	default 183
<i>The integer (base 10) value of the character to use as the middle dot symbol.</i>		
<i>Env variable and full documentation: see MIDDLE_DOT_CHARACTER_4D</i>		
Squared symbol	<i>integer (base 10)</i>	default 178
<i>The integer (base 10) value of the character to use as the squared symbol.</i>		
<i>Env variable and full documentation: see SQUARED_CHARACTER_4D</i>		
Degrees character	<i>integer (base 10)</i>	default 176
<i>The integer (base 10) value of the character to use as the degrees character.</i>		
<i>Env variable and full documentation: see DEGREES_CHARACTER_4D</i>		

GUI > MTF Editor

GUI > MTF Editor> General

Default MTF editor width	<i>number box</i>	default 750
<i>the value is the width in pixels of the MTF Left/Right Template Modifiers.</i>		
<i>Env variable and full documentation: see NEW_MTF_EDITOR_DEFAULT_WIDTH_4D</i>		
Default MTF editor height	<i>number box</i>	default 250
<i>the value is the height in pixels of the MTF Left/Right Template Modifiers.</i>		
<i>Env variable and full documentation: see NEW_MTF_EDITOR_DEFAULT_HEIGHT_4D</i>		
Default MTF editor zoom buffer (%)	<i>real box</i>	default 5
<i>the value is percentage.</i>		
<i>if Autopan is on for the MTF Left/Right Template Modifiers panel, then when a command is clicked on in the panel and the region to pan into is not displayed on the view, then the extent displayed it the required amount increased by the real_value percentage.</i>		
<i>Env variable and full documentation: see NEW_MTF_EDITOR_ZOOM_BUFFER_4D</i>		
Default MTF editor autopan on	<i>tick box</i>	default tick
<i>if ticked, the default for Autopan is on for the MTF Left/Right Template Modifiers panel.</i>		
<i>if not ticked, the default for Autopan is off for the MTF Left/Right Template Modifiers panel.</i>		

Env variable and full documentation: see [NEW_MTF_EDITOR_AUTOPAN_DEFAULT_4D](#)

GUI > MTF Editor> Fixed/Snipped/Decision Colours

Fixed colour colour box default blue

the colour of the text in the Type column for the Fixed commands in the MTF Left/Right Template Modifiers panel.

Env variable and full documentation: see [FIXED_ZONE_COLOUR_4D](#)

Fixed width colour colour box default light blue

the colour of the text in the Type column for the Fixed commands involving width, in the Modifiers section of the Left/Right Template Modifiers panel.

Env variable and full documentation: see [FIXED_WIDTH_ZONE_COLOUR_4D](#)

Fixed height colour colour box default dark blue

the colour of the text in the Type column for the Fixed commands involving height, in the Modifiers section of the Left/Right Template Modifiers panel.

Env variable and full documentation: see [FIXED_HEIGHT_ZONE_COLOUR_4D](#)

Fixed xfall colour colour box default dark blue

the colour of the text in the Type column for the Fixed commands involving xfall, in the Modifiers section of the Left/Right Template Modifiers panel.

Env variable and full documentation: see [FIXED_XFALL_ZONE_COLOUR_4D](#)

Snippet colour colour box default RGB(155, 140, 150)

the colour of the text in the Type column for the Snippet command in the Modifiers section of the Left/Right Template Modifiers panel.

Env variable and full documentation: see [SNIPPET_ZONE_COLOUR_4D](#)

Decision colour colour box default purple

the colour of the text in the Type column for the Decision commands in the Modifiers section of the Left/Right Template Modifiers panel.

Env variable and full documentation: see [DECISION_ZONE_COLOUR_4D](#)

GUI > MTF Editor> Cut/Fill Colours

Cut colour colour box default red

the colour of the text in the Type column for the Cut commands (other than those involving width, height or slope) in the Modifiers section of the Left/Right Template Modifiers panel.

Env variable and full documentation: see [CUT_ZONE_COLOUR_4D](#)

Cut width colour colour box default light red

the colour of the text in the Type column for the Cut commands involving width, in the Modifiers section of the Left/Right Template Modifiers panel.

Env variable and full documentation: see [CUT_WIDTH_ZONE_COLOUR_4D](#)

Cut height colour colour box default dark red

the colour of the text in the Type column for the Cut commands involving height, in the Modifiers section of the Left/Right Template Modifiers panel.

Env variable and full documentation: see [CUT_HEIGHT_ZONE_COLOUR_4D](#)

Cut slope colour colour box default dark red

the colour of the text in the Type column for the Cut commands involving slope, in the Modifiers section of the Left/Right Template Modifiers panel.

Env variable and full documentation: see [CUT_SLOPE_ZONE_COLOUR_4D](#)

Fill colour colour box default green

the colour of the text in the Type column for the Fill commands (other than those involving width, height or slope) in the Modifiers section of the Left/Right Template Modifiers panel.

Env variable and full documentation: see [FILL_ZONE_COLOUR_4D](#)

Fill width colour colour box default light green

the colour of the text in the Type column for the Fill commands involving width, in the Modifiers section of the Left/Right Template Modifiers panel.

Env variable and full documentation: see [FILL_WIDTH_ZONE_COLOUR_4D](#)

Fill height colour colour box default dark green

the colour of the text in the Type column for the Fill commands involving height, in the Modifiers section of the Left/Right Template Modifiers panel.

Env variable and full documentation: see [FILL_HEIGHT_ZONE_COLOUR_4D](#)

Fill slope colour colour box default dark green

the colour of the text in the Type column for the Fill commands involving slope, in the Modifiers section of the Left/Right Template Modifiers panel.

Env variable and full documentation: see [FILL_SLOPE_ZONE_COLOUR_4D](#)

GUI > MTF Editor> Final Colours

Final colour colour box default light brown RGB(147, 87, 28)

the colour of the text in the Type column for the Final commands (other than those involving width or slope) in the Modifiers section of the Left/Right Template Modifiers panel.

Env variable and full documentation: see [FINAL_ZONE_COLOUR_4D](#)

Final width colour colour box default dark brown

the colour of the text in the Type column for the Final commands involving width, in the Modifiers section of the Left/Right Template Modifiers panel.

Env variable and full documentation: see [FINAL_WIDTH_ZONE_COLOUR_4D](#)

Final cut colour colour box default light brown

the colour of the text in the Type column for the Final command for Final Cut slope, in the Modifiers section of the Left/Right Template Modifiers panel.

Env variable and full documentation: see [FINAL_CUT_SLOPE_ZONE_COLOUR_4D](#)

Final fill colour colour box default light brown

the colour of the text in the Type column for the Final command for Final Fill slope, in the Modifiers section of the Left/Right Template Modifiers panel.

Env variable and full documentation: see [FINAL_FILL_SLOPE_ZONE_COLOUR_4D](#)

Final no cut colour colour box default light brown

the colour of the text in the Type column for the Final command for No Cut slope, in the Modifiers

section of the Left/Right Template Modifiers panel.

Env variable and full documentation: see [FINAL_NO_CUT_SLOPE_ZONE_COLOUR_4D](#)

Final no fill colour colour box default light brown

the colour of the text in the Type column for the Final command for No Fill slope, in the Modifiers section of the Left/Right Template Modifiers panel.

Env variable and full documentation: see [FINAL_NO_FILL_SLOPE_ZONE_COLOUR_4D](#)

Final no cut/fill colour colour box default light brown

the colour of the text in the Type column for the Final commands for No cut/fill, in the Modifiers section of the Left/Right Template Modifiers panel.

Env variable and full documentation: see [FINAL_NO_CUT_FILL_SLOPE_ZONE_COLOUR_4D](#)

GUI > Boxing Editor

Boxing wall offset measure box default 0.000001

when boxing automatically creates a vertical wall, this is the offset distance between the top and bottom of the vertical wall.

Env variable and full documentation: see [BOXING_WALL_OFFSET_4D](#)

Rules colour colour box default blue

the colour of the text in the Type column in the Boxing Rules panel for all Boxing command other than Comment, Decision, Goto and Label.

Env variable and full documentation: see [BOXING_RULES_COLOUR_4D](#)

Comment colour colour box default yellow

background colour for the Comment boxing command grid row in the Boxing Rules panel. The text in the grid row is black.

Env variable and full documentation: see [BOXING_COMMENT_COLOUR_4D](#)

Decision/Goto colour colour box default mauve

the colour of the text in the Type column for the Decision and Goto commands in the Boxing Rules panel.

Env variable and full documentation: see [BOXING_DECISION_GOTO_COLOUR_4D](#)

Label colour colour box default light red

the colour of the text in the Type column for the Label command in the Boxing Rules panel.

Env variable and full documentation: see [BOXING_LABEL_COLOUR_4D](#)

Warnings and Error Reporting

Double confirm delete tick box default not tick

*If ticked, the user is asked twice to confirm for deletes and cleans.
If not ticked, the user is asked once to confirm for deletes and cleans.*

Env variable and full documentation: see [DOUBLE_CONFIRM_DELETE_4D](#)

Disable mtf warnings tick box

*If ticked, write mtf warnings to the background window.
If not ticked, display the mtf warnings in the text editor.*

Env variable and full documentation: see [DISABLE_MTF_WARNINGS_4D](#)

Crash log level	choice box	MiniDumpNormal MiniDumpWithDataSegs MiniDumpWithFullMemory MiniDumpWithHandleData MiniDumpFilterMemory MiniDumpScanMemory MiniDumpWithUnloadedModules MiniDumpWithIndirectlyReferencedMemory MiniDumpFiltureModulePaths MiniDumpWithProcessThreadData MiniDumpWithPrivateReadWriteMemory MiniDumpWithoutOptionalData
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Controls the amount of information written out if **12d Model** crashes.

Environment variable MINI_DUMP_LEVEL_4D

External Apps

External Apps > AutoCAD

Autocad template folder folder box
if non blank, the full path name of the folder holding Autocad template files.
Env variable and full documentation: see [ACAD_SEEDFILES_4D](#)

Acad pat file box
If non blank, the full path name of the AutoCAD patterns file.
Env variable and full documentation: see [AUTOCAD_PATTERNS_4D](#)

External Apps > CivilCAD

CivilCAD folder folder box
if non blank, the full path name of the folder holding CivilCAD files.
Env variable and full documentation: see [CIVILCAD_PATH_4D](#)

External Apps > Microstation

Microstation seed folder folder box
if non blank, the full path name of the folder of Microstation seed files.
Env variable and full documentation: see [MS_SEEDFILES_4D](#)

External Apps > TP Stakeout

TP Stakeout folder folder box
if non blank, the full path name of the folder of TP Stakeout files.
Env variable and full documentation: see [TP_STAKEOUT_PATH_4D](#)

External Apps > VPath

Vpath Windows folder folder box

if non blank, the full path name of the folder for the Queensland Main Road Windows program Vpath - for vehicle turning paths.

Env variable and full documentation: see [WINDOWS_VEHICLE_PATH_4D](#)

External Apps > Winter

Winter data folder folder box

if non blank, the full path name of the Folder containing the Winter data of N-values for Australia.

Env variable and full documentation: see [WINTER_DATA_4D](#)

Winter faster interpretation tick box default tick

if tick, re-reading the Winter data is avoided and this speeds up the calculation for the Winter interpolations.

Env variable and full documentation: see [WINTER_USE_NEW_METHOD_4D](#)

Variables

the Variables grid allows for the entry of 12d environment variables that have not been especially included in the Edit Environment Variables panel.

Variable **Value**

*The variable tab consists of a table for specifying environment variable names (**Variable**) and setting their values (**Value**).*

*This is mainly used for setting environment variables that are not already in the **Edit Environment Variables** panel.*

Env Configuration

Position of menu: Project =>Management =>Env configuration

The default **12d Model** system uses the 12d Solutions supplied **set_ups** and **library** folders in **Program files\12d\12d Model\10.0** and the user supplied folders **user** and **user_lib** in **c:\12d\10.00**.

There are **12d Model** environment variables in **env.4d** that can modify the location of each of these folders and most set up files, dongle to be used and the workspace file for new projects.

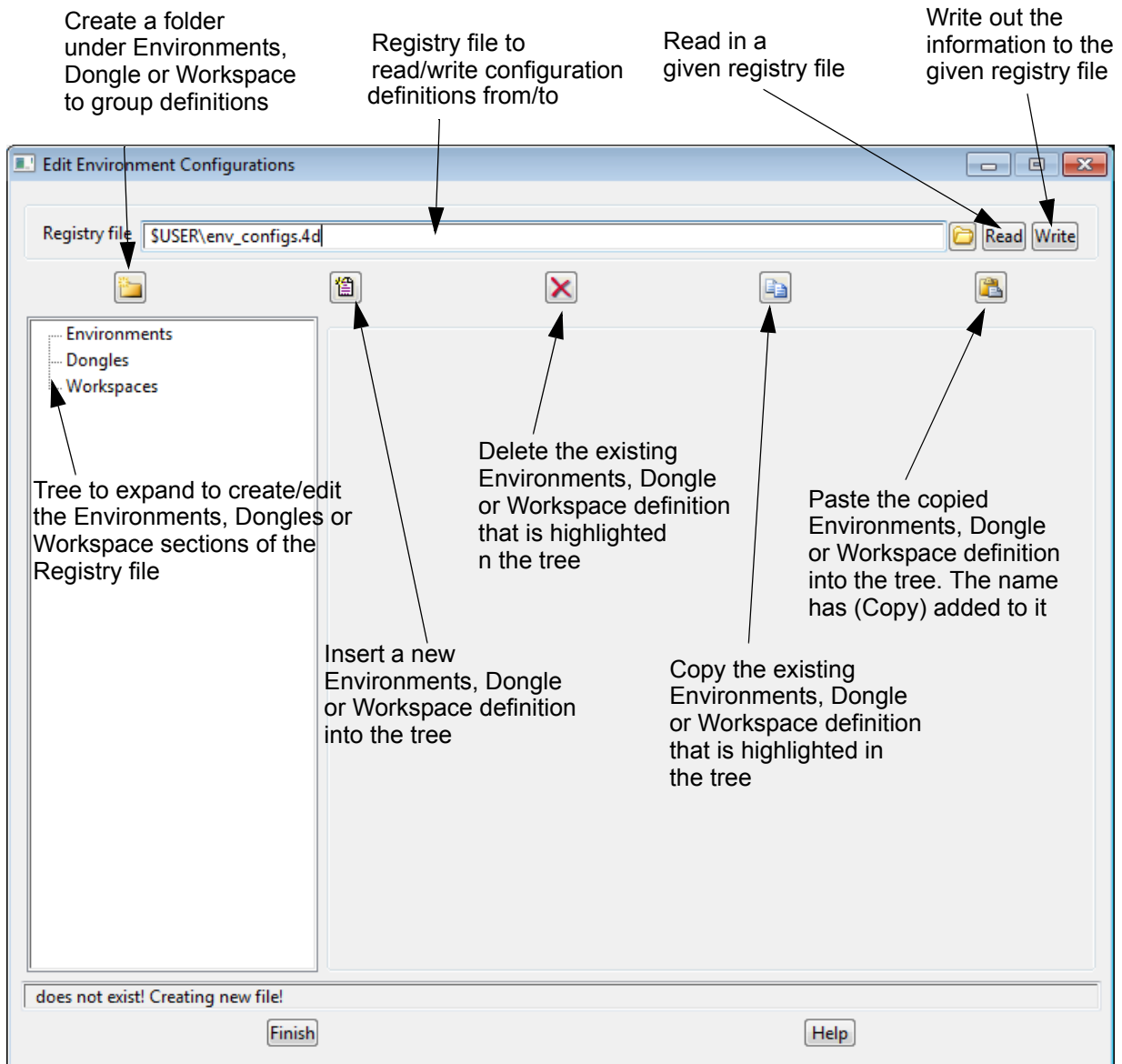
For most users this provides enough customisation however for users requiring totally different **user** and **user_lib** folders for different clients will find the above system too restricting.

For example, one project may be for a Main Roads Department which requires its own mapping files, linestyle files, ppf files etc. Another project is for a Local Authority who has totally different requirements.

Environment Configurations can

- (a) define the environment variable file **end.4d** to be used. Hence if different **env.4d** files have been set up for different clients, the environment configuration file quickly sets up that binding for a project.
- (b) define environment variables that over writes the values set up in the **env.4d** file being used for the project. Often a whole new env file is not required but just the replacement of some of the environment variables. For example, just override the location of the folders **user** and **user_lib** from those in the **env.4d** file being used.
- (c) define the computer with the network dongle to be used with the project. If used, this will override any settings in the env.4d file and values in Environments.
- (d) define the workspace file to be used for new projects. If used, this will override any settings in the env.4d file or values in *Environments*.

Selecting **Env configuration** displays the **Edit Environment Configuration** panel which defines the different Environment configurations, Dongle and Workspace settings.

**Buttons at Bottom**

grid

Write

button

*write out a Registry file***Read**

button

read in the registry file given in the Registry file field.

Each of the sections Environments, Dongles and Workspaces will now be described in greater detail.

For the section *Registry file*, go to
Environments
Dongles
Workspaces

[Creating/Editing a Registry File](#)

[Creating/Editing an Environments Set Up](#)

[Creating/Editing a Dongles Set Up](#)

[Creating/Editing a Workspaces Set Up](#)

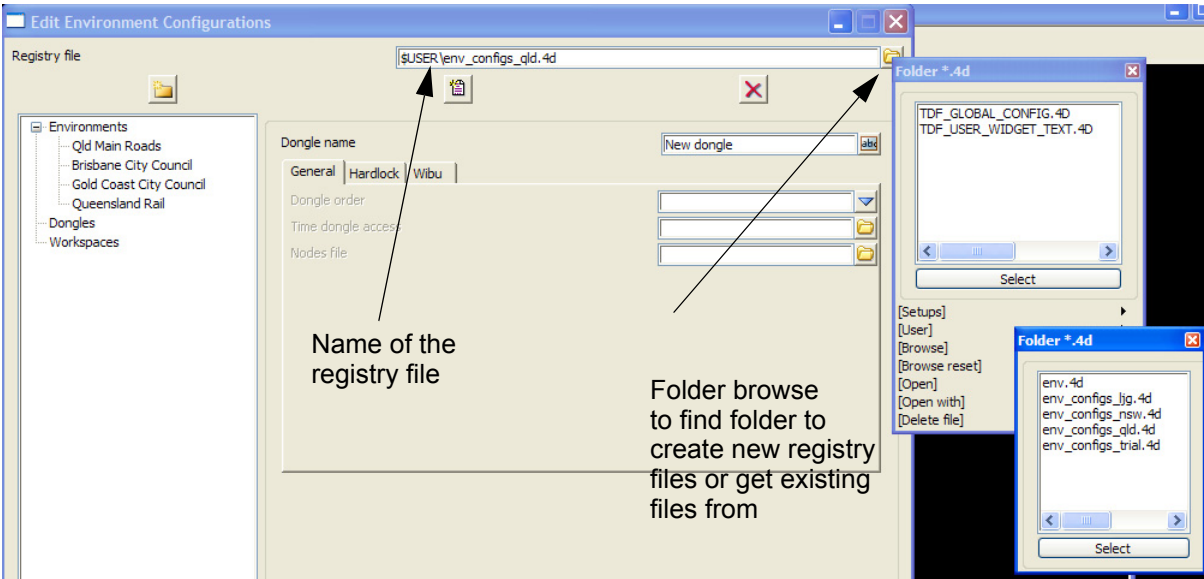
How To Use the Edit Environment Configurations Panel

Creating/Editing a Registry File

When the **Edit Environment Configurations** panel is opened, if no **env_configs.4d** file exists in the **User** folder for that project, a new blank **env_configs.4d** file is automatically created.

To create a **Registry file** of a different name, navigate to the folder to write the registry file to, type the registry file name into the **Registry file box** and hit <enter>. All the created information will be written away to this file when the **Write** icon is clicked on the **Edit Environment Configurations** panel.

The edit and modify a **new Registry file**, type in the path name or use the navigator on the **Registry file box** and select the required registry file. Clicking on the **Read** icon reads in the information from the selected registry file.



Each of the sections **Environments**, **Dongles** and **Workspaces** will now be described in greater detail.

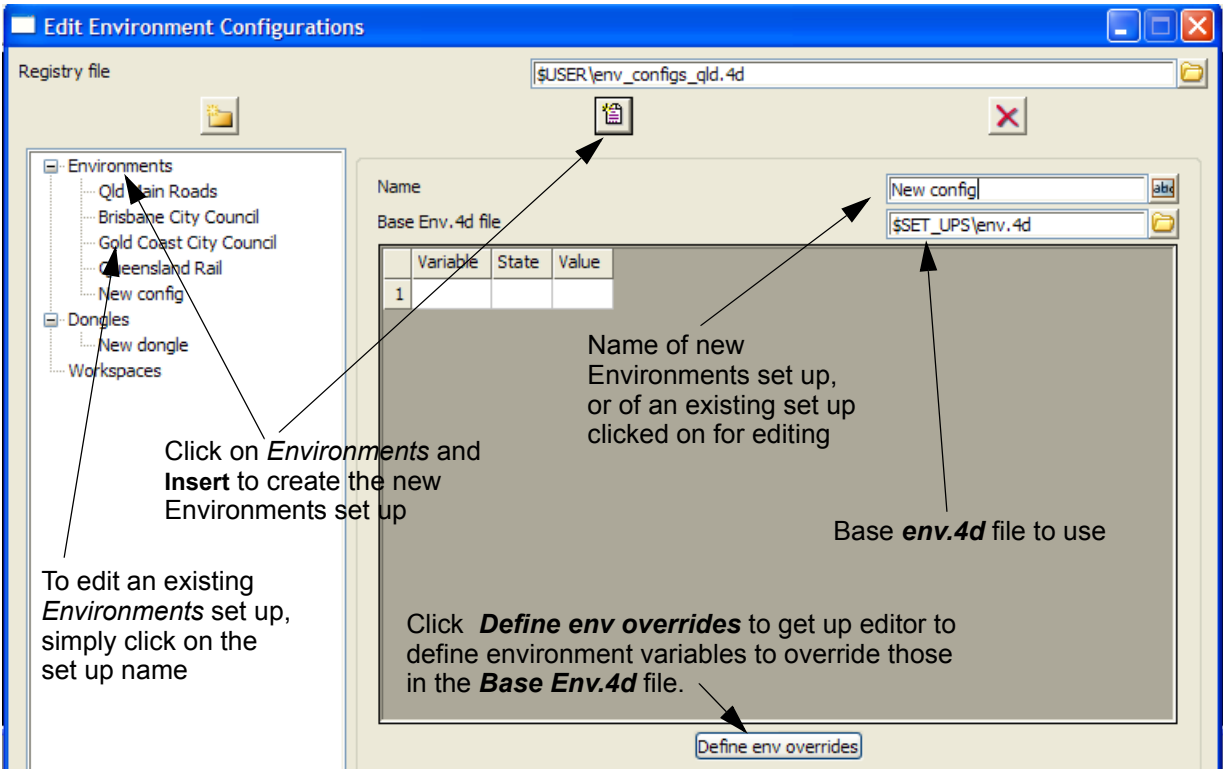
For the section *Environments*, go to [Creating/Editing an Environments Set Up](#)
Dongles [Creating/Editing a Dongles Set Up](#)
Workspaces [Creating/Editing a Workspaces Set Up](#)

Creating/Editing an Environments Set Up

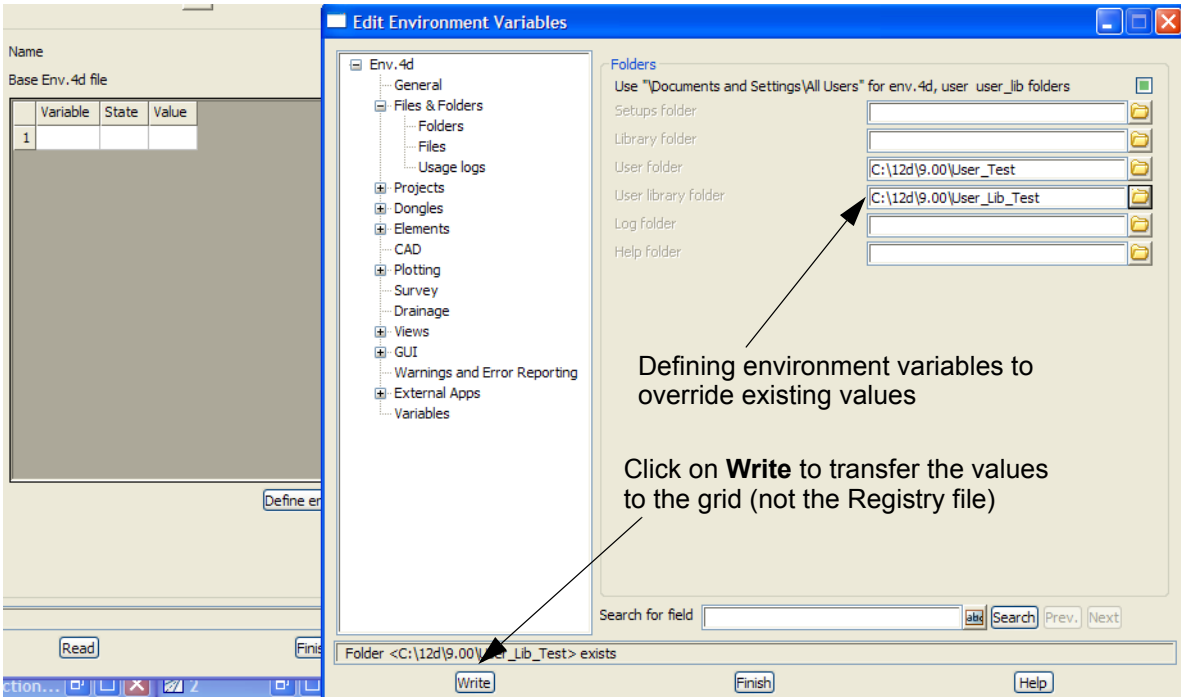
To create a new **Environments** set up, click on the **Environments** node and then on the **Insert** button.

To edit an existing **Environments** set up, simply click on the **name** of the set ups to be edited in the **Environments** section

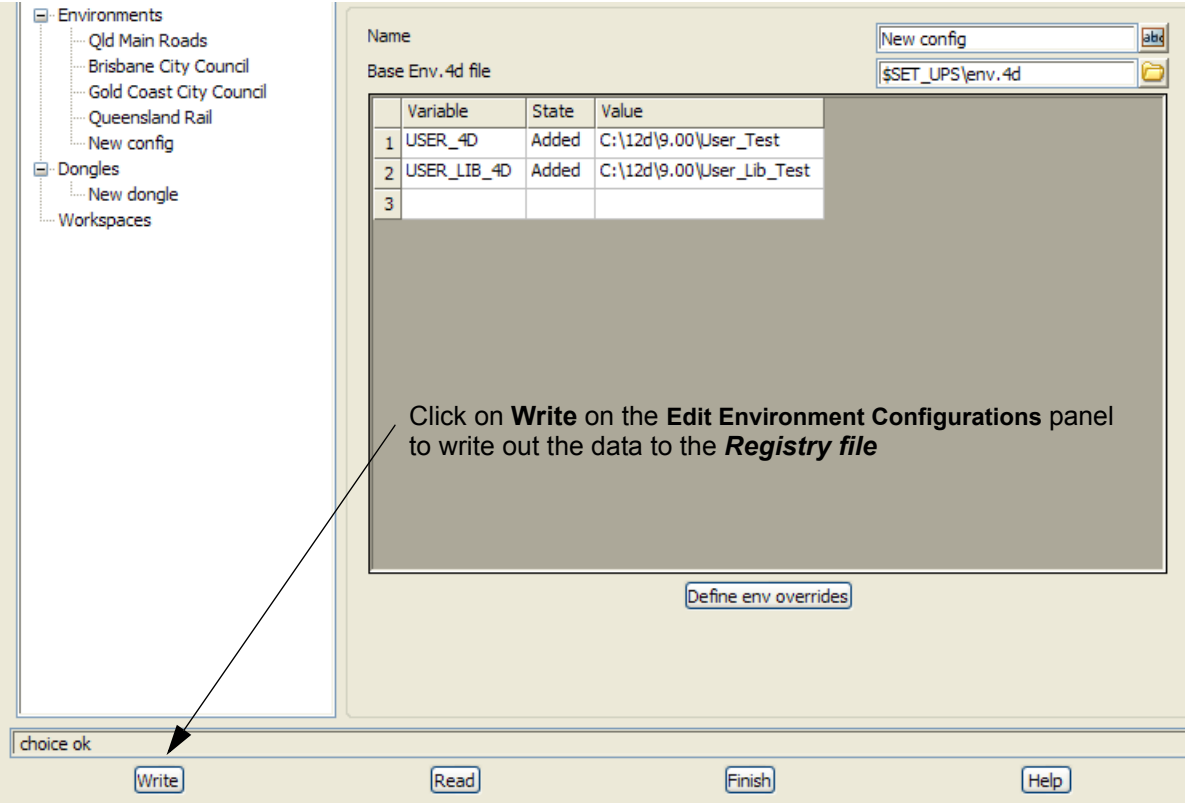
If the **Base Env.4d file** field is **blank**, then the default **env.4d** file is used for the project.
If the **Base Env.4d file** field is not blank, then it gives the (path) name of the file to use as the **env.4d** file.



Any environment variable can be overridden by typing its name and value into the grid, or by bringing up an environment variable editor by clicking on **Define env overrides** button and fill in the required values in the **Edit Environment Variables** panel that is brought up.

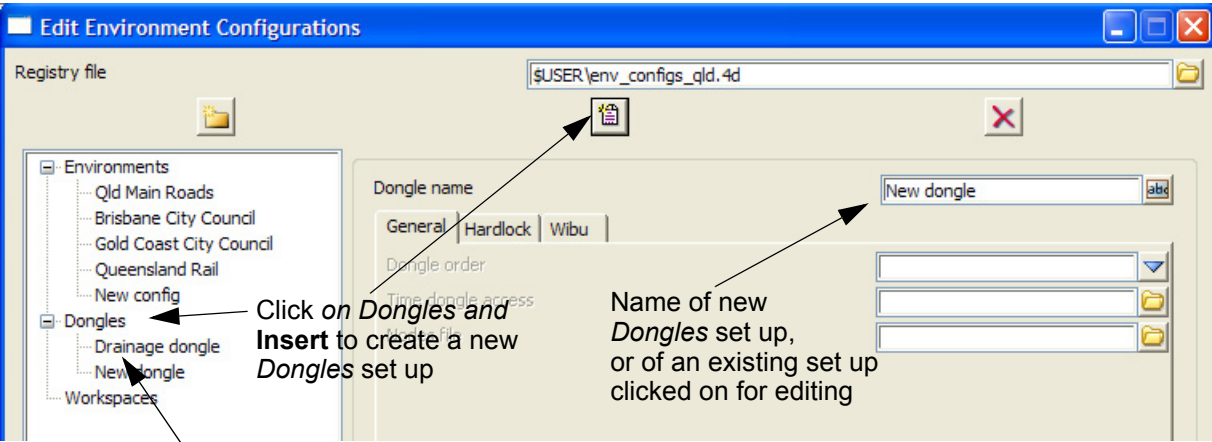


Clicking on **Write** in the **Edit Environment Configuration** panel writes out all the data for the sections *Environments*, *Dongles* and *Workspaces*, to the registry file.



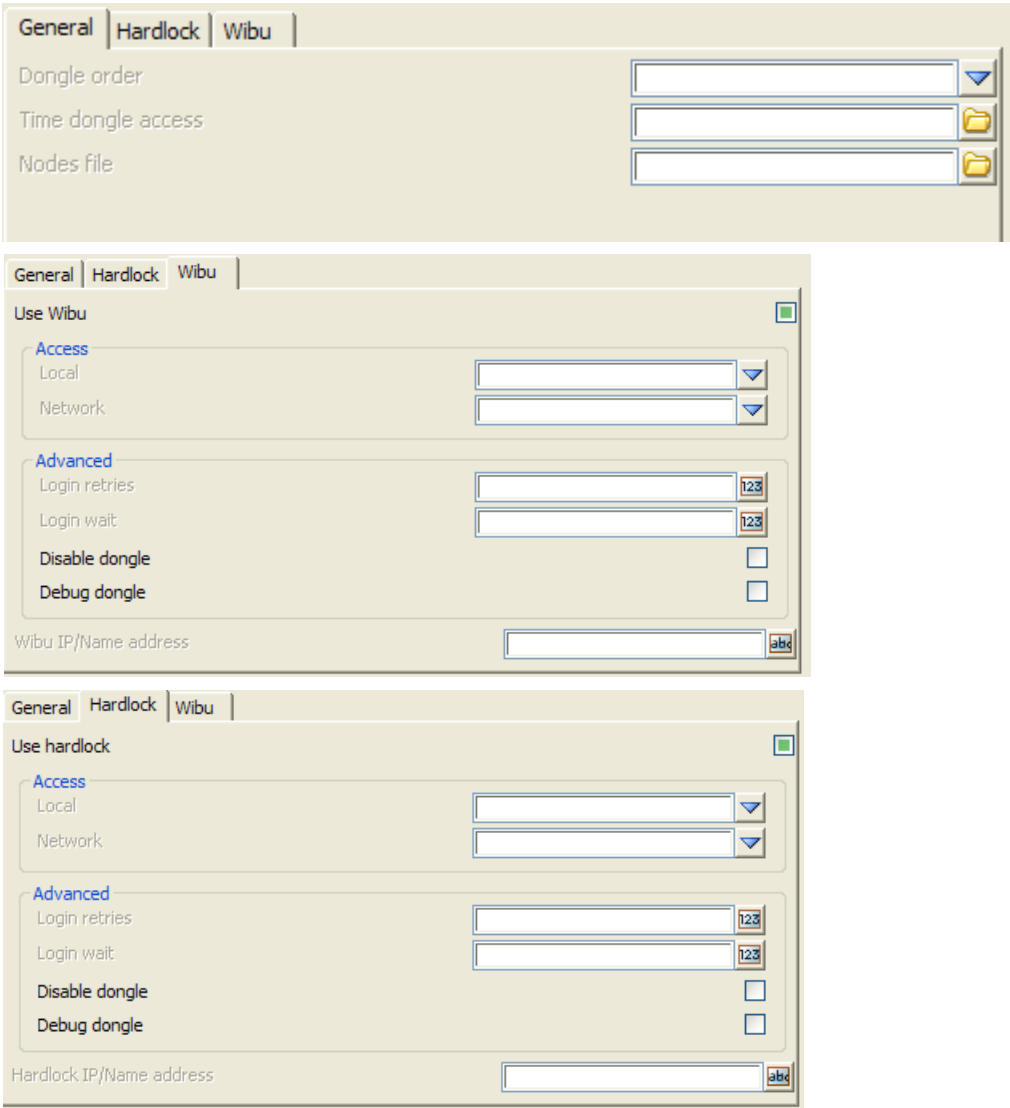
Creating/Editing a Dongles Set Up

To create a new **Dongle** set up, click on the *Dongles* node and then on the **Insert** button.
To edit an existing **Dongle** set up, simply click on the name of the **Dongle** set up to be edited.

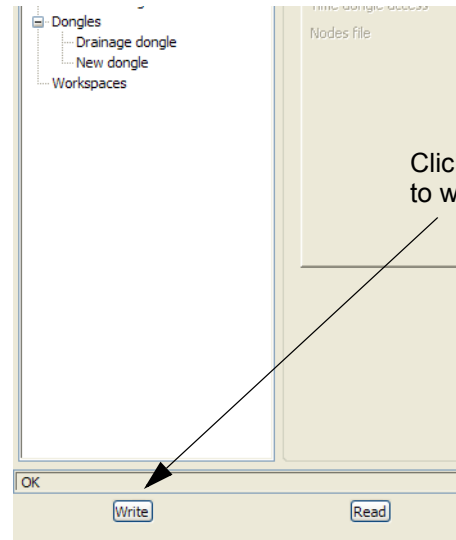


To edit an existing *Dongles* set up, simply click on the set up **name**

Any environment variable values defined in the *General*, *Hardlock* and *Wibu* tabs will override those in the environment file.



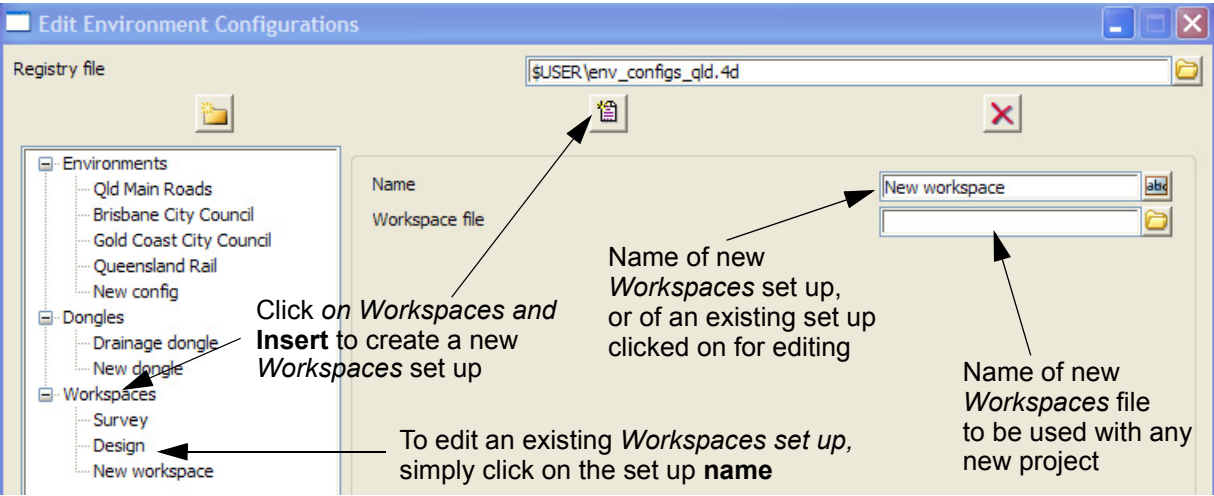
Clicking on **Write** in the **Edit Environment Configuration** panel writes out all the data for the sections *Environments*, *Dongles* and *Workspaces*, to the registry file.



Click on **Write** on the **Edit Environment Configurations** panel to write out the data to the **Registry file**

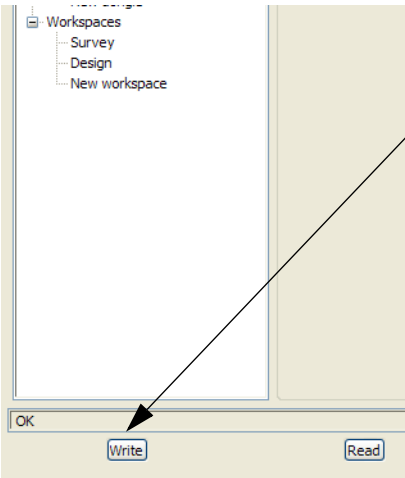
Creating/Editing a Workspaces Set Up

To create a new **Workspaces** set up, click on the *Workspaces* node and then on the **Insert** button.
To edit an existing **Workspaces** set up, simply click on the name of the **workspaces** set up to be edited.



The full path name of the *Workspaces* file to be used when creating new projects is recorded in the **Workspace file** panel field.

Clicking on **Write** in the **Edit Environment Configuration** panel writes out all the data for the sections *Environments*, *Dongles* and *Workspaces*, to the registry file.



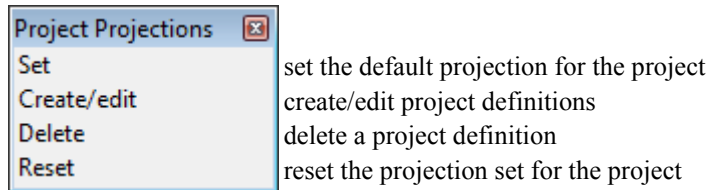
Click on **Write** on the **Edit Environment Configurations** panel to write out the data to the **Registry file**

Projections

Position of option on menu: Project =>Management =>Projections

User defined Projections can be defined using the Create/edit option. A user defined projection can then be set for the project (the project projection). Values from the project projection (e.g. scale factor) are used in various options.

The **Project projections** walk-right menu contains various projection items.



For the option *Set*, go to the section

Create/edit

Delete

Reset

[Set Projection.](#)

[Create/Edit Projection.](#)

[Delete Projection.](#)

[Reset Projection.](#)

The options in the menu will now be described.

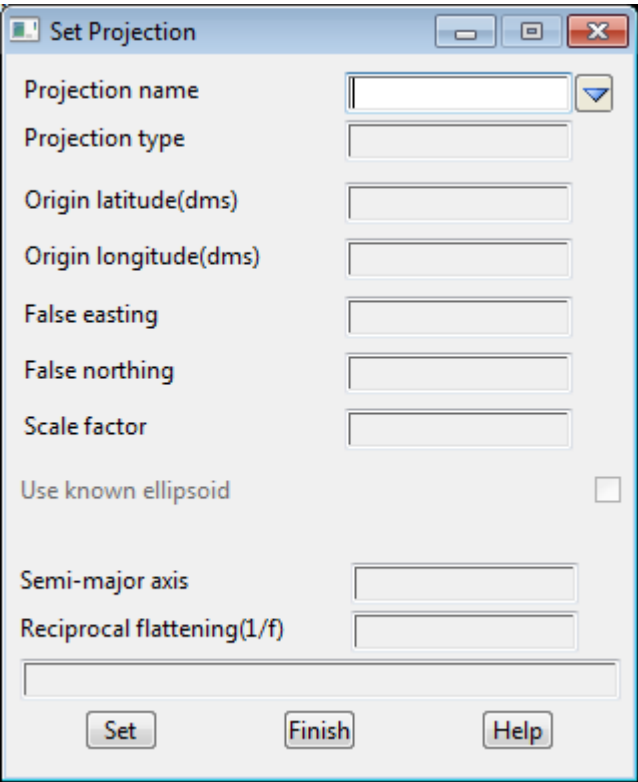
Set Projection

Position of option on menu: Project =>Management =>Projections =>Set

The *Set* option sets the *Project Projection* to be the one selected from the list defined projections.

To define a new projection, see [Create/Edit Projection.](#)

On selecting the *Set* option, the **Set Projection** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Datum name	input		all defined projections
<i>name of the projection to be set as the Project projection.</i>			
<i>Depending on the projection type, the relevant projection parameters are displayed in the rest of the fields in the panel.</i>			
<i>To define a new projection, see Create/Edit Projection.</i>			

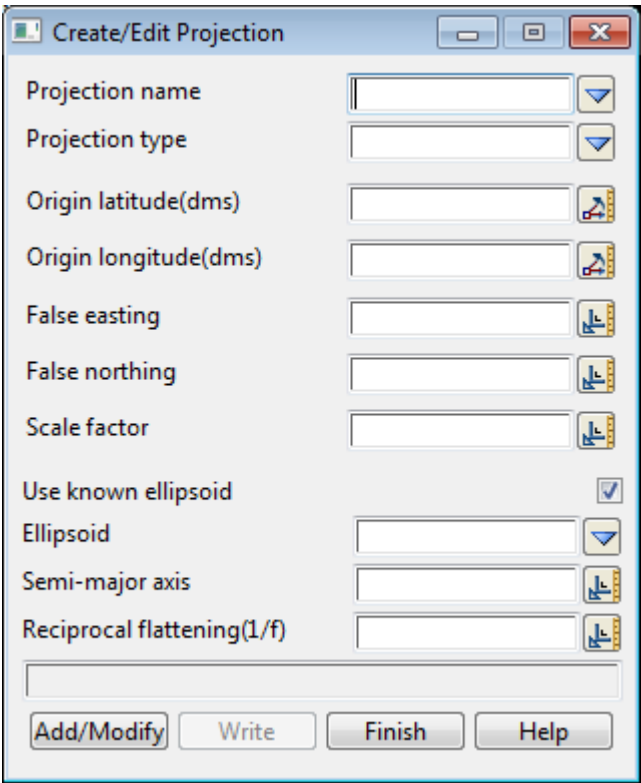
Set	button
<i>after selecting this button, the projection for the project is set to that given in the Project name field. The project projection is used in a number of options in 12d Model.</i>	

Create/Edit Projection

Position of option on menu: Project =>Management =>Projections =>Create/Edit

This option defines a new projection, or edits an existing projection in the current list of available projections.

On selecting the Create/edit option, the Create/edit Projection panel is displayed.



For more information about terminology used in this sections, see the Appendix [Geodetics Summary](#).

Field Description	Type	Defaults	Pop-Up
Datum name <i>name of the projection to be set as the Project projection.</i>	input		all defined projections
Projection Type <i>the type of projection to be set as the Project projection.</i>	input		Transverse Mercator, UTM RSO, General

For more information on defining a **general** projection, please go to [Defining a General Cartographic Projection](#)

Depending on the projection type, the relevant projection parameters can be entered.

Use known ellipsoid <i>if ticked, the ellipsoid for the projection has been defined previously and the parameters for the particular ellipsoid can be used. The values of defined ellipsoids are displayed when a selection is made from the ellipsoid pop-up box (e.g. GRS80).</i>	tick box	tick
<i>if not ticked then the ellipsoid parameters can be defined by entering the ellipsoid parameters.</i>		

Add/Modify button
after selecting this button, the user defined projection is added to the current list or the existing projection definition is modified. using the entered values. A number of new projections can be added by simply entering the relevant data and selecting the add/modify button.

Write button
after selecting this button, the user defined projections defined by the add/modify process are written to a carto.4d file which can be written to various locations. This means that the new

defined projections can be used for other **12d Model** projects. For more information on the **Write** button, go to the section [Writing Set Up Files](#) in the Appendix [Setting Up and Configuring 12d](#)

Defining a General Cartographic Projection

A general *cartographic projection* is defined by giving a series of parameters starting with the mandatory +proj parameter giving the projection type. For example,

+proj=*projection_type* e.g. +proj=tmerc or +proj=utm

To specify the Earth's elliptical figure used in the projection, two parameters are required.

The first required value is the major semi-axis of the ellipse or equatorial radius,

major semi-axis of the ellipse +a= *value*

and the second parameter can be any one of the following standard forms:

minor semi-axis of the ellipse	+b= <i>value</i>
flattening	+f= <i>value</i>
reciprocal flattening (i.e. 1/f)	+rf= <i>value</i>
eccentricity	+e= <i>value</i>
eccentricity squared	+es= <i>value</i>

For example, the Australian National Spheroid (ANS) is defined by:

+a=6378160
+rf= 298.25

GRS80 is defined by:

+a=6378137
+rf= 298.257222101

WGS84 is defined by:

+a=6378137
+rf= 298.257223663

A further three parameters are common to most projections:

the central meridian +lon_0=*value*, and the cartesian offsets for the respective x and y axis, +x_0=*value*, +y_0=*value* (often referred to as false easting and northing).

central meridian	+lon_0= <i>value</i>	<i>units in decimal</i>
<i>degrees</i>		
x offset- false easting	+x_0= <i>value</i>	
y offset - false northing	+y_0= <i>value</i>	

A fourth parameter, +lat_0=*value*, is used to designate a central parallel and associated y axis origin for a projection.

Unless a value is specified for the parameters lon_0, lat_0, x_0 and y_0, they are assumed to be zero.

Other parameters will depend on the particular projection used.

Transverse Mercator Projection +proj=tmerc

project	+proj=tmerc
scale factor	+k= <i>value</i>

e.g. Metro-Perth is:

+proj=tmerc +a=6378160 +rf=298.25 +lon_0=115.833333333 +lat_0=0.0 +x_0=54466.561
+y_0=3690893.265 +k=1.0

Perth Coastal Grid 1984 (PCG84) is:

+proj=tmerc +a=6378160 +rf=298.25 +lon_0=115.833333333 +x_0=40000 +y_0=3800000
+k=1.000006

Universal Transverse Mercator Projection +proj=utm

This is a special form of the Transverse Mercator Projection. The central meridian is constrained to 6 degree intervals starting at 3 degrees. An extra parameter exists called +zone where +zone=1 specifies the region from 180 degree W to 174 degrees W (equivalent to +lon_0=177 degrees W) and proceeds easterly until +zone=60 for the region from 174 degree E to 180 degrees E (i.e. +lon_0=177 degrees E). Hence

$$+zone=N \quad N = 1, 2, \dots, 60$$

which automatically defines the central meridian $+lon_0 = 6 \times N - 183$ where N = zone number.

The +south option adds a false northing of 10,000,000 m (used for AMG and MGA co-ordinates) for projection in the Southern Hemisphere.

$$+south \quad \text{defines } +y_0 = 10000000$$

In all cases, for a Universal Transverse Mercator projection, a false easting of 500,000 m is used.

$$+x_0 = 500000$$

Australian Map Grid (AMG84)

The Australian Map Grid is a Universal Transverse Mercator Projection with

- (a) coordinates are in metres
- (b) zones are 6 degrees wide plus overlapping belts of 80 kilometres at each grid junction
- (c) AMG zones are numbered from zone 49 with central meridian 111 degrees E to zone 57 with central meridian 159 degrees E.
- (d) the origin of each zone is the intersection of the central meridian with the equator
- (e) a central scale factor, k, is defined as 0.9996
- (f) a false easting of 500,000 and a false northing of 10,000,000 are used
- (g) uses the Australian National Spheroid +a=6378160 +rf=298.25

For example, the definition of AMG zone 50 is:

$$+proj=utm \quad +south \quad +zone=50 \quad +k=0.9996 \quad +a=6378160 \quad +rf=298.25$$

Map Grid of Australia (MGA94)

The Map Grid of Australia is a Universal Transverse Mercator Projection with

- (a) coordinates are in metres
- (b) zones are 6 degrees wide plus overlapping belts of 80 kilometres at each grid junction
- (c) MGA zones are numbered from zone 49 with central meridian 111 degrees E to zone 57 with central meridian 159 degrees E.
- (d) the origin of each zone is the intersection of the central meridian with the equator
- (e) a central scale factor, k, is defined as 0.9996
- (f) a false easting of 500,000 and a false northing of 10,000,000 are used.
- (g) uses GRS80 +a=6378137 +rf=298.257222101

For example, the definition of MGA zone 50 is:

$$+proj=utm \quad +south \quad +zone=50 \quad +k=0.9996 \quad +a=6378137 \quad +rf=298.257222101$$

Lambert Conformal Conic Projection +proj=lcc

This is a special from of the Conic Projection.

There are two standard parallels +lat_1 and +lat_2 and the projection is centred on +lat_0 and +lon_0

For example, a Lambert Conformal Conic Conformal with standard parallels of 15 degrees South and 39 degrees South, centred at centred at 27degrees South 134degrees East, with a false origin at that point is 5,000,000m/5,000,000m and using the Australian National Spheroid (i.e. AGD84) is

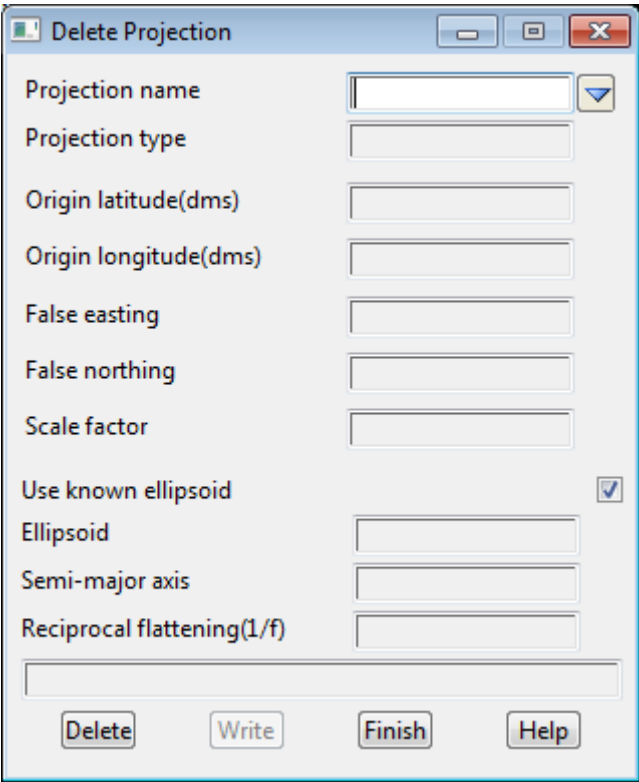
```
+proj=lcc +lat_1=-15 +lat_2=-39 +lon_0=134 +lat_0=-27
+x_0=5000000 +y_0=5000000 +a=6378160 +rf=298.25
```

Delete Projection

Position of option on menu: Project =>Management =>Projections =>Delete

The **Delete** option deleted a projection from the list of available projections.

On selecting the **Delete Projection** option, the **Delete Projection** panel is displayed.



The fields and buttons used in this panel have the following functions.			
Field Description	Type	Defaults	Pop-Up
Datum name	input		all defined projections
<i>name of the projection to be deleted from the Project projection list.</i>			
<i>Depending on the projection type, the relevant projection parameters are displayed.</i>			
Delete	button		
<i>after selecting this button, the selected projection is deleted from the project projection list. This can be done for a number of projections by simply selecting the projection to be deleted and selecting the delete button.</i>			
Write	button		

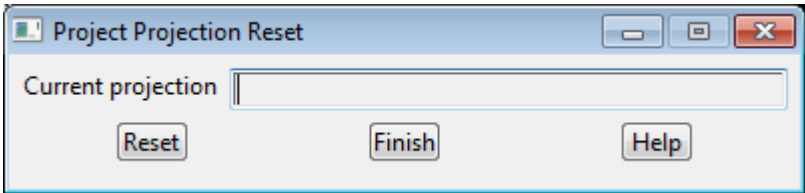
after selecting this button, the list of projections altered by the delete process can be written in various locations. This means that the updated projections list will be used to set current and future projects. For more information on the **Write** button, go to the section [Writing Set Up Files](#) in the Appendix [Setting Up and Configuring 12d](#)

Reset Projection

Position of option on menu: Project =>Management =>Projections =>Reset

The Reset option is used to remove the projection set for the project.

On selecting the reset Projection option, the Project Projection Reset panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	pop-Up
-------------------	------	----------	--------

Current projection	output only		
<i>name of the projection currently set for the project.</i>			

Reset	button		
<i>after selecting this button, the projection for the project is set to none. That is, no project has been set for the Project</i>			

N values

Position of option on menu: **Project =>Management =>N values**

N values are the separation distances between the geoid and the ellipsoid. In GPS surveys, heights are often given in ellipsoid heights whilst most other level datums are based on the geoid. Since most geodetic calculations are based on the ellipsoid, any observations should be reduced onto the ellipsoid. This reduction process takes into the consideration the heights above the ellipsoid. Therefore, it is necessary to convert non ellipsoid heights to ellipsoid values by adding the geoid-ellipsoid separations (n values). There are various methods for determining the N values.

An N value method can be defined using the Create/edit option. Values from the project N value settings are used to determine which method is used to calculate N values. These values are used in various options where the level values are not ellipsoid values and require the N value to be added to get to an ellipsoid height. A user defined N value method can then be set for the project (the project N value setting) which is then the default N Values in any panel.

For more information about terminology used in this section, see the Appendix [Geodetics Summary](#).

The **Project n value** walk-right menu contains various projection items.

Project N value settings

Set

Create/edit

Delete

Reset

set the default N-values for the project

create/edit N-values definitions

delete a N-values definition

reset the N-values set for the project

- For the option *Set*, go to the section

[Set N-Values.](#)
- Create/edit*

[Create/Edit N-Values.](#)
- Delete*

[Delete N-Values.](#)
- Reset*

[Reset N-Values.](#)

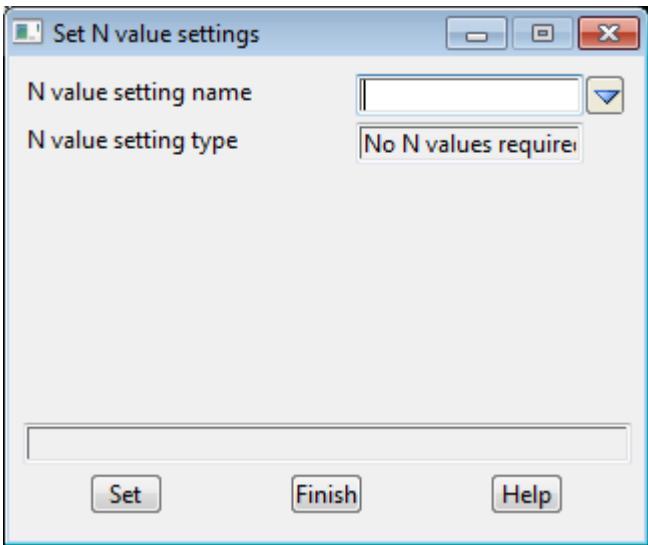
The options in the menu will now be described.

Set N-Values

Position of option on menu: **Project =>Management =>N values =>Set**

The **Set** option sets the Project N Values and these are then used as the default in panels.

On selecting the **Set** option, the **Set N value settings** panel is displayed.



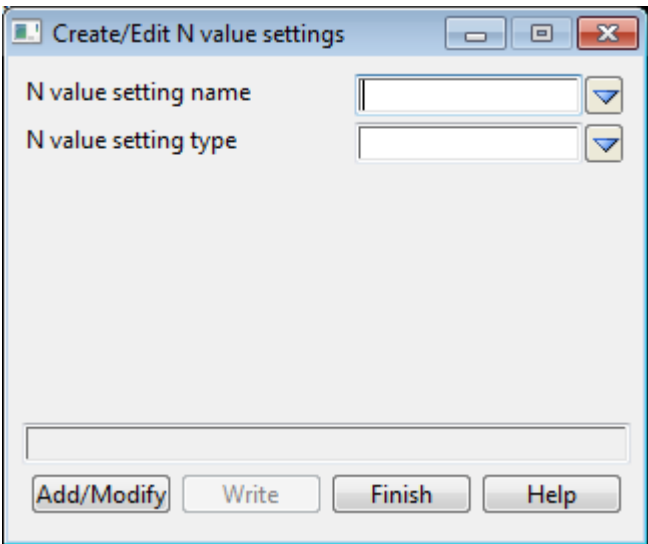
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
N value setting name <i>name of the n value setting to be set as the Project N value setting.</i>	choice box		all defined N value settings
N value setting type <i>Depending on the N value interpolation method, the relevant method is displayed.</i>	input		defined N value types
Set <i>after selecting this button, the current N value setting is set using the displayed values. These values are used as defaults in panels that need N values for calculations</i>	button		

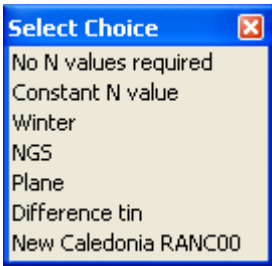
Create/Edit N-Values

Position of option on menu: Project =>Management =>N values=>Create/Edit

On selecting the Create/edit option, the Create/edit N value settings panel is displayed.



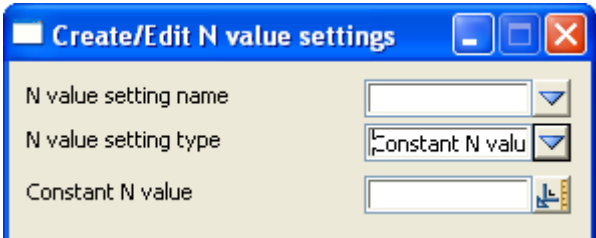
Field Description	Type	Defaults	Pop-Up
N value setting name <i>name of the n value setting to be set as the Project N value setting.</i>	choice box		all defined N value settings
N value setting type <i>There are various methods for the determination of the N values. These are given in the choice box:</i>	choice box		defined N value types



Depending on the setting type chosen, the panel will display the appropriate fields.

No N values required: This applies to data that already has ellipsoid heights and requires no interpolation for N values.

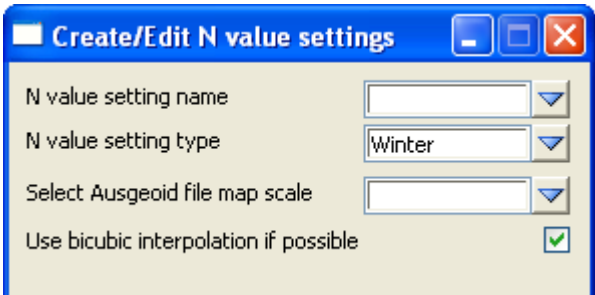
For N value setting type = Constant N value



Field Description	Type	Defaults	Pop-Up
Constant N value <i>this N value will be used for the entire n value interpolation process. (i.e. it will not change).</i>	input box		

For N value setting type = Winter

This method uses the same method as the Winter interpolation software supplied by Auslig. The data files used should be winter compatible and reside in a folder that is pointed to by the WINTER_DATA_4D parameter in the env.4d file. The data files can be downloaded from the Auslig website.



Field Description	Type	Defaults	Pop-Up
Select Ausgeoid file map scale	choice box		1:100,000
			1:250,000
			1:1,000,000

*this value will be dependant on the type of files to be used by winter. **The files themselves should be in a folder that is pointed to by the WINTER_DATA_4D parameter in the setup area of the env.4d file.***

Use bicubic interpolation if possible	tick box	ticked
---------------------------------------	----------	--------

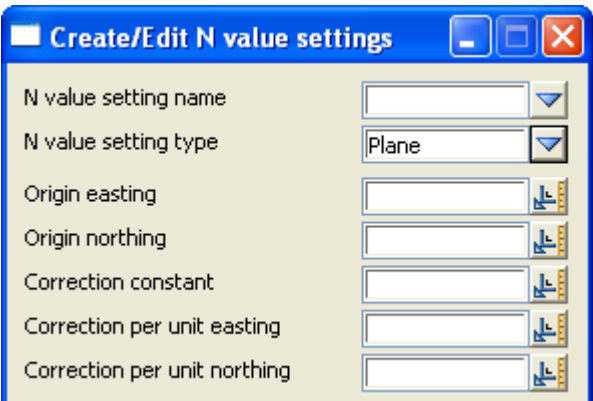
if ticked, the bicubic interpolation method will be used if possible.

For N value setting type = NGS

This method is currently under development.

For N value setting type = Plane

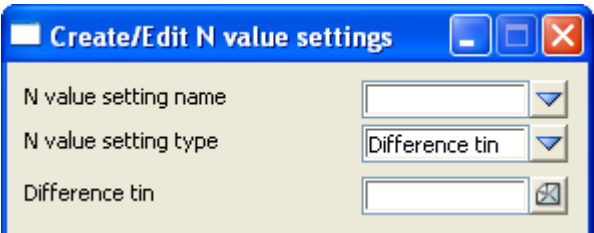
This method allows a plane to be defined allowing N values to be derived from that plane.



Field Description	Type	Defaults	Pop-Up
Origin easting	input box		
<i>the origin easting value.</i>			
Origin northing	input box		
<i>the origin easting value.</i>			
Corr constant	input box		
<i>the constant z value of the plane.</i>			
Corr per unit easting	input box		
<i>the z value correction per unit easting.</i>			
Corr per unit northing	input box		
<i>the z value correction per unit nothing.</i>			

For N value setting type = Difference tin

This method allows value to be interpolated from a difference tin. A difference tin is simply a tin of difference values (N values). This tin can be re-triangulated as new points become available, thus introducing more points than a regular grid.



Field Description	Type	Defaults	Pop-Up
Difference tin	tin box		Available tins

the difference tin from which the N values will be interpolated.

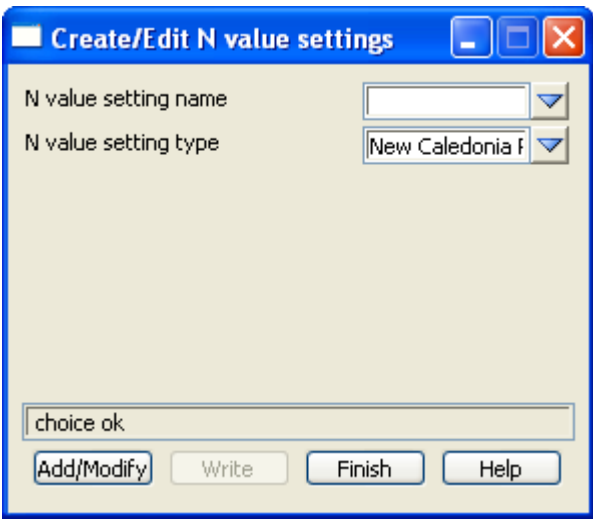
Add/Modify button

after selecting this button, the user defined N value settings are added to the current list or the existing N value settings is modified. using the entered values. A number of new settings can be added by simply entering the relevant data and selecting the add/modify button.

Write button

*after selecting this button, the user defined N value settings defined by the add/modify process can be written to the file nvalues.4d in various locations. This means that the defined N value settings will be allowed to be set in current and future projects. For more information on the **Write** button, go to the section [Writing Set Up Files](#) in the Appendix [Setting Up and Configuring 12d](#)*

For N value setting type = New Caledonia RANC00

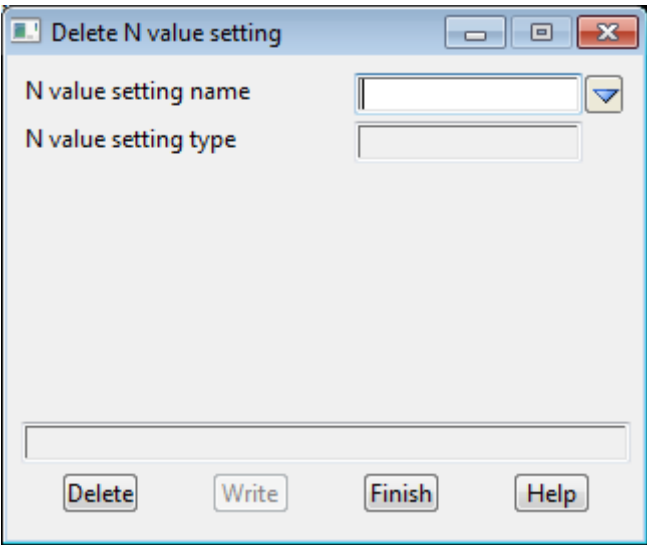


Delete N-Values

Position of option on menu: **Project =>Management =>N value =>Delete**

The **Delete** option deleted a projection from the list of available projections.

On selecting the Delete option, the Delete N value setting panel is displayed.



The fields and buttons used in this panel have the following functions.

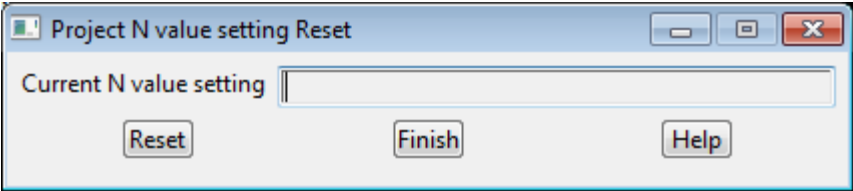
Field Description	Type	Defaults	Pop-Up
N value setting name	input		all defined N value settings
<i>name of the setting to be deleted from the N value setting list. Depending on the setting type, the relevant setting parameters are displayed.</i>			
Delete	button		
<i>after selecting this button, the selected N value setting is deleted from the setting list. This can be done for a number of n value settings by simply selecting the projection to be deleted and selecting the delete button.</i>			
Write	button		
<i>after selecting this button, the list of n value settings altered by the delete process can be written to the nvalues.4d file in various locations. This means that the updated n value settings list will be used to set current and future projects. For more information on the Write button, go to the section Writing Set Up Files in the Appendix Setting Up and Configuring 12d</i>			

Reset N-Values

Position of option on menu: Project =>Management =>N values =>Reset

The.Reset option is used to remove the projection set for the project.

On selecting the reset option, the Project N value setting reset panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Current N value setting output only
name of the n value setting, set for the project.

Reset button
after selecting this button, the N value setting for the project is set to none. That is, no N value setting has been set for the Project

7 Parameters

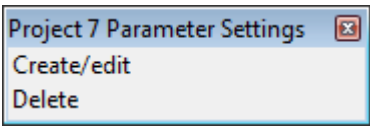
Position of option on menu: Project =>Management =>7 parameters

Seven (7) parameter transformations are used to transform data between two ellipsoids. They are also known as 7 parameter similarity transforms, Bursa-Wolf and 7 parameter Helmert transformations.

Warning: the definition and hence sign of some terms varies between countries.

In **12d Model**, the seven parameter similarity transformations are used in the **General Transformation** option Survey =>Conversions =>General transformations (see [General Transformations](#) in the chapter [Survey](#)) and the transformation is applied in the Global XYZ system.

The 7 parameters walk-right menu contains options to create and delete seven parameter transformation setting.



create/edit 7 parameter definitions
delete 7 parameter definitions

For the option *Create/edit*, go to
Delete

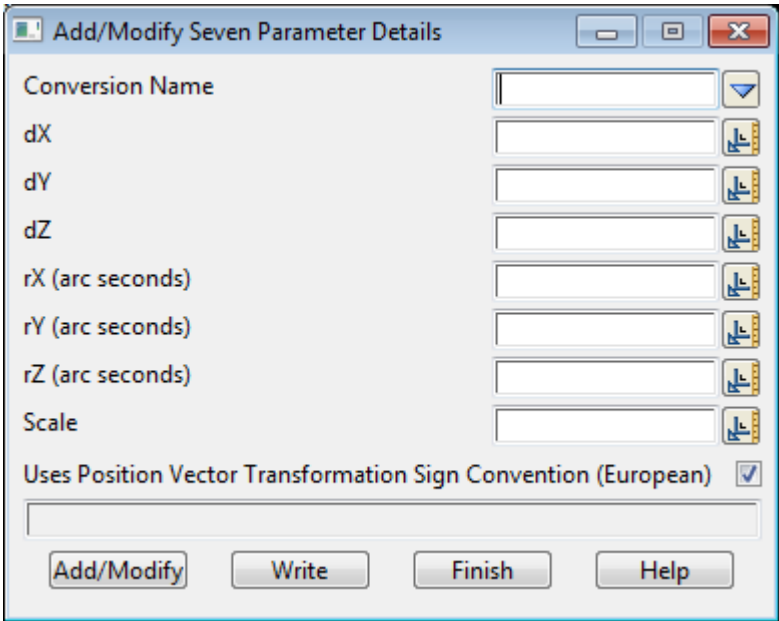
[Create/Edit 7 Parameters](#)
[Delete 7 Parameters](#)

The options in the menu will now be described.

Create/Edit 7 Parameters

Position of option on menu: Project =>Management =>7 parameters=>Create/Edit

On selecting the *Create/edit* option, the **Add/Modify Seven Parameter Details** panel is displayed.



Field Description	Type	Defaults	Pop-Up
Conversion name <i>name of the 7 parameter setting to be created/edited.</i>	choice box		all defined 7 param settings

DX, DY, DZ input box
the translations for the 7 parameter transformation.

rX (arc seconds), rY (arc seconds), rZ (arc seconds)input box
the rotations, in arc seconds, for the 7 parameter transformation.

Scale input box
the scale for the 7 parameter transformation.

Use Position Vector Transformation sign convention (European) tick box
*if ticked, the European Position Vector Transformation convention is used.
If not ticked, PVT sign is not used (mainly not used for USA).*
Depending on the sign convention, some of the parameters will have the opposite sign.

Add/Modify button
*after selecting this button, either the new 7 parameter set is created or an exiting one modified. To save the setting list, use the **Write** button.*

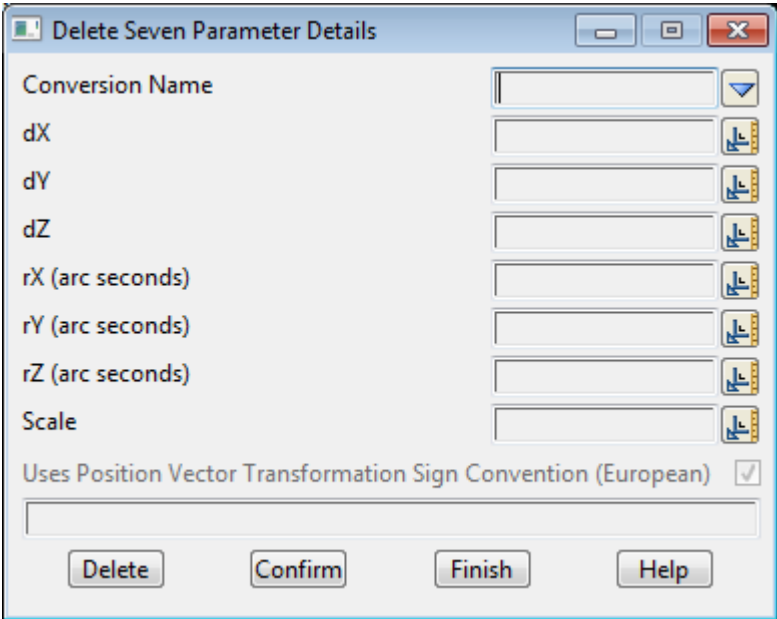
Write button
*after selecting this button, the user defined 7 parameter settings are written out to the file **7params.4d** in the user selected folder. This means that the 7 parameter settings will be available in the current and future projects. For more information on the **Write** button, go to the section [Writing Set Up Files](#) in the Appendix [Setting Up and Configuring 12d](#)*

Delete 7 Parameters

Position of option on menu: Project =>Management =>7 parameters =>Delete

The **Delete** option deleted a seven parameter set from the list of available seven parameter settings.

On selecting the **Delete** option, the **Delete 7 Parameter Details** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Conversion name input all defined 7 param settings

name of the 7 parameters setting to be deleted from the 7 parameter settings list.
The relevant setting parameters are displayed.

Delete button

*after selecting this button, the selected 7 parameter setting is deleted from the setting list. This can be done for a number of 7 parameter sets by simply selecting the name to be deleted and selecting the delete button. To save the modified setting list, use the **Write** button*

Write button

*after selecting this button, the user defined 7 parameter settings are written out to the file **7params.4d** in the user selected folder. This means that the 7 parameter settings will be available in the current and future projects. For more information on the **Write** button, go to the section [Writing Set Up Files](#) in the Appendix [Setting Up and Configuring 12d](#)*

Project Workspace

Position of option on menu: Project =>Management =>Workspace

Options to set up the project

The **Project Workspace** walk-right menu contains various projection items.



For the option *Setup*, go to
Load

[Workspace Setup](#)
[Project Workspace Load](#)

Workspace Setup

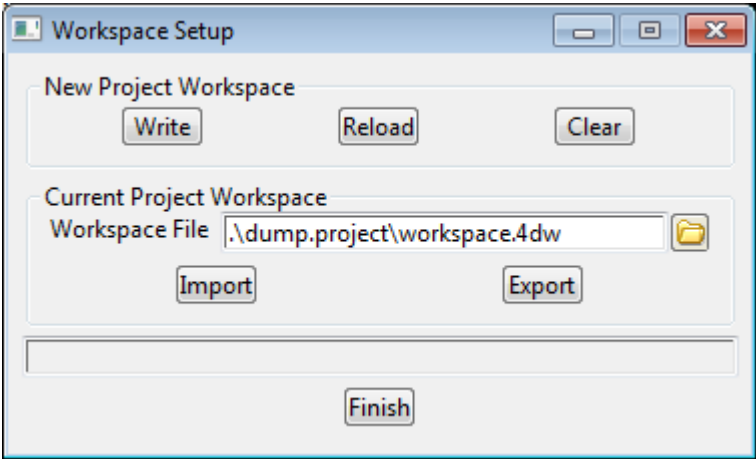
Position of option on menu: Project =>Management =>Workspace =>Setup

The workspace file is used to define the position of toolbars and output window for a new projects.

Once inside an existing project, the workspace file is no longer used and the final positions of the toolbars and output window are recorded inside the project so they come up in the same final position as when the project is reopened.

The **Workspace Setup** option allows the user to define new workspace setup files that can be loaded at any time in an existing project or used as the default workspace file used for all new projects.

On selecting the **Setup** option, the **Workspace Setup** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Write	button		
<i>write out the current toolbar configuration to a .4dw file.</i>			
Load	button		
<i>read in the workspace.4dw file in the current project folder.</i>			

- Clear

button

remove all the current toolbars and read in the default workspace.4dw file
- Workspace file

file box

current workspace file*.4dw files

name of the workspace file to re imported/exported
- Import

button

read in and use the workspace file given in the Workspace file field.
- Export

button

write the current toolbar settings out to the workspace file given in the Workspace file field.

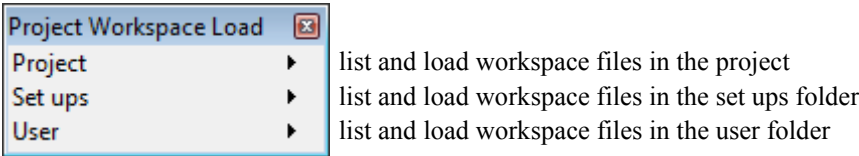
Project Workspace Load

Position of option on menu: Project =>Management =>Workspace >Load

This option displays and selects a project workspace file to set up the icons etc. on the screen.

The **Project Workspace Load** walk-right menu contains further walk-rights to display the workspace files in the local project, the set ups folder and the user folder.

To load a workspace file, simply click on the name in the walk-right lists.



Tags



For the option *Tag tree* go to
Find new tags

[Tag Tree](#)
[Register new tags](#)

Tag Tree

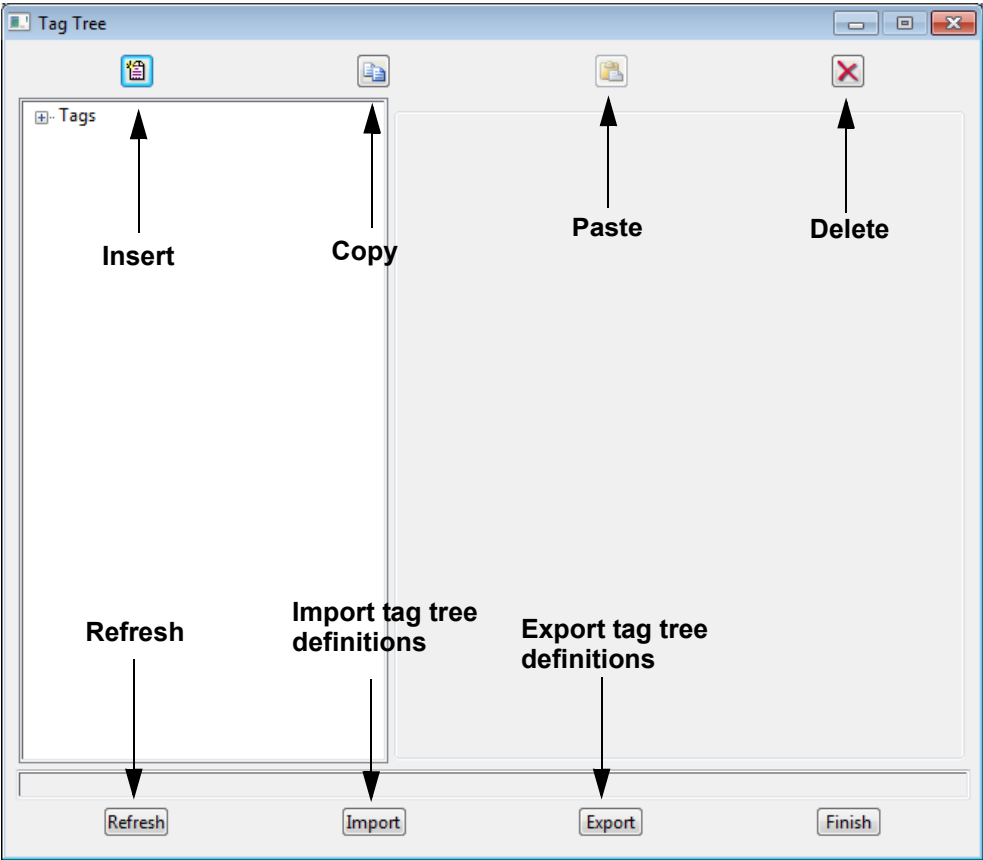
Position of option on menu: Project =>Management =>Tags =>Tag tree

The **12d Model** objects *models*, *tins* and *strings* can be tagged with an unlimited number of user defined text strings called **tags**. For example, a string may be tagged with the two tags, "survey day 1" and "sewer".

Tags names are **case sensitive** and must be **unique**. Tags are used in an increasing number of **12d Model** options. For example, on a view, models can be selected for adding/removing by giving a *tag* name.

To further increase their usefulness, tags in a project can also be assigned a **hierarchy**, or **tree structure**. However that will be discussed shortly after first describing how to create, apply and removed simple tags (see [Defining a Tag Tree \(Tag Hierarchy\)](#)).

Selecting **Tags** displays the **Tag Tree** panel which is used to defined tags, and also apply and remove tags from objects.



Buttons at Bottom

grid

Refresh

button

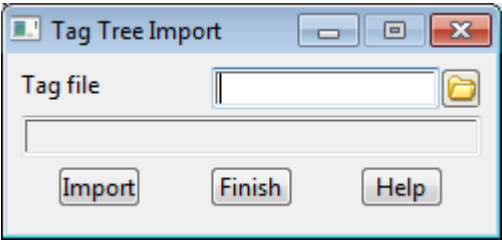
refresh the grid.

Import

button

import a tag tree definition file.

Clicking on Import brings up the Tag Tree Import panel.



Tag file

tags box

all .tags files

name of the tag file to read the tag definitions from.

Import

button

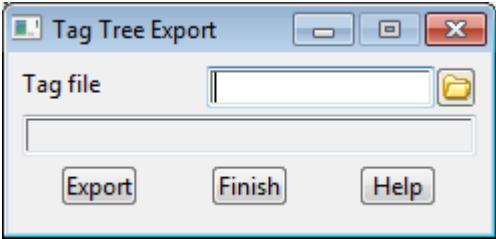
*read in the tag definitions from the **Tag file** and merge them with the current definitions for the project.*

Export

button

export a tag tree definition file.

*Clicking on **Export** brings up the **Tag Tree Export** panel.*



Tag file

tags box

all .tags files

name of the tag file to write the project tag definitions out to.

Export

button

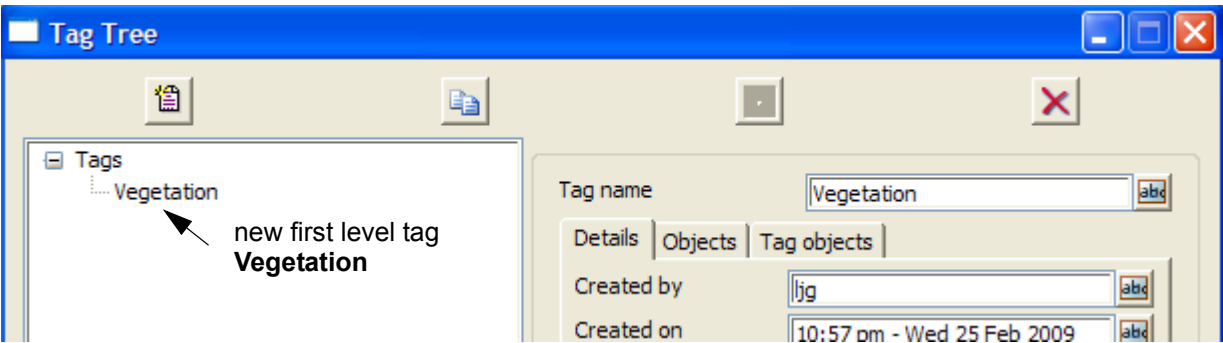
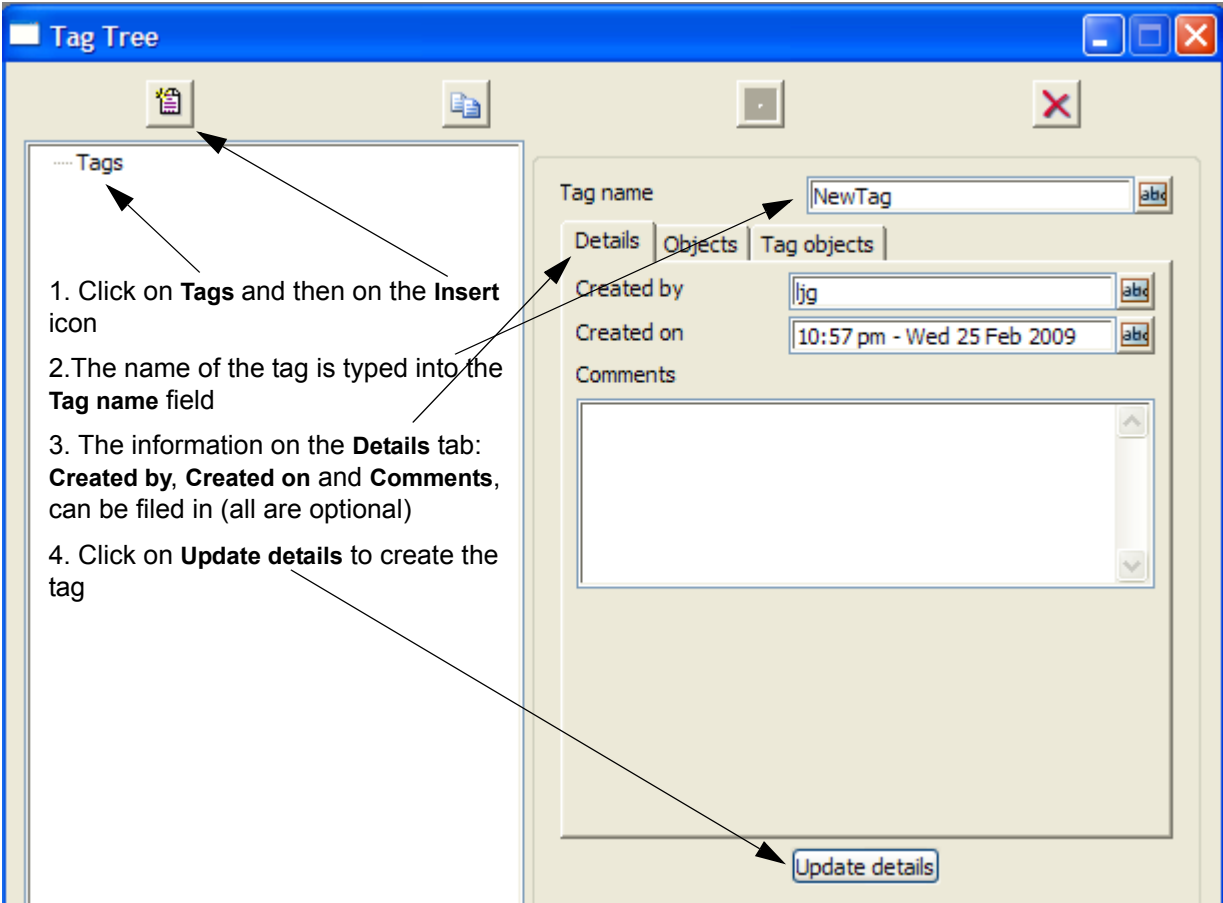
*write out the tag tree definition for this project to the **Tag file**.*

How To Use the Tag Tree Panel

Creating a Tag

To create a **new first level tag**, click on **Tags** and then the **Insert** icon.

The name of the tag is typed into the Tag name field, the information on the Details tab: Created by, Created on and Comments, can be filled in (all are optional) and then click on Update details to create the tag.



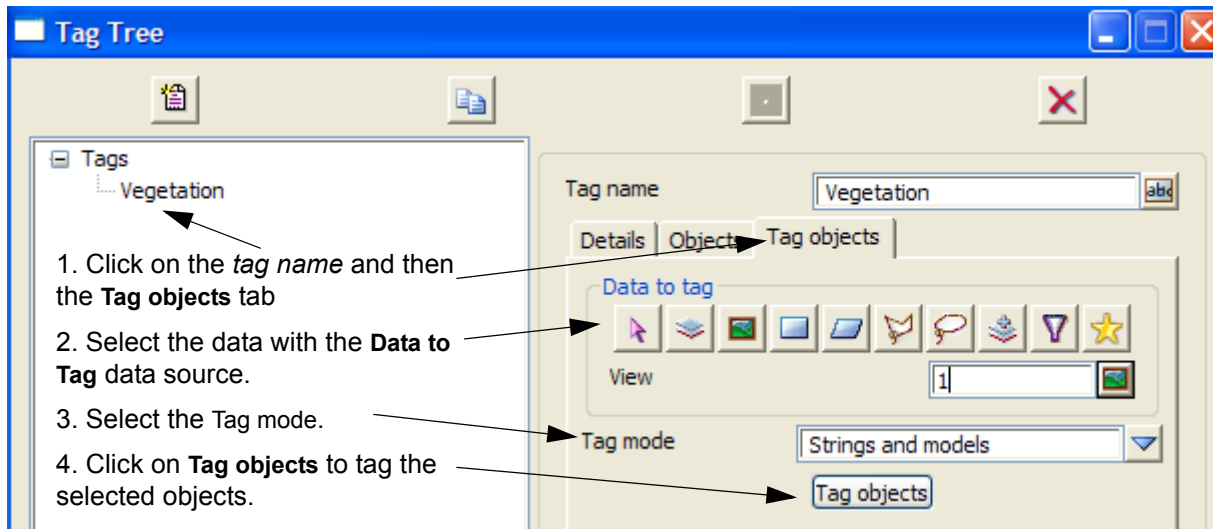
Applying a Tag To Objects

To apply a tag, click on the *tag name* and then the Tag Objects tab.

Select the data with the **Data to Tag** data source.

Select the Tag mode (choice of *Strings only*, *Models only*, *Strings and models*).

Click on Tag objects to tag the selected objects.



Retrieving and Deleting Tagged Objects

To retrieve a list of data tagged with a certain tag, click on the *tag name* and then the Objects tab.
Click on Retrieve to list all the objects with the tag.
To remove tags, click the tick on in the Remove column.
Click on Remove to remove the tag from the ticked objects.

Note - clicking RB on the **Remove** at the *top of the column* in the grid brings up a panel with options to set all the ticks on, set all the ticks off or toggle the tick state.

Tag Tree

Tags

Vegetation

1. Click on the *tag name* and then the **Objects** tab

2. Click on **Retrieve** to list all the objects with the tag.

3. To **remove** tags, click the tick on in the Remove column.

4. Click on **Remove** to remove the tag from the objects with a tick in the **Remove** column.

Tag name

Vegetation

Details

Objects

Tag objects

	Remove	Type	Name
1	<input type="checkbox"/>	Model	base
2	<input type="checkbox"/>	Model	new base
3	<input type="checkbox"/>	Model	mesh
4	<input type="checkbox"/>	String	edgeofpad
5	<input type="checkbox"/>	String	
6	<input type="checkbox"/>	String	
7	<input type="checkbox"/>	String	
8	<input type="checkbox"/>	String	xs 0
9	<input type="checkbox"/>	String	xs 1
10	<input type="checkbox"/>	String	xs 2
11	<input type="checkbox"/>	String	xs 3
12	<input type="checkbox"/>	String	xs 4

Retrieve

Remove

Defining a Tag Tree (Tag Hierarchy)

Tag names are **case sensitive** and must be **unique** and objects can be tagged with **more than one** tag. For example, a string may be tagged with the two tags, "survey day 1" and "sewer"

To further increase their usefulness, tags in a project can also be assigned a **hierarchy**, or **tree structure**.

A **tag tree structure** can be created for the project by following the rules:

1. Tags can be **first level tags** or **sub-tags**, but not both.
2. **First level tags** are tags created at the top level of the tag tree. That is, they are the level directly below the **Tags** label in the **Tag Tree** panel.
3. **Sub-tags** are tags that are created as sub-tags of a **first level tag**, or **sub-tags of other sub-tags**
4. First level tags can not be used as sub-tags and sub-tags can not be a first level tag.
5. **Tag names** must be **unique** amongst **all tags - first level tags** and **sub-tags**. So you can't have a first level tag with the same name as a sub-tag, and vice-versa.
6. The same subtag name can not appear more than once in any single **tag-subtag** sequence.

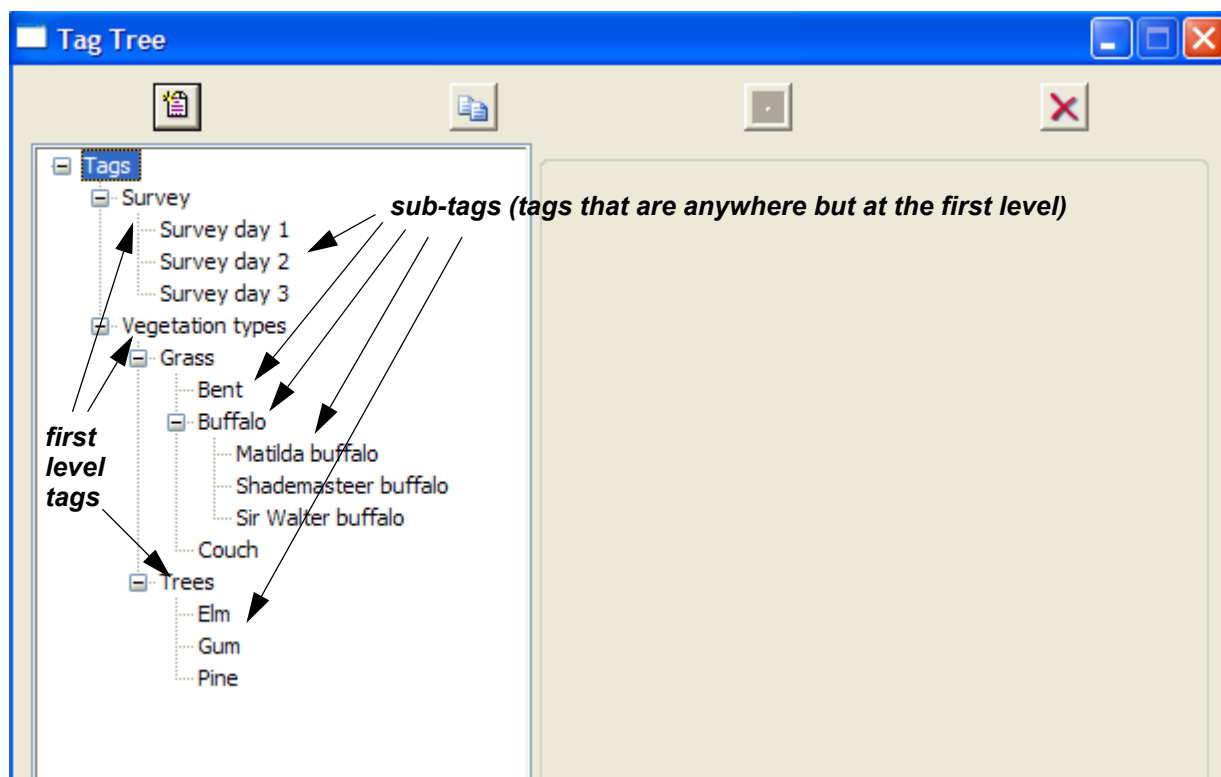
For example, you can have a tag *Vegetation types* with a subtag of *Grass* and with a sub-sub-tag of *Bent*. but you can't have a tag *Vegetation types* with a subtag of *Grass*, a sub-subtag of *Bent*, and a sub-sub-subtag of *Grass*.

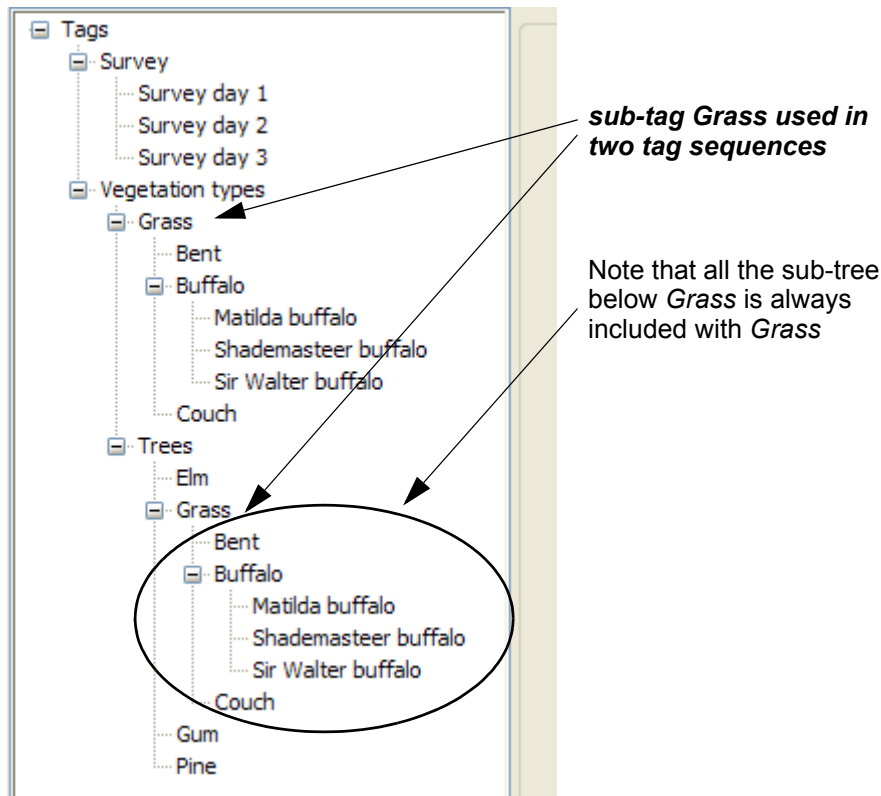
That is *Vegetation types > Grass > Bent* is allowed
but *Vegetation types > Grass > Bent > Grass* is **not allowed**

Note that because tags are case sensitive

Vegetation types > Grass > Bent > grass is allowed.

7. A subtag can appear in more than one tag sequence as long as Rule 6 is not violated.





A tag hierarchy can be very useful.

For example, if we have the tags and tag tree as defined in the previous picture, adding the models tagged as *Trees* with the **Add Tagged Models** option will also add the models tagged with *Elm*, *Gum*, *Pine*, *Grass*, *Bent*, *Buffalo*, *Matilda buffalo*, *Shademasteer buffalo*, *Sir Walter buffalo* and *Couch* **even if they are not tagged as Trees**.

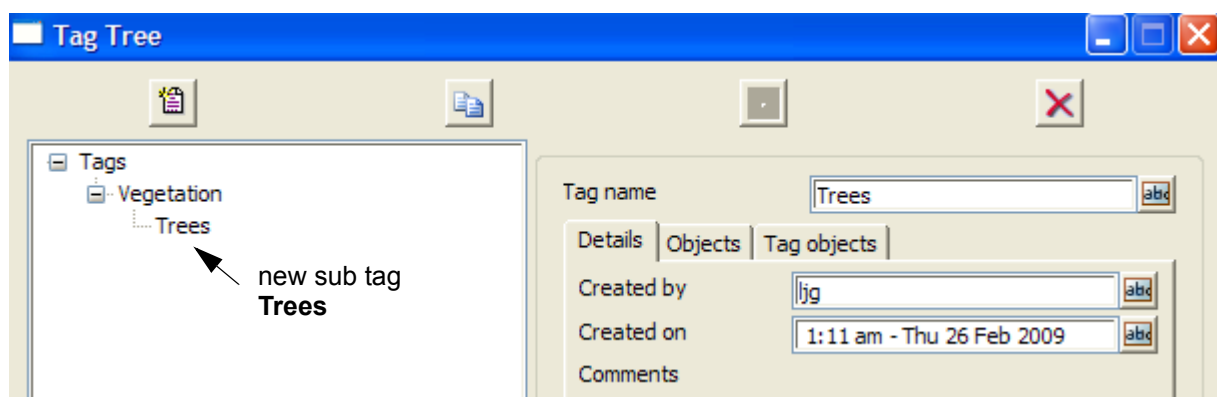
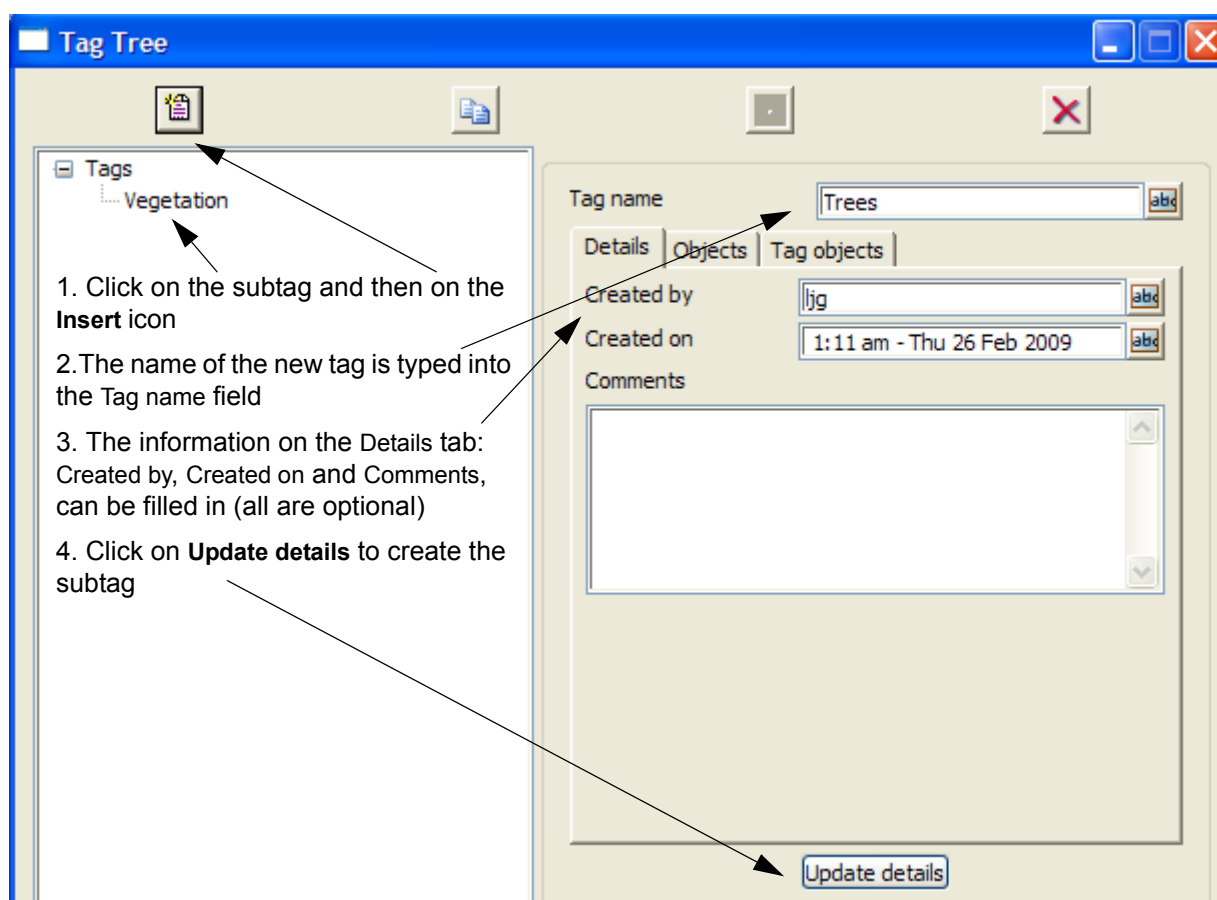
If *Grass* was removed as a subtag of *Trees* then adding *Trees* with the **Add Tagged Models** option will then only add the models tagged with *Trees*, *Elm*, *Gum* and *Pine*. So no new tagging was needed, just a modification to the tag tree definition.

Creating a Tag Tree Structure

To create a subtag of any tag is very similar to creating a first level tag.

To create a **new sub tag**, click on the tag to have the subtag, and then click on the **Insert** icon.

The name of the subtag is typed into the Tag name field, the information on the Details tab: Created by, Created on and Comments, can be filled in (all are optional) and then click on Update details to create the subtag.

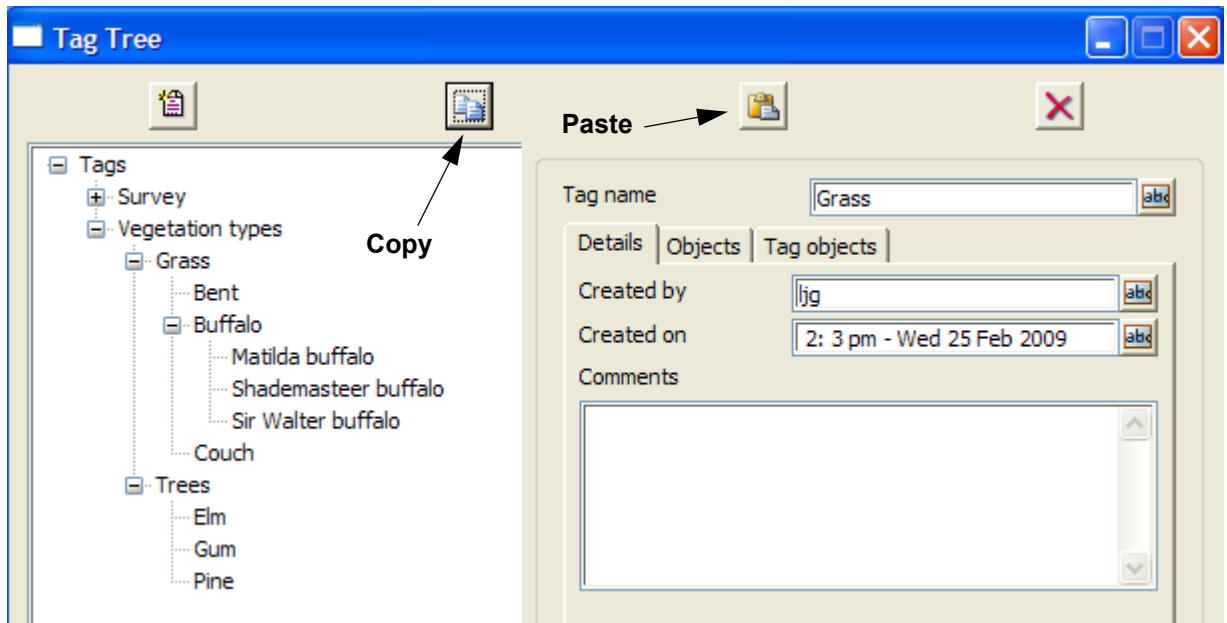


Copy and Paste in a Tag Tree Structure

The **Copy** and **Paste** icons are used to copy subtags around the tag tree structure.

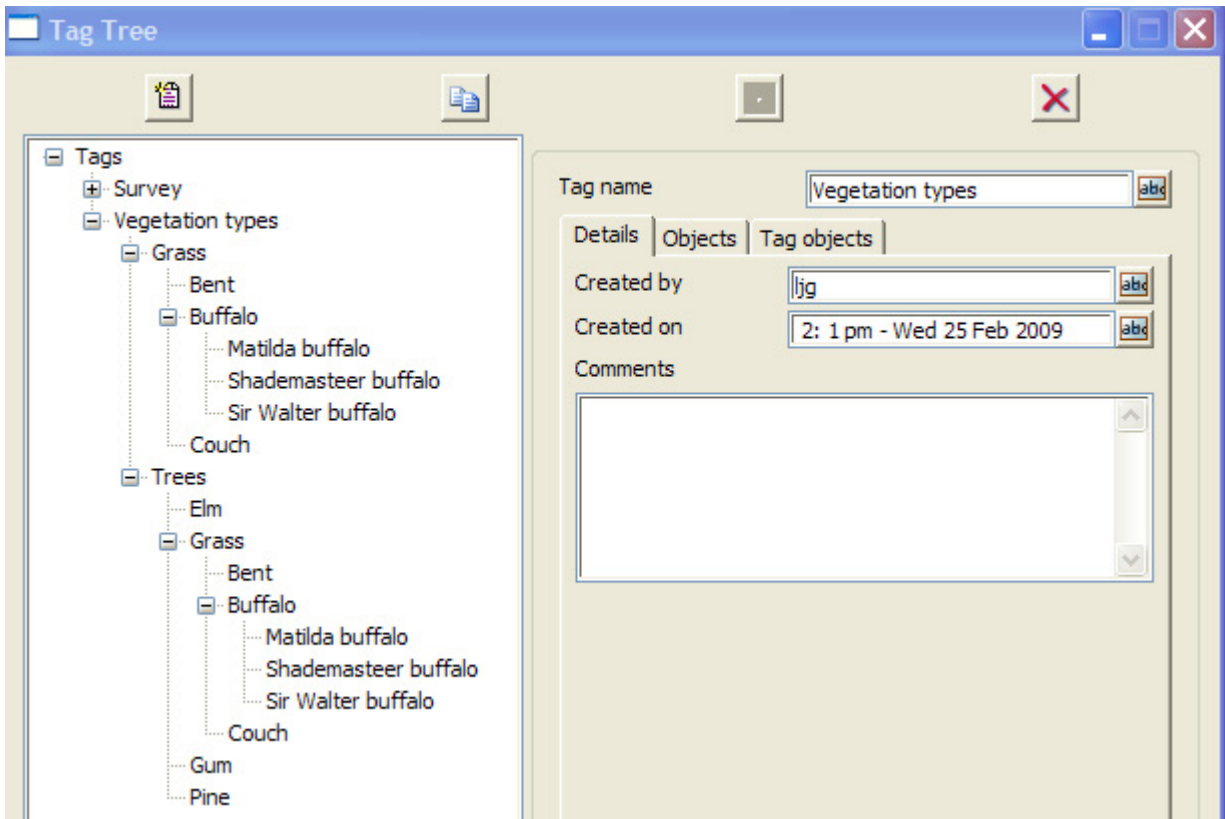
To copy, first click on the subtag you wish to copy (say *Grass*), and then click on the Copy icon.

The Paste button will then become active.



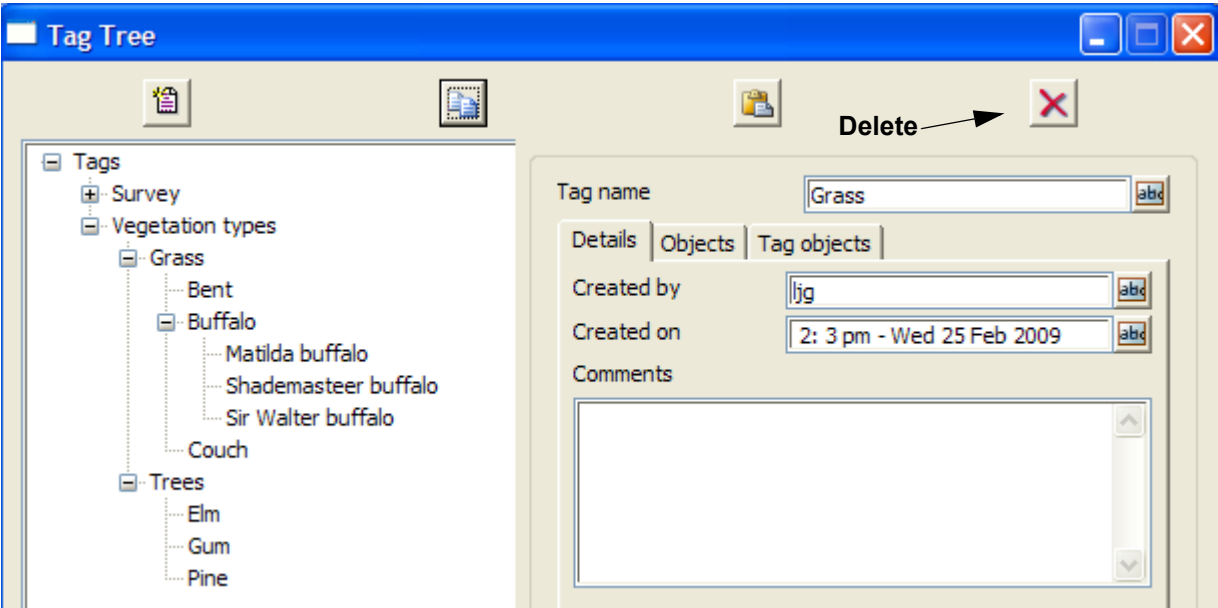
Now click on the first level tag or subtag to copy the subtag to (say *Trees*), and then click on the **Paste** icon.

The subtag (and the tree below it) will now be copied as a subtree of the selected tag.



Deleting a Subtag in Tag Tree Structure

A first level tag or subtag can be deleted from anywhere in the tree by simply clicking on the tag to be deleted and then clicking on the **Delete** icon.



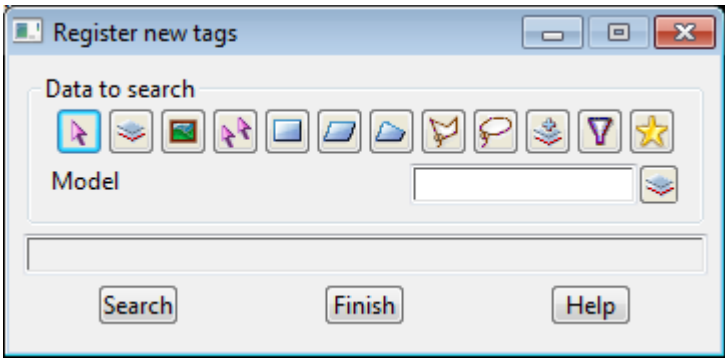
Register new tags

Position of option on menu: Project =>Management =>Tags => Find new tags

Register new tags is used to locate any new tags that have been added on models or strings which have not been registered with the project.

Unregistered tags may occur when reading in a 12da that contains models or strings with tags. Until a tag is registered, it can not be used in source boxes or other panels.

Selecting **Find new tags**, brings up the **Register new tags** panel.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Data to search		source		

Data to search - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Search	button
<i>perform the search</i>	

Tree

- Position of option on menu:

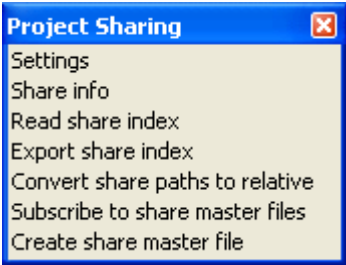
Project =>Tree
- Position of option on menu:

Project =>Management =>Tree
- For documentation on this option, go to the section

Project =>Tree (see [Tree](#))

Project Sharing

The **Sharing** walk-right menu is:



- For the option Settings please go to

[Project Share Settings](#)
- Share info

[Sharing Information](#)
- Read share index

[Add Shares By Index File](#)
- Export share index

[Export A Share Index File](#)
- Convert share paths to relative

[Convert Share Paths To Relative](#)
- Subscribe to share master files

[Subscribe to Sharing Master Files](#)
- Create share master file

[Sharing Master File](#)

Project Share Settings

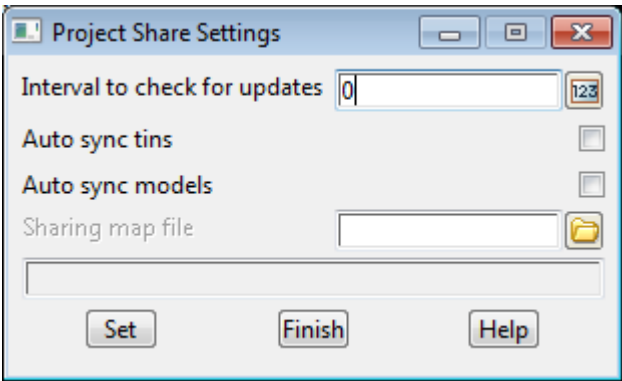
Position of option on menu: Project =>Management =>Sharing =>Settings

There are three environment variables that control the auto-synchronizing of any shared models or tins added to this project.

SHARE_CHECK_INTERVAL_4D	number_of_seconds
AUTO_MODEL_SYNC_4D	1 or 0
AUTO_TIN_SYNC_4D	1 or 0

This option will temporarily modify the values for this session. When the project is restarted, the values will revert to those given by the environment variables.

Selecting **Share settings** brings up the **Project Share Settings** panel.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Interval to check for updates	input
--------------------------------------	-------

time in seconds to check if any of the shared models or tins added to the project have been updated in the server projects.

The environment variable controlling this when the project starts up is

`SHARE_CHECK_INTERVAL_4D` number_of_seconds

The value is only modified for this session. To permanently change the value, please modify the environment variable.

Autosync tins	tick box
----------------------	----------

if ticked, the server projects for any shared tins added to this project are checked to see if they have been modified (checked every `SHARE_CHECK_INTERVAL` seconds). If any tins have been modified, they are re-copied to this project.

The environment variable controlling this when the project starts up is

`AUTO_TIN_SYNC_4D` 1 or 0

The value is only modified for this session. To permanently change the value, please modify the environment variable.

Autosync models	tick box
------------------------	----------

if ticked, the server projects for any shared models added to this project are checked to see if they have been modified (checked every `SHARE_CHECK_INTERVAL` seconds). If any models have been modified, they are re-copied to this project.

The environment variable controlling this when the project starts up is

`AUTO_MODEL_SYNC_4D` 1 or 0

The value is only modified for this session. To permanently change the value, please modify the environment variable.

Set	button
------------	--------

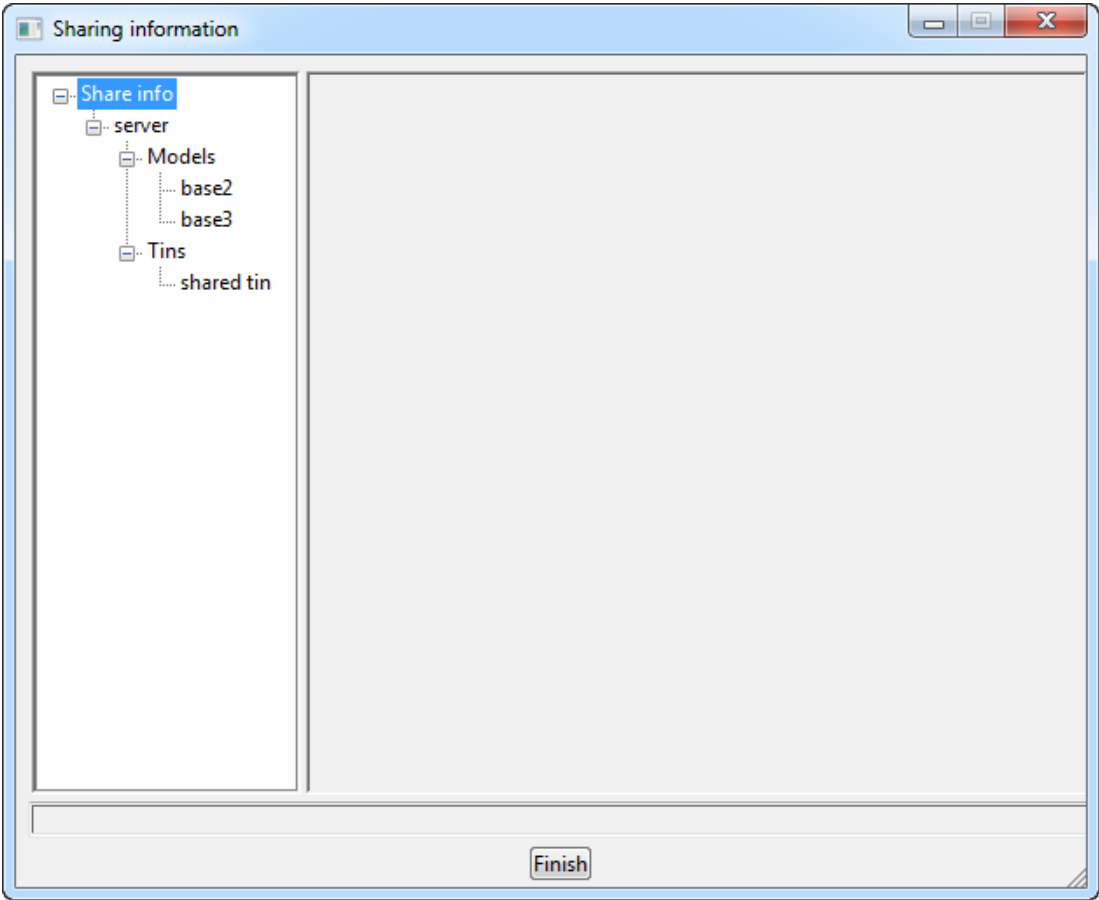
set the values in the panel for this session. The values will revert back to the ones given by the environment variables when the project is restarted.

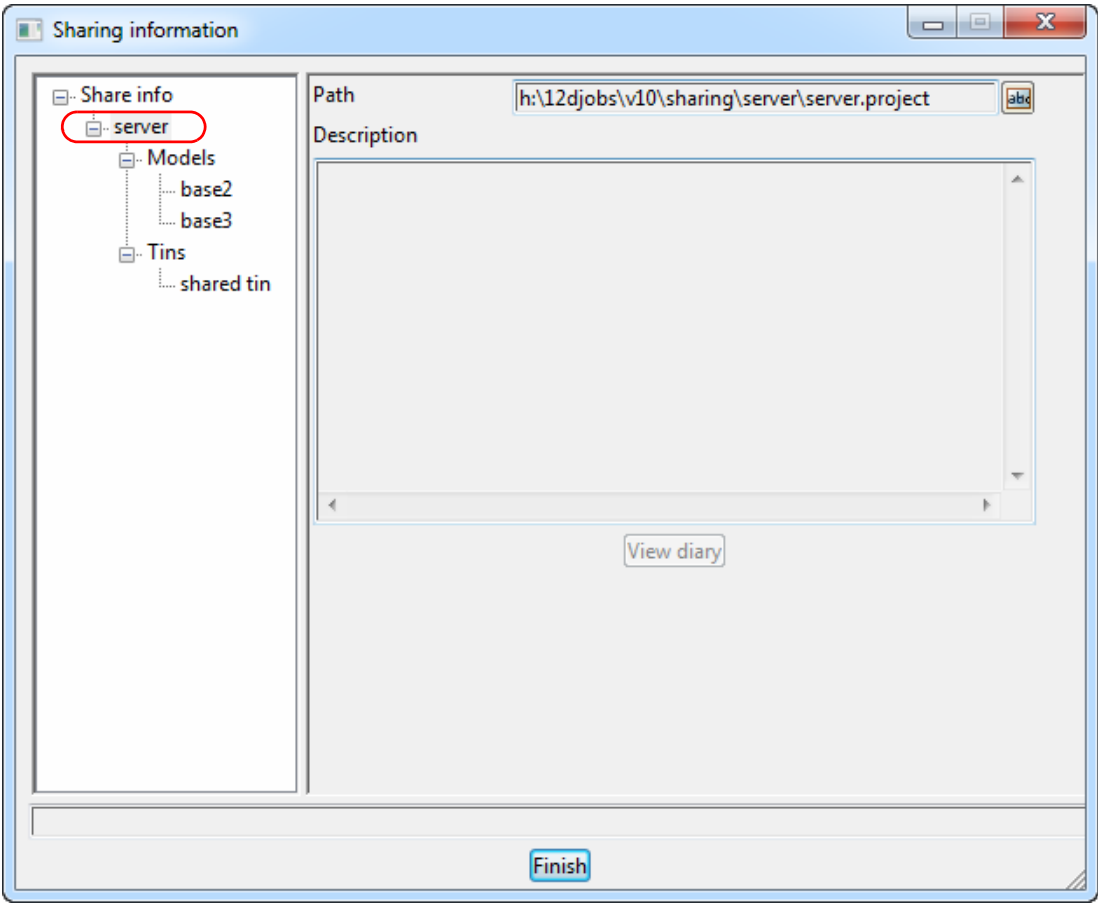
The values are only modified for this session and will evert back to the ones given by the environment variables when the project is restarted. To permanently change the value, please modify the environment variable.

Sharing Information

Position of option on menu: Project =>Management =>Sharing =>Share info

This panel shows information about all models and tins shared into your current project.
Selecting Share info brings up the **Sharing information** panel.





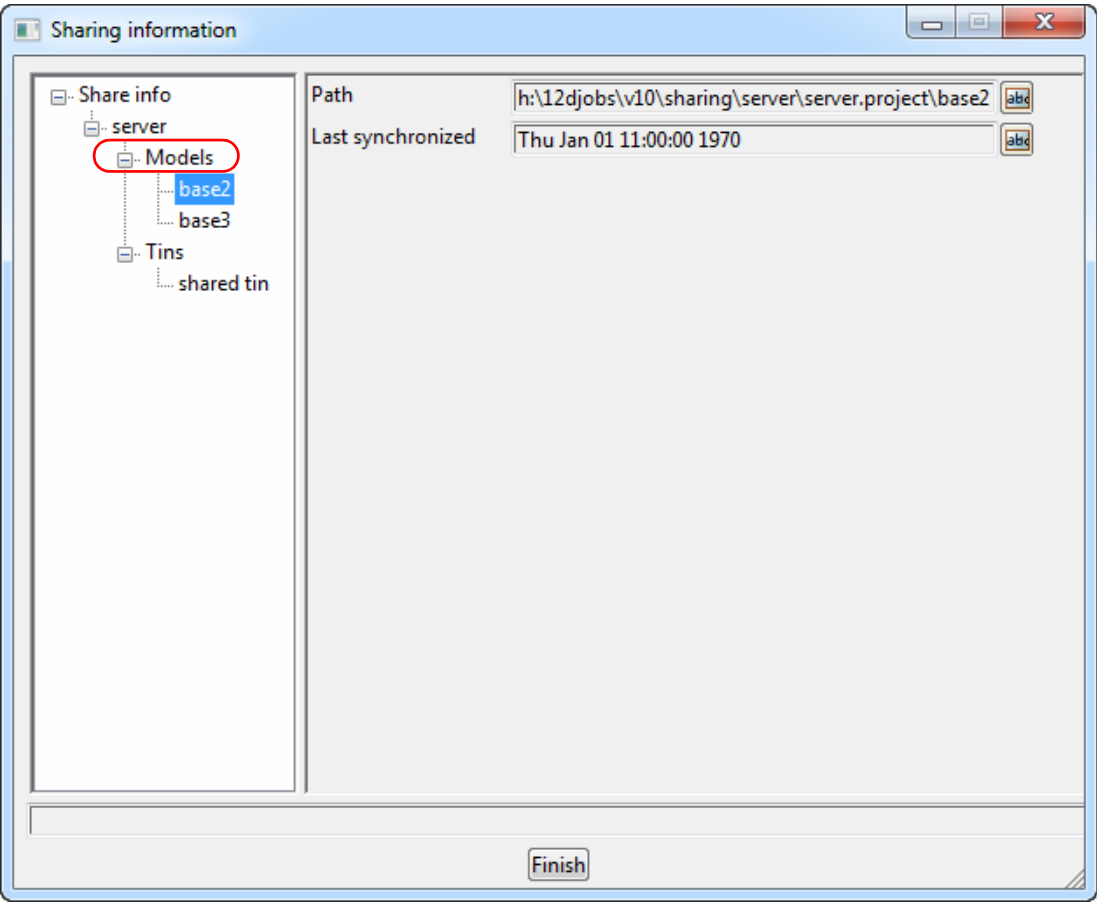
Server Node

Each server you are sharing from is listed in the tree.
Selecting the server node displays the path of the server, the project description and an option to view the diary for that project.

The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
View diary		button		

Views the diary for that project - disabled if no project diary created



Models Node

Each Model Node shows details about the shared model.

The fields and buttons used in this panel have the following functions.

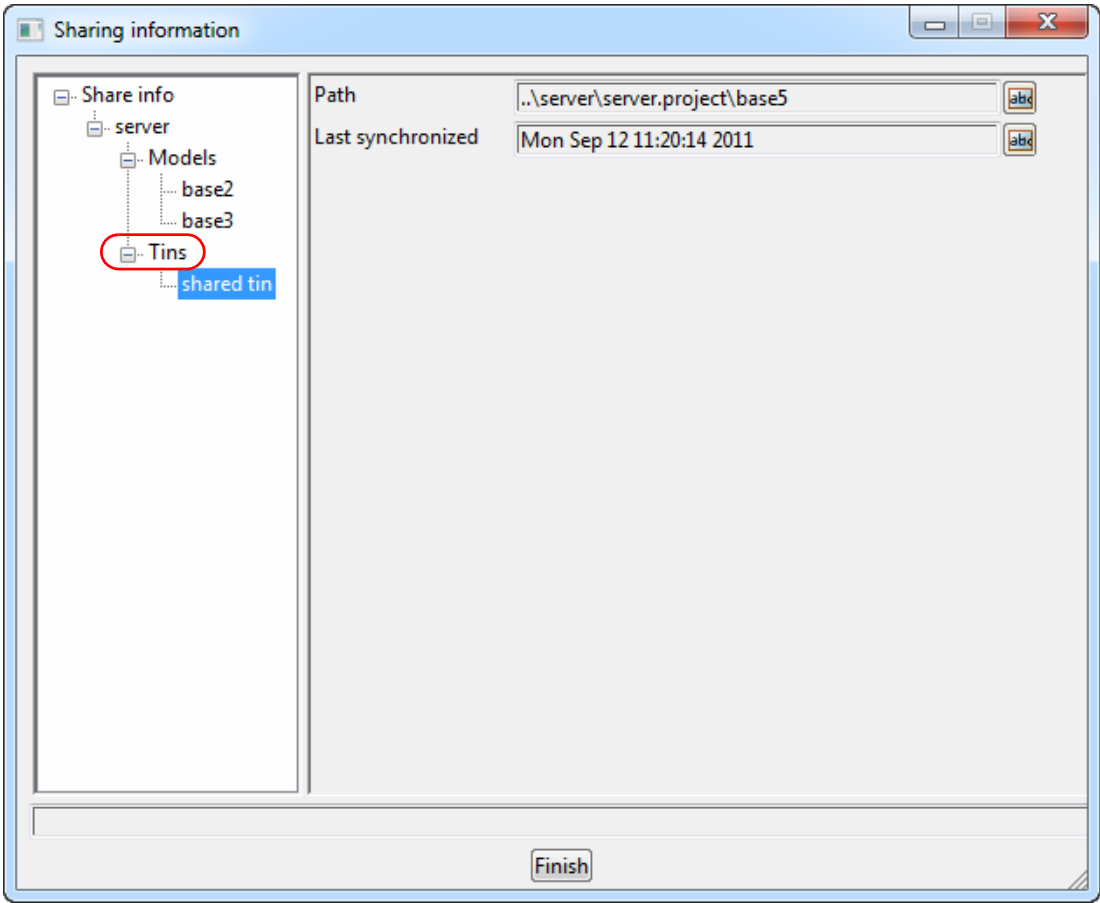
Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Path

the path to the original source of the model

Last Synchronized

the time the model was last synchronized



Tin Node

Each Tin Node shows details about the shared tin.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Path

the path to the original source of the tin

Last Synchronized

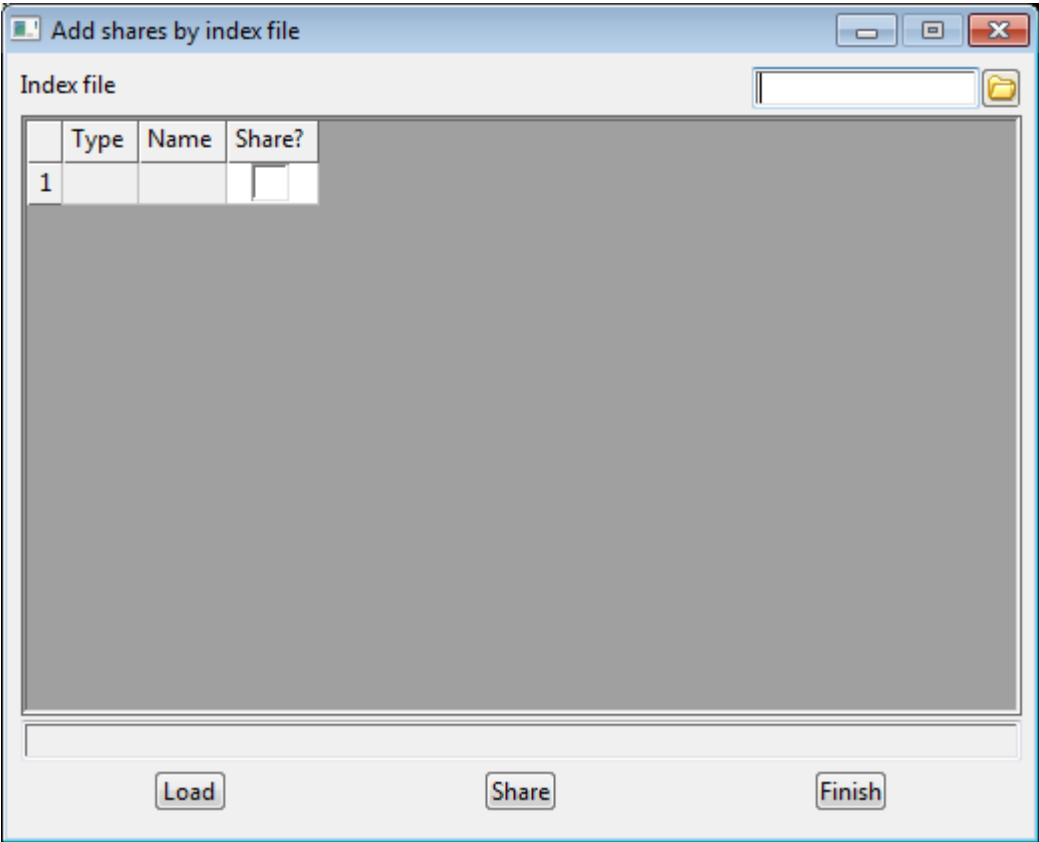
the time the tin was last synchronized

Add Shares By Index File

Position of option on menu: Project =>Management =>Sharing =>Read share index

This panel loads shared tin and model details from a share index file, created by [Export A Share Index File](#) and allows you to choose which items should be shared into your project.

Selecting **Read share index** brings up the **Add Shares By Index File** panel.



The fields and buttons used in this panel have the following functions.

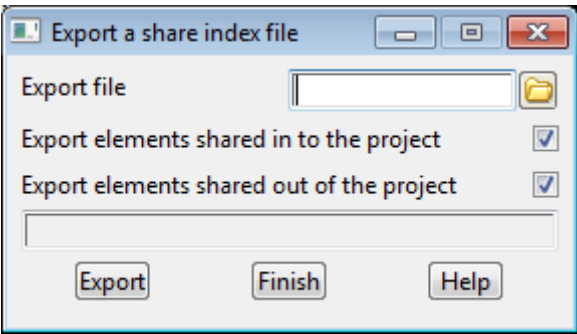
Field	Description	Type	Defaults	Pop-Up
Index file		file		
	<i>the sharing index file to read</i>			
Type				
	<i>the type of element (model or tin)</i>			
Name				
	<i>the name of the element</i>			
Share?		tick box		
	<i>whether or not to share the element in</i>			
Load		button		
	<i>loads the information from the selected index file</i>			
Share		button		
	<i>adds the selected shares to the project</i>			

Export A Share Index File

Position of option on menu: Project =>Management =>Sharing =>Export share index

This panel exports a list of all the shared elements (models and tins) that have been shared into this project. This can then be used to recreate the same sharing setup in another client project.

Selecting **Export share index** brings up the **Export a share index file** panel



The fields and buttons used in this panel have the following functions.

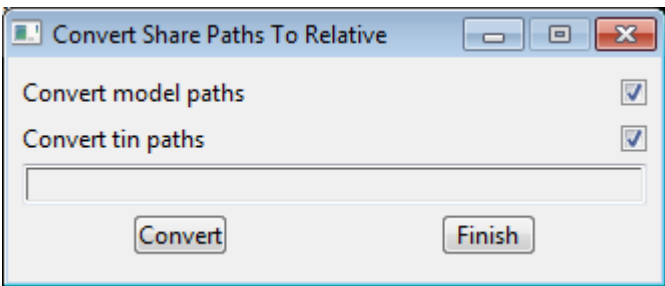
Field Description	Type	Defaults	Pop-Up
Export file <i>the file to export details to</i>	file		
Export <i>exports the sharing information</i>	button		

Convert Share Paths To Relative

Position of option on menu: Project =>Management =>Sharing=>Convert share paths to relative

This option changes the share paths of models and tins from absolute path names to relative path names. It is mainly used for projects where the share names were recorded as full paths names (e.g. V8 projects).

Selecting **Convert share paths to relative** brings up the **Convert Share Paths to relative** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Convert model paths <i>if ticked, the absolute path names of shared models added to this project will be converted to relative</i>	tick box		tick

paths.

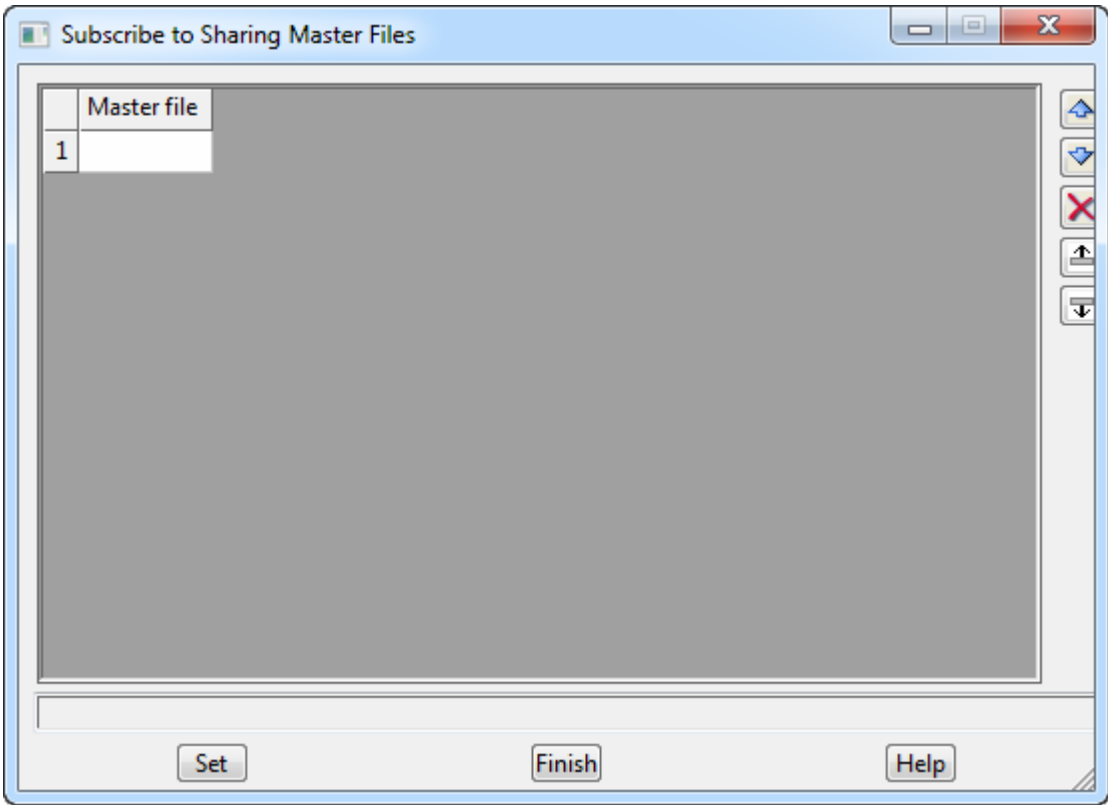
Convert tin paths	tick box	tick
if ticked, the absolute path names of shared tins added to this project will be converted to relative paths.		
Convert	button	
convert absolute paths to relative.		

Subscribe to Sharing Master Files

Position of option on menu: Project =>Management =>Sharing =>Subscribe to share master files

This panel allows you to subscribe to a set of sharing master files. Each master file defines a set of known models and tins, which will be shared into this project.

Selecting **Subscribe to share master files** brings up the **Subscribe to Sharing Master Files** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Set	button		
sets the list of files to which you wish to subscribe			

Note that the share check interval must be set, which can be set from the [Project Share Settings](#) panel.

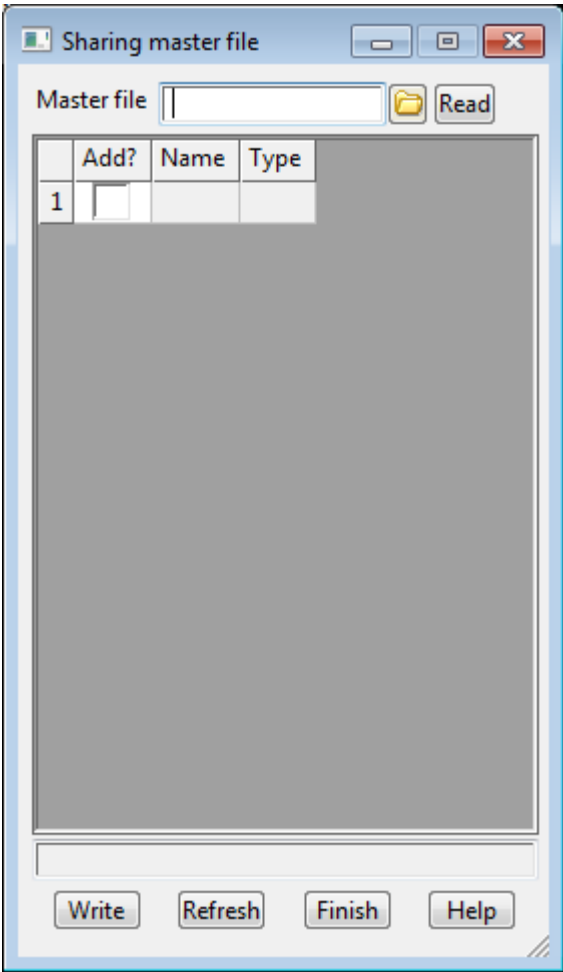
Sharing Master File

Position of option on menu: Project =>Management =>Sharing =>Create share master files

This panel allows you to define a sharing master file. A sharing master file can be created and subscribed to by a number of clients. This will enforce and define the set of shared models and tins the clients will consume. Updating the sharing master file will likewise update the clients, at a set interval as defined by the client.

This panel will list all models and tins that the user has marked as shareable.

Selecting **Create share master files** brings up the **Sharing master file** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Master file			
<i>the file to write to</i>			
Add?	tick box		
<i>whether or not to add the item to the sharing master file</i>			
Name			
<i>the name of the model or tin</i>			
Type			
<i>the type of the element (model or tin)</i>			

- Write

button

writes the sharing master file
- Refresh

button

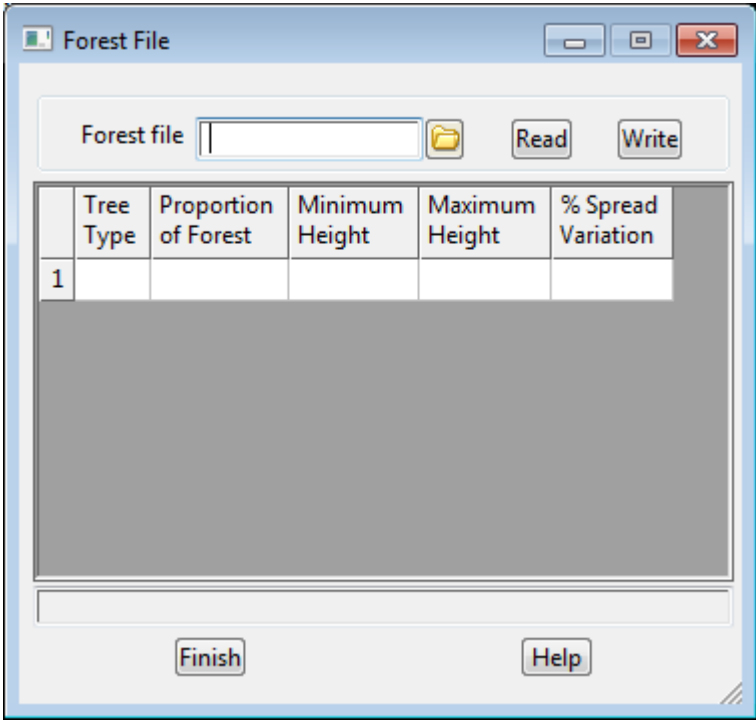
refreshes the list of shareable models and tins

Forest File

Position of option on menu: Project =>Management =>Forest file

The **Forest file** option creates files to control the types of trees, variation in heights and spreads and relative proportions of the various tree types in the file.

Selecting Forest file brings up the **Forest file** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Forest file	file box		*.forest
<i>name for the forest definitions.</i>			
Read	button		
<i>read in the forest file given in Forest file</i>			
Write	button		
<i>write out to forest file to the file given in Forest file.</i>			
Tree grid	grid		
Tree type	billboard select		
<i>name of the billboard to be placed for the tree - 12d trees are under the Trees, Palms and</i>			

Shrubs section of the billboards.

Proportion of Forest positive real *.forest

relative proportions of the forest made up of this tree. The actual proportion is this value over the sum of all the values in this column.

Maximum/Minimum Height positive reals

min and maximum heights to use for this tree type.

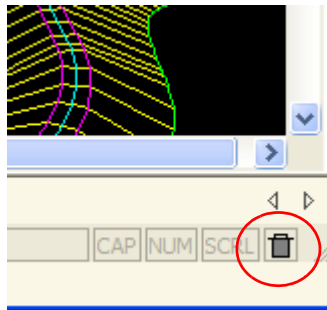
% Spread Variation positive real between 0 and 100

Trash Bin

Position of option on menu: Project =>Management =>Trash bin

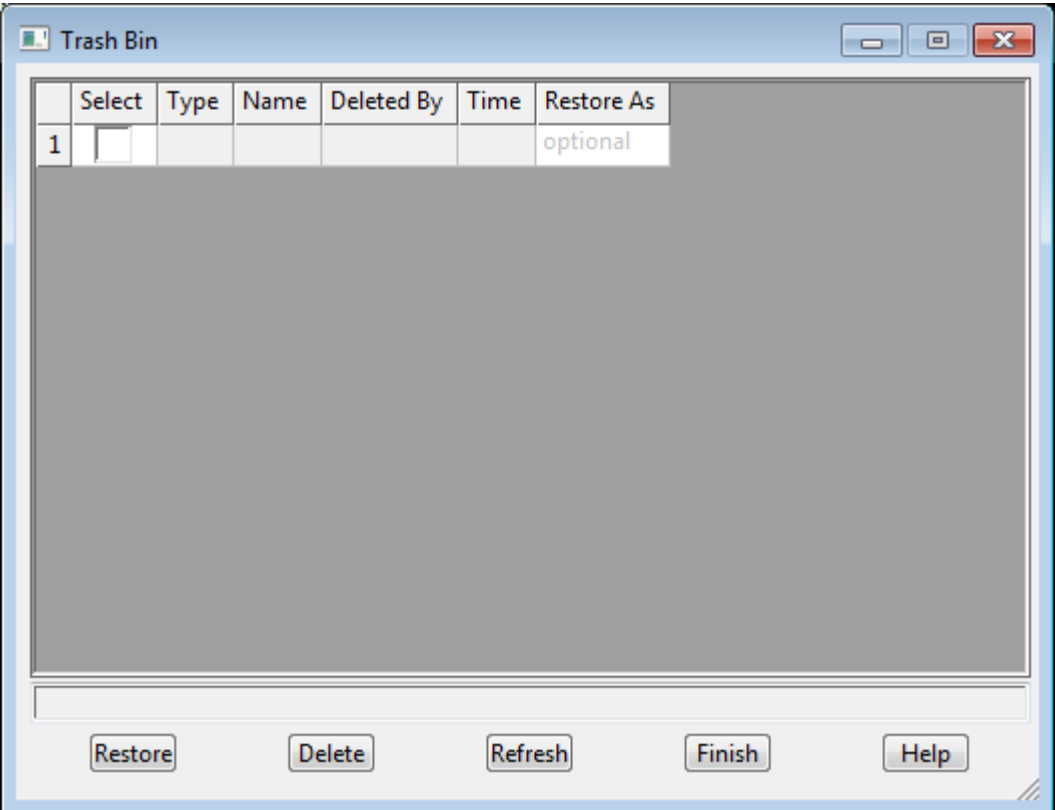
If the **Trash Bin** is turned on (by setting the env variable USE_TRASH_BIN_4D) then any deleted models, tins, functions and templates are not deleted from the disk but moved to the **12d Trash Bin**. Also for any models that are cleaned, the strings are moved to the trash bin.

If there is any data in the trash bin, a trash bin icon is displayed in the bottom left had corner of the project window.



Clicking on the trash bin icon, brings up the **Trash Bin** panel which displays the tins, templates or functions that have been deleted, and the models that have been deleted or cleaned. The delete/cleaned objects can be restored to the project.

Selecting Trash bin from Project =>Management =>Trash bin, also brings up the **Trash Bin** panel.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Trash Bin Grid		grid		
Type		output only		model, tin
	<i>type of object - model or tin.</i>			
Name		output only		
	<i>name of the object.</i>			
Deleted by		output only		
	<i>name of the user who deleted/cleaned the object.</i>			
Time		output only		
	<i>time of the deletion.</i>			
Select		tick box		
	<i>ticked if this object is to be Restored/Deleted. Note that right bottom on Select brings up a menu to Toggle (tick to no tick, no tick to tick), Set (set all to tick), or Clear (set all to no tick) for the entire column.</i>			
Restore As		text		
	<i>if not blank, the name the restore the object as.</i>			
	<i>If blank, restore the object with its original name in the Name column.</i>			
Buttons		grid		
Restore		button		
	<i>restore all the ticked objects.</i>			

- Delete

button

delete all the ticked objects from the trash. These items are then permanently deleted.
- Refresh

button

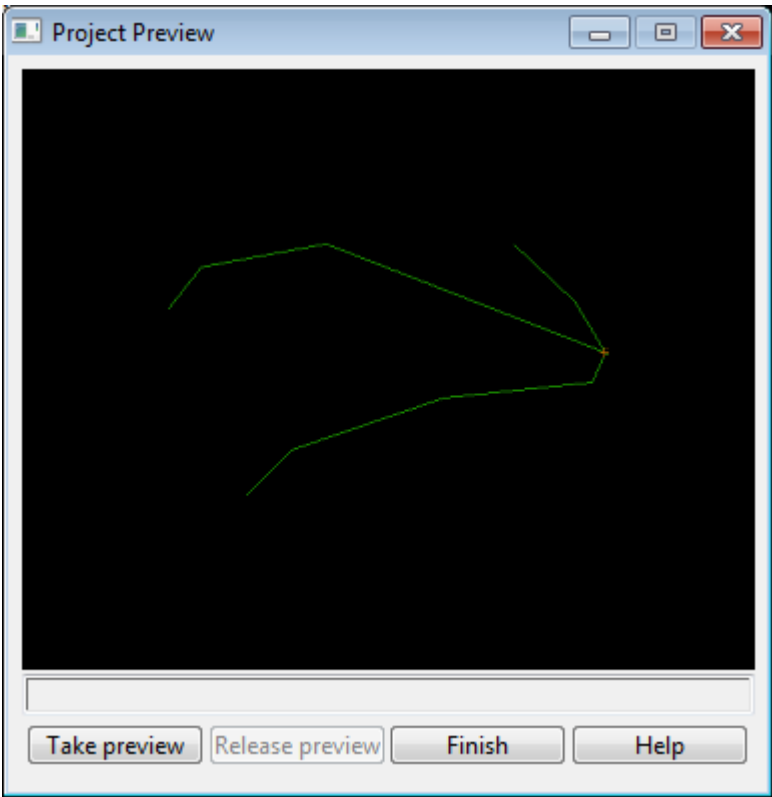
refresh the grid.

Project Preview

Position of option on menu: Project =>Management =>Project preview

When a **12d Model** project is exited, an image is saved to display in the New/Open project options. The image can be the last active view or an image defined by the user. The *Project preview* option can write out a user selected image or remove one if a fixed image has been previously set.

Selecting **Project preview** brings up the **Project Preview** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Take preview	button		
<i>if clicked, the image of the current active view is written and set to be used as a fixed project preview image. That is, this image is always used as the project preview.</i>			
Release preview	button		
<i>active when a fixed image is being used for the project preview. In that case if it is then clicked, the fixed image is deleted. An automatic image of the last active view will then be saved each time the project is exited.</i>			

Toggle Density Drawing

Position of option on menu: Project =>Management =>Toggle density drawing

Toggles the **Use density drawing** tick box in the **Defaults** panel.

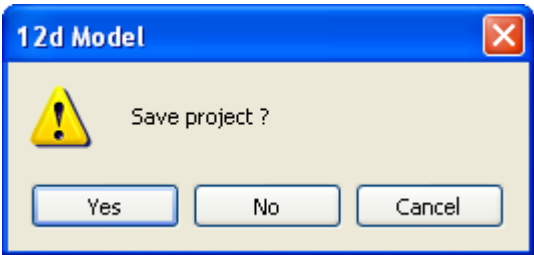
For more information on **density drawing**, see [Use density drawing tick box](#).

Note: This setting is only applicable to the 250M version of **12d Model**.

Restart

Position of option on menu: Project =>Restart

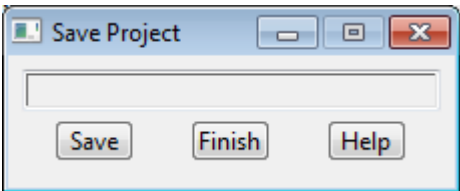
The **Restart** option exits the current **12d Model** project and then restart using the same project.
Useful for testing changes to set up files etc.
It will prompt if project **Save** is required.



Save

Position of option on menu: Project =>Save

The **Save** option saves the working project to disk.
On the **Save** from the Main menu, simply select the option and the project is saved.
On selecting **Save** from the floating Projects menu, the **save project** panel is displayed.



The position of the **save project** panel is also saved and the panel automatically placed on the screen when the project is started up again.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Save	button		

after selecting this button, the working project is saved to disk.

Tree

Position of option on menu: Project =>Tree

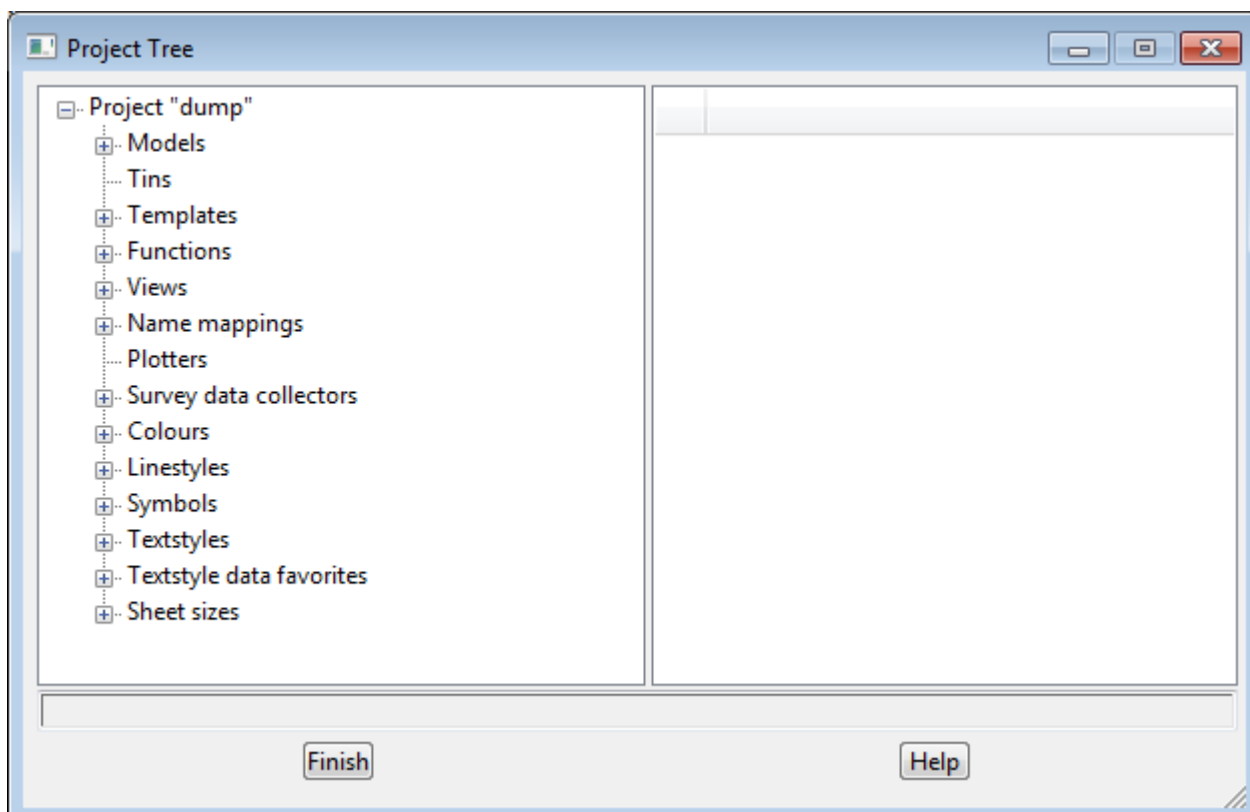
Position of option on menu: Project =>Management =>Tree

The **Tree** option is under continual development and being extended with each version of 12d Model.

Tree is used to drill down through information about the data in the project (for example models, tins and views) and also to interactive create/edit/edit most of the set-up information that is contained in text files. These include:

- (a) Name mapping (file names.4d) documented in the section [Name Mappings](#)
- (b) Plotters set-ups (file plotters.4d) which is not yet documented. See the section [Plotters](#).
- (c) Survey data collectors (file survey.4d) documented in the section [Survey Data Collectors](#)
- (d) Linestyles (file linestyl.4d) documented in the section [Linestyles](#)
- (e) Symbols (file symbols.4d) documented in the section [Symbols](#)
- (f) Textstyles (file textstyl.4d) documented in the section [Textstyles](#)
- (g) Textstyle data favourites (file textstyle_names.4d) documented in [Textstyle Data Favourites](#)
- (h) Sheet sized (file sheets.4d) documented in the section [Sheet Sizes](#)

On selecting the **Tree** option, the **Project Tree** panel is displayed.

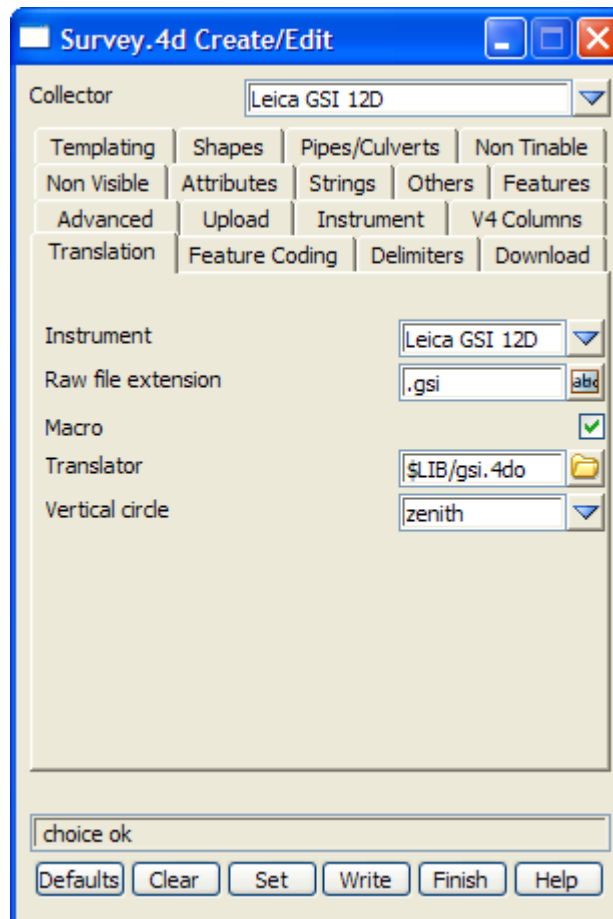


Note: This is a resizable panel.

Clicking on a **+** expands that browse tree node to show what items are available to get more information on. Clicking on a **-** collapses that browse tree node,

For the items *Name mappings*, *Plotters*, *Survey data collectors*, *Textstyles* and *Textstyle data favourites*, once they are expanded then the items displayed need no further expansion (there is no + displayed in front of the items) and double clicking on the expanded items brings up the create/edit panels for the item.

For example, clicking on + for *Survey data collectors* and then double clicking on a data collector brings up the *Survey.4d Create/Edit* panel.



For the option *Name mappings*, go to
Plotters
Survey data collectors
Linestyles
Symbols
Textstyles
Textstyle data favourites
Sheet sizes

[Name Mappings](#)
[Plotters](#)
[Survey Data Collectors](#)
[Linestyles](#)
[Symbols](#)
[Textstyles](#)
[Textstyle Data Favourites](#)
[Sheet Sizes](#)

Name Mappings

Position of option on menu: Project =>Tree

The name mapping file is used in all panel fields requiring the *name* of a string and the name field in the CAD Controlbar.

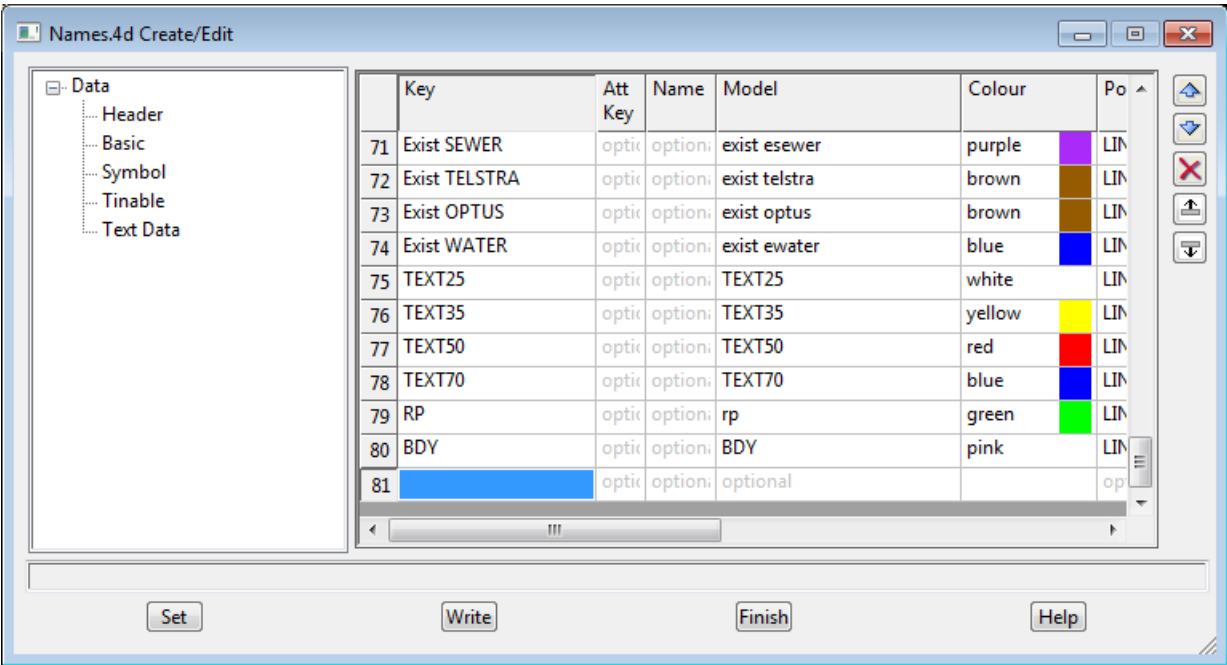
After the string name is typed, if the <Enter> is pressed then each section of the name mapping file being used for the project is searched for matches with the key.

If there is a match of the string name with a key, then the name, model, colour point/line type etc. for that key will be used in the appropriate panel fields, or toolbar fields, that go with the string name.

Click on *Name mapping* to expand the items and then double click LB on *Create name mapping* to create/edit the name mapping file *names.4d*.

Double clicking LB on any of the items below *Create name mapping* will also create/edit the *names.4d* file.

In either case, the **Names.4d Create/Edit** panel will then appear.



Buttons

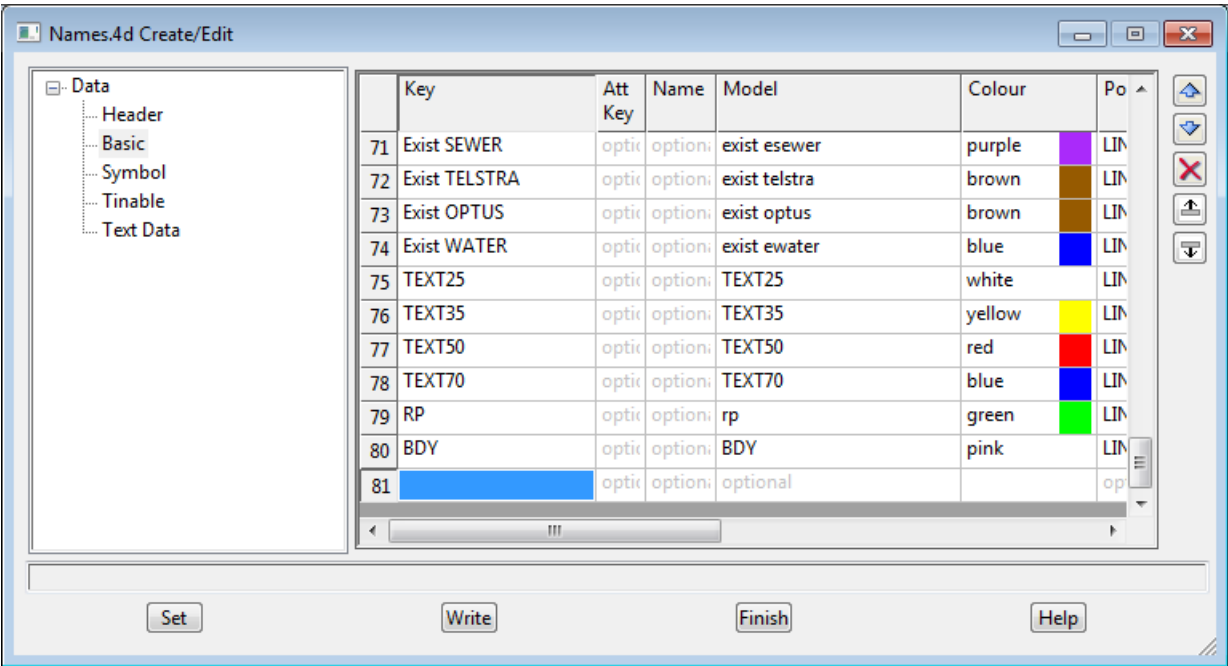
Set button

sets the definition for this editing session of the project - the information will be lost when the project is exited.

Write button

*write the information to the file names.4d. The file can then be used when projects are started. The information won't be used for the current session unless the **Set** button is selected as well. For more information on the **Write** button, go to the section [Writing Set Up Files](#) in the Appendix [Setting Up and Configuring 12d](#)*

Basic Tab



Key input
*the string name is searched against the list of keys for the **Basic** tab until a first match is found. If a match is found, then any non-blank data in the grid is used to fill out the appropriate panel fields or toolbar fields. The key can include wild cards (*) or wild characters (?)*

Name input
if not blank, name used to replace the string name by. This is usually blank.

Model model grid available models
if not blank, model to use

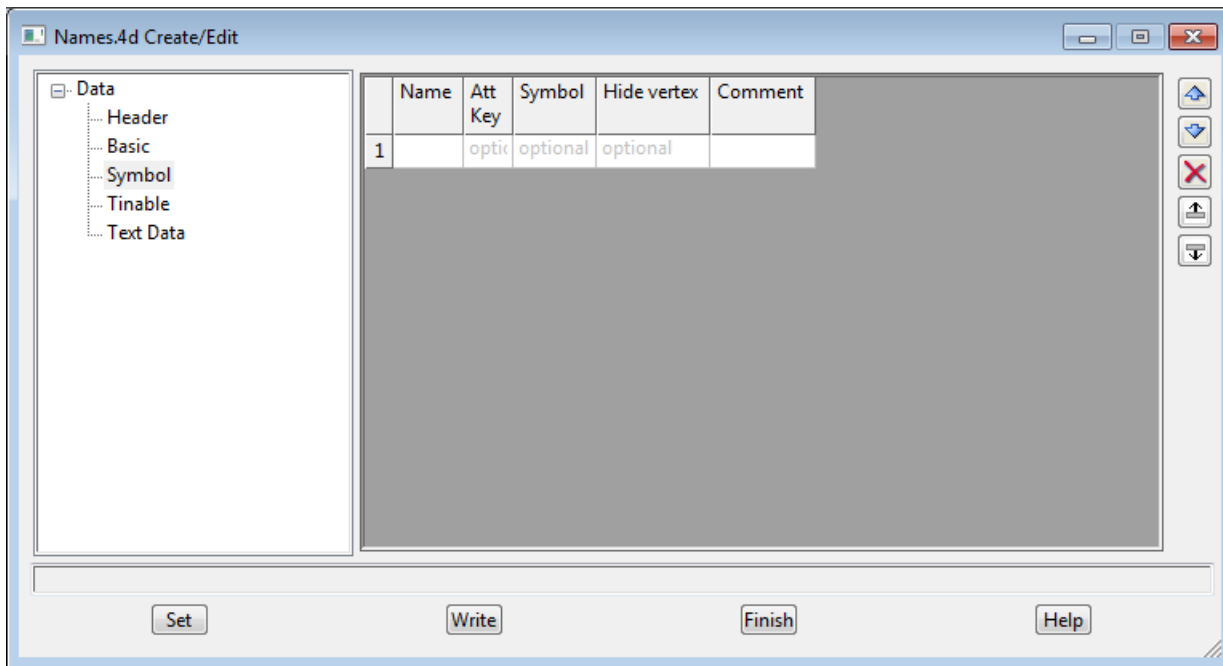
Colour colour grid available colours
if not blank, colour to use

Point Line point/line grid point/line
if not blank, point-line type to use

Weight input
if not blank, weight to use for strings with linestyle 1

Comment input
user comment

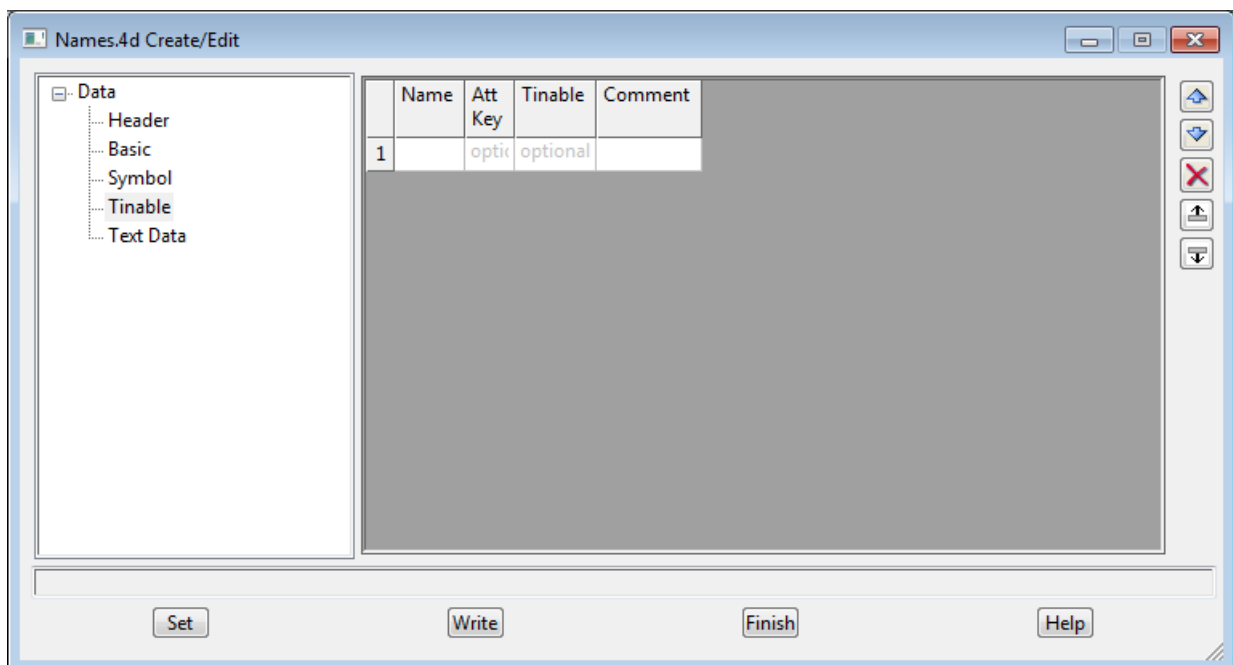
Symbols Tab



Key input

*the string name is searched against the list of keys for the **Symbols** tab until a first match is found. If a match is found, then any non-blank data in the grid is used to fill out the appropriate panel fields or toolbar fields. The key can include wild cards (*) or wild characters*

Tinable Tab



Key input

*the string name is searched against the list of keys for the **Tinable** tab until a first match is found. If a match is found, then any non-blank data in the grid is used to fill out the appropriate panel fields or toolbar fields. The key can include wild cards (*) or wild characters*

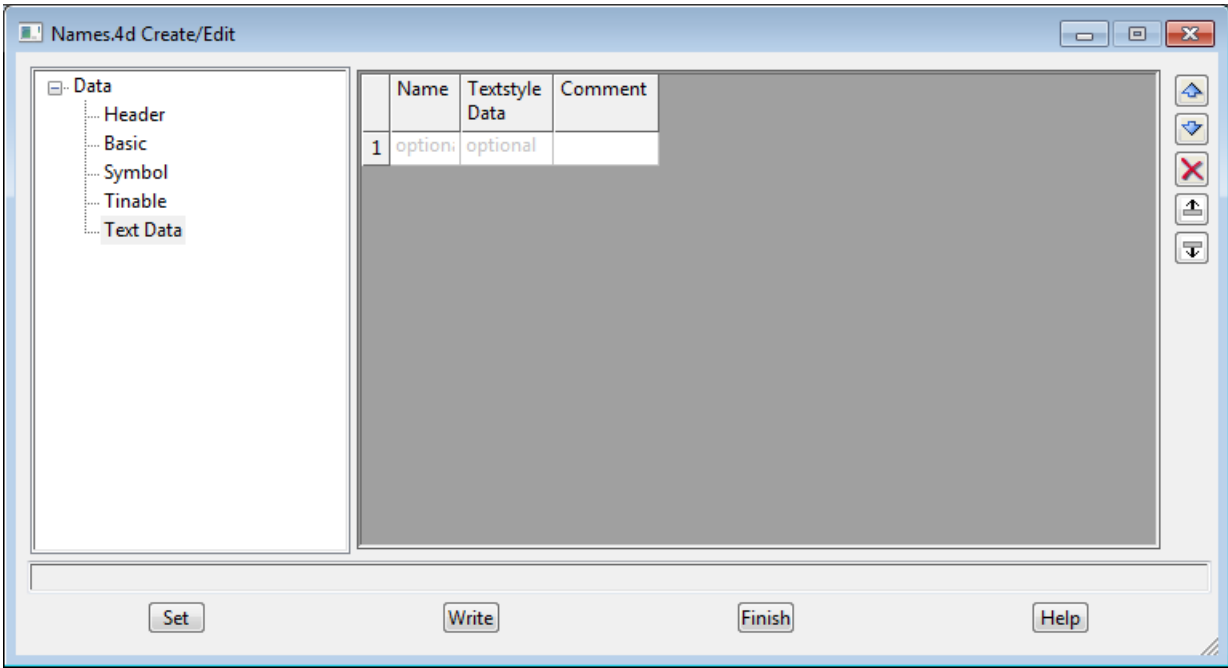
Tinable tinability grid

*if **no**, the entire string is non tinable. That is, the vertices are not included in any triangulation.*

*If **yes**, the entire string is tinable. That is, the vertices are used in any triangulation and the segments between the vertices are used as breaklines.*

*If **points**, the vertices of a string are tinable but the segments are not. That is, the vertices are used in any triangulation but the segments between the vertices are used as breaklines.*

Text Data Tab



Key input

*the string name is searched against the list of keys for the **Text Data** tab until a first match is found. If a match is found, then any non-blank data in the grid is used to fill out the appropriate panel fields or toolbar fields. The key can include wild cards (*) or wild characters*

Plotters

User defined plotters can be set up in **12d Model** and the information is stored in the file `plotters.4d` which is fully documented in the section [User Defined Plotters](#) in the Appendix [Plotters and Plotting](#).

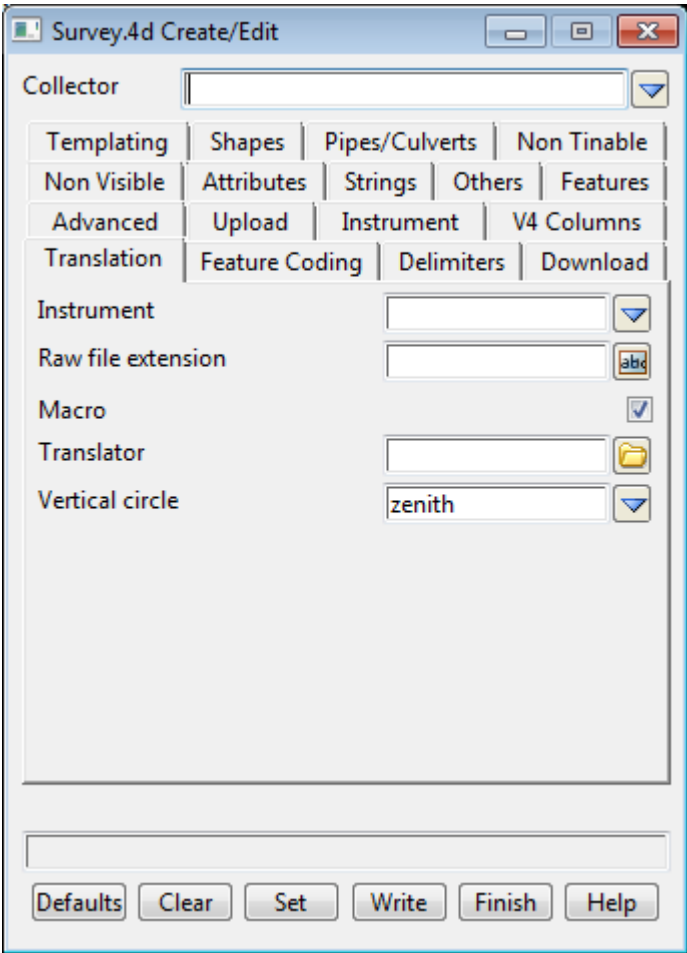
The interactive editor **Plotters** on the Browse option is not yet fully implemented or documented.

Survey Data Collectors

Position of option on menu: Project =>Tree

Click on *Survey data collectors* to expand the item and then double click LB on *Create data collector* to create a new data collector, or double click LB on an existing data collector in the list to edit an existing data collector definition.

The **Survey.4d Create/Edit** panel will then appear.



This option is fully documented in the [Data Collector Definitions](#) section in the Appendix [12d Survey Guide](#).

Linestyles

Position of option on menu: **Project =>Tree**

Click on *Linestyles* to expand the item and then double click LB on *Create linestyle* to create, edit or delete linestyles, or double click LB on an existing textstyle in the list to edit an existing linestyle definition. The **Linestyle Create/Edit/Delete** panel will then appear.

The linestyle can be created interactively in **12d Model** by drawing the new linestyle using strings containing lines, arcs, circles and text. This information can then be used to create the linestyle.

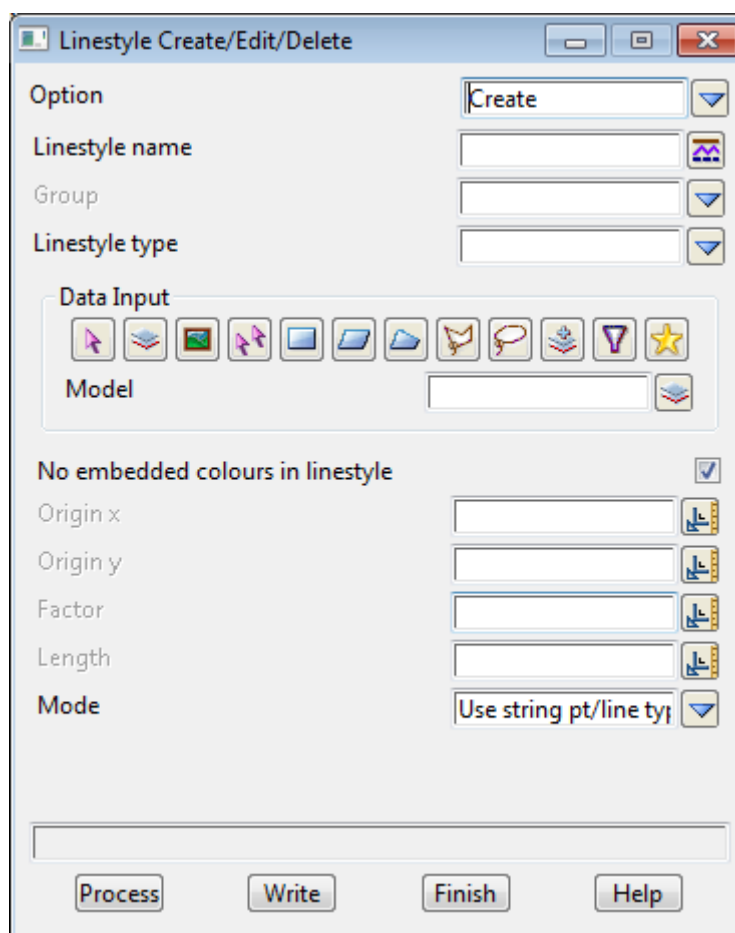
To edit a linestyle, the current definition is written to a model which can then be edited to create the modified linestyle.

The definition of a linestyle includes:

- (a) a unique name
- (b) the Group to show the linestyle under in the linestyle pop-up
- (c) the linestyle type

All the information for linestyles is stored in the text file *linestyl.4d* but the **Linestyle Create/Edit/Delete** panel is normally used to create and modify the file rather than using a text editor. (the file *linestyl.4d* is fully documented in the [Line Styles](#) section of the Appendix [Line styles, Symbols and Textstyles](#)).

The **Linestyle Create/Edit/Delete** panel is:



Linestyle Create/Edit/Delete

Option

Edit

Linestyle name

Group

Linestyle type

Edit linework

Model for linestyle

Write out linestyle

No embedded colours in linestyle

☒

Origin x

Origin y

Factor

Length

Mode

Use string pt/lin

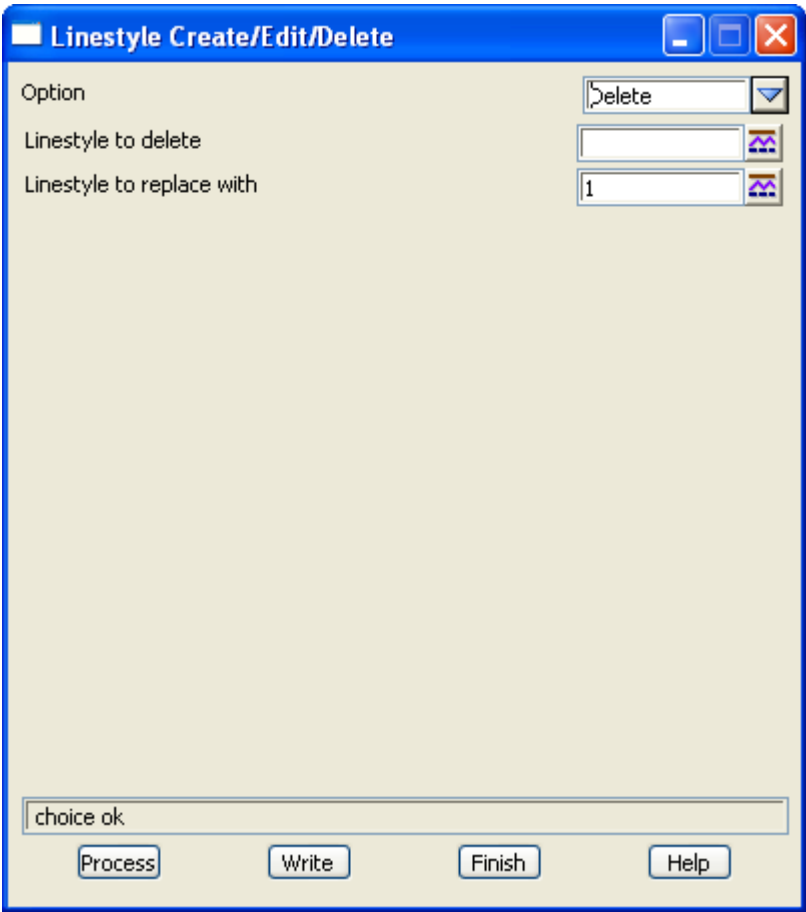
choice invalid

Process

Write

Finish

Help



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Option <i>type of edit</i>	choice box	Create	Create, Edit, Delete
Linestyle name <i>name of the linestyle to be created, edited or deleted.</i>	input		available linestyles
Group <i>name of the group for the linestyle - can be a new group name.</i>	input		available groups
Linestyle type <i>type of the linestyle.</i>	choice box	world	user, pixel, world, paper, 2 point, group

For Option choice "Create" - Data input

Data input <i>data to be used to create the linestyle.</i>	source box	model
----------------------------------------------------------------------	------------	-------

For Option choice "Edit" - Edit line work

Model for linestyle <i>model to write the linestyle out to so that it can be edited.</i>	model box	available models
Write out linestyle <i>when selected, the linestyle is written out to the Model for linestyle.</i>	button	

For Option choice "Delete"

Linestyle to delete	linestyle box	available linestyle
<i>name of the linestyle to delete.</i>		
Linestyle to replace it with	linestyle box	1 available linestyle
<i>when the linestyle is deleted, any string with that linestyle has to have a new linestyle. This is the linestyle that is set for strings with the deleted linestyle</i>		

For the Linestyle type - User, Pixel, World, Paper

No imbedded colours in linestyle	tick box	tick
<i>if ticked then no colours from the data are used in the linestyle.</i>		
<i>If not ticked then any colours used in the data are used in the linestyle</i>		
Origin x/y	double box	
<i>if non blank, the x/y value for the origin of the linestyle.</i>		
<i>If blank, a value is calculated by 12d.</i>		
Factor	double box	
<i>if non blank, the linestyle is factored up by this value.</i>		
<i>If blank, the factor is taken to be 1.</i>		
Length	double box	
<i>if non blank, the linestyle is repeated after this length.</i>		
<i>If blank, the linestyle length is calculated by 12d.</i>		
Mode	choice box	use string pt/line type only at vertices, repeat style
<i>if use string pt/line type, then if the string pt/line type is line then the linestyle is repeated after the Length value. If the string pt/line type is point, then the linestyle is only drawn at each vertex of the string.</i>		
<i>If only at vertices, then the linestyle is only drawn at each string vertex regardless of the strings pt/line type.</i>		
<i>If repeat style, then the linestyle is repeated after the Length value regardless of the strings pt/line type.</i>		

For the Linestyle type - 2 point

No imbedded colours in linestyle	tick box	tick
<i>if ticked then no colours from the data are used in the linestyle.</i>		
<i>If not ticked then any colours used in the data are used in the linestyle</i>		
Origin x/y	double box	
<i>if non blank, the x/y value for the first origin of the linestyle.</i>		
<i>If blank, a value is calculated by 12d.</i>		
Origin 2 x/y	double box	
<i>if non blank, the x/y value for the second origin of the linestyle.</i>		
<i>If blank, a value is calculated by 12d.</i>		
Stretch in	choice box	one direction, both directions
<i>if "one direction", the linestyle is only stretched along the axis joining the two original points. The linestyle is not stretched perpendicular to that axis.</i>		
<i>If "both directions", the linestyle is stretched in all directions.</i>		
Drawn on	choice box	every line/arcevery line/arc, every second line/arc

*if "one direction", the linestyle is only stretched along the axis joining the two original points. The linestyle is not stretched perpendicular to that axis.
If "both directions", the linestyle is stretched in all directions.*

For Linestyle type - Group

Linestyle grid

list of linestyles that make up the this one linestyle.

Buttons

Process button

process the data in the panel fields. The internal definitions of the linestyles is modified. The definitions are not written to the linestyle file.

Write button

*write the modifications to the file `linestyl.4d` file. This files can then be used when projects are opened up. The information won't be used for the current session unless the **Process** button is selected as well. For more information on the **Write** button, go to the section [Writing Set Up Files](#) in the Appendix [Setting Up and Configuring 12d](#)*

This option updates the files `linestyles.4d` which is fully documented in the [Line Styles](#) section in the Appendix [Line styles, Symbols and Textstyles](#).

Symbols

Position of option on menu: Project =>Tree

Click on *Symbols* to expand the item and then double click LB on *Create symbol* to create, edit or delete symbols, or double click LB on an existing symbol in the list to edit an existing symbol definition. The **Symbol Create/Edit/Delete** panel will then appear.

The symbol can be created interactively in **12d Model** by drawing the new symbol using strings containing lines, arcs, circles and text. This information can then be used to create the symbol.

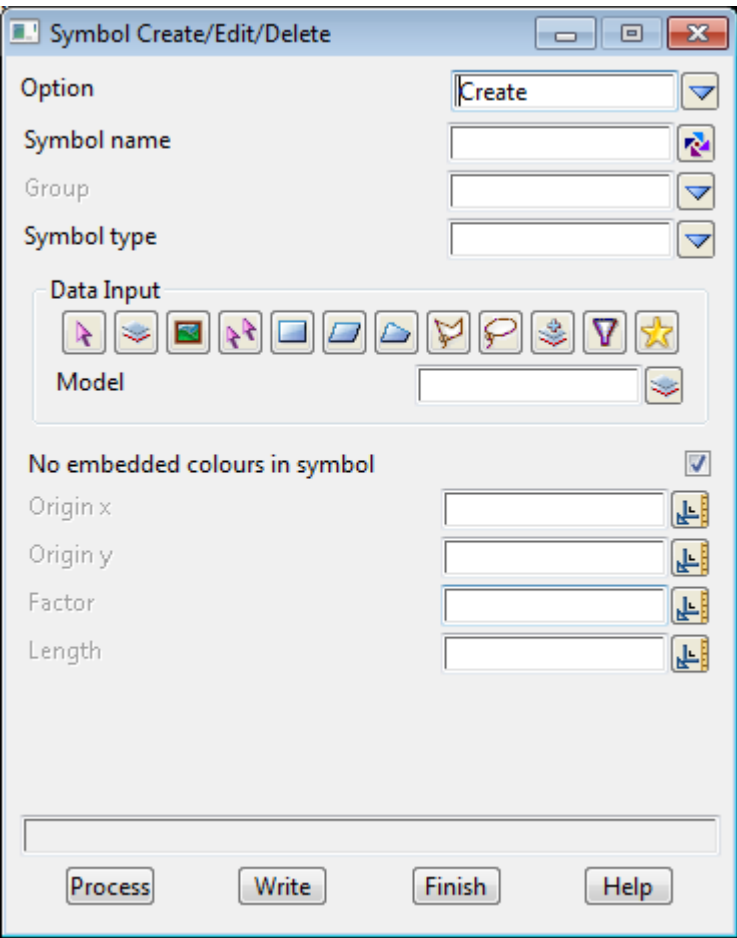
To edit a symbol, the current definition is written to a model which can then be edited to create the modified symbol.

The definition of a symbol includes:

- (a) a unique name
- (b) the Group to show the symbol under in the symbol pop-up
- (c) the symbol type

All the information for linestyles is stored in the text file symbols.4d but the **Symbol Create/Edit/Delete** panel is normally used to create and modify the file rather than using a text editor. (the file *symbols.4d* is fully documented in the [Line Styles](#) section of the Appendix [Line styles, Symbols and Textstyles](#)).

The **Symbol Create/Edit/Delete** panel is:



Symbol Create/Edit/Delete

Option

Edit

Symbol name

Group

Symbol type

Edit linework

Model for symbol

Write out symbol

No embedded colours in symbol

☒

Origin x

Origin y

Factor

Length

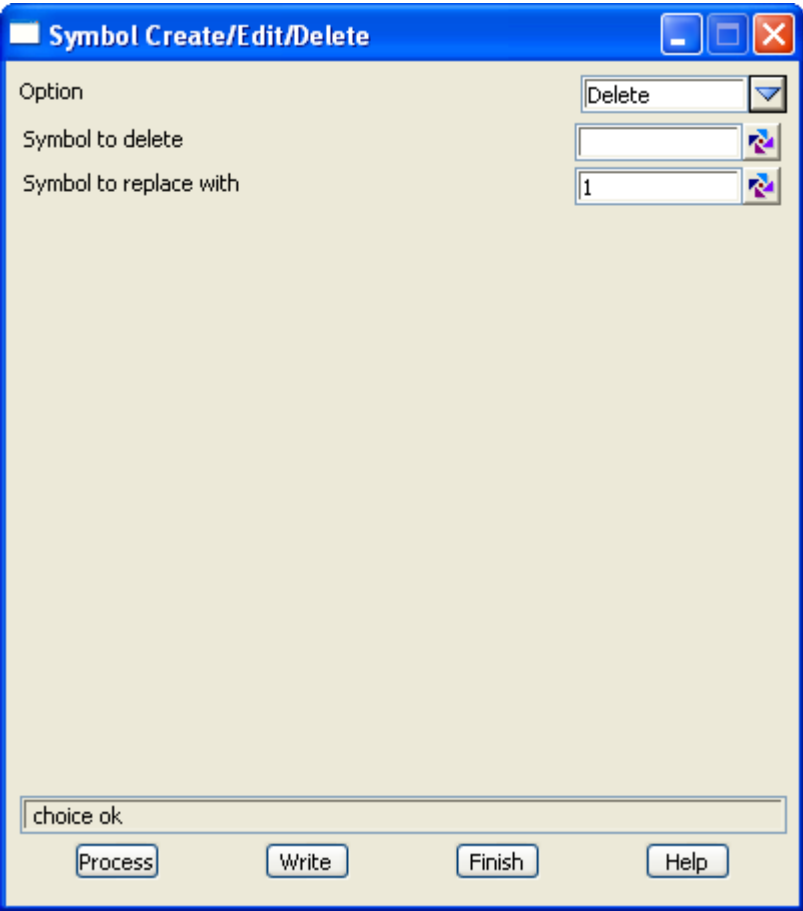
choice invalid

Process

Write

Finish

Help



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Option <i>type of edit</i>	choice box	Create	Create, Edit, Delete
Symbol name <i>name of the linestyle to be created, edited or deleted.</i>	input		available symbols
Group <i>name of the group for the symbol - can be a new group name.</i>	input		available groups
Symbol type <i>type of the symbol.</i>	choice box	world	pixel, world, paper
For Option choice "Create" - Data input			
Data input <i>data to be used to create the symbol.</i>	source box		model
For Option choice "Edit" - Edit line work			
Model for symbol <i>model to write the symbol out to so that it can be edited.</i>	model box		available models
Write out symbol <i>when selected, the symbol is written out to the Model for symbol.</i>	button		

For Option choice "Delete"

Symbol to delete symbol box available symbols
name of the linestyle to delete.

Symbol to replace it with symbol box 1available symbols
when the symbol is deleted, any vertex of a string with that symbol has to have a new symbol. This is the symbol that is set for strings with the deleted symbol

No imbedded colours in symbol tick box tick
*if **ticked** then no colours from the data are used in the symbol.
If **not ticked** then any colours used in the data are used in the symbol*

Origin x/y double box
*if non blank, the x/y value for the origin of the symbol.
If blank, a value is calculated by 12d.*

Factor double box
*if non blank, the symbol is factored up by this value.
If blank, the factor is taken to be 1.*

Length double box
*if non blank, the symbol is repeated after this length.
If blank, the symbol length is calculated by 12d.*

Process button
process the data in the panel fields. The internal definitions of the symbols is modified. The definitions are not written to the symbol file.

Write button
*write the modifications to the file symbols.4d file. This files can then be used when projects are opened up. The information won't be used for the current session unless the **Process** button is selected as well. For more information on the **Write** button, go to the section [Writing Set Up Files](#) in the Appendix [Setting Up and Configuring 12d](#)*

This option updates the files symbols.4d which is fully documented in the [Symbols](#) section of the Appendix [Line styles, Symbols and Textstyles](#).

Textstyles

Position of option on menu: **Project =>Tree**

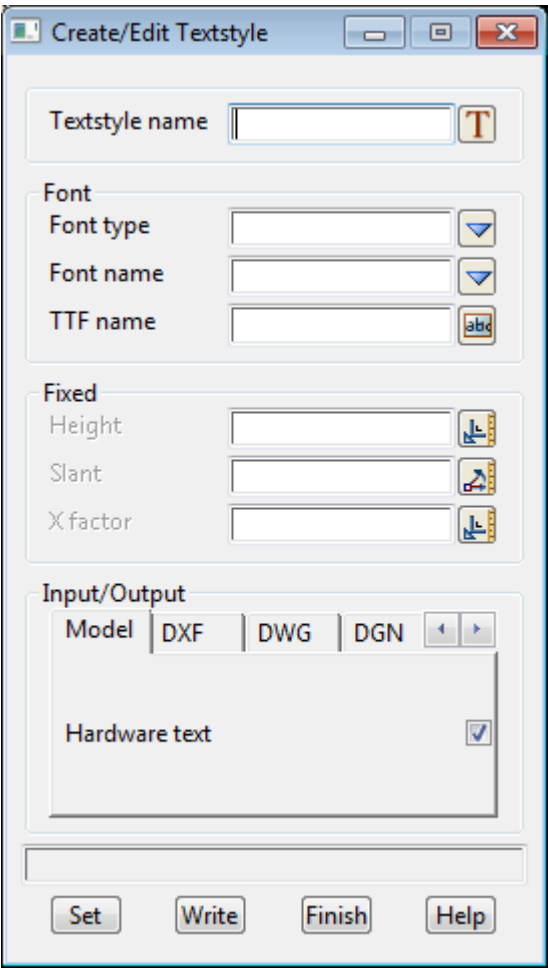
Click on *Textstyles* to expand the item and then double click LB on *Create textstyle* to create a new textstyle, or double click LB on an existing textstyle in the list to edit an existing textstyle definition. The **Create/Edit Textstyle** panel will then appear.

The textstyle definition includes

- (a) a unique name
- (a) the font used for textstyle - this may be a true type font
- (b) mappings of textstyle names when reading in data from AutoCAD and Microstation
- (c) mappings of textstyle names when writing data out to AutoCAD, Microstation and **12d Model** Models.

All the information for textstyles and fonts is stored in text files (textstyl.4d and fonts.4d) but the **Create/Edit Textstyle** panel is normally used to create and modify the files rather than using a text editor. (the files *textstyles.4d* and *fonts.4d* which are fully documented in the [Textstyles and Fonts](#) section of the Appendix [Line styles, Symbols and Textstyles](#)).

The **Create/Edit Textstyle** panel is:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Textstyle name	input		available textstyles

name of the textstyle to be defined or edited.

Font section

Font name	output	recent projects
name of the font to be used for the textstyle.		
True type font	tick box	tick
if ticked then the font is a true type font. The next box asks for the True Type Font name. If not ticked then the font needs an SHP file to define the characters. The next box asks for the SHP name.		
TTF name	input	available true type fonts
name of the true type font.		
SHP name	input	available SHP files
name of the SHP file to define the characters.		

Fixed section

Input/Output section

Model tab

Hardware text	tick box	tick
if ticked then any 12d Model text is written out to a model as text strings. If not ticked then each characters of a text string is turned into individual lines and arcs (i.e. each character is stroked).		

DXF tab

Hardware text	tick box	tick
if ticked then any 12d Model text is written out to the DXF file as text. If not ticked then each characters of a text string is turned into individual lines and arcs (i.e. each character is stroked).		
Input name	input	
when a DXF file is read in, any text in the DXF file with style of this Input name , is converted to 12d Model text strings with the textstyle Textstyle name .		
Output name	input	
if the Hardware text flag is set to tick - when data is written out to a DXF file, any 12d Model text with the textstyle of the name in the field Textstyle name , is converted to DXF text with style of this Output name . If the Hardware text flag is not set to tick, then this field is ignored.		

DWG tab

Hardware text	tick box	tick
if ticked then any 12d Model text is written out to the DWG file as text. If not ticked then each characters of a text string is turned into individual lines and arcs (i.e. each character is stroked).		
Input name	input	
when a DGN file is read in, any text in the DGN file with style of this Input name , is converted to 12d Model text strings with the textstyle Textstyle name .		
Output name	input	
if the Hardware text flag is set to tick - when data is written out to a DWG file, any 12d Model text with the textstyle of the name in the field Textstyle name , is converted to DWG text with style of this Output name . If the Hardware text flag is not set to tick, then this field is ignored.		

DGN tab

Hardware text tick box tick

*if **ticked** then any **12d Model** text is written out to the DGN file as text.
If **not ticked** then each characters of a text string is turned into individual lines and arcs (i.e. each character is stroked).*

Input name input

*when a DGN file is read in, any text in the DGN file with style of this **Input name**, is converted to **12d Model** text strings with the textstyle **Textstyle name**. For DGN, the text style must be a number between 1 and 64.*

Output name input

*if the **Hardware text** flag is set to tick - when data is written out to a DGN file, any **12d Model** text with the textstyle of the name in the field **Textstyle name**, is converted to DGN text with style of this **Output name**. For DGN, the text style name must be a number between 1 and 64.
If the **Hardware text** flag is not set to tick, then this field is ignored.*

Other tab

Hardware text tick box tick

*if **ticked** then any **12d Model** text is written out to the file as text.
If **not ticked** then each characters of a text string is turned into individual lines and arcs (i.e. each character is stroked).*

Input name input

*when a file is read in, any text in the file with style of this **Input name**, is converted to **12d Model** text strings with the textstyle **Textstyle name**.*

Output name input

*if the **Hardware text** flag is set to tick - when data is written out to a file, any **12d Model** text with the textstyle of the name in the field **Textstyle name**, is converted to text with style of this **Output name**.
If the **Hardware text** flag is not set to tick, then this field is ignored.*

Buttons

Set button

sets the definition for this editing session of the project - the information will be lost when the project is exited.

Write button

*write the information to the files **textstyle.4d** and **fonts.4d** files. These files can then be used when projects are started. The information won't be used for the current session unless the Set button is selected as well. For more information on the **Write** button, go to the section [Writing Set Up Files](#) in the Appendix [Setting Up and Configuring 12d](#)*

*This option updates the files **textstyles.4d** and **fonts.4d** which are fully documented in the [Textstyles and Fonts](#) section of the Appendix [Line styles, Symbols and Textstyles](#).*

Textstyle Data Favourites

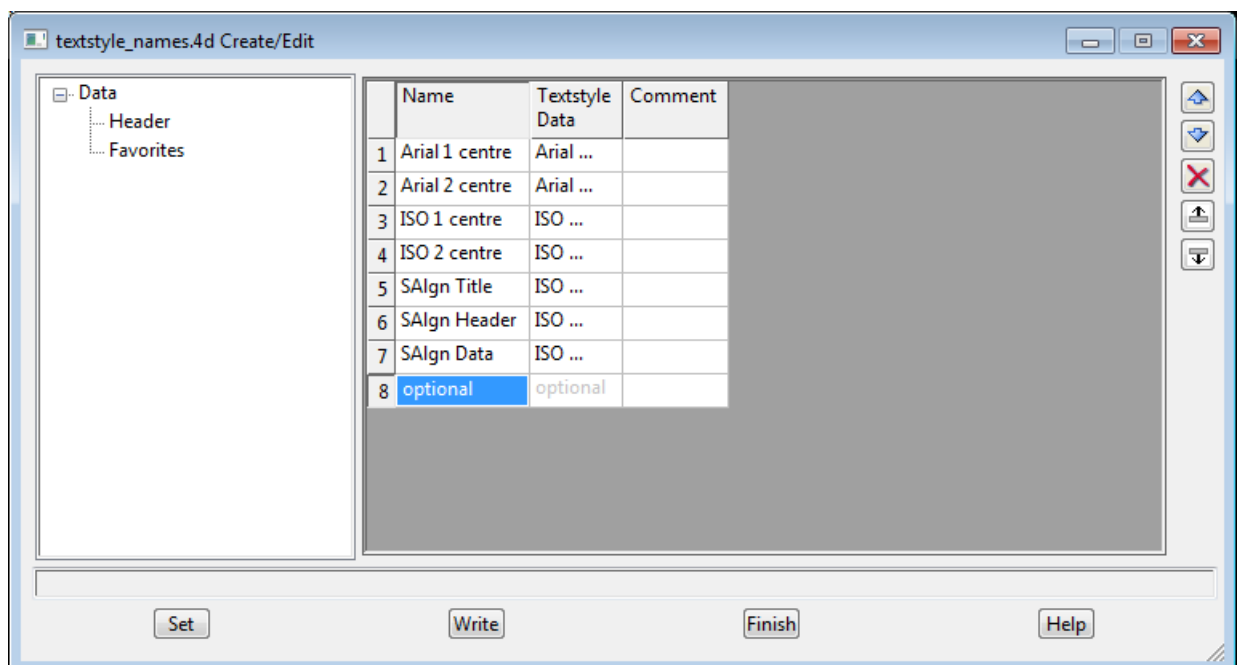
Position of option on menu: **Project =>Tree**

The *textstyle data favourites* option defines a set of text style parameters recorded with a user given name. When ever a text style needs to be defined, the name of a *textstyle data favourite* can be selected and the values of the favourite used for the text.

To define or modify a textstyle favourite, click on *Textstyle data favourites* in the *Browse* list to expand the item and then double click LB on *Create textstyle data favourite* to create/edit the *textstyle_names.4d* file.

Double clicking LB on any of the items below *Create textstyle data favourite* will also create/edit the *textstyle_names.4d* file.

In either case, the **Textstyle_names.4d Create/Edit** panel will then appear.



Buttons

Set button

sets the definition for this editing session of the project - the information will be lost when the project is exited.

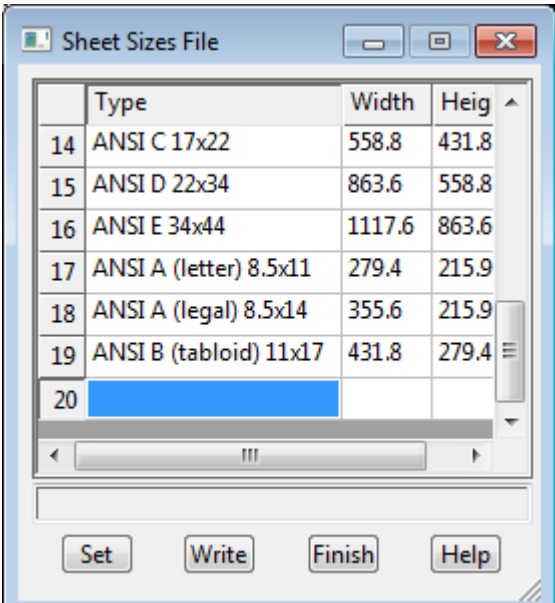
Write button

write the information to the `textstyle_names.4d` file. The file can then be used when projects are started. The information won't be used for the current session unless the **Set** button is selected as well. For more information on the **Write** button, go to the section [Writing Set Up Files](#) in the Appendix [Setting Up and Configuring 12d](#)

Sheet Sizes

Position of option on menu: Project =>Tree

Click on *Sheet sizes* to expand the item and then double click LB on *Create sheet size* to bring up the **Sheet Sizes File** panel to create, edit or delete sheet size definitions, or double click LB on an existing sheet size in the list to also bring up the **Sheet Sizes File** panel.



Buttons

Set button

sets the definition for this editing session of the project - the information will be lost when the project is exited.

Write button

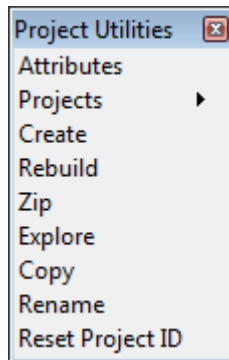
*write the information to the file sheets.4d. The file can then be used when projects are started. The information won't be used for the current session unless the **Set** button is selected as well. For more information on the **Write** button, go to the section [Writing Set Up Files](#) in the Appendix [Setting Up and Configuring 12d](#)*

This option updates the file *sheets.4d* which is fully documented in the [Sheet Sizes File](#) section of the Appendix [Setting Up and Configuring 12d](#).

Utilities

Position of menu: Project =>Utilities

The *utilities* walk-right menu contains various project items.



For the option *Attributes*, go to

Projects

Create

Rebuild

Zip

Explore

Copy

Rename

Reset Project Id

[Attributes](#)

[Projects](#)

[Create](#)

[Rebuild](#)

[Zip](#)

[Explore](#)

[Copy](#)

[Rename](#)

[Reset Project ID](#)

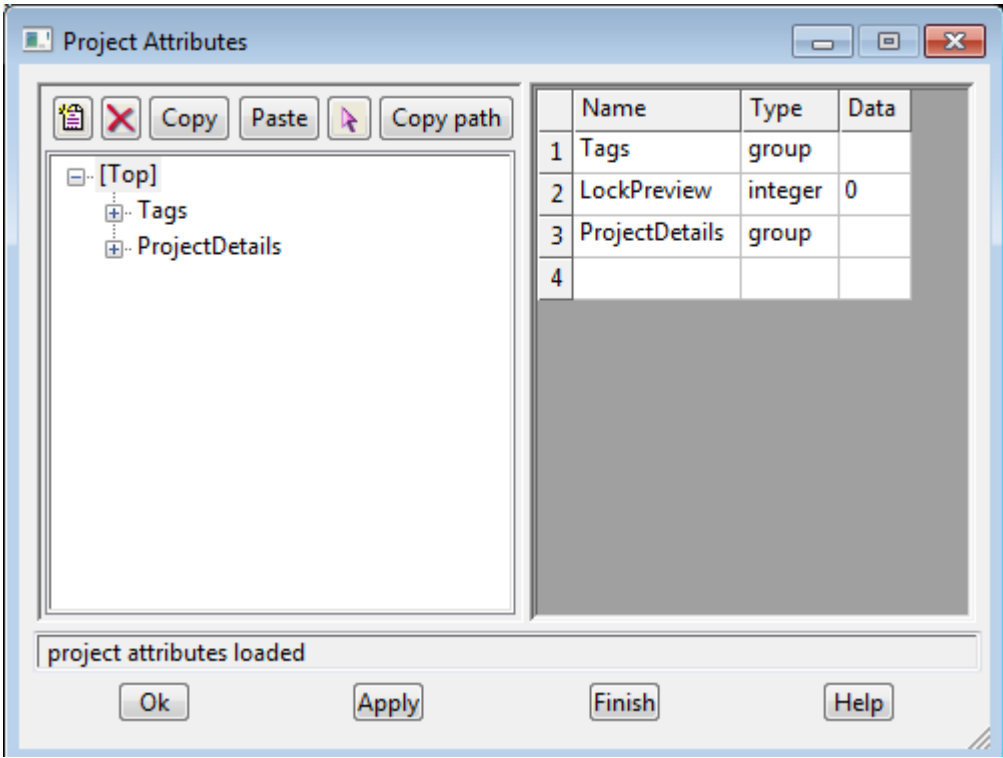
The options in the menu will now be described.

Attributes

Position of option on menu: Project =>Utilities =>Attributes

The *Attributes* options displays, creates and edits the attributes for the current project

On selecting *Attributes*, the **Project Attributes** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description Type Defaults Pop-Up

Name
name of the attribute

Type integer, real, text
type of attribute - integer, real or text

Data
value for the attribute

OK button
set the attributes to the values in the panel and then exit the panel.

Apply button
set the attributes to the values in the panel but don't exit the panel.

Projects

Position of option on menu: Project =>Utilities =>Projects

The **projects** walk-right menu provides a list of all the projects available in the working folder. Each project is contained in a sub-folder of the working folder.

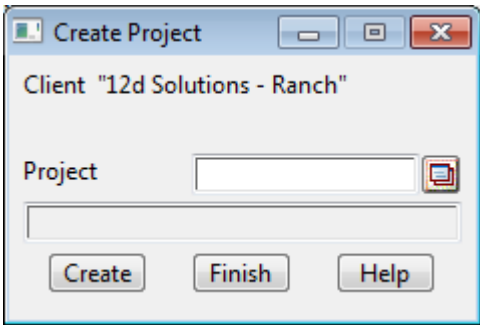
Selecting a project from the walk-right list will bring up the **Change Project** panel with the selected project name already in the New project panel field.

For more in formation on the **Change Project** panel, go to the earlier section [Open](#)

Create

Position of option on menu: Project =>Utilities =>Create

On selecting the Create option, the **Create Project** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Project	input		
<i>name of the new project to be created.</i>			
Create	button		
<i>after selecting this button, a new project folder is created. The working project does not change to the new project.</i>			

Rebuild

Position of option on menu: Project =>Utilities =>Rebuild

The **rebuild** option is used to try and rebuild a project if some of the information has been corrupted.

On selecting the option, the project header file will be deleted and re-created and all the models, tins, templates and functions inside the project's folder added back into the project. The view information for the original project will be lost.

On selecting the **rebuild** option, the **rebuild project** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Project	input		
<i>the name of the project to be rebuilt.</i>			
Rebuild	button		
<i>after selecting this button, the project given in the project field is rebuilt.</i>			

Note - the current (working) project cannot be rebuilt.

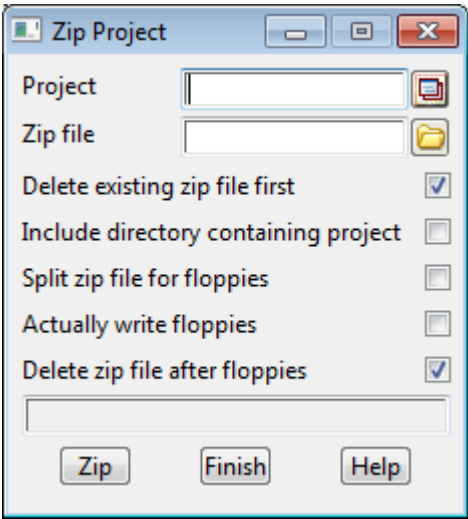
Zip

Position of option on menu: Project =>Utilities =>Zip

The **zip** option is used to make a zipped up a copy of any project (including the saved current project) in the working folder.

NOTE - this only contains the information in the ".project" folder. It does not include any files in the working folder.

On selecting the **zip** option, the **zip project** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Project <i>name of the project to be zipped up.</i>	input	none	projects in folder
Zip file <i>name of the zip file for the project.</i>	input		*.zip
Delete existing zip file first <i>if ticked and a zip file already exists, the existing file is deleted before the zip is done. If not ticked, any existing files of the same name in the existing zip file will be replaced and any new files will be added to the zip file.</i>	tick box	tick	
Include folder containing project <i>if ticked, the whole folder containing the project (not just the project) will be zipped.</i>	tick box		
Split zip file for floppies <i>if ticked, the zip file will be split into 1.4 Mb files.</i>	tick box		
Actually write floppies <i>if ticked, a batch file will be created and begun which asks for floppies to be inserted and then writes the split zip files onto them.</i>	tick box		
Delete zip file after floppies <i>if ticked, delete the zip file and any split files after the floppies are created.</i>	tick box	tick	
Zip <i>after selecting this button, a zip file of the project (or directory containing the project) given in the project field is made.</i>	button		

Explore

Position of option on menu: Project=>Utilities=>Explore

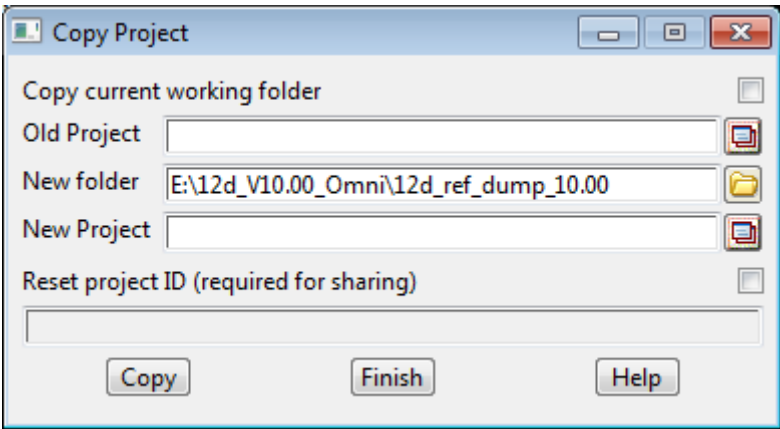
The **Explore** brings up the Windows Explorer showing the contents of the working folder. That is, showing the contents of the folder *containing* the project.

Copy

Position of option on menu: Project =>Utilities =>Copy

The **copy** option is used to make a copy of any project (other than the current project) in the working folder.

On selecting the **copy** option, the **copy project** panel is displayed.



The fields and buttons used in this panel have the following functions.

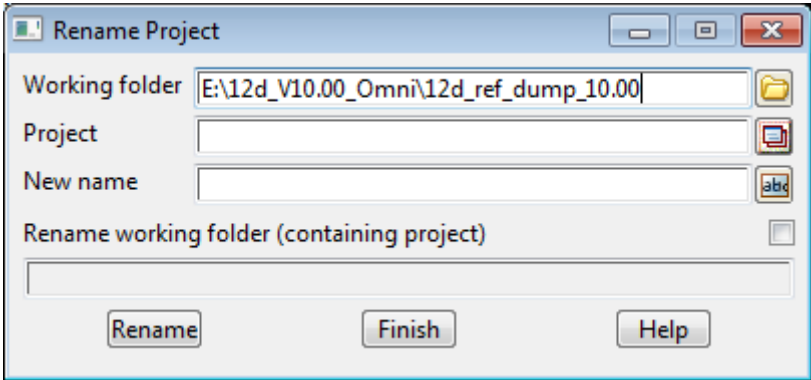
Field Description	Type	Defaults	Pop-Up
Copy current working folder	tick box		none
<i>if ticked, the entire working folder containing the project is copied to the New folder.</i>			
Old project	input	none	projects in folder
<i>name of the project to be copied.</i>			
New folder	input		current working folder
<i>name of the folder to copy the project to.</i>			
New project	input		
<i>name of the copy of the project. The new project name cannot be the same as an existing project in the New folder.</i>			
Reset project ID (required for sharing)	tick box		
<i>if ticked, 12d will automatically reset the project id in the new copy of the project. This will prevent multiple projects with the same id, which are not allowed when sharing from one project to another. if not ticked, 12d will not reset the project id in the new copy of the project.</i>			
Copy	button		
<i>after selecting this button, a complete copy of the project given in the old project field is made and saved under the name given in the new project field. If Copy current working folder is ticked, the contents of the working folder containing the project is also copied.</i>			

Rename

Position of option on menu: Project =>Utilities =>Rename

The **Rename** option is used to rename any project (other than the current project) in the working folder, and if required, the working folder as well.

On selecting **Rename**, displays the **Rename project** panel.



The fields and buttons used in this panel have the following functions.

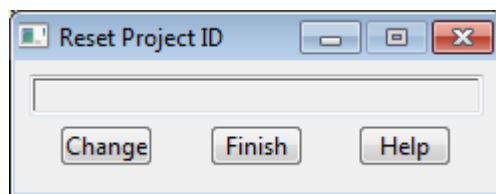
Field	Description	Type	Defaults	Pop-Up
Working folder		folder box		folder browse
	<i>name of the folder that contains the project to be renamed (the working folder for the project).</i>			
Project		project box		projects in working folder
	<i>name of the project to rename - this can't be the project currently opened.</i>			
New name		input		
	<i>name of the new name for the project. The new project name cannot be the same as an existing project in the working folder.</i>			
Rename working folder (containing the project)		tick box		
	<i>if tick, if the working folder containing the project to be renamed is the same as the project name, then the working folder will also be renamed.</i>			
Rename		button		
	<i>after selecting this button, the selected project will be given the new name. If 'Rename working folder (containing project)' is ticked and the name working folder is the same as the project, then the working folder will also be renamed.</i>			

Reset Project ID

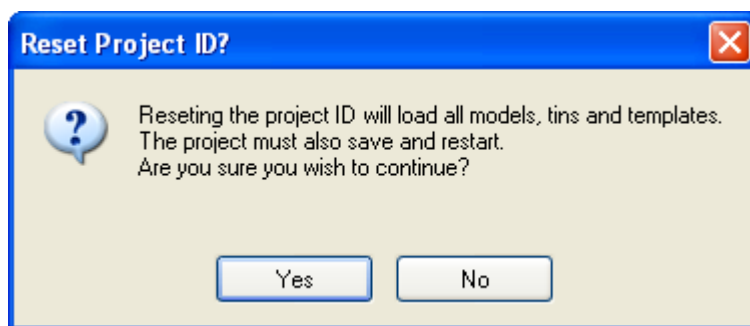
Position of option on menu: Project =>Utilities =>Reset Project ID

This option is used when a project has the same id as another project. If a user wishes to share from a server project that is a copy of another project, then the project ID must be reset.

On selecting the **Reset Project ID** option, the **Reset Project ID** panel is displayed.



Selecting **Change** displays the **Reset Project ID?** panel on the screen.

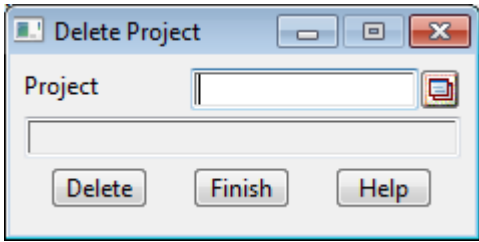


Selecting the **Yes** button will cause the project to resave and **12d Model** will restart.

Delete

Position of option on menu: Project ==>Delete

On selecting the delete project option, the **delete project** panel is displayed.



The fields and buttons used in the delete project panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Project	input		available projects

name of project to delete

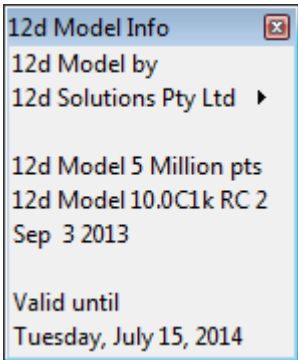
Delete	button
---------------	--------

*after selecting this button, a **yes-no** pop-up menu appears to confirm that deleting the project is required. If deletion is confirmed, the selected project is deleted from the computer disk.*

12d Model

Position of option on menu: Project =>12d Model

The 12d model walk-right menu and the walk-right by menu are



12d Solutions phone, fax
etc.

12d Model version
date version compiled



12d Solutions phone, fax etc.

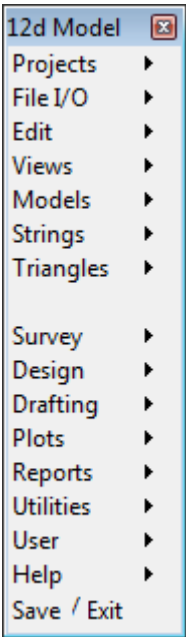
The walk-right menu for **Originators** is:



12d Model Menu

Position of option on menu: Project =>12d Model menu

Selecting the **12d Model Menu** option brings up the floating **12d Model** menu as described at the beginning of this chapter.



For the option *Projects*, go to the chapter

File I/O

Edit

Views

Models

Strings

Triangles

Survey

Design

Drafting

Plots

Reports

Utilities

User

Help

Save/ Exit

[Projects](#)

[File I/O](#)

[Edit](#)

[View](#)

[Models](#)

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[Triangles](#)

[Survey](#)

[Design](#)

[Drafting](#)

[Plots](#)

[Reports](#)

[Utilities](#)

[User](#)

[Help](#)

[Save and Exit](#)

Exit

Selecting Exit exists **12d Model**

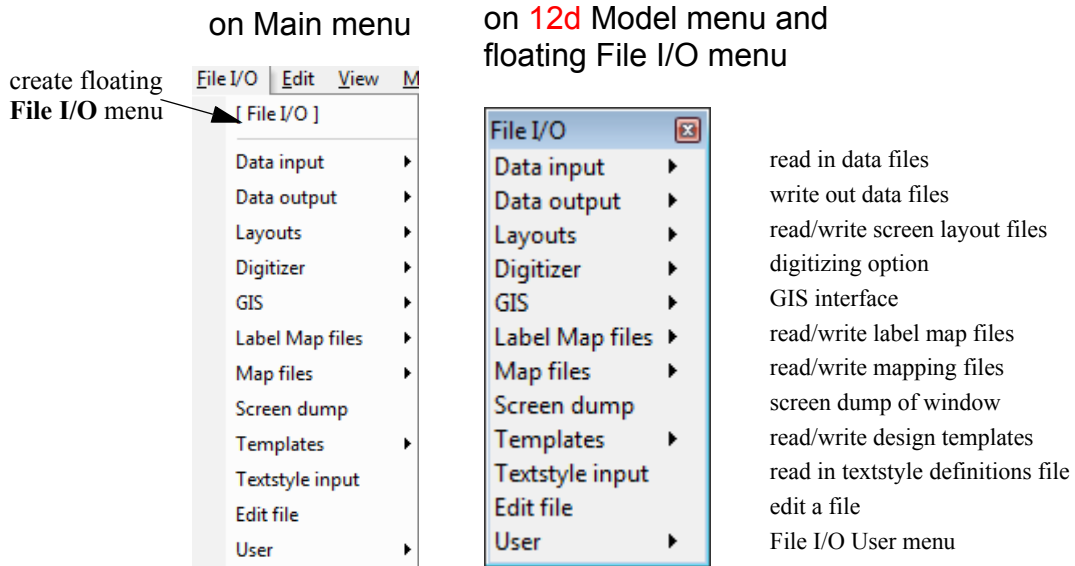
Also see the chapter [Save and Exit](#)

9 File I/O

Position of menu: File I/O

The facilities for reading and writing data files, layout files, textstyle definitions, template files into and out of **12d** Model, plus screen dumps are collected under the **File i/o** menu.

The **file i/o** walk-right menu containing these options is:



For *Data input*, go to

Data output

Layouts

Digitizer

GIS

Label Map files

Map files

Screen dump

Templates

Textstyle input

Edit file

[Data Input](#)

[Data Output](#)

[Layouts](#)

[Digitizer](#)

[GIS](#)

[Label Map Files](#)

[Map Files](#)

[Screen Dump](#)

[Templates](#)

[Textstyle Input](#)

[Edit a File](#)

Layouts

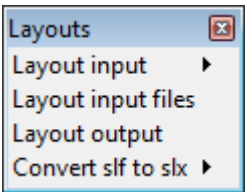
Position of menu: File I/O =>Layouts

The options under **Layouts** read and write screen layout files.

The screen layout format to use is the slx format (an XML format) introduced in **12d Model 10**.

There is also an option to convert the older format, slf, to slx.

The **Layouts** walk-right menu is

	
Layout input	read in layout files from working folder, Lib or User Lib
Layout input files	read in one of more layout files
Layout output	write out a screen layout file
Convert slf to slx	convert a pre V10 layout file (slf) to V10 layout file (slx)

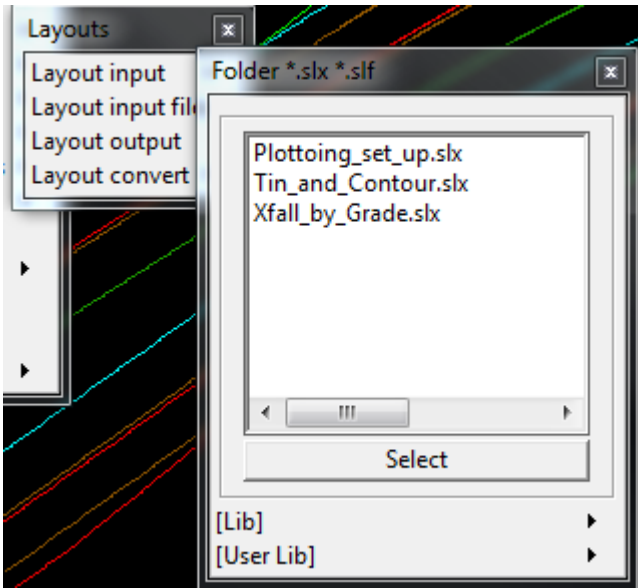
For *Layout input*, go to
Layout input files
Layout output
Convert slf to slx

[Layout Input](#)
[Layout Input Files](#)
[Layout Output](#)
[Convert slf to slx Format](#)

Layout Input

Position of option on menu: File I/O =>Layouts =>Layout input

Walking right on **layout input** lists all screen layout files (files ending in .slx or .slf) in the working folder, or by further walking right on the [Lib] or [User lib], all screen layout files in [Lib] or [User lib] will be listed.



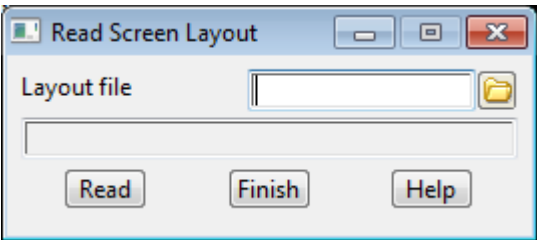
Clicking on a file in a one of the list runs the selected screen layout file and places on the screen, the menus and panels recorded in the screen layout file.

If Clicking on reads in a screen layout file (*.slf) which can create most menus and panels and place them on the screen.

The screen layout file can be created by the **layout output** option, the Menu/Panel Dump option, or by any text editor.

Note

If the *File I/O* menu or the *Layouts* menu, is pinned, clicking LB on **Layout input** brings up the **Read Screen Layout** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Layout file	input		*.slx and *.slf
<i>the name of the screen layout file to read the screen layout information from.</i>			
Read	button		
<i>after selecting this button, the screen layout file will be read in.</i>			

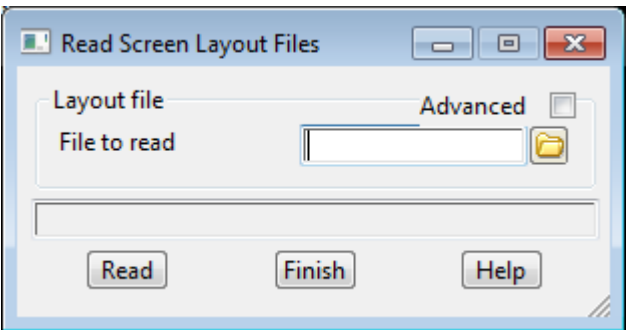
Layout Input Files

Position of option on menu: File I/O =>Layouts =>Layout input files

The **layout input** files option reads in one or more screen layout files (files ending in .slx or .slf) which can create most menus and panels and place them on the screen.

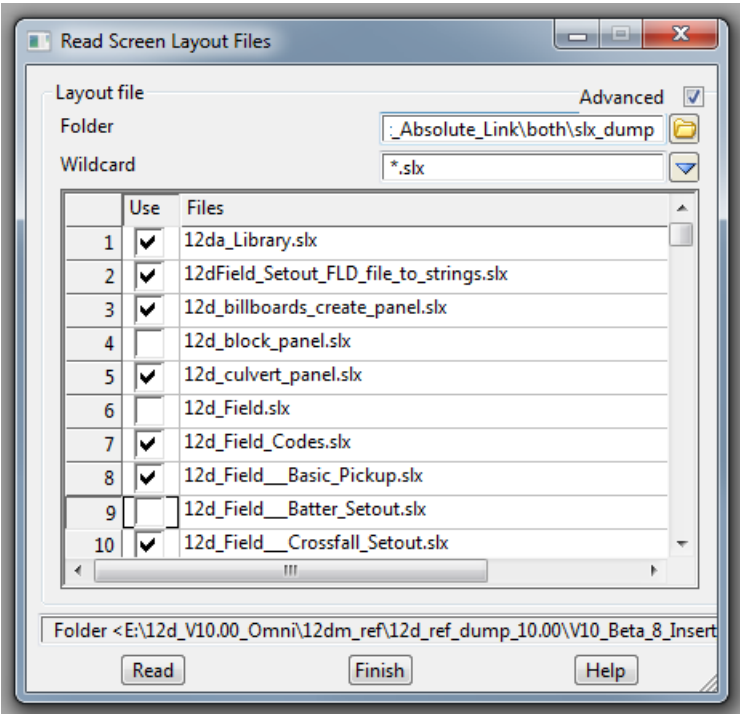
The screen layout file can be created by the **Layout output** option or by any editor.

On selecting the **Layout input** files option, the **Read Screen Layout Files** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Advanced	tick box	not ticked	
<i>if ticked, a folder containing slx/slf files can be selected, an optional Wildcard given, and all the slx/slf files satisfying the Wildcard are displayed in a grid. Files in the grid can be selected/not selected.</i>			



When **Read** is pressed, all the selected files are read.

Layout file input *.slx and *.slf

the name of the file to read the screen layout information from.

Read button

after selecting this button, the screen layout file will be read in.

Layout Output

Position of option on menu: File I/O =>Layouts =>Layout Output

The **layout output** option writes out information on almost all the objects on the screen, and for views, their sizes, into what is called a **screen layout file**.

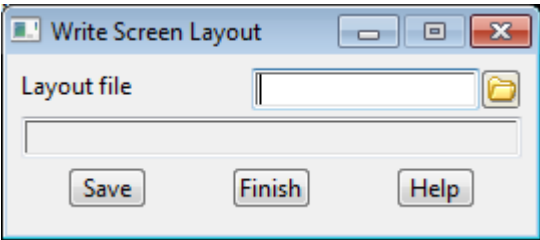
For any menus, its screen position is recorded, and for panels, its position and all the information set for the panel is also recorded.

The screen layout file can then be read back in by options such as **layout input** and **Layout input files**, to recreate on the screen the menus and panels recorded in the screen layout file (but not the views).

Since the screen layout file is editable, users can create their own special layout files.

The view size information is helpful in building up a set_up_file to define the initial screen layout.

On selecting the **Layout output** option, the **Write Screen Layout** panel is displayed.



The fields and buttons used in this panel have the following functions.

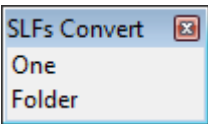
Field Description	Type	Defaults	Pop-Up
Layout file <i>the name of the file to print the screen layout information to.</i>	input		*.slf
Save <i>after selecting this button, the screen layout information will be printed out.</i>	button		

Convert slf to slx Format

Position of option on menu: File I/O =>Layouts =>Layout Convert

The options on the **Layout Convert** walk-right menu convert the older screen layout format (*.slf) to the new xml format (*.slx) introduced in **12d Model 9**.

Layout Convert walk-right menu containing these options is:



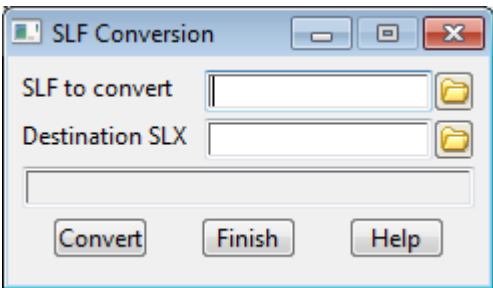
For the option *One*, go to [SLF Conversion](#)
For the option *Folder*, go to [Convert a Folder of Screen Layout Files](#)

SLF Conversion

Position of option on menu: File I/O =>Layouts =>Layout Convert=> One

The **One** option is for converting a single slf to a slx file.

Selecting **One** brings up the **SLF Conversion** panel.



The fields and buttons used in this panel have the following functions.

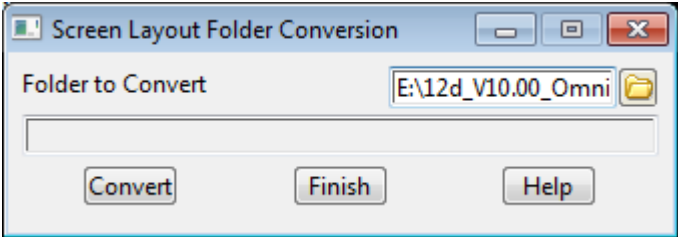
Field Description	Type	Defaults	Pop-Up
Slf to convert	file box		*.slf
<i>the name of the pre v9 format screen layout file to convert to a XML screen layout file.</i>			
<i>When a slf file is selected from the pop-up list, or types in and <enter> hit, then the slf file name, with the slf replaced by slx, is written to the Destination slx field.</i>			
Destination slx	file box		*.slx
<i>the slf file is converted to an XML screen layout file and given the name in Destination slx.</i>			
Convert	button		
<i>after selecting this button, the slf file will be converted to a slx file</i>			

Convert a Folder of Screen Layout Files

Position of option on menu: File I/O =>Layouts =>Layout Convert=> Folder

The **Folder** option is for converting a folder of slf files to a slx files.

Selecting **Folder** brings up the **Screen Layout Folder Conversion** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Folder to convert	input		*.slf
<i>the folder containing all the slf files to convert to slx files</i>			
Convert	button		
<i>after selecting this button, the all the slf files in the folder Folder to convert are converted to slx files. The converted files are given the same name as the slf files except the slf is replaced by slx.</i>			

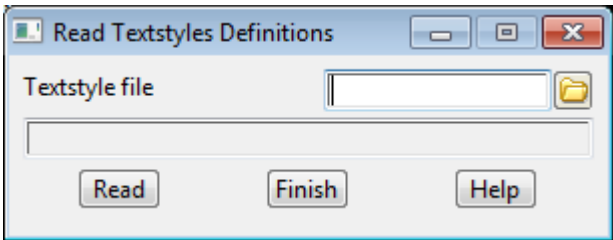
Textstyle Input

Position of option on menu: File I/O =>Textstyle Input

When 12d Model starts up, a textstyles definition file can be automatically read in. The textstyles definitions file defines the textstyles and fonts used in the project.

It is possible to redefine the textstyles by reading in another textstyles definitions file using the **Textstyle input** option.

On selecting the **Textstyle input** option, the **Read Textstyles Definitions** panel is displayed.



The fields and buttons used in this panel have the following functions.

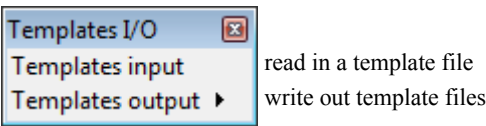
Field Description	Type	Defaults	Pop-Up
Textstyle file <i>the name of the file to read the textstyle information from.</i>	input		*.tsf
Read <i>after selecting this button, the textstyles definitions file will be read in.</i>	button		

Templates

Position of menu: File I/O =>Templates

The option under **Template** read and write Design Template files.

The **Templates** walk-right menu is



For *Templates input*, go to
Templates output

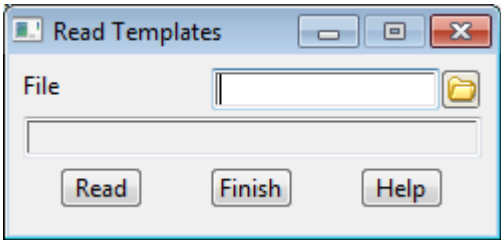
[Templates Input](#)
[Templates Output](#)

Templates Input

Position of option on menu: File I/O =>Templates =>Templates Input

This option is used to read in templates from files in the special 12d Model template format.

On selecting the **Templates input** option, the **Read Templates** panel is displayed.



The fields and buttons used in this panel have the following functions.

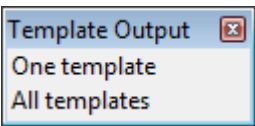
Field Description	Type	Defaults	Pop-Up
File <i>name of the 12d template file to be read in</i>	input		*.tpl files
Read <i>read the data in.</i>	button		

Note if a template already exists, then the template in the file is ignored.

Templates Output

Position of menu: File I/O =>Templates =>Templates Output

The **templates output** option writes out one or all templates in the 12d Model template format. The **Output** walk-right menu is



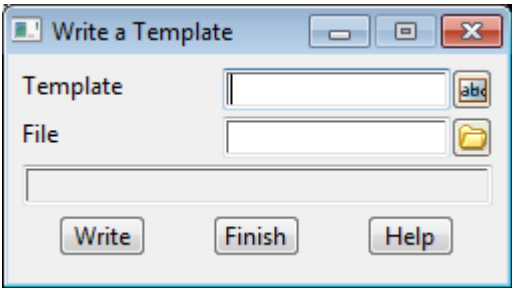
For the option **One template**, go to [One Template](#)

One Template

Position of option on menu: File I/O =>Templates =>Templates Output =>One Template

This option is for writing a single template out in the special 12d template format.

On selecting the One template option, the **Write a Template** panel is displayed.



The fields and buttons used in this panel have the following functions.

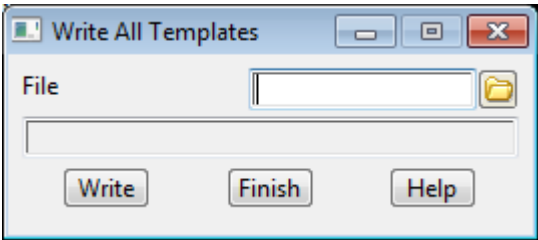
Field Description	Type	Defaults	Pop-Up
Template	input		available templates
<i>name of the template to be written out.</i>			
File	input		
<i>name of the file to write the template to.</i>			
Write	button		
<i>after selecting this button, the template given in the template field will be written out to the file with the name given in the file field.</i>			

All Templates

Position of option on menu: File I/O =>Templates =>Templates output =>All templates

This option is for writing all template out in the special 12d Model template format.

On selecting the All templates option, the **Write All Templates** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
File	input		
<i>name of the file to write all the templates to.</i>			
Write	button		

*all the templates will be written out to the file with the name given in the **file** field.*

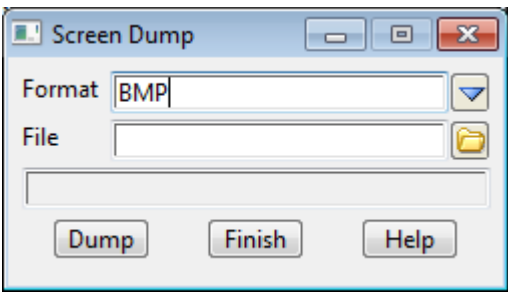


Screen Dump

Position of option on menu: File I/O =>Screen dump

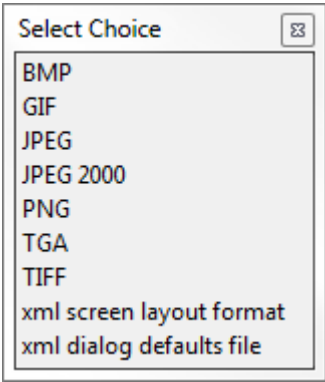
The 12d Model screen can be dumped to disk in a variety of images formats, or as a screen layout file.

On selecting the Screen dump option, the **Screen Dump** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Format	choice box	BMP	



format to write the screen dump out in.

File	file box	*.bmp files
-------------	----------	-------------

file to write the screen. dump to.

Dump	button
-------------	--------

after selecting this button, the screen/window is dumped out in the selected format.

Map Files

Position of menu: File I/O => Map files

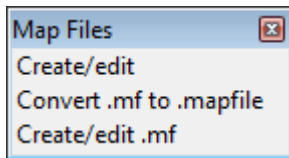
The main options under **Map files** is **Create/edit** which creates and edits **12d Map Files** which are used in many **12d Model** panels

The Map File format uses is the **.mapfile** format (an XML format) introduced in **12d Model 10**.

There is also an option to convert the older format, **.mf**, to the XML **.mapfile**.

Note: if the **Create/edit** option is used on an old format file, it is automatically converted to the new format.

The **Map files** walk-right menu is



create/edit a mapfile

convert pre-V9 map file format to XML format map files

create/edit a pre-V9 map file

For **Create/edit**, go to

Convert .mf to .mapfile

Create/edit .mf

[Create/Edit a Map File](#)

[Convert .mf Files to .mapfile](#)

[Create/Edit .mf File](#)

Create/Edit a Map File

Position of option on menu: File I/O =>Map files =>Map File

The **Map file** option is used to **create** or **edit 12d Map Files** which are used in many **12d Model** options for reading in data, reducing surveys, mapping existing data etc.

A **12d Map file** consists of sections of tables or grids of keys or entity-masks which are used to select specific data to set many string properties such as string name, colours, linestyles, symbols, models, extrusions and tinability for the strings that are being created and/or modified by the **12d Model** option.

For example, the **X Y Z Input** options reads in an XYZ file and creates strings of (x,y,z) data with string names for the lines strings. A **12d Map File** can be used in option to give the strings other properties such as colour, linestyle, colour fills, pipe diameters etc.

The Map File consists of sections such as Basic, Fills and Pipes, which are displayed as a tree. The strings are processed by each section of the tree, going in order from the top to the bottom of the Map File tree.

Each section of the Map File uses matching of specific string information against a **Key** to select strings and/or vertices and/or segments for processing by that section of the Map File.

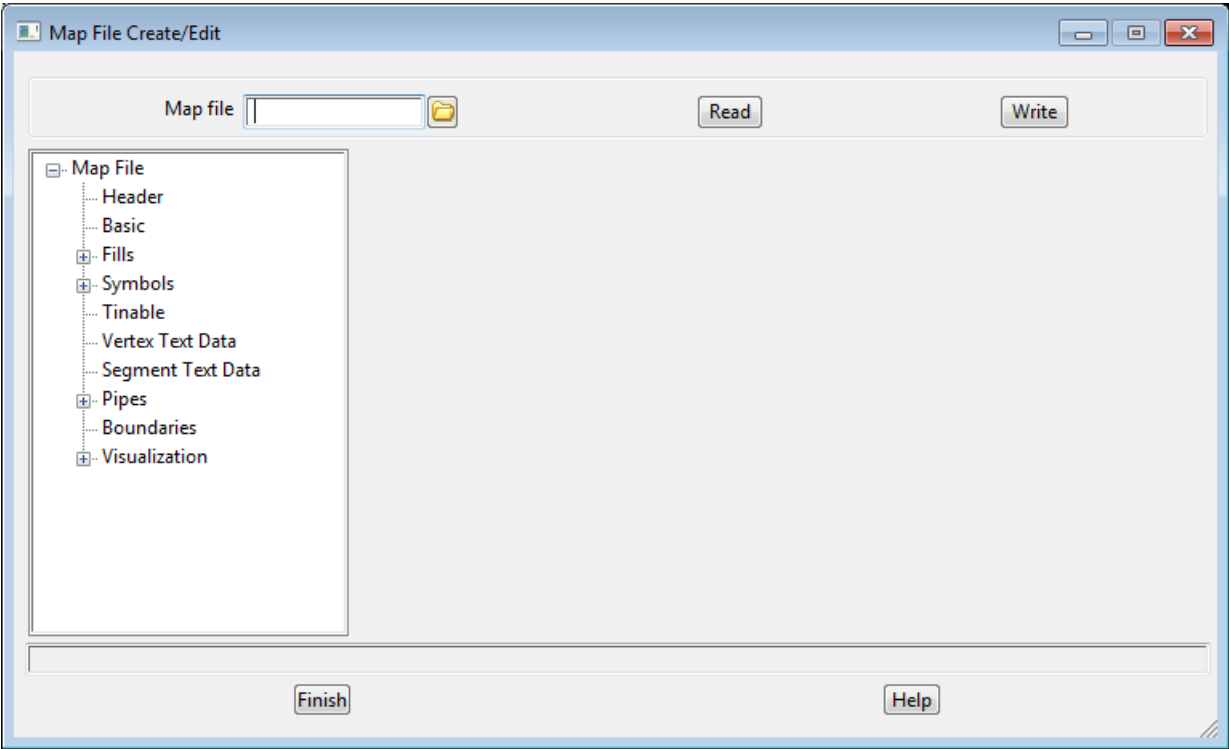
The **Basic** section is the first section used and takes the data that had been created by the option and uses the Entity Name and string attributes created by the option to set string properties such as string name, colour, point-line type, linestyle, weight and model. What the Entity Name actually is depends on the particular option that the Map File is being used in.

For example, the Survey Data Reduction option uses the **field code** as the entity-name, the xyzs reader uses the **string name** in the xyzs file as the entity-name but in the DWG reader, no entity name exists and the **AutoCAD layer** can be used as the entity-name. For the DGN reader, a combination of Level, Colour, Linestyle and Weight can be the entity name.

After the **Basic** section is applied, the string has a definite string name that is used as part of the matching key in all the other sections of the Map File.

In the other sections of the Map File, the **Key** is a combination of string names, and/or string attribute values **Att key**, and/or vertex attribute values **Vertex Att key** and/or segment attribute values **Segment Att key**

Selecting **Map file** brings up the **Map File Create/Edit** panel:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Map file <i>name of the map file to be created or edited.</i> <i>If it is a .mf file, it is automatically converted to the new xml format and written out as a .mapfile.</i>	input		*.mapfile, *.mf
Read <i>read in the map file given in the map file field and load the data into the fields of the table. If the file doesn't exist, an error message is given.</i>	button		
Write <i>write out the data in the table to the file name given in the Map file field. If the file already exists, a replace-cancel panel checks to see if the existing file is to be over written - if cancel is selected, nothing is written out.</i>	button		

For more information on *Header*, go to

- Basic*
- Fills*
- Symbols*
- Tunable*
- Vertex Text Data*
- Segment Text Data*
- Pipes*
- Boundaries*
- Visualization*

- [Header](#)
- [Basic](#)
- [Fills](#)
- [Symbols](#)
- [Tunable](#)
- [Vertex Text Data](#)
- [Segment Text Data](#)
- [Pipes](#)
- [Boundaries](#)
- [Visualization](#)

Using attribute values [Map File Substitution by Attributes](#)

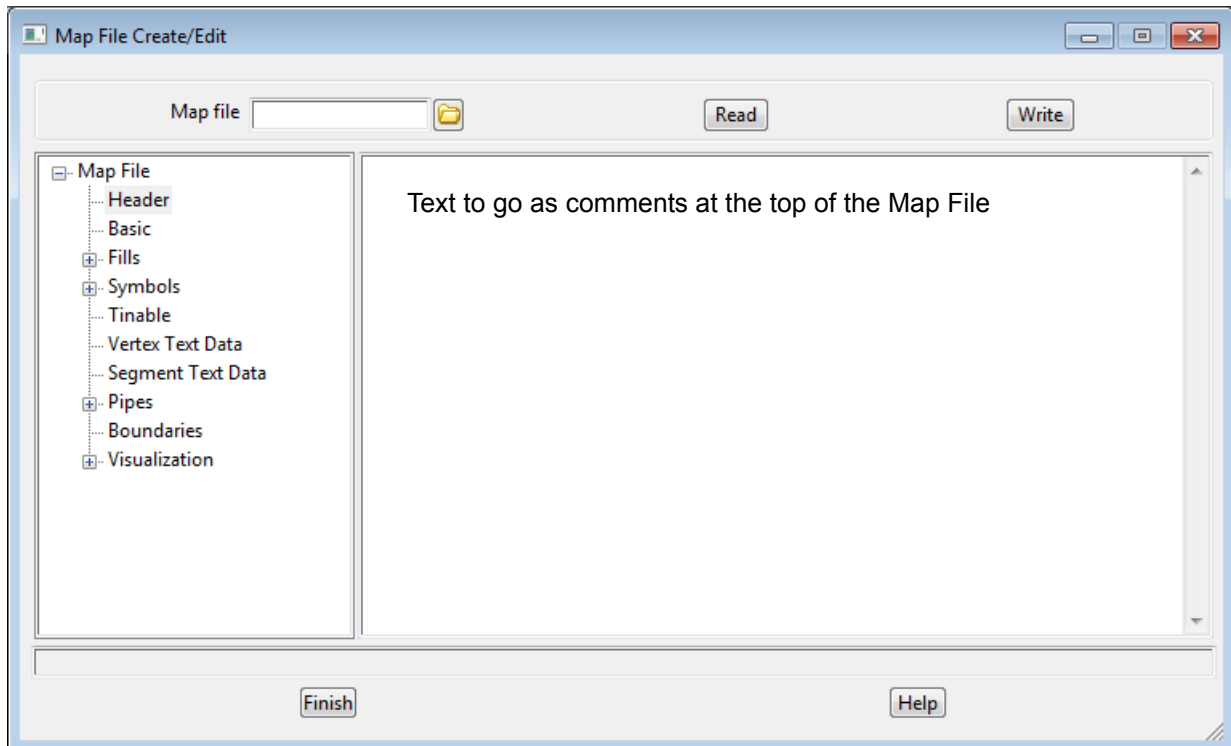
Logging in the Map File

[Map File Logging](#)

Header

Header just has lines of comment text. A common use is to document which client the file is to be used for, or the revision history.

The text written in the right hand side of the panel is written out as comments at the top of the Map file.

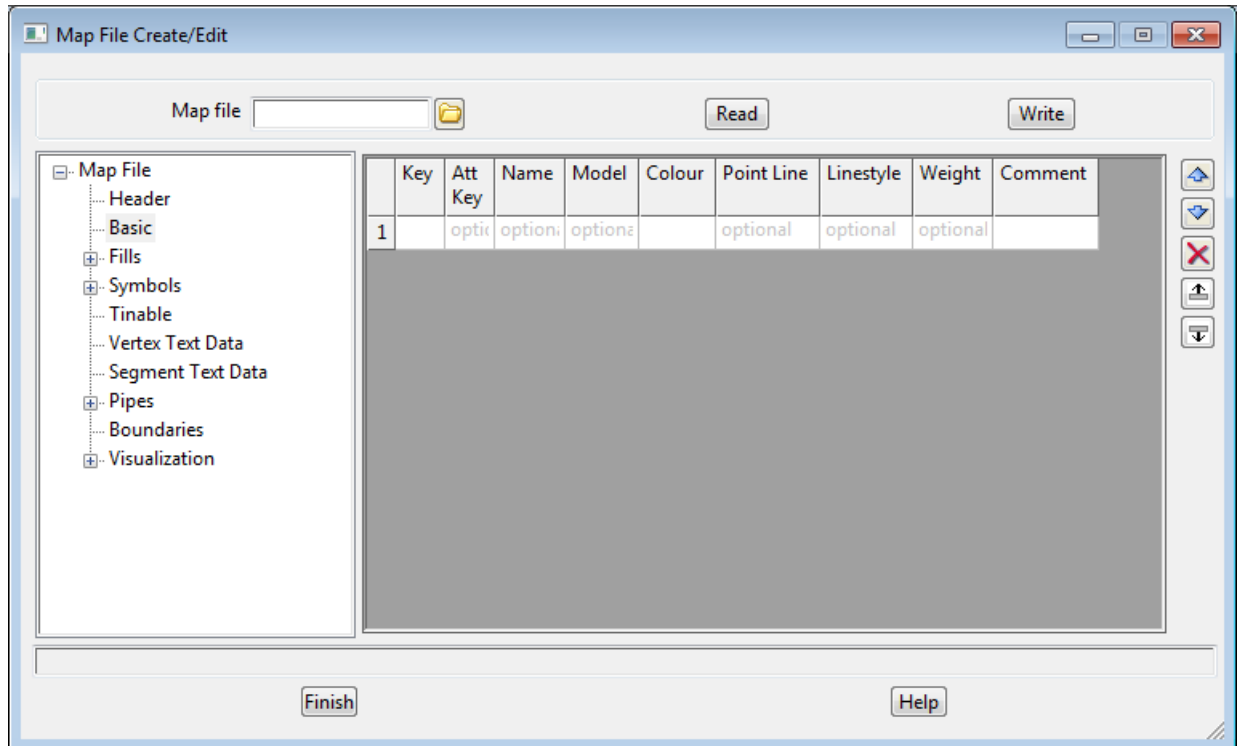


Go to the next section [Basic](#) or return to [Create/Edit a Map File](#).

Basic

The **Basic** grid selects data using the **Key** and **Att Key** and sets the name, model, colour, linestyle, point-line type, and weight for the created strings.

Note: the **final string name** is the **Name** set by the **Basic** grid, or if none is set in the **Basic** grid, then it is the **Entity Name**.



Field Description	Type	Defaults	Pop-Up
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Processing Using Key and Att Key

when an Entity finds a first match with **Key** and **Att Key** in the grid (see [Matching Using Key and Att Key](#)), the created string is given the properties as defined in the parameters of the matching line.

Key and Att Key

select colour pop-up

Key is a Text grid cell and the text entered into **Key** can include wild cards * and wild characters ?. The **Entity Name** is matched against **Key**.

Att Key is an Attribute Data grid cell which contains the definition of the attributes and their values that are to be matched against. There can be more than one attribute in the Attribute Data but they must have unique names.

The **Entity Attributes** are matched against the attribute details in **Att Key**.

To access **Att Key**, click LB on the **Att Key** field to highlight the field, then click LB again to bring up the **Attribute Data** panel. To enter data see [Attribute Data Panel](#).

Matching Using Key and Att Key:

The Entity being mapped needs an Entity Name (which may be blank) and can also have Entity Attributes. The Entity may even have some other properties such as colour, linestyle etc.

Starting with the first line of the grid, matching and processing occurs as follows

*If **Key** and **Att Key** are not blank, and a match of the Entity Name occurs with **Key** and a match of the Entity Attributes occurs with **Att Key**, then the rest of the fields for this line of the Map File grid are used on the created string.*

If **Key** is not blank and **Att Key** is blank, and a match of the Entity Name occurs with **Key**, then the rest of the fields for this line of the Map File grid are used on the created string.

If **Key** is blank then no match occurs and this line of the Map File grid is ignored.

If a **match occurs**, then no tests for matches against **Key** and **Att Key** further down in the grid are made.

If **no match occurs**, then this line of the map file grid is ignored and a test for a match is made against the next line of the grid.

Note: all the fields on the line after **Att Key** can have attribute substitution from string attributes. See [Map File Substitution by Attributes](#).

Name select name pop-up

if non-blank, the created string is given this **Name**.

if blank, the original Entity Name (which matched against **key**) is used as the string name.

Important Note: the resulting string name is used for matching in all the subsequent Map File nodes (e.g. Fills, Symbols, Pipes, Visualisation etc).

Model select model pop-up

if non-blank, the model to be used for all strings produced by this line of the map file grid.

if blank, the string's model is not modified. Note: some options may allow **Model** to be ignored.

Colour select colour pop-up

if non-blank, the colour to be used for all strings produced by this line of the map file grid.

if blank, the string's colour is not modified.

Point Line select choice point, line

if non-blank, the breakline type to be used for all strings produced by this line of the map file grid.

if blank, the string's point-line type is not modified. If data is coming from a field file, then the data may be coded as a line or point string.

Linestyle select linestyle pop-up

if non-blank, the linestyle to be used for all strings produced by this line of the map file grid.

if blank, the string's linestyle is not modified.

NOTE: If the point-line type is point then the linestyle is used as a symbol at each vertex of the string. The size of the symbol at each point is given in the linestyle definition. If a symbol at each point is required whose size, colour and rotation may need to be modified at each point, then the **Symbol** section must be used to place a symbol at each vertex and a world style must be used in the symbol name field in the **Symbol** tab. See [Symbols](#).

Weight

if non-blank, the weight to be used for all strings produced by this line of the map file grid.

if blank, the string's weight is not modified.

Comment

comment to be used in this line of the map file.

To assist in debugging a **Map File**, match logging can be turned on. See [Map File Logging](#).

Go to the next section [Fills](#) or return to [Create/Edit a Map File](#).

Fills

Fills creates fills for the selected super strings (closed and non-closed).

Super strings can support more than one fill type per string. For example, a super string can have a solid fill, and an I Acad fill at the same time.

The order of drawing the fill types is: solid, bitmap, pattern, hatch, acad.

For more information on *Solid Fill*, go to

[Fills >Solid Fill](#)

Bitmap Fill

[Fills >Bitmap Fill](#)

Pattern Fill

[Fills >Pattern Fill](#)

Autocad Fill

[Fills >Autocad Fill](#)

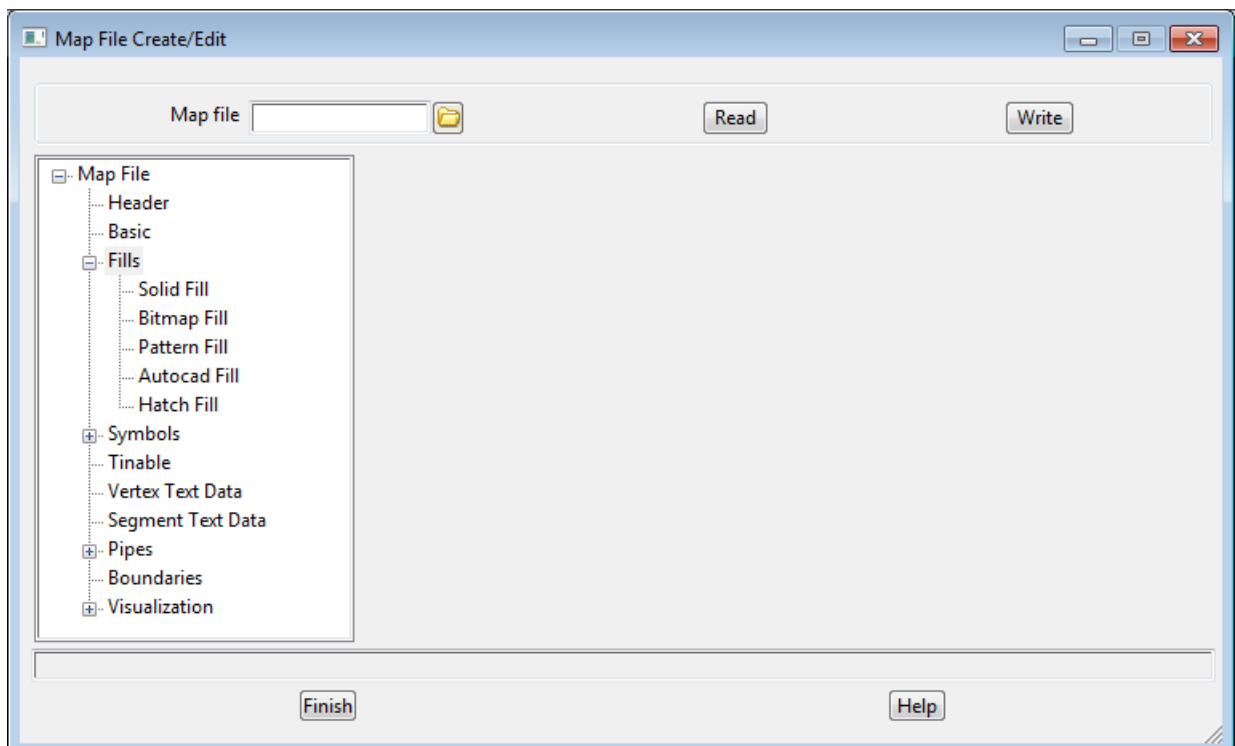
Hatch Fill

[Fills >Hatch Fill](#)

Multiple Fills

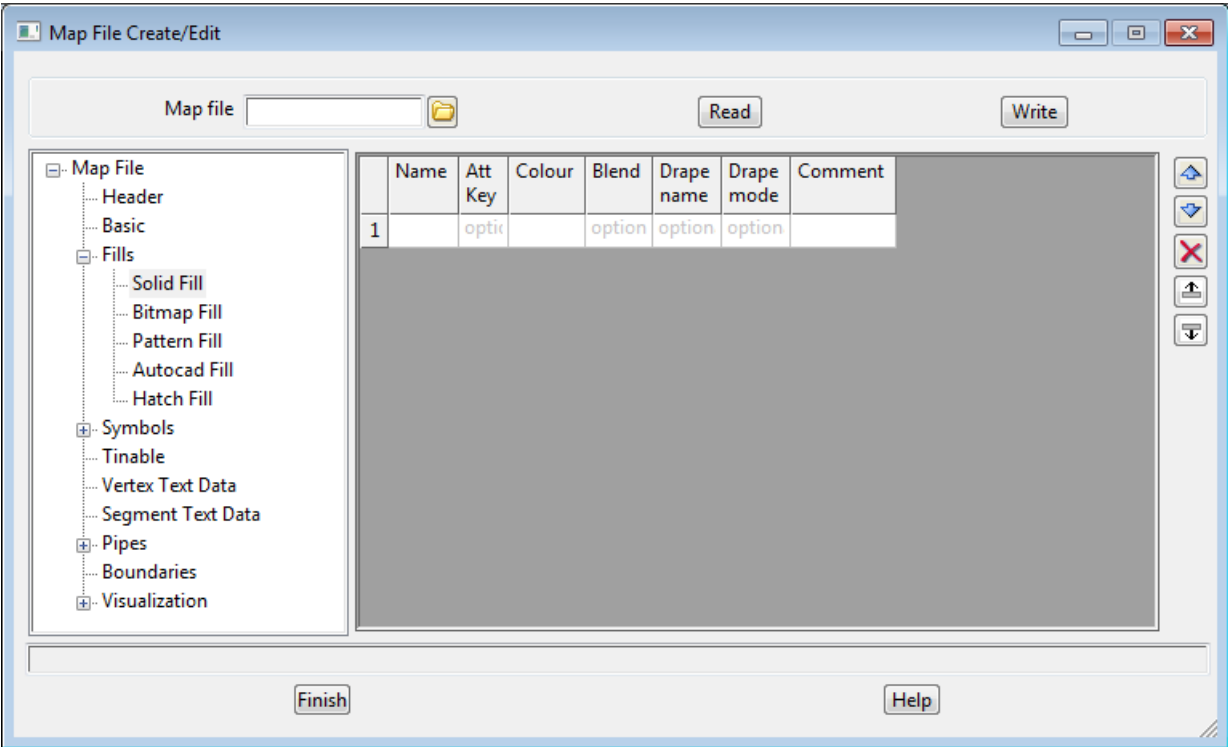
[Multiple Fills](#)

Note: there are settings for Plan Views that determines how fills are drawn on plan views (see [Face Flags for View](#) in the chapter [View Menus](#)).



Fills >Solid Fill

Solid Fill sets whether super strings (closed and non-closed) are filled with a "solid" colour, and optionally with some level of blending (transparency).



Field Description Type Defaults Pop-Up

Processing Using Name and Att Key

when a string finds a first match with **Name** and **Att Key** in the grid (see [Matching Using Name and Att Key](#)), the string is given a Solid Fill as defined in the parameters of the matching line.

Name and Att Key

Name is at Text grid and the text entered into **Name** can include wild cards * and wild characters ?. The string name is matched against **Name**.

Att Key is an Attribute Data grid cell which contains the definition of the attributes and their values that are to be matched against. There can be more than one attribute in the Attribute Data but they must have unique names.

The **string** attributes are matched against the attribute details in **Att Key**.

To access **Att Key** data, click LB on the **Att Key** field to highlight the field, then click LB again to bring up the **Attribute Data** panel. To enter data, see [Attribute Data Panel](#).

Matching Using Name and Att Key:

Strings are first created via the **Basic** node and given a string name of either the Entity Name or the text given in the Name column of the Basic Map File grid.

Starting with the first line of the grid, matching and processing occurs as follows

If **Name** and **Att Key** are not blank, and a match of the string name occurs with **Name** and a match of the string attributes occurs with **Att Key**, then the rest of the fields for this line of the Map File grid are used on the string.

If **Name** is not blank and **Att Key** is blank, and a match of the string name occurs with **Name**, then the rest of the fields for this line of the Map File grid are used on the string.

If **Name** in blank then no match occurs and this line of the Map File grid is ignored.

If a **match occurs**, then no tests for matches against **Name** and **Att Key** further down in the grid are made.

If **no match occurs**, then this line of the map file grid is ignored and a test for a match is made against the next line of the grid.

Note: all the fields on the line after **Att Key** can have attribute substitution from string attributes. See [Map File Substitution by Attributes](#).

Colour

select colour pop-up

colour to use to fill the super string with. If the super string is not closed, the fill will apply as if the super string was closed.

This field can not be blank.

Blend

measures box

At Point, Point to Point, String from Point, String to Point)

if **not blank**, the blend value to use for the solid fill. This value is between 0.0 and 1.0 and controls the amount of transparency of the fill.

if **blank** the blend value of 1.0 is assumed.

TODO: measures box makes no sense....

Drape name

if **not blank**, the string is given this as a Drape name. That is, a name that is used to specify which strings are draped as the solid filled super string onto a tin.

This allows the plan shape of a polygon to be drawn on top of a tin. A good example would be a polygon defining the shape of a "left turn arrow" which the user wants drawn on top of the road design tin. If the user adds the road design tin (and the tin has a **Plan polygon drape name** set to the **Drape name** set here), then the model containing the polygon onto an OpenGL perspective view, the "left turn arrow" will be drawn after the tin and draped onto the tin.

If **blank**, no drape name is given to the string.

To access the render settings panel use **View=>Visualisation=>Tin Render Settings** (see [Tin Render Settings](#)). To see the effect of the drape requires the visualisation module.

Drape mode

choice box

Colour, Colour to texture

if **Drape name** is blank this field is not used.

if non blank, and the value is

Colour, the solid fill colour of the super string is used to draw onto the surface of the tin.

Colour to texture, the value of the solid fill colour is mapped via the **Texture mapping** field of the **Tin Render Settings** panel and a texture drawn inside the polygon draped onto the tin.

Drape mode cannot be blank if **Drape name** is present.

To access the render settings panel use **View=>Visualisation=>Tin Render Settings** (see [Tin Render Settings](#)). To see the effect of the drape requires the visualisation module.

Comment

comment to be used in this line of the map file.

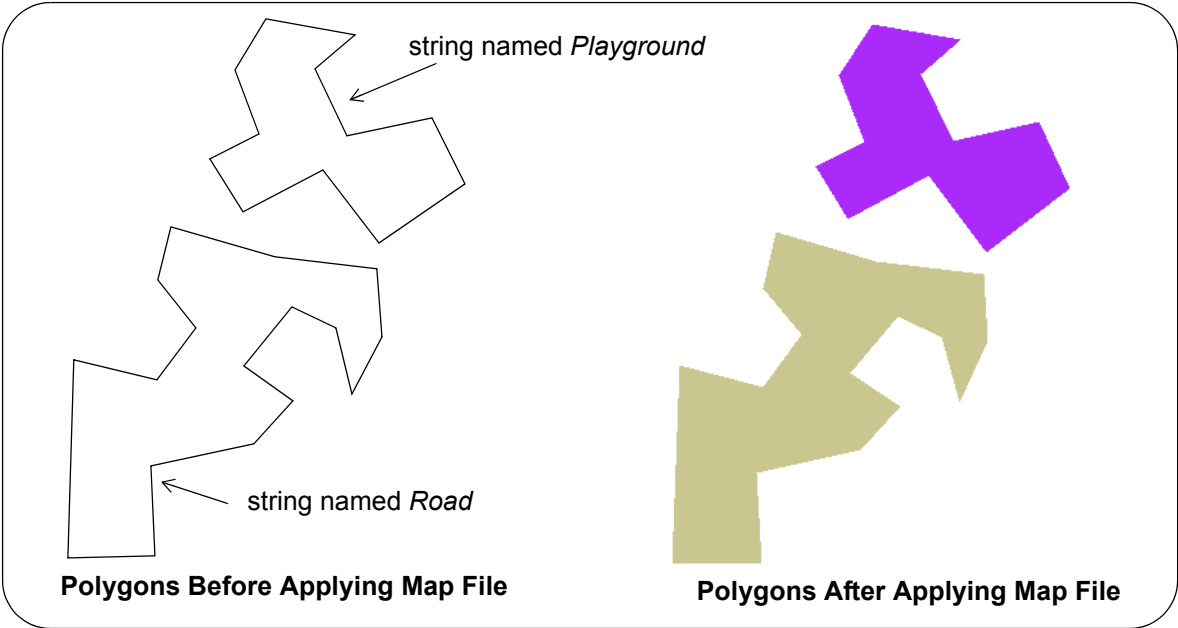
To assist in debugging a **Map File**, match logging can be turned on. See [Map File Logging](#).

Example of Solid Fill

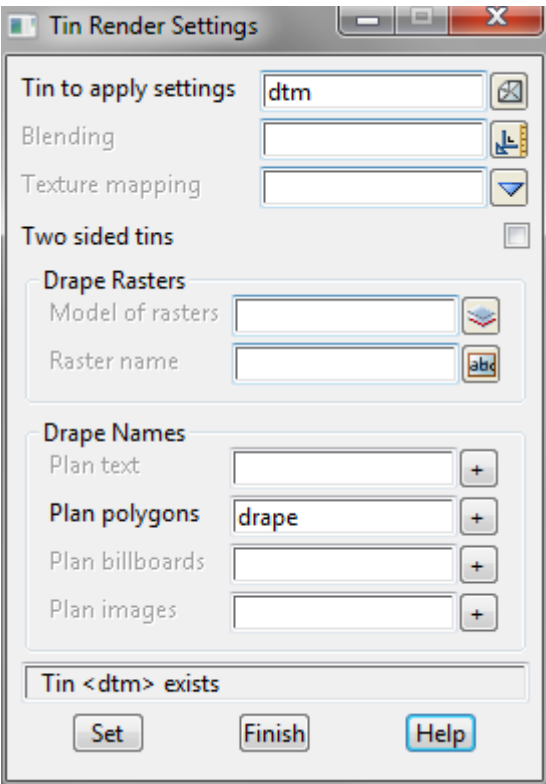
Applying the following **Solid Fill** entries to polygons called *Road* and *Playground*:

	Name	Att Key	Colour	Blend	Drape name	Drape mode	Comment
1	Road*		concrete1	1	drape	Colour to texture	
2	Playground		purple	1	drape	Colour	

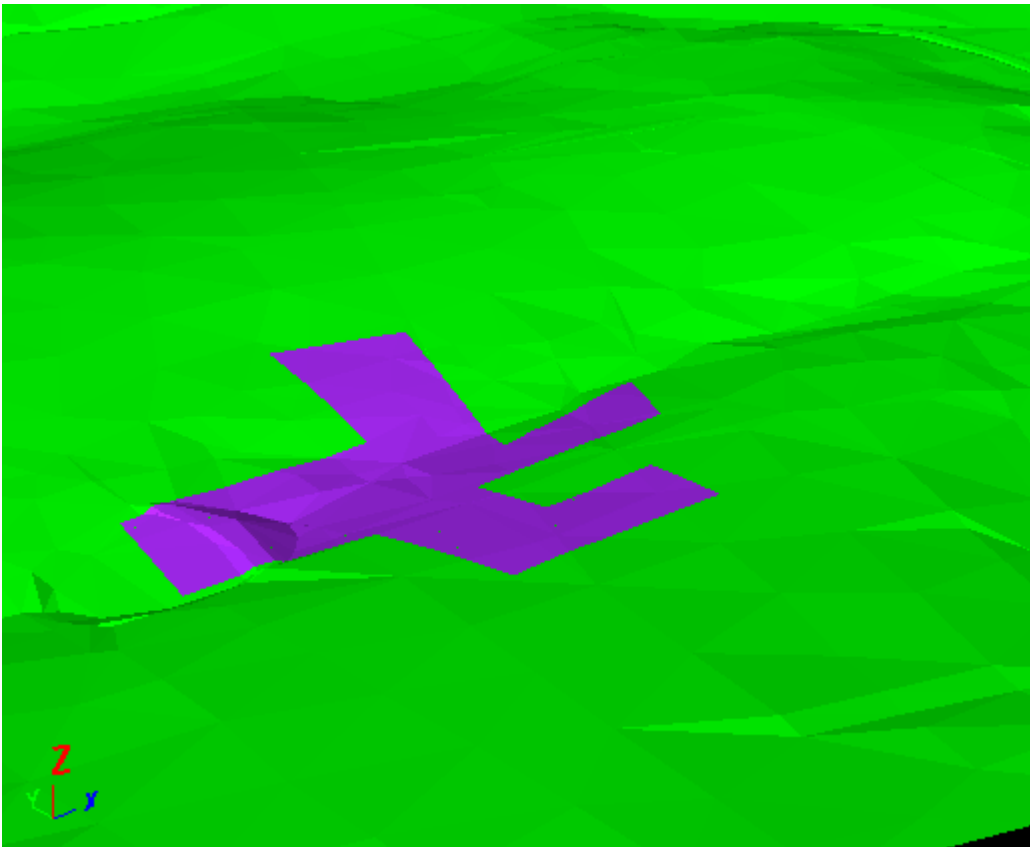
produces the solid filled polygons



If the above solid fill details have been applied to a closed super string, and using the **Tin Render Settings** panel to set **Plan polygon** field to "drape" for the tin called "dtm"



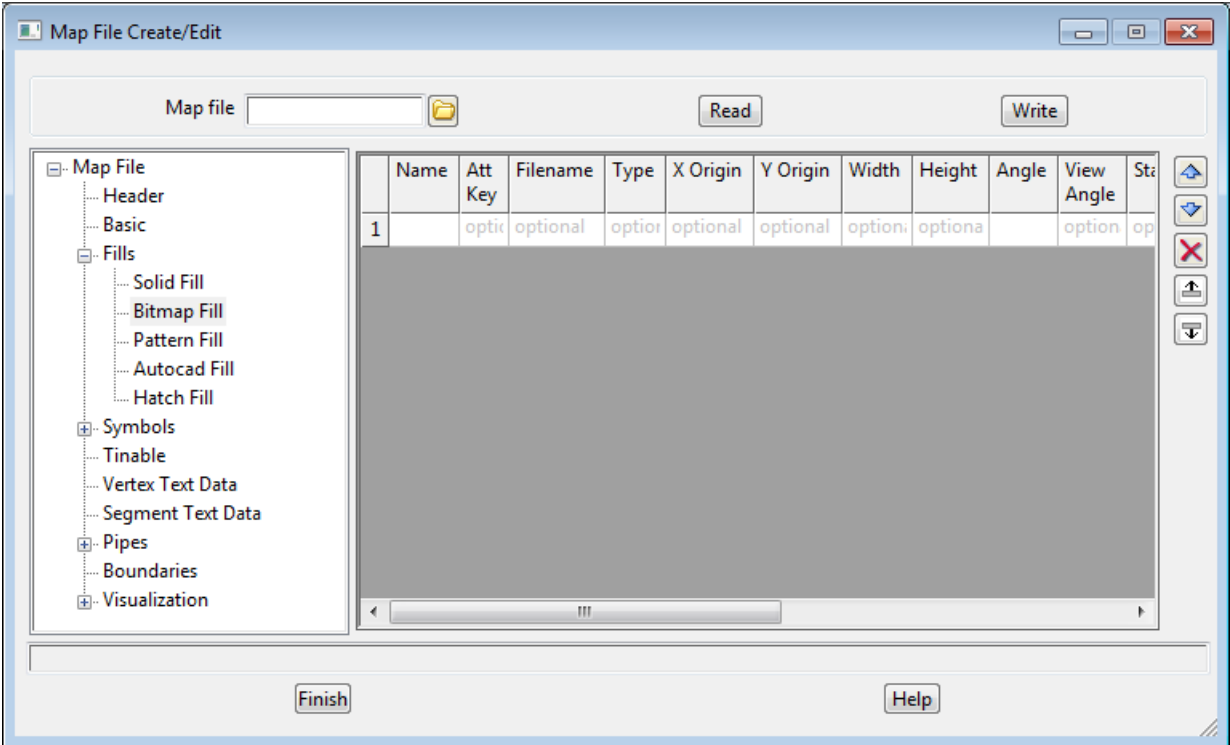
the result will be



Go to the next section [Fills >Bitmap Fill](#) or return to [Fills](#) or [Create/Edit a Map File](#).

Fills >Bitmap Fill

Bitmap Fill sets whether super strings (closed and non-closed) are filled with a bitmap pattern.



Processing Using Name and Att Key

when a string finds a first match with **Name** and **Att Key** in the grid (see [Matching Using Name and Att Key](#)), the string is given a **Bitmap Fill** as defined in the parameters of the matching line.

Name and Att Key

Name is at Text grid. The *string name* is matched against **Name**.
Att Key is an Attribute Data grid cell. The *string attributes* are matched against the attribute details in **Att Key**.
For further information on what is allowed in **Name** and **Att Key**, and how to access **Att Key**, see [Name and Att Key](#).

Note: all the fields on the line after **Att Key** can have attribute substitution from string attributes. See [Map File Substitution by Attributes](#).

Filename	file	.*bmp
The bitmap file to be used for filling. Only BMP files are currently supported.		
Type	choice box	paper, world, device, screen (device), pixels (device)
The units of size. This means the bitmap can be drawn with either world size, paper size (mm) or device size.		
X/Y Origin	measures box	At Point, Point to Point, String= from Point, String to Point)
The x/y co-ordinate of the origin point of the repeated pattern.		
Width/Height	measures box	At Point, Point to Point, String= from Point, String to Point)

The width/height of the bitmap in the selected units.

Angle measures box At Point, Point to Point, String=
from Point, String to Point)

*The orientation of the bitmap pattern relative to the x axis measured in the anti-clockwise direction.
The units are dms (degrees minutes and seconds) and typed in using [HP Notation](#).*

View Angle choice box yes, no

*if not blank, this field controls whether **Angle** is relative to the x axis or to the plotting x axis.
If **yes** and we are plotting, **Angle** is measured relative to the x axis of the plot rotation.
If **no**, **Angle** is measured absolute to the world x axis
If blank, **Angle** is measured absolute to the world x axis.*

Stagger measures box At Point, Point to Point, String=
from Point, String to Point)

*if not blank, this field allows each alternate row of bitmaps to be staggered (offset) by the specified
value. **Stagger** is measured in the selected units along the x axis in the rotated system.
If blank, a **Stagger** of 0.0 is assumed.*

Space X/Y measures box At Point, Point to Point, String=
from Point, String to Point)

*The distance in the selected units along the x/y axis in the rotated system between each instance of the
bitmap.*

Transparent select colour pop-up

*The transparency colour within the bitmap. This means any pixel of this colour within the bitmap is not
drawn.*

Solid Colour select colour pop-up

*if not blank, when the bitmaps become too small to be legible, instead of drawing the bitmaps, the
super string is solid filled with colour **Solid colour**.*

Solid Blend measures box At Point, Point to Point, String=
from Point, String to Point)

*if not blank, and **Solid Colour** is specified, the solid fill is drawn with blend value **Solid Blend**. The
blend value is between 0.0 and 1.0.
If blank, **Solid Blend** is assumed to be 1.0.*

Drape Name

reserved for future use

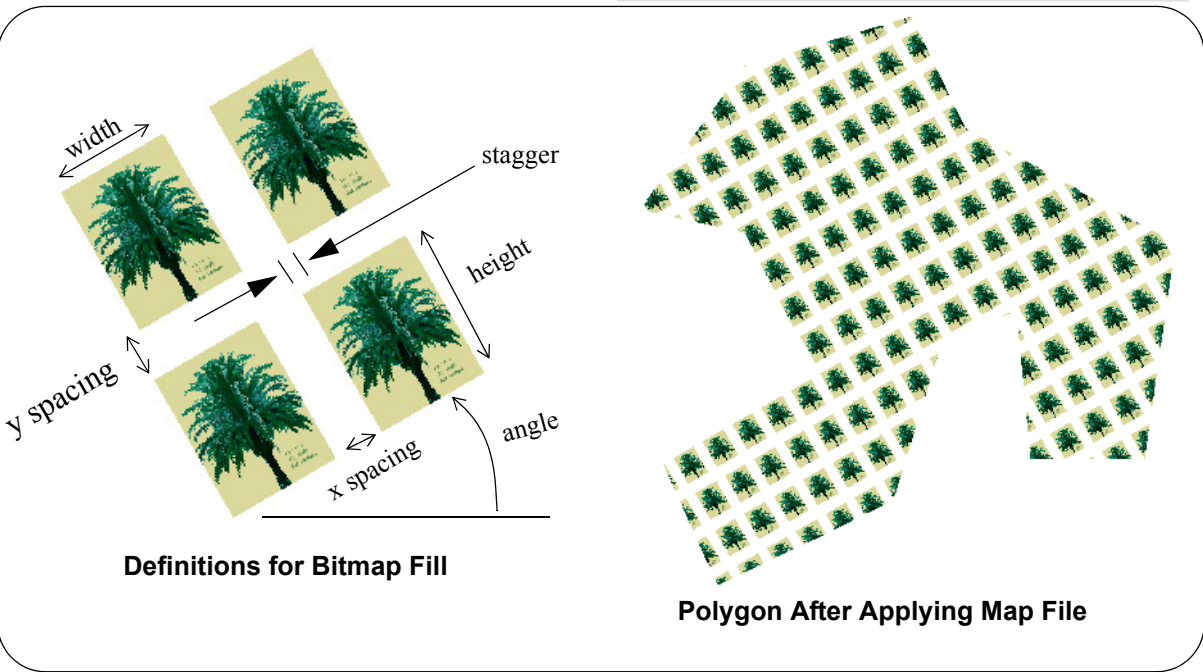
Comment

comment to be to be used in this line of the map file.

To assist is debugging a **Map File**, match logging can be turned on. See [Map File Logging](#).

Examples of Bitmap Fill

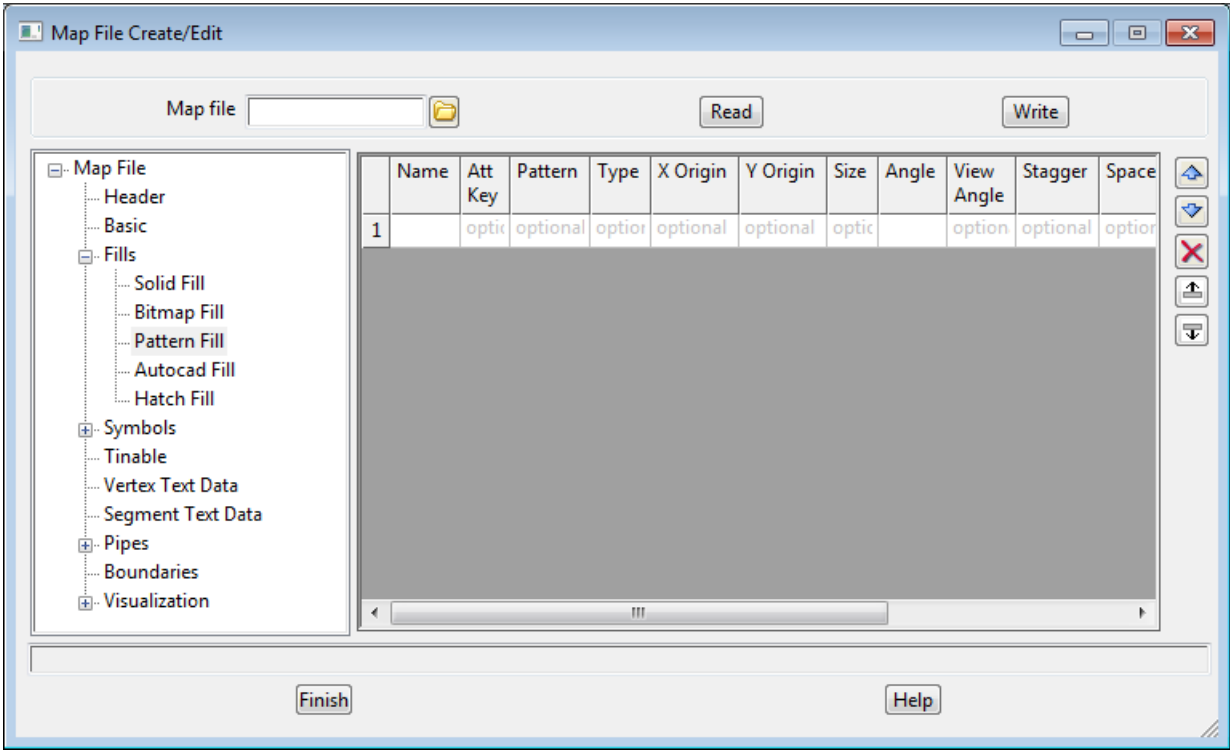
	Name	Att Key	Filename	Type	X Origin	Y Origin	Width	Height	Angle	View Angle	Stagger	Space X	Space Y	Transparent	Solid Colour	Solid Blend	Drape name	Comment
1	bf106		\$LIB\12D_palm 1.bmp	world	100	100	9	12	30		1	4	4		off yellow	0.5		



Go to the next section [Fills >Pattern Fill](#) or return to [Fills](#) or [Create/Edit a Map File](#).

Fills >Pattern Fill

Pattern Fill uses a pattern from the **12d Model** pattern file, *12d.pattern*, to fill the selected super strings.



Processing Using Name and Att Key

when a string finds a first match with **Name** and **Att Key** in the grid (see [Matching Using Name and Att Key](#)), the string is given a 12d Pattern Fill as defined in the parameters of the matching line.

Name and Att Key

Name is at Text grid. The **string name** is matched against **Name**.
Att Key is an Attribute Data grid cell. The **string attributes** are matched against the attribute details in **Att Key**.
For further information on what is allowed in **Name** and **Att Key**, and how to access **Att Key**, see [Name and Att Key](#).

Note: all the fields on the line after **Att Key** can have attribute substitution from string attributes. See [Map File Substitution by Attributes](#).

Pattern select Pattern pop-up
The pattern name to be applied. These patterns are defined in the file **patterns.12d**
For more information on the 12d pattern definition please go to the section [12d Patterns File](#).

Type choice box paper, world, device
The units of size. This means the pattern can be drawn with either world size, paper size (mm) or device size.

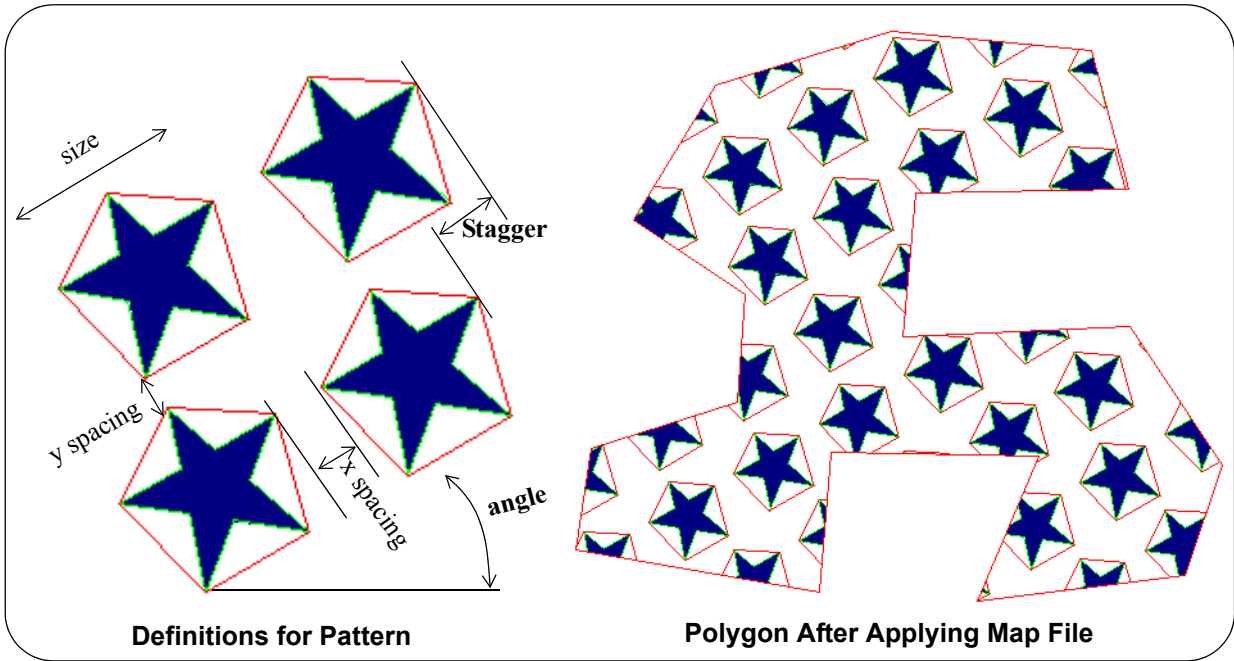
X/Y Origin measures box At Point, Point to Point, String= from Point, String to Point)
The x/y co-ordinate of the origin point of the repeated pattern.

Size	measures box	At Point, Point to Point, String= from Point, String to Point)
<i>The size of the pattern in the selected units given in Type.</i>		
Angle	measures box	At Point, Point to Point, String= from Point, String to Point)
<i>The orientation of the pattern relative to the x axis measured in the anti-clockwise direction. The units are dms (degrees minutes and seconds) and typed in using HP Notation.</i>		
View Angle	choice box	yes, no
<i>if not blank, this field controls whether Angle is relative to the x axis or to the plotting x axis.</i>		
<i>If yes and we are plotting, Angle is measured relative to the x axis of the plot rotation.</i>		
<i>If no, Angle is measured absolute to the world x axis</i>		
<i>If blank, Angle is measured absolute to the world x axis.</i>		
Stagger	measures box	At Point, Point to Point, String= from Point, String to Point)
<i>if not blank, this field allows each alternate row of patterns to be staggered (offset) by the specified value. Stagger is measured in the selected units along the x axis in the rotated system.</i>		
<i>If blank, a Stagger of 0.0 is assumed.</i>		
Space X/Y	measures box	At Point, Point to Point, String= from Point, String to Point)
<i>The distance in the selected units along the x/y axis in the rotated system between each instance of the pattern.</i>		
Solid Colour		select colour pop-up
<i>if not blank, when the pattern become too small to be legible, instead of drawing the pattern, the super string is solid filled with colour Solid colour.</i>		
Solid Blend	measures box	At Point, Point to Point, String= from Point, String to Point)
<i>if not blank, and Solid Colour is specified, the solid fill is drawn with blend value Solid Blend. The blend value is between 0.0 and 1.0.</i>		
<i>If blank, Solid Blend is assumed to be 1.0.</i>		
Comment		
<i>comment to be to be used in this line of the map file.</i>		

To assist is debugging a **Map File**, match logging can be turned on. See [Map File Logging](#).

Examples of Pattern Fill

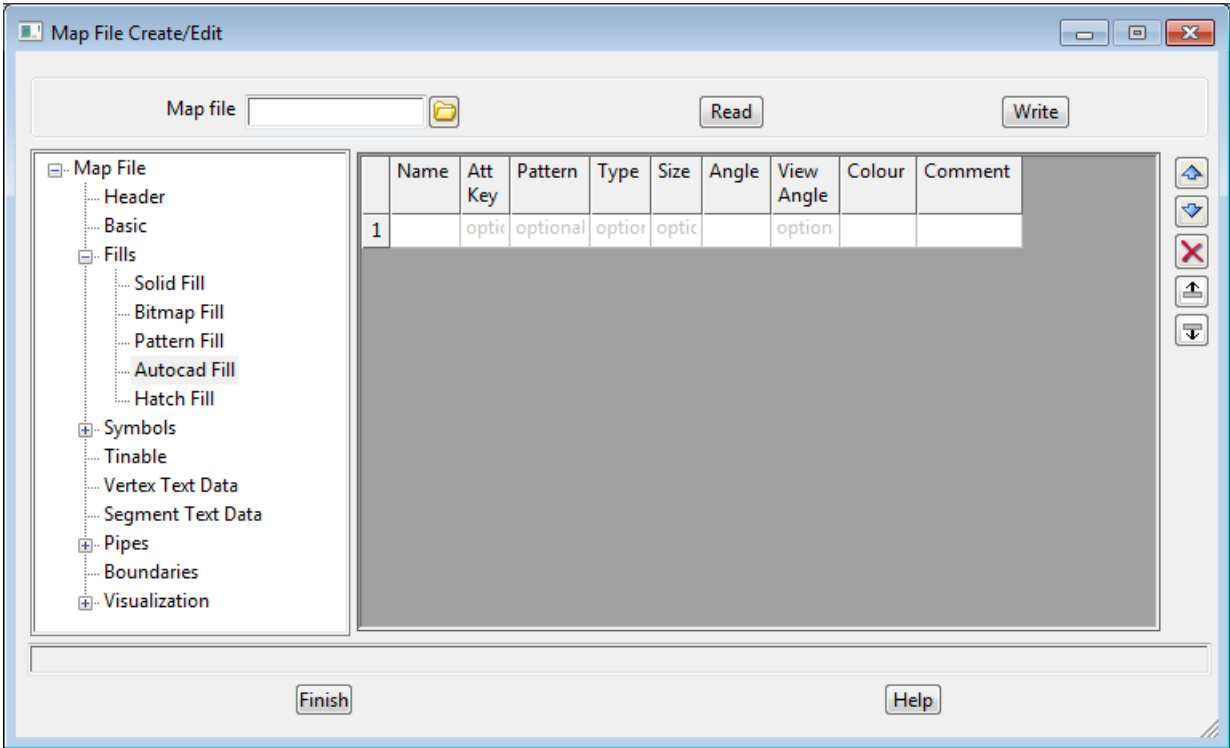
	Name	Att Key	Pattern	Type	X Origin	Y Origin	Size	Angle	View Angle	Stagger	Space X	Space Y	Solid Colour	Solid Blend	Comment
1	pf46		star with bitmap dots	world	0	0	20	30	no	6	6	4			



Go to the next section [Fills >Autocad Fill](#) or return to [Fills](#) or [Create/Edit a Map File](#).

Fills >Autocad Fill

AutoCad Fill uses a pattern from the **AutoCAD pattern** file to fill the selected super strings.



Processing Using Name and Att Key

when a string finds a first match with **Name** and **Att Key** in the grid (see [Matching Using Name and Att Key](#)), the string is given an AutoCAD Pattern Fill as defined in the parameters of the matching line.

Name and Att Key

Name is at Text grid. The *string name* is matched against **Name**.
Att Key is an Attribute Data grid cell. The *string attributes* are matched against the attribute details in **Att Key**.
For further information on what is allowed in **Name** and **Att Key**, and how to access **Att Key**, see [Name and Att Key](#).

Note: all the fields on the line after **Att Key** can have attribute substitution from string attributes. See [Map File Substitution by Attributes](#).

Pattern select autocad pattern

The autocad pattern name to be applied. These patterns are defined via acad.pat.
This is an autocad file.

Type

The units of size. This means the pattern can be drawn with either world size, paper size (mm) or device size.

Size

The size of the pattern in the units given by **Type**.

Angle measures box At Point, Point to Point, String=
from Point, String to Point)

The orientation of the pattern relative to the x axis measured in the anti-clockwise direction. The units are dms (degrees minutes and seconds) and typed in using [HP Notation](#).

View Angle	choice box	yes, no
-------------------	------------	---------

*if not blank, this field controls whether **Angle** is relative to the x axis or to the plotting x axis.*

If **yes** and we are plotting, **Angle** is measured relative to the x axis of the plot rotation.

*If no, **Angle** is measured absolute to the world x axis*

If blank, **Angle** is measured absolute to the world x axis.

This is an extension.

Colour

The colour of the pattern.

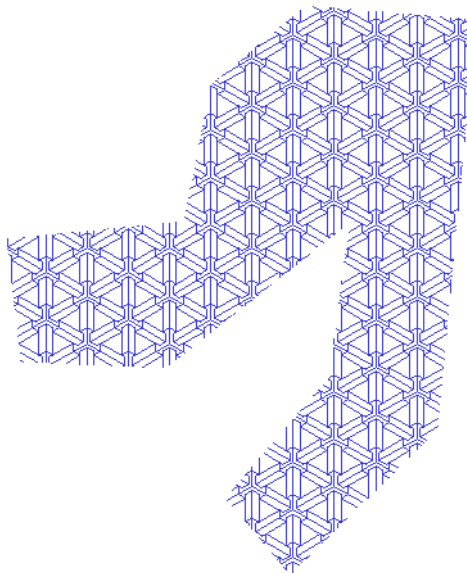
Comment

comment to be to be used in this line of the map file.

To assist in debugging a **Map File**, match logging can be turned on. See [Map File Logging](#).

Example of AutoCAD Fill

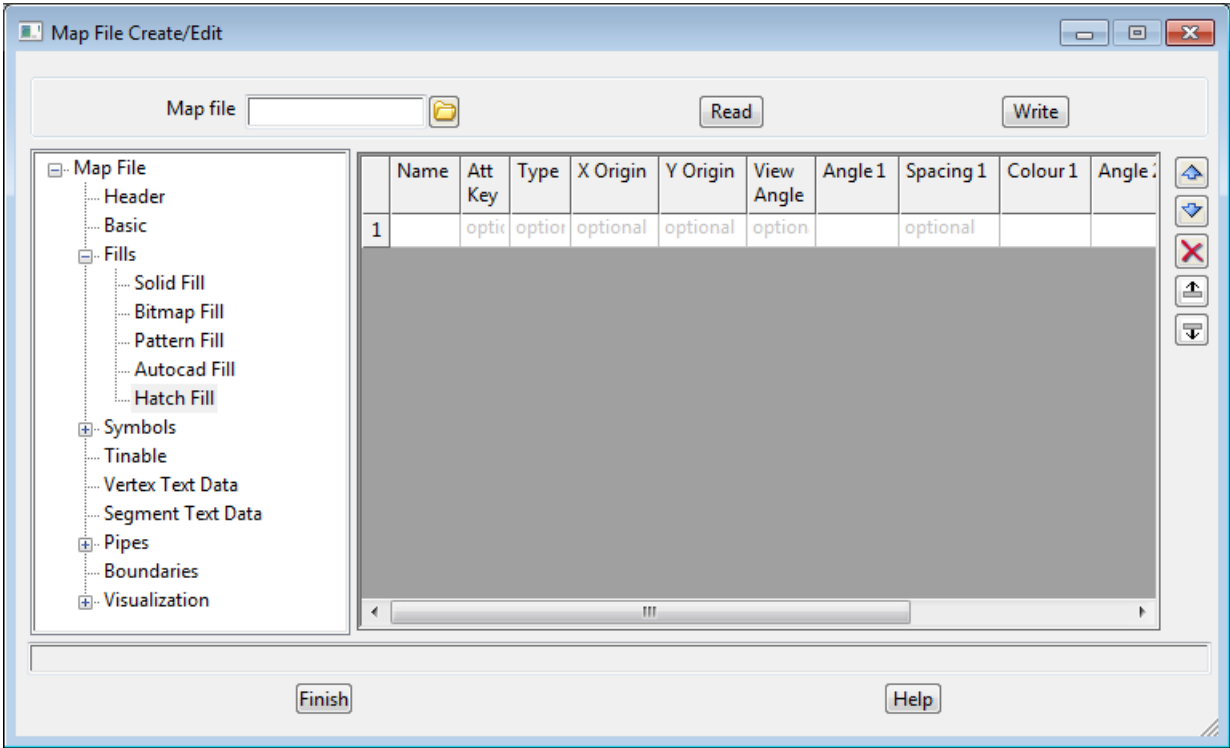
	Name	Att Key	Pattern	Type	Size	Angle	View Angle	Colour	Comment
1	pl04		ESCHER	world	10	30	no	dark blue	



Go to the next section [Fills > Hatch Fill](#) or return to [Fills](#) or [Create/Edit a Map File](#).

Fills > Hatch Fill

Hatch Fill sets whether super strings (closed and non-closed) are filled with a hatch pattern. The hatch pattern consists of one or two sets of lines drawn at specified angles.



Processing Using Name and Att Key

when a string finds a first match with **Name** and **Att Key** in the grid (see [Matching Using Name and Att Key](#)), the string is given a Hatch Pattern Fill as defined in the parameters of the matching line.

Name and Att Key

Name is at Text grid. The *string name* is matched against **Name**.
Att Key is an Attribute Data grid cell. The *string attributes* are matched against the attribute details in **Att Key**.

For further information on what is allowed in **Name** and **Att Key**, and how to access **Att Key**, see [Name and Att Key](#).

Note: all the fields on the line after **Att Key** can have attribute substitution from string attributes. See [Map File Substitution by Attributes](#).

Type select choice box

The units of **Spacing 1** and **Spacing 2**. This means the pattern can be drawn with either world size, paper size (mm) or device size.

X/Y Origin

The x/y co-ordinate of the anchor point of the repeated pattern.

View Angle choice box yes, no

if not blank, this field controls whether **Angle 1** and **Angle 2** are relative to the x axis or to the plotting x axis.

If yes and we are plotting, **Angle 1** and **Angle 2** are measured relative to the x axis of the plot rotation.

If no, **Angle 1** and **Angle 2** are measured absolute to the world x axis

*If blank, **Angle 1** and **Angle 2** are measured absolute to the world x axis.*

Angle 1 measures box At Point, Point to Point, String=
from Point, String to Point)

*The orientation of the first set of lines relative to the x axis measured in the anti-clockwise direction.
The units are dms (degrees minutes and seconds) and typed in using [HP Notation](#).*

Spacing 1

*The distance between the first set of lines (drawn at an angle **Angle 1**) in the units selected in the **Type** column.*

Colour 1

The colour of the first set of lines.

Angle 2 measures box At Point, Point to Point, String=
from Point, String to Point)

*The orientation of the second set of lines relative to the x axis measured in the anti-clockwise direction.
The units are dms (degrees minutes and seconds) and typed in using [HP Notation](#).*

Spacing 2

*The distance between the second set of lines (drawn at an angle **Angle 2**) in the units selected in the **Type** column.*

Colour 2

The colour of the second set of lines.

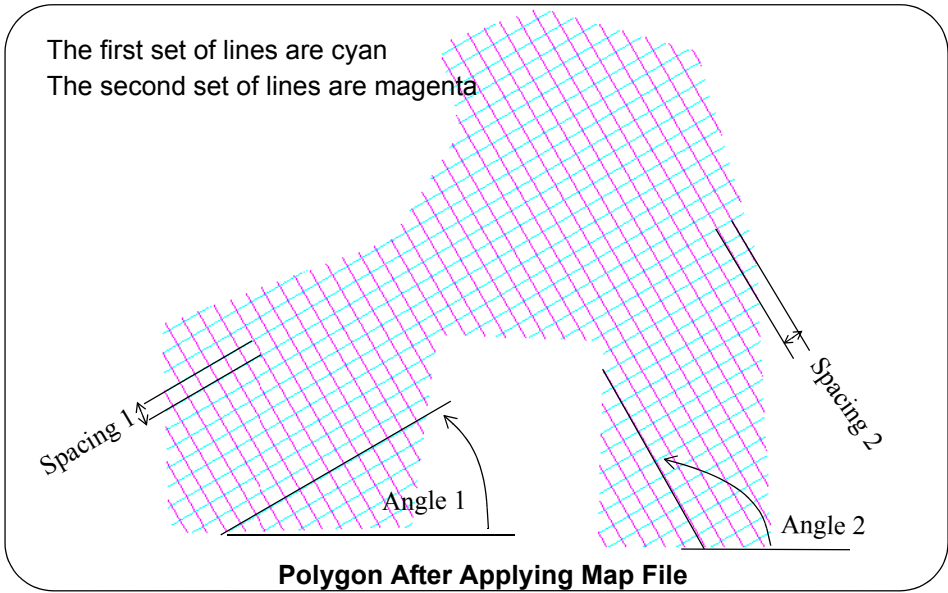
Comment

comment to be to be used in this line of the map file.

To assist is debugging a **Map File**, match logging can be turned on. See [Map File Logging](#).

Example of Hatch Fill

	Name	Att Key	Type	X Origin	Y Origin	View Angle	Angle 1	Spacing 1	Colour 1	Angle 2	Spacing 2	Colour 2	Comment
1	ht07		world	0	0		30	10	cyan	120	10	magenta	



Go to the next section [Multiple Fills](#) or return to [Fills](#) or [Create/Edit a Map File](#).

Multiple Fills

Super strings support more than one fill type per string. For example, a super string can have a solid fill, and an I Acad fill at the same time.

The order of drawing the fill types is: solid, bitmap, pattern, hatch, acad.

Go to the next section [Symbols](#) or return to [Fills](#) or [Create/Edit a Map File](#).

Symbols

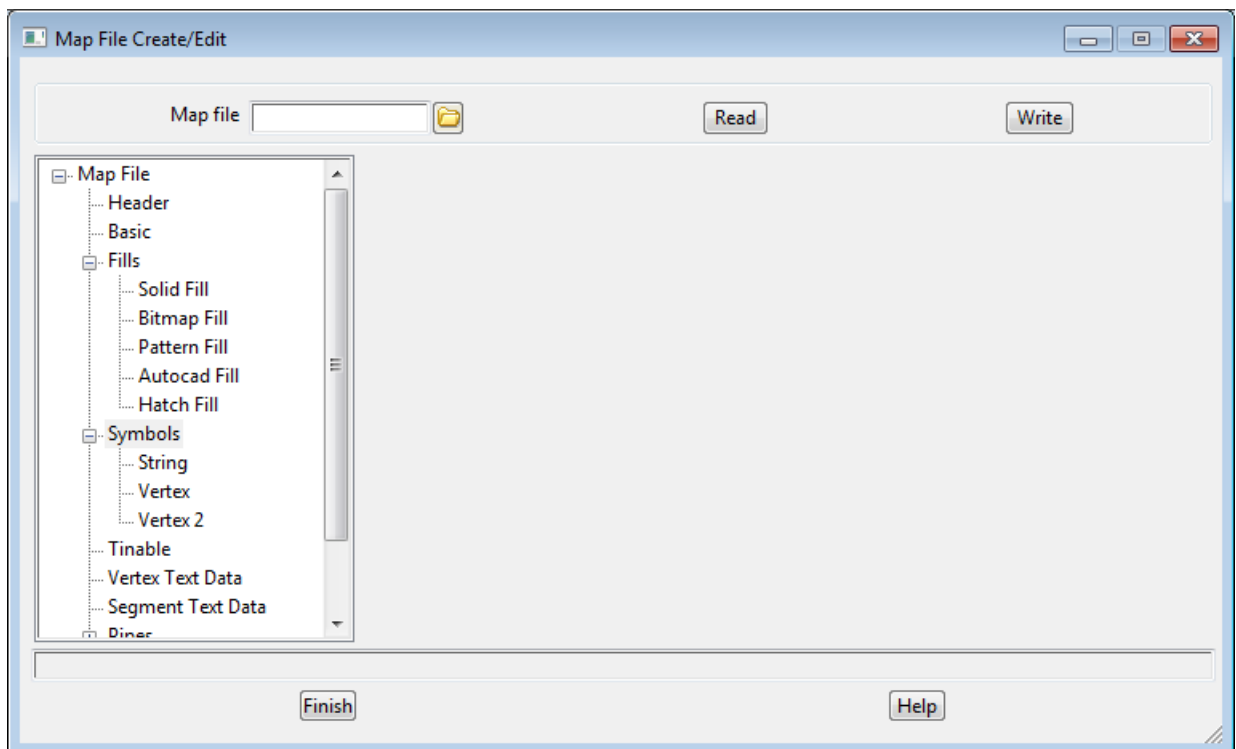
The **Symbols** node creates symbols at the vertices of the super strings.

There can only be **one** symbol at each vertex so if **Symbols >String** is used to set symbols for every vertex of a string, and **Symbols >Vertex** applies a different symbol to any of those vertices, then the symbols from **Symbols >Vertex** are used at the appropriate vertices.

Symbols >Vertex 2 can be used to generate a second symbol at a vertex position BUT **Symbols >Vertex 2** creates a **new** string with a vertex and the second symbol.

For more information on *String*, go to
Vertex
Vertex 2

[Symbols >String](#)
[Symbols >Vertex](#)
[Symbols >Vertex 2](#)

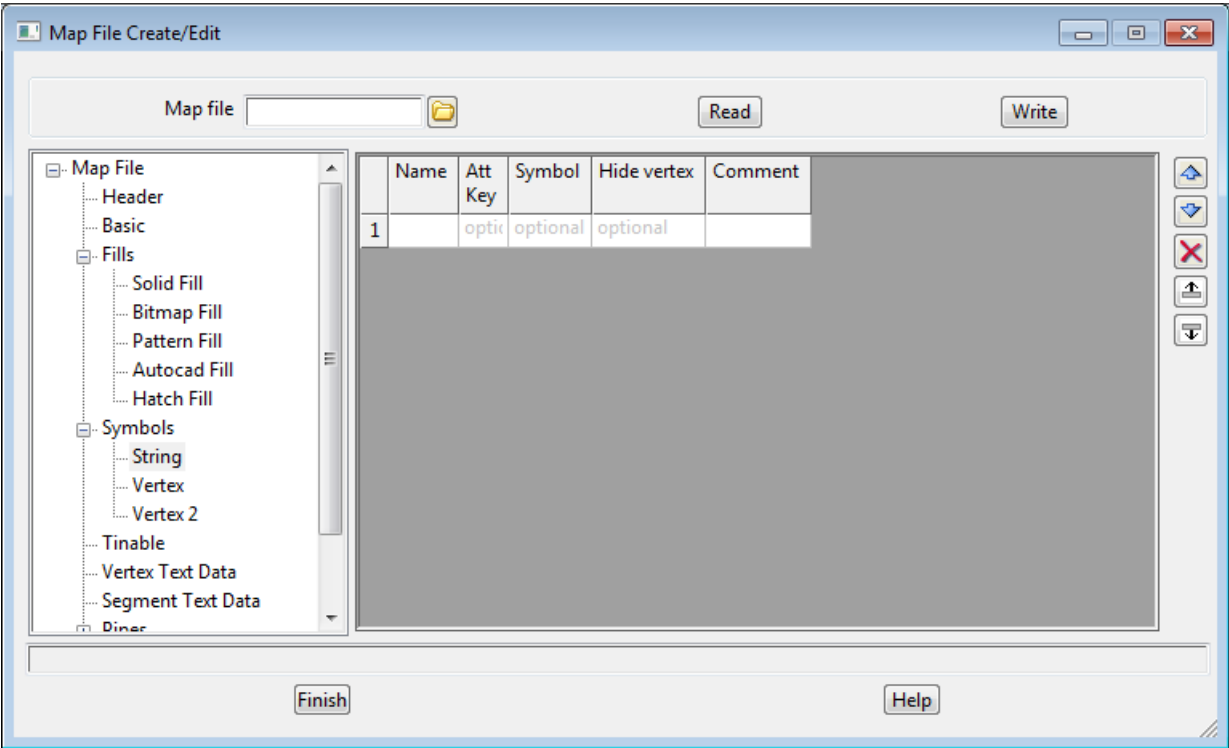


Symbols >String

String sets the same symbol at each vertex of a super string

IMPORTANT NOTE:

There can only be **one** symbol at each vertex so if **Symbols >String** is used to set symbols for every vertex of a string, and **Symbols >Vertex** applies a different symbol to any of those vertices, then the symbols from **Symbols >Vertex** are used at the appropriate vertices.



Processing Using Name and Att Key

when a string finds a first match with **Name** and **Att Key** in the grid (see [Matching Using Name and Att Key](#)), each vertex of the string is given a **Symbol** as defined in the parameters of the matching line.

Name and Att Key

Name is at Text grid. The **string name** is matched against **Name**.
Att Key is an Attribute Data grid cell. The **string attributes** are matched against the attribute details in **Att Key**.

For further information on what is allowed in **Name** and **Att Key**, and how to access **Att Key**, see [Name and Att Key](#).

Symbol

select symbol data

Symbol is an **Symbol Information** grid cell and sets parameters for creating a symbol on the vertices of super strings. The symbol is positioned about the vertex.

This field can not be blank.

To access **Symbol**, click LB on the **Symbol** field to highlight the field, then click LB again to bring up the **Symbol Information** panel. See [Symbol Data](#) for information about the field to enter.

Note: Fields in the **Symbol Information** can have attribute substitution from string attributes. See [Map File Substitution by Attributes](#).

Hide vertex

tick box

if ticked, no default cross is placed at the vertex of the string.

*Note: **Hide Vertex** can have attribute substitution from string attributes. See [Map File Substitution by Attributes](#).*

Comment

comment to be to be used in this line of the map file.

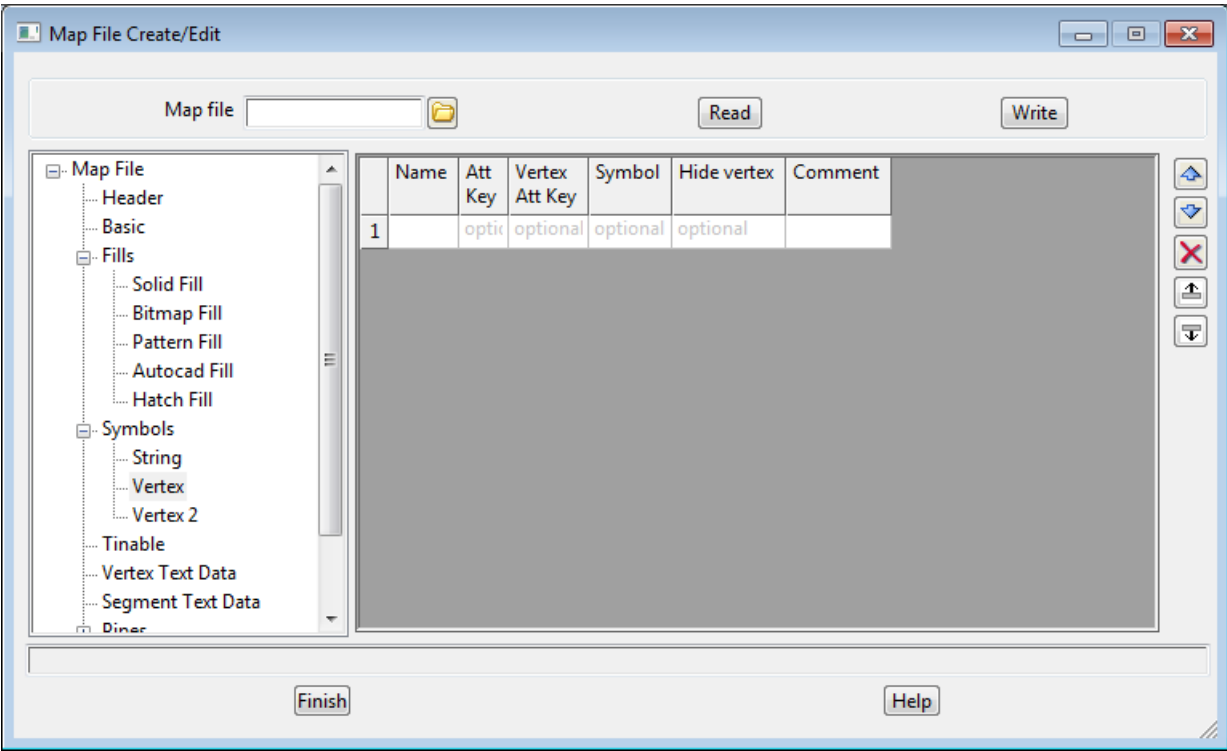
To assist is debugging a **Map File**, match logging can be turned on. See [Map File Logging](#).

Go to the next section [Symbols >Vertex](#) or return to [Symbols](#) or [Create/Edit a Map File](#).

Symbols >Vertex

Vertex sets a given symbol for each vertex of a super string that matches a string name, a string attribute value and a vertex attribute value.

There can only be **one** symbol at each vertex so if **Symbols >String** is used to set symbols for every vertex of a string, and **Symbols >Vertex** applies a different symbol to any of those vertices, then the symbol from **Symbols >Vertex** is used at the appropriate vertices.



Processing Using Name, Att Key and Vertex Att Key

when a string finds a first match with **Name**, **Att Key** and **Vertex Att Key** in the grid (see [Matching Using Name, Att Key and Vertex Att Key](#)), each matching vertex of the string is given a Symbol as defined in the parameters of the matching line.

Name, Att Key and Vertex Att Key

Name is at Text grid and the text entered into **Name** can include wild cards * and wild characters ?. The string name is matched against **Name**. This field can not be blank.

Att Key is an Attribute Data grid cell which contains the definition of the attributes and their values that are to be matched against. There can be more than one attribute in the Attribute Data but they must have unique names.

The **string** attributes are matched against the attribute details in **Att Key**.

Vertex Att Key is an Attribute Data grid cell which contains the definition of the vertex attributes and their values that are to be matched against. There can be more than one vertex attribute in the Attribute Data but they must have unique names.

The **vertex** attributes are matched against the attribute details in **Vertex Att Key**.

To access **Att Key** or **Vertex Att Key** data, click LB on the **Att Key/Vertex Att Key** field to highlight the field, then click LB again to bring up the **Attribute Data** panel. To enter data, see [Attribute Data Panel](#).

Matching Using Name, Att Key and Vertex Att Key:

Strings are first created via the **Basic** node and given a string name of either the Entity Name or the text

given in the **Name** column of the Basic Map File grid.

Starting with the first line of the grid, matching and processing occurs as follows

*If **Name**, **Att Key** and **Vertex Att Key** are not blank, and a match of the string name occurs with **Name**, a match of the string attributes occurs with **Att Key** and a match of the string vertex attributes occurs with **Vertex Att Key**, then the rest of the fields for this line of the Map File grid are used on this string vertex.*

*If **Name** and **Att Key** are not blank, and **Vertex Att Key** is blank, and a match of the string name occurs with **Name** and a match of the string attributes occurs with **Att Key**, then the rest of the fields for this line of the Map File grid are used on each string vertex.*

*If **Name** and **Vertex Att Key** are not blank, and **Att Key** is blank, and a match of the string name occurs with **Name** and a match of a string vertex attribute occurs with **Vertex Att Key**, then the rest of the fields for this line of the Map File grid are used on this string vertex.*

*If **Name** is not blank and **Att Key** and **Vertex Att Key** are blank, and a match of the string name occurs with **Name**, then the rest of the fields for this line of the Map File grid are used on each string vertex.*

*If **Name** is blank then no match occurs and this line of the Map File grid is ignored.*

*If a **match occurs**, then no tests for matches against **Name**, **Att Key** and **Vertex Att Key** further down in the grid are made.*

*If **no match occurs**, then this line of the map file grid is ignored and a test for a match is made against the next line of the grid.*

Symbol

select symbol data

Symbol is Symbol Information grid cell and sets parameters for creating a symbol on the vertices of super strings. The symbol is positioned about the vertex.

This field can not be blank.

*To access **Symbol**, click LB on the **Symbol** field to highlight the field, then click LB again to bring up the **Symbol Information** panel.*

***Note:** Fields in the **Symbol Information** can have attribute substitution from vertex attributes. See [Map File Substitution by Attributes](#).*

Hide vertex

tick box

if ticked, no default cross is placed at the vertex of the string.

***Note:** **Hide Vertex** can have attribute substitution from string attributes. See [Map File Substitution by Attributes](#).*

Comment

comment to be to be used in this line of the map file.

To assist is debugging a **Map File**, match logging can be turned on. See [Map File Logging](#).

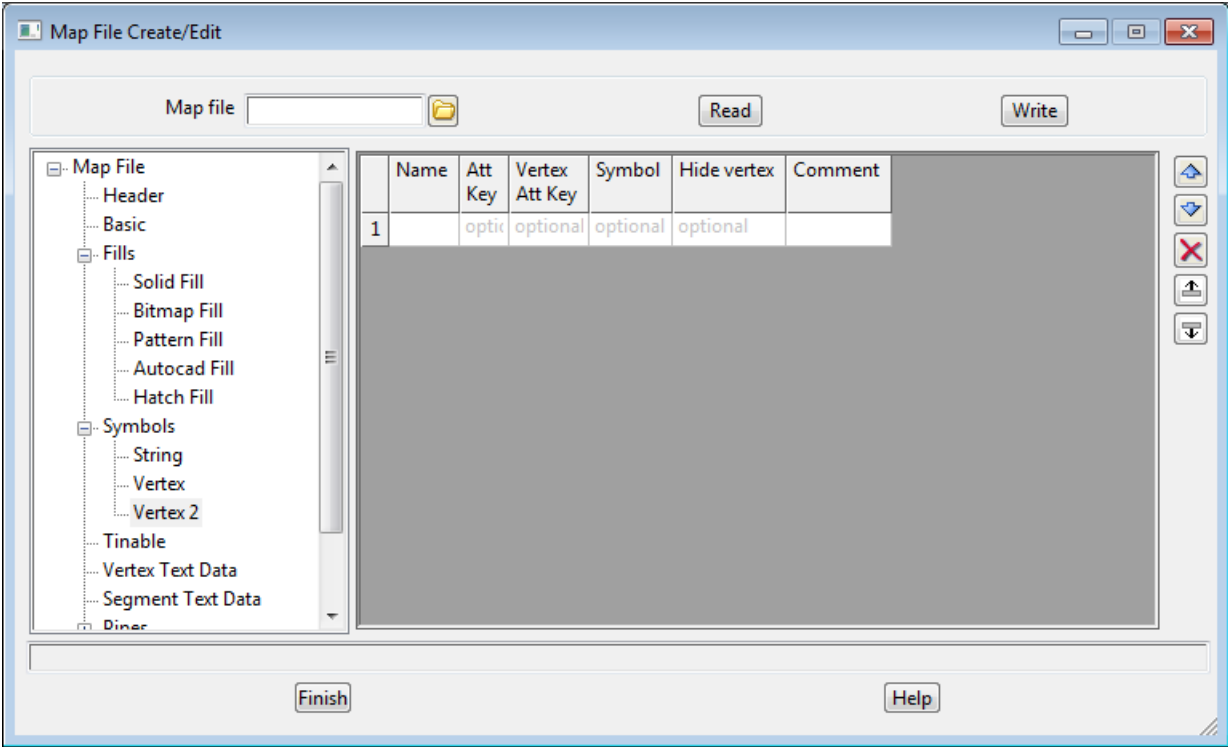
Go to the next section [Symbols >Vertex 2](#) or return to [Symbols](#) or [Create/Edit a Map File](#).

Symbols >Vertex 2

Vertex 2 creates a *new* string with vertices and symbols at those super strings that match a string name, a string attribute value and a vertex attribute value in the **Symbols >Vertex 2** grid.

IMPORTANT RESTRICTION:

Symbols >Vertex 2 does not work for **Utilities =>H-Z =>Map**.



Processing Using Name, Att Key and Vertex Att Key

when a string finds a first match with **Name**, **Att Key** and **Vertex Att Key** in the grid (see [Matching Using Name, Att Key and Vertex Att Key](#)), each matching vertex of the string is given a **Symbol** as defined in the parameters of the matching line.

Name, Att Key and Vertex Att Key

Name is at Text grid. The *string name* is matched against **Name**.

Att Key is an Attribute Data grid cell. The *string attributes* are matched against the attribute details in **Att Key**.

Vertex Att Key is an Attribute Data grid cell. The *vertex attributes* are matched against the attribute details in **Att Key**.

For further information on what is allowed in **Name** and **Att Key**, and how to access **Att Key**, see [Name, Att Key and Vertex Att Key](#).

Symbol

select symbol data

Symbol is Symbol Information grid cell and sets parameters for creating a symbol on the vertices of super strings. The symbol is positioned about the vertex.

This field can not be blank.

To access **Symbol**, click LB on the **Symbol** field to highlight the field, then click LB again to bring up the **Symbol Information** panel.

Note: Fields in the **Symbol Information** can have attribute substitution from vertex attributes. See [Map File Substitution by Attributes](#).

Hide vertex

tick box

if ticked, no default cross is placed at the vertex of the string.

Note: **Hide Vertex** can have attribute substitution from string attributes. See [Map File Substitution by Attributes](#).

Comment

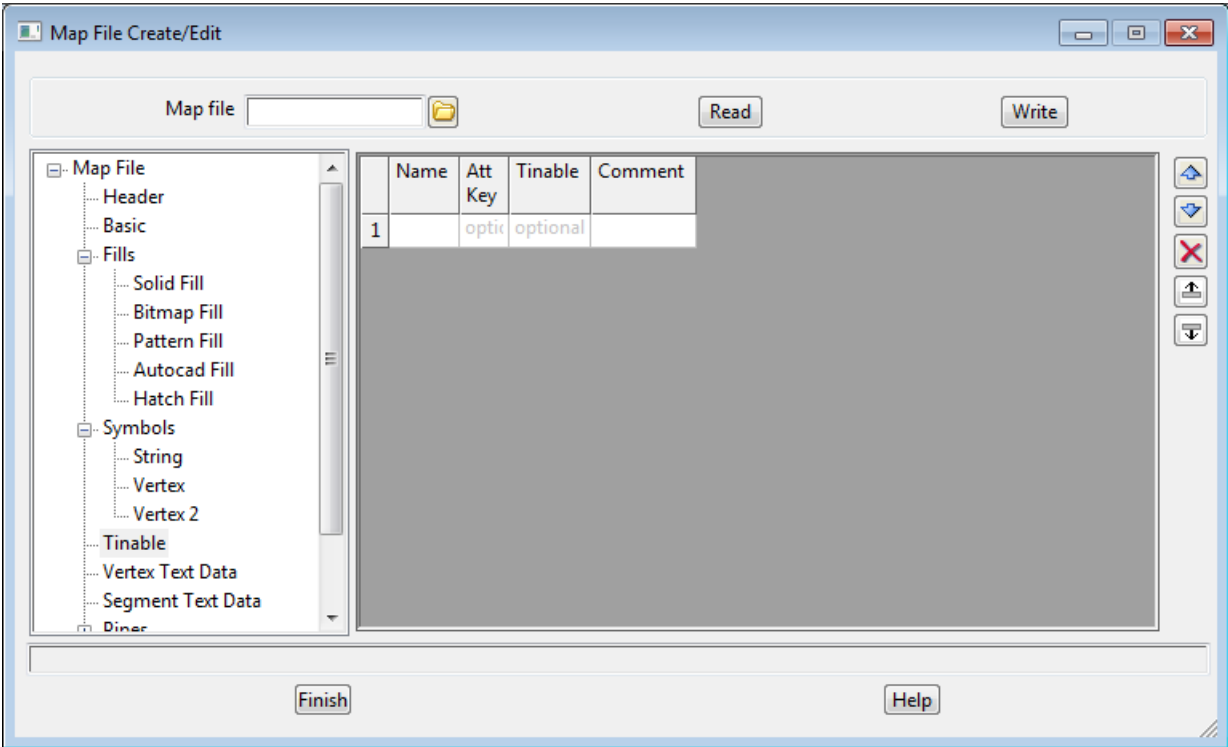
comment to be to be used in this line of the map file.

To assist is debugging a **Map File**, match logging can be turned on. See [Map File Logging](#).

Go to the next section [Tunable](#) or return to [Symbols](#) or [Create/Edit a Map File](#).

Tinable

Tinable sets whether the vertices and segments are tinable (used in triangulations), not tinable (not used in triangulations) or only the vertices (points) are tinable.



Processing Using Name and Att Key

when a string finds a first match with **Name** and **Att Key** in the grid (see [Matching Using Name and Att Key](#)), each vertex and segment of the string is given a tinability value as defined in the parameters of the matching line.

Name and Att Key

Name is at Text grid. The **string name** is matched against **Name**.
Att Key is an Attribute Data grid cell. The **string attributes** are matched against the attribute details in **Att Key**.
For further information on what is allowed in **Name** and **Att Key**, and how to access **Att Key**, see [Name and Att Key](#).

Tinable

yes, no, points

if **yes**, the vertices and segments for all the strings matching the **Name** and **Att Key** are tinable.
If **no**, the vertices and segments for all the strings matching the **Name** and **Att Key** are not tinable.
If **points**, the segments are not tinable and the vertices are tinable for all the strings matching the **Name** and **Att Key**.
This field can not be blank.

Note: **Tinable** can have attribute substitution from string attributes. See [Map File Substitution by Attributes](#).

Comment

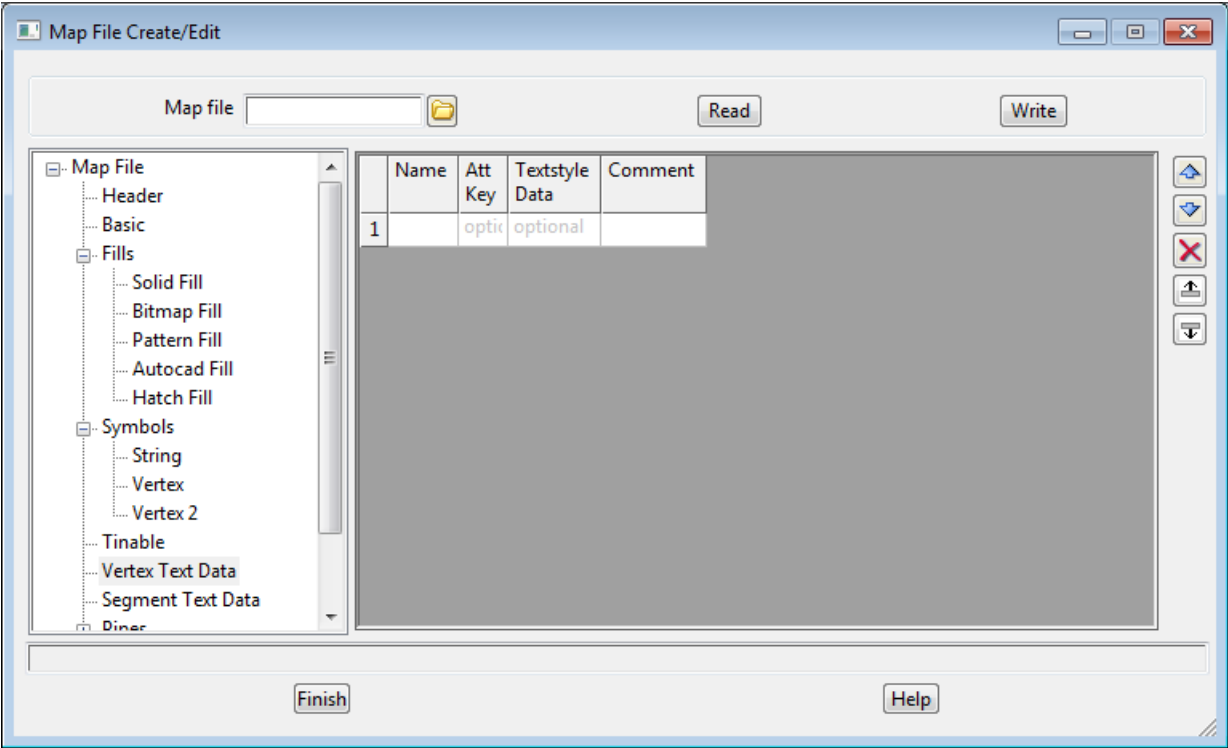
comment to be to be used in this line of the map file.

To assist in debugging a **Map File**, match logging can be turned on. See [Map File Logging](#).

Go to the next section [Vertex Text Data](#) or return to [Create/Edit a Map File](#).

Vertex Text Data

Vertex Text Data sets parameters for displaying vertex text on super strings.



Processing Using Name and Att Key

when a string finds a first match with **Name** and **Att Key** in the grid (see [Matching Using Name and Att Key](#)), a **Textstyle Data** for use with vertex text on the string is given in the parameters of the matching line.

Name and Att Key

Name is at Text grid. The **string name** is matched against **Name**.
Att Key is an Attribute Data grid cell. The **string attributes** are matched against the attribute details in **Att Key**.

For further information on what is allowed in **Name** and **Att Key**, and how to access **Att Key**, see [Name and Att Key](#).

Textstyle Data

select textstyle data menu

Textstyle Data is a Textstyle Data grid cell. The Textstyle Data sets text parameters (see [Text Definitions](#)) for displaying vertex text on all strings matching **Name** and **Att Key**.

To access the **Textstyle Data**, click LB on the **Textstyle Data** field to highlight the field, then click LB again to bring up the **Textstyle Data** panel.

Note: Fields in the **Textstyle Data** can have attribute substitution from string attributes. See [Map File Substitution by Attributes](#).

Comment

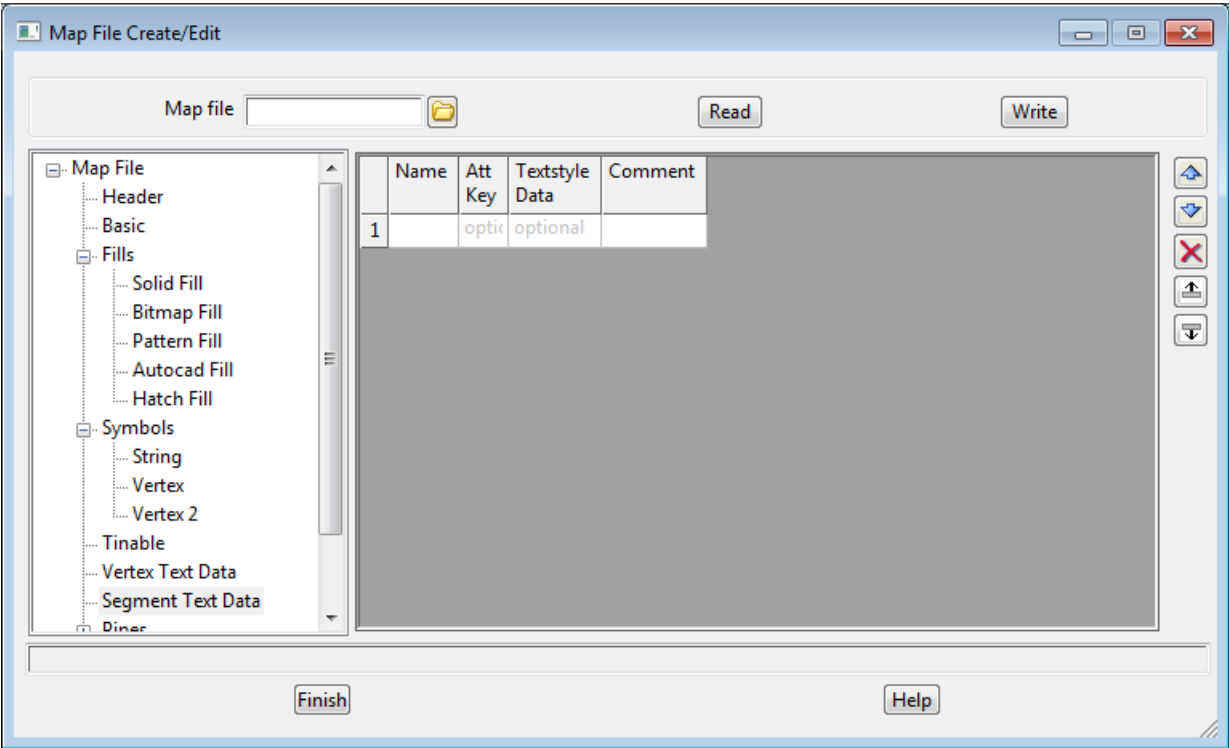
comment to be to be used in this line of the map file.

To assist is debugging a **Map File**, match logging can be turned on. See [Map File Logging](#).

Go to the next section [Segment Text Data](#) or return to [Create/Edit a Map File](#).

Segment Text Data

Segment Text Data sets parameters for displaying segment text on super strings.



Processing Using Name and Att Key

when a string finds a first match with **Name** and **Att Key** in the grid (see [Matching Using Name and Att Key](#)), a **Textstyle Data** for use with segment text on the string is given in the parameters of the matching line.

Name and Att Key

Name is at Text grid. The *string name* is matched against **Name**.
Att Key is an Attribute Data grid cell. The *string attributes* are matched against the attribute details in **Att Key**.
For further information on what is allowed in **Name** and **Att Key**, and how to access **Att Key**, see [Name and Att Key](#).

Textstyle Data

select textstyle data menu

Textstyle Data is a Textstyle Data grid cell. The Textstyle Data sets text parameters (see [Text Definitions](#)) for displaying segment text on all strings matching **Name** and **Att Key**.
To access the **Textstyle Data**, click LB on the **Textstyle Data** field to highlight the field, then click LB again to bring up the **Textstyle Data** panel.
Note: Fields in the **Textstyle Data** can have attribute substitution from string attributes. See [Map File Substitution by Attributes](#).

Comment

comment to be to be used in this line of the map file.

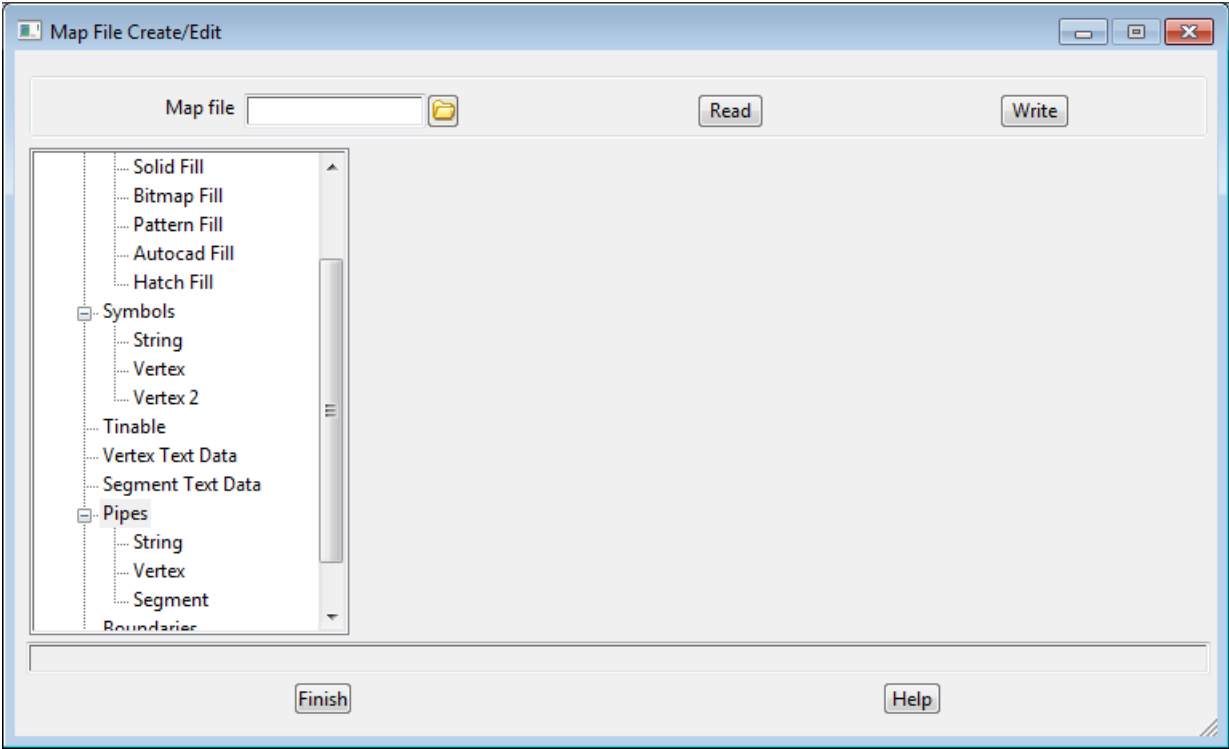
To assist is debugging a **Map File**, match logging can be turned on. See [Map File Logging](#).

Go to the next section [Pipes](#) or return to [Create/Edit a Map File](#).

Pipes

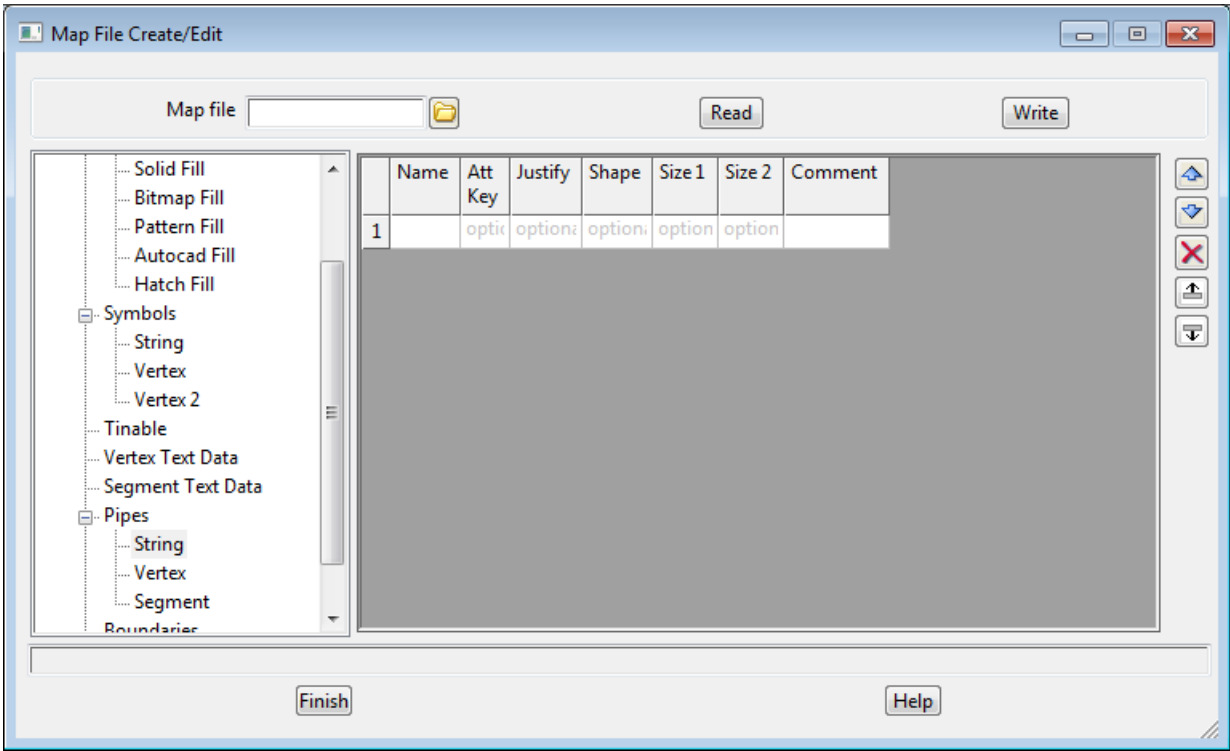
The **Pipes** node turns the string into a super pipe and sets parameters for pipe justification, whether it is round pipe and its diameter, or a rectangular pipe (culvert) and its width and height.

For information on *String*, go to [Pipes >String](#)
 Vertex [Pipes >Vertex](#)
 Segment [Pipes >Segment](#)



Pipes >String

Strings matches on string name and string attributes to make the selected string a pipe string with either a diameter (round pipe) or a width and height (rectangular pipe), and a justification for the z-values of the string.



Processing Using Name and Att Key

when a string finds a first match with **Name** and **Att Key** in the grid (see [Matching Using Name and Att Key](#)), the super string is turned into a super pipe using the parameters of the matching grid line.

Name and Att Key

Name is at Text grid. The *string name* is matched against **Name**.
Att Key is an Attribute Data grid cell. The *string attributes* are matched against the attribute details in **Att Key**.

For further information on what is allowed in **Name** and **Att Key**, and how to access **Att Key**, see [Name and Att Key](#).

Note: all the fields on the line after **Att Key** can have attribute substitution from string attributes. See [Map File Substitution by Attributes](#).

Justify invert, centre, obvert

the justification for the pipe string.
This field can not be blank.

Shape diameter, culvert

sets whether the pipe is a round pipe or a rectangular pipe (culvert).
If **diameter**, the string is made a round pipe.
If **culvert**, the string is made a rectangular pipe.
This field can not be blank.

Size 1 measures menu

for **Shape choice diameter**, the diameter of all the segments of the pipe are set to the value in **Size 1**.
For **Shape choice culvert**, the width of all the segments of the pipe are set to the value in **Size 1**.
This field can not be blank.

Size 2

measures menu

for **Shape choice culvert**, the height of all the segments of the pipe are set to the value in **Size 2**.
for **Shape choice diameter**, this field is ignored.
This field can only be blank for a **Shape choice diameter**.

Comment

comment to be to be used in this line of the map file.

To assist is debugging a **Map File**, match logging can be turned on. See [Map File Logging](#).

Example of Pipes >String

Vertex

Vertex 2

Tinable

Vertex Text Data

Segment Text Data

Pipes

String

Vertex

	Name	Att Key	Justify	Shape	Size 1	Size 2	Comment
1	*	1 attribute	Invert	diameter	\$Diameter	optional	
2	*	attributes {		vert	\$Width	\$Height	
3		text "Shape" "Rectangular"		ional	optional	optional	

select strings with a **string text** attribute named **Shape** and with the value "Rectangle"

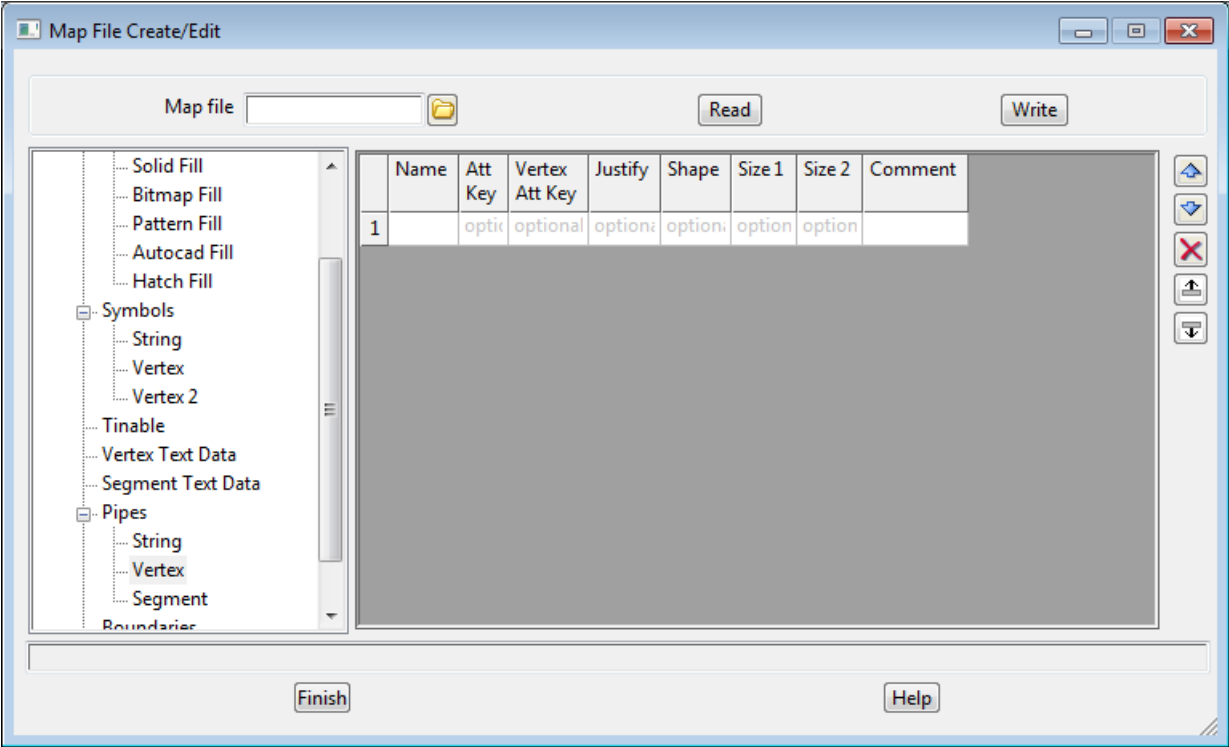
use the value of the **string** attribute named **Width** as the value in **Size 1** to use for the string

Go to the next section [Pipes >Vertex](#) or return to [Pipes](#) or [Create/Edit a Map File](#).

Pipes >Vertex

Vertex sets parameters for the sizing and justification of the **segment starting** with the selected vertex of the super string.

Note: All the segments of a super pipe string must have the same Shape. That is, all the segments must be **Shape diameter** (round pipe segment) or all the segments must be **Shape culvert** (rectangular pipe segment). And **Shape** must be the same as any **Shape** set for the string in [Pipes >String](#).



Processing Using Name, Att Key and Vertex Att Key

when a string finds a first match with **Name**, **Att Key** and **Vertex Att Key** in the grid (see [Matching Using Name, Att Key and Vertex Att Key](#)), the segment that starts with the matching vertex of the string, is given the pipe justification, pipe shape and pipe size as defined in the parameters of the matching line.

Name, Att Key and Vertex Att Key

Name is at Text grid. The **string name** is matched against **Name**.
Att Key is an Attribute Data grid cell. The **string attributes** are matched against the attribute details in **Att Key**.
Vertex Att Key is an Attribute Data grid cell. The **vertex attributes** are matched against the attribute details in **Att Key**.

For further information on what is allowed in **Name** and **Att Key**, and how to access **Att Key**, see [Name, Att Key and Vertex Att Key](#).

Note: all the fields on the line after **Vertex Att Key** can have attribute substitution from vertex attributes. See [Map File Substitution by Attributes](#).

Justify invert, centre, obvert
the justification for this segment of the pipe string.

This field can not be blank.

Shape

diameter, culvert

sets whether this segment of the pipe is a round pipe or a rectangular pipe (culvert).

*If **diameter**, the segment is made a round pipe.*

*If **culvert**, the segment is made a rectangular pipe.*

This field can not be blank.

***Note:** the shape can not be different from a shape set by Pipes >String*

Size 1

measures menu

*for **Shape** choice **diameter**, the diameter of this segments of the pipe is set to the value in **Size 1**.*

*For **Shape** choice **culvert**, the width of this segments of the pipe is set to the value in **Size 1**.*

This field can not be blank.

Size 2

measures menu

*for **Shape** choice **culvert**, the height of this segment of the pipe is set to the value in **Size 2**.*

*for **Shape** choice **diameter**, this field is ignored.*

*This field can only be blank for a **Shape** choice **diameter**.*

Comment

comment to be to be used in this line of the map file.

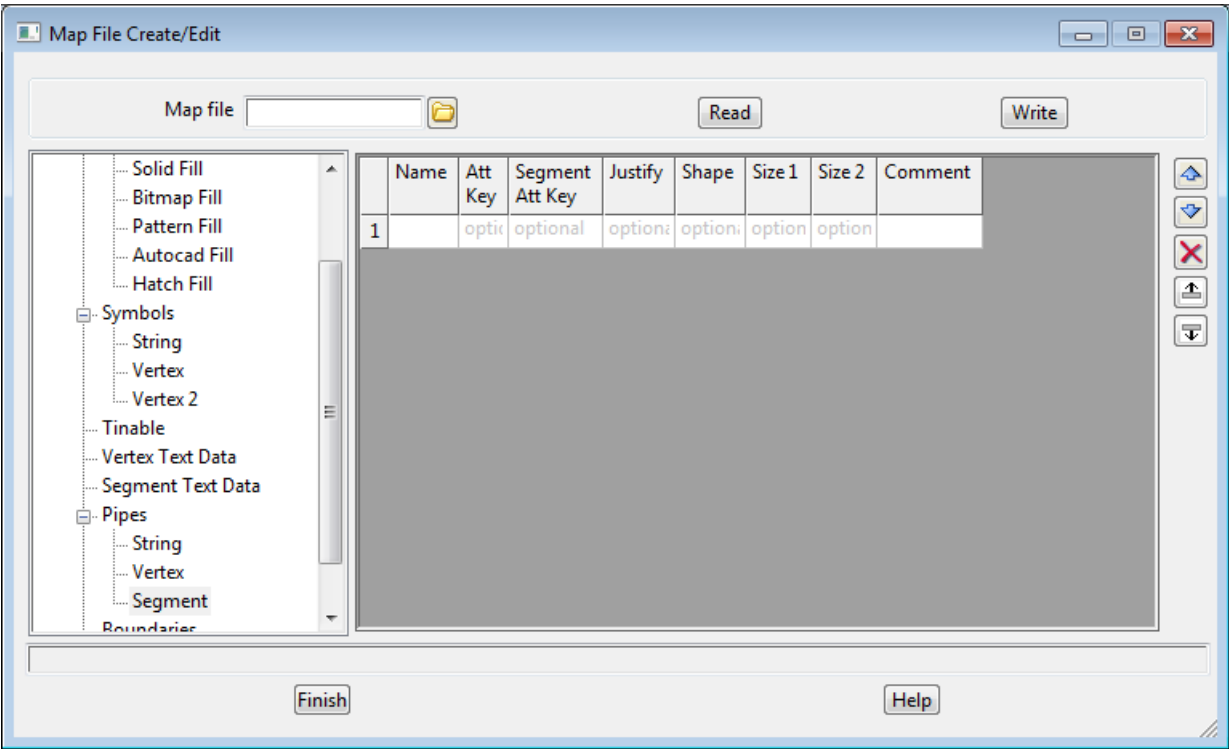
To assist is debugging a **Map File**, match logging can be turned on. See [Map File Logging](#).

Go to the next section [Pipes >Segment](#) or return to [Pipes](#) or [Create/Edit a Map File](#).

Pipes >Segment

Segment sets parameters for the sizing and justification of the selected segment of the super string.

Note: All the segments of a super pipe string must have the same Shape. That is, all the segments must be **Shape *diameter*** (round pipe segment) or all the segments must **Shape *culvert*** (rectangular pipe segment). And **Shape** must be the same as any **Shape** set for the string in [Pipes >String](#).



Processing Using Name, Att Key and Segment Att Key

when a string finds a first match with **Name**, **Att Key** and **Segment Att Key** in the grid (see [Matching Using Name, Att Key and Segment Att Key](#)), each matching segment of the string is the pipe, justification, pipe shape and pipe size as defined in the parameters of the matching line.

Name, Att Key and Segment Att Key

Name is at Text grid and the text entered into **Name** can include wild cards * and wild characters ?. The string name is matched against **Name**. This field can not be blank.

Att Key is an Attribute Data grid cell which contains the definition of the attributes and their values that are to be matched against. There can be more than one attribute in the Attribute Data but they must have unique names.

The **string** attributes are matched against the attribute details in **Att Key**.

Segment Att Key is an Attribute Data grid cell which contains the definition of the segment attributes and their values that are to be matched against. There can be more than one segment attribute in the Attribute Data but they must have unique names.

The **segment** attributes are matched against the attribute details in **Segment Att Key**.

To access **Att Key** or **Segment Att Key** data, click LB on the **Att Key**/ **Segment Att Key** field to highlight the field, then click LB again to bring up the **Attribute Data** panel. To enter data, see [Attribute Data Panel](#).

Matching Using Name, Att Key and Segment Att Key:

Strings are first created via the **Basic** node and given a string name of either the Entity Name or the text

given in the Name column of the Basic Map File grid.

Starting with the first line of the grid, matching and processing occurs as follows

If **Name**, **Att Key** and **Segment Att Key** are not blank, and a match of the string name occurs with **Name**, a match of the string attributes occurs with **Att Key** and a match of the string segment attributes occurs with **Segment Att Key**, then the rest of the fields for this line of the Map File grid are used on this string segment.

If **Name** and **Att Key** are not blank, and **Segment Att Key** is blank, and a match of the string name occurs with **Name** and a match of the string attributes occurs with **Att Key**, then the rest of the fields for this line of the Map File grid are used on each string segment.

If **Name** and **Segment Att Key** are not blank, and **Att Key** is blank, and a match of the string name occurs with **Name** and a match of a string segment attribute occurs with **Segment Att Key**, then the rest of the fields for this line of the Map File grid are used on this string segment.

If **Name** is not blank and **Att Key** and **Segment Att Key** are blank, and a match of the string name occurs with **Name**, then the rest of the fields for this line of the Map File grid are used on each string segment.

If **Name** is blank then no match occurs and this line of the Map File grid is ignored.

If a **match occurs**, then no tests for matches against **Name**, **Att Key** and **Segment Att Key** further down in the grid are made.

If **no match occurs**, then this line of the map file grid is ignored and a test for a match is made against the next line of the grid.

Note: all the fields on the line after **Segment Att Key** can have attribute substitution from segment attributes. See [Map File Substitution by Attributes](#).

Justify

invert, centre, obvert

the justification for this segment of the pipe string.
This field can not be blank.

Shape

diameter, culvert

sets whether this segment of the pipe is a round pipe or a rectangular pipe (culvert).

If **diameter**, the segment is made a round pipe.

If **culvert**, the segment is made a rectangular pipe.

This field can not be blank.

Note: the shape can not be different from a shape set by Pipes >String

Size 1

measures menu

for **Shape** choice **diameter**, the diameter of this segments of the pipe is set to the value in **Size 1**.

For **Shape** choice **culvert**, the width of this segments of the pipe is set to the value in **Size 1**.

This field can not be blank.

Size 2

measures menu

for **Shape** choice **culvert**, the height of this segment of the pipe is set to the value in **Size 2**.

for **Shape** choice **diameter**, this field is ignored.

This field can only be blank for a **Shape** choice **diameter**.

Comment

comment to be used in this line of the map file.

To assist in debugging a **Map File**, match logging can be turned on. See [Map File Logging](#).

Example of Pipes >Segment

String

Vertex

Vertex 2

Tinable

Vertex Text Data

Segment Text Data

Pipes

String

Vertex

Segment

Boundaries

	Name	Att Key	Segment Att Key	Justify	Shape	Size 1	Size 2	Comment
1	*	1 attribute	1 attribute	Invert	diameter	\$Diameter	optional	
2	*	optional	attributes { text "Shape" "Rectangular"	ert	\$Width	\$Height		
3		optional		onal	optional	optional		

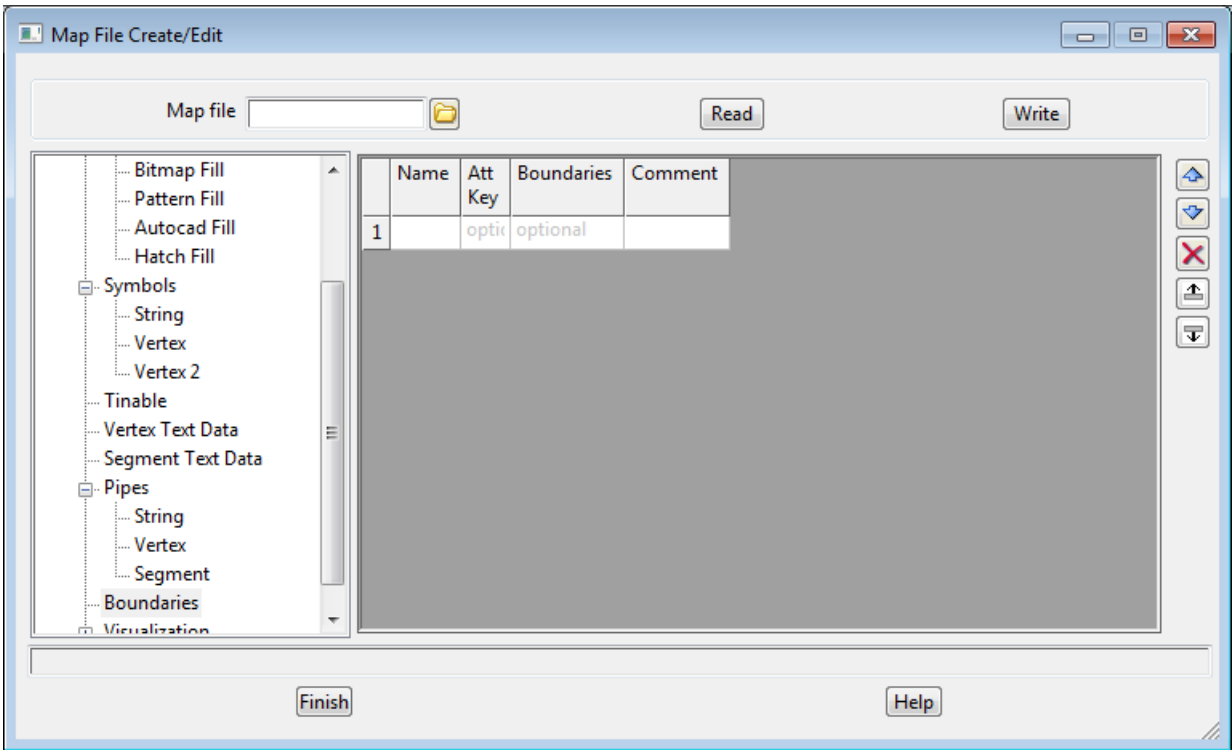
select segments with a **segment text** attribute named **Shape** and with the value "Rectangle"

use the value of the **segment** attribute named **Width** as the value in **Size 1** to use for this segment

Go to the next section [Boundaries](#) or return to [Pipes](#) or [Create/Edit a Map File](#).

Boundaries

Boundaries sets an attribute for the string so that when it is used for Nulling of triangles in a Tin, the triangles inside the string will either be set to null (exclude), or set back to not null (include).



Processing Using Name and Att Key

when a string finds a first match with **Name** and **Att Key** in the grid (see [Matching Using Name and Att Key](#)), the string is given a **Boundaries** value as defined in the parameters of the matching line.

Name and Att Key

Name is at Text grid. The **string name** is matched against **Name**.
Att Key is an Attribute Data grid cell. The **string attributes** are matched against the attribute details in **Att Key**.
For further information on what is allowed in **Name** and **Att Key**, and how to access **Att Key**, see [Name and Att Key](#).

Boundaries

exclude, include

If **exclude**, then any triangles inside the string are set to null.
If **include**, then any triangles inside the string are reset so that they aren't null.
This field can not be blank.
This field can not be blank.

Note: **Boundaries** can have attribute substitution from segment attributes. See [Map File Substitution by Attributes](#).

Comment

comment to be used in this line of the map file.

To assist is debugging a **Map File**, match logging can be turned on. See [Map File Logging](#).

Go to the next section [Visualization](#) or return to [Create/Edit a Map File](#).

Visualization

Note that when any Visualization mapping is applied, it is additive. This means that these mappings are added to any existing visualization element of the super string. This allows for a number of extrusions or billboards to be applied on a mapping. It does have the unexpected result that if you run Map File **Apply** more than once, multiple instances of Visualization mappings can end up on a same string. For more information on extrusions, see [Extrusions](#).

For Visualisation >Library Extrude, go to

String Extrude

Interval Extrude

Group Extrude

Library Billboard 2d

Library Billboard 3d

Library Billboard Plan

Forest

[Visualisation >Library Extrude](#)

[Visualisation >String Extrude](#)

[Visualisation >Interval Extrude](#)

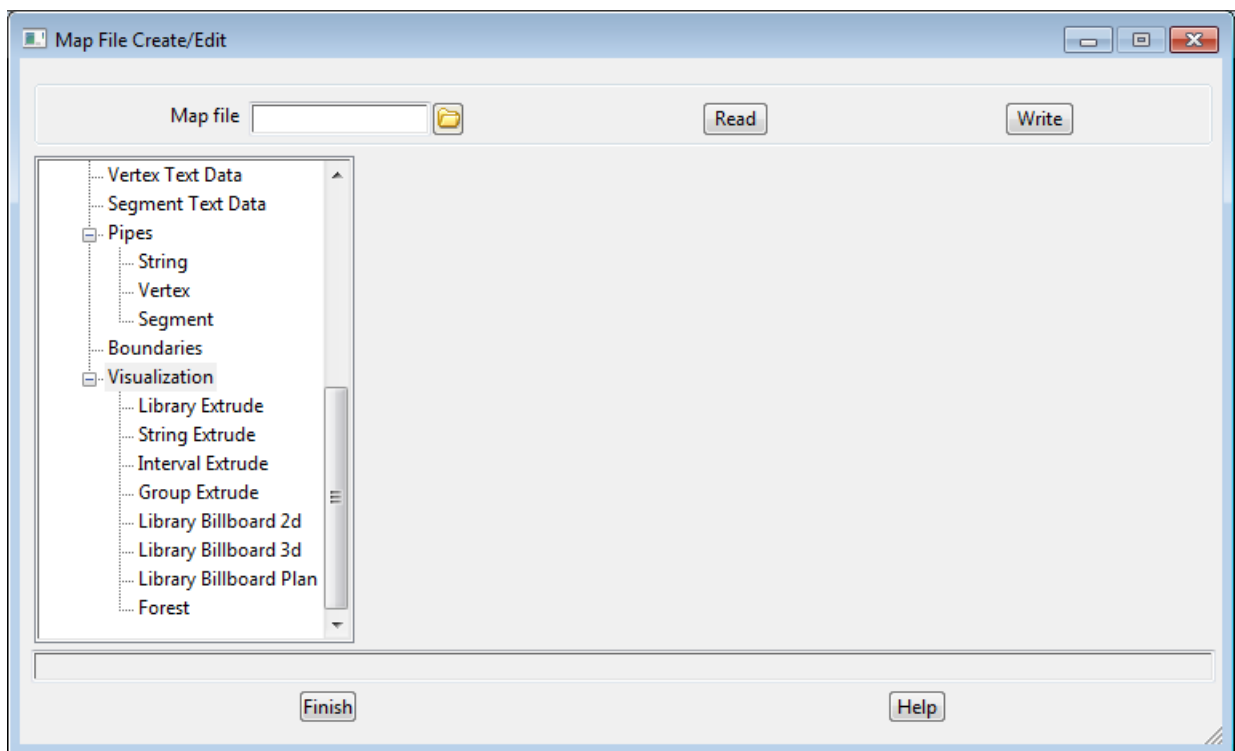
[Visualisation >Group Extrude](#)

[Visualisation >Library Billboard 2d](#)

[Visualisation >Library Billboard 3d](#)

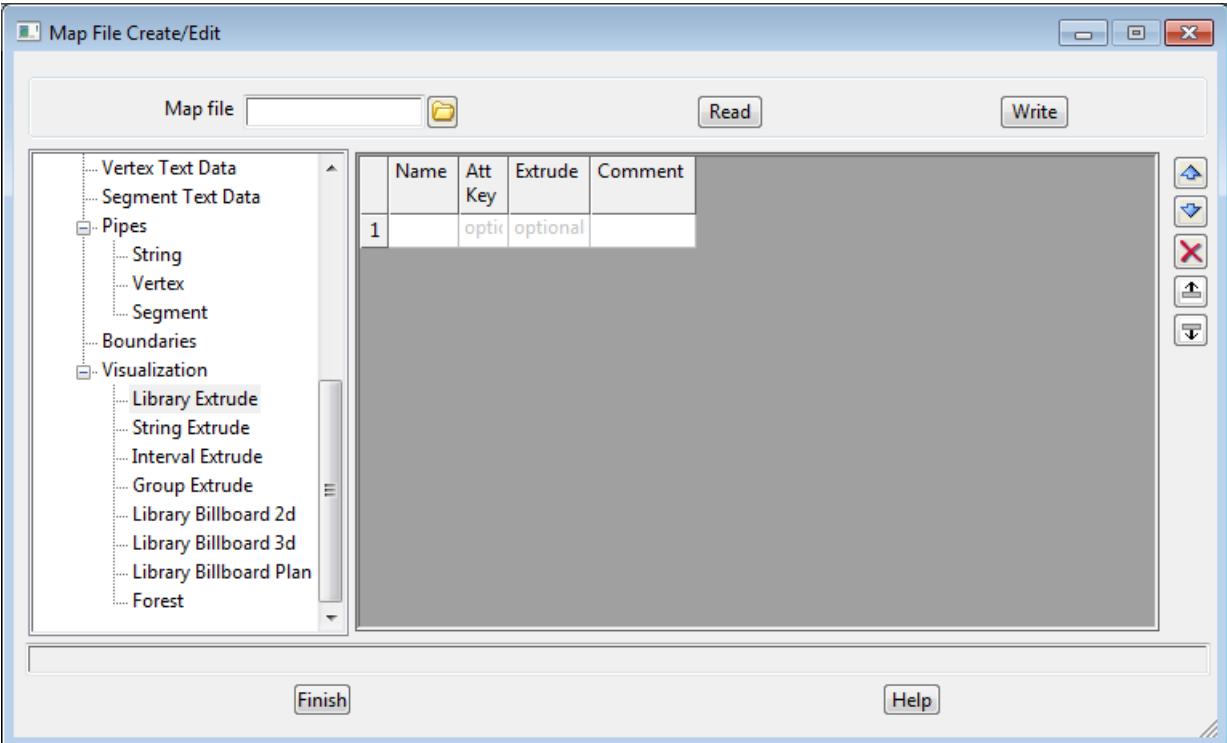
[Visualisation >Library Billboard Plan](#)

[Visualisation >Forest](#)



Visualisation >Library Extrude

Library Extrude applies an extrude from the 12d library to selected super strings. Note that extrudes can only be applied to super strings.



Processing Using Name and Att Key

when a string finds a first match with **Name** and **Att Key** in the grid (see [Matching Using Name and Att Key](#)), the string is given the Library Extrude as defined in the parameter of the matching line.

Name and Att Key

Name is at Text grid. The *string name* is matched against **Name**.
Att Key is an Attribute Data grid cell. The *string attributes* are matched against the attribute details in **Att Key**.

For further information on what is allowed in **Name** and **Att Key**, and how to access **Att Key**, see [Name and Att Key](#).

Extrude

select extrudes menu

the library extrude to apply to the super string. This extrude can any extrude type, and is applied to the entire length of the string.

Note: **Extrude** can have attribute substitution from string attributes. See [Map File Substitution by Attributes](#).

Comment

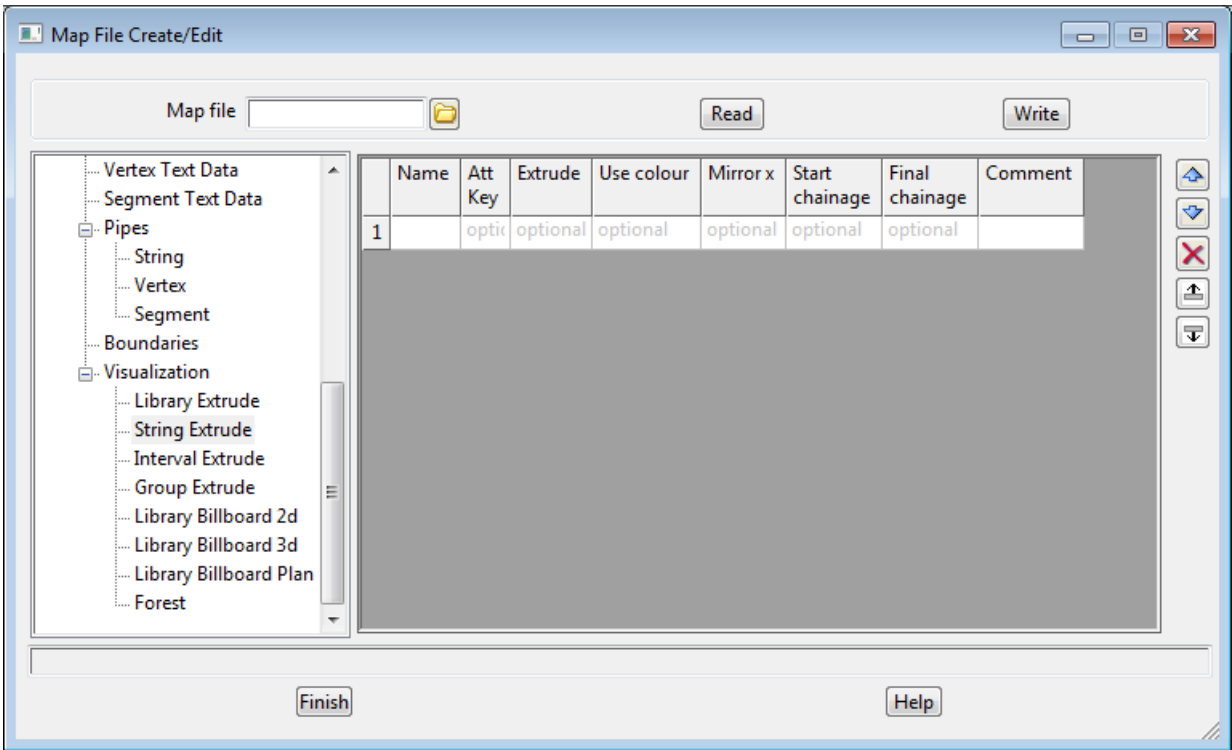
comment to be to be used in this line of the map file.

To assist is debugging a **Map File**, match logging can be turned on. See [Map File Logging](#).

Go to the next section [Visualisation >String Extrude](#) or return to [Visualization](#) or [Create/Edit a Map File](#).

Visualisation >String Extrude

String Extrude applies an extrude to selected super strings. Note that extrudes can only be applied to super strings or super alignments.



Processing Using Name and Att Key

when a string finds a first match with **Name** and **Att Key** in the grid (see [Matching Using Name and Att Key](#)), the string is given the extrude as defined in the parameter of the matching line.

Name and Att Key

Name is at Text grid. The *string name* is matched against **Name**.

Att Key is an Attribute Data grid cell. The *string attributes* are matched against the attribute details in **Att Key**.

For further information on what is allowed in **Name** and **Att Key**, and how to access **Att Key**, see [Name and Att Key](#).

Note: all the fields on the line after **Att Key** can have attribute substitution from string attributes. See [Map File Substitution by Attributes](#).

Extrude

the library extrude to be applied. This extrude must be of the type *string extrude*.

If *blank*, no extrusion is applied.

Use Colour

if *yes*, the colours in the extrusion are used.

If *no* or *blank*, the colour of the super string is used.

Mirror X

if *yes*, the x values of the extrusion are mirrored. This allows for one extrusion definition to be used in both a left and right context.

If *no* or *blank*, not mirroring occurs.

Start Chainage

*if **not blank**, the extrusion starts at this chainage.*

*If **blank**, the extrusion starts at the beginning of the string.*

Final Chainage

*if **not blank**, the extrusion ends at this chainage.*

*If **blank**, the extrusion end at the end of the string.*

Comment

comment to be to be used in this line of the map file.

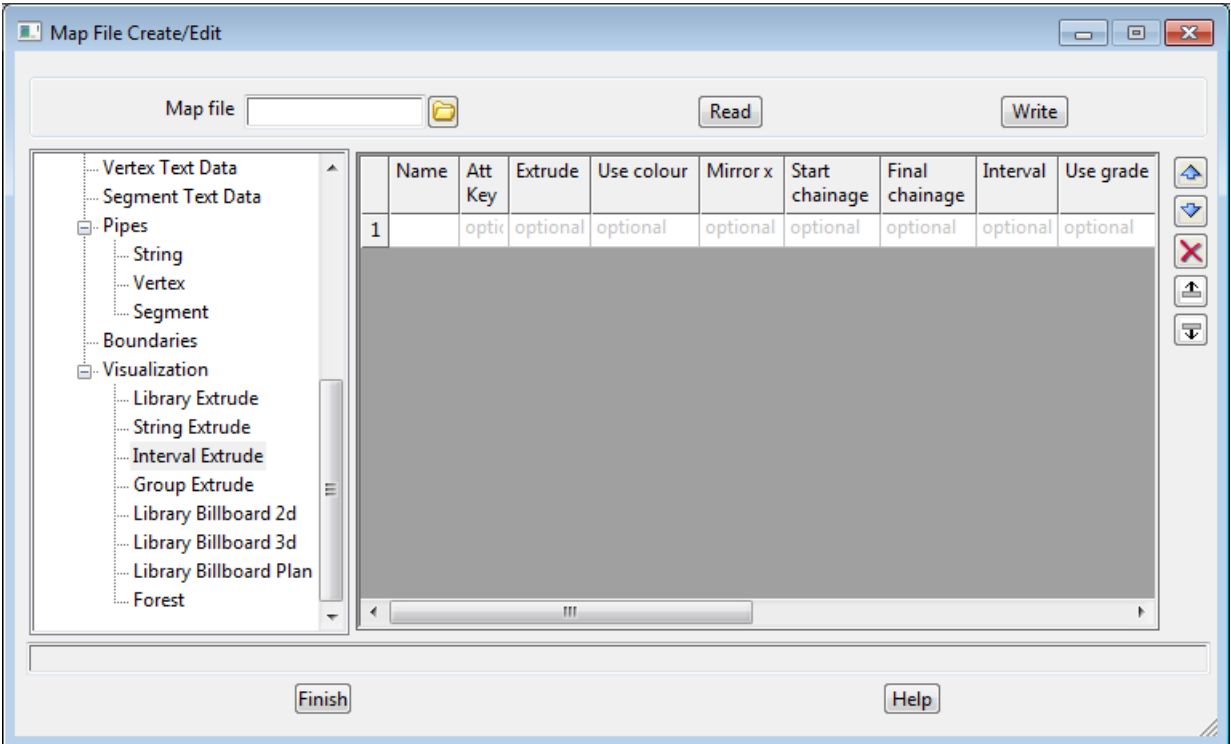
To assist is debugging a **Map File**, match logging can be turned on. See [Map File Logging](#).

Go to the next section [Visualisation >Interval Extrude](#) or return to [Visualization](#) or [Create/Edit a Map File](#).

Visualisation >Interval Extrude

Interval Extrude applies an extrude to selected super strings. Note that extrudes can only be applied to super strings and super alignments. A typical use of interval extrudes is placing guide posts down the length of a string at a regular interval. The process here is that you reference an existing interval extrude, and can optionally apply one more components of a 3d transformation to it. For more information on transformations, see [3D Transformations](#).

Each **extrude** drawn at the interval will take the x,y,z, and direction from the string first, then any transformation is applied. So in the example of the post, if no transformation is applied, each post will be positioned on the string and oriented in the direction of the string.



Processing Using Name and Att Key

*when a string finds a first match with **Name** and **Att Key** in the grid (see [Matching Using Name and Att Key](#)), the string is given the interval extrude as defined in the parameters of the matching line.*

Name and Att Key

Name is at Text grid. The **string name** is matched against **Name**.
Att Key is an Attribute Data grid cell. The **string attributes** are matched against the attribute details in **Att Key**.

*For further information on what is allowed in **Name** and **Att Key**, and how to access **Att Key**, see [Name and Att Key](#).*

Note: all the fields on the line after **Att Key** can have attribute substitution from string attributes. See [Map File Substitution by Attributes](#).

Extrude

*the library extrude to be applied. This extrude must be of the type **interval extrude**.
If **blank**, no extrusion is applied.*

Use Colour

*if **yes**, the colours in the extrusion are used.*

*If **no** or **blank**, the colour of the super string is used.*

Mirror X

*if **yes**, the x values of the extrusion are mirrored. This allows for one extrusion definition to be used in both a left and right context.*

*If **no** or **blank**, not mirroring occurs.*

Start Chainage

*if **not blank**, the extrusion starts at this chainage.*

*If **blank**, the extrusion starts at the beginning of the string.*

Final Chainage

*if **not blank**, the extrusion ends at this chainage.*

*If **blank**, the extrusion end at the end of the string.*

Interval

the spacing between instances of the extrude along the string.

Use grade

*if **no** or **blank**, the interval extrude is drawn upright.*

*If **yes**, the interval extrude is on the same angle as the segment of the string it is on.*

X/Y/Z rotation

the relative rotation about the x/y/z-axis.

*If **blank**, no rotation is applied.*

X/Y/Z factor

the factor applied to x/y/z coordinates of the extrusion.

*If **blank**, no factor is applied.*

X/Y/Z offset

the offset applied to the x/y/z coordinate of each interval point on the string.

*If **blank**, no offset is applied.*

Comment

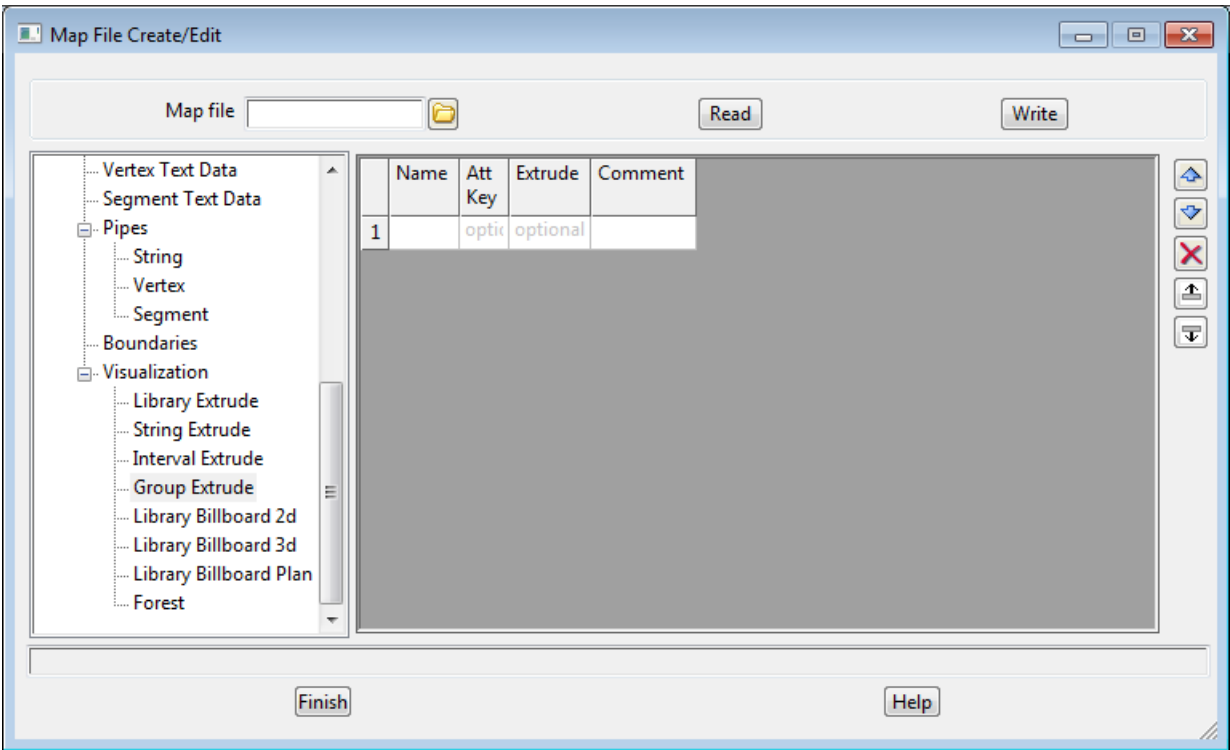
comment to be to be used in this line of the map file.

To assist in debugging a **Map File**, match logging can be turned on. See [Map File Logging](#).

Go to the next section [Visualisation >Group Extrude](#) or return to [Visualization](#) or [Create/Edit a Map File](#).

Visualisation >Group Extrude

Group Extrude applies a group extrude to selected super strings. Note that extrudes can only be applied to super strings, or super alignments.



Processing Using Name and Att Key

when a string finds a first match with **Name** and **Att Key** in the grid (see [Matching Using Name and Att Key](#)), the string is given the group extrude as defined in the parameter of the matching line.

Name and Att Key

Name is at Text grid. The *string name* is matched against **Name**.
Att Key is an Attribute Data grid cell. The *string attributes* are matched against the attribute details in **Att Key**.

For further information on what is allowed in **Name** and **Att Key**, and how to access **Att Key**, see [Name and Att Key](#).

Extrude

the library extrude to be applied. This extrude must be of the type **group extrude**.
If **blank**, no extrusion is applied.

Note: **Extrude** can have attribute substitution from string attributes. See [Map File Substitution by Attributes](#).

Comment

comment to be to be used in this line of the map file.

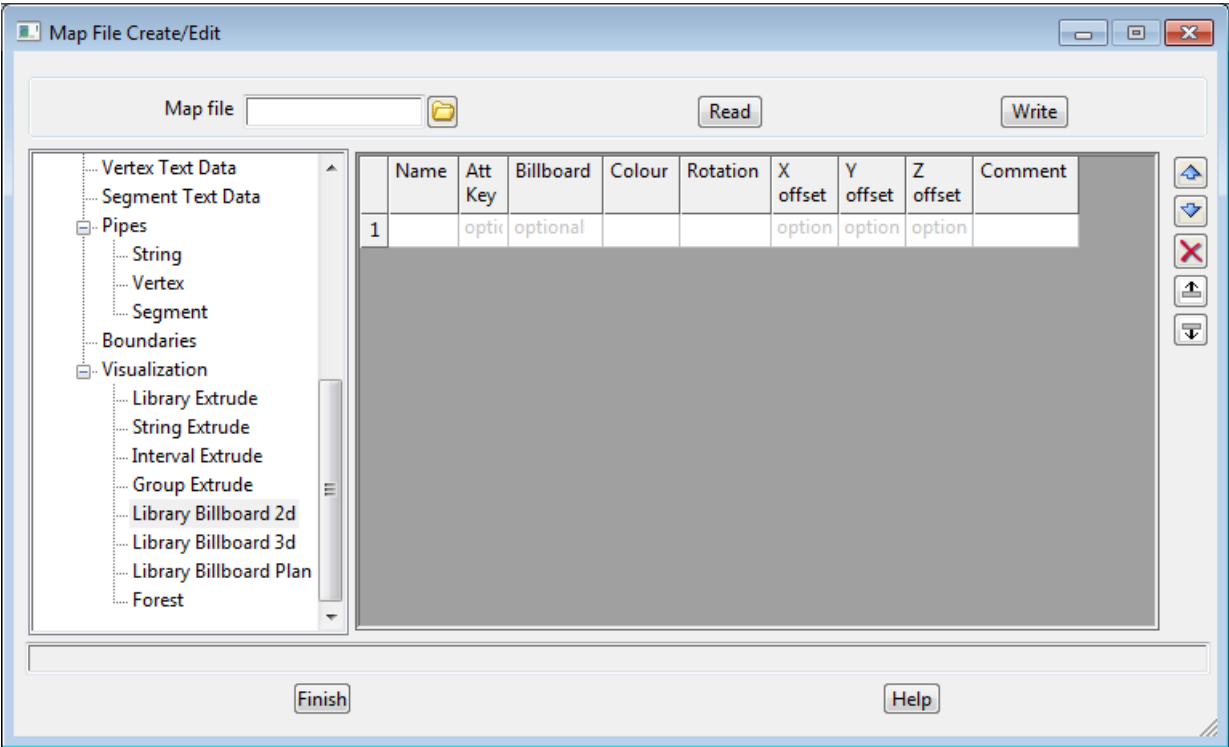
To assist is debugging a **Map File**, match logging can be turned on. See [Map File Logging](#).

Go to the next section [Visualisation >Library Billboard 2d](#) or return to [Visualization](#) or [Create/Edit a Map File](#).

Visualisation >Library Billboard 2d

This section of documentation is a work in progress and will be updated in subsequent releases.

The process here is that you reference a library billboard, and can optionally apply one more components of a 3d transformation to it. For more information on transformations, see [3D Transformations](#). For more information on library billboards, see [Billboards](#).



Processing Using Name and Att Key

when a string finds a first match with **Name** and **Att Key** in the grid (see [Matching Using Name and Att Key](#)), the string is given the a library 2d billboard as defined in the parameter of the matching line.

Name and Att Key

Name is at Text grid. The *string name* is matched against **Name**.
Att Key is an Attribute Data grid cell. The *string attributes* are matched against the attribute details in **Att Key**.
 For further information on what is allowed in **Name** and **Att Key**, and how to access **Att Key**, see [Name and Att Key](#).

Note: all the fields on the line after **Att Key** can have attribute substitution from string attributes. See [Map File Substitution by Attributes](#).

Billboard

Colour

Rotation

X/Y/Z offset

Comment

comment to be to be used in this line of the map file.

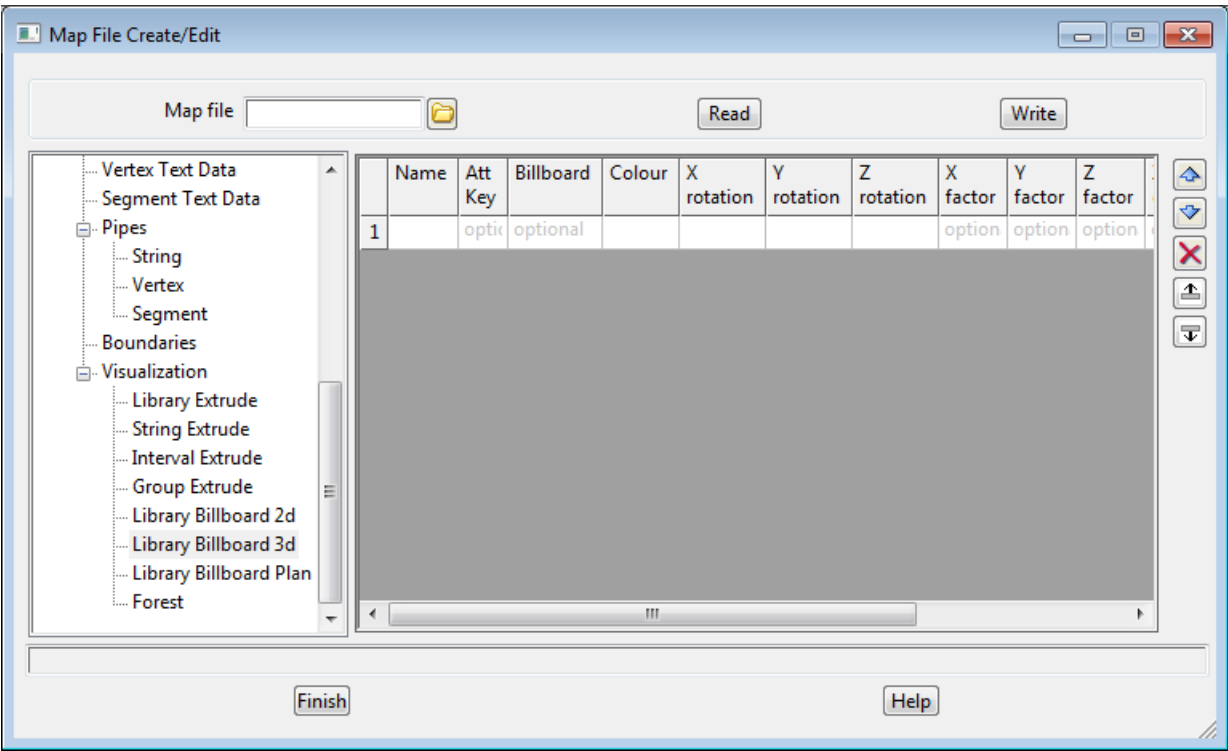
To assist in debugging a **Map File**, match logging can be turned on. See [Map File Logging](#).

Go to the next section [Visualisation >Library Billboard 3d](#) or return to [Visualization](#) or [Create/Edit a Map File](#).

Visualisation >Library Billboard 3d

This section of documentation is a work in progress and will be updated in subsequent releases.

The process here is that you reference a library billboard, and can optionally apply one more components of a 3d transformation to it. For more information on transformations, see [3D Transformations](#). For more information on library billboards, see [Billboards](#).



Processing Using Name and Att Key

when a string finds a first match with **Name** and **Att Key** in the grid (see [Matching Using Name and Att Key](#)), the string is given the a library 3d billboard as defined in the parameter of the matching line.

Name and Att Key

Name is at Text grid. The *string name* is matched against **Name**.
Att Key is an Attribute Data grid cell. The *string attributes* are matched against the attribute details in **Att Key**.

For further information on what is allowed in **Name** and **Att Key**, and how to access **Att Key**, see [Name and Att Key](#).

Note: all the fields on the line after **Att Key** can have attribute substitution from string attributes. See [Map File Substitution by Attributes](#).

Billboard

Colour

X/Y/Z rotation

X/Y/Z factor

X/Y/Z offset

Comment

comment to be to be used in this line of the map file.

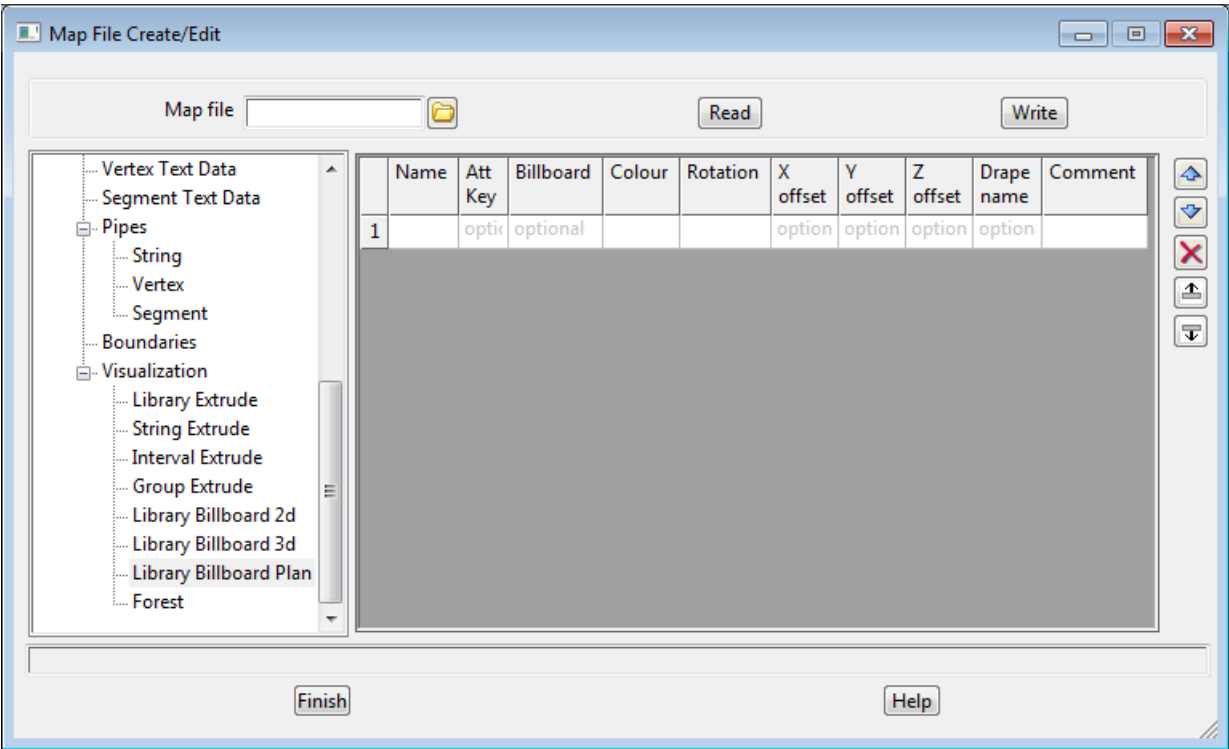
To assist is debugging a **Map File**, match logging can be turned on. See [Map File Logging](#).

Go to the next section [Visualisation >Library Billboard Plan](#) or return to [Visualization](#) or [Create/Edit a Map File](#).

Visualisation >Library Billboard Plan

This section of documentation is a work in progress and will be updated in subsequent releases.

The process here is that you reference a library billboard, and can optionally apply one more components of a 3d transformation to it. For more information on transformations, see [3D Transformations](#). For more information on library billboards, see [Billboards](#).



Processing Using Name and Att Key

when a string finds a first match with **Name** and **Att Key** in the grid (see [Matching Using Name and Att Key](#)), the string is given the a library plan billboard as defined in the parameter of the matching line.

Name and Att Key

Name is at Text grid. The *string name* is matched against **Name**.
Att Key is an Attribute Data grid cell. The *string attributes* are matched against the attribute details in **Att Key**.
For further information on what is allowed in **Name** and **Att Key**, and how to access **Att Key**, see [Name and Att Key](#).

Note: all the fields on the line after **Att Key** can have attribute substitution from string attributes. See [Map File Substitution by Attributes](#).

Billboard

Colour

Rotation

X/Y/Z offset

Drape name

Comment

comment to be to be used in this line of the map file.

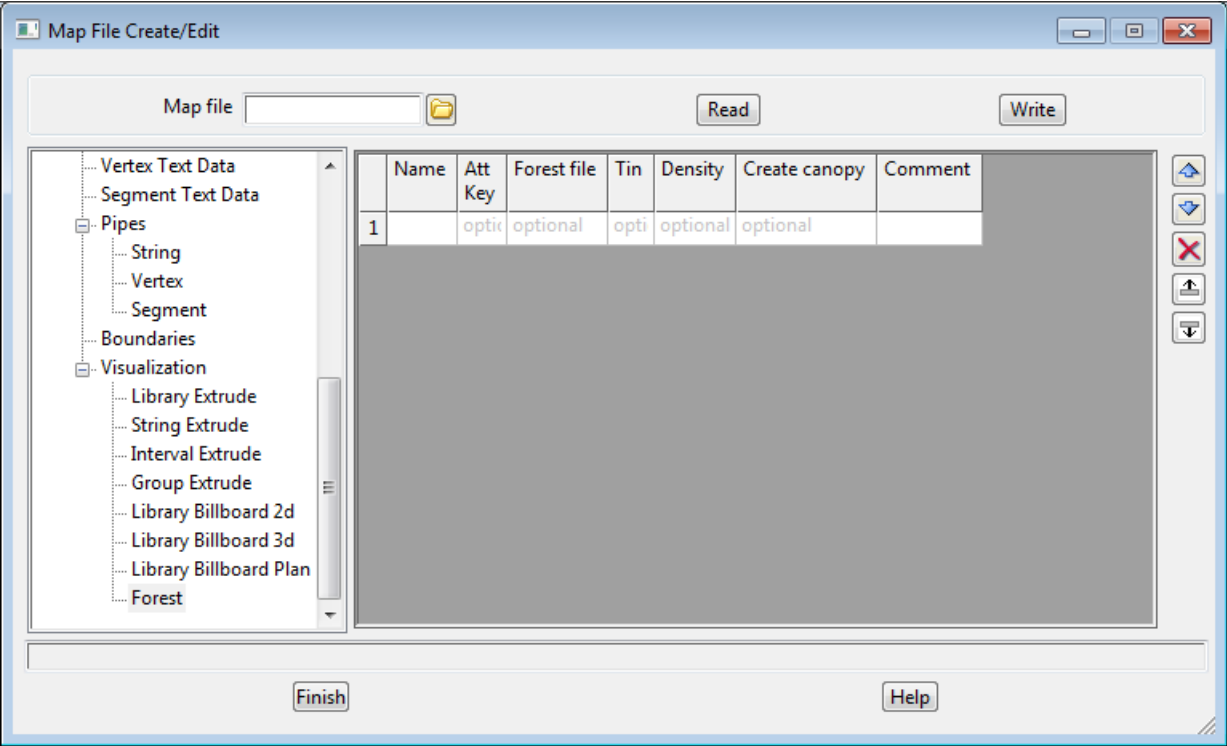
To assist is debugging a **Map File**, match logging can be turned on. See [Map File Logging](#).

Go to the next section [Visualisation >Forest](#) or return to [Visualization](#) or [Create/Edit a Map File](#).

Visualisation >Forest

Forest applies a Forest file to selected strings. If a string is open then its is taken as closed by joining the first and last points before applying the Forest file.

This section of documentation is a work in progress and will be updated in subsequent releases.



Processing Using Name and Att Key

when a string finds a first match with **Name** and **Att Key** in the grid (see [Matching Using Name and Att Key](#)), a forest file is applied to the string as specified by the parameter of the matching line.

Name and Att Key

Name is at Text grid. The *string name* is matched against **Name**.
Att Key is an Attribute Data grid cell. The *string attributes* are matched against the attribute details in **Att Key**.
For further information on what is allowed in **Name** and **Att Key**, and how to access **Att Key**, see [Name and Att Key](#).

Note: all the fields on the line after **Att Key** can have attribute substitution from string attributes. See [Map File Substitution by Attributes](#).

Forest file

the name of the Forest file to use for the string.

Tin

the tin to put the base on the trees on

Density

the number of tries per hectare

Create canopy

Comment

comment to be to be used in this line of the map file.

To assist is debugging a **Map File**, match logging can be turned on. See [Map File Logging](#).

Go to the next section [Map File Substitution by Attributes](#) or return to [Visualization](#) or [Create/Edit a Map File](#).

Map File Substitution by Attributes

Once there has been a first match for an element with the **Name and Att key (or Vertex Att key or Segment Att key)** of a line in the grid, the remaining fields in the rest of the grid line are applied to the element.

To increase the usefulness of the remaining fields in the line, it is possible to use the **value of an attribute** from the element, rather than just the static value in the field.

To use the value of an attribute in the grid field, simply **specify the attribute pathname prefixed by the \$ sign**.

For example, if it was the **Tinable** section of the Map File (see [Tinable](#)), and the tinability of the string is to be given by a string attribute called **12d Field/My Tinability**, type

```
$12d Field/My Tinability
```

into the **Tinable** cell of the grid.

So **\$** denotes the start of the attribute substitution.

The **value of the attribute** must be a **valid** answer (in the case of the Tinable cell, it must be **no**, **yes**, or **point**). If the value of the attribute is **not** a valid answer, a logline in the output window will be generated to identify the element in error and the line in the mapfile.

Note that the **\$** character must be the first character in the field, and that the rest of the field is taken as the attribute pathname so quotes should not be used even if there are spaces in the attribute pathname. Hence only one attribute can be used in the substitution process for a grid cell.

Remember that attribute names are case sensitive and in the case where more than one attribute of the same name exists, the first attribute found will be used.

Note - Attribute substitution is valid in the **Textstyle Data** and **Symbol Information** panels on a grid line.

Vertex

Vertex 2

Tinable

Vertex Text Data

Segment Text Data

Pipes

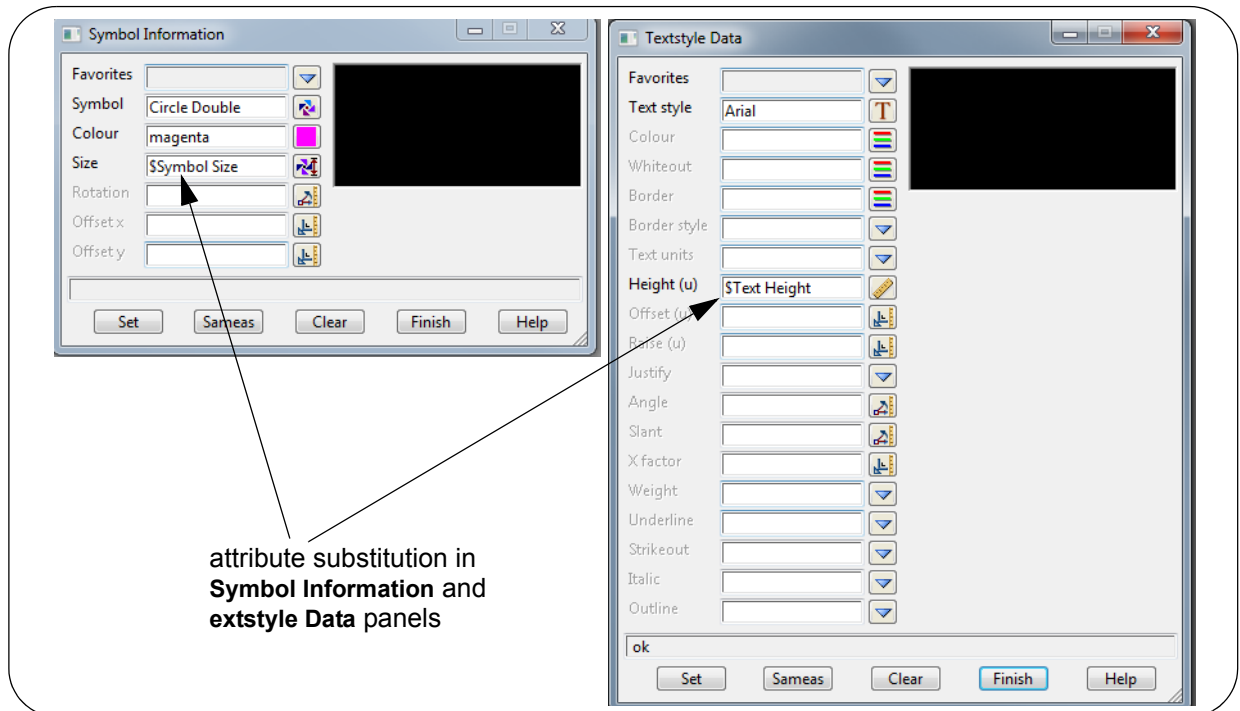
String

Vertex

	Name	Att Key	Justify	Shape	Size 1	Size 2	Comment
1	*	1 attribute	Invert	diameter	\$Diameter	optional	
2	*	attributes {		vert	\$Width	\$Height	
3		text "Shape" "Rectangular"		ional	optional	optional	

select strings with a **string text** attribute named **Shape** and with the value "Rectangle"

use the value of the **string** attribute named **Width** as the value in **Size 1** to use for the string



An Important Restriction

There is currently no way of distinguishing between string, vertex or segment attributes in the grid cells.

So if you are in a section of the Map File that has:

- only an **Att Key**, then **only string attributes** can be used for substitution in the grid cells in that section. For example [Tunable](#).
- an **Att Key** and a **Vertex Att Key** then **only vertex attributes** can be used for substitution in the grid cells in that section. For example [Symbols >Vertex](#).
- an **Att Key** and a **Segment Att Key** then **only segment attributes** can be used for substitution in the grid cells in that section. For example [Pipes >Segment](#).

Go to the next section [Map File Logging](#) or return to [Visualization](#) or [Create/Edit a Map File](#).

Map File Logging

To help determine what is going on, or not going on, when using a Map File, **Logging** can be turned on.

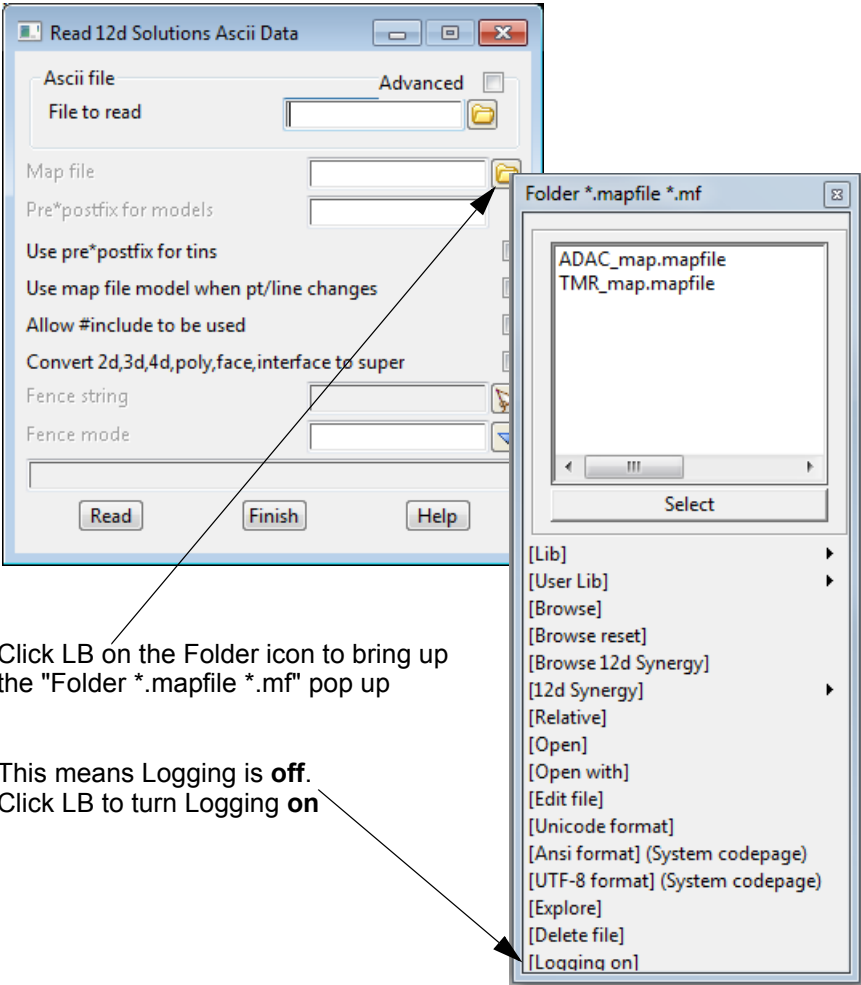
When turned on, as a Map File processes the data and a match occurs, an entry is written to the **Output Window** giving in what section of the Map File section the match occurred, the line number of that section of the grid that the match occurred (written as item number), and by clicking onto the created log line, the mapped object will be highlighted.

To turn **Map File Logging** on or off, click LB or RB on the folder icon at the end of the **Map File** panel field to bring up the **Folder *.mapfile *.mf** pop up.

If **[Logging off]** is displayed then Logging is now turned **on** and clicking LB on [Logging off] will turn Logging off.

If **[Logging on]** is displayed then Logging is now turned **off** and clicking LB on [Logging on] will turn Logging on.

For example, when reading in a **12d Ascii** file, clicking LB on the **Map file** panel field brings up the **Folder *.mapfile *.mf** pop up.



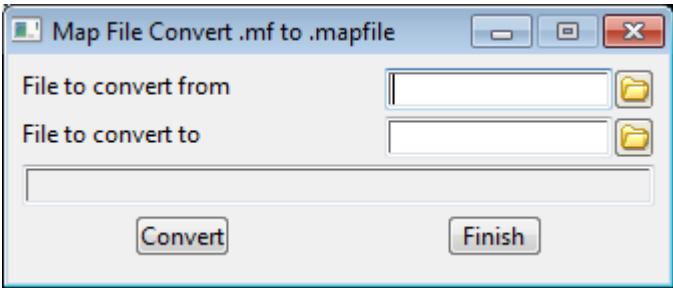
Note: Logging can generate a large number of log lines and this could affect the performance of 12d Model. So it is a good idea to save the project first, or run the logging in a temporary project.

Convert .mf Files to .mapfile

Position of option on menu: File I/O =>Map files =>Convert .mf to .mapfile

The **map file convert** option converts a map file in the pre-V9 format to the XML map file format introduced in **12d Model 9**.

Selecting **Convert .mf to .mapfile** displays the **Map File Convert .mf to .mapfile** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
File to convert from <i>name of the pre-V9 map file to be converted to the new map file format</i>	file box		*.mf
File to convert to <i>name of the new converted map file</i>	file box		*.mapfile
Convert <i>convert a file in the pre-V9 map file format to the new map file format.</i>	button		

Create/Edit .mf File

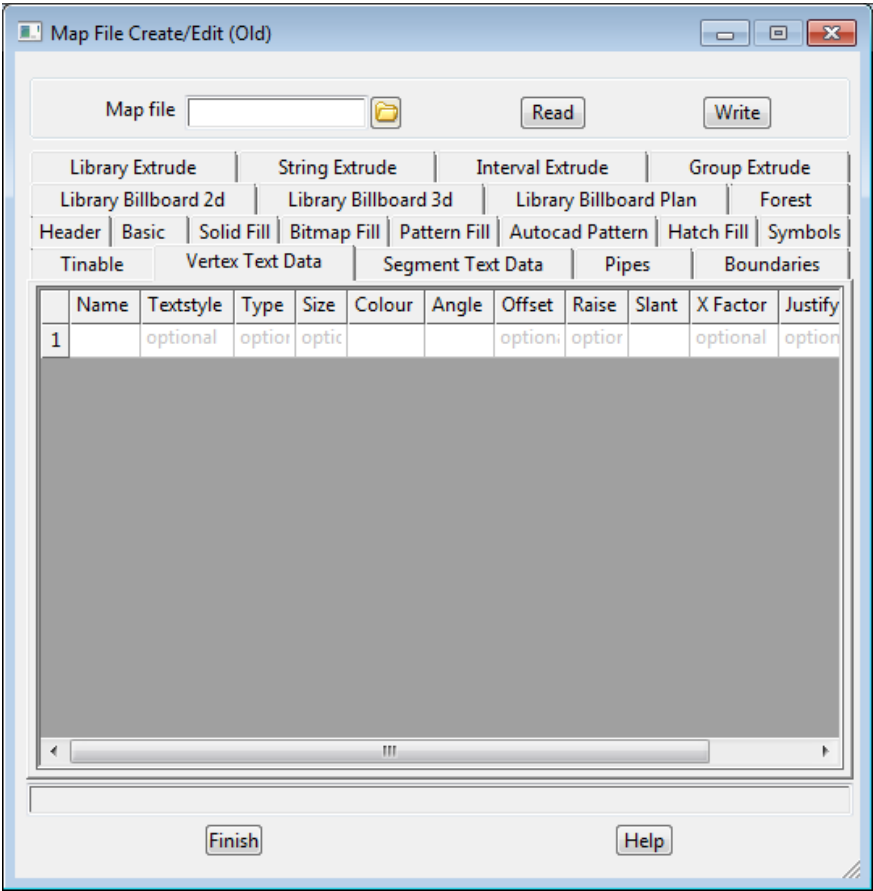
Position of option on menu: File I/O =>Map files =>Create/edit .mf

The Create/edit .mf option **creates** and/or **edit** the 12d Map Files in the pre-V9 format.

This old format is now superseded so the user should use [Convert .mf Files to .mapfile](#) to convert old .mf files to the .mapfile format, or the option [Create/Edit a Map File](#) does this conversion when you select a .mf file. This editor is only supplied for a while and will be removed in a future version.

Vertex Text Data

The **Vertex Text Data** tab sets parameters for drawing text on the vertices of super strings.



Key

select name menu

key to match the string name against in the Vertex Text Data tab. The key can include wild cards (*) and wild characters (?).

If a match occurs, then the rest of the grid fields for this line of this tab of the map file are used and no other tests for matches against keys further down in the table are made.

If a match does not occur, then a test for a match is made against the key on the next line of this tab of the map file.

Textstyle

select text style menu

the textstyle used for any vertex text for all strings matching the key.

This field can not be blank.

Type

screen, paper, world

*the textstyle type used for any vertex text for all strings matching the key.
This field can not be blank.*

Size measures menu

*the size of the vertex text to be used for each vertex of all strings matching the key.
This field can not be blank.*

Colour select colour menu

*the colour of the vertex text to be used for each vertex of all strings matching the key.
This field can not be blank.*

Angle measures menu

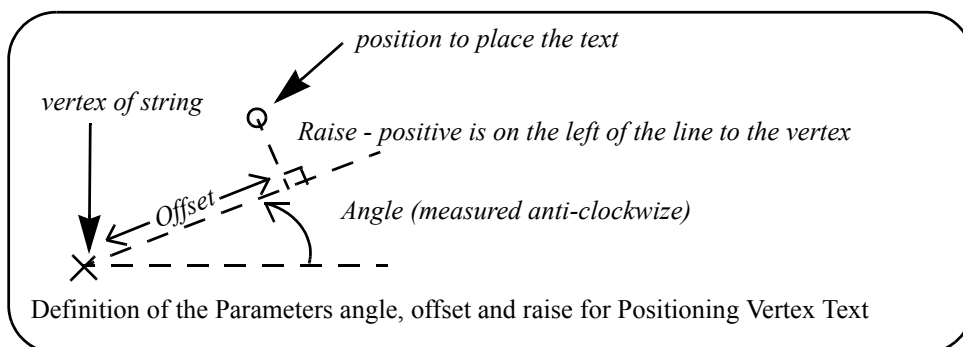
*the angle of the vertex text to be used for each vertex of all strings matching the key.
This field can not be blank.*

Offset measures menu

*the distance to offset the text from each vertex of the strings matching the key.
This field can not be blank.*

Raise measures menu

*the distance to perpendicularly raise the text for each vertex of all strings matching the key.
This field can not be blank.*



Slant Measures menu

*the slant for the vertex text of all strings matching the key.
This field can not be blank.*

X factor Measures menu

*the x-factor for the vertex text of all strings matching the key.
This field can not be blank.*

Justify Select Justification Choice menu

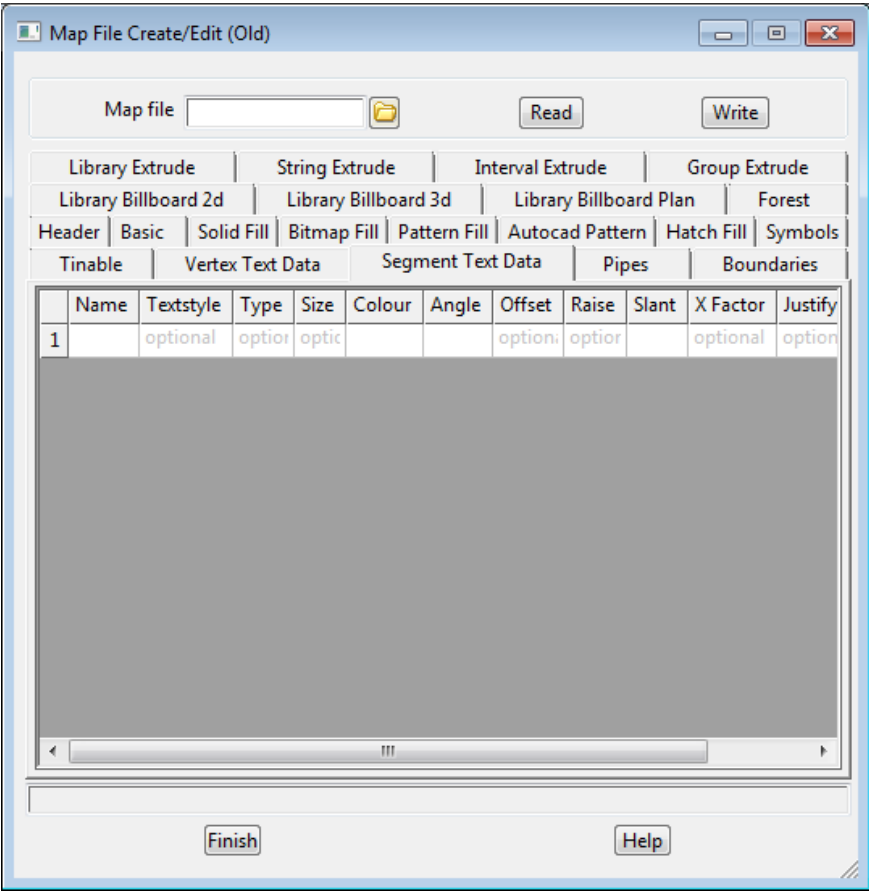
*the justification for the vertex text of all strings matching the key.
This field can not be blank.*

Comment

comment to be used in this line of the map file. A double slash // is written out to the ascii map file before the comment, and a comment in an ascii map file is read in and displayed without the double slash.

Segment Text Data

the Segment Text Data tab sets parameters for drawing text on the segments of super strings. The text is positioned about the mid point of the segment.



- Key

select name menu

key to match the string name against in the **Segment Text Data** tab. The key can include wild cards (*) and wild characters (?).

If a match occurs, then the rest of the grid fields for this line of this tab of the map file are used and no other tests for matches against keys further down in the table are made.

If a match does not occur, then a test for a match is made against the key on the next line of this tab of the map file.
- Textstyle

select text style menu

the textstyle used for any segment text for all strings matching the key.

This field can not be blank.
- Type

screen, paper, world

the textstyle type used for any segment text for all strings matching the key.

This field can not be blank.
- Size

measures menu

the size of the segment text to be used for each segment of all strings matching the key.

This field can not be blank.
- Colour

select colour menu

the colour of the segment text to be used for each segment of all strings matching the key.

This field can not be blank.
- Angle

measures menu

the angle of the segment text to be used for each segment of all strings matching the key.

This field can not be blank.

Offset

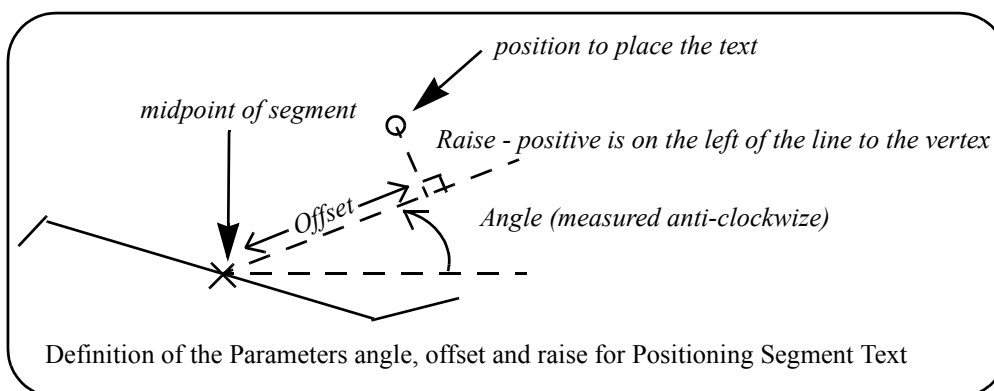
measures menu

*the distance to offset the text from each segment of the strings matching the key.
This field can not be blank.*

Raise

measures menu

*the distance to perpendicularly raise the text for each segment of all strings matching the key.
This field can not be blank.*

**Slant**

Measures menu

*the slant for the segment text of all strings matching the key.
This field can not be blank.*

X factor

Measures menu

*the x-factor for the segment text of all strings matching the key.
This field can not be blank.*

Justify

Select Justification Choice menu

*the justification for the segment text of all strings matching the key.
This field can not be blank.*

Comment

comment to be to be used in this line of the map file. A double slash // is written out to the ascii map file before the comment, and a comment in an ascii map file is read in and displayed without the double slash.

Label Map Files

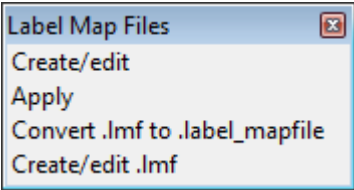
Position of menu: File I/O =>Label Map files

The option Create/edit creates and edits **Label Map** files which are then used in the Label Map File **Apply** option.

From **12d Model 10**, the Label Map file has an XML format (the file ends in .label_mapfile). Before **12d Model 10** there was a format with files ending in .lmf so there is an option to convert from the older format, .lmf, to the newer .label_mapfile format.

Note: if the **Create/edit** option is used on an old format file, it is automatically converted to the new format.

The Map files walk-right menu is



- create/edit a label mapfile
- apply a label map file to data
- convert pre-V10 label map file format to XML format label map files
- create/edit a pre-V10 label map file

For *Create/edit*, go to
Apply
Convert .lmf to .label_mapfile
Create/edit .lmf

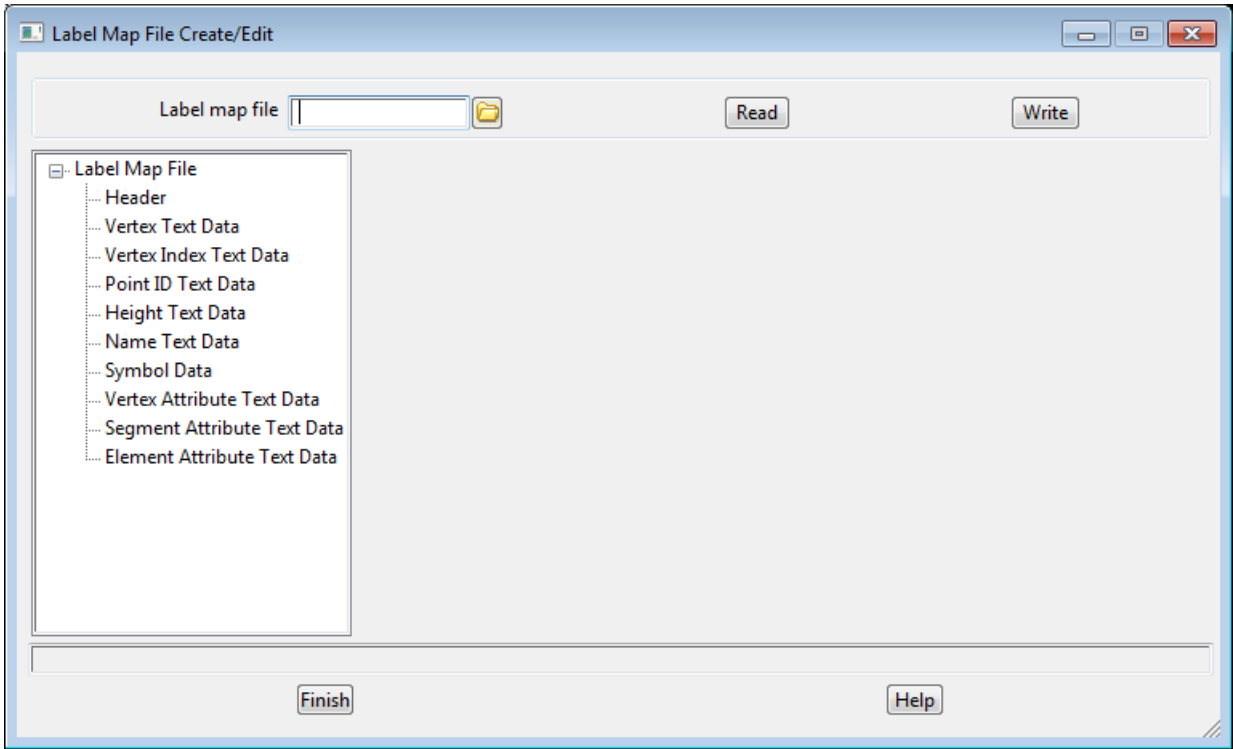
- [Create/Edit Label Map File](#)
- [Apply a Label Map File](#)
- [Convert .lmf Files to .label_mapfile](#)
- [Create/Edit Pre-V10 Label Map File](#)

Create/Edit Label Map File

Position of option on menu: File I/O =>Label Map files =>Create/edit

The **label map file** option **creates** or **edits** the label map files which is used in the **Apply Label Map File** option to create various labels at string vertices and segments.

Selecting Create/edit brings up the **Label Map File Create/Edit** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Label map file	input		*.label_mapfile and *.lmf
<i>name of the label map file to be created or edited.</i>			
<i>If it is a .lmf file, it is automatically converted to the new xml format and written out as a .label_mapfile file.</i>			

Bottom buttons

Read	button
<i>read in the label map file given in the Label map file field and load the data into the fields of the table. If the file doesn't exist, an error message is given.</i>	
Write	button
<i>write out the data in the table to the file name given in the Label map file field. If the file already exists, a Replace-Cancel panel checks to see if the existing file is to be over written - if no or cancel is selected, nothing is written out.</i>	

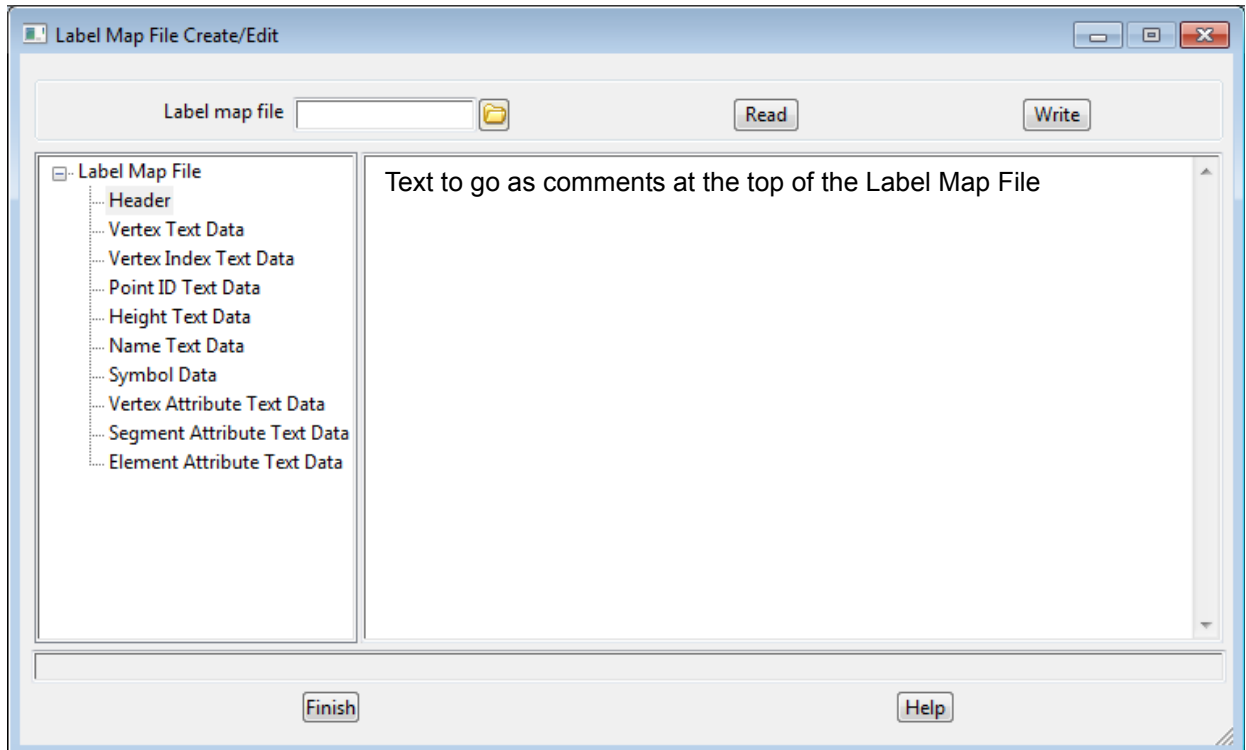
For more information on Header	Header
Vertex Text Data	Vertex Text Data
Vertex Index Text Data	Vertex Index Text Data
Point ID Text Data	Point Id Text Data
Height Text Data	Height Text Data
Name Text Data	Name Text Data

Symbols	Symbol Data
Vertex Attribute Text Data	Vertex Attribute Text Data
Segment Attribute Text Data	Segment Attribute Text Data
Element Attribute Text Data	Element Attribute Text Data

Header

Header just has lines of comment text. A common use is to document which client the file is to be used for, or the revision history.

The text written in the right hand side of the panel is written out as comments at the top of the Label Map file.



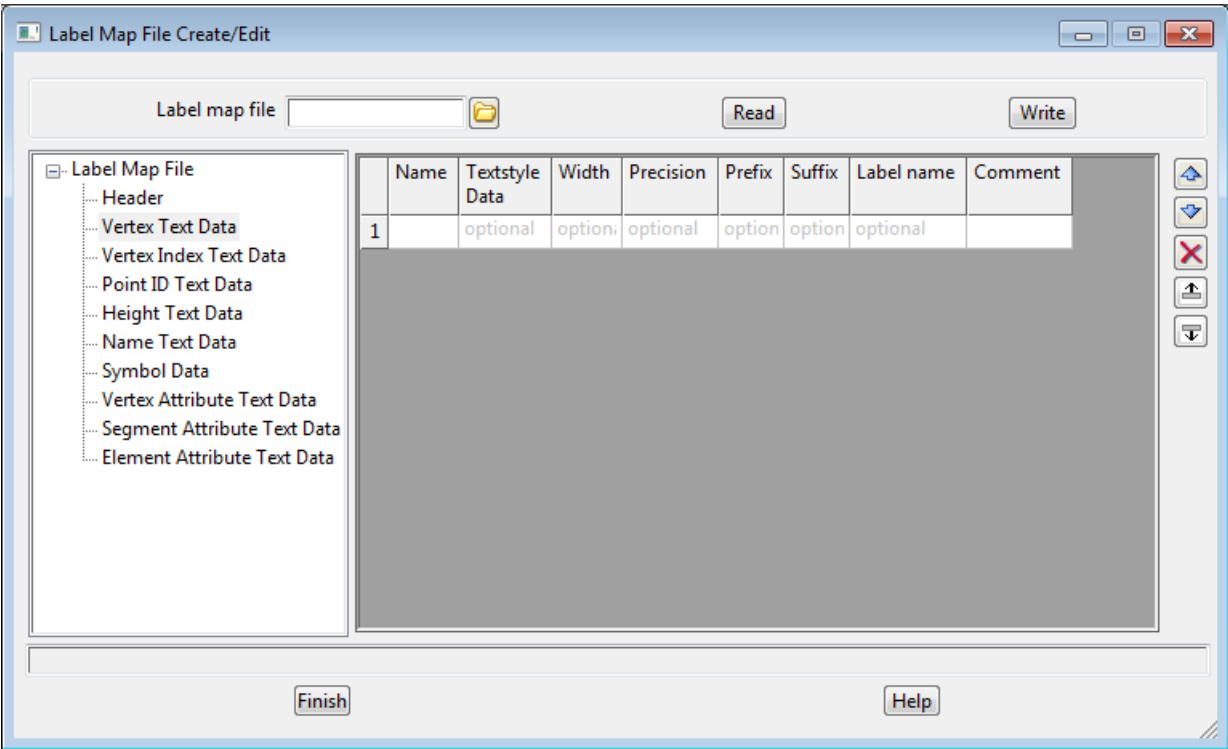
Go to the next section [Vertex Text Data](#) or return to [Create/Edit Label Map File](#).

Vertex Text Data

Super strings can have text at **each** vertex of the super string. **Vertex Text Data** creates labels from the vertex text at each vertex.

The **Vertex Text Data** grid specifies **which strings are selected** and how a label containing the **vertex text** for each vertex of the selected strings is created.

For each selected string, a new super string is created with vertices at the same position as the vertices of the selected string, and with the labels created as vertex text at the appropriate vertices of the new super string.



Name select name menu for fields

for the selected strings, labels are created from the vertex text at each vertex. See [Selecting Strings using Name](#):

For each selected string, a new super string is created with vertices at the same position as the vertices of the selected string, and with the labels created as vertex text at the appropriate vertices of the new super string.

Selecting Strings using Name:

The text in the **Name** column is the name of the strings to be selected. **Name** can include wild cards * and wild characters ? to allow matching of multiple strings.

For each string, the string name is compared to the text in the **Name** column for this line and if there is a match then the string is selected to label using the parameters in this line of the Label Map file.

If a match occurs for a line, then this line of the Label Map file grid is used and no other lines are tested against.

If no match occurs, then this line of the Label Map file grid is ignored and a test for a match is made against the next line of the grid.

Hence the order of the text in the **Names** column in the grid is important, especially when wild cards and wild characters are used.

Textstyle data select textstyle data menu for fields

textstyle data for labels. This controls the units, size, colour, border etc for the created text

Width

if non blank, the minimum number of number of characters that is allowed for the vertex text before applying the prefix and suffix.

*If the number of characters in the vertex text is less than **Width** characters, then additional spaces are added to the left of the vertex text so that there are **Width** characters.*

*If the number of characters in the vertex text is greater than **Width**, then **Width** is ignored. Hence the vertex text is not truncated.*

*For example if **Width** is set to 20 and the vertex text has only ten characters, then an extra 10 spaces are added to the left of the vertex text before applying the Prefix/Suffix.*

if blank, the vertex text is used with no space padding.

Precision

not applicable

Prefix/Suffix

prefix/suffix for the text

Label name

the created super strings are given this name

Comment

comment to be to be used in this line of the map file.

Go to the next section [Vertex Index Text Data](#) or return to [Create/Edit Label Map File](#).

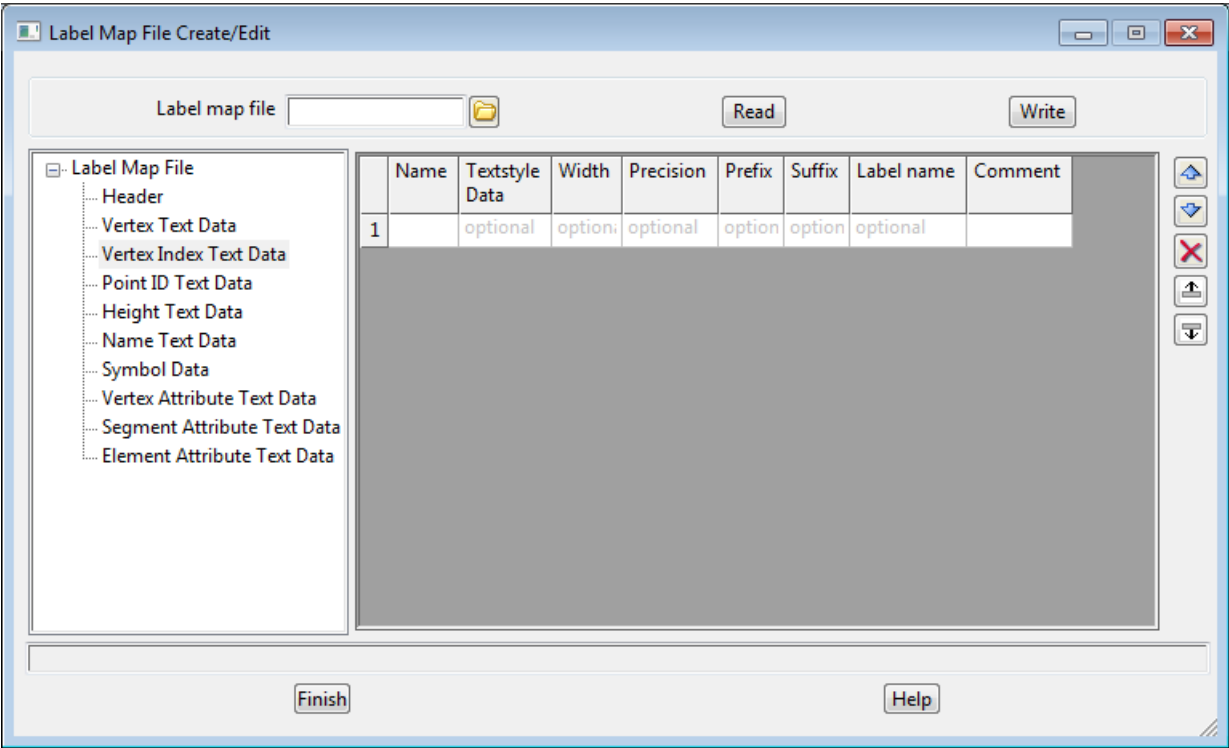
Vertex Index Text Data

Vertex Index Text Data labels the vertex index at each vertex.

The **Vertex Index Text Data** grid specifies *which strings are selected* and how a label containing the **vertex index** for each vertex of the selected strings is created.

For each selected string, a new super string is created with vertices at the same position as the vertices of the selected string, and with the labels created as vertex text at the appropriate vertices of the new super string.

Note: the vertex index is the position of the vertex in the string. For example if the vertex is the tenth vertex in the string, then the vertex index is 10.



Name select name menu for fields
for the selected strings, labels are created from the vertex index of each vertex. See [Selecting Strings using Name:](#)
For each selected string, a new super string is created with vertices at the same position as the vertices of the selected string, and with the labels created as vertex text at the appropriate vertices of the new super string.

Textstyle data select textstyle data menu for fields
textstyle data for labels. This controls the units, size, colour, border etc for the created text

Width
*if non blank, the minimum number of characters allowed for the vertex index (including **Precision**) before applying the prefix and suffix.*
*If the number of digits in the vertex index (including **Precision**) is less than **Width** characters, then additional spaces are added to the left of the text so that there are **Width** characters.*
*If the number of digits in the vertex index (including **Precision**) is greater than **Width**, then **Width** is ignored. Hence the vertex index value is not truncated.*
*As an example, if **Width** is set to 10 and the vertex index is 23 and **Precision** is 3, then the label is " 023". That is, an extra seven spaces is added to the left of the vertex index value.*

if blank, the vertex text is used with no modification.

Precision

*if the number of digits in the vertex index is less than the absolute value of **Precision**, then left 0 padding is used to bring the number of digits in the text up to the absolute value of **Precision**.*

*As an example, if **Width** is set to 10 and the vertex index is 23 and **Precision** is 3, then the label is "023". That is, an extra seven spaces is added to the left of the vertex index value.*

Prefix/Suffix

prefix/suffix for the text

Label name

the created super strings are given this name

Comment

comment to be to be used in this line of the map file.

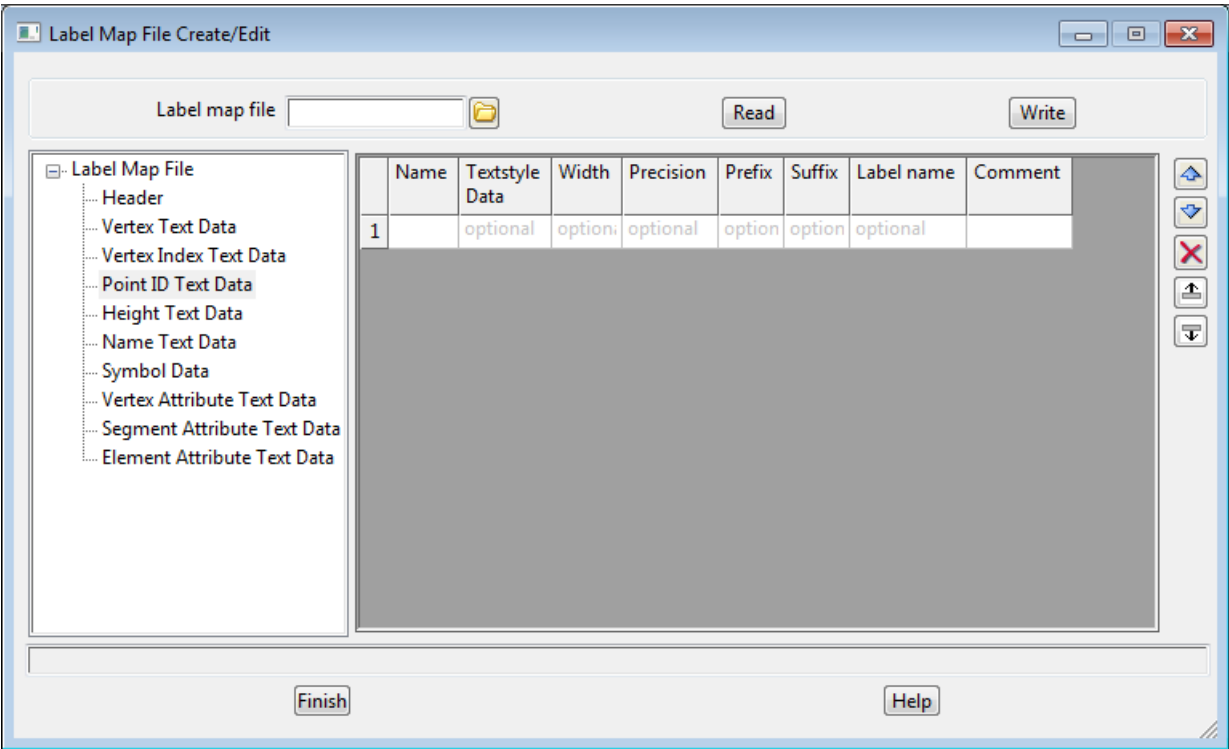
Go to the next section [Point Id Text Data](#) or return to [Create/Edit Label Map File](#).

Point Id Text Data

Super strings can have a **Point ID** at **each** vertex of the super string. **Point ID Text Data** labels the Point ID at each vertex.

The **Point ID Text Data** grid specifies **which strings are selected** and how a label containing the **Point ID**'s for each vertex of the selected strings is created.

For each selected string, a new super string is created with vertices at the same position as the vertices of the selected string, and with the labels created as vertex text at the appropriate vertices of the new super string.



Name select name menu for fields
for the selected strings, labels are created from the Point ID of each vertex. See [Selecting Strings using Name](#):

For each selected string, a new super string is created with vertices at the same position as the vertices of the selected string, and with the labels created as vertex text at the appropriate vertices of the new super string.

Textstyle data select textstyle data menu for fields
textstyle data for labels. This controls the units, size, colour, border etc for the created text

Width
if non blank, the minimum number of characters that is allowed for the Point ID text before applying the prefix and suffix.
*If the number of characters in the Point ID text is less than **Width** characters, then additional spaces are added to the left of the Point ID so that there are **Width** characters.*
*If the number of characters in the Point ID text is greater than **Width**, then **Width** is ignored. Hence the Point ID text is not truncated.*
*For example if **Width** is set to 20 and the Point ID text has only ten characters, then an extra 10 spaces are added to the left of the Point ID text before applying the Prefix/Suffix.*
if blank, the Point ID text is used with no space padding.

Precision

not applicable

Prefix/Suffix

prefix/suffix for the text

Label name

the created super strings are given this name

Comment

comment to be to be used in this line of the map file.

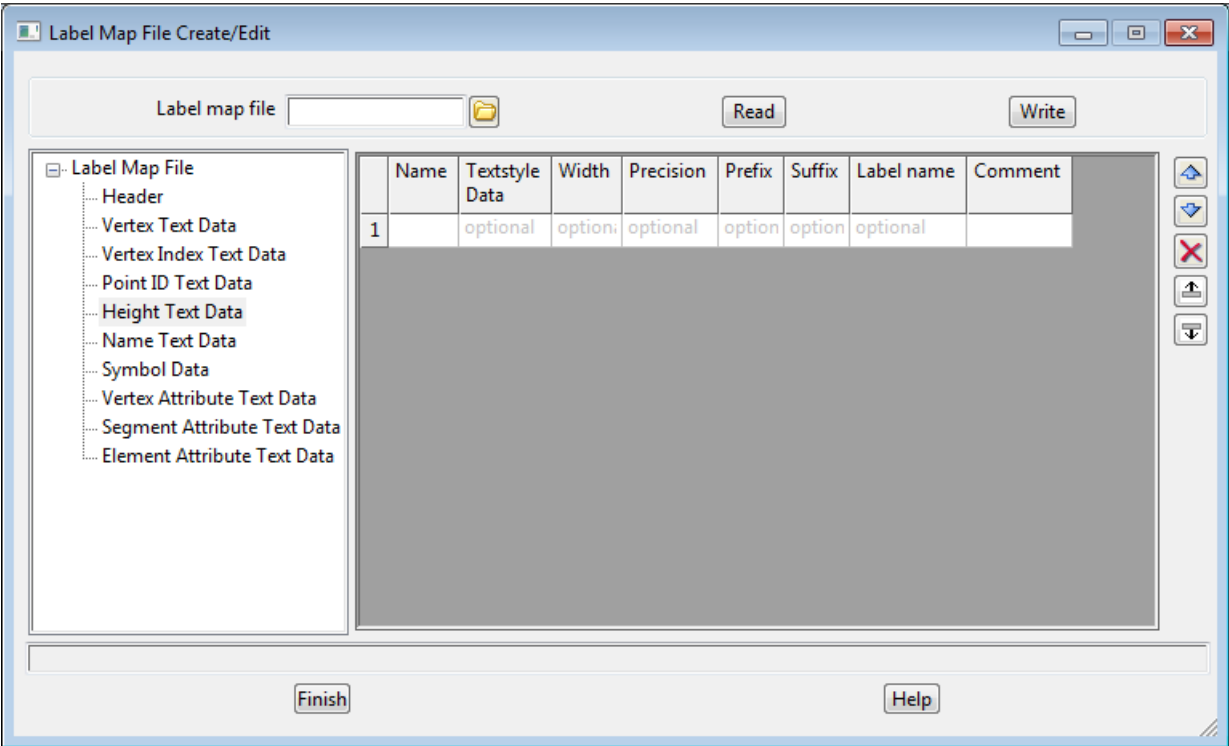
Go to the next section [Height Text Data](#) or return to [Create/Edit Label Map File](#).

Height Text Data

Height Text Data labels the height at each vertex.

The **Height Text Data** grid specifies **which strings are selected** and how a label containing the **height (z-value)** for each vertex of the selected strings is created.

For each selected string, a new super string is created with vertices at the same position as the vertices of the selected string, and with the labels created as vertex text at the appropriate vertices of the new super string.



Name select name menu for fields

for the selected strings, labels are created from the height (z-value) of each vertex. See [Selecting Strings using Name:](#)

For each selected string, a new super string is created with vertices at the same position as the vertices of the selected string, and with the labels created as vertex text at the appropriate vertices of the new super string.

Textstyle data select textstyle data menu for fields

textstyle data for labels. This controls the units, size, colour, border etc for the created text

Width

*if non blank, the minimum number of characters allowed for the z-value (including **Precision**) before applying the prefix and suffix.*

*If the number of digits in the z-value (including **Precision**) is less than **Width** characters, then additional spaces are added to the left of the text so that there are **Width** characters.*

*If the number of digits in the z-value (including **Precision**) is greater than **Width**, then **Width** is ignored. Hence the z-value is not truncated (other than by **Precision**).*

*As an example, if **Width** is set to 10 and the z-value is 23.2 and **Precision** is 3, then the label is " 23.200". That is, an extra four spaces is added to the left of the z-value.*

*if blank, the z-value with **Precision** is used with no further modification.*

Precision

if positive, the number of decimal places after the decimal point.

if negative, the absolute number is the number of decimal places to first calculate the text of the z-value for but then any trailing zeros after the decimal place are removed.

Important Note: *this use of positive and negative for not eliminating/eliminating trailing zeros after the decimal place is the opposite to plot parameters.*

Prefix/Suffix

prefix/suffix for the text

Label name

the created super strings are given this name

Comment

comment to be to be used in this line of the map file.

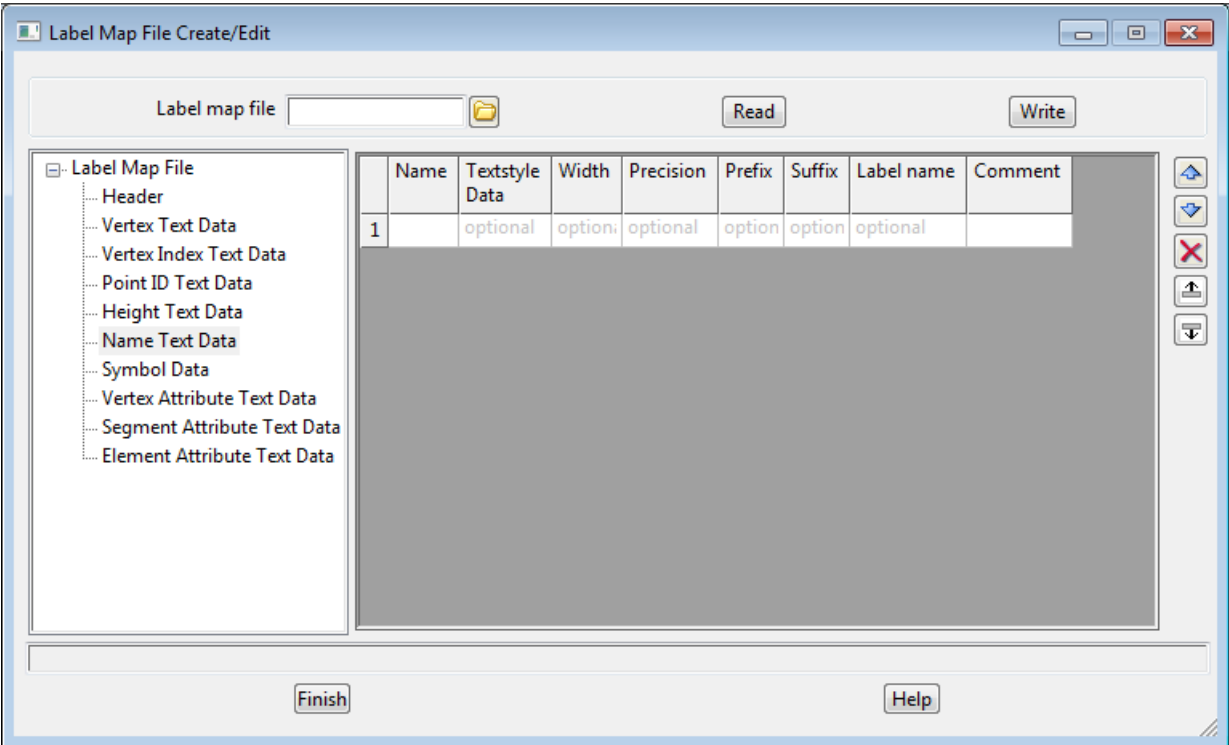
Go to the next section [Name Text Data](#) or return to [Create/Edit Label Map File](#).

Name Text Data

Name Text Data labels the string name at each vertex.

The **Name Text Data** grid specifies **which strings are selected** and how a label containing the **string name** (often referred to as string **Code** by Surveyors) for each vertex of the selected strings is created.

For each selected string, a new super string is created with vertices at the same position as the vertices of the selected string, and with the labels created as vertex text at the appropriate vertices of the new super string.



Name select name menu for fields
for the selected strings, labels are created from the string name. See [Selecting Strings using Name:](#) For each selected string, a new super string is created with vertices at the same position as the vertices of the selected string, and with the labels created as vertex text at the appropriate vertices of the new super string.

Textstyle data select textstyle data menu for fields
textstyle data for labels. This controls the units, size, colour, border etc for the created text

Width
if non blank, the minimum number of characters that is allowed for the string name text before applying the prefix and suffix.
*If the number of characters in the string name is less than **Width** characters, then additional spaces are added to the left of the string name text so that there are **Width** characters.*
*If the number of characters in the string name is greater than **Width**, then **Width** is ignored. Hence the string name is not truncated.*
*For example if **Width** is set to 20 and the string name has only ten characters, then an extra 10 spaces are added to the left of the string name before applying the Prefix/Suffix.*
if blank, the string name text is used with no space padding.

Precision

not applicable

Prefix/Suffix

prefix/suffix for the text

Label name

the created super strings are given this name

Comment

comment to be to be used in this line of the map file.

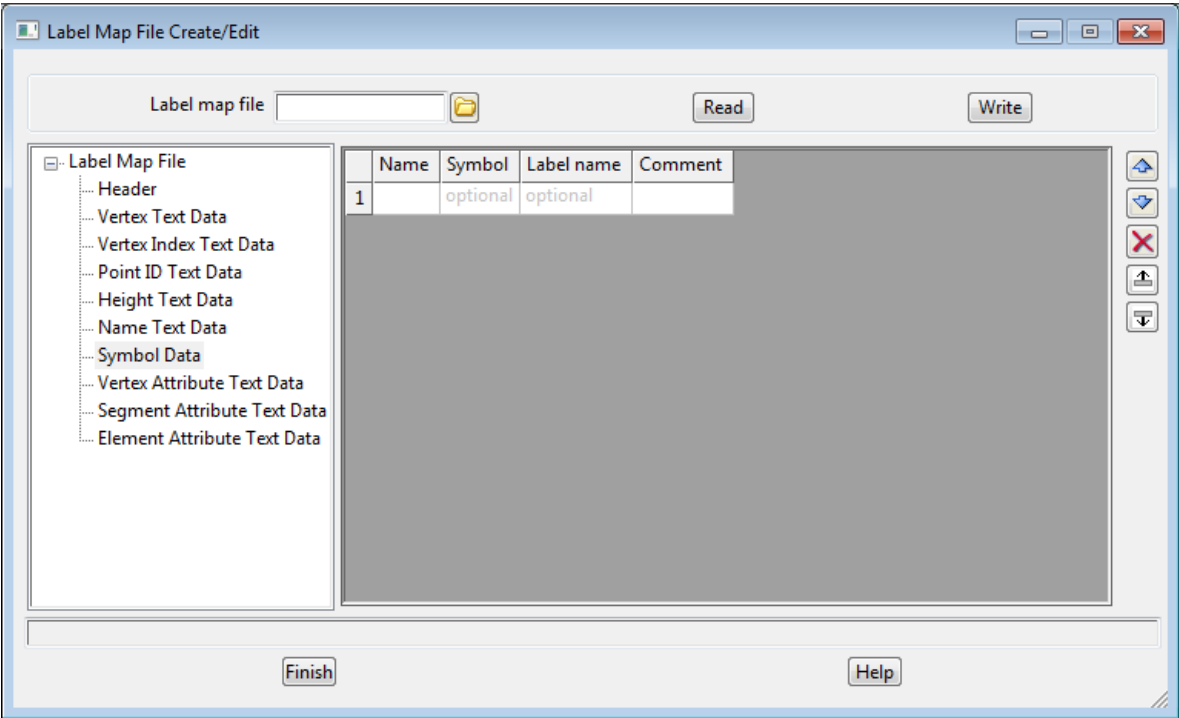
Go to the next section [Symbol Data](#) or return to [Create/Edit Label Map File](#).

Symbol Data

Symbol Data creates symbols at each vertex.

The **Symbol Data** grid specifies *which strings are selected* and what symbol is created at the position of each vertex of the selected strings.

For each selected string, a new super string is created with vertices at the same position as the vertices of the selected string, and with symbols created as vertex symbols at each vertex of the new super string.



Name select name menu for fields

for the selected strings, symbols are created at each vertex. See [Selecting Strings using Name:](#)

For each selected string, a new super string is created with vertices at the same position as the vertices of the selected string, and with symbols created as vertex symbols at each vertex of the new super string.

Symbol select symbol menu for fields

symbol for the vertices. This controls the size, colour, rotation etc for the created symbol.

Label name

the created super strings are given this name

Comment

comment to be to be used in this line of the map file.

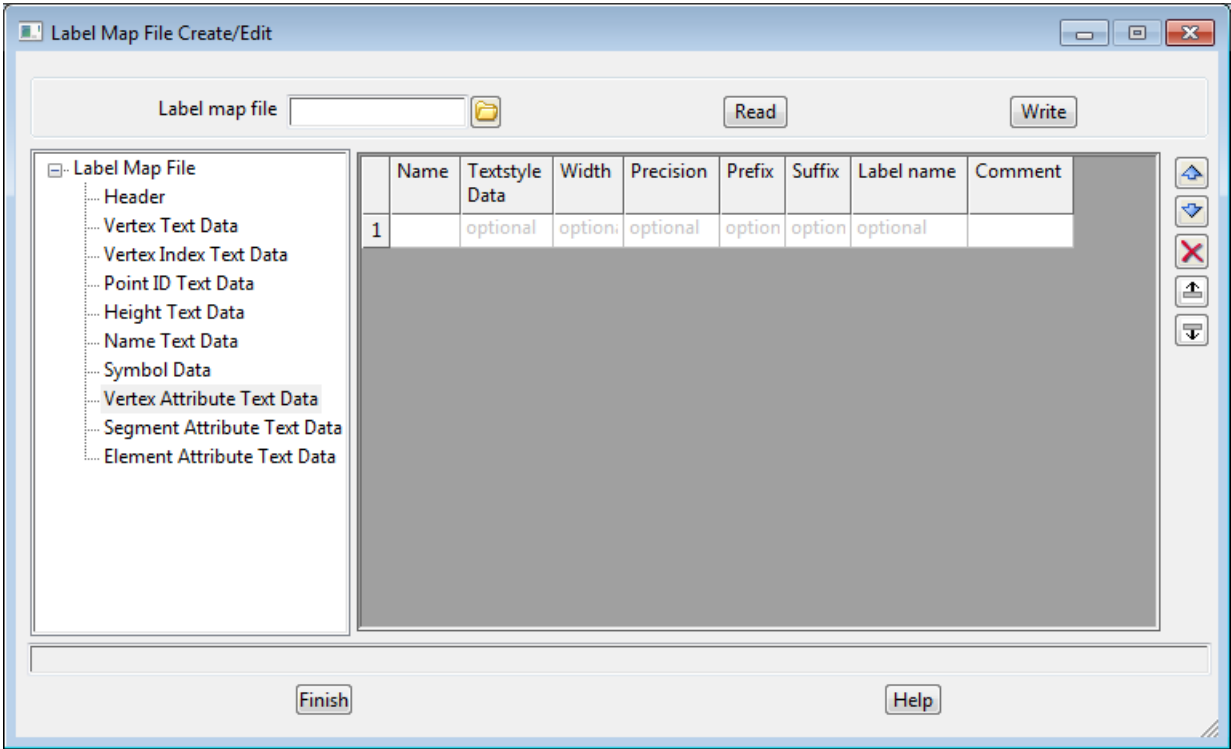
Go to the next section [Vertex Attribute Text Data](#) or return to [Create/Edit Label Map File](#).

Vertex Attribute Text Data

Super strings can have attributes at **each vertex** of the super string. **Vertex Attribute Text Data** labels the **value** of vertex attributes at each vertex.

The **Vertex Attribute Text Data** grid specifies **which strings and which vertex attributes are selected** and how a label containing the **value of the vertex attribute** is created for each vertex of the selected strings.

For each selected string, a new super string is created with vertices at the same position as the selected vertices of the selected string, and with the labels created as vertex text at the appropriate vertices of the new super string.



Name select name menu for fields

for the selected strings and the selected **vertex attributes** of those strings, a label is created from the **value** of the vertex attribute using the parameters in this line of the Label Map file. See [Selecting Strings and Attributes Using Name:](#).

For each selected string, a new super string is created with vertices at the same position as the selected vertices of the selected string, and with the labels created as vertex text at the appropriate vertices of the new super string.

Selecting Strings and Attributes Using Name:

The text in the **Name** column is made up of the name of the string to be selected, followed by / and then the path name of the attribute (see [Attribute Pathname](#)) to be selected. **Name** can include wild cards * and wild characters ? to allow matching on multiple strings and/or multiple attributes.

For each string, the string name and attribute path is compared to the text in the **Name** column for this line and if there is a match then the label from the selected attribute is created using the parameters in this line of the Label Map file.

For example

Drain*/Adac/Pit/* would search any string with the name starting with "Drain" and gets matches for any third level attribute in the second level attribute group "Adac/Pit".

Note that it is the **name** of the attribute used for **selection** but it is the **values** of the selected attribute that are used in the **labels**.

If a match occurs for a line, then this line of the Label Map file grid is used and no other lines are tested against.

If no match occurs, then this line of the Label Map file grid is ignored and a test for a match is made against the next line of the grid.

*Hence the order of the text in the **Name** column in the grid is important, especially when wild cards and wild characters are used.*

Textstyle data

select textstyle data menu for fields

textstyle data for labels. This controls the units, size, colour, border etc for the created text

Width

*If the attribute is type **text**:*

if non blank, the minimum number of characters that is allowed for the attribute text before applying the prefix and suffix.

*If the number of characters in the attribute text is less than **Width** characters, then additional spaces are added to the left of the attribute text so that there are **Width** characters.*

*If the number of characters in the attribute text is greater than **Width**, then **Width** is ignored. Hence the attribute text is not truncated.*

*For example if **Width** is set to 20 and the attribute text has only ten characters, then an extra 10 spaces are added to the left of the attribute text before applying the Prefix/Suffix.*

if blank, the attribute text is used with no space padding.

*If the attribute is type **real**:*

*if non blank, the minimum number of characters allowed for the attribute real value (including **Precision**) before applying the prefix and suffix.*

*If the number of digits in the attribute real value (including **Precision**) is less than **Width** characters, then additional spaces are added to the left of the text so that there are **Width** characters.*

*If the number of digits in the attribute real value (including **Precision**) is greater than **Width**, then **Width** is ignored. Hence the attribute real value is not truncated (other than by **Precision**).*

*As an example, if **Width** is set to 10 and the attribute real value is 23.2 and **Precision** is 3, then the label is " 23.200". That is, an extra four spaces is added to the left of the vertex index value.*

*if blank, the attribute real value with **Precision** is used with no further modification.*

*If the attribute is type **integer**:*

*if non blank, the minimum number of characters allowed for the attribute integer value (including **Precision**) before applying the prefix and suffix.*

*If the number of digits in the attribute integer value (including **Precision**) is less than **Width** characters, then additional spaces are added to the left of the text so that there are **Width** characters.*

*If the number of digits in the attribute integer value (including **Precision**) is greater than **Width**, then **Width** is ignored. Hence the attribute integer value is not truncated.*

*As an example, if **Width** is set to 10 and the attribute integer value is 23 and **Precision** is 3, then the label is " 023". That is, an extra seven spaces is added to the left of the attribute integer value.*

if blank, the attribute integer value text is used with no modification.

Precision

*If the attribute is type **text** then not applicable.*

*If the attribute is type **real**:*

if positive, the number of decimal places after the decimal point.

if negative, the absolute number is the number of decimal places to first calculate the text of the attribute real value for but then any trailing zeros after the decimal place are removed.

Important Note: *this use of positive and negative for not eliminating/eliminating trailing zeros*

after the decimal place is the opposite to plot parameters.

*If the attribute is type **integer**:*

*if the number of digits in the attribute integer value is less than the absolute value of **Precision**, then left 0 padding is used to bring the number of digits in the text up to the absolute value of **Precision**.*

*As an example, if **Width** is set to 10 and the attribute integer value is 23 and **Precision** is 3, then the label is " 023". That is, an extra seven spaces is added to the left of the attribute integer value.*

Prefix/Suffix

prefix/suffix for the text

Label name

the created super strings are given this name

Comment

comment to be to be used in this line of the map file.

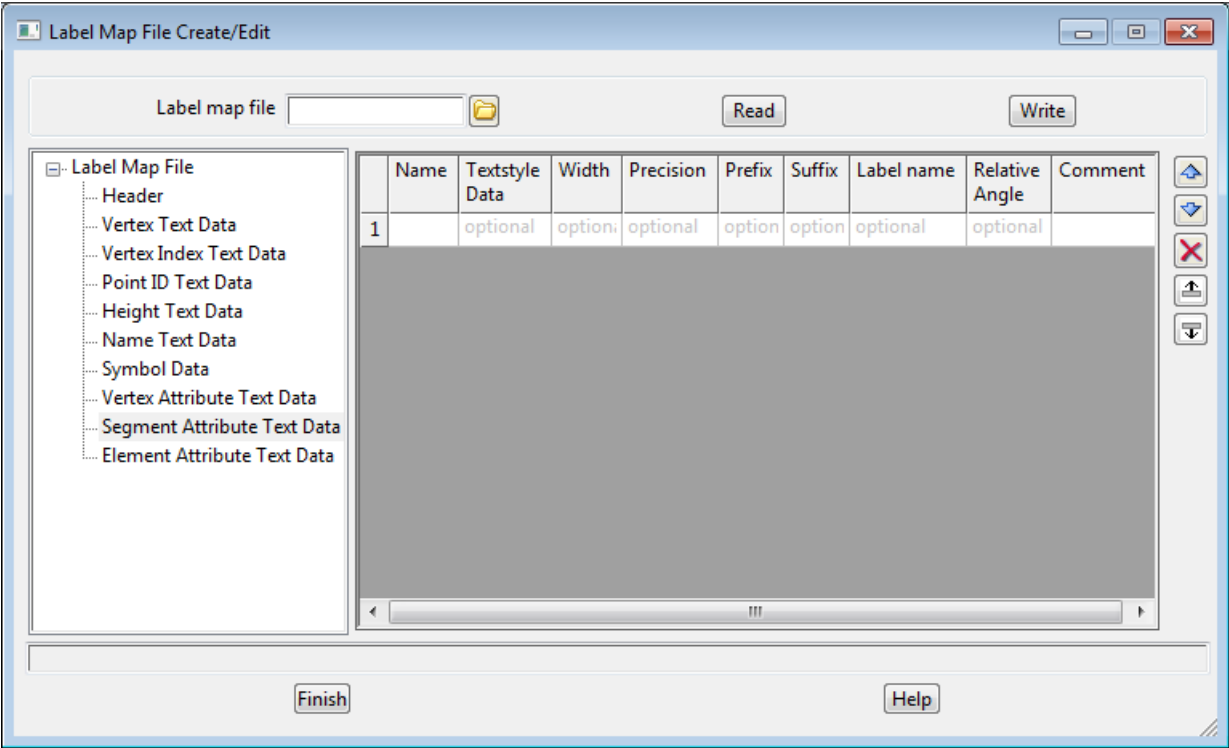
Go to the next section [Segment Attribute Text Data](#) or return to [Create/Edit Label Map File](#).

Segment Attribute Text Data

Super strings can have attributes at **each segment** of the super string. **Segment Attribute Text Data** labels the segment attribute at each segment.

The **Segment Attribute Text Data** grid specifies **which strings and which segment attributes are selected** and how a label containing the **value of the segment attribute** is created for each segment of the selected strings.

For each selected string and selected segment attribute, text strings are created with vertices at the mid point of the selected segments of the selected string, and with the labels created as the text.



Name select name menu for fields

for the selected strings and the selected **segment attributes** of those strings, a label is created from the **value** of the segment attribute using the parameters in this line of the Label Map file. See [Selecting Strings and Attributes Using Name:](#).

For each selected string and selected segment attribute, text strings are created with vertices at the mid point of the selected segments of the selected string, and with the labels created as the text.

Textstyle data select textstyle data menu for fields

textstyle data for labels. This controls the units, size, colour, border etc for the created text

Width

If the attribute is type **text**:

if non blank, the minimum number of characters that is allowed for the attribute text before applying the prefix and suffix.

If the number of characters in the attribute text is less than **Width** characters, then additional spaces are added to the left of the attribute text so that there are **Width** characters.

If the number of characters in the attribute text is greater than **Width**, then **Width** is ignored. Hence the attribute text is not truncated.

For example if **Width** is set to 20 and the attribute text has only ten characters, then an extra 10 spaces are added to the left of the attribute text before applying the Prefix/Suffix.

if blank, the attribute text is used with no space padding.

*If the attribute is type **real**:*

*if non blank, the minimum number of characters allowed for the attribute real value (including **Precision**) before applying the prefix and suffix.*

*If the number of digits in the attribute real value (including **Precision**) is less than **Width** characters, then additional spaces are added to the left of the text so that there are **Width** characters.*

*If the number of digits in the attribute real value (including **Precision**) is greater than **Width**, then **Width** is ignored. Hence the attribute real value is not truncated (other than by **Precision**).*

*As an example, if **Width** is set to 10 and the attribute real value is 23.2 and **Precision** is 3, then the label is " 23.200". That is, an extra four spaces is added to the left of the vertex index value.*

*if blank, the attribute real value with **Precision** is used with no further modification.*

*If the attribute is type **integer**:*

*if non blank, the minimum number of characters allowed for the attribute integer value (including **Precision**) before applying the prefix and suffix.*

*If the number of digits in the attribute integer value (including **Precision**) is less than **Width** characters, then additional spaces are added to the left of the text so that there are **Width** characters.*

*If the number of digits in the attribute integer value (including **Precision**) is greater than **Width**, then **Width** is ignored. Hence the attribute integer value is not truncated.*

*As an example, if **Width** is set to 10 and the attribute integer value is 23 and **Precision** is 3, then the label is " 023". That is, an extra seven spaces is added to the left of the attribute integer value.*

if blank, the attribute integer value text is used with no modification.

Precision

*If the attribute is type **text** then not applicable.*

*If the attribute is type **real**:*

if positive, the number of decimal places after the decimal point.

if negative, the absolute number is the number of decimal places to first calculate the text of the attribute real value for but then any trailing zeros after the decimal place are removed.

Important Note: *this use of positive and negative for not eliminating/eliminating trailing zeros after the decimal place is the opposite to plot parameters.*

*If the attribute is type **integer**:*

*if the number of digits in the attribute integer value is less than the absolute value of **Precision**, then left 0 padding is used to bring the number of digits in the text up to the absolute value of **Precision**.*

*As an example, if **Width** is set to 10 and the attribute integer value is 23 and **Precision** is 3, then the label is " 023". That is, an extra seven spaces is added to the left of the attribute integer value.*

Prefix/Suffix

prefix/suffix for the text

Label name

the created super strings are given this name

Relative angle

*if **yes**, the angle of the label is the angle of the segment that the segment text is coming from **PLUS** the Angle of the text given in the Textstyle Data column.*

*if **no**, the angle of the label is the Angle of the text given in the Textstyle Data column.*

Comment

comment to be to be used in this line of the map file.

Go to the next section [Element Attribute Text Data](#) or return to [Create/Edit Label Map File](#).

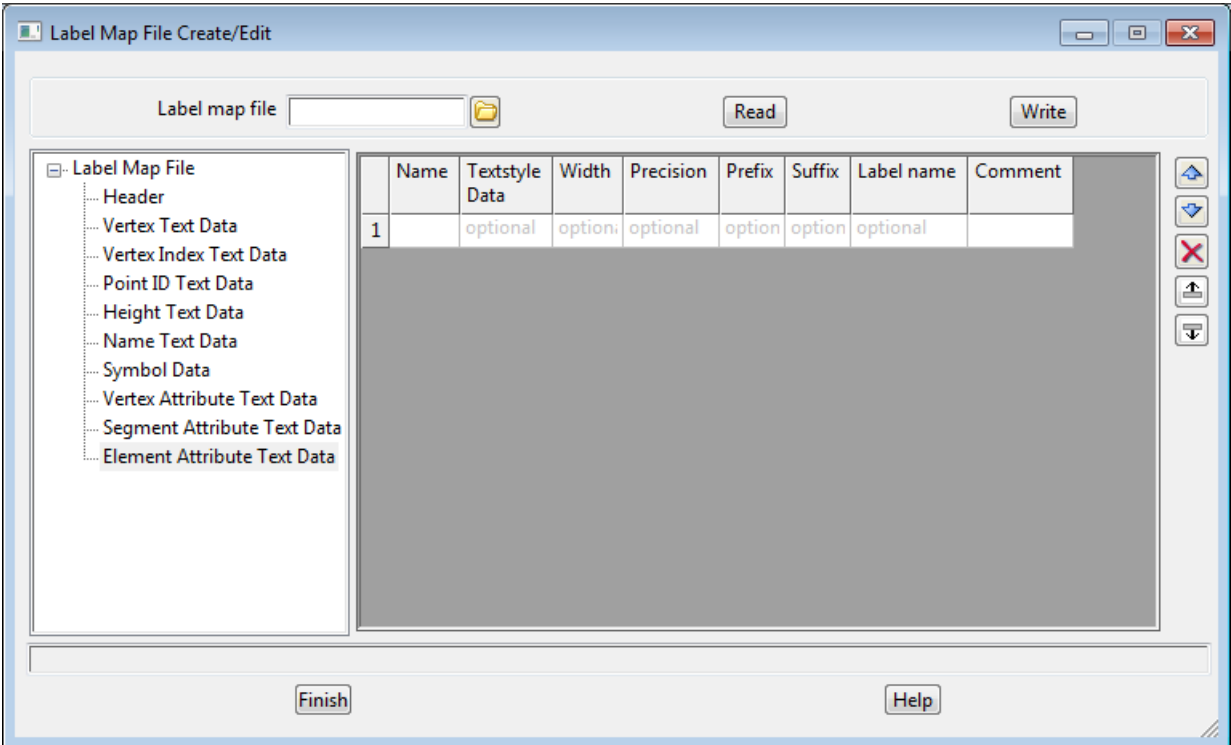
Element Attribute Text Data

Element Attribute Text Data labels the string attributes of string.

The **Element Attribute Text Data** grid specifies *which strings and which string attributes are selected* and how a label containing the *value of the string attribute* is created for each string attribute of the selected strings.

For each selected string and selected string attribute, text strings are created with the label as the text and the position of the text string as:

- the position of the first vertex for a point string
- the centroid of the string for closed strings that are not point strings
- the mid chainage position for open strings that are not a point strings.



Name select name menu for fields

*for the selected strings and the selected **string attributes** of those strings, a label is created from the **value** of the string attribute using the parameters in this line of the Label Map file. See [Selecting Strings and Attributes Using Name:](#)*

For each selected string and selected string attribute, text strings are created with the label as the text and the position of the text string as:

- the position of the first vertex for a point string*
- the centroid of the string for closed strings that are not point strings*
- the mid chainage position for open strings that are not a point strings.*

Textstyle data select textstyle data menu for fields

textstyle data for labels. This controls the units, size, colour, border etc for the created text

Width

*If the attribute is type **text**:*

- if non blank, the minimum number of characters that is allowed for the attribute text before applying the prefix and suffix.*
- If the number of characters in the attribute text is less than **Width** characters, then additional spaces are added to the left of the attribute text so that there are **Width** characters.*

If the number of characters in the attribute text is greater than **Width**, then **Width** is ignored. Hence the attribute text is not truncated.

For example if **Width** is set to 20 and the attribute text has only ten characters, then an extra 10 spaces are added to the left of the attribute text before applying the Prefix/Suffix.

if blank, the attribute text is used with no space padding.

If the attribute is type **real**:

if non blank, the minimum number of characters allowed for the attribute real value (including **Precision**) before applying the prefix and suffix.

If the number of digits in the attribute real value (including **Precision**) is less than **Width** characters, then additional spaces are added to the left of the text so that there are **Width** characters.

If the number of digits in the attribute real value (including **Precision**) is greater than **Width**, then **Width** is ignored. Hence the attribute real value is not truncated (other than by **Precision**).

As an example, if **Width** is set to 10 and the attribute real value is 23.2 and **Precision** is 3, then the label is " 23.200". That is, an extra four spaces is added to the left of the vertex index value.

if blank, the attribute real value with **Precision** is used with no further modification.

If the attribute is type **integer**:

if non blank, the minimum number of characters allowed for the attribute integer value (including **Precision**) before applying the prefix and suffix.

If the number of digits in the attribute integer value (including **Precision**) is less than **Width** characters, then additional spaces are added to the left of the text so that there are **Width** characters.

If the number of digits in the attribute integer value (including **Precision**) is greater than **Width**, then **Width** is ignored. Hence the attribute integer value is not truncated.

As an example, if **Width** is set to 10 and the attribute integer value is 23 and **Precision** is 3, then the label is " 023". That is, an extra seven spaces is added to the left of the attribute integer value.

if blank, the attribute integer value text is used with no modification.

Precision

If the attribute is type **text** then not applicable.

If the attribute is type **real**:

if positive, the number of decimal places after the decimal point.

if negative, the absolute number is the number of decimal places to first calculate the text of the attribute real value for but then any trailing zeros after the decimal place are removed.

Important Note: this use of positive and negative for not eliminating/eliminating trailing zeros after the decimal place is the opposite to plot parameters.

If the attribute is type **integer**:

if the number of digits in the attribute integer value is less than the absolute value of **Precision**, then left 0 padding is used to bring the number of digits in the text up to the absolute value of **Precision**.

As an example, if **Width** is set to 10 and the attribute integer value is 23 and **Precision** is 3, then the label is " 023". That is, an extra seven spaces is added to the left of the attribute integer value.

Prefix/Suffix

prefix/suffix for the text

Label name

the created super strings are given this name

Comment

comment to be to be used in this line of the map file.

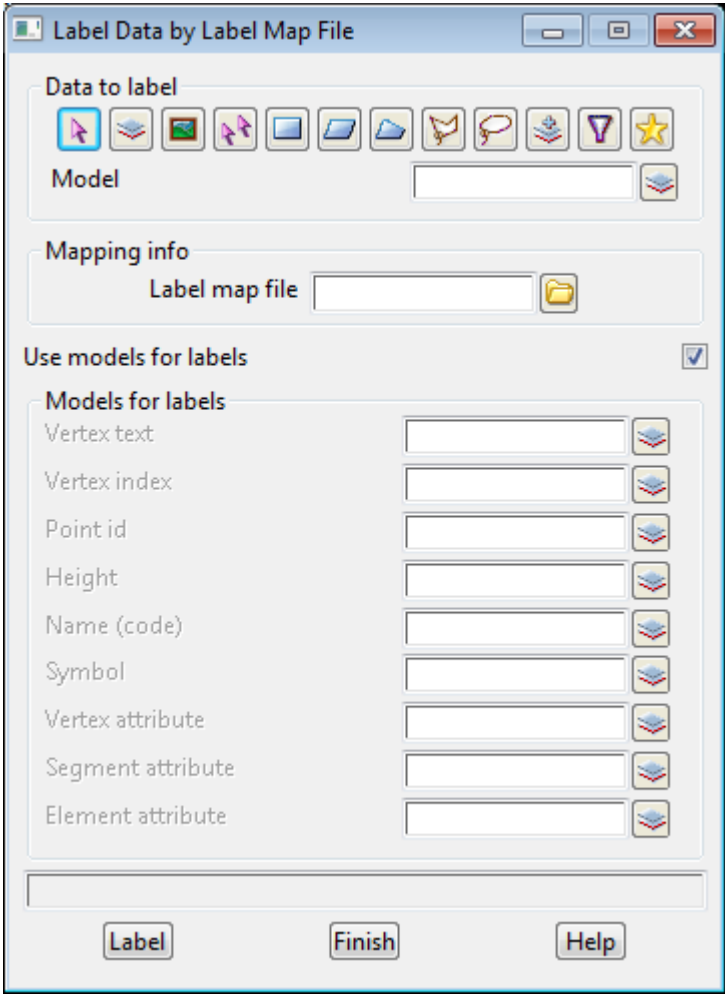
Go to the next section [Apply a Label Map File](#) or return to [Create/Edit Label Map File](#).

Apply a Label Map File

Position of option on menu: File I/O =>Use Label Map File

Use a *Label Map File* to create text labels for all strings in the selected data source and that match the criteria in the sections of the *Label Map File*.

Selecting **Apply** brings up the **Label Data by Label Map File** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type		Model	
-------------------------	--	-------	--

data source type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data source	input		
--------------------	-------	--	--

source of data is to be selected and processed by the Label Map File.

Label map file	input		*.lmf
-----------------------	-------	--	-------

name of the Label Map File to process the selected data.

Use models for labels	tick box	tick	
------------------------------	----------	------	--

*if ticked, the **Models for labels** section is displayed and labels are only created for the type of data that has a non blank model name in the "Model for labels" area. The created labels go into that model.*

*For example, Vertex text labels will only be created if the **Vertex text** field is not blank.*

Vertex text, Vertex index, Point id, Height, Name (code), Symbol, Vertex attribute, Segment attribute, Element attribute

*If Use models for labels is not ticked, the above panel fields are used as **Pre*Post** text in conjunction with the label Map File name to create model names.*

Label	button
--------------	--------

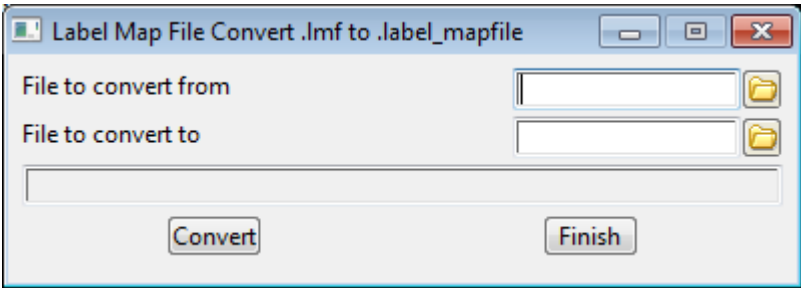
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Convert .lmf Files to .label_mapfile

Position of option on menu: File I/O =>Label Map files =>Convert .lmf to .label_mapfile

The Label map file convert option converts a label map file in the pre-V9 format to the XML label map file format introduced in **12d Model 10**.

Selecting Convert .lmf to .label_mapfile displays the **Label Map File Convert .lmf to .label_mapfile** panel.



The fields and buttons used in this panel have the following functions.

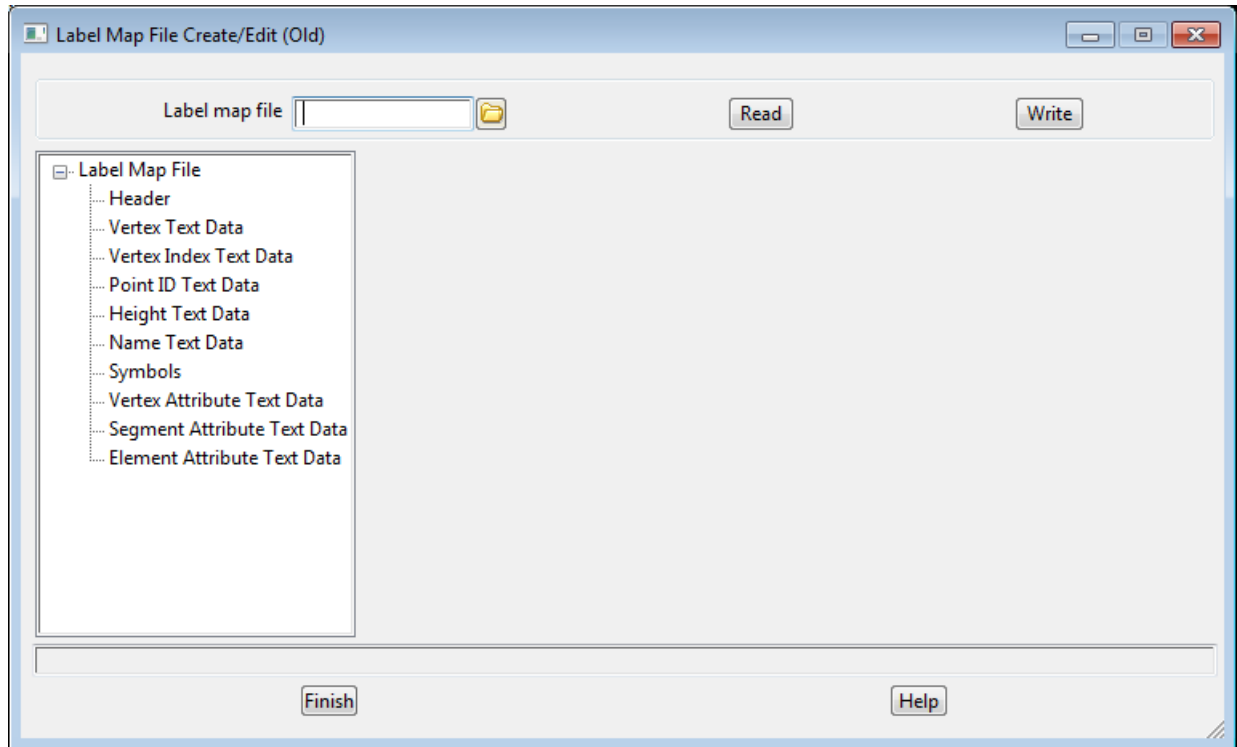
Field Description	Type	Defaults	Pop-Up
File to convert from <i>name of the pre-V10 label map file to be converted to the new label map file format</i>	file box		*.lmf
File to convert to <i>name of the new converted label map file</i>	file box		*.label_mapfile
Convert <i>convert a file in the pre-V10 label map file format to the new label map file format.</i>	button		

Create/Edit Pre-V10 Label Map File

Position of option on menu: File I/O =>Label Map files =>Create/edit .lmf

This option is for editing the superseded label map file format and should not be used.

Please use the new Label Map File format Created/edit option ([Create/Edit Label Map File](#)).

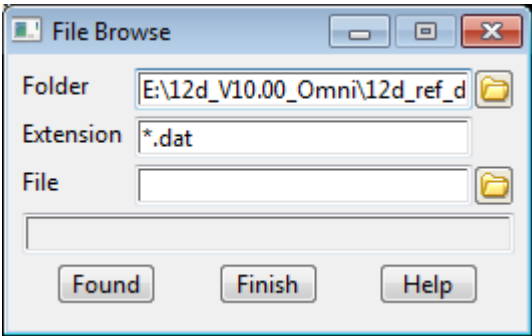


Edit a File

Position of option on menu: File I/O =>Edit

Files can be searched for and then displayed in the editor using the browse option.

Selecting **Edit** brings up the **File Browse** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Folder	input	current folder	Microsoft browser
<i>folder to search for files with the extension given in the extension field.</i>			
Extension	input	*.dat	
<i>wild cards and extension to limit the search of files. An <enter> needs to be typed after changing the extension.</i>			
File	input		files satisfying the folder and extension fields.
<i>select the file to be displayed in the editor.</i>			
Found	button		
<i>display in the editor the file of the name given in the file field.</i>			

Note

The **editor** is pointed to by the environment variable EDITOR_4D (see Appendix A).

GIS

Position of menu: File I/O =>GIS

The **FDO (Feature Data Objects)** is used to communicate with external servers such as **GIS** packages and external databases, including **SQL Server**, **Oracle** and **MySQL**.

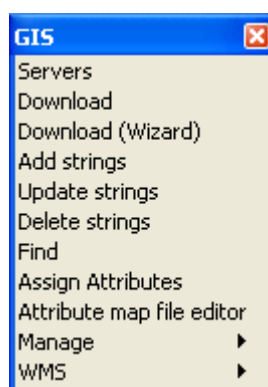
Depending on the services provided by the external data source, vector data may be downloaded, updated or new data inserted. Raster images may also be dynamically downloaded and displayed via the **WMS (Web Mapping Service)**.

The list of services **12d Model** currently supports includes:

- WFS (Web Feature Service)
- ArcSDE
- Oracle databases
- SQL Server databases
- MySQL databases
- Basic ODBC (Open Database Connectivity), such as Excel and Access
- PostGreSQL
- SQLite
- PostGIS
- Shape files
- SDF files
- OGR formats (see http://www.gdal.org/ogr/ogr_formats.html)
- WMS (Web Mapping Service) for Raster downloads

Some server types may not be available if you do not have the required third party components, as installed with the third party software. You may need to contact the vendors of the data source if you experience difficulty.

The GIS walk-right menu containing these options is:



For the option Servers, go to

Download

Download (Wizard)

Add strings

Update strings

Delete strings

[Edit GIS Servers](#)

[GIS Download](#)

[GIS Download Wizard](#)

[GIS Add Strings](#)

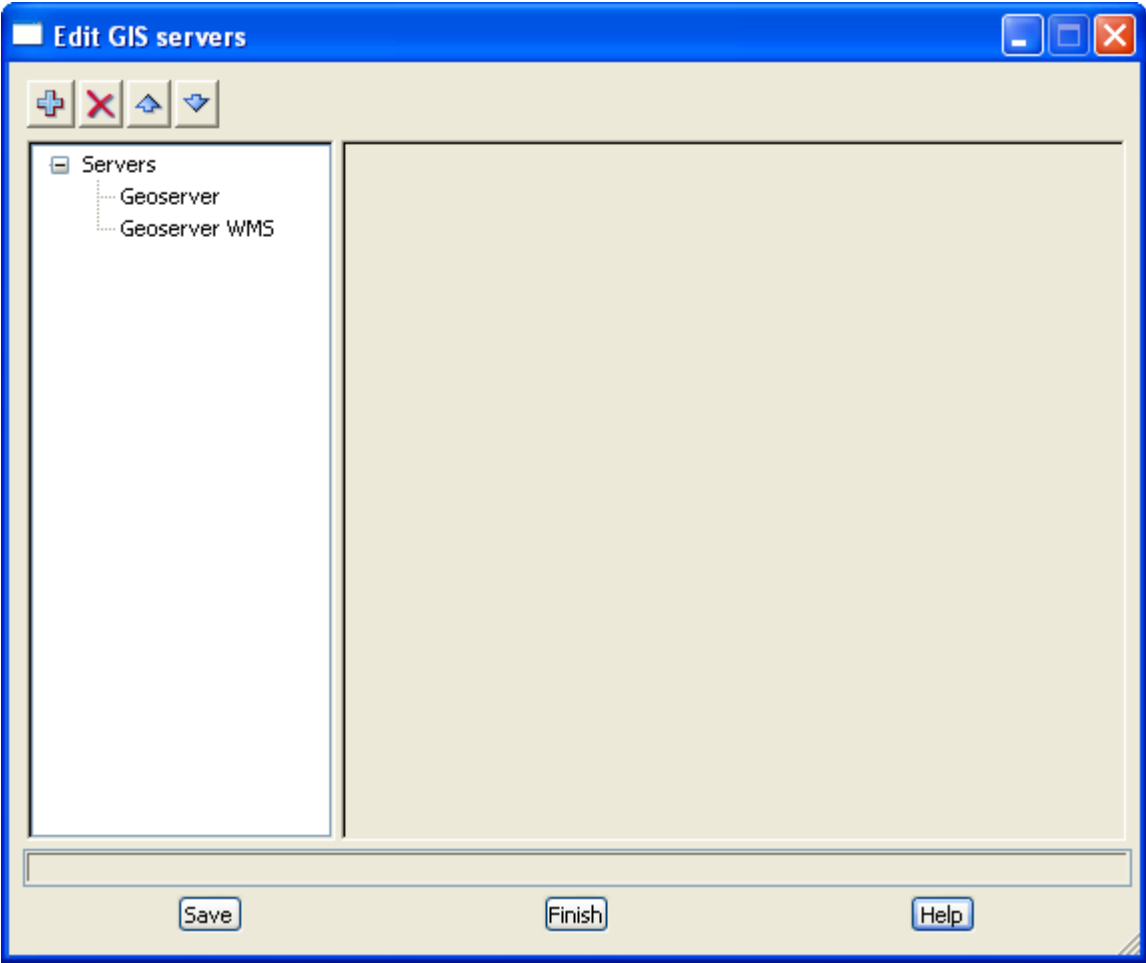
[GIS Update Strings](#)

[GIS Delete Strings](#)




Find	Find GIS Strings
Assign Attributes	GIS Assign Attributes
Attribute map file editor	Attribute Map File
Manage	Manage FDO
WMS	WMS

Edit GIS Servers

Position of option on menu: File I/O =>GIS =>Servers
Selecting Servers brings up the **Edit FDO servers** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Insert 	button		
<i>Adds a new server</i>			
Delete 	button		
<i>Deletes the selected server</i>			
Up 	button		

Moves the server up in the list

Down  button

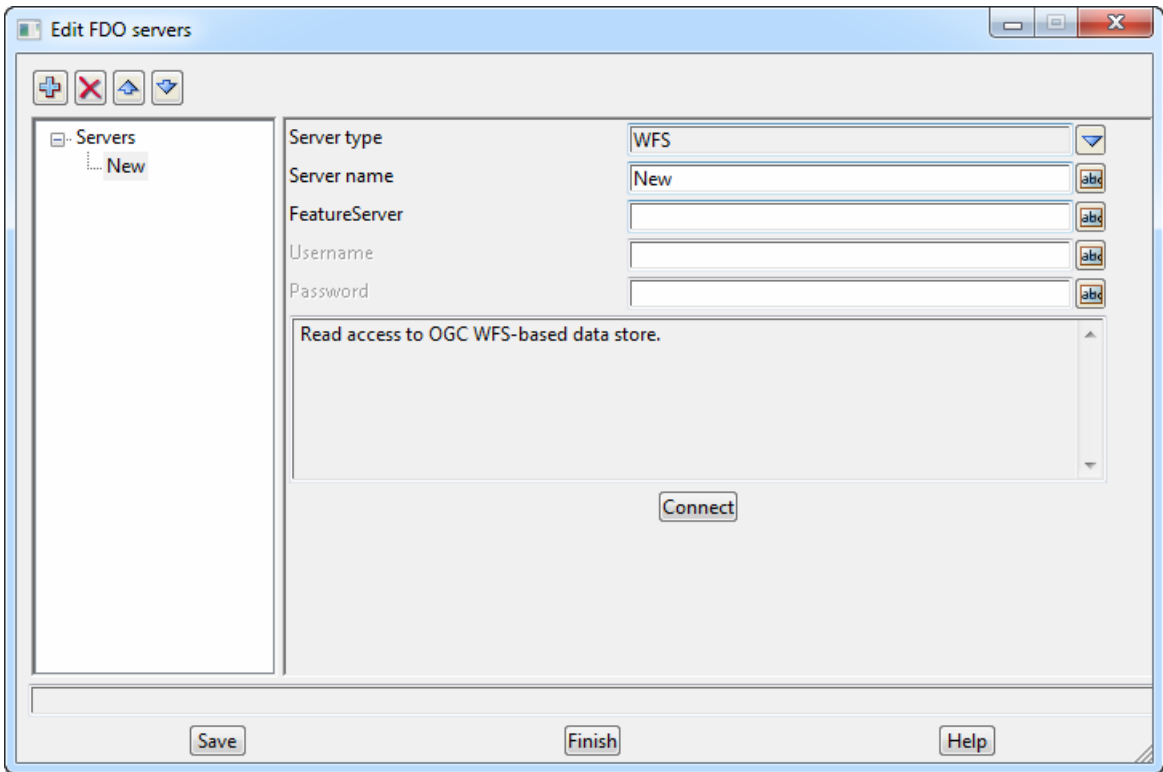
Moves the server down in the list

Save button

Saves the list of servers

WFS Server Setup

This panel provides access to edit the required information for connection to a **WFS (Web Feature Service)** server.



The fields and buttons used in this panel have the following functions.

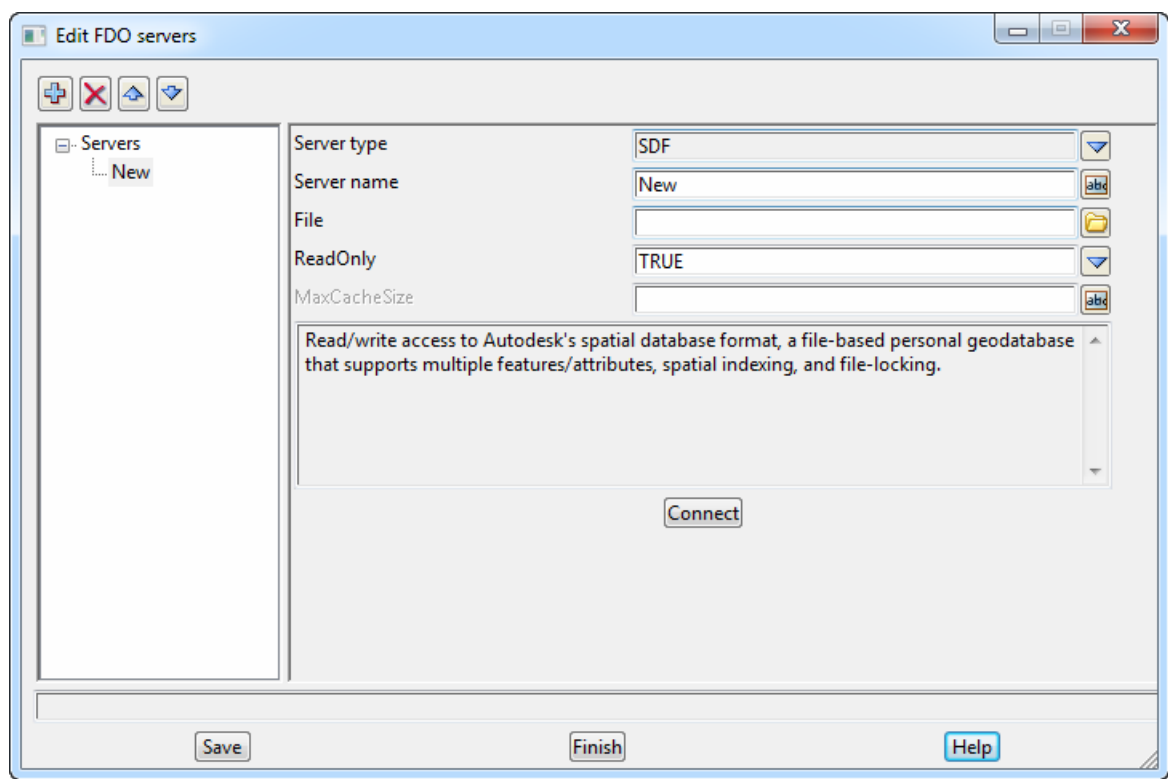
Field Description	Type	Defaults	Pop-Up
Server type <i>the type of server</i>	choice box		
Server name <i>the name by which you will refer to the server</i>			
FeatureServer <i>the HTTP address of the server</i>			
Username <i>an optional username</i>			
Password			

an optional password

Connect button
Tests the connection to the server

SDF Server Setup

This provides access to edit the required information for connection to a file in **AutoDesk's SDF format (spatial database format)**.

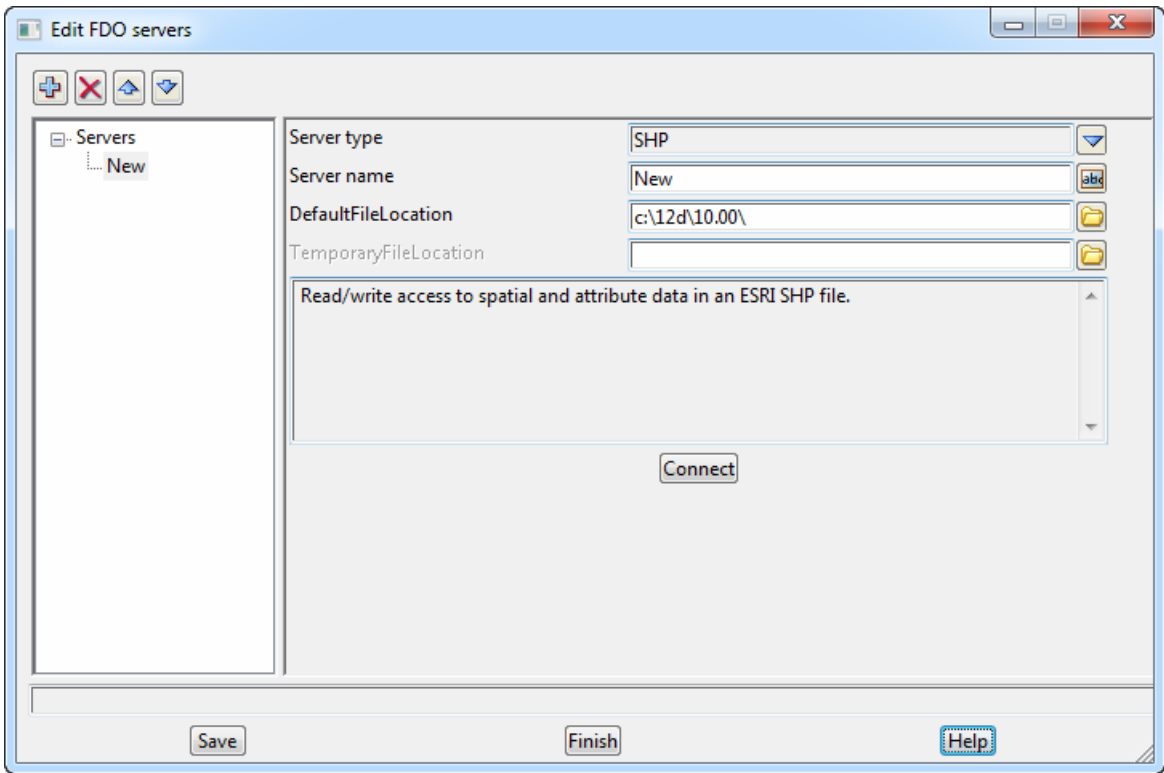


The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Server type <i>the type of server</i>	choice box		
Server name <i>the name by which you will refer to the server</i>			
File <i>the file to read / write</i>	file		
ReadOnly <i>whether or not to access the file in a read only fashion</i>	choice box		True, False
MaxCacheSize <i>an optional setting to determine the maximum cache size used in SDF operations</i>			
Connect <i>Tests the connection to the file</i>	button		

SHP Server Setup

This provides access to edit the required information for connection to a file or set of files in **ESRI's SHP** file format.

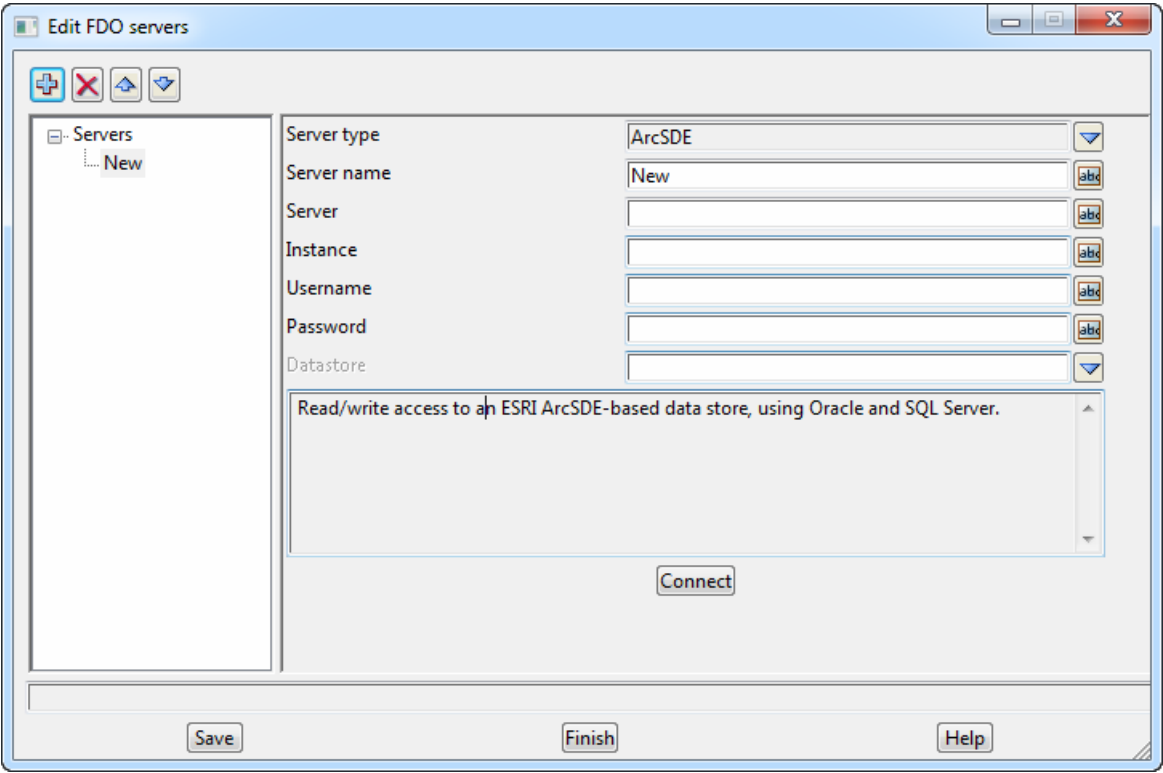


The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Server type <i>the type of server</i>	choice box		
Server name <i>the name by which you will refer to the server</i>			
DefaultFileLocation <i>where the SHP file(s) to read/write reside</i>	file		
TemporaryFileLocation <i>an optional field to specify where the FDO should write any required temporary files</i>	file		
Connect <i>Tests the connection settings</i>	button		

ArcSDE Server Setup

This provides access to edit the required information for connection to an **ArcSDE** server. If you do not know the data store name, you may need to connect to the server once to retrieve the list of names.



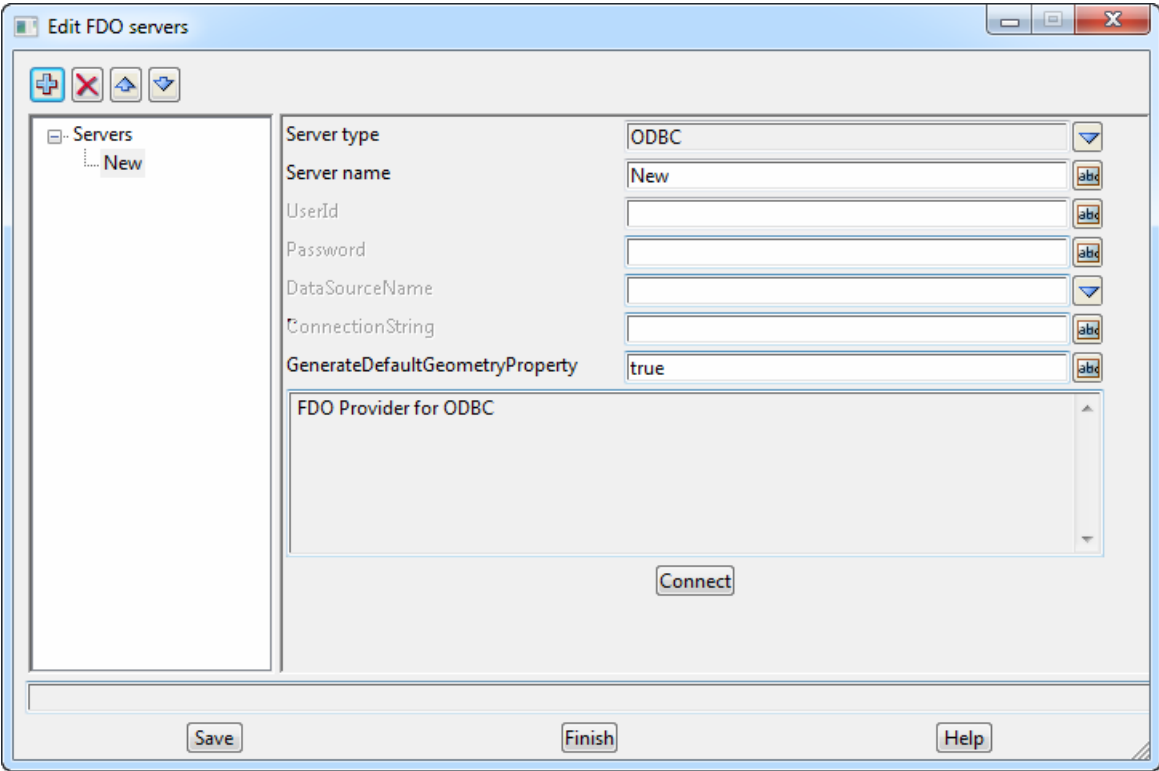
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Server type <i>the type of server</i>	choice box		
Server name <i>the name by which you will refer to the server</i>			
Server <i>the address of the remote ArcSDE server</i>			
Instance <i>the instance name or port number</i>			
Username <i>the username under which you will connect to the server</i>			
Password <i>the required password for connecting to the server</i>			
Datastore <i>if a datastore is required, you must enter it here. If you do not know the name of the datastore, click Connect and the list of datastores will be retrieved</i>			
Connect <i>Tests the connection to the server and retrieves the list of datastores</i>	button		

ODBC Server Setup

This provides access to setup a connection to a generic **ODBC (Open Database Connectivity)** data source, such as **Microsoft Excel** or **Microsoft Access**.

Because this is a generic connection type, you will be required to know the necessary combination of settings including DSN or Connection String. This may involve knowing the specific driver required to connect to the data source.



The fields and buttons used in this panel have the following functions.

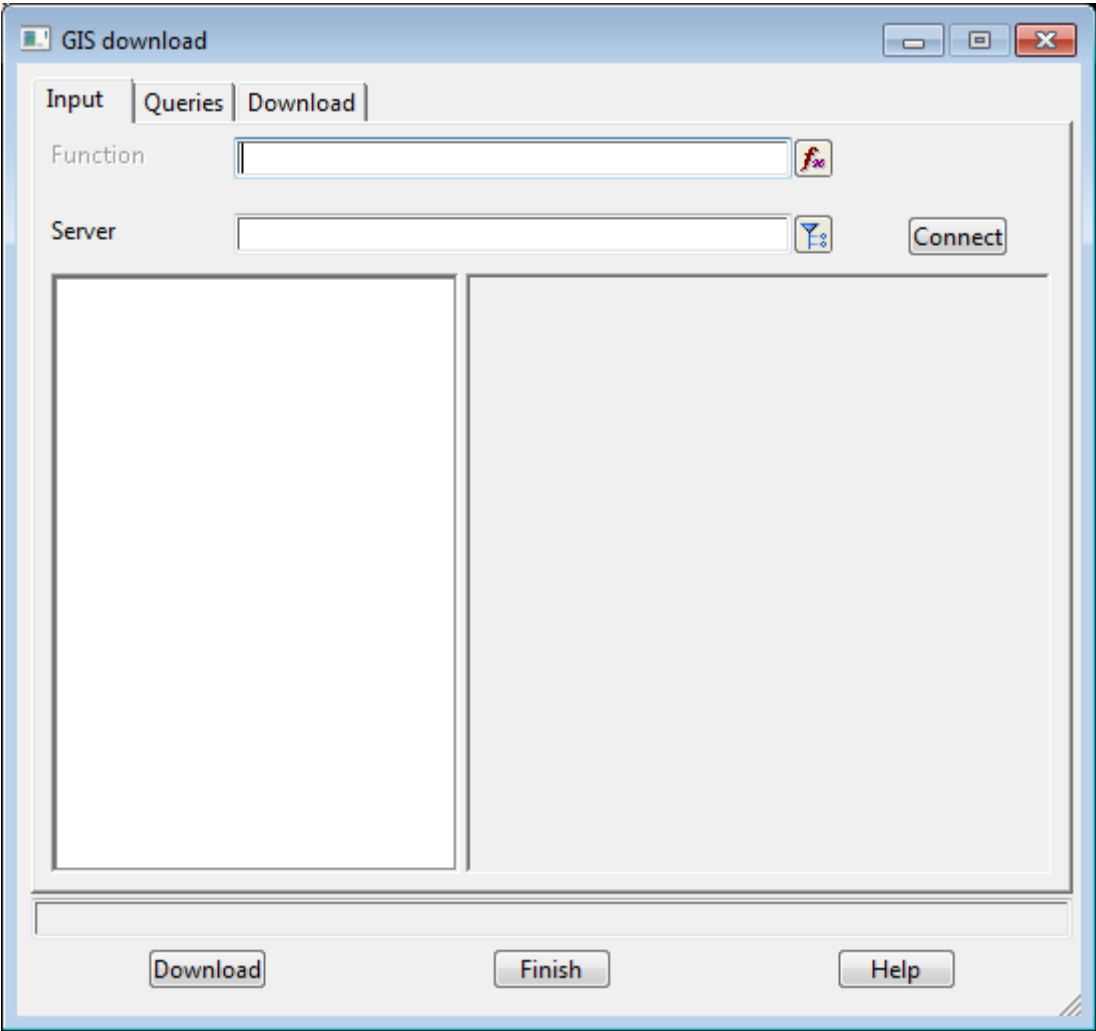
Field Description	Type	Defaults	Pop-Up
Server type <i>the type of server</i>	choice box		
Server name <i>the name by which you will refer to the server</i>			
UserId <i>an optional user id for the connection</i>			
Password <i>an optional password for the connection</i>			
DataSourceName <i>an optional data source name (or DSN)</i>			
ConnectionString <i>an optional connection string</i>			
GenerateDefaultGeometryProperty			

whether or not to generate the default geometry property if one does not exist

Connect button
Tests connection to the data source

GIS Download

Position of option on menu: File I/O =>GIS =>Download
Selecting **Download** brings up the **GIS download** panel.



- For a description of the *Input* tab, see [Input tab](#)
- For a description of the *Queries* tab, see [Queries tab](#)
- For a description of the *Download* tab, see [Download tab](#)
- For a description of the *Download* button, see [Download button](#)

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Input tab			
Function	function box		available GIS functions

an optional function. A function is required for edits and inserts

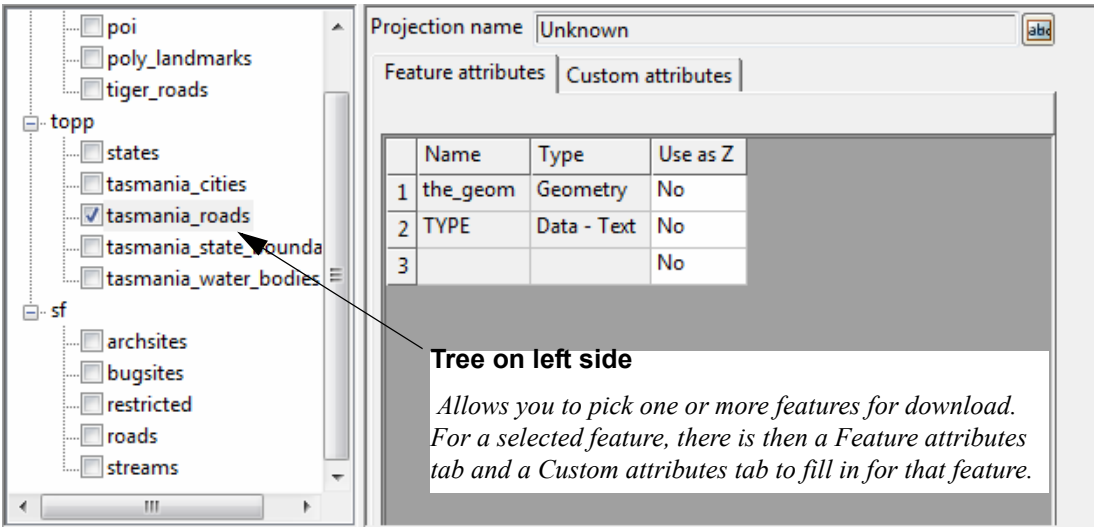
Server

the server you wish to connect to

Connect

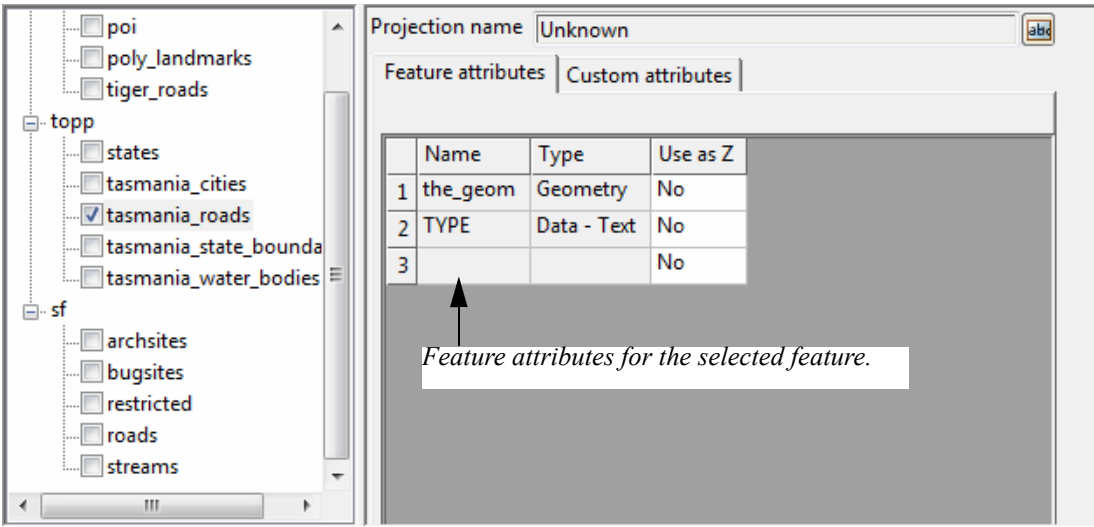
button

connects to the server and retrieves the list of features available for download. The list of features is displayed as a tree control on the left hand side of the panel.



Input tab: Feature Attributes Tab

The Feature attributes grid displays the set of attributes to be downloaded as part of the selected feature.



Name

the name of the downloaded feature attribute

Type

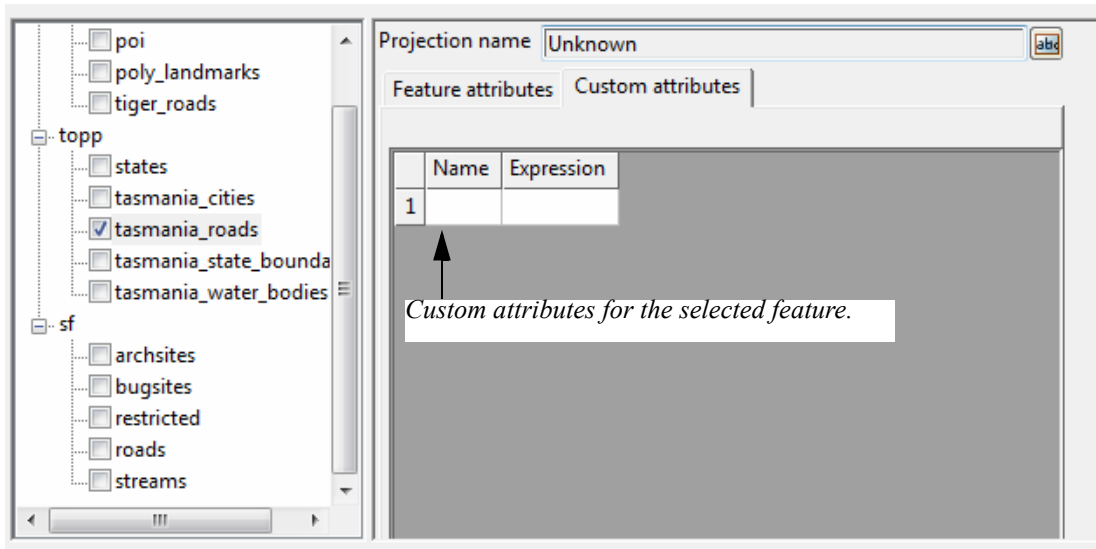
the type of the downloaded feature

Use as Z

whether or not this attribute should be used as a Z level on strings

Input tab: Custom Attributes tab

The Custom attributes grid defines the set of attributes to be downloaded as part of the selected feature.

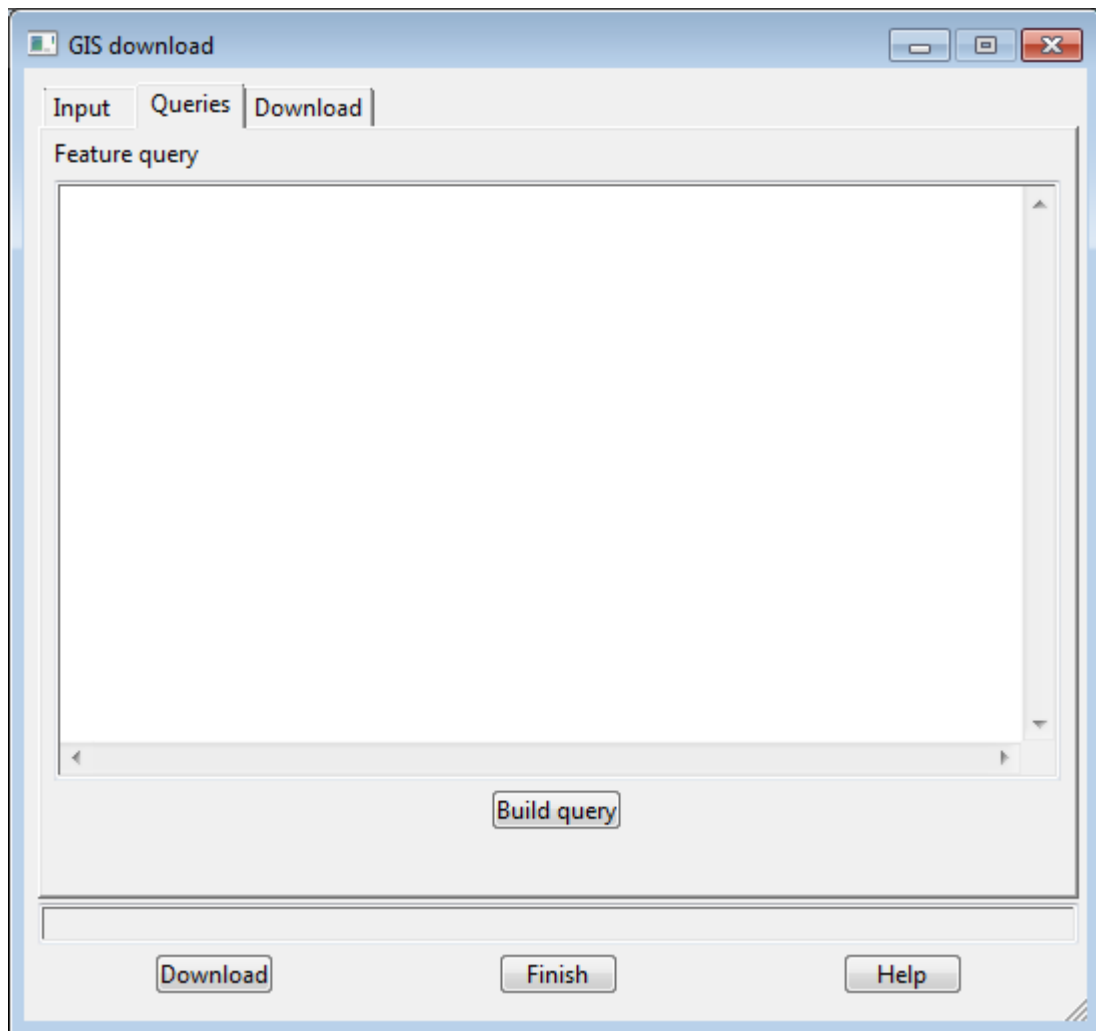


Name

the name of the attribute to be downloaded

Expression

the expression to calculate the attribute (see [Query Building](#))

Queries tab**Feature Query**

an optional query to send to the server for downloads

Build Query button

shows a helper panel for building queries (see [Query Building](#))

downloads the requested features from the server

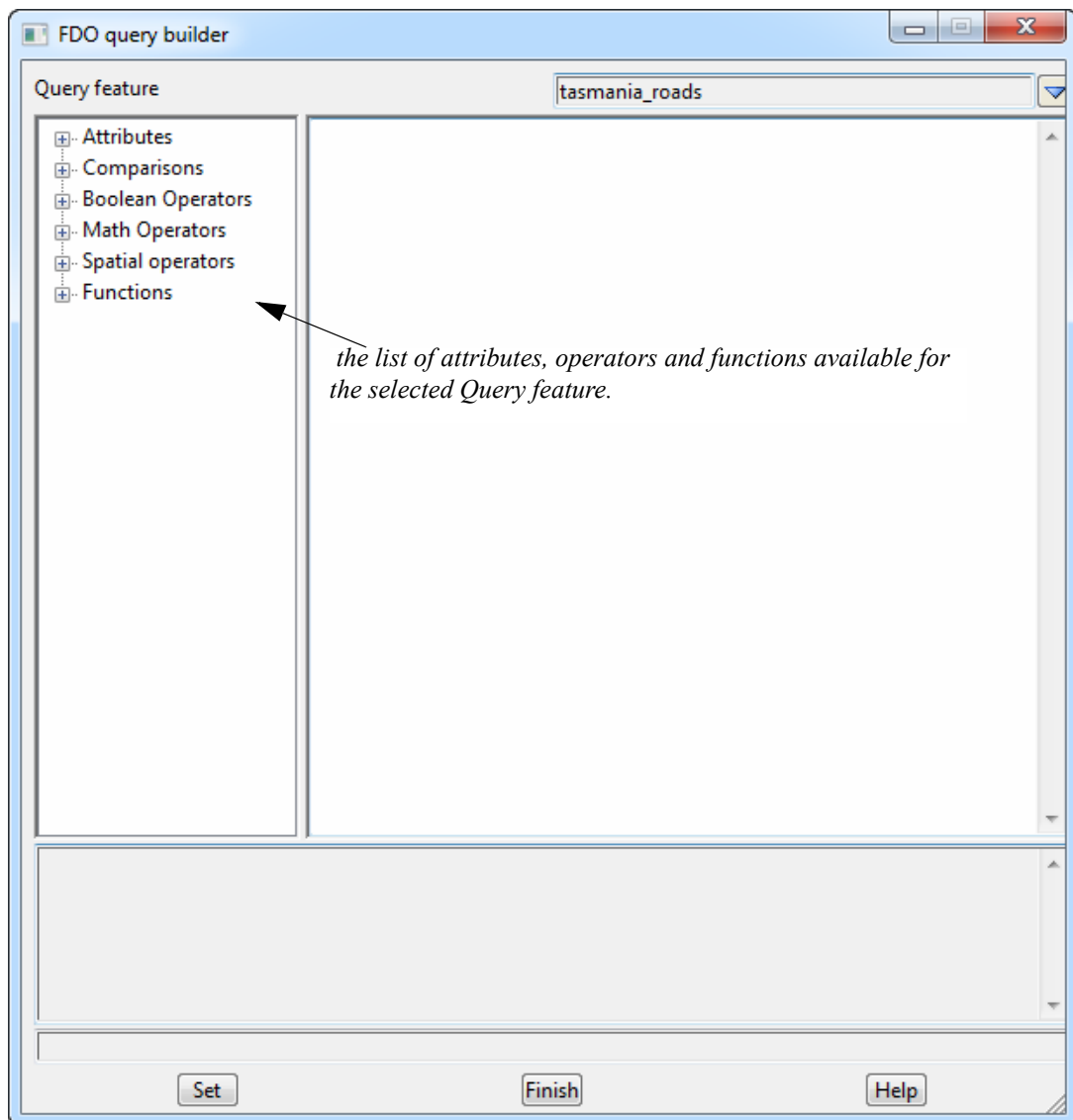
Query Building

This panel helps build queries for constraining feature downloads.

Note that the features, attributes and queries available are determined by the server you are connecting to and will not be documented here.

If the server publishes help information about the query operation, then it will be listed at the bottom of the panel.

Select **Build query**  to bring up the FDO query builder panel



Query feature

the feature to build a query for

Left side

the list of attributes, operators and functions available

Right side

the current query

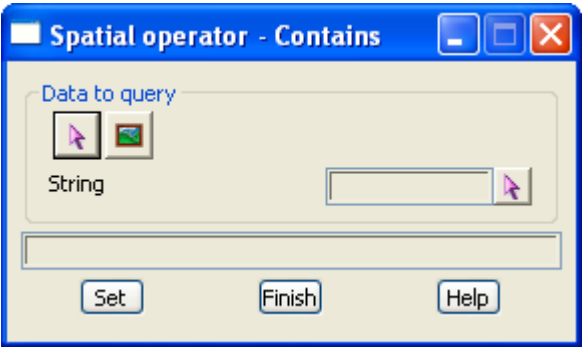
Bottom

any description of the operator

Spatial Operators

Spatial operators are special operators that allow you to refer to an operation against existing geometry. Examples may include whether or not the geometry attribute contains, crosses, intersects or touches another piece of geometry.

For these operators, a panel in the following style will be presented.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data to query

the data to operate against

Set

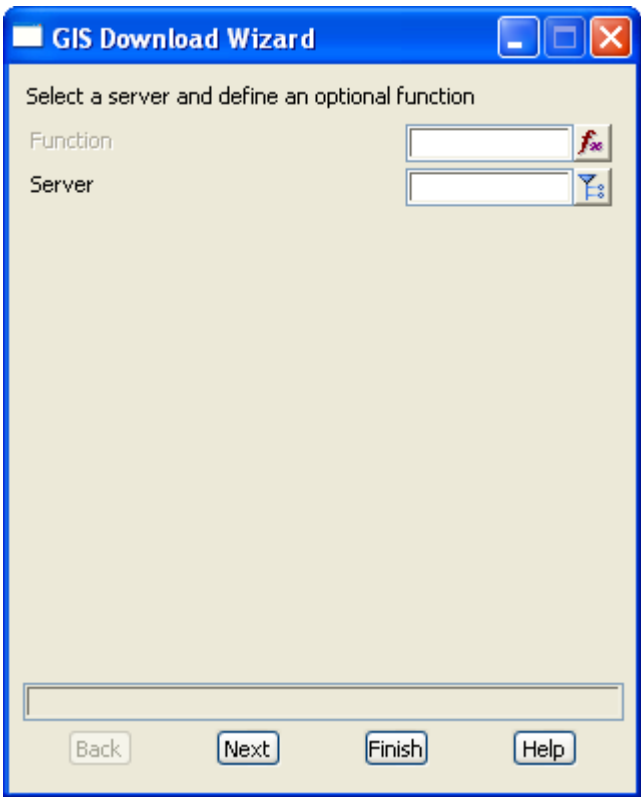
Sets the data for the query

GIS Download Wizard

Position of option on menu: File I/O =>GIS =>Download (Wizard)

This is a wizard style interface to assist in setting up an GIS download.

Selecting **Download (Wizard)** brings up the **FDO Download Wizard** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Throughout the wizard, the following buttons Back and Next will be available			

Back

Takes you back to the last step

Next

Takes you to the next step

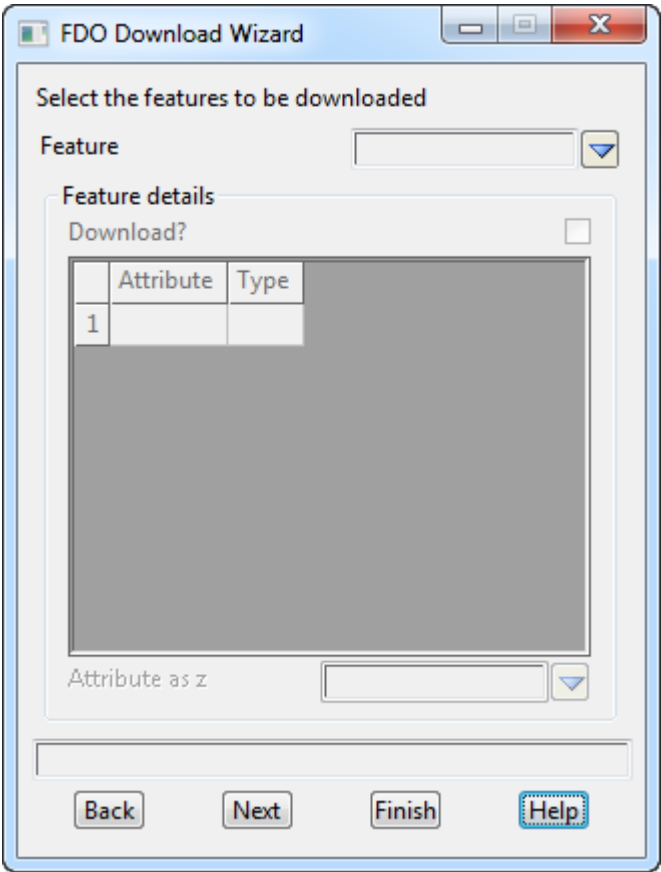
Function

an optional function to create for this FDO download

Server

the server to connect to

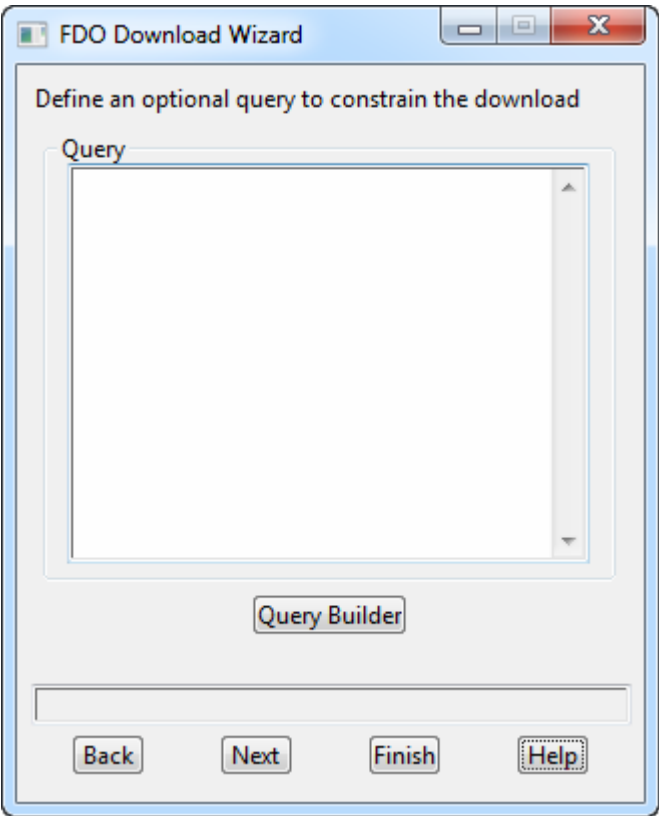
Feature Selection Step



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Feature <i>the feature to view settings for</i>	choice box		
Download? <i>whether or not to download this feature</i>	tick box		
Attribute as z <i>which attribute, if any, to use as the z level for strings</i>			

Query Step



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

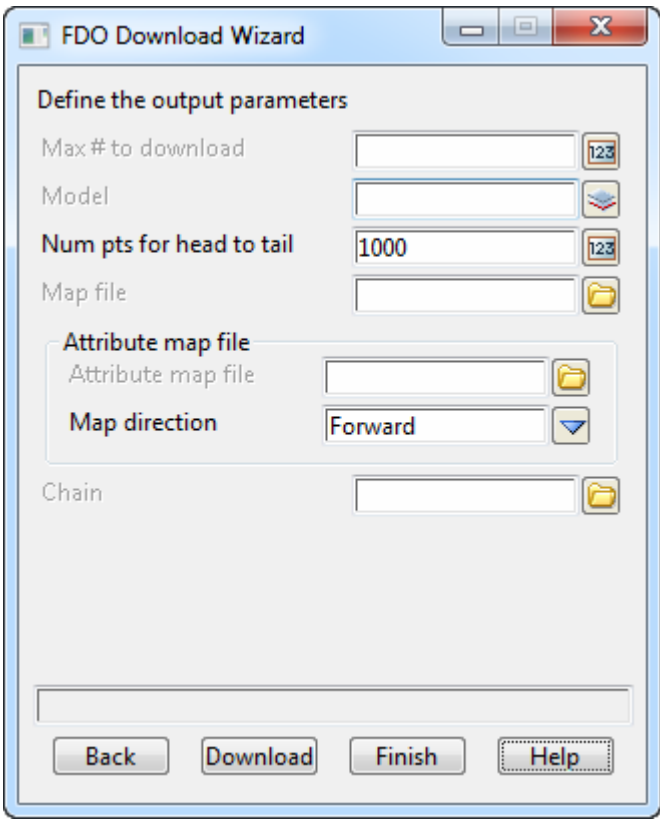
Query

the query to send to the server to constrain features

Query Builder

*opens the **FDO Query builder** panel. See the section on [Query Building](#)*

Output Parameters Step



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Define the Output parameters

Max # to download

the maximum number of strings to download

Model	model box
--------------	-----------

an optional model to download into

Num pts for head to tail

an optional number of points for head to tailing point strings

Map file	file
-----------------	------

an optional map file to apply to downloaded strings

Attribute map file

Attribute map file	file
---------------------------	------

an optional attribute map file to apply to attributes

Map direction	choice box	Forward, Backward
----------------------	------------	-------------------

the direction to apply to the attribute map file

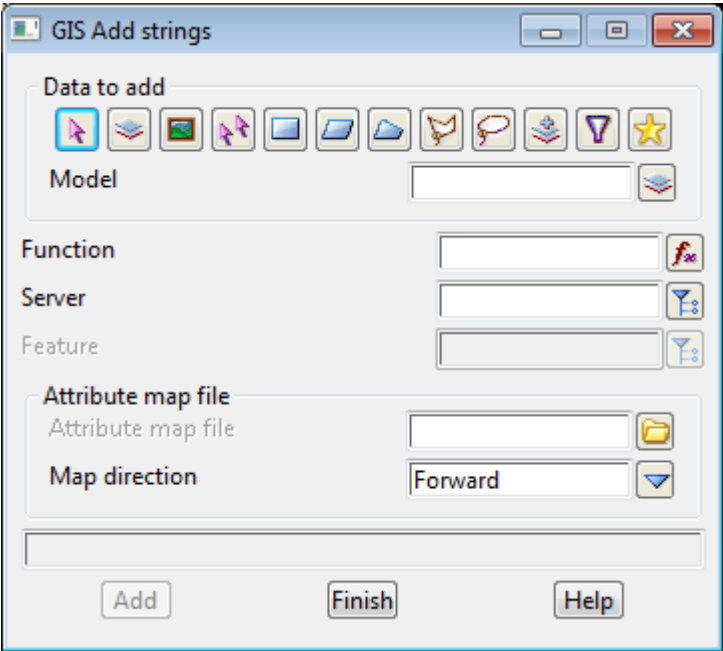
Chain	file
--------------	------

an optional chain to run after the download completes. This is only available if not run in a function.

Download button
downloads the requested features from the server

GIS Add Strings

Position of option on menu: File I/O =>GIS =>Add strings
This allows a user to add strings to a known server. This is only allowed if the server permits the operation.
Selecting Add strings brings up the **GIS Add Strings** panel.



The fields and buttons used in this panel have the following functions.			
Field Description	Type	Defaults	Pop-Up
Data to add			
<i>the data set to add to the server</i>			
Function			
<i>the existing FDO function to which strings will be added</i>			
Server			
<i>the server to connect to</i>			
Feature			
<i>the feature to add strings to</i>			
Attribute map file			
Attribute map file			
<i>an attribute map file to apply to any strings to be uploaded</i>			
Map direction	choice box		Forward, Backward
<i>the direction of mapping</i>			
Add	button		

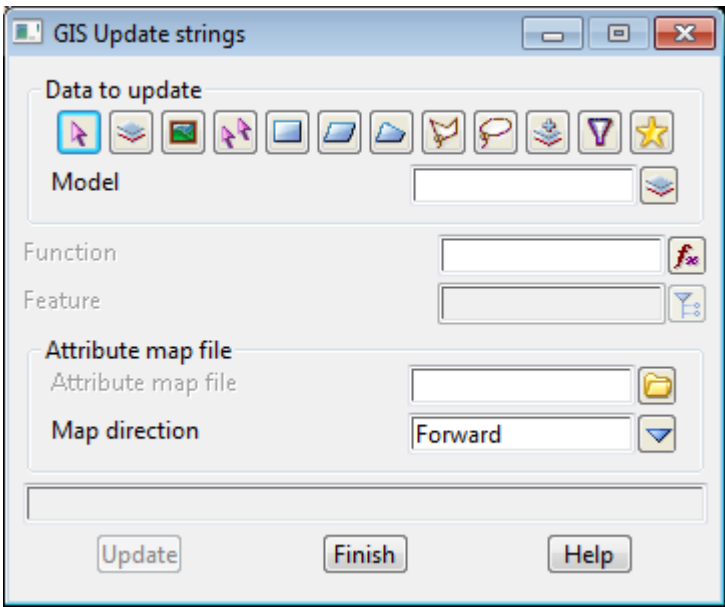
uploads the new strings to the server. Disabled until the function and server are set.

GIS Update Strings

Position of option on menu: File I/O =>GIS =>Update strings

This panel allows a user to upload / update strings on the remote server, if the server permits the operation.

Selecting **Update strings** brings up the **GIS Update Strings** panel.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Data to update

the data set of strings to update on the server

Function

the existing FDO function containing strings to be updated

Feature

the feature to update

Attribute map file

Attribute map file	file
<i>the attribute map file to apply</i>	

Map direction	choice box	Forward, Backward
<i>the attribute map file direction to apply to the attribute map file</i>		

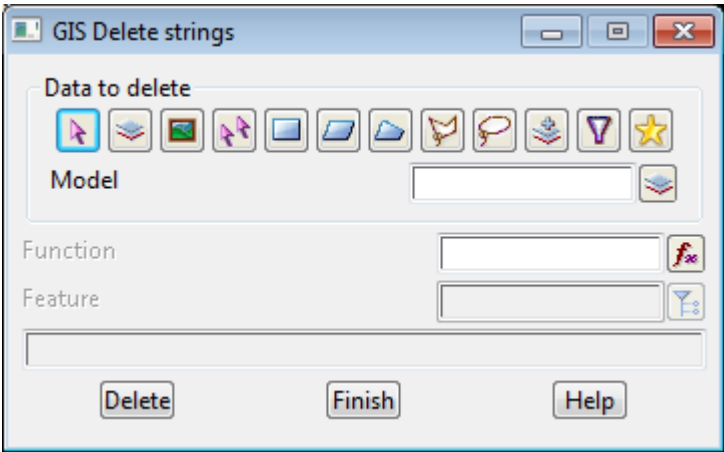
Update	button
<i>Connects to the server and sends the strings to be updated</i>	

GIS Delete Strings

Position of option on menu: File I/O =>GIS =>Delete strings

This panel allows a user to delete strings from the FDO server, if the server permits the operation.

Selecting **Delete strings** brings up the **GIS Delete Strings** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data to delete

the data set to delete from the server

Function

the existing FDO function containing the strings to be deleted

Feature

the feature from which the strings will be deleted

Delete

button

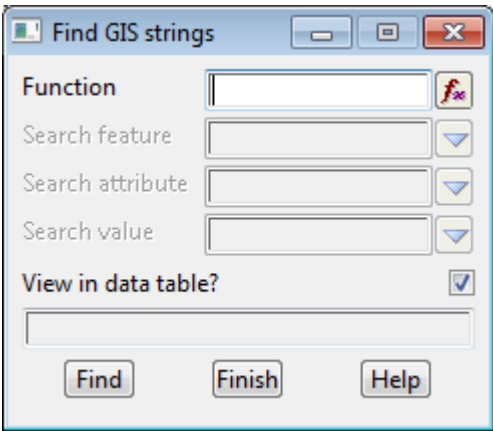
Connects to the server and deletes the specified strings

Find GIS Strings

Position of option on menu: File I/O =>GIS =>Find

This allows a user to find downloaded strings by a feature and an optional attribute / value pair.

Selecting **Find** brings up the **Find GIS Strings** panel.



The fields and buttons used in this panel have the following functions.

Field Description Type Defaults Pop-Up

Function

the FDO function containing the strings. Once entered, the list of features will become available

Search feature

the feature to search through

Search attribute

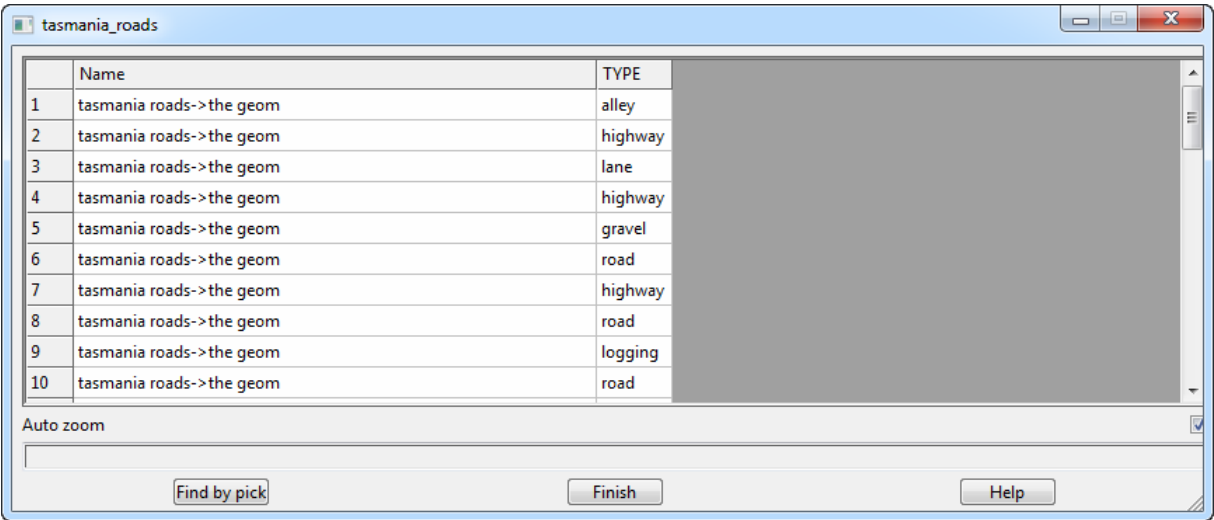
an optional attribute to search for. If not set, all strings in the feature will be found

Search value

the value of the attribute to search for

View in data table? tick box

whether or not to view in a separate data table or in the output window. The data table, below, will pan when the row is selected.



Auto zoom tick box

whether or not to zoom to the selected feature

Find by pick

finds a row based on a string selection

Find button

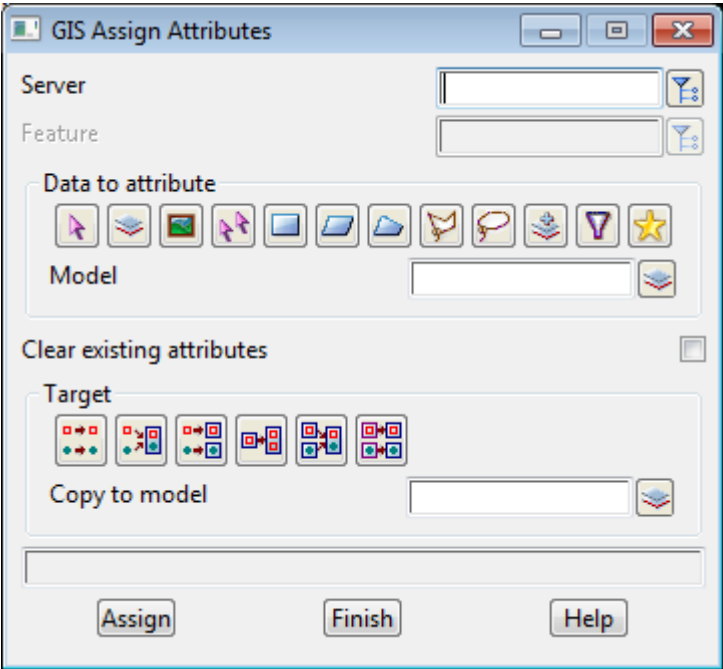
Finds the strings

GIS Assign Attributes

Position of option on menu: File I/O =>GIS =>Assign Attributes

This panel allows you to take the schema from a server and feature and create attributes with default values to a data set.

Selecting **Assign Attributes** brings up the **GIS Assign Attributes** panel.



The fields and buttons used in this panel have the following functions.

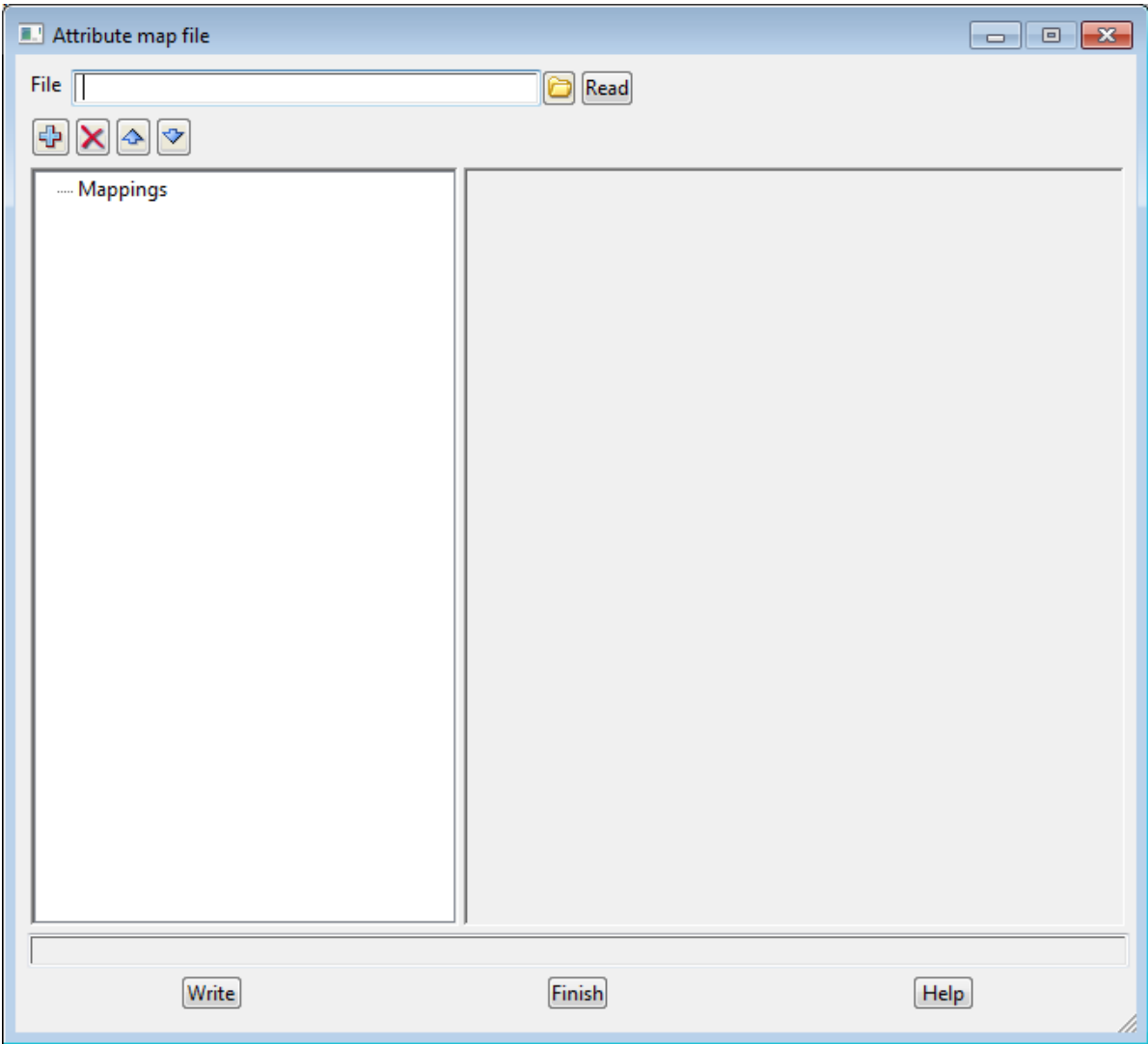
Field Description	Type	Defaults	Pop-Up
Server			
<i>the server to connect to</i>			
Feature			
<i>the feature to use the schema from</i>			
Data to attribute			
<i>the data set to apply feature attributes to</i>			
Clear existing attributes	tick box		
<i>whether or not to clear existing attributes from the data set</i>			
Target			
<i>the target data set</i>			
Assign	button		
<i>assigns the feature attributes to the data source / target set</i>			

Attribute Map File

Position of option on menu: File I/O =>GIS =>Attribute map file editor

This panel allows you to define a mapping from one attribute format to another. This allows you to map from attributes defined by an external data source to meet your attribute schema requirements, or vice versa.

Selecting **Attribute map file editor** brings up the **Attribute map file** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
File <i>the attribute mapping file to edit</i>			
Read <i>reads the file</i>	button		
Insert <i>adds a new mapping</i>			
Delete			

deletes the select mapping

Up

Moves the mapping up in the list

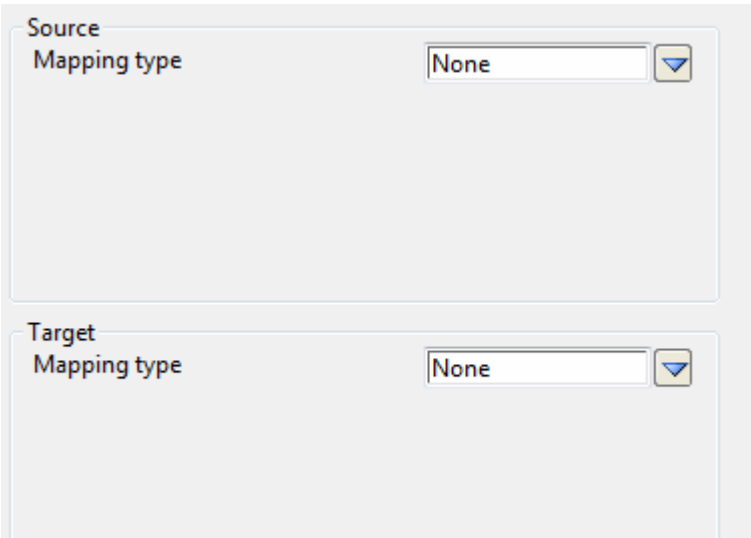
Down

Moves the mapping down in the list

Write button

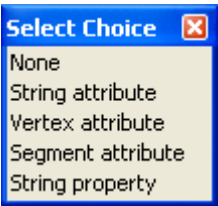
writes the mapping

After selecting **insert** the **Source Mapping Type** choice box and **Target Mapping Type** choice box appear on the screen.



Source Mapping Type choice box

the type of attribute to map from



For String attribute see [String/Vertex/Segment attribute](#)

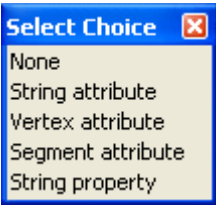
Vertex attribute see [String/Vertex/Segment attribute](#)

Segment attribute see [String/Vertex/Segment attribute](#)

String property see [String Property attribute](#)

Target Mapping Type choice box

the type of attribute to map to



For String attribute see [String/Vertex/Segment attribute](#)
Vertex attribute see [String/Vertex/Segment attribute](#)
Segment attribute see [String/Vertex/Segment attribute](#)
String property see [String Property attribute](#)

String/Vertex/Segment attribute

Mapping type	String attribute	
Name	<input type="text"/>	
Expected type	<input type="text"/>	
Date format	<input type="text"/>	
Default value	<input type="text"/>	

Name
the name of the attribute

Expected type choice box
the type of attribute to be expected

Date format
an optional date format (to convert to/from a date string)

Default value
an optional default value to use if the attribute is not found

String Property attribute
Maps to / from a property on a string, such as colour, name, height, weight etc.

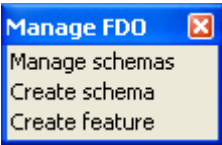
Mapping type	String property	
Properties	<input type="text"/>	
Default value	<input type="text"/>	

Properties choice box
the property to map to / from

Default value
an optional default value to use if the value is not found

Manage FDO

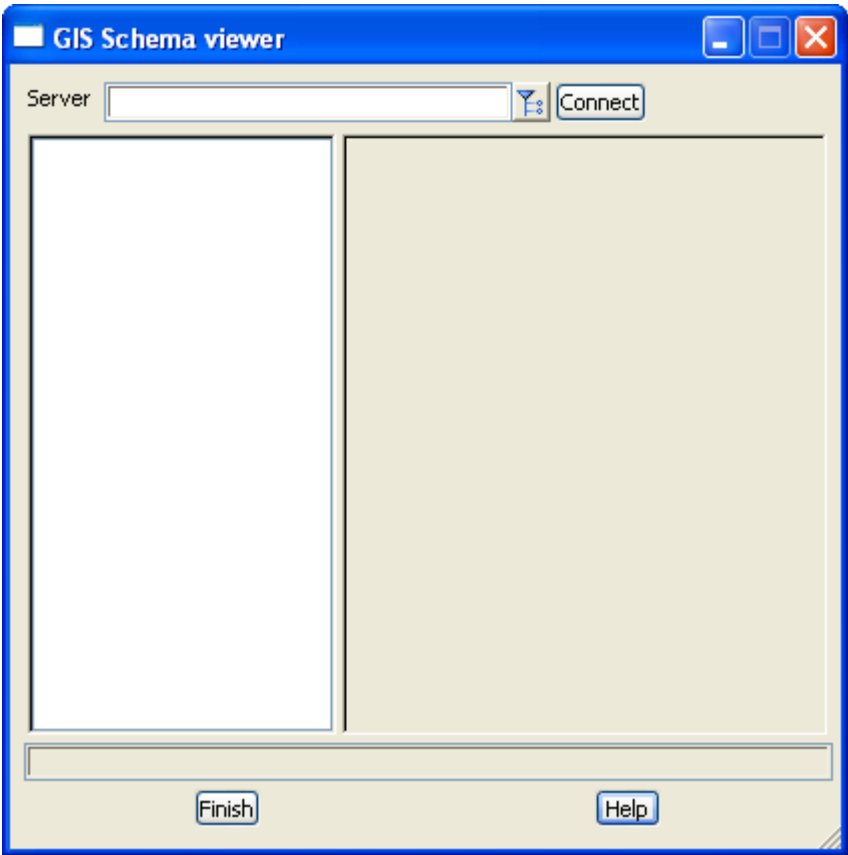
Position of option on menu: File I/O =>GIS =>Manage
The **Manage FDO** walk-right menu containing these options is:



For the option Manage Schemas go to [GIS Schema Viewer](#)
Create Schema [Create FDO Schema](#)
Create Feature [Create GIS Feature](#)

GIS Schema Viewer

Position of option on menu: File I/O =>GIS =>Manage => Manage Schemas
This panel allows you to view and edit schemas, if editing is permitted by the server.
Selecting **Manage Schemas** brings up the **GIS Schema Viewer** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Server			
<i>the server to view schemas for</i>			

Connect button
connects to the server and downloads all schema information available

When a schema is selected, the right side of the panel will display:

The screenshot shows a software panel with a 'Name' field containing 'Features' and a 'Description' text area below it. At the bottom of the panel are two buttons: 'Delete' and 'Create feature'.

Delete button
deletes the selected schema - only available if permitted by the server

Create feature button
creates a new feature in this schema - only available if permitted by the server

When a feature is selected, the right side of the panel will display the list of attributes and their types.

The screenshot shows a software panel with a 'Projection name' field containing 'Unknown'. Below it is a table with two columns: 'Name' and 'Type'. The table has two rows: row 1 with 'ID' and 'Data - Int16', and row 2 with empty cells. At the bottom of the panel are two buttons: 'Edit' and 'Delete'.

	Name	Type
1	ID	Data - Int16
2		

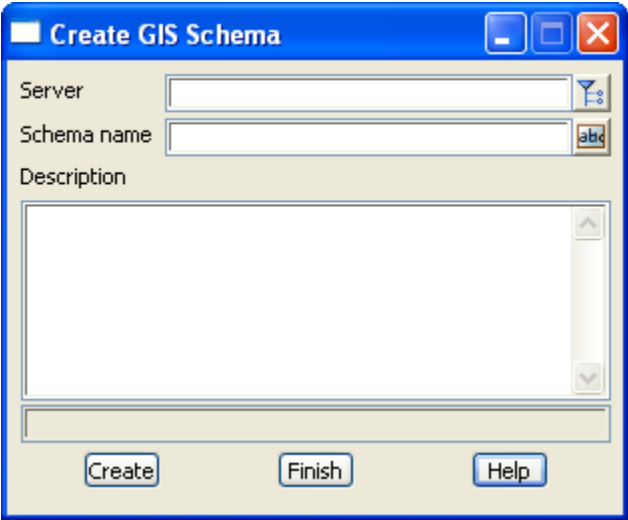
Edit
edits the selected feature see [Create GIS Feature](#)- only available if permitted by the server

Delete
deletes the current feature - only available if permitted by the server

Create FDO Schema

Position of option on menu: File I/O =>GIS =>Manage => Create Schema

This panel creates a new schema on a remote server, if the operation is permitted by the server. Selecting **Create Schema** brings up the **Create GIS Schema** panel.



The fields and buttons used in this panel have the following functions.

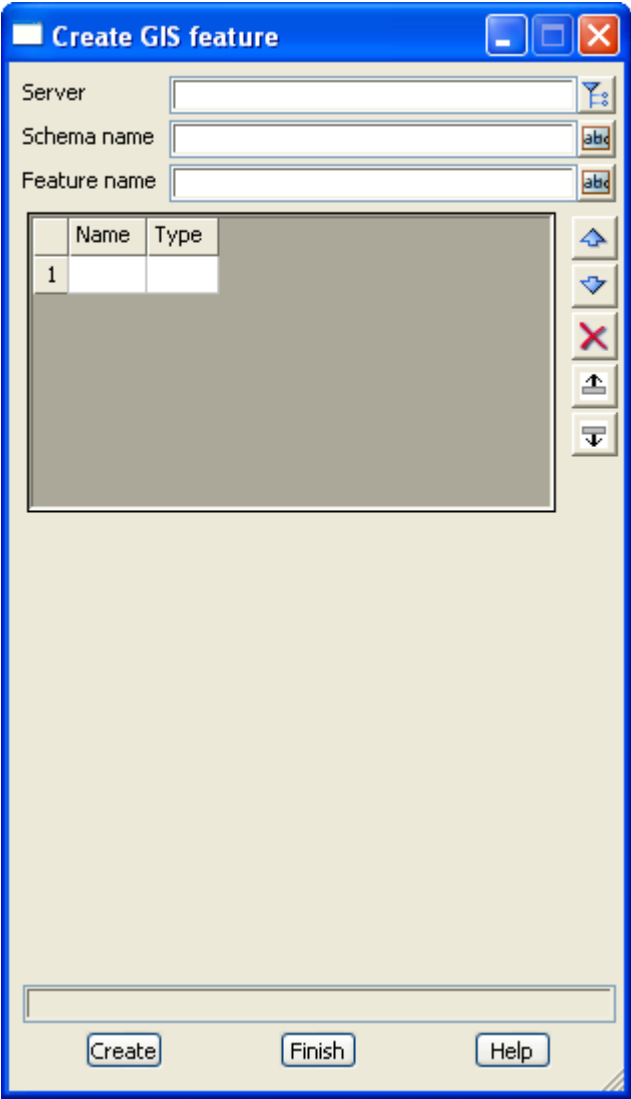
Field	Description	Type	Defaults	Pop-Up
Server				
	<i>the name of the server to create a schema on</i>			
Schema name				
	<i>the name of the schema</i>			
Description				
	<i>an optional description about the schema</i>			
Create				
	button			
	<i>attempts to create the new schema on the remote server</i>			

Create GIS Feature

Position of option on menu: File I/O =>GIS =>Manage => Create feature

This panel creates a new feature in a schema, if the remote server permits the operation.

Selecting Create feature brings up the **Create GIS Feature** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Server			
<i>the name of the server to create the feature</i>			
Schema			
<i>the name of the schema to create a feature in</i>			
Feature name			
<i>the name of the feature to create</i>			
Grid Column Name			
<i>the name of the attribute to create</i>			

Grid Column Type

the type of attribute to make

Each row in the grid has a number of additional parameters to fill in.
The standard set of fields are:

Description

Default value

Identifier?

☐

Auto generate?

☐

Nullable?

☐

Read only?

☐

Description

a description of the attribute

Default value

an optional default value

Identifier? tick box

whether or not this attribute is an identifier attribute

Nullable? tick box

whether or not this attribute is nullable (can have a null value)

Auto generate? tick box

whether or not the server should auto generate the value of the attribute

Read only? tick box

whether or not the attribute is a read only attribute

Geometry attributes have the following fields:

Description

Has z values?

☐

Description

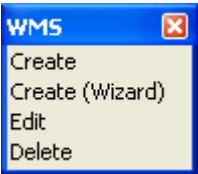
a description of the attribute

Has z values? tick box
whether or not the geometry contains z values

WMS

Position of option on menu: File I/O =>GIS =>WMS
Position of option on menu: Strings =>WMS

The WMS walk-right menu containing these options is:



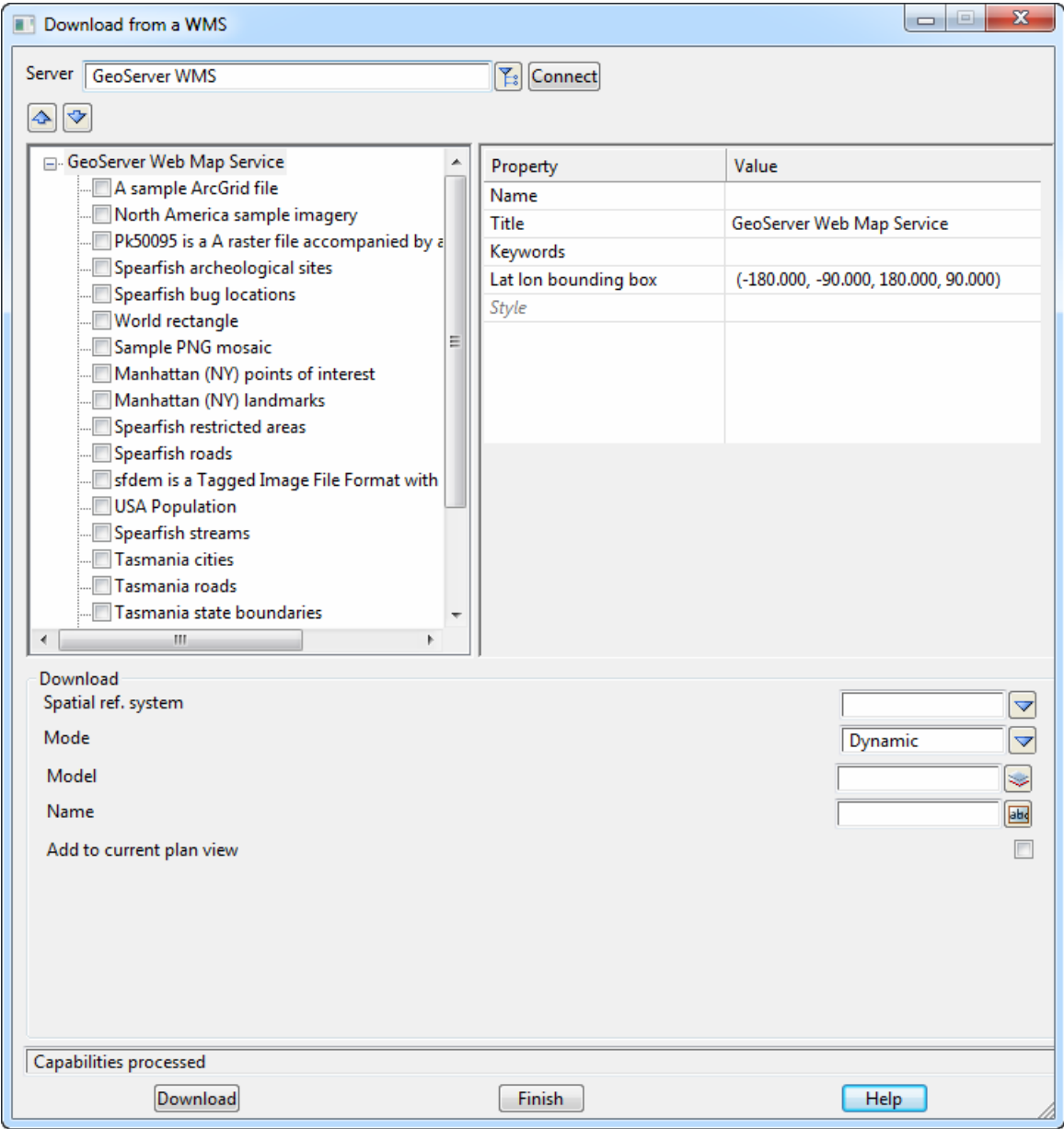
For the option Create go to	Download from a WMS
Create (Wizard)	WMS Wizard
Edit	Edit a WMS Image
Delete	Delete a WMS Image

Download from a WMS

Position of option on menu: File I/O =>GIS =>WMS =>Create

This panel allows you to set up an image to be downloaded from a **WMS (Web Mapping Server)**, either dynamically or as a once off download.
Selecting Create brings up the **Download from a WMS** panel.





The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Server			
<i>the WMS server to download from</i>			
Connect	button		
<i>connects to the server and downloads the schema</i>			
Up arrow			
<i>moves the layer up in order in which they will be downloaded.</i>			
Down arrow			
<i>moves the layer down in order in which they will be downloaded.</i>			
Spatial ref system			

the spatial reference system to use when downloading

Mode choice box Dynamic, Save as file
Dynamic (update as you pan around), or Save as file

Model model box
the model to add a dynamic WMS image to

Name
the name of the image

Add to current plan view tick box
Whether or not to add to the current plan view

If the mode is **Save as file**, the following fields will be displayed.:

Mode: Save as file
Format:
Bounding box:
Maintain bounding box ratio:
Size: Width: Height:
Save as:

Format
the format of the image to download

Bounding box
whether or not to define a bounding box

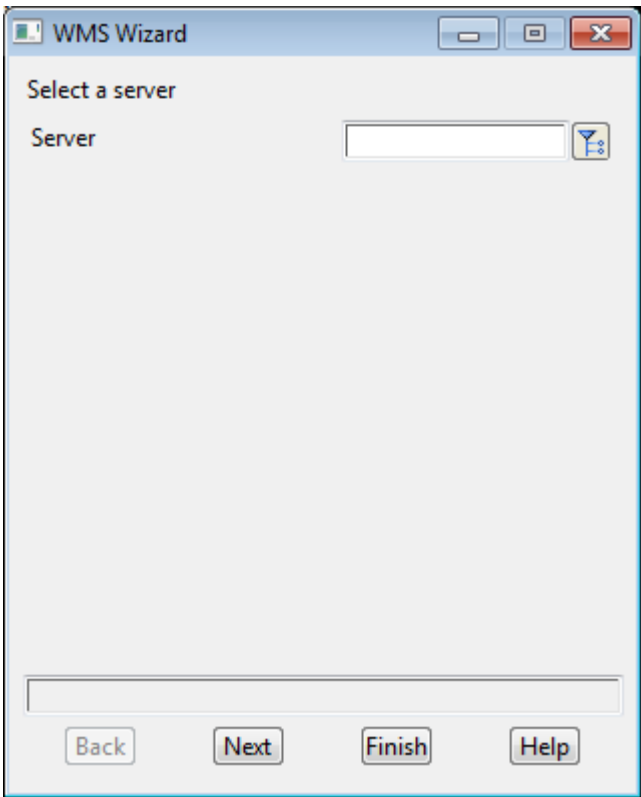
Maintain bounding box ratio
whether or not to maintain the ratio of the bounding box on the server

Size
defines the width and height of the image file

Save as
the target file for the image

WMS Wizard

Position of option on menu: File I/O =>GIS =>WMS =>Create (Wizard)
This panel allows you to set up an image to be downloaded from a **WMS (Web Mapping Server)**, either dynamically or as a once off download, via a wizard like interface.
Selecting Create (Wizard) brings up the **WMS Wizard** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Throughout the wizard, the following buttons will be available:

Back

Takes you back to the last step

Next

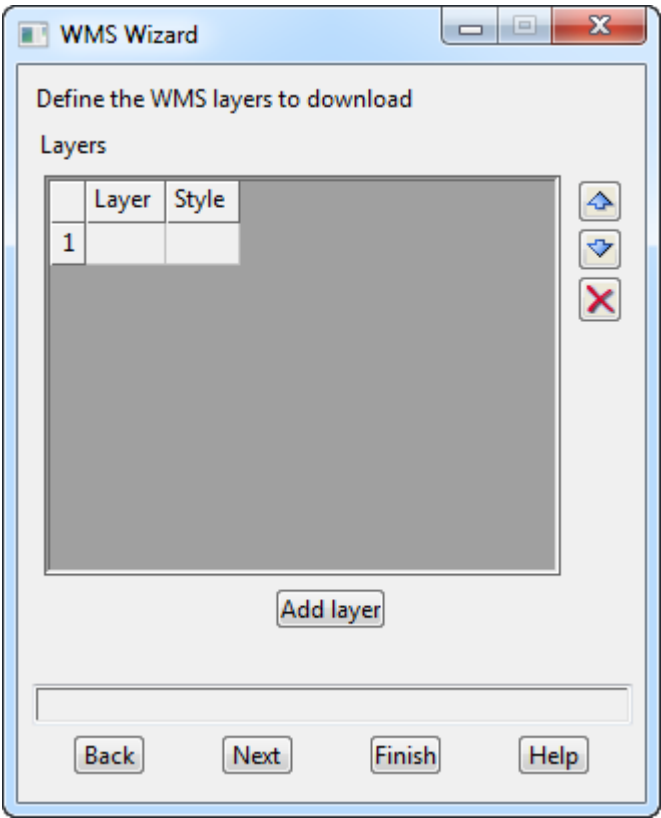
Takes you to the next step

Server

the server to download from

Layer Selection Step

This panel allows you to select the layers to be downloaded

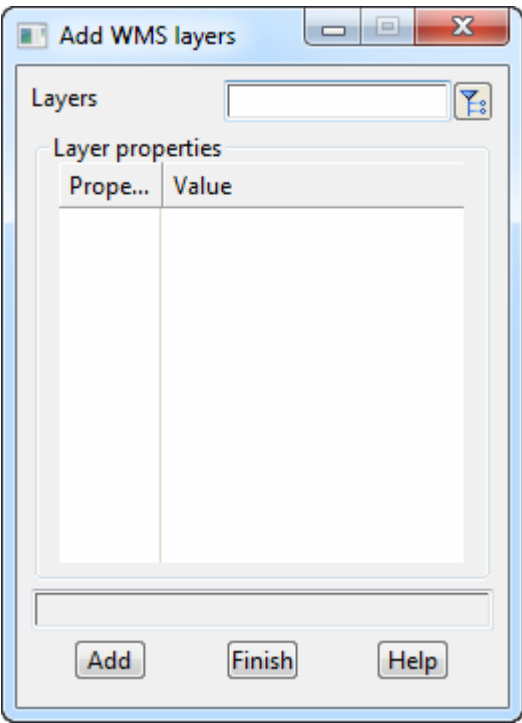


Add layers button

shows the list of layers to be downloaded

*Selecting **Add layers** bring up the **Add WMS layers** panel*

Add WMS layers

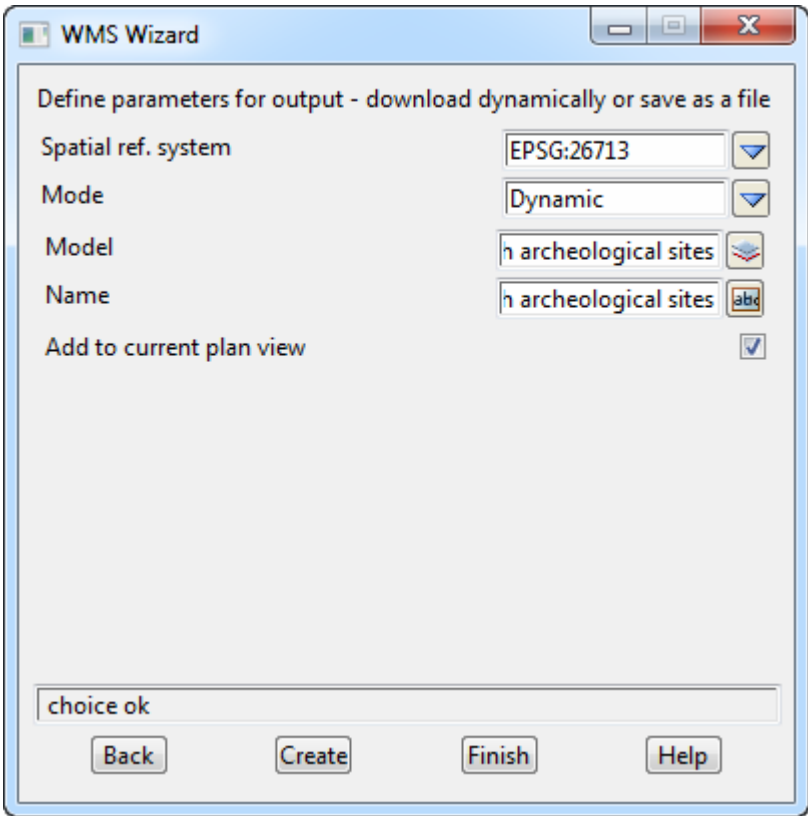


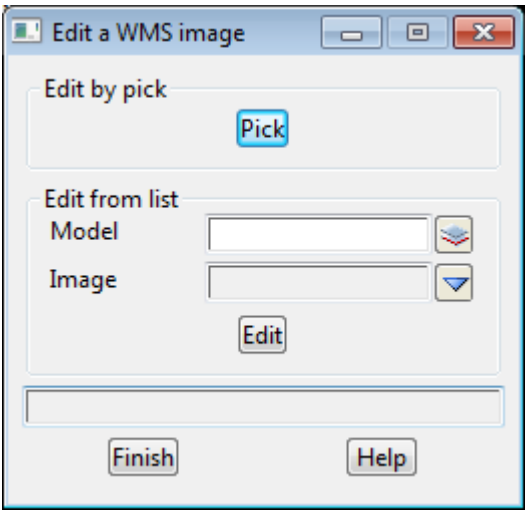
Layers

the layer to add or view properties

Add

adds the layer





The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Edit by Pick

Pick	button
<i>pick the WMS image to string, by picking its extent</i>	

Edit from list

Model	model box
<i>the model to look for WMS images in</i>	

Image	
<i>the WMS image within the model to edit</i>	

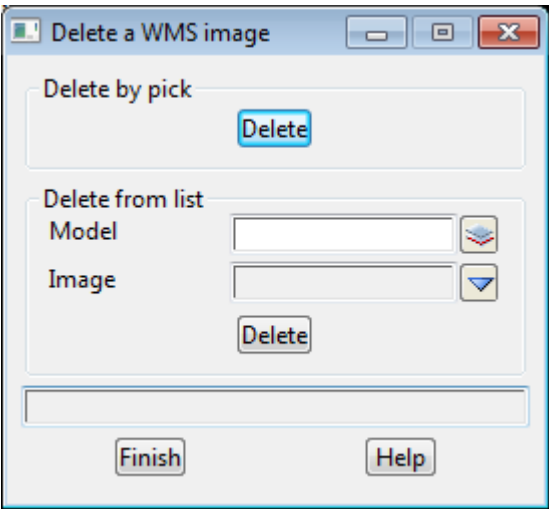
Edit	button
<i>edits the selected WMS image</i>	

Delete a WMS Image

Position of option on menu: File I/O =>GIS =>WMS =>Delete

Deletes a **WMS** image, as selected by picking or by specifying by model and image name.

Selecting **Delete** brings up the **Delete a WMS Image** panel.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Delete by pick

Delete		button		
	<i>pick the WMS image to string, by picking its extent</i>			

Delete from list

Model		model box		
	<i>the model to look for WMS images in</i>			

Image				
	<i>the WMS image within the model to delete</i>			

Delete				
	<i>delete the selected WMS image</i>			

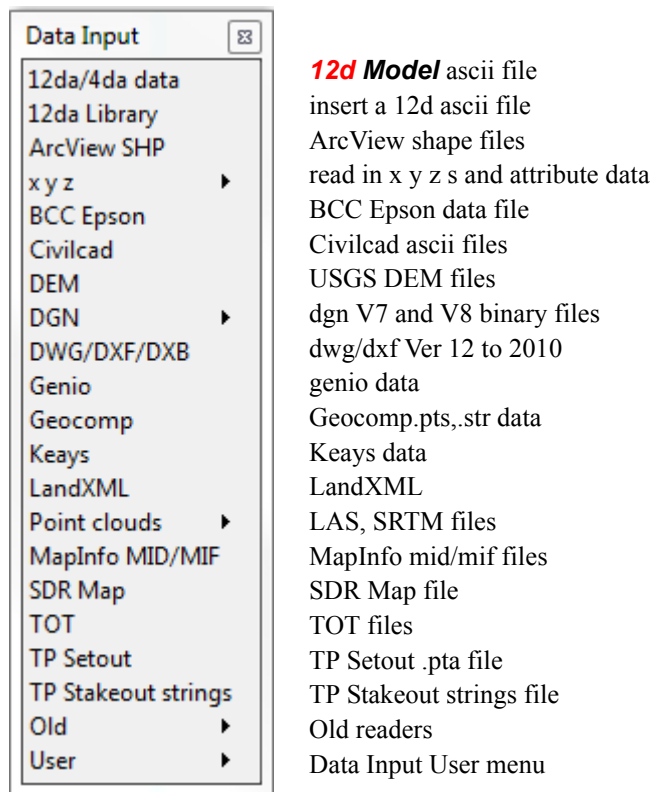
10 Data Input

Position of menu: File I/O =>Data input

The facilities for reading data files into **12d** Model are collected under the **File i/o=>Data input** menu.

Some of the formats are provided in the base product (xyz data, BCC Epson, **12d** Model HP plots and **12d** Model ascii files) and the rest are optional (dxf, genio, geocomp, etc.).

The default *Input null value* is described in the section [Input Null Value](#)



The default *Input null value* is described in the section [Input Null Value](#)

For the option *12da data*, go to

12da Library

ArcView SHP

x y z

BCC Epson

Civilcad

DEM

DGN

DWG/DXF/DXB

Genio

Geocomp

Keays

LandXML

[12d Ascii Input](#)

[12da Library](#)

[ArcView SHP Input](#)

[Input X Y Z Text Files](#)

[BCC Epson Input](#)

[CivilCad Input](#)

[DEM Input](#)

[Input DGN Binary Files](#)

[DWG/DXF Input.](#)

[Genio Input.](#)

[Geocomp Input.](#)

[Keays Input.](#)

[LandXML Input.](#)

Point clouds

MapInfo

SDR Map

TOT

TP Setout

TP Stakeout strings

Old

[Input Point Cloud Files](#)

[Mapinfo Input.](#)

[SDR Map Input.](#)

[TOT Input.](#)

[TP Setout Input.](#)

[TP Stakeout Strings Input.](#)

[Old Inputs](#)

Input Null Value

In three dimensional data, it is possible that a point can have a valid plan position but an undefined height. In **12d** Model, there is a special **null** value (-9.9e29) which is used internally when height is undefined.

In other software systems, the null value may be different.

To allow for different null values, **12d** Model has an **i/o null height** parameter.

As data is read in, the height is checked and if it is equal to the **i/o null height**, then it is replaced by the **12d** Model null height.

The **i/o null height** is set in **Default Settings** tab of the **Defaults** panel in the **Project =>Management =>Defaults** (see [Defaults](#)).

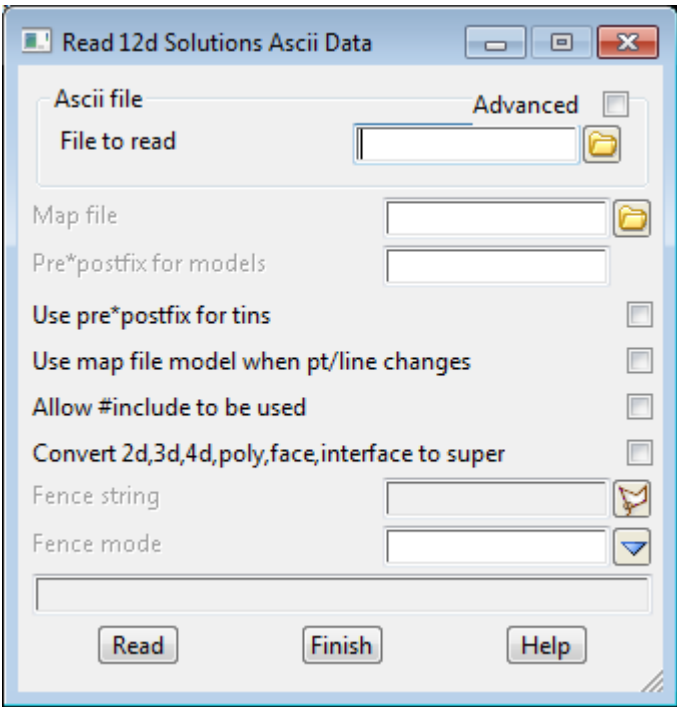
Note - some input panels have their own special null value field which is used instead of the **i/o** null height.

12d Ascii Input

Position of option on menu: File I/O =>Data input =>12d/4da data

The 12d Ascii format is a special format defined by 12D Solutions to allow data to be easily transferred from other programs into 12D Solutions software such as 12d Model. The 12d Ascii format is given in the Appendix.

Selecting the 12d/4da data brings up the **Read 12d Solutions Ascii Data** panel:

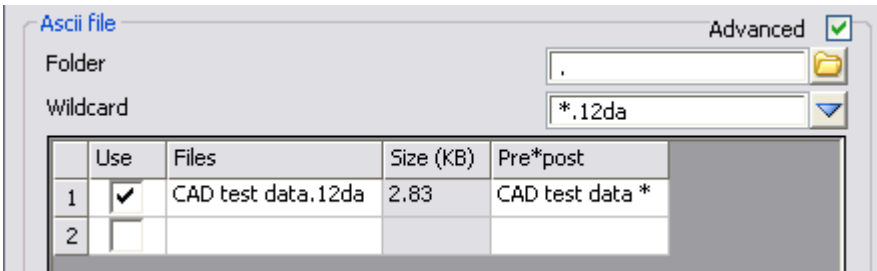


The fields and buttons used in this panel have the following functions.

Field Description Type Defaults Pop-Up

Advanced tick box

*if **ticked**, a grid to allow multiple 12d ascii files to be read in, is opened. A wild card is used to select all the files to be read in.*



Folder folder box

folder to search for files using the Wild card

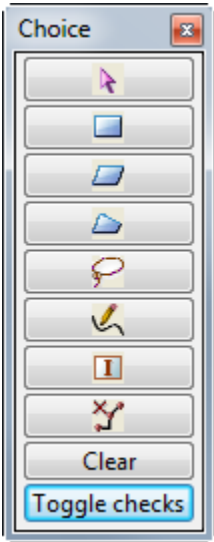
Wildcard input

wild card to use in search for files in the given folder

Use tick box

*if **ticked**, read in the file*

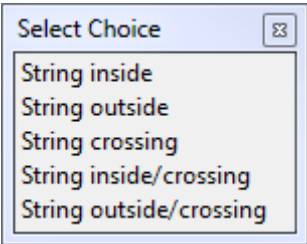
Files	output	
<i>name of the file in the folder</i>		
Size (KB)	output	
<i>file size</i>		
Pre*post	text input	
<i>if non blank, pre*post text to use for the models in this 12d ascii file (see Pre*Postfix Panel Fields) for information on using pre*postfix.</i>		
<i>If blank, use the pre*post text from the Pre*postfix for models panel field.</i>		
 <i>Note - if a non-blank value for Pre*post is given in the column for a file then the Pre*postfix for models is ignored.</i>		
File to read	file box	*.12da or *.4da files
<i>name of the 12d Model Ascii file to be read in.</i>		
Map file	file box	*.mf files
<i>if non-blank, the name of the 12d map file to be used for all strings read in, including any files given with the Advanced mode ticked on.</i>		
<i>If blank, no map file is used</i>		
 <i>When using a map file, the string name is used as the entity-name for matching with the keys in the map file. See the section Create/Edit a Map File in the chapter File I/O for information about 12d map files.</i>		
Pre*postfix for models	pre*postfix box	
<i>if non-blank, a prefix and a postfix to be applied to the model names used in the mapping file.</i>		
<i>Go to the section Pre*Postfix Panel Fields for information on using pre*postfix.</i>		
 <i>Note - if a non-blank value for Pre*post is given in the column for a file then the Pre*postfix for models is ignored.</i>		
Use pre*postfix for tins	tick box	not ticked
<i>if ticked, a prefix and a postfix are to be applied to any tin names in the 12d Ascii data.</i>		
<i>Go to the section Pre*Postfix Panel Fields for information on using pre*postfix.</i>		
 <i>Warning - if a tin already exists in 12d Model with the tin name, then the tin cannot be read in from the 12d Ascii file.</i>		
Use map file model when pt/line changes	tick box	
<i>if not ticked and the pt/line type of the string does not match that in the map file, then the string is placed in.</i>		
<i>If tick, the.</i>		
Allow #include to be used	tick box	
<i>if ticked, expand an files referenced by an #include.</i>		
<i>If not ticked, ignore the #includes</i>		
Convert 2d, 3d, 4d, poly, face, interface to super	tick box	
<i>if ticked, 2d/3d/4d/poly/face/interface strings are converted to super strings.</i>		
Fence string	polygon box	
<i>A polygon is selected/created and used with the Fence mode choice to restrict the selection of strings read in from the 12d Ascii file.</i>		
<i>Clicking LB on the Select Polygon icon on the right hand side of the Fence string field allows the user to select a polygon.</i>		
<i>Clicking RB on the Select Polygon icon on the right hand side of the Fence string field brings up the Polygon Choice Box for the user to select a method of creating/selecting a polygon.</i>		



Clicking MB does nothing.

Fence mode choice box available choices

The strings selected are then restricted to those using the polygon and satisfying the Fence mode:



String inside - strings totally inside the polygon
String outside - strings totally outside the polygon
String crossing - strings crossing the polygon
String inside/crossing - strings totally inside or crossing the polygon
String outside/crossing - strings totally outside or crossing the polygon

Fence Modes

Read button

reads the data in.

12da Library

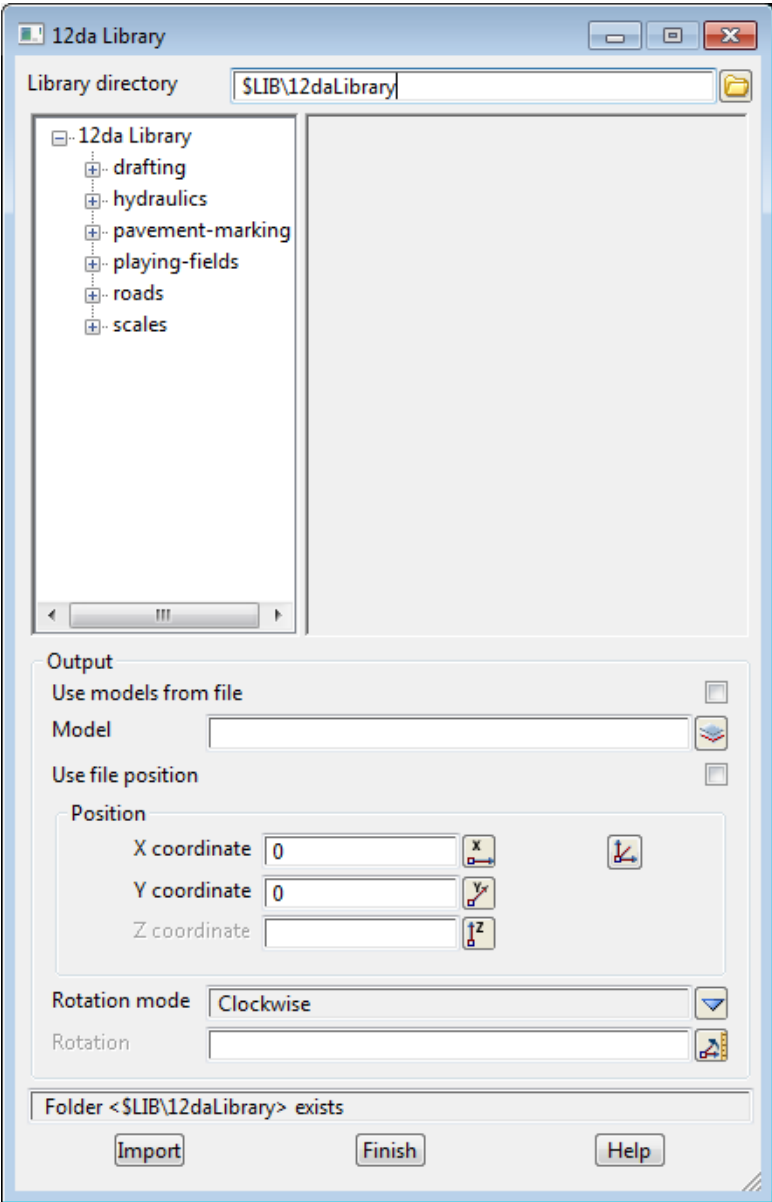
Position of option on menu: File I/O =>Data input =>12da Library

The **12da Library** allows a user to load 12das from a 'library', defined by a directory structure.

Every folder within the nominated directory will be searched for 12da files, and this directory structure will be shown in the tree on the left hand side of the panel. When selected, the 12da will be shown in a preview on the right.

These 12das can be output into a nominated model, and a specific position, or you can choose to use the file position.

Selecting **12da Library** brings up the **12da Library** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Library directory	file		
<i>the directory to search for 12das in</i>			

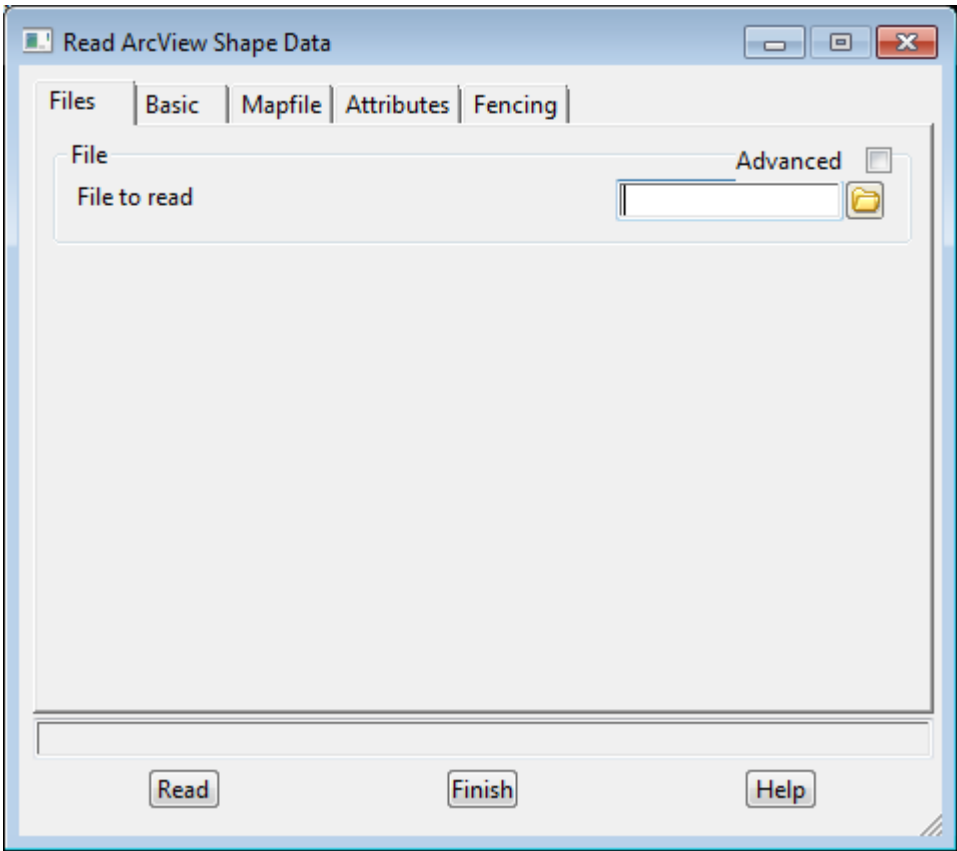
Use models from file	tick box	
<i>if ticked use the models specified in the 12da</i>		
Model	model box	
<i>if not using the models listed in the file, the model for the data in the 12da</i>		
Use file position	tick box	
<i>if ticked use the file specified in the file position</i>		
Position x coordinate		
<i>the x-coordinate for the data, if not using the position in the file</i>		
Position y coordinate		
<i>the y-coordinate for the data, if not using the position in the file</i>		
Position z coordinate		
<i>an optional y-coordinate for the data, if not using the position in the file</i>		
Rotation mode	choice box	Clockwise, Anti- clockwise
<i>how to apply an optional rotation (Clockwise or Anti -clockwise)</i>		
Rotation		
<i>an optional rotation to apply</i>		

ArcView SHP Input

Position of option on menu: File I/O =>Data input =>ArcView SHP

Option to read in ArcView shaped files.

Selecting **ArcView SHP** brings up the **Read ArcView Shape Data** panel.



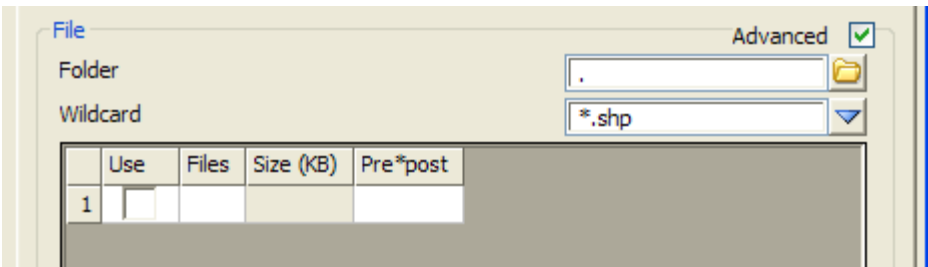
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Files tab

Advanced tick box

*if **ticked**, a grid to allow multiple ArcView shape files to be read in, is opened. A wild card is used to select all the files to be read in.*



Folder folder box
folder to search for files using the Wild card

Wildcard input

wild card to use in search for files in the given folder

Use tick box
if **ticked**, read in the file

Files output
name of the file in the folder

Size output
file size

Pre*post text input
if **non blank**, pre*post text to use for the models in this Arcview shp file (see [Pre*Postfix Panel Fields](#)) for information on using pre*postfix.
If **blank**, use the pre*post text from the Pre*postfix for models panel field.

Note - if a non-blank value for **Pre*post** is given in the column for a file then the **Pre*postfix for models** is ignored.

File to read file box *.shp files
name of the ArcView shape file. **12d Model** then reads this and the two (2) other files that go with the shape file. The two other file extensions are *.shx and *.dbf.
If no attribute is mapped to model, then the file name (minus the .shp) is used as the model for the data.

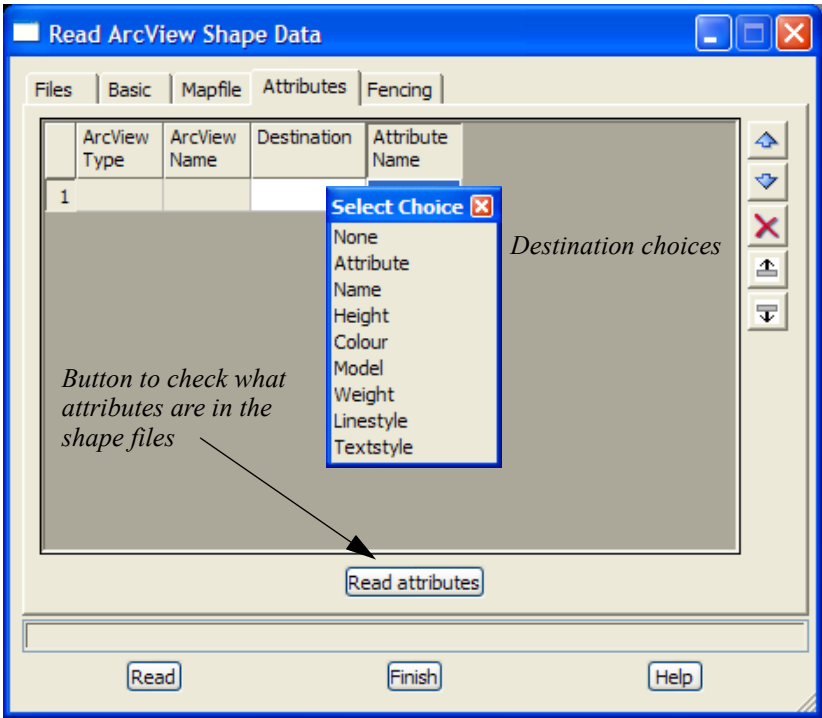
Map file tab

Map file file box *.mf and *.mapfile files
if **non-blank**, the name of the 12d map file to be used for all strings read in.
If **blank**, no map file is used

When using a map file, the string name is used as the entity-name for matching with the keys in the map file. See the section [Create/Edit a Map File](#) in the chapter [File I/O](#) for information about 12d map files.

Pre*postfix for models pre*postfix box
if non-blank, a prefix and a postfix to be applied to the model names used in the mapping file.
Go to the section [Pre*Postfix Panel Fields](#) for information on using pre*postfix.

Attributes tab



Read attributes button

Click to check what attributes are present in the ArcView shape files and any ArcView attributes found are listed in the **ArcView Type** and **ArcView Name** columns in the grid.

Destination Grid column

type of 12d attribute to map the Arcview attribute to:

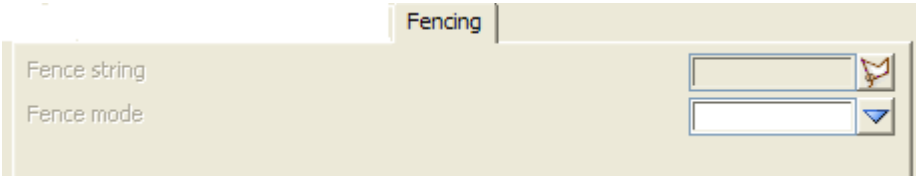
- none - don't use the attribute - the attribute is ignored
- attribute - use as 12d attribute
- name - use as 12d string name
- height - use as 12d vertex height
- colour - use as 12d string colour
- model - use as model name
- weight - use as string weight
- linestyle - use as 12d linestyle
- textstyle - use as 12d textstyle

Note - if no ArcView attribute is mapped to Model, then the file name (minus the .shp) is used as the model for the data.

Attribute name Grid column

if non blank and the ArcView attribute is being sent to a 12d attribute, then this is the s12d attribute name

Fencing tab



Fence string polygon box

string to use to restrict the data being read in.

Fence mode choice box

String inside

String inside/crossing
String outside
String outside/crossing
String crossing

String inside - read string in if it is totally inside the polygon
String inside/crossing - read string in if it is totally inside, or crossing the polygon
String outside - read string in if it is totally outside the polygon
String outside/crossing - read string in if it is totally outside, or crossing the polygon
String crossing - string in if it is crossing the polygon
Note - only whole strings are read in.

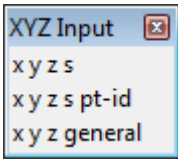
Read button
read the data in.

Input X Y Z Text Files

Position of menu: File I/O =>Data input =>x y z

The options under x y z read in vertices of strings from a text format. It is also possible to read in string names, point id's, string, segment and vertex attributes.

The X Y Z walk-right menu is



- read in x y z s data
- user specified x y z s point id
- user specified x y z s point no and attribute

For x y z s, go to
x y z pt_id
x y z general

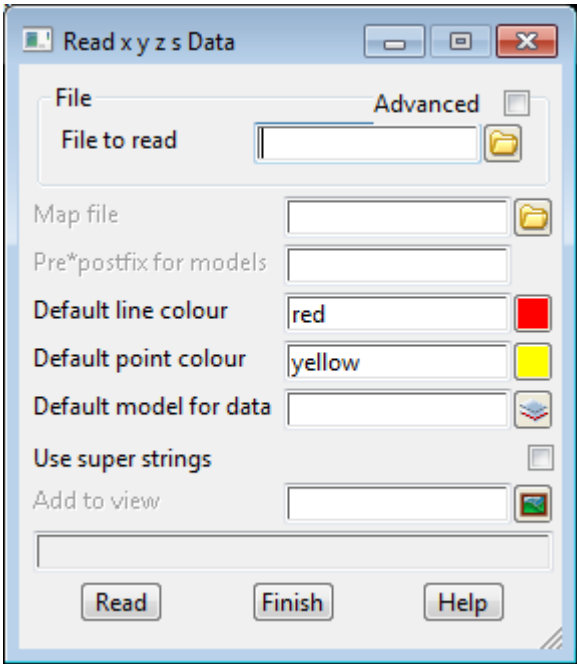
- [X Y Z Input](#)
- [X Y Z user Format Input](#)
- [X Y Z and Attributes User Format Input](#)

X Y Z Input

Position of option on menu: File I/O =>Data input =>x y z s

The x-y-z-s option reads in the xyzs format which is designed so that point and line strings can be quickly and easily coded and entered into 12d Model. It is **not** intended for more complex strings such as alignments and text where the 12d Model ascii format is more suitable. See [Input X Y Z S File Format](#))

Selecting xyzs brings up the **Read xyzs Data** panel.

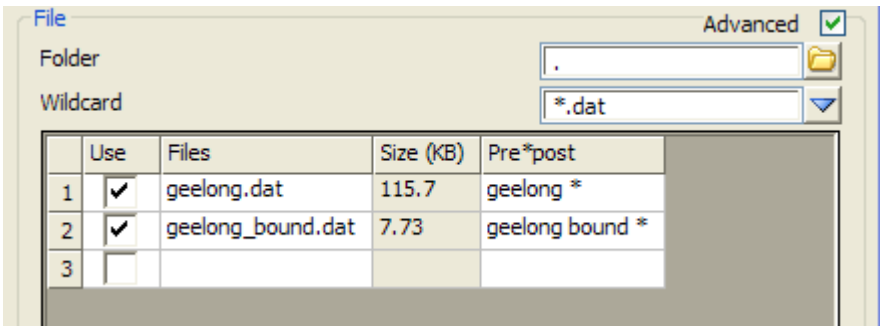


The fields and buttons used in this panel have the following functions.

Field Description Type Defaults Pop-Up

Advanced tick box

*if **ticked**, a grid to allow multiple files to be read in, is opened. A wild card is used to select all the files to be read in.*



Folder folder box

folder to search for files using the Wild card

Wildcard input

wild card to use in search for files in the given folder

Use tick box

*if **ticked**, read in the file*

Files	output	
<i>name of the file in the folder</i>		
Size	output	
<i>file size</i>		
Pre*post	text input	
<i>if non blank, pre*post text to use for the models in this xyzs file (see Pre*Postfix Panel Fields for information on using pre*postfix.</i>		
<i>If blank, use the pre*post text from the Pre*postfix for models panel field.</i>		
 <i>Note - if a non-blank value for Pre*post is given in the column for a file then the Pre*postfix for models is ignored.</i>		
File	file box	*.dat files
<i>name of the data file to be read in</i>		
Map file	map file box	*.mf files
<i>if non-blank, the name of the 12d map file to be used for all strings read in.</i>		
<i>If blank, no map file is used</i>		
 <i>When using a map file, the string name is used as the entity-name for matching with the keys in the map file. See the section Create/Edit a Map File in the chapter File I/O for information about 12d map files.</i>		
Pre*postfix for models	pre*postfix box	
<i>if non-blank, a prefix and a postfix to be applied to the model names used in the mapping file.</i>		
<i>Go to the section Pre*Postfix Panel Fields for information on using pre*postfix</i>		
Default line colour	colour box	default colour available colours
<i>colour used for line-strings (if no colour is defined in the file)</i>		
Default point colour	colour box	default pt colour available colours
<i>colour used for the crosses in point-strings (if no colour is defined in the file)</i>		
Default model for data	model box	available models
<i>name of the model that the data is to be placed in. The model will be created if it does not already exist. This field must be filled in.</i>		
Use super strings	tick box	
<i>if ticked, super strings will be created.</i>		
<i>If not ticked, 3d strings will be created.</i>		
Add to view	view box	available views
<i>if non blank, the default model will be automatically added to the given view</i>		
Read	button	
<i>read the data into the model given in the model field.</i>		

Input X Y Z S File Format

The x-y-z-s format is designed so that point and line strings can be quickly and easily coded and entered into 12d Model. It is **not** intended for more complex strings such as alignments and text where the 12d Model ascii format is more suitable.

For the x-y-z format, **point** data is set out with one point of x y z data per line. The three values are separated by one or more spaces (free format). For example

```
990          3          10
112          1001       23.5
```

A point-string is represented in 12d Model with a cross at each point. The colour of the cross can be defined by including a POINT_COLOUR command on the line before the point-string begins.

For example, a two point point-string with red crosses would be coded as

```
POINT_COLOUR      red
100.3  990.3   10
112   1001    23.5
```

Line string data is also set out with one point per line (in the order that the points occur in the string) but with a string label included at the end of each line. The string label is repeated for each point in the string. The line string terminates when the string label changes to another name for a new line string or is blank for a point string.

A line-string is drawn with a line connecting a point to its neighbouring points in the string (the string links). The colour of the links of the string can be set using the LINE_COLOUR command.

For example, a green, three point line-string called S1 becomes

```
LINE_COLOUR green
100.3  990.3  10   S1
112   1001   23.5 S1
119.3 1203.1 29.4 S1
```

Notes

- (a) The name of the line string can include spaces but in that case the name must be enclosed in quotes ". For example, the string name may be "toe 1".
- (b) If a string of a certain name is created and the string name reoccurs in the file, then a new string with the same name is created. It is not joined to the earlier string.

xyz Map File

See the section [Create/Edit a Map File](#) in the chapter [File I/O](#) for information about **12d Map Files**.

The **name** of the xyzs string is used as the entity-name to be used for matching with a map file. The map file can be used to override the breakline type of line-strings in the x-y-z file.

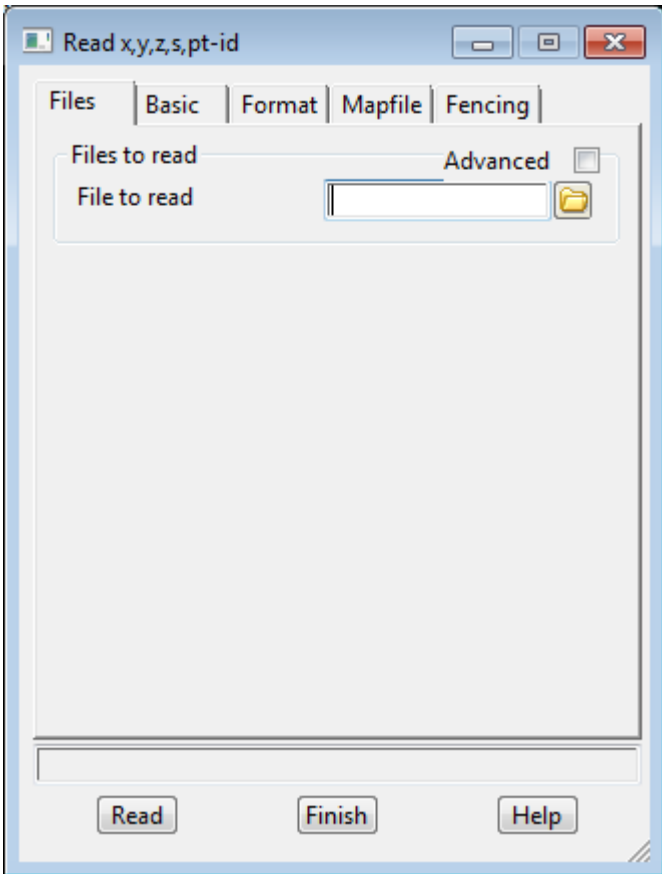
X Y Z user Format Input

Position of option on menu: File I/O =>Data input =>x y z s pt_no

On selecting the read x,yzs,pt_no option, the read xyzs pt no panel is displayed.

This option reads data in one line at a time with the values separated by a delimiter (tab, space, semi-colon or comma) or the data on each line can be in fixed width columns.

In either case, the user specifies the order that the x, y, z, s and point number are in and if desired, only an x and y value needs to be read in.



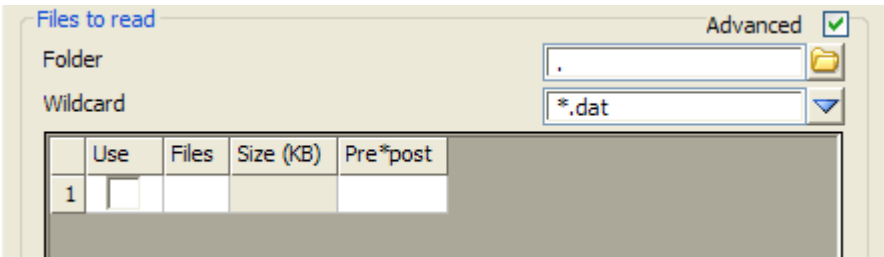
The fields and buttons used in this panel have the following functions.

Field Description Type Defaults Pop-Up

Files tab

Advanced tick box

*if **ticked**, a grid to allow multiple files to be read in, is opened. A wild card is used to select all the files to be read in.*



Folder	folder box	
<i>folder to search for files using the Wild card</i>		
Wildcard	input	
<i>wild card to use in search for files in the given folder</i>		
Use	tick box	
<i>if ticked, read in the file</i>		
Files	output	
<i>name of the file in the folder</i>		
Size	output	
<i>file size</i>		
Pre*post	text input	
<i>if non blank, pre*post text to use for the models in this file (see Pre*Postfix Panel Fields for information on using pre*postfix.</i>		
<i>If blank, use the pre*post text from the Pre*postfix for models panel field.</i>		
<i>Note - if a non-blank value for Pre*post is given in the column for a file then the Pre*postfix for models is ignored.</i>		
File to read	input	*.dat files
<i>name of the data file to be read in</i>		

Basic tab

Default line colour	colour box	default colour	available colours
<i>colour used for line-strings (if no colour is defined in the file)</i>			
Default point colour	colour box	default pt colour	available colours
<i>colour used for the crosses in point-strings (if no colour is defined in the file)</i>			
Default text style	input		available textdatas
<i>textdata for the point ids</i>			
Skip column headers	tick box		
<i>if ticked, the first line of the file is skipped.</i>			
Join all	tick box		
<i>if ticked, all vertices with the same string names are joined together regardless of where they are in the file. The order of the vertices is the order they occur in the file.</i>			
<i>If not ticked then any time a string name changes in the file, a new string is created. So if the same string name occurs but separated by a different string name, then more than one string of that same name will be created. The order of the vertices is the order they occur in the file.</i>			
Default model for data	model box		available models
<i>name of the model that the data is to be placed in. The model will be created if it does not already exist. This field must be filled in.</i>			
Add to view	view box		available views
<i>if non blank, the default model will be automatically added to the given views</i>			

Format tab

Input mode	choice box	delimiter	delimiter, fixed width
<i>if delimiter, the type of delimiter and the columns for the x, y and optionally z, name and point number are given.</i>			
Delimiter	choice box	tab \f	one space, tab \t, semi colon, comma many spaces
<i>if fixed width, the start and end positions are given for x, y and optionally z, name and point number.</i>			

Input mode

Delimiter

Column number in file

X

Y

Z

R

Name

Str no.

Pt no.

Ver text

Seg text

Delimiter

tab "t"

Input mode

Fixed width

Start/end postion

X

to

Y

to

Z

to

R

to

Name

to

Str no.

to

Pt no.

to

Ver text

to

Seg text

to

Mapfile tab

Map file

file box

*.mf files

if **non-blank**, the name of the 12d map file to be used for all strings read in, including any files given with the **Advanced** mode ticked on.
If **blank**, no map file is used

When using a map file, the string name is used as the entity-name for matching with the keys in the map file. See the section [Create/Edit a Map File](#) in the chapter [File I/O](#) for information about 12d map files.

Pre*postfix for models

pre*postfix box

if non-blank, a prefix and a postfix to be applied to the model names used in the mapping file.
Go to the section [Pre*Postfix Panel Fields](#) for information on using pre*postfix.

Note - if a non-blank value for **Pre*post** is given in the column for a file then the **Pre*postfix for models** is ignored.

Fencing tab

Fencing

Fence string

Fence mode

Fence string

polygon box

string to use to restrict the data being read in.

Fence mode

choice box

- String inside
- String inside/crossing
- String outside
- String outside/crossing
- String crossing

String inside - read string in if it is totally inside the polygon
String inside/crossing - read string in if it is totally inside, or crossing the polygon
String outside - read string in if it is totally outside the polygon
String outside/crossing - read string in if it is totally outside, or crossing the polygon
String crossing - string in if it is crossing the polygon
Note - only whole strings are read in.

Read

button

read the data into the model given in the model field.

X Y Z and Attributes User Format Input

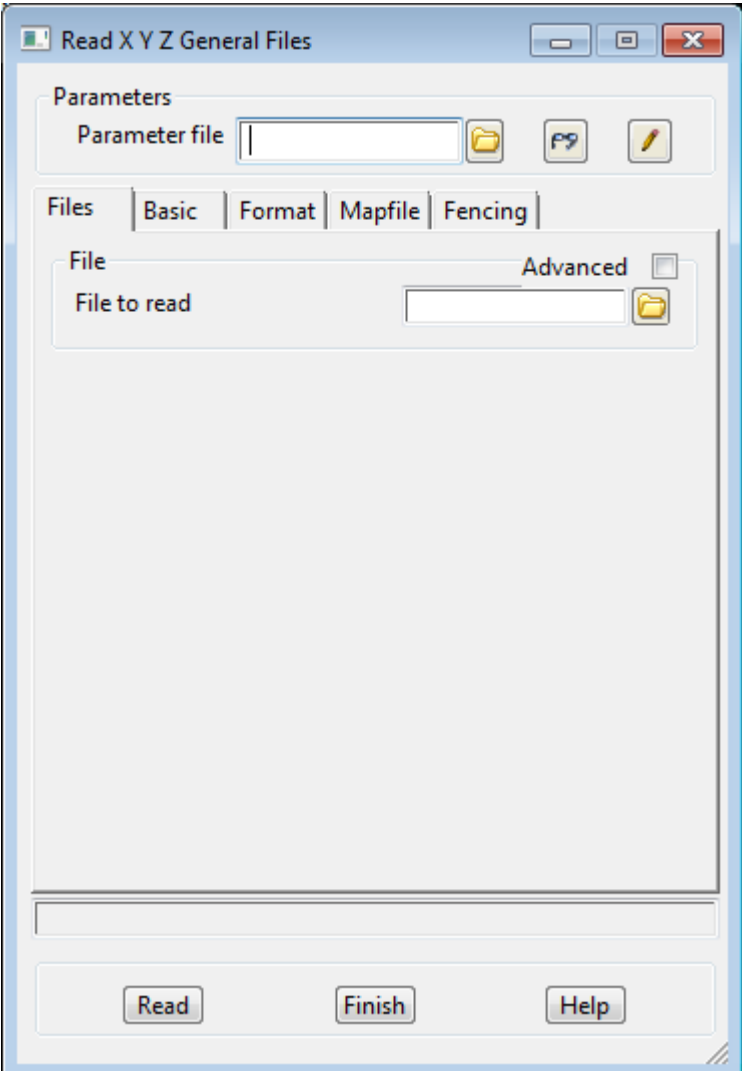
Position of option on menu: File I/O =>Data input =>x y z general

On selecting the read x,y,z general option, the **Read x y z s General Files** panel is displayed.

This option reads data in one line at a time with the values separated by a delimiter (tab, space, semi-colon or comma) or the data on each line can be in fixed width columns.

In either case, the user specifies the order that the x, y, z, string name, point number and attributes appear in the file. If desired, only an x and y value needs to be read in.

The set-ups for defining all the positions of all the data in the file can be written out to a file (.xyf) for re-use.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
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Parameters section

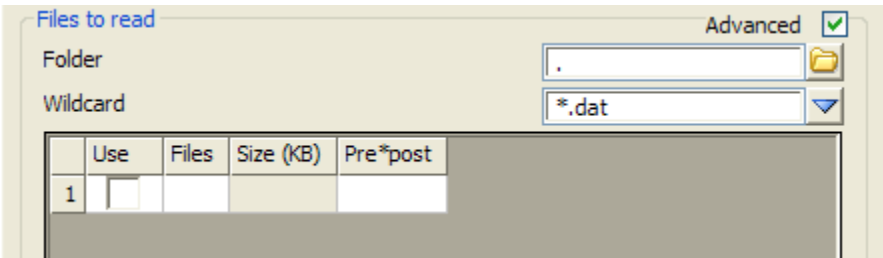
Parameter file	input		*.xyf files
<i>name of the file containing the settings for how the data is positioned in the input file.</i>			
Read icon	button		
<i>read the parameter file in.</i>			
Write icon	button		

write the setting in the panel out to a parameter file.

Files tab

Advanced tick box

if **ticked**, a grid to allow multiple files to be read in, is opened. A wild card is used to select all the files to be read in.



Folder folder box

folder to search for files using the Wild card

Wildcard input

wild card to use in search for files in the given folder

Use tick box

if **ticked**, read in the file

Files output

name of the file in the folder

Size output

file size

Pre*post text input

if **non blank**, pre*post text to use for the models in this file (see [Pre*Postfix Panel Fields](#) for information on using pre*postfix).

If **blank**, use the pre*post text from the Pre*postfix for models panel field.

Note - if a non-blank value for **Pre*post** is given in the column for a file then the **Pre*postfix for models** is ignored.

File to read input *.dat files

name of the data file to be read in

Basic tab

Default line colour colour box default colour available colours

colour used for line-strings (if no colour is defined in the file)

Default point colour colour box default pt colour available colours

colour used for the crosses in point-strings (if no colour is defined in the file)

Default text style input available textdatas

textdata for the point ids

Skip column headers tick box

if **ticked**, the first line of the file is skipped.

Join all tick box

if **ticked**, all vertices with the same string names are joined together regardless of where they are in the file. The order of the vertices is the order they occur in the file.

If **not ticked** then any time a string name changes in the file, a new string is created. So if the same string name occurs but separated by a different string name, then more than one string of that same name will be created. The order of the vertices is the order they occur in the file.

Default model for data model box available models
name of the model that the data is to be placed in. The model will be created if it does not already exist. This field must be filled in.

Add to view view box available views
if non blank, the default model will be automatically added to the given views

Format tab

Input mode choice box delimiter delimiter, fixed width
*if **delimiter**, the type of delimiter and the columns for the x, y and optionally z, name and point number are given.*

Delimiter choice box tab \f one space, tab \t, semi colon, comma many spaces

*if **fixed width**, the start and end column positions are given for x, y and optionally z, name and point number.*

Column number/Start end position section

information to read in (x,y,z, attributes etc.) and its position in the input file.

Input mode

Delimiter

Delimiter

tab "\t"

Column number in file

	Information Type	Position #
1		

	Attribute Mode	Name	Type	Position #
1				

Input mode

Fixed width

Delimiter

tab "\t"

Start/end position

	Information Type	Start	End
1			

	Attribute Mode	Name	Type	Start	End
1					

Mapfile tab

Map file file box *.mf files
*if **non-blank**, the name of the 12d map file to be used for all strings read in, including any files given with the **Advanced** mode ticked on.*
*If **blank**, no map file is used*

When using a map file, the string name is used as the entity-name for matching with the keys in the map file. See the section [Create/Edit a Map File](#) in the chapter [File I/O](#) for information about 12d map files.

Pre*postfix for models pre*postfix box
*if non-blank, a prefix and a postfix to be applied to the model names used in the mapping file. Go to the section [Pre*Postfix Panel Fields](#) for information on using pre*postfix.*

***Note** - if a non-blank value for **Pre*post** is given in the column for a file then the **Pre*postfix for models** is ignored.*

Fencing tab



Fence string	polygon box	
	<i>string to use to restrict the data being read in.</i>	
Fence mode	choice box	String inside
		String inside/crossing
		String outside
		String outside/crossing
		String crossing

String inside - read string in if it is totally inside the polygon
String inside/crossing - read string in if it is totally inside, or crossing the polygon
String outside - read string in if it is totally outside the polygon
String outside/crossing - read string in if it is totally outside, or crossing the polygon
String crossing - string in if it is crossing the polygon
Note - only whole strings are read in.

Read	button
	<i>read in the data</i>

BCC Epson Input

Position of option on menu: File I/O =>Data input =>BCC Epson

The **BCC Epson** input option is designed to read in files in the BCC (Brisbane City Council) Epson format.

The BCC Epson format is point based with unique point numbers for each point. It also has the concept of **non-tinable** points. Since the super string supports vertex tinability, it is the best string type to use for storing data coming in BCC Epson format. Also the BCC Epson point ids are stored as the point ids of the super string vertices.

BCC Epson breaks its data up by a feature code and a **12d** Model map file can be used to define models, colours, linestyles etc. where the BCC **feature code** as the entity-name (key) in the map file.

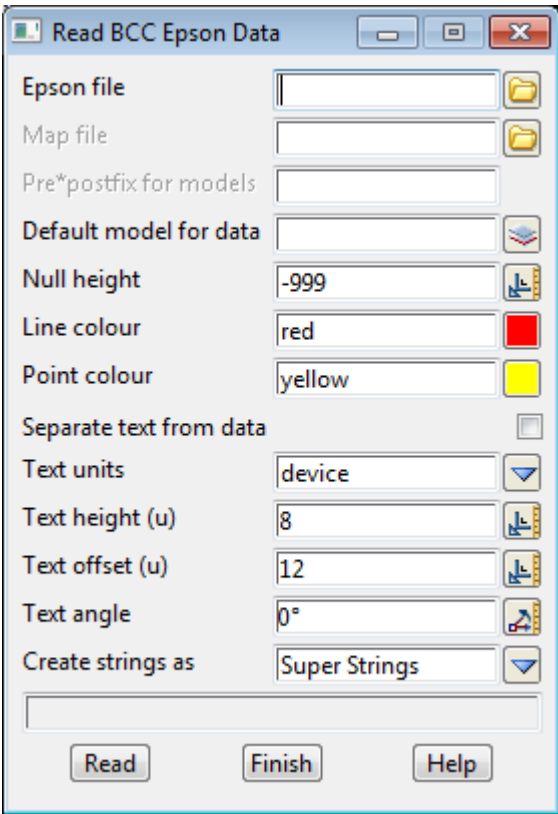
The best way to read in BCC Epson data is to have a map file which maps BCC Epson feature codes into strings with the same name as the feature code, and also places the strings into sensible models.

See the section [Create/Edit a Map File](#) in the chapter [File I/O](#) for information about 12d map files used in this option.

Note:

All text after column 68 in the BCC Epson file is considered to be a note.

On selecting the **BCC Epson** option, the **Read BCC Epson Data** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Epson file <i>name of the BCC Epson file to be read in.</i>	input		.dat and .sur files

Map file	input	*.mf files	
<i>if non-blank, the name of the map file to be used for all strings read in. If blank, no map file is used. The BCC Epson feature code is used as the entity-name to match against the key in the 12d map file. See the section Create/Edit a Map File in the chapter File I/O for information about 12d map files used in this option.</i>			
Pre*postfix for models	pre*postfix box		
<i>if non-blank, a prefix and a postfix to be applied to the model names used in the mapping file. Go to the section Pre*Postfix Panel Fields for information on using pre*postfix.</i>			
Default model for data	input	available models	
<i>name of the model that any unmapped data is placed in. The model will be created if it does not already exist. This field must be filled in.</i>			
Null height	input	-999	
<i>if non-blank, any BCC Epson z values equalling this value are taken as null values.</i>			
Line colour	input	red	available colours
<i>colour for BCC Epson string s.</i>			
Point colour	input	yellow	available colours
<i>colour for BCC Epson points that are not part of strings.</i>			
Separate text from data	tick box		
<i>if not ticked, text is used in 4d or super stings if ticked, separate text strings are created.</i>			
Text units	input	pixels	pixels, world
<i>units for the height of the text label.</i>			
Text height (u)	input		
<i>height of the text (in text units).</i>			
Text offset (u)	input		
<i>distance (in text units) to offset the text from its (x,y) placement position.</i>			
Text angle	input		
<i>angle of the text.</i>			
Create strings as	input	Super Strings	3d, 4d, Polyline, Super
<i>type of strings to create.</i>			
Read	button		
<i>read the data in.</i>			

CivilCad Input

CivilCad input is a separate chargeable module.

Position of option on menu: File I/O =>Data input =>Civilcad

The civilcad input option is designed to read in CivilCad Version 4, 5 and some 6 ascii files.

CivilCad breaks its data up by a layer name only. By default, CivilCad layers are mapped into 12d Model models.

CivilCad has no strings but only points, lines, arcs and circles. CivilCAD spirals are ignored. When reading in CivilCad data, 12d Model will try to head to tail consecutive lines from the same layer to create strings.

The CivilCad format is point based with unique point ids for each point. It also has the concept of non-contourable or non-tinable points.

Since the super string supports point tinability, it is the best string type to use for storing data coming in CivilCad format. CivilCad point ids are stored as the point numbers of the super string vertices.

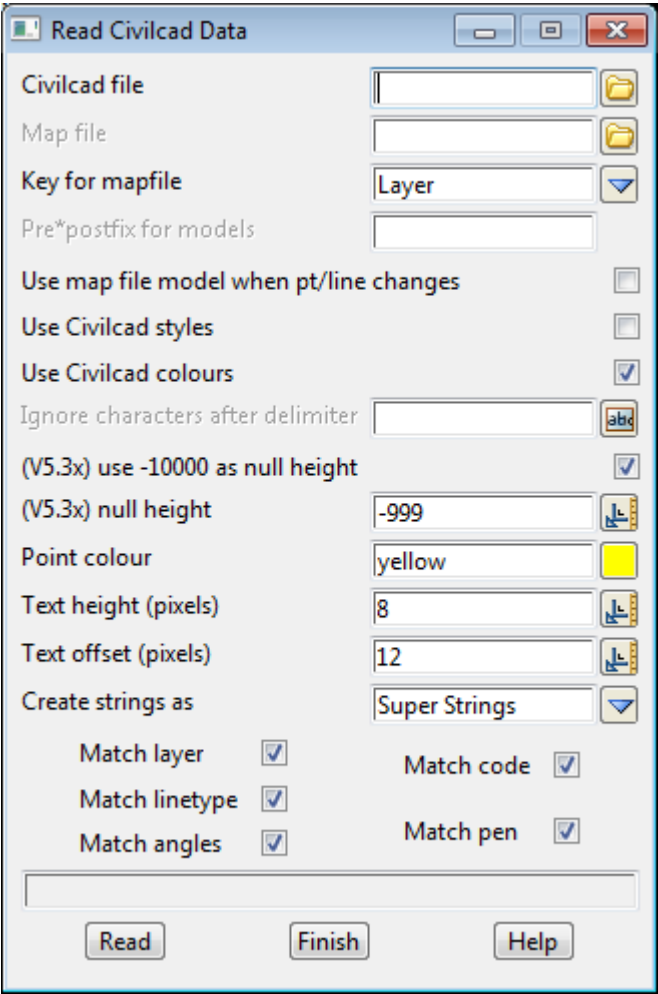
In CivilCad, a layer is defined to contain only breaklines or non-breaklines. In 12d Model, this simply corresponds to strings having a line or point *breakline* type.

If a **map** file is used when reading CivilCad data, either the CivilCad **layer** name, entity code, layer/code or code/layer can be used as the entity-name to match against the **key**.

See the section [Create/Edit a Map File](#) in the chapter [File I/O](#) for information about 12d map files.

Warning - CivilCad has a null value of -10,000 - these values may need to be nulled in 12d Model after the CivilCad data is read in.

On selecting CivilCAD, the **Read Civilcad Data** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Civilcad file <i>name of the Civilcad ascii file to be read in.</i>	file box		*.asc and *.as5 files
Map file <i>if non-blank, the name of the map file to be used for all strings read in If blank, no map file is used. The Key for map file defines what is used to match against the key in the map file. See the section Create/Edit a Map File in chapter File I/O for information about 12d map files.</i>	map file box		*.mf files
Key for map file <i>if Layer, the Civilcad layer is used as the entity-name to match against the key in the map file. if Code, the Civilcad layer is code as the entity-name to match against the key in the map file.</i>	choice box	Layer	Code, Layer, Code/Layer, Layer/Code
Pre*postfix for models <i>if non-blank, a prefix and a postfix to be applied to the model names used in the mapping file. Go to the section Pre*Postfix Panel Fields for information on using pre*postfix.</i>	pre*postfix box		
Use CivilCad styles <i>if ticked, then the CivilCad linestyle number is used as the 12d Model linestyle name.</i>	tick box		
Use CivilCad colours	tick box		

if **ticked**, then the CivilCad colour number is used as the 12d Model colour number.

Ignore characters after delimiter tick box

if **ticked**, r.

(V5.3x) use -10000 as null height tick box tick

if **ticked**, any CivilCad z values of -10,000 are taken as null values.

(V5.3x) null height input -999

the value in the CivilCAD file to use as null height if User -10000 is not ticked.

Point colours colour box yellow available colours

colour for CivilCad points that are not part of strings.

Text height (pixels) input 8

the height in pixels of any text created, or for point numbers.

Text offset (pix) input 12

the offset (in pixels) from the (x,y) coordinate position for any text or point numbers.

Create strings as input Super Strings Lines and Arcs
3d Strings and Arcs,
Polyline Strings
Super Strings

type of strings to create.

Match flags tick box

CivilCad data consists of individual lines and arcs. When reading CivilCad data, it undergoes head to tail processing and the match flags specify what CivilCad data can be joined.

Match layer/code/linetype/angles/pen tick box

if **ticked**, then any CivilCad lines and arcs must have the same layer/code/linetype/angle/pen before they can be joined in the head to tail process.

Read button

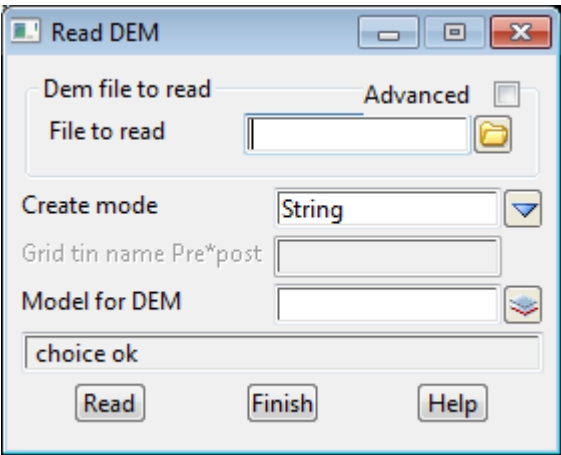
read the data in.

DEM Input

Position of option on menu: File I/O =>Data input =>DEM

The **DEM** option is designed to read in Digital Elevation Model data in the Arc/Info format.

On selecting **DEM**, the **Read DEM** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Format <i>format of the DEM to read in.</i>	choice box	Arc/Info ASCII	Arc/Info ASCII Grid *.dem
Dem file to read <i>name of the DEM file to be read in.</i>	file box		
File to read			
Create mode	choice box	String	String, Grid string, Grid tin
Grid tin name Pre*post			
Model for DEM <i>model to put the DEM data in.</i>	model box		available models
Read <i>read the data in.</i>	button		

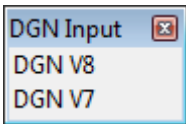
Input DGN Binary Files

Position of menu: File I/O =>Data input =>DGN

DGN input and output is a separate chargeable module.

The options under **DGN** read DGN V7 and DGN V8 binary files.

The **DGN** walk-right menu is



read DGN V8 binary file
read DGN V7 binary file

For *DGN V8*, go to [Input DGN V8](#)
DGN V7 [DGN V7 Binary Input](#)

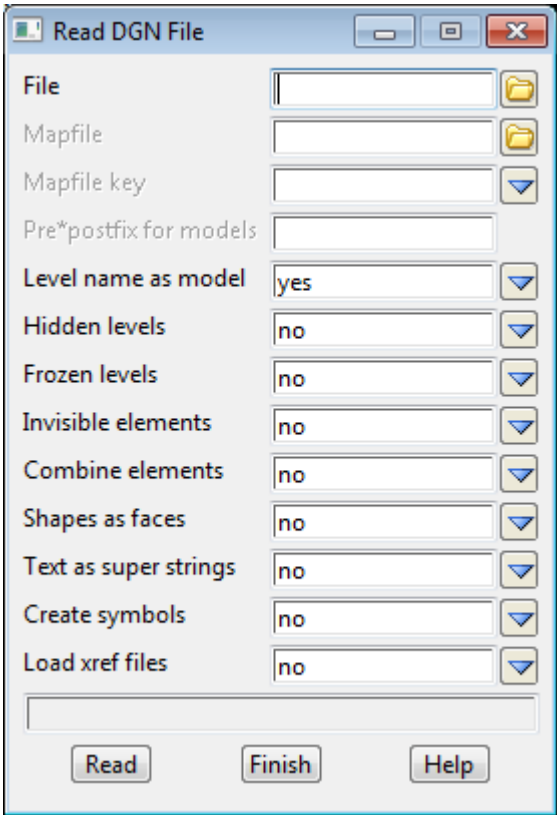
Input DGN V8

Position of option on menu: File I/O =>Data input =>DGN =>DGN V8

NOTE: the format for DGN V8 has been changed and has not been published. There is a beta version of the DGN reader to try and read DGNV8. At this stage it is probably better to use DWG I/O to go in and out of Microstation V8.

Note: this option is under development

Selecting **DGN V8** brings up the **Read DGN File** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
File <i>name of the DGN V8 binary file to be read in</i>	input		*.dgn files
Read <i>read the data in.</i>	button		

DGN V7 Binary Input

DGN binary input is a separate chargeable module.

Position of option on menu: File I/O =>Data input =>DGN =>DGN V7

The DGN input option is designed to read in Intergraph and Microstation binary models (.dgn files) up to V7. Microstation V8 has a new undocumented format which is read in with the DGN V8 options (.).

Because of the limited number of levels available in an DGN file, the colour, linestyle and weight of items are often used to differentiate data types. For special files for VicRoads, there is also an DGN attribute which can be used to tag data.

Hence the entity-name used for matching in a map file when reading DGN files into 12d Model can be either the:

- s DGN **level**
- s VicRoads **attribute**
- s DGN level, colour, linestyle, weight
- s VicRoads attribute, colour, linestyle, weight

In the DGN map file, the four level key is given as a single key made up of the four items separated by | (with no additional spaces) in the order:

level or VicRoads attribute | colour | line style | weight

For example, the key

30|2|0|0 means level 30, colour 2, style 0 and weight 0

A * can be used for any of the four items to indicate that no match is required for that item.

30|*|0|* means level 30, any colour, style 0, any weight

If a map file is not used, the DGN data is read into a 12d Model string of the same name as the DGN level and the DGN colour numbers are mapped to 12d Model colours. All the strings created go to the **Default model for data** specified in the *Read DGN Data* panel.

See the section [Create/Edit a Map File](#) in the chapter [File I/O](#) for information about 12d map files.

Text for Points in DGN

A further complication with DGN is that many Microstation users record individual points as a text entity with a character from a possibly user defined DGN font to represent a symbol at the point. The text then often has a justification other than left-bottom.

However, Microstation does not record the (x,y) coordinates of the justification point but only the left-bottom position to draw the symbol at. The actual (x,y) point needs to be calculated from the text justification and the actual symbol size.

Unfortunately this requires a knowledge of the DGN font symbol being used to calculate the true (x,y) position for the text justification point.

To help read in text as points so that they may be included in processes such as triangulation, in the DGN reader, it is possible to create 4d strings (which consist of an (x,y,z) point plus a piece of text) instead of a text string.

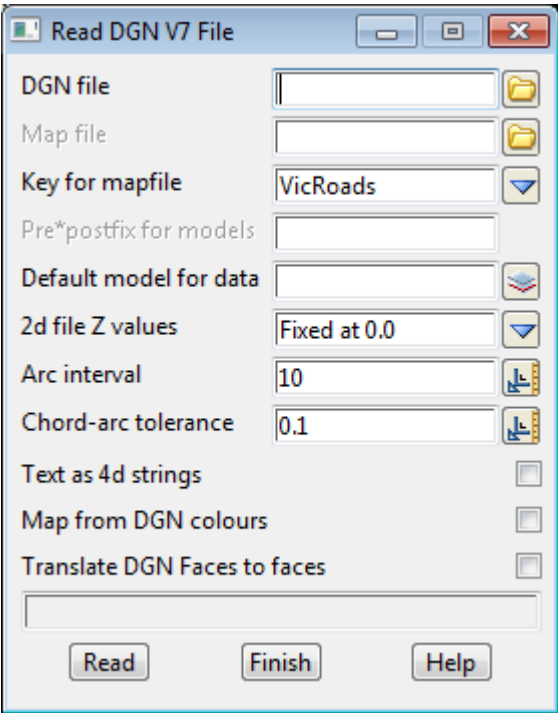
Warning

Because of the problem with needing to know the DGN font information to correctly calculate the (x,y) coordinate of the text, creating a 4d string instead of text will not fix the error in the (x,y) coordinates if an incorrect font is used in 12d Model.

The only safe solution is to avoid data in DGN format if the points are being represented by text.

NOTE: the format for DGN V8 has been changed and has not been published. There is a beta version of the DGN reader to try and read DGNV8. At this stage it is probably better to use DWG I/O to go in and out of Microstation V8.

On selecting the DGNV7 option, the **Read DGN V7 File** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
DGN file <i>name of the DGN binary file to be read in</i>	input		*.dgn files
Map file <i>if non-blank, the name of the map file to be used for all strings read in. If blank, no map file is used. The DGN level is used as the string name and all strings go to the Default model for data. See the section Create/Edit a Map File in the chapter File I/O for information about 12d map files.</i>	input		*.mf files
Key for mapfile	input	VicRoads	level, VicRoads, level/colour/linestyle/weight

Vicroads/colour/linestyle/weight

specifies how the key from the mapfile is interpreted.

Pre*postfix for models pre*postfix box
*if non-blank, a prefix and a postfix to be applied to the model names used in the mapping file.
Go to the section [Pre*Postfix Panel Fields](#) for information on using pre*postfix.*

Default model for data input available models
model to use for strings not mentioned in the map file or if no map file is used.

2d file Z values input Fixed at 0.0 fixed at 0.0,
contour Z low, contour Z high
element Z low, element Z high

z value to use for 2d .dgn file

Arc interval input 10
*interval to use to break 3d circles into segments.
Note - a 3d circle in DGN is a circle in an included plane. This is not the same as a circle in civil work
which is a circle in **plan view**. A 3d circle in an included plane does not project onto a circle in a plan
view except in the special case when the inclined plane is parallel to the x-y plane.*

Chord-arc tolerance input 0.1
chord to arc tolerance to use when breaking 3d circles into segments.

Text as 4d strings tick box
*if **ticked**, text is read in as a 4d string (an (x,y,z) coordinate plus a piece of text)*

Map from DGN Colours tick box
*if **not ticked**, DGN colour number n is mapped to **12d Model** colour n.
if **ticked**, some of the DGN colours are attempted to be mapped to **12d Model** colours.*

Translate DGN faces to faces tick box
*if **ticked**, DGN faces are read in as **12d Model** face strings.*

Read button
read the data in.

DWG/DXF Input

DWG/DXF input is a separate chargeable option

Position of option on menu: File I/O =>Data input =>DWG/DXF/DX8

The **DWG/DXF** input option is designed to read most Autocad DWG and DXF files.

Each DWG/DXF item has an associated layer. By default, **12d** Model creates models of the same name as the layers (or with an additional user supplied prefix) and the DWG/DXF items placed in them.

However, this can be over written using a standard **12d map file** where the key is matched against Autocad **layers** rather than string names.

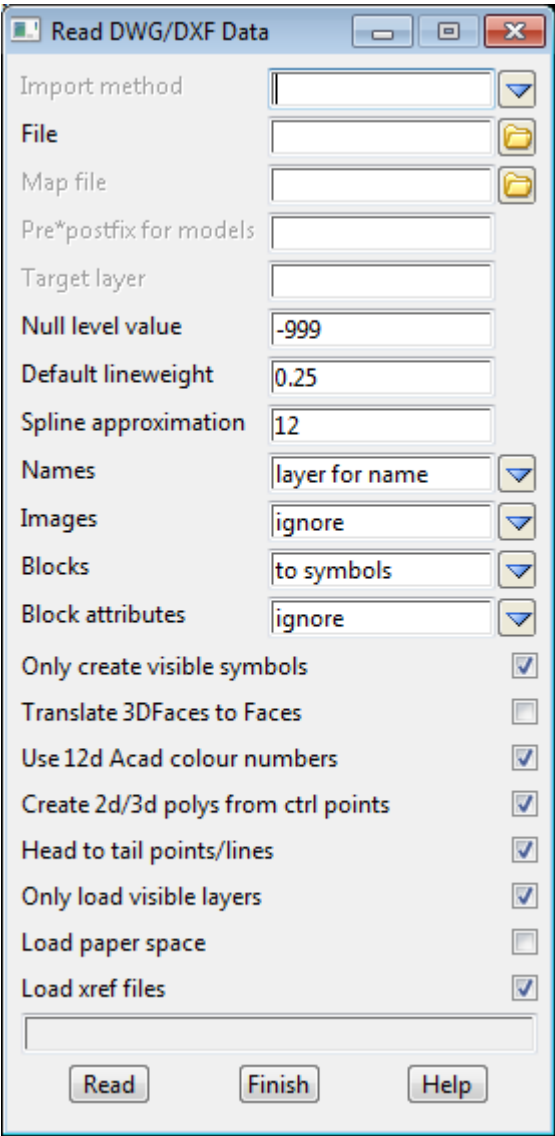
See the section [Create/Edit a Map File](#) in the chapter [File I/O](#) for information about 12d map files.

Autocad blocks are recognised and either a point with the block name is created or the blocks are expanded into their components, each time they are referenced in the DWG/DXF file.

Bulges in polylines can only be interpreted correctly when the polyline has a constant z-value. For this case, a **12d** Model polyline string is created from the DXF polyline.

Finally, DWG/DXF POINT entities of the same layer and colour can be concatenated into one point string as they are read in.

On selecting the **DWG/DXF/DX8** option, the **Read DWG/DXF Data** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Format <i>type of Autocad file to read in</i>	choice box	DWG	DWG, DXF
File <i>name of the DWG or DXF file to read in</i>	file box		*.dwg or *.dxf files
Map file <i>if non-blank, the name of the map file to be used for all DWG/DXF layers read in. The DWG/DXF layer is the entity-name for matching against the key in the map file. If blank, no map file is used. See the section Create/Edit a Map File in the chapter File I/O for information about 12d map files.</i>	map file box		*.mf, *.mapfile files
Pre*postfix for models <i>if non-blank, a prefix and a postfix to be applied to the model names used in the mapping file. Go to the section Pre*Postfix Panel Fields for information on using pre*postfix.</i>	pre*postfix box		
Target layer <i>if non-blank, only autocad items in the layer with the name given in the target layer field will be read in.</i>	input		
Null level value	input	-999	

<i>z-value to treat as a null level</i>			
Default AutoCAD lineweight	input	0.25	
<i>lineweight to use when it is undefined in an AutoCAD entity.</i>			
Spline approximation	input	12	
<i>splines are broken into small segments</i>			
Names	choice box	layer for name	no name, layer for name
<i>if no name, strings are not given a name.</i>			
<i>if layer for name, strings are given the name of the AutoCAD layer they were on.</i>			
Images	choice box	to plan images	to plan images, to rasters, ignore
Blocks	choice box	to symbols	to symbols, explode, to points
<i>if to symbols, blocks are read in as 12d Symbols of the same name.</i>			
<i>if explode, blocks are read in and exploded into vertices and line work.</i>			
<i>if to points, a 12d vertex is created at each block.</i>			
Only create visible symbols	tick box	tick	
Translate 3DFaces to faces	tick box		
<i>if tick, DWG/DXF faces are read in as 12d Model face strings.</i>			
User 12d ACAD colour numbers	tick box		
Create 2d/3d polys from ctrl points	tick box		
Head to tail points/lines	tick	tick	
<i>if ticked, DWG/DXF POINT entities of the same layer and colour are concatenated into one point string as they are read in and DWG/DXF LINE entities of the same layer and colour are</i>			
Only load visible layers	tick	tick	
<i>if ticked, only DWG/DXF visible layers are read in otherwise all layers are read in.</i>			
Load paper space	tick	no tick	
<i>if ticked, paper space data will be read in.</i>			
Load xref files	tick	no tick	
<i>if ticked, an xref files in the DWG/DXF are also read in.</i>			
Read	button		
<i>read the data in.</i>			

Genio Input

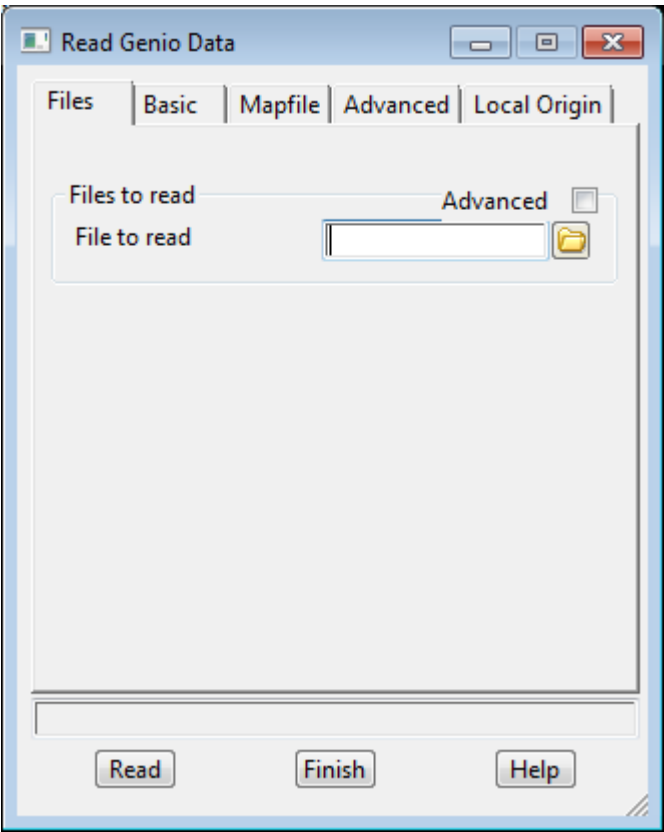
Position of option on menu: File I/O =>Data input =>Genio

Genio input is a separate chargeable module.

The software package MX (formerly called Moss) includes a data file format called GENIO for use in transferring data between Moss and other programs (see the MX Manual for a partial description of genio). There is currently two default genio input formats - versions 6 and 7.
12d Model recognizes both formats.

For information on the Genio file format support by 12d Model, please go to the section [Genio File Format](#)

On selecting the genio option, the **read genio data** panel is displayed.



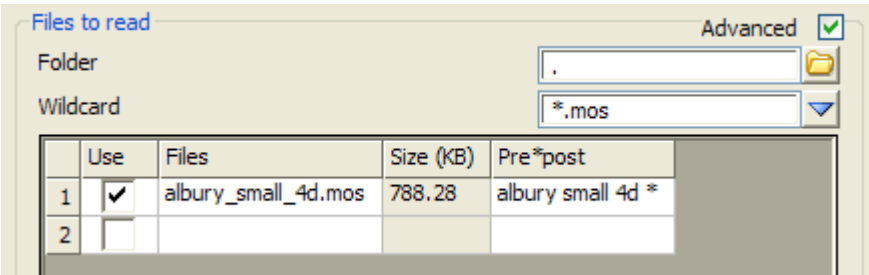
The fields and buttons have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Files tab

Advanced	tick box
-----------------	----------

*if **ticked**, a grid to allow multiple files to be read in, is opened. A wild card is used to select all the files to be read in.*



Folder folder box
folder to search for files using the Wild card

Wildcard input
wild card to use in search for files in the given folder

Use tick box
if *ticked*, read in the file

Files output
name of the file in the folder

Size output
file size

Pre*post text input
if *non blank*, pre*post text to use for the models in this file (see [Pre*Postfix Panel Fields](#) for information on using pre*postfix.
if *blank*, use the pre*post text from the Pre*postfix for models panel field.

Note - if a non-blank value for **Pre*post** is given in the column for a file then the **Pre*postfix for models** is ignored.

File to read file box default *.mos files
This can be modified by the environment variable GENIO_WILDCARD_4D
name of the genio file to be read in

Basic tab

Transition type transition box clothoid transition pop-up
type of transition used in the genio file

Line colour colour box default colour available colours
colour used for line-strings

Point colour colour box default pt colour available colours
colour used for the crosses in point-strings (genio string labels starting with **P**).

Text style data for 4d strings
the text style data to use for the text in any 4d strings in the genio file

Text style data for text
the text style data to use for text strings in the genio file

Multiply text height by 10 tick box
if *ticked*, the text size is multiplied by 10

Mapfile tab

Map file file box *.mf files
if *non-blank*, the name of the 12d map file to be used for all strings read in, including any files given with the **Advanced** mode ticked on.

If blank, no map file is used

When using a map file, the string name is used as the entity-name for matching with the keys in the map file. See the section [Create/Edit a Map File](#) in the chapter [File I/O](#) for information about 12d map files.

Pre*postfix for models pre*postfix box

if non-blank, a prefix and a postfix to be applied to the model names used in the mapping file. Go to the section [Pre*Postfix Panel Fields](#) for information on using pre*postfix.

Note - if a non-blank value for **Pre*post** is given in the column for a file then the **Pre*postfix for models** is ignored.

Advanced tab

Compress 3d to 2d tick box tick

if **ticked**, convert any 3d strings with constant z-value to 2d strings.

Convert 6d to alignment tick box tick

if **ticked**, convert any 6d strings to **12d Model** alignment strings.

Generate Point ID's tick box no tick

if **ticked**,.

Create control stations from SSTN tick box no tick

if **ticked**, control stations are created in **12d Model** for each point in a genio string named SSTN

Smigs file ? tick box no tick

if **ticked**, try to interpret the genio file as a Smigs genio file.

Use super strings tick box tick

if **ticked**, all strings are read in as super string

Use invisible segments for discontinuities tick box

if **ticked**, MX strings with discontinuities are read in as super strings with invisible segments.

If **not ticked**, MX strings with discontinuities are broken into pieces when read in.

G strings to super alignments tick box no tick

if **ticked**, MX G strings are read in as 12d super alignments

Debug G strings tick box no tick

because of the lack of documentation of the G string in MX, a G string may not be interpreted correctly. If **ticked**, a super string is created with the information from the MX G string to try and help interpret what the data was.

Reverse calc super alignments tick box no tick

Better way of interpreting VG tick box tick

if **ticked**, a different method for interpreting vertical geometry in a MX G strings is used. This may or may not be successful.

Local Origin tab

Local origin x y box x y selector

if **non-blank**, the given coordinates are used as a local origin when reading in the data. That is, the local origin values are subtracted from each data point as it is read in.

Read button

read in the genio data from the file given in the file field.

Genio File Format

The software package MX (formerly called Moss) includes a data file format called GENIO for use in transferring data between Moss and other programs (see the MX Manual for a partial description of genio). There is currently two default genio input formats - versions 6 and 7.

12d Model recognizes both formats.

MX provides three options (001,003,017) to allow variations in the format of the genio 080 records. 12d Model recognizes and uses each option.

MX free format (that is, using commas and the 'field-number=' syntax) is allowed.

For example

080,ABCD, ,5=0.0

MX 2d, 3d, 4d, 6d, text and most 12d and text strings are loaded directly into 12d Model strings. For 5d, the strings are processed but only the 3d information is used and loaded into 12d Model. The MX 10d (volume string) is allowed in the genio file but will not be read into 12d Model.

In the genio file, the GENIO card defines the name of the MX model for the following strings. 12d Model loads the strings into a 12d Model model with the same name as the MX model. However, 12d Model allows the user to define a map file which may over-ride the Genio card.

A genio file may contain more than one MX model, each genio model being separated by a 999 card. 12d Model will load each separate MX model into a 12d Model model with the same name as the MX model.

If an error occurs whilst reading a genio record, the genio record will be skipped and, if possible, the next genio record read.

12d Map File

See the section [Create/Edit a Map File](#) in the chapter [File I/O](#) for information about 12d map files.

The **name** of the MX string is used as the entity-name to be used for matching in a 12d map file.

The MX model given in the GENIO record is taken to be the default model for the genio reader.

Hence the genio map file can be used to over-ride the MX GENIO card and the MX default for point strings (this is necessary for genio files generated from non MX systems that don't use the correct point string convention).

For **text** in a Genio file (the string name for text must start with a * in the Genio file), the *key in the map file must* start with **geniotext** followed by the characters to match on which will be matched against the characters following the * in the genio string name. For example

```
geniotextEB* * text yellow point "PHCP" // matches text
will match any Genio text with the string name starting with "*EB"
```

Note that * is not a wild card in the Genio string name but the "EB*" after "geniotext" is for use by the 12d map file and hence is an "EB" followed by a wild card. Hence it matches against any Genio text name starting with "*EB".

Summary

12d Model **recognizes** the following genio options for MX V6 and V7 formats -

GENIO	
FINISH	
001	format card
003	order card
017	angle card
080	for 2d, 3d, 4d, 6d, 12d and text strings
080	the 3d information only for 5d strings
090	triangulation information
999	

genio comment lines

12d Model accepts MX null values of -999.0

12d Model **ignores** the genio options:

080 for **10d** strings

A12d map file can be used to select the colour and model for any strings read in from the MX genio file whose names match the keys in the map file.

Geocomp Input

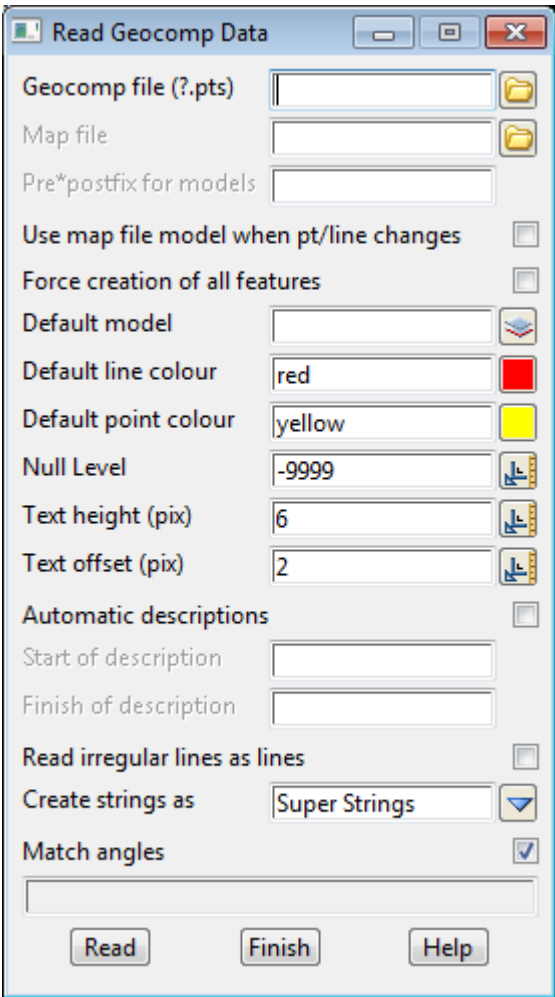
Position of option on menu: File I/O =>Data input =>Geocomp

Geocomp input is a separate chargeable module.

Geocomp is a points based software package used for manipulating and reducing survey data on a PC.

Geocomp data is held in two ascii files - the points file and the strings file. These ascii files can be used to transfer data from Geocomp to 12d Model. More information on the Geocomp data structure is given in the previous section [Geocomp File Format](#).

Selecting Geocomp displays the Read Geocomp Data panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Geocomp file (? .pts) <i>name of the Geocomp points file to be read in. The corresponding strings file is also used.</i>	file box		*.pts files
Map file <i>if non-blank, the name of the map file to be used for all strings read in. If blank, no map file is used. See the section Create/Edit a Map File in the chapter File I/O for information about 12d map files.</i>	map file box		*.mf and *.mapfile files

Pre*postfix for models	pre*postfix box		
<i>if non-blank, a prefix and a postfix to be applied to the model names used in the mapping file. Go to the section Pre*Postfix Panel Fields for information on using pre*postfix.</i>			
Use mapfile model when pt/line changes	tick box	no tick	
<i>if ticked, then if the geocomp.str file says the entity is a line (point) feature and the map file says it is a point (line), the mapfile is used.</i>			
Default model	model box		available models
<i>model to use for strings not mentioned in the map file</i>			
Default line colour	colour box	default colour	available colours
<i>colour used for line-strings</i>			
Default point colour	colour box	default pt colour	available colours
<i>colour used for the crosses in point-strings.</i>			
Null level	input	-9999	
<i>the Geocomp z-values to be considered null z-values.</i>			
Text height (pix)	input	8	
<i>the height in pixels of any text created for point number or Geocomp descriptions.</i>			
Text offset (pix)	input	2	
<i>the offset (in pixels) from the (x,y) coordinate position for the text of a 4d string.</i>			
Automatic descriptions	tick box		
<i>if ticked, then the first three characters of the entity code are compared to the first 3 characters of the 20 character description and if they are the same, the text is only characters 6 to 15 of the description.</i>			
Start of description	input		
<i>the user can restrict the amount of the geocomp description that is read in. if non-blank, this is the number of the character position to start reading the description from. If blank, the start position is 1.</i>			
Finish of description	input		
<i>if non-blank, this is the number of the character position to end reading the description from. If blank, it is the end of the geocomp description.</i>			
Read irregular lines as lines	tick		
<i>if ticked, Geocomp irregular lines are read in as strings.</i>			
Create strings as	input	Super Strings	Polyline Strings Super Strings
<i>type of strings to create.</i>			
Match angles	tick	tick	
<i>if ticked, preference is given to joining geocomp lines of similar angles first. if not ticked, geocomp lines are joined in the order they are in the file.</i>			
Read	button		
<i>read in the Geocomp data from the points file and (corresponding strings file) given in the file field.</i>			

Geocomp File Format

Geocomp input is a separate chargeable module.

Geocomp is a software package used for manipulating and reducing survey data on a PC.

Geocomp is a point based system. The fundamental data consists of individual points with unique point numbers and entities such as lines and arcs defined in terms of the points.

Geocomp data is held in two ascii files - the points file and the strings file. These ascii files can be used to transfer data from Geocomp to 12d Model.

The Geocomp **points file** is a sequential list of points, one point per line. Each point consists of the data

 easting, northing, elevation, stand-point-number

 that is

 x-value, y-value, z-value, stand-point-number

The line number of each point in the file is also the unique **point number** for that point. For example, the point defined on the eleventh line of the points file, **is** point number eleven.

The stand-point-number is the point number of the instrument station used for collecting the points coordinates. The stand-point-number is not used in 12d Model.

The Geocomp **strings file** defines how the Geocomp **entity types** are constructed from points in the point file. The Geocomp entity types are

Entity Number	Description
1	two point lines
2	irregular lines
3	arc defined by start point, point on arc, end point
4	arc defined by start point, arc centre, end point
5	point feature
6	circle defined by centre and a point on the circle

The strings file also gives each defined entity an **entity number**.

The 12d Model Geocomp data reader recognises all the entity types in the strings file **except** for irregular lines (type 2).

All point numbers referred to in the strings file are references to the (implied) point numbers of points in the points file. Hence both files are needed to define the Geocomp data and the order of points in the point file is critical and cannot be modified.

The Geocomp naming convention for the two files is to use the six digit Geocomp job number as a name stem and append **.pts** for the points file and **.str** for the strings file.

That is,

geocomp-job-number.pts	points file
geocomp-job-number.str	strings file

For example

099999.pts	is the point file for Geocomp job number 099999
099999.str	is the strings file for Geocomp job number 099999

12d Model uses a wider data set than is directly represented in the Geocomp points and strings files. However, by observing a number of conventions and processing the strings file data according to these conventions, the Geocomp data can be sensibly passed across to 12d Model.

For example, although the Geocomp strings file only defines two-point lines, 12d Model can construct strings of many points from consecutive two-point lines by joining the lines together

whenever

- (a) the second point of one line is the same as the first point of the next line in the file and
- (b) the lines have the same entity number.

The entity number of the consecutive lines is used as the 12d Model string name.

Similarly, consecutive point features with the same entity number are joined to form a 12d Model 4d **point** string with the entity number as the string name.

In the Geocomp strings file, **descriptive text** can also be included at the end of each line defining an entity. The text is enclosed within double quotes ". The descriptive text is ignored for all entities **except point features**.

For a point-feature, which is represented in 12d Model as a 4d string, the descriptive text is recorded as the text label for that point.

By using a systematic entity and descriptive text labelling system in Geocomp, it is possible to sensibly transfer all of the Geocomp data to 12d Model.

Note - in Geocomp, a z-value of -9999 represents a null z-value, that is, a z-value that has **not** been defined. Any Geocomp null values are recorded as 12d Model null values.

Geocomp Map File

See the section [Create/Edit a Map File](#) in the chapter [File I/O](#) for information about 12d map files.

Using the conventions described in the previous section, Geocomp data can be interpreted as 12d Model strings with entity-names corresponding to the Geocomp entity numbers.

Hence the Geocomp **entity numbers** are used as the entity-names for matching with a map file.

If no match is found with the map file, the default colours and model given in the Geocomp read panel are used. The point-line type is taken to be **point** for point feature entities (entity type 5) and **line** point-line type for all other entities. The geocomp entity number is used as the string name and the style set to 1.

WARNING

If the **breakline type** in the map file is set to point or line and this does not match the point or string type coming from the geocomp file, then the string is placed in the **defaults** model. This is a consistency check for entities that can only be a point **or** a line breakline type (but not both). To disable this feature, a * can be used in the map file for the breakline type and then the breakline type is determined by whether the Geocomp entity is a point feature or not.

Summary

12d Model **recognizes** the following Geocomp entity types

Entity Number	Entity type
1	two point lines
3	arc defined by start point, point on arc, end point
4	arc defined by start point, arc centre, end point
5	point feature
6	circle defined by centre and a point on the circle

12d Model **recognizes** the Geocomp null values of -9999

12d Model **ignores** the entity type

2	irregular lines
---	-----------------

A Geocomp map file can be used to specify the string name, breakline type, colour, style and model for strings read from the Geocomp ascii files.

Note - the breakline type of a string of Geocomp point features (entity type 5) will always be set to **point** regardless of the Geocomp map file.

Keays Input

Position of option on menu: **File I/O =>Data input =>Keays**

The **Keays** input option is designed to read in Keays (RoadPak) files in trf format.

The Keays data has a code and notes, and the code and notes can be used with a **12d** Model map file to define models, colours, linestyles etc.

The Keays note is made up of individual notes separated by spaces. Each individual note (in order) can be used as part of the entity-name for use with the map file.

In the Keays map file, the multi-level key is given as a single key made up of the required items separated by | (with no additional spaces) in the order:

Code | note 1 | note 2 | ... | note n

For example, the key:

BD|building| means code BD, note 1 = "building"

A * can be used for any of the items to indicate that no match is required for that item.

BD|*|top| means code BD, anything for note 1, note 2 = "top"

A * and nothing else after the code means that all notes are accepted.

BD* means code BD and any notes

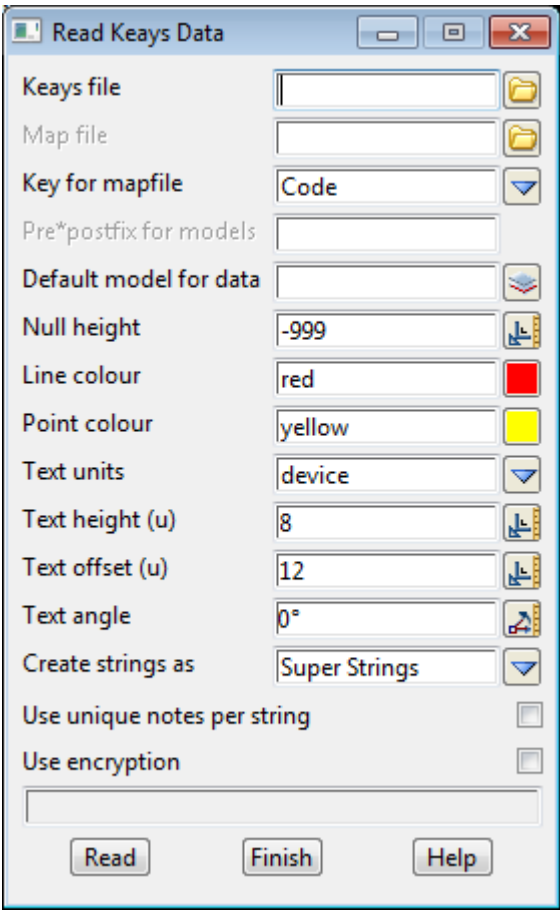
A * at the end of the notes means any note is a match from that point onwards.

BD|*|top|* means code BD, anything for note 1, note2 = "top",
and any note after note 2.

If a map file is not used or no match is found in the map file, the Keays data is placed into the default model with its code as the string name.

See the section [Create/Edit a Map File](#) in the chapter [File I/O](#) for information about 12d map files.

On selecting the **Keays** option, the **Read Keays Data** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Keays file <i>name of the Keays trf file to be read in.</i>	file box		*.trf
Map file <i>if non-blank, the name of the map file to be used for all strings read in. If blank, no map file is used. The Keays code and note can be used as the entity-name to match against the key in the map file. See the section Create/Edit a Map File in the chapter File I/O for information about 12d map files.</i>	map file box		*.mf files
Key for map file <i>if code, the Keays code is used as the key for the map file. If code/note, the Keays code and note is used as the key for the map file.</i>	input	code	code, code/note
Pre*postfix for models <i>if non-blank, a prefix and a postfix to be applied to the model names used in the mapping file. Go to the section Pre*Postfix Panel Fields for information on using pre*postfix.</i>	pre*postfix box		
Default model for data <i>name of the model that any unmapped data is placed in. The model will be created if it does not already exist. This field must be filled in.</i>	model box		available models
Null height <i>if non-blank, any Keays z values equalling this value are taken as null values.</i>	input	-999	
Line colour <i>colour for Keays string s.</i>	colour box	red	available colours

Point colour	colour box	yellow	available colours
<i>colour for Keays points that are not part of strings.</i>			
Text units	input	pixels	pixels, world
<i>units for the height of the text label.</i>			
Text height (u)	input		
<i>height of the text (in text units).</i>			
Text offset (u)	input		
<i>distance (in text units) to offset the text from its (x,y) placement position.</i>			
Text angle	input	0	
<i>angle of the note text.</i>			
Create strings as	input	Super Strings	3d, 4d, Polyline, Super
<i>type of strings to create.</i>			
Use unique notes per string	tick box		
<i>if ticked, a change of code or note is used to break Keays string data into strings. This also applies to the point ids and notes text.</i>			
Use encryption	tick box		
<i>if ticked, then the last 4 characters of the code is used to denote tinability and boundary information.</i>			
Read	button		
<i>read the data in.</i>			

LandXML Input

Position of option on menu: File I/O =>Data input =>LandXML

LandXML is a format that attempts to cover some civil and surveying entities. It does not include any information such as colours, styles etc. but just some geometry definitions.

Unfortunately to make the format useful, every vendor has their own proprietary extensions which makes the format of only limited value. A different tailored LandXML reader is required for each vendor variation. The names and definitions of transitions vary from vendor to vendor.

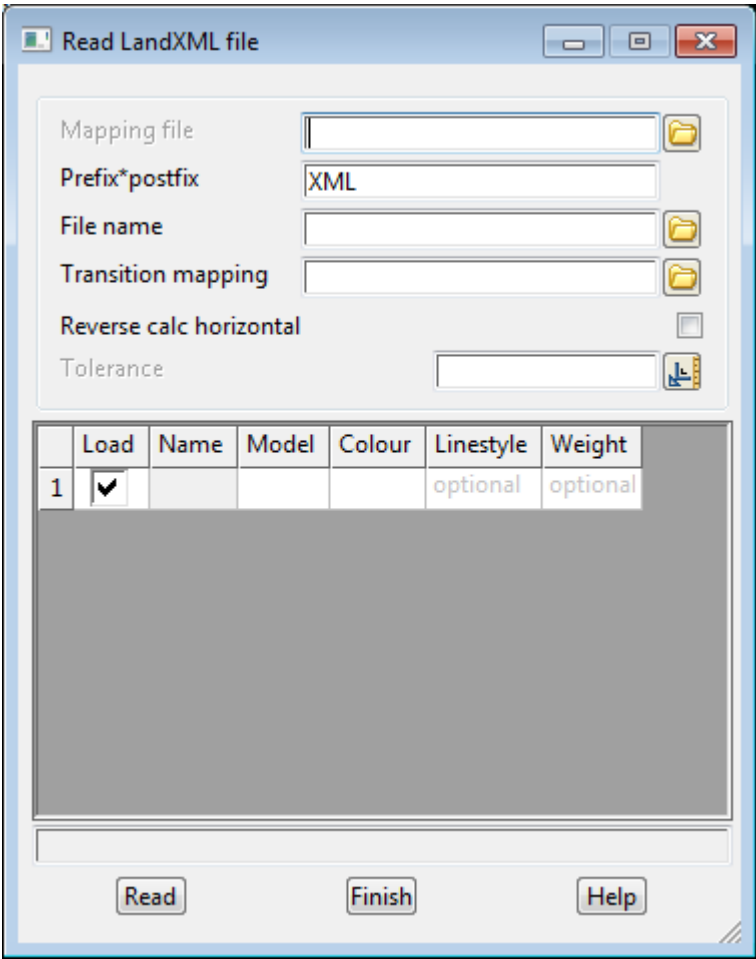
Finally the methodology behind the LandXML model is based on US ideas of using X-sections and not strings to model data. This makes is unsuitable except for simple civil models.

One possible use of LandMXL may be to get access to data from vendors packages such as AutoCAD and Microstation who only have non-published proprietary formats.

12d Model has special LandXML readers for LINZ-XML (for LandOnline NZ) and Leica-XML.

This option is under continual developed as the LandXML standard keep changing.

On selecting the **LandXML** option, the **Read LandXML File** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Map file	map file box		*.mf files
<i>if non-blank, the name of the map file to be used for all strings read in.</i>			

If blank, no map file is used.

See the section [Create/Edit a Map File](#) in the chapter [File I/O](#) for information about 12d map files.

Pre*postfix for models pre*postfix box
if non-blank, a prefix and a postfix to be applied to the model names used in the mapping file.
Go to the section [Pre*Postfix Panel Fields](#) for information on using pre*postfix.

File file box *.xml files
name of the LandXML file to be read in

Transition mapping file box *.trans_map files
file containing the mapping of transitions between the names of LandXML transitions and equivalent transitions in 12d Model

File setting

Load tick box
if ticked, load the xml file

Name
name of the xml file

Model model cell available models
model to read the xml data into

Colour colour cell available colours
colour to use for the strings in the xml file

Linestyle linestyle cell available linestyles
linestyle to use for the strings

Weight input
weight to use for the strings

Read button
read the data into the model given in the model field.

Input Point Cloud Files

Position of menu: File I/O =>Data input =>Point cloud

The options under **Point cloud input** read data in LAS and SRTM formats.

The **Point cloud** walk-right menu is

Point Cloud Input

LAS

SRTM

read LAS data
user specified x y z s point no and attribute

For LAS, go to

SRTM

[Read LAS Files](#)

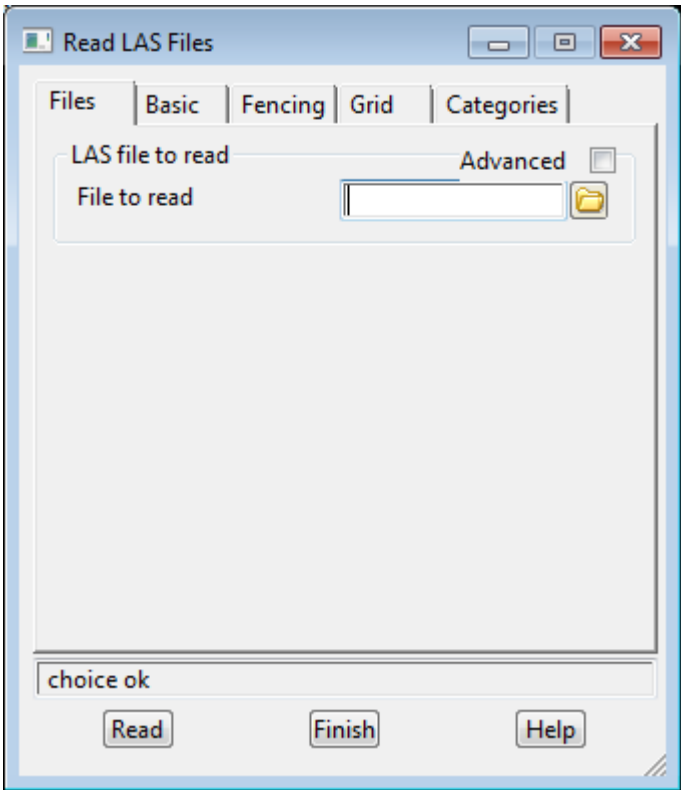
[Read SRTM Files](#)

Read LAS Files

Position of option on menu: File I/O =>Data Input =>LAS

This section of documentation is a work in progress and will be updated in subsequent releases.

Selecting **LAS** brings up the **Read LAS Files** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Files tab

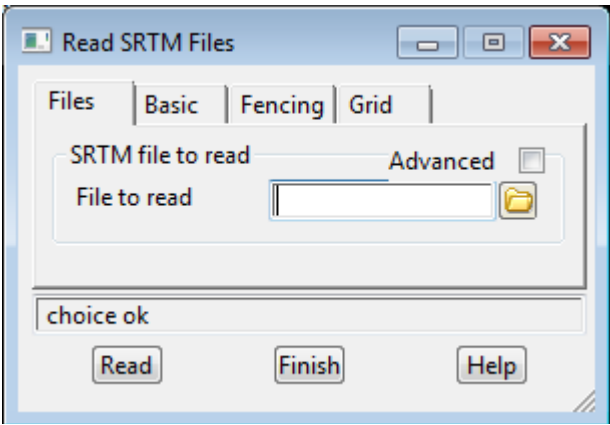
LAS file to read

Advanced	tick box
File to read	file box
Read	button

Read SRTM Files

Position of option on menu: File I/O =>Data Input =>Point cloud =>SRTM

This section of documentation is a work in progress and will be updated in subsequent releases.
Selecting SRTM brings up the **Read SRTM Files** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Files tab

SRTM file to read

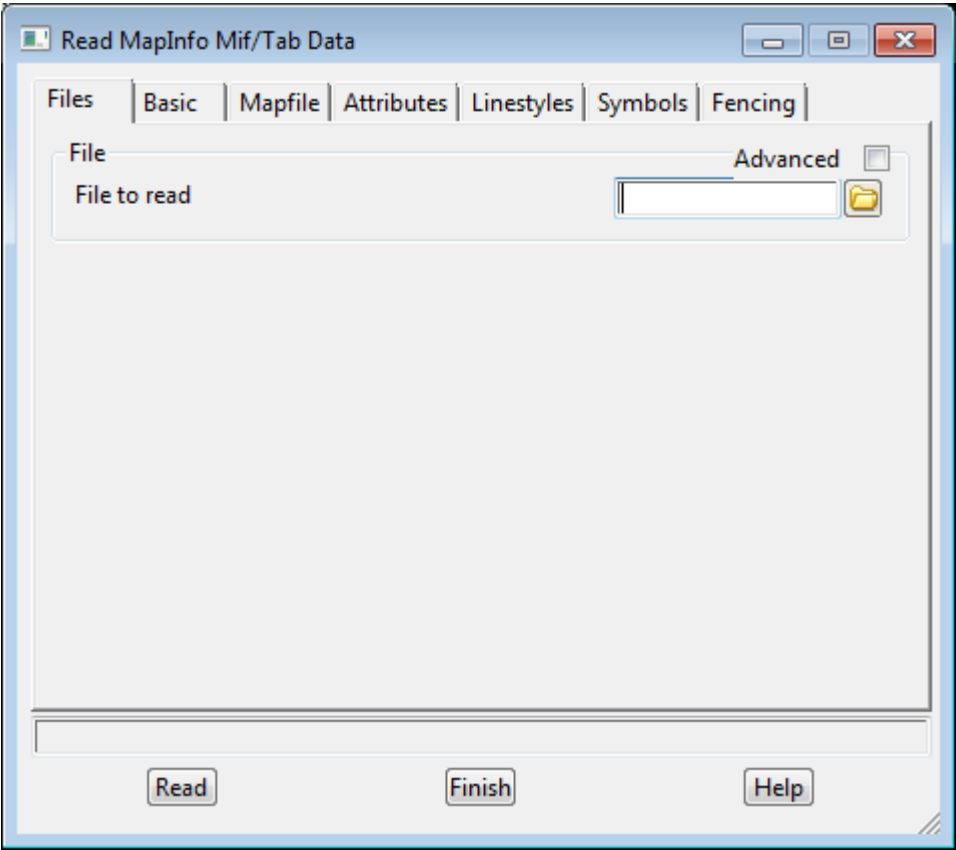
Advanced	tick box
-----------------	----------

File to read	file box
---------------------	----------

Read	button
-------------	--------

Mapinfo Input

Position of option on menu: File I/O =>Data input =>Mapinfo MID/MIF
Selecting **MapInfo MID/MIF** brings up the **Read MapInfo Mif/Tab Data** panel.

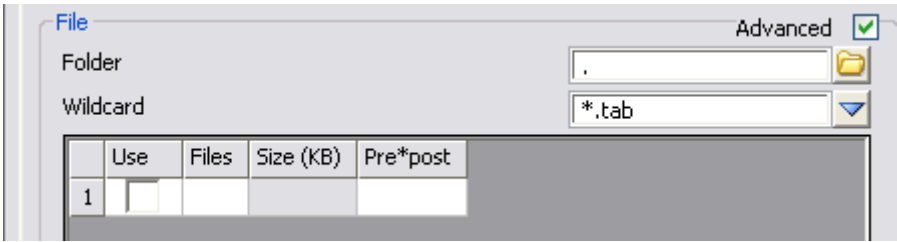


The fields and buttons used in this panel have the following functions.

Field Description Type Defaults Pop-Up

Advanced tick box

*if **ticked**, a grid to allow multiple files to be read in, is opened. A wild card is used to select all the files to be read in.*



Folder folder box

folder to search for files using the Wild card

Wildcard input

wild card to use in search for files in the given folder

Use tick box

*if **ticked**, read in the file*

Files output
name of the file in the folder

Size output
file size

Pre*post text input
*if **non blank**, pre*post text to use for the models in this file (see [Pre*Postfix Panel Fields](#) for information on using pre*postfix.
If **blank**, use the pre*post text from the Pre*postfix for models panel field.*

*Note - if a non-blank value for **Pre*post** is given in the column for a file then the **Pre*postfix for models** is ignored.*

File to read file box *.tab or *.mif files
*name of the MapInfo file.
If no attribute is mapped to model, then the file name (minus the .tab or .mif) is used as the model for the data.*

Basic tab

Default colour for black colour box white available colours
colour to use in 12d for black in MapInfo

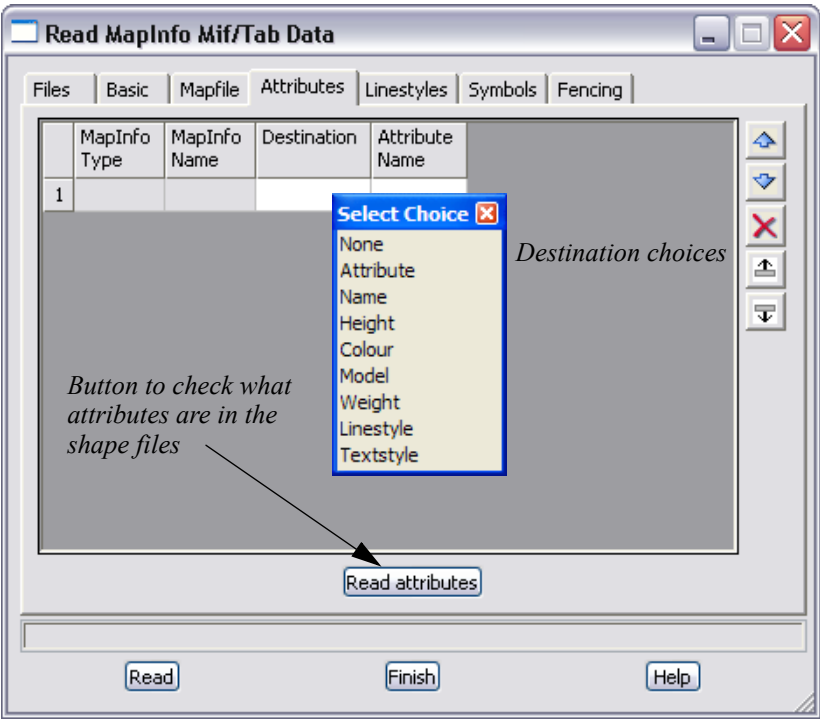
Map file tab

Map file file box *.mf and *.mapfile files
*if **non-blank**, the name of the 12d map file to be used for all strings read in.
If **blank**, no map file is used*

When using a map file, the string name is used as the entity-name for matching with the keys in the map file. See the section [Create/Edit a Map File](#) in the chapter [File I/O](#) for information about 12d map files.

Pre*postfix for models pre*postfix box
*if non-blank, a prefix and a postfix to be applied to the model names used in the mapping file.
Go to the section [Pre*Postfix Panel Fields](#) for information on using pre*postfix.*

Attributes tab



Read attributes button

Click to check what attributes are present in the MapInfo files and any MapInfo attributes found are listed in the **MapInfo Type** and **MapInfo Name** columns in the grid.

Destination Grid column

type of 12d attribute to map the MapInfo attribute to:
none - don't use the attribute - the attribute is ignored
attribute - use as 12d attribute
name - use as 12d string name
height - use as 12d vertex height
colour - use as 12d string colour
model - use as model name
weight - use as string weight
linestyle - use as 12d linestyle
textstyle - use as 12d textstyle

Note - if no MapInfo attribute is mapped to Model, then the file name (minus the .tab or .mif) is used as the model for the data.

Attribute name Grid column

if non blank and the MapInfo attribute is being sent to a 12d attribute, then this is the 12d attribute name

Linestyles tab

MapInfo linestyle Grid column

MapInfo linestyle name

12d linestyle Grid column

12d linestyle to map the MapInfo linestyle to

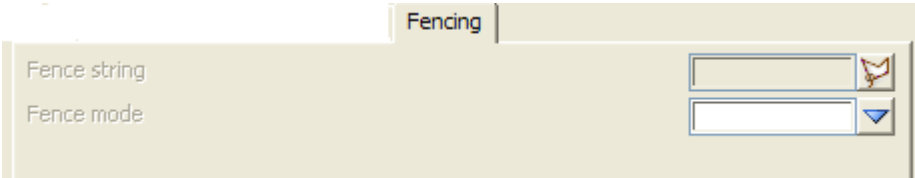
Symbols tab

MapInfo symbol Grid column

MapInfo symbol name

12d symbol Grid column
12d symbol to map the MapInfo symbol to

Fencing tab



Fence string polygon box
string to use to restrict the data being read in.

Fence mode choice box

String inside
String inside/crossing
String outside
String outside/crossing
String crossing

String inside - read string in if it is totally inside the polygon
String inside/crossing - read string in if it is totally inside, or crossing the polygon
String outside - read string in if it is totally outside the polygon
String outside/crossing - read string in if it is totally outside, or crossing the polygon
String crossing - string in if it is crossing the polygon
Note - only whole strings are read in.

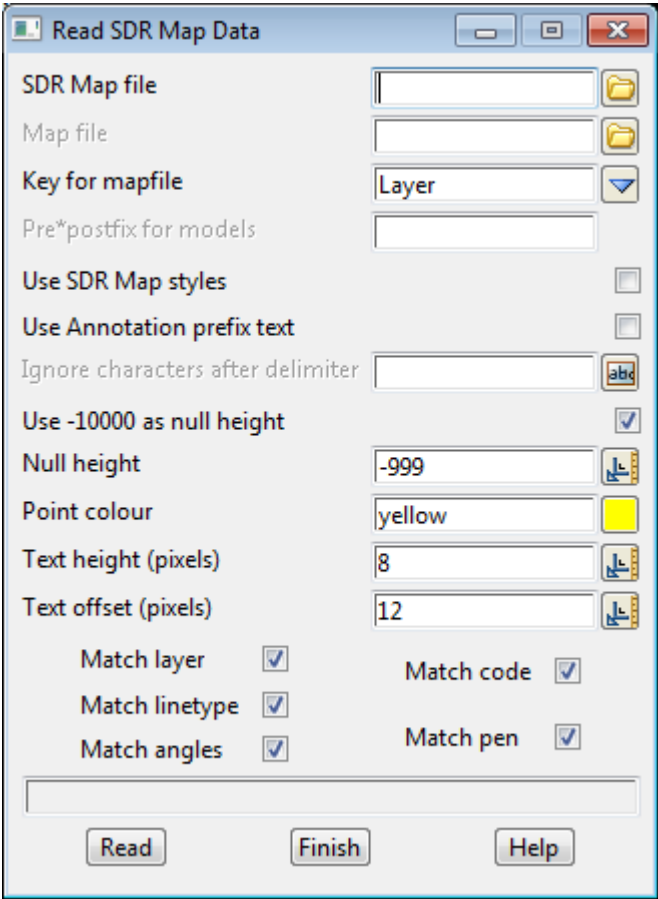
Read button
read the data in

SDR Map Input

Position of option on menu: File I/O =>Data input =>SDR Map

The **SDR Map** input option is designed to read in files in the SDR Map ASCII format.

On selecting the **SDR Map** option, the **Read SDR Map Data** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
SDR Map file <i>name of the SDR Map ascii file to be read in.</i>	file box		*.txt
Map file <i>if non-blank, the name of the map file to be used for all data read in. See the section Create/Edit a Map File in the chapter File I/O for information about 12d map files.</i>	map file box		*.mf and *.mapfile files
Key for map file <i>if code, the SDRmap code is used as the key for the map file. If layer, the SDRmap layer is used as the key for the map file. If code/layer, the SDRmap code/layer is used as the key for the map file. If layer/code, the SDRmap layer/code is used as the key for the map file.</i>	choice box	code	code, layer code/layer, layer/code
Pre*postfix for models <i>if non-blank, a prefix and a postfix to be applied to the model names used in the mapping file. Go to the section Pre*Postfix Panel Fields for information on using pre*postfix.</i>	pre*postfix box		

- Use SDR Map styles** tick box
if ticked,
- Use Annotation prefix text** tick box
if ticked,
- Ignore characters after delimiter** input
if non-blank, all characters on the line after the given delimiter will be ignored.
- Use -10000 as null height** tick box tick
*if ticked, any z value of -10000 is converted to a null height in **12d Model**.*
- Null height** input -999
*if **non-blank**, any SDR Map z values equalling this value are converted to null values in **12d Model**.*
- Point colour** colour box yellow available colours
colour for SDR Map points that are not part of strings.
- Text height (pixels)** input
height of the text in pixels
- Text offset (pixels)** input
distance in pixels to offset the text from its (x,y) placement position.
- Match flags** tick box
SDRMap data consists of individual lines and arcs. When reading SDRMap data, it undergoes head to tail processing and the match flags specify what SDRMap data can be joined.
- Match layer/code/linetype/angles/pen** tick box
*if **ticked**, then any SDRMap lines and arcs must have the same layer/code/linetype/angle/pen before they can be joined in the head to tail process.*
- Read** button
read the data in

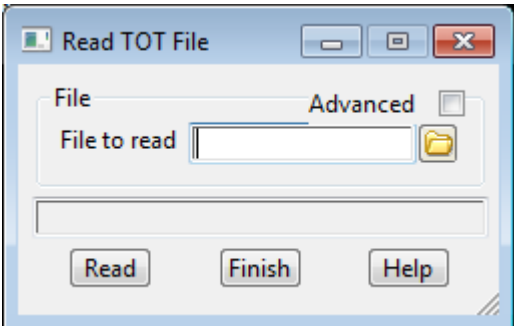
TOT Input

Position of option on menu: File I/O =>Data input =>TOT

The TOT option attempts to read in TOT files.

Note: TOT is a format used by Model Maker, a software program from South Africa.

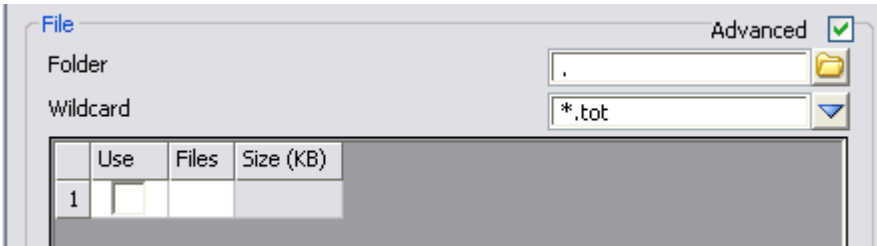
Selecting TOT brings up the **Read TOT File** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Advanced	tick box		
<i>if ticked, a grid to allow multiple TOT files to be read in, is opened. A wild card is used to select all the files to be read in.</i>			



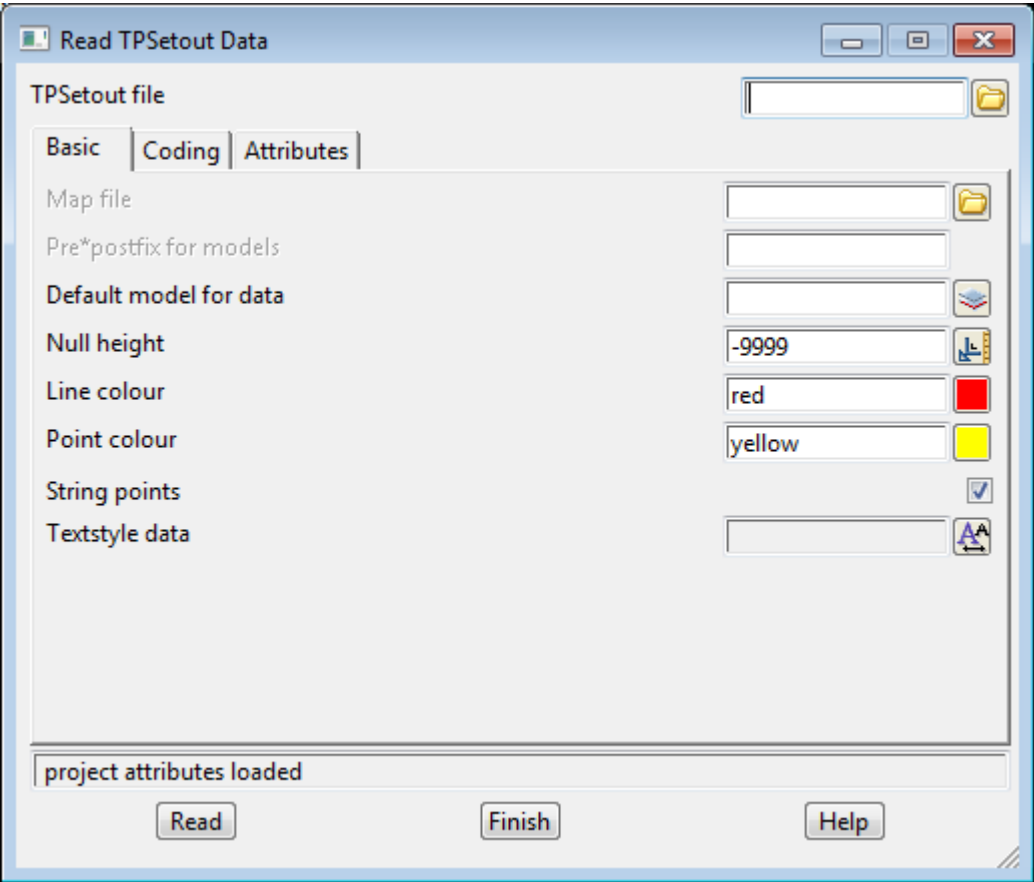
Folder	folder box	
<i>folder to search for files using the Wild card</i>		
Wildcard	input	
<i>wild card to use in search for files in the given folder</i>		
Use	tick box	
<i>if ticked, read in the file</i>		
Files	output	
<i>name of the file in the folder</i>		
Size	output	
<i>file size</i>		
File to read	file box	*.TOT files
<i>name of the TOT file to read in</i>		
Read	button	
<i>read the data in</i>		

TP Setout Input

Position of option on menu: File I/O =>Data input =>TP Setout

The TP Setout input option is designed to read in .pta files from TP Setout

Selecting TP Setout brings up the **Read TP Setout Data** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
TP Setout file <i>name of the TP Setout .pta file to be read in.</i>	file box		*.pta

Basic tab

Map file <i>if non-blank, the name of the map file to be used for all strings read in. If blank, no map file is used. The TP Setout code is used as the entity-name to match against the key in the map file. See the section Create/Edit a Map File in the chapter File I/O for information about 12d map files.</i>	map file box		*.mf files
Pre*postfix for models <i>if non-blank, a prefix and a postfix to be applied to the model names used in the mapping file. Go to the section Pre*Postfix Panel Fields for information on using pre*postfix.</i>	pre*postfix box		
Default model for data <i>name of the model that any unmapped data is placed in. The model will be created if it does not already exist. This field must be filled in.</i>	model box		available models
Null height	input	-9999	

if non-blank, any TP Setout z values equalling this value are taken as null values.

Line colour colour box red available colours
colour for TP Setout strings.

Point colour colour box yellow available colours
colour for TP Setout points that are not part of strings.

String points tick box tick
if ticked, points with the same description are joined together.
If not ticked, points with the same description are not joined together.

Textstyle data textstyle data box available textstyle datas
textstyle data used for any text labels

Coding tab

Point ids in column 5 tick box
if ticked, there are points ids in column 5 of the file.

Feature code input
number of characters in the feature code

String number input
number of characters in the string number

Point ids input
number of characters in the point ids

Attributes tab

Name
Type
Data

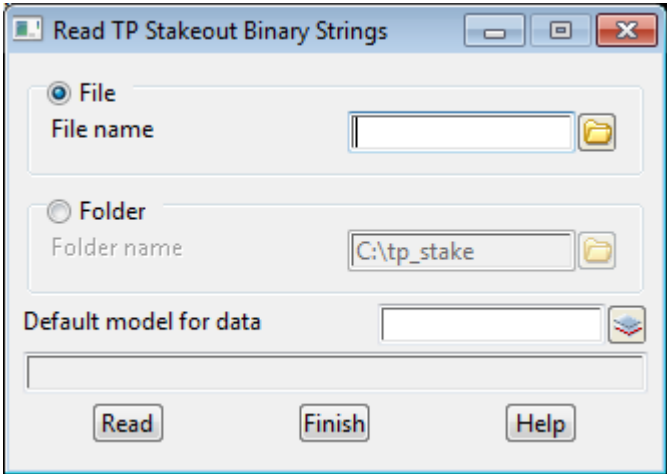
Read button
read the data in.

TP Stakeout Strings Input

Position of option on menu: File I/O =>Data input =>TP Stakeout strings

The **TP Stakeout strings** input option is designed to read in .3db files (binary strings) from TP Stakeout.

Selecting **TP Stakeout strings** brings up the **Read TP Stakeout Binary Strings** panel.



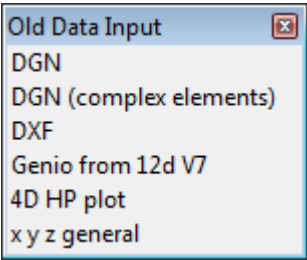
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
File	radio button		
<i>if on then an individual binary string file is to be read in.</i>			
File name	file box		*.3db files
<i>if non-blank, the name of the binary string file to read in.</i>			
Folder	radio button		
<i>if on then the all the binary string files in the folder are to be read in.</i>			
Folder name	folder box		
<i>if non-blank, all the binary string files in this folder are read in.</i>			
Default model for data	input		available models
<i>name of the model to read the binary strings into.</i>			
Read	button		
<i>read the data in.</i>			

Old Inputs

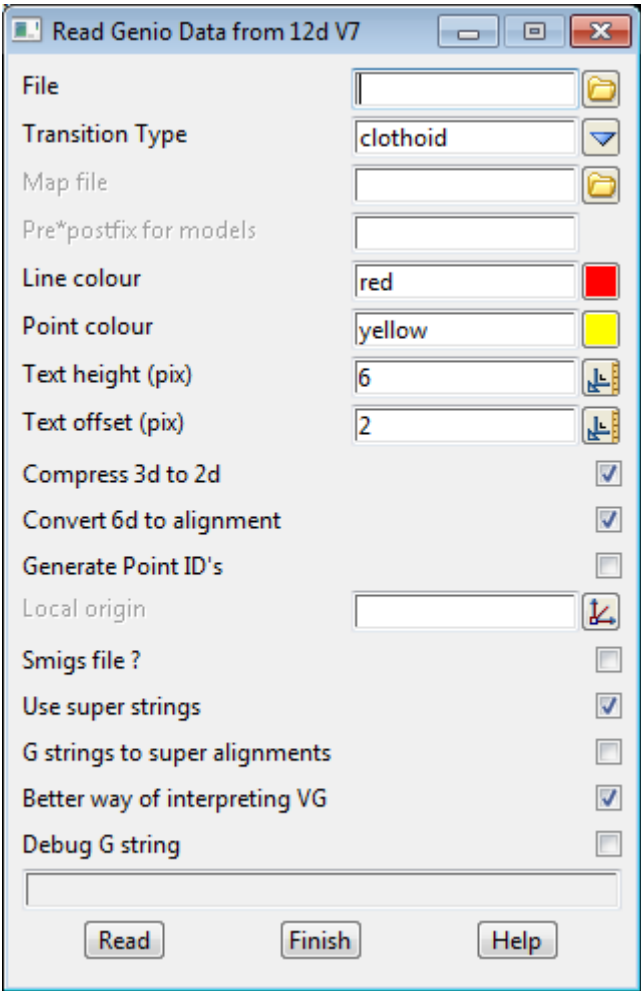
Position of menu: File I/O =>Data input =>Old

The Old menu contains superseded options. The Old walk-right menu is



Genio from 12d V7

This section of documentation is a work in progress and will be updated in subsequent releases.



12D HP Plot File

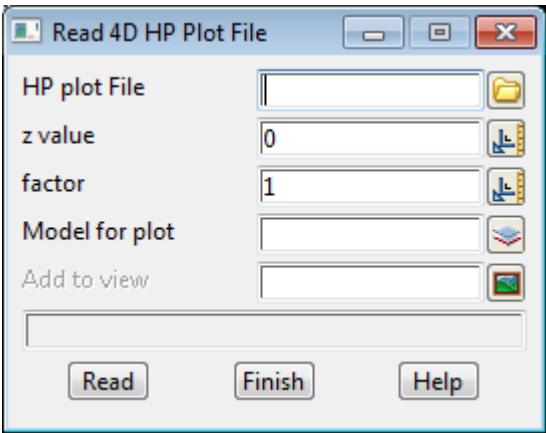
Position of option on menu: File I/O =>Data input =>Old =>4D HP plot

12d Model has options to create plots for HPGL compatible plotters. This option reads back into 12d Model any plots created by 12d Model using HPGL plot options.

A plot file is only a two dimensional file defined in millimetres. When read back into 12d Model, the units are automatically multiplied by 1000.

In the option, the user can supply a further factor to multiply the x and y coordinates by and also a z-value which is used as a z coordinate for all the lines in the plot file.

On selecting the 12d HP plot option, the read 4D HP plot file panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
HP plot file <i>name of the 12d HP plot file to be read in</i>	input		*.hp files
z value <i>z coordinate to use for the lines read in from the plot file</i>	input	0.0	
Factor <i>the default units used when reading in a plot file are multiplied by 1000. They are then multiplied by this value.</i>	input	1.0	
Model for plot <i>name of the model that the plot file is to be placed in. The model will be created if it does not already exist. This field must be filled in.</i>	input		available models
Add to view <i>if a view name is entered, then the model will be automatically added to the view. This field can be blank.</i>	input		available views
Read <i>read the plot file into the model given in the model field.</i>	button		

DXF Input

Position of option on menu: File I/O =>Data input =>Old =>DXF

DXF input is a separate chargeable option

The **DXF** input option is designed to read most autocad DXF files (up to Version 12), including binary DXF which was introduced in AutoCAD Release 10 as a means of addressing the problems of large file sizes, slow processing and limited accuracy that occur when using the ASCII DXF format. **12d Model** will automatically sense whether the input file is binary or ASCII.

The standard Autocad colours can be mapped to the equivalent **12d Model** colours or just mapped on a one-to-one basis to **12d Model** colour numbers.

Each DXF item has an associated layer. By default, **12d Model** creates models of the same name as the layers (or with an additional user supplied prefix) and the DXF items placed in them.

However, this can be over-written using a standard **12d map file** where the key is matched against Autocad **layers** rather than string names.

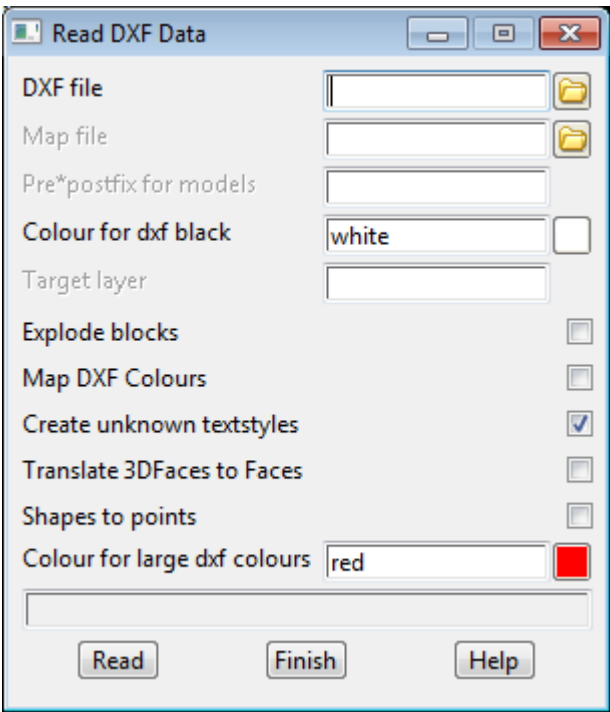
See the section [Create/Edit a Map File](#) in the chapter [File I/O](#) for information about 12d map files.

Autocad blocks are recognised and either a point with the block name is created or the blocks are expanded into their components, each time they are referenced in the DXF file.

Bulges in polylines can only be interpreted correctly when the polyline has a constant z-value. For this case, a **12d Model** polyline string is created from the DXF polyline.

Finally, DXF POINT entities of the same layer and colour are concatenated into one point string as they are read in.

On selecting the **DXF** option, the **read dxf data** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
DXF File <i>name of the DXF file to be read in</i>	input		*.dxf files
Map file <i>if non-blank, the name of the map file to be used for all DXF layers read in. The DXF layer is the entity-name for matching against the key in the map file.</i>	input		*.mf files

- If blank, no map file is used.
See the section [Create/Edit a Map File](#) in the chapter [File I/O](#) for information about 12d map files.*
- Prefix for models** input
if non-blank, all 12d Model model names created by the reader will be prefixed by this name.
- Colour for dxf black** input white available colours
if the DXF colour of an item is black, then the colour in the colour for black field is used for the item in 12d Model.
- Target layer** input
if non-blank, only autocad items in the layer with the name given in the target layer field will be read in.
- Explode blocks** tick no tick
*if ticked, autocad blocks are exploded in 12d Model.
If not ticked, blocks are not exploded and a point string is placed at the position of the block.*
- Map DXF colours** tick no tick
*if ticked, the first seven DXF colours are mapped to the corresponding default 12d Model colours.
If no ticked, the nth DXF colour is mapped to the nth 12d Model colour.*
- Create unknown textstyles** tick tick
*if ticked, then if a textstyle in the DXF file is not already defined in 12d Model, then a new 12d Model textstyle of the same name is created.
If no ticked, then the 12d Model textstyle "I" is used for any unknown DXF textstyles.*
- Translate 3DFaces to face** tick no tick
if ticked, DXF faces are read in as 12d Model face strings.
- Colour for large dxf colours** input red available colours
if the DXF colour is greater than the largest colour number defined in the 12d Model colour map, then the colour in the colour for large dxf colours field is used for the DXF colour.
- Read** button
read the data in.

User X Y Z and Attributes Input - Pre V9

Position of option on menu: File I/O =>Data input =>Old => x y z general

Note - this option was replaced in **12d Model 9**.

On selecting the read x,y,z general option, the **Read x y z s General File** panel is displayed.

This option reads data in one line at a time with the values separated by a delimiter (tab, space, semi-colon or comma) or the data on each line can be in fixed width columns.

In either case, the user specifies the order that the x, y, z, string name, point number and attributes appear in the file. If desired, only an x and y value needs to be read in.

The set-ups for defining all the positions of all the data in the file can be written out to a file (.xyf) for re-use.

Read X Y Z General File

Parameters

Parameter file

File

Input settings

Map file

Pre*postfix for models

Default line colour

red

Default point colour

yellow

Default text style

Default model for data

Add to view

Skip column headers

Join all

Create missing attributes

Input mode

Delimiter

Delimiter

tab "\t"

Column number in file

	Information Type	Column #
1		

	Attribute Mode	Name	Type	Column #
1				

Fencing

Fence string

Fence mode

Read

Finish

Help

User X Y Z and Attributes Input - Pre V9

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The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Parameters section			
Parameter file <i>name of the file containing the settings for how the data is positioned in the input file.</i>	input		*.xyf files
Read icon <i>read the parameter file in.</i>	button		
Write icon <i>write the setting in the panel out to a parameter file.</i>	button		
Input settings section			
File <i>name of the data file to be read in</i>	input		*.dat files
Map file <i>if non-blank, the name of the map file to be used for all strings read in. If blank, no map file is used. The string name is used as the entity-name for matching with the keys in the map file. See the section Create/Edit a Map File in the chapter File I/O for information about 12d map files.</i>	file box		*.mf files
Pre*postfix for models <i>if non-blank, a prefix and a postfix to be applied to the model names used in the mapping file. Go to the section Pre*Postfix Panel Fields for information on using pre*postfix.</i>	pre*postfix box		
Default line colour <i>colour used for line-strings (if no colour is defined in the file)</i>	input	default colour	available colours
Default point colour <i>colour used for the crosses in point-strings (if no colour is defined in the file)</i>	input	default pt colour	available colours
Default text style <i>textdata for the point ids and other text</i>	input		available textdatas
Default model for data <i>name of the model that the data is to be placed in. The model will be created if it does not already exist. This field must be filled in.</i>	input		available models
Add to view <i>if a view name is entered, then the model will be automatically added to the view. This field can be blank.</i>	input		available views
Skip column headers <i>if ticked, the first line of the file is skipped.</i>	tick box		
Join all <i>if ticked, all vertices with the same string names are joined together regardless of where they are in the file. The order of the vertices is the order they occur in the file. If not ticked then any time a string name changes in the file, a new string is created. So if the same string name occurs but separated by a different string name, then more than one string of that same name will be created. The order of the vertices is the order they occur in the file.</i>	tick box		
Input mode <i>if delimiter, the type of delimiter and the columns for the x, y and optionally z, name and point number are given.</i>	choice box	delimiter	delimiter, fixed width
Delimiter <i>if fixed width, the start and end column positions are given for x, y and optionally z, name and point number.</i>	choice box	tab \f	one space, tab \t, semi colon, comma many spaces

Column number/Start end position section

information to read in (x,y,z, attributes etc.) and its position in the input file.

Input mode

Delimiter

Delimiter

tab "\t"

Column number in file

	Information Type	Position #
1		

	Attribute Mode	Name	Type	Position #
1				

Input mode

Fixed width

Delimiter

tab "\t"

Start/end position

	Information Type	Start	End
1			

	Attribute Mode	Name	Type	Start	End
1					



11 Data Output

Position of menu: File I/O =>Data output

12d Model provides output options so that data in a model or on a view can be written out to a disk file. this may be to allow data to be transferred to other programs for further processing or simply to get a readable list of data.

The default *Output null value* is described in the section [Output Null Value](#)

The data output walk-right menu containing these options is

Data Output	
12da/4da data	write out data in 12d Model Ascii format
ArcView SHP	ArcView SHP file
x y z	x y z data
DEMs	write out DEM data for a tin
DGN	DGN binary
DWG/DXF/DXB	DXF/DWG file
Genio	MX (Moss)genio data
LandXML	LandXML data
MapInfo	MapInfo data
Civilcad V5	Civilcad V5.0 file
Geocomp	Geocomp pts and str files
TP Stakeout triangles	TP Stakeout triangles
TP Stakeout strings	TP Stakeout binary strings
KML	KML
IFC	IFC
Old	Old formats
User	User Data Output menu

For the option *12da data*,

ArcView SHP

x y z

DEMs

DGN

DWG/DXF/DBX

Genio

LandXML

MapInfo

Civilcad V5.0

Geocomp

TP Stakeout triangles

TP Stakeout strings

KML

IFC

Old

[12d Ascii Output.](#)

[ArcView SHP Output](#)

[Output X Y Z Text Files](#)

[DEMs in the chapter Triangles](#)

[Output DGN Binary Files](#)

[Output DWG/DFX/DXB Files](#)

[Genio Output](#)

[LandXML Output](#)

[Output MapInfo MID/MIF Files](#)

[Civilcad](#)

[Geocomp](#)

[TP Stakeout Triangles Output](#)

[TP Stakeout Strings Output](#)

[KML Output](#)

[IFC Output](#)

[Old Outputs](#)

Output Null Value

When writing out data for other systems, it is usually not appropriate to write out the internal 12d Model null height (- 9.9e29).

Consequently as data is written out, any 12d Model null heights are replaced by the value given by the I/O null height parameter.

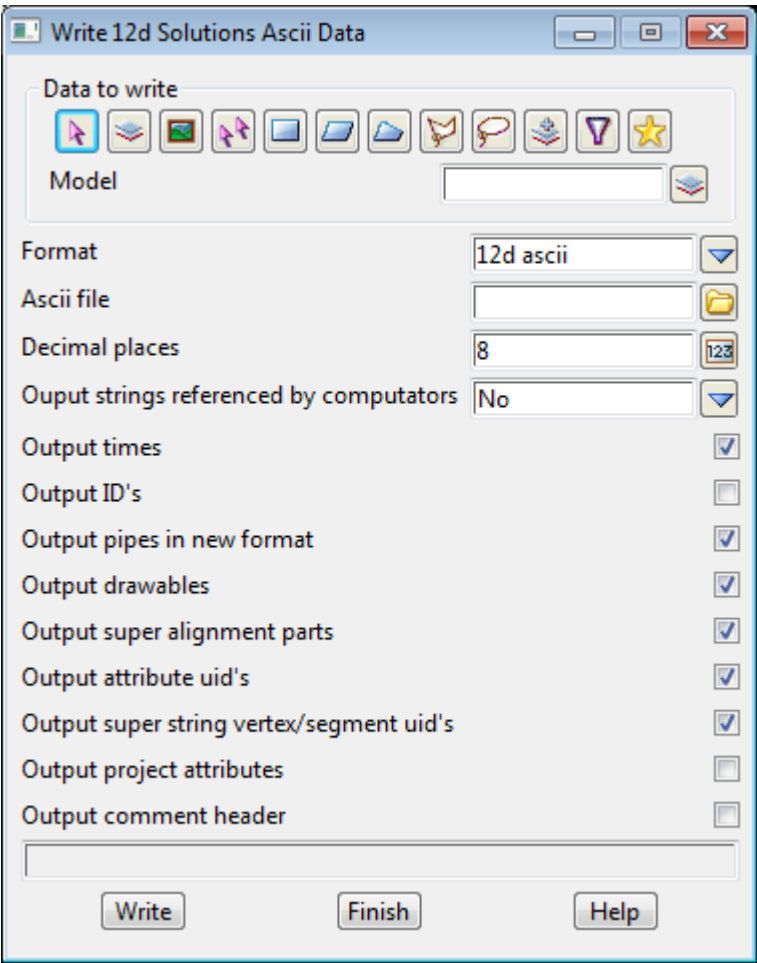
The I/O null height is set in **Default Settings** tab of the **Defaults** panel in the option **Utilities=>Defaults**.

12d Ascii Output

Position of option on menu: File I/O =>Data output =>12da/4da data

The 12d ascii (4D Ascii) format is a special text format defined by 4D Solutions (see the Appendix) for writing out **12d Model** data.This option is used to write out **12d** Model data in the 12d Ascii format.

Selecting the 12d data brings up the **Write 12d Solutions Ascii Data** for panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source	input		
<i>source of data is to be written out to a file.</i>			
Format	choice	12d ascii	12d ascii, 4d ascii
<i>use 12d ascii or 4d ascii format (the only difference is the file name ending)</i>			

Ascii file	input	*.12da or *.4da
<i>name of the file for the information to be written out to in 12d Ascii format. If the file already exists, the data will be appended to the file.</i>		
Decimal places	input	8
<i>number of decimal places used when writing the data out.</i>		
Output string references by computators	choice box	No Yes, No , De-reference
<i>if Yes, any strings referenced by computators by strings in the data source that are not in the data source, are also written out.</i>		
<i>If No, any strings referenced by computators by strings in the data source that are not in the data source, are NOT written out.</i>		
<i>If De-reference, any super strings in the data source with computators are de-referenced. That is, the computators are replaced by internal elements of the string.</i>		
Output times	tick box	
<i>if ticked, write out the creation times etc. for the objects.</i>		
<i>If not ticked, don't write out the creation times etc. for the objects.</i>		
Output ID's	tick box	
<i>if ticked, write out the object ID's.</i>		
<i>If not ticked, don't write out the object ID's.</i>		
Output drawables	tick box	
<i>if ticked, write out the internal super alignment labelling as text.</i>		
Output super alignment parts	tick box	
<i>if ticked, write out all the construction details for super alignments.</i>		
<i>If not ticked, don't write out the construction details. Just write out the HG and VG segments.</i>		
Output attribute uid's	tick box	
<i>if ticked, write out the attribute uids.</i>		
Output project attributes	tick box	
<i>if ticked, write out the project attributes. the construction details for super alignments.</i>		
Output comment header	tick box	
<i>if ticked, write out information as comments at the top of the 12da file.</i>		
Write	button	
<i>write out, in 12d Ascii format, all the string data specified by the Data source.</i>		

ArcView SHP Output

Position of option on menu: File I/O =>Data output =>ArcView SHP

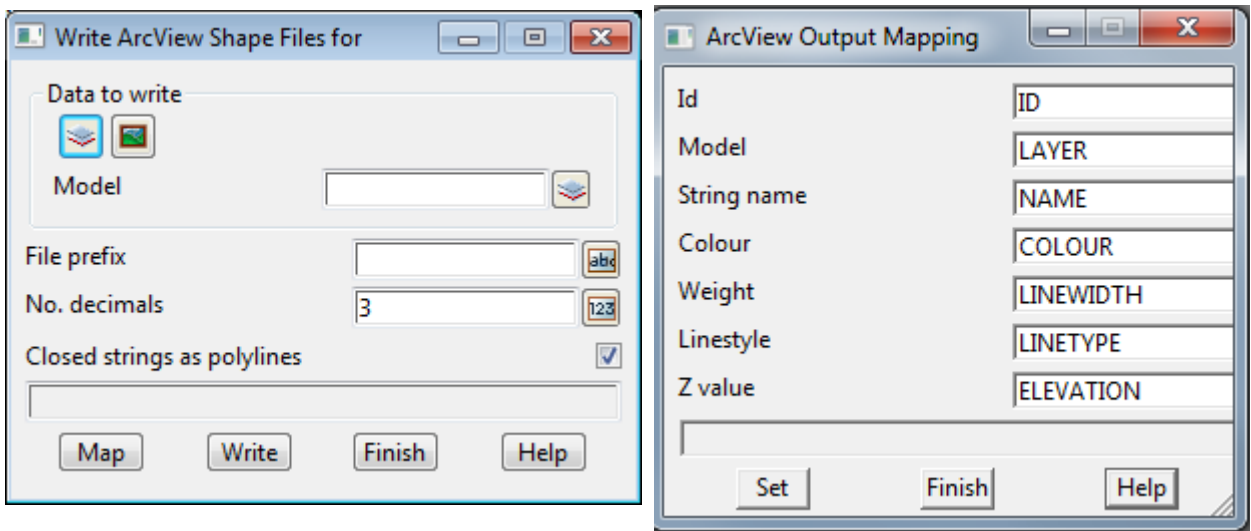
ArcView i/o is a separate chargeable module.

This Option is currently under development.

The *ArcView Shape File* format consists of nine different files containing different data types.

The ArcView shape format has no colour, model or layer information, string names etc. so this information has to be passed through as attributes for the data.

Selecting ArcView SHP displays the **Write ArcView Shape Files for** panel.



The fields and buttons used in the **Write ArcView Shape Files for** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type		Model	
-------------------------	--	-------	--

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data source	input		
--------------------	-------	--	--

source of data is to be written out to a file.

File prefix	input		
--------------------	-------	--	--

prefix to use for the nine different shape files to be produced for the data.

No. decimals	integer box	3	
---------------------	-------------	---	--

number of decimal places to use in the shape files.

Closed strings as polylines	tick box	3	
------------------------------------	----------	---	--

if ticked, write out closed strings in polyline shape files

Map	button		
------------	--------	--	--

*brings up the **ArcView Mapping** panel which defines the ArcView attributes to write the standard **12d Model** string header information out to.*

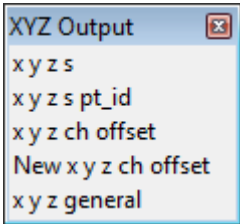
Write	button		
<i>write out, in ArcView shape file format, all the string data specified by the Data source.</i>			
The fields and buttons used in the ArcView Mapping panel have the following functions.			
Field Description	Type	Defaults	Pop-Up
Id		ID	
<i>if non blank, write out an integer number which increments from 1.</i>			
Model		LAYER	
<i>if non blank, write out the model of the string to this attribute.</i>			
String name		NAME	
<i>if non blank, write out the name of the string to this attribute.</i>			
Colour		COLOUR	
<i>if non blank, write out the colour of the string to this attribute.</i>			
Weight		LINEWIDTH	
<i>if non blank, write out the weight of the string to this attribute.</i>			
Linestyle		LINETYPE	
<i>if non blank, write out the linestyle of the string to this attribute.</i>			
Z value		ELEVATION	
<i>if non blank, write out the first z-value of the string to this attribute.</i>			
Set	button		
<i>record the attribute names given in the panel as the ones to be use when writing out the data.</i>			

Output X Y Z Text Files

Position of menu: File I/O =>Data output =>x y z

The options under x y z out write out vertices of selected strings in a text format. It is also possible to write out string names, point id's, string, segment and vertex attributes, and chainages and offsets from a selected string.

The X Y Z walk-right menu is



- x y z s data
- user specified x y z s point id
- user specified x y z chainage and offset
- new user specified x y z chainage and offset
- user specified x y z s point no and attribute

- For x y z s, go to
- x y z pt_id
 - x y z ch offset
 - New x y z ch offset
 - General x y z etc

- [X Y Z S Output](#)
- [User X Y Z S Output](#)
- [User X Y Z Chainage and Offset Output](#)
- [User X Y Z Chainage and Offset Output](#)
- [User X Y Z and Attributes Output](#)

X Y Z S Output

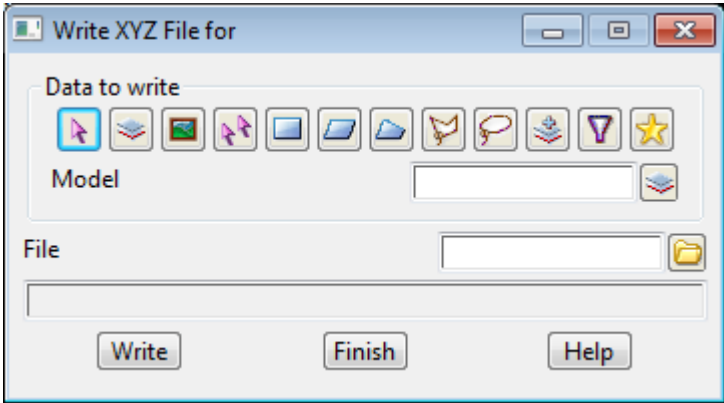
Position of option on menu: File I/O =>Data output =>x y z =>x y z s

The xyzs output format is identical to the input format - one point per line with the **x y** and **z** values separated by spaces, and **s** is the string name.

A string's colour and label are used as colour records and string labels in the output file.

4d, interface, super strings and alignment strings are only output as 3d strings. The use of the **12d** Model ascii file format is formatted for writing out all **12d Model** string types.

Selecting the xyzs option brings up the **Write XYZ File for** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type	Model	
	<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>	
Data source	input	
	<i>source of data is to be written out to a file.</i>	
File	input	*.dat files
	<i>name of the file for the information to be written out to.</i>	
Write	button	
	<i>write out, in x y z s format, all the string data specified by the Data source.</i>	

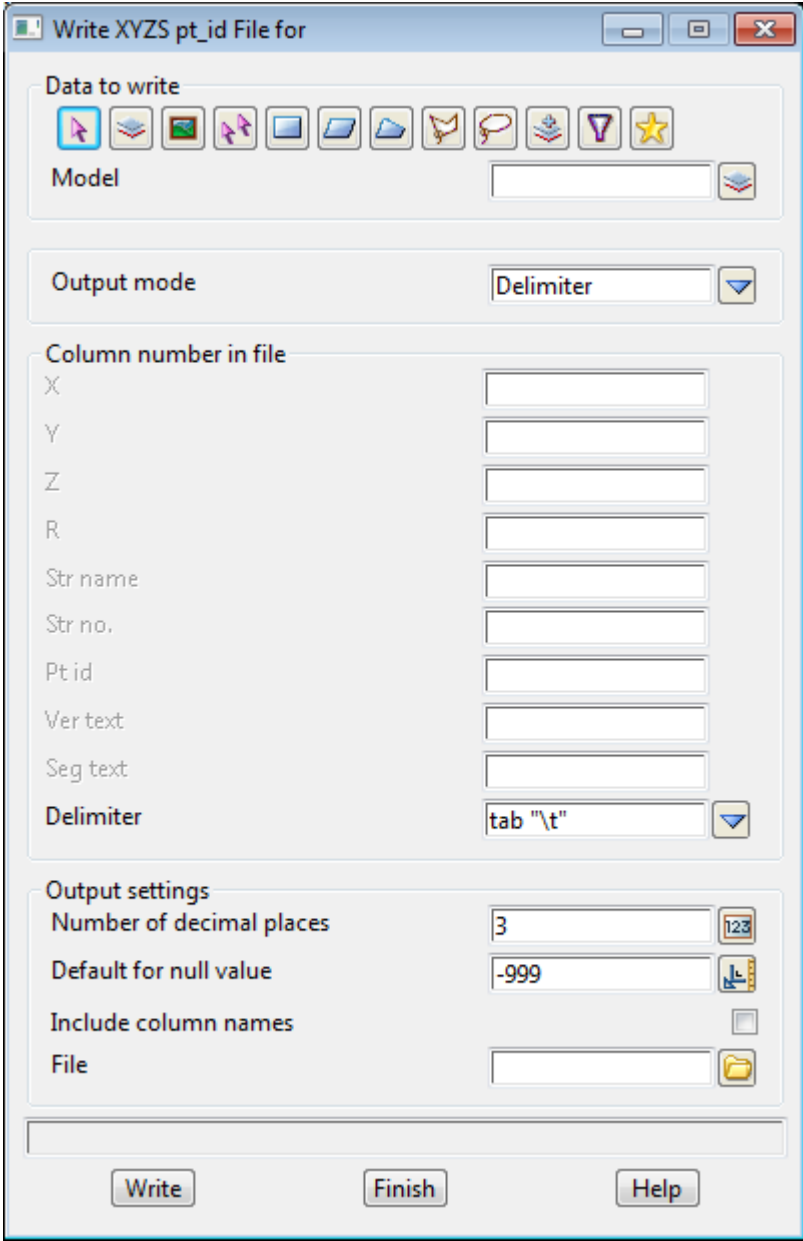
User X Y Z S Output

Position of option on menu: **File I/O =>Data output =>x y z =>x y z s pt_id**

The xyzs output format is identical to the user specified input format - one point per line with the x y z s and point id values in a user specified order separated by either delimiters or in fixed width columns.

super strings, 4d, interface and alignment strings are only output as 3d strings. The use of the **12d** Model ascii file format is used for writing out all **12d Model** strings types.




Selecting the xyzs pt_no brings up the **Write XYZS pt_id File** for panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data source	input
<p>  </p> <p> </p> <p>  </p> <p>  </p> <p> </p> <p> </p> <p>  </p> <p> </p> <p> </p> <p>  </p> <p>  </p> <p> </p> <p>  </p> <p>  </p> <p> </p> <p> </p> <p>  </p> <p> </p> <p> </p> <p>  </p> <p>  </p> <p> </p>	<p>  </p> <p> </p> <p>  </p> <p>  </p> <p> </p> <p> </p> <p>  </p> <p> </p> <p> </p> <p>  </p> <p>  </p> <p> </p> <p>  </p> <p>  </p> <p> </p> <p> </p> <p>  </p> <p> </p> <p> </p> <p>  </p> <p>  </p> <p> </p>

source of data is to be written out to a file.

Output mode	choice box	delimiter	delimiter, fixed width
--------------------	------------	-----------	------------------------

if **delimiter**, the type of delimiter and the columns for the x, y, z, name and point number are given (and are all optional).

If fixed width, the start and end column positions are given for x, y, z, name and point number which are all optional.

Output Settings

Number of decimal places input box	3
-------------------------------------------	---

number of decimal places to use in the x, y and z values.

Default for null value	input box	-999
-------------------------------	-----------	------

value to write out for z when it is a null value in **12d Model**.

Include column names tick box

if ticked, the names x, y, z etc. are written out in the appropriate columns as the first line of the file.

File input *.dat files

name of the file for the information to be written out to.

Write button

write out all the string data specified by the Data source.

User X Y Z Chainage and Offset Output

Position of option on menu: File I/O =>Data output =>x y z =>x y z s ch offset

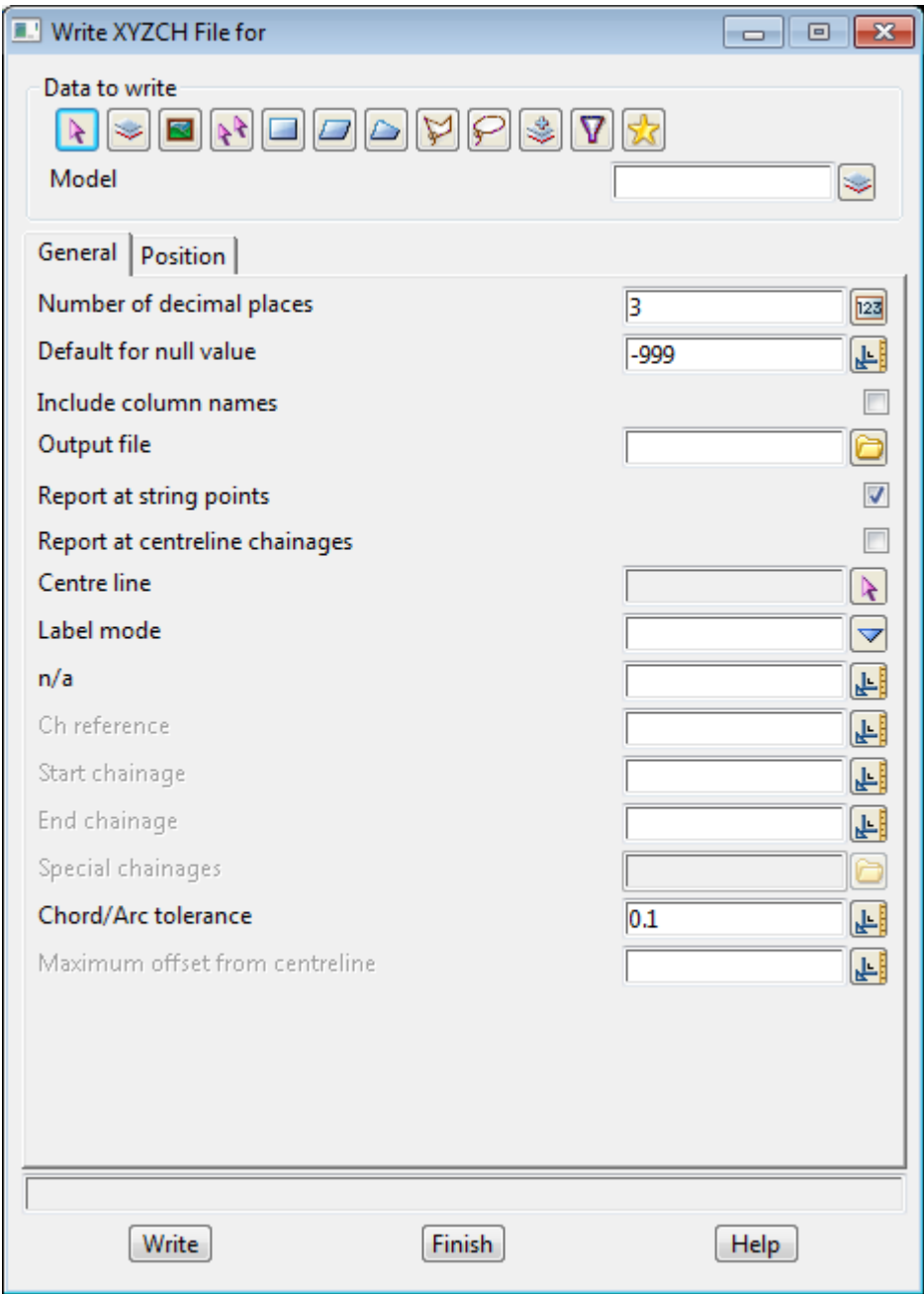
Position of option on menu: File I/O =>Data output =>x y z =>New x y z s ch offset

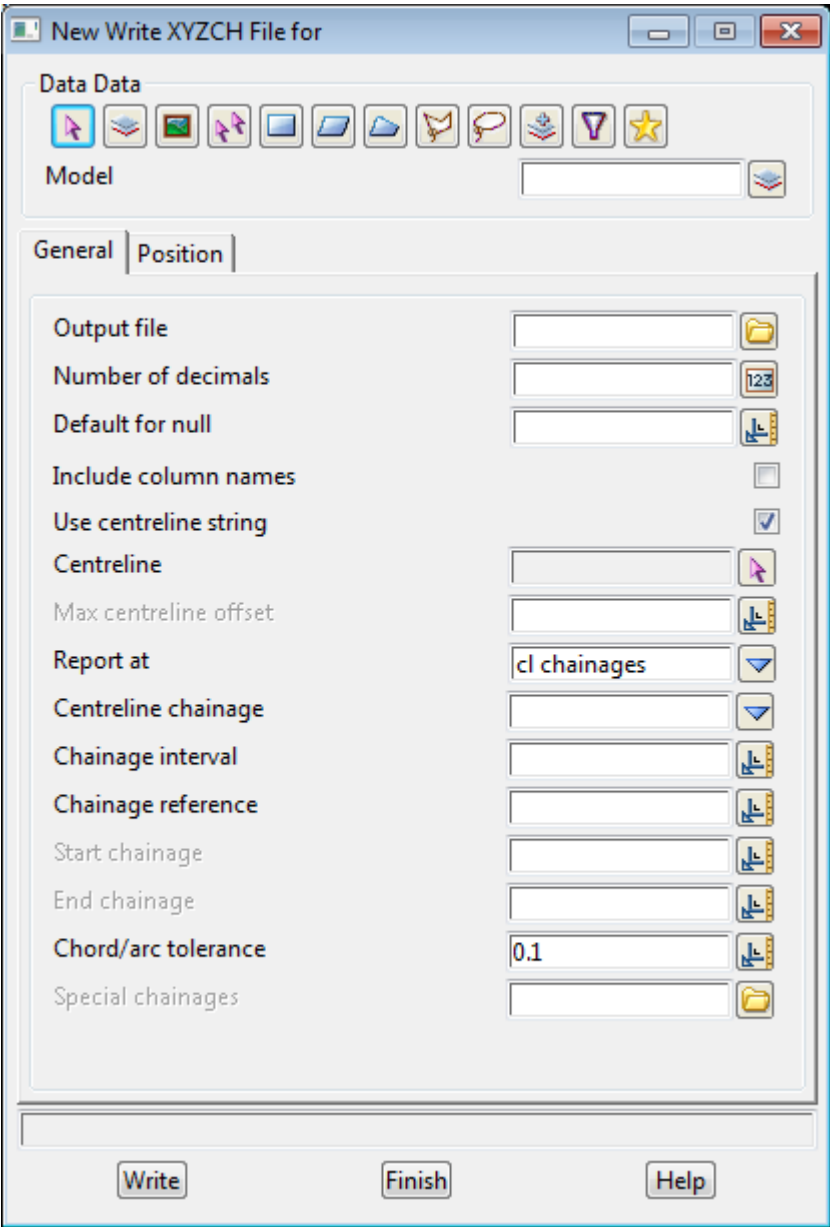
The *New xyz ch offset* option was introduced in V7C1g and will replace the standard option.

The difference is that the new option turns off the panel fields that are not required.

The *xyz and ch* output option writes out the x, y, z and chainage values for each string or a centreline string can be selected and the x, y, z and chainage values from the original string are output along with the chainage and offset from the selected reference string.

Selecting *xyzs ch offset* brings up the **Write XYZSCH File for** panel.





The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type		Model	
-------------------------	--	-------	--

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data source	input		
--------------------	-------	--	--

source of data is to be written out to a file.

Write	button		
--------------	--------	--	--

write out all the data specified by the Data source.

General tab

Number of decimal places	input box	3	
<i>number of decimal places to use in the x, y, z and chainage values.</i>			
Default for null value	input box	-999	
<i>value to write out for z when it is a null value in 12d Model.</i>			
Include column names	tick box		
<i>if ticked, the names x, y, z etc. are written out in the appropriate columns as the first line of the file.</i>			
Output File	input		*.dat files
<i>name of the file for the information to be written out to.</i>			
Report at string points	tick box		
<i>if ticked, the values are output for the points (vertices) of the strings from the data source. If a centre line has been selected, then the chainage for the centre line is calculated by dropping the string vertex onto the centre line.</i>			
Report at centreline chainages	tick box		
<i>if ticked, the specified chainages of the selected centre line (given by label mode etc.) are used and then the positions on the strings from the data source are calculated by going out at right angles to the centre line at the chainage.</i>			
Centreline	string select		
<i>optional - a selected centreline to use for chainages.</i>			
Label mode	input		regular interval, regular interval (plus end pts) end points only horizontal TPs, vertical TPs, horizontal discontinuities vertical discontinuities all discontinuities, crests/sags all horizontal points
<i>type of chainages to use from the centreline.</i>			
Ch interval or n/a	input		
<i>the regular interval to use for chainages.</i>			
Ch reference	input	0	
<i>the chainages to user are integer multiples of the chainage interval added to the reference chainage. For example, if the reference chainage is 23.2 and the chainage interval 10, the chainages 3.2, 13.2, 23.2, 33.2 etc. will be used.</i>			
Start chainage	input		
<i>if non-blank, the string chainage to start using. If blank, start at the beginning of the string.</i>			
End chainage	input		
<i>if non-blank, the string chainage to finish.</i>			

If blank, go to the end of the selected string.

Special chainage file box
file of special chainages to use.

Chord/arc tolerance input default chord/arc tolerance
the chord to arc tolerance to use on the centreline string for determining how many points are used around horizontal curves.

Maximum offset from centreline
if non blank, any vertices further than this distance from the centreline will NOT be written out.
If non blank, all vertices will be written out.

Position tab

Output mode choice box delimiter delimiter, fixed width
*if **delimiter**, then the specified data is written out, each value separated by the delimiter given in the Delimiter field.*
*If **fixed width**, the specified data is written out to a fixed position on the line. An end position is also given.*

String name
if the column number (delimiter) or start-end position (fixed width) is given, then the name of the string from the data source is written out. Otherwise it is not written out.

String vertex index
if the column number (delimiter) or start-end position (fixed width) is given, then the vertex index of the string vertex is written out.

String point id
if the column number (delimiter) or start-end position (fixed width) is given, then the point id of the vertex of the string is written out.

String chainage
if the column number (delimiter) or start-end position (fixed width) is given, then the string chainage of the vertex of the string is written out (not the centre line chainage).

String x/y/z
if the column number (delimiter) or start-end position (fixed width) is given, then the x/y/z co-ordinate of the position on the string is written out (not the centre line x/y/z).

CL offset
if the column number (delimiter) or start-end position (fixed width) is given, then the offset of the string from the centre line is written out.

CL chainage
if the column number (delimiter) or start-end position (fixed width) is given, then the chainage of the centre line is written out.

CL x/y/z

if the column number (delimiter) or start-end position (fixed width) is given, then the x/y/z co-ordinate of the position on the centre line string is written out.

User X Y Z and Attributes Output

Position of option on menu: **File I/O =>Data output =>x y z =>x y z general**

The xyzs output format is identical to the user specified input format - one point per line with the x y z s, point id and attribute values in a user specified order separated by either delimiters or in fixed width columns.

In either case, the user specifies the order that the x, y, z, string name, point id and attributes appear in the file. Only one or more of the items needs to be written out.

The set-ups for defining all the positions of all the data in the file can be written out to a file (.xyf) for re-use.

Super strings, 4d, interface and alignment strings are only output as 3d strings. The 12d Model ascii file format is used for writing out all string types.

Selecting **xyzs general** brings up the **Write X Y Z General File for** panel.

Write X Y Z General File for

Data to write

Model

Parameters

Parameter file

Output settings

Number of decimal places 3

Default for null value -999

Include column names ☐

Mode for attribute column names

File

Output mode Delimiter

Delimiter tab "\t"

Column number/Position in file

	Information Type	Column #
1		

	Attribute Mode	Attribute Name	Column #
1			

Write Clipboard Finish Help

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data to write section

Data source type Model
data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data source input
source of data is to be written out to a file.

Parameters section

Parameter file input *.xyf files
name of the file containing the settings for how the data is positioned in the output file.

Read icon button
read the parameter file in.

Write icon button
write the setting in the panel out to a parameter file.

Output settings section

Number of decimal places input box 3
number of decimal places to use in the x, y and z values.

Default for null value input box -999
*value to write out for z when it is a null value in **12d Model**.*

Include column names tick box
if ticked, the names x, y, z etc. are written out in the appropriate columns as the first line of the file.

File input *.dat files
name of the file for the information to be written out to.

Output mode choice box Delimiter Delimiter, Fixed width
*if **Delimiter**, the type of delimiter and the columns for the x, y, z, string name, attributes etc. are given (and are all optional).*

*If **Fixed width**, the start and end column positions are given for x, y, z, string name, attributes etc. which are all optional.*

Delimiter choice box tab \f one space, tab \t, semi colon, comma many spaces

*if **Output mode** is **Delimiter**, then this is the type of delimiter to separate data in the output file.*

Information Type Grid - Column number in file (Delimiter) or Start/ End (Fixed Width)

Information Type choice box x coord, y coord, z coord, chainage, radius segment major, string name, string number string name/string number, point id vertex text, segment text

information to write out (x,y,z, attributes etc.) and this position in the output file.

Position # (Delimiter) or **Start/ End** (Fixed Width)

if Delimiter, the position number of the information in the tab separated file.

If Fixed Width, the start and end column position for the information.

Attribute Grid

Attribute Mode choice box string, segment, vertex
type of attribute to write out

Attribute Name
name of the attribute to write out

Position # (Delimiter) or **Start/ End** (Fixed Width)
if Delimiter, the position number of the information in the tab separated file.
If Fixed Width, the start and end column position for the information.

Write button
write out all the string data specified by the Data source to the given file.

Clipboard button
write out all the string data specified by the Data source to the clipboard.

Output DGN Binary Files

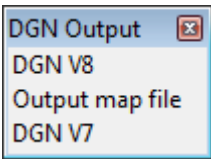
Position of menu: File I/O =>Data output =>DGN

DGN output is a separate chargeable module.

The options under **DGN** write DGN V7 and DGN V8 binary files.

There is also an option to create/edit a DGN output map file.

The **DGN** walk-right menu is



- write DGN V8 binary file
- Create/edit Output map file for DGN V8 binary
- write DGN V7 binary file

For *DGN V8*, go to
Output map file
DGN V7

- [Output DGN V8](#)
- [DGN V8 Output Map File Create/Edit](#)
- [Output DGN V7](#)

Output DGN V8

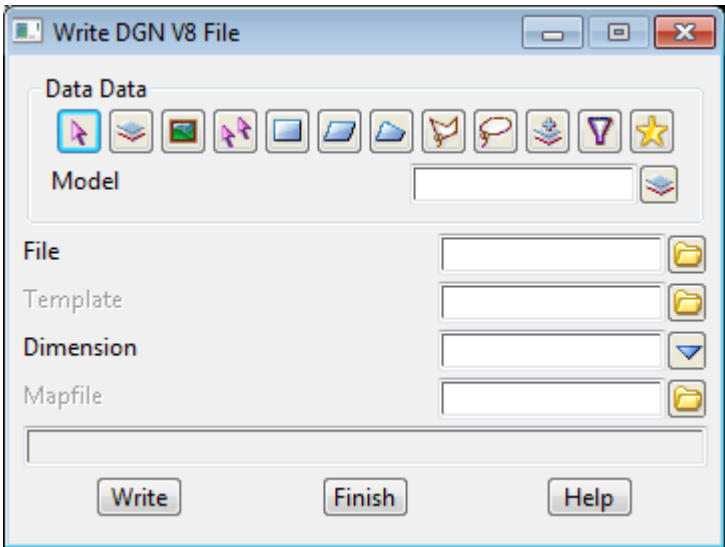
Position of option on menu: File I/O =>Data output =>DGN =>DGN V8

DGN output is a separate chargeable module.

NOTE: the format of the DGN file has changed for DGN V8 but it is proprietary to Bentley and it has not been published. This is a beta version of the DGN V8 Writer to try and write DGN V8 binary files. At this stage it is better to use DWG I/O to go in and out of Microstation V8.

Note: this option is under development

On selecting the **DGN V8** option, the **Write DGN V8 File** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

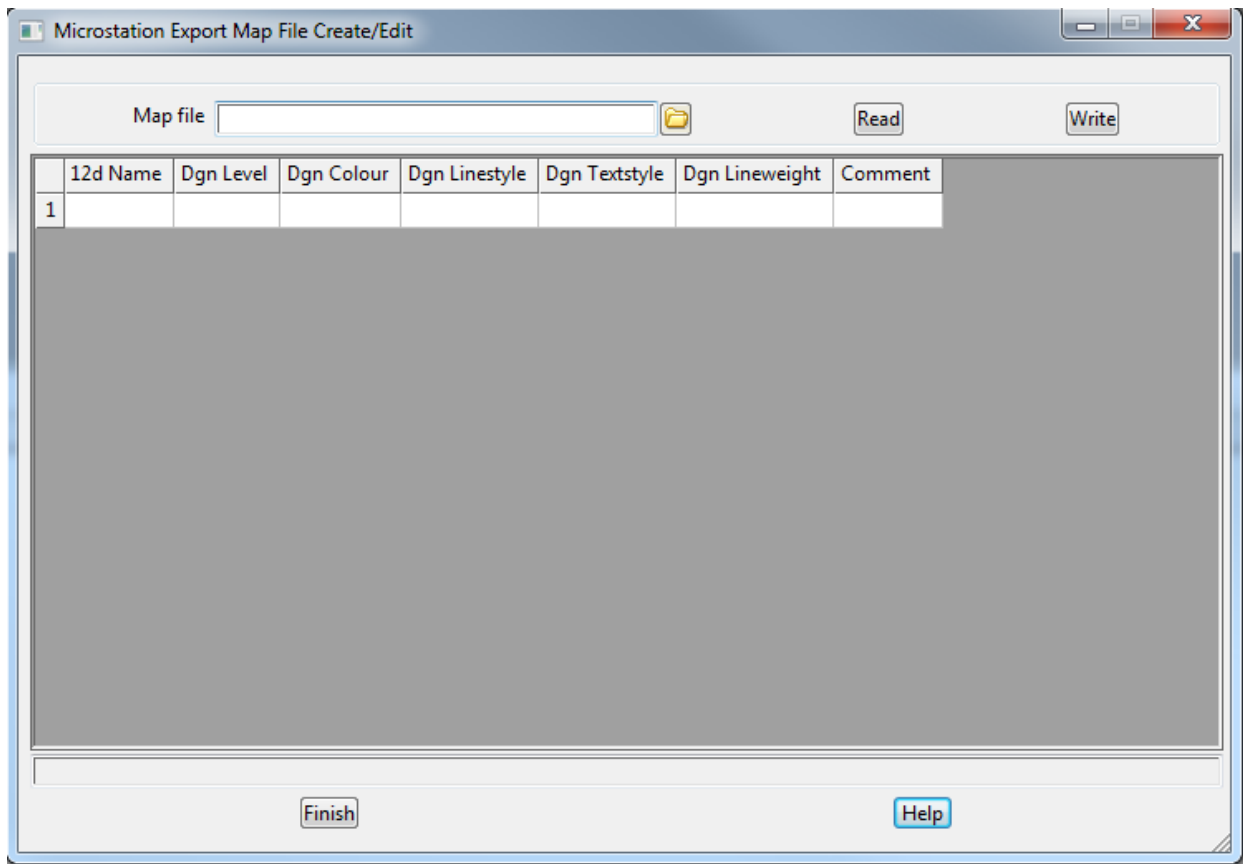
Data source type	Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>		
Data source	input	
<i>source of data is to be written out to the DGN file.</i>		
DGN V8 file	file box	*.dgn files
<i>name of the DGN V8 binary file to be write out to</i>		
Dimension	choice box	2d. 3d
<i>dimension of the DGN file</i>		
Template	file box	*.dgn files
<i>name of the DGN binary file to use as a DGN template</i>		
DGN output map file	file box	*.dgnmfx files
<i>name of the DGN output mapping file to use</i>		
Write	button	
<i>read the data out as a DGN V8 binary file.</i>		

DGN V8 Output Map File Create/Edit

Position of option on menu: File I/O => Data Output => DGN => Output map file

The DGN output map file option **creates** or **edits** the map files used when writing data out to Microstation DGN V8 binary format using the DGN V8 option (not used for plotting to DGN V8).

Selecting DGN output map file brings up the **DGN Export Map File Create/Edit** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Map file <i>name of the DGN output map file to be created or edited.</i>	input		*.acadmf
Read <i>read in the DGN output map file given in the map file field and load the data into the fields of the table. If the file doesn't exist, an error message is given.</i>	button		
Write <i>write out the data in the table to the file name given in the map file field. If the file already exists, a Replace-Cancel panel checks to see if the existing file is to be over written - if no or cancel is selected, nothing is written out.</i>	button		

Grid Cells

- 12d Name**
12d Model string names for the mapping to apply to - wild cards () and characters (!) can be used.*
- DGN level**

*Microstation level to send the selected strings to. Use * to write the **12d Model** model of the string out*

Dgn colour

*Microstation colour to use for the selected strings. Use * for **12d Model** colour number.*

Dgn linestyle

*Microstation linestyle to use for the selected strings. Use * for **12d Model** linestyle*

Dgn Textstyle

*Microstation Textstyle to use for the selected strings. Use * for **12d Model** text style*

Dgn lineweight

Microstation lineweight to use for the selected strings.

Output DGN V7

Position of option on menu: File I/O =>Data output =>DGN =>DGN V7

DGN output is a separate chargeable module.

Using the DGN V7 option, 12d Model produces DGN binary files (*.dgn files - as defined in the public domain by Intergraph Corp) as used by Intergraph and Microstation. Since DGN V7 supports 3d faces, the triangles created in 12d Model can be transferred to DGN V7 for use in shaded models and walk-throughs.

DGN V7 files are either 2d or 3d. 12d Model can write either type of file. If a 3d file is being written, the 12d Model strings will be written out as three dimensional DGN lines. The alignment strings and arcs will be approximated by short lines.

If a 2d file is being written, arcs in alignment strings are written out as DGN plan arcs.

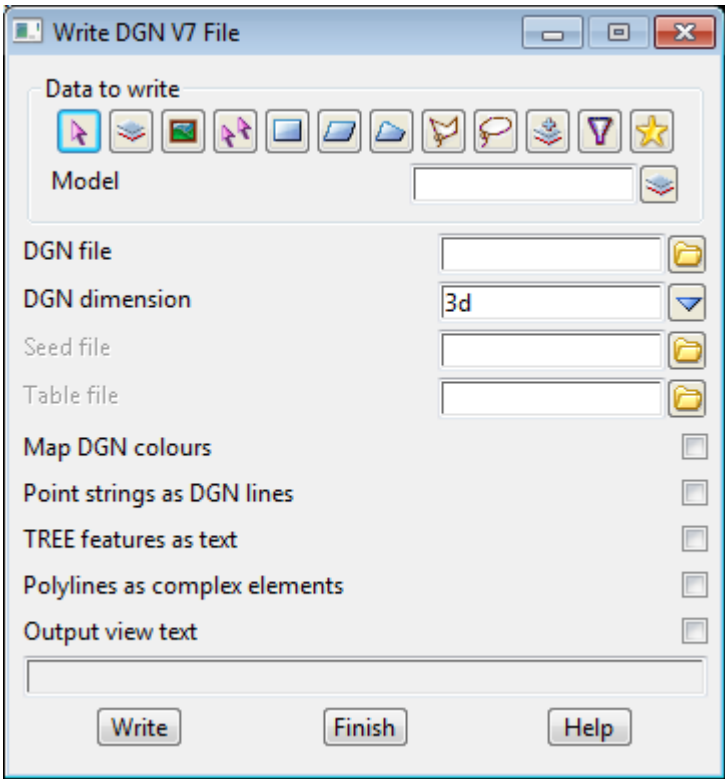
When creating a DGN V7 binary file, it is often convenient to append the information to an existing DGN file known as a seed file (the seed file usually contains set up information for the DGN V7 drawing).

In 12d Model the user can specify a folder containing seed files by pointing to it using the environment variable MS_SEEDFILES_4D. In the DGN V7 output option, the pop-up for the seed file panel field displays all the files ending in .dgn in the folder pointed to by MS_SEEDFILES_4D.

If the environment variable MS_SEEDFILES_4D has not been set, the pop-up uses the current working folder to search for seed files.

It is possible to use an output map file (called a table file) with string name as the key to set DGN V7 levels, colours, weight, style and special symbols (see next section). Because of the limitation of 64 levels in DGN V7, using a table file is normally the best method of getting data across to DGN V7.

On selecting the DGN V7 option, the Write DGN V7 File panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source	input		
<i>source of data is to be written out to a DGN V7 binary file.</i>			
DGN file	input		*.dgn
<i>name of the DGN V7 file to write the model/view data out to. If the file exists, it is appended to, and the settings for TCB variables are read from the file. If the file does not exist, it is created with default TCB settings. The file is created either 2d or 3d depending on the DGN Dimension field.</i>			
DGN Dimension	input	3d	2d/3d
<i>this field controls the dimension of DGN files created for the case where the file named in the Seed file does not exist.</i>			
Seed file	input		files in the seed folder
<i>if non-blank, this field gives the name of the DGN V7 file to be used as a seed file for the DGN V7 output. The folder containing the seed files, the seed folder, is given by the environment variable MS_SEEDFILES_4D.</i>			
Table file	input		*.tbl file
<i>if non-blank, the file is used as an output map file between 12d Model and the .dgn binary file.</i>			
Map DGN Colours	tick box		
<i>if not ticked, 12d Model colour number n is mapped to DGN V7 colour n. if ticked, some of the 12d Model colours are attempted to be mapped to DGN V7 colours.</i>			
Point strings as DGN line	tick box		
<i>if ticked, 12d Model points go out as DGN V7 two point strings with the same value for each point. if not ticked, 12d Model points go out to DGN V7 points.</i>			
TREE features as text	tick box		
<i>if ticked and there is a table file match for TREE, then 12d Model writes out feature strings of name "TREE" as text in DGN. Other feature strings go out as circles. if not ticked, all 12d Model feature strings go out as DGN V7 circles.</i>			
Polylines as complex elements	tick box		
<i>if ticked and DGN dimension is 2d, 12d Model writes out polylines as complex elements made up of lines and arcs. if not ticked, the polyline goes out as individual lines and arcs.</i>			
Output view text	tick box		
<i>if ticked, any view text turned on (point numbers, z-values etc.) are output as text in DGN V7. if not ticked, view text is not output.</i>			
Write	button		
<i>write out the all the data specified by the Data source to the file given in the DGN file field.</i>			

DGN V7 Output Mapping File (Table File)

When using the output options to write out a DGN V7 file, a DGN V7 output mapping file (table file) can be used, with string names as the key, so that the user can specify DGN level, colour, weight, style and some information which is placed in an DGN attribute. The format is based on the VicRoads specification.

The key can have wild cards (*) and wild characters (?) as for the input map files.

The table consists of lines containing either 8 or 16 free format fields. Fields 9-16 can be left off if they are not needed.

The key for the map is the **12d Model** string name which is given as the first field of a line. The rest of the fields on the line are used for .dgn information.

field 1	12d Model string name (any length but if field 2 is a *, only the first four characters are passed)						
field 2	text of which the first four characters are used in a DGN V7 attribute. For example,						
	the VicRoads code						
field 3	AS2482 feature code						
field 4	description	(any length but quotes needed if there are embedded spaces)					
field 5	line level	(between 1 and 64)					
field 6	line colour	(between 1 and 256)					
field 7	line weight	(between 1 and 7)					
field 8	line style						

fields 9-16 are only used for special symbols placed at points.

field 9	symbol font	(between 0 and 7)
field 10	symbol character	
field 11	symbol character justification	
field 12	symbol character height	
field 13	symbol character width	
field 14	symbol level	
field 15	symbol weight	
field 16	symbol colour	

Field 1, the **12d Model** string name, can contain wild cards * or wild characters ?.

Field 2, a text string, and the first four characters of the text is inserted into a DGN V7 attribute. This DGN V7 attribute is used by the **12d Model** DGN V7 reader for matching with a **12d Model** input map file.

If field 2 is a * then the first four characters of the **12d Model** string name is inserted as an Intergraph attribute.

Line strings and Text strings only use fields 1 to 8 and ignore fields 9-16 (if they exist).

Fields 9 through 16 are only used for **12d Model** point strings which are then mapped with the specified Intergraph symbol at each point of the string.

If either field 12 or 13 is zero, then it is interpreted to mean that only the first 8 fields are used.

If any of the fields 5 through 16 (except 9 and 11) is a *, then that field is not used in the map.

Double quotes " are entered as text as \", a ' as \' and a \ as \\.

An example of a map table where the first four characters of the **12d Model** string names are passed directly through to the DGN attribute.

CONT	*	50020000	"Contour - Standard "	2	4	0	0
TOP	*	25060001	"Top - Cut/fill/bank "	2	11	1	2
TOE	*	25060002	"Toe - Cut/fill/bank "	3	11	1	7
ES*	*	50090001	"Existing surface-spot "	4	9	1	0
				110	A	7	1000
						1000	4

0 9
CIND * 50080000 "Contour - Index " 2 4 1 0

An example of a map table where the **12d Model** string names are used for mapping but different names go through to the DGN attribute.

101 CONT 50020000 "Contour - Standard " 2 4 0 0
102 TOP 25060001 "Top - Cut/fill/bank " 2 11 1 2
104 ES 50090001 "Existing surface-spot" 4 9 1 0 110 A 7 1000 1000 4 0
9

Output DWG/DFX/DXB Files

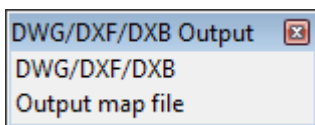
Position of menu: File I/O =>Data output =>DWG/DXF/DXB

DWG/DXF/DXB i/o is a separate chargeable module.

The option under **DWG/DXF/DXB** writes DWG, DXF and DXB files in a variety of AutoCAD formats.

There is also an option to create/edit an AutoCAD output map file.

The **DWG/DXF/DXB** walk-right menu is



write DWG/DXF/DXB V8 files

Create/edit Output map file for DWG

For *DWG/DXF/DXB*, go to
Output map file

[DWG/DXF/DXB Output](#)

[AutoCAD Output Map File Create/Edit](#)

DWG/DXF/DXB Output

Position of option on menu: File I/O =>Data output =>DWG/DXF/DXB =>DWG/DXF/DXB

DWG/DXF/DXB i/o is a separate chargeable module.

The DWG/DXF output format is for writing data out in a format compatible with AutoCAD versions 2.5 to 20010.

12d Model line strings are output as POLYLINES, point strings as a series of AutoCAD POINTs and triangles as 3DFACES.

By default, the string or triangle colour is used in the Autocad colour record. The DXF layer used is the items model name with any spaces in the model name replaced by a minus (-). However, a DXF output map file with matches on string name can be used to give DXF layers, colours and line type (see next section).

Super strings, 4d, interface and alignment strings can only output as Autocad POLYLINES.

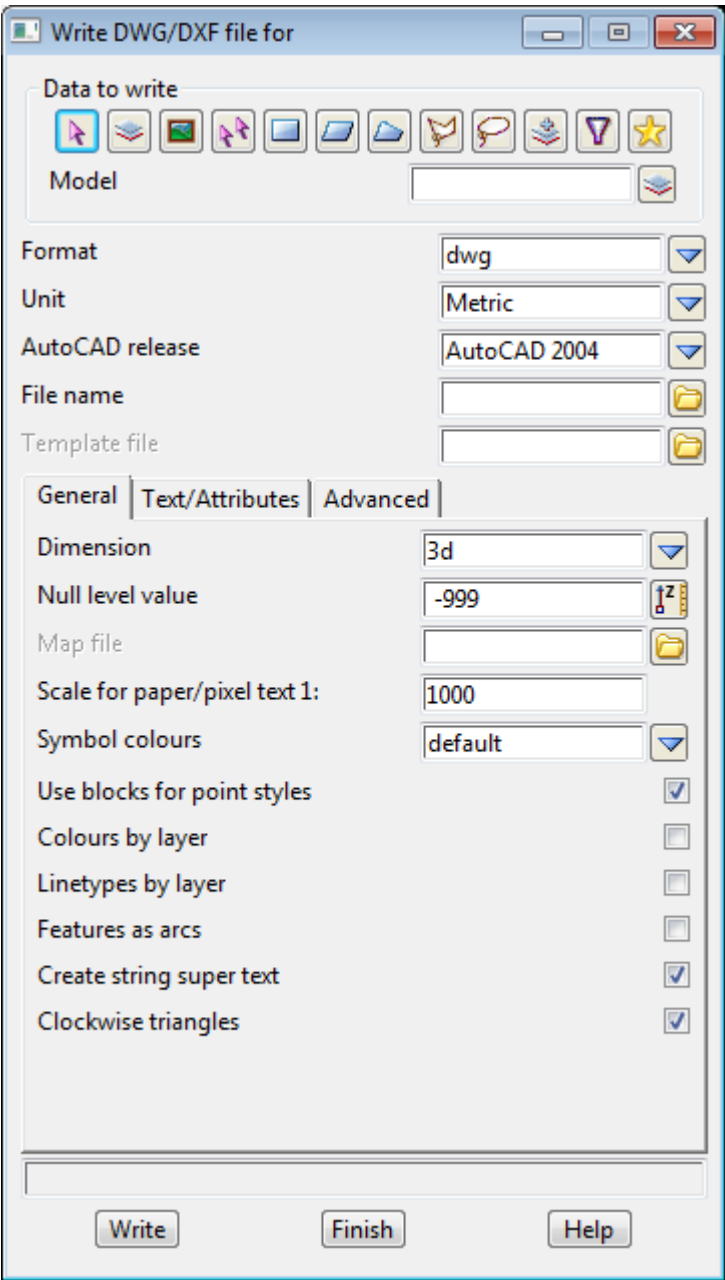
When creating an AutoCAD file, it is often convenient to use an existing AutoCAD file as a template or **seed file** (the seed file usually contains set up information for the AutoCAD drawing).

In **12d Model**, the user can specify a folder containing seed files by pointing to it using the environment variable ACAD_SEEDFILES_4D. In the AutoCAD DWG/DXF output option, the pop-up for the **seed file** panel field displays all the files with the appropriate ending in the folder pointed to by ACAD_SEEDFILES_4D.

If the environment variable ACAD_SEEDFILES_4D has not been set, the pop-up uses the current working folder to search for seed files.

It is also possible to use a label map file to create labels for vertex information such as z-values, symbols and point numbers which are written directly to the AutoCAD file. See the section [Create/Edit Label Map File](#) and [Apply a Label Map File](#) for more information on the label map file.

On selecting the **DWG/DXF** output option, the **Write DWG/DXF file for** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source	input		
<i>source of data is to be written out to a file.</i>			
Format	choice	dwg	dwg, dxf, bdx
<i>AutoCAD format of the file.</i>			

Unit	choice	Metric	Metric, English
<i>AutoCAD units type.</i>			
AutoCAD release	choice	AutoCAD 2004	AutoCAD 12, 13, 14 AutoCAD 2000, 2002, 2004 2005, 2006, 2007
<i>AutoCAD version of the file to be produced.</i>			
File name	input		
<i>name of the ACAD file for the data to be written out to.</i>			
Template file	input		
<i>name of the file to use as the AutoCAD template</i>			

Button at Bottom

Write	button		
<i>write out, in DWG/DXF format, all the data specified by the Data source, to the file given in the file field.</i>			

General tab

Dimension	choice	3d	2d, 2d and contours 3d,3d
<i>if 2d, the z-value of all the data is set to zero and arcs and curves in alignment strings are written out as dxf polylines with bulges for the arcs.</i>			
<i>If 2d and contours 3d, the z-value of all the non-contour data is set to zero and arcs and curves in alignment strings are written out as dxf polylines with bulges for the arcs. Contours are written out as 3d polylines.</i>			
<i>If 3d, strings will be written out as three dimensional DXF polylines. Alignment strings and arcs will be approximated by short lines.</i>			
Null level value	input	-999	
<i>AutoCAD z-value to use for any vertices with the 12d Model null value</i>			
Map file	input		*.acadmfp files
<i>if non-blank, the name of an AutoCAD output map file to map the data. See Apply a Label Map File.</i>			
Scale for paper/pixel text 1:	input	1000	
<i>scale to use to convert 12d Model paper and pixel text to ACAD world units</i>			
Symbol colour	choice box	default	default, by block, by layer
<i>if default, use the 12d Model colour.</i>			
<i>If By block, write out as BY BLOCK.</i>			
<i>If By layer, write out as BY LAYER.</i>			
Use blocks for point styles	tick box		
<i>if ticked, write out blocks for symbols at vertices</i>			

If *underscore*, then spaces in **12d Model** names go out as underscores to ACAD layer names.

If *hyphen*, then spaces in **12d Model** names go out as hyphens to ACAD layer names.

Acad point style	choice	style 0	Acad point styles
-------------------------	--------	---------	-------------------

Point mode	choice	relative	relative, absolute
-------------------	--------	----------	--------------------

if relative, then

If absolute, then.

Point size (%)	input	5
-----------------------	-------	---

Output view text	tick box	no tick
-------------------------	----------	---------

if ticked, any view text turned on (point numbers, z-values etc.) are output as text in DXF.
if not ticked, view text is not output.

Explode interface strings	tick box	no tick
----------------------------------	----------	---------

if ticked, interface strings are broken into separate strings for the cut or fill colour.
If not ticked, interface strings are written out as one string in magenta.

Use model name for mapping	tick box	no tick
-----------------------------------	----------	---------

if ticked,
if not ticked,.

Use symbol name for mapping	tick box	no tick
------------------------------------	----------	---------

if ticked,
if not ticked,.

Use textstyle_data name for mapping	tick box	no tick
--------------------------------------------	----------	---------

if ticked,
if not ticked,.

Associate vertex attributes with symbol	tick box	no tick
------------------------------------------------	----------	---------

if ticked,
if not ticked,.

Vertex attributes height	input	-999
---------------------------------	-------	------

Transition chainage interval

since AutoCAD does not have a transition element (spirals etc.), a transition can only be approximated. This is the chainage length to break up transitions.

Transition chord to arc

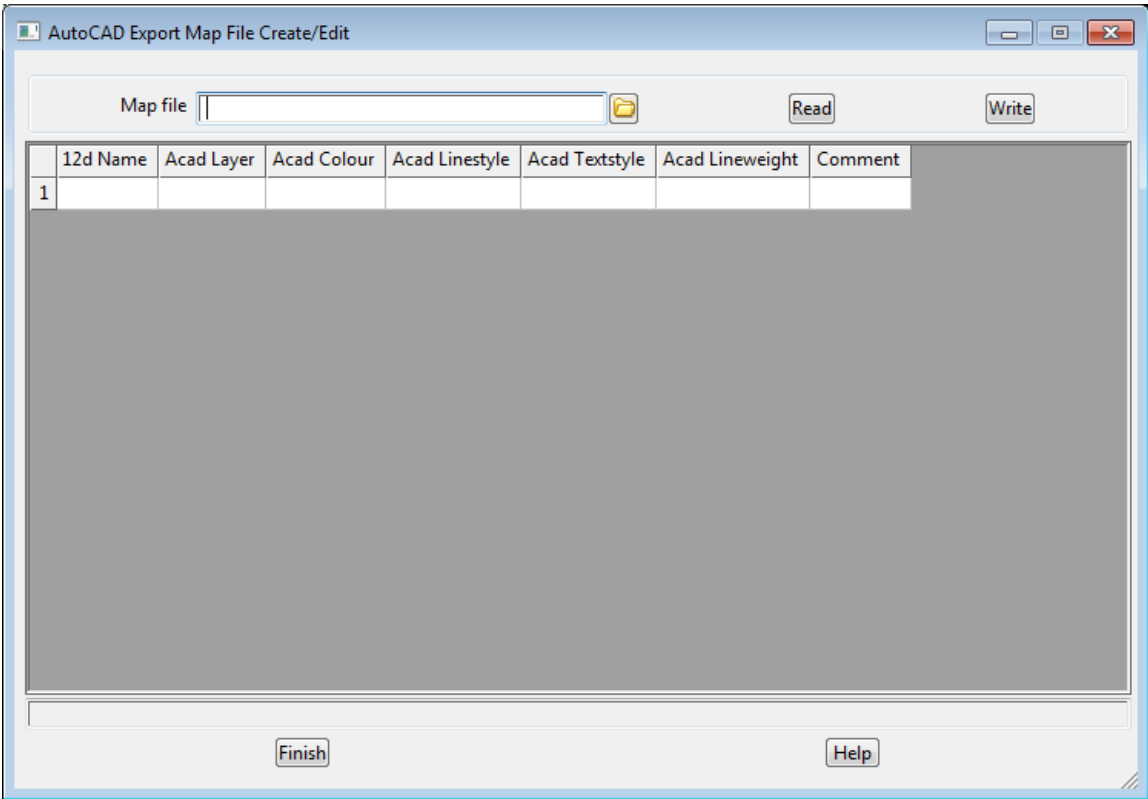
chord-to-arc tolerance when approximating transitions

AutoCAD Output Map File Create/Edit

Position of option on menu: **File I/O =>DWG/DXF/DXB => Output map file**

The **Output map file** option **creates** or **edits** the map files used when writing data out to AutoCAD using the DWG Output option (not used for plotting to AutoCAD).

Selecting **I**Output map file brings up the **AutoCAD Export Map File Create/Edit** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Map file	input		*.acadmf
<i>name of the AutoCAD output map file to be created or edited.</i>			
Read	button		
<i>read in the AutoCAD output map file given in the map file field and load the data into the fields of the table. If the file doesn't exist, an error message is given.</i>			
Write	button		
<i>write out the data in the table to the file name given in the map file field. If the file already exists, a Replace-Cancel panel checks to see if the existing file is to be over written - if no or cancel is selected, nothing is written out.</i>			

Grid Cells

- 12d Name**
- 12d Model** string names for the mapping to apply to - wild cards (*) and characters (!) can be used.
- Acad layer**
- AutoCAD layer to send the selected strings to. Use * to write the **12d Model** model of the string out

Acad colour

*AutoCAD colour to use for the selected strings - a number between 0 and 256. Use * for **12d Model** colour number. Use BYLAYER for ACD BYLAYER*

Acad linestyle

*AutoCAD linestyle to use for the selected strings. User * for **12d Model** linestyle or BYLAYER for ACD BYLAYER*

Acad Textstyle

*AutoCAD Textstyle to use for the selected strings. Use * for **12d Model** text style*

Acad lineweight

AutoCAD lineweight to use for the selected strings.

Comment

Place comments in this field.

DWG/DXF Output Map File

See [AutoCAD Output Map File Create/Edit](#).

When using the output options to write out a DWG/DXF file, an output map file can be used, with **12d Model** string names as the entity-name to match the key, so that the user can specify AutoCAD colour and style. BYLAYER can be used with colour and style.

The key can have wild cards (*) and wild characters (?) as for the input map files. The fields in the DWG/DXF output map file are (ACD = AutoCAD):

field 1	key - string name	can include wild cards * and wild characters ?
field 2	new name	not output to DXF
field 3	ACD layer	* for 12d Model name
field 4	ACD colour	number between 0 and 256, * for 12d Model colour mapped to ACD,
		BYLAYER for ACD BYLAYER
field 5	ACD line type	* for 12d Model linestyle, BYLAYER for ACD BYLAYER
field 6	ACD text style	not yet used, * for 12d Model text style

An example of an DWG/DXF output map file is.

//	1	2	3	4	5	6
//	key	name	layer	colour	linetype	textstyle
	cont*	ignored	CONTOURS	1	1	*
	EB*	ignored	ROAD	2	CONTINUOUS	*
	103	ignored	*	3	*	*
	fe*	ignored	FENCE	*	BYLAYER	*
	SURV*	ignored	SURVEY	BYLAYER	DASH	*

Genio Output

Position of option on menu: File I/O =>Data output =>Genio

Genio i/o is a separate chargeable module.

The **Genio output** option write out the strings selected by the data source, to a genio file, the format used by MX (formerly Moss). A genio 001 option is used to specify the record format.

Because MX and in 12d Model have different data types, not all 12d Model data can be transferred to MX. The user must be aware of what data can be transferred to MX.

1. MX model names are limited to thirty two characters (in upper case). Hence the first thirty two characters of the 12d Model model name are converted to upper case and used as the MX model name.
2. MX string names can only be four characters and each string in MX must have a unique name. This limits MX to a maximum of 1,679,616 string. Strings can have the same name in the genio file but the strings will be *renamed* when read into MX to give each string a unique name.

Since 12d Model places no restrictions on string name length, the following rules are used to produce genio string names.

For a **line-string**, the first four characters of the string name are used as the genio string name. The four characters are mapped to upper case. Remember that MX line strings can not start with a P.

For a **point-strings** whose names start with **P**, the first four characters of the string name are used as the genio string name. Otherwise the genio string name is **P** plus the first three letters of the point-string name. The three letters are mapped to upper case.

3. 12d Model null heights go out as -999 to MX.
4. The four character limit and uniqueness for MX string names restricts the number of strings that can be read into MX. For example, since points strings must start with P so there can be a maximum of 46,656 point strings. Or if a MX string must start with ABB say, then there can only be 36 distinct ABB strings in the MX project.
5. All MX x and y co-ordinates have to be positive. That is, all co-ordinates must be in the first quadrant.
6. 12d text strings go out as MX text strings but there is a maximum of 44 characters in the MX text string. There is no unit for height in the MX text string as well as no font. The name of a MX text string must start with a * so 12d Model uses * and the first three characters of the text string's name.
7. 2d and 3d strings in 12d Model go out to MX as 2d and 3d strings respectively.
8. 4d strings in 12d Model go out to MX as 4d strings except that the text is restricted to four characters.
9. Alignment and super alignments can be written out to MX as MX 3d, 6d or 12d string.
10. For super strings:

Point id's are ignored in all cases.

On the Genio output panel, this is a tick box *Include segment text* and if it is ticked then segment text is written out as MX text strings, otherwise segment text is ignored.

On the Genio output panel, this is a tick box *Include vertex text* and if it is ticked then the super string is written out as a MX 4d string and with the first four characters as the vertex text for a point.

Attributes are ignored in all cases.

Diameter and culvert **width** and **height** are ignored.

Colour and **segment colour** are ignored.

If there is an **invisibility** segment, the string is broken into two.

Tinability is a real problem. MX has no such concept apart from the entire string being a point string or a line string. There is a tick box to write out non-tinable data. If a segment is non tinable, the string is broken into two.

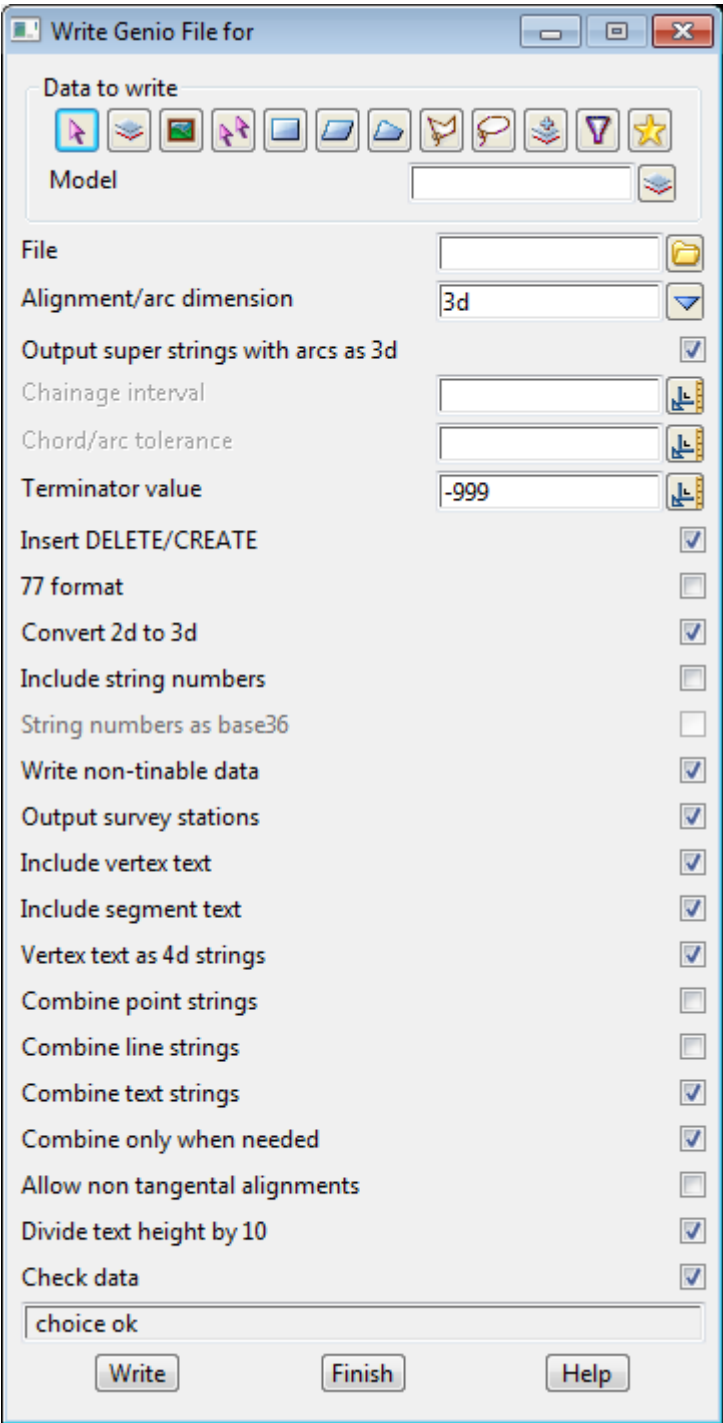
Arcs in super strings or arc strings or circles are broken into line segments using the chord to arc tolerance in the genio output panel, or the system default if there is no value in the panel.

Super strings with a fixed z-value and no vertex text (i.e. that is no z-value at each point, just the one z for the entire string) go out at MX 2d strings.

Super strings with a z-value at each vertex and no vertex text (that is a z-value at each point) go out as MX 3d string

Super strings with a z-value at each vertex and vertex text (that is a z-value at each point and text at each point) go out as MX 4d strings with the four characters of the vertex text as the forth dimension.

On selecting the **Genio** output option, the **Write Genio File for** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source	input		
<i>source of data is to be written out to a file.</i>			
File	input		*.mos files
<i>name of the genio file the model/view is to be written out to. If the file already exists, the data will be appended to the bottom of the file.</i>			
Alignment/arc dimension	input	3d	3d,6d,12d, 6d & 12d
<i>if 3d is selected, alignment and arc strings as written out as MX 3d string as a series of straight lines (x, y, z at each point).</i>			
<i>If 6d is selected, alignment and arc strings are written out as MX 6d strings (chainage, x, y, z, bearing, and radius at each point).</i>			
<i>If 12d is selected, alignment and arc strings are written out as MX geometry strings (called 12d strings in MX). This is the only way that full horizontal and vertical geometry can be transferred to MX.</i>			
<i>If 6d & 12d is selected, alignment and arc strings are written out as MX 6d strings and MX geometry strings.</i>			
Output super strings with arcs as 3d	tick box		
<i>if ticked,</i>			
Chainage interval	input		
<i>if 3d is selected as the Alignment/arc dimension, the alignments and arcs are approximated using the Chainage interval and\ the Chord/arc tolerance.</i>			
Chord/arc tolerance	input		
<i>if 3d is selected as the Alignment/arc dimension, the alignments and arcs are approximated using the Chainage interval and\ the Chord/arc tolerance.</i>			
Terminator value	input	-999	
<i>value to use to terminate strings in the genio file.</i>			
Insert DELETE/CREATE	tick box	tick	
<i>if ticked, the genio commands DELETE and CREATE are written at the top of the file to correctly define the moss models for the data.</i>			
77 format	tick box		
<i>if ticked, use the MX 77 formats for the genio strings.</i>			
Convert 2d to 3d	tick box	tick	
<i>if ticked, write strings with a fixed z-value (2d strings) out in MX 3d string format in the genio file.</i>			
Include string numbers	tick box		
<i>if ticked, the MX string name includes the surveyors string number. Note - the MX string name can still only be four characters.</i>			

String numbers as base 36 tick box

*if **ticked**, the surveyors string number is converted to Base 36 (that is user 0...9, A... Z). Note - the MX string name can still only be four characters.*

Write non-tinable data tick box tick

*if **ticked**, strings that are not tinable are written out.*

*If **not ticked**, strings that are not tinable are not written out.*

Output survey stations tick box tick

*if **ticked**,*

Include vertex text tick box tick

*if **ticked**, write out strings with vertex text as MX 4d string with the first four characters of the vertex text as the text on the MX 4d string, otherwise do not write the text out.*

Include segment text tick box tick

*if **ticked**, write out segment text as text strings otherwise do not write the text out.*

Vertex text as 4d strings tick box tick

*if **ticked**, vertex text is written out as a MX 4d string*

Combine point strings tick box

*if **ticked**, point strings of the same name in 12d are combined into one point string when written out.*

Combine line strings tick box

*if **ticked**, strings of the same name in 12d are combined into one MX string (using MX discontinuities to separate the strings) when written out. This is trying to get over the MX four character name limitation.*

Combine text strings tick box tick

*if **ticked**, text strings of the same name in 12d are combined into one MX text string when written out. This is trying to get over the MX four character name limitation.*

Combine only when needed tick box tick

*if **ticked**, when there are more strings of the same name in 12d than the MX four character name restriction would allow, the strings are combined into one MX string when written out. This is trying to get over the MX four character name limitation.*

Allow non tangential alignments tick box

*if **ticked**, alignments where some elements are not tangential are written out.*

*if **not ticked**, alignments with non tangential elements are not written out.*

Divide text height by 10 tick box tick

*if **ticked**, divide the text height by 10*

Write button

write out in genio format all the data specified by the Data source, to the file given in the file field. If the file already exist, the data will be appended to the file.

LandXML Output

Position of option on menu: File I/O =>Data output =>LandXML

LandXML i/o is a separate chargeable module.

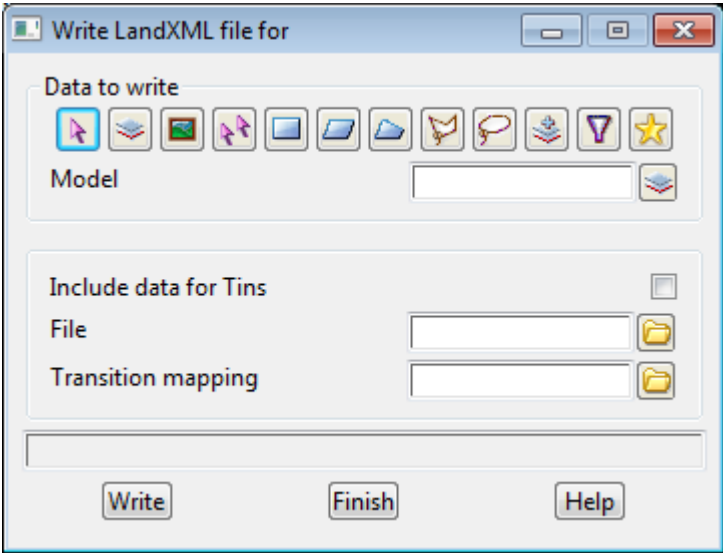
LandXML is a format that attempts to cover some civil and surveying entities. It does not include any information such as colours, styles etc. but just some geometry definitions.

Unfortunately to make the format useful, every vendor has their own proprietary extensions which makes the format of only limited value. A different tailored LandXML writer is required for each vendor variation. The names and definitions of transitions vary from vendor to vendor (**12d Model** has special LandXML writers for LINZ-XML (for LandOnline NZ) and Leica-XML)

Finally the methodology behind the LandXML model is based on US ideas of using X-sections and not strings to model data. This makes is unsuitable except for simple civil models.

This option is under continual developed as the LandXML standard keep changing.

On selecting the **LandXML** option, the **Read LandXML File** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Data source type			Model	
-------------------------	--	--	-------	--

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data source	input			
--------------------	-------	--	--	--

source of data is to be written out to a file.

Include data for Tins	tick box			
------------------------------	----------	--	--	--

if ticked, tins are included in the LandXML output

File	input			*.xml
-------------	-------	--	--	-------

name of the LandXML file to write to

Transition mapping				*.trans_map files
---------------------------	--	--	--	-------------------

file containing the mapping of transitions between the names of LandXML transitions and equivalent transitions in 12d Model

Write button

write the selected data to a LandXML file.

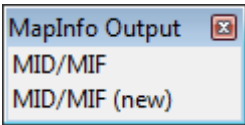
Output MapInfo MID/MIF Files

Position of menu: File I/O =>Data output =>Mapinfo

MID/MIF i/o is a separate chargeable module.

The options under MapInfo write out MapInfo MID and MIF files.

The MapInfo walk-right menu is



write out MID/MIF data
another MID/MIF writer

For MID/MIF
MID/MIF (new)

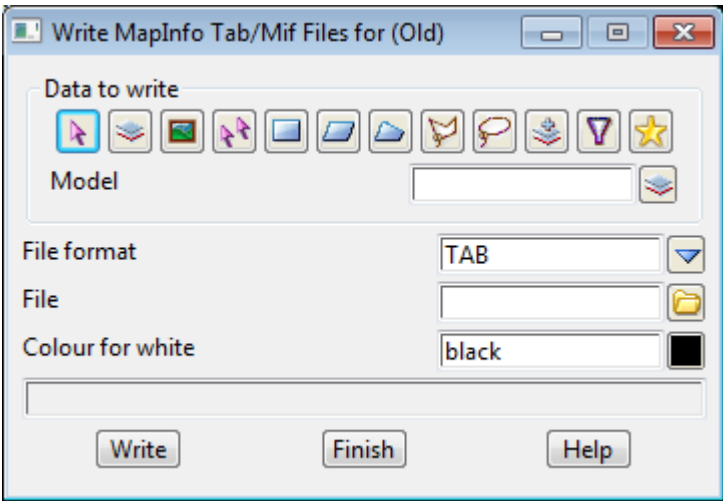
[Write Mapinfo Tab/Mif Files For](#)
[Write Mapinfo Tab/Mif Files For \(New\)](#)

Write Mapinfo Tab/Mif Files For

Position of option on menu: File I/O =>Data output =>Mapinfo =>MapInfo MID/MIF

The MapInfo MID/MIF format is used for sending data to MapInfo.

On selecting the MapInfo MID/MIF option, the Write MapInfo Tab/Mif Files for panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type		Model	
-------------------------	--	-------	--

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data source	input		
--------------------	-------	--	--

source of data is to be written out to a file.

File format	choice box	TAB	TAB, MIF
--------------------	------------	-----	----------

MapInfo format to use for writing out the data.

File	choice box	*.tab, *.mif files
	<i>name of the file to write the data out to.</i>	
Colour for white	colour box	available colours
	<i>colour to use in MapInfo for white in 12d Model (because MapInfo has a white background).</i>	
Write	button	
	<i>write out, in MapInfo file format, all the string data specified by the Data source.</i>	

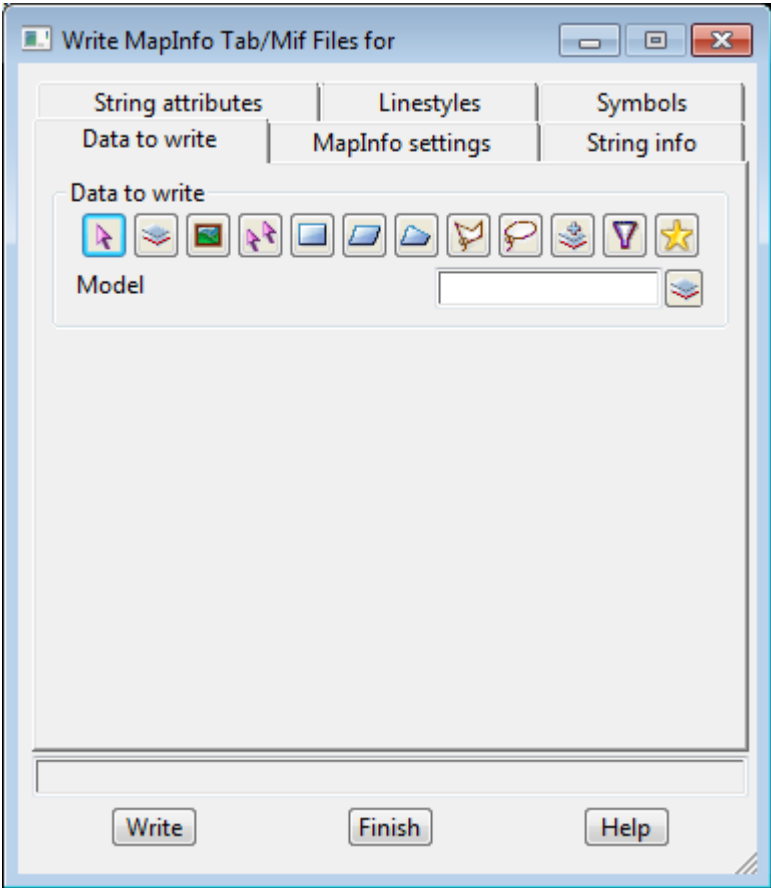
Write Mapinfo Tab/Mif Files For (New)

Position of option on menu: File I/O =>Data output =>Mapinfo =>MapInfo MID/MIF (new)

This section of documentation is a work in progress and will be updated in subsequent releases.

The *MapInfo MID/MIF* format is used for sending data to MapInfo.

On selecting the **MapInfo MID/MIF** option, the **Write MapInfo Tab/Mif Files for** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data to write Tab			
Data source type		Model	

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data source input

source of data is to be written out to a file.

MapInfo settings Tab

Co-ordinate system choice box

MapInfo file of coordinate definitions. The coordinate system that the current data is in is selected from the list.

***Note** - data in MapInfo is stored in longitude and attitude. When MapInfo reads data in it needs to know the coordinate system that the data is in so that it can convert the data to longitude/attitude as it reads the file. The list of coordinate systems in the Coordinate system pop-up is in the file mapinfo.4d. Mapinfo.4d has exactly the same format as the file MAPINFOW.PRJ used by MapInfo.*

*If there are any coordinate systems missing that are in your MapInfo system, simply copy the file MAPINFOW.PRJ from your MapInfo system into the **12d Model User** folder and give it the name mapinfo.4d instead of MAPINFOW.PRJ*

File format choice box TAB TAB, MIF

MapInfo format to use for writing out the data.

File choice box *.tab, *.mif files

name of the file to write the data out to.

Colour for white colour box available colours

colour to use in MapInfo for white in **12d Model** (because MapInfo has a white background).

Scale for paper/pixel text 1: real box 1000

scale to use to map paper and pixel text sizes

String Info Tab

String Attributes Tab

Linestyles Tab

Symbols Tab

Write button

write out, in MapInfo file format, all the string data specified by the Data source.

Civilcad

Position of option on menu: File I/O =>Data output =>Civilcad V5

Civilcad output is an *unsupported* option supplied to users with the Civilcad input option. Civilcad input is a chargeable module.

Because of the limitations of the CivilCAD ascii format, the CivilCAD output option can only output a limited number of **12d Model** data types.

The Civilcad output option writes some **12d Model** data to a CivilCAD 5.0 ascii file. Because CivilCAD ascii can only take points, lines between two points and arcs, only **12d Model** data that can output that way can be written out.

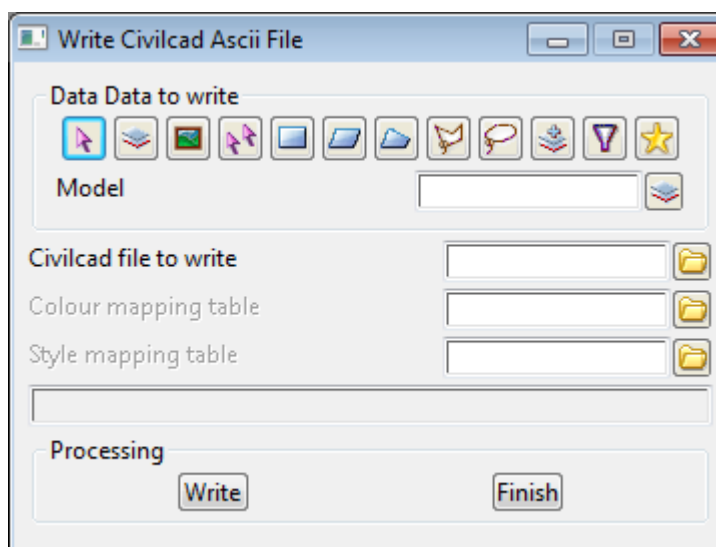
The only **12d Model** data types that can be written out to Civilcad ascii are:

- 2d strings
- 3d strings
- arcs
- circles
- polylines
- the line work from super strings
- text

Note that the following **12d Model** data that *can not* be output to CivilCAD ascii:

- alignments
- super alignments
- drainage/sewer strings
- pipeline strings
- pipe strings
- attributes
- most super string properties
- triangulations
- rasters

On selecting the Civilcad output option, the **Write CivilCAD ascii File** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source	input		
<i>source of data is to be written out to a file.</i>			
CivilCAD file to write	input		*.as5 files
<i>name of the file the model/view is to be written out to. If the file already exists, the data will be appended to the bottom of the file.</i>			
Colour mapping table			*.as5_colour_map files
<i>mapping of 12d colours to CivilCAD colours</i>			
Style mapping table			*.as5_style_map files
<i>mapping of 12d linestyles to CivilCAD linestyles</i>			
Write	button		
<i>write the selected data out in CivilCAD format</i>			

Geocomp

Position of option on menu: File I/O =>Data output =>Geocomp

Geocomp output is a *unsupported* option supplied to users with the Geocomp input option. Geocomp input is a chargeable module.

Because of the limitations of the Geocomp points and strings files, the Geocomp output option can only output a limited number of **12d Model** data types.

The Geocomp output option writes some **12d Model** data to Geocomp Points and Strings files. Because Geocomp can only take points, lines between two points and arcs, only **12d Model** data that can output that way can be written out.

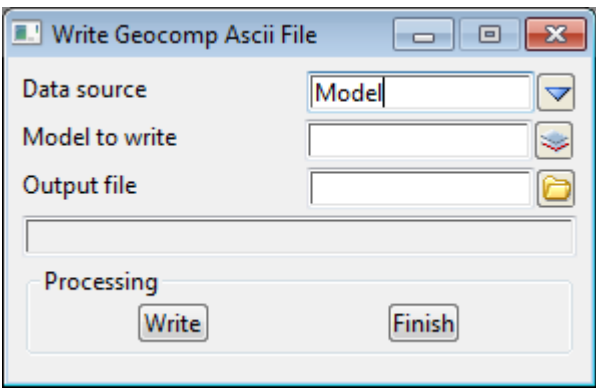
The only **12d Model** data types that can be written out to Geocomp points and strings files are:

- 2d strings
- 3d strings
- arcs
- circles
- polylines
- the line work from super strings
- text

Note that the following **12d Model** data types that *can not* be output to Geocomp:

- alignments
- super alignments
- drainage/sewer strings
- pipeline strings
- pipe strings
- attributes
- most super string properties
- triangulations
- rasters

On selecting the Geocomp output option, the **write Geocomp ascii file** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data to write <i>the type of data to be written out to a file.</i>	choice box	Model	Model, View

Data type source

source of data is to be written out to a file.

Output file

file box

.pts/.str files

name of the file the model/view is to be written out to. If the file already exists, the data will be appended to the bottom of the file.

Write

button

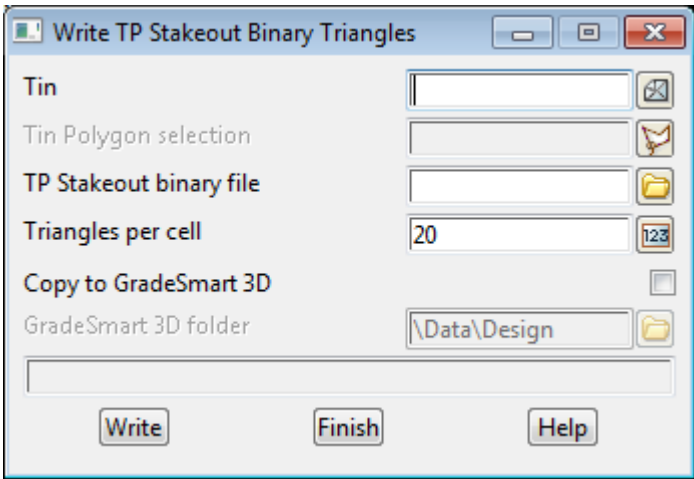
write out Geocomp Points and Strings files the data in the model/view given in the model/view field, to the file given in the output file field.

TP Stakeout Triangles Output

Position of option on menu: File I/O =>Data output =>TP Stakeout triangles

The *TP Stakeout triangles* option writes out a tin as a TP Stakeout binary file.

On selecting the TP Stakeout triangles output option, the **Write TP Stakeout Binary Triangles** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin to write out in TP Stakeout binary format.</i>	tin box		available tins
Tin polygon selection <i>if selected, only triangles with their centroid inside this string are written out</i>	poly string-select		
TP Stakeout binary file <i>name of the file for the triangles</i>	input		*.tsb
Triangles per cell <i>a TP Stakeout parameter</i>			
Copy to GradeSmart 3D <i>if ticked, copy file to GradeSmart folder</i>	tick box		
GradeSmart 3D folder <i>folder for GradeSmart files</i>	folder box		
Write <i>write out the tin in TP Stakeout binary format.</i>	button		

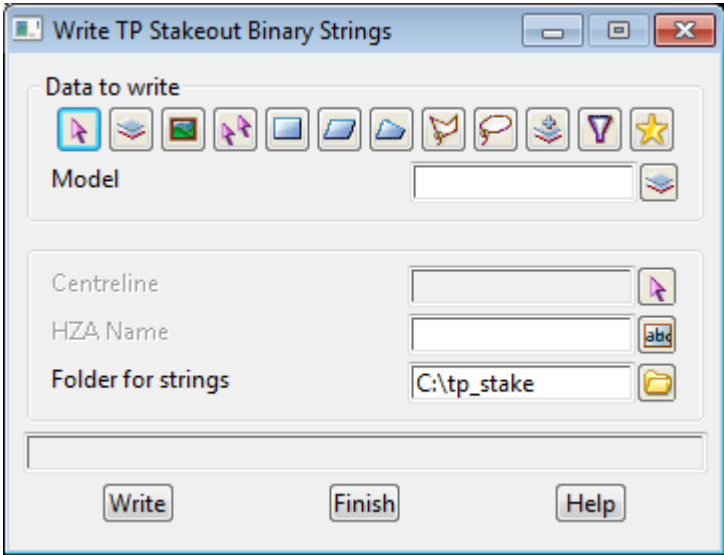
TP Stakeout Strings Output

Position of option on menu: File I/O =>Data output =>TP Stakeout strings

Note - this is a chargeable option

The *TPStakeout strings* option writes out selected strings as a TP Stakeout binary file.

Selecting TP Stakeout strings brings up the **Write TP Stakeout Binary Strings** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type		Model	
-------------------------	--	-------	--

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data source	input		
--------------------	-------	--	--

source of data is to be written out to a file.

Centreline	string select		
-------------------	---------------	--	--

centreline string to use as the reference chainage for other strings.

HZA name

Folder for stings	folder		
--------------------------	--------	--	--

name of the folder to write out the strings to.

Write	button		
--------------	--------	--	--

write out the strings in TP Stakeout binary format.

KML Output

Position of option on menu: File I/O =>Data output =>KML

The *KML* option writes out selected **super strings** and **tins** in the KML/KMZ file format which is used by Google Earth to load users data into the Google Earth environment.

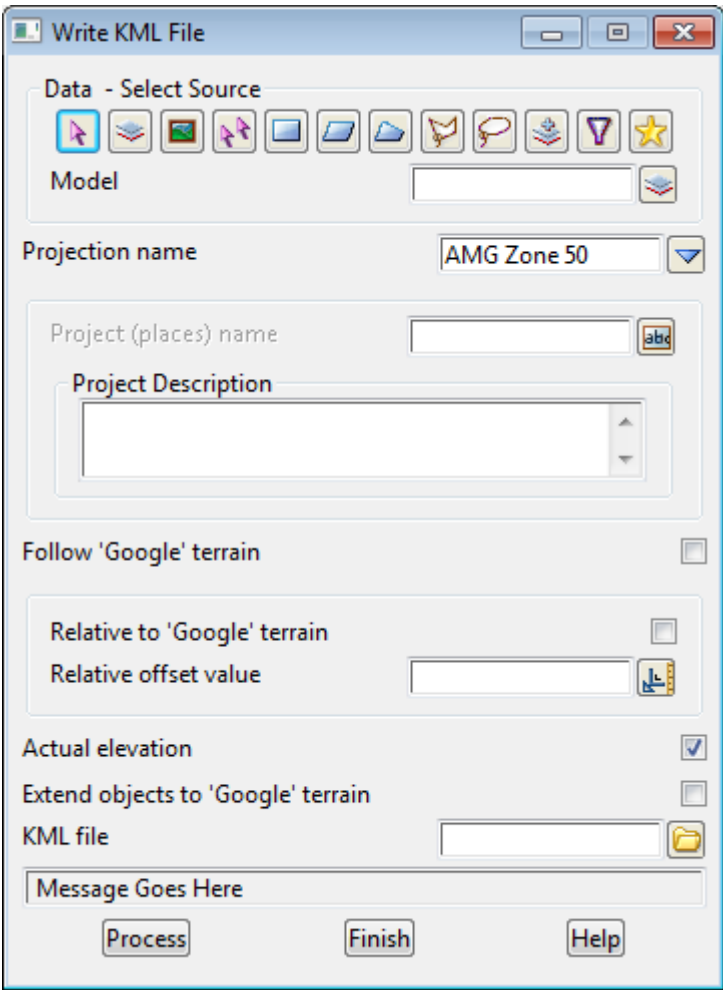
The Google terrain can be significantly different to the terrain from survey data. If the terrain is ticked on in Google Earth it may be higher than the surveyed terrain and obscure the data from 12d.

Google Earth uses the WGS84 Ellipsoid so data must be in a projection based on either the WGS84 or GSR 80 ellipsoids, and the projection for the data known.

Google Earth does not display negative elevations.

If Google Earth does not initialise correctly and centre on the data written from **12d Model**, selecting a 'model' or 'string' will fit the data to the Google Earth display.

Selecting **KML** brings up the **Write KML** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type	Model		
-------------------------	-------	--	--

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data source input

*source of data is to be written out to a file.
Only super strings and tins are output to the KML file*

Projection name projection box

Google Earth uses Latitude and Longitude using the WGS84 spheroid (ellipsoid) to display information in its spatial location. This means that the data to be written to Google Earth should be in a coordinate system that is the same as the a mapping projection and is based on the WGS84 or GSR 80 spheroid. This field is a list of projections created from the users carto.4d file. Select the 'projection name' from the list that matches the coordinate system of the data

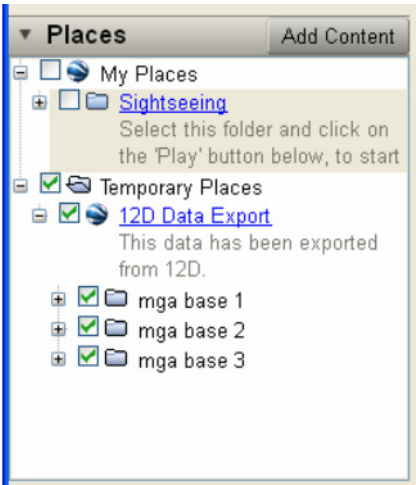
***NOTE** - this projection must be based on the WGS84 or GSR80 ellipsoid (for example MGA and NOT AMG).*

Project (Places) name

*Enter the name to be shown in the Google Earth 'Places'.
If left blank, the file name from the KML file field is shown in the Google Earth 'Places'.*

Project Description

if non blank, this text will describe the project under the 'Project Name' in Google Earth.



Note:

One and only one of the next three options Follow Google terrain, Relative to Google terrain, and Actual elevation can be ticked on. Ticking one on will untick the other one that was set. You can't untick one except by ticking on a different one.

Follow Google terrain tick box

If ticked, the elevations of the data in 12d are ignored and the objects are 'clamped' to the terrain in Google Earth.

Relative to Google terrain tick box

*If ticked, the elevations of the 12d data are ignored and the objects are 'clamped' to the terrain in Google Earth **plus** the value given in the Relative offset value field.*

Relative offset value



if Relative to Google terrain is ticked, the data is offset by this amount above the Google terrain. If this value is zero then it is the same as Follow Google terrain.

Actual elevation tick box

if ticked, the z values from the 12d are used to display the objects in Google Earth

Extend objects to Google terrain tick box

if ticked the objects are displayed in Google Earth as a shape that extends from the Google terrain to the object

KML file file box *.kmz files

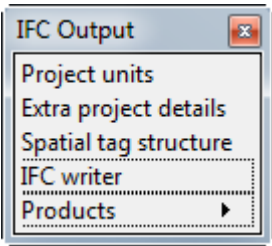
name of the kmz file to be written. The kml file is an xml style of file and the kmz file is the kml file in the 'zip' compression format.

Process button

write out the data in KML format.

IFC Output

The IFC Output walk-right menu is



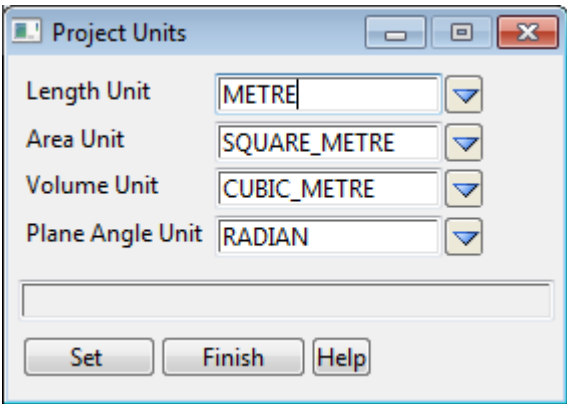
For the option <i>Project units</i> , go to	Project Units
<i>Extra project details</i>	Extra Project Details
<i>Special tag structure</i>	Spatial Tag Structure
<i>IFC Writer</i>	IFC Writer
<i>Products</i>	Products

Project Units

Position of option on menu: File I/O =>Data output =>IFC => Project units

This section of documentation is a work in progress and will be updated in subsequent releases.

Selecting **Project units** brings up the **Project Units** panel.



The fields and buttons used in this panel have the following functions.

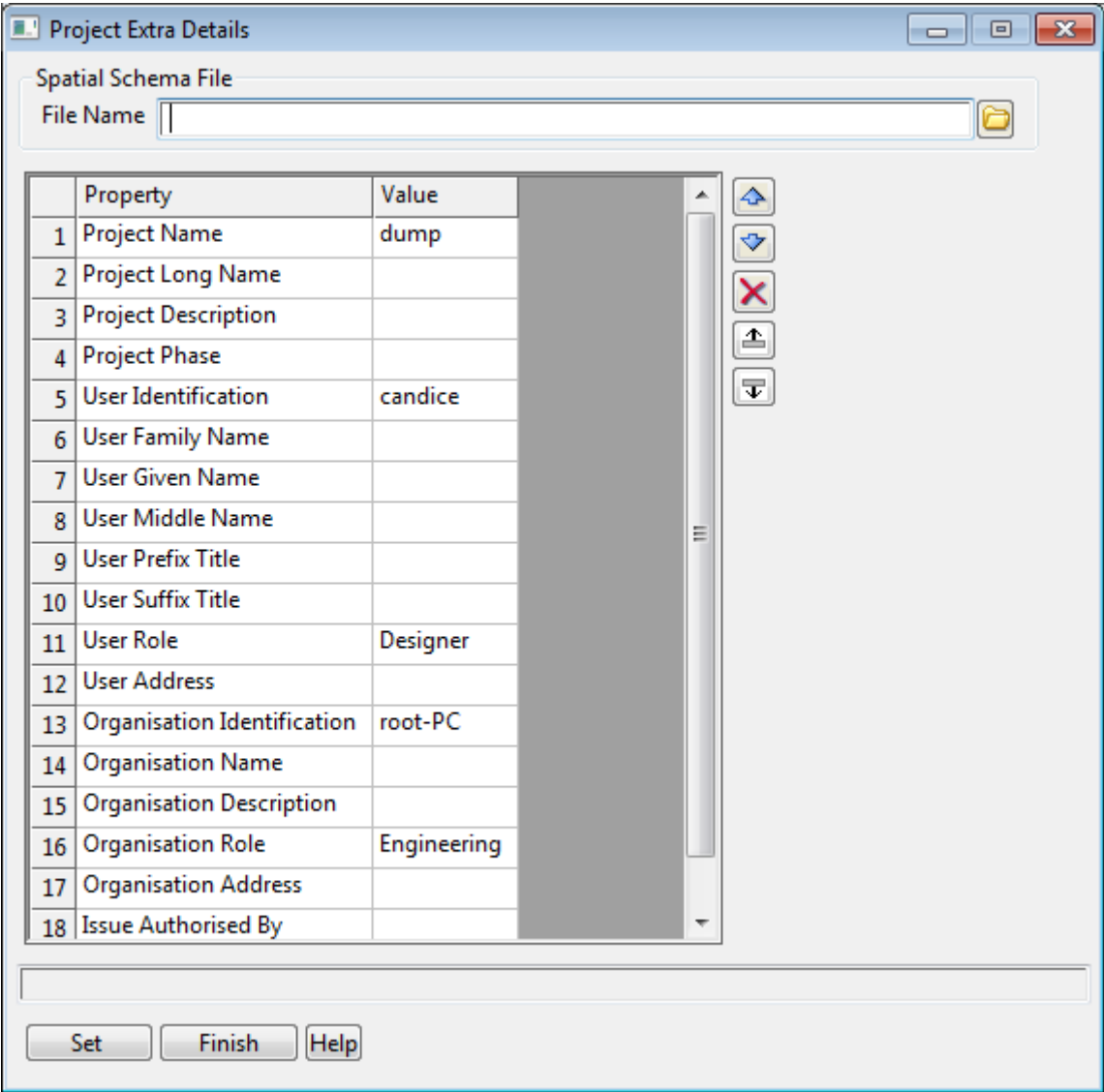
Field Description	Type	Defaults	Pop-Up
Length Unit	choice box		
Area Unit	choice box		
Volume Unit	choice box		
Plane Angle Unit	choice box		

Extra Project Details

Position of option on menu: File I/O =>Data output =>IFC => Extra project details

This section of documentation is a work in progress and will be updated in subsequent releases.

Selecting Extra project details brings up the **Project Extra Details** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Spatial Schema File			
File Name	file box		available *.xml files

Grid

Property

Value

Up

Down

Delete

Insert above

Insert below

Buttons at bottom

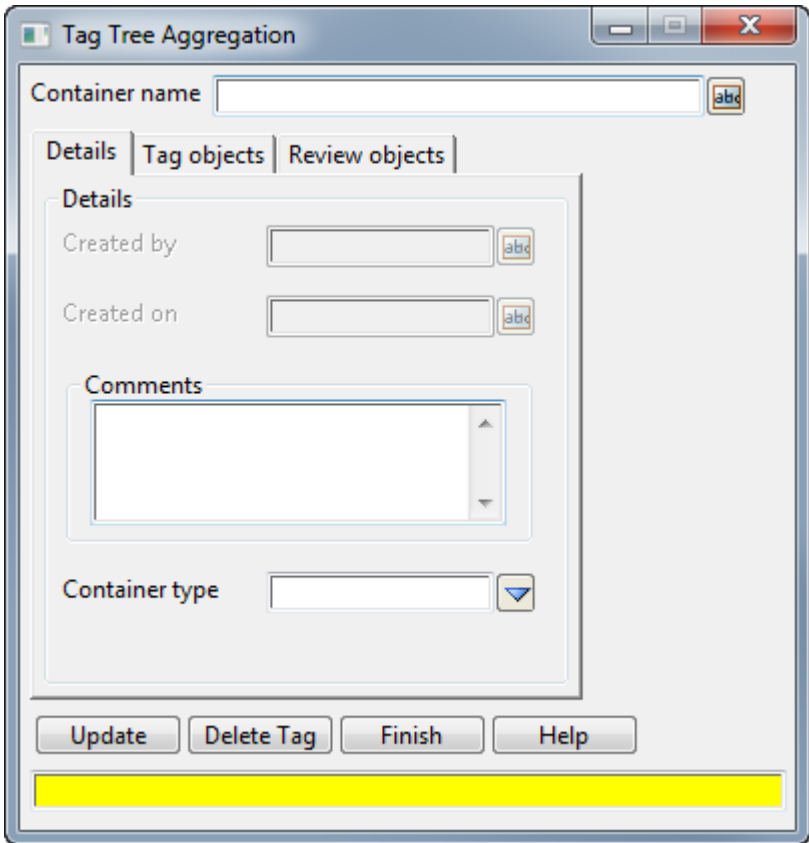
Set button

Spatial Tag Structure

Position of option on menu: File I/O =>Data output =>IFC => Spatial tag structure

This section of documentation is a work in progress and will be updated in subsequent releases.

Selecting Spatial tag structure brings up the **Tag Tree Aggregation** panel.

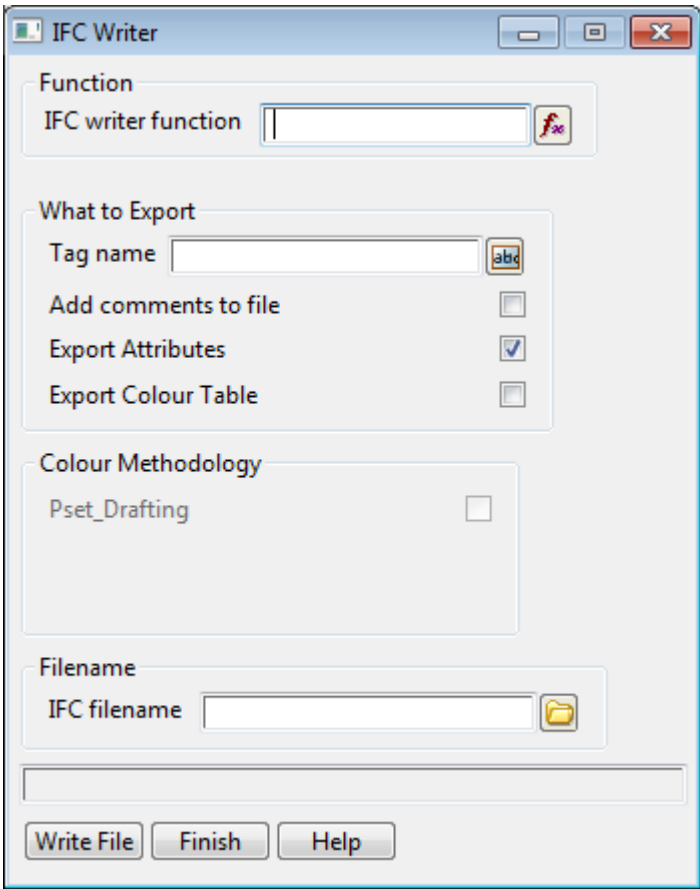


IFC Writer

Position of option on menu: File I/O =>Data output =>IFC => IFC Writer

This section of documentation is a work in progress and will be updated in subsequent releases.

Selecting IFC Writer brings up the **IFC Writer** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Function			
IFC writer function	function box		available functions
What to Export			
Tag name	input		
Add comments to file	tick box	not ticked	
Export Attributes	tick box	ticked	
Export Colour Table	tick box	not ticked	
Colour Methodology			

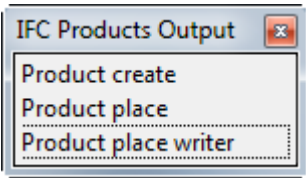
Pset_Drafting	tick box	not ticked
IFC_PropertySet	tick box	not ticked
IFC_Material	tick box	not ticked
IFC Filename	file box	available *.ifc files
Filename		
Write File	button	

Products

Position of option on menu: File I/O =>Data output =>IFC => Products

This section of documentation is a work in progress and will be updated in subsequent releases.

Selecting **Products** brings up the **Products** menu.



For the option *Product create*, go to
Product place
Product place writer

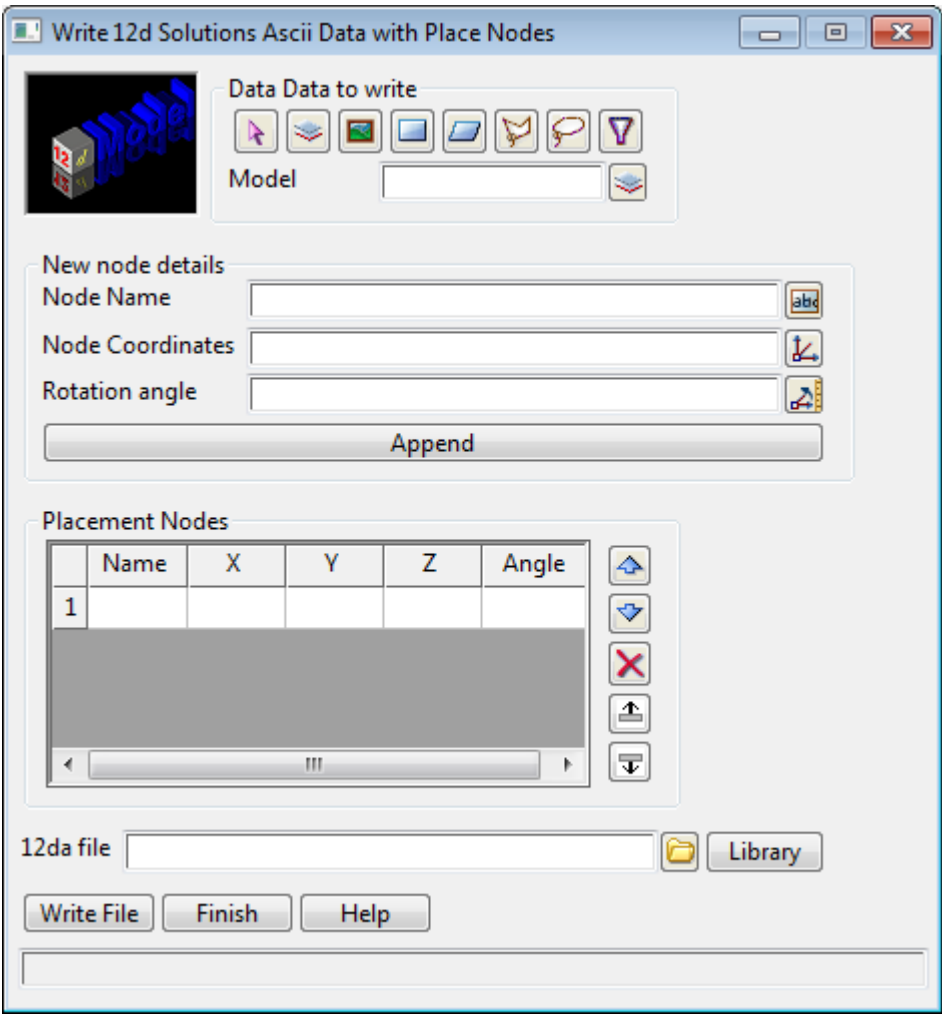
[Writing 12d Solutions Ascii Data with Place Nodes](#)
[Product Place](#)
[Product Place Writer](#)

Writing 12d Solutions Ascii Data with Place Nodes

Position of option on menu: File I/O =>Data output =>IFC => Products =>Product create

This section of documentation is a work in progress and will be updated in subsequent releases.

Selecting **Product create** brings up the **Write 12d Solutions Ascii Data with Place Nodes** panel.

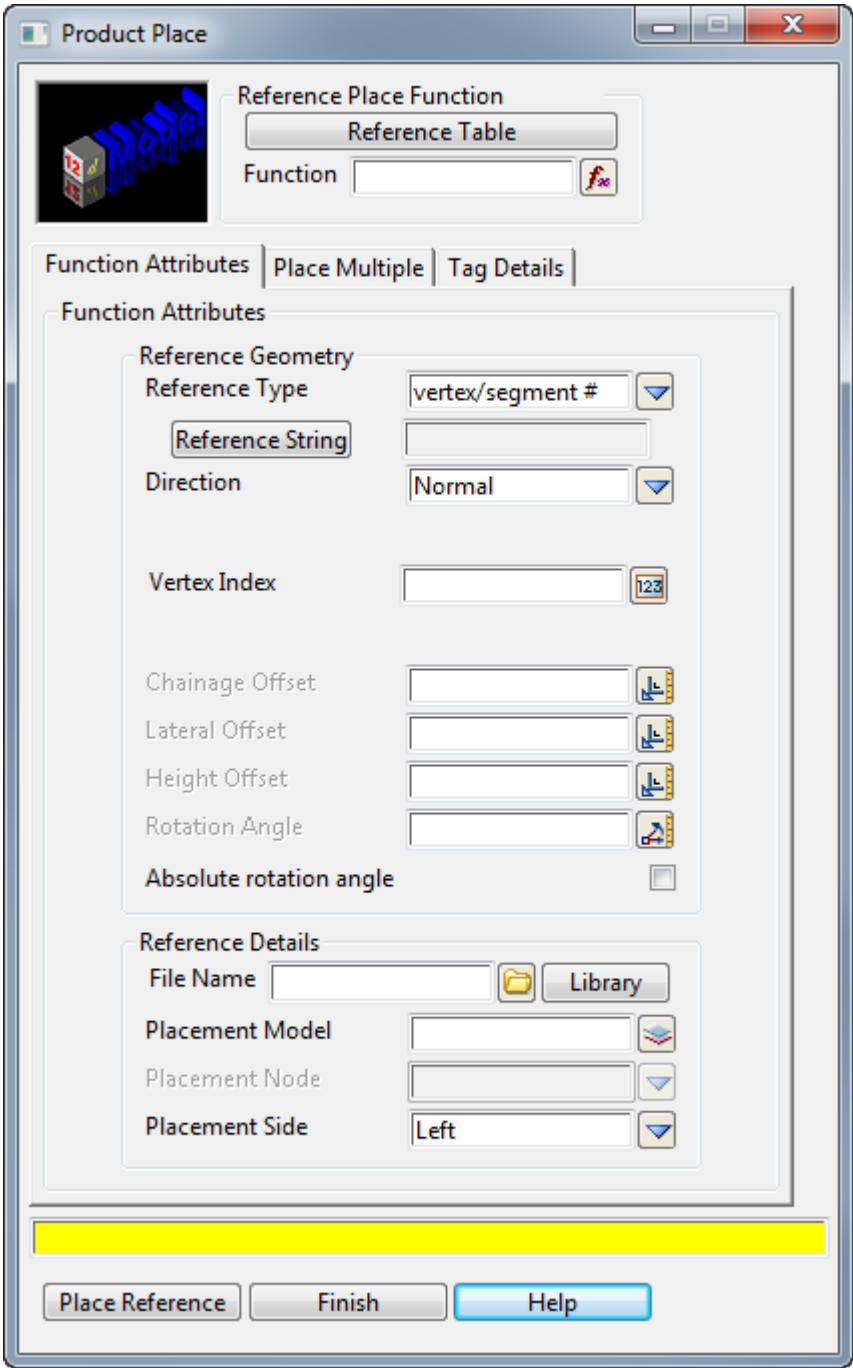


Product Place

Position of option on menu: File I/O =>Data output =>IFC => Products =>Product place

This section of documentation is a work in progress and will be updated in subsequent releases.

Selecting **Product place** brings up the **Product Place** panel.

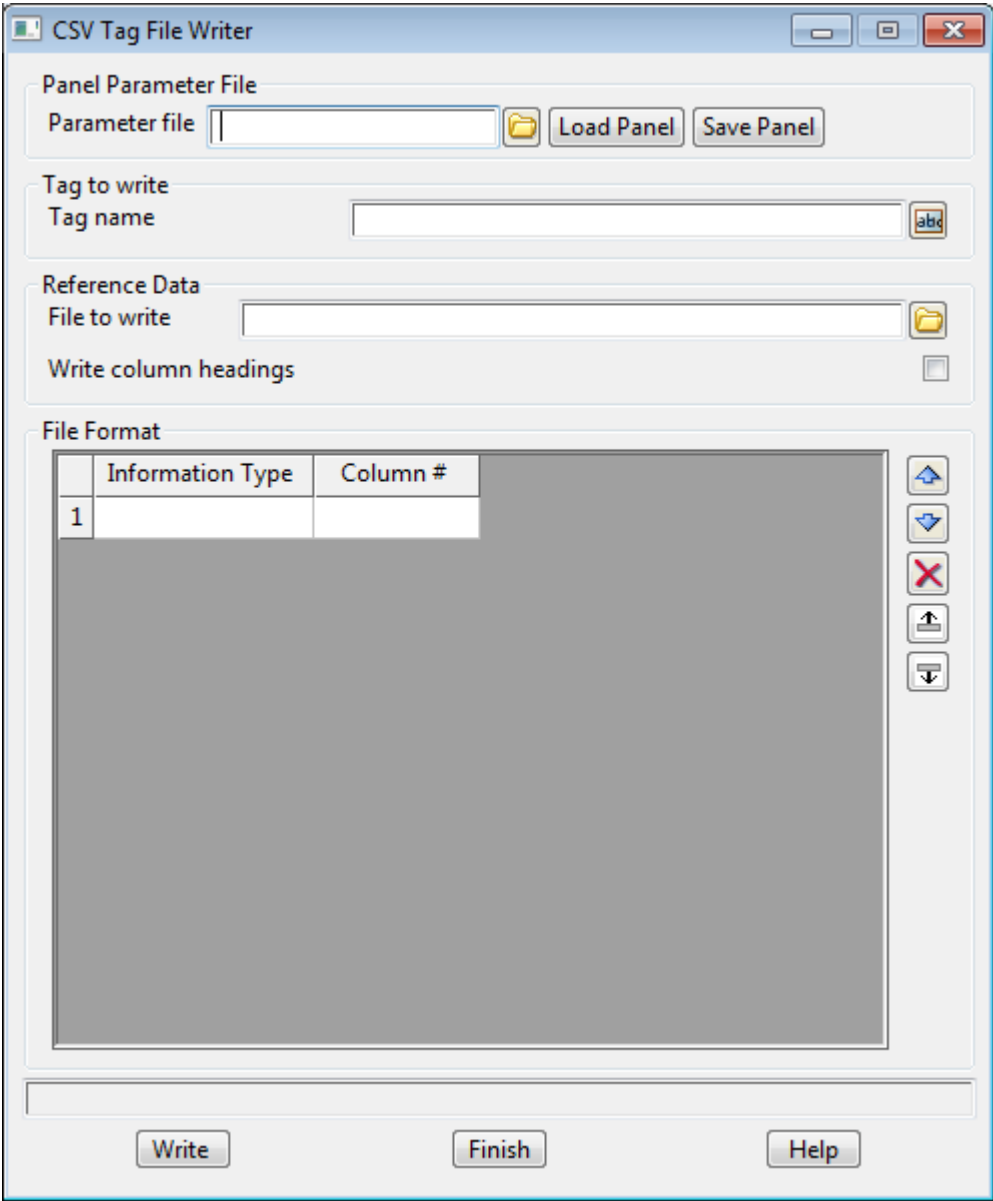


Product Place Writer

Position of option on menu: File I/O =>Data output =>IFC => Products =>Product place writer

This section of documentation is a work in progress and will be updated in subsequent releases.

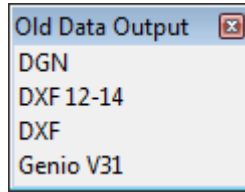
Selecting **Product place writer** brings up the **CSV Tag File Writer** panel.



Old Outputs

Position of menu: File I/O =>Data output =>Old

The **Old** menu contains superseded options. The **Old** walk-right menu is



DXF 12-14 Output

Position of option on menu: File I/O =>Data output =>Old =>DXF 12-14

SUPERSEDED OPTION

The DXF 12-14 output format is for writing data out in a format compatible with AutoCAD. The DXF file produced **does not** have a full DXF header with the required line types, text styles, fonts already defined. Hence the DXF file needs to be loaded into an **existing** Autocad drawing.

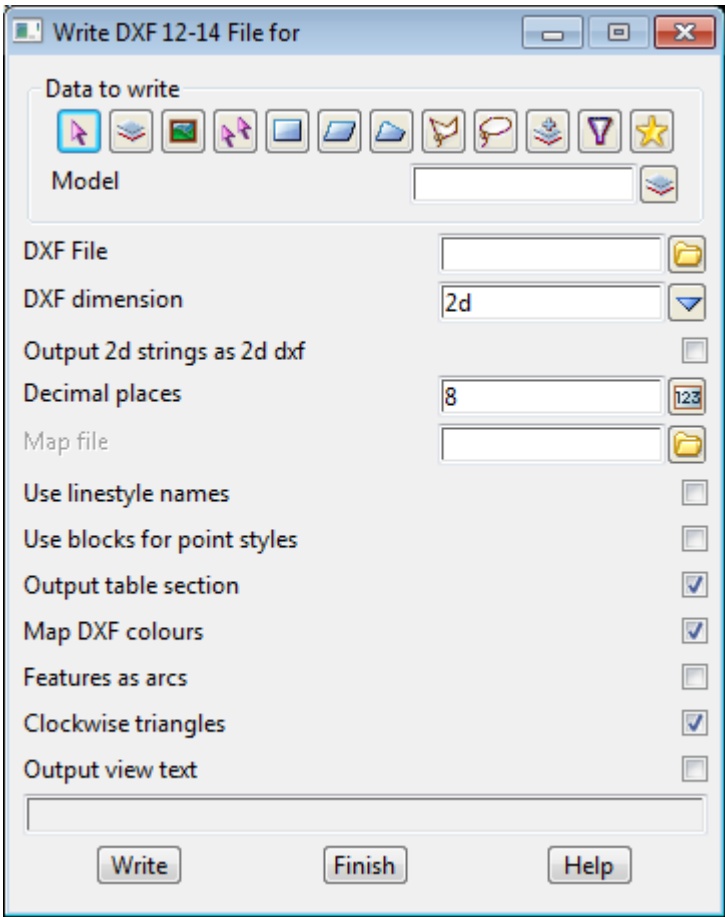
AutoCAD Release 10 introduced binary DXF files as a means of addressing the problems of large file sizes, slow processing and limited accuracy that occur when using the ASCII DXF format. 12d Model can write binary DXF files. See the Precision field below.

12d Model line strings are output as POLYLINES, point strings as a series of AutoCAD POINTs and triangles as 3DFACES.

By default, the string or triangle colour is used in the Autocad colour record. The DXF layer used is the items model name with any spaces in the model name replaced by a minus (-). However, a DXF output map file with matches on string name can be used to give DXF layers, colours and line type (see next section).

At this stage, 4d, interface and alignment strings are only output as Autocad POLYLINES.

On selecting the **DXF 12-14** output option, the **Write DXF 12-14 File for** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type	Model		
data selection type - for a full description go to Data Source in the chapter Tools and Concepts			
Data source	input		
source of data is to be written out to a file.			
DXF File	input	*.dxf files	
name of the file for the information to be written out to. If the file already exists, the data will be appended to the file.			
DXF Dimension	input	2d	2d, 3d
if 3d , strings will be written out as three dimensional DXF polylines. Alignment strings and arcs will be approximated by short lines. If 2d , the z-value of all the data is set to zero and arcs and curves in alignment strings are written out as dxf polylines with bulges for the arcs.			
Decimal places	input	8	
the number of decimal places to be used for co-ordinates etc. in the DXF file. If this number is negative , a binary DXF file will be written. The actual number specified becomes irrelevant in this case, since full precision is preserved in a binary DXF file.			
Map file	input	*.mf files	
if non-blank, the name of a file to be used as a 12d Model to DXF output map file.			
Use linestyle names	tick box		
if ticked , a 12d Model string's linestyle name is used as the DXF element's line type ("I" goes to CONTINUOUS). if not ticked , all DXF line types are CONTINUOUS.			
Use blocks for point styles	tick box		
if ticked , for each 12d Model point string, an AutoCAD block of the same name as the 12d Model string's linestyle is places at each point.			
Output table section	tick box	tick	
if ticked , an AutoCAD table section is written out at the top of the DXF file.			
Map DXF colours	tick box	tick	
if ticked , a mapping is made between the first seven default 12d Model colours and the corresponding DXF colours. The other 12d Model colours are mapped to the DXF colour of the same colour number. If not ticked , the nth 12d Model colour is mapped to the nth DXF colour.			
Features as arcs	tick box		
if ticked , feature strings output as arcs in DXF. if not ticked , the centre of the feature string is output as a point.			
Output view text	tick box		
if ticked , any view text turned on (point numbers, z-values etc.) are output as text in DXF. if not ticked , view text is not output.			

Write button

write out, in DXF format, the data in the model/view given in the model/view field, to the file given in the file field.



DXF Output Map File

When using the output options to write out a DXF file, an output map file can be used, with **12d Model** string names as the entity-name to match the key, so that the user can specify AutoCAD colour and style. BYLAYER can be used with colour and style.

The key can have wild cards (*) and wild characters (?) as for the input map files. The fields in the DXF output map file are (ACD = AutoCAD):

field 1	key - string name	can include wild cards * and wild characters ?
field 2	new name	not output to DXF
field 3	ACD layer	* for 12d Model name
field 4	ACD colour	number between 0 and 256, * for 12d Model colour mapped to ACD,
		BYLAYER for ACD BYLAYER
field 5	ACD line type	* for 12d Model linestyle, BYLAYER for ACD BYLAYER
field 6	ACD text style	not yet used, * for 12d Model text style

The DXF file produced needs to be loaded into an existing Autocad drawing which has the ACD layers and linetypes defined.

An example of an DXF output map file is.

//	1	2	3	4	5	6
//	key	name	layer	colour	linetype	textstyle
	cont*	CONT	CONTOURS	1	1	*
	EB*	TOP	ROAD	2	CONTINUOUS	*
	103	TOP	*	3	*	*
	fe*	TOP	FENCE	*	BYLAYER	*
	SURV*	TOP	SURVEY	BYLAYER	DASH	*

DXF Output

Position of option on menu: File I/O =>Data output =>Old =>DXF

SUPERSEDED OPTION

The DXF output format is for writing data out in a format compatible with AutoCAD version 15. The DXF file produced **does not** have a full DXF header with the required line types, text styles, fonts already defined. Hence the DXF file needs to be loaded into an existing Autocad drawing.

This option is the one used in 12d Model V3.1. It is now superseded by the **DWG/DXF** output option.

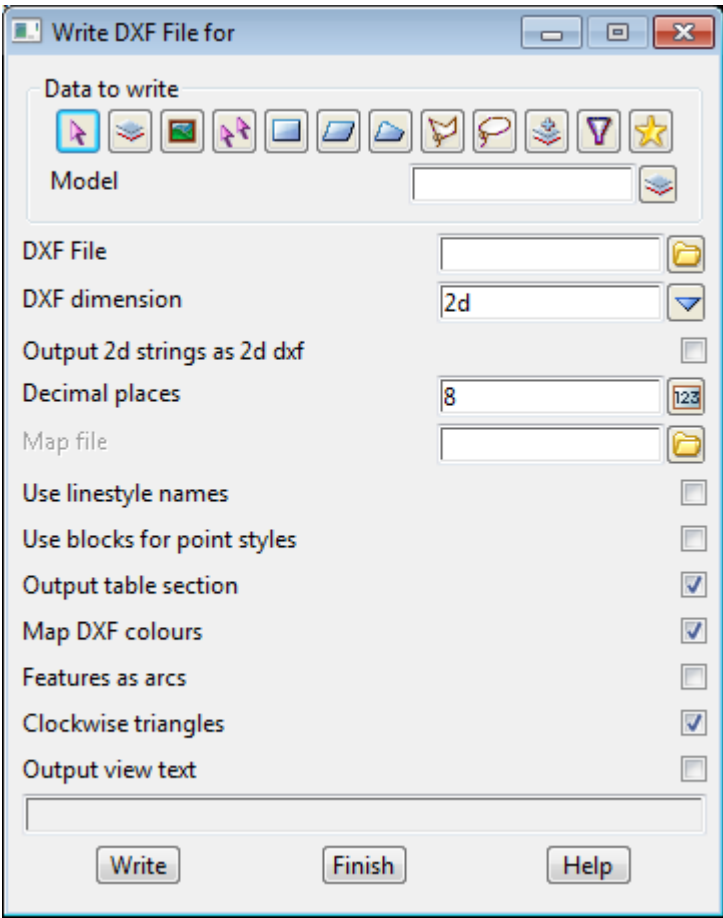
AutoCAD Release 10 introduced binary DXF files as a means of addressing the problems of large file sizes, slow processing and limited accuracy that occur when using the ASCII DXF format. 12d Model can write binary DXF files. See the Precision field below.

12d Model line strings are output as POLYLINES, point strings as a series of AutoCAD POINTs and triangles as 3DFACES.

By default, the string or triangle colour is used in the Autocad colour record. The DXF layer used is the items model name with any spaces in the model name replaced by a minus (-). However, a DXF output map file with matches on string name can be used to give DXF layers, colours and line type (see next section).

At this stage, 4d, interface and alignment strings are only output as Autocad POLYLINES.

On selecting the **DXF** output option, the **Write DXF file for** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source	input		
<i>source of data is to be written out to a file.</i>			
DXF File	input		*.dxf files
<i>name of the file for the information to be written out to. If the file already exists, the data will be appended to the file.</i>			
DXF Dimension	input	3d	2d, 3d
<i>if 3d, strings will be written out as three dimensional DXF polylines. Alignment strings and arcs will be approximated by short lines. If 2d, the z-value of all the data is set to zero and arcs and curves in alignment strings are written out as dxf polylines with bulges for the arcs.</i>			
Decimal places	input	8	
<i>the number of decimal places to be used for co-ordinates etc. in the DXF file. If this number is negative, a binary DXF file will be written. The actual number specified becomes irrelevant in this case, since full precision is preserved in a binary DXF file.</i>			
Map file	input		*.mf files
<i>if non-blank, the name of a file to be used as a 12d Model to DXF output map file.</i>			
Use linestyle names	tick box		
<i>if ticked, a 12d Model string's linestyle name is used as the DXF element's line type ("I" goes to CONTINUOUS). if not ticked, all DXF line types are CONTINUOUS.</i>			
Use blocks for point styles	tick box		
<i>if ticked, for each 12d Model point string, an AutoCAD block of the same name as the 12d Model string's linestyle is placed at each point.</i>			
Output table section	tick box	tick	
<i>if ticked, an AutoCAD table section is placed at the beginning of the DXF file.</i>			
Map DXF colours	tick box	tick	
<i>if ticked, a mapping is made between the first seven default 12d Model colours and the corresponding DXF colours. The other 12d Model colours are mapped to the DXF colour of the same colour number. If not ticked, the nth 12d Model colour is mapped to the nth DXF colour.</i>			
Features as arcs	tick box		
<i>if ticked, feature strings output as arcs in DXF. if not ticked, the centre of the feature string is output as a point.</i>			
Output view text	tick box		
<i>if ticked, any view text turned on (point numbers, z-values etc.) are output as text in DXF.</i>			

if not **ticked**, view text is not output.

Write button

write out, in DXF format, the data in the model/view given in the model/view field, to the file given in the file field.

DXF Output Map File

When using the output options to write out a DXF file, an output map file can be used, with **12d Model** string names as the entity-name to match the key, so that the user can specify AutoCAD colour and style. BYLAYER can be used with colour and style.

The key can have wild cards (*) and wild characters (?) as for the input map files. The fields in the DXF output map file are (ACD = AutoCAD):

field 1	key - string name	can include wild cards * and wild characters ?
field 2	new name	not output to DXF
field 3	ACD layer	* for 12d Model name
field 4	ACD colour	number between 0 and 256, * for 12d Model colour mapped to ACD,
		BYLAYER for ACD BYLAYER
field 5	ACD line type	* for 12d Model linestyle, BYLAYER for ACD BYLAYER
field 6	ACD text style	not yet used, * for 12d Model text style

The DXF file produced needs to be loaded into an existing Autocad drawing which has the ACD layers and linetypes defined.

An example of an DXF output map file is.

//	1	2	3	4	5	6
//	key	name	layer	colour	linetype	textstyle
	cont*	CONT	CONTOURS	1	1	*
	EB*	TOP	ROAD	2	CONTINUOUS	*
	103	TOP	*	3	*	*
	fe*	TOP	FENCE	*	BYLAYER	*
	SURV*	TOP	SURVEY	BYLAYER	DASH	*

Genio V3.1 Output

Position of option on menu: File I/O =>Data output =>Old =>Genio V31

SUPERSEDED OPTION

Genio i/o is a separate chargeable module.

This is the genio output module from 12d Model V3.1. This module has been replaced by the new genio module but the genio v3.1 will be left in V4.0 in case there a any problems with the new module.

The genio v3.1 output option uses a non-default format to write out the strings in a model or on a view, to a genio file. A genio 001 option is used to specify the record format.

The first thirty two characters of the model name are converted to upper case and used as the Moss model name.

In Moss, string labels can have a maximum of four characters. Since 12d Model places no restrictions on string name length, the following rules are used to produce genio string labels.

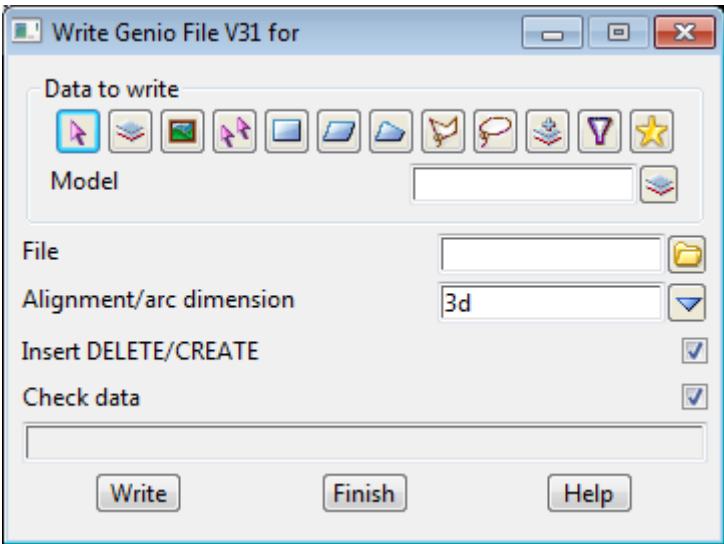
For a line-string, the first four characters of its string name are used as the genio string label. The four characters are mapped to upper case.

Similarly for point-strings whose names start with P. Otherwise the genio string label is P plus the first three letters of the point-string name. The three letters are mapped to upper case.

The name of a Moss text string must start with a * so 12d Model uses * and the first three characters of the text string's name.

An alignment string can be written out as either a moss 3d, 6d or 12 string.

On selecting the Genio V31 output option, the Write Genio File V31 for panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type		Model	
-------------------------	--	-------	--

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data source	input		
--------------------	-------	--	--

source of data is to be written out to a file.

File	input	*.mos files	
<i>name of the file the model/view is to be written out to. If the file already exists, the data will be appended to the bottom of the file.</i>			
Alignment dimension	input	3d	3d,6d,12d
<i>if 3d is selected, alignment strings as written out as a 3d string as a series of straight lines.</i>			
<i>If 6d is selected, alignment strings are written out as Moss 6d strings.</i>			
<i>If 12d is selected, alignment strings are written out as Moss geometry strings. This is the only way that full horizontal and vertical geometry can be transferred to Moss.</i>			
Insert DELETE/CREATE	tick box	tick	
<i>if ticked, the genio commands DELETE and CREATE are written at the top of the file to correctly define the moss models for the data.</i>			
Write	button		
<i>write out in genio format the data in the model/view given in the model/view field, to the file given in the file field. If the file already exist, the data will be appended to the file.</i>			

Eagle Output

Position of option on menu: File I/O =>Data output =>Old =>Eagle

Eagle is a 3D CAD package used throughout Australia, Asia and Europe.

Using the **Eagle output** option, **12d Model** produces an Eagle command file which is used by Eagle to create an Eagle model. Since Eagle supports 3D faces, the triangles created in **12d Model** can be transferred to Eagle for use in shaded models and walk-throughs.

Instead of colours, Eagle uses pens, dash styles, line thicknesses and frags. To allow the user to map **12d Model** colours to appropriate Eagle settings, an **Eagle map file** setting out the **12d Model** and Eagle relationships can be provided.

The eagle map file is a user created file consisting of a list of **12d Model** colours and the Eagle pen, dash style, pen thickness and frag to be used for the colour.

The map file is set out with one **12d Model** colour per line. The line begins with the **12d Model** colour followed by the Eagle pen number, dash style, thickness and frag to be used for the **12d Model** colour. Each item is separated by one or more spaces.

For example, if the **12d Model** colour **red** is to be mapped to Eagle pen 3, dash style 4, thickness 2 and frag 1, then the line in the eagle map file would be

red 3 4 2 1

If a map file is used, as each string is written out, the map file is searched sequentially until a colour match is made.

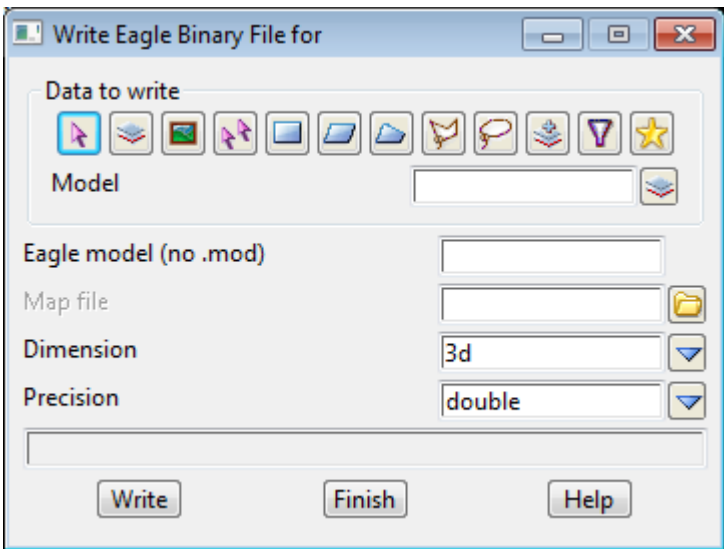
If no match is found, the colour of the string is used as a pen number and default values used for dash, thickness and frag.

Comments can be included in the map file by preceding the comment with a double forward slash (i.e. //). Anything on the line following the // will be ignored.

For example,

// 12d colour	pen	dash	thick	frag
red	3	4	2	1
green	4	1	1	2

On selecting the **Eagle** option, the **Write Eagle Command File for** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source	input		
<i>source of data is to be written out to a file.</i>			
Eagle Command File	input		*.cmd files
<i>name of the Eagle command file to write the model/view out to. If the file already exists, the data will be appended to the bottom of it. To be consistent with the Eagle file naming convention, the file name should end in .cmd</i>			
Eagle model	input		
<i>name of the Eagle model to be used for the data. Only the characters A-Z, a-z, 0-9 and - are allowed in an Eagle model name. Do not include a .mod in the name.</i>			
Map file	input		*.emf files
<i>if non-blank, the name of the map file to be used for all string colours. If blank, no map file is used.</i>			
Write	button		
<i>write out the data from the model/view given in the model/view field to the file given in the eagle command file field. The Eagle model has the name given in the Eagle model field. If the file already exists, the data is appended to the file.</i>			

Eagle Binary Output

Position of option on menu: File I/O =>Data output =>Old =>Eagle Binary

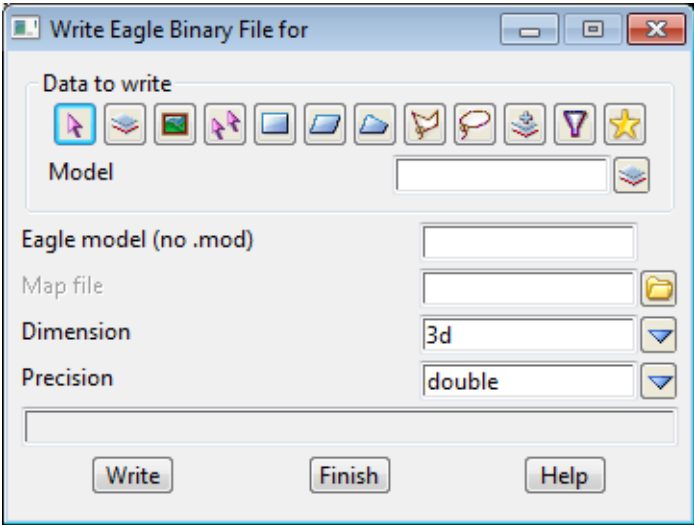
Eagle binary i/o is a separate chargeable module.

Using the Eagle binary output option, 12d Model produces Eagle binary models. Since Eagle supports 3D faces, the triangles created in 12d Model can be transferred to Eagle for use in shaded models and walk-throughs.

Since Eagle uses pens, dash styles, line thicknesses and frags rather than colours, an eagle map file is used to define the relationships between 12d Model colours and Eagle pens, dash styles, thickness and frags. The map file is the same as described in the eagle output option.

The 12d Model string name is written to the second attribute of the corresponding eagle item.

On selecting the Eagle binary option, the Write Eagle Binary File for panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type		Model	
-------------------------	--	-------	--

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data source	input		
--------------------	-------	--	--

source of data is to be written out to a file.

Eagle model	input		
--------------------	-------	--	--

stem of the name of the eagle model to write the model/view data out to. Because an eagle model has a maximum size, more than one model may be created. The eagle model names will have a sequence number appended to the name stem given in the eagle model field.

Map file	input		*.emf files
-----------------	-------	--	-------------

if non-blank, the name of the map file to be used for all string colours. If blank, no map file is used.

Dimension	input	3d	2d/3d
------------------	-------	----	-------

if 3d, strings will be written out as three dimensional eagle lines. The alignment strings and arcs will be approximated by short lines.

If 2d, the z-value of all the data is set to zero and arcs and curves in alignment strings are written out as eagle plan arcs.

Precision input double single/double
the precision of the eagle models.

Write button
write out the data from the model/view given in the Model/view field to the file given in the eagle model field.



12 Digitizer

Position of menu: File I/O =>Digitizer

The **Digitizer** option is used with a digitizing table to create **12d** Model strings from existing maps or plans.

Contours (2d strings), feature strings (3d strings), spot heights (points strings), 4d strings, circles, arcs and text can all be digitized with this option.

The digitized data can be added to a new or existing **12d** Model project.

The digitizing process consists of a number of steps.

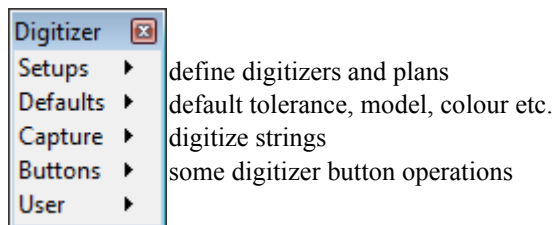
- providing a digitizer definition file
- selecting the type of digitizer to be used
- registering a new plan or map on the digitizer, or continuing with a previously registered plan (resuming).
- selecting a default digitizing tolerance, default model, colour and name for digitized strings.
- digitizing the information

These steps are described totally in the next five sections and are then summarized.

A summary of the step is given at the end of this chapter in the section [Summary](#).

The digitizer can be set up using WinTab which is preferred method, or by using a definition in the **12d** digitizer definitions file, digitize.4d. A quick description of the digitizer definition file is given in the section [Digitizer Definitions](#). The format for the digitizers_definitions file is given in the section [Digitizer Definitions File](#).

The **Digitizer** walk-right menu is laid out to reflect the standard sequence of digitizer operations.



For the option *Setups*, go to

Defaults

Capture

Buttons

[Setups](#)

[Defaults](#)

[Capture](#)

[Buttons](#)

Digitizer Definitions

Most digitizers now support the WinTab definition for communicating with Windows and that is the preferred method to be used with **12d** Model.

If the digitizer supports WinTab then the WinTab drivers need to be installed before the digitizer can be used by **12d** Model. The WinTab drivers are supplied with the digitizer, not by 12d Solutions.

Once the WinTab drivers are installed, no further information is required by **12d** Model and the

rest of this section can be ignored.

Unfortunately if WinTab is not supported, each brand of digitizer has its own method of communicating with a computer and a software package.

To allow for a variety of digitizers not supported by WinTab, 12d Solutions has its own ascii format for defining the important features of a particular digitizer. The digitizer definitions file is also used to tailor digitizer button usage at a particular site.

For example, the **digitizer file** defines which buttons on the digitizer puck are used to:

digitize new (add) points	add button
end the digitizing of a string	end button
turn tolerance on/off	tolerance button
delete the last digitized point	delete point button

When 12d Model starts up, it checks to see if an environment variable called DIGITIZERS_4D exists and if it does, then the file it points to is used to provide the definitions for the digitizers.

If the environment variable is not set, then 12d Model searches for a file called **digitize.4d** in the standard 12d Model search sequence for set up files.

Only digitizers that have been defined in the digitizers definitions file can be selected for use from within 12d Model.

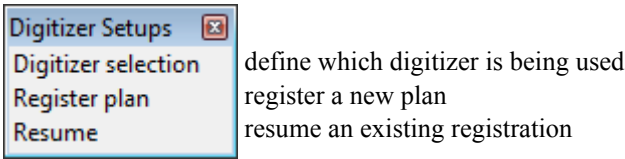
The format for the digitizers definitions file is given in the section [Digitizer Definitions File](#).

Setups

Position of menu: File I/O =>Digitizer =>Setups

The **setups** menu contains options to select the digitizer to be used, register the co-ordinate system on a new plan or map sheet and for resuming the registration for a plan or map sheet already registered.

The **setups** walk-right menu is

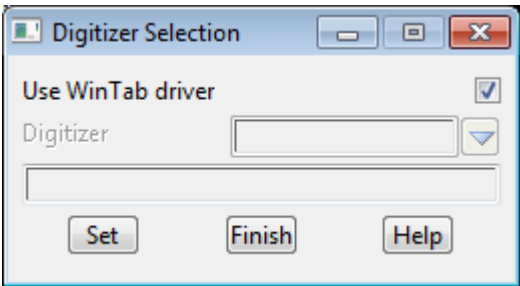


Each options will now be described in detail.

Digitizer Selection

Position of option on menu: File I/O=>Digitizer=>Setups=>Digitizer selection

On selecting the **digitizer selection** option, the **digitizer selection** panel is displayed.



This panel displays the current digitizer selected and allows a different one to be selected from those defined in the digitizers definitions file.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use Wintab drive	tick box		
<i>if ticked then user WinTab drivers.</i> <i>If not ticked, then the Digitizer field is enabled and must have a digitizer selected.</i>			
Digitizer	input	current digitizer	available digitizers
<i>the name of the current digitizer is displayed in this field. The current digitizer is changed by selecting a different name from the pop-up for the digitizer field and then selecting the Set button.</i> <i>This field is only used if Use WinTab driver is not ticked.</i>			
Set	button		
<i>if Use Wintab driver is set to tick and the Wintab drivers exist, then the 'Wintab Monitor' panel is placed on the screen. The WinTab Monitor displays the digitizer co-ordinates and the digitizer button being used. The information describing the use of the digitizer buttons is written to the Output Window (see below). Do not close the Wintab Monitor panel or the digitizer will stop being read.</i>			

*If Use Wintab driver is set to tick and the Wintab drivers **don't** exist, an error message is displayed.*

If Use Wintab driver is not set to tick, then after selecting this button, the digitizer given in the digitizer field will be used as the current digitizer.

Typical Message to Output Window if WinTab Drivers are Installed

Interface: Wintab 32-bit Digitizer Services.

Number of devices: 1

Device 1: GTCO MM-compatible Tablet; Version 1.00.00.08; Format: MM; Firmware: MM III

12 x 12 Tablet by Summagraphics Firmware Version 1.91

The default device is device 1

Number of cursors is 3

Cursor 1: 2 button stylus

Cursor 2: 4 button puck - active

Cursor 3: 16 button puck

Number of buttons on active cursor is 4

Button 1: button 1

Button 2: button 2

Button 3: button 3

Button 4: button 4

Use Button 1 for Add point to string

Use Button 2 for End string

Use Button 3 for Delete point from string

Use Button 4 for Close string

Register Plan

Position of option on menu: File I/O=>Digitizer=>Setups=>Register plan

Before the information on a plan or map can be digitized, the relationship between the co-ordinate system of the plan and the digitizer must be determined.

In 12d Model, this relationship is given by specifying the plan co-ordinates and then the position on the digitizer of three or more points. These special points are known as control points.

The affine transformation for the control points is then calculated and if accepted by the user, is used to convert digitizer co-ordinates to plan co-ordinates.

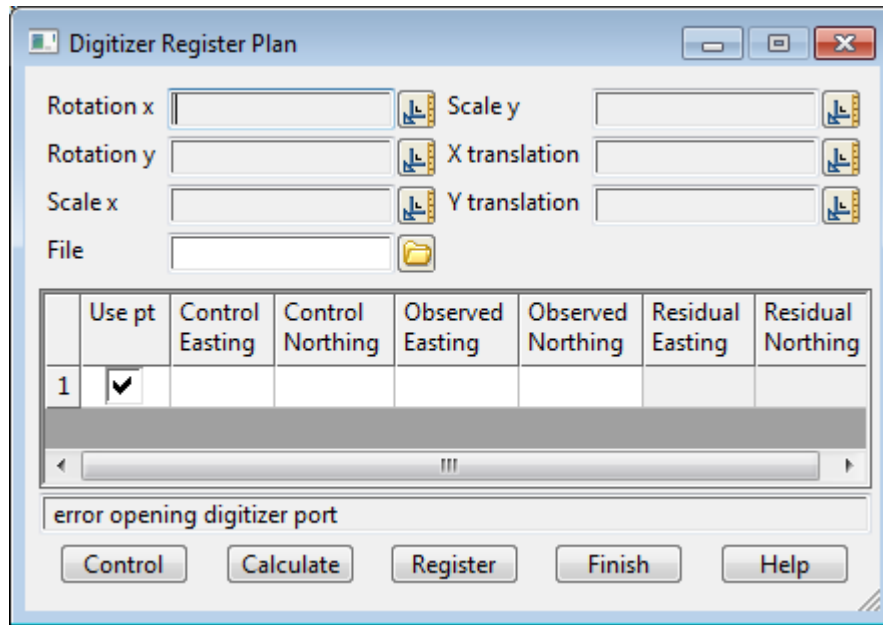
This process is called "registering a plan".

Once a plan has been registered, the information is saved to a file. This file can be used in the **resume plan** option to register the plan without having to re-enter the control points.

Warning

If the plan is moved on the digitizer, it must be re-registered since the current affine transformation will be invalid.

After selecting the **register plan** option, the **digitizer register plan** panel is displayed.



The main purpose of this panel is to display and register the affine transformation parameters. The fields and buttons used in the **digitizer register plan** panel will be discussed after the selection of the control points.

After selecting the **register plan** option, the **digitizer register plan** panel is placed on the screen and the option sits waiting for the user to enter the information for each control point.

This is achieved by

- selecting the control point with the mouse if it already exists in **12d Model**, or by typing in its plan co-ordinates (easting northing)

and then

- selecting the control point's position on the digitizer tablet using the digitizers **add point** button. Alternatively, if the control points already exist in **12d Model**, they can be selected rather than using typed input

This process is repeated for each control point and is terminated by selecting **cancel** from the **pick ops** pop-up menu instead of selecting a new control point.

The **calculate** button calculates the affine transformation for all the control points in the grid with the **Use pt** ticked on.

The affine parameters are

- the rotation of the x axis of the plan co-ordinates with respect to the digitizer x axis
- the rotation of the y axis of the plan co-ordinates with respect to the digitizer y axis
- the x and y scale factors for the plan co-ordinates with respect to the digitizer coordinates
- the x and y translations for the plan co-ordinates with respect to the digitizer coordinates

Once calculated, these values are displayed in the **digitizer register plan** panel.

If further control points are required, selecting the **control** button on the **digitizer register plan** panel will restart the control point picking mechanism. Each new control point will be added to the grid.

The new affine transformation can be calculated by selecting the **calculate** button on the **digitizer register plan** panel.

Finally, once the user is satisfied with the affine transformation, it can be **registered** and stored in

an ascii file for future use by entering a filename into the file field of the **digitizer register plan** panel and then selecting the **register** button from that panel.

Summarising, the fields and buttons in the **digitizer register plan** panel have the following functions

Field Description	Type	Defaults	Pop-Up
Rotation x/y	output		
<i>the rotation of the x/y axis of the plan co-ordinates with respect to the digitizer x/y axis</i>			
Scale x/y	output		
<i>the x/y scale factor for the plan co-ordinates with respect to the digitizer coordinates</i>			
Translation x/y	output		
<i>the x/y translation for the plan co-ordinates with respect to the digitizer coordinates</i>			
File	input	*.aff	
<i>the name of the file to record the affine parameters.</i>			
Control	button		
<i>restarts the selection process for choosing more control points.</i>			
Calculate	button		
<i>calculates the affine parameters based on the control point selection.</i>			
Register	button		
<i>write the affine transformation to the file given in the file field and register the affine transformation as the current one to be used for the digitising session.</i>			
Finish	button		
<i>remove the panel from the screen.</i>			

Warning

The affine transformation must be registered using the **register** button before the **finish** button is selected or it will be lost.

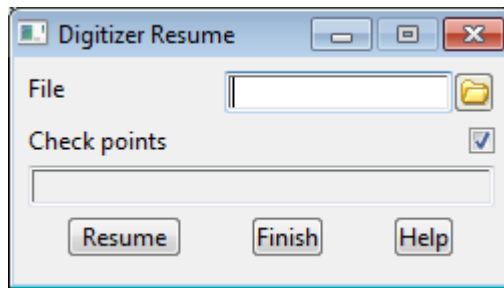
Resume Plan

Position of option on menu: File I/O=>Digitizer=>Setups=>Resume

When digitising a large plan, it is often necessary to spread the digitising over more than one session in 12d Model.

If the plan has not been moved on the digitizer since it was registered, the affine transformation can be restored with the **resume plan** option rather than having to register the plan again.

On selecting the **resume plan** option, the **digitizer resume** panel is displayed.



To resume digitizing with an affine transformation recorded during an earlier registration session, simply enter the name of the affine file into the file field on the **digitizer resume** panel and then select the **resume** button.

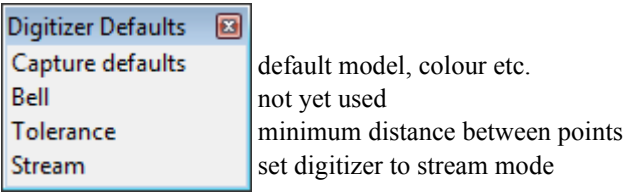
Warning

If the plan is moved on the digitizer, it must be re-registered since the current affine transformation will be invalid.

Defaults

Position of menu: File I/O=>Digitizer=>Deafults

The **defaults** menu sets default model, colour etc. and tolerance which are used when digitizing.
The **defaults** walk-right menu is

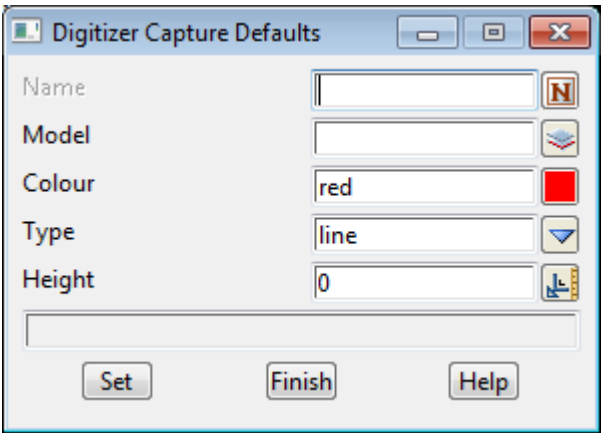


Each options will now be described.

Capture Defaults

Position of option on menu: File I/O=>Digitizer=>Deafults=>Capture defaults

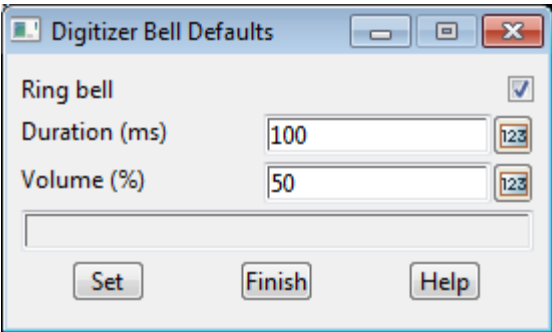
For any new string a name, model, colour, breakline type and default height are needed. When digitizing, the same values are often required for a large number of the strings. The **capture defaults** panel is used to set default values for digitized strings.
On selecting the **capture defaults** option, the **digitizer capture defaults** panel is displayed.



In the digitizing **capture** options, whenever a new string is selected, the values for name, model, colour, breakline type and height are taken from the **digitizer capture defaults** panel.

Bell

Not yet implemented



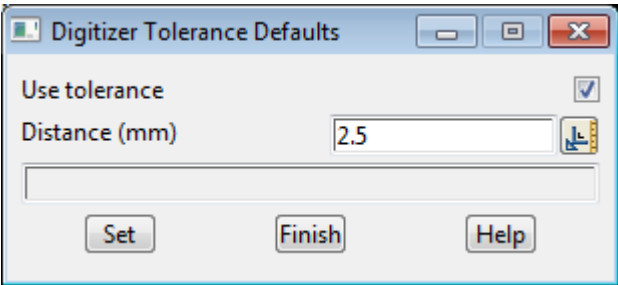
Tolerance

Position of option on menu: File I/O=>Digitizer=>Deafults=>Bell

When points are being digitized, a new point is often only required when it is a certain distance from the previous point on the digitizer. This is especially important for steam digitizing when hundreds of points per second may be captured.

The **tolerance** option allows the user to specify the minimum plan distance (in millimetres) between successive digitized points in a string.

On selecting the **tolerance** option, the **digitizer tolerance defaults** panel is displayed.



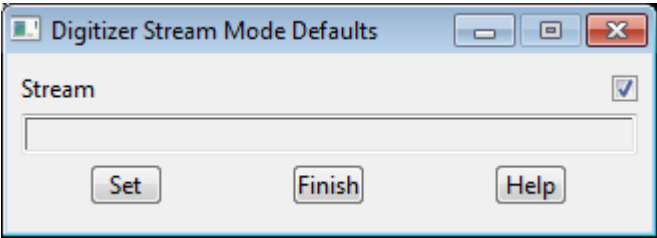
The fields and buttons used in this panel have the following meanings.

Field Description	Type	Defaults	Pop-Up
Use tolerance	tick box	tick	
<i>if tick, a new point taken from the digitizer is only accepted if it is at least the distance given in the distance field away from the previous recorded point in the string.</i>			
Distance (mm)	input	2.5	
<i>the minimum separation distance, in millimetres, between successive digitized points in a string.</i>			
Set	button		
<i>set the use tolerance and distance values.</i>			

Stream

Position of option on menu: File I/O=>Digitizer=>Deafults=>Stream

Not yet documented.

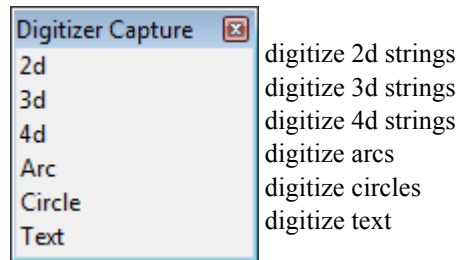


Capture

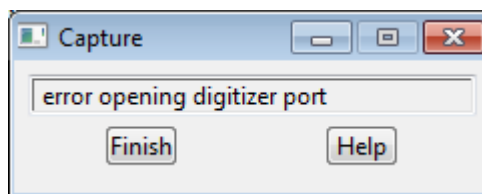
Position of menu: File I/O=>Digitizer=>Capture

The **capture** menu is for digitizing strings into **12d** Model.

The **capture** walk-right menu is



The first time any of the option from this menu is selected, the **capture** panel is placed on the screen.

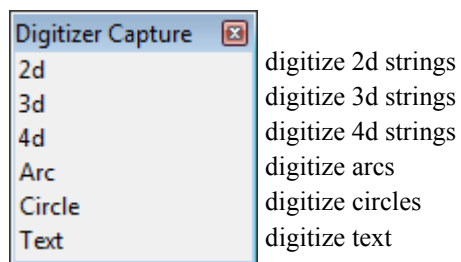


This panel is used to display the transformed co-ordinates for each digitized point that passes the tolerance test, and some special digitizer messages (for example, tolerance on/off).

To **change** the type of string being captured, simply select the new type from the **digitize capture** panel. This is normally only done at the end of capturing a string, not part way through.

To **terminate the digitizing session**, select **finish** on the **capture** panel.

Each of the methods for capturing data available in the **digitizer capture** menu will now be described.



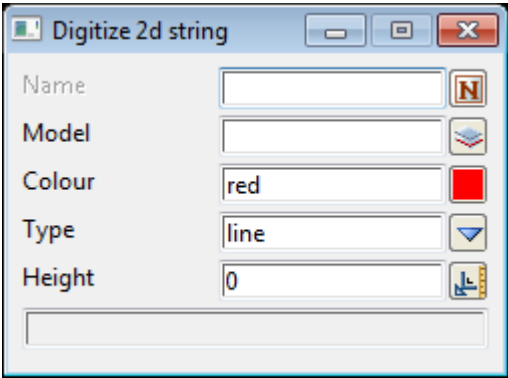
For the option **2d**, go to [2d](#)
3d [3d](#)
4d [4d](#)
Arc [Arc](#)
Circle [Circle](#)
Text [Text](#)

2d

Position of option on menu: File I/O=>Digitizer=>Capture=>2d

This option is used to digitize 2d strings.

On selecting the 2d option, the **Digitize 2d string** panel is displayed.



The fields and buttons in the **digitize 2d string** panel have the following meanings.

Field	Description	Type	Defaults	Pop-Up
Name		input	name of new string	name from capture defaults
Model	<i>model for the new string</i>	input	capture defaults model	available models
Colour	<i>colour of the new string</i>	input	capture def colour	available colours
Type	<i>breakline type of the new string.</i>	input	capture def type	point, line
Height	<i>height of the 2d string.</i>	input	capture def height	

If the **digitize 2d string** panel is created by the 2d option, the values in the name, model, colour, type and height fields are taken from the **digitizer capture defaults** panel.

Any of the values in the **digitize 2d string** can be modified before digitizing the 2d string begins.

Digitizing begins by pressing the **add** button on the digitizer puck when the puck is above the first point of the new string.

The co-ordinates of the selected point are then displayed in the **capture** panel and the **digitize 2d string** panel removed from the screen.

Further points are digitized by either pressing the **add** button again or if stream mode is on, holding the **add** button down and moving along the string being digitized.

The 2d string is terminated when the **end** button is pressed on the digitizer puck.

After selecting the **end** button, the **digitize 2d string** panel is again placed on the screen with the filled values the same as the 2d string just digitized.

The digitizing process is repeated for the new 2d string.

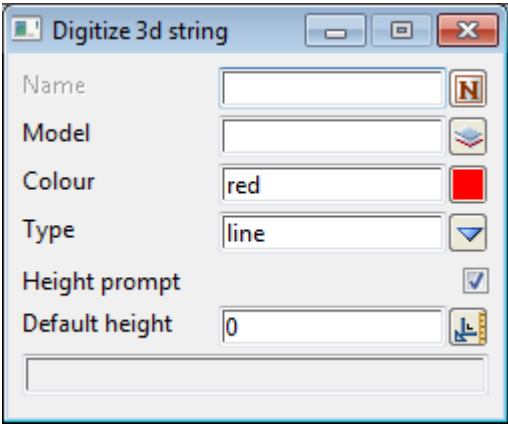
3d

Position of option on menu: File I/O=>Digitizer=>Capture=>3d

This option is used to digitize 3d strings.

Digitizing 3d strings is similar to 2d strings except that different z-values can exist at each of the digitized points.

On selecting the 3d option, the **Digitize 3d string** panel is displayed.



The fields and buttons in the **digitize 3d string** panel are similar to the **digitize 2d string** panel except for the fields

Field Description	Type	Defaults	Pop-Up
Height prompt	tick box	tick	

*if **tick**, after each point is digitized, an enter height box is placed on the screen. The height of the digitized point is typed into the box.*

*If **not tick**, the default height is used as the z-value for the digitized point.*

Default height	input	capture default height
<i>height of the point if the height prompt is set to no.</i>		

If the **digitize 3d string** panel is created by the 3d option, the values in the name, model, colour, type and height fields are taken from the **digitizer capture defaults** panel.

As for digitizing 2d strings, any of the values in the **digitize 3d string** can be modified before digitizing begins.

Digitizing begins by pressing the **add** button on the digitizer puck when the puck is above the first point of the new string.

The co-ordinates of the selected point are displayed in the **capture** panel and the **digitize 3d string** panel removed from the screen.

If the height prompt field is set to **tick**, an enter height box is placed on the screen with the previous typed height in it. The height for the digitized point in typed into the box, terminated by a <return>. The enter height box then disappears.

Further points are digitized by either pressing the **add** button again or if stream mode is on, holding the **add** button down and moving along the string being digitized.

Again, if the height prompt is set to **yes**, the enter height box will appear after each digitized point.

The 3d string is terminated when the **end** button is pressed on the digitizer puck.

After selecting the **end** button, the **digitize 3d string** panel is again placed on the screen with the field values the same as the 3d string just digitized.

The digitizing process is repeated for the new 3d string.

Warning

If stream digitizing is used for the 3d string, the height prompt should be set to **not tick**.

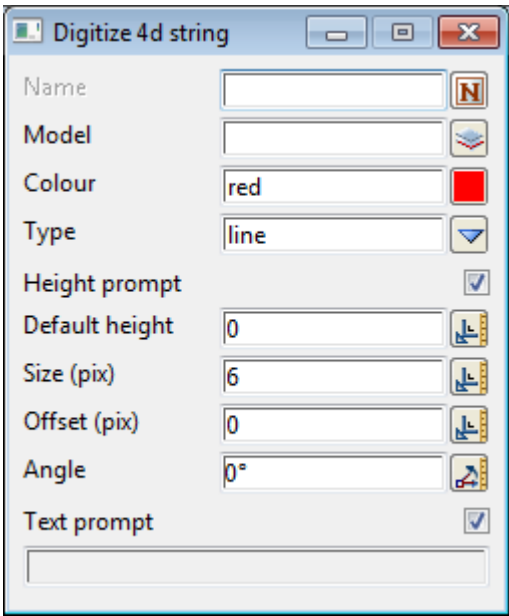
4d

Position of option on menu: File I/O=>Digitizer=>Capture=>4d

This option is used to digitize 4d strings.

Digitizing 4d strings is similar to 3d strings except that as well as a different z-value at each point, a text string also exits at each of the digitized points.

On selecting the 4d option, the **Digitize 4d string** panel is displayed.



The fields and buttons in the **digitize 4d string** panel are similar to the **digitize 3d string** panel except for the fields

Field Description	Type	Defaults	Pop-Up
Text prompt	input	yes	yes, no
<i>if tick, after each point is digitized, an enter text box is placed on the screen. The text for the digitized point is typed into the box.</i>			
<i>If not tick, no text is used at the digitized point.</i>			
Size (pix)	input	default text size	
<i>height (in pixels) of the text at each point.</i>			
Angle	input	0	
<i>angle of the text at each point.</i>			
Offset (pix)	input	0	
<i>offset (in pixels) of the text from the digitized point.</i>			

If the **digitize 4d string** panel is created by the 4d option, the values in the name, model, colour, type and height fields are taken from the **digitizer capture defaults** panel.

As for digitizing 3d strings, any of the values in the **digitize 4d string** can be modified before digitizing begins.

Digitizing begins by pressing the **add** button on the digitizer puck when the puck is above the first point of the new string.

The co-ordinates of the selected point are displayed in the **capture** panel and the **digitize 4d string** panel removed from the screen.

If the height prompt field is set to **tick**, an enter height box is placed on the screen with the previous typed height in it. The height for the digitized point is typed into the box, terminated by a <return>. The enter height box then disappears.

If the text prompt field is set to **tick**, an enter text box is placed on the screen. The text for the digitized point is typed into the box, terminated by a <return>. The enter text box then disappears.

Further points are digitized by either pressing the **add** button again or if stream mode is on, holding the **add** button down and moving along the string being digitized.

Again, the enter height and enter text boxes will appear after each digitized point if the height prompt and text prompts are set to **tick**.

The 4d string is terminated when the **end** button is pressed on the digitizer puck.

After selecting the **end** button, the **digitize 4d string** panel is again placed on the screen with the values in the fields from the 4d string just digitized.

The digitizing process is repeated for the new 4d string.

Warning

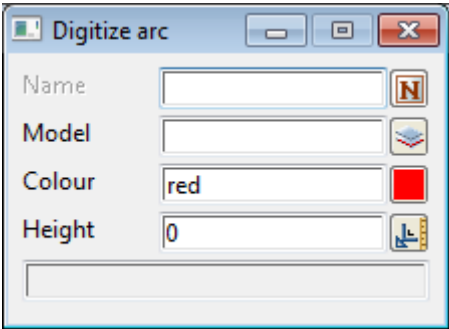
If stream digitizing is used for the 4d string, the height prompt and text prompt should be set to **not tick**.

Arc

Position of option on menu: File I/O=>Digitizer=>Capture=>Arc

This option is used to digitize arcs by digitizing three points on the arc - the arc start point, a point on the arc and the arc end point.

On selecting the arc option, the **Digitize arc** panel is displayed.



The fields and buttons in the **digitize arc** panel are similar to the **digitize 3d string** panel except for the field

Field Description	Type	Defaults
Height	input	capture default height

height given to the two end points of the arc.

If the **digitize arc** panel is created by the arc option, the values in the name, model, colour and height fields are taken from the **digitizer capture defaults** panel.

As for digitizing 3d strings, any of the values in the **digitize arc** panel can be modified before digitizing an arc begins.

Digitizing begins by pressing the **add** button on the digitizer puck when the puck is above the first point of the new arc.

The co-ordinates of the selected point are displayed in the **capture** panel and the **digitize arc** panel removed from the screen.

Next a point on the arc between the arc end points is digitized followed by the arc end point.

After the end point is digitized, the arc is automatically created and the **digitize arc** panel again placed on the screen with the field values the same as the arc just digitized.

The digitizing process is repeated for the new arc.

Warning

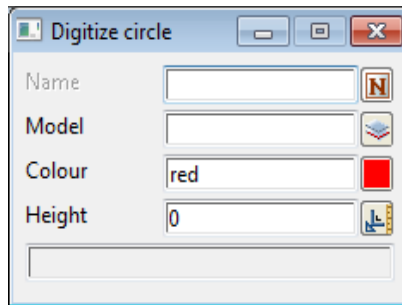
Stream digitizing should not be used for arcs.

Circle

Position of option on menu: File I/O=>Digitizer=>Capture=>Circle

The **circle** option is used to digitize circles by digitizing the centre point and one point on the circle.

On selecting the **circle** option, the **Digitize circle** panel is displayed.



The fields and buttons in the **digitize circle** panel are the same as the **digitize arc** panel.

If the **digitize circle** panel is created by the **circle** option, the values in the name, model, colour and height fields are taken from the **digitizer capture defaults** panel.

As for digitizing arcs, any of the values in the **digitize circle** panel can be modified before digitizing of the circle begins.

Digitizing begins by pressing the **add** button on the digitizer puck when the puck is above the circle point of the new circle.

The co-ordinates of the selected point are displayed in the **capture** panel and the **digitize circle** panel removed from the screen.

Next a point on the circle is digitized. The circle is then fully defined and automatically created.

The **digitize circle** panel is again placed on the screen with the field values the same as the circle just digitized.

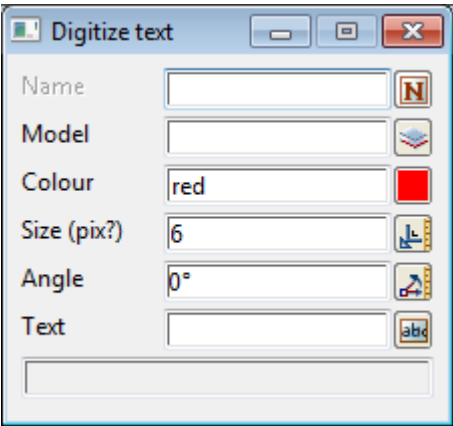
The digitizing process is repeated for the new circle.

Warning

Stream digitizing should **not** be used for circles.

Text

Position of option on menu: File I/O=>Digitizer=>Capture=>Text
Not yet implemented



Buttons

Position of menu: File I/O=>Digitizer=>Buttons

The various options on the **Buttons** menu can be used instead of pushing buttons on the digitizer puck.

The main use for this is when the digitizer puck has only a small number of buttons.

The **Buttons** walk-right menu is

Digitizer Buttons	
Delete point	delete last point
End	end string
Stream toggle	turn stream on/off
Tolerance toggle	turn tolerance on/off
Open	open string
Close	close string
Clear	delete all points in string

Summary

The steps for digitizing are

1. Point to digitizers definitions file

The file containing the definitions of the digitizers is created and either called **digitize.4d**, or the environment variable **DIGITIZERS_4D** is set to point to the file.

2. Select a digitizer

Use the menu item **File I/O =>Digitizer=> Setups=> Digitizer selection**

3. Register a new plan or resume an old plan

To register a new plan, use menu item **File I/O =>Digitizer=> Setups=> Register plan**

After selecting the option, the software is waiting for the user to give the co-ordinates and position of control points on the digitizer.

Control Point Loop

(a) type in easting northing of the control point

(b) pick point on the digitizer

The loop is terminated by getting up the **pick ops** menu with the mouse and picking **Cancel**

Then select **calculate** from the **digitizer control point table** panel and check the calculated affine parameters in the **digitizer register plan** panel.

Once happy with the affine parameters, save them away by typing a filename (ending in **.aff**) into the file field of the **digitizer register plan** panel and then select the **register** button.

Alternatively, to resume digitizing a previously registered plan that has not moved on the digitizing tablet, use menu item **File I/O =>Digitizer =>Setups=> Resume plan**

Type the affine file name into the file field of the **digitizer resume** panel and select **resume**.

4. Set the capture defaults

Menu items under **Digitizer =>Defaults**

5. Digitize a bounding polygon for the area to be digitized

Use the menu item **Digitizer =>Capture =>2d**

This step is not strictly necessary, however, the polygon can be used to easily fit the digitized data onto a view.

6. Digitize the data

Use the menu items under **Digitizer =>Capture**

Digitizer Definitions File

Unfortunately, each brand of Digitizer has its own method of communicating with a computer and a software package.

To allow for a variety of digitizers, 4D Solutions has its own ascii format for defining the important features of a particular digitizer.

When 12d Model starts up, it checks to see if an environment variable called DIGITIZERS_4D exists and if it does, then the file it points to is used to provide the definitions for the digitizers.

DIGITIZERS_4D filename

If the environment variable is not set, then 12d Model searches for a file called **digitize.4d** in the standard 12d Model search sequence for set up files.

Only digitizers that have been defined in the digitizer definitions file can be selected for use from within 12d Model.

The digitizers definition file format is a simple ascii format and consists of one or more digitizer definitions. Each digitizer definition in the file begins with the key word **digitizer** followed by the digitizer name and then appropriate digitizer commands enclosed within curly braces { }.

Available Digitizer Commands

Commands to define communication with the digitizer:

port	text
baud	300 600 1200 2400 4800 9600 19200 38400
charbits	5 6 7 8
parity	none even odd
stopbits	1 2

Commands to define the size of the digitizing area:

xdimension	integer	// length of digitizer area in mm
ydimension	integer	// height of digitizer area in mm
resolution	real	// resolution in mm

Commands to define contents of the text string returned when digitizing:

stringlength	integer	// length of the text string returned
buttonstart	integer	// position in text for button id
buttonend	integer	
xstart	integer	// position for x value
xend	integer	
ystart	integer	// position for y value
yend	integer	

Command to define sequences to send to digitizer:

startup	text	// digitizer start up sequence
finishup	text	// digitizer finish up sequence
pointmode	text	// text to put digitizer into point mode
streammode	text	// text to put into stream mode (track mode)

Commands to define the meaning of the button values returned from the digitizer:

These commands may occur more than once since some digitizers have more than one return

value for the same thing.

addpoint	text	// digitize a point
end	text	// end the string being digitized
delpoint	text	// delete the last point digitized
toggletol	text	// toggle tolerance
togglestream	text	// toggle stream mode
clearstr	text	// clear all points in the current string
openstr	text	// open the current string
closestr	text	// closes the current string

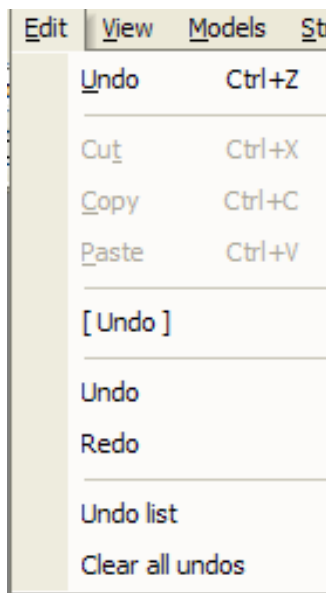
Notes

1. spaces in text - any text string that includes spaces or only numbers, must be enclosed in double quotes “ ”.
2. comments - anything after // until the end of the line is ignored.
3. blank lines - blank lines are ignored



13 Edit

The **Edit** menu contains the **Undo** and **Redo** options.



Infinite **Undo** and **Redo** facilities have been implemented for many of the **12d** Model options. However, because much of the power of **12d** Model comes from being able to leave options hanging and editing more than one string at a time, this made the standard concept of *Undo/Redo* of limited benefit to **12d** Model users.

Consequently, the following methodology has been adopted for **Undo** and **Redo** in **12d** Model:

Independent undo and redo lists are maintained for each string being edited and these list are cleared once the editor is left.

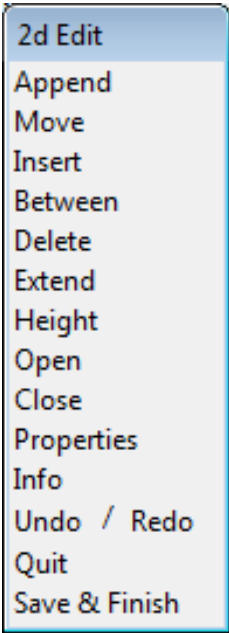
There is also a main undo/redo list which is used for all other options that can be undone. The main undo/redo lists are cleared when the **12d** Model session is exited.

Please continue to the next section [Undo and Redo for Editors](#).

Undo and Redo for Editors

Each editor contains its own **Undo/Redo** option on its **nd Edit** menu and whilst a string is being edited, the editor maintains its own undo/redo lists.

For example, for a 2d string, the **Undo/Redo** option is just above the **Quit** option.



As each edit is made to the string, the state of the string before the edit is added to the top of the string's **undo** list and the **redo** list is emptied.

If **undo** is selected from the **nd edit** menu, the last edit operation for that string will be **undone** and the undone operation added to the top of the string's **redo** list.

If another **undo** is selected before another edit is made to the string, what is now was last operation on the string will be **undone** (is was the second last operation before the previous undo) and the undone operation added to the top of the string's **redo** list.

If **redo** is selected from the **nd edit** menu, then the top operation on the **redo** list is redone, and the state of the string before the redo is added to the top of the undo list.

Hence edits for he string can be **undone** and **redone** whilst in the edit session for the string.

When the edit session is completed by selecting either **quite** or **finish** from the **nd edit** menu, the undo and redo lists for the edit session are deleted and the operations for the edit session can no longer be undone or redone.

Note

If more than one string is being edited at the same time, each string editor maintains its own undo/redo lists so that the undo/redo operations for the different strings do not get intertwined.

Hence if **undo** or **redo** is selected from a particular strings **nd edit** menu, the undo or redo applies **only** to the operations performed on that particular string, no matter what other **nd edit** options where performed on other strings.

Please continue to the next section [Undo and Redo for other Options](#).

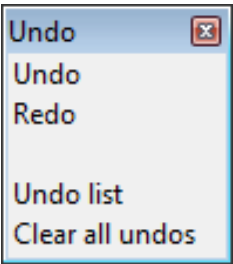
Undo and Redo for other Options

As well as the undo/redo lists maintained by the string editors, there is another set of undo/redo list maintained for all other options that support undo and redo. These are called the **main undo** and **redo** lists.

For a description of the undo in **12d Model**, please go to the section [Edit](#).

The **undo** option which controls the main undo/redo lists, is the on the Edit menu from the main menu.

If **undo** is selected from the **undo** menu, the last undoable option performed (apart from editor operation on strings) will be **undone** and the undone operation added to the top of the main **redo** list.



If another **undo** is selected before another undoable option is performed, what is now was last operation will be **undone** (is was the second last operation before the previous undo) and the undone operation added to the top of the main **redo** list.

If **redo** is selected from the **undo** menu, then the top operation on the main **redo** list is redone, and the state before the redo is added to the top of the undo list.

Hence many operations can be **undone** and **redone**.

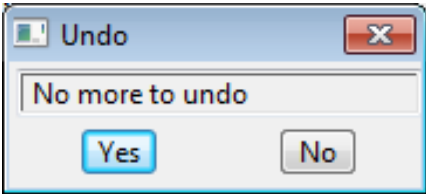
When the **12d** Model session is completed by selecting either **exit** from the **12d Model** menu, the undo and redo lists for the session are deleted and the operations for the session can no longer be undone or redone.

For the option <i>Undo</i> , go to the section	Undo.
<i>Redo</i>	Redo
<i>Undo list</i>	Undo List
<i>Clear all undos</i>	Clear all Undos

For some restrictions on the Undo/Redos, please continue to the section [Some Restrictions on Undo and Redo.](#)

Undo

If **undo** is selected from the **undo** menu, the **undo** panel showing the last operation to *undo* is displayed.

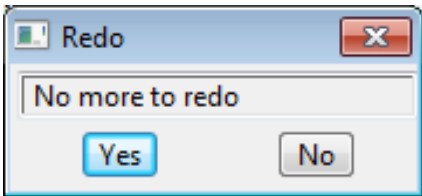


For some restrictions on the Undo/Redos, please continue to the section [Some Restrictions on Undo and Redo.](#)

Redo

If **redo** is selected from the **undo** menu, the **redo** panel showing the last operation to *redo* is

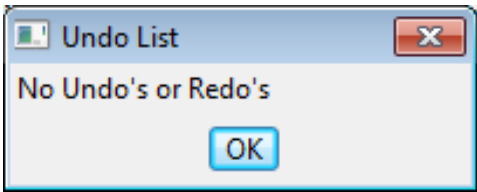
displayed.



For some restrictions on the Undo/Redos, please continue to the section [Some Restrictions on Undo and Redo](#).

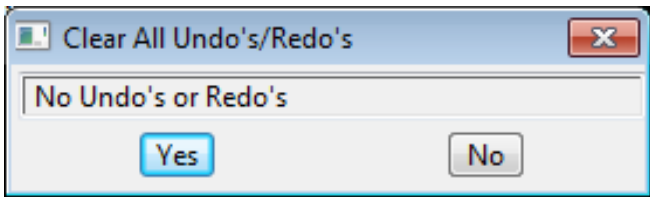
Undo List

If **undo list** is selected from the **undo** menu, a list of all the items on the undo list is displayed in the **undo list** panel.



Clear all Undos

Selecting **clear all undo** from the **undo** menu will bring up a clear all undo's/redo's **yes-no** panel.



If **yes** is selected, the main undo and redo lists will be cleared.

Some Restrictions on Undo and Redo

Undo and Redo are available for most of the **Strings** options and most of the **Utilities** options.

Undo is available for all **File=>Input** options but there are no Redos for these Undos.

Undo is available for all **Utilities=>Global** options that use the **Output** option with the Mode set to one of the three copy modes. There are no Redos with these Undos.

There are no Undos for **Models=>Delete** and **Models=>Clean**.

14 Models

Position of menu: Model

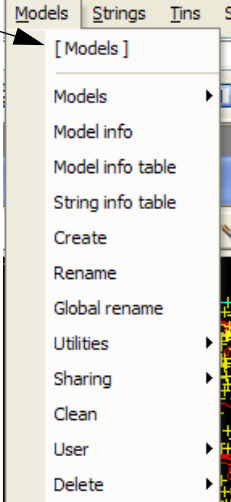
In 12d Model, models contain all the terrain and design information in the form of strings and tins.

The **Models** menu contains the options needed to create new models, rename models, report, clean models and delete models from the project.

The **models** walk-right menu is

on Main menu

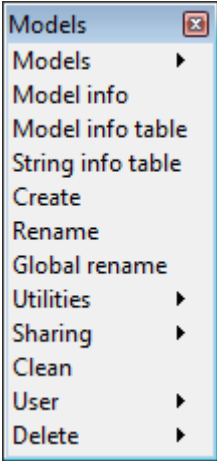
create floating
Models menu



[Models]

- Models
- Model info
- Model info table
- String info table
- Create
- Rename
- Global rename
- Utilities
- Sharing
- Clean
- User
- Delete

on 12d Model menu and
floating Models menu



- Models
- Model info
- Model info table
- String info table
- Create
- Rename
- Global rename
- Utilities
- Sharing
- Clean
- User
- Delete

- list of models and model info
- information on models
- in table form, gives min, max x,y,z for each model
- " " gives min, max x,y,z for each string in model
- create a model
- rename a model
- rename many models
- options to add, remove and save models
- sharing models
- clean all items in a model
- Models User menu
- delete models from disk

For the option *Models*, go to section

Model info

Model info table

String info table

Create

Rename

Global rename

Utilities

Sharing

Clean

Delete

[Models](#)

[Model Information](#)

[Model Information Table](#)

[String Information Table](#)

[Create](#)

[Rename](#)

[Global Rename](#)

[Utilities](#)

[Sharing](#)

[Clean](#)

[Delete](#)

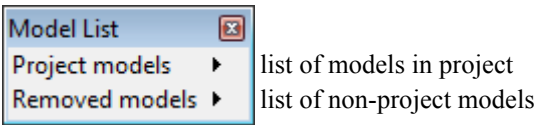
Models

Position of menu: **Model =>Models**

The **Models** walk-right menu provides options to list all the models in the project, and list all the models in the project area but not added to the project (removed models).

If a model is selected from the project model list, then it is automatically loaded into the **Model Information** panel.

The **Models** walk-right menu is



For Project models go to
Removed models

[Project Models](#)
[Removed Models](#)

Project Models

Position of option on menu: **Model =>Models =>Project models**

The **project models** walk-right menu provides a list of all the models in the project and if a model name is selected from the list, a model information panel is fired up with the selected model name already in the model field.

Removed Models

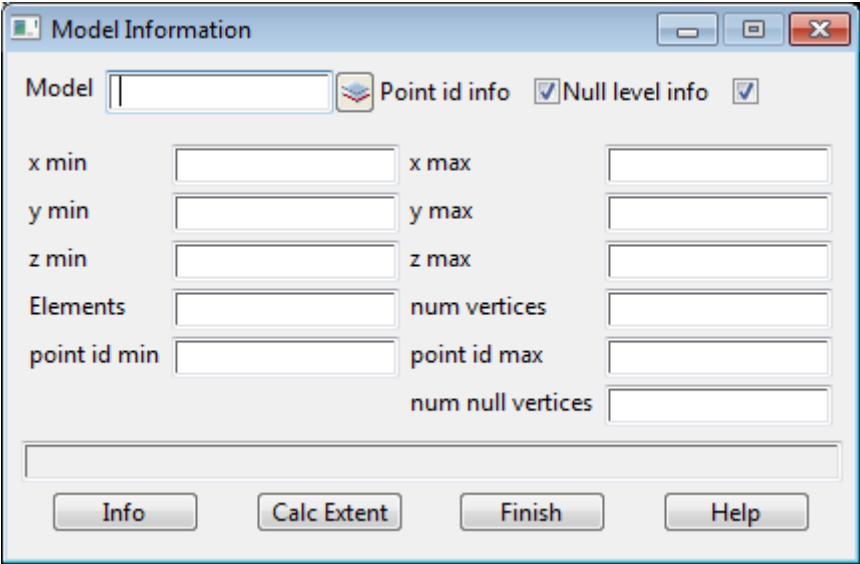
Position of option on menu: **Model =>Models =>Removed Models**

The **removed models** walk-right menu provides a list of all the models in the project area that are not in the project.

They would be mainly models that were in the project but have been removed from the project but not deleted from the disk.

Model Information

Position of option on menu: Model=>Model Info
Selecting Model info fires up the Model Information panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Model	input		available models
<i>input the name of the model to get information about</i>			
xmin/ymin/zmin, xmax/ymax/zmax	output		
<i>returns the model limits</i>			
point id min/max	output		
<i>minimum/maximum integer point id in the model</i>			
Elements	output		
<i>returns the number of elements in the model</i>			
num vertices	output		
returns the number of vertices in the model			
num null vertices	output		
returns the number of null vertices in the model			
Info	button		
<i>get the information for the model given in the Model field.</i>			
Calc Extent	button		
<i>recalculate the x, y, z bounding box for the model given in the Model field.</i>			

How to Use the Panel

The model information for the model given in the model field is retrieved and placed in the appropriate panel fields when the model name is entered into the model field from the pop-ups, or a <return> is entered after entering the model name into the model field, or on selecting the **Info** button.

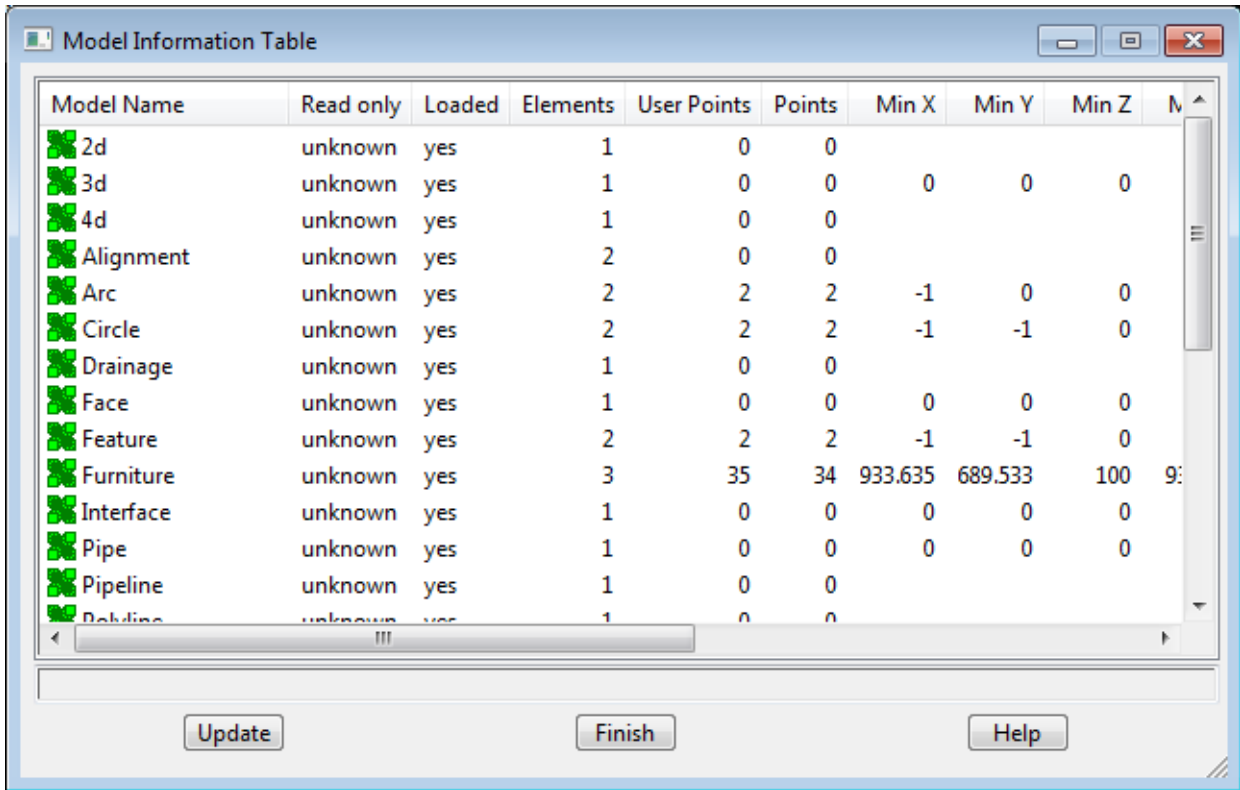
Model Information Table

Position of option on menu: Model =>Model Info Table

The **Model info table** option displays the minimum and maximum x, y and z values for every model in the project in one scrolling table.

The models and minimum and maximum columns can be sorted into ascending or descending order by using bringing up the **sort** menu on the column header fields.

Selecting **Model info table** fires up the **Model Information Table** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Model	column		sort menu

all the models in the project are listed in the model column.

Read only	column		sort menu
------------------	--------	--	-----------

Loaded	column		sort menu
---------------	--------	--	-----------

*if no, in this current opening of the project, the model has not yet been fully loaded into **12d Model**.*

Min X, Min Y, Min Z	columns		sort menu
Max X, Max Y, Max Z			

the minimum/maximum values for the model are displayed in the columns

Created/Updated	columns	dates
------------------------	---------	-------

date the model was first created/updated

Update	button
---------------	--------

recalculate the minimum/maximum information in the table.

Notes

- 1. This is a scrolling panel. If there is too much information to fit into the table, then the scrolling arrow on the right hand side of the table must be used to display the extra information.
- 2. The grid can be sorted by any of the columns.

String Information Table

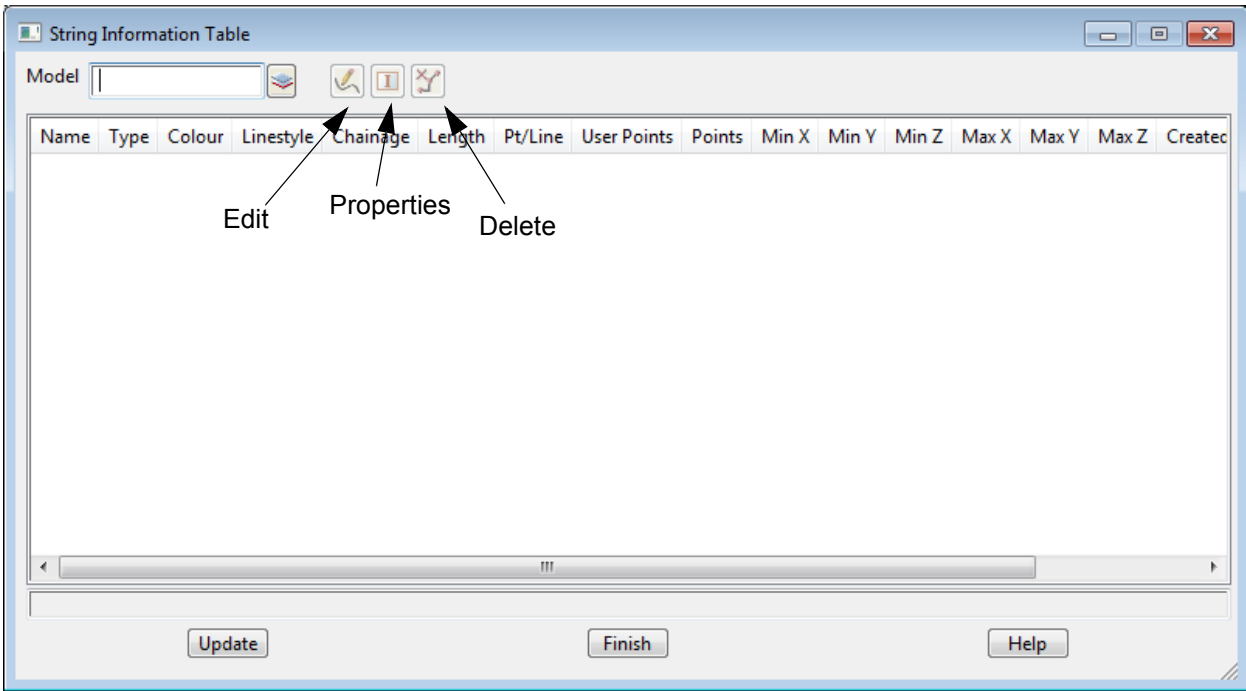
Position of option on menu: **Model =>String info table**

The **String info table** option displays the minimum and maximum x, y and z values for every string in a given model in one scrolling table.

The models and minimum and maximum columns can be sorted into ascending or descending order by using bringing up the **sort** menu on the column header fields.

Selecting **String info table** fires up the **String Information Table** panel.

The greyed out icons **Edit**, **Properties**, **Delete** only appear when a model has been selected and a row of the table selected.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Model	Model box		available models
<i>give the name of the model to calculate the minimum/maximum string information for the table.</i>			
Name	column		sort menu
<i>all the strings in the selected model are listed in the name column.</i>			
Type, Colour, Linestyle	column		sort menu
<i>type, colour and linestyle of the string</i>			
Chainage	column		sort menu
<i>start chainage of the string</i>			
Length	column		sort menu
<i>2d length of the string</i>			
Pt/Line	column		sort menu
<i>point/line breakline type for the string</i>			
Min X, Min Y, Min Z	columns		sort menu

Max X, Max Y, Max Z

the minimum/maximum values for each string in the model are displayed in the columns

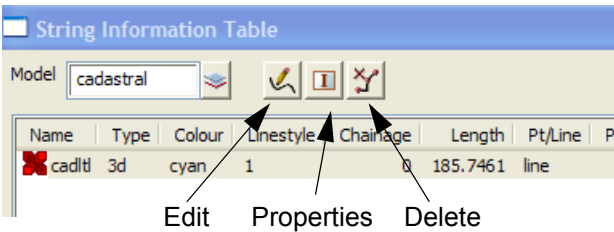
Created/Updated columns dates

date the string was first created/updated

Update button

recalculate the minimum/maximum information in the table.

When data has been read in for a model, the three icons, **Edit**, **Properties**, **Delete** appear



After clicking on a row in the table (and hence specifying a string), the specified string is highlighted on any plan views it is on, and the icons can be used to *edit* the string, bring up the string properties table or *delete* the string.

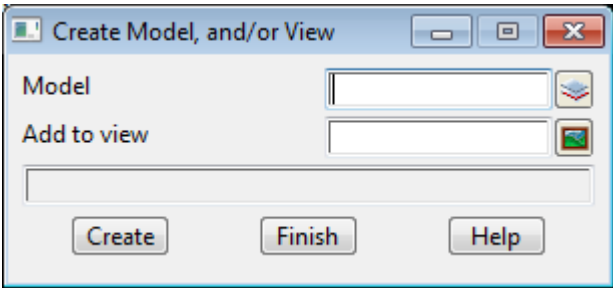
Notes

1. This is a scrolling panel. If there is too much information to fit into the table, then the scrolling arrow on the right hand side of the table must be used to display the extra information.
2. The grid can be sorted by any of the columns.

Create

Position of option on menu: Model =>Create

On selecting the Create option, the **Create Model, and/or View** panel is displayed. This panel can be used to create new models and add a model to a view.



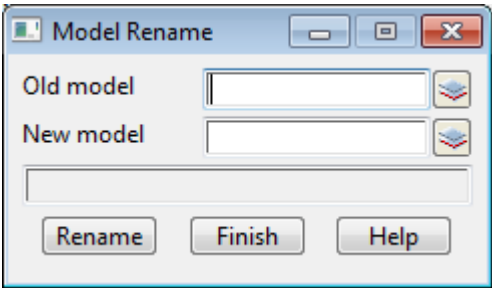
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Model	model box		all models
<i>name of the model to be created and/or added to a model and/or view.</i>			
Add to view	view box		all views
<i>if non-blank, the name of the view to which the model given in the model-field will be added.</i>			
Create	button		
<i>If the model given in the Model field does not exist, it will be created.</i>			
<i>If the add to view field is non-blank, then the model given in the model field will be added to the view given in the add to view field.</i>			

Rename

Position of option on menu: Model =>Rename

On selecting the **rename** option, the **Model Rename** panel is displayed. This panel can be used to change the names of existing models



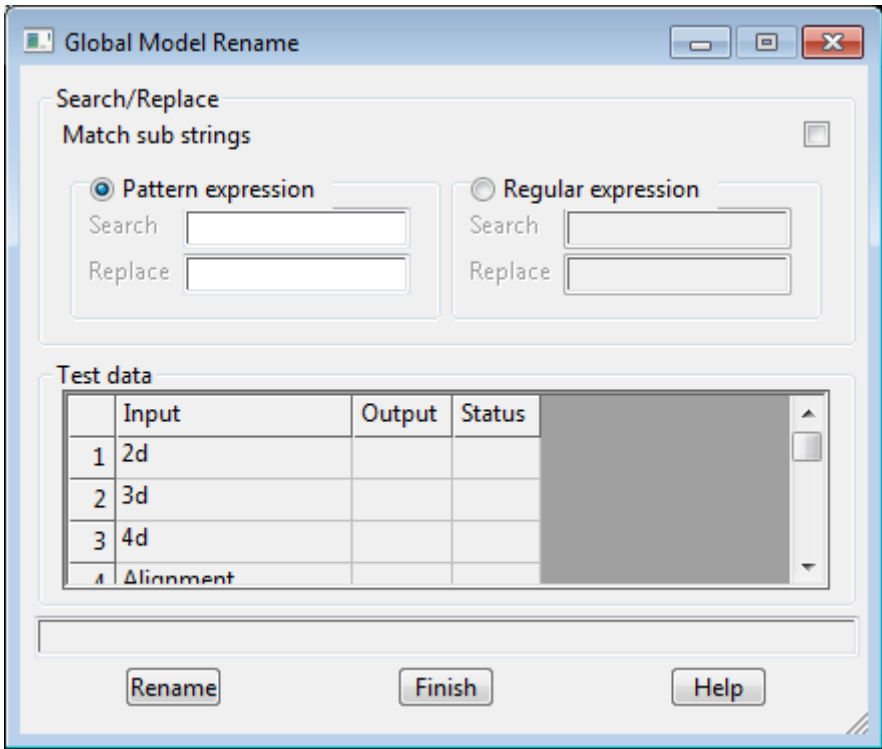
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Old model <i>name of the model to be renamed.</i>	model box		all models
New model <i>new name for the model</i>	model box		
Rename <i>Change the name of the model in the old model field to the name given in the new model field.</i>	button		

Global Rename

Position of option on menu: Model =>Global rename

Selecting the **Global rename**, displays the **Global Model Rename** panel. This panel is used to change the names of many existing models by matching according to a *pattern* expression or a *regular* expression.



The fields and buttons used in this panel have the following functions.

Field Description Type Defaults Pop-Up

Match sub strings tick box

*if **ticked**, the Search expression is used to match against part of each model name.
If **not ticked**, the Search expression is used to match against the entire model name.*

Pattern expression radio button

*if set on, then **Pattern** expressions given in the Search and Replace fields are used to modify model names. Pattern expressions include the standard wild card * and wild character !.*

Search input

pattern to search for in the model names. For example " tin" will select all models with a name ending with " tin"*

Replace input

replacement for the search pattern found in the model name. For example, "tin " in the Replace field, takes the matched part of the model name and adds "tin " to the front of it.

Hence the Search pattern " tin" and Replace pattern "tin *" finds all models with names ending in " tin" and renames them with the name starting with "tin " (and the " tin" at the end of the name is dropped off).*

Regular expression radio button

*if set on, then **Regular** expressions given in the Search and Replace fields are used to modify model names.*

Search input

regular expression to search for in the model names.

Replace input

replacement for the search expression found in the model name.

Test data grid

The Test data grid shows the effect of the Search and Replace on all the model names in the project.

*The **Input** column shows the existing model name.*

*The **Output** column shows the name after applying the Search and Replace.*

*The **Status** column displays if their has been a **match** or **no match**.*

Rename button

change the name of all the models in the project according to the selected Search and Replace fields.

Utilities

Position of menu: **Model =>Utilities**

The **utilities** menu contains miscellaneous options involving models.

The **utilities** walk-right menu is

Model Utilities

Attributes

Add

Copy project models

Remove

Save

Project models utilities

User

create/edit attributes for models

add removed and other project models to project

copy model from another project

remove models from project

save models to disk

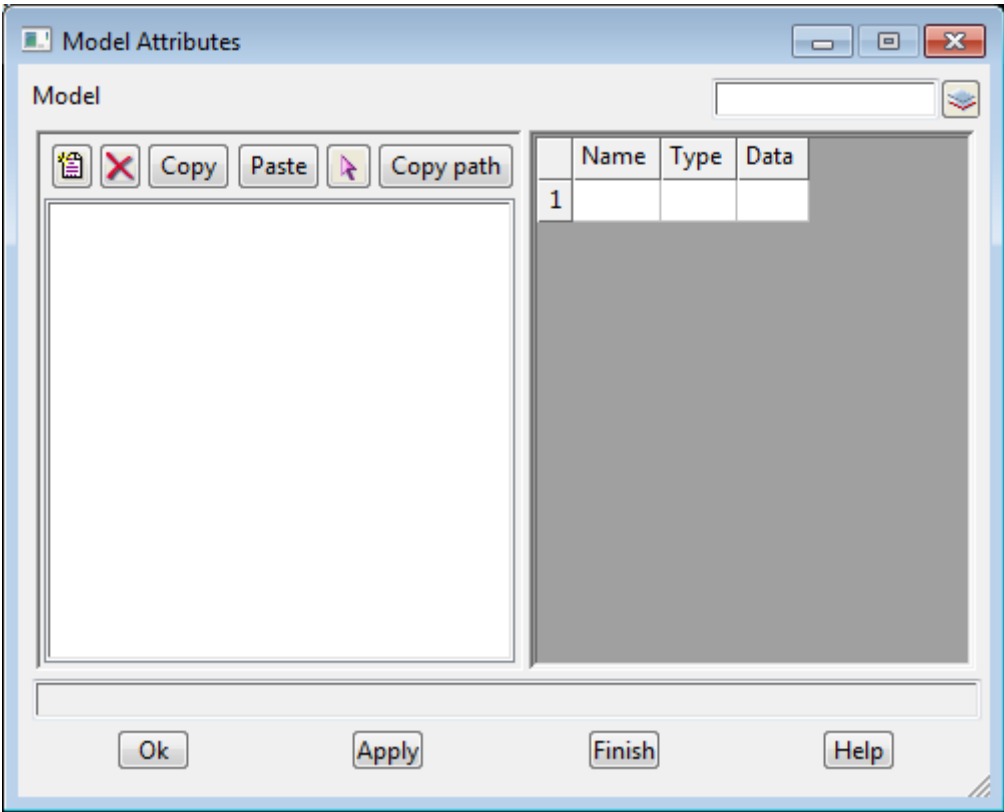
For the option <i>Attributes</i> , go to	Attributes
<i>Add</i>	Add
<i>Copy project models</i>	Copy Project Models
<i>Remove</i>	Remove
<i>Save</i>	Save
<i>Project model utilities</i>	Project Model Utilities

Attributes

Position of option on menu: **Model =>Utilities =>Attributes**

The **Attributes** options displays, creates and edits attributes for models.

On selecting **Attributes**, the **Model Attributes** panel is displayed.

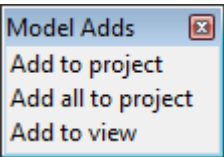


The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults
Model	<i>model to create/edit attributes of</i>	model box	all available models
Name	<i>name of the attribute</i>		
Type	<i>type of attribute - integer, real or text</i>		integer, real, text
Data	<i>value for the attribute</i>		
OK	<i>set the attributes to the values in the panel and then exit the panel.</i>		button
Apply	<i>set the attributes to the values in the panel but don't exit the panel.</i>		button

Add

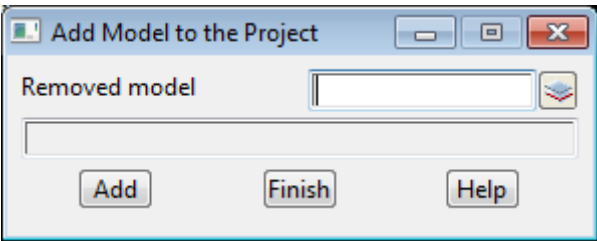
Position of menu: Model =>Utilities =>Add
Models can be added to the project and to views.
The **model adds** walk-right menu is



For the option Add to project go to [Add To Project](#)
Add all to project [Add All To Project](#)
Add to view [Add to View](#)

Add To Project

Position of option on menu: Model =>Utilities =>Add =>Add to project
The **add to project** option is used to add a removed model back into the project.
On selecting the **add to project** option, the **add model to the project** panel is displayed.

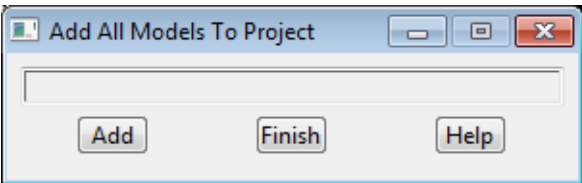


The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Removed model	input		removed models
<i>name of the model not in the project that is to be added to the project.</i>			
Add	button		
<i>add the model given in the removed model field to the working project.</i>			

Add All To Project

Position of option on menu: Model =>Utilities =>Add => Add all to Project
The **add all to project** option is used to add all the removed models back into the project.
On selecting the **add all to project** option, the **add all models to project** panel is displayed.



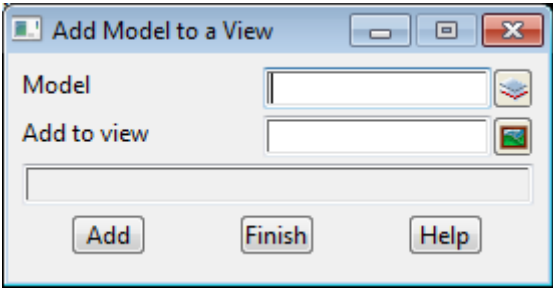
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Add	button		
<i>after selecting this button, all removed models in the working project will be added to the project.</i>			

Add to View

Position of option on menu: Model =>Utilities =>Add =>Add to view

On selecting the add to view option, the add model to a view panel is displayed.



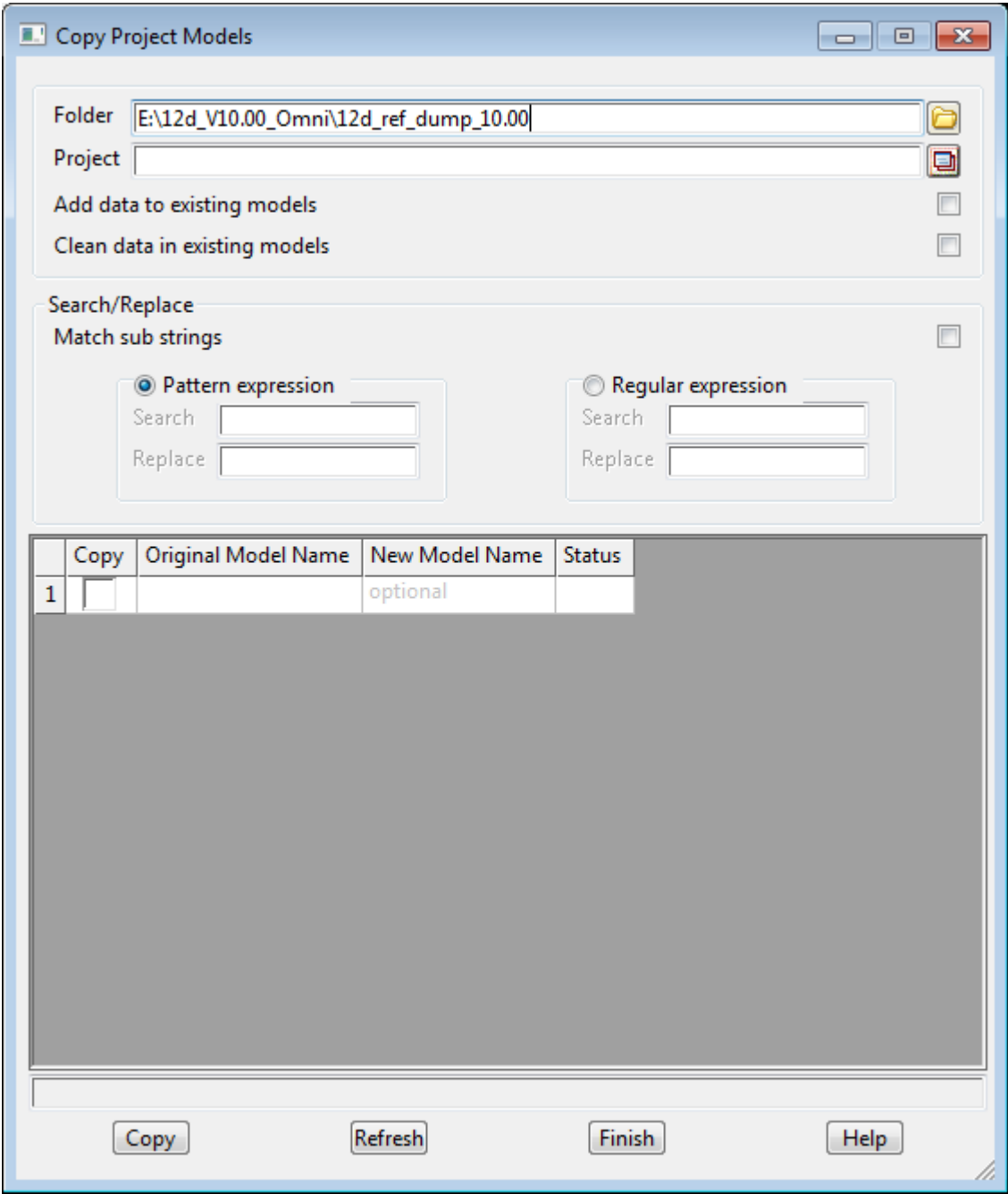
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Model <i>name of the model to be added to a view.</i>	input		available models
Add to view <i>name of the view to which the model given in the model field will be added.</i>	input		available views
Add <i>add the model given in the model field to the view given by the add to view field.</i>	button		

Copy Project Models

Position of option on menu: Model =>Utilities =>Copy Project Models

Selecting copy project models brings up the **Copy Project Models** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Folder	input		Select folder panel
<i>name of the folder that the project to get the model from, is in.</i>			
Project	input		projects in the folder
<i>name of the project in the folder given in the folder field, that the model is to be copied from.</i>			
<i>Once a project is selected, all the models from that project will be listed in the Original Model Name</i>			

column.

Add data to existing models tick box

if ticked, if the model that the data is being read into already exists, the new data is copied into the model

Clean data in existing models tick box

if ticked, any existing data in the models being read into, is first cleaned out.

NOTE - If neither tick box is ticked then if the model already exists, **no data is copied**.

Search/Replace

section for renaming models from the selected project

Match sub strings tick box

*if **ticked**, the **Search** expression is used to match against part of each model name.
If **not ticked**, the **Search** expression is used to match against the entire model name.*

Pattern expression radio button

*if set on, then **Pattern** expressions given in the Search and Replace fields are used to modify model names. Pattern expressions include the standard wild card * and wild character !.*

Search input

pattern to search for in the model names. For example " tin" will select all models with a name ending with "tin "*

Replace input

replacement for the search pattern found in the model name. For example, "tin " takes the matched part of the model name and adds " tin " to the front of it.

Hence the Search pattern " tin" and Replace pattern "tin *" finds all models with names ending in " tin" and renames them with the name starting with "tin " (and the " tin" at the end of the name is dropped off).*

Regular expression radio button

*if set on, then **Regular** expressions given in the Search and Replace fields are used to modify model names.*

Search input

regular expression to search for in the model names.

Replace input

replacement for the search expression found in the model name.

Model Names Grid

*The models selected by the Search and Replace expressions are shown in the **Original Model Name** column. Note that if the model already exists in the current project, then the cell for that model in Original Model Name column will be displayed in yellow.*

Copy tick box

*if ticked, the model will be copied.
If not ticked, the model will not be copied*

*Clicking RB on **Copy** at the top of the column brings up a menu to **Clear** which turns all the ticks off.*

Original Model Name column

name of the existing model in the selected project

New Model Name column

*if **non-blank**, the new name to be given to the copied model.
If blank, the original model name is used.*

The New Model Names can be from applying the Search and Replace, or just typing them in.

Status column

displays if their has been a match or no match for the search/replace for renaming models

Copy button

copy to this project, the model given in the model field from the project given in the project field.

Refresh button

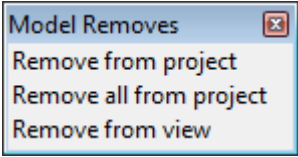
refresh the list of all models in the selected project

Remove

Position of menu: Model =>Utilities =>Remove

Models can be removed from the project and from views.

The **model removes** walk-right menu is



The options in the menu will now be described.

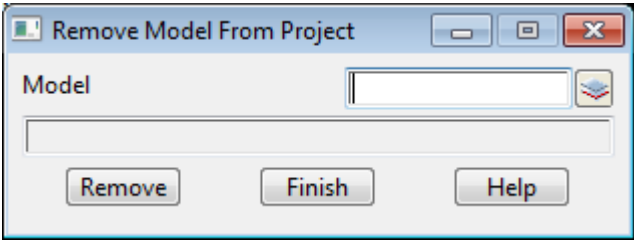
For the option Remove from project go to
Remove all from project
Remove from view

[Remove Model from Project](#)
[Remove All Models From Project](#)
[Remove From View](#)

Remove Model from Project

Position of option on menu: Model =>Utilities =>Remove =>Remove from project

On selecting the **remove from project** option, the **remove model from project** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Model	input		available models

name of the model to be remove from the working project.

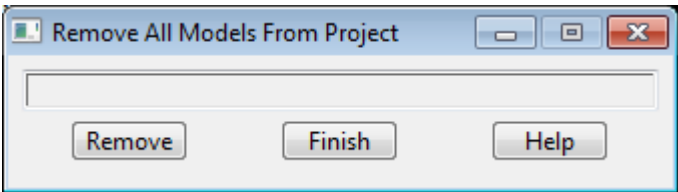
Remove button

after selecting this button, the model given in the model field will be removed from the working project.

Remove All Models From Project

Position of option on menu: Model =>Utilities =>Remove =>Remove from all projects

On selecting the **remove all** option, the **remove all models from project** panel is displayed.



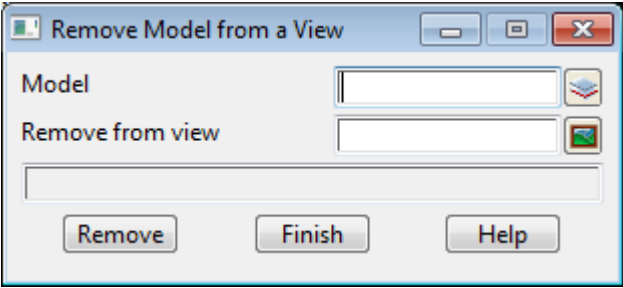
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Remove	button		
<i>after selecting this button, all models in the working project will be removed. Next, all views will be refreshed. Finally, unless an error occurs, the panel will be removed.</i>			

Remove From View

Position of option on menu: Model =>Utilities =>Remove =>Remove from view

On selecting the remove from view option, the **remove model from a view** panel is displayed.



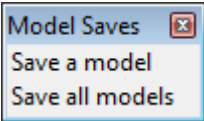
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Model	input		available models
<i>name of the model to be removed from a view.</i>			
Remove from view	input		available views
<i>name of the view from which the model given in the model field will be removed.</i>			
Remove	button		
<i>remove the model given in the model field from the view given in the remove from view field.</i>			

Save

Position of menu: Model =>Utilities =>Save

Models can be saved on disk so that they can be used for future project work or in other projects.
The **model saves** walk-right menu is

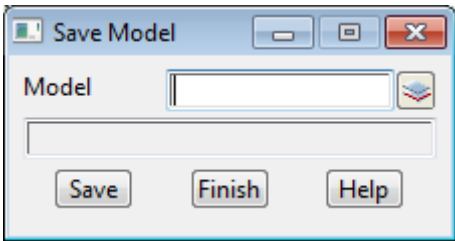


The options in the menu will now be described.
For the option Save a model go to [Save a Model](#)
 Save all models [Save All Models](#)

Save a Model

Position of option on menu: Model =>Utilities =>Save =>Save a model

On selecting the **save a model** option, the **save model** panel is displayed.



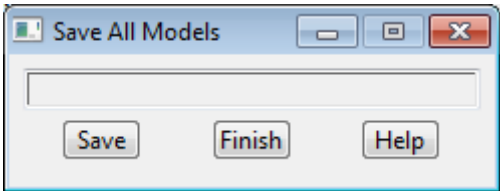
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Model <i>name of the model to be saved.</i>	input		available models
Save <i>after selecting this button, the model given in the model field will be saved to disk.</i>	button		

Save All Models

Position of option on menu: Model =>Utilities =>Save =>Save all models

On selecting the **save all models** option, the **save all models** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Save	button		

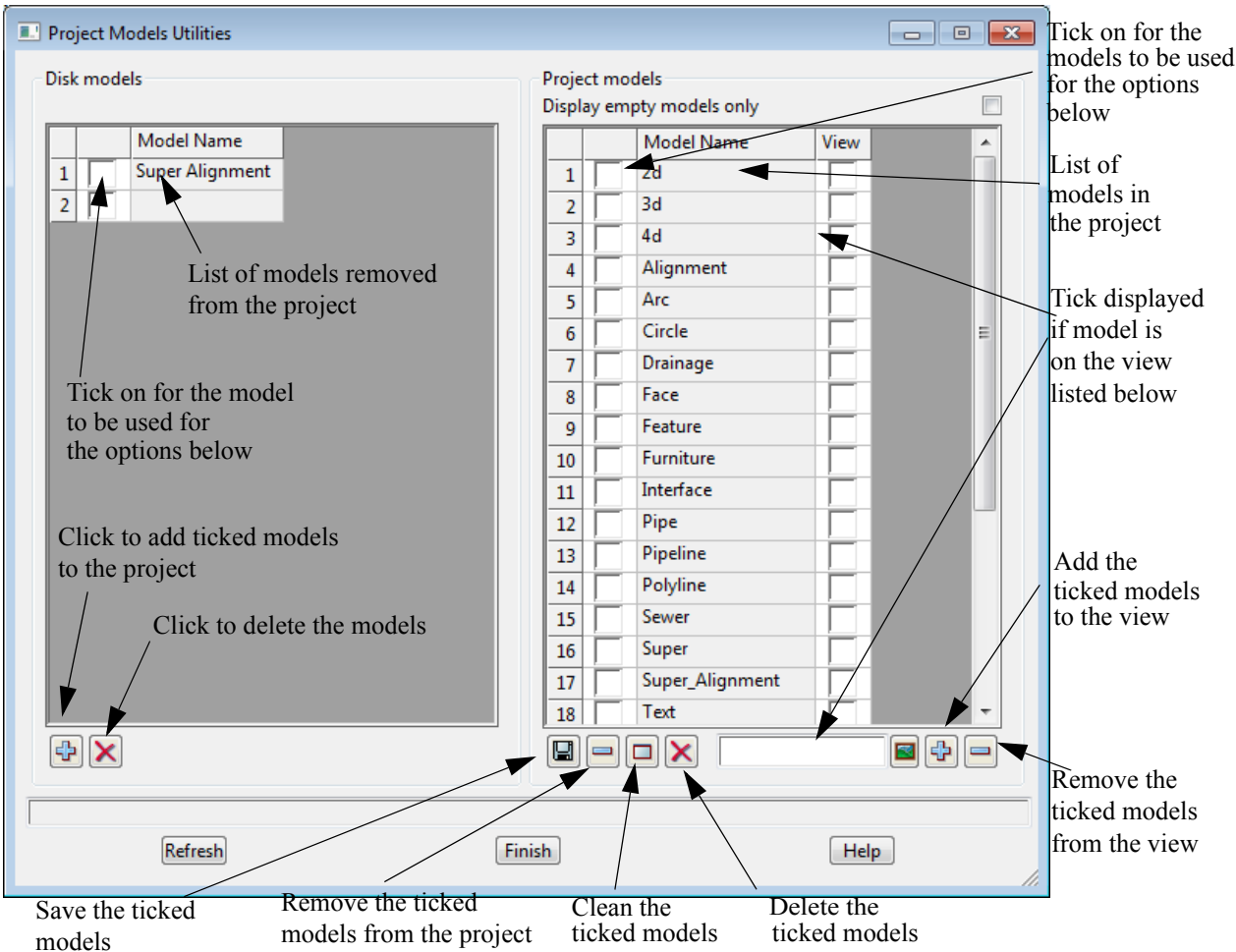
after selecting this button, all models in the working project that have been modified since they were last saved, will be saved to disk. Unless an error occurs, the panel will be removed after the saving is completed.

Project Model Utilities

Position of option on menu: Model =>Utilities =>Project model utilities

The **Project Model Utilities** panels can add/remove models from the project, clean and delete models, add/remove models from views.

On selecting **Project model utilities**, the **Project Model Utilities** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description Type DefaultsPop-Up

Disk Models section

options to add removed models to the project and delete removed models

Project Models section

options to save/remove/clean/delete models, add/remove models from a view

Display empty models only tick box

*if **ticked**, only empty models are listed.*

Refresh

button

refresh the model properties displayed in the panel

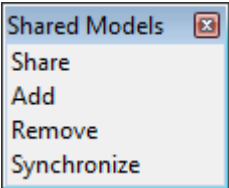
Sharing

Position of menu: **Model =>Sharing**

Sharing allows models from a project (the server project) to be added to other projects (client projects).

Before any models can be added to a client project, they must first be tagged in the server project as allowed to be shared.

The **Sharing** walk-right menu is

	<p>allow models in this project to used by other projects</p> <p>add a shared model from another project</p> <p>remove a model shared from another project</p>
-----------------------------------------------------------------------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------

- | | |
|-------------------------------------|-------------------------------------------|
| For the option <i>Share</i> , go to | Share Models |
| <i>Add</i> | Add Shared Models |
| <i>Remove</i> | Remove Shared Models |
| <i>Synchronize</i> | Synchronize Shared Models |

Share Models

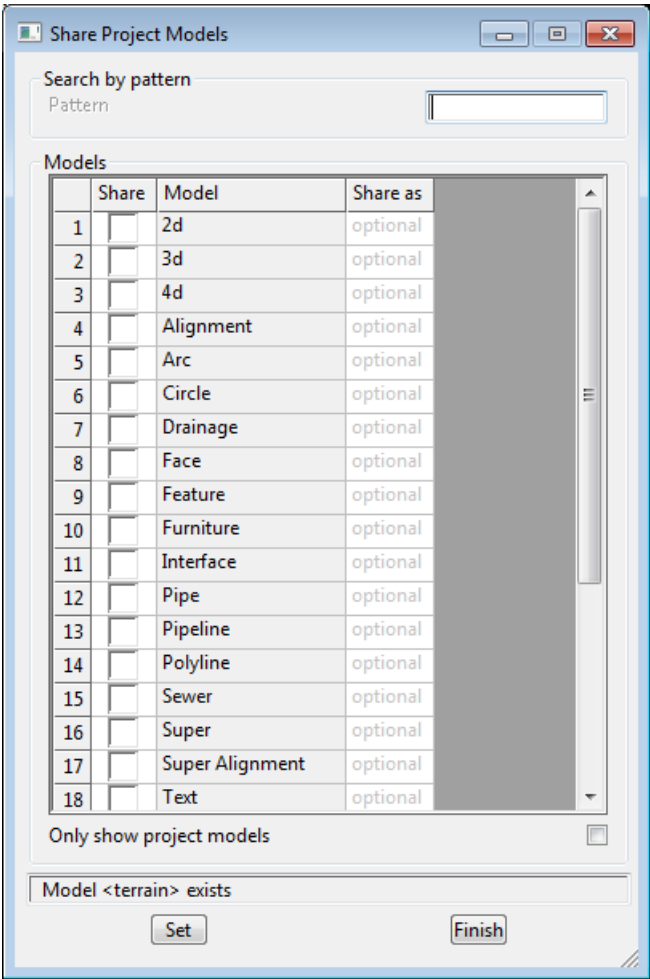
Position of option on menu: **Model =>Sharing =>Share**

Before models in a server project can be added to client projects, the models must be made available for sharing in the server project by using the **Share** option.

All models that have been made available for sharing are displayed in model lists in a colour defined by an environment variable. The default colour is a yellow (RGB of (255,166,0))

This option also can reverse the process. That is, remove the availability of a model for sharing. If this is done then clients who have shared this model will be warned.when starting up their project and/or synchronizing occurs

Selecting **Share** displays the **Share Project Models** panel.



The fields and buttons used in this panel have the following functions.

Field Description Type DefaultsPop-Up

*All the models in the project are listed in the **Share Project Models** panel and if a model has been tagged for Sharing, a tick will be displayed in the **Share** column of the grid.*

Pattern

*if a pattern is typed then all the models matching the pattern will have a tick placed in the **Share** column. If * is typed then all models are ticked for sharing.*

Share grid column

*tick if the model is to be made available for sharing when the **Set** button is pressed.*

All models that have been made available for sharing are displayed in model lists in a colour defined by an environment variable. The default colour is a yellow (RGB of (255,166,0)).

*Clicking RB on **Share** at the top of the column brings up a menu to **Toggle** the ticks, **Set** all the ticks on, **Clear** to turn all the ticks off.*

Model grid column

this column lists all the models in the project

Share as grid column

an optional name with which the model will be shared out to clients. Leave it blank to share under the original name.

Set button

clicking **Set** marks all the models with a tick in the **Tick** column as being available for sharing. Those models without a tick will not be available for sharing.

Add Shared Models

Position of option on menu: Model =>Sharing =>Add

The **Add** option is used to add shared models from a server project, to this project (a client project).

All models that have been added as shared models are displayed in model lists in a colour defined by an environment variable. The default colour is blue.

Selecting **Add** displays the **Add Shared Models to Project** panel.

	Add	Original Model Name	New Model Name	Status
1	<input checked="" type="checkbox"/>		optional	

The fields and buttons used in this panel have the following functions.

Field Description	Type	DefaultsPop-Up
-------------------	------	----------------

- Folder

folder box

select folder

folder to look for **12d Model** projects. When a folder is selected, all the **12d Model** projects in the folder will be displayed in a **Projects** pop-up list.
- Project

folder box

select folder

name of the **12d Model** project in the folder given in the **Folder** field, to search for models marked for sharing. Once a project is selected, all the models marked for sharing from that project will be listed in the **Original Model Name** column.

Search/Replace

section for renaming models from the selected project

- Match sub strings

tick box

if **ticked**, the **Search** expression is used to match against part of each model name.
If **not ticked**, the **Search** expression is used to match against the entire model name.
- Pattern expression

radio button

if set on, then **Pattern** expressions given in the **Search** and **Replace** fields are used to modify model names. Pattern expressions include the standard wild card * and wild character !.
- Search

input

pattern to search for in the model names. For example **"* exist"** will select all models with a name ending with **" exist"**
- Replace

input

replacement for the search pattern found in the model name. For example, **"exist "** in the **Replace** field takes the matched part of the model name and adds **" exist "** to the front of it.

Hence the **Search** pattern **"* exist"** and **Replace** pattern **"exist *"** finds all models with names ending in **" exist"** and renames them with the name starting with **"exist "** (and the **" exist"** at the end of the name is dropped off).

- Regular expression

radio button

if set on, then **Regular** expressions given in the **Search** and **Replace** fields are used to modify model names.
- Search

input

regular expression to search for in the model names.
- Replace

input

replacement for the search expression found in the model name.

Model Names Grid

The models available for sharing in the selected project are shown in the **Original Model Name** column. Any renaming by the **Search** and **Replace** expressions are shown in the **New Model Name** column. Note that if the model already exists in the current project, then the cell for that model in **Original Model Name** column will be displayed in yellow.

- Add

tick box

if **ticked**, the model will be added to this project as a shared model.
If **not ticked**, the model will not be added to this project as a shared model.

Clicking **RB** on **Add** at the top of the column brings up a menu to **Clear** which turns all the ticks off.

Note - a shared model that has been previously added can only be removed by using the **Model**
=>Sharing =>Remove option.

- Original Model Name

column

this column lists all the models in the server project available for sharing.
- New Model Name

column

if **non-blank**, the new name to be given to shared model in this project.
If blank, the original model name is used.

The New Model Names can be from applying the Search and Replace, or by just typing them in.

Status output column

displays if their has been a match or no match for the search/replace for renaming models

Add button

add to this project (a client project) as a shared model, the ticked models given in the Original Model Name field from the project given in the Project field.

Refresh button

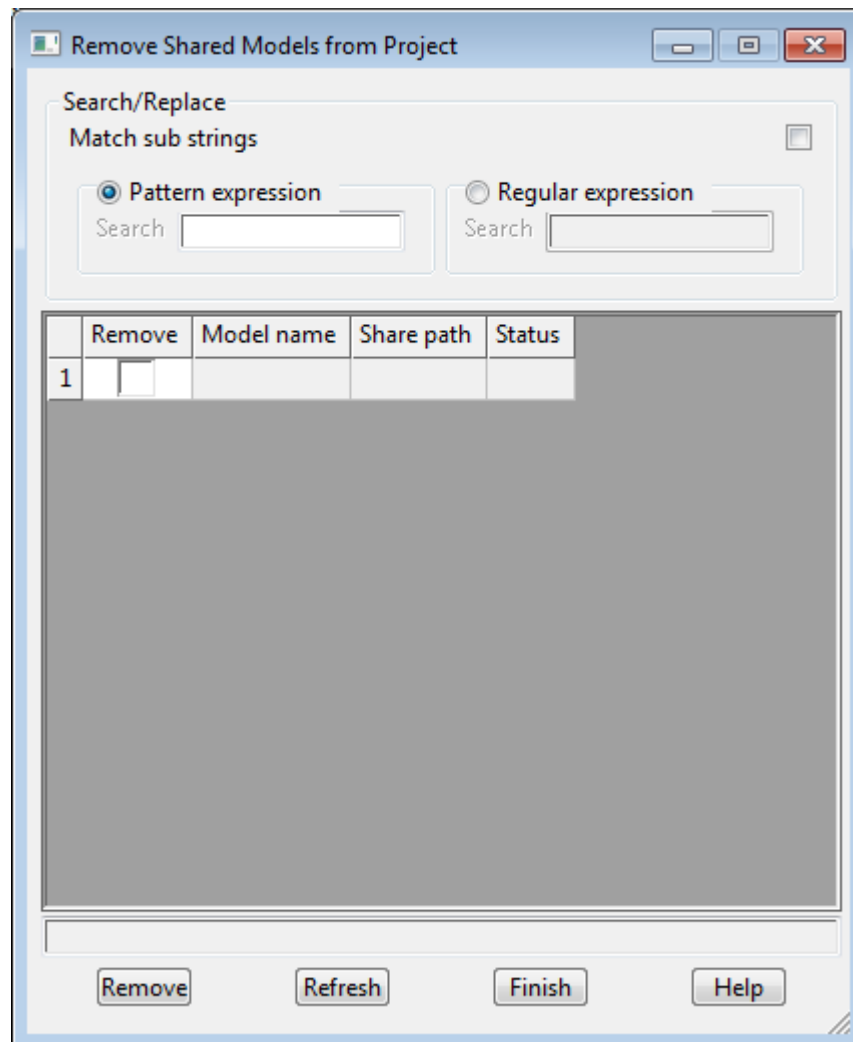
refresh the list of all models available for sharing in the selected server project

Remove Shared Models

Position of option on menu: **Model =>Sharing =>Remove**

The **Remove** option is used to remove shared models from the project. The shared models would have been previously added to the project with the **Model =>Sharing =>Add** option.

Selecting **Remove** displays the **Remove Shared Models from Project** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults
Search/Replace		
<i>section for selecting by expressions, models in this project that are shared from other projects</i>		
Match sub strings	tick box	
<i>if ticked, the Search expression is used to match against part of each model name.</i>		
<i>If not ticked, the Search expression is used to match against the entire model name.</i>		
Pattern expression	radio button	
<i>if set on, then Pattern expressions given in the Search fields are used to select shared model names.</i>		
<i>Pattern expressions include the standard wild card * and wild character !.</i>		
Search	input	

*pattern to search for in the model names. For example "** exist" will select all models with a name ending with " exist"*

Regular expression radio button

*if set on, then **Regular** expressions given in the Search field are used to select shared model names.*

Search input

regular expression to search for in the shared model names.

Model Names Grid

list of all shared models added to the project.

Remove tick box

if ticked, the model will be removed from this project as a shared model.

If not ticked, the model will not be removed.

*Clicking RB on **Remove** at the top of the column brings up a menu to **Clear** which turns all the ticks off.*

Model Name column

this column lists all the models added as shared models from other server projects

Share path

this column lists the path name to the server project and the original model name in the server project

Status column

displays if there has been a match or no match for the Search for selecting shared models

Remove button

*clicking **Remove** removes as shared models from this project, all the models with a tick.*

Refresh button

*clicking **Refresh** refreshes the list of all shared models previously added to the project*

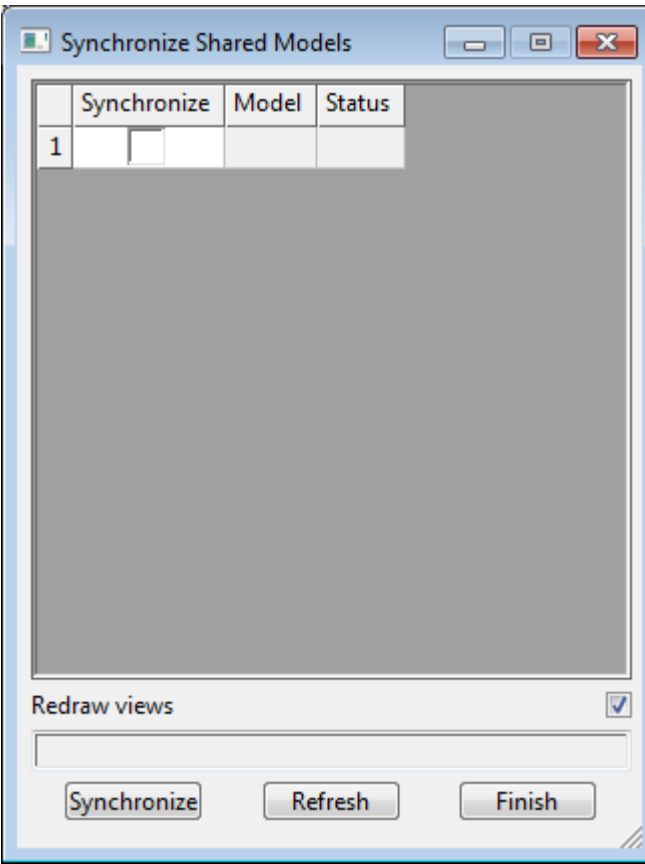
Synchronize Shared Models

Position of option on menu: Model =>Sharing =>Synchronize

The **Synchronize** option is used to updated any added shared models. The shared models would have been previously added to the project with the **Model =>Sharing =>Add** option.

Three environment variables control the synchronization of updates of added shared models and tins. For more information on synchronizing, go to the section [Project Share Settings](#).

Selecting **Synchronize** displays the **Synchronize Shared Models** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	DefaultsPop-Up
Synchronize <i>if ticked and the model has changed in the server project, then it will be re-copied from the server project when the Synchronize button is pressed.</i> <i>Clicking RB on Copy at the top of the column brings up a menu to Toggle the ticks, Set all the ticks on, Clear to turn all the ticks off.</i>	tick boxes in grid column	
Model <i>this column lists all the models in this project that have been added from other (server) projects</i>	grid column	
Synchronize <i>clicking Synchronize re-copies any models with a tick from the server projects</i>	button	
Status <i>Status will either be Ok or No Longer Shared to reflect the status of the model on that row.</i>		

Redraw views tick box

Whether or not to redraw all the views any of the synchronized models are on.

Refresh button

*clicking **Refresh** refreshes the list of all shared models previously added to the project*

Clean

Position of option on menu: Model => Clean

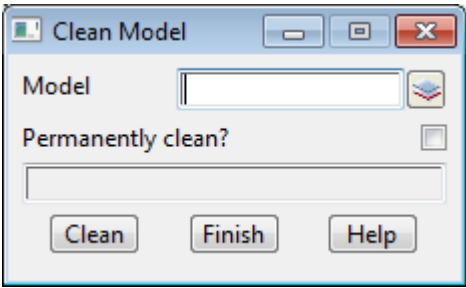
The **clean** option is used to delete all the strings in a model but the model itself is not deleted. The model is still attached to any views it had been added to.

To help protect the user against disasters, when a model is selected for cleaning, a **yes-no** pop-up menu is invoked to confirm that the user did intend cleaning out the model.

Wild cards (*) and wild characters (!) can be used to select the models to clean and then a list of selected models is displayed for confirmation.

If cleaning is confirmed, all the strings in the selected models are deleted.

Selecting **Clean** displays the **Clean Model** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Model	model box		available models
<i>name of the model to be cleaned out. Wild cards * and characters ? can be used to give a list of models to be cleaned.</i>			
Permanently clean?	tick box		
<i>if ticked, the cleaned strings will not go to the trash bin but will be permanently deleted.</i>			
Clean	button		
<i>after selecting this button, all strings in the model given in the model field will be deleted. A yes-no pop-up is used to confirm that cleaning is required.</i>			

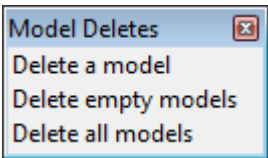
Delete

Position of menu: Model => Delete

Using the **delete** option, models can be deleted from disk so that they no longer can be accessed or take up disk space.

To help protect the user against disasters, when a model is selected for deletion, a **yes-no** pop-up menu is used to confirm that deleting the model is intended. If deletion is confirmed, the selected model is deleted from the project and the disk. For extra security, there is also a **Trash Bin** (see [Trash Bin](#) in the chapter [Projects](#)) where models can automatically be moved to on delete before being permanently deleted from disk.

The model delete walk-right menu is



For the option <i>Delete a model</i> , go to	Delete a Model
<i>Delete empty models</i>	Delete Empty Models
<i>Delete all models</i>	Delete All Models

Delete a Model

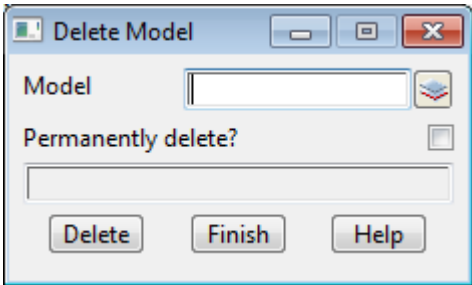
Position of option on menu: Model =>Delete =>Delete a Model

The **delete a model** option is used to delete a model in the working project.

Wild cards (*) and wild characters (!) can be used to select the models to delete and then a list of selected models is displayed for confirmation.

If a **12d Model trash bin** is being used, the deleted models may be moved to the trash bin rather than deleted from disk (see [Trash Bin](#)).

Selecting **Delete a model** brings up the **Delete Model** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Model	input		available models
<i>name of the model to be deleted. Wild cards * and characters ? can be used to give a list of models to be deleted.</i>			
Permanently delete	tick box		

if ticked, the deleted models will not go to the trash bin but will be permanently deleted from disk.

Delete button

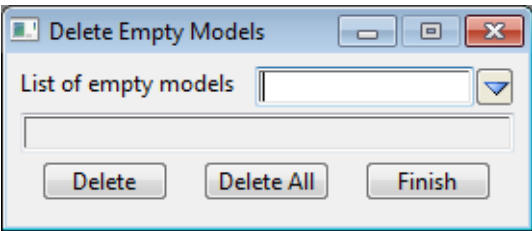
*after selecting this button, the model given in the model field will be deleted from the computer disk. A **yes-no** pop-up is used to confirm that deletion is required.*

Delete Empty Models

Position of option on menu: Model =>Delete =>Delete Empty Models

The **delete empty models** option displays a list of all the empty models in the project and can delete selected empty models or all of them.

Selecting **Delete empty models** brings up the **Delete Empty Models** panel.



The fields and buttons used in this panel have the following functions.

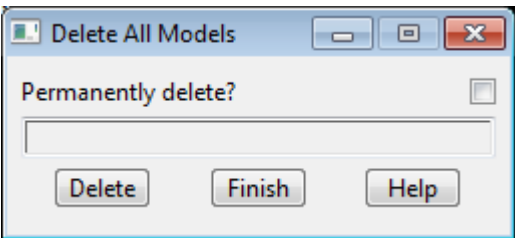
Field Description	Type	Defaults	Pop-Up
List of empty models	models		available models
<i>the pop-up brings up a list of all the empty models in the project. A model can be selected from the list and it will be deleted after selecting the delete button.</i>			
Delete	button		
<i>delete the model given in the list of empty models field.</i>			
Delete all	button		
<i>delete all the empty models in the project.</i>			

Delete All Models

Position of option on menu: Model =>Delete =>Delete All Models

The **delete all models** option will delete all the models in the project. It does not delete models that are in the project area but not yet added to the project.
If a **12d Model trash bin** is being used, the deleted models may be moved to the trash bin rather than deleted from disk (see [Trash Bin](#)).

On selecting the **Delete all models** option, the **Delete All Models** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Permanently delete	tick box		
<i>if ticked, the deleted models will not go to the trash bin but will be permanently deleted from disk.</i>			
Delete	button		
<i>after selecting this button, a yes-no pop-up is used to confirm that deletion is required. If it is, all models in the working project will be deleted from disk. All views will be refreshed and unless an error occurs, the panel will be removed.</i>			

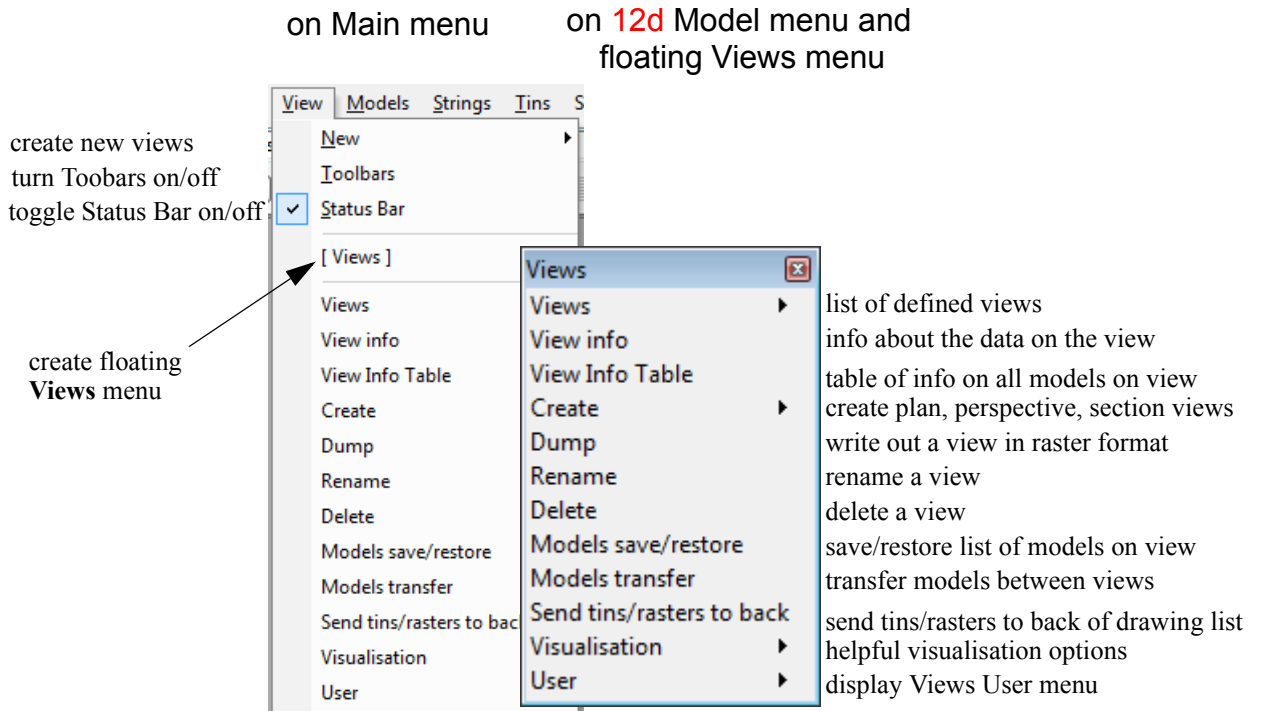
15 View

Position of menu: View

Views are the drawing display areas in 12d Model.

The View walk-right menu contains options to list existing views and create new views. The view drawing and manipulation options are in the View menus attached to each view.

The Views walk-right menu is



For the option *New*, go to

Toolbars

Status bar

Views

View info

View info table

Create

Dump

Rename

Delete

Models save/restore

Models transfer

Send tins/rasters to back

Visualisation

[New](#)

[Toolbars](#)

[Status Bar](#)

[Views](#)

[View Info](#)

[View Information Table](#)

[Create](#)

[Dump](#)

[Rename](#)

[Delete](#)

[Models Save/Restore](#)

[Models Transfer](#)

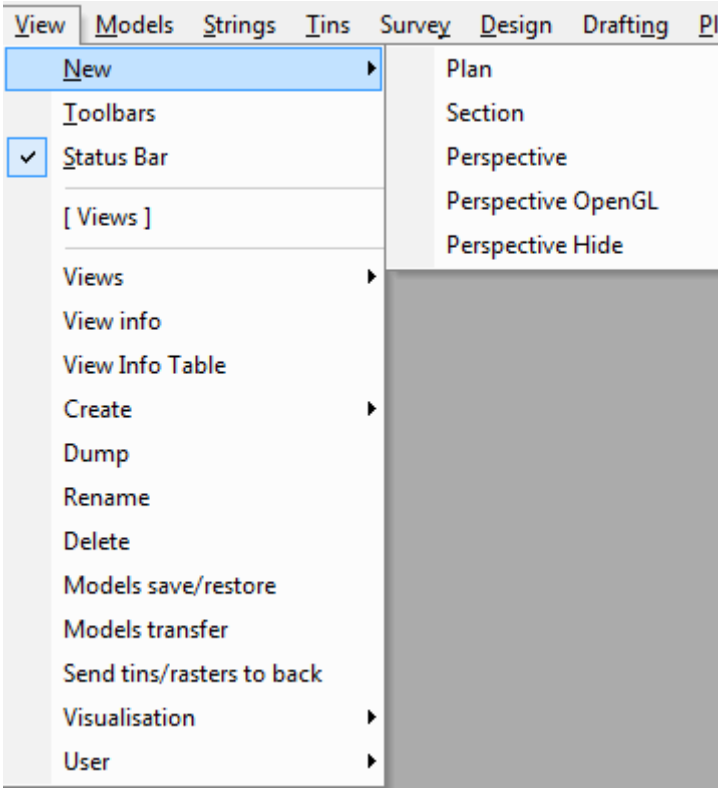
[Send Tins/Rasters to Back](#)

[Visualisation](#)

New

Position of option on menu: View =>New

The **New** walk-right menu provides options to create views of type *Plan*, *Section*, *Perspective*, *Perspective OpenGL* and *Perspective Hide*.

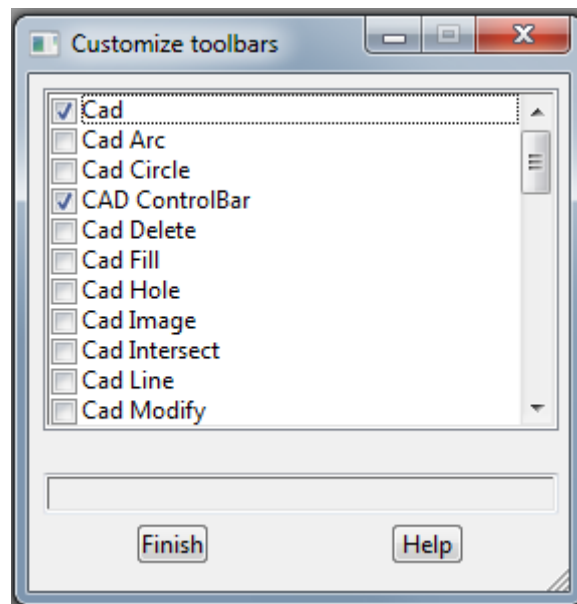


After selecting one of the options, a new view of the appropriate type with the next sequential view number is created in the Views Area.

Toolbars

Position of option on menu: View =>Toolbars

Clicking on **Toolbars** brings up the **Customize Toolbars** panel



Clicking the tick on/off for a given toolbar or controlbar in the *Toolbars* list turns the toolbar or controlbar on/off.

Status Bar

Position of option on menu: View =>Status Bar

Toggles the *Status Bar* on/off.

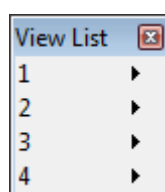
For more information please see [Status Bar](#) in the chapter [Tools and Concepts](#)

Views

Position of option on menu: View =>Views

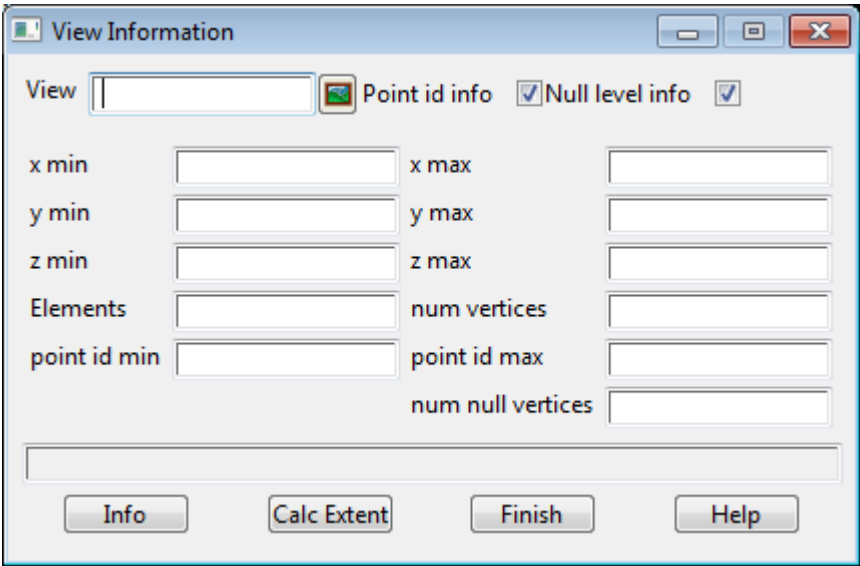
The **Views** walk-right menu provides a list of the all the views defined in this session of **12d Model**.

For each view in the list, a further walk-right menu lists all the models added to that view.



View Info

Position of option on menu: View =>View Info
Selecting View info fires up the **View information** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View	input		available views
<i>input the name of the view to get information about</i>			
Point id info	tick box	tick	
<i>if ticked, the Point id min and Point id max fields are shown on the panel and when the Info button is pressed, their values calculated for the data on the view. If not ticked, the Point id min and Point id max fields are not shown on the panel.</i>			
Null level info	tick box	tick	
<i>if ticked, the Num null vertices field is shown on the panel and when the Info button is pressed, the value calculated for the data on the view. If not ticked, the he Num null vertices field is not shown on the panel.</i>			
xmin/ymin/zmin, xmax/ymax/zmax	output		
<i>returns the limits of all the models on the view</i>			
Point id min/max	output		
<i>minimum/maximum integer point id in the model</i>			
Elements	output		
<i>returns the number of elements in all the models on the view</i>			
Num vertices	output		
<i>returns the number of points in all the models on the view</i>			
Point id min	output		
<i>the minimum Point id for the data on the view.</i>			

Point id max output
the maximum Point id for the data on the view.

Num null vertices output
returns the number of null vertices in all the models on the view

Info button
get the information for the view given in the view field.

Calc Extent button
recalculate the x, y, z bounding box for the models on the view given in the view field.

How to Use the Panel

The view information for the view given in the view field is retrieved and placed in the appropriate panel fields when the view name is entered into the view field from the pop-ups, or a <enter> is entered after entering the view name into the view field, or on selecting the **info** button.

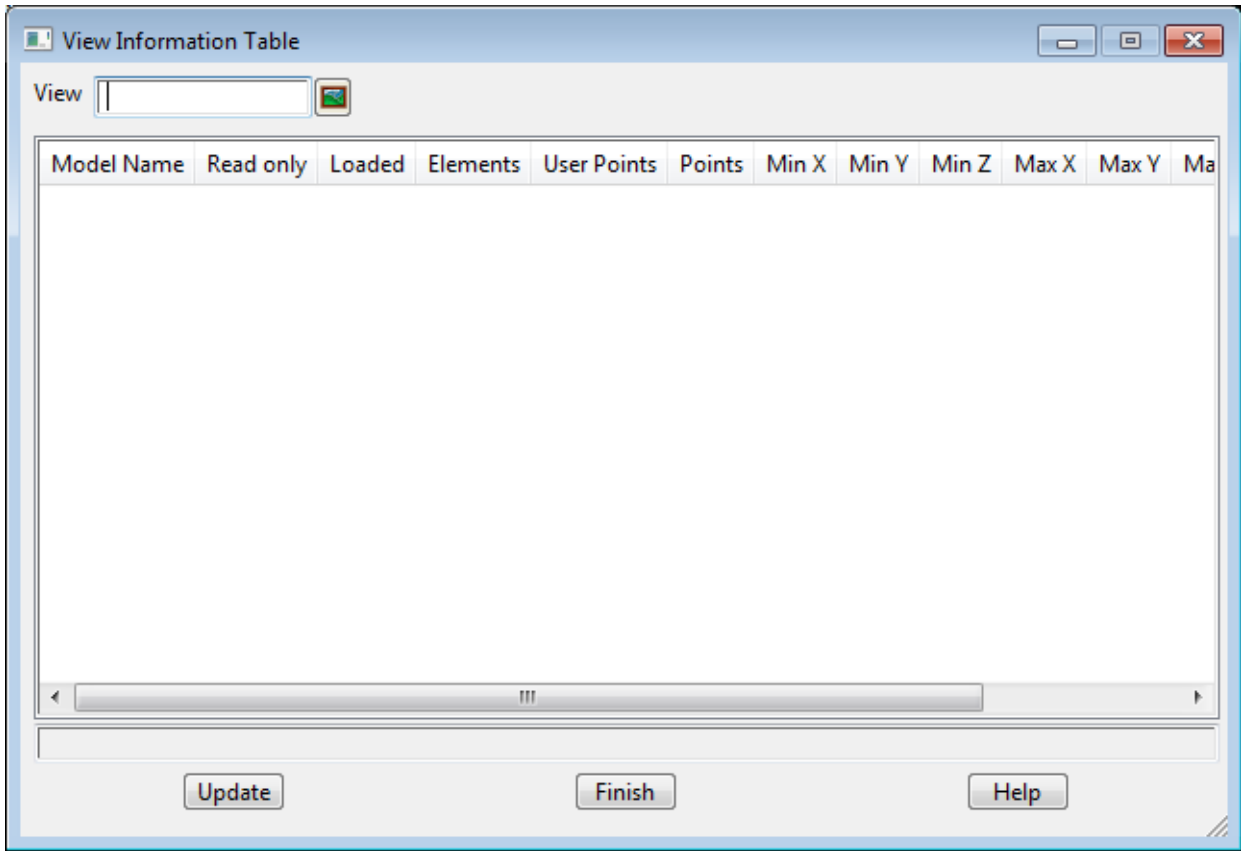
View Information Table

Position of option on menu: View =>View info table

The **View information table** option displays the minimum and maximum x, y and z values for every model on the view, and by double-clicking on a model name in the list, brings up a String Information Table that lists all the strings in that model (see [Model Information Table](#)).

The models and minimum and maximum columns can be sorted into ascending or descending order by using bringing up the **sort** menu on the column header fields.

Selecting **View info table** fires up the **View Information Table** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>the name of the view to list all the models for</i>	view box		available views
Model <i>all the models in the view are listed in the model column.</i>	column		sort menu
Read only	column		sort menu
Loaded <i>if no, in this current opening of the project, the model has not yet been fully loaded into 12d Model.</i>	column		sort menu
Min X, Min Y, Min Z Max X, Max X, Max Z <i>the minimum/maximum values for the model are displayed in the columns</i>	columns		sort menu

Created/Updated columns dates

dates the model was first created/updated

Update button

recalculate the minimum/maximum information in the table.

Notes

1. This is a scrolling panel. If there is too much information to fit into the table, then the scrolling arrow on the right hand side of the table must be used to display the extra information.
2. The grid can be sorted by any of the columns.

Create

Position of menu: View =>Create

The floating Create menu item operates in two ways.

First, if Create itself is activated (by clicking LB when Create is highlighted), the **New View** panel appears. The **New View** panel can be used to create plan, perspective and sections views.

Secondly, the Create walk-right brings up a the View Create menu. This walk-right menu has separate options for creating plan, perspective and section views.

The Main menu option View => Create will only work the second way

The Create walk-right menu is

View Create

Plan view

Perspective view

Perspective OpenGL view

Section view

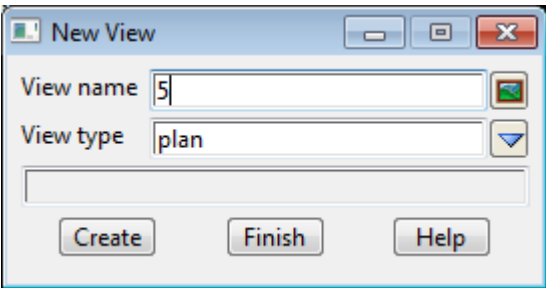
create a plan view
create a perspective view
create a perspective OpenGL view
create a section view

The **New View** panel obtained by clicking LB on the Create menu item and the three options on the View Create menu will now be described.

For the option <i>New view</i> , go to	New View
<i>Plan view</i>	Plan, Perspective and Section Views
<i>Perspective view</i>	Plan, Perspective and Section Views
<i>Perspective OpenGL view</i>	Plan, Perspective and Section Views
<i>Section view</i>	Plan, Perspective and Section Views

New View

On selecting the Create option, the **New View** panel is displayed.



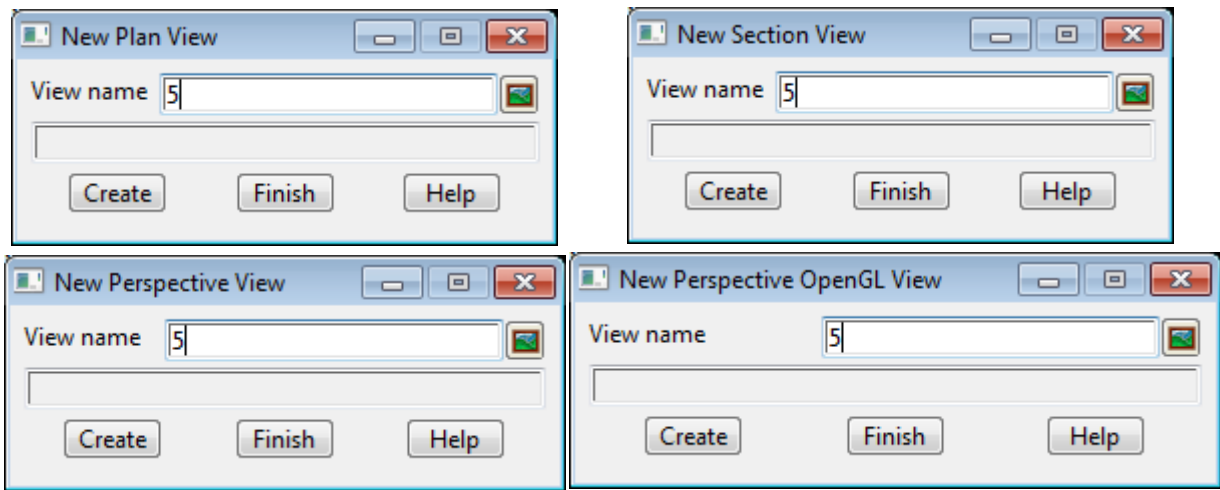
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View name <i>name of the new view to be created.</i>	view box	next view number	
View type <i>type of the view to be created. There are three types of views - plan, perspective, perspective openGL and sections views.</i>	choice box	plan	plan, persp, section, persp openGL
Create <i>after selecting this button, a new view of the name and type given in the panel is created in the Views Area. The panel then disappears.</i>	button		

Plan, Perspective and Section Views

Position of option on menu: View =>Create =>Plan/Perspective/Perspective OpenGL/Section view

On the Plan/ Perspective/Perspective OpenGL/Section view option, the **New Plan/Perspective/ Perspective OpenGL/ Section view** panel is displayed.



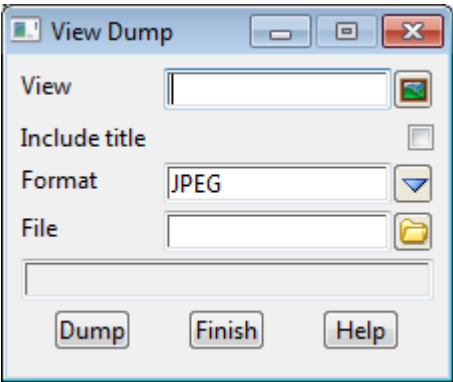
The fields and buttons used in this panels have the following functions.

Field Description	Type	Defaults	Pop-Up
View name	input	next view number	
<i>name of the new plan/perspective/section view to be created.</i>			
Create	button		
<i>after selecting this button, the new view of the specified name is created in the Views Area. The panel then disappears.</i>			

Dump

Position of option on menu: View =>Dump

This option is used to write the view out in a user selected raster format. The option is identical to the **Dump** option on the **View System** menu.



The fields and buttons used in this panel have the following functions.

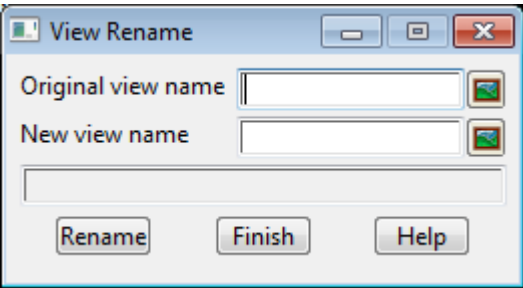
Field Description	Type	Defaults	Pop-Up
View <i>name of the view to be dumped</i>	view box		available views
Include title <i>if ticked, include the view title area in the dump</i>	tick box		
Format <i>format of the dump of the view</i>	choice box	jpeg	bmp, gif, jpeg, jpeg 2000, png, tga
File <i>name of the file for the dump of the view</i>	file box		
Dump <i>dump the view in the given format</i>	button		

Rename

Position of option on menu: View =>Rename

This option renames an existing view.

Selecting **Rename** brings up the **View Rename** panel:



The fields and buttons used in this panels have the following functions.

Field Description	Type	Defaults	Pop-Up
Original view name <i>current name of the view</i>	view box		available views
New view name <i>new name for the view</i>	view box		available views
Rename <i>rename the view</i>	button		

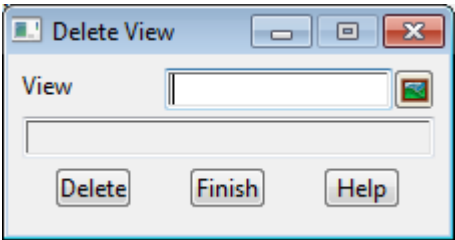
Delete

Position of option on menu: View =>Delete

This option deletes an existing view.

Since the easiest method to delete a view is to use the **[X]** in the top right hand corner of the view, the *Delete View* option is mainly used in rare cases such as when the view is not responding due a graphics card problem.

Selecting **Delete** brings up the **Delete View** panel:



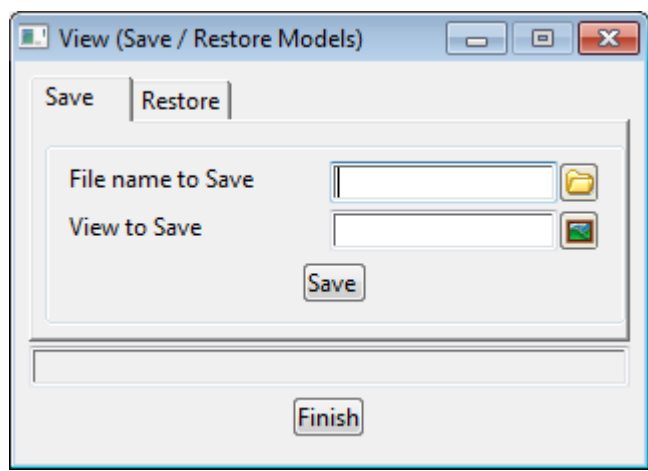
The fields and buttons used in this panels have the following functions.

Field	Description	Type	Defaults	Pop-Up
View		view box		available views
	<i>name of the view to delete</i>			
Delete		button		
	<i>delete the view</i>			

Models Save/Restore

Position of option on menu: View =>Models save/restore

This option is used to write out a list of models on the view and also to read in a list of models and add them to a given view.
On selecting the **Models save/restore** option, the **view save/restore models** panel is displayed.



The fields and buttons used in this panels have the following functions.

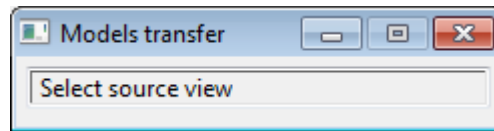
Field Description	Type	Defaults	Pop-Up
Save tab	tab		
File name for save <i>file for model list.</i>	file		*.vml files
View to save <i>view to write out list of model for.</i>	view		available views
Save <i>after selecting this button, the names of all the model on the view are written out to the file.</i>	button		
Restore tab	tab		
File name to restore <i>file of model list.</i>	file		*.vml files
View to add <i>view to add the models in the model list to.</i>	view		available views
Read <i>read the list of models.</i>	button		
Restore <i>add the models in the list just read in to the given view.</i>	button		

Models Transfer

Position of option on menu: View =>Models transfer

This option is used to add all the models on one view to a different view.

Selecting **Models transfer** brings up the **Models Transfer** panel:



The user is then asked to click in the view to get the models from (source view) and then to select the destination view where the models are to be added to.

Note - if the destination view is a new view, click on **Fit** first to give the new view a valid co-ordinate system.

Send Tins/Rasters to Back

Position of option on menu: View =>Send tins/rasters to back

This option is used to send tins and rasters to the back of the drawing list.

Visualisation

Position of menu: View =>Visualisation

This is a chargeable module which uses the Perspective OpenGL view to create realistic 3d pictures using raster drapes, bitmaps and extrusions along super strings.

The Visualisation walk-right menu is

Visualisation	
Tin render settings	sets textures for tins
Tin height render settings	stretches an image of a tin using a height range
Render drape	set rasters for draping on
Texture map edit	edit texture map file
Billboards	creating/edit/place billboards
Extrusions	extrusions
Meshes	create/place meshes
Timelines	create/run timelines
Utilities	create clouds, fences, forests etc

For *Tin render settings*, go to
Tin height render settings
Render drape
Texture map edit
Billboards
Extrusions
Meshes
Timelines
Utilities

[Tin Render Settings](#)
[Tin Height Render Settings](#)
[Render Drape](#)
[Texture Map Edit](#)
[Billboards](#)
[Extrusions](#)
[Meshes](#)
[Timelines](#)
[Utilities](#)



Tin Render Settings

Position of option on menu: View =>Visualisation =>Tin render settings

Position of option on menu: Tins =>Edit =>Render settings

For a tin added to a Perspective OpenGL view with Shade ticked on, the triangles of the tin can be displayed as solid colour or various degrees of transparency depending of the Blending value for the tin which can vary between 1 and 0. If Blending is 1 the tin is opaque and triangles display as a solid colour, and Blending of 0 means the triangles are totally transparent.

A tin can be *one sided* and only viewable from above, or *two sided* and viewable from above or below.

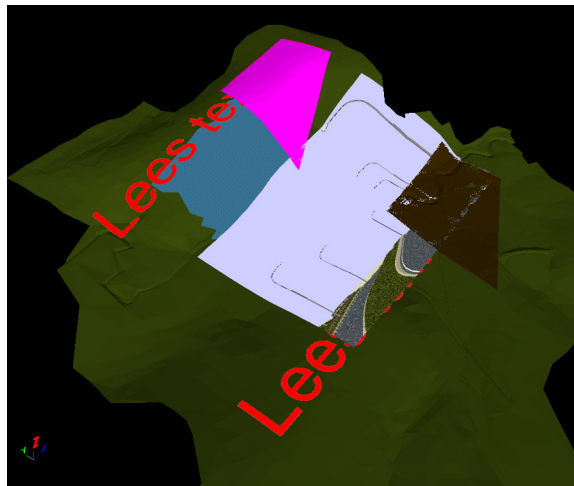
Rasters, such as photos, can also be associated with a tin and when the tin is displayed in a Perspective OpenGL view with the shade turned on, the rasters are draped onto the tin wherever the triangles are still the base colour.

For triangles that are not the base tin colour, textures can be applied to the triangle using a **Texture mapping** file where the triangle colour is the index into the mapping file.

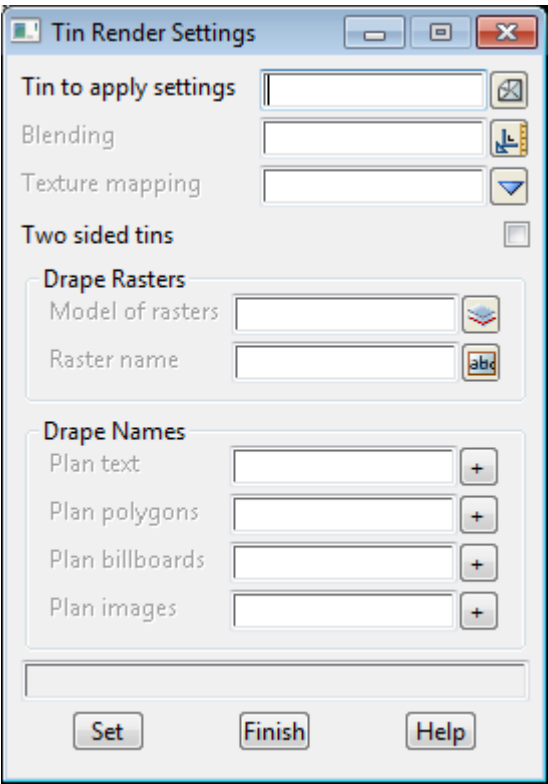
Finally text, filled polygons, text, billboards and images in models added to any Perspective OpenGL view that the tin is on can also be attributed so that they can be draped and displayed on the tin.

All these properties are known as ***Tin Render Settings*** and are set using this option.

IMPORTANT NOTE: the ***Visualisation*** module is required for the ***Tin Render Settings*** to be used on a Perspective OpenGL view.



Selecting Tin render settings brings up the **Tin Render Settings** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin to apply settings <i>name of the tin to apply/modify the Tin Render Settings. Any existing Tin Render Settings of the tin are loaded into the appropriate panel fields so that they can be modified.</i>	tin box		available tins
Blending <i>Blending control the level of transparency of the tin. 0 means the tin is totally transparent (and hence invisible) and 1 means that the tin is opaque (non-transparent) and can't be seen through at all. If blank, then the Blending value defaults to 1 and the tin is opaque (non-transparent).</i>	input		
Texture mapping <i>if non blank, the name of the set of colour-to-texture mappings that is defined in the file textures_maps.4d. The Texture Mapping set defines for a colour; what texture from the textures.4d file is applied to the triangles of the tin that have been coloured this colour (and the colour in no the base tin), rather than applying any raster to those triangles.</i>	texture mapping file box		
Two sided tins <i>if ticked, the tin is visible when viewed from both above and below. For example, the tin used for the bottom of a bridge needs to be two-sided. If non-tick, then the tin is one sided and only shows when viewed from above.</i>	tick box		
Drape Rasters			
Model of rasters <i>if not blank, the model of ortho-rectified rasters to be associated with the tin and draped onto the tin when the tin is on a Perspective OpenGL view. The raster images will only be draped onto triangles that have the base tin colour.</i>	model box		available models

Raster name input

if non blank, the name of an ortho-rectified raster to be associated with the tin (and hence draped onto the tin when the tin is on a Perspective OpenGL view).

Drape Names

WARNING WHEN USING DRAPE NAMES

Because draped text, billboards, images and textures can all occur at the same (x,y) value and hence have the same z-value at that point, there are certain ordering rules controlling what you see.

*First the **model** containing the **tin** needs to be brought to the **FRONT** of the view using **Perspective OpenGL View Menu: Models =>Models to front**.*

Then textures using the tin colour and the Texture mapping file will be drawn first, draped text will be next, then draped polygons and draped images fight it out.

Plan text

*if not blank, when the tin is on a Perspective OpenGL view, then for all super strings in models also added to that view, all **vertex text** that is using a **true type font** are draped onto the tin.*

Plan polygons

*when the tin is on a Perspective OpenGL view, then for all super strings in models also added to that view, if a super string in the model has an Integer string attribute with this name then it is draped onto the tin and if the value of the attribute is zero (0) the super string is draped and coloured using the strings fill colour, or if the value is one (1), a texture is draped onto the tin and the fill colour is used as the **reference** to the **Texture mapping** file given in the Texture mapping field, to specify which texture to drape.*

The Integer string attribute name and value can be set using the option

***View =>Visualisation =>Render drape** (see [Render Drape](#)) or by setting an Integer string attribute of the required name and value using the option **Strings =>Properties =>Attributes** (see [Attributes](#)).*

Plan billboards

when the tin is on a Perspective OpenGL view, then for all super strings in models also added to that view, if a super string in the model has an Integer string attribute with this name and any value, all horizontal billboards (i.e. have Vertical turned off) are draped onto the tin.

The Integer string attribute with this name can be set using the Drape name field in the option

***View =>Visualisation=>Billboards =>Add/Remove (ss)** (see [Add and Remove Billboard from Super String](#)) or by setting an Integer string attribute of the required name using the option **Strings =>Properties =>Attributes** (see [Attributes](#)).*

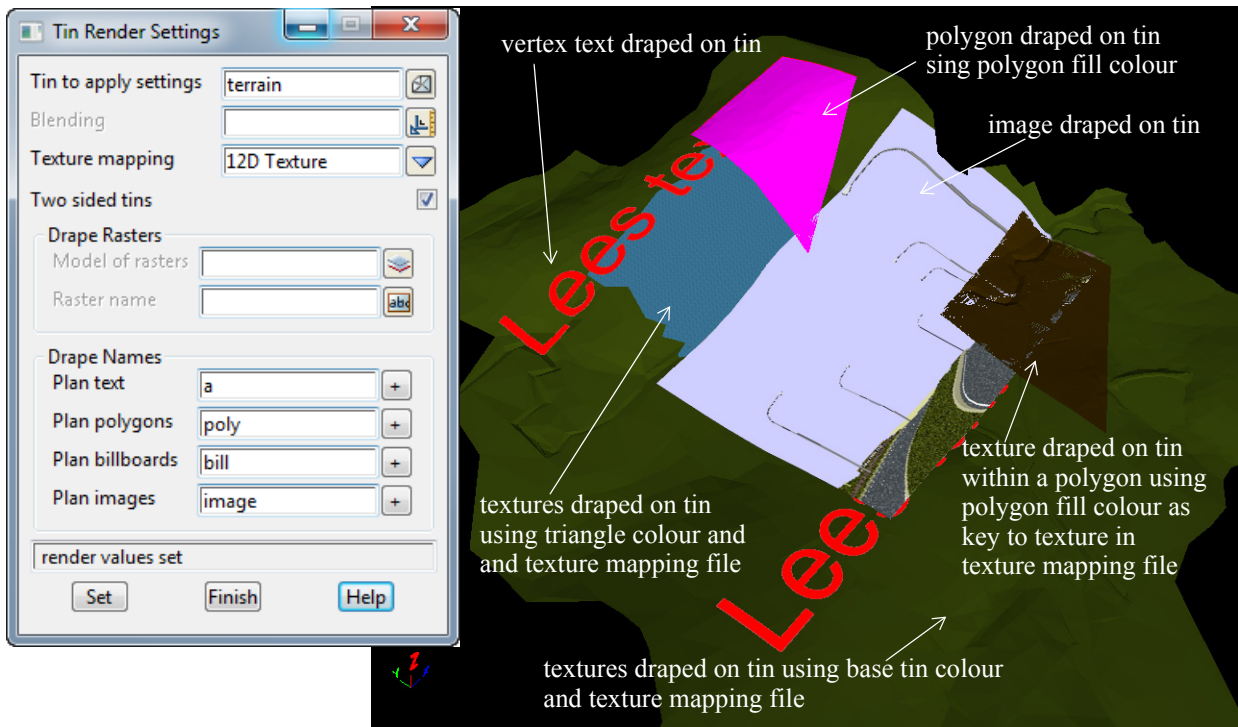
Plan images

when the tin is on a Perspective OpenGL view, then for all super strings in models also added to that view, if a super string in the model has an Integer string attribute with this name and any value, all images on the super string are draped onto the tin.

*The Integer string attribute of this name is set using the option **Strings =>Properties =>Attributes** (see [Attributes](#)).*

Set button

apply the data in the panels fields to the tin.



Tin Height Render Settings

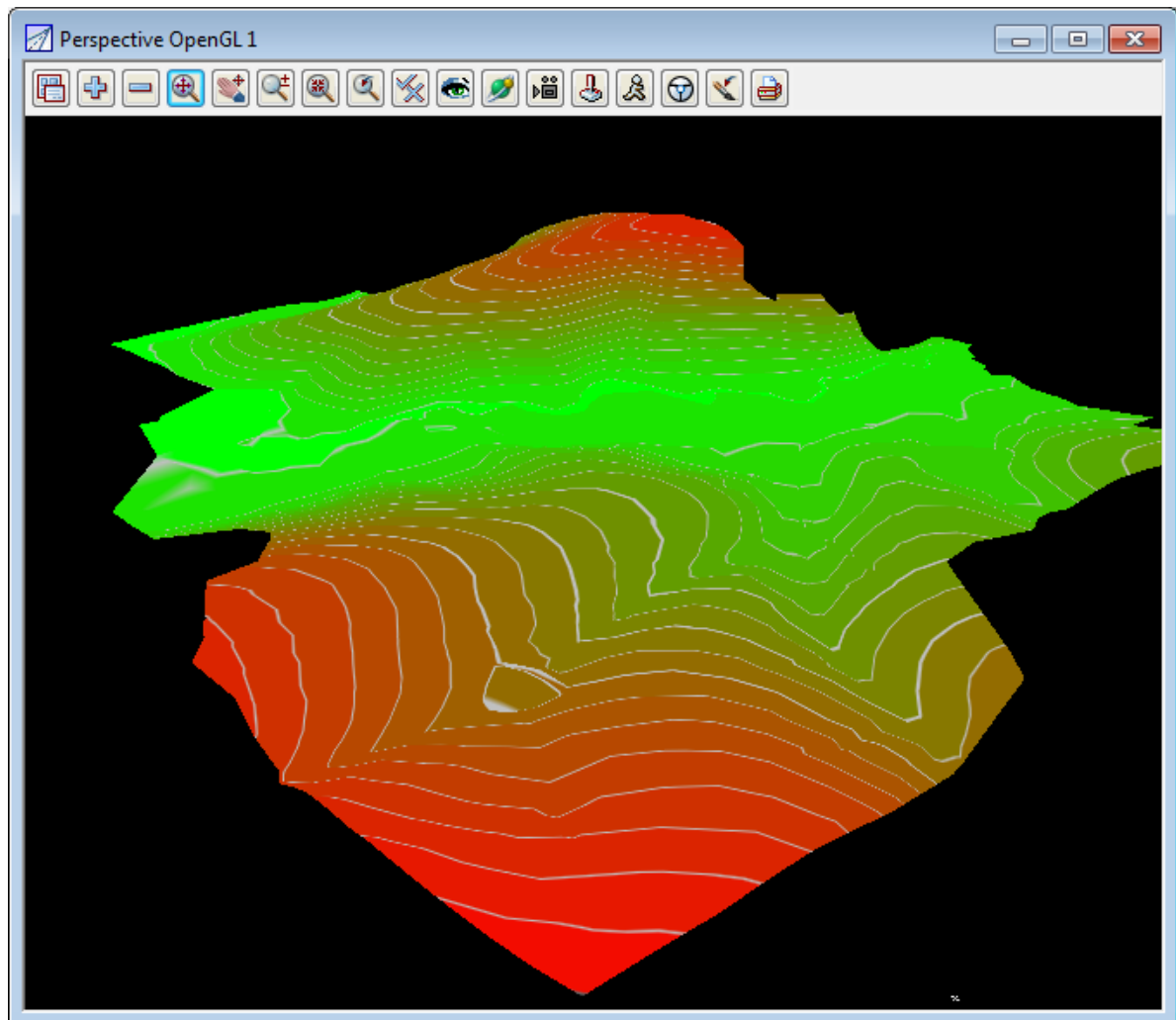
Position of option on menu: View => Visualisation => Tin height render settings

For a tin (that is not a super tin) the *Tin Height Render Setting* option sets the a texture map and parameters that can be stretched over the specified height range.

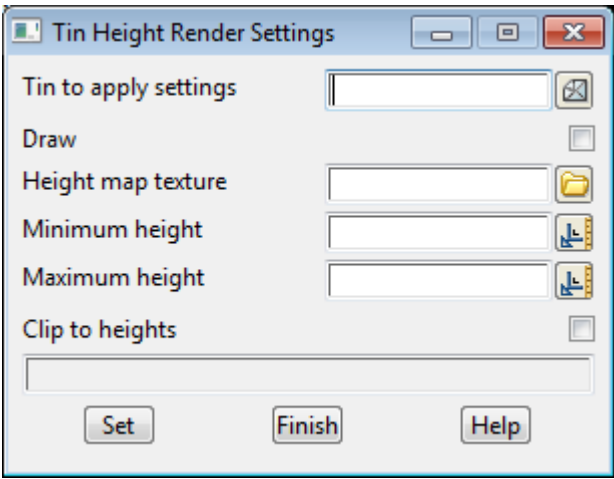
To see the effect, the tin must be on a *Perspective OpenGL* view with *Shade* ticked on, and you have the **Visualisation** module.

Notes


1. this only displays when you have the **Visualisation** module.
2. This option does not work for a Super Tin.



Selecting **Tin height render settings** brings up the **Tin Height Render Settings** panel:



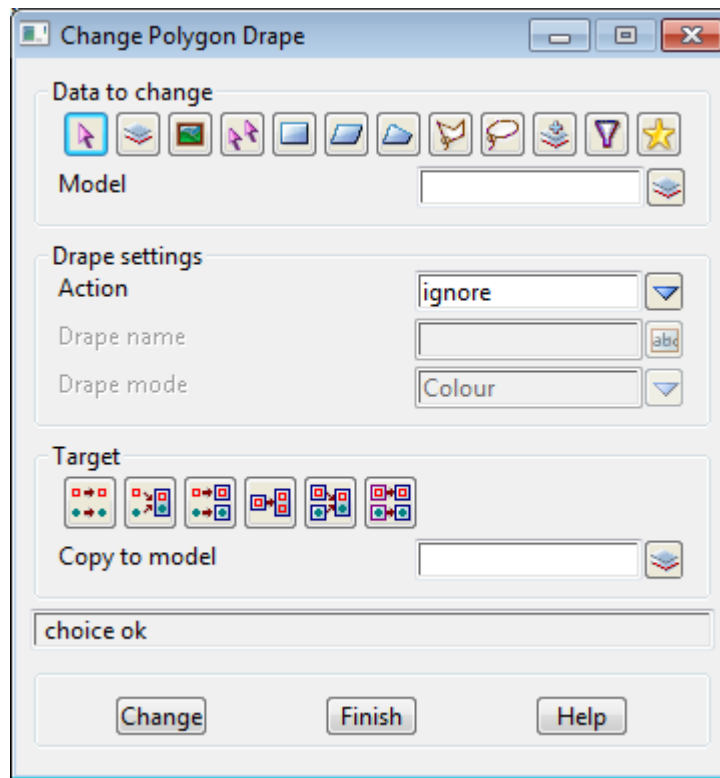
The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin to apply settings	tin box		available tins
<i>the tin to apply the height texture map to. This can then be toggle on/off with the Draw tick box.</i>			
Draw	tick box	not ticked	
<i>if ticked, the height texture map will be applied to the tin when it is on an Perspective OpenGL view. If not ticked, the height texture map is not applied to the tin. However the height texture map is still associated with the tin and Draw can be ticked back on at any time.</i>			
Height map texture	file box		.bmp, png file
<i>the texture map to stretched over the height range given in the Minimum height and Maximum height fields.</i>			
<i>The texture map is a bitmap that is one pixel high by n pixels wide, usually with a colour gradation going from left to right. The bitmap is stretched over the minimum and maximum height with the left side of the texture map being at the minimum height and the right side of the texture map being at the maximum height.</i>			
<i>For example, the file Height_map_texture.bmp from Library.</i>			
			
Minimum height	measure box		available measures
<i>the minimum height to stretch the height map texture over.</i>			
Maximum height	measure box		available measures
<i>the maximum height to stretch the height map texture over.</i>			
Clip to heights	tick box	not ticked	
<i>if ticked, the tin is only displayed where the height map texture is applied. That is, the tin is only displayed between the Minimum height and the Maximum height.</i>			
<i>If not ticked, the tin is displayed over the entire range of the tin.</i>			
Set	button		
<i>set the values in the panel for the tin given in Tin to apply settings.</i>			

Render Drape

Position of option on menu: View => Visualisation => Render drape

Selecting **Render drape** brings up the **Change Polygon Drape** panel.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source	input		
<i>source of data to be processed.</i>			
Action	choice box	ignore	set, clear, ignore
<i>if set, for each selected polygon, an Integer string attribute is created with the attribute name Drape name and the value of the attribute is</i>			
<i>0 if Drape mode is Colour and</i>			
<i>1 if Drape mode is Colour to texture.</i>			
<i>If clear, for each selected polygon the Integer string attribute with name Drape name is removed.</i>			
<i>If ignore, nothing is done.</i>			
Drape name			
<i>name of the Integer attribute that is set for the string. The attribute name is used to identify these polygon in the View->Visualisation->Tin Render Settings Render Settings (see Plan polygons in the Drape Names section)</i>			
Drape mode	choice box		Colour, Colour to texture
<i>if Colour - the fill colours of the selected polygons are used for the drape</i>			
<i>If Colour to texture - the fill colours of the selected polygons are used to reference the texture in the Texture Mapping file</i>			
Target type			

Data target type - where to put the processed strings. For a full description go to [Data Target](#) in the chapter [Tools and Concepts](#)

Target info input
extra information required for the target.

Change button
process the selected strings.

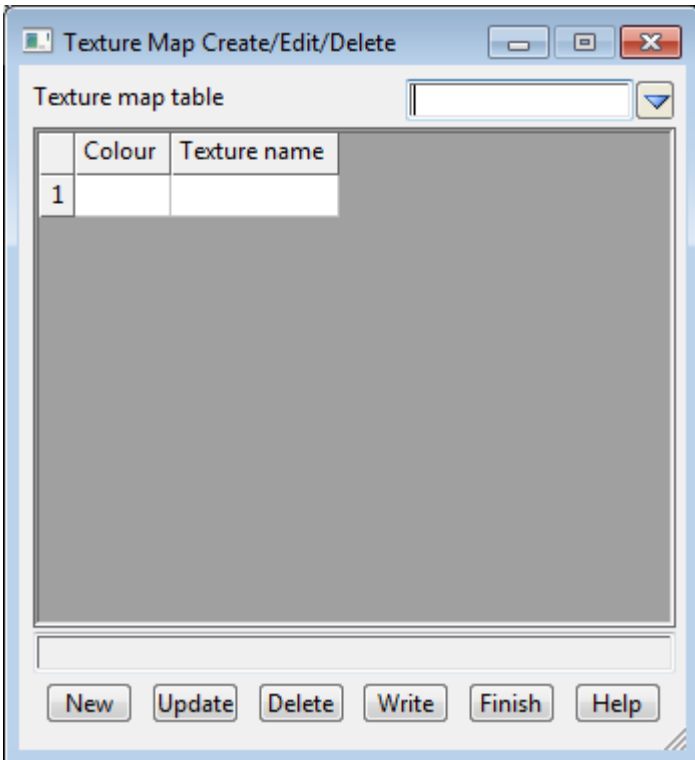
Texture Map Edit

Position of option on menu: Visualisation =>Texture map edit

This option edits the texture mapping file (texture_map.4d) which contains the *texture map tables* that can be applied to the coloured triangles of a tin in renderings.

Each texture map table must have a unique name.

On selecting the **Text map edit** option, the **Texture Map Create/Edit/Delete** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Texture map table			
<i>name of the texture map table inside the texture map file.</i>			
Colour			
		colour box	available colours
<i>colour to apply the texture to.</i>			
Texture name			
		texture box	available textures
<i>texture to apply to all triangles with the specified colour</i>			
New			
		button	
<i>to create a new texture map table, click on the New button and then type the texture map table name into the Texture map table field. Then start filling in the Colour and Texture name columns.</i>			
Update			
		button	
<i>update the given Texture map table with the values in the Colour and Texture name columns.</i>			
Delete			
		button	
<i>Delete the texture map table named in the Texture map table field.</i>			
Write			
		button	
<i>write out the texture map information to the texture map file, texture_map.4d.</i>			

Billboards

Position of menu: View =>Visualisation =>Billboards

The billboard options plane an image onto a rectangular billboard. this can be used to display background scenes, signs etc.

The **Billboard** walk-right menu is

Billboards	
Create and add	create a billboard and add an image to it
Add/Remove (ss)	add/remove a billboard to the vertices of a super string
Create many	
Create Forest	create a forest within a polygon
Trees/shrubs	place a billboard tree/shrub
Create from EXIF JPEG files	

For the option *Create and add*, go to

- Add/Remove (ss)*
- Create many*
- Create forest*
- Trees/shrubs*
- Create from EXIF JPEG files*

- [Create and Place Billboard.](#)
- [Add and Remove Billboard from Super String](#)
- [12D - Billboard Signs Create](#)
- [Create Forest](#)
- [Trees/Shrubs as Faces and Billboards](#)
- [Create Billboards from EXIF JPEG Files](#)



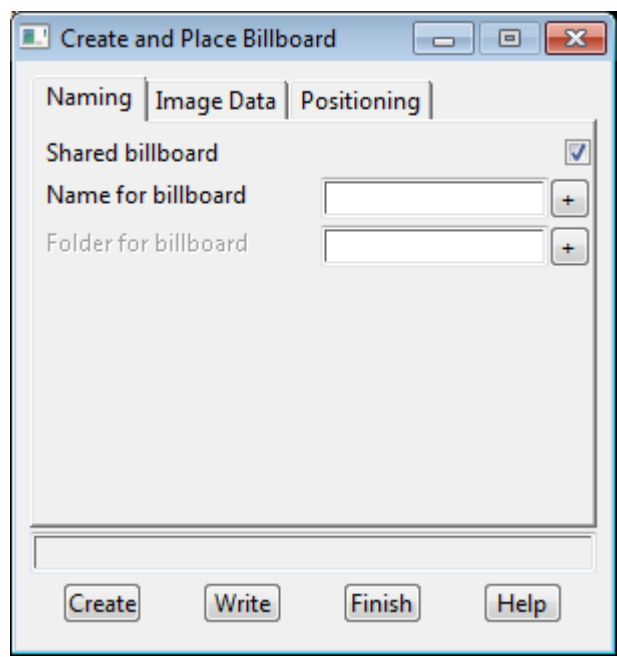
Create and Place Billboard

Position of option on menu: View =>Visualisation => Billboards =>Create and add

This option defines a billboard (its size and position, the image on the billboard, etc.) and adds it to a super string and can **also** add it to the file *billboards.4d* which is used by other options.

The option **always** creates a super string with the billboard on it, so if you just wanted to add a billboard definition to the *billboards.4d* file, then use this option which creates a super string with the billboard, but then **delete** the created super string.

On selecting the Create and add option, the **Create and Place Billboards** panel is displayed.



The fields and buttons used in this panels have the following functions.

Field	Description	Type	Defaults	Pop-Up
Naming tab				
tab				
Shared billboard		tick box	ticked	
<i>if ticked, the information about the billboard is added to the billboards.4d file and then when the super string is created, it only references the required billboard information from the billboards.4d file. Note: the Write button needs to be clicked to write out the billboards.4d file with the new billboard definition. If not ticked, all the information about the billboard is saved with the super string and nothing is written to, or used from the billboards.4d file.</i>				
Name for billboard		billboard box		
<i>the name of the billboard to use in the billboards.4d file. This must be unique amongst all the billboard names in the billboards.4d file.</i>				
Folder for billboard		text box		
<i>the billboard folder in which to place the billboard named above. This is just a grouping mechanism for all the billboard names. If the Folder does not exist in the billboards.4d file, it will be created.</i>				
Image Data tab				
tab				
Image file		file box		
<i>name of the file containing the image to place on the billboard</i>				
Alpha file		file box		
<i>currently not supported</i>				

Image polygon	polygon box		
<i>this polygon is used to crop the image. The billboard origin (0,0) is at the centre of the image and the world size of the image is determined by the Width and Height fields below. The Image polygon must also be drawn with the same (0,0) reference and in world units.</i>			
Number of fans	integer box		
<i>the billboard can consist of multiple copies of the image rotated equally around 180 degrees of the z-axis at x=0. This is mainly used for trees so that you see a tree no matter which direction you look from. If Number of fans = 1, then the image is used on both sides of the billboard. If Number of fans is left blank, then the image is used on one side of the billboard and the side is given the colour specified in the Colour field on the Positioning tab.</i>			
Width	measure box		
<i>the width in world units for the billboard (before the billboard it is cropped by any Image polygon).</i>			
Height	measure box		
<i>the height in world units for the billboard (before the billboard is cropped by any Image polygon).</i>			
Positioning tab	tab		
Model	model box		
<i>model for the created super string with the billboard.</i>			
Coordinate	measure box		
<i>the (x,y,z) coordinate of the vertex of the super string which has the billboard placed on it.</i>			
Colour	colour box		
<i>the colour used for the back of a billboard when Number of fans is left blank. Note if number of fans is 1 or more then the same image is used on both sides of the blades of the fan.</i>			
Billboard type	choice box	Vertical	Vertical, Threed, Plan
<i>if Vertical, the string is placed vertically (upright) and nothing else is needed. If Threed, a grid for entering Factor, Rotate and Offset values is displayed and these are used to control the position of the billboard in 3d. If Plan, the billboard is a horizontal billboard and will draw on a Plan view. A billboard must be a Plan (or Horizontal) billboard when using Drape names for Plan billboards in the Tin Render Settings panel to drape horizontal billboards onto a tin (see Tin Render Settings).</i>			
Angle	measure box		
<i>the angle the billboard is rotated in the (x,y) plane. Angle is measured counterclockwise in degrees in HP Notation with zero along the x-axis.</i>			
Offset x, Offset y, Offset z			
<i>x/y/z distance to place the billboard away from the super string vertex.</i>			
Buttons at Bottom			
Create	button		
<i>creates the super string with the billboard on it.</i>			
Write	button		
<i>writes out the new billboards.4d file.</i>			

Add and Remove Billboard from Super String

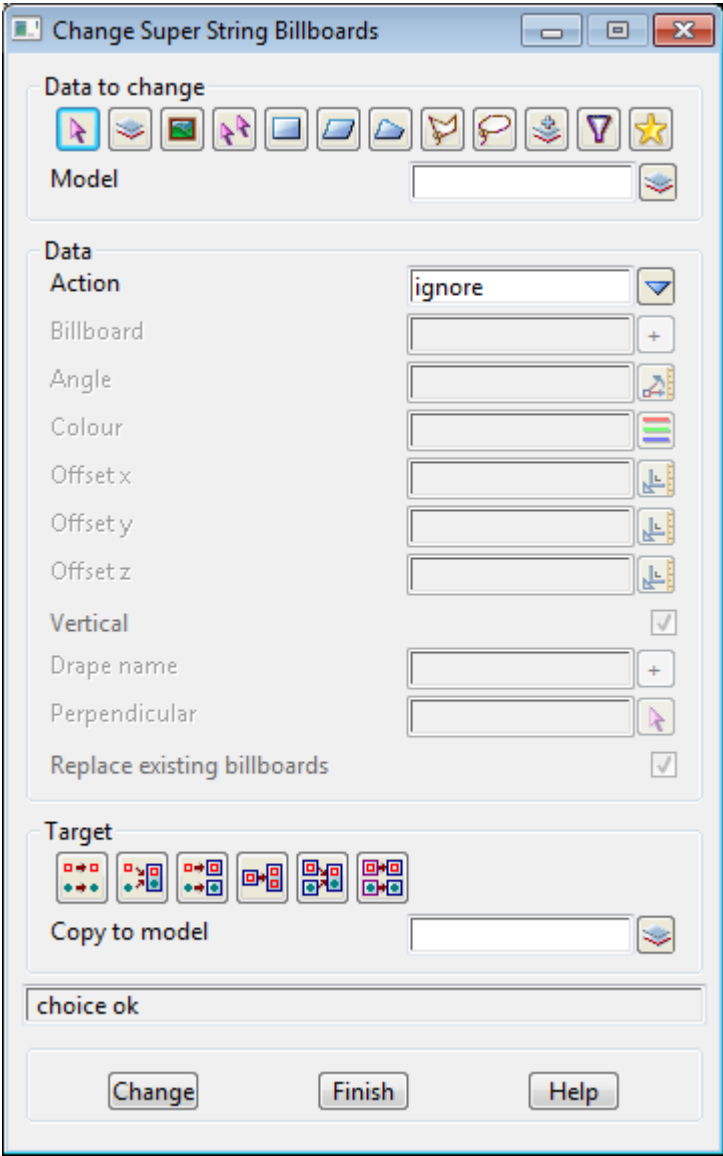
Position of option on menu: View =>Visualisation => Billboards =>Add/Remove (ss)

Each vertex of a super string can have its own billboard.

A billboard consists of an image and a width and height.

The **Add/remove from super string** option places a selected billboard either in a vertical plane or as a plan image at a user given distance from each vertex of a super string. The image is at a given angle or perpendicular to a selected string. An example could be the image on a stop sign which is in the vertical plane.

Selecting Add/Remove (ss) brings up the **Change Super String Billboard** panel.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type

Model

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data source

input

source of data to be processed.

Action	choice box	ignore	set, clear, ignore
<i>if set, the billboard is placed at each vertex in the super string.</i> <i>If clear, the billboard information at each vertex is cleared.</i> <i>If ignore, nothing is done to the billboard information.</i>			
Billboard	billboard box		
<i>billboard to be used.</i>			
Angle	angle box		
<i>angle to rotation the billboard - positive is counter clockwise. This is ignored if Perpendicular is used.</i>			
Colour	colour box		
<i>colour for the back of the billboard.</i>			
Offset x, Offset y, Offset z			
<i>x/y/z distance to place the billboard away from the super string vertex.</i>			
Vertical	tick box		
<i>if ticked, the string is placed vertically and nothing else is needed.</i> <i>If not ticked, the billboard is a horizontal billboard and will draw on a Plan view. This is also needed when using Drape names for Plan billboards in the Tin Render Settings panel to drape horizontal billboards onto a tin (see Tin Render Settings).</i>			
Drape name	input		
<i>if Vertical is not ticked, then this field can be modified.</i> <i>If not blank, an Integer string Attribute is created with this name. The Drape name is used in the Tin Render Settings panel (see Tin Render Settings) for draping horizontal billboards onto a tin.</i>			
Perpendicular	string select box		
<i>if a string is selected, then the billboard is placed on the line going through the vertex and perpendicular to the selected string. Angle is ignored.</i>			
Target type			
<i>Data target type - where to put the processed strings. For a full description go to Data Target in the chapter Tools and Concepts</i>			
Target info	input		
<i>extra information required for the target.</i>			
Change	button		
<i>process the selected strings.</i>			

12D - Billboard Signs Create

Position of option on menu: View =>Visualisation =>Billboards =>Create Many

This option takes images and creates entries in the billboards.4d file.

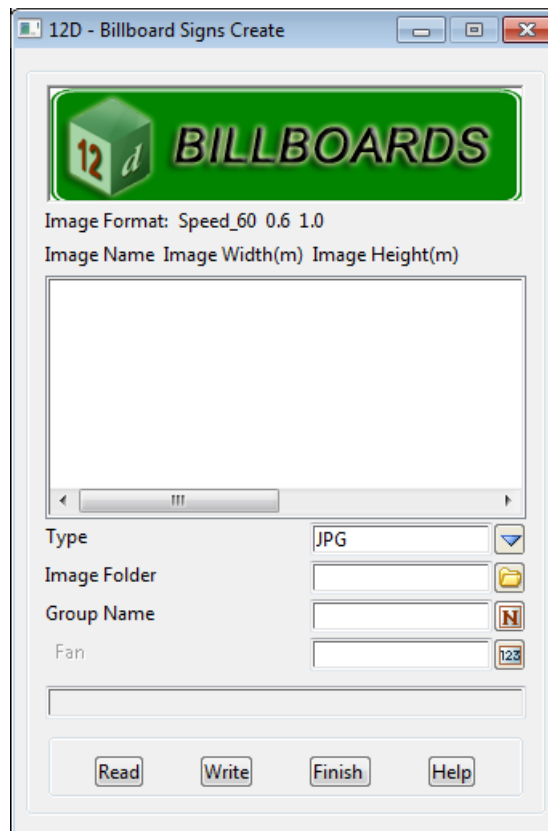
Note that it does not create a super string with a billboard on it.

The option requires that you rename your images in the appropriate format:

Name Width (m) Height (m) -> space separated.

For example, "sign 20 5.jpg" creates a billboard with the name "sign" which is 20 units wide and 5 units high.

Selecting Create Many displays the **12D - Billboard Signs Create** panel:



The fields and buttons used in the panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Type	Type of image files to read in.	choice box	JPG	BMP, JPG, PNG,TGA, ALL
Image Folder	Browse to a dedicated folder. File names are used to create the billboard name, width and height, e.g. sign 20 5.jpg creates a billboard with the name sign 20 units wide and 5 units high.	file box		
Group Name	The billboard group to add the selected images to.	text box		
Fan	If not blank , the number of extra fans to add to the billboard. If blank , no extra fans will be added to the billboard.	number box		

Read button

Loads all the images of the specified type into 12d and adds them to the Group specified in the billboards.4d file. If the Group does not exist it is created.

Write button

Appends the new group to the billboards.4d file. You must restart 12d load the new billboards.4d file.



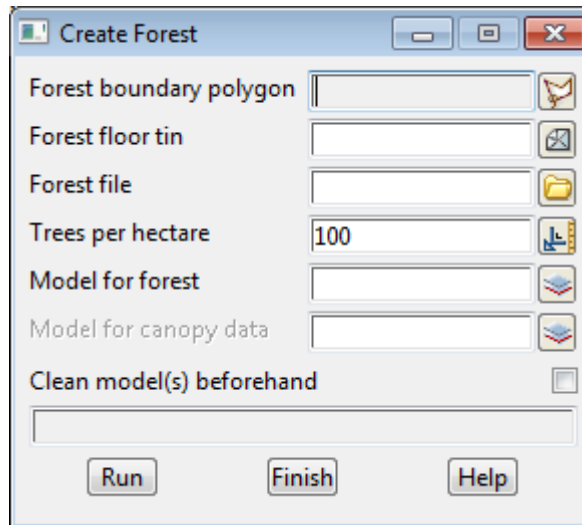
Create Forest

Position of option on menu: Visualisation =>Billboards =>Create forest

Create forest creates randomly placed trees and shrubs in a selected polygon.

The forest make up is controlled by a user defined forest file which gives the types and distribution of trees, and variation in size and spread.

Selecting Create forest displays the **Create Forest** panel



The fields and buttons used in the panel have the following functions.

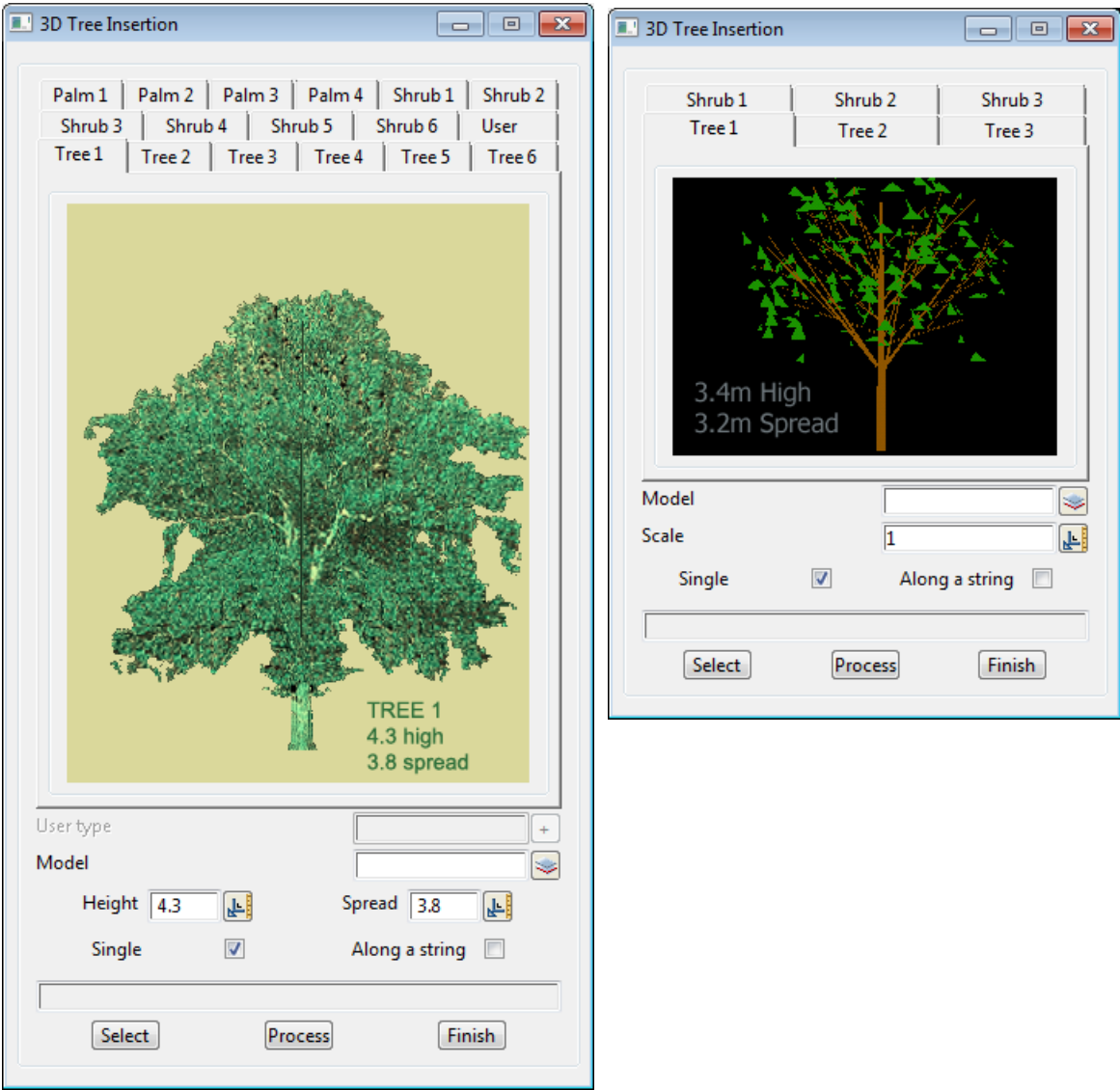
Field Description	Type	Defaults	Pop-Up
Forest boundary polygon <i>polygon to create the forest within</i>	string select		
Forest floor tin <i>tin to use for the z-value for the base of the trees</i>	tin box		available tins
Forest file <i>file to give the make up of the forest. For more information, go to Forest File</i>	file box		.forests files
Trees per hectare <i>density of the forest given by the number of trees per hectare</i>	input		
Model for forest <i>model to place the trees in</i>	model box		available models
Model for canopy data <i>if non blank, points are created for the tops of the trees in the forest. These can be used to triangulated to give a top of trees tin.</i>	model box		available models
Clean model (s) beforehand <i>if ticked, the forest and forest canopy models are cleaned before the option is run</i>	tick box		
Run <i>run the option</i>	button		

Trees/Shrubs as Faces and Billboards

Position of option on menu: View =>Visualisation => Billboards =>Trees/shrubs
Position of option on menu: View =>Visualisation => Utilities =>Trees/shrubs faces

The Trees/shrubs - faces option inserts the trees and shrubs as face elements. This means that each tree may consist of hundreds or thousands of faces.
The Trees/shrubs option inserts the images of trees and shrubs as a fanned billboard. This means that each tree consists of only one points.

On selecting the Trees/shrubs option, the 3D Tree Insertion panel is displayed and on selecting the Trees/shrubs faces option, the 3D Tree Insertion - Faces panel is displayed.



The fields and buttons used in these panels have the following functions.

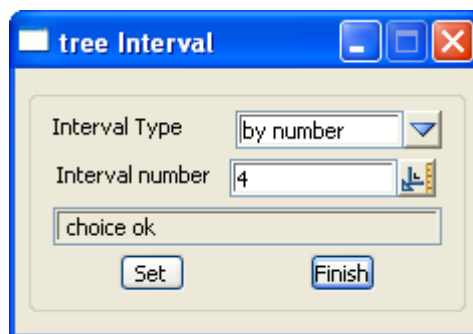
Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Tree and Shrub tabs

click on the tab to display the type of tree/shrub to be inserted. The picture shows the tree height and spread.

Model	model box	available models
	<i>model to add the tree/shrub to.</i>	
Height and Spread	real value	varies
	<i>parameters for scaling</i>	
Single	radio button	
	<i>if ticked then the tree is placed at the selected position.</i>	
Along a string	radio button	
	<i>if ticked then the tree is placed along a string. When the string is selected then a Tree Interval panel is brought up to specify how the trees are placed along the string.</i>	
Select	button	
	<i>select the string or position for the tree.</i>	
Process	button	
	<i>insert the trees/shrubs.</i>	

Tree Interval



This panel is for specifying how often the trees/shrubs are to be inserted along the string.

Field Description	Type	Defaults	Pop-Up
Interval type	choice box	by number	by number by distance by special chg file by vertex

*if **by number**: an Interval number field is displayed on the panel and the tree is inserted that many times along the string.*

*if **by distance**: an Interval distance field is displayed on the panel and the tree is inserted with that distance separation along the string.*

*if **by special chg file**: a Special chg file field is displayed on the panel and the tree is inserted along the string at the chainages given in the file.*

*if **by vertex**: the tree is inserted at every vertex of the string.*

Set	button
	<i>set the parameters for tree interval to those in the panel.</i>

Create Billboards from EXIF JPEG Files

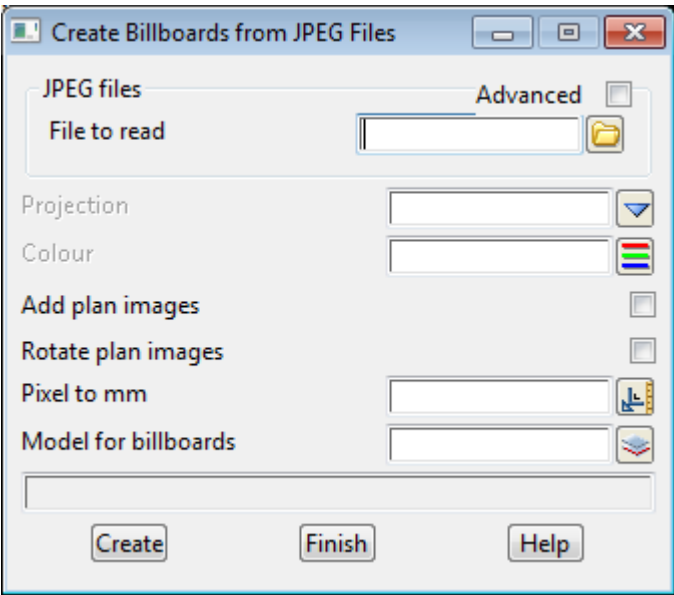
Position of option on menu: View =>Visualisation => Billboards =>Create from EXIF JPEG Files

This option reads in JPEG files which must include EXIF and GPS information. This information is then used to create and position a billboard with the image on the billboard.

If a Projection is selected by the user, then it is used to convert the lat/long of the GPS values to the XYZ co-ordinates. If no Projection is given, then the co-ordinates are left as lat/long.

Note: EXIF is short for Exchangeable Image File, a format that is a standard for storing interchange information in digital photography image files using JPEG compression. Almost all new digital cameras use the EXIF annotation, storing information on the image such as shutter speed, exposure compensation, F number, what metering system was used, if a flash was used, ISO number, date and time the image was taken, white balance, auxiliary lenses that were used and resolution.

Selecting Create from EXIF JPEG Files brings up the **Create Billboards from JPEG Files** panel.



The fields and buttons in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

JPEG files

Advanced	tick box	not ticked
-----------------	----------	------------

clicking **Advanced** brings up a grid to allow the user to enter many JPEG files.

File to read	file box	available *.jpg files
---------------------	----------	-----------------------

the JPEG files to read in and create images from. The JPEG file must include EXIF and GPS information, which is used to position the image. If Projection is not blank, then it is used to convert the lat/long of the GPS values to the XYZ co-ordinates. If Projection is blank, then the co-ordinates are left as lat/long.

Projection	choice box
-------------------	------------

if a Project Projection is set, then it is placed in the Projection field. This can be changed to any other projection. The projection is used to convert the lat/long of the GPS values to the XYZ co-ordinates. If no projection is set, then the co-ordinates are left as lat/long.

Colour	colour box	available colours
---------------	------------	-------------------

if **not blank** and **Add plan images** is not ticked, then this colour is used for the back of the billboard. If **blank**, the colour is white.

Add plan images tick box not ticked

*if **ticked**, plan images are created instead of billboards.*

Rotate plan images tick box not ticked

*if **ticked** and **Add plan images** is ticked, the rotate value from the EXIF will be used to rotate the image.*

Pixel to mm measure box

*the units for images are pixels (width and height). The pixel width and height of the image are multiplied by the **Pixel to mm** (mm being millimetres) value to give width and height size in world unit (metres) which is needed when inserting the image.*

Model for billboards model box

the model for the image to be inserted into.

Create button

*when all the fields have been entered, the **Create** button creates images from the selected files.*

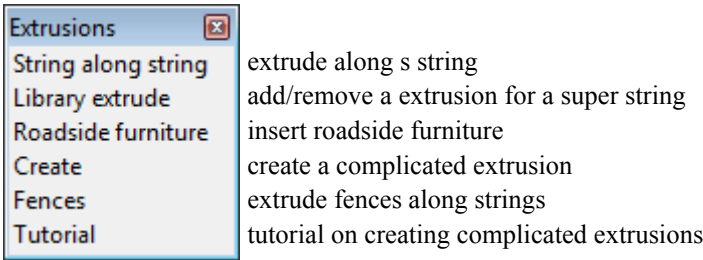
Extrusions

Position of menu: View =>Visualisation =>Extrusions

In it basic form, an extrusion is taking a cross-section and pushing it (extrude it, or sweep it) along a string to create a 3d object. For example, a circle extruded along a string creates a pipe. For more information, go to the section [Defining Extrudes and Extrusions](#).

There is a library of extrusions read in for the project, usually stored in the file extrusions.4d.

The Extrusions walk-right menu is



For the option String along string, go to	String Extrude
Library extrude	Change Library Extrude
Roadside furniture	Roadside Furniture
Create	Create Group Extrusions
Fences	Fences
Tutorial	Tutorial to Create Group Extrusions

More information on extrudes is found in the section [Defining Extrudes and Extrusions](#)

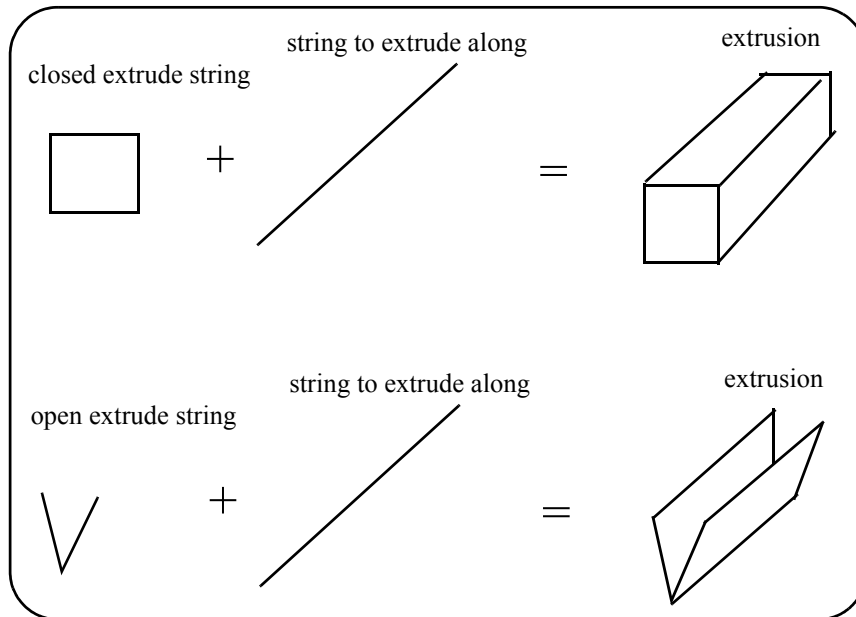
Defining Extrudes and Extrusions

In it basic form, an extrusion is simply taking a cross-section and pushing it (extrude it) along a string to create a 3d object. For example, a circle extruded along a string creates a pipe.

The string that is pushed along the string is called the **extrude**.

Note: this is also know as a Sweep or Swept Path.



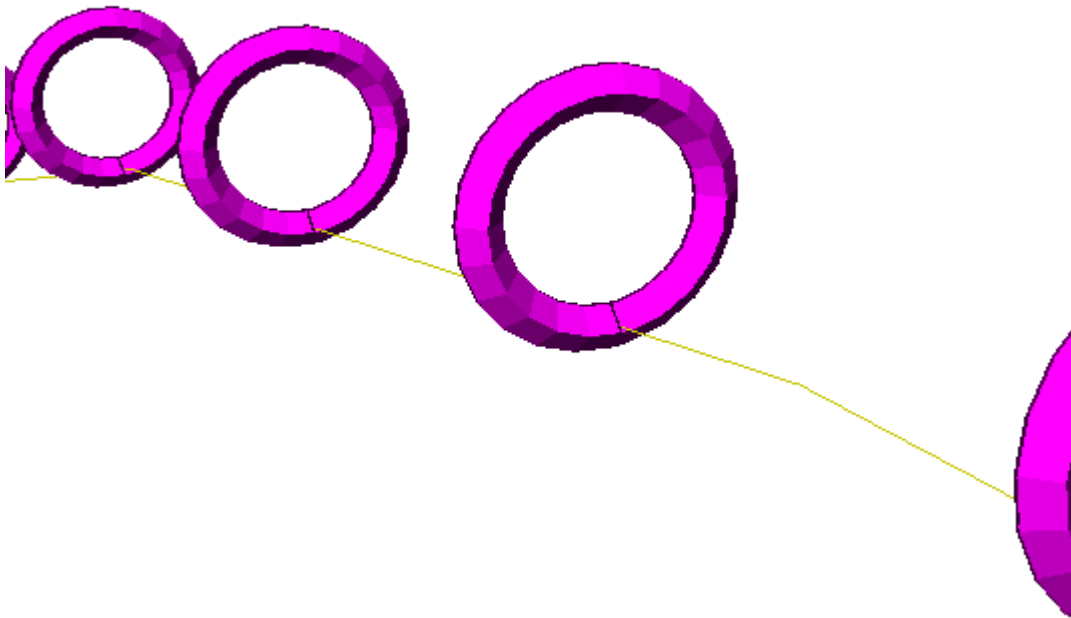


Only the (x,y) co-ordinates of the string used as the extrude are used and that gives the shape of the cross section with the ((0,0) point being the point where the string being extruded along sit.

So the (x,y) co-ordinates of the extrude are being taken as (offset, height) in the plane perpendicular to the string being extruded along. So extrudes are normally defined around (0,0) in the (x,y) plane.

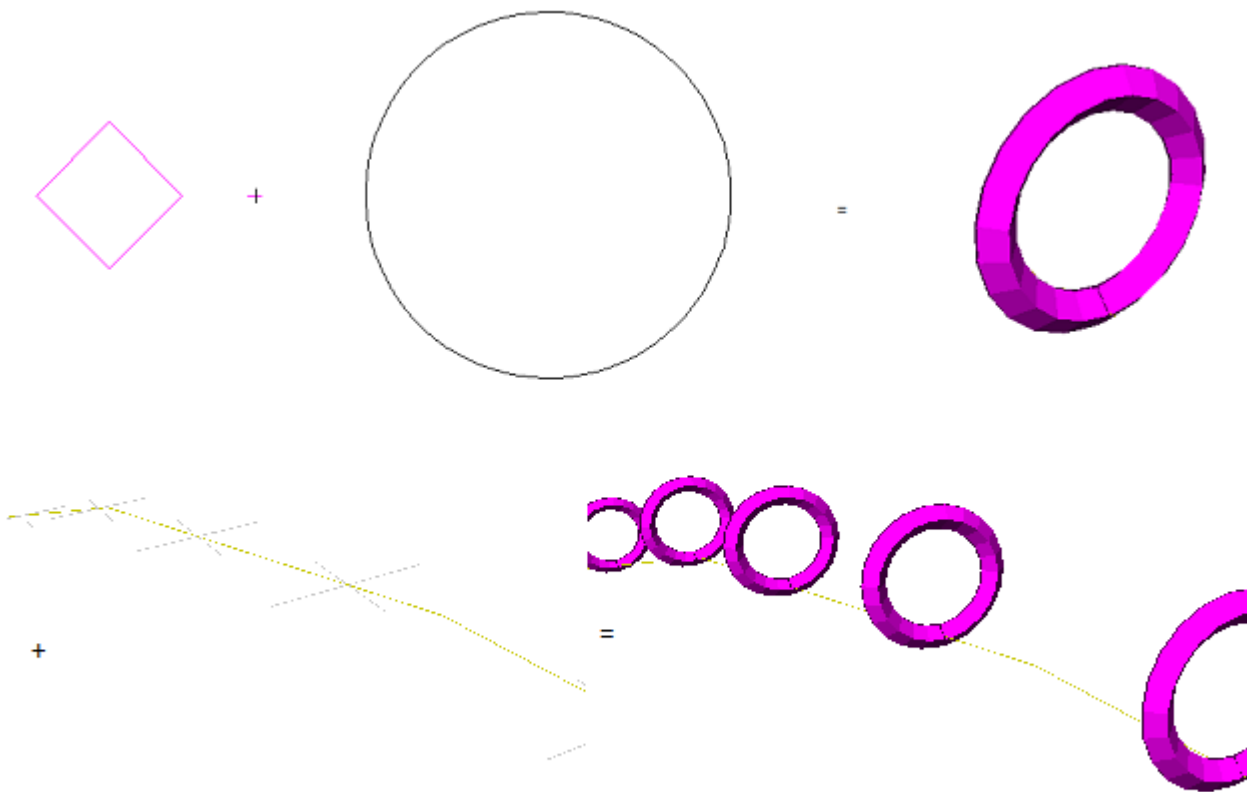
Interval extrude

The interval extrude can be seen as a series of string extrudes applied along the string at a specified interval distance. Here is a example of a 'Ring' interval extrude:



This extrude is defined by a diamond being extruded along a circle, and finally being instanced

along the super string at the specified interval.



The extrusions.4d fragment defining this extrude is:

```
interval_extrude {  
  
    name      "Vertical Ring"  
    colour    true  
    mirror_x  false  
  
    interval  4.0  
  
    factor_x  1.0  
    factor_y  1.0  
    factor_z  1.0  
  
    rotate_x  0.0  
    rotate_y  90.0  
    rotate_z  0.0  
  
    offset_x  0.0  
    offset_y  0.0
```




```

    offset_z    0.0

    at_grade    false

    path {

// the string that the extrude is drawn along

        name      "circle path"
        breakline line
        colour     white
        style      1
        closed     1

        data_3d {          // note must be defined with x,y,z data
            0 0.0 0.0
            1 0.0 0.0
        }
        radius_data {
            0.5
            0.5
        }
        interval {
            chord_arc  0.005
            distance    -999
        }
    }
    data {

// the shape of the extrude

        name      "path data"
        breakline line
        colour     magenta
        style      1
        closed     1

        data_2d {
            -0.1  0.0
            0.0   0.1
            0.1   0.0
            0.0  -0.1
        }
        interval {
            chord_arc  0.001
            distance    -999
        }
    }
}

```

TODO: define group extrude:

A group extrude is a combination of string and interval extrudes.

3D Transformations

This transformation consists of factor (scale), rotation, and offset (translation) for x, y, and z. Transformations are always applied in the following order

rotate, factor, offset	about the axes	z, y, x
rotate z	occurs in the x-y plane (plan rotation)	
rotate y	occurs in the x-z plane (slope rotation)	
rotate x	occurs in the y-z plane (super-elevation rotation)	
factor z		
factor y	note: factors are commutative (any order is the same)	
factor x		
offset z		
offset y	note: offsets are commutative (and order is the same)	
offset x		

Note that the rotations about each axis are in the **local** coordinate system of the object being rotated. So after each rotation, the axes are also rotated.

String Extrude

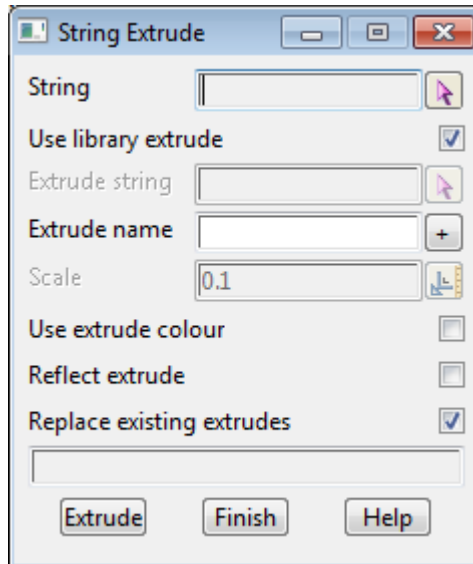
Position of option on menu: View =>Visualisation => Extrude along string

The **String along string** option extrudes a selected super string along a super string.

It can also be used to extrude a library extrude along string. But if a library extrude is to be applied to many strings, the Library Extrude option is more appropriate ([Change Library Extrude](#))

More information on extrudes is found in the section [Defining Extrudes and Extrusions](#)

On selecting the **Extrude** option, the **String Extrude** panel is displayed.



The fields and buttons in this panel have the following functions.

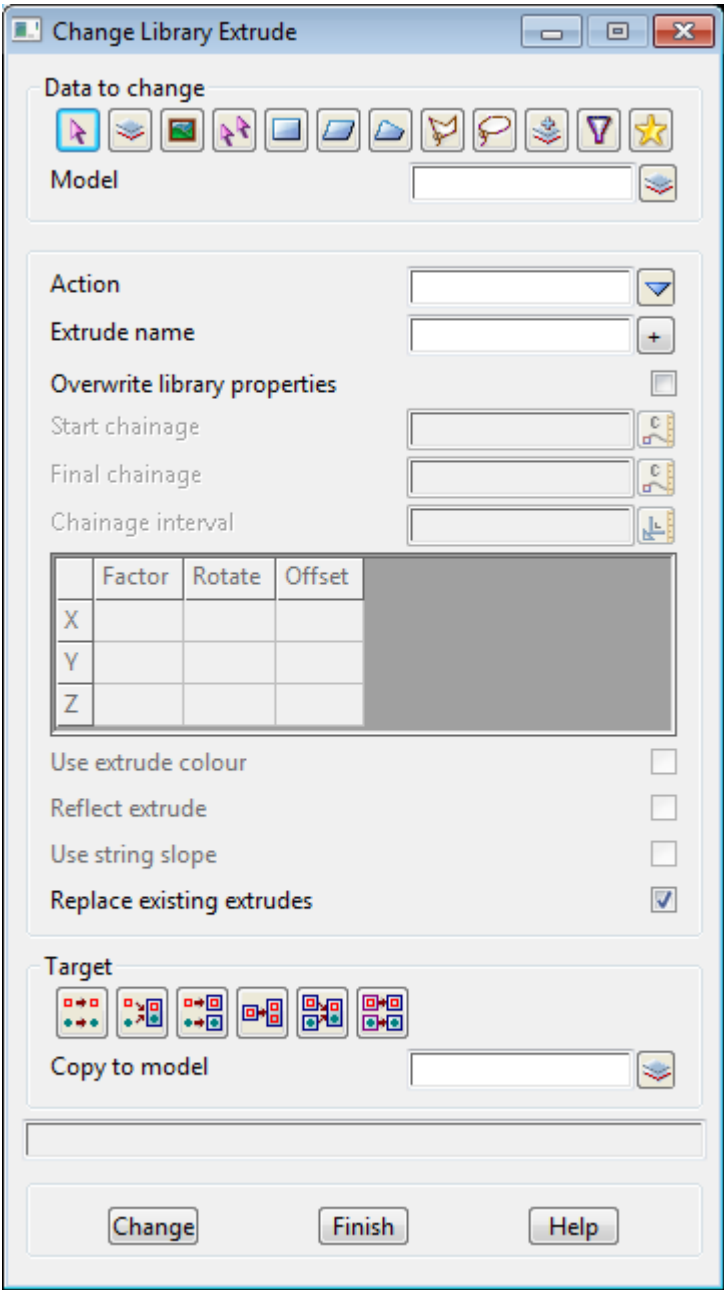
Field Description	Type	Defaults	Pop-Up
String <i>super string to extrude along</i>	string select		
Use library extrude <i>if ticked, an existing extrusion is selected from the extrusion library. The extrude from the library is selected in the Extrude name field. If not ticked, the Extrude string and Scale panel fields are used.</i>	tick box		
Extrude name <i>select the name of the extrude to use from the extrude library.</i>	extrude box		
Extrude string <i>if a library extrude is not being used, then a string is selected to define the extrusion shape.</i>	string select		
Scale <i>value to multiply the extrude string co-ordinates by.</i>	real value input	0.1	
Use extrude colour <i>if ticked, the placement uses the information in the grid on the panel. if no ticked, then the string segment colour is used for the extrusion.</i>	tick box		
Reflect extrude <i>if ticked, the extrude is reflected in the local y axis before it is applied.</i>	tick box		
Replace existing extrudes <i>if ticked, all existing extrudes are cleared before the new one is applied.</i>	tick box		
Extrude <i>Create the extrusion.</i>	button		

Change Library Extrude

Position of option on menu: Visualisation =>Library extrude

This option can apply an extrusion from the extrusions library, extrusions.4d, to a super string, or change the extrusion applied to a super string, or remove an extrusion from a super string.

Selecting **Library extrude** brings up the **Change Library Extrude** panel.



The fields and buttons used in the panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Data source type			Model	
-------------------------	--	--	-------	--

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data source	input			
--------------------	-------	--	--	--

source of data to be processed.

Action	choice box	set, clear
<i>if clear, all existing extrusions are removed from the selected super strings. The only other fields to be filled in is the Target.</i>		
<i>If set, a library extrude is applied to the selected super strings.</i>		
Extrude name	extrude box	list of extrusions
<i>extrude to be applied to the super strings.</i>		
Overwrite library properties	tick box	
<i>if ticked, the placement of the extrude uses the information in the grid on the panel.</i>		
<i>If not ticked, the placement properties are taken from the extrude in the library.</i>		
Start/end chainage	chainage box	
<i>start/end chainage for applying the extrusion.</i>		
Start/end chainage	chainage box	
<i>start/end chainage for applying the extrusion. If blank, use the strings start/end.</i>		
Chainage interval		
<i>for an interval extrude only - interval to use for the extrude.</i>		
Grid of X,Y,X against Factor, Rotate, Offset		
<i>placement information for applying the extrude.</i>		
Use extrude colour	tick box	
<i>if ticked, the placement uses the information in the grid on the panel.</i>		
<i>if no ticked, then the string segment colour is used for the extrusion.</i>		
Reflect extrude	tick box	
<i>if ticked, the extrude is reflected in the local y axis before it is applied.</i>		
Replace existing extrudes	tick box	
<i>if ticked, all existing extrudes are cleared before the new one is applied.</i>		
Target type		
<i>Data target type - where to put the processed strings. For a full description go to Data Target in the chapter Tools and Concepts</i>		
Target info	input	
<i>extra information required for the target.</i>		
Change	button	
<i>process the selected string</i>		

Roadside Furniture

Position of option on menu: View =>Visualisation => Extrusions =>Roadside furniture

This option is for inserting extruded objects that have been supplied by 12D Solutions Pty Ltd. It includes street lights, log barriers, park bench, posts and columns, walls, timber fences, guard rails, signs etc.

The list of items that can be inserted is being continuously upgraded by 12D Solutions.

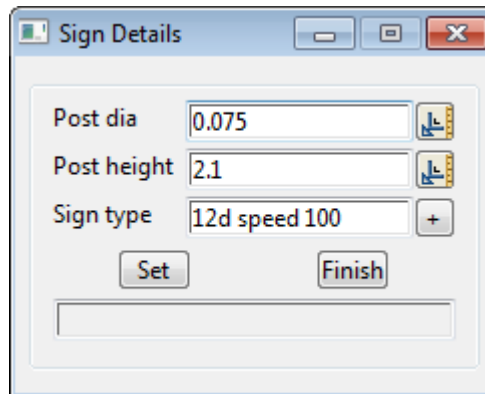
Selecting **Roadside furniture** brings up the **Roadside Furniture** panel.



Clicking on the tabs brings up the information required for that piece of roadside furniture.

For all the tabs other than Park Bench, Street Light and Guard Rail, once a tab had been selected, moving the cursor over the picture brings up a special panel for the extra information required.

For example, for the Sign tab, moving the cursor over the picture brings up the Sign Details panel:



New 12D Ascii

This option is similar to the others e.g. Street Light, but allows the user to create their own features and place them in the same manner as the others on the panel.

Specifications for an ascii file:

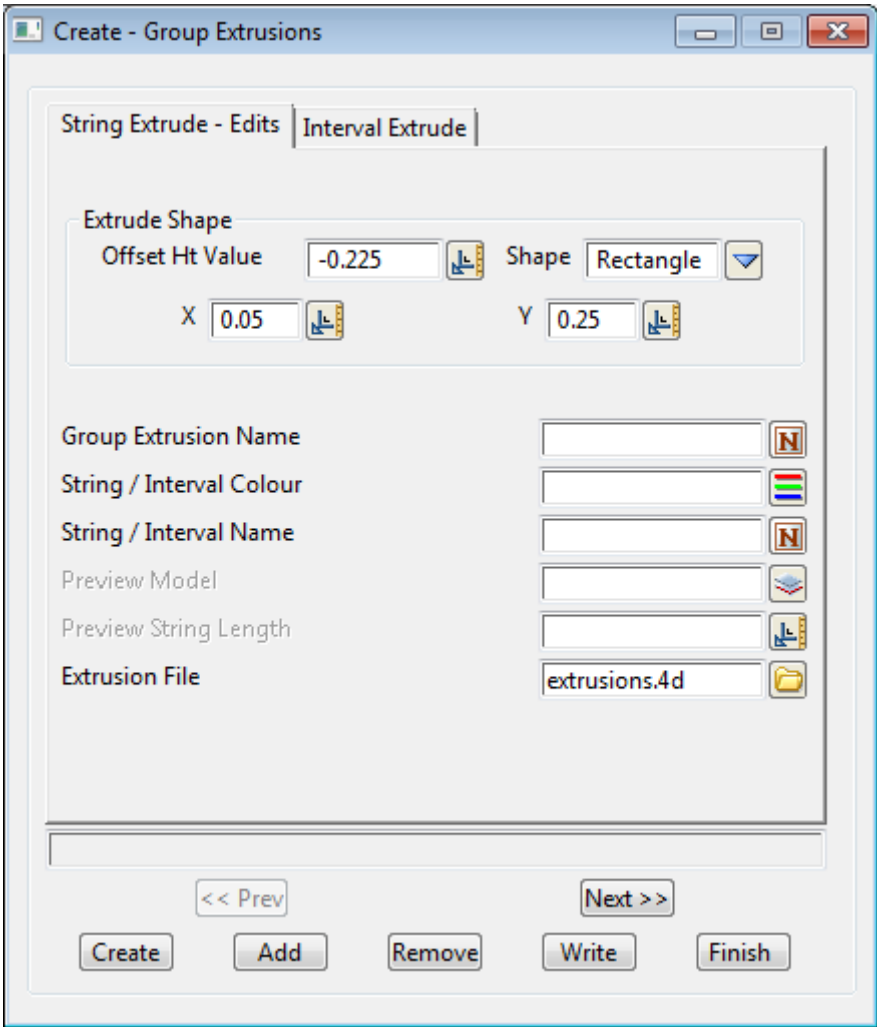
The stem of the ascii file name, the model name in the ascii file and the stem of the bitmap name showing the picture of the object..... "MUST" be the same e.g. File: User Street Light.12da Model: User Street Light Bitmap: User Street Light.bmp

Bitmap size to be 345W x 250H pixels

Place the 12da file and the bitmap in your User_Library

Create Group Extrusions

Position of option on menu: View =>Visualisation => Extrusions =>Create
The Create option creates groups extrusions and saves then to the extrusions.4d file.
Selecting Create brings up the **Create - Group Extrusions** panel.

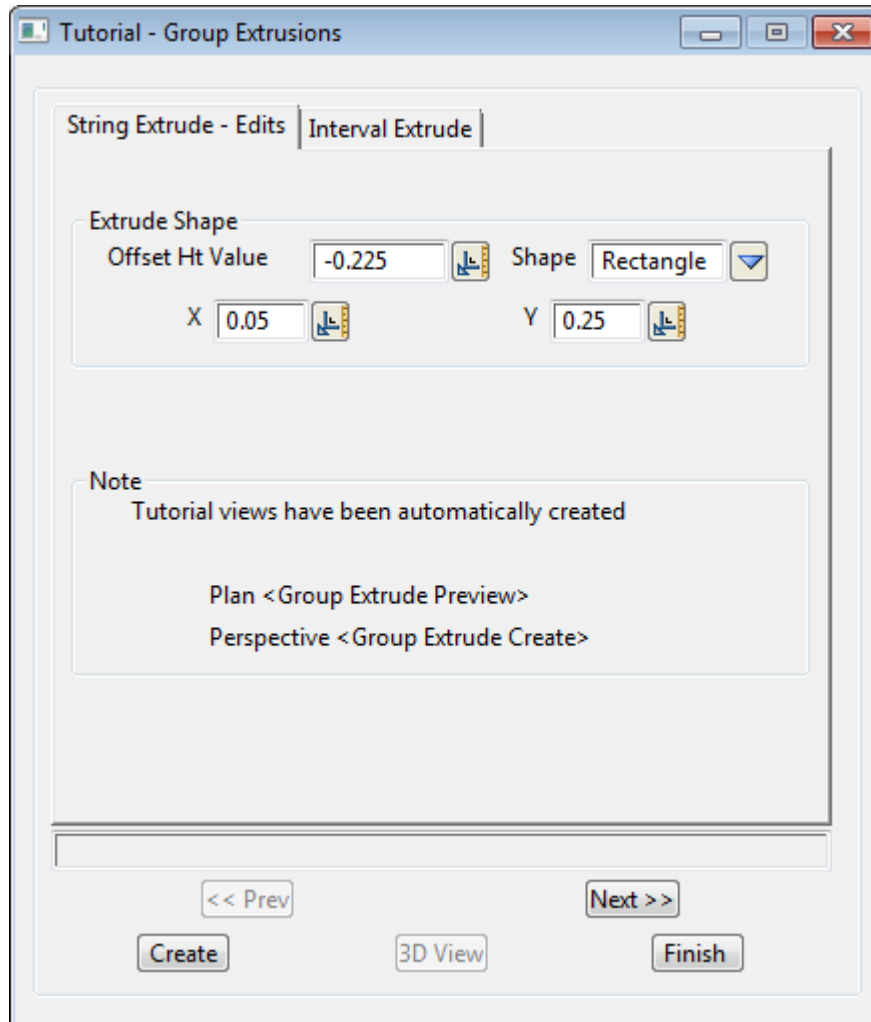


Tutorial to Create Group Extrusions

Position of option on menu: View => Visualisation => Extrusions => Tutorial

The **Tutorial** option demonstrates how to create group extrusions and will also create group extrusions.

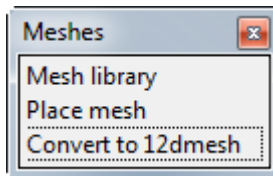
Selecting **Tutorial** brings up the **Tutorial - Group Extrusions** panel.



Meshes

Position of menu: View =>Visualisation =>Meshes

The **Meshes** walk-right menu is



For the option Mesh library go to

[Mesh Library](#)

Place Mesh

[Place a Mesh](#)

Convert to 12dmesh

[Convert to 12dMesh Format](#)

Mesh Library

Position of option on menu: View =>Visualisation =>Meshes =>Mesh Library

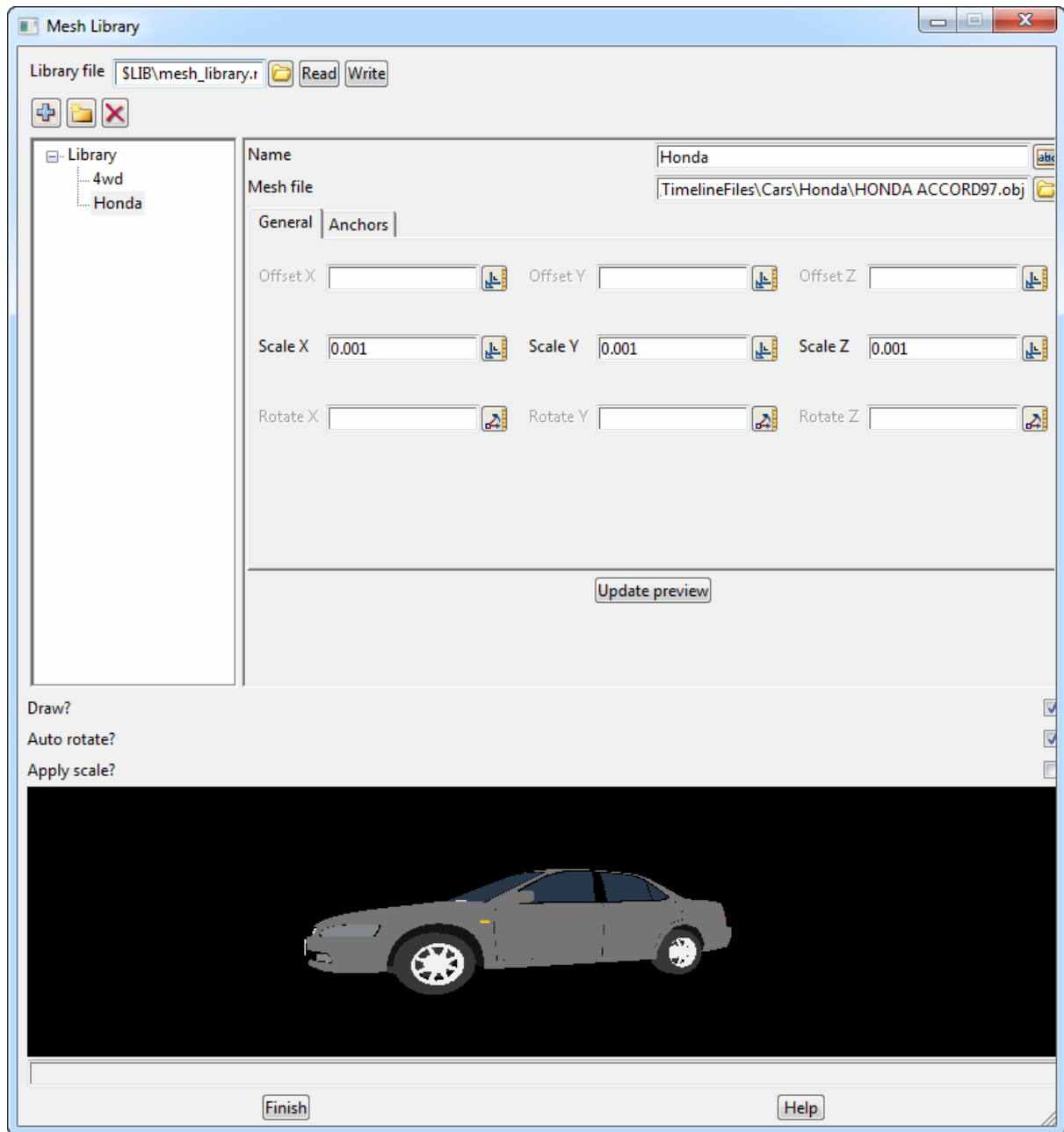
Position of option on menu: View =>Visualisation =>Timelines =>Mesh Library

The **Mesh Library** allows you to predefine meshes and the standard transformations required to get them into a world co-ordinate system. As meshes may come from a variety of packages that use arbitrary scales, rotations or offsets, this may be necessary.

It can also be used to define anchors, to anchor a mesh to the tin. This can be useful to get your mesh to conform to a terrain, such as a vehicle running down a road.

The mesh can then be written to the mesh library file, mesh_library.4d

Selecting **Mesh Library** brings up the **Mesh Library** panel.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Library file	file		
<i>the mesh library file to read/write</i>			
Read	button		
<i>reads a mesh library file</i>			
Write	button		
<i>writes a mesh library file</i>			
+ (Add)	button		
<i>adds a new mesh</i>			

Folder (Create Folder)

Creates a new folder for categorising meshes

Delete

Deletes a mesh or folder

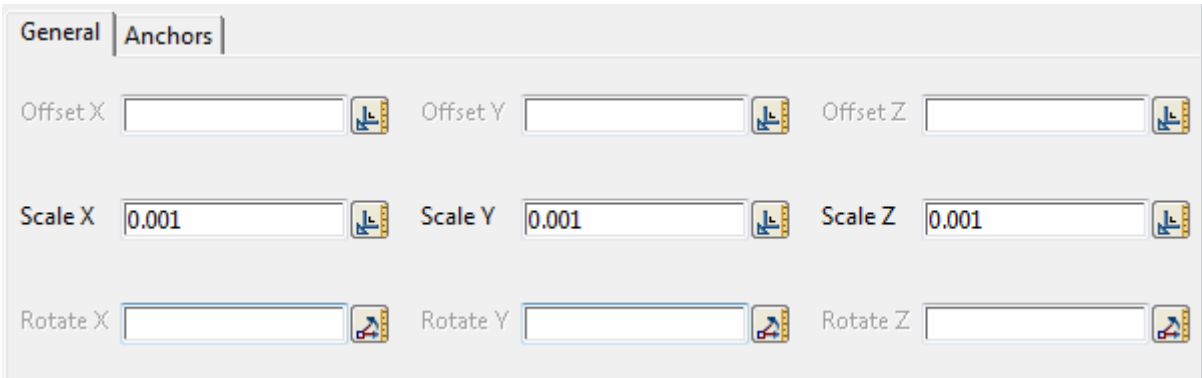
Name

the name of the current mesh

Mesh file

the mesh file, in OBJ format

General tab



Offset x

an optional offset along the x axis to apply

Offset y

an optional offset along the y axis to apply

Offset z

an optional offset along the z axis to apply

Scale x

an optional scale to apply to the x scale of the object

Scale y

an optional scale to apply to the y scale of the object

Scale z

an optional scale to apply to the z scale of the object

Rotate x

an optional rotation around the x axis

Rotate y

an optional rotation around the y axis

Rotate z

an optional rotation around the z axis

Anchors tab

The **Anchors** tab is used to define anchors, for anchoring a mesh to a tin. To do this, you must

define four anchors, at each corner of the mesh.

The screenshot shows a software interface with a tabbed window. The 'Anchors' tab is selected. It contains four sections for defining mesh anchors: 'Back left', 'Back right', 'Front left', and 'Front right'. Each section has three input fields for X, Y, and Z coordinates, each with a small icon to its right. At the bottom of the tab is a 'Find anchors' button.

Back left

defines the co-ordinates of the back left point of the mesh

Back right

defines the co-ordinates of the back right point of the mesh

Front left

defines the co-ordinates of the front left point of the mesh

Front right

defines the co-ordinates of the front right point of the mesh

Find anchors button

*As you may not know the co-ordinates, you may use the **Find Anchors** button to see a list of a number of the lowest points on the mesh. For more information see [Find Anchors](#)*

Update Preview button

updates the preview based on the transformation settings

Draw? tick box

whether or not to draw the mesh in the viewer at the bottom

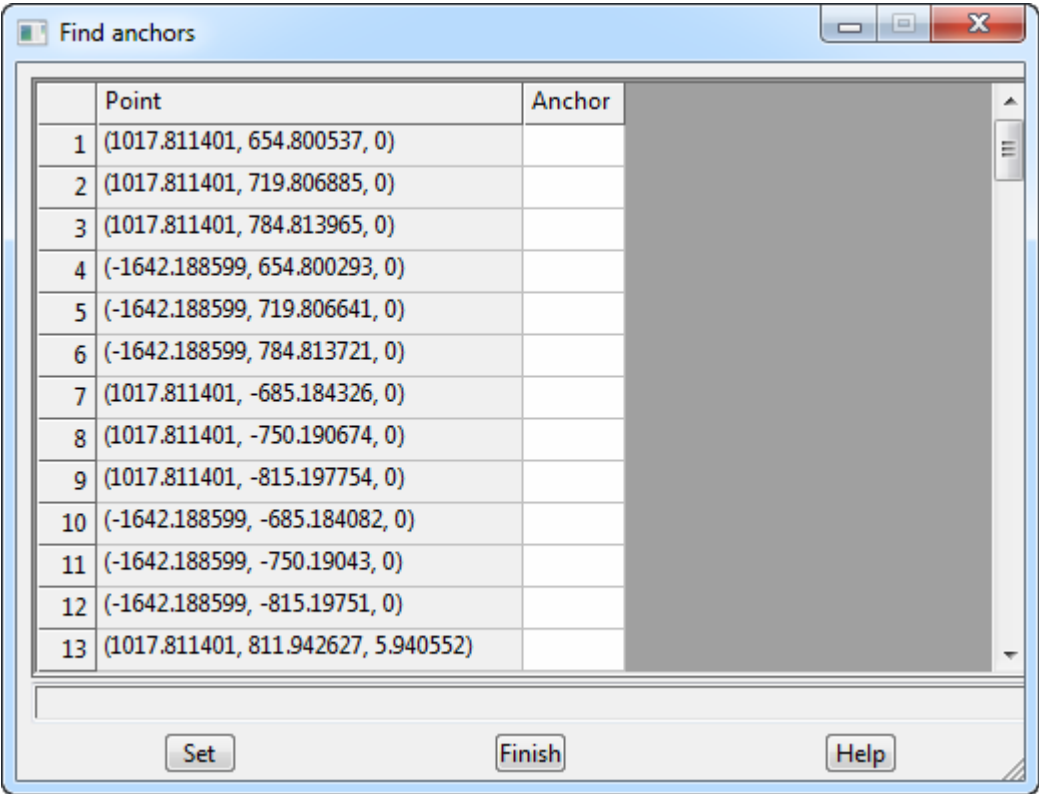
Auto rotate? tick box

whether or not to automatically rotate the mesh

Auto scale? tick box

whether or not to scale the mesh based on supplied transformations

Find Anchors



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Point
a known anchor point

Anchor
the anchor to set. You only need to set four anchors.

Set button
sets the anchor points

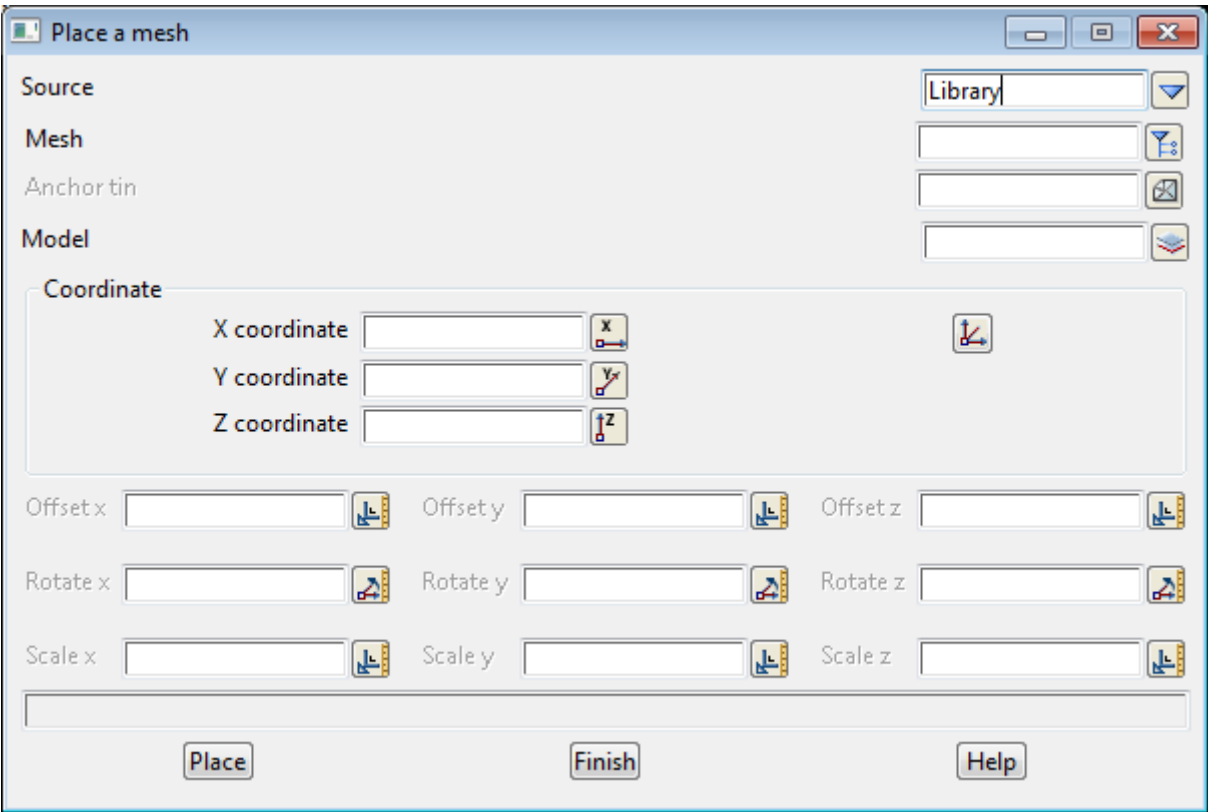
When you select a row, the preview on the [Mesh Library](#) will show a symbol to indicate where that co-ordinate is located.

Place a Mesh

Position of option on menu: View =>Visualisation =>Meshes =>Place a mesh

This panel allows you to place a mesh as the vertex of a super string.

Selecting Place a mesh brings up the Place a mesh panel.



The fields and buttons used in the panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Source		choice box		Library, File

Whether the mesh comes from the Mesh Library or a separate file

if Sources is Library:

Mesh

the name of the mesh (from the mesh library) to place

Anchor tin

an optional tin to anchor the mesh to

if Source is File:

Mesh file

the file (containing the mesh definition) to use

Model model box

the model to place the mesh in

Coordinate

the co-ordinate to place the mesh at

Offset x

an optional offset along the x axis to apply

Offset y

an optional offset along the y axis to apply

Offset z

an optional offset along the z axis to apply

Scale x

an optional scale to apply to the x scale of the object

Scale y

an optional scale to apply to the y scale of the object

Scale z

an optional scale to apply to the z scale of the object

Rotate x

an optional rotation around the x axis

Rotate y

an optional rotation around the y axis

Rotate z

an optional rotation around the z axis

Place button

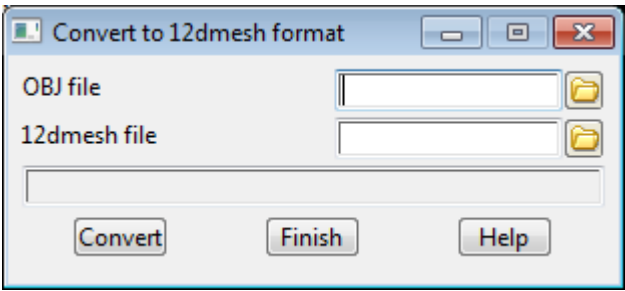
places the mesh

Convert to 12dMesh Format

Position of option on menu: View =>Visualisation =>Meshes =>Convert to 12dmesh

This option converts most files in OBJ format to the 12dmesh format.

Selecting Convert to 12dmesh brings up the **Convert to 12dmesh format** panel.



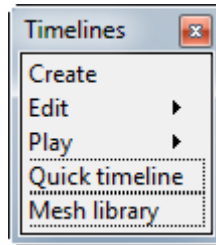
The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
OBJ file <i>the OBJ file to convert to 12dmesh format.</i>	file box		available *.obj files
12dmesh file <i>the name of the new .12dmesh file.</i>	file box		available *.12dmesh files
Convert <i>converts the OBJ file.</i>	button		

Timelines

Position of menu: View =>Visualisation =>Timelines

The Timelines walk-right menu is



For the option *Create* go to

Edit

Play

Quick timeline

Mesh library

[Timeline Editor](#)

[Edit a Timeline](#)

[Play a Timeline](#)

[Quick Timeline Create](#)

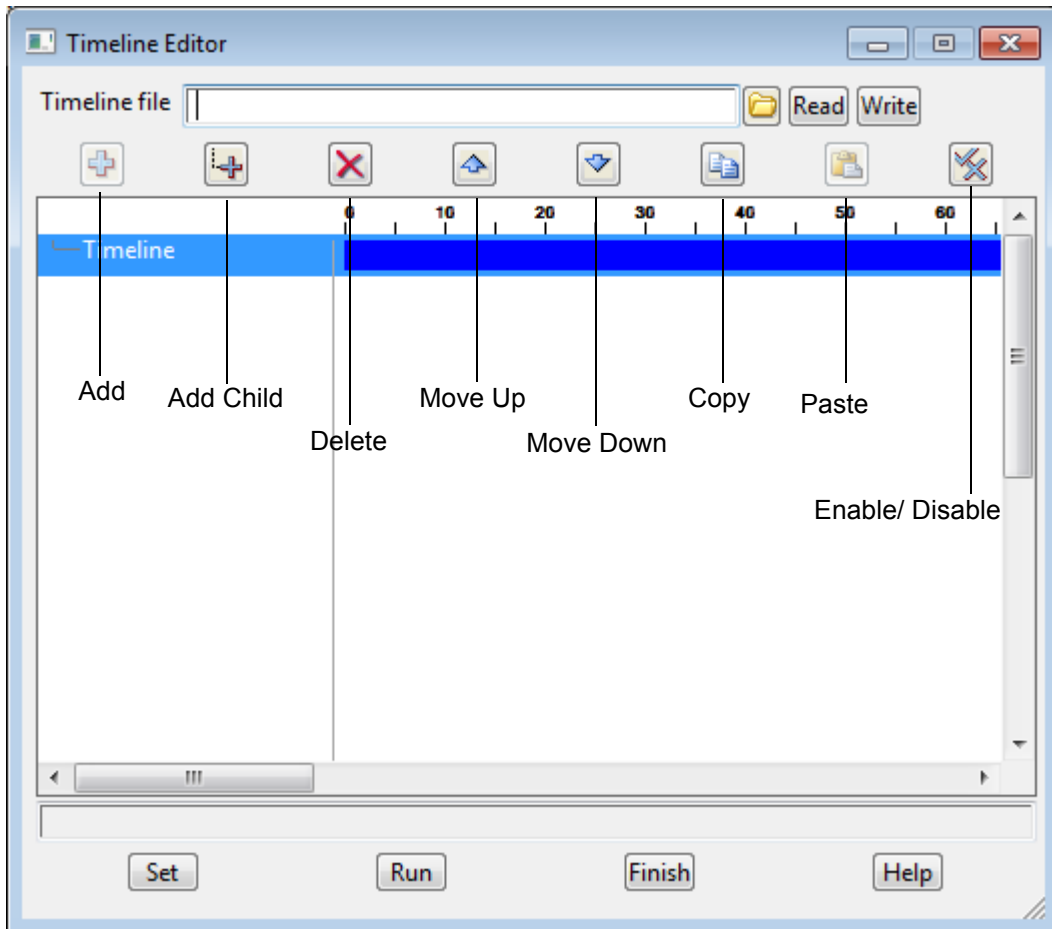
[Mesh Library](#)

Timeline Editor

Position of menu: View =>Visualisation =>Timelines => Create

This is the main **Timeline Editor**. The left side shows the tree of timelines. The right side shows the time, in seconds, during which any given timeline will be active. To edit a timeline, simply double click it.

Selecting *Create* brings up the **Timeline Editor** panel.

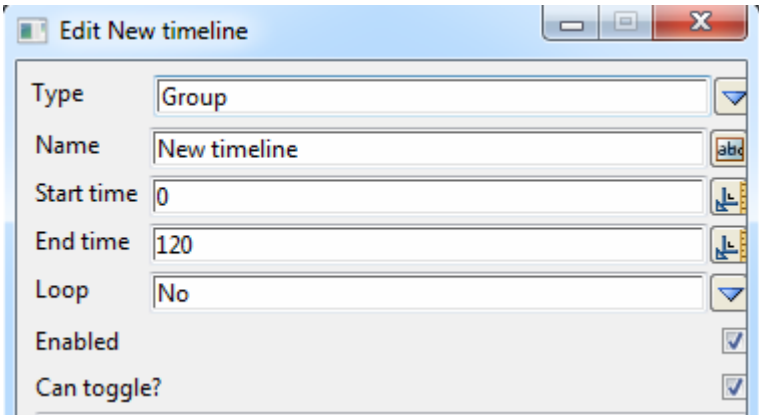


The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Timeline file <i>the timeline file to edit</i>	file		
Read <i>reads the supplied timeline file</i>	button		
Write <i>writes the current timeline file</i>	button		
Add <i>adds a new timeline at the current level</i>	button		
Add Child <i>adds a child to the current timeline</i>	button		
Delete <i>deletes the current timeline</i>	button		
Move Up <i>moves the current timeline up</i>	button		
Move Down <i>moves the current timeline down</i>	button		

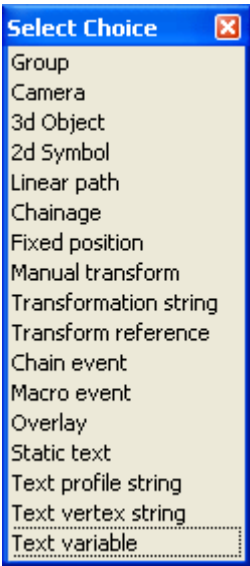
Copy	button
<i>copies the current timeline</i>	
Paste	button
<i>pastes the last copied timeline</i>	
Enable / Disable	button
<i>enables or disables the current timeline</i>	
Set	button
<i>sets the current timeline details</i>	
Run	button
<i>runs the current timeline</i>	

Timeline Common Fields and Buttons



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Type	choice box		



Sets the type of timeline to edit. For more information on each Type, see [Edit Timeline Types](#)

Name

the name of the timeline

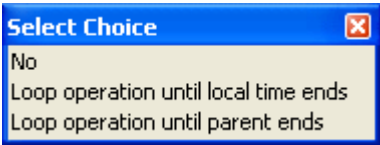
Start Time

the time this timeline should start playing

End Time

the time this timeline should stop playing

Loop choice box



the loop mode to apply for this timeline

No - no looping

Loop operation until local time ends - if the operation of the timeline takes less time than the supplied duration, you may nominate for it to repeat the operation until the end time is reached

Loop until parent ends - loop this timeline until the parent time completes

Enabled tick box

whether or not it is enabled

Can Toggle? tick box

whether or not this timeline can be toggled on or off during playback

Set button

sets the details for the timeline

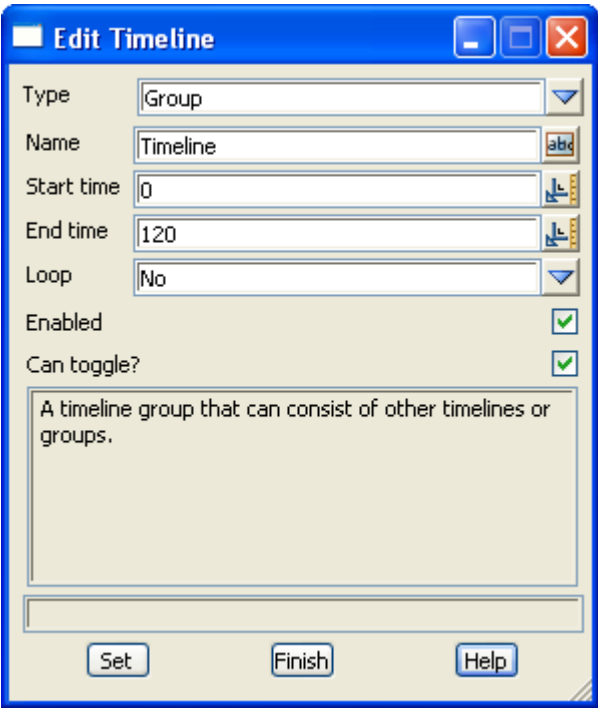
Edit Timeline Types

For Group, go to	Group Timeline
Camera	Camera Timeline
3d Object	3d Object Timeline
2d Symbol	2d Symbol Timeline
Linear path	Linear Path Timeline
Chainage	Chainage Timeline
Fixed Position	Fixed Position Timeline
Manual transform	Manual Transform Timeline
Transformation string	Transformation String Timeline
Transform reference	Transform Reference Timeline
Chain event	Chain Event Timeline
Macro event	Macro Event Timeline
Overlay	Overlay Timeline
Static text	Static Text Timeline
Text profile string	Text Profile String Timeline
Text vertex string	Text Vertex String Timeline
Text variable	Text Variable Timeline

Group Timeline

The editor for a group timeline, which consists of other timelines.





The fields and buttons used in the panel have the following functions.

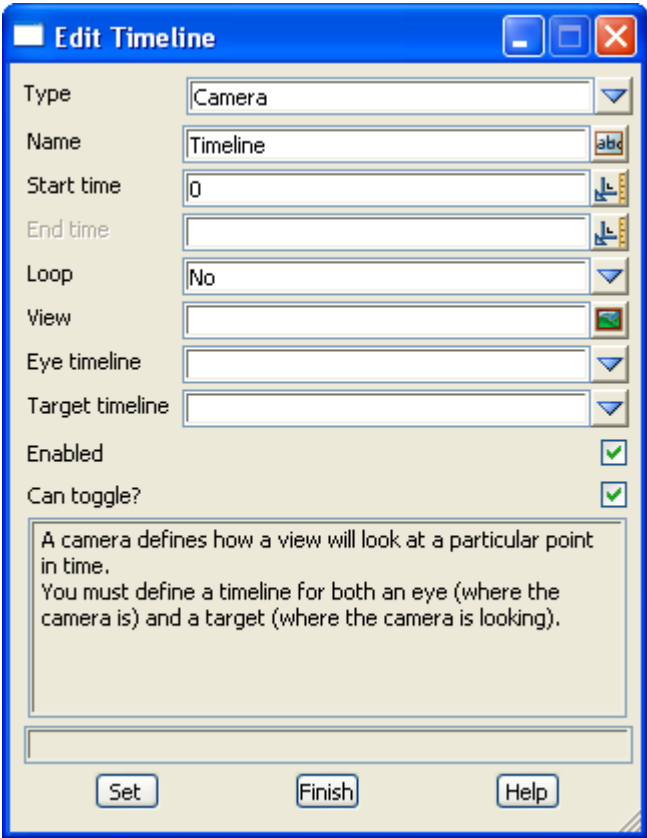
Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

There are no fields other than common fields and buttons. For more information on common fields and buttons please see [Timeline Common Fields and Buttons](#).

Camera Timeline

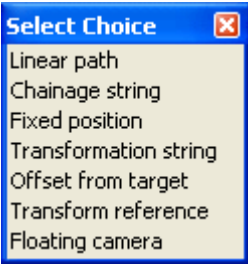
The **Camera Timeline** directs a perspective view where to look at a given time. It is defined by two other timelines - an **eye** and a **target**. There are several different types of timelines available for both **eye** and **target**. When the details are set, two children timelines will be created, one for the **eye** and one for the **target**.

The details for how the **eye** and **target** should behave should be accessed through these two children timelines.



The fields and buttons used in the panel have the following functions.

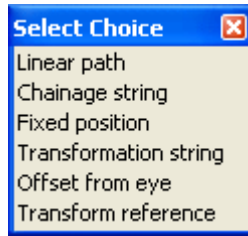
Field Description	Type	Defaults	Pop-Up
View <i>the view to control</i>	view box		
Eye timeline <i>the type of eye timeline</i>	choice box		



- Linear Path* - See [Linear Path Timeline](#)
- Chainage String* - See [Chainage Timeline](#)
- Fixed Position* - See [Fixed Position Timeline](#)
- Transformation String* - See [Transformation String Timeline](#)
- Offset from Target* - Offsets the eye from the target. See [Manual Transform Timeline](#)
- Transform Reference* - See [Transform Reference Timeline](#)

Floating Camera - See [Floating Eye Timeline](#)

Target timeline choice box
the type of target timeline



Linear Path - See [Linear Path Timeline](#)

Chainage String - See [Chainage Timeline](#)

Fixed Position - See [Fixed Position Timeline](#)

Transformation String - See [Transformation String Timeline](#)

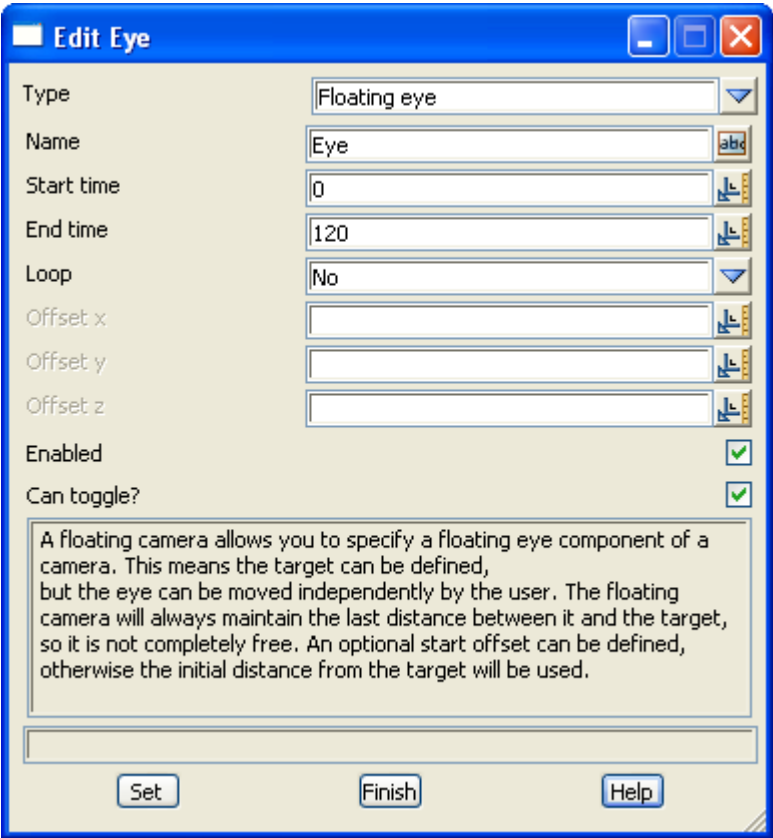
Offset from eye - Offsets the target from the eye. See [Manual Transform Timeline](#)

Transform Reference - See [Transform Reference Timeline](#)

For all other fields and buttons please see [Timeline Common Fields and Buttons](#).

Floating Eye Timeline

A **Floating Eye** allows the camera to be fixed on a known target, but the user can retain control over the position of the eye. The **Floating Eye** is a camera type. It can only be accessed by first setting the eye type of a camera to **Floating Camera**.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Offset x

an optional x offset from the target. If not set, the current x offset from the target will be used.

Offset y

an optional y offset from the target. If not set, the current y offset from the target will be used.

Offset z

an optional z offset from the target. If not set, the current y offset from the target will be used.

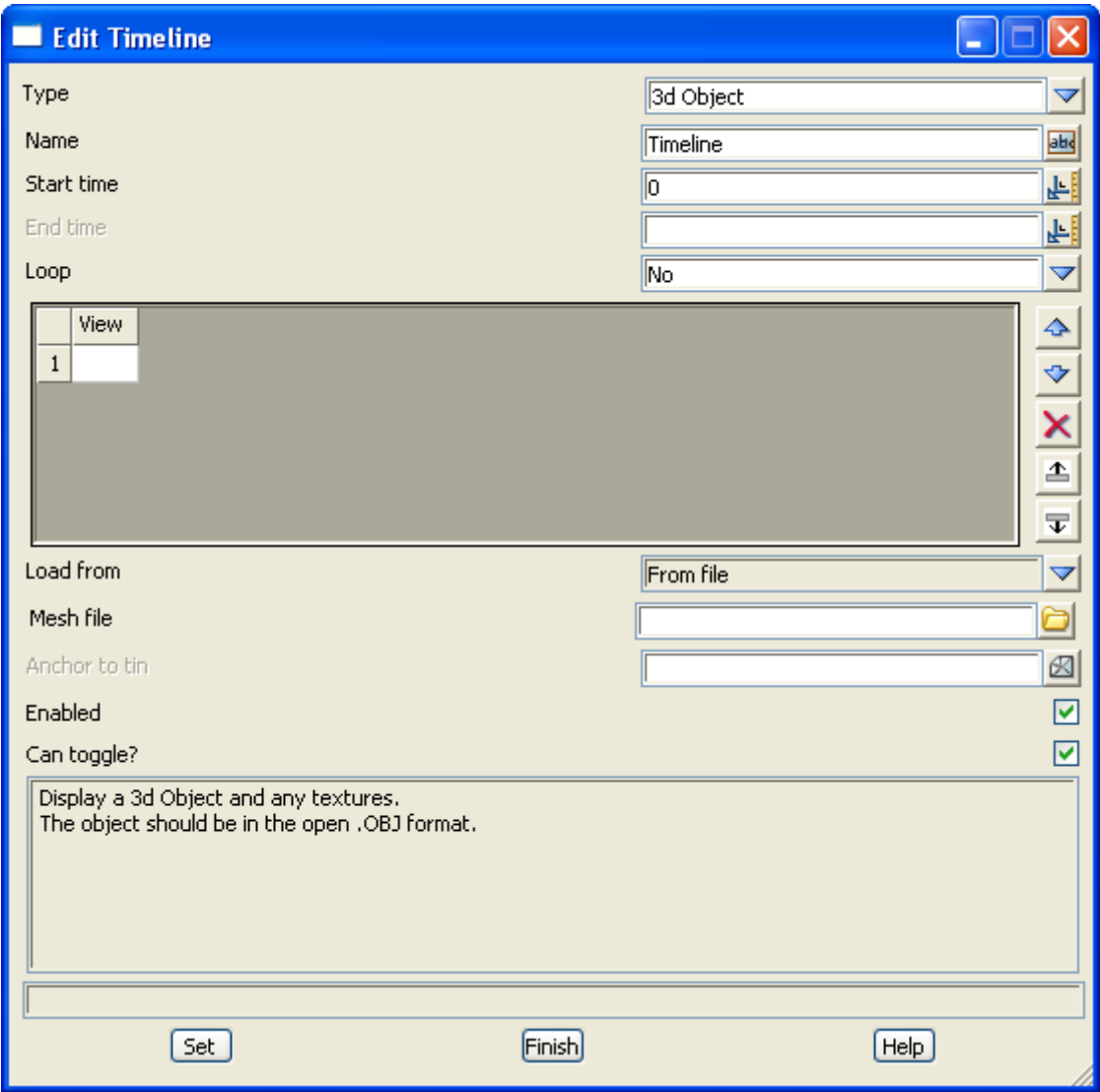
For all other fields and buttons please see [Timeline Common Fields and Buttons](#).

3d Object Timeline

The **3d Object Timeline** draws a 3d object on any number of views at a given time. A 3d object may include a mesh from another package, in the OBJ (Alias Wavefront) format.

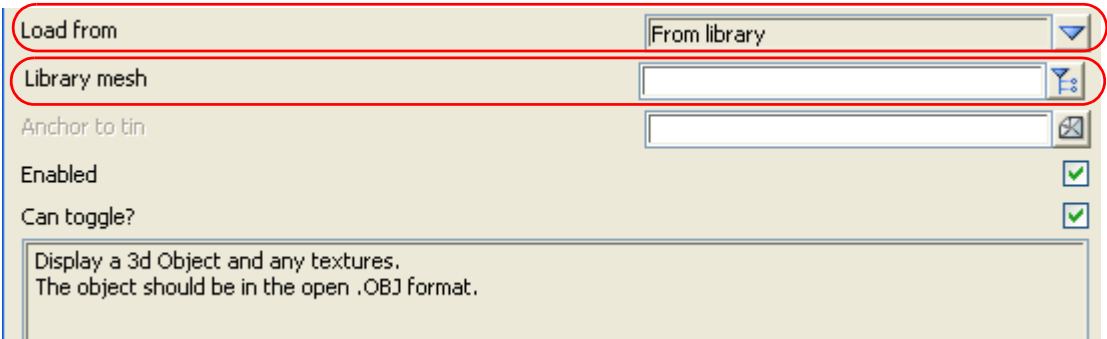
Creating a **3d Object Timeline** will create two sub timelines automatically - the initial transformation and other transformations.

Initial transformations should be used to convert your mesh into world co-ordinates, as meshes may come from a number of packages with arbitrary scale, offsets or rotations.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View Grid <i>the list of OpenGL perspective views to draw on</i>			
Load From <i>whether to load from a known file or the library</i>	choice box		From library, From file
Mesh file <i>when loading from file, the mesh file to use</i>	file		
Anchor to tin <i>a tin to anchor the mesh to - useful for vehicles on terrain. Note that this will only work for a library mesh that has anchor points defined.</i>			



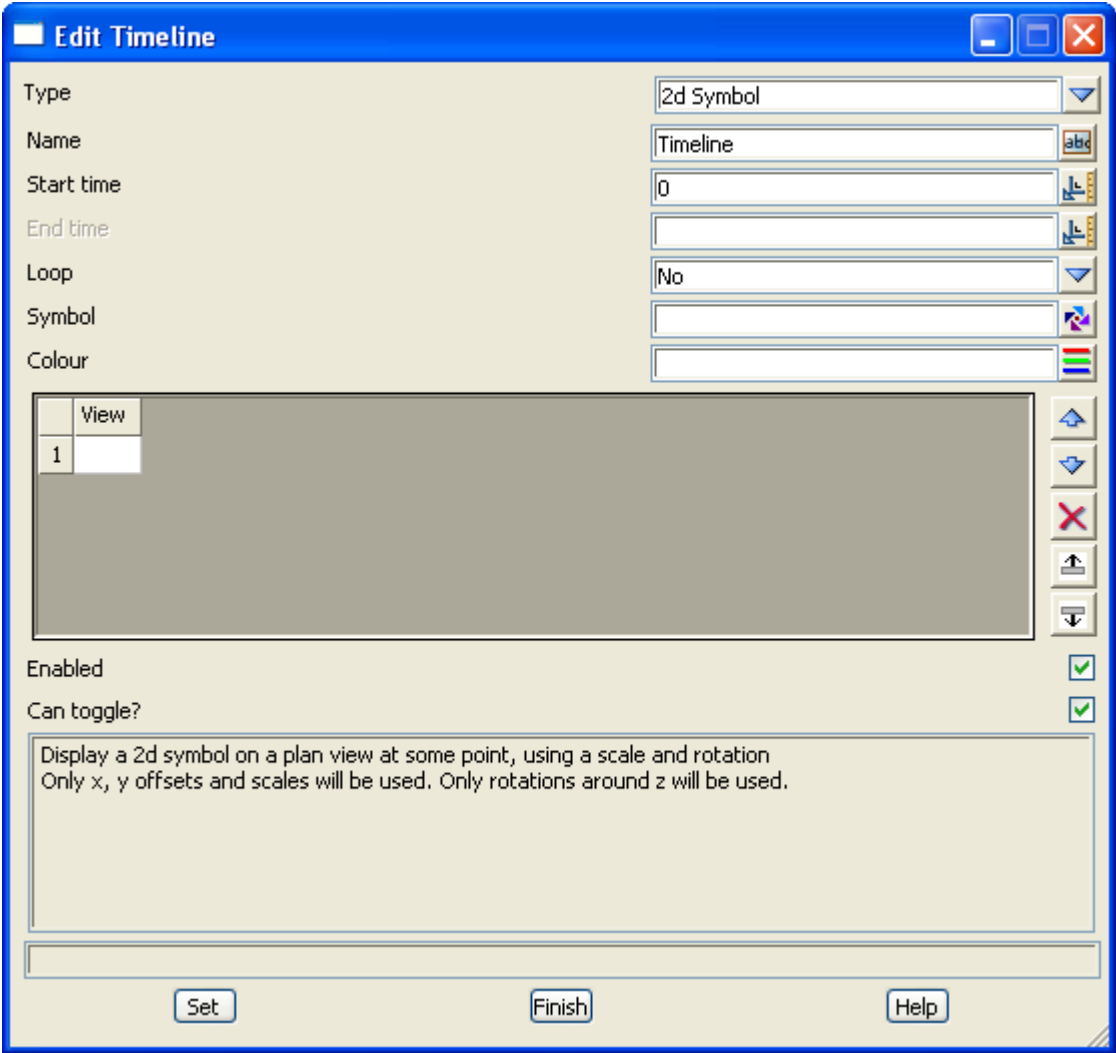
Library mesh

*this field is displayed when **From Library** is selected from the **Load From** choice box.
when loading from a library, the mesh to use*

For all other fields and buttons please see [Timeline Common Fields and Buttons](#).

2d Symbol Timeline

This allows you to define the settings for drawing a 2d symbol on a number of plan views.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Symbol <i>the symbol to draw</i>	symbol box		
Colour <i>the colour for the symbol</i>	colour box		
View grid <i>the list of plan views to draw the symbol</i>			

For all other fields and buttons please see [Timeline Common Fields and Buttons](#).

Linear Path Timeline

This editor defines the settings for a **Linear Path Timeline**. A **Linear Path Timeline** returns the position and direction on a string linearly, to fit the amount of time supplied.

Edit Timeline

Type

Linear path

Name

Timeline

Start time

0

End time

Loop

No

Path string

Start chainage

End chainage

Offset

0

Reverse?

Enabled

Can toggle?

Move a transform (such as for a 3d Object) over a string over the length of a timeline.

Set

Finish

Help

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Path string	string select		

the string to follow

Start chainage

the optional start chainage

End chainage

the optional end chainage

Offset

an offset from the path string

Reverse? tick box

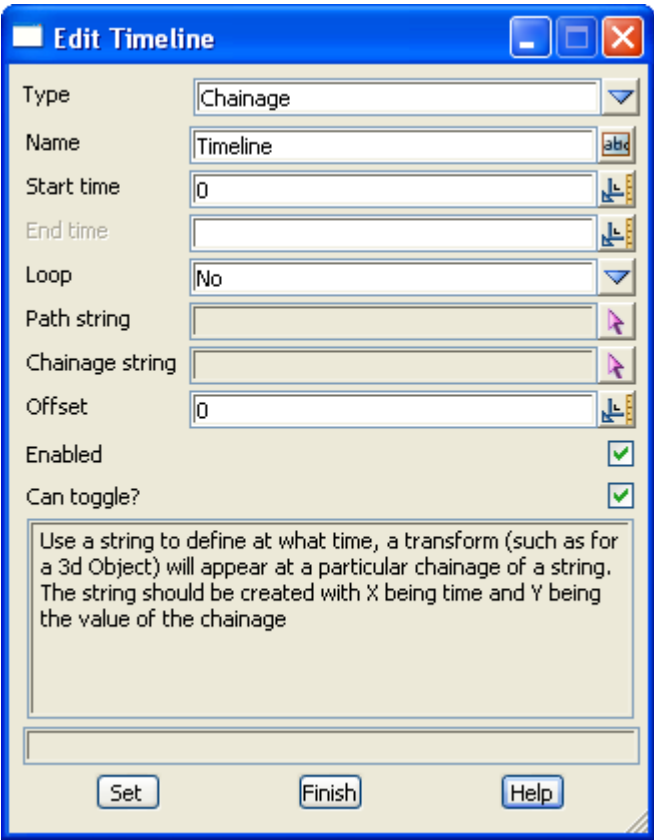
whether or not to reverse the direction (start at end)

For all other fields and buttons please see [Timeline Common Fields and Buttons](#).

Chainage Timeline

This editor allows you to define the settings for a **Chainage Timeline**. The **Chainage Timeline** follows a string or path by querying another string that defines the chainage to use at a given time. For the **Chainage Timeline**, the chainage string should be defined with X being time and Y being the chainage.

The **Chainage Timeline** will return the position and direction at the current chainage of the path string.



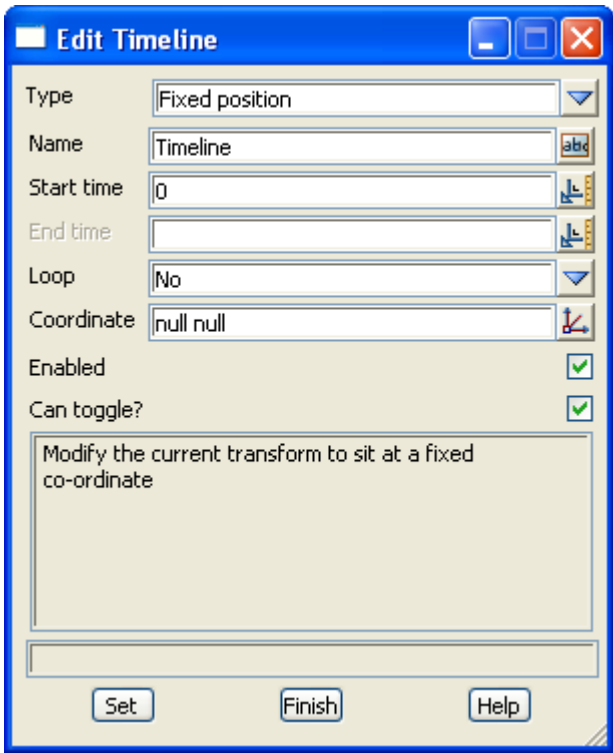
The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Path string <i>the string to follow</i>	string select		
Chainage string <i>the string that defines what chainage to use at what time</i>	string select		
Offset <i>an offset from the path string</i>	input		

For all other fields and buttons please see [Timeline Common Fields and Buttons](#).

Fixed Position Timeline

This editor allows you to define the settings for a **Fixed Position Timeline**. A **Fixed Position Timeline** will always return the supplied position.



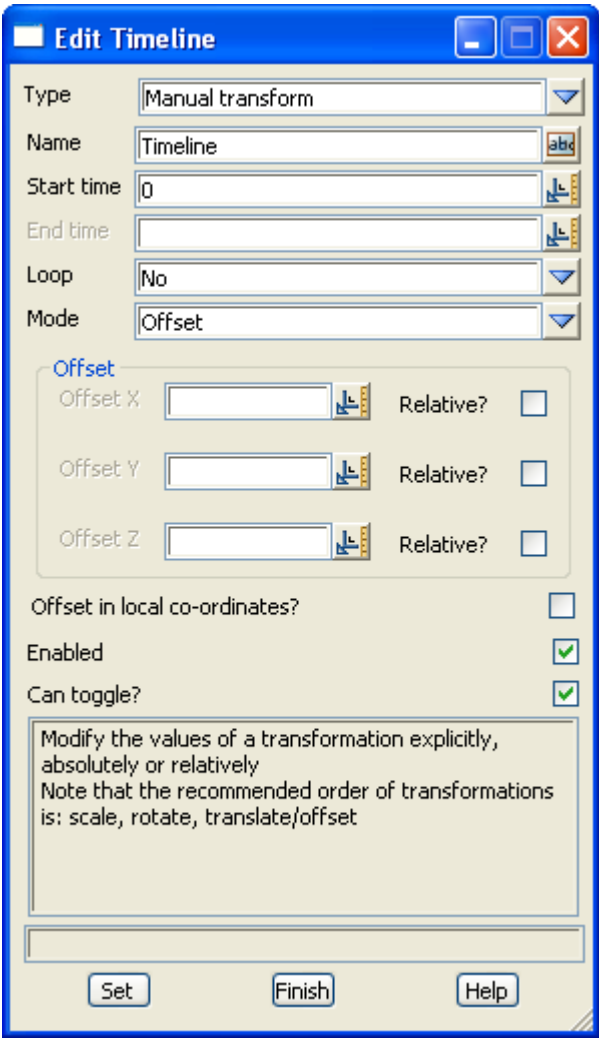
The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Coordinate <i>the coordinate of the fixed position</i>			

For all other fields and buttons please see [Timeline Common Fields and Buttons](#).

Manual Transform Timeline

This editor defines the settings for a **Manual Transform Timeline**. A manual transform is either an offset, rotation or scale on the current transformation being applied to a timeline.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Mode	choice box		Offset, Rotate, Scale
<i>the mode of transformation: offset, rotate or scale</i>			
Offset defines the parameters for an offset transformation			

Offset X

the optional offset to x

Relative?

tick box

whether or not Offset X is a relative or absolute offset

Offset Y

the optional offset to y

Relative?

tick box

whether or not Offset Y is a relative or absolute offset

Offset Z

the optional offset to z

Relative?

tick box

whether or not Offset Z is a relative or absolute offset

Offset in local co-ordinates tick box

whether or not the offset should be applied before or after the transformation to local co-ordinates

Rotate defines the parameters for a rotation transformation
Rotate X

the optional rotation around the x axis

Relative?

tick box

whether or not the X rotation is relative or absolute

Rotate Y

the optional rotation around the y axis

Relative?

tick box

whether or not the Y rotation is relative or absolute

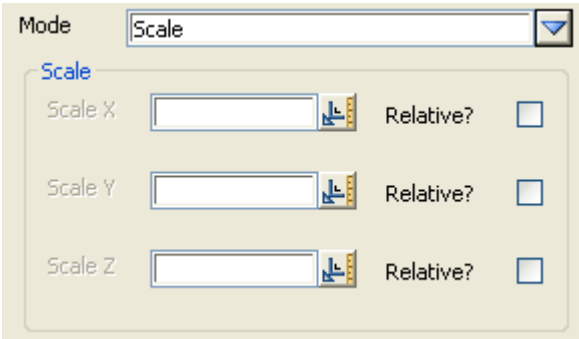
Rotate Z

the optional rotation around the z axis

Relative? tick box

whether or not the Z rotation is relative or absolute

Scale defines the parameters for a scaling transformation



Scale X

the optional x scale

Relative? tick box

whether or not the x scale is relative

Scale Y

the optional y scale

Relative? tick box

whether or not the y scale is relative

Scale Z

the optional z scale

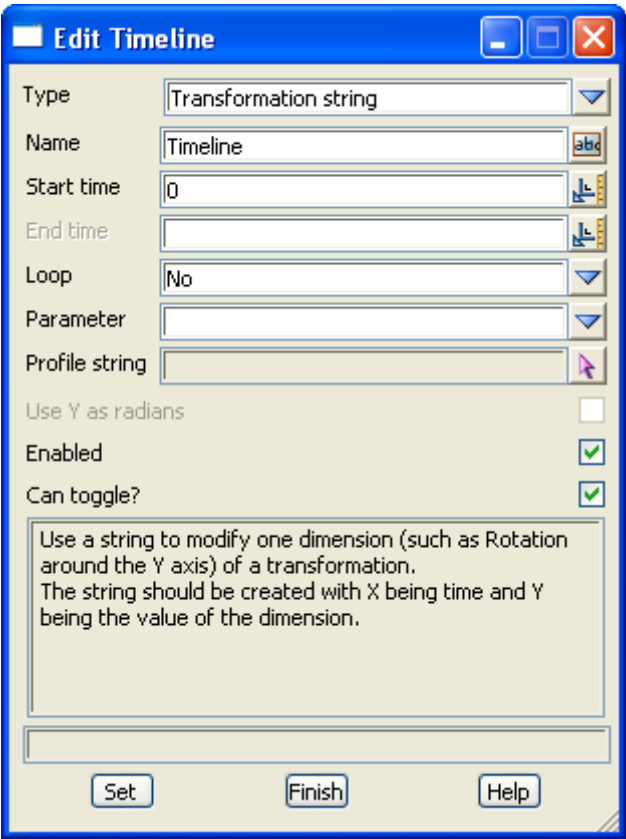
Relative? tick box

whether or not the z scale is relative

For all other fields and buttons please see [Timeline Common Fields and Buttons](#).

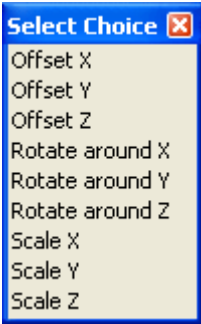
Transformation String Timeline

The **Transformation String Timeline** modifies one parameter of a transformation, based on a profile string. The profile string should be created such that x is time and y is the value of the parameter.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Parameter <i>the parameter to update.</i>	choice box		



Options are: Offset X, Offset Y, Offset Z, Rotate around X, Rotate around Y, Rotate around Z, Scale X, Scale Y, Scale Z

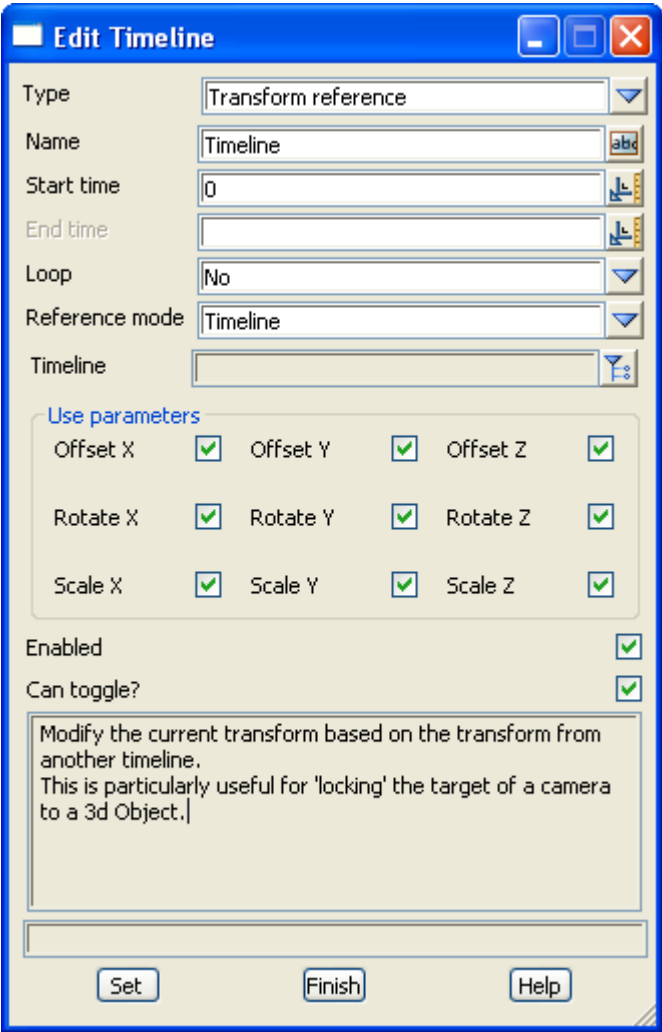
Profile string <i>the profile string to use to modify the parameter</i>	string select
-----------------------------------------------------------------------------------	---------------

Use Y as Radians <i>enabled when the parameter is a rotation parameter.</i> <i>if ticked, the value of Y will be considered to be radians rather than degrees.</i>	tick box
---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	----------

For all other fields and buttons please see [Timeline Common Fields and Buttons](#).

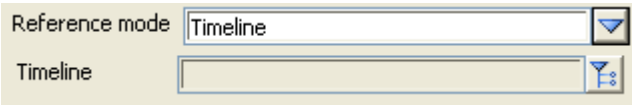
Transform Reference Timeline

This editor defines the settings for a **Transform Reference Timeline**. A **Transform Reference Timeline** uses the transformation as supplied by another timeline. It is useful, for example, to make the target of a camera follow a vehicle, as it will return all the transformations from the reference timeline.



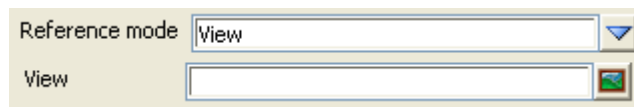
The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Reference mode	choice box		Timeline, View
<i>whether to reference another timeline or a view</i>			



Timeline

the timeline to reference, if **Reference mode** is set to **Timeline**



View

the view to reference, if **Reference mode** is set to **View**

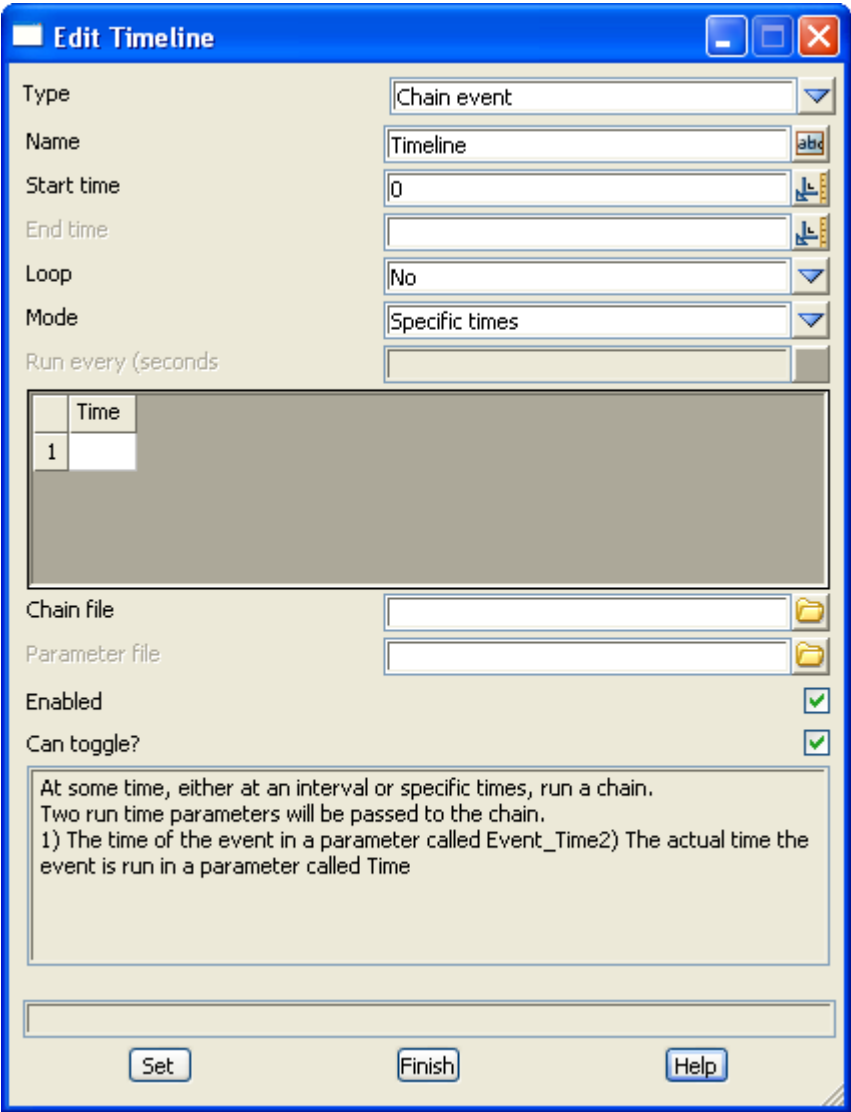
Use Parameters

defines which of the parameters to use from the transformation

For all other fields and buttons please see [Timeline Common Fields and Buttons](#).

Chain Event Timeline

This allows you to define the settings for a **Chain Event Timeline**. A **Chain Event Timeline** runs a chain at discrete intervals or specific times.



The fields and buttons used in the panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Mode		choice box		Specific times, On interval
<i>the mode - either specific times, or on an interval</i>				
Run every (seconds)				
<i>if mode is set to On Interval, the interval, in seconds, between runs of the chain</i>				
Time Grid				
<i>if mode is set to Specific times, the list of times, in seconds, the chain should be run</i>				
Chain file		file		
<i>the chain file to run</i>				
Parameter file		file		
<i>the optional parameter file to pass to the chain</i>				

For all other fields and buttons please see [Timeline Common Fields and Buttons](#).

Macro Event Timeline

This allows you to define the settings for a **Macro Event Timeline**. A **Macro Event Timeline** runs a macro at discrete intervals or specific times.

Edit Timeline

Type

Macro event

Name

Timeline

Start time

0

End time

Loop

No

Mode

Specific times

Run every (seconds)

Time

1

Macro file

Arguments

Enabled

☒

Can toggle?

☒

At some time, either at an interval or specific times, run a macro.
Two command line arguments will be passed down to the macro.
1) The time of the event
2) The actual time the event is run

Set

Finish

Help

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Mode	choice box		Specific times, On interval
<i>the mode - either specific times, or on an interval</i>			
Run every (seconds)			
<i>if mode is set to On interval, the interval, in seconds, between runs of the macro</i>			
Time Grid			
<i>if mode is set to Specific times, the list of times, in seconds, the macro should be run</i>			

Macro file file

the macro file to run

Arguments

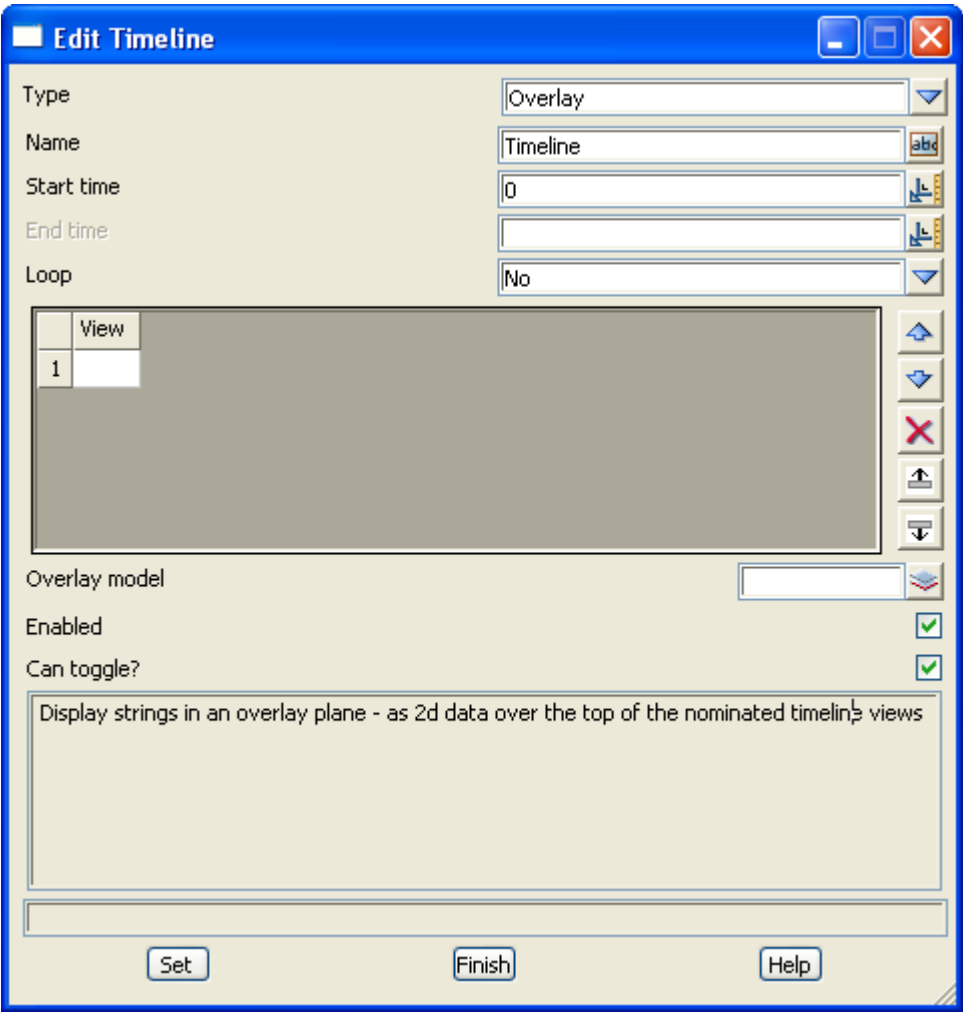
the optional arguments to pass to the macro

For all other fields and buttons please see [Timeline Common Fields and Buttons](#).

Overlay Timeline

This editor defines the setting for an **Overlay Timeline**. An **Overlay Timeline** draws a model as an overlay, or on a 2 dimensional plane, on top of a number of perspective views. Any children timelines will also appear in the overlay plane.

An **Overlay Timeline** is quite useful for showing diagnostic or other information.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

View Grid

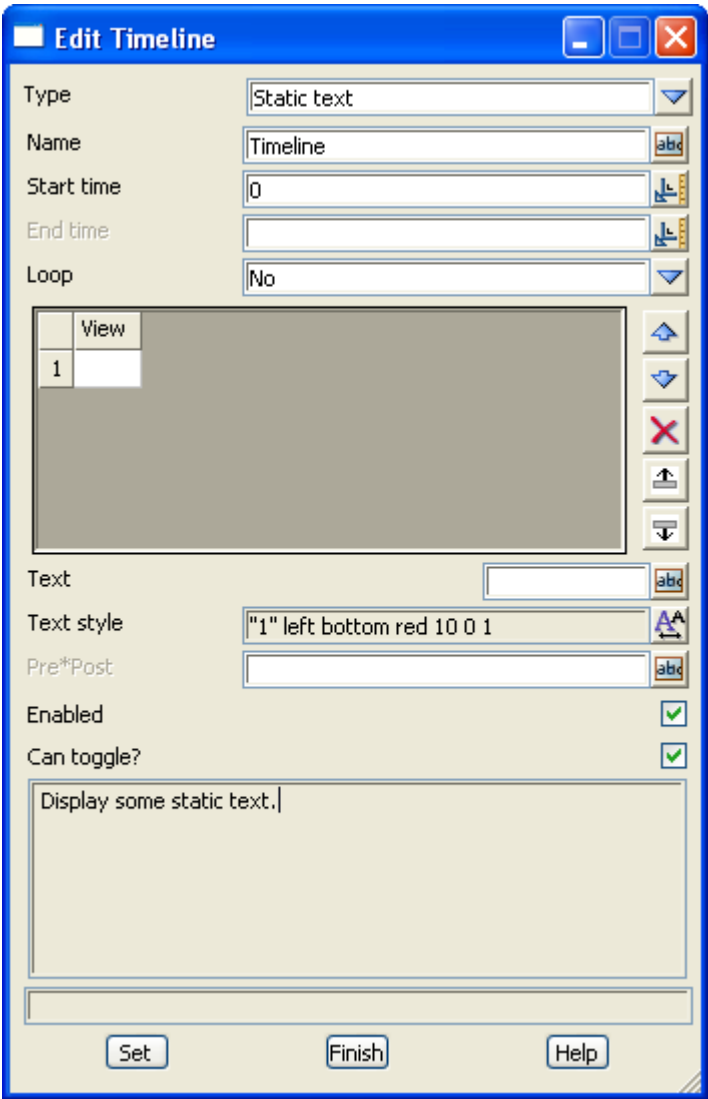
the set of views to draw the overlay plane on

Overlay model model box
the model to draw as an overlay plane

For all other fields and buttons please see [Timeline Common Fields and Buttons](#).

Static Text Timeline

This editor edits the settings for a **Static Text Timeline**. A **Static Text Timeline Draws** user defined text on a perspective view.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View Grid <i>the list of perspective views to draw on</i>			
Text <i>the text to draw</i>			
Text style			

the style of the text

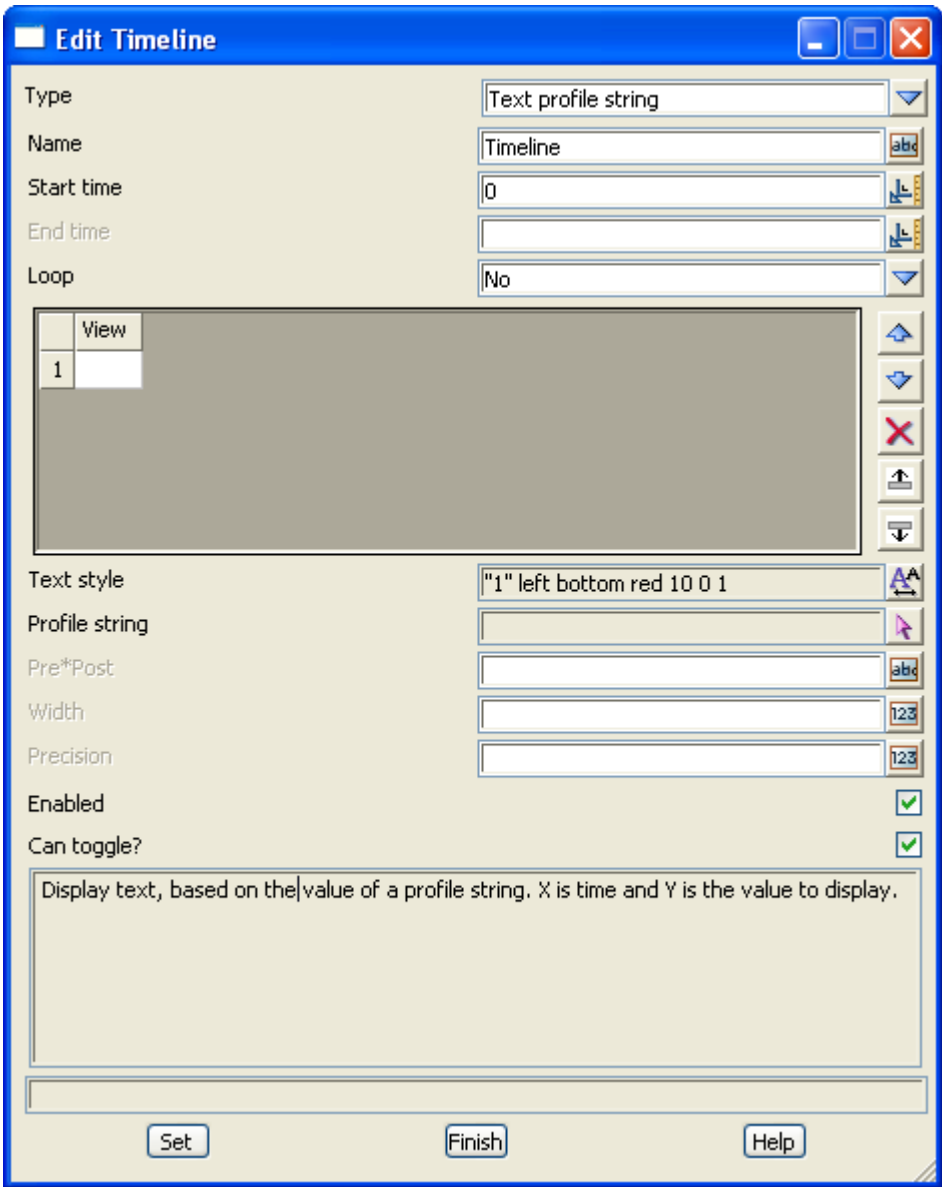
Pre*Post

*an optional pre*post to apply to the text*

For all other fields and buttons please see [Timeline Common Fields and Buttons](#).

Text Profile String Timeline

This edits the settings for a **Text Profile String Timeline**. A **Text Profile String Timeline** displays text as defined by a profile string, at each time step in the timeline. The profile string should be created with X being time and Y being the value to display.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

View grid

the list of OpenGL views to draw text on

Text style

the style of the text

Profile string

string select

the profile string to use

Pre*Post

*an optional Pre*Post to be applied to the text*

Width

an optional width of the text

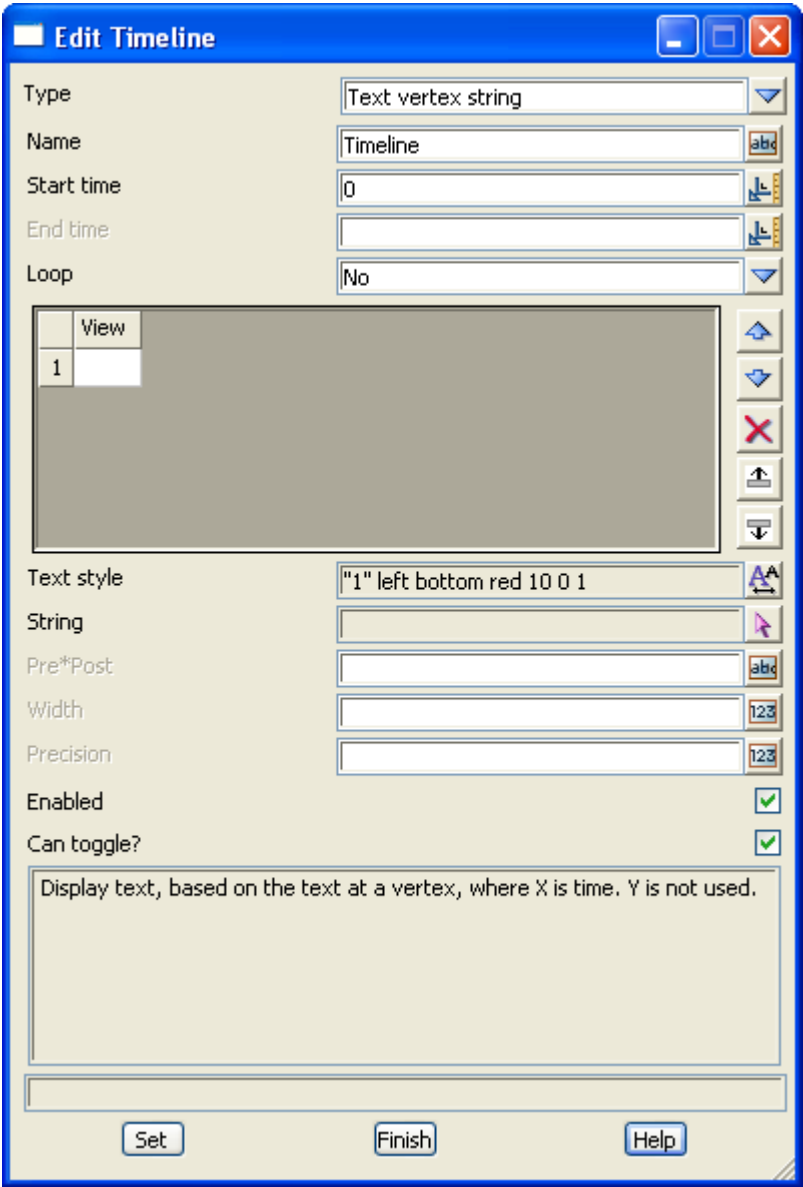
Precision

an optional precision for the text - used when displaying variables of type Real

For all other fields and buttons please see [Timeline Common Fields and Buttons](#).

Text Vertex String Timeline

This editor allows you to define the settings for a **Text Vertex String Timeline**. A **Text Vertex String Timeline** draws the text on the vertex of a supplied profile string at the given time. The string should be created such that X is time.



The fields and buttons used in the panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

View Grid

the list of OpenGL views to draw the text on

String

string select

the string to draw

Text style

the style of the text

Pre*Post

*an optional Pre*Post to be applied to the text*

Width

an optional width of the text

Precision

an optional precision for the text - used when displaying variables of type Real

For all other fields and buttons please see [Timeline Common Fields and Buttons](#).

Text Variable Timeline

This edits the settings for a **Text Variable Timeline**. A **Text Variable Timeline** displays text on a number of OpenGL perspective views, by specifying a variable or property of another timeline.

Each timeline publishes a number of variables or properties that can be used - such as start time, end time or other context specific items.

The 'Edit Timeline' dialog box is shown with the following fields and controls:

- Type:** Text variable
- Name:** Timeline
- Start time:** 0
- End time:** (empty)
- Loop:** No
- View:** A table with one row and one column, containing the number '1'.
- Source timeline:** (empty)
- Variable:** (empty)
- Text style:** "1" left bottom red 10 0 1
- Pre*Post:** (empty)
- Width:** 123
- Precision:** 123
- Enabled:** ☒
- Can toggle?:** ☒
- Description:** Display text, based on some variable of another timeline.
- Buttons:** Set, Finish, Help

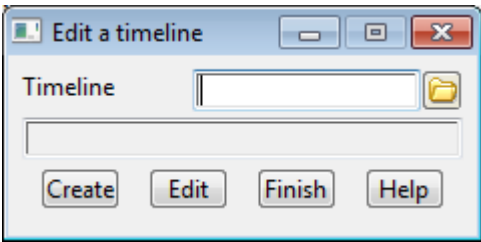
The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View grid			
<i>the list of OpenGL views to draw the text on</i>			
Source timeline			
<i>the timeline whose variable you wish to draw as text</i>			
Variable	choice box		
<i>the variable to be drawn</i>			
Text style			
<i>the style of the text</i>			
Pre*Post			
<i>an optional Pre*Post to be applied to the text</i>			
Width			
<i>an optional width of the text</i>			
Precision			
<i>an optional precision for the text - used when displaying variables of type Real</i>			

For all other fields and buttons please see [Timeline Common Fields and Buttons](#).

Edit a Timeline

Position of option on menu: View =>Visualisation =>Timelines => Edit
This panel creates a new timeline file or edits an existing one.
Selecting Edit brings up the Edit a timeline panel.



The fields and buttons used in the panel have the following functions.

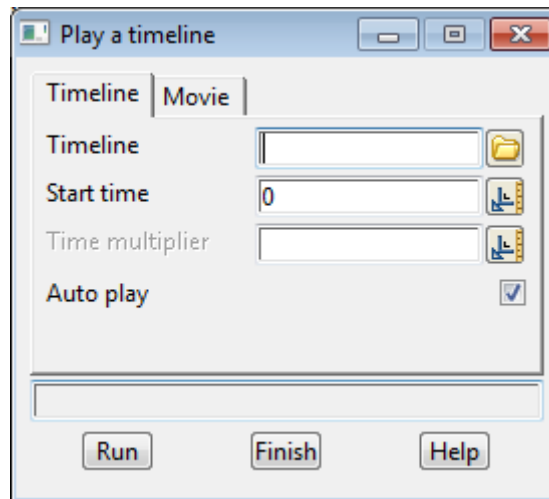
Field Description	Type	Defaults	Pop-Up
Timeline	file		
<i>the file to edit or create</i>			
Create	button		
<i>creates the new file</i>			
Edit	button		
<i>edits an existing timeline file</i>			

Play a Timeline

Position of option on menu: View => Visualisation => Timelines => Play

This panel plays a timeline file.

Selecting **Play** brings up the **Play a timeline** panel.



The fields and buttons used in the panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Timeline tab

Timeline		file		
-----------------	--	------	--	--

the timeline file to run

Start time

the time at which to start playing the file

Time multiplier

an optional multiplier (for example, setting this to 2 would run the timeline at 2x, meaning each second would take half a second to play)

Auto play		tick box		
------------------	--	----------	--	--

whether or not to start playing the timeline when it is run

Movie tab

Create movie?		tick box		
----------------------	--	----------	--	--

if ticked, a movie is generated

Movie file		file box		
-------------------	--	----------	--	--

name of the movie file

available *.avi files

Record whole application		tick box		
---------------------------------	--	----------	--	--

if ticked, the whole application will be recorded, rather than just a selected view

View		view box		
-------------	--	----------	--	--

(only if Record whole application is not ticked) the view of which to record the movie

Frames per second		number box	10	
--------------------------	--	------------	----	--

the number of frames per second

Buttons at bottom

Run

button

runs the timeline

Timeline Playback Control Bar

The timeline playback control bar appears when a timeline is running. It offers playback controls while the timeline runs.



The fields and buttons used in the panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Restart				
<i>Restarts the timeline</i>				

Step back				
<i>Steps back by the nominated time step (the input box on the right)</i>				

Play / Pause	/			
<i>Plays or pauses the playback of the timeline</i>				

Stop				
<i>stops running the timeline</i>				

Step forward				
<i>Steps forward by the nominated time step (the input box on the right)</i>				

Time multiplier				
<i>Sets the time multiplier. For more information on the Change Timeline Multiplier panel, please see Change Timeline Multiplier</i>				

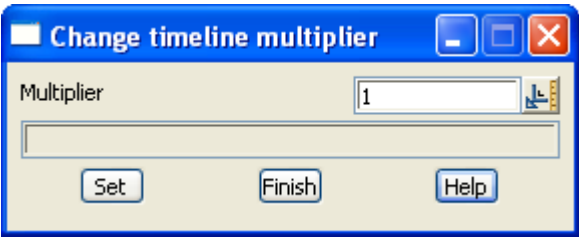
Interactive camera				
<i>Defines interactive cameras at runtime</i>				
<i>For more information on the Timeline Camera panel, please see Timeline Camera</i>				

Toggle				
<i>Toggles timelines enabled state on or off. For more information on the Enable/ Disable Timelines panel, please see Enable / Disable Timelines</i>				

Change Timeline Multiplier

This sets the current time multiplier for the timeline. For example, setting this to 2 would run the timeline at 2x, meaning each second would take half a second to play.

Clicking  on the **Timeline Playback Control Bar** brings up the **Change timeline multiplier** panel.



The fields and buttons used in the panel have the following functions.

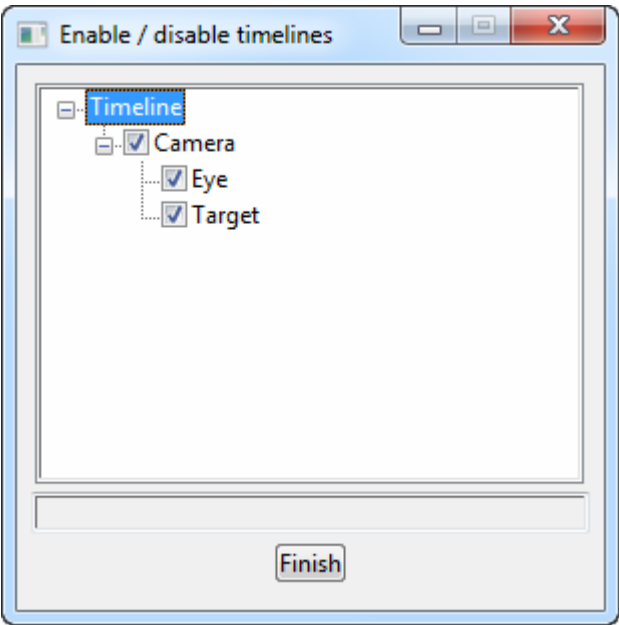
Field Description	Type	Defaults	Pop-Up
Multiplier <i>the multiplier to apply</i>	input		
Set <i>sets the multiplier</i>	button		

Enable / Disable Timelines


This panel provides a list of the timelines currently running and allows you to enable or disable them quickly. They can only be enabled or disabled if they are set to **Can toggle?**. Note that if you disable a parent, all child timelines will also be disabled. The **Can toggle?** tick box is found on the editor for each timeline.

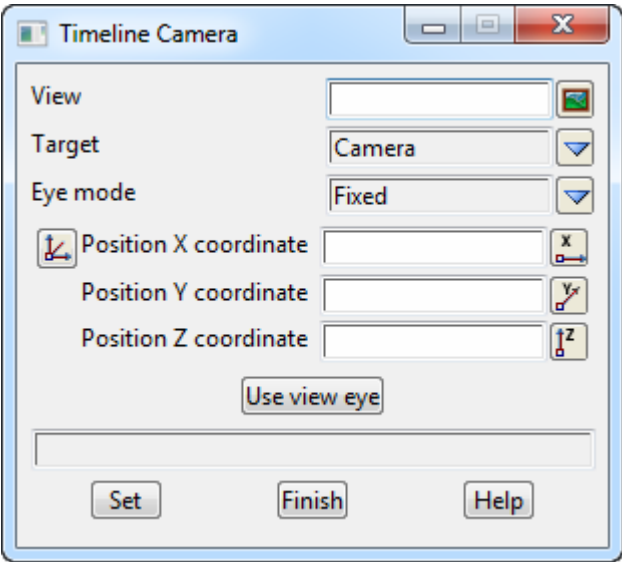
To disable, simply tick off the required timeline and vice versa to enable them again.

Clicking  on the **Timeline Playback Control Bar** brings up the **Enable/ disable timelines** panel.



Timeline Camera

This panel allows you to define cameras for a supplied view during run time.
Clicking  on the **Timeline Playback Control Bar** brings up the **Timeline Camera** panel.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>the perspective view to control</i>	view box		
Target <i>a target timeline to reference</i>	choice box		

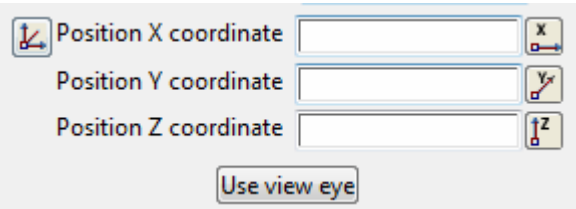
Eye Mode

choice box

Fixed, Offset, Floating

the mode for the eye of the camera, either fixed, offset or floating

Fixed



Position X coordinate
the x coordinate of the fixed eye

Position Y coordinate
the y coordinate of the fixed eye

Position Z coordinate
the z coordinate of the fixed eye

Use view eye *button*
loads the eye settings from the supplied view

Offset



Offset X
the x offset of the eye from the target

Offset Y
the y offset of the eye from the target

Offset Z
the z offset of the eye from the target

Floating

Floating mode sets the timeline camera into a floating mode. This means the camera will be set to a fixed target, but the user will retain control over the camera. When started, the camera will start at the current offset from the target.

Set

button

Creates and sets the details for the camera

Quick Timeline Create

Position of option on menu: View =>Visualisation =>Timelines => Quick timeline

This option creates a timeline along a selected Drive String, with the choice of a set of vehicles and/or a floating camera.

An optional Start and End chainage can be entered to limit the length of travel.

Enter a speed for the drive and an anchor tin for the four tyre anchor points of the vehicles.

The Calc Time button will calculate, in seconds, the travel time Duration at the selected speed.

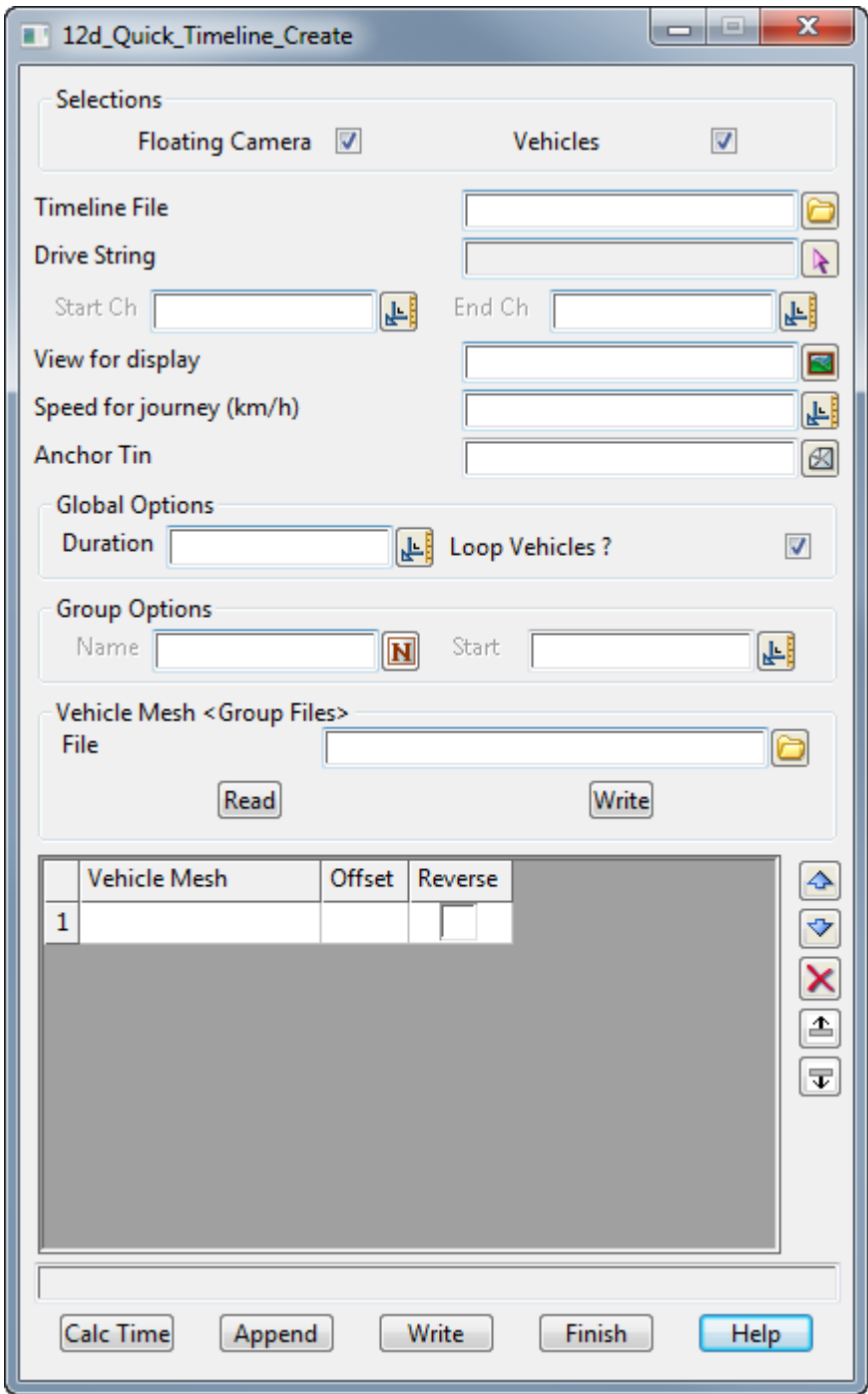
Vehicles are defined as meshes and can be Grouped together under a Name and a start time (in seconds)....optional.

Upon completing your selections (Drive String, Speed, Vehicles etc).... Save the selection using the Append button, and Write the file out.

Note: More than one Drive string and set of vehicles can be selected, appended and finally all written out in the same timeline file. Depending on the location of your drive string selection and its direction, you may have to enter an offset for the vehicles, and/or tick Reverse.

Once the timeline is written, it can be played under View=>Visualisation=>Timelines=>Play

Selecting **Quick timeline** brings up the 12d Quick timeline create panel.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
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Selections

Floating Camera	tick box	ticked
------------------------	----------	--------

A floating camera allows you to specify the floating eye component of a camera.

The target is defined as the Drive String, but during the playing of the timeline, the eye can be moved independently by the user (e.g. using the Orbit).

Vehicles	tick box	ticked
-----------------	----------	--------

Ticking this option on turns on appropriate fields for setting up timelines for vehicles.

Timeline File file box available files

If non-blank, entry used as timeline file name.

Drive String string select

If selected, string is used as timeline drive string and timeline duration can be calculated.

If non-blank, entry used as timeline file name.

Start Ch real

If non-blank, entry used as start of timeline...optional.

End Ch real

If non-blank, entry used as end of timeline...optional.

View for display view box available views

If non-blank, entry used to play back the timeline (an Open GL Perspective View is required).

Speed for journey (km/h) real

If non-blank, entry used to calculate the timeline duration in seconds.

Anchor Tin tin box

If non-blank, entry used as the location for the four vehicle tyre points.

Global Options

Duration real

If non-blank, entry used as timeline length (can be calculated initially via the Calc Time button).

Loop Vehicles? tick box ticked

If ticked, the set of vehicles will be replayed during the timeline.

Group Options

Name name box

If non-blank, entry used for the grouping of the vehicles under that name and can be toggled off during the playing of the timeline...optional.

Start real

If non-blank, entry used for start time of the group (in seconds)...optional.

Vehicle Mesh <Group Files>

File file box

If non-blank, entry used for populating the grid selection of vehicle meshes.

Refer library for standard examples.

Read button

Reads in the file above and populates the vehicle grid.

Write button

Writes out the data currently in the vehicle grid to the file.

Vehicle Mesh Grid:

Vehicle Mesh

Vehicle choices (can be viewed under View=>Visualisation=>Meshes=>Mesh library

Offset Real

If non-blank entry used for offset from drive string

Reverse tick box not ticked

If ticked, vehicles will run in the opposite direction to the drive string direction.

Calc Time button

Calculates the time of travel in seconds using the Drive String and Speed of journey.

Append button

One or more timelines (Drive String, speed, vehicle etc) can be appended, before finally being written out to the timeline file.

Write button

After appending, the Timeline File is written out.

Utilities

Position of menu: View =>Visualisation =>Utilities

The Utilities walk-right menu is

Visualise Utilities	
Clouds	create box of clouds as background
Sky dome	create sky dome of clouds as background
Billboards on strings	change billboards on super strings
Fences	inserting fences
Forest	create forest
Houses	insert houses
Line marking	create strings for line marking
Line marking (New)	
Roadside furniture	insert fences, guard rails, signs, walls etc.
Trees/shrubs	insert trees and shrubs as billboards
Trees/shrubs faces	insert trees and shrubs as faces
Traffic signals	
Colour within polygon	colour within a polygon
Explode (text)	explode text into vectors so it can be draped onto surface
Head to tail faces	
Create plan images from JPEG's	

For the option *Clouds* go to the section

Sky dome

Billboards on strings

Fences

Forest

Houses

Line marking

Line marking (New)

Roadside furniture

Trees/shrubs billboards

Trees/shrubs faces

Traffic signals

Colour within polygon

Explode (text)

Head to tail faces

Create plan images from JPEG's

[Clouds](#)

[Sky dome](#)

[Create and Place Billboard](#)

[Fences](#)

[Create Forest](#)

[Houses](#)

[Line Marking](#)

[Line Marking \(New\)](#)

[Roadside Furniture](#)

[Trees/Shrubs as Faces and Billboards](#)

[Trees/Shrubs as Faces and Billboards](#)

[Traffic Lighting Placement](#)

[Colour Within Polygon](#) in the chapter [Triangles](#)

[Explode Text](#) in the chapter [Utilities](#)

[Head to tail faces](#)

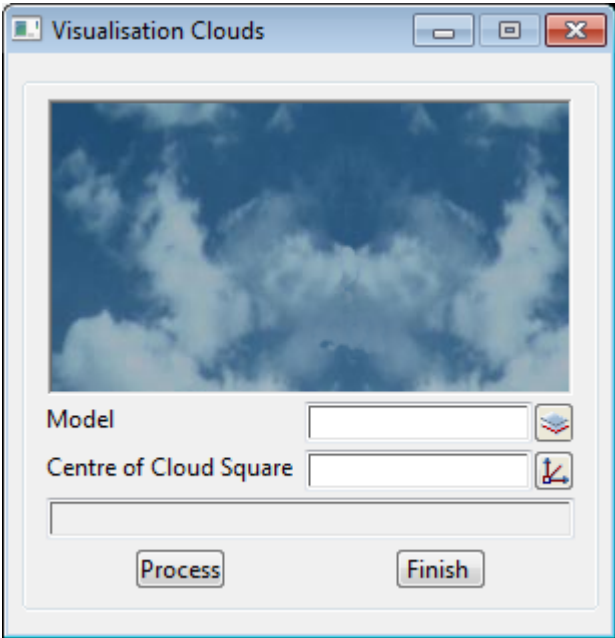
[Create Plan Images from JPEG Files](#)

Clouds

Position of option on menu: View =>Visualisation =>Utilities =>Clouds

This option is used to create a square box around the view with the cloud image on the inside of it. From within a scene, this will then appears as a sky with clouds as the background.

On selecting the Clouds option, the Visualisation Clouds panel is displayed:



The fields and buttons used in the panel have the following functions.

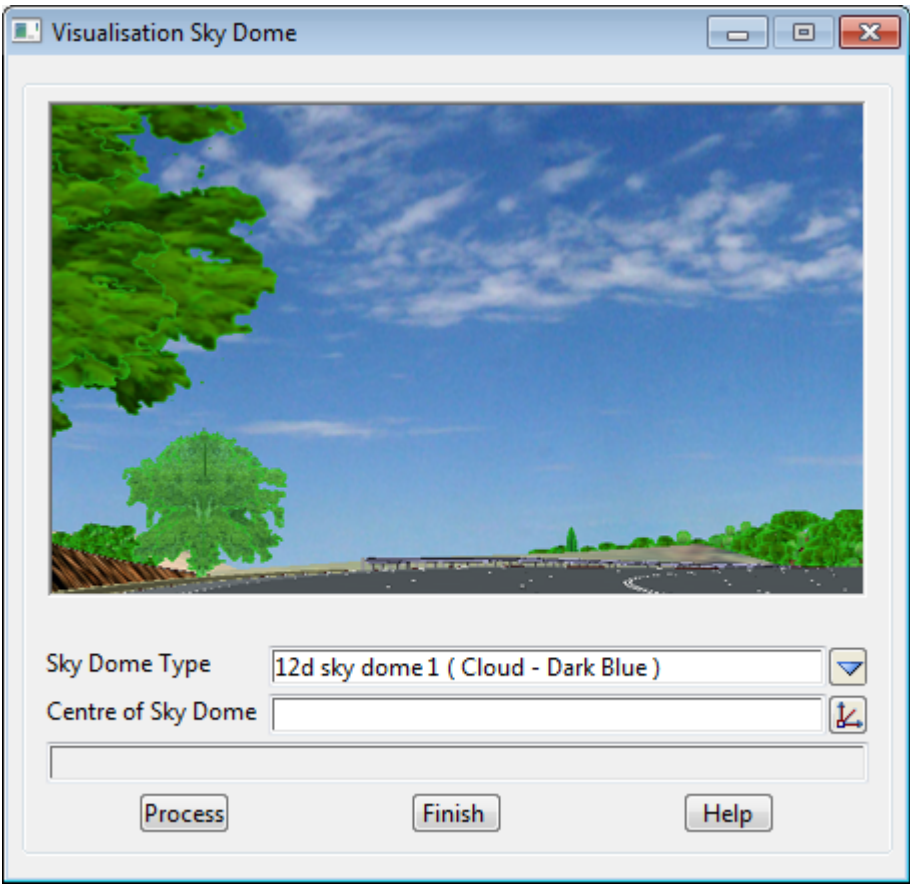
Field Description	Type	Defaults	Pop-Up
Model <i>model to place the cloud square in.</i>	model box		available models
Centre of cloud square <i>give the x y z co-ordinates for the centre of the cloud square.</i>	xyz box		position select
Process <i>create the cloud square.</i>	button		

Sky dome

Position of option on menu: View =>Visualisation =>Utilities =>Sky dome

This option reads in a 12da of a triangulation and a raster image to form a dome, that represents the sky.

On selecting the Sky dome option, the **Visualisation Sky Dome** panel is displayed:



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Sky Dome Type	choice box		Drop down selection available, with a preview above.
<i>12d Sky Dome 1 (Cloud - Dark Blue)</i>			
<i>12d Sky Dome 2 (Cloud - Haze)</i>			
<i>12d Sky Dome 3 (Cloud - Light Blue)</i>			
<i>12d Sky Dome 4 (Cloud - Snow Mtns)</i>			
<i>12d Sky Dome 5 (Clear Sky)</i>			
Centre of Sky Dome	valid x,y,z		
Process	button		
<i>Read in data from Library and translate to centre coords</i>			
Model Format			

12d Sky Dome Data	(3 dimensional data for the triangulation)
12d Sky Dome Tin	(3 dimensional triangulation)
12d Sky Dome 1 Raster	(2 dimensional raster for the triangulation)

Note:

More than one sky type can be read in and used but the selected raster is then applied to the same tin.

To view the sky dome in the OpenGL perspective view, add the **12d Sky Dome Tin model** only to the view.



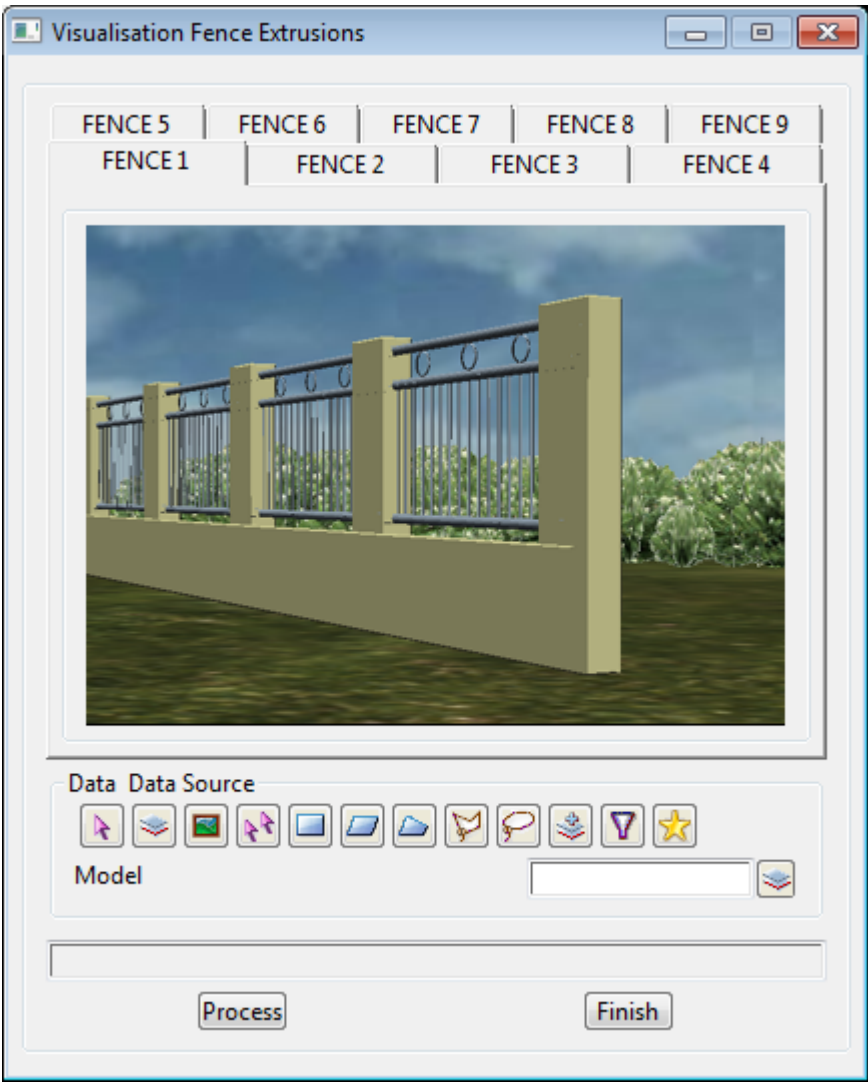
Fences

Position of option on menu: View =>Visualisation => Extrusions =>Fences

This option is for extruded 12d Solutions supplied fences along strings.

The list of fences is being continuously upgraded by 12d Solutions.

Selecting the Fences brings up the **Visualisation Fence Extrusions** panel.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Clicking on the tabs brings up the type of fence to be extruded along selected super strings.			
Data source type	Model		
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source	input		
<i>source of super string to extrude fences along</i>			
Process	button		
<i>apply the fence to the selected super strings</i>			

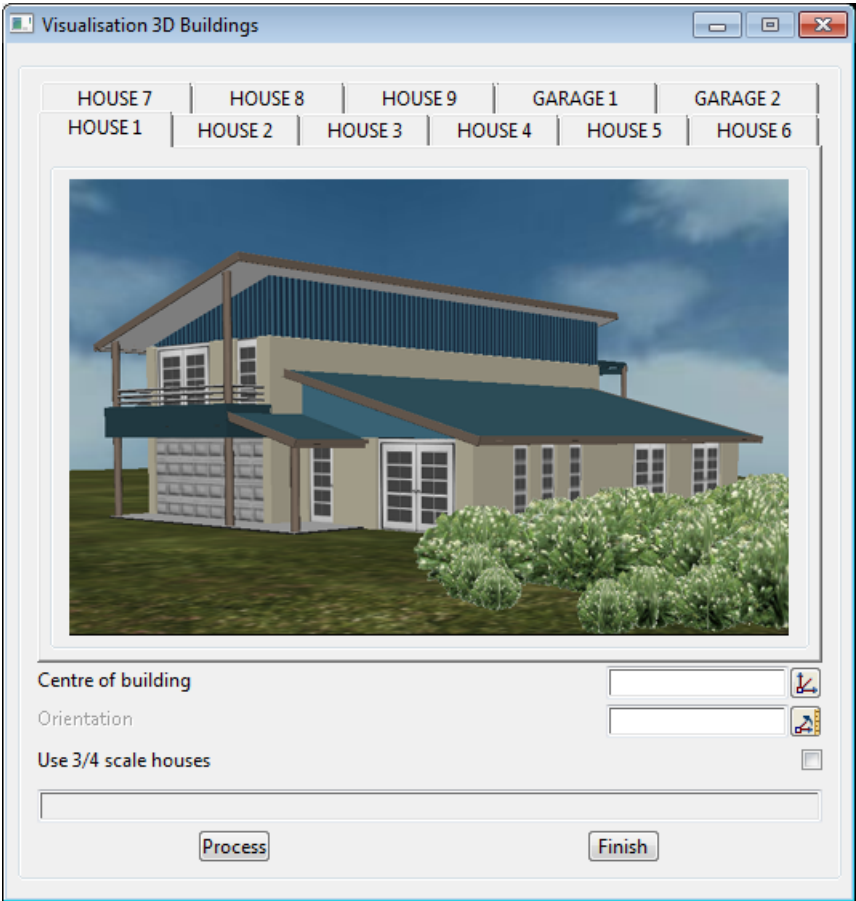
Houses

Position of option on menu: View =>Visualisation => Utilities =>Houses

This option is for inserting 12d Solutions supplied houses.

The list of houses is being continuously upgraded by 12d Solutions.

Selecting the Houses brings up the Visualisation 3D Buildings panel.



The fields and buttons used in the panel have the following functions.

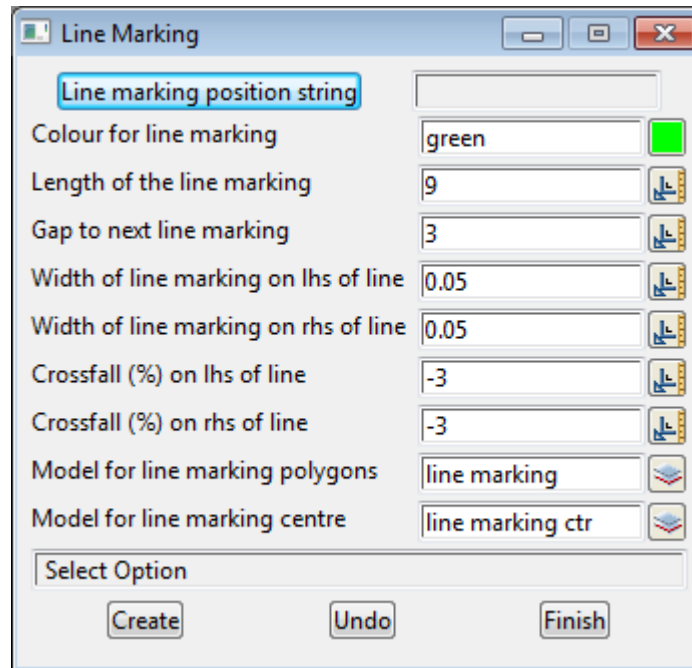
Field Description	Type	Defaults	Pop-Up
Clicking on the tabs brings up the type of house to be inserted.			
Centre of building	xyz box		position select
give the x y z co-ordinates for the centre of the base of the inserted building			
Orientation	angle box		angle select
give the angle to orient the building			
Process	button		
insert the selected building			

Line Marking

Position of option on menu: View =>Visualisation =>Utilities => Line marking

This option is used to create polygon data in 3d representing the line marking on a road. The polygons can then be included in the design tin for triangulating and the “Colour Triangles Within a Polygon” option used to colour the triangles for use in shades and renderings.

The line marking polygons created by the option represents a dashed line style centred around the selected line marking string marking the position of the dashed line. The length and separation of the dashed lines are user defined and the width of the dash is defined by a width to the left and a width to the right of the line marking string.



The fields and buttons used in this panel have the following functions:

Field	Description	Type	Defaults	Pop-Up
line marking position string	string select <i>select the string to define the position of the line marking on the road. The string will also provide z-values for use in creating the line marking.</i>			
Colour for line marking	input box <i>colour for the line marking polygons.</i>		green	available colours
Length of the line marking	input box <i>length of each line mark dash.</i>		9	
Gap to next line marking	input box <i>distance between the line marking dashes.</i>		3	
Width of line marking on lhs of line	input box <i>width of the line marking on the left hand side of the line marking position string.</i>		0.05	
Width of line marking on rhs of line	input box <i>width of the line marking on the right hand side of the line marking position string.</i>		0.05	
Crossfall (%) on lhs of line	input box <i>cross fall for the part of the line marking on the left hand side of the line marking position string (so z-</i>		-3	

values for the polygon can be calculated).

Crossfall (%) on rhs of lineinput box -3
cross fall for the part of the line marking on the right hand side of the line marking position string (so z-values for the polygon can be calculated).

Model for line marking polygons model box line marking available models
model for the polygons representing the line marking.

Model for line marking centre model box line marking ctr available models
model for a string with just the part of the line marking position string which is inside the line marking polygons.

Create button
run the option and create the line marking polygons.

Undo button
undo the last set of polygons created since the panel was up.

Line Marking (New)

Position of option on menu: View =>Visualisation =>Utilities => **Line marking (New)**

This option is made up of several parts.

1. Create line marking polygons:

The drop down menu has a list of linemarking definitions, that match the linestyle in 12d.

The length, gap and width values are used to create polygons along the strings selected.

Fill in the Linemarking model, colour and the optional tin (used to drape the polygons).

2. Apply Extrusions Only:

In this option extrusions are matched to linestyles, rather than producing individual polygons.

3. Pavement Arrows:

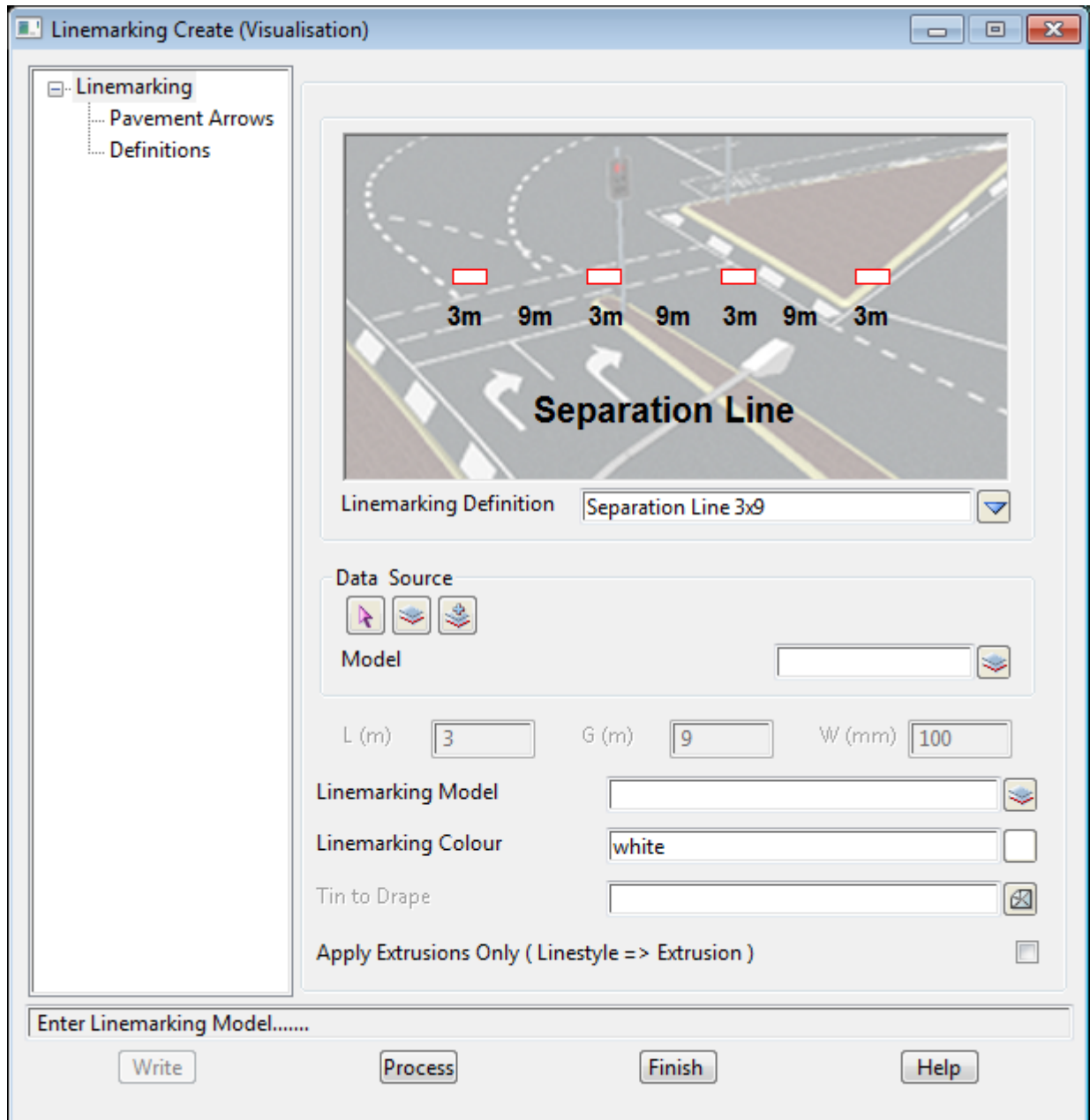
In this option polygons are created from the symbol definition.

Single Arrows can be placed, using the **Dynamic Orientation** button to select an x,y point on screen.

Multiple Arrows:

Arrow Edge Line Reference	"Pick with direction" along a string
Arrow Spacing	Distance apart
Arrow Offset	Relative to the directional pick
Arrow Start Point	If you select a right turn lane string, picking with direction towards an intersection, then the start point would be at the intersection and subsequent arrows placed at the Arrow Spacing away from the intersection.

Selecting **Line marking (New)** brings up the **Linemarking Create (Visualisation)** panel.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Linemarking Menu

Linemarking Definition	choice box	Separation Line 3x9	various
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selected definition is displayed in draw box above

Data source		Model	
--------------------	--	-------	--

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Linemarking Model	model box		select model
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model name for linemarking

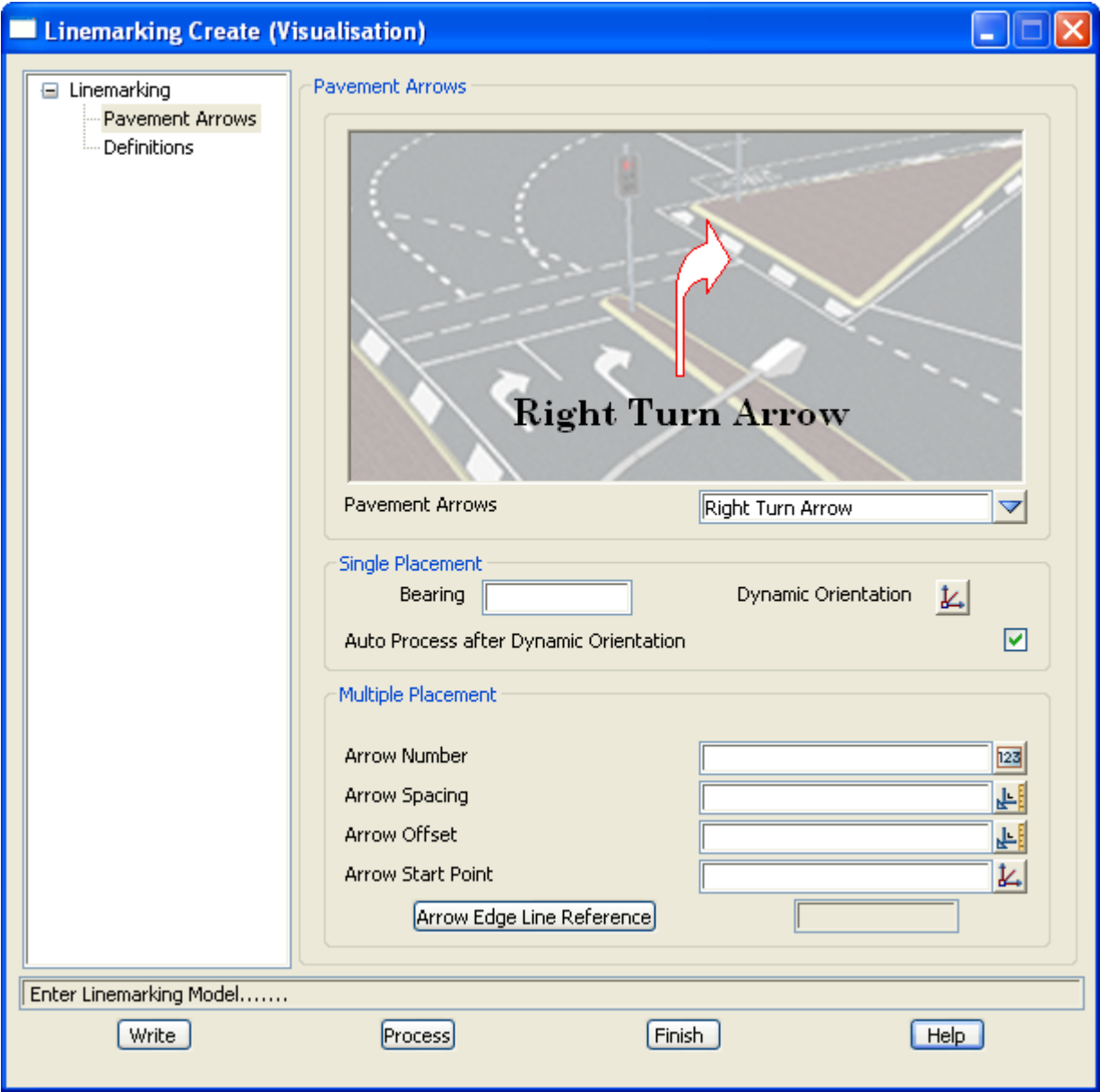
Linemarking Colour	input	white	available colours
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the colour of linemarking polygons or arrows

Tin to Drape input select tin
if non-blank, then the strings created are draped onto this tin

Box Offset input 10
Distance to place the IP Info boxes from the IP

Apply Extrusions Only (Linestyle => Extrusion) tick box
If ticked, extrusions are matched to linestyles in the data source, rather than producing individual polygons



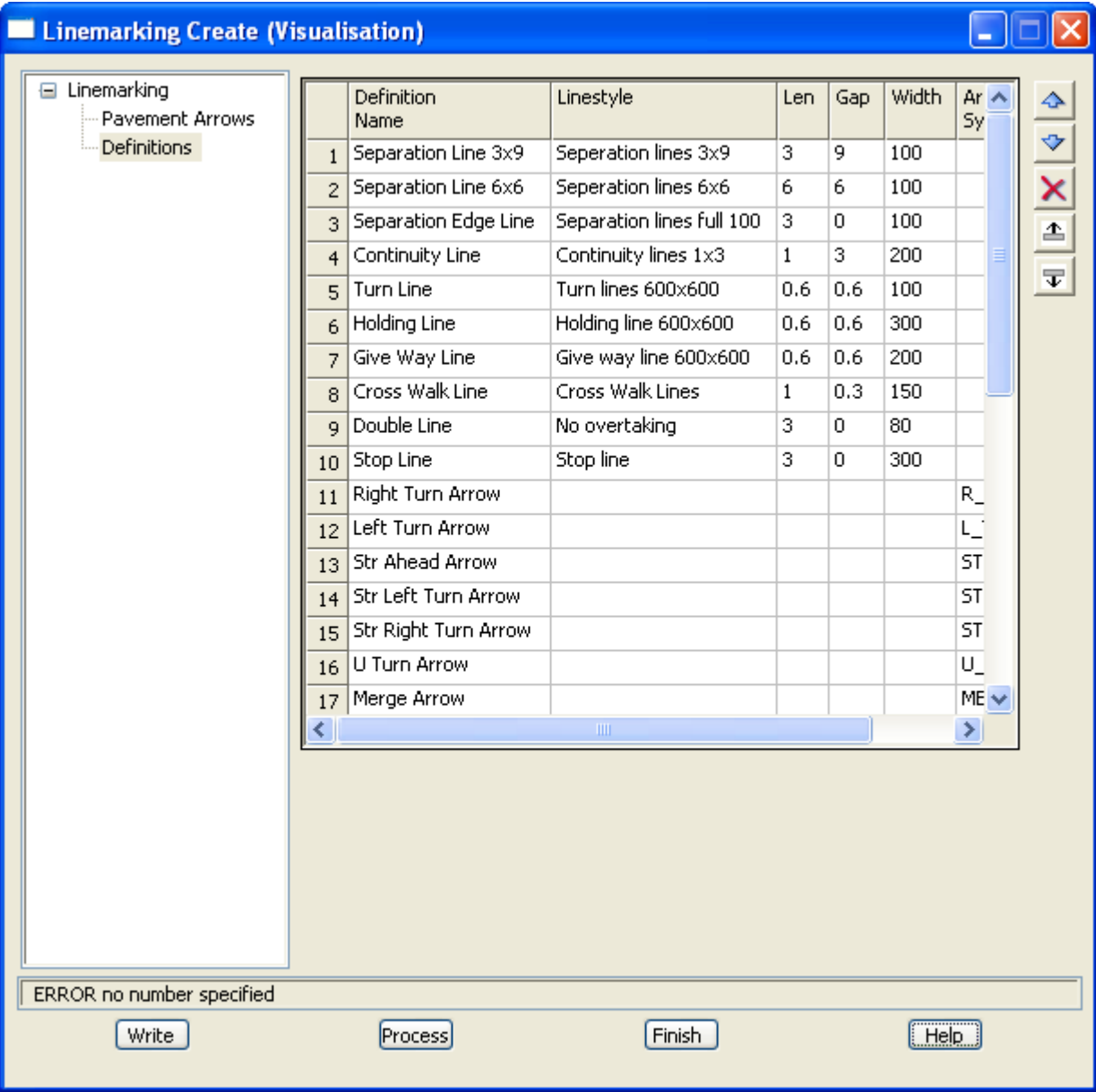
Field Description	Type	Defaults	Pop-Up
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Pavement Arrows Menu

Pavement Arrows	choice box	Right Turn Arrow	various
------------------------	------------	------------------	---------

selected arrow type is displayed in draw box above

Single Placement:**Bearing** real*enter bearing if doing a single arrow placement, rather than dynamic***Dynamic Orientation** xyz pick*select point, look for rotating arrow if auto process ticked on***Auto Process after Dynamic Orientation** tick box*If ticked, auto rotation activated after insertion point is accepted***Multiple Placement:****Arrow Number** integer*number of arrows required***Arrow Spacing** measures boxAt Point, Point to Point,
String from Point, String
to Point)*interval distance along arrow edge string to place arrows***Arrow Offset** measures boxAt Point, Point to Point,
String from Point, String
to Point)*offset from arrow edge string***Arrow Start Point** xyz pick*Example: If you select a right turn lane string, picking with direction towards an intersection,
then the start point would be at the intersection and subsequent arrows placed at the **Arrow Spacing**
away from the intersection.***Arrow Edge Line Reference** select pick*reference and orientation string for arrows..."pick with direction"*



Definitions

A default file [12d_linemarking.def] is read in from the library and saved to the.project area.
Edits can be carried out to the following definitions.

Field Description	Type	Defaults		Pop-Up
Definition	Linestyle	Len	Gap	Width
Separation Line 3x9	Separation lines 3x9	3	9	100
Separation Line 6x6	Separation lines 6x6	6	6	100
Separation Edge Line	Separation lines full 100	3	0	100
Continuity Line	Continuity lines 1x3	1	3	200
Turn Line	Turn lines 600x600	0.6	0.6	100
Holding Line	Holding line 600x600	0.6	0.6	300
Give Way Line	Give way line 600x600	0.6	0.6	200
Cross Walk Line	Cross Walk Lines 1x0.3	1	0.3	150

Double Line	No overtaking	3	0	80
Stop Line	Stop line	3	0	300

Arrow Symbol

Right Turn Arrow	R_TURN
Left Turn Arrow	L_TURN
Str Ahead Arrow	ST_AHEAD
Str Left Turn Arrow	ST_L_TURN
Str Right Turn Arrow	ST_R_TURN
U Turn Arrow	U_TURN
Merge Arrow	MERGE

Write button

Write out any definition changes to 12d_linemarking.def

Process button

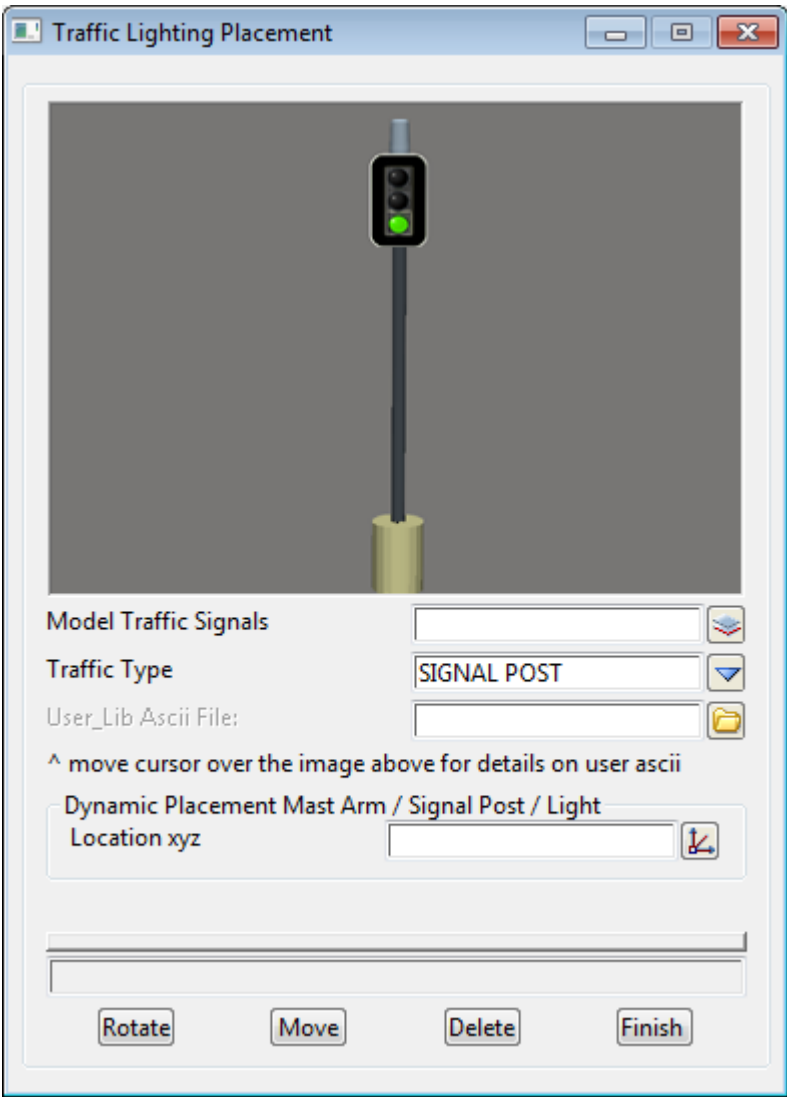
Runs and creates the linemarking

Traffic Lighting Placement

Position of option on menu: View =>Visualisation =>Utilities =>Traffic signals

This section of documentation is a work in progress and will be updated in subsequent releases.

On selecting the Traffic signals option, the **Traffic Lighting Placement** panel is displayed:



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Model Traffic Signals	model box		available models
Traffic Type	choice box	SIGNAL POST	available choices
User_Lib Ascii File:	file		
Location xyz			
Rotate	button		
Move	button		
Delete	button		

Colour Within Polygon

Position of option on menu: View =>Visualisation =>Utilities =>Colour within polygon

This option colours triangles in a tin. It has already been documented as

Tins =>Colour =>Colour within polygon

in the section [Colour Within Polygon](#) in the chapter [Triangles](#).

Explode Text

Position of option on menu: View =>Visualisation =>Utilities =>Explode text

This option explodes text into lines and arcs. It has already been documented as

Utilities =>A-G => Explode text

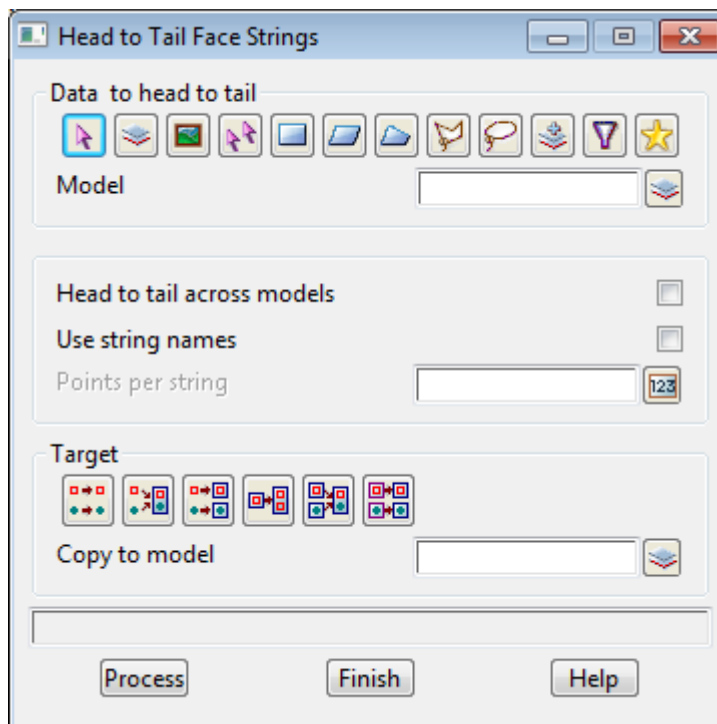
in the section [Explode Text](#) in the chapter [Utilities](#).

Head to tail faces

Position of option on menu: View =>Visualisation =>Utilities =>Head to tail faces

This section of documentation is a work in progress and will be updated in subsequent releases.

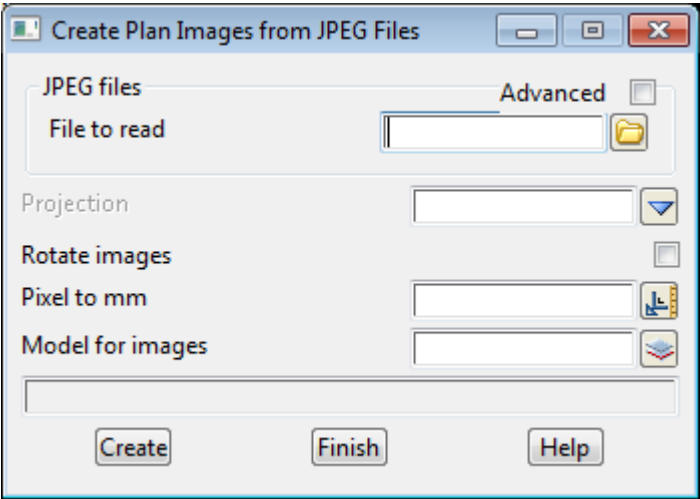
Selecting Head to tail faces brings up the **Head to Tail Face Strings** panel.



Create Plan Images from JPEG Files

Position of option on menu: View =>Visualisation =>Utilities =>Create plan images from JPEG's

Selecting Create plan images from JPEG's brings up the **Create Plan Images from JPEG Files** panel.



The fields and buttons used in the panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Advanced		tick box	not ticked	
-----------------	--	----------	------------	--

*clicking **Advanced** brings up a grid to allow the user to enter many JPEG files.*

File to read		file box		available *.jpg files
---------------------	--	----------	--	-----------------------

the JPEG files to read in and create images from. The JPEG file must include EXIF and GPS information, which is used to position the image. If Projection is not blank, then it is used to convert the lat/long of the GPS values to the XYZ co-ordinates. If Projection is blank, then the co-ordinates are left as lat/long.

Projection		choice box		
-------------------	--	------------	--	--

if a Project Projection is set, then it is placed in the Projection field. This can be changed to any other projection. The projection is used to convert the lat/long of the GPS values to the XYZ co-ordinates. If no projection is set, then the co-ordinates are left as lat/long.

Rotate images		tick box	not ticked	
----------------------	--	----------	------------	--

*if **ticked**, the rotate value from the EXIF will be used to rotate the image.*

Pixel to mm		input box		
--------------------	--	-----------	--	--

*the units for images are pixels (width and height). The pixel width and height of the image are multiplied by the **Pixel to mm** (mm being millimetres) value to give width and height size in world unit (metres) which is needed when inserting the image.*

Model for images		input box		
-------------------------	--	-----------	--	--

the model for the image to be inserted into.

Create		button		
---------------	--	--------	--	--

*when all the fields have been entered, the **Create** button creates images from the selected files.*

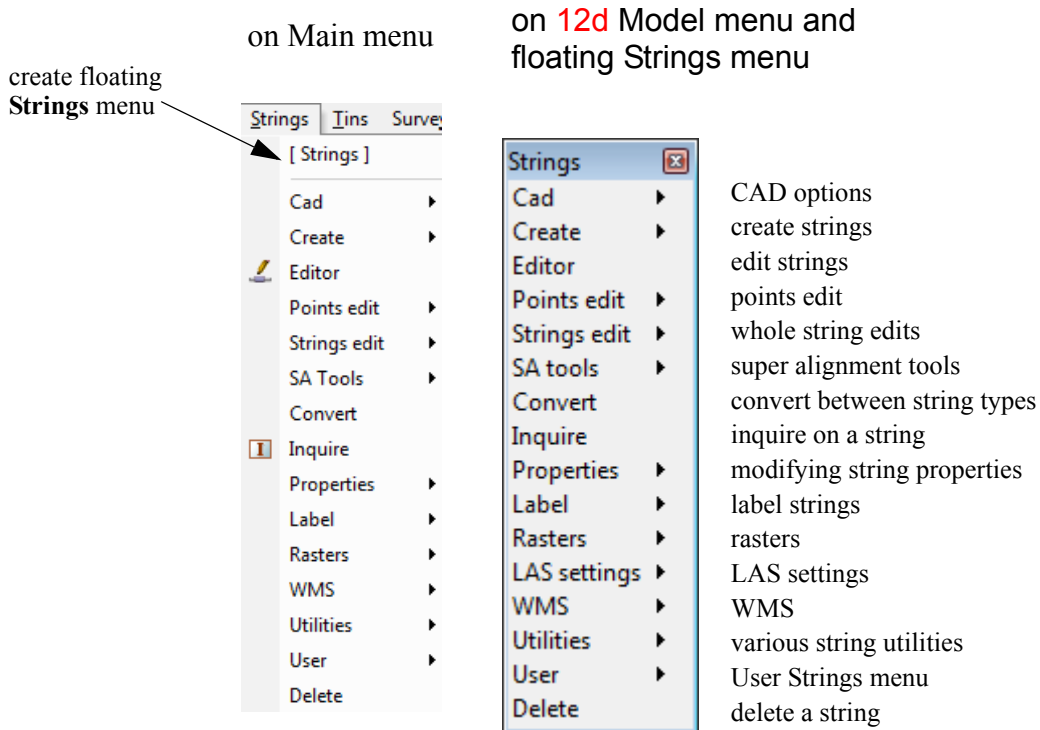
16 Strings

Position of menu: Strings

Strings are the basic modelling elements of 12d Model.

The Strings walk-right menu contains options to create, edit and manipulate strings in a variety of ways including copying, moving strings between models and deleting strings.

The Strings walk-right menu is



For the option CAD, go to [CAD](#)

Create [Create](#)

Editor [Editor](#)

Points edit [Points Edit](#)

Strings edit [Strings Edit](#)

SA Tools [SA Tools](#)

Convert [Convert](#)

Inquire [Inquire](#)

Properties [Properties](#)

Label [Label](#)

Rasters [Rasters](#)

LAS settings [Point Clouds](#)

WMS [WMS](#)

Utilities [Utilities](#)

User [User](#)

Delete [Delete](#)

Note

For the floating menu, the **Strings** option has another mode of operation. Rather than moving onto the walk-right arrow, if LB is clicked when the **strings** button is highlighted on the 12d Model menu, the **String inquire** panel is displayed on the screen. Unfortunately this does not work on the *Main* menu.

CAD

Position of option on menu: Strings =>CAD

In **12d Model** there are CAD options which are available under both the Strings =>CAD menu and flyouts on the *CAD Toolbar* which by default, is on the left hand side of the **12d Model** screen.

The CAD options create and edit strings using a variety of methods and are fully described in the section [CAD Options](#).

The *strings* created by the *CAD menu* or *CAD toolbars* use values in the three *controlbars* (**Cad Controlbar**, **Symbol Controlbar**, and **Text Controlbar**) to define string attributes such as name, model and colour.

So the controlbars will be described in full in the section [CAD, Symbol and Text Controlbars](#) before the CAD options.

For basic information on toolbars and controlbars, see the section [Toolbars and Controlbars](#) in the chapter [Tools and Concepts](#).

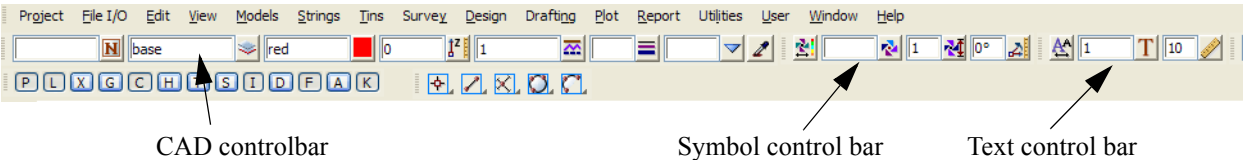
The CAD options create various elements using a number of methods. These options make use of **Tool bars** and **Control bars**. Tool bars just have icons on them but Control bars have icons and also controls such as a model box on them. The method groupings are shown on the toolbars (e.g. Points, Lines etc.).

For details on each of the walk rights menus on the CAD menu, go to the section [CAD Options](#)

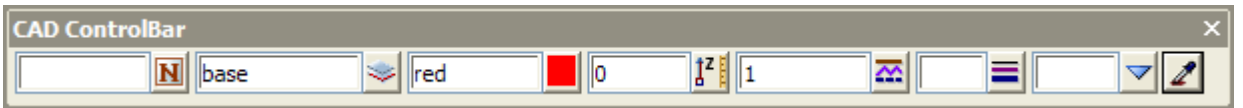
For details on the Controlbars go to the section [CAD, Symbol and Text Controlbars](#)

CAD, Symbol and Text Controlbars



This default position of the *controlbars* is on the top left hand side of the screen under the main menu.



CAD Controlbar



The fields and buttons used in CAD controlbar have the following functions.

Field	Description	Type	Defaults	Pop-Up
	<i>name of string. If a valid name already exists in names.4d, the + button can be used to bring up a choice box of available names. On selection of a valid name, the rest of the values in the control bar will be filled out. e.g. colour, linetype etc.</i>	name box		names.4d names
		model box	cogo	existing models

this field can be recognised by the model icon button on the right hand side of the field. The user can select an existing model by selecting the model icon. If a new model is to be used, the user simply types the model name into the field.



colour box red standard 12d colours

this field can be recognised by the colour icon button on the right hand side of the field. The user can select a 12d standard colour model by selecting the colour icon



input height measures menu

this field allows a height or z value to be assigned to the created elements. If a valid value exists, this value will be applied to the created element. This is regardless if the z value was specified in an XYZ box. If blank, the null value is used.

If no value is specified, the level will be interpolated where possible. A value of null can be entered into the height field as well so that created vertices will be given a null height value.



linetype box 1 valid linestyles

this field can be recognised by the linestyle icon button on the right hand side of the field. The user can select a valid linestyle by selecting the linestyle icon.



weight box

this field can be recognised by the weight icon button on the right hand side of the field. The user can type in the required weight (millimetres on the plot). If blank, no weight is assigned.



tinability box no, yes, points

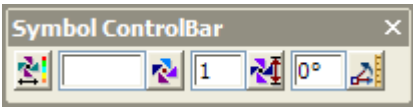
the choices in this field set the tinability for the string.
If **no**, no vertices or segments in the string are tinable.
If **yes**, all vertices and segments in the string are tinable.
If **point**, all vertices in the string are tinable but not the segments.







button

the eye dropper allows the user to select an existing element which will define the cad control bar values.

Symbol Controlbar



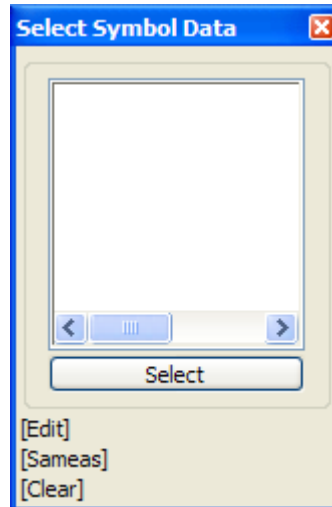
The fields and buttons used in Symbol controlbar have the following functions.

Field Description	Type	Defaults	Pop-Up
The  symbols data box allows a symbols favourite to be selected and fill the other boxes. The symbols data box will be described after the other controls.			
	symbols box		valid symbols
this field can be recognised by the symbol icon button on the right hand side of the field. The user can select a valid symbol by selecting the symbol icon.			
	input		size measures menu
this field gives the size of the created symbols. If a valid value exists, this value will be applied to the created symbol.			
	input		angle measures menu
this field gives the angle of the created symbols. If a valid value exists, this value will be applied to the created symbol.			

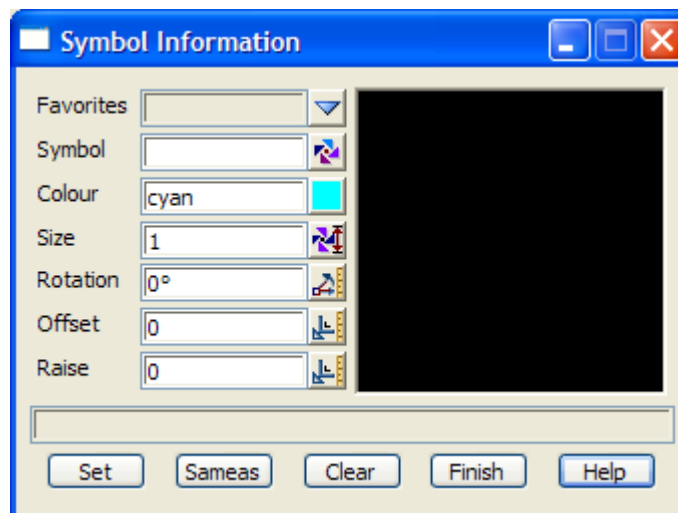


Symbols data box

on pressing the button a list of available symbols data predefined names read from the **symbols_names.4d** file are displayed. If a symbols data is selected, the values are used for the other Symbol Controlbar fields.



If no names exist, the user can edit the current settings by selecting the edit button and bring up the **Symbols Information** panel. This allows for definition of symbol colour, sized, rotation, offset and raise.



Text Controlbar

Text can occur as a text string, or on vertices and segments of a super string.

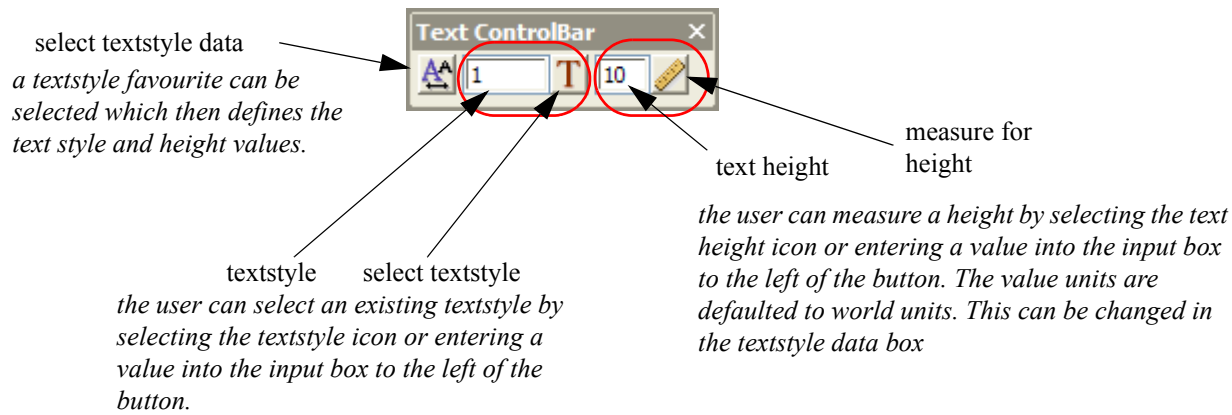
Each type of text has a vertex (these are displayed when Vertices are toggle on in a plan view), a justification point, a rotation, an offset and raise value.

The vertex and justification point only coincide if the offset and raise values are both zero. What parts of the text on a super string vertex or segment that can be independently modified depends on the settings for the super string.


For the CAD text options, the created elements will have attributes as defined by the **Text**

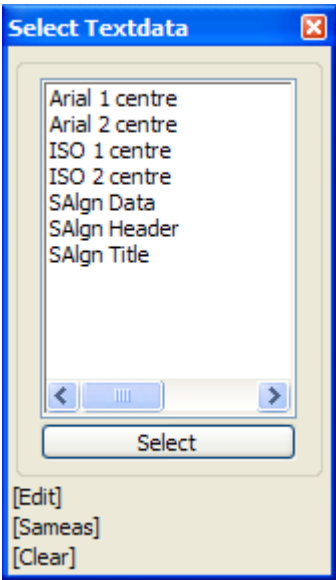
Controlbar. The default position of the Text Controlbar is in top middle of the screen under the main menu.

The **Text Controlbar** is

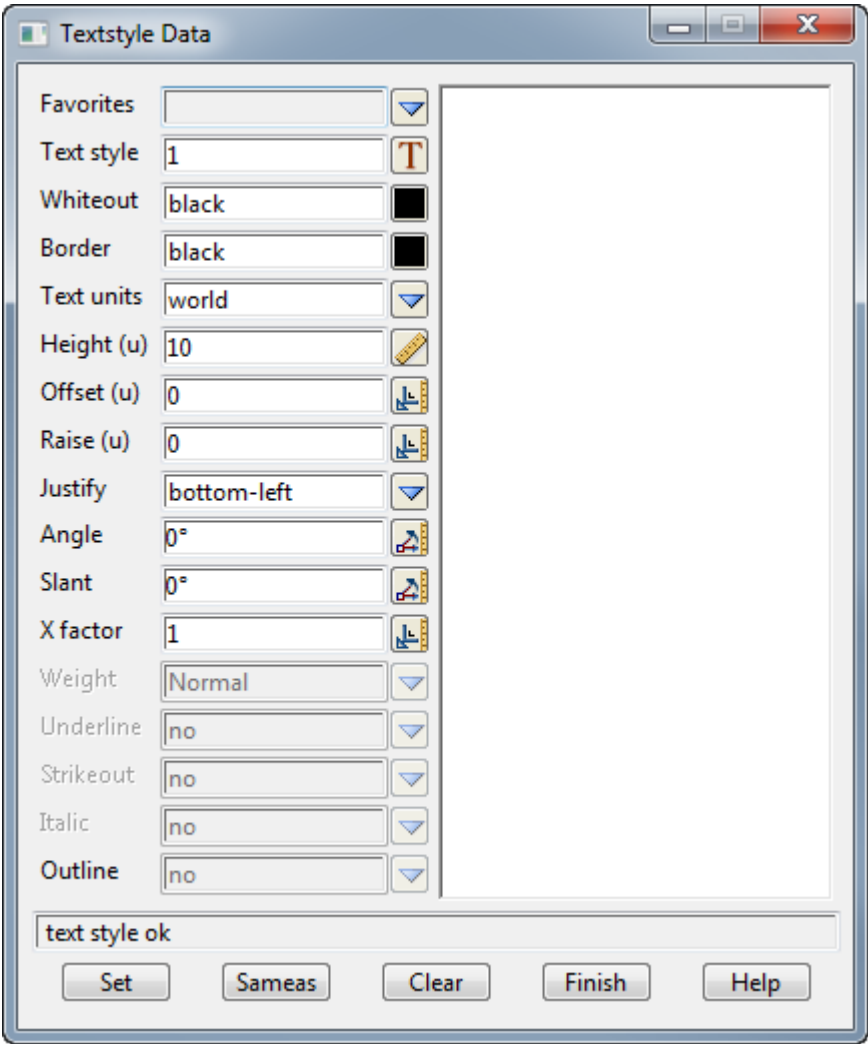


The operation of the Textstyle data box is as follows:

 **Textstyle data box**
on pressing the button a list of available textdata predefined names read from the **textstyle_names.4d** file are displayed.



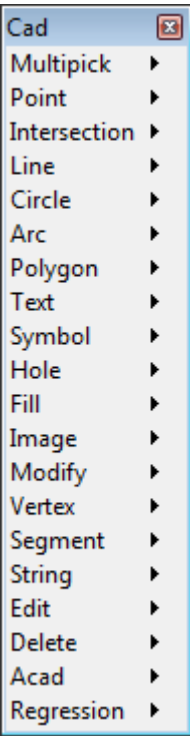
If no names exist, the user can edit the current settings by selecting the edit button and bring up the **Textstyle Data** panel. This allows for definition of textstyle, units, height offset raise etc.



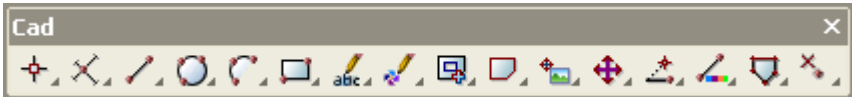
CAD Options

The CAD options are available from the CAD menu or from the CAD toolbar. The CAD toolbar is a flyout toolbar.

The CAD walk-right menu is



and the CAD Toolbar is



The string creation process is similar for each string type and for editing strings as well. On selecting the appropriate option, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

For the option *Multipick*, go to

<i>Multipick</i>	CAD Multipick
<i>Point</i>	CAD Point
<i>Intersection</i>	CAD Intersection
<i>Line</i>	CAD Line
<i>Circle</i>	CAD Circle
<i>Arc</i>	CAD Arc
<i>Polygon</i>	CAD Polygon
<i>Text</i>	CAD Text
<i>Symbol</i>	CAD Symbol
<i>Hole</i>	CAD Hole
<i>Fill</i>	CAD Fill
<i>Image</i>	CAD Image
<i>Modify</i>	CAD Modify
<i>Vertex</i>	CAD Vertex

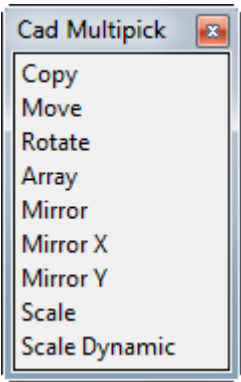
<i>Segment</i>	<u>CAD Segment</u>
<i>String</i>	<u>CAD Edit Strings</u>
<i>Edit</i>	<u>CAD Edit</u>
<i>Delete</i>	<u>CAD Delete</u>
<i>Acad</i>	<u>Cad Acad</u>
<i>Regression</i>	<u>CAD Regression</u>

CAD Multipick

Position of option on menu: Strings =>CAD =>Multipick

This section of documentation is a work in progress and will be updated in subsequent releases.

The Cad Multipick walk-right menu is



For selecting the data, see

[Selecting with Multipick](#)

For the option *Copy*, go to

[CAD Multipick Copy](#)

Move

[CAD Multipick Move](#)

Rotate

[CAD Multipick Rotate](#)

Array

[CAD Multipick Array](#)

Mirror

[CAD Multipick Mirror](#)

Mirror X

[CAD Multipick Mirror X](#)

Mirror Y

[CAD Multipick Mirror Y](#)

Scale

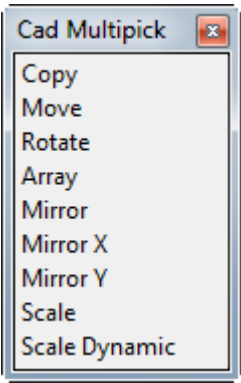
[CAD Multipick Scale](#)

Scale Dynamic

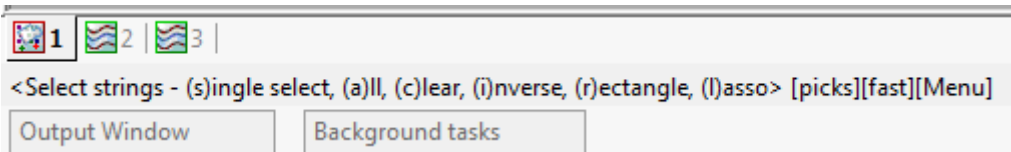
[CAD Multipick Scale Dynamic](#)

Selecting with Multipick

Upon selecting any of the Multipick options from the CAD Multipick menu



the *Screen Message Area* prompts are shown for selecting selection options.

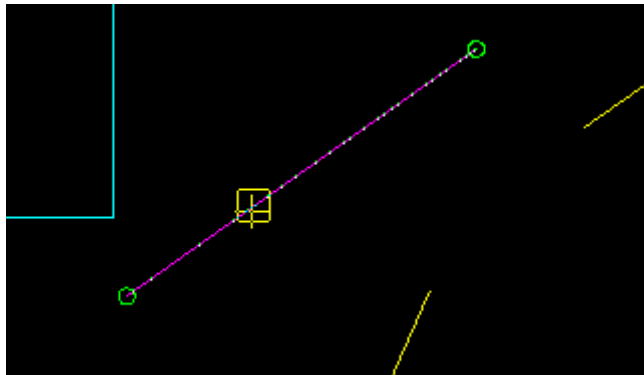


The default option is <m> for multipick select.

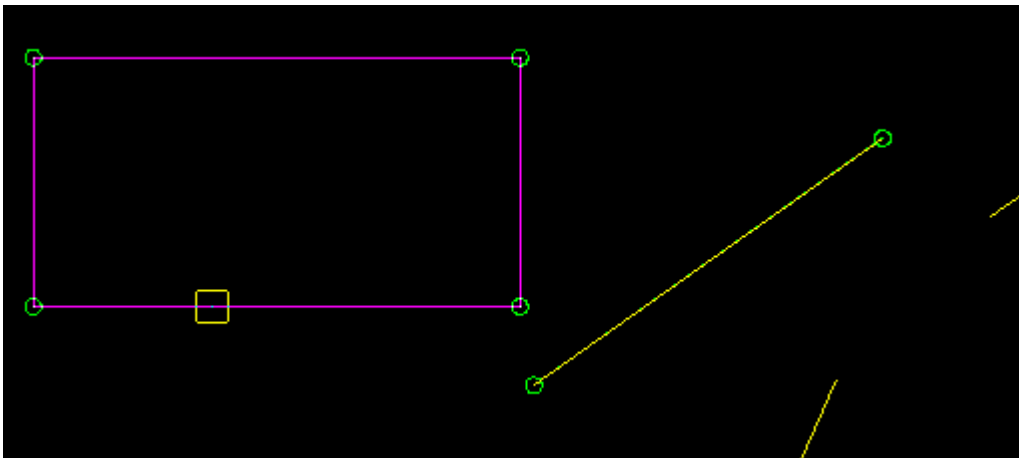
For <m> go to	Multipick
<s>	Single
<a>	All
<c>	Clear
<i>	Inverse
<r>	Rectangle
</>	Lasso

Multipick

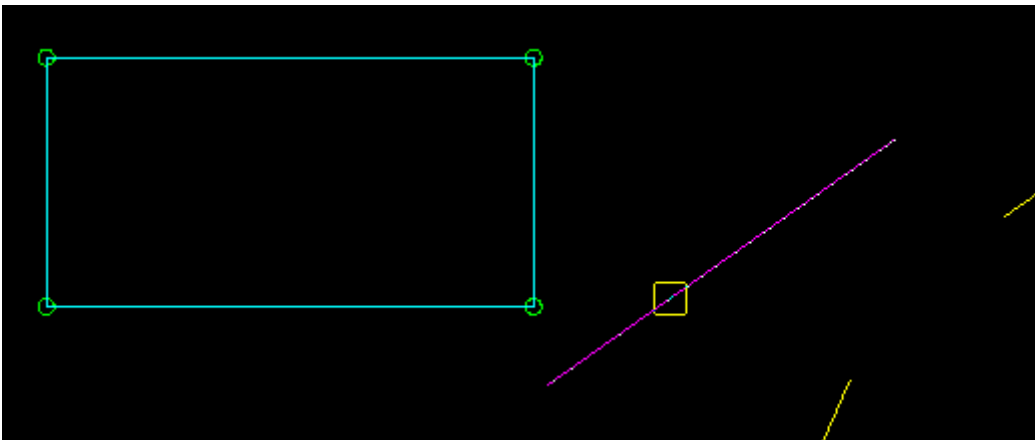
For <m>, strings are selected by clicking LB on the string, but unlike a normal select, **the string is not accepted**. After LB is clicked, the string is highlighted and circles placed at the string vertices to indicate that the string is part of the **Multipick set**.



Another string is added to the *Multipick set* by clicking LB on the new string and again **not accepting**. This string will also be drawn with circles at each of its vertices to indicate that it is part of the *Multipick set*.



A string is **removed** from a *Multipick set* by simply clicking LB on the string (and not accepting). The string is then deselected and the circles are removed from the vertices of the string to indicate that it is no longer part of the *Multipick set*.



When all the required strings of the *Multipick set* have been selected, the Multipick selection is terminated by clicking MB (accepting).

The selected strings in the *Multipick set* are then passed on to the CAD Multipick option for processing. For example, if the Multipick was part of **Multipick Copy**, then after Accepting, the **Copy** part of the **Multipick Copy** takes over.

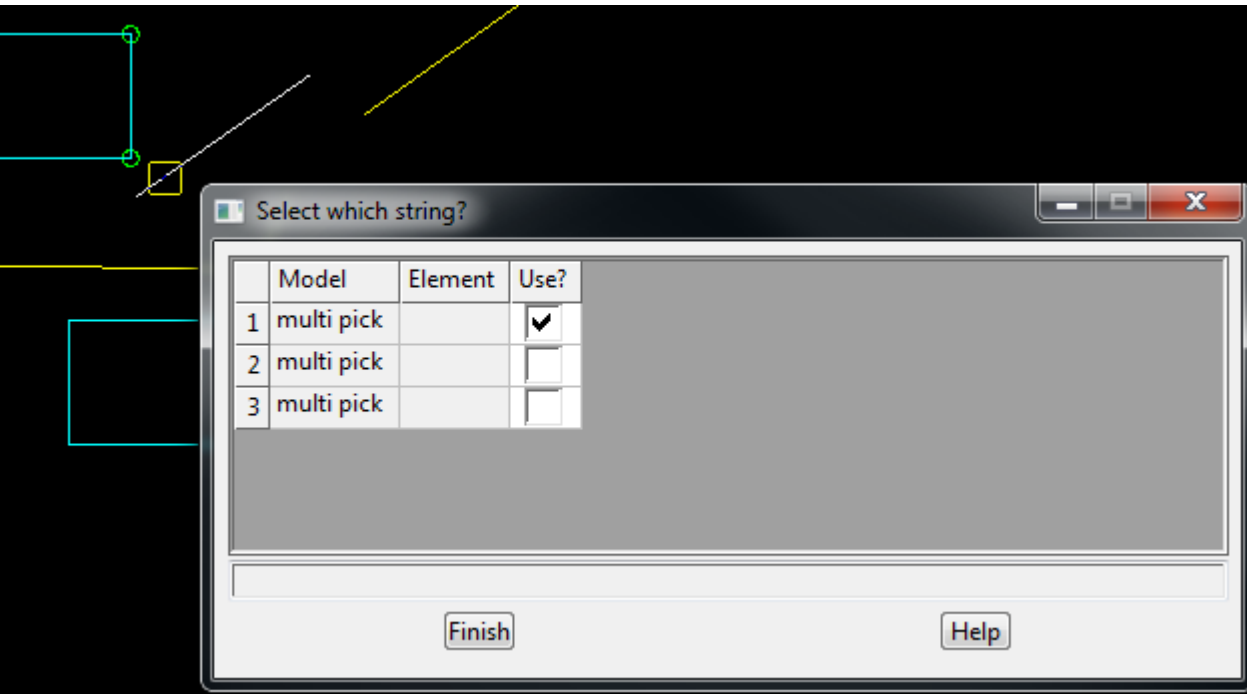
Once the Multipick option (e.g. **Multipick Copy**) is completed, the **Multipick set** is cleared and the Multipick CAD option begins again, and the process of building up a new **Multipick set** begins again for that same option.

To terminate the *Multipick option*, simply press <Esc>.

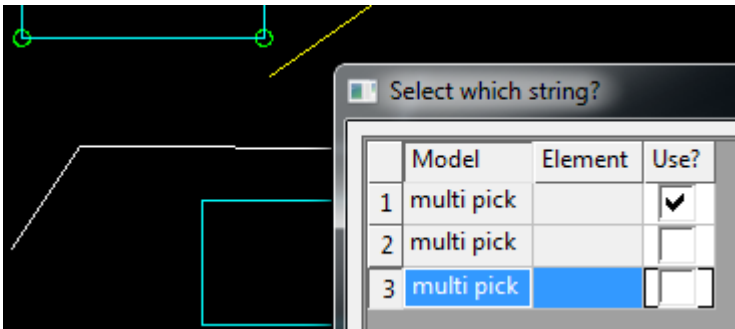
Note:

Because LB is used to keep adding new strings to the **Multipick set**, it can't be used for the normal cycling through a selection set when more than one string satisfies the picking tolerance. So when more than one string satisfies the picking criteria a **Select which string?** panel is placed on the screen with the list of strings satisfying the LB picking criteria.

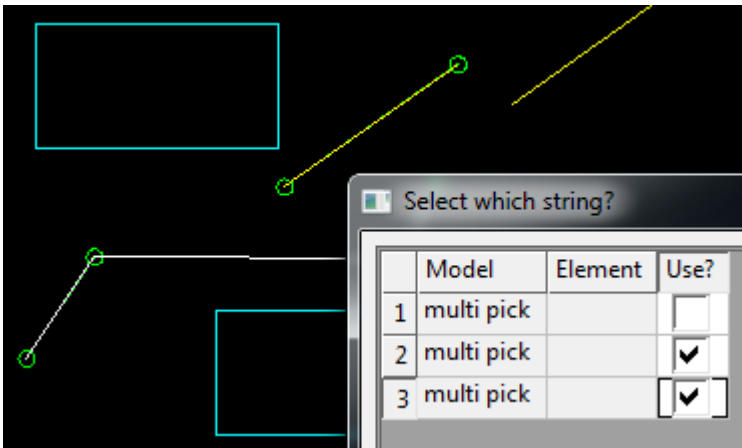
If the string is already in the *Multipick set*, there will be a *tick* in the **Use?** column.



Clicking on a line in the grid highlights the string.



And clicking in the **Use?** column to make a **tick** will add the string to the *Multipick* set and place circles on each of its vertices, or **turning off a tick** will deselect the string from the *Multipick* set and remove the circles from each of its vertices.



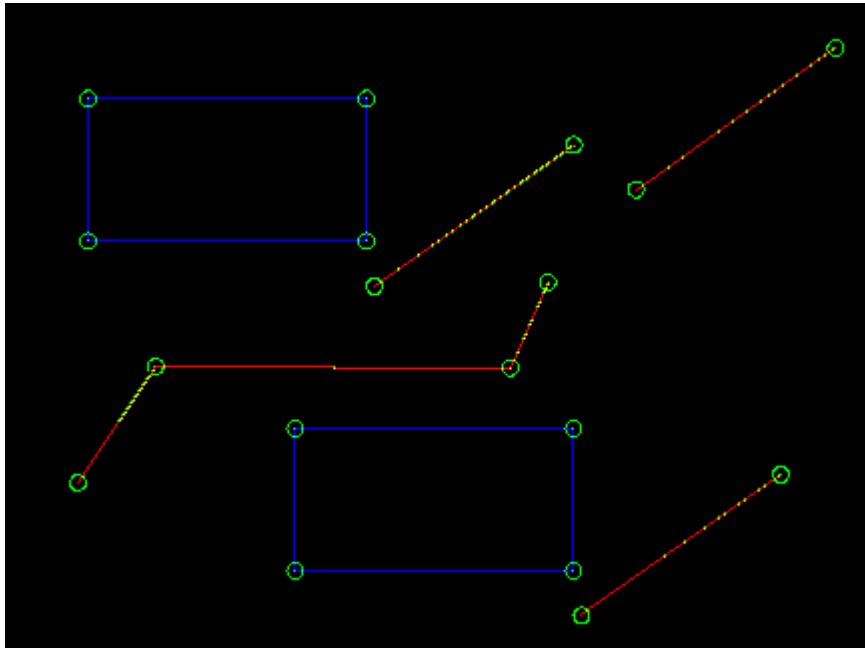
Clicking on the **Finish** button or **X** terminates that LB selection.

Single

<s> places the option back into the mode of selecting a single string. That is, Multipick is not used.

All

<a> will add all the strings in the models on the current view to the Multipick set. Note that the strings do not have to be visible on the view to be selected by **<a>**.

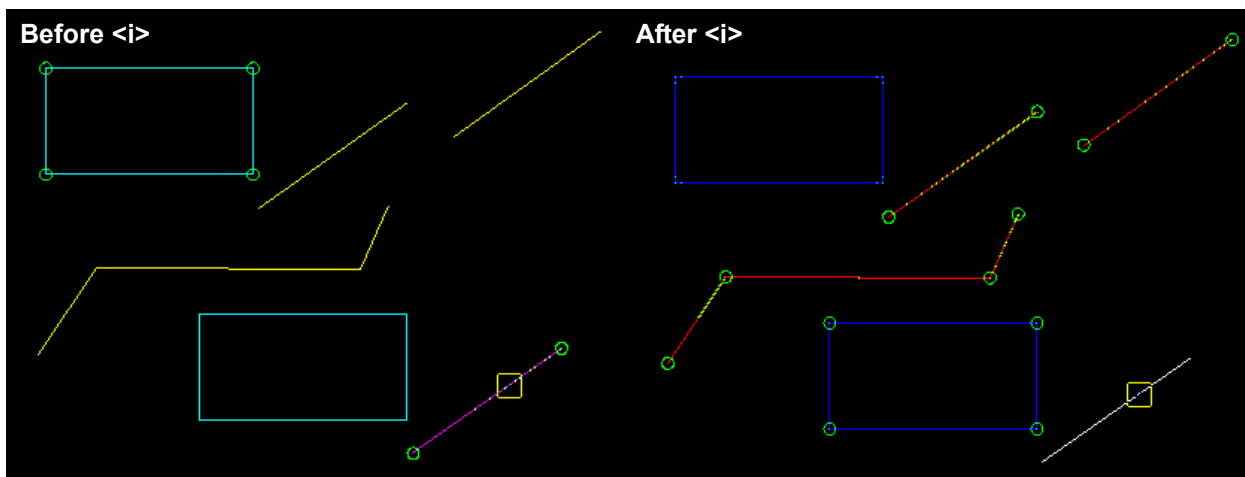


Clear

<c> will clear the current *Multipick set*. That is, all selected strings are deselected.

Inverse

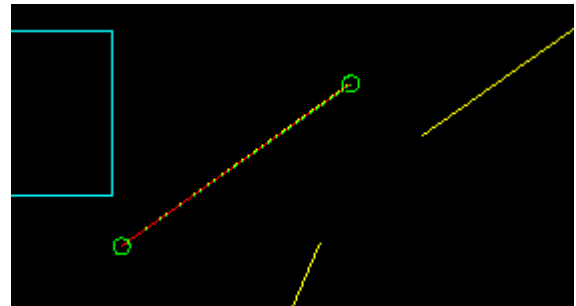
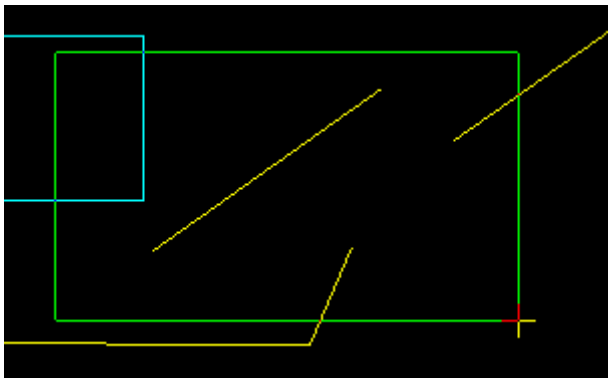
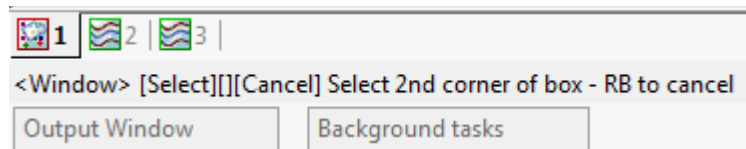
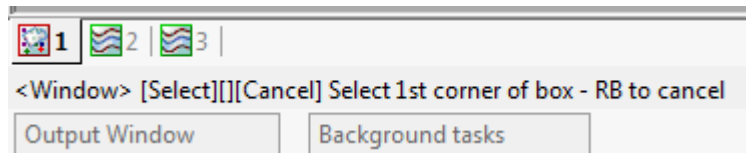
<i> will take the inverse of the current *Multipick set*. That is, all strings in the models on the current view that are currently in the *Multipick set* are deselected, and all strings in the models on the current view that are not in the *Multipick set* are added to the *Multipick set*. Note that the strings do not have to be visible on the view to be selected/deselected by <i>.



Rectangle

<r> requires the user to create a rectangle and all strings totally enclosed by that rectangle will be added to the *Multipick set* if they are not already in the *Multipick set*, or **deselected** if they are already in the *Multipick set*.

After pressing <r>, the first corner of the rectangle is selected by pressing and holding down LB, and the cursor is then dragged to the second corner of the rectangle and LB released.

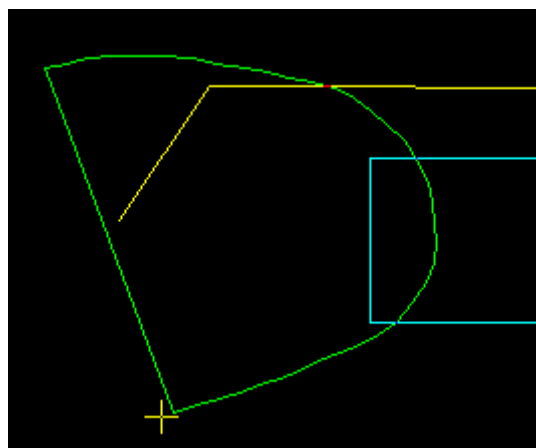


The strings totally enclosed by the rectangle are then added to/removed from the *Multipick* set.

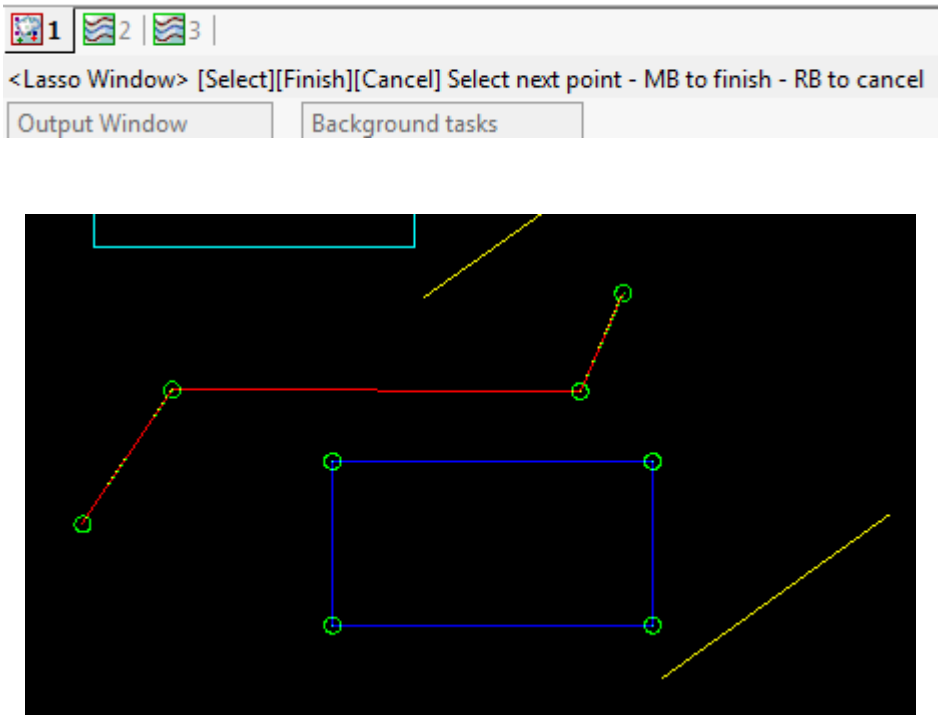
Lasso

<I> requires the user to create a lasso, and all strings enclosed by or crossing the lasso will be added to the Multipick set if they are not in the Multipick set, or deselected if they are already in the Multipick set.

After pressing <I>, the lasso start point is selected by pressing and holding down LB and the cursor is then dragged to trace out the lasso. LB is then released to stop adding to the lasso.



MB is pressed and released to accept the lasso. If LB is pressed down before accepting the lasso, further points are added to the lasso until LB is released.



The strings totally enclosed by, or crossing, the lasso are then added/removed from the *Multipick* set.

CAD Multipick Copy

For selecting the data, see [Selecting with Multipick](#)

After data has been selected, a base point is selected and the Copy part of the option is the same as the [CAD Copy](#) command.

CAD Multipick Move

For selecting the data, see [Selecting with Multipick](#)

After data has been selected, a base point is selected and the Move part of the option is the same as the [CAD Move](#) command.

CAD Multipick Rotate

For selecting the data, see [Selecting with Multipick](#)

After data has been selected, a base point is selected and the Rotate part of the option is the same as the [CAD Rotate](#) command.

CAD Multipick Array

For selecting the data, see [Selecting with Multipick](#)

After data has been selected, a base point is selected and the Array part of the option is the same as the [CAD Array](#) command.

CAD Multipick Mirror

For selecting the data, see [Selecting with Multipick](#)

After data has been selected, a base point is selected and the Mirror part of the option is the same as the [CAD Mirror](#) command.

CAD Multipick Mirror X

For selecting the data, see [Selecting with Multipick](#)

After data has been selected, a base point is selected and the Mirror X part of the option is the same as the [CAD Mirror X Axis](#) command.

CAD Multipick Mirror Y

For selecting the data, see [Selecting with Multipick](#)

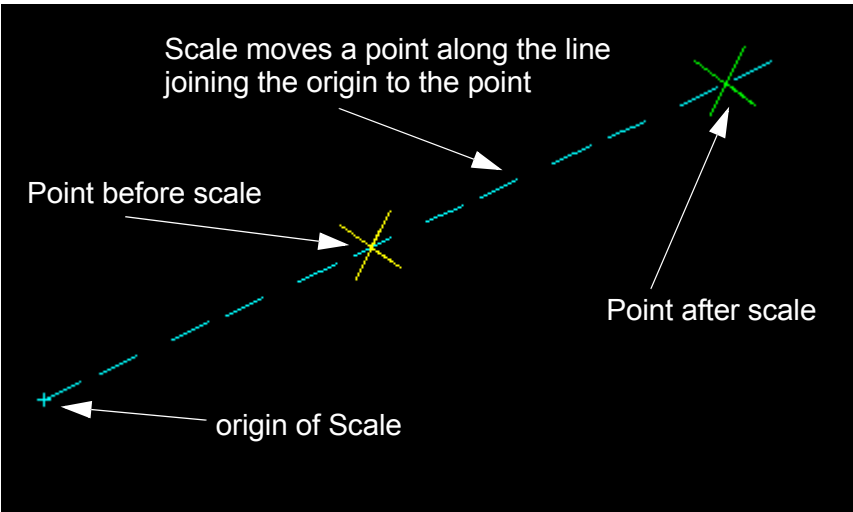
After data has been selected, a base point is selected and the Mirror Y part of the option is the same as the [CAD Mirror Y Axis](#) command.

Scale About an Origin

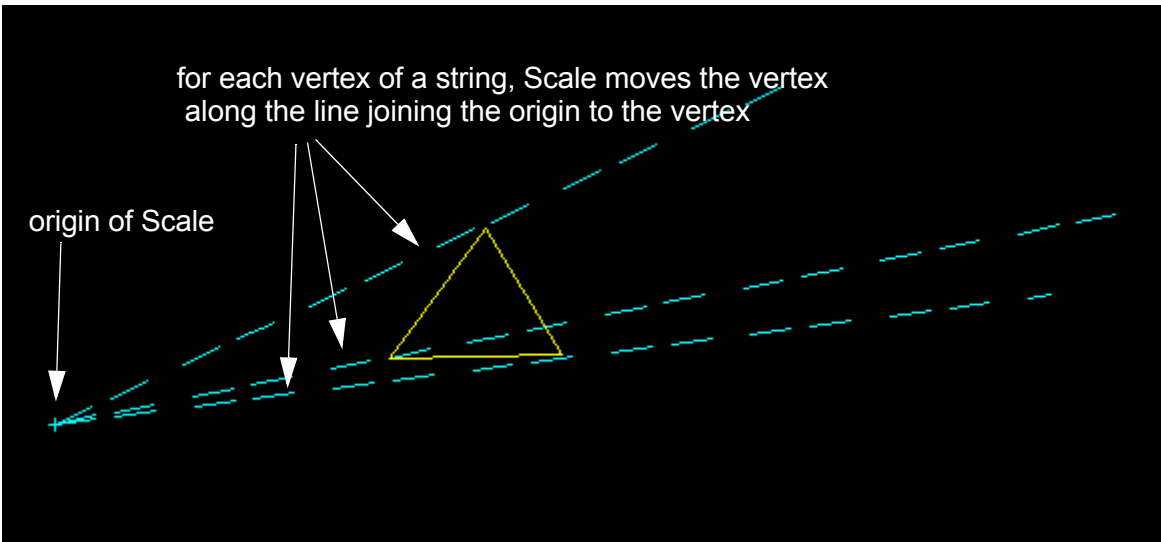
A number of options use the concept of **Scaling** about an **Origin**.

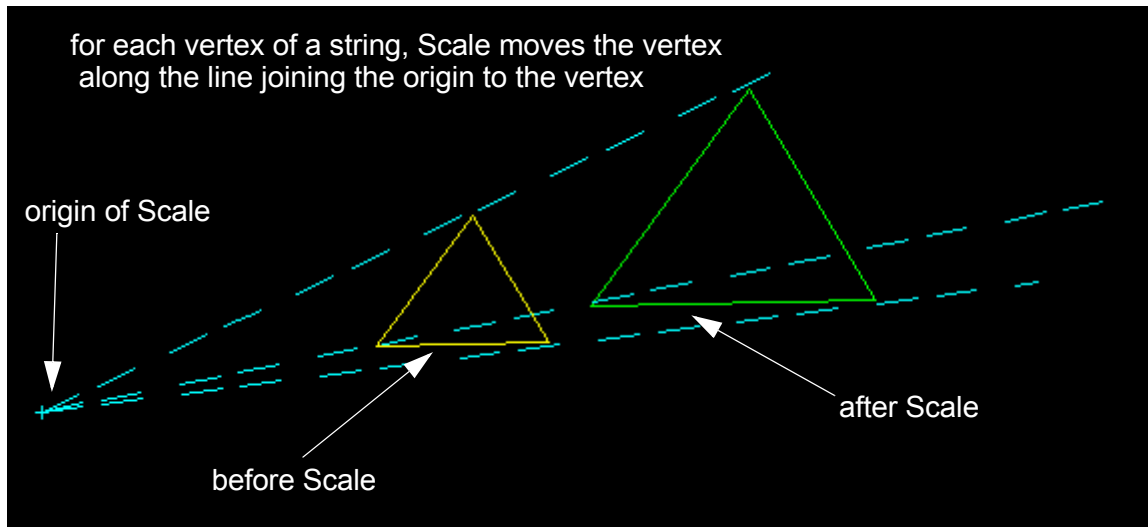
To scale a point about an Origin by a given scale factor, the point is moved along the line joining the point to the origin so that

$$\text{distance between the scaled point and the origin} = \text{scale factor} * \text{distance from point to origin}$$



A **string** is scaled about an origin by a given scale factor by scaling each vertex in the string about the origin by the scale factor.



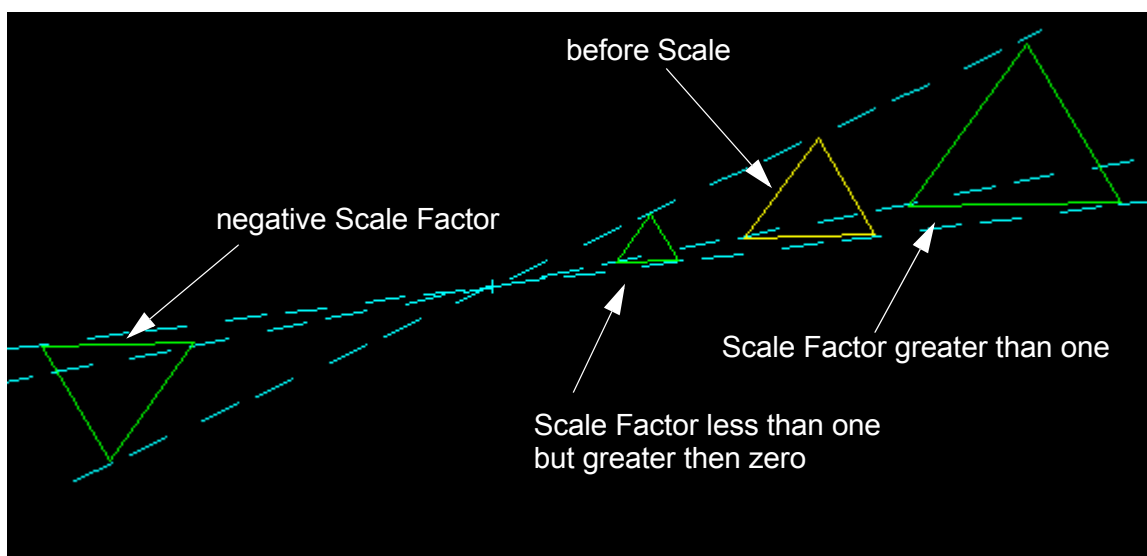


If the Scale Factor is greater than one, then the scaled string is enlarged and is on the same side of the origin as the original string but further from the origin than the original string.

If the Scale Factor is less than one but greater than zero, then the scaled string is reduced and is between the origin and the original string.

If the Scale Factor is negative then the scaled string is on the opposite side of the origin to the original string.

A Scale Factor of zero would put all the vertices of the string on top of the origin.



CAD Multipick Scale

For selecting the data, see [Selecting with Multipick](#)

For the definition of scaling about an origin, see [Scale About an Origin](#)

After data has been selected, an Origin point is selected and the Scale part of the option is the same as the [CAD Scale](#) command.

CAD Multipick Scale Dynamic

For selecting the data, see [Selecting with Multipick](#)

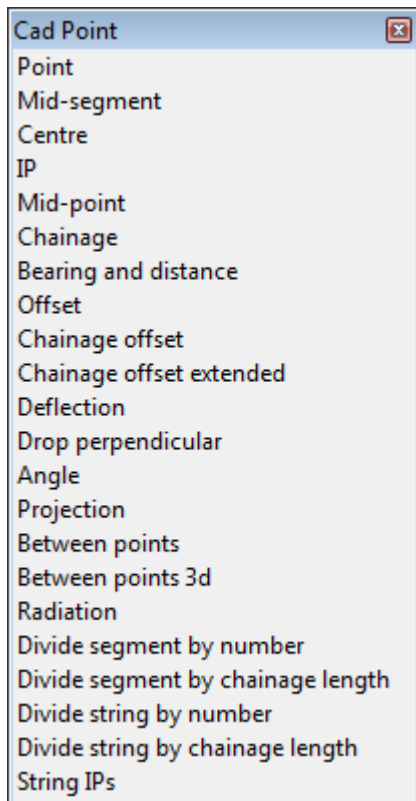
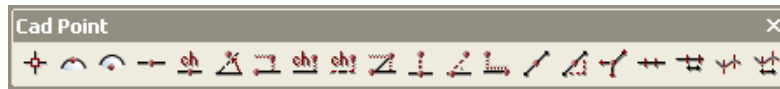
For the definition of scaling about an origin, see [Scale About an Origin](#)

After data has been selected, an Origin point and Start Scale position is selected and the Scale Dynamic part of the option is then similar to the [CAD Scale Dynamic](#) command.

CAD Point

Position of option on menu: Strings =>CAD =>Point

The Point walk-right menu is



Menu of Options to Create New One Point Strings

at a user selected position	Point
at middle of a selected segment	Mid-segment
at the centre point of an arc	Centre
at the IP of a selected arc or transition segment	IP
at the middle of the two selected points	Mid-point
at the position of a chainage along a selected string	Chainage
a given bearing and distance from a selected position	Bearing and distance
at the offset position of a point on a selected string	Offset
at the offset position of a chainage along a selected string	Chainage offset
at the offset position of a chainage along a selected string extended	Chainage offset extended
a given distance at right angles to a selected string	Deflection
dropped perpendicularly onto a selected string	Drop perpendicular
a given distance at a given angle to a selected string	Angle
projected a chainage distance along a selected string	Projection
distance between two selected positions	Between points
distance between two selected positions with interpolated z	Between points 3d
many points at given bearings and distances from a selected position	Radiation
points which divide selected seg into a number of equal segs	Divide segment by number
points which divide selected seg into segs of given length	Divide segment by chainage length
points which divide selected string into a number of equal pieces	Divide string by number
points which divide selected string into pieces of given length	Divide string by chainage length
creates new points for each vertex of a string	String IPs

For the option *Point*, go to

Mid-segment

Centre

IP

Mid-point

Chainage

Bearing and distance

Offset

Chainage offset

Chainage offset extended

Deflection

Drop perpendicular

Angle

Projection

Between points

Between points 3d

Radiation

Divide segment by number

[Point](#)

[Mid Segment](#)

[Centre](#)

[IP](#)

[Mid point](#)

[Chainage](#)

[Bearing and distance](#)

[Offset](#)

[Chainage offset](#)

[Chainage offset extended](#)

[Deflection](#)

[Drop Perpendicular](#)

[Angle](#)

[Projection](#)

[Between Points](#)

[Between points 3d](#)

[Radiation](#)

[Divide segment by number](#)

Divide segment by chainage length
Divide string by number
Divide string by chainage length
String IPs

[Divide segment by chainage length](#)
[Divide string by number](#)
[Divide string by chainage length](#)
[String IPs](#)

Point

Position of option on menu: Strings =>CAD =>Point =>Point

or by selection of appropriate icon from the toolbar. 

This option creates a single vertex (point) string.

On selecting **Point**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

The user can select a position with the mouse and on accepting that point (Middle mouse button or enter) the point is created at the selected position. The model, colour, height, *etc.* are defined in the **Cad Control Bar**.

The snap mode will influence the mouse selection. For example if cursor snap is on, the user can choose a position not yet defined. If point snap is on and the selection snaps to an existing point, the option will place another point at that location.

The user can also activate the selection menu used with the mouse (right button) that allows various positioning options.

Specification of a position can also be done by the direct input of the xyz coordinate of the point by pressing the space bar to bring up the enter XYZ panel or by typing of the value to bring up the XYZ panel. **NOTE:** The z value will default to the value entered into the **Cad Control Bar** whether or not it is specified in the XYZ box. If no height value exists in the **Cad Control Bar** then a value will be interpolated if possible, otherwise a null value will be assigned.

Mid Segment

Position of option on menu: Strings =>CAD =>Point =>Mid segment

or by selection of appropriate icon from the toolbar. 

This option creates a point in the middle of a selected line or arc segment.

On selecting **Mid segment**, the user is prompted to select a segment and a vertex is created at the mid point of the segment. The model, colour, height, *etc.* are defined in the **Cad Control Bar**.

Centre

Position of option on menu: Strings =>CAD =>Point =>Centre

or by selection of appropriate icon from the toolbar. 

This option creates a point at the centre of a selected arc or circle.

On selecting **Centre** the user is prompted to select an arc and a vertex is created at the centre of the arc. The model, colour, height, *etc.* are defined in the **Cad Control Bar**.

IP

Position of option on menu: Strings =>CAD =>Point =>IP

or by selection of appropriate icon from the toolbar. 

This option creates a point at the IP of a selected arc or transition segment. That is, it creates a point at the intersection of the tangent from the start of the segment and the tangent at the end of

the segment. Picking a straight segment will give an error.

On selecting **IP** the user is prompted to select an arc or transition segment and a new point is created at the IP of the selected segment. The model, colour, height, etc. are defined in the **Cad Control Bar**.

Mid point

Position of option on menu: Strings =>CAD =>Point =>Mid point

or by selection of appropriate icon from the toolbar. 

This option creates a point in the middle of two selected positions.

On selecting **Mid point**, the user is prompted to select the first position and then the second position. A vertex is created at the mid point of the two selected positions. The model, colour, height, etc. are defined in the **Cad Control Bar**.

Chainage

Position of option on menu: Strings =>CAD =>Point =>Chainage

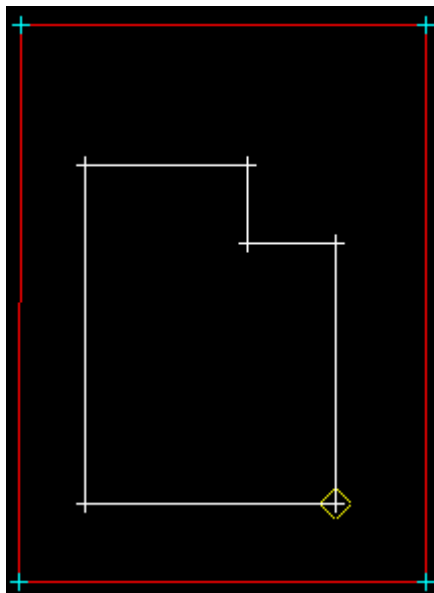
or by selection of appropriate icon from the toolbar. 

This option creates a new point at the position of a user specified chainage of an existing string.

On selecting **Chainage**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

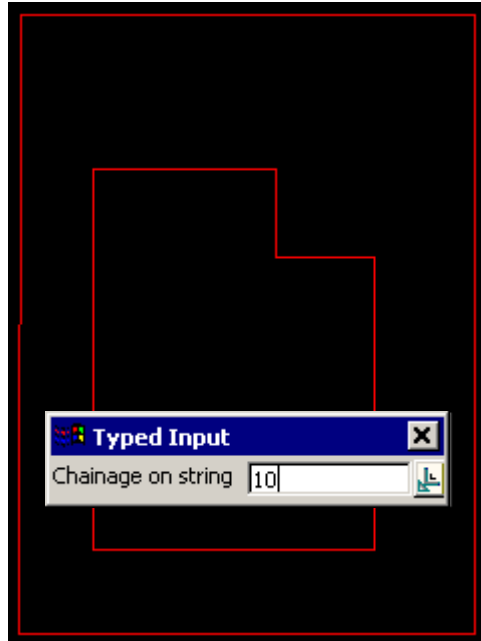
STEP 1:

The user selects a valid string (left mouse button) and accepts that string (Middle mouse button or <Enter>).

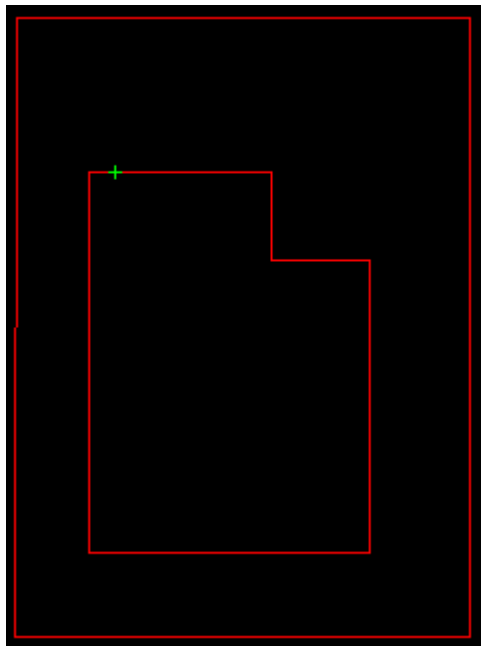


STEP 2:

The user enters a chainage value where a point should be placed followed by the <Enter> key. This chainage is with respect to the selected string.


**STEP 3:**

A new one point string is created at the position on the string at the given chainage.



To create another point, the user is prompted for the string as per **STEP 1**.

Bearing and distance

Position of option on menu: Strings =>CAD =>Point =>Bearing and distance
or by selection of appropriate icon from the toolbar. 

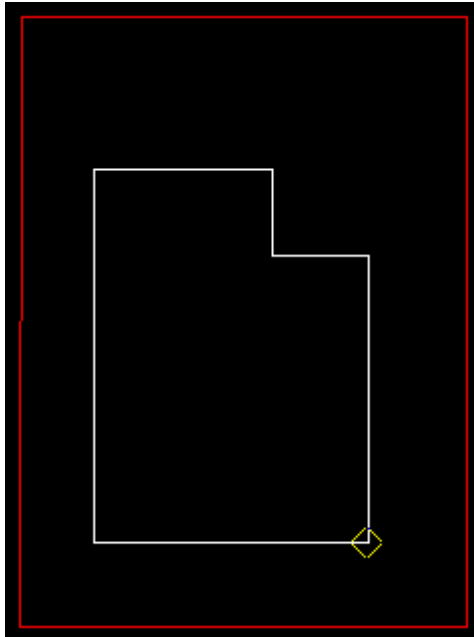
This option calculates a point string that is located a given bearing and distance from a start position.

On selecting **Bearing and distance**, the user is prompted for the relevant data in the screen

message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

A start position is selected and accepted.

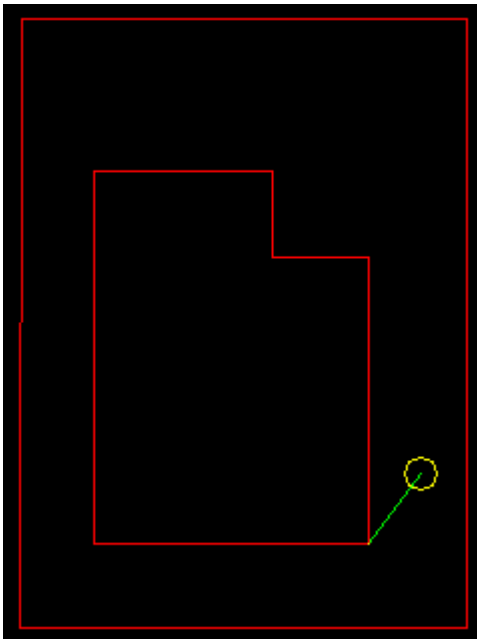


STEP 2:

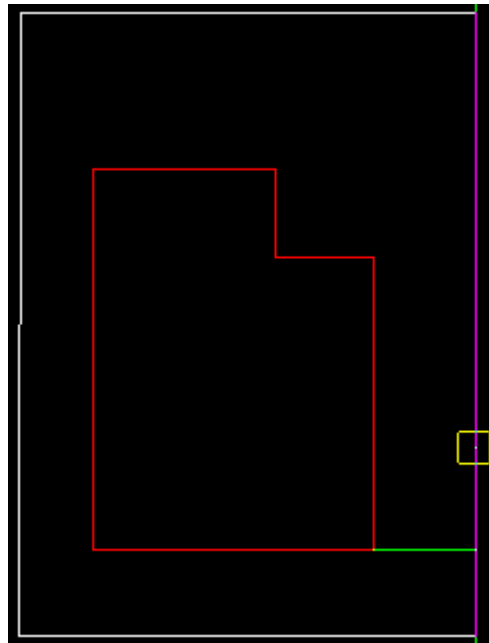
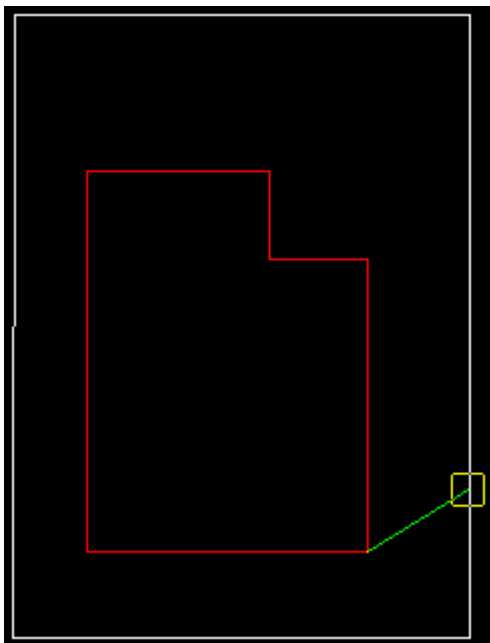
A bearing is selected with the mouse or entered in via the keyboard. For typed entry, simply start typing or press the space bar to bring up the bearing entry box. The value is entered into the input box followed by the enter key.

The line drawn represents the bearing value and changes with movement of the mouse. If the user wants to see what the current value of the bearing is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to create the point or the input box can be closed and the rubber banding (graphically changing) of the bearing continued.

Note: The Page up and page down keys can be used when the input angle box comes up to add or subtract intervals of 90 degrees.



This option also allows the definition of the bearing by the selection of the 2nd point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next. The example shown below is the perpendicular case.

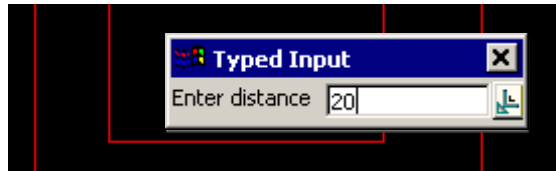
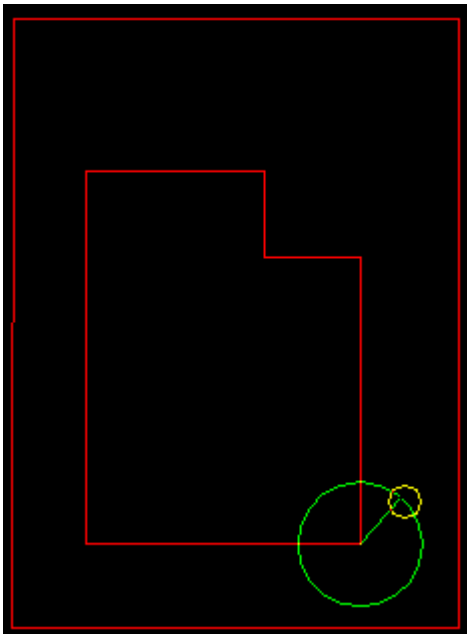


STEP 3:

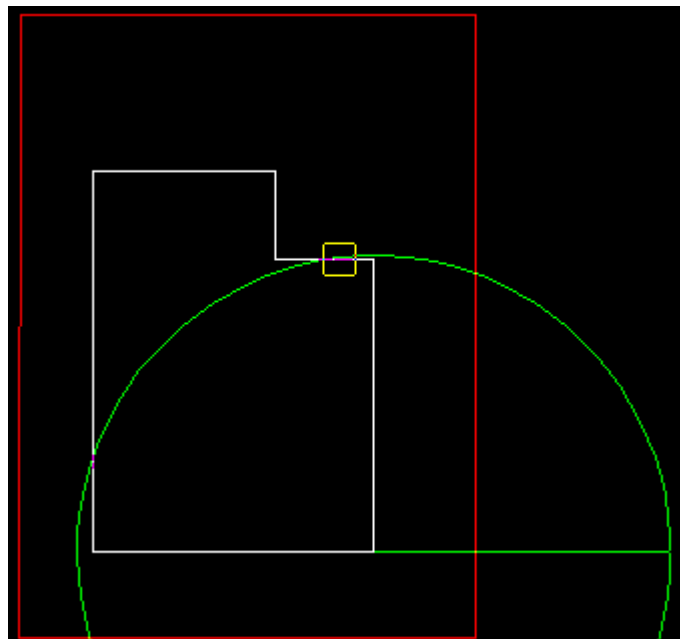
A distance is selected and accepted with the mouse or entered in via the keyboard. For typed entry, simply start typing or press the space bar to bring up the distance entry box. The value is entered into the input box followed by the Enter key.

The circle drawn represents the distance value and changes with movement of the mouse. If the

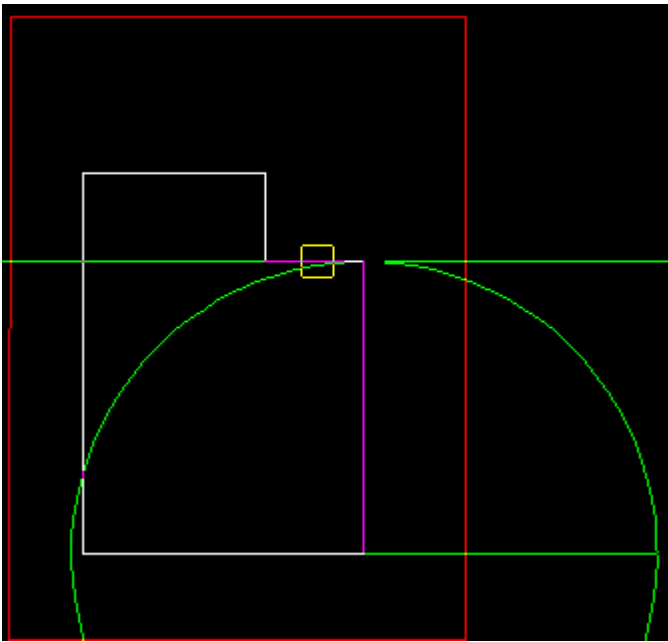
user wants to see what the current value of the distance is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to create the point or the input box can be closed and the rubber banding (graphically changing) of the circle continued.



This option also allows the definition of the distance by the selection of the 2nd point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next. The example shown below is the perpendicular case.

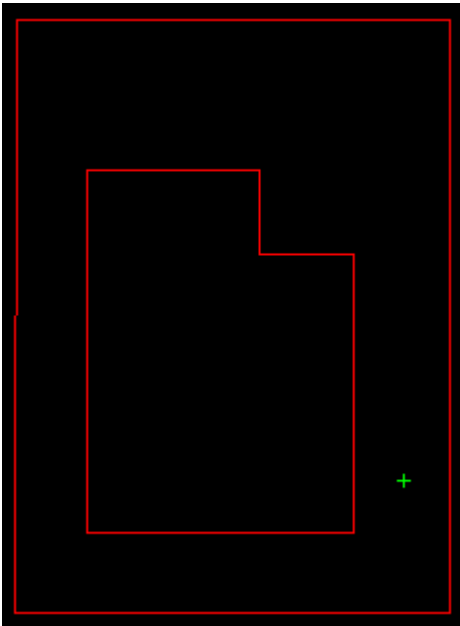


The perpendicular distance shown below by the purple line will be used at the defined bearing to create the point.

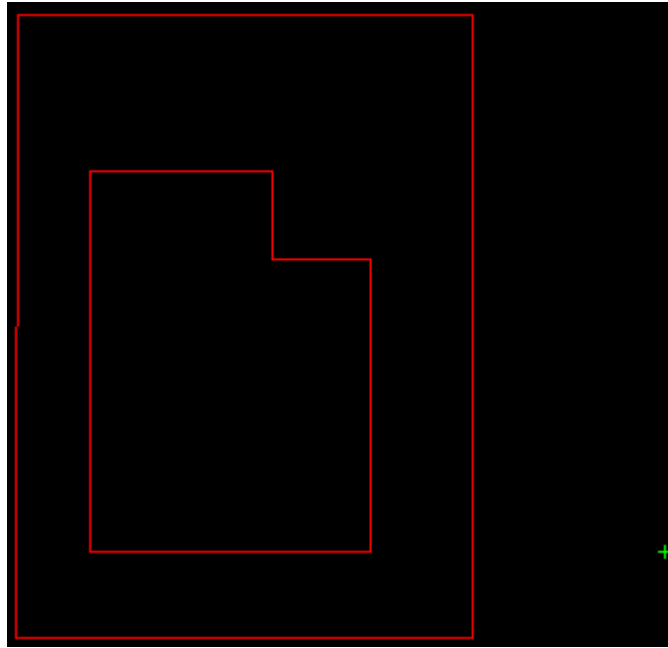


STEP 4:

A point string is created using the information supplied. By entry into the input boxes:



Or by using the perpendicular/tangential tools:



Offset

Position of option on menu: Strings =>CAD =>Point =>Offset

or by selection of appropriate icon from the toolbar.



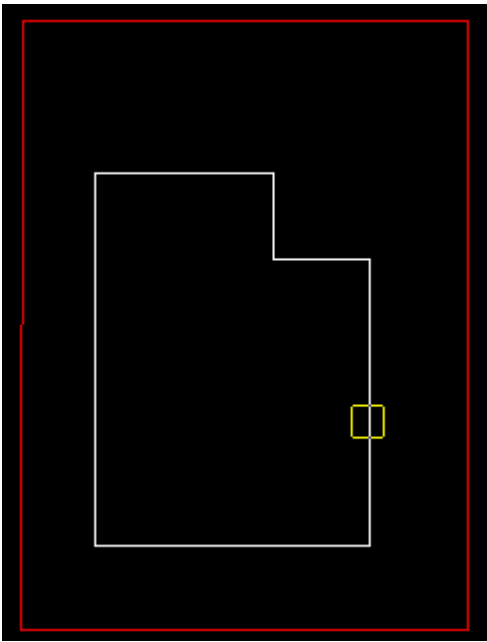
This option creates a one point string that is located by reference to a string, a control point, a chainage distance along the string from the control point and an offset to the selected string.

After selection and acceptance of a string, a control point is selected and accepted. This point is dropped perpendicular onto the string. The distance along the string is measured from this dropped point. Positive distances are in the direction that the string was picked. Finally a offset to the string can be specified for the placement of the new point string.

On selecting **Offset**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

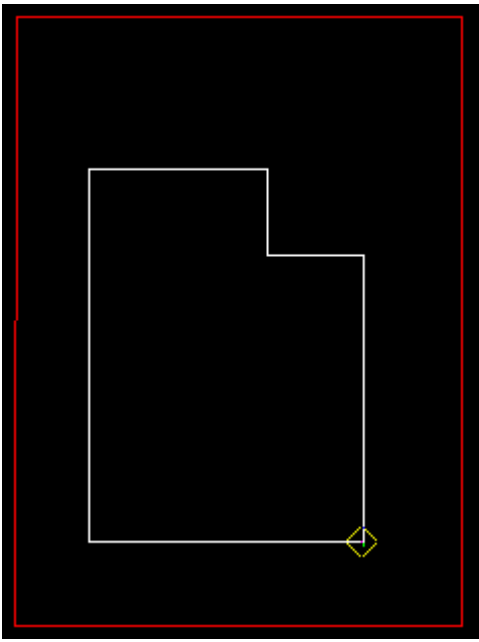
STEP 1:

The user selects and accepts a string with direction. This defines what side the offset applies to.



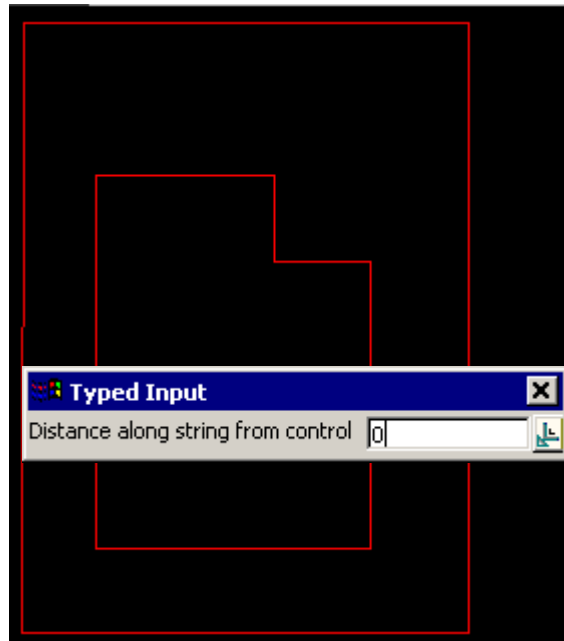
STEP 2:

The user picks and accepts a control point to be dropped onto the selected string.

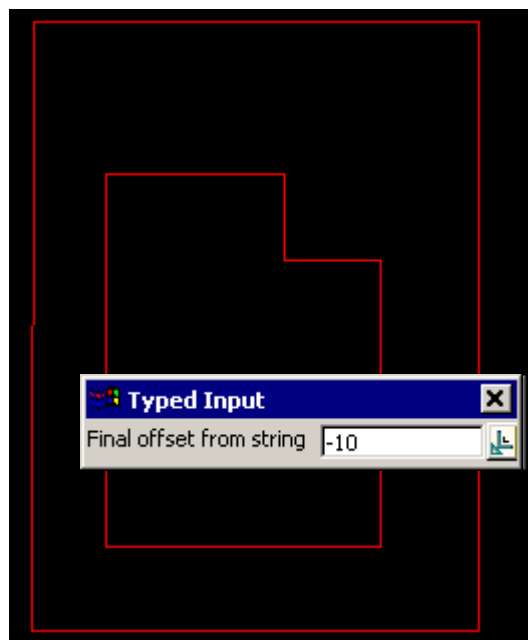


STEP 3:

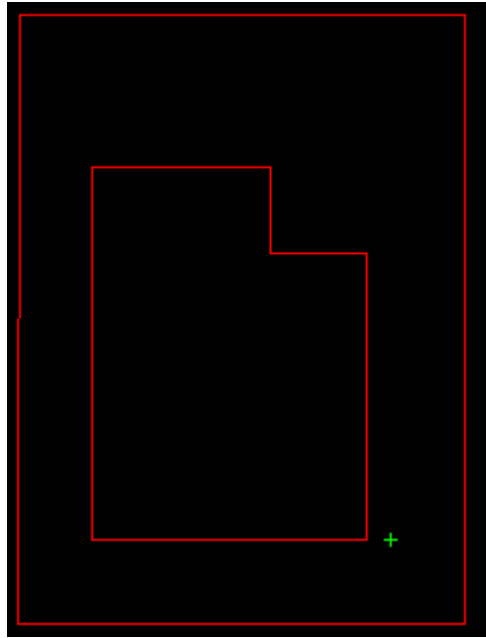
A distance along from the dropped point is specified. Positive distances are in the direction of the string selection pick. The value is entered into the input box followed by the Enter key.

**STEP 4:**

An offset relative to the selected string (and direction) is specified in the input box followed by the enter key.

**STEP 5:**

A point string is created using the information supplied.



Chainage offset

This option creates a one point string that is located perpendicular to the reference string with a defined offset.

STEP 1:

The user selects the reference string with direction.

STEP 2:

The user specifies a chainage on the reference string.

STEP 3:

The user specifies an offset distance from the reference string.

A one point string is created using the information supplied.

Chainage offset extended

Is similar to chainage offset except the specified chainage can be extended beyond the start and end chainages of the selected string.

Deflection

Position of option on menu: Strings =>CAD =>Point =>Deflection

or by selection of appropriate icon from the toolbar. 

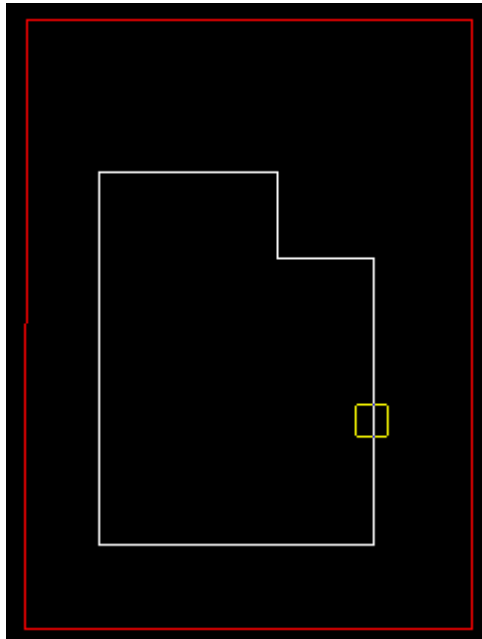
This option creates a one point string that is located by reference to a string, a control point, a distance along the string from the control point, a deflection angle and deflection distance.

After selection of a string, a control point is selected. This point is dropped perpendicular onto the string. A distance along the string can be entered to move the measure point. Positive distances are in the direction that the string was picked. A deflection angle is specified which is a clockwise angle from the measure point. The deflection distance is the distance from the measure point to the point which is to be created.

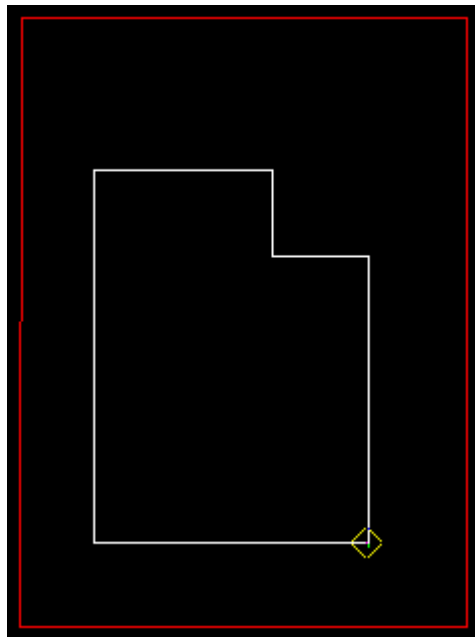
On selecting **Deflection**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

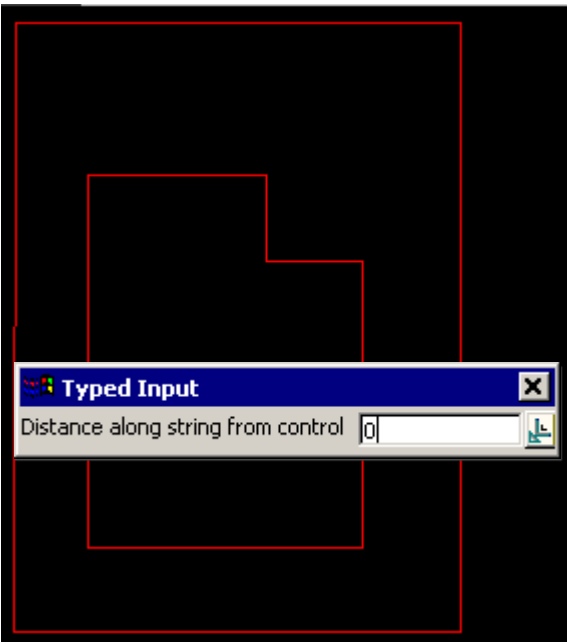
The user selects and accepts a string with direction.

**STEP 2:**

The user picks and accepts a control point to be dropped onto the selected string.

**STEP 3:**

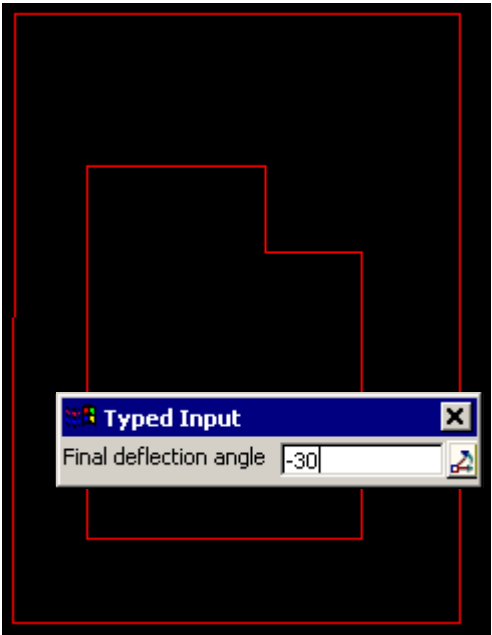
A distance along from the dropped point is specified. Positive distances are in the direction of the string selection pick. The value is entered into the input box followed by the enter key.



STEP 4:

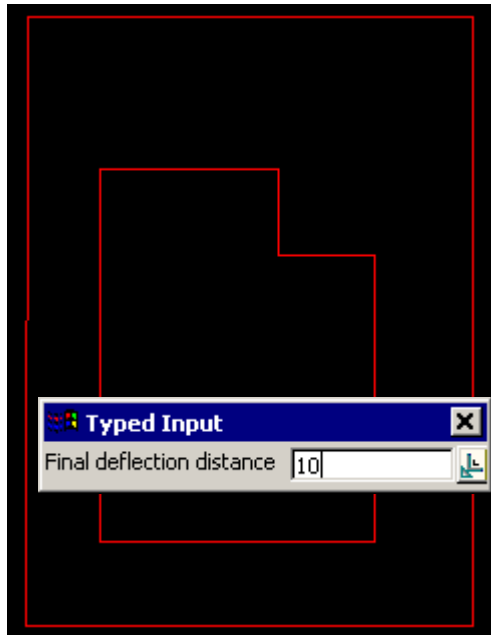
A deflection angle is specified. This angle is clockwise, relative to the direction of the string selection pick. The value is entered into the input box followed by the enter key.

Note: The Page up and page down keys can be used when the input angle box comes up to add or subtract intervals of 90 degrees.

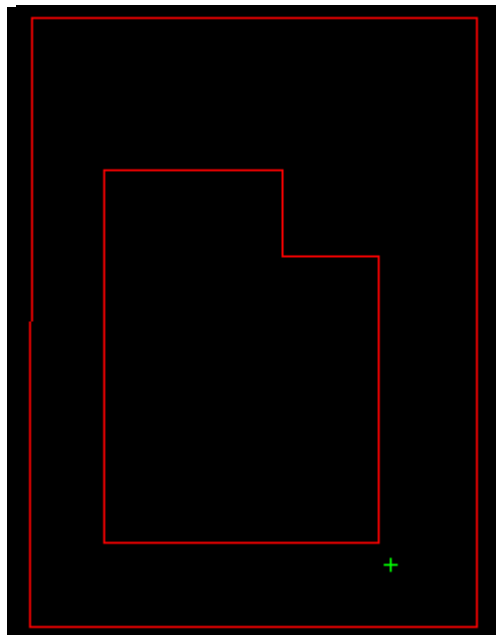


STEP 5:

A deflection distance is supplied. Positive is in the direction of the string selection pick. The value is entered into the input box followed by the enter key.

**STEP 6:**

A point string is created using the information supplied.

**Drop Perpendicular**

Position of option on menu: Strings => CAD => Point => Drop perpendicular

or by selection of appropriate icon from the toolbar.

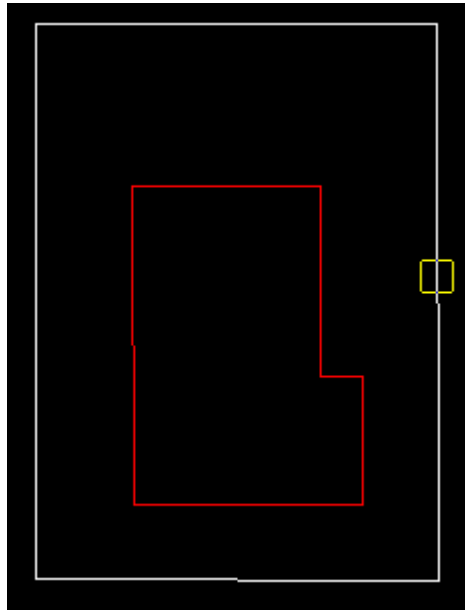


This option creates a one point string by dropping from a user selected position perpendicularly onto a user selected string.

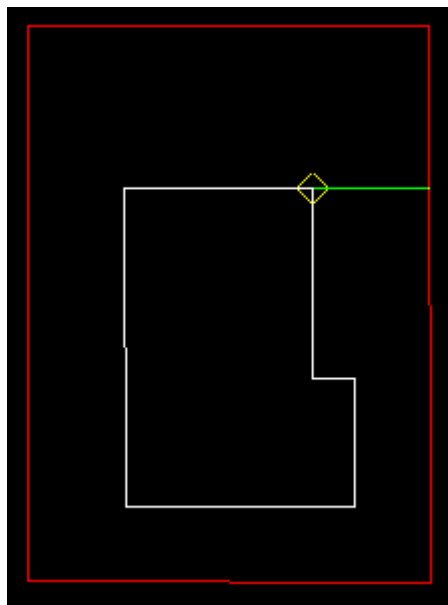
On selecting **Drop perpendicular**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

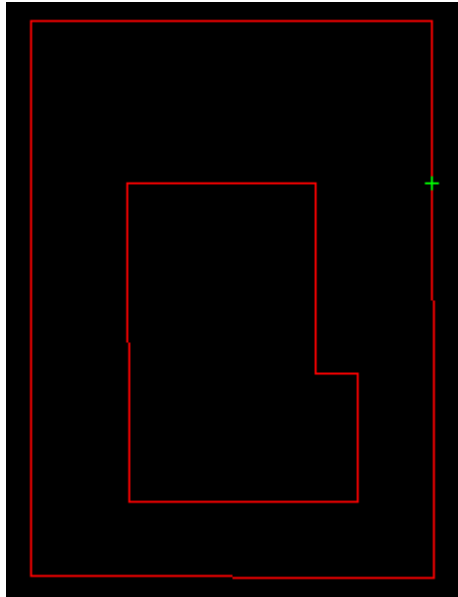
The user selects a string and accepts (with direction) to have the point dropped onto.

**STEP 2:**

The user picks and accepts a position to drop onto the nominated string

**STEP 3:**

A point string is created at the perpendicular drop point.



Angle

This option creates a one point string that is located by projecting a selected position back to a string by a specified angle.

STEP 1:

User selects and accepts a string to have the point projected onto.

STEP 2:

User specifies an angle for the projection.

STEP 3:

User selects a position on the screen to be projected back to the string.

STEP 4:

A one point string is created, which form the nominated angle with the selected position on **STEP 3**.

Projection

Position of option on menu: Strings =>CAD =>Point =>Projection

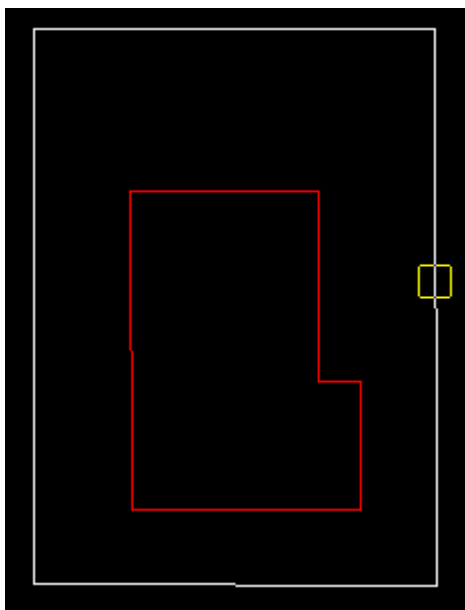
or by selection of appropriate icon from the toolbar. 

This option creates a one point string that is located by firstly dropping a point onto a string and then giving a distance along the string from the dropped point.

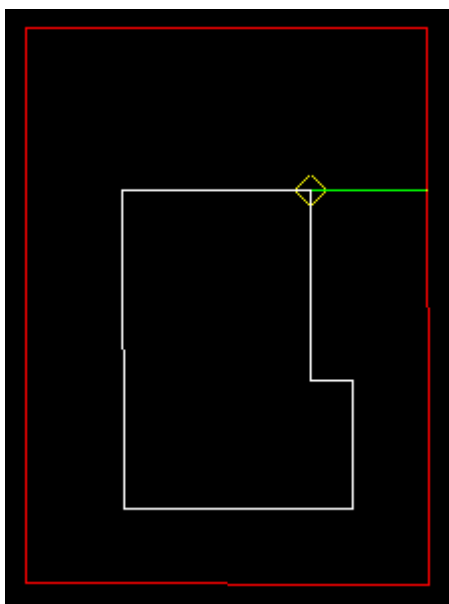
On selecting **Projection**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

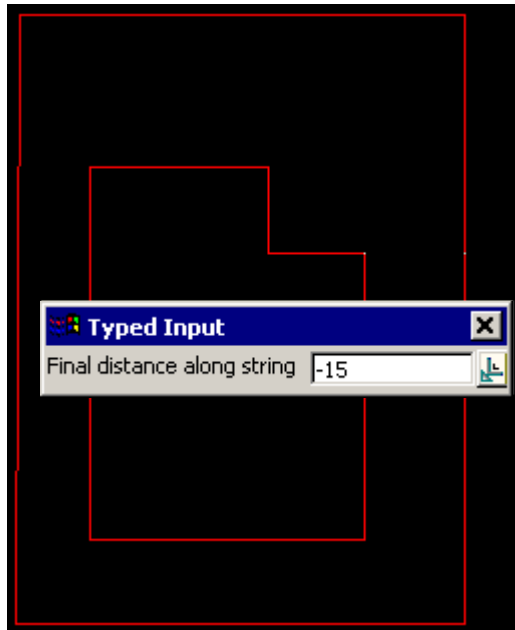
The user selects and accepts a string (with direction) to have the point dropped onto

**STEP 2:**

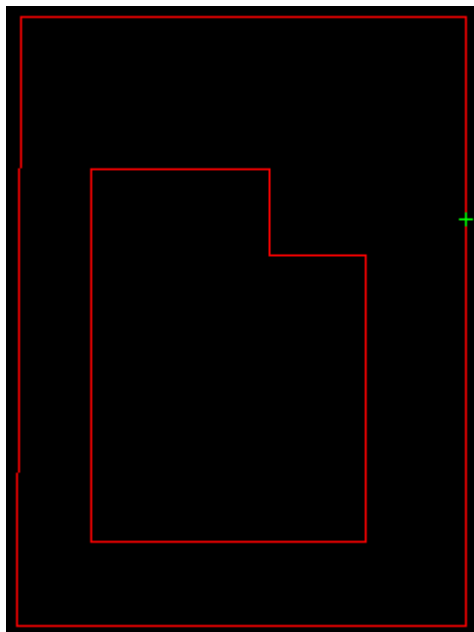
The user picks and accepts a position to drop onto the nominated string

**STEP 3:**

The user is prompted for the distance along the string. Positive distances are in the direction that the string was picked. A value is entered into the input box followed by the enter key.

**STEP 4:**

The point string is created the nominated distance along the string from the dropped point.

**Between Points**

Position of option on menu: Strings =>CAD =>Point =>Between points

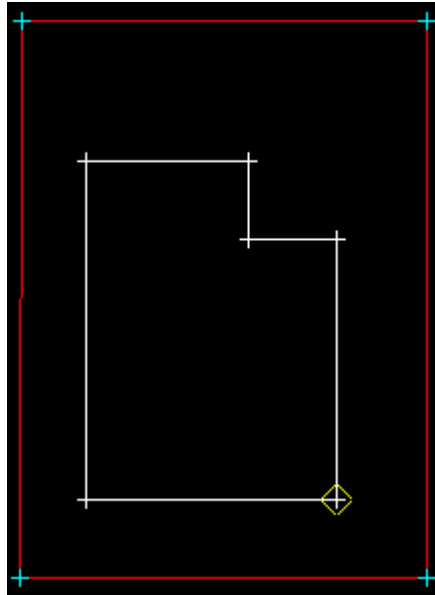
or by selection of appropriate icon from the toolbar. 

This option creates a one point string that is on the line between two selected positions and a given distance from the first point.

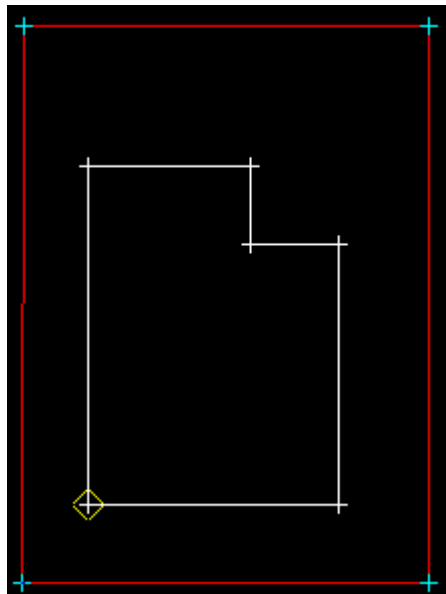
On selecting **Between points**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

The user selects a start point. Specification of a position can be done by the direct input of the xyz coordinate of the point by pressing the space bar to bring up the enter XYZ panel or by typing of the value to bring up the XYZ panel. The user can also select a point with the mouse and accepts that point (Middle mouse button or enter).

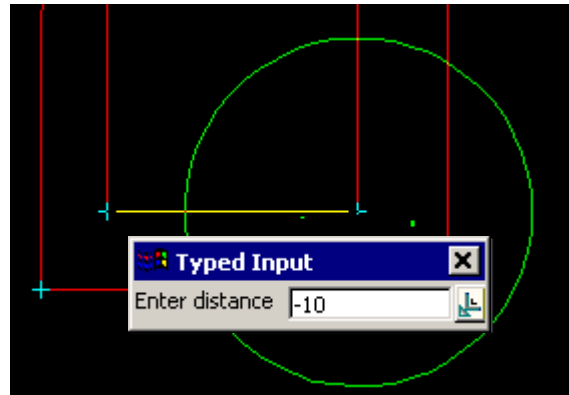
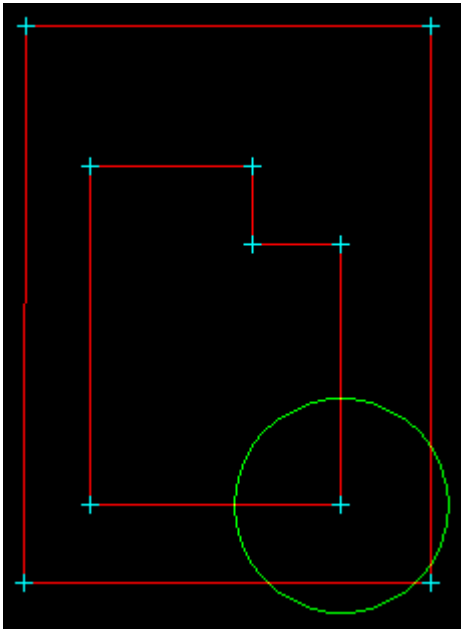
**STEP 2:**

The user picks a 2nd point and accepts that point (Middle mouse button or enter) to define the reference line.

**STEP 3:**

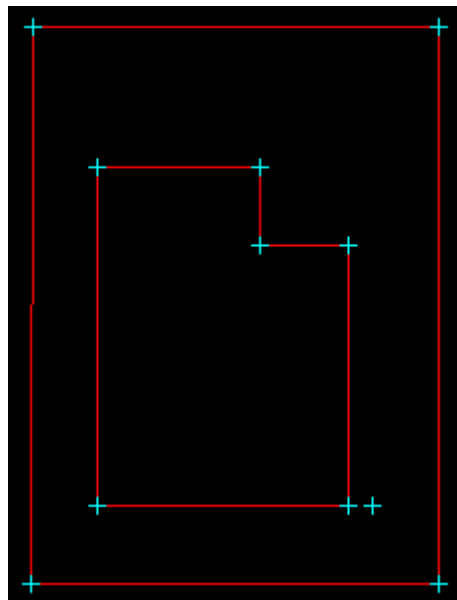
A distance from the 1st point to create the point is given either by selection with the mouse or by typing a value. To type a value, simply start typing and the input box for the distance will appear. Alternatively you can press the space bar to bring up the input box. Enter the value and then the enter key.

The circle drawn represents the distance value and changes with movement of the mouse. If the user wants to see what the current value of the distance is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to create the point or the input box can be closed and the rubber banding (graphically changing) of the circle continued.



STEP 4:

A point is created on the segment specified by the selection of the 1st and 2nd points, at the nominated distance. Negative distances can be entered as in this example.



Between points 3d

Position of option on menu: Strings =>CAD =>Point =>Between points 3d

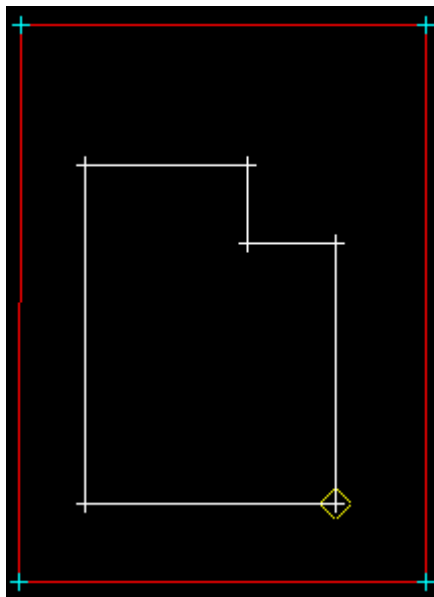
or by selection of appropriate icon from the toolbar. 

This option creates a one point string that is on the line between two selected positions and a given distance from the first point. The z-value of the string is interpolated from the two selected positions.

On selecting **Between points 3d**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

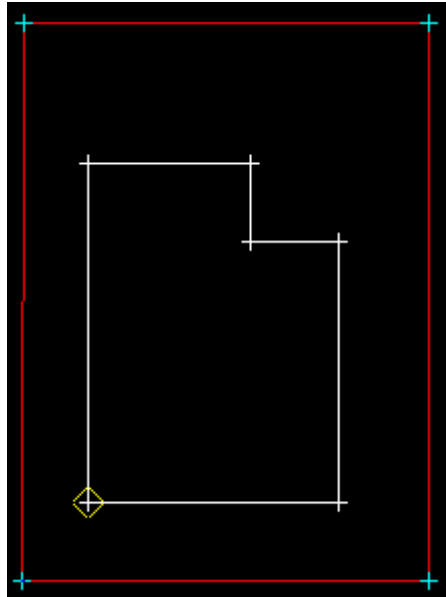
STEP 1:

The user selects a start point. Specification of a position can be done by the direct input of the xyz coordinate of the point by pressing the space bar to bring up the enter XYZ panel or by typing of the value to bring up the XYZ panel. The user can also select a point with the mouse and accepts that point (Middle mouse button or enter).



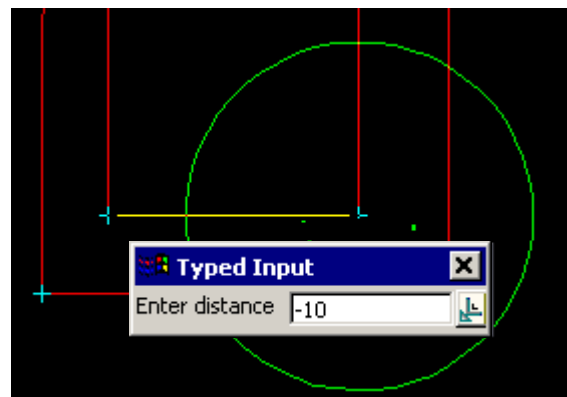
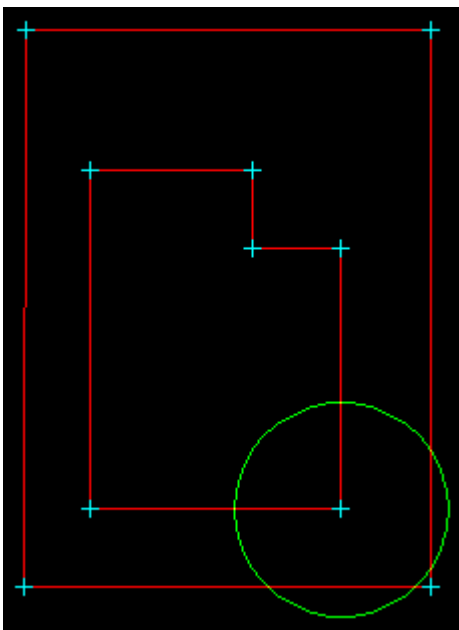
STEP 2:

The user picks a 2nd point and accepts that point (Middle mouse button or enter) to define the reference line.

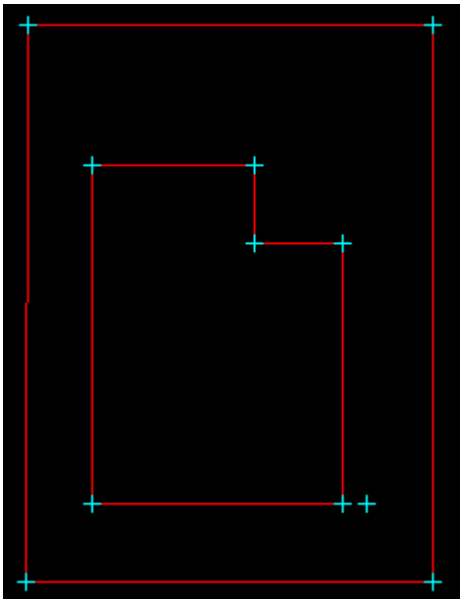
**STEP 3:**

A distance from the 1st point to create the point is given either by selection with the mouse or by typing a value. To type a value, simply start typing and the input box for the distance will appear. Alternatively you can press the space bar to bring up the input box. Enter the value and then the enter key.


The circle drawn represents the distance value and changes with movement of the mouse. If the user wants to see what the current value of the distance is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to create the point or the input box can be closed and the rubber banding (graphically changing) of the circle continued.

**STEP 4:**

A point is created on the segment specified by the selection of the 1st and 2nd points, at the nominated distance. Negative distances can be entered as in this example.



Radiation

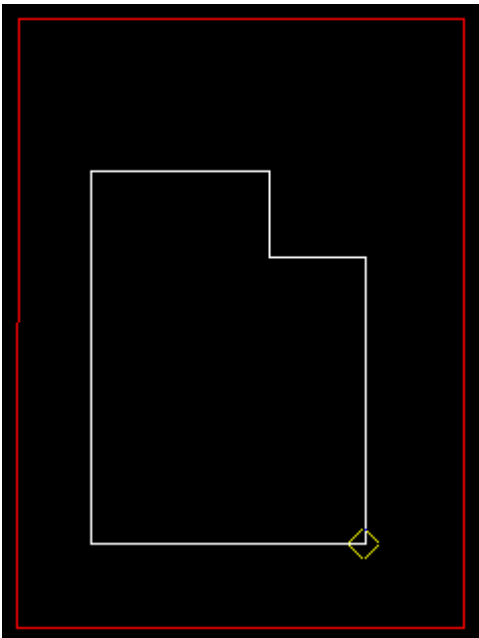
Position of option on menu: Strings =>CAD =>Point =>Radiation
or by selection of appropriate icon from the toolbar. 

This option creates a series of one point strings that are located by given bearings and distances from a chosen start position.

On selecting **Radiation**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

A start position is selected and accepted.

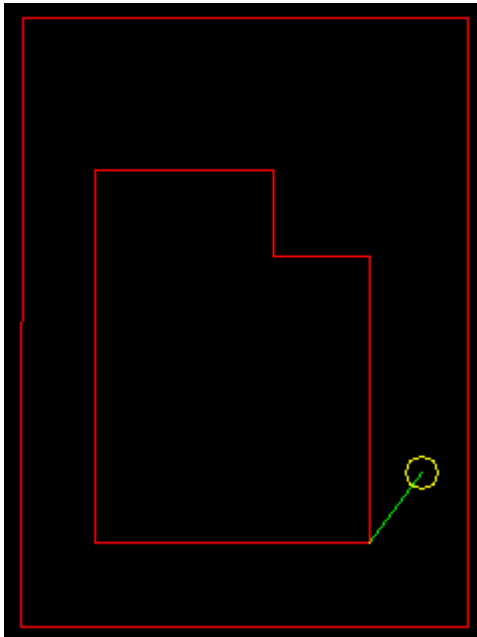


STEP 2:

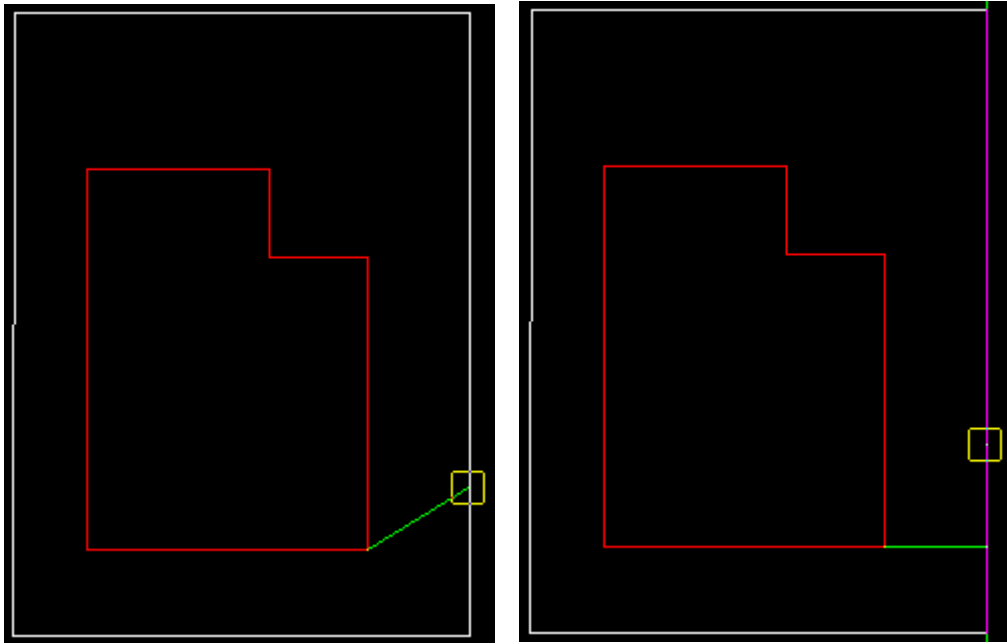
A bearing is selected with the mouse or entered in via the keyboard. For typed entry, simply start typing or press the space bar to bring up the bearing entry box. The value is entered into the input box followed by the enter key.

The line drawn represents the bearing value and changes with movement of the mouse. If the user wants to see what the current value of the bearing is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to create the point or the input box can be closed and the rubber banding (graphically changing) of the bearing continued.

Note: The Page up and page down keys can be used when the input angle box comes up to add or subtract intervals of 90 degrees.



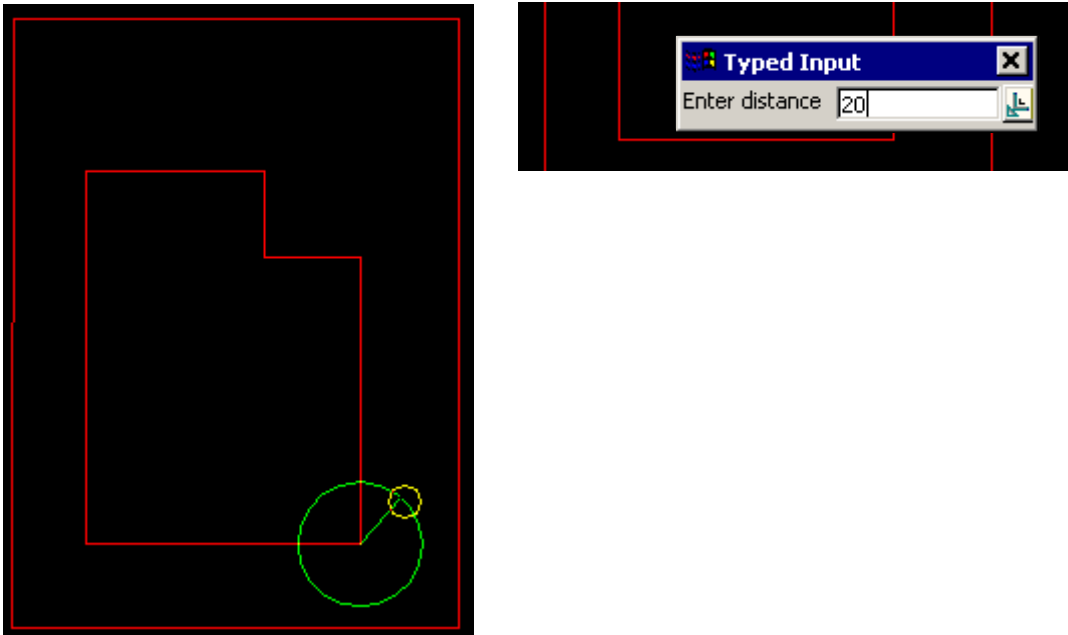
This option also allows the definition of the bearing by the selection of the 2nd point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next. The example shown below is the perpendicular case.



STEP 3:

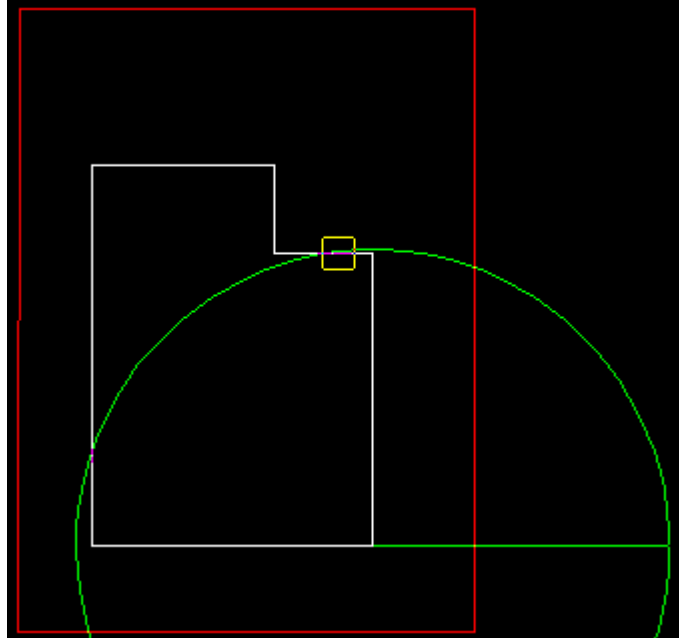
A distance from the start point to create the point is given either by selection with the mouse or by typing a value. To type a value, simply start typing and the input box for the distance will appear. Alternatively you can press the space bar to bring up the input box. The value is entered into the input box followed by the enter key.

The circle drawn represents the distance value and changes with movement of the mouse. If the user wants to see what the current value of the distance is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to create the point or the input box can be closed and the rubber banding (graphically changing) of the circle continued.

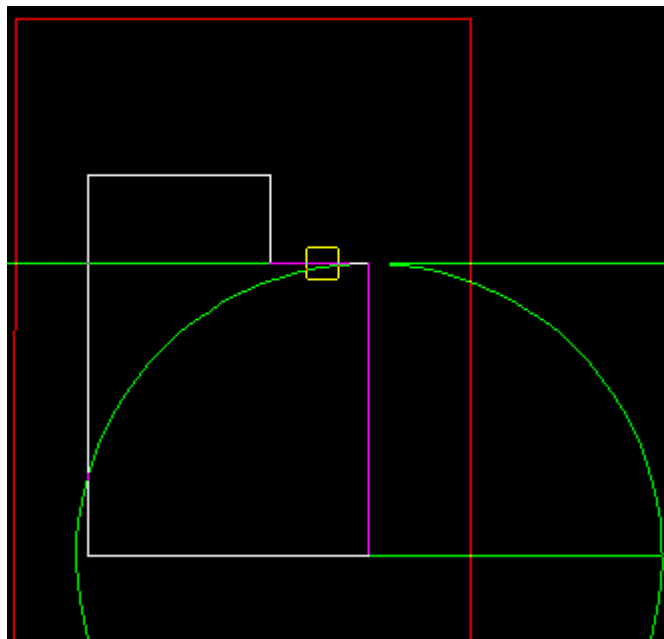


This option also allows the definition of the distance by the selection of the 2nd point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the

mouse to change from one solution to the next. The example shown below is the perpendicular case.

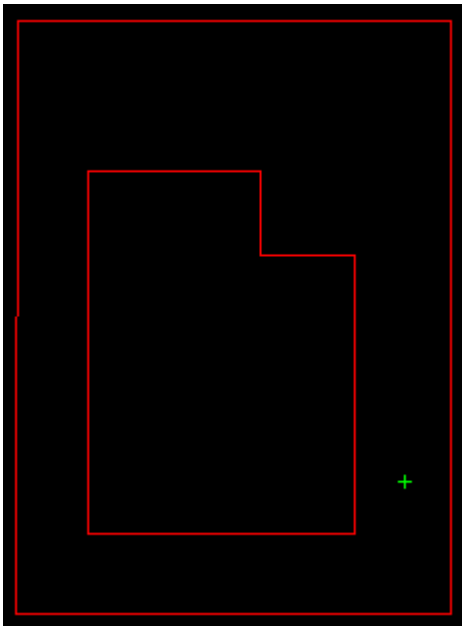


The perpendicular distance shown below by the purple line will be use at the defined bearing to create the point.



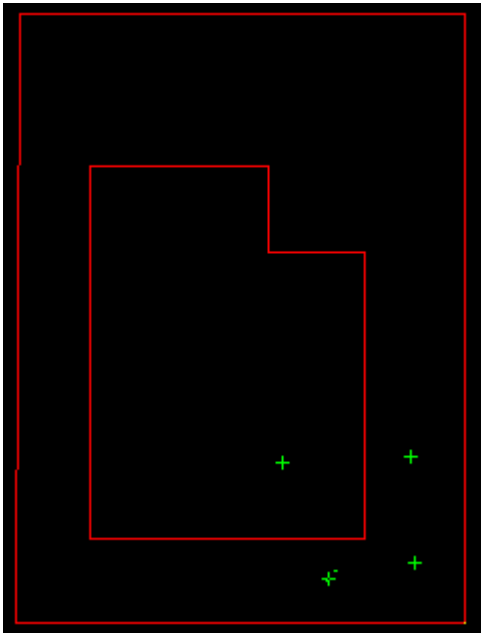
STEP 4:

A point string is created using the information supplied.




STEP 5

The next bearing and distance is prompted for as per step 3 and 4. Consequent points are created from the original start point selected.



Divide segment by number

Position of option on menu: Strings =>CAD =>Point =>Divide segment by number
or by selection of appropriate icon from the toolbar. 

This option creates one point strings which will break up a super string **segment** into equal pieces based on a user given number of intervals. The first and last points are not created since they are taken to be the end points of the selected segment. So for five intervals, four new one point strings are created. The option works for line or arc segments of a super string.



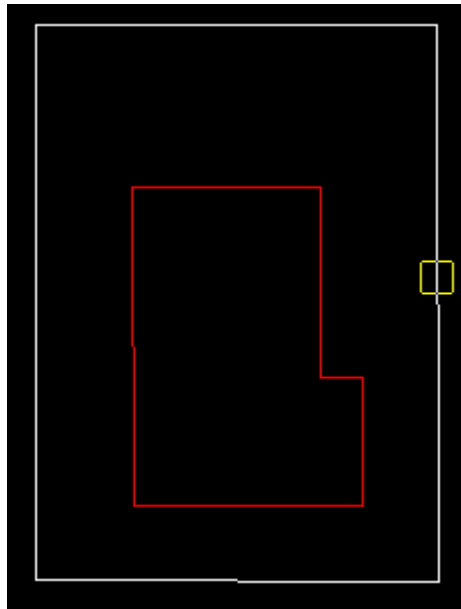
NOTES:

1. No vertices are inserted into the selected super string - the option **Strings =>Strings edits =>Segment strings** does that.
2. This option is for super strings only.

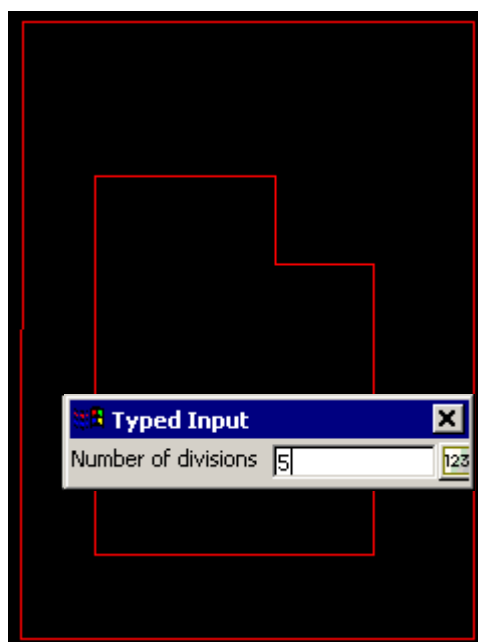
On selecting **Divide segment by number**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

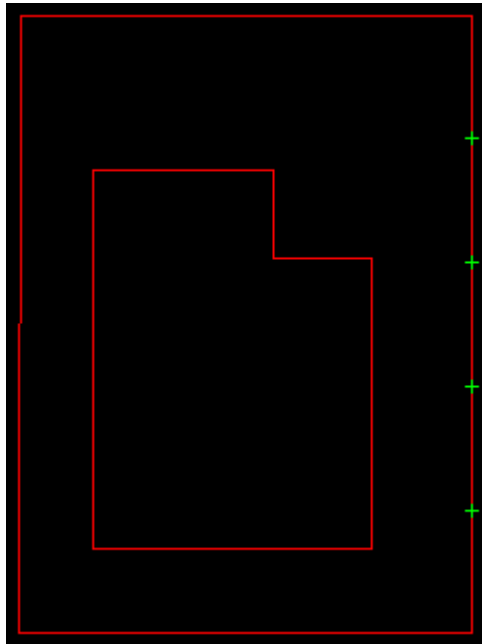
A super string segment is selected and accepted.

**STEP 2:**

The user is prompted for the number of divisions. The value is entered into the input box followed by the enter key.

**STEP 3:**

Given the above information, the new points are created.



Divide segment by chainage length

Position of option on menu: Strings =>CAD =>Point =>Divide segment by chainage length

or by selection of appropriate icon from the toolbar. 

This option creates one point strings which will break up a super string **segment** into pieces based on a user given chainage length. The process starts from the 1st point of the segment and continues until no more pieces can be created without going past the last point of the segment (the last piece may not be the correct length). This options works for line or arc segments of a super string.

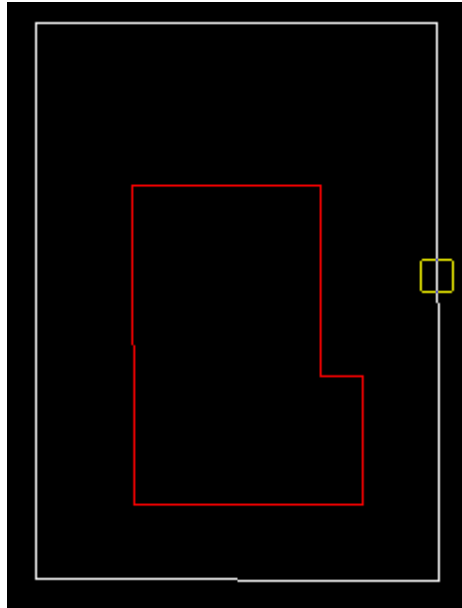
NOTES:

1. No vertices are inserted into the selected super string - the option Strings =>Strings edits =>Segment strings does that.
2. This option is for super strings only.

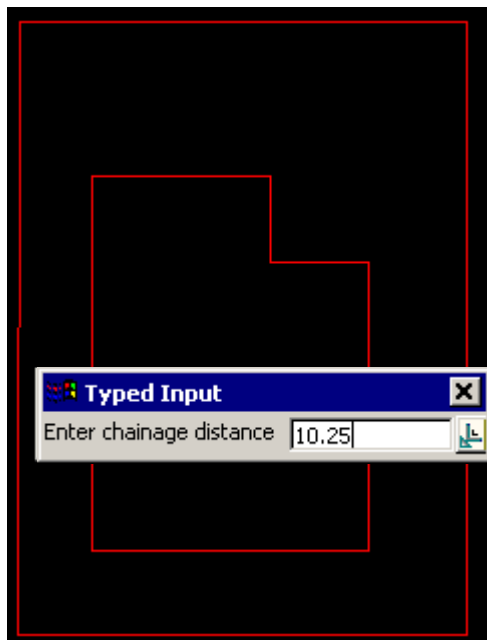
On selecting **Divide segment by chainage length**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

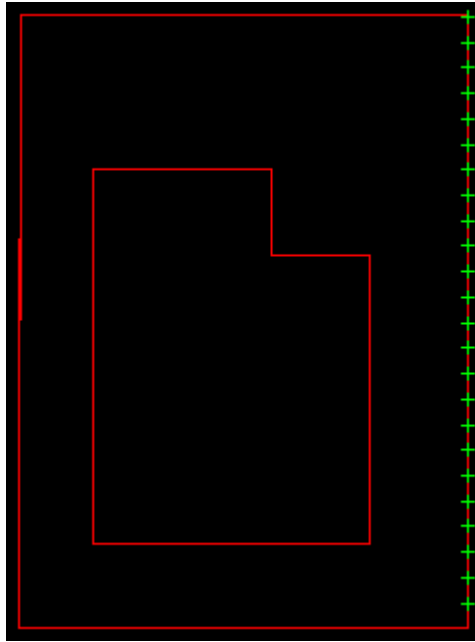
A super string segment is selected and accepted.

**STEP 2:**

The user is prompted for the chainage distance. The value is entered into the input box followed by the enter key.

**STEP 3:**

Given the above information, the new points are created.



Divide string by number

Position of option on menu: Strings =>CAD =>Point =>Divide string by number

or by selection of appropriate icon from the toolbar. 

This option creates one point strings which will break up a super string into equal pieces based on a user given number of divisions. The first and last points are not created since they are taken to be the end points of the selected string. So for five intervals, four new one point strings are created.

NOTES:

1. No vertices are inserted into the selected super string - the option **Strings =>Strings edits =>Segment strings** does that.
2. This option is for super strings only.

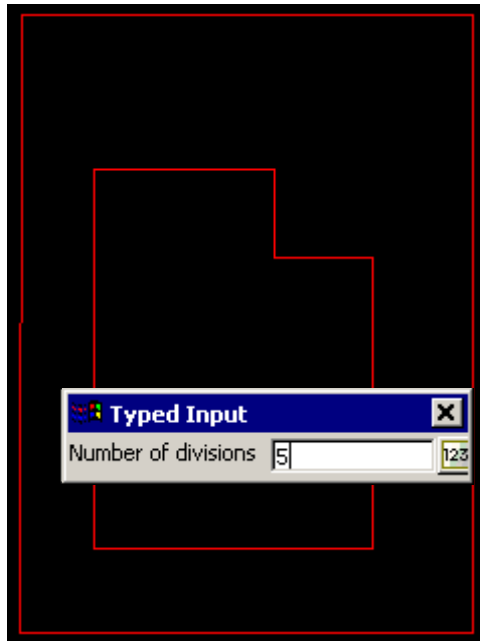
On selecting **Divide string by number**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

A super string is selected and accepted.

STEP 2:

The user is prompted for the number of divisions. The value is entered into the input box followed by the enter key.

**STEP 3:**

Given the above information, the new points are created.

Divide string by chainage length

Position of option on menu: Strings =>CAD =>Point =>Divide string by chainage length

or by selection of appropriate icon from the toolbar. 

This option creates one point strings which will break up a *super string* into pieces based on a user given chainage length. The process starts from the 1st vertex of the strings and continues until no more pieces can be created without going past the last vertex of the string (the last piece may not be the correct length).

NOTES:

1. No vertices are inserted into the selected super string - the option Strings =>Strings edits =>Segment strings does that.
2. This option is for super strings only.

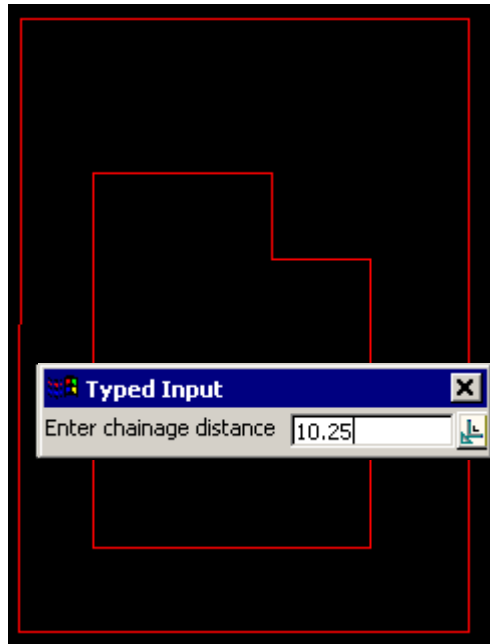
On selecting **Divide string by chainage length**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

A super string is selected and accepted.

STEP 2:

The user is prompted for the chainage distance. The value is entered into the input box followed by the <Enter> key.

**STEP 3:**

Given the above information, the new points are created.

String IPs

Position of option on menu: Strings =>CAD =>Point =>String IPs

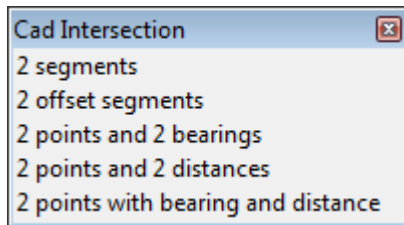
This option creates a separate point at each vertex of a selected string.

On selecting **String IPs** the user is prompted to select a string and a new point (a one vertex super string) is created for each vertex on the selected string. The model, colour, height, *etc.* for the new points are defined in the **Cad Control Bar**.

CAD Intersection

Position of option on menu: Strings =>CAD =>Intersection

The Intersection walk-right menu is



Menu of Options to Create One Point Strings by Intersections

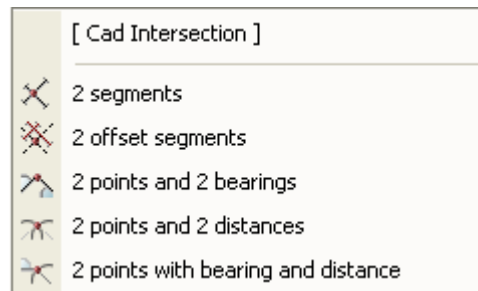
by intersecting two selected segments

by intersecting two offset selected segments

by given bearings from two selected positions

create a point with given distances from two selected positions

by selecting posn and bearing and another selected posn and dist



For the option *2 segments*, go to

2 offset segments

2 points and 2 bearings

2 points and 2 distances

2 points with bearing and distance

[2 segments](#)

[2 offset segments](#)

[2 points and 2 bearings](#)

[2 points and 2 distances](#)

[2 points with bearing and distance](#)

2 segments

Position of option on menu: Strings =>CAD =>Intersection=> 2 segments

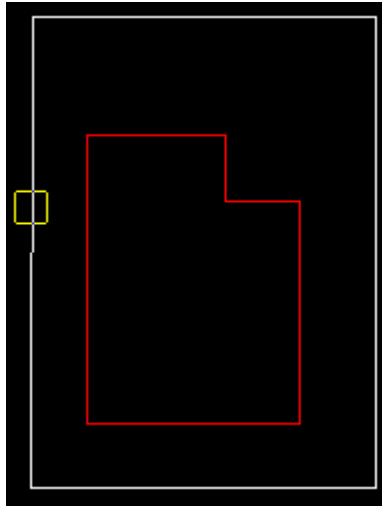
or by selection of appropriate icon from the toolbar.

This option creates a point at the intersection of the projections of two line or arc segments.

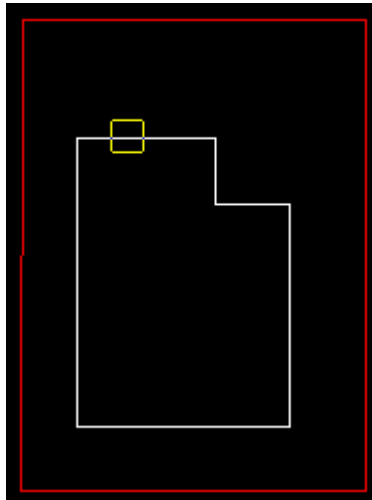
On selecting *2 segments*, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

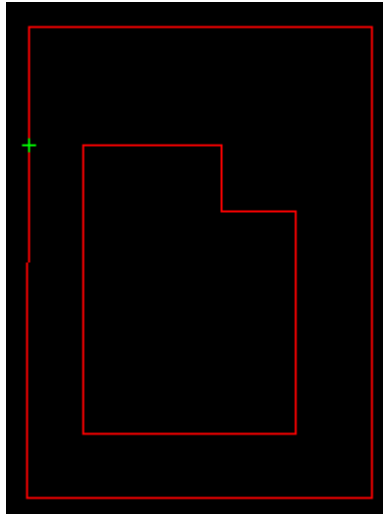
The 1st segment is selected and accepted.

**STEP 2:**

The 2nd segment is selected and accepted.

**STEP 3:**

A point is created at the intersection of the two segments (if a solution exists). Note that the 2nd segment in this case has been projected to enable a solution to be calculated.



2 offset segments

Position of option on menu: Strings =>CAD =>Intersection=> 2 offset segments

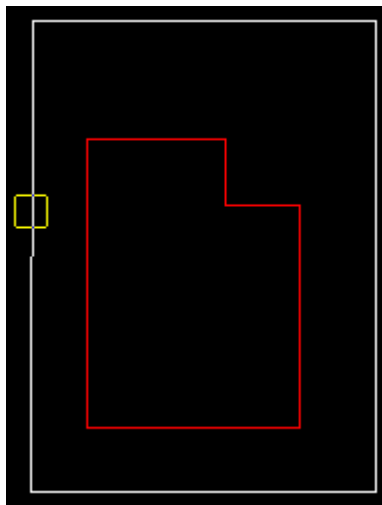
or by selection of appropriate icon from the toolbar. 

This option creates a point at the intersection of the offsets of two selected segments.

On selecting **2 offset segments**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

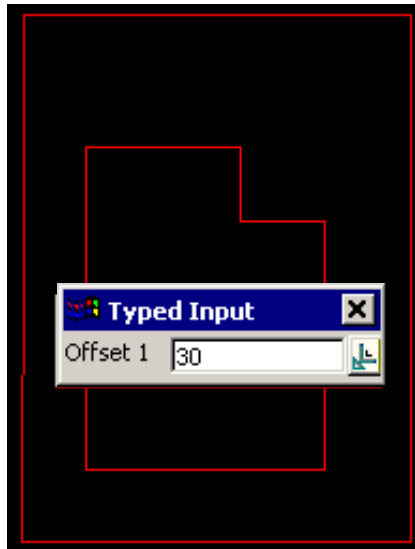
STEP 1:

The 1st segment is selected and accepted with direction. This sets the positive direction of the offset to the right of the direction of pick.

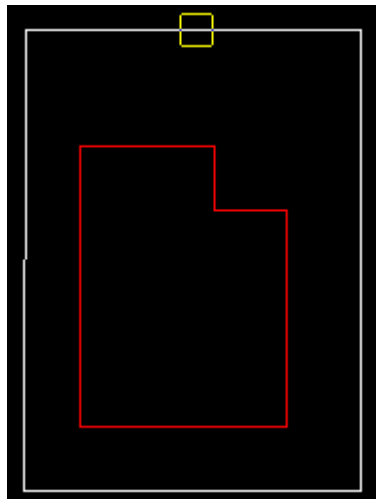


STEP 2:

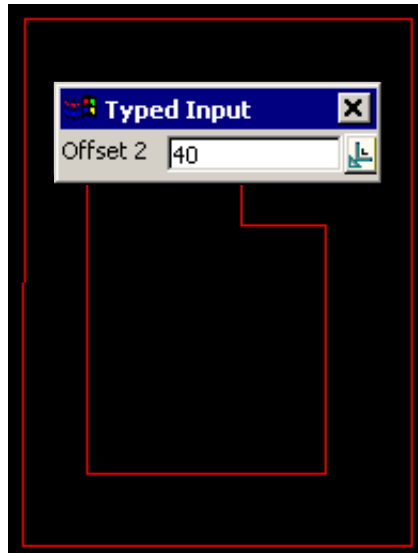
The offset is given by into an offset input box. The positive direction is at 90 degrees to the direction of pick for the segment. The value is entered into the input box followed by the enter key.

**STEP 3:**

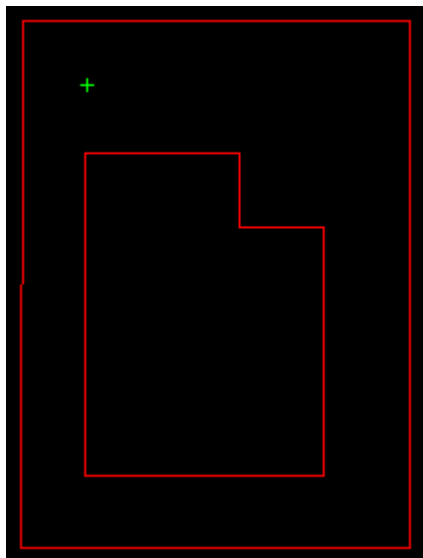
The 2nd segment is selected with direction and accepted. This sets the positive direction of the offset to the right of the direction of pick.

**STEP 4:**

The offset is given by into an offset input box. The positive direction is at 90 degrees to the direction of pick for the segment. The value is entered into the input box followed by the enter key.

**STEP 5:**

A point is created at the intersection of the projected lines offset to the segments (if a solution exists).



2 points and 2 bearings

Position of option on menu: Strings =>CAD =>Intersection=>2 points and 2 bearings

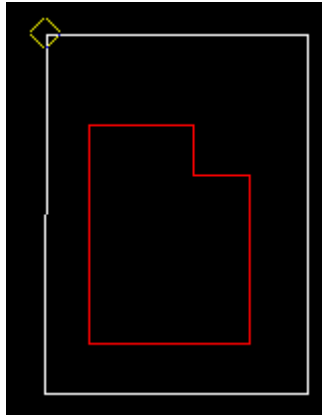
or by selection of appropriate icon from the toolbar. 

This option creates a point by using two points and two bearings.

On selecting **2 points and 2 bearings**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

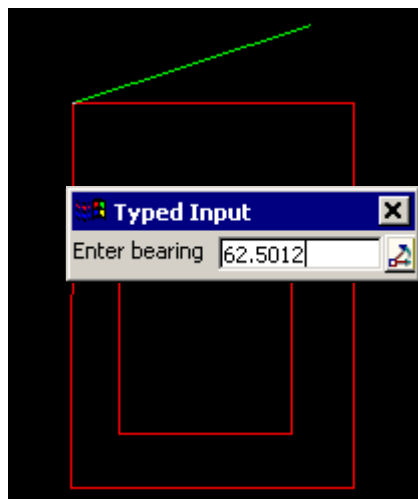
The 1st point is selected and accepted.

**STEP 2:**

A bearing from the 1st point to create the point is given either by selection with the mouse or by typing a value. To type a value, simply start typing and the input box for the bearing will appear. Alternatively you can press the space bar to bring up the input box. The value is entered into the input box followed by the enter key.

The line drawn represents the bearing value and changes with movement of the mouse. If the user wants to see what the current value of the bearing is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to create the point or the input box can be closed and the rubber banding (graphically changing) of the line continued.

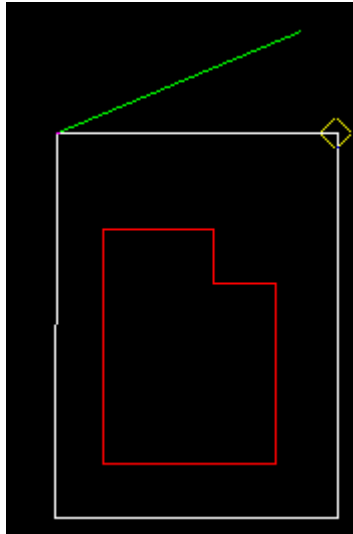
Note: The Page up and page down keys can be used when the input angle box comes up to add or subtract intervals of 90 degrees.



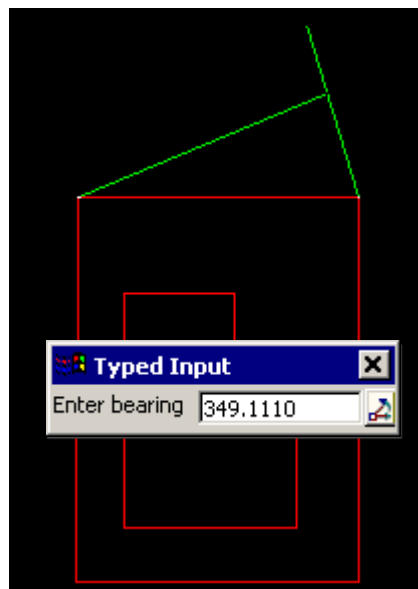
This option also allows the definition of the bearing by the selection of the 2nd point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next.

STEP 3:

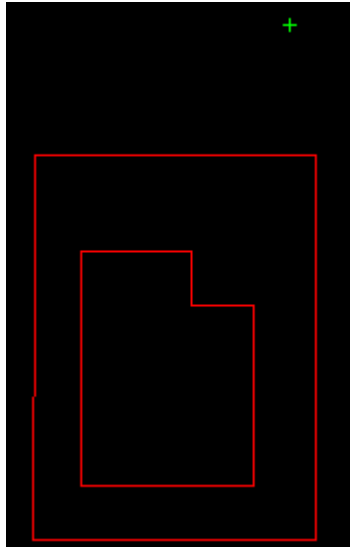
The 2nd point to create the point from is selected and accepted.

**STEP 4:**

A bearing from the 2nd point to create the point is given using the optional outlined in **STEP 2** above.

**STEP 5:**

The point is created if there is a valid solution.



2 points and 2 distances

Position of option on menu: Strings =>CAD =>Intersection=>2 points and 2 distances

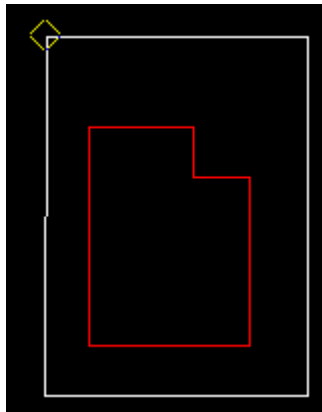
or by selection of appropriate icon from the toolbar. 

This option creates a point using two points and two distances.

On selecting **2 points and 2 distances**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

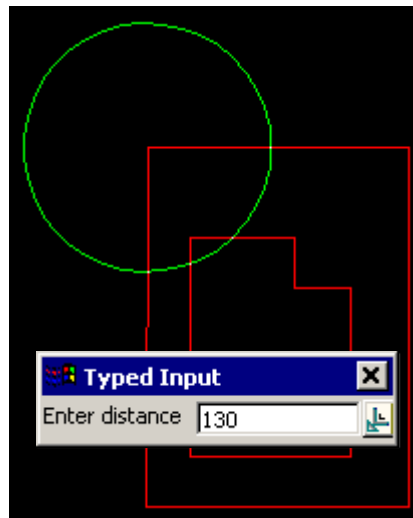
The 1st point is selected and accepted.



STEP 2:

A distance from the 1st point to create the point is given either by selection with the mouse or by typing a value. To type a value, simply start typing and the input box for the distance will appear. Alternatively you can press the space bar to bring up the input box. The value is entered into the input box followed by the enter key.

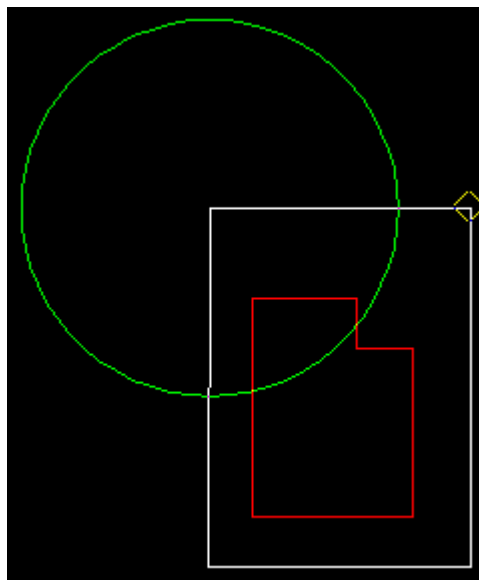
The circle drawn represents the distance value and changes with movement of the mouse. If the user wants to see what the current value of the distance is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to create the point or the input box can be closed and the rubber banding (graphically changing) of the circle continued.



This option also allows the definition of the distance by the selection of the 2nd point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next. The example shown below is the perpendicular case.

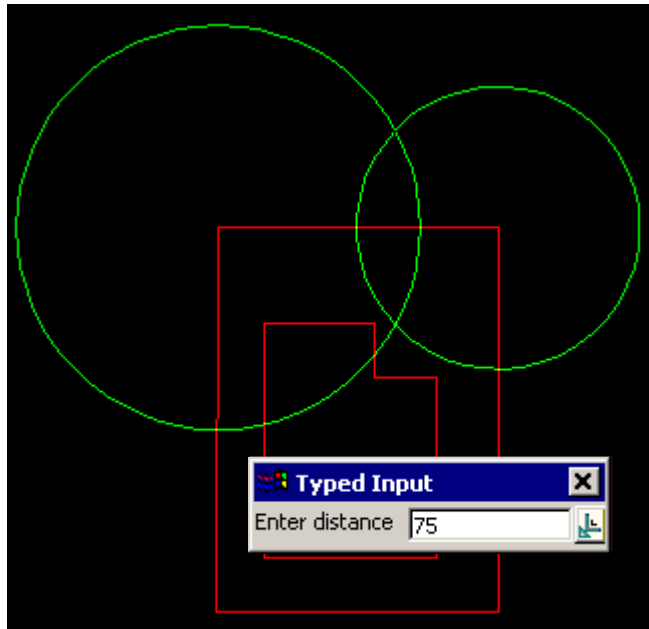
STEP 3:

The 2nd point to create the point from is selected.



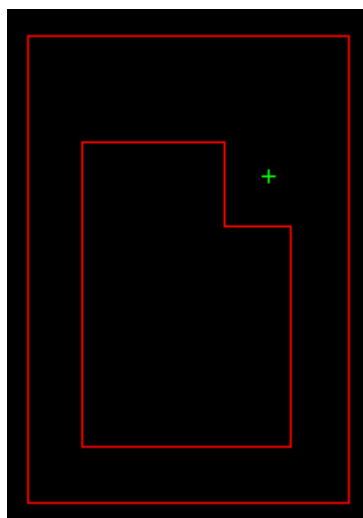
STEP 4:

A distance from the 2nd point to create the point is given using the optional outlined in **STEP 2** above.

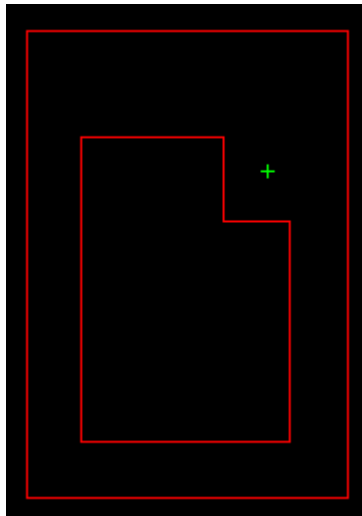
**STEP 5:**

As there is two solutions, the user can select the correct one depending on the method of construction. This can be done by the direct entry of distances or by use of the mouse.

1. Distance entry. After the entry of the 1st distance, the 2nd point is selected. Following the selection of the 2nd point, the 2nd radius is shown (rubber banding). The user can select one of the two solutions by choosing with a **LB** mouse click over the approximate position of the required solution. The solution chosen is the closest solution to the selected point. The final radius can then be entered via the keyboard by simply starting typing which brings up the radius entry panel automatically. This panel can also be activated by pressing the space bar.
2. Use of the mouse. The 1st point is selected and the radius entered by using the mouse or by direct entry from the keyboard. The 2nd point is then selected and the 2nd radius is displayed (rubber banding). A solution can be chosen by selecting with a **LB** mouse click over the required solution. The final solution will be the closest one to the selection. **MB** to accept the intersection and create the point.

**STEP 6:**

The point is created if there is a valid solution.



2 points with bearing and distance

Position of option on menu: Strings =>CAD =>Intersection=>2 points with bearing and distance

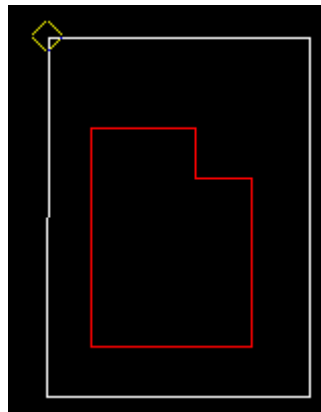
or by selection of appropriate icon from the toolbar. 

This option creates a point from a given point and a bearing, and a second point and a distance.

On selecting **2 points with bearing and distance**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

The 1st point is selected and accepted.



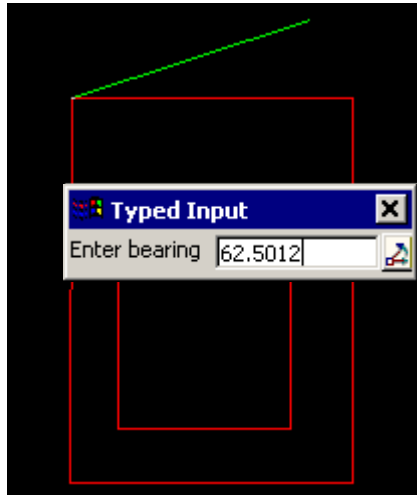
STEP 2:

A bearing from the 1st point to create the point is given either by selection with the mouse or by typing a value. To type a value, simply start typing and the input box for the bearing will appear. Alternatively you can press the space bar to bring up the input box. The value is entered into the input box followed by the enter key.

The line drawn represents the bearing value and changes with movement of the mouse. If the user wants to see what the current value of the bearing is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to create the point or the input box can be closed and the rubber banding (graphically changing) of the line continued.

Note: The Page up and page down keys can be used when the input angle box comes up

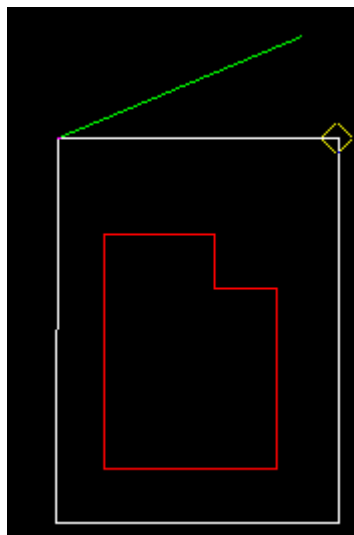
to add or subtract intervals of 90 degrees.



This option also allows the definition of the bearing by the selection of the 2nd point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next.

STEP 3:

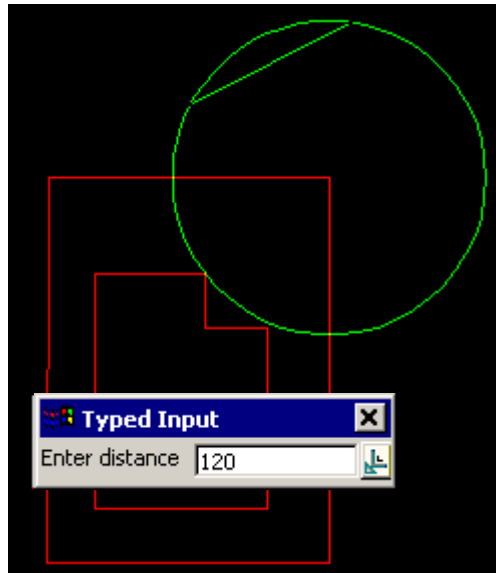
The 2nd point to create the point from is selected and accepted.



STEP 4:

A distance from the 2nd point to create the point is given either by selection with the mouse or by typing a value. To type a value, simply start typing and the input box for the distance will appear. Alternatively you can press the space bar to bring up the input box. The value is entered into the input box followed by the enter key.

The circle drawn represents the distance value and changes with movement of the mouse. If the user wants to see what the current value of the distance is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to create the point or the input box can be closed and the rubber banding (graphically changing) of the circle continued.

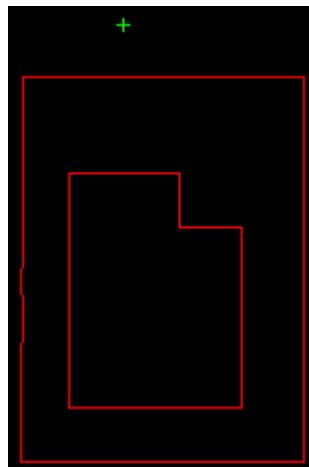


This option also allows the definition of the distance by the selection of the 2nd point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next. The example shown below is the perpendicular case.

A line is drawn between the two possible solutions.

STEP 5:

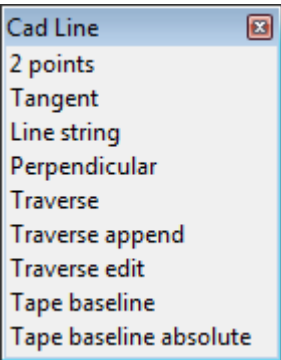
As there is two solutions, the user can select the correct one with the mouse.



CAD Line

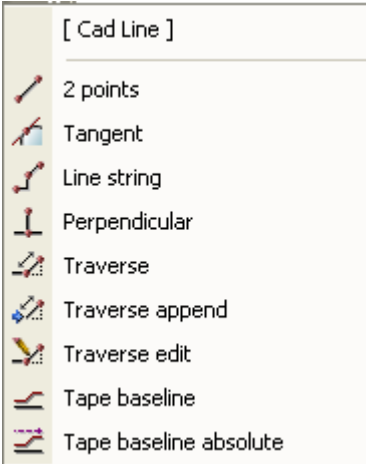
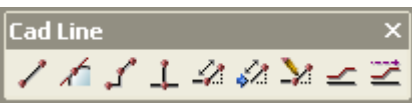
Position of option on menu: Strings =>CAD =>Line

The Line walk-right menu is



Menu of Options to Create Strings

- create a two vertex (point) super string
- create tangent to two selected items (vertices and/or arcs)
- create a many vertex super string
- create a two points string perpendicular to a reference string
- create many vertex super string by bearing distances from previous vertex
- append to a super string using bearing distance entry
- modify the bear/distance of a selected segment
- create string with vertices a dist along and dist offset to a line
- create string with vertices a dist along and dist offset absolute to a line



For the option *2 points*, go to

- | | |
|-------------------------------|----------------------------------------|
| <i>Tangent</i> | 2 Points |
| <i>Line string</i> | Tangent |
| <i>Perpendicular</i> | Line string |
| <i>Traverse</i> | Perpendicular |
| <i>Traverse append</i> | Traverse |
| <i>Traverse edit</i> | Traverse append |
| <i>Tape baseline</i> | Traverse edit |
| <i>Tape baseline absolute</i> | Tape baseline |
| | Tape baseline absolute |

2 Points

Position of option on menu: Strings =>CAD =>Line =>2 points

or by selection of appropriate icon from the toolbar. 

This option creates two vertex super strings with a line between the two vertices.

On selecting **2 points**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

The user can select a position with the mouse and on accepting that point (Middle mouse button or enter) the point is created at the selected position. The model, colour, height etc. are defined in the **Cad Control Bar**.

The snap mode will influence the mouse selection. For example if cursor snap is on, the user can

choose a position not yet defined. If point snap is on and the selection snaps to an existing point, the option will place another point at that location.

The user can also activate the selection menu used with the mouse (right button) that allows various positioning options.

Specification of a position can also be done by the direct input of the xyz coordinate of the point by pressing the space bar to bring up the enter XYZ panel. **NOTE:** The z value will default to the value entered into the **Cad Control Bar** whether or not it is specified in the XYZ box. If no height value exists in the **Cad Control Bar**

The 2nd point is selected in the same way as the 1st point. The line is created after successful selection and acceptance of the 2nd point. The option remains current so that a number of lines can be created.

Tangent

Position of option on menu: Strings =>CAD =>Line =>Tangent

or by selection of appropriate icon from the toolbar. 

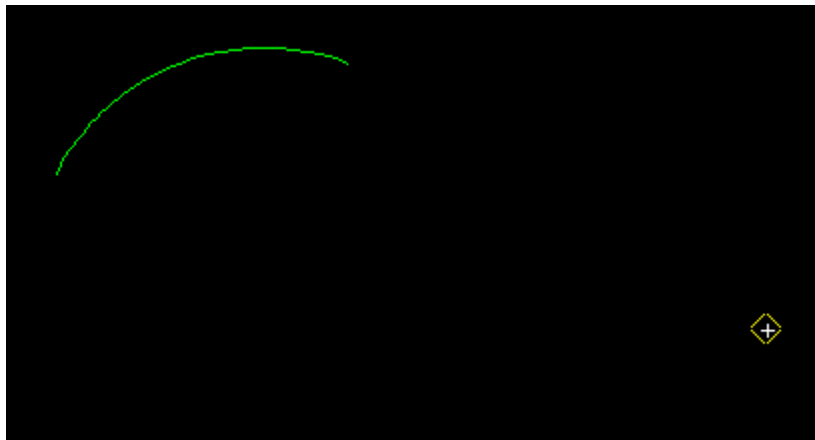
This option creates the tangential line between two elements.

NOTE: This option is for super strings only. When Selecting an arc or circle, the selection must be a line snap with direction. If a point is selected on the arc/circle the line will be draw between the selected points and not the tangent.

On selecting **Tangent**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

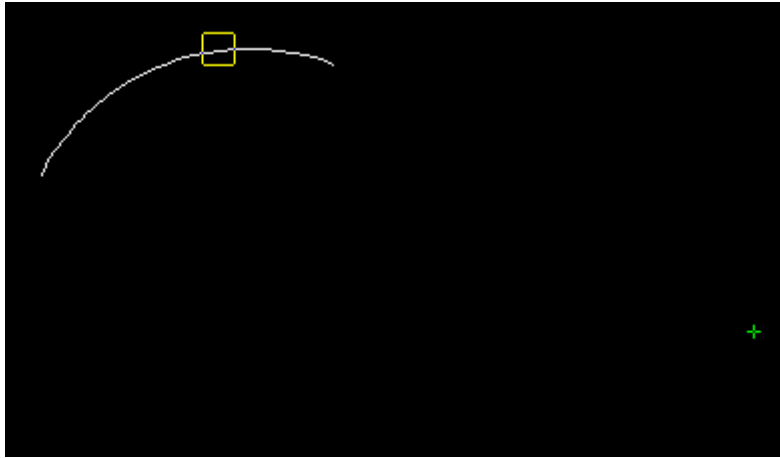
STEP 1:

A start position of the reference line is selected and accepted.

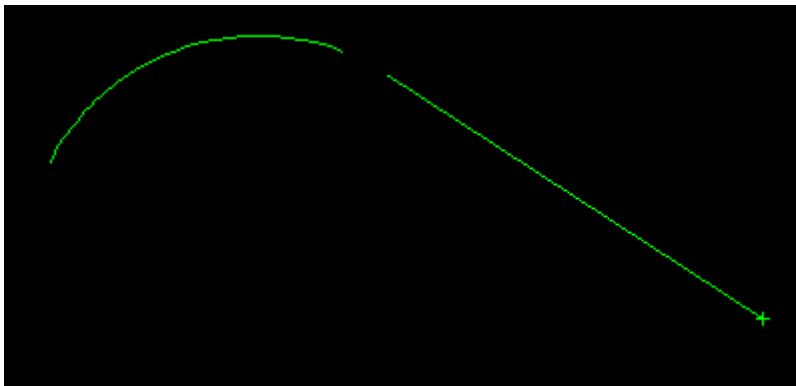


STEP 2:

The user selects and accepts the arc/circle segment with direction. The direction is required because there are two possible solutions. In this case, the direction was anti clockwise.

**STEP 3:**

After accepting the segment, a line is drawn from the 1st selected point to the tangent point. Note that in this example, the arc is produced around so that a solution can be found.

**Line string**

Position of option on menu: Strings =>CAD =>Line =>Line string

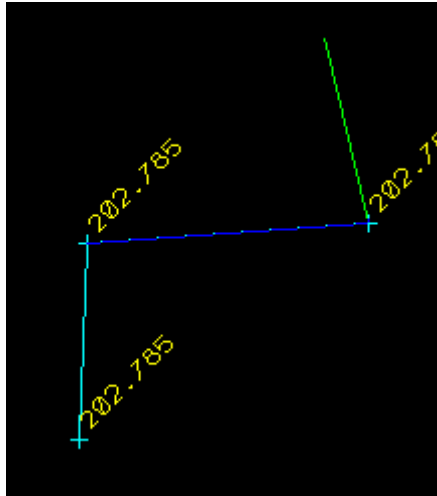
or by selection of appropriate icon from the toolbar. 

This option creates a string of many points.

On selecting **Line string**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

The position of each vertex of the string is selected and accepted in order from the first to the last vertex.



Perpendicular

This option creates a string by selecting a reference string and a reference point the create a line from the reference point perpendicular to the reference string.

On selecting **Perpendicular**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

A reference string is selected and accepted.

STEP 2:

A line is drawn from the current mouse position perpendicular to the reference string

STEP 3:

After the final position is accepted, a line string is created which start from the selected position and perpendicular to the reference string.

Traverse

Position of option on menu: Strings =>CAD =>Line=>Traverse

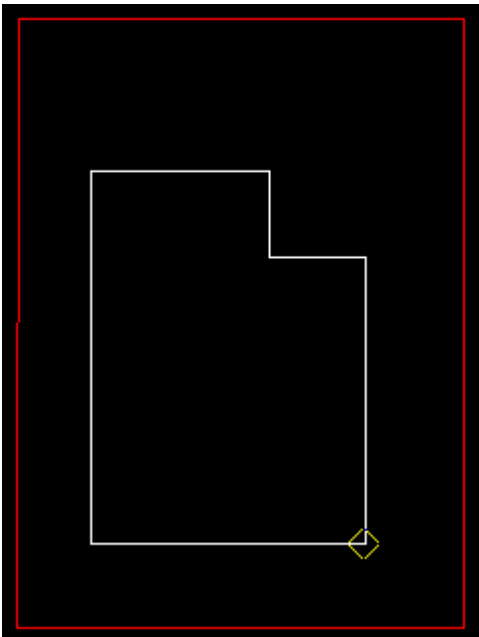
or by selection of appropriate icon from the toolbar. 

This option creates a string by giving the bearing and distance of each vertex from the previous vertex. The position of the first vertex is the start of the string and then the bearing and distance is given to define the position of the next vertex. The created vertex then become the position to take the next bearing and distance from.

On selecting **Traverse**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

A start position is selected and accepted. This becomes the first vertex of the string.

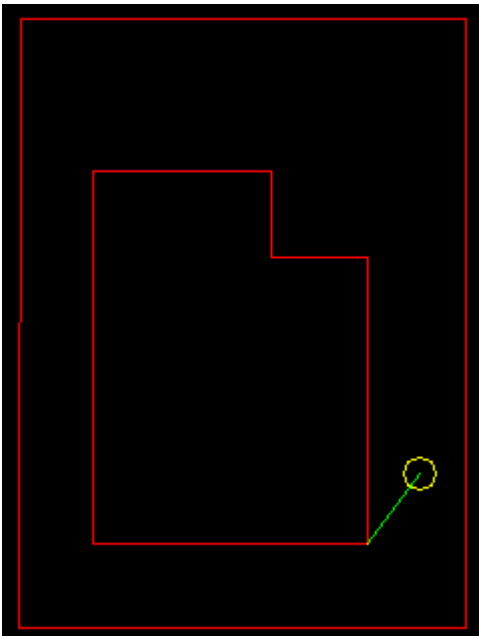


STEP 2:

A line is drawn from the vertex to the current mouse position. If the user wants to see what the current value of the bearing is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to create the point or the input box can be closed and the rubber banding (graphically changing) of the bearing continued.

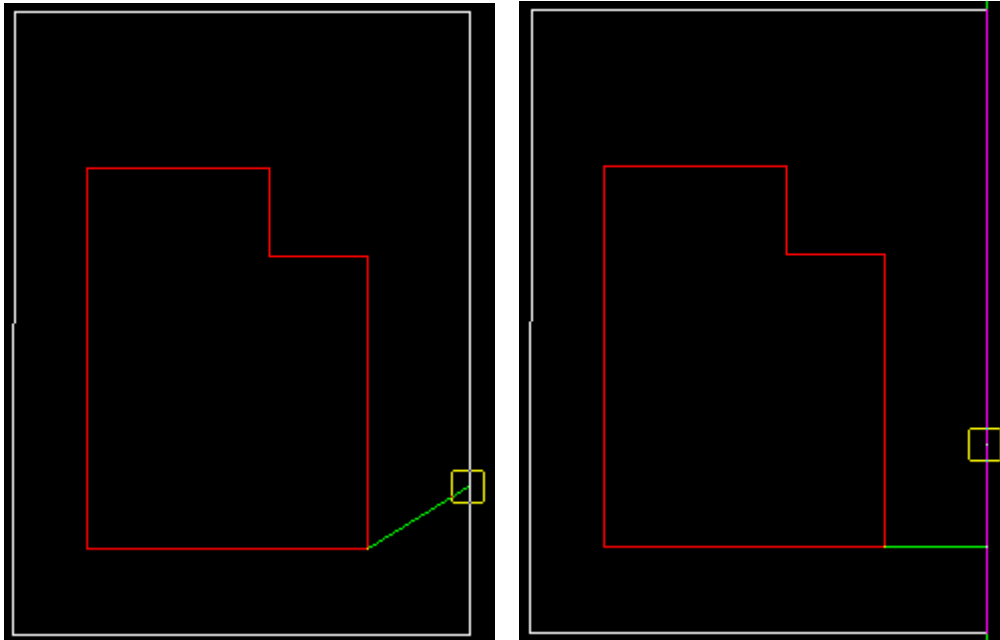
For typed entry, simply start typing or press the space bar to bring up the bearing entry box. The value is entered into the input box followed by the enter key.

Note: The Page up and page down keys can be used when the input angle box comes up to add or subtract intervals of 90 degrees.



This option also allows the definition of the bearing by the selection of the 2nd point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user

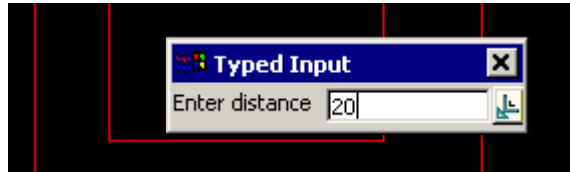
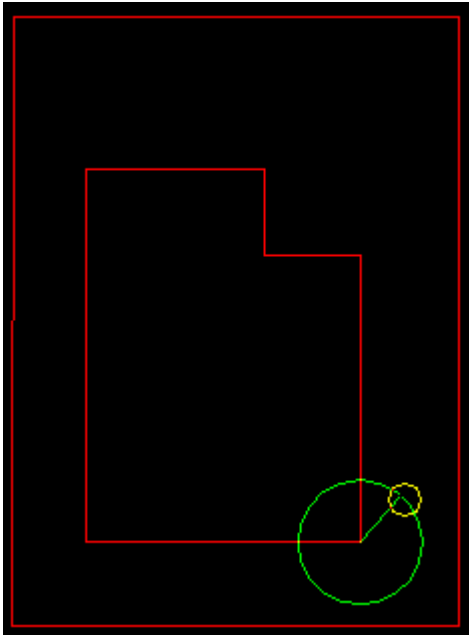
selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next. The example shown below is the perpendicular case.



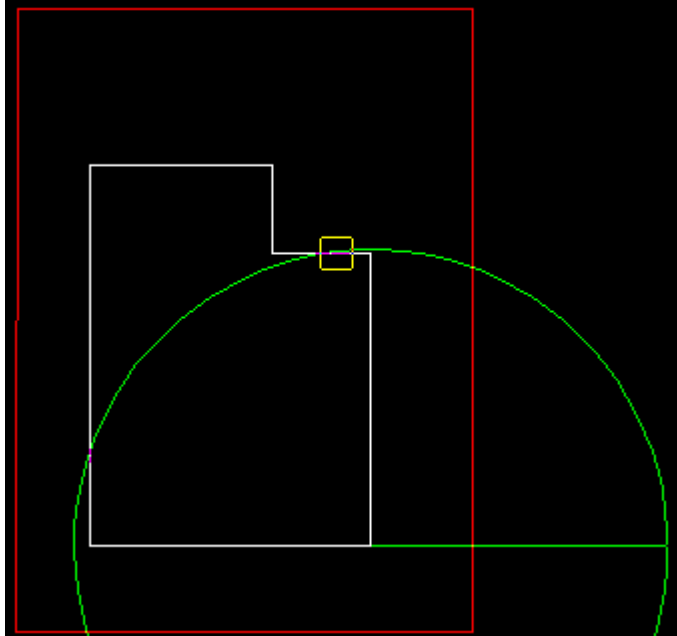
STEP 3:

A distance from the start point to create the point is given either by selection with the mouse or by typing a value. To type a value, simply start typing and the input box for the distance will appear. Alternatively you can press the space bar to bring up the input box. The value is entered into the input box followed by the enter key.

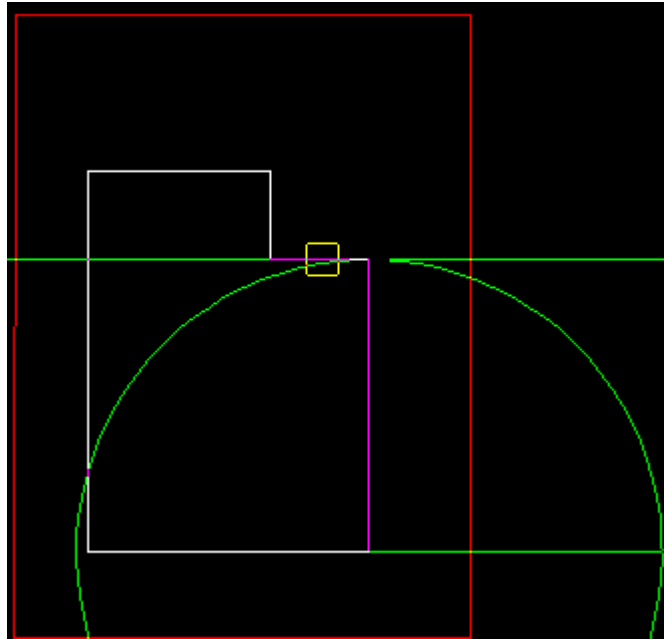
The circle drawn represents the distance value and changes with movement of the mouse. If the user wants to see what the current value of the distance is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to create the point or the input box can be closed and the rubber banding (graphically changing) of the circle continued.



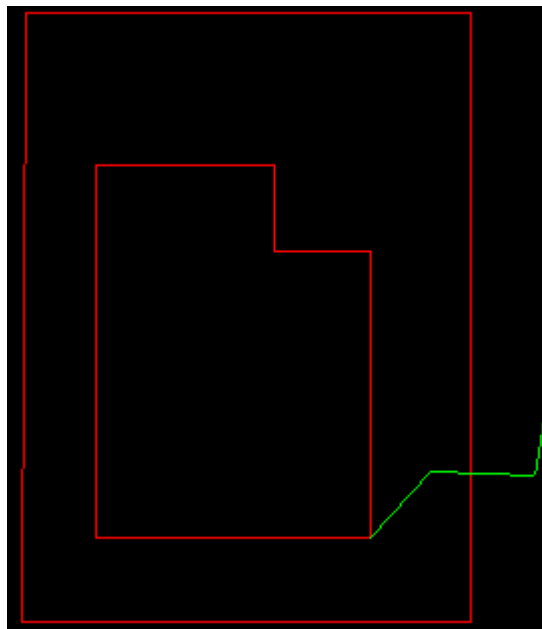
This option also allows the definition of the distance by the selection of the 2nd point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next. The example shown below is the perpendicular case.



The perpendicular distance shown below by the purple line will be use at the defined bearing to create the point.

**STEPS 4-5:**

The next bearing and distance is prompted for as per step 4 and 5. The start point is now the last created point. A number of segments can be entered in this way.

**Traverse append**

Position of option on menu: Strings =>CAD =>Line =>Traverse append

or by selection of appropriate icon from the toolbar. 

This option adds vertices to the **end** of a super string by giving the bearing and distance of each vertex from the previous vertex. When a string is selected, the end of the string becomes the position that the bearing distance is taken from. The created vertex then become the position to take the next bearing and distance from.

On selecting **Traverse append**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

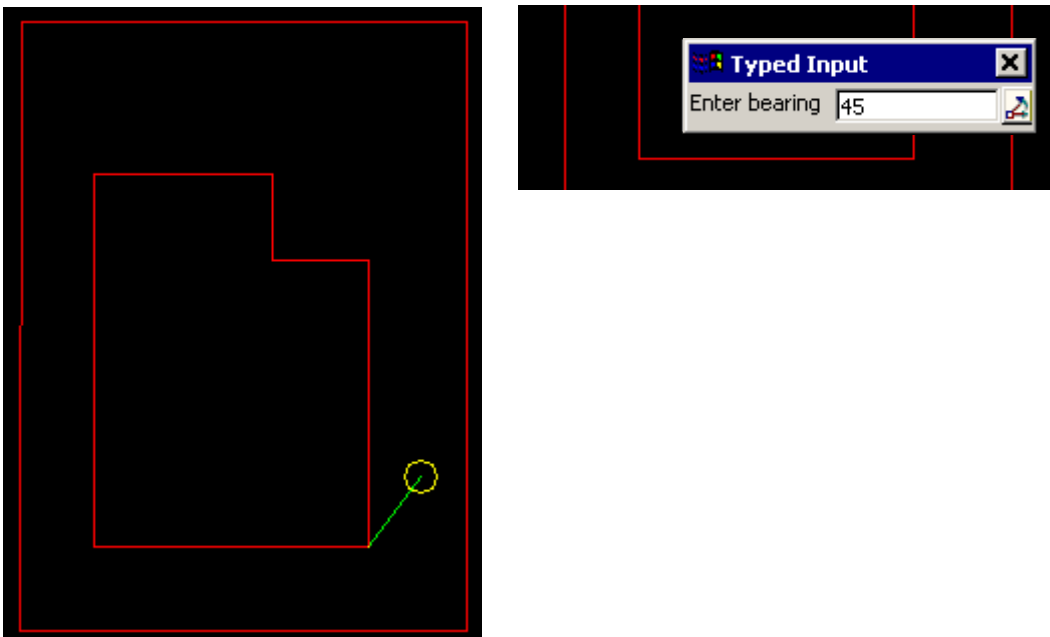
A string to append vertices to is selected and accepted. The end of this string becomes the position to define the first bearing distance from.

STEP 2:

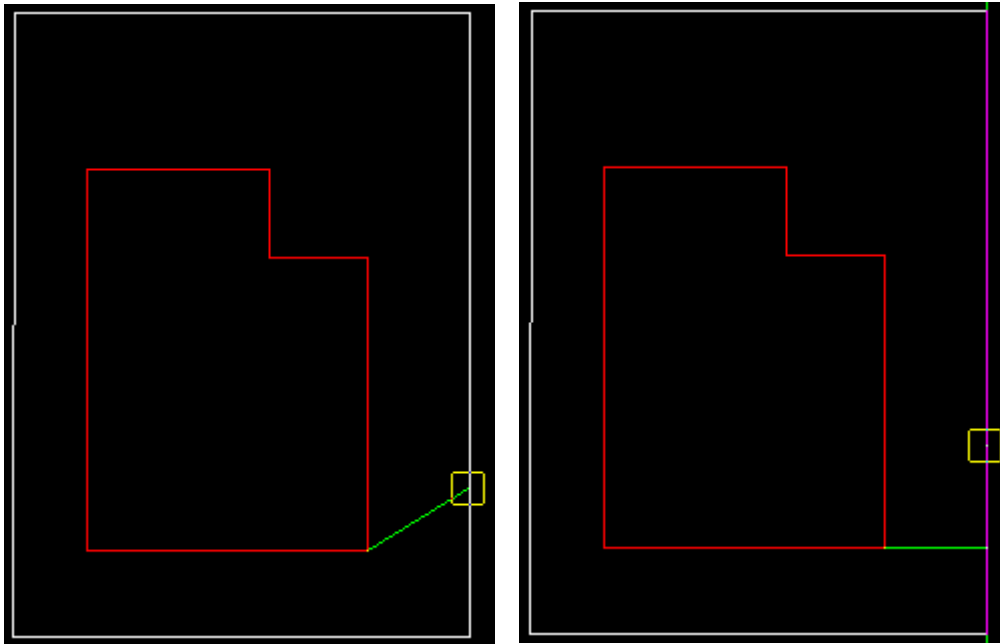
A line is drawn from the last vertex to the current mouse position. If the user wants to see what the current value of the bearing is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to create the point or the input box can be closed and the rubber banding (graphically changing) of the bearing continued.

For typed entry, simply start typing or press the space bar to bring up the bearing entry box. The value is entered into the input box followed by the enter key.

Note: The Page up and page down keys can be used when the input angle box comes up to add or subtract intervals of 90 degrees.

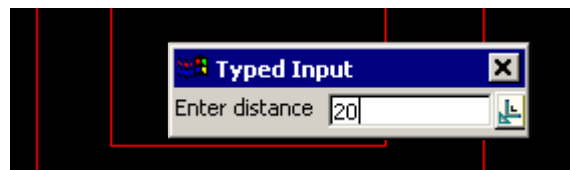
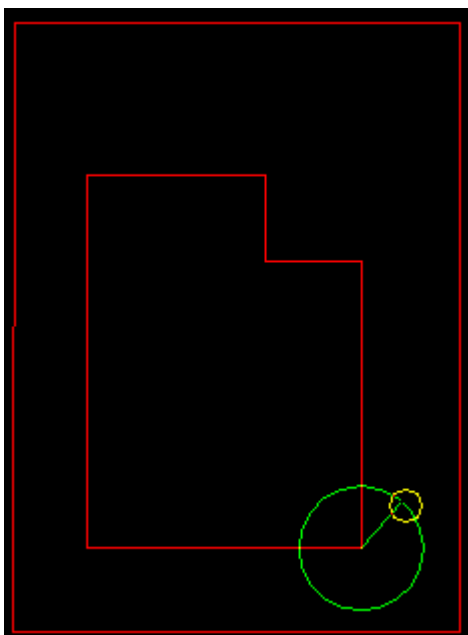


This option also allows the definition of the bearing by the selection of the 2nd point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next. The example shown below is the perpendicular case.

**STEP 3:**

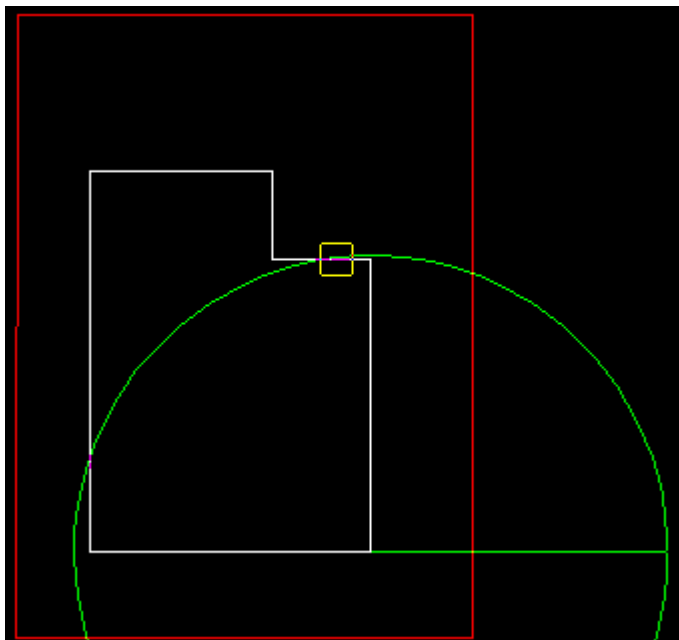
A distance from the start point to create the point is given either by selection with the mouse or by typing a value. To type a value, simply start typing and the input box for the distance will appear. Alternatively you can press the space bar to bring up the input box. The value is entered into the input box followed by the enter key.

The circle drawn represents the distance value and changes with movement of the mouse. If the user wants to see what the current value of the distance is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to create the point or the input box can be closed and the rubber banding (graphically changing) of the circle continued.

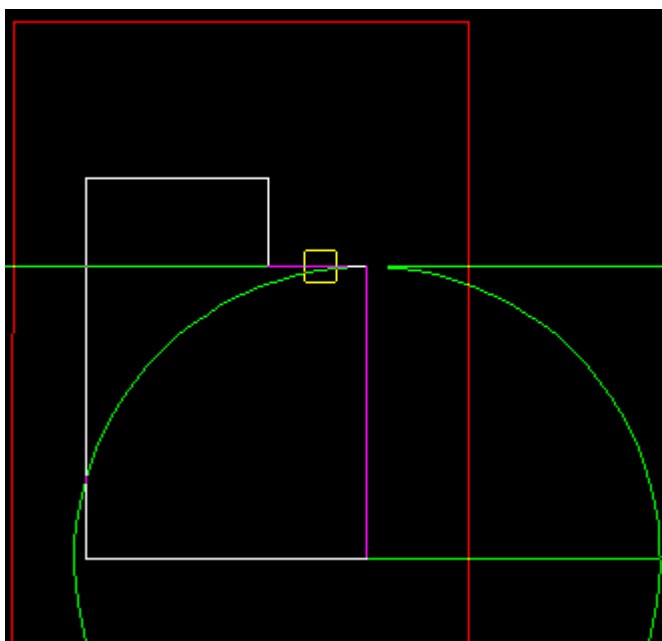


This option also allows the definition of the distance by the selection of the 2nd point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user

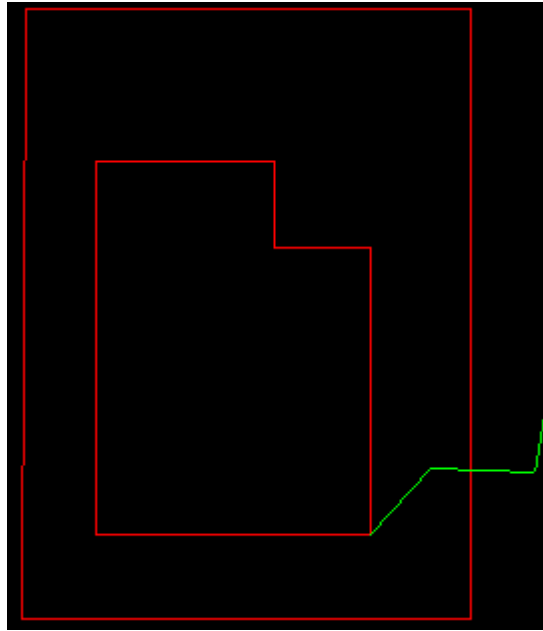
selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next. The example shown below is the perpendicular case.



The perpendicular distance shown below by the purple line will be use at the defined bearing to create the point.

**STEPS 4-5:**

The next bearing and distance is prompted for as per step 4 and 5. The start point is now the last created point. A number of segments can be entered in this way.



Traverse edit

Position of option on menu: Strings =>CAD =>Line =>Traverse edit

or by selection of appropriate icon from the toolbar. 

This option changes the bearing and length of a selected line segment of a super string.

On selecting **Traverse edit**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

A line segment of a string is selected and accepted. This segment is the one to have its bearing distance redefined.

STEP 2:

A **Bearing** and then the **Distance** typed input boxes are presented with the current values for the line segment displayed. After new values are entered (or just <enter> if the original value is to be maintained) then the new bearing and distance values are applied to the start vertex of the segment to produce a new end vertex. The rest of the string keeps the same bearing/distances are in the original string.

Note: The **Page up** and **page down** keys can be used when the input bearing box comes up to add or subtract intervals of 90 degrees.

Tape baseline

Position of option on menu: Strings =>CAD =>Line =>Tape baseline

or by selection of appropriate icon from the toolbar. 

This option creates a line string by entering distances between points and the offset distance to a user defined reference line string.

On selecting **Tape baseline**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

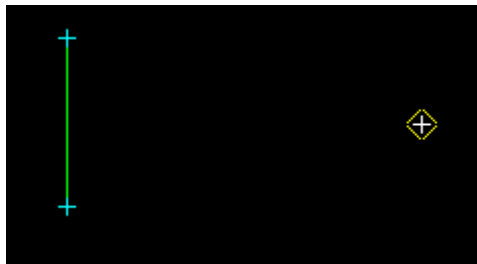
A start position of the reference line is selected and accepted.

Note: Originating at the start point, the reference line will extend to infinity after intercepting the 2nd point. The offset values are made relative to this reference line. The reference line will be removed once the option has been terminated.



STEP 2:

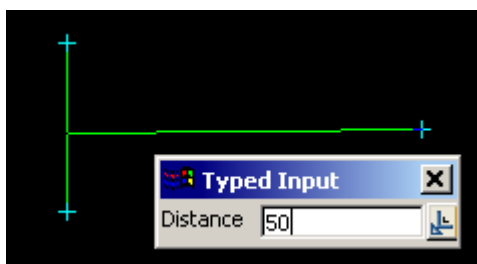
The interception point for the reference line is selected and accepted.



STEP 3:

After the start and interception points are accepted, the reference line is constructed and the Distance Input box appears. A distance value is to be entered into the Input box, followed by the enter key. For the first point, the distance entered is relative to the start point of the reference line. A positive value means a distance towards the intercept point (from the start point).

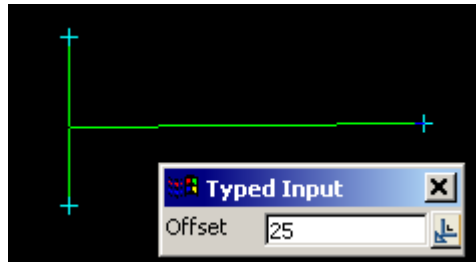
Note: The distance is always relative to the previously entered vertex (positive is from start point to intercept point along the reference line).



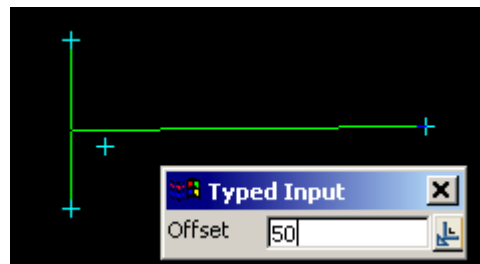
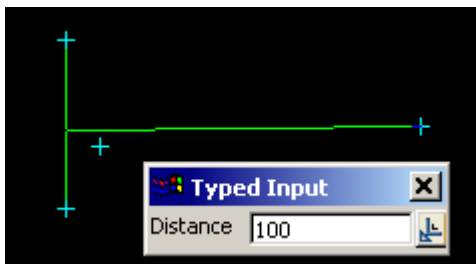
STEP 4:


After the distance value has been entered, the Offset Input box will appear. Type the required offset value into the Input box and press the enter key.

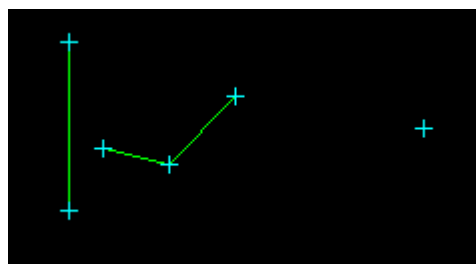
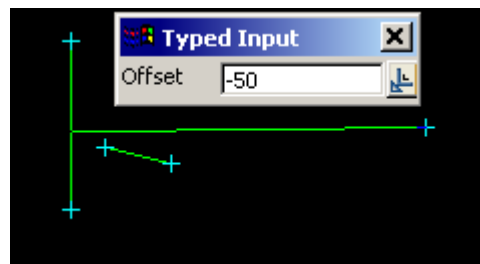
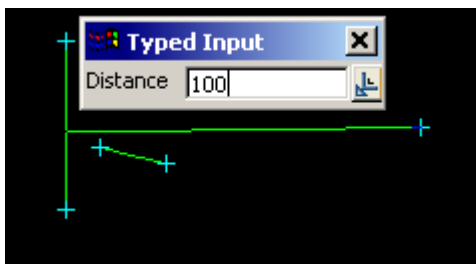
Note: The offset distance is always relative to the reference line (negative is to the left).

**STEP 5:**

Steps 3 and 4 should be repeated until the required number of vertices have been created in the line string.

**STEP 6:**

The option can be terminated by click on the close button  on the Input box, followed by the Esc key.

**Tape baseline absolute**

Position of option on menu: Strings => CAD => Line => Tape baseline absolute

or by selection of appropriate icon from the toolbar. 

This option creates a line string by entering distances from the start point and the offset distance to a user defined reference line string.

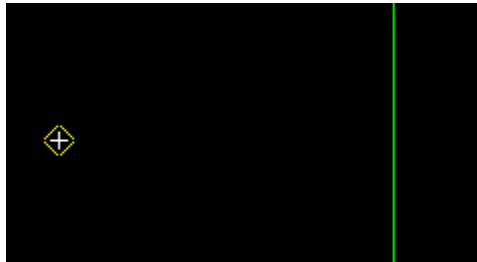
On selecting **Tape baseline absolute**, the user is prompted for the relevant data in the screen

message box located at the bottom left hand corner of the **12d Model** application window.

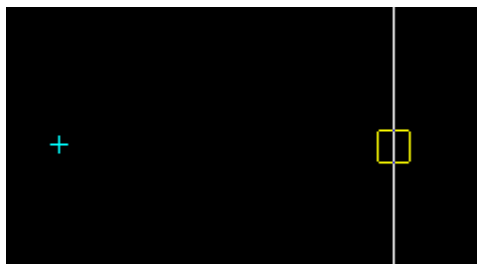
STEP 1:

A start position of the reference line is selected and accepted.

Note: Originating at the start point, the reference line will extend to infinity after intercepting the 2nd point. The offset values are made relative to this reference line. The reference line will be removed once the option has been terminated.

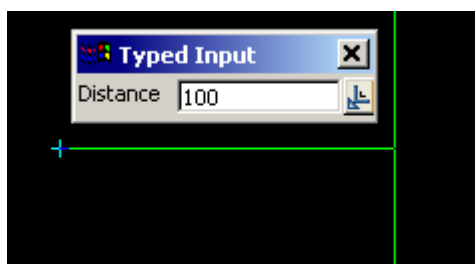
**STEP 2:**

The interception point for the reference line is selected and accepted.

**STEP 3:**

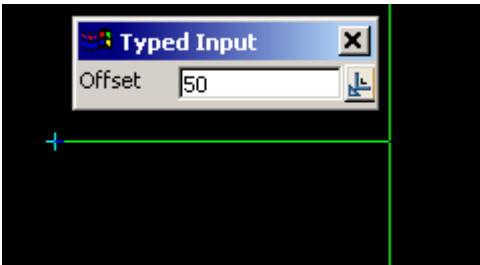
After the start and interception points are accepted, the reference line is constructed and the Distance Input box appears. A distance value is to be entered into the Input box, followed by the enter key. For the absolute option, all distances entered are relative to the start point of the reference line. A positive value means a distance towards the intercept point (from the start point).

Note: For the absolute option, distances are always relative to the start point of the reference line (positive is from start point to intercept point along the reference line).

**STEP 4:**

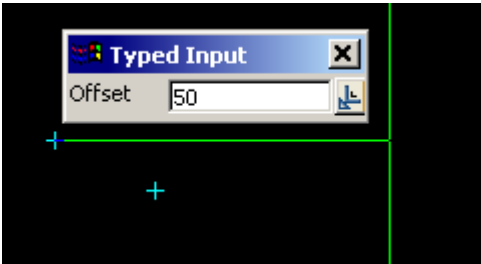
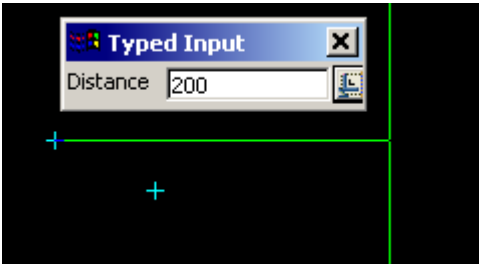
After the distance value has been entered, the Offset Input box will appear. Type the required offset value into the Input box and press the enter key.

Note: The offset distance is always relative to the reference line (negative is to the left).




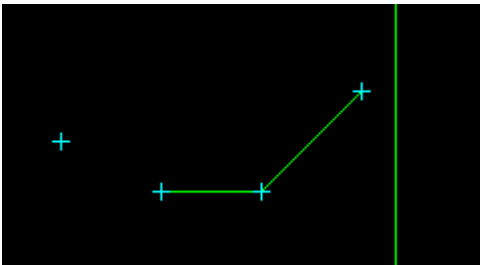
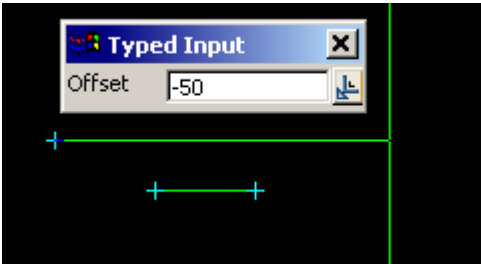
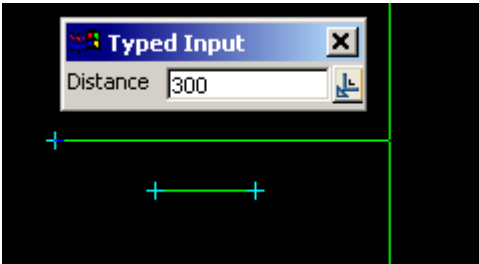
STEP 5:

Steps 3 and 4 should be repeated until the required number of vertices have been created in the line string.



STEP 6:

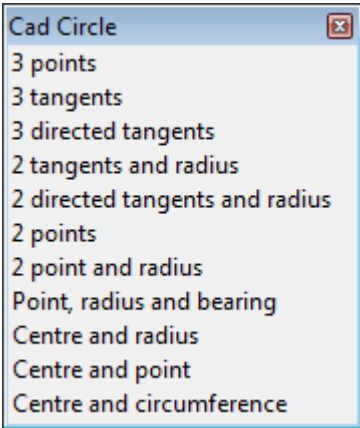
The option can be terminated by click on the close button  on the Input box, followed by the Esc key.



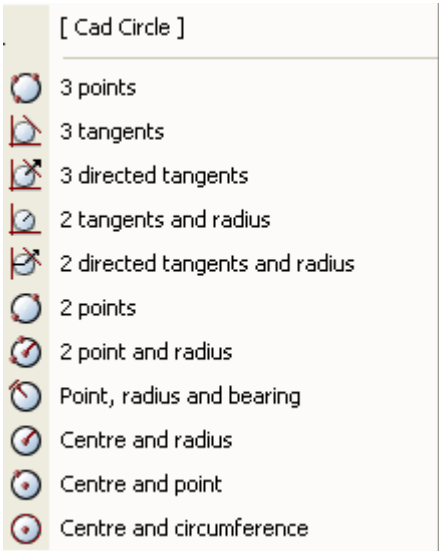
CAD Circle

Position of option on menu: Strings =>CAD =>Circle

The Circle walk-right menu is



from 3 selected points
tangential to 3 tangents (including points)
tangential to 3 directed tangents (including points)
known radius and tangential to 2 tangents
known radius and tangential to 2 directed tangents
from 2 points on diameter
through 2 points and known radius
through point with known radius and a bearing at point
centre position and specified radius
centre position and point on circle
centre position and the circumference of the circle



For the option *3 points*, go to
3 tangents
3 directed tangents
2 tangents and radius
2 directed tangents and radius.
2 points
2 points and radius
Point, radius and bearing
Centre and radius
Centre and point
Centre and circumference

[3 Points](#)
[3 tangents](#)
[3 directed tangents](#)
[2 tangents and radius](#)
[2 directed tangents and radius](#)
[2 points](#)
[2 point and radius](#)
[Point, radius and bearing](#)
[Centre and radius](#)
[Centre and point](#)
[Centre and circumference](#)

3 Points

Position of option on menu: Strings =>CAD =>Circle =>3 points

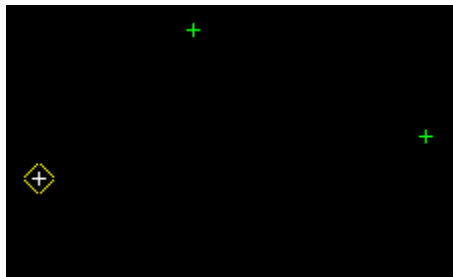
or by selection of appropriate icon from the toolbar. 

This option creates the circle through three selected points.

On selecting 3 points, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

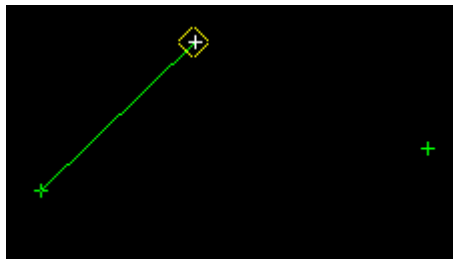
The 1st point is selected with the mouse or entered in via the keyboard. To specify the 1st point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter the 1st point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.



STEP 2:

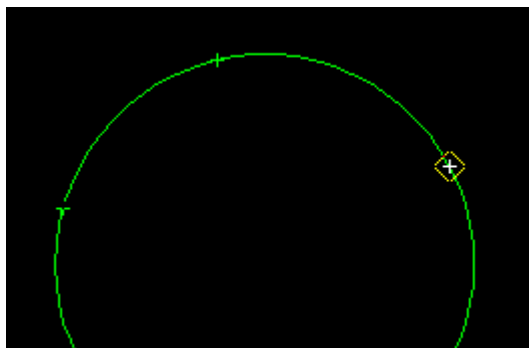
The 2nd point is selected and accepted.

After the 2nd point is accepted a circle will be displayed 'rubber banding' to the various solutions according to the position of the cursor. This will continue until the 3rd point is selected and accepted.



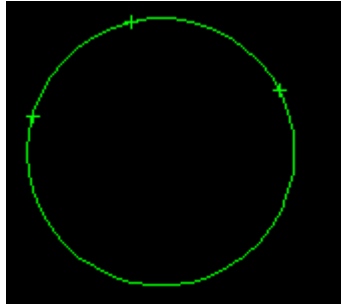
STEP 3:

The 3rd point is selected and accepted.



STEP 4:

A circle is constructed through the three selected points

**3 tangents**

Position of option on menu: Strings =>CAD =>Circle=>3 tangents

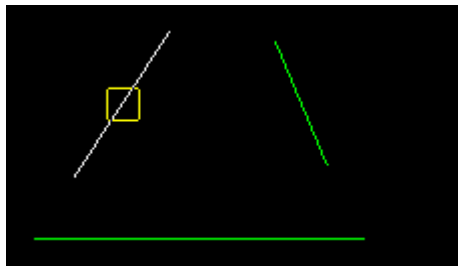
or by selection of appropriate icon from the toolbar. 

This option creates a circle that is tangential to three selected segments.

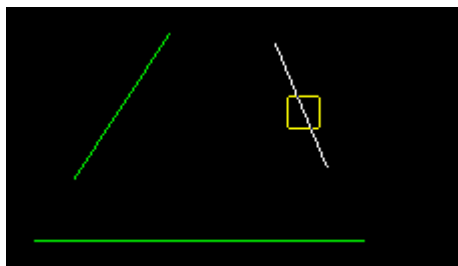
On selecting **3 tangents**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

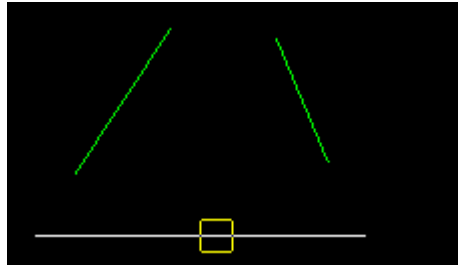
The 1st tangent is selected with the mouse (Left Button) and accepted (Middle Button).

**STEP 2:**

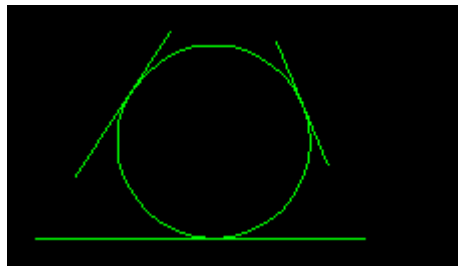
The 2nd tangent is selected and accepted.

**STEP 3:**

The 3rd tangent is selected and accepted.

**STEP 4:**

A circle is constructed that touches each of the three selected tangents.

**3 directed tangents**

Position of option on menu: Strings =>CAD =>Circle =>3 directed tangents

or by selection of appropriate icon from the toolbar. 

This option creates a circle that is tangential to three selected segments. The segments are selected in order and with direction and the circle is to the right of the direction of the selected segments.

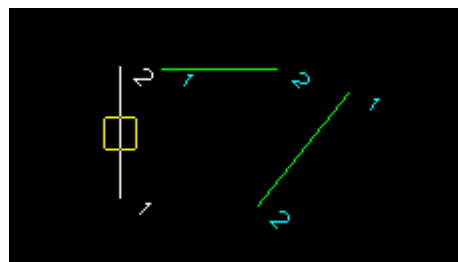
On selecting **3 directed tangents** the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

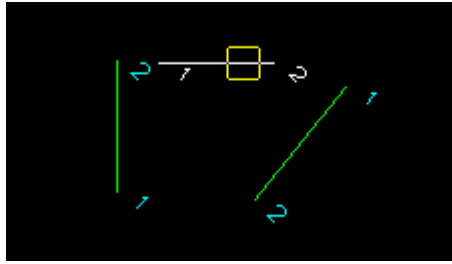
Select and accept the 1st tangent.

Note: For this option the direction of the selected tangents is important. The circle will be constructed to the right of a tangent. A user may reverse the direction of a tangent by selecting the tangent *with direction*. For further notes on picking tangents with direction, see [Picking with Direction](#) in the chapter [Tools and Concepts](#).

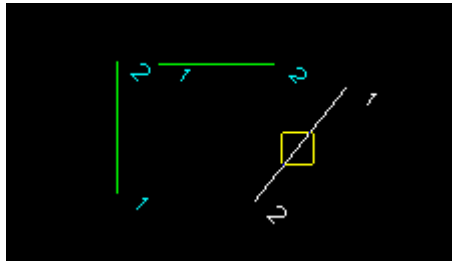
Note: The Vertex indices can be displayed by toggling the option on the Toggle Menu.

**STEP 2:**

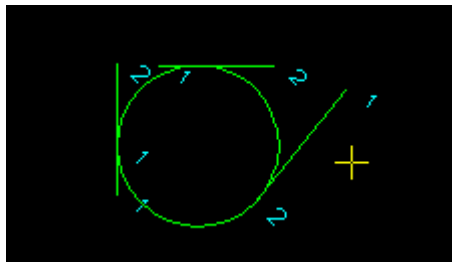
The 2nd tangent is selected and accepted.

**STEP 3:**

The 3rd tangent is selected and accepted.

**STEP 4:**

If a solution exists, a circle is constructed using the given information.



2 tangents and radius

Position of option on menu: Strings =>CAD =>Circles=>2 tangents and radius

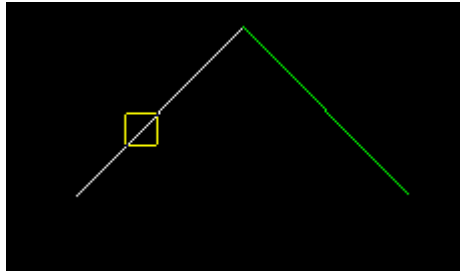
or by selection of appropriate icon from the toolbar. 

This option creates a circle with a given radius that is tangential to two selecting segments.

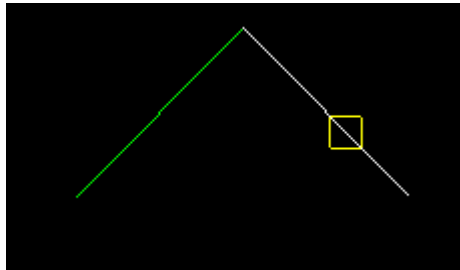
On selecting **2 tangents and radius**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.


STEP 1:

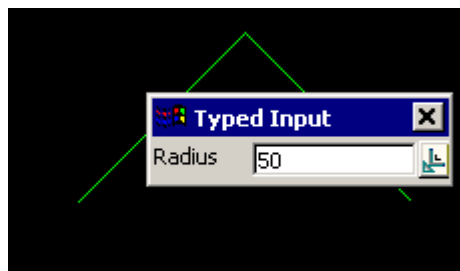
Select the 1st tangent with the mouse (Left Button) and accept it (Middle Button).

**STEP 2:**

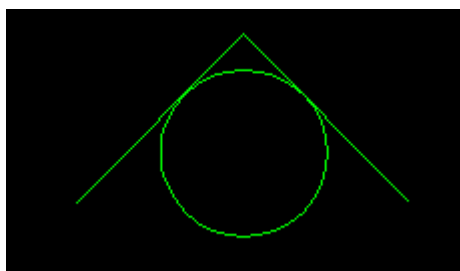
Select the 2nd tangent and accept it.

**STEP 3:**


After the 2nd tangent is accepted, the Radius Input box will appear. Type the radius value into the Input box and press the enter key. The browse button  on the Input box can be used to define the radius by measuring existing elements.

**STEP 4:**

If a solution exists, a circle is fitted touching the two selected tangents using the given radius.



2 directed tangents and radius

Position of option on menu: Strings =>CAD =>Circle=>2 directed tangents and radius
or by selection of appropriate icon from the toolbar. 

This option creates a circle with a given radius that is tangential to two selected segments that are picked with direction.

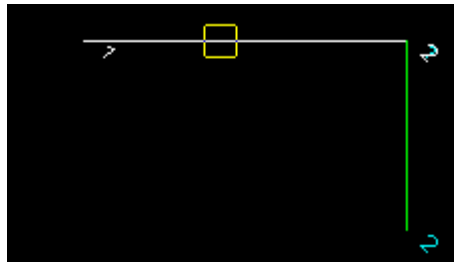
On selecting **2 directed tangents and radius**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

Select and accept the 1st tangent.

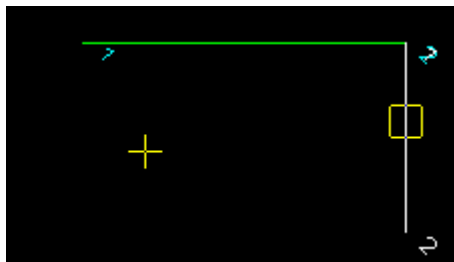
Note: For this option the direction of the selected tangents is important. The circle will be constructed to the right of a tangent. A user may reverse the direction of a tangent by selecting the tangent *with direction*. For further notes on picking tangents with direction, see [Picking with Direction](#) in the chapter [Tools and Concepts](#).

Note: The Vertex indices can be displayed by toggling the option on the Toggle Menu.




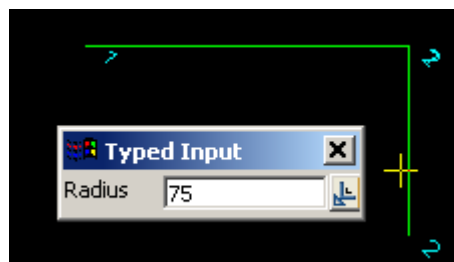
STEP 2:

The 2nd tangent is selected and accepted.



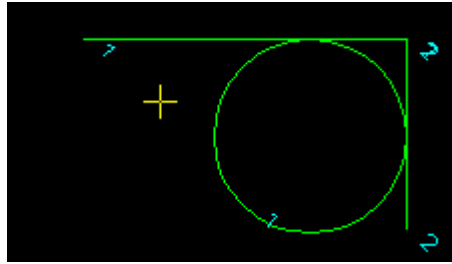
STEP 3:

After the 2nd tangent is accepted, the Radius Input box will appear. Type the radius value into the Input box and press the Enter key. The browse button  on the Input box can be used to define the arc radius by measuring existing elements.



STEP 4:

If a solution exists, a circle is constructed using the given information.



2 points

Position of option on menu: Strings =>CAD =>Circle =>2 points

or by selection of appropriate icon from the toolbar. 

This option creates a circle by selecting two points that define the diameter of the circle.

On selecting **2 points**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

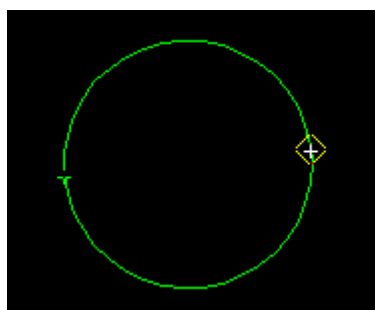
The 1st point is selected with the mouse or entered in via the keyboard. To specify the 1st point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter the 1st point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.

After the 1st point is accepted a circle will be displayed 'rubber banding' to the various solutions according to the position of the cursor (cursor position taken as the other end of a diameter). This will continue until the 2nd point is selected and accepted.



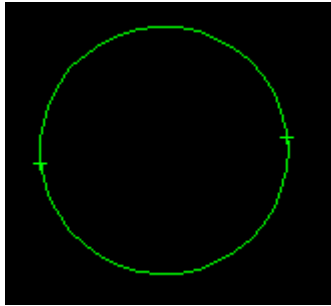
STEP 2:

The 2nd point is selected and accepted.



STEP 3:

The circle is constructed through the two selected points. The two points define the diameter.



2 point and radius

Position of option on menu: Strings =>CAD =>Circle =>2 point and radius

or by selection of appropriate icon from the toolbar. 

This option creates a circle of a given radius that goes through two selected points.

On selecting **2 point and radius**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

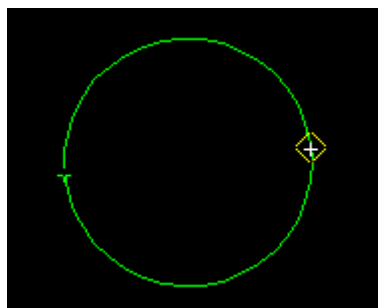
The 1st point is selected with the mouse or entered in via the keyboard. To specify the 1st point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter the 1st point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.

After the 1st point is accepted a circle will be displayed 'rubber banding' to the various solutions according to the position of the cursor. This will continue until the 2nd point is selected and accepted.



STEP 2:

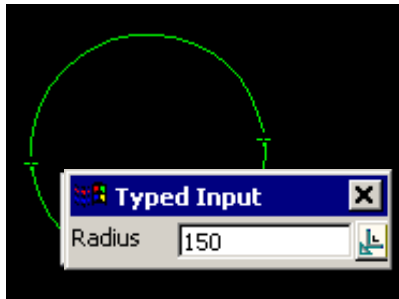
The 2nd point is selected and accepted.



STEP 3:

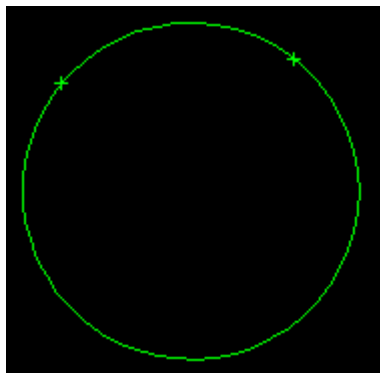
After the 2nd point is accepted, the Radius Input box will appear. The radius value is entered into

the input box followed by the enter key.



STEP 4:

If a solution exists, the circle is fitted through the two selected points using the given radius.



Point, radius and bearing

Position of option on menu: Strings =>CAD =>Circle=>Point, radius and bearing

or by selection of appropriate icon from the toolbar. 

This option creates a circle of a given radius, a selected point on the circle and the bearing of the tangent to the circle at that point.

On selecting **Point, radius and bearing**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.


STEP 1:

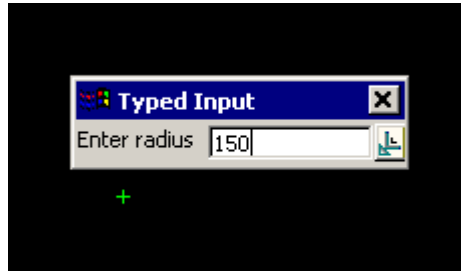
The 1st point is selected with the mouse or entered in via the keyboard. To specify the 1st point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter a 1st point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the Enter key.




STEP 2:

After the 1st point is accepted, the **Enter radius** input box will appear. Type the radius value into

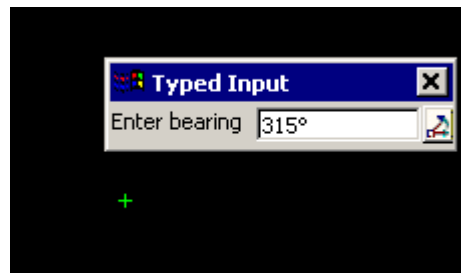
the Input box and press the enter key. The browse button  on the Input box can be used to define the arc radius by measuring existing elements.



STEP 3:

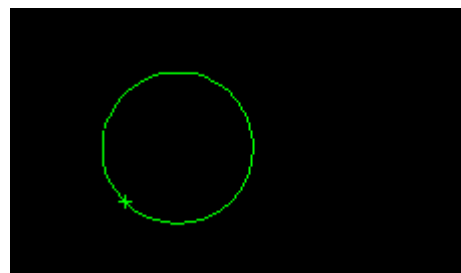
After the radius has been entered, the **Enter bearing** input box will appear. Type the bearing into the Input box and press the enter key. The browse button  on the Input box can be used to define the bearing by measuring existing elements.

Note: The Page Up and Page Down keys can be used when the Enter Bearing input box comes up to add or subtract intervals of 90 degrees.



STEP 4:

If a solution exists, a circle is fitted from the given bearing at the selected point using the selected radius.



Centre and radius

Position of option on menu: Strings =>CAD =>Circle =>Centre and radius

or by selection of appropriate icon from the toolbar. 

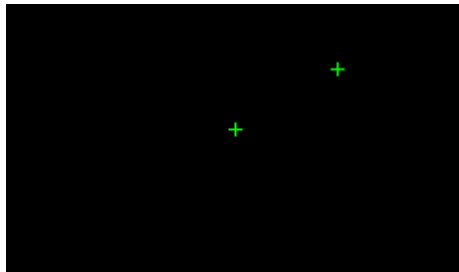
This option creates a circle of a given radius and a selected centre point

On selecting **Centre and radius**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

A centre point is selected with the mouse or entered in via the keyboard. To specify a centre point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter a centre point with the keyboard, simply start typing or press the space bar to bring up the XYZ

Input box. Type the coordinates into the XYZ Input box and press the enter key.




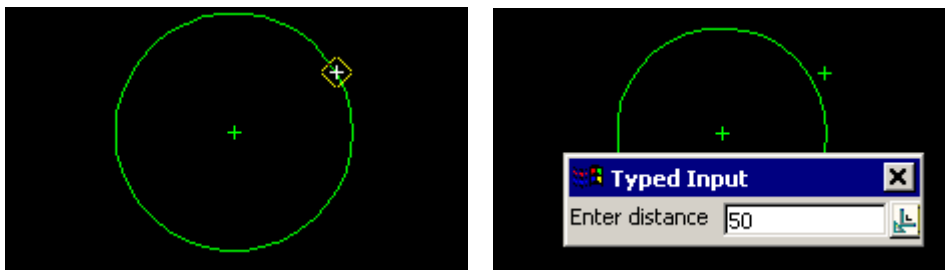
STEP 2:

After the centre point is accepted a circle will be displayed 'rubber banding' to the various solutions according to the position of the cursor. This will continue until a radius value is entered.

A radius value is selected with the mouse or entered in via the keyboard.

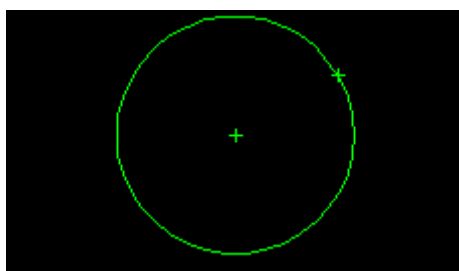
To specify a radius value with the mouse, a point must be selected (Left Button) and accepted (Middle Button). This option also allows the definition of the radius by the selection of the 2nd point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next.

To enter a radius value with the keyboard, simply start typing or press the space bar to bring up the Radius Input box. Type the radius value into the Radius Input box and press the enter key. The browse button  on the Input box can be used to define the arc radius by measuring existing elements.



STEP 3:

The circle is constructed through the centre point using the specified radius.



Centre and point

Position of option on menu: Strings =>CAD =>Circle =>Centre and point

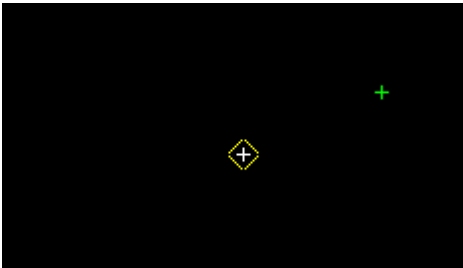
or by selection of appropriate icon from the toolbar. 

This option creates a circle by selecting a centre point and then using the cursor to select a second point that in on the circle.

On selecting **Centre and point**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

A centre point is selected with the mouse or entered in via the keyboard. To specify a centre point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter a centre point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.



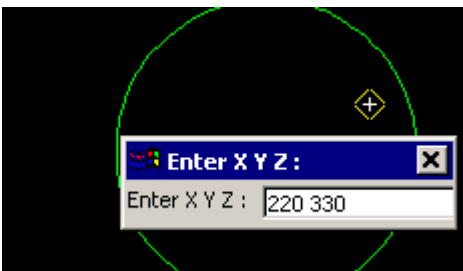
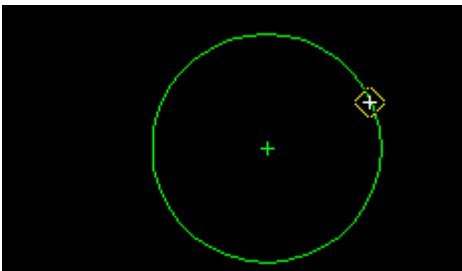
STEP 2:

After the centre point is accepted a circle will be displayed ‘rubber banding’ to the various solutions according to the position of the cursor. This will continue until a radius value is entered.

A radius value is selected with the mouse or entered in via the keyboard.

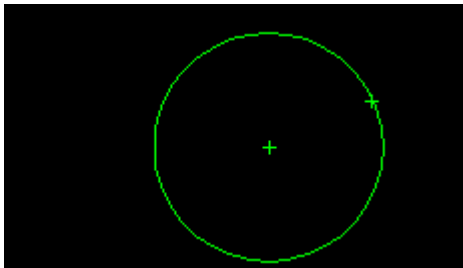
To specify a radius value with the mouse, a point must be selected (Left Button) and accepted (Middle Button). This option also allows the definition of the radius by the selection of the 2nd point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next.

To enter a radius value with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the point into the Input box and press the enter key.



STEP 3:

A circle is constructed using the two points defined by the user.



Centre and circumference

Position of option on menu: Strings =>CAD =>Circle=>Centre and circumference

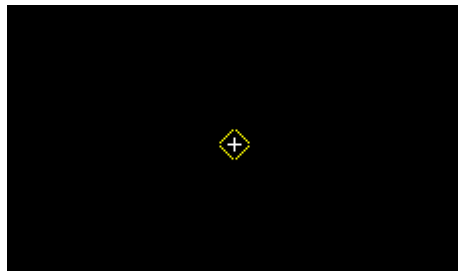
or by selection of appropriate icon from the toolbar. 

This option creates a circle by selecting the centre point and giving a circumference value.


On selecting **Centre and circumference**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

A centre point is selected with the mouse or entered in via the keyboard. To specify a centre point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter a centre point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.



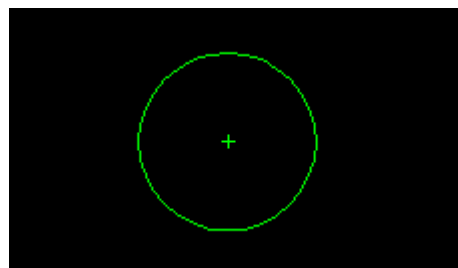
STEP 2:

After the centre point is accepted, the **Circumference** Input box will appear. Type the circumference length into the Input box and press the enter key. The browse button  on the Input box can be used to define the arc radius by measuring existing elements.



STEP 3:

A circle is constructed using the centre point and the given circumference.

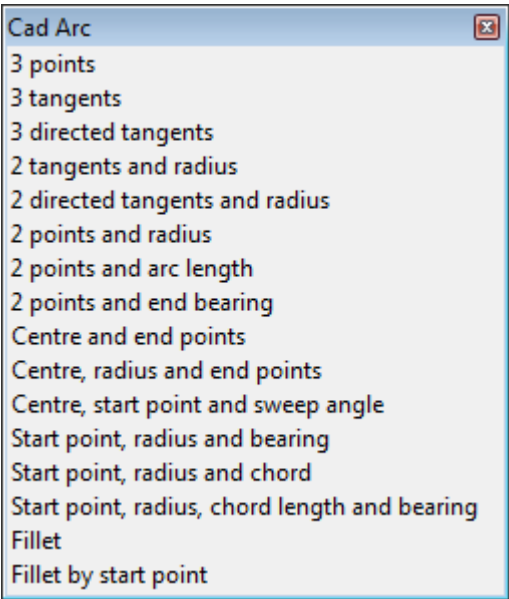


CAD Arc

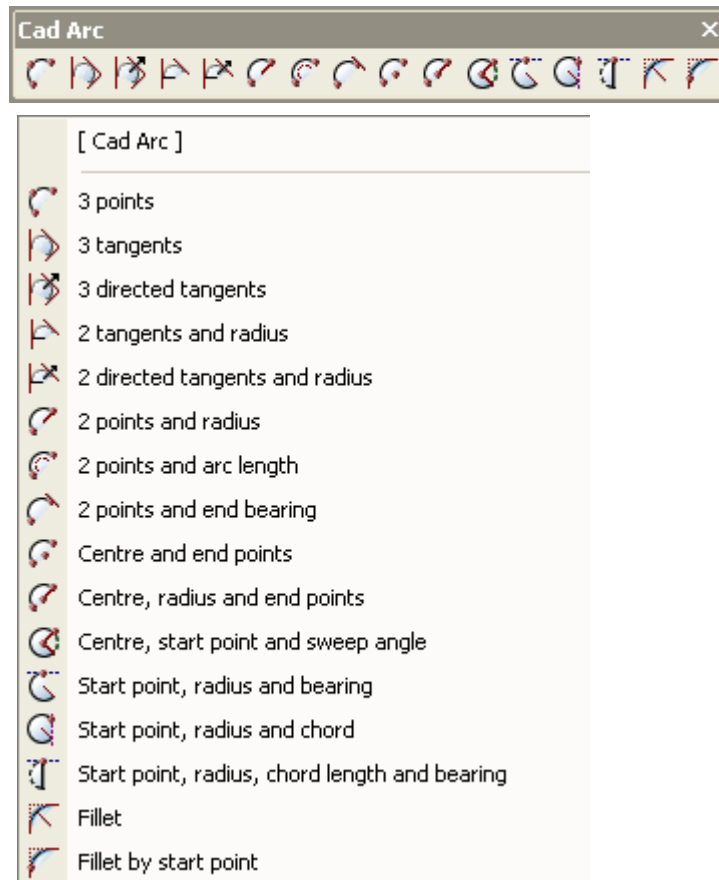
Position of option on menu: Strings =>CAD =>Arc

The arc options creates **super string arcs**, not arc strings. The options Strings =>Create =>Arc create arc strings.

The Arc walk-right menu is



- from 3 selected points
- tangential to 3 tangents (including points)
- tangential to 3 directed tangents (including points)
- known radius and tangential to 2 tangents
- known radius and tangential to 2 directed tangents
- through 2 points and known radius
- 2 points and known arc length
- 2 points and known bearing at first point
- centre and end points
- centre, radius and end points
- centre, start point and sweep angle
- through point with known radius and a bearing at point
- start point, radius and chord length
- start point, radius and chord length and bearing
- fillet between 2 segments and given radius
- fillet between 2 segments with selected start point



For the option *3 points*, go to

3 tangents

3 directed tangents

2 tangents and radius

2 directed tangents and radius

2 points and radius

2 points and arc length

2 points and end bearing

Centre and end points

Centre, radius and end points

Centre, start point and sweep angle

Start point, radius, and bearing

Start point, radius and chord

Start point, radius, chord length and bearing

Fillet

Fillet by start point

[3 points](#)

[3 tangents](#)

[3 directed tangents](#)

[2 tangents and radius](#)

[2 directed tangents and radius](#)

[2 points and radius](#)

[2 points and arc length](#)

[2 points and end bearing](#)

[Centre and end points](#)

[Centre, radius and end points](#)

[Centre, start point and sweep angle](#)

[Start point, radius and bearing](#)

[Start point, radius and chord](#)

[Start point, radius, chord length and bearing](#)

[Fillet](#)

[Fillet by start point](#)

3 points

Position of option on menu: Strings =>CAD =>Arc =>3 points

or by selection of appropriate icon from the toolbar. 

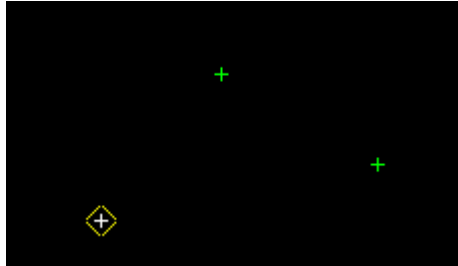
This option creates the arc through three selected points and the first and third points are the start and end of the arc.

On selecting *3 points*, the user is prompted for the relevant data in the screen message box

located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

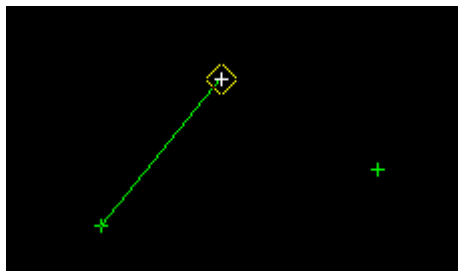
The 1st point is selected with the mouse or entered in via the keyboard. To specify the 1st point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter the 1st point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the Enter key.



STEP 2:

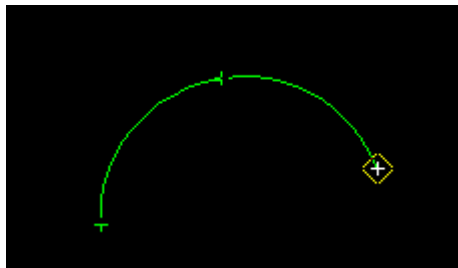
The 2nd point is selected and accepted.

After the 2nd point is accepted an arc will be displayed 'rubber banding' to the various solutions according to the position of the cursor. This will continue until the 3rd point is selected and accepted.



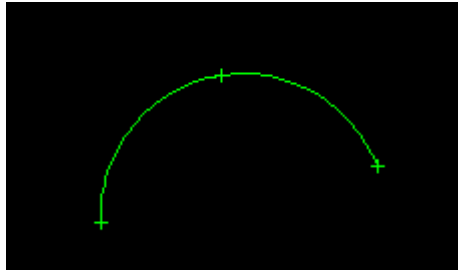
STEP 3:

The 3rd point is selected and accepted.



STEP 4:

An arc is constructed through the three selected points.



3 tangents

Position of option on menu: Strings =>CAD =>Arc =>3 tangents

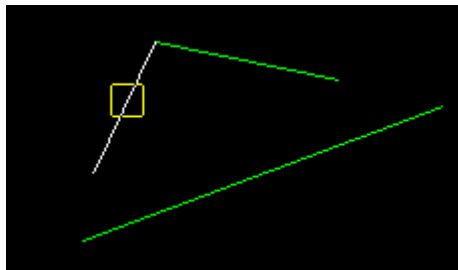
or by selection of appropriate icon from the toolbar. 

This option creates an arc that is tangential to three selected segments. The first and third segments are the start and end of the arc.

On selecting **3 tangents**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

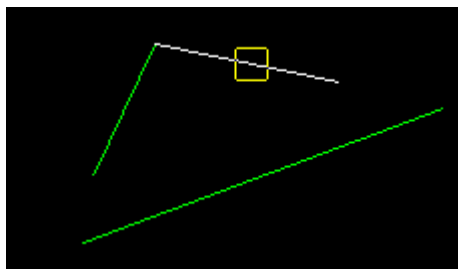
STEP 1:

The 1st tangent is selected with the mouse (Left Button) and accepted (Middle Button).



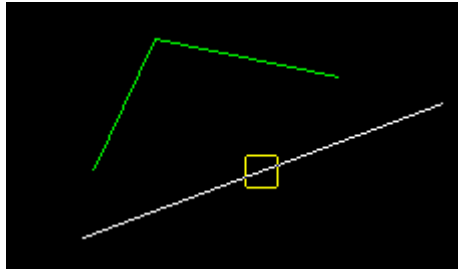
STEP 2:

The 2nd tangent is selected and accepted.

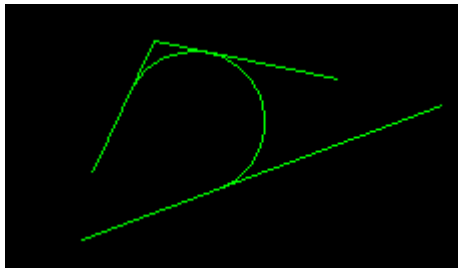


STEP 3:

The 3rd tangent is selected and accepted.

**STEP 4:**

The arc is constructed touching the three selected tangents.

**3 directed tangents**

Position of option on menu: Strings =>CAD =>Arc =>3 directed tangents

or by selection of appropriate icon from the toolbar. 

This option creates an arc that is tangential to three selected segments. The segments are selected in order and with direction and the arc is to the right of the direction of the selected segments. The first and third segments are the start and end of the arc.

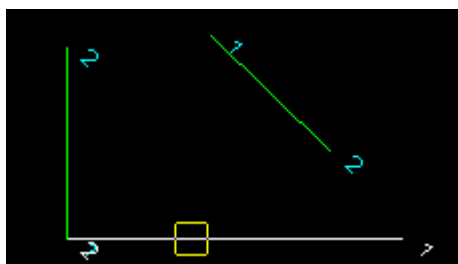
On selecting **3 directed tangents**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

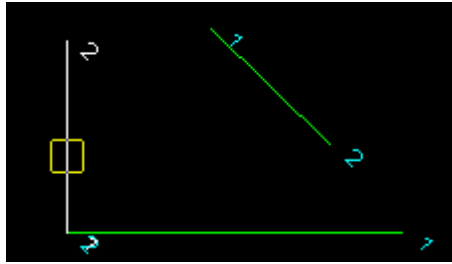
Select and accept the 1st tangent.

Note: For this option the direction of the selected tangents is important. The arc will be constructed to the right of the tangent. A user may reverse the direction of the tangent by selecting a tangent *with direction*. For further notes on picking tangents with direction, see [Picking with Direction](#) in the chapter [Tools and Concepts](#).

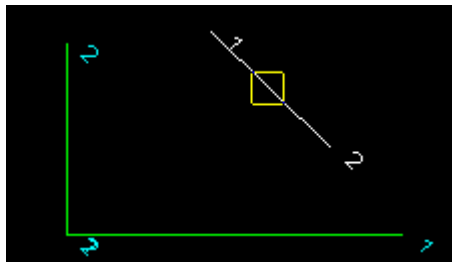
Note: The Vertex indices can be displayed by toggling the option on the Toggle Menu.

**STEP 2:**

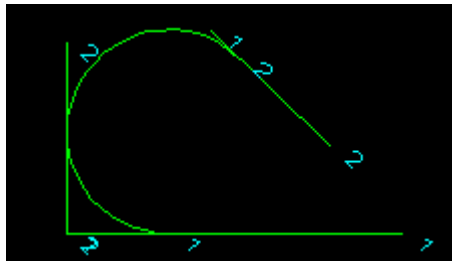
The 2nd tangent is selected and accepted.

**STEP 3:**

The 3rd tangent is selected and accepted.

**STEP 4:**

If a solution exists, an arc is constructed using the given information.



2 tangents and radius

Position of option on menu: Strings => CAD => Arc => 2 tangents and radius

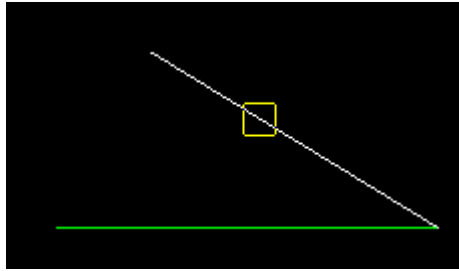
or by selection of appropriate icon from the toolbar. 

This option creates an arc with a given radius that is tangential to two selecting segments. This is the same as a fillet.

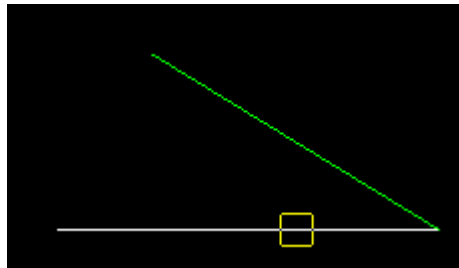
On selecting **2 tangents and radius**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.


STEP 1:

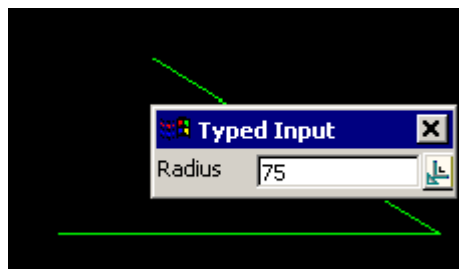
The 1st tangent is selected with the mouse (Left Button) and accepted (Middle Button).

**STEP 2:**

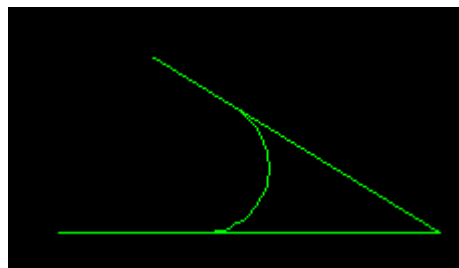
The 2nd tangent is selected and accepted.

**STEP 3:**

After the start point is accepted, the Radius Input box will appear. Type the radius value into the Input box and press the enter key. The browse button  on the Input box can be used to define the arc radius by measuring existing elements.

**STEP 4:**

If a solution exists, the arc is fitted through the two selected tangents using the given radius.



2 directed tangents and radius

Position of option on menu: Strings =>CAD =>Arc =>2 directed tangents and radius

or by selection of appropriate icon from the toolbar. 

This option creates an arc with a given radius that is tangential to two selected segments that are

picked with direction.

On selecting 2 **directed tangents and radius**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

Select and accept the 1st tangent.

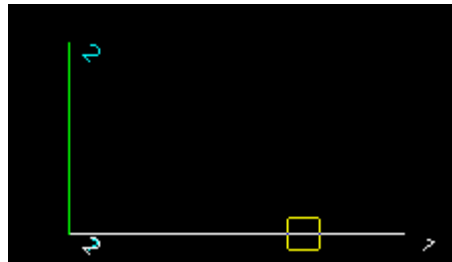
Note: For this option the direction of the selected tangents is important. The arc will be constructed to the right of a tangent. A user may reverse the direction of a tangent by selecting the tangent *with direction*. For further notes on picking tangents with direction, see [Picking with Direction](#) in the chapter [Tools and Concepts](#).

Note: The Vertex indices can be displayed by toggling the option on the Toggle Menu.




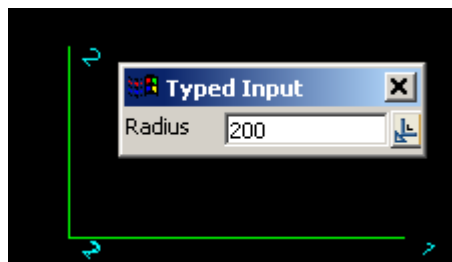
STEP 2:

The 2nd tangent is selected and accepted.



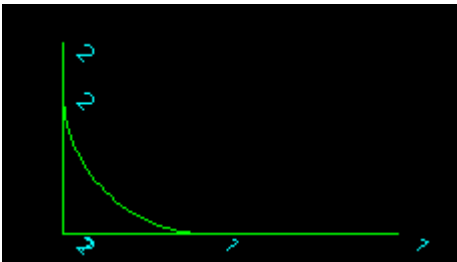
STEP 3:

After the start point is accepted, the Radius Input box will appear. Type the radius value into the Input box and press the enter key. The browse button  on the Input box can be used to define the arc radius by measuring existing elements.



STEP 4:

If a solution exists, the arc is fitted through the two selected tangents using the given radius.



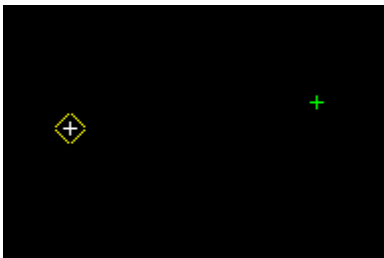
2 points and radius

Position of option on menu: Strings =>CAD =>Arc =>2 points and radius
or by selection of appropriate icon from the toolbar.

This option creates an arc of a given radius that starts and ends on two selected points.
On selecting **2 points and radius**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

The 1st point is selected with the mouse or entered in via the keyboard. To specify the 1st point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter the 1st point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.



STEP 2:

After the start point is accepted, the Radius Input box will appear. Type the radius value into the Input box and press the enter key. The browse button on the Input box can be used to define the arc radius by measuring existing elements.

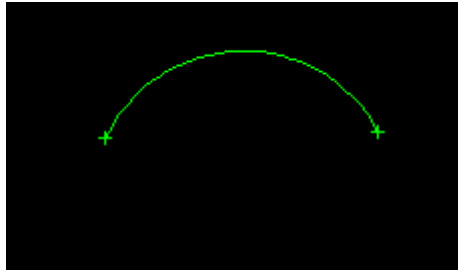


STEP 3:

The 2nd point is selected and accepted.

STEP 4:

If a solution exists, an arc is constructed using the given information.



2 points and arc length

Position of option on menu: Strings =>CAD =>Arc =>2 points and arc length

or by selection of appropriate icon from the toolbar 

This option creates an arc of a given arc length that starts and ends on two selected points.


On selecting **2 points and arc length**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

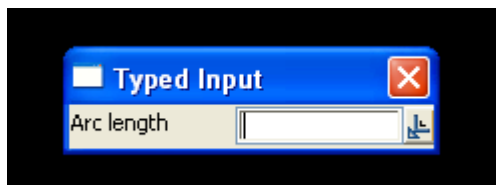
STEP 1: 12d

The 1st point is selected with the mouse or entered in via the keyboard. To specify the 1st point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter the 1st point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.



STEP 2:

After the start point is accepted, the Arc length Input box will appear. Type the arc length value into the Input box and press the enter key. The browse button  on the Input box can be used to define the arc length by measuring existing elements.

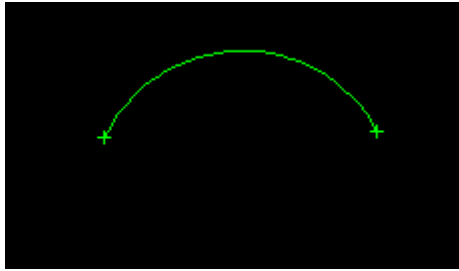


STEP 3:


The 2nd point is selected and accepted.

STEP 4:

If a solution exists, an arc is constructed using the given information.



2 points and end bearing

Position of option on menu: Strings =>CAD =>Arc =>2 points and end bearing
or by selection of appropriate icon from the toolbar. 

This option creates an arc that starts and end on two selected points and has a given bearing of the tangent at the end point (the end bearing).

On selecting **2 points and end bearing**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

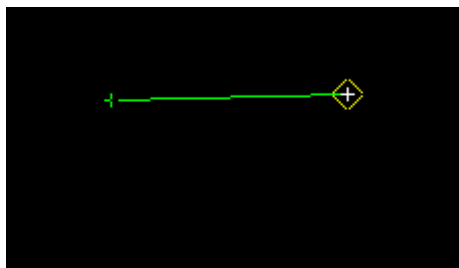
STEP 1:

The 1st point is selected with the mouse or entered in via the keyboard. To specify the 1st point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter the 1st point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.




STEP 2:

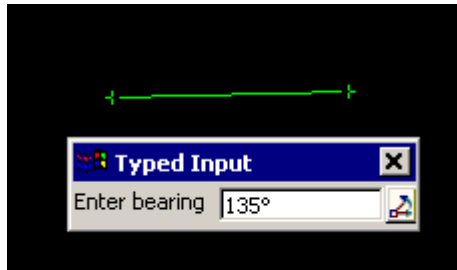
The 2nd point is selected and accepted.



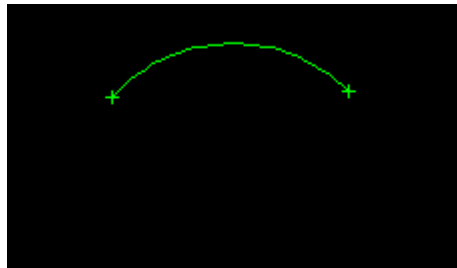
STEP 3:

After the 2nd point is accepted, the Enter bearing input box will appear. Type the bearing into the Input box and press the enter key. The browse button  on the input box can be used to define the bearing by measuring existing elements.

Note: The Page Up and Page Down keys can be used when the Enter Bearing input box comes up to add or subtract intervals of 90 degrees.

**STEP 4:**

If a solution exists, the arc is fitted through the two selected points with the end point of the given bearing.



Centre and end points

Position of option on menu: Strings =>CAD =>Arc =>Centre and end points

or by selection of appropriate icon from the toolbar. 

This option creates an arc by selecting in order, the centre point and the start and end points. The radius of the arc is the distance between the centre and the start point.

On selecting **Centre and end points**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

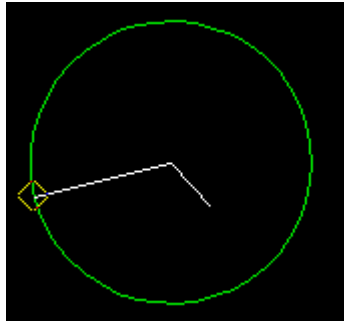
STEP 1:

A centre point is selected with the mouse or entered in via the keyboard. To specify a centre point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter a centre point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.

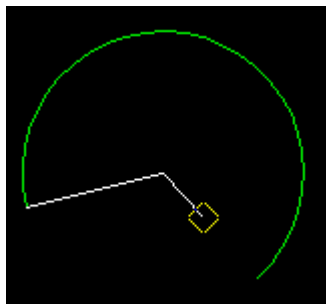
After the centre point is accepted a circle will be displayed 'rubber banding' to the various solutions according to the position of the cursor. This will continue until the start point is selected and accepted.

**STEP 2:**

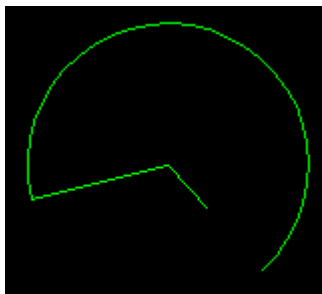
Select and accept the start point. This point defines the radius and the start of the arc.

**STEP 3:**

The end point of the arc is specified.

**STEP 4:**

The arc is constructed using the given information.



Centre, radius and end points

Position of option on menu: Strings =>CAD =>Arc =>Centre, radius and end points

or by selection of appropriate icon from the toolbar. 

This option allows the creation of an arc given a centre point, radius, start and end points.

This option creates an arc of a given radius by selecting in the centre point and the start and end positions.

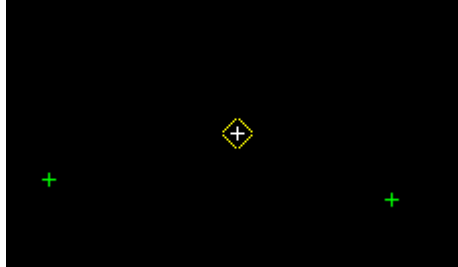
On selecting **Centre, radius and end points** the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:


A centre point is selected with the mouse or entered in via the keyboard. To specify a centre point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter a centre point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.

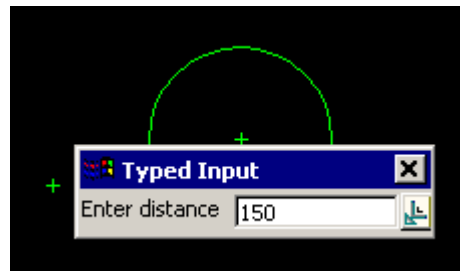
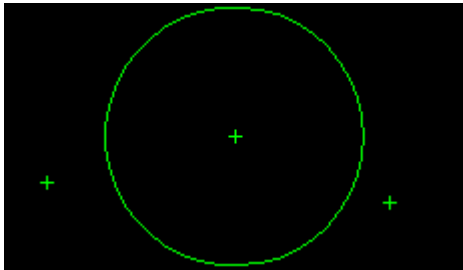
After the centre point is accepted a circle will be displayed 'rubber banding' to the various

solutions according to the position of the cursor. This will continue until the start point is selected and accepted.



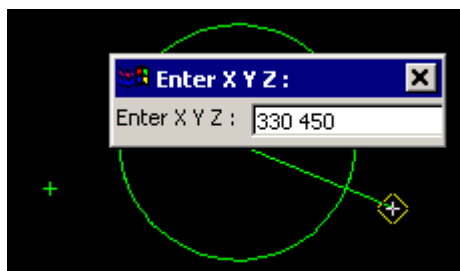
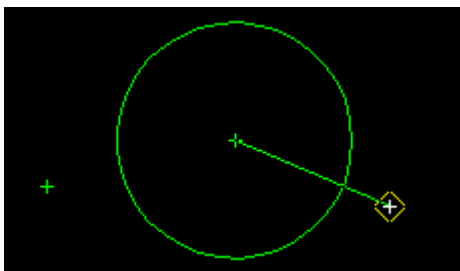
STEP 2:

A radius value is selected with the mouse or entered in via the keyboard. To specify a radius value with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter radius value with the keyboard, simply start typing or press the space bar to bring up the Radius Input box. Type the radius value into the Radius Input box and press the Enter key. The browse button  on the Input box can be used to define the arc distance by measuring existing elements.



STEP 3:

A start point defines the start of the sweep angle to define where to start the arc. It can be selected with the mouse or entered in via the keyboard. To specify a start point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter a start point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the Enter key.

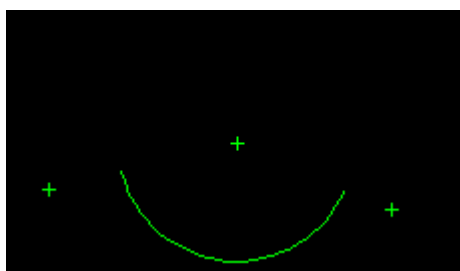


STEP 4:


The end point of the arc is specified. The start and end points define the sweep angle to define the arc. The rubber banding of the arc will use the cursor position as the end position until a end point is selected and accepted. It can be selected with the mouse or entered in via the keyboard. To specify a start point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter a start point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key. The end point does not have to be on the arc itself. It is used to define the sweep angle.

**STEP 5:**

The arc is constructed using the given information.



Centre, start point and sweep angle

Position of option on menu: Strings =>CAD =>Arc =>Centre, start point and sweep angle
or by selection of appropriate icon from the toolbar. 

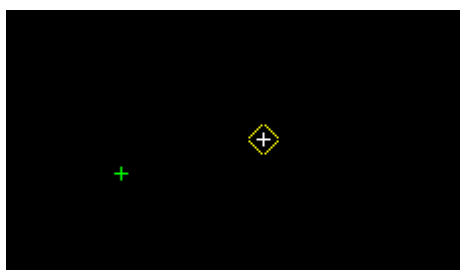
This option creates an arc by selecting a centre point and a start points and giving a sweep angle. The radius of the arc is the distance between the centre and start point.

On selecting **Centre, start point and sweep angle**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

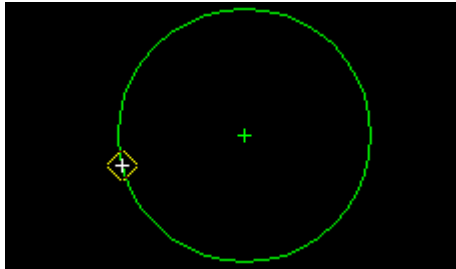
A centre point is selected with the mouse or entered in via the keyboard. To specify a centre point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter a centre point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.

After the 1st point is accepted a circle will be displayed 'rubber banding' to the various solutions according to the position of the cursor. This will continue until the 2nd point is selected and accepted.


**STEP 2:**

The 2nd point is selected with the mouse or entered in via the keyboard. This point defines the radius as well as the start point of the arc. To specify the 2nd point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter the 2nd point with the keyboard,

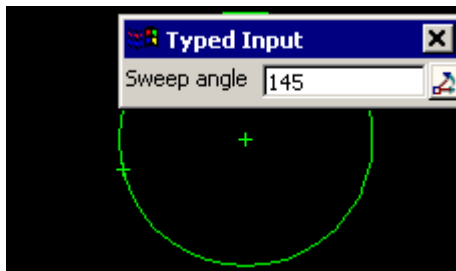
simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.



STEP 3:

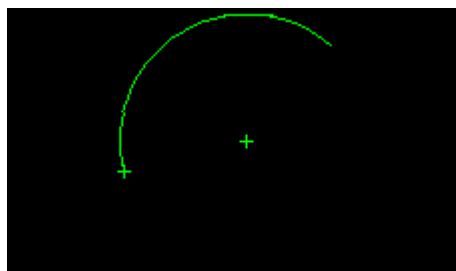
After the 2nd point is accepted, the **Sweep Angle** input box will appear. Type the sweep angle value into the input box and press the enter key. The browse button  on the Input box can be used to define the arc radius by measuring existing elements.

Note: The Page up and page down keys can be used when the input angle box comes up to add or subtract intervals of 90 degrees.



STEP 4:

The arc is created using the information supplied



Start point, radius and bearing

Position of option on menu: Strings =>CAD =>Arc =>Start point, radius and bearing

or by selection of appropriate icon from the toolbar. 

This option creates an arc of a given radius, starting at a selected point and bearing of the tangent at the start point and going for a given arc length.


On selecting the **Start point, radius and bearing** option, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

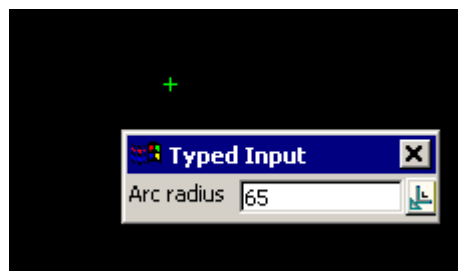
STEP 1:


A start point is selected with the mouse or entered in via the keyboard. To specify a start point

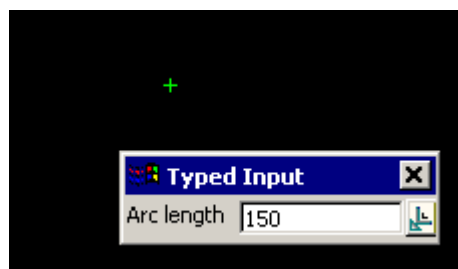
with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter a start point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.


**STEP 2:**

After the start point is accepted, the Arc Radius Input box will appear. Type the radius value into the Input box and press the enter key. The browse button  on the Input box can be used to define the arc radius by measuring existing elements.

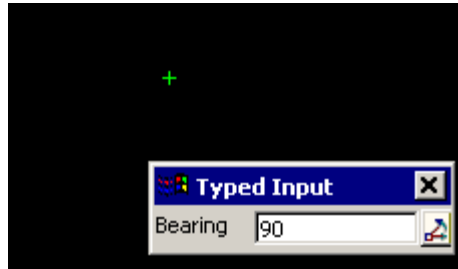
**STEP 3:**

After the radius has been entered, the **Arc Length** Input box will appear. Type the arc length into the Input box and press the enter key. The browse button  on the Input box can be used to define the arc distance by measuring existing elements.

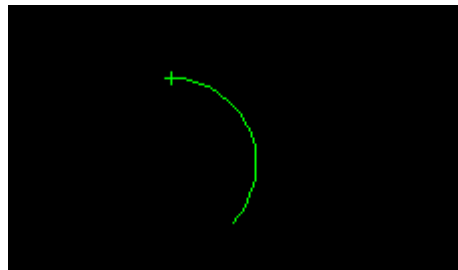
**STEP 4:**

After the arc length is accepted, the Bearing Input box will appear. Type the bearing into the Input box and press the enter key. The browse button  on the Input box can be used to define the bearing by measuring existing elements.


Note: The Page Up and Page Down keys can be used when the Bearing Input box comes up to add or subtract intervals of 90 degrees.

**STEP5:**

The arc is created with the given information.



Start point, radius and chord

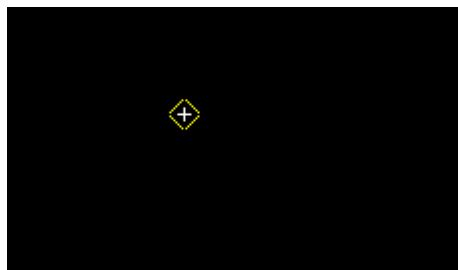
Position of option on menu: Strings =>CAD =>Arc =>Start point, radius and chord
or by selection of appropriate icon from the toolbar. 


This option creates an arc of a given radius, starting from a selected point and with a given chord bearing at the start point and a given arc length.

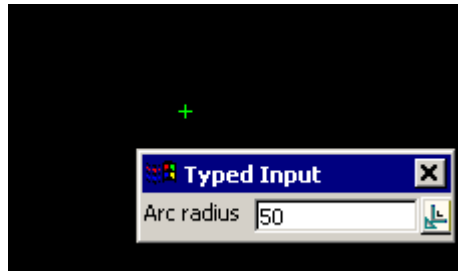
On selecting **Start point, radius and chord**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.


STEP 1:

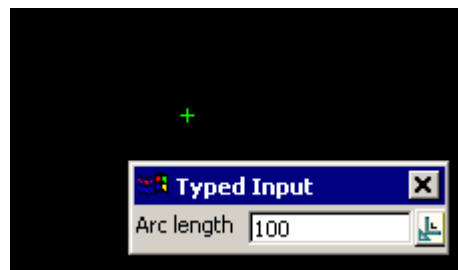
The start point is selected with the mouse or entered in via the keyboard. To specify the start point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter the start point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.


**STEP 2:**

After the start point is accepted, the **Arc Radius** Input box will appear. Type the radius value into the Input box and press the enter key. The browse button  on the Input box can be used to define the arc radius by measuring existing elements.

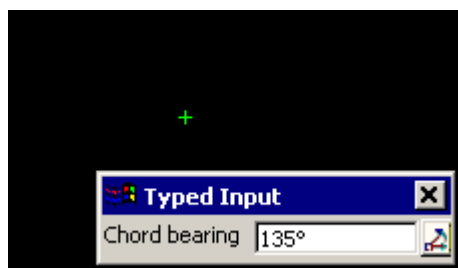
**STEP 3:**

After the arc radius is entered, the **Arc Length** Input box will appear. Type the arc length into the Input box and press the enter key. The browse button  on the Input box can be used to define the arc distance by measuring existing elements.

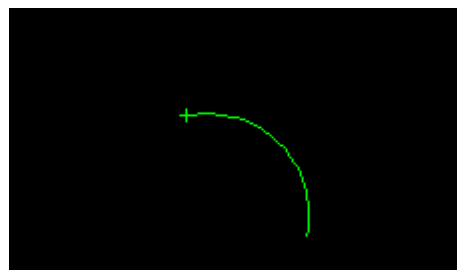
**STEP 4:**

After the arc length is entered, the **Chord Bearing** Input box will appear. Type the bearing into the Input box and press the enter key. The browse button  on the Input box can be used to define the bearing by measuring existing elements.


Note: The **Page Up** and **Page Down** keys can be used when the **Chord Bearing** Input box comes up to add or subtract intervals of 90 degrees.

**STEP 5:**

An arc is created with the given information.



Start point, radius, chord length and bearing

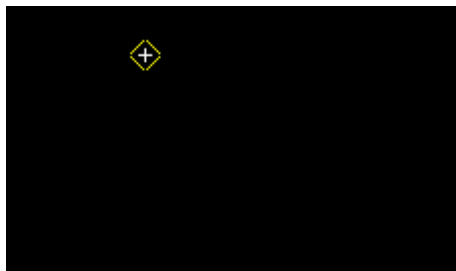
Position of option on menu: Strings =>CAD =>Arc =>Start point, radius, chord length and bearing
or by selection of appropriate icon from the toolbar. 

This option creates an arc of a given radius, starting from a selected point, with a given bearing of the tangent at the start point and a given chord length from the start point.


On selecting **Start point, radius, chord length and bearing**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

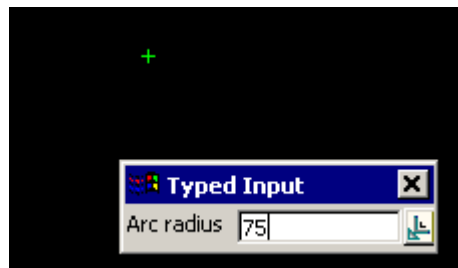
STEP 1:

A start point is selected with the mouse or entered in via the keyboard. To specify a start point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter a start point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.




STEP 2:

After the start point is accepted, the **Arc Radius** Input box will appear. Type the radius value into the Input box and press the enter key. The browse button  on the Input box can be used to define the arc radius by measuring existing elements.




STEP 3:

After the radius has been entered, the **Chord Length** Input box will appear. Type the chord length into the Input box and press the enter key. The browse button  on the Input box can be used to define the chord length by measuring existing elements.



STEP 4:

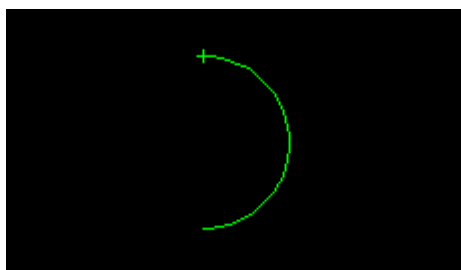
After the chord length has been entered, the **Bearing** Input box will appear. Type the bearing of the start tangent into the Input box and press the enter key. The browse button  on the Input box can be used to define the bearing by measuring existing elements.

Note: The Page Up and Page Down keys can be used when the Bearing Input box comes up to add or subtract intervals of 90 degrees.



STEP 5:

The arc is created with the given information.



Fillet

Position of option on menu: Strings =>CAD =>Arc =>Fillet

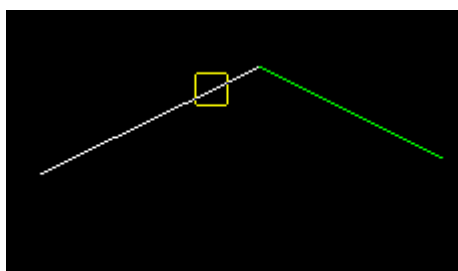
or by selection of appropriate icon from the toolbar. 

This option creates an arc given a fillet radius

On selecting **Fillet**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

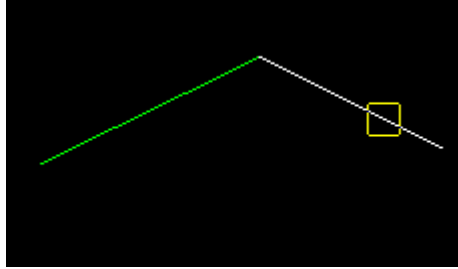
The 1st segment where the fillet is to depart from is selected and accepted. This should be done by a pick with direction. The direction will influence the calculations as there are a number of solutions for intersecting segments. In the case shown, the direction was in a north-east direction.




STEP 2:

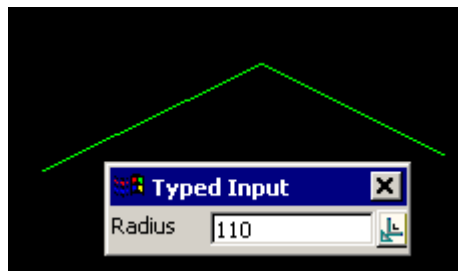
The 2nd segment where the fillet is to arrive from is selected and accepted. This should be done by a pick with direction. The direction will again influence the calculations as there are a number

of solutions for intersecting segments. In the case shown the direction was in a south-east direction



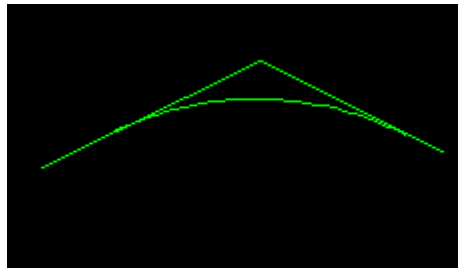
STEP 3:

After the 2nd segment is accepted, the Arc Radius Input box will appear. Type the radius of the fillet in the Input box (positive radius for curves curving to the right) and press the enter key. The browse button  on the Input box can be used to define the arc radius by measuring existing elements.



STEP 4:

The fillet arc is placed between the selected segments.



Fillet by start point

Position of option on menu: Strings =>CAD =>Arc =>Fillet by start point

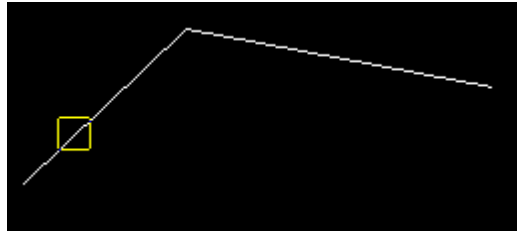
or by selection of appropriate icon from the toolbar. 

This option creates an arc that is a fillet between two selected sections and with a selected fillet start point (which will be a tangent point of the created arc).

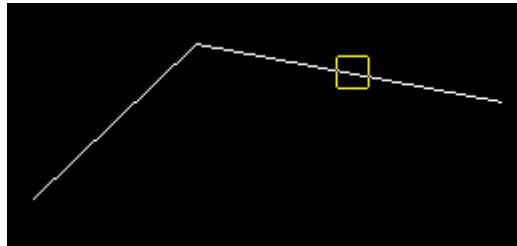
On selecting **Fillet by start point**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

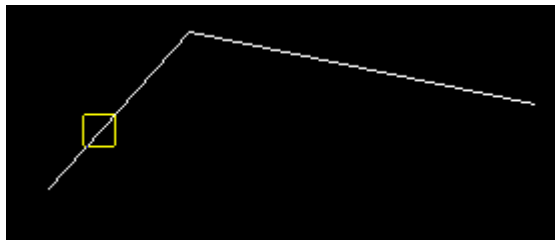
The 1st segment where the fillet is to depart from is selected and accepted. This should be done by a pick with direction. The direction will influence the calculations as there are a number of solutions for intersecting segments. In the case shown the direction was in a north-east direction.

**STEP 2:**

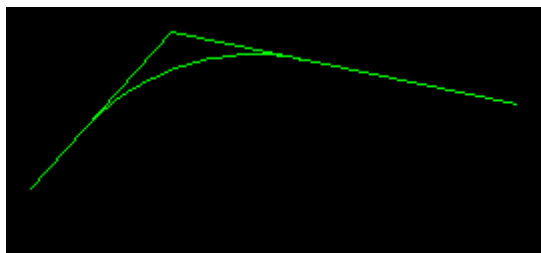
The 2nd segment where the fillet is to arrive from is selected and accepted. This should be done by a pick with direction. The direction will again influence the calculations as there are a number of solutions for intersecting segments. In the case shown the direction was in a south-east direction

**STEP 3:**

The tangent start point of the fillet is selected and accepted.

**STEP 4:**

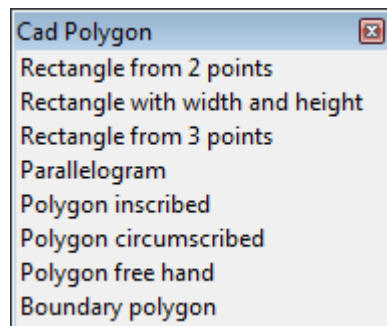
The fillet arc is placed between the selected segments.



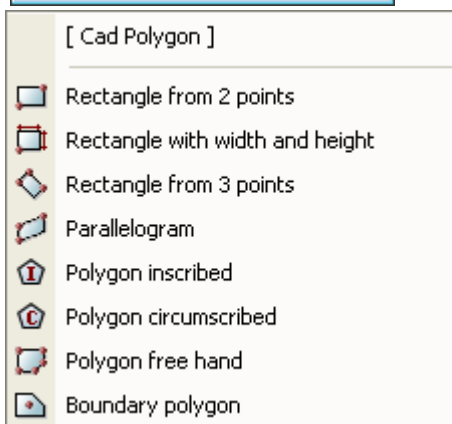
CAD Polygon

Position of option on menu: Strings =>CAD =>Polygon

The Cad polygon walk-right menu is



rectangle (fillet/chamfer) parallel to axes by picking 2 diagonal corners
 rectangle parallel to axes by picking BL point, width and height
 2 points defining base, 3rd point defining height
 2 points defining base, 3rd point defining corner
 centre point, number of sides and point on circumference
 centre point, number of sides and point on circumference
 pick in polygon vertices (in order)
 find polygon from lines and arcs, surrounding selected point



For the option *Rectangle from 2 points*, go to
Rectangle with width and height
Rectangle from 3 points
Parallelogram
Polygon inscribed
Polygon circumscribed
Polygon free hand
Boundary polygon

[Rectangle from 2 points](#)
[Rectangle with width and height](#)
[Rectangle from 3 points](#)
[Parallelogram](#)
[Polygon inscribed \(in a circle\)](#)
[Polygon Circumscribed About a Circle](#)
[Free Hand Polygon](#)
[Create Boundary Polygon](#)

Rectangle from 2 points

Position of option on menu: Strings =>CAD =>Polygon =>Rectangle from 2 Points

or by selection of appropriate icon from the toolbar. 

This option creates a rectangle parallel to the x and y axis by selecting two diagonal corners of the rectangle.

On selecting **Rectangle from 2 Points**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

The 1st point is selected with the mouse or entered in via the keyboard. To specify the 1st point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter the 1st point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.

After the 1st point is accepted a rectangle will be displayed 'rubber banding' to form a rectangle

with the first point and the cursor position being diagonal corners. This will continue until the 2nd point is selected and accepted.



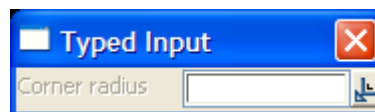
STEP 2:

The following message is displayed in the screen message box:

<[N] Pick opposite corner or (r)adius, (c)hamfer, (l)ength> [picks][Fast][Menu]

Output Window

If filleted corners are required, type **r** and enter the *corner radius*.

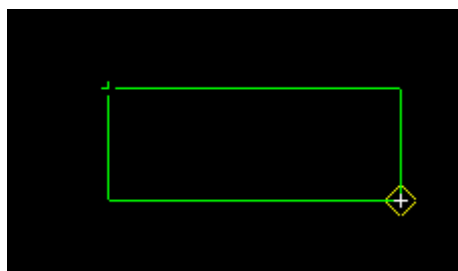


If chamfered corners are required, type **c** and enter the *chamfer length*.

If a fillet or chamfer has been selected, type **n** to turn it off.

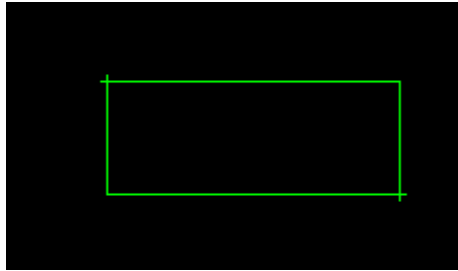
STEP 3:

The 2nd point is selected with the mouse or entered in via the keyboard. To specify the 2nd point with the mouse, a point must be selected and accepted. To enter the 2nd point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.



STEP 4:

The rectangle is created with the given information.



Rectangle with width and height

Position of option on menu: Strings =>CAD =>Polygon =>Rectangle with width and height

or by selection of appropriate icon from the toolbar. 

This option creates a rectangle parallel to the x and y axis by selecting a start point and giving the width and height of the rectangle.

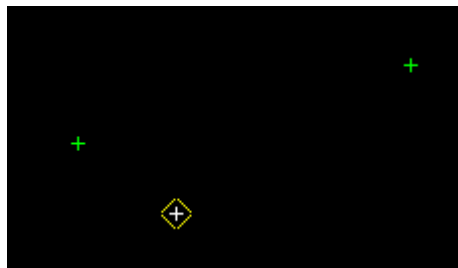
On selecting **Rectangle with width and height**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:


The start point is selected with the mouse or entered in via the keyboard. To specify the start point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter the start point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.


This point defines the bottom left point of the rectangle.

After the start point is accepted, the width will be displayed 'rubber banding' to right of the start point (positive distance). The width is equal to the distance from the start point to the position of the cursor. This will continue until the width is selected and accepted.




STEP 2:


The width is selected with the mouse or entered in via the keyboard. To specify the width with the mouse, a point must be selected and accepted. To enter the width with the keyboard, simply start typing or press the space bar to bring up the Distance Input box. Type the distance into the Distance Input box and press the enter key. The browse button  on the Input box can be used to define the distance by measuring existing elements.

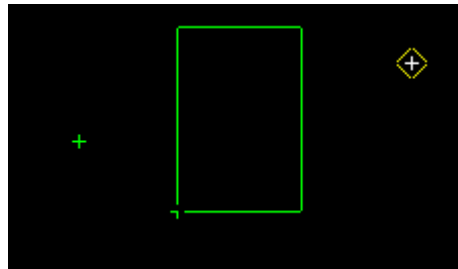
A negative distance (to the left of the 1st point) can be entered via the Distance Input box in two ways. Either type a negative distance, or use the browse button  to select a distance, then place a minus "-" sign in front of the distance value.

After the width is accepted, the width of the rectangle is confirmed and the height will be displayed 'rubber banding' upwards on the screen. The height is equal to the distance from the found width point to the position of the cursor. The rectangle will be created once the height is selected and accepted.

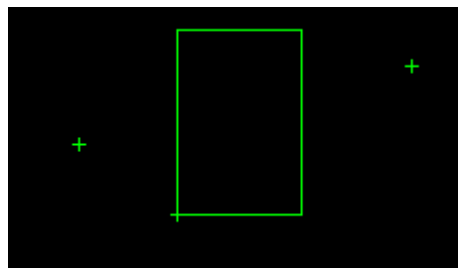
**STEP 3:**

The height is selected with the mouse or entered in via the keyboard. To specify the height with the mouse, a point must be selected and accepted. To enter the height with the keyboard, simply start typing or press the space bar to bring up the Distance Input box. Type the distance into the Distance Input box and press the enter key. The browse button  on the Input box can be used to define the distance by measuring existing elements.

A negative distance (below of the 2nd point) can be entered via the Distance Input box in two ways. Either type a negative distance, or use the browse button  to select a distance, then place a minus "-" sign in front of the distance value.

**STEP 4:**

The rectangle is created with the given information.



Rectangle from 3 points

Position of option on menu: Strings =>CAD =>Polygon =>Rectangle from 3 points

or by selection of appropriate icon from the toolbar. 

This option creates a rectangle by selecting three points. The first and second point define the base of the rectangle, which can be at any angle, and the third point is on the opposite side of the rectangle. The rectangle can be filleted or chamfered.

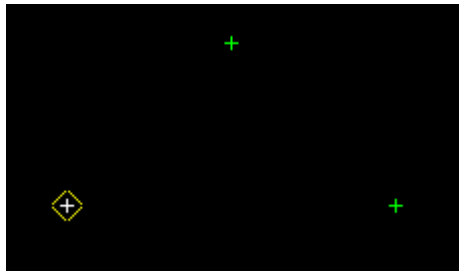
On selecting **Rectangle from 3 points**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:


The 1st point is selected with the mouse or entered in via the keyboard. To specify the 1st point

with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter the 1st point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.

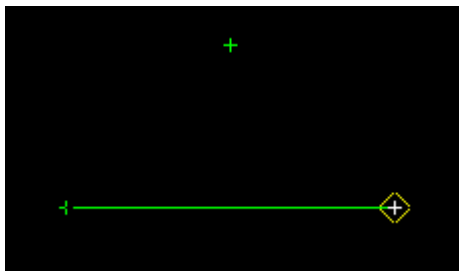
After the 1st point is accepted, the base of the rectangle will be displayed 'rubber banding' on the screen. The baseline length is equal to the distance from the 1st point to the position of the cursor. This will continue until the 2nd point is selected and accepted.



STEP 2:

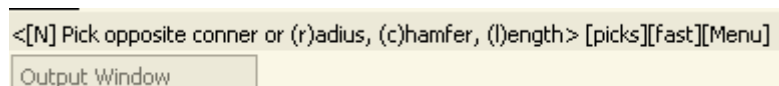
The 2nd point is selected with the mouse or entered in via the keyboard. To specify the 2nd point with the mouse, a point must be selected and accepted. To enter the 2nd point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key. The browse button  on the Input box can be used to define the distance by measuring existing elements.

After the 2nd point is accepted, the baseline of the rectangle is confirmed and the height will be displayed 'rubber banding' on the screen. The height is equal to the distance from the 2nd point to the position of the cursor. The rectangle will be created once the height is selected and accepted.

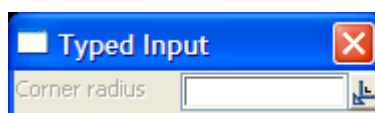


STEP 3:

The following message is displayed in the screen message box:




If filleted corners are required, type **r** and enter the *corner radius*.

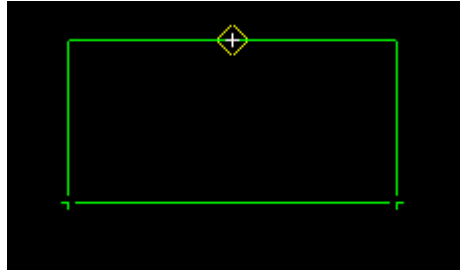


If chamfered corners are required, type **c** and enter the *chamfer length*.

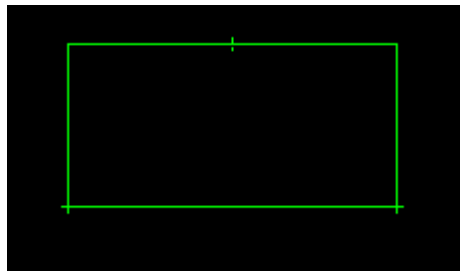
If a fillet or chamfer has been selected, type **n** to turn it off.

STEP 4:

The height is selected with the mouse or entered in via the keyboard. To specify the height with the mouse, a point must be selected and accepted. To enter the 3rd point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key. The browse button  on the Input box can be used to define the distance by measuring existing elements.

**STEP 5:**

The rectangle is created with the given information.

**Parallelogram**

Position of option on menu: Strings =>CAD =>Polygon =>Parallelogram

or by selection of appropriate icon from the toolbar. 

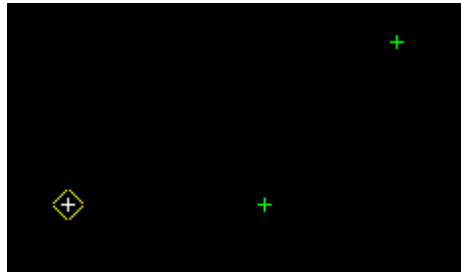
This option creates a parallelogram by selecting three points. The first and second point define the base of the parallelogram, which can be at any angle, and the third point is the end point of the opposite side of the parallelogram.


On selecting **Parallelogram**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

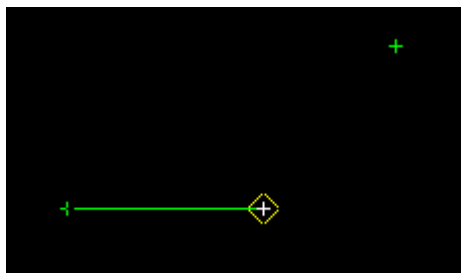
The 1st point is selected with the mouse or entered in via the keyboard. To specify the 1st point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter the 1st point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.


After the 1st point is accepted, the base of the rectangle will be displayed 'rubber banding' on the screen. The baseline length is equal to the distance from the 1st point to the position of the cursor. This will continue until the 2nd point is selected and accepted.

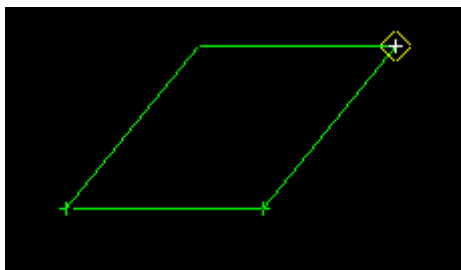
**STEP 2:**

The 2nd point is selected with the mouse or entered in via the keyboard. To specify the 2nd point with the mouse, a point must be selected and accepted. To enter the 2nd point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key. The browse button  on the Input box can be used to define the distance by measuring existing elements.

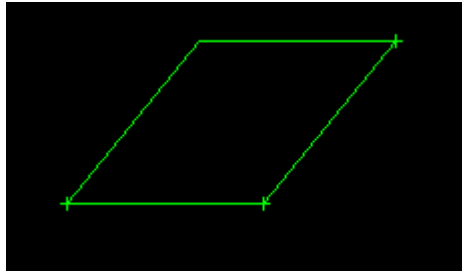
After the 2nd point is accepted, the baseline of the parallelogram is confirmed and the height will be displayed 'rubber banding' on the screen. The height is equal to the distance from the 2nd point to the position of the cursor. The parallelogram will be created once the height is selected and accepted.

**STEP 3:**

The height is selected with the mouse or entered in via the keyboard. To specify the height with the mouse, a point must be selected and accepted. To enter the 3rd point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key. The browse button  on the Input box can be used to define the distance by measuring existing elements.

**STEP 4:**

The parallelogram is created with the given information.



Polygon inscribed (in a circle)

Position of option on menu: Strings =>CAD =>Polygon =>polygon inscribed

or by selection of appropriate icon from the toolbar. 

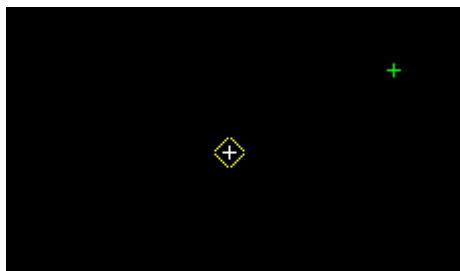
This option creates a polygon with a user defined number of sides on the inside of a circle.

The polygon is constructed inside a circle, thus each corner of the polygon touches the circumference of the circle defined by the user. Conversely using the **Polygon circumscribed** option, the midpoint of each side of the polygon touches the circumference of the circle creating a polygon outside the circle.

On selecting **polygon inscribed**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

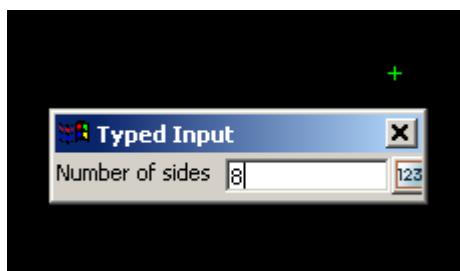
The centre point is selected with the mouse or entered in via the keyboard. To specify the centre point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter the centre point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.



STEP 2:

After the centre point is accepted, the Number of Sides Input box will appear. Type in the desired number of sides for the polygon into the Input box and press the enter key.

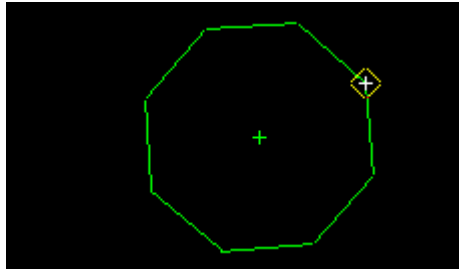
After the number of sides have been selected, the polygon will be displayed 'rubber banding' on the screen. The polygon will be created once the radius is selected and accepted.



STEP 3:

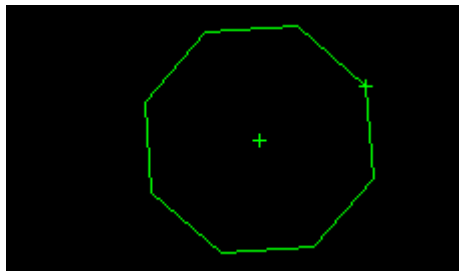
Before a polygon can be created inside the circle, its radius must be defined by the user. To specify the radius with the mouse, a point must be selected and accepted. To enter the point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.

Note: One of the polygon's corners will be located on the point selected to defined the circle's radius



STEP 4:

A polygon is created inside a circle with a radius defined by the user.



Polygon Circumscribed About a Circle

Position of option on menu: Strings =>CAD =>Polygon =>Polygon circumscribed

or by selection of appropriate icon from the toolbar. 

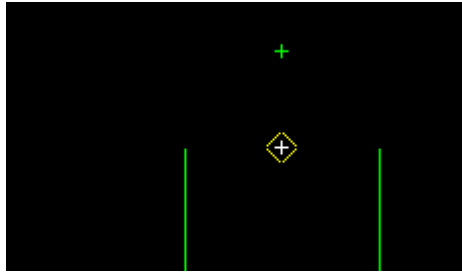
This option creates a polygon with a user defined number of sides on the outside a circle.

The polygon is constructed outside a circle, thus the midpoint of each side of the polygon touches the circumference of the circle defined by the user. Conversely using the **Polygon inscribed** option, each corner of the polygon touches the circumference of the circle creating a polygon inside the circle.

On selecting **Polygon circumscribed**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

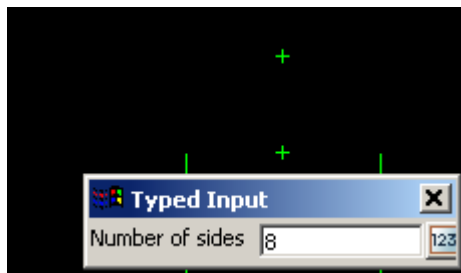
STEP 1:

The centre point is selected with the mouse or entered in via the keyboard. To specify the centre point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter the centre point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.

**STEP 2:**

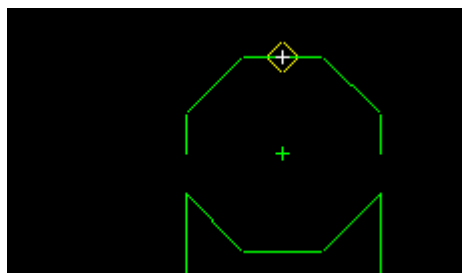
After the centre point is accepted, the Number of Sides Input box will appear. Type in the desired number of sides for the polygon into the Input box and press the enter key.

After the number of sides have been selected, the polygon will be displayed 'rubber banding' on the screen. The polygon will be created once the radius is selected and accepted.

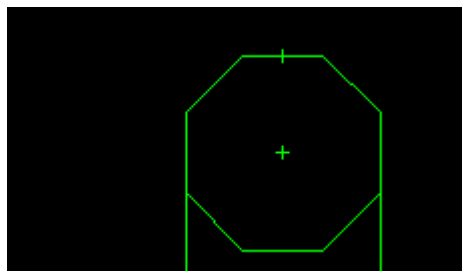
**STEP 3:**

Before a polygon can be created outside the circle, its radius must be defined by the user. To specify the radius with the mouse, a point must be selected and accepted. To enter the point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.

Note: One midpoint of the polygon's side will be located on the point selected to defined the circle's radius

**STEP 4:**

A polygon is created outside the circle with a radius defined by the user.



Free Hand Polygon

Position of option on menu: Strings =>CAD =>Polygon =>Polygon free hand

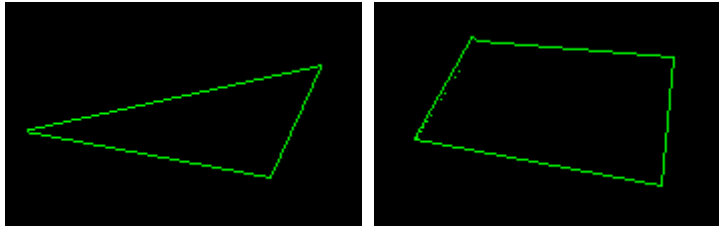
or by selection of appropriate icon from the toolbar. 

This option creates a closed polygon from selected vertices.

On selecting **Polygon free hand**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

Pick and accept the position to form the vertices of the polygon. As each vertex is accepted, the polygon is automatically closed.



STEP 2:

The polygon is finished by pressing the <Esc> key.

Create Boundary Polygon

Position of option on menu: Strings =>CAD =>Polygon =>Boundary polygon

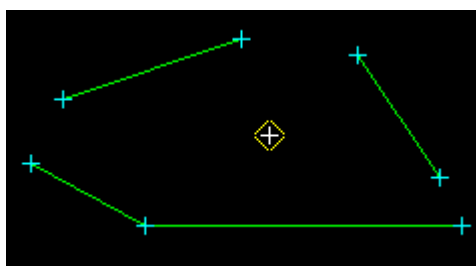
or by selection of appropriate icon from the toolbar. 

This option tries to form a boundary from a selected set of segments.

On selecting **Boundary polygon**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

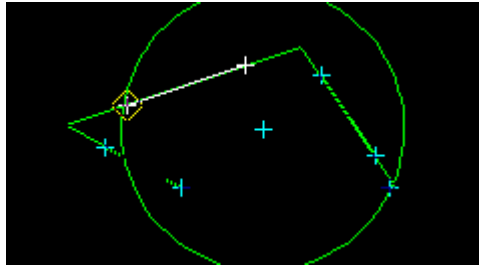
STEP 1:

Pick a position inside the lines, arcs and strings to form a bounding polygon from.

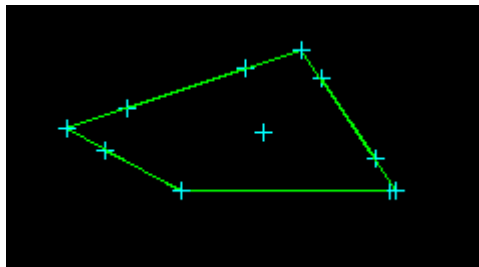


STEP 2:

A circle is then drawn centred on the selected position with circumference going through the position of the cursor. Drag the cursor out until it encloses all the data to be used to create the closest bounding polygon around the centre.

**STEP 3:**

On accepting the circle position, an attempt is made to create the inner polygon using all the strings inside the circle.



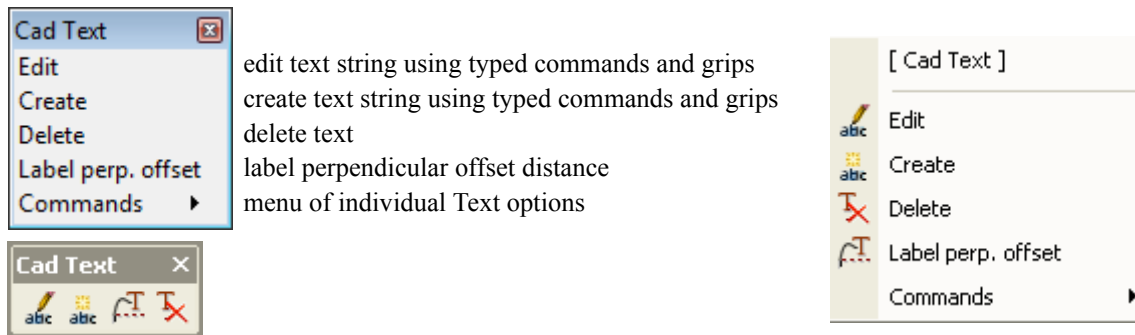
CAD Text

Position of option on menu: Strings =>CAD =>Text

Position of option on menu: Various toolbars

Text can occur as a text string, on vertices and segments of a super string or on vertices of a 4d string. But the display position of text is not as straight forward as simply placing a point. For more information about text, go to the section [Text Definitions](#) in the chapter [Tools and Concepts](#).

The Text walk-right menu is



For the option *Edit*, go to

Create

Delete

Label perp. offset

Commands

[Edit Text](#)

[Create Text](#)

[Text Delete](#)

[Label Perpendicular Offset](#)

[CAD Text Commands](#)

Create Text

Position of option on menu: Strings =>CAD =>Text =>Create

or by selection of appropriate icon from the toolbar. 

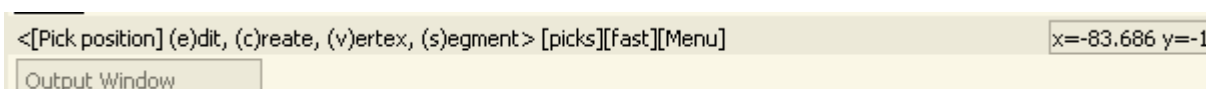
For information about text and its definitions, go to the section [Text Definitions](#) in the chapter [Tools and Concepts](#).

12d Model has two CAD text options **Create** and **Edit**. However both of these run the same option which starts up in different modes - **Create** is in the mode to create text as straight text, or text on a super string vertex or on a super string segment and **Edit** which edits existing text.

Once either CAD text option is started it is possible to change between the **Create** and **Edit** modes at any time.

The **Create** option creates text strings, text at super string vertices and text on super string segments, and then displays a list key commands in the screen message area, and grips on screen, to quickly allow editing of the text, text size, colour, rotation, style, angle, raise, justification point etc.

After selecting the option, the **Pick position** message is displayed in the screen message area.



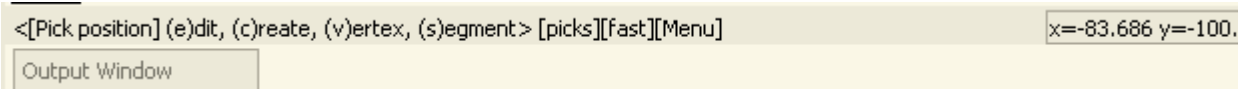
To go from **Create** to **Edit** mode, type **e** - go to [To Go from Create to Edit Mode - Typing e](#)

To create a text string, type **c** - go to [Creating a Text String - Typing c](#)

To create vertex text, type **V** - go to [Creating Text at a Super String Vertex- Typing v](#)
To create segment text, type **S** - go to [Creating Text at a Super String Segment- Typing s](#)

Creating a Text String - Typing c

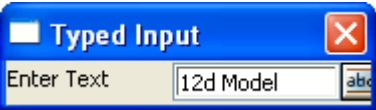
After typing **C**, the **Pick position** message is again displayed in the screen message area and the position of the text is then selected with the cursor.



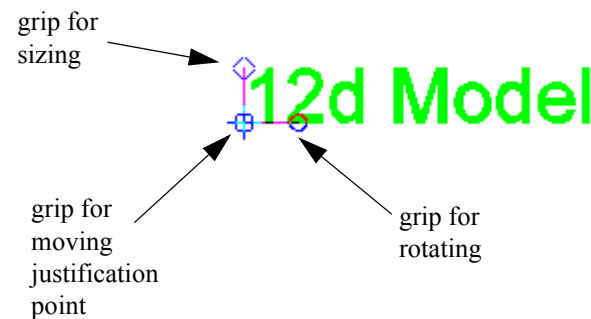
When the position is accepted an **Enter text** typed input box is then displayed on the screen.



The text is typed into the box and the <enter> key pressed.

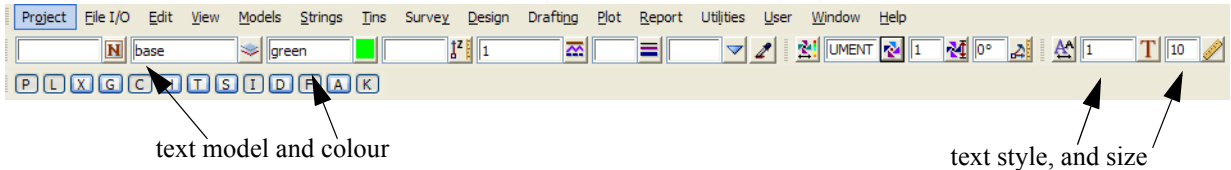


The text vertex and text justification point is placed at that position and the direction of the text is parallel to the x-axis. The angle and raise are both zero and the text justification is (left x, bottom y).



When the text is displayed, grips for quick editing of size, rotation and moving of the justification point are also shown. The appropriate grip can then selected for quick editing. For details on using the grips, go to the section [Text Grips](#) in the chapter [Tools and Concepts](#).

For the new text, the style and height are taken from the **Text controlbar** and the model and colour from the **CAD controlbar** (see [CAD, Symbol and Text Controlbars, Symbol Controlbar](#) and [CAD Controlbar](#)).



After the text is created, a list of typed options is then displayed in the screen message area.

```
<[J] Pick grip point or (v)ertex, (c)olour, (s)tyle, ( ) (t)ext, (h)eight, (w)factor, (n)ew, (f)inish, (m)ore...> [picks][fast][Menu]
```

Output Window

and if **m** is typed, the rest of the options are shown

```
<[J] (o)ffset, (r)aise, (a)ngle, (x)justify, (y)justify, (d)efault, (->)next, (<-)previous, (m)ore..., (l)ock, no auto(p)an> [picks][fast][Menu]
```

Output Window

These options are the same as when editing existing text, and will be described in detail in the section [Edit Text](#).

C is the default if nothing is typed.

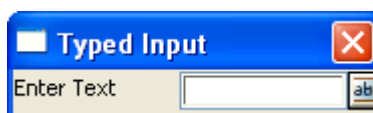
Creating Text at a Super String Vertex- Typing v

After typing **v**, the **Pick vertex** message is displayed in the screen message area and the vertex of the super string to place the text at is then selected with the cursor.

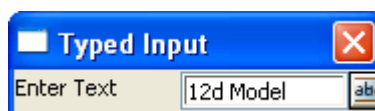
```
<[Pick vertex] (e)dit, (c)reate, (v)ertex, (s)egment> [picks][fast][Menu]
```

Output Window

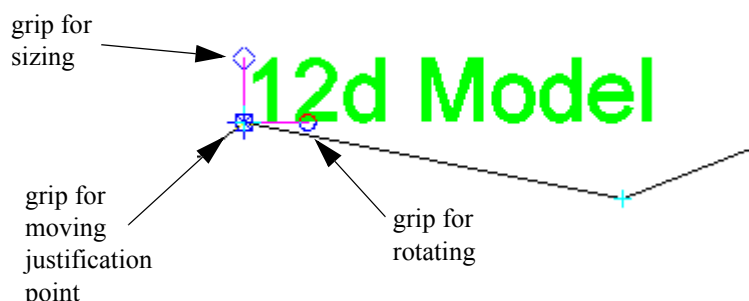
When the vertex is accepted an **Enter text** typed input box is then displayed on the screen.



The text is typed into the box and the <enter> key pressed.

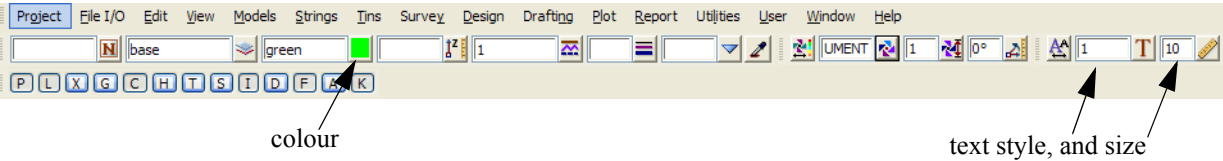


The text justification point is placed at the selected string vertex and the direction of the text is parallel to the x-axis. The angle and raise are both zero and the text justification is (left x, bottom y).

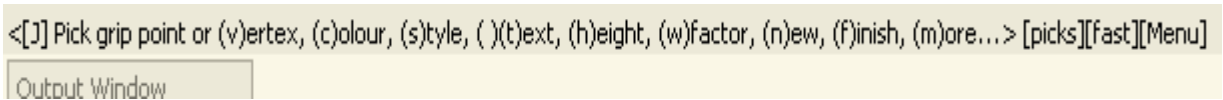


When the text is displayed, grips for quick editing of size, rotation, moving of the justification point and string vertex are also shown. The appropriate grip can then be selected for quick editing. For details on using the grips, go to the section [Text Grips](#) in the chapter [Tools and Concepts](#).

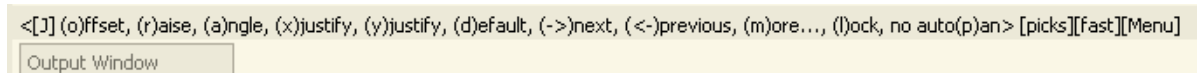
For the new text, the style and height are taken from the **Text controlbar** and colour from the **CAD controlbar** (see [CAD, Symbol and Text Controlbars](#), [Symbol Controlbar](#) and [CAD Controlbar](#)). The created text will be part of the super string so no model is required.



After the vertex text is created, a list of typed options is then displayed in the screen message area.



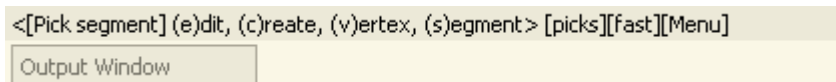
and if **m** is typed, the rest of the options are shown



These option are the same as when editing existing text, and will be described in detail in the section [Edit Text](#).

Creating Text at a Super String Segment- Typing s

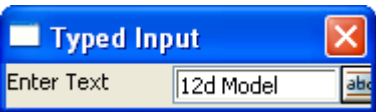
After typing **s**, the **Pick segment** message is displayed in the screen message area and the segment of the super string to place the text on is then selected with the cursor.



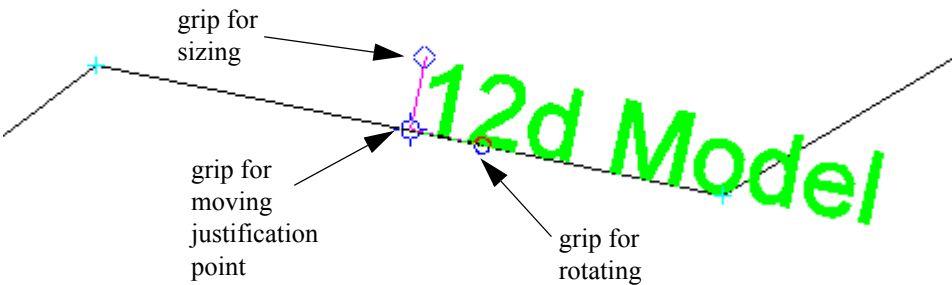
When the segment is accepted an **Enter text** typed input box is then displayed on the screen.



The text is typed into the box and the <enter> key pressed.

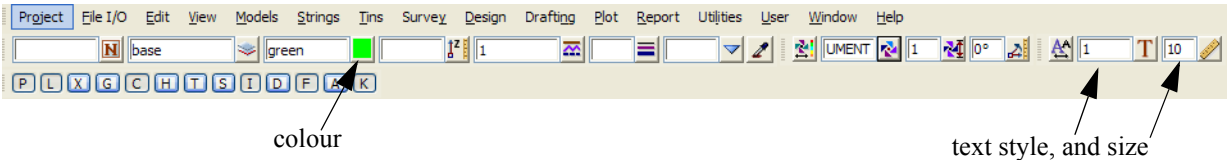


The text justification point is placed at the centre of the segment and the direction of the text is parallel to the segment. The angle and raise are both zero and the text justification is (left x, bottom y).



When the text is displayed, grips for quick editing of size, rotation and moving of the justification point are also shown. The appropriate grip can then selected for quick editing. For details on using the grips, go to the section [Text Grips](#) in the chapter [Tools and Concepts](#).

For the new text, the style and height are taken from the **Text controlbar** and colour from the **CAD controlbar** (see [CAD, Symbol and Text Controlbars](#), [Symbol Controlbar](#) and [CAD Controlbar](#)). The created text will be part of the super string so no model is required.



After the segment text is created, a list of typed options is then displayed in the screen message area.

```
<[S] Pick grip point or (c)olour, (s)tyle, ( )t)ext, (h)eight, (w)factor, (n)ew, (f)inish, (m)ore...> [picks][fast][Menu]
```

Output Window

and if **m** is typed, the rest of the options are shown

```
<[S] (o)ffset, (r)aise, (a)ngle, (x)justify, (y)justify, (d)efault, (->)next, (<-)previous, (m)ore..., no auto(p)an, <-previous, ->next> [picks][fast][Menu]
```

Output Window

These option are the same as when editing existing text, and will be described in detail in the section [Edit Text](#).

To Go from Create to Edit Mode - Typing e


After typing **e**, the **Pick text** message is displayed in the screen message area.

```
<[Pick text] (e)dit, (c)reate, (v)ertex, (s)egment> [picks][fast][Menu]
```

Output Window

This is the same as when selecting the Edit option from the CAD Text toolbar and will be described in detail in the section [Edit Text](#).

Edit Text

Position of option on menu: Strings =>CAD =>Text =>Edit
or by selection of appropriate icon from the toolbar. 

For information about text and its definitions, go to the section [Text Definitions](#) in the chapter [Tools and Concepts](#).

12d Model has two CAD text options **Create** and **Edit**. However both of these run the same option which starts up in different modes - **Create** is in the mode to create text as straight text, or text on a super string vertex or on a super string segment and **Edit** which edits existing text.

Once either CAD text option is started it is possible to change between the Create and Edit modes at any time.

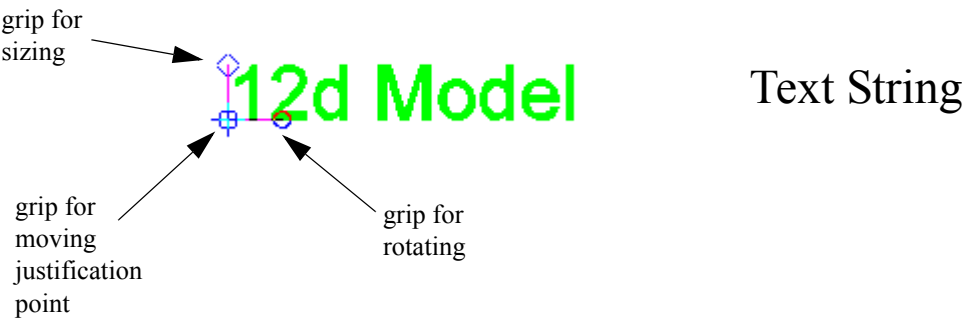
The **Edit** option edits text as either text strings, text at super string vertices or text on super string segments.

After typing **e**, the **Pick text** message is displayed in the screen message area

```
<[Pick text] (e)dit, (c)reate, (v)ertex, (s)egment> [picks][Fast][Menu]  
Output Window
```

and text either as a text string, or text on a super string vertex or segment, is then selected by the mouse for editing.

The selected text with the text edit grips is shown on screen, and a list of available typed commands in the screen message area to quickly allow editing of the text, text size, colour, rotation, style, angle, raise, justification point, vertex, etc.



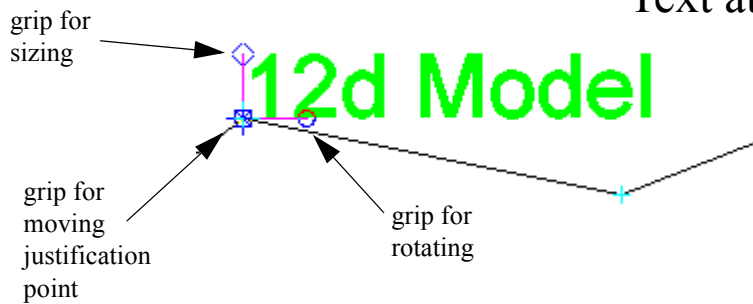
Options displayed after selecting text

```
<[J] Pick grip point or (v)ertex, (c)olour, (s)tyle, ( )t)ext, (h)eight, (w)factor, (n)ew, (f)inish, (m)ore...> [picks][Fast][Menu]  
Output Window
```

and by typing **m**

```
<[J] (o)ffset, (r)aise, (a)ngle, (x)justify, (y)justify, (d)efault, (->)next, (<-)previous, (m)ore..., (l)ock, no auto(p)an> [picks][Fast][Menu]  
Output Window
```

Text at Super String Vertex



Options displayed after selecting text

```
<[J] Pick grip point or (v)ertex, (c)olour, (s)tyle, ( ) (t)ext, (h)eight, (w)factor, (n)ew, (f)inish, (m)ore...> [picks][fast][Menu]
```

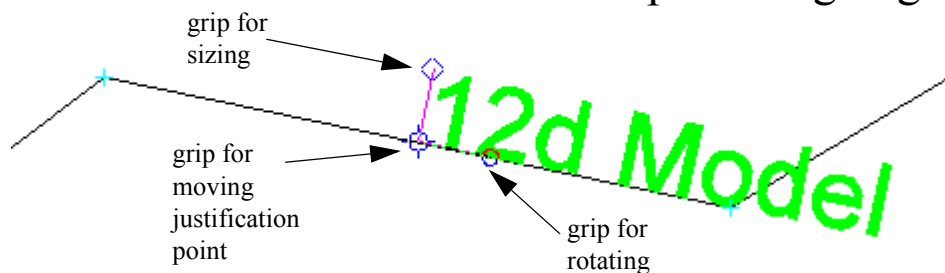
Output Window

and by typing **m**

```
<[J] (o)ffset, (r)aise, (a)ngle, (x)justify, (y)justify, (d)efault, (->)next, (<-)previous, (m)ore..., (l)ock, no auto(p)an> [picks][fast][Menu]
```

Output Window

Text on Super String Segment



Options displayed after selecting text

```
<[S] Pick grip point or (c)olour, (s)tyle, ( ) (t)ext, (h)eight, (w)factor, (n)ew, (f)inish, (m)ore...> [picks][fast][Menu]
```

Output Window

and by typing **m**

```
<[S] (o)ffset, (r)aise, (a)ngle, (x)justify, (y)justify, (d)efault, (->)next, (<-)previous, (m)ore..., no auto(p)an, <-previous, ->next> [picks][fast]
```

Output Window

To change the text colour, type **C** - go to [Change Text Colour - Typing c](#)

To change the text style, type **S** - go to [Change Text Style - Typing s](#)

To change the actual text, type **t** or press **space bar** - go to [Change Text - Pressing space bar or Typing t](#)

To change the text height, type **h** - go to [Change Text Height - Typing h](#)

To change the text width factor, type **w** - go to [Change Text Width Factor - Typing w](#)

To create/edit a new text, type **n** - go to [Create/Edit New Text - Typing n](#)

To end the create/edit option, type **f** - go to [Finish the Create/Edit - Typing f](#)

To show the other line of options, type **m** - go to [Show Other Line of Options - Typing m](#)

To change the text offset, type **o** - go to [Change Text Offset - Typing o](#)

To change the text raise, type **r** - go to [Change Text Raise - Typing r](#)

To change the text angle, type **a** - go to [Change Text Angle - Typing a](#)

To change the text x justification, type **x** - go to [Change Text X Justification - Typing x](#)

To change the text y justification, type **y** - go to [Change Text Y Justification - Typing y](#)

To reset some text values to their defaults, type **d** - go to [Reset Text Parameters to Defaults - Typing d](#)

To change focus to the next text, press **->** - go to [Change Focus to the Next Text in String - Pressing right arrow key \(->\)](#)

To change focus to the previous text, press **<-** - go to [Change Focus to the Previous Text in String - Pressing left arrow key \(<-\)](#)

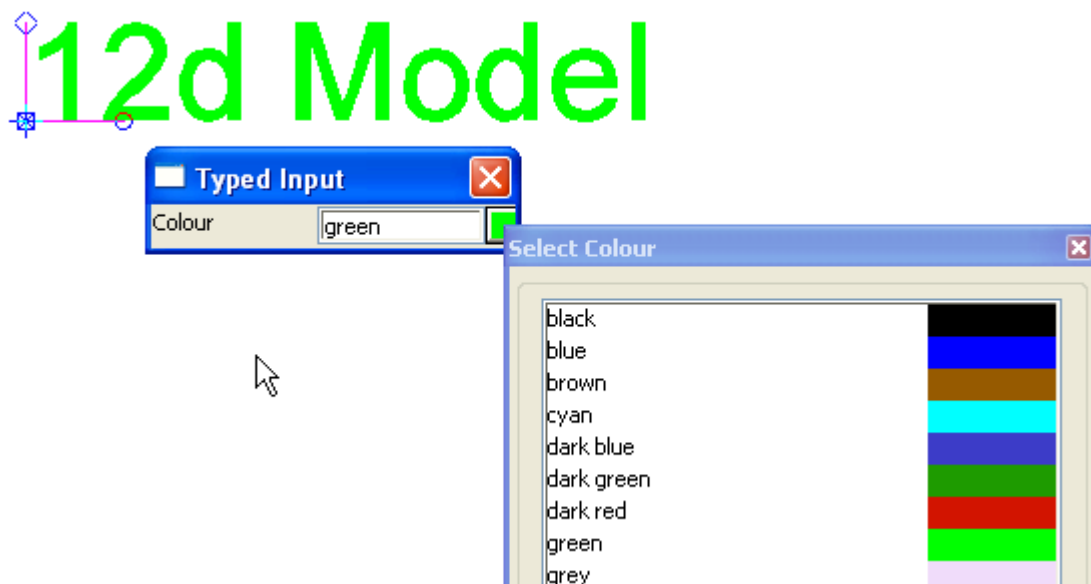
To show the other line of options, type **m** - go to [Show Other Line of Options - Typing m](#)

To toggle vertex lock on and off, type **l** - go to [Toggle Lock - Typing l](#)

To toggle autopan on and off, type **p** - go to [Toggle Autopan - Typing p](#)

Change Text Colour - Typing c

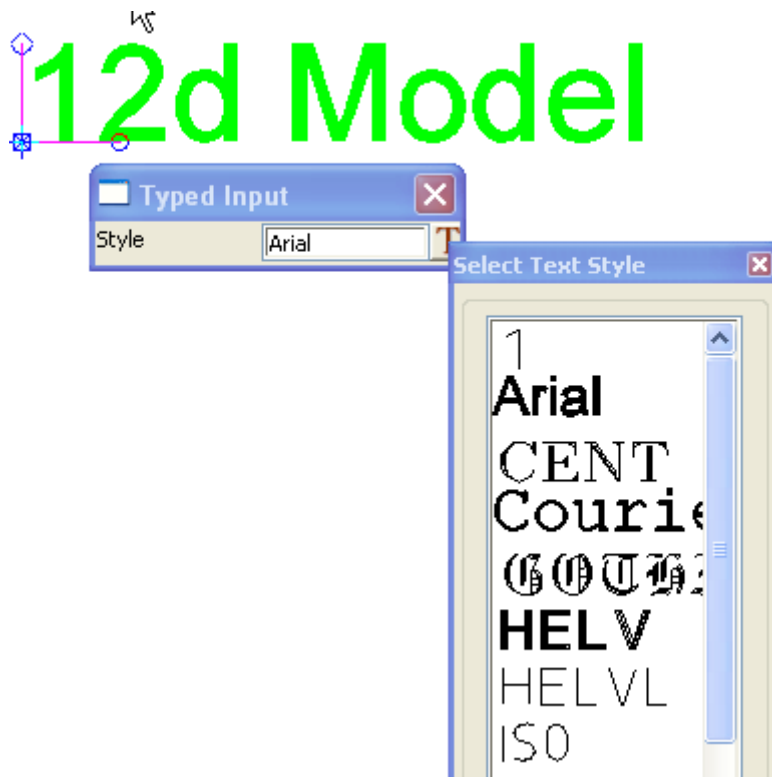
After typing **c**, a Colour **Typed input** box appears with the current text colour displayed.



The new colour for the text is typed into the Colour input box followed by the <enter> key, or by selecting a colour from the **Select Colour** box which is brought up by clicking B1 on the colour button.

Change Text Style - Typing s

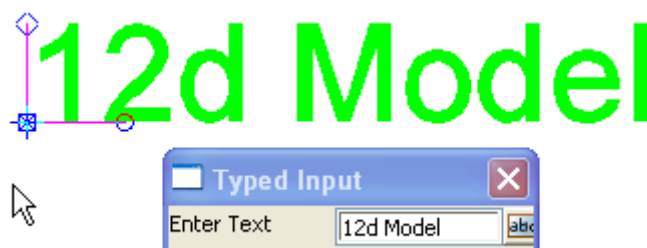
After typing **s**, a Style **Typed input** box appears with the current text style displayed.



The new style for the text is typed into the Style input box followed by the <enter> key, or by selecting a style from the **Select Text Style** box which is brought up by clicking B1 on the style button.

Change Text - Pressing space bar or Typing t

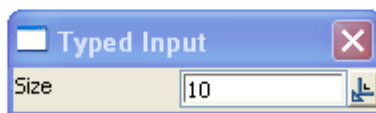
After typing **t** or pressing the space bar, an Enter Text **Typed input** box appears with the current text in it.



The new text is typed into the Enter Text input box followed by the <enter> key.

Change Text Height - Typing h

After typing **h**, a Size **Typed input** box appears with the current text height in it.

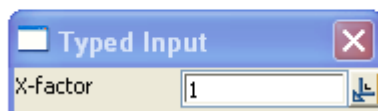



The new height is typed into the Size input box followed by the <enter> key.

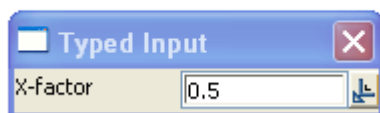
Note - Many arithmetic expressions are supported in the **Size** typed input box (e.g. 10+27). See the section [Expressions in Panel Fields](#) in the chapter [Tools and Concepts](#).

Change Text Width Factor - Typing w

After typing **W**, a X-Factor **Typed input** box appears with the current width (x-factor) in it.

The new width (x-factor) is typed into the X-factor input box followed by the <enter> key.

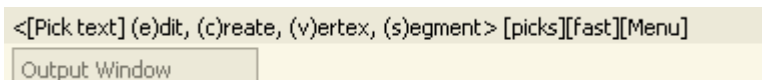




width (x-factor) = 0.5

Note - Many arithmetic expressions are supported in the **X-factor** typed input box (e.g. 0.5*2.2). See the section [Expressions in Panel Fields](#) in the chapter [Tools and Concepts](#).

Create/Edit New Text - Typing n

If the option was in **Edit** mode and **n** is typed, a new **Edit** is started (**e** mode). The **Pick text** message is displayed in the screen message area and another text is selected to edit.



Or a **new** text can be created by typing **C**, **V** or **S**. See the section [Create Text](#) for more information on **C**, **V** and **S**.

If the option was in **Create** mode and **n** is typed, a new **Create** is started in the **C** mode. The

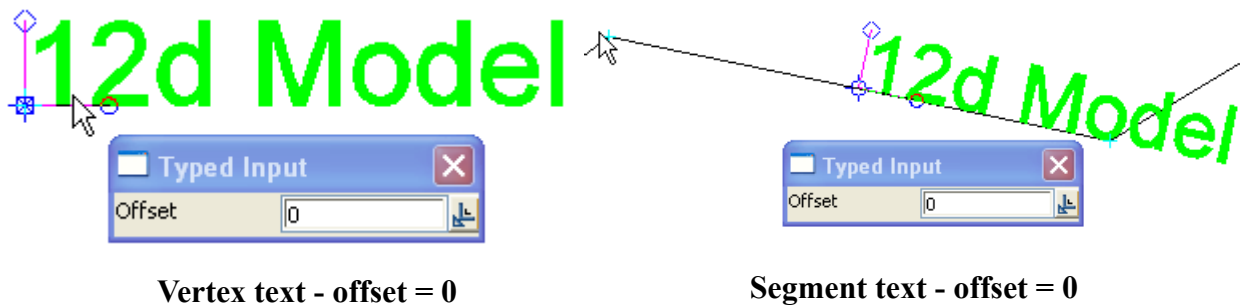
Pick position message is displayed in the screen message area and a new text is created.

<[Pick position] (e)dit, (c)reate, (v)ertex, (s)egment> [picks][Fast][Menu] x=-83.686 y=-100.4
Output Window

Or a **new** segment or vertex text can be created by typing **V** or **S** or the Edit mode can be entered by typing **E**. See the section [Create Text](#) for more information on **C**, **V** and **S**.

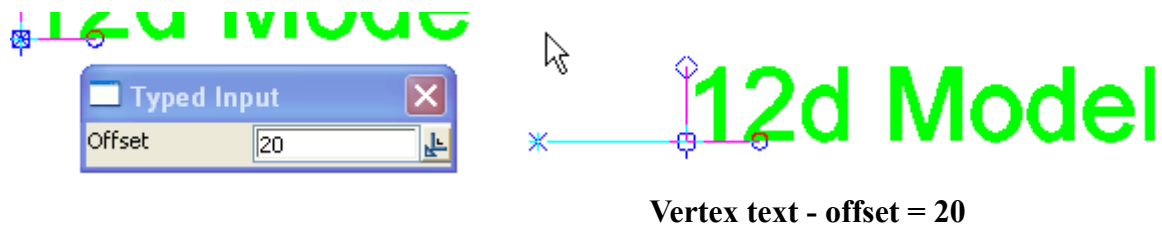
Change Text Offset - Typing o

After typing **O**, an Offset **Typed input** box appears with the current text offset in it.



The new offset is typed into the Offset input box followed by the <enter> key.

The text justification point will be offset by the new amount



For information about text and the definition of **offset**, go to the section [Text Definitions](#) in the chapter [Tools and Concepts](#).

Note - Many arithmetic expressions are supported in the **Offset** typed input box (e.g. 10+27). See the section [Expressions in Panel Fields](#) in the chapter [Tools and Concepts](#).

Change Text Raise - Typing r

After typing **r**, a Raise **Typed input** box appears with the current text raise in it.



12d Model

Vertex text - raise = 0

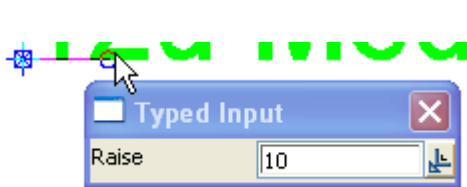


12d Model

Segment text - raise = 0

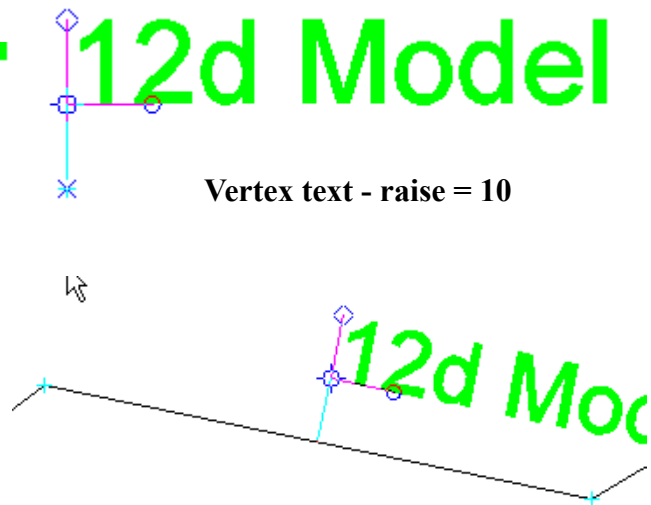
The new raise is typed into the Raise input box followed by the <enter> key.

The text justification point will be raised by the new amount



12d Model

Vertex text - raise = 10



12d Model

Segment text - raise = 10

For information about text and the definition of **raise**, go to the section [Text Definitions](#) in the chapter [Tools and Concepts](#).

Note - Many arithmetic expressions are supported in the **Raise** typed input box (e.g. 10+27). See the section [Expressions in Panel Fields](#) in the chapter [Tools and Concepts](#).

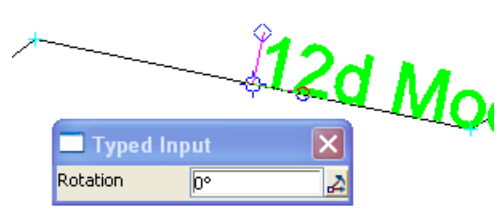
Change Text Angle - Typing a

After typing **a**, a Rotation **Typed input** box appears with the current text angle in it.



12d Model

Vertex text - angle = 0



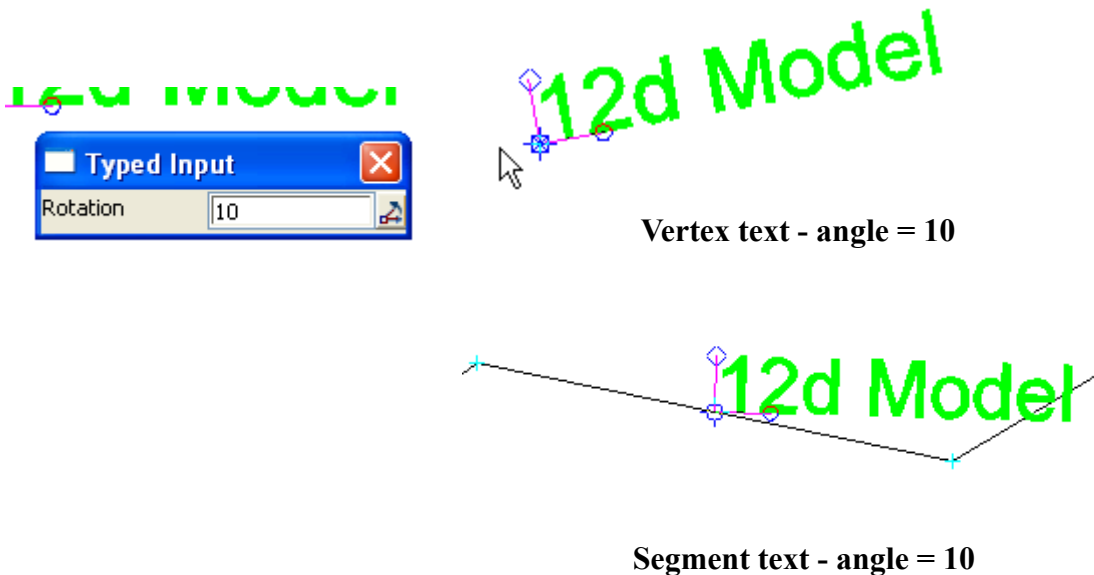
12d Model

Segment text - angle = 0

The new angle is typed into the Rotation input box followed by the <enter> key.

The direction of the text point will be rotated by the new amount.

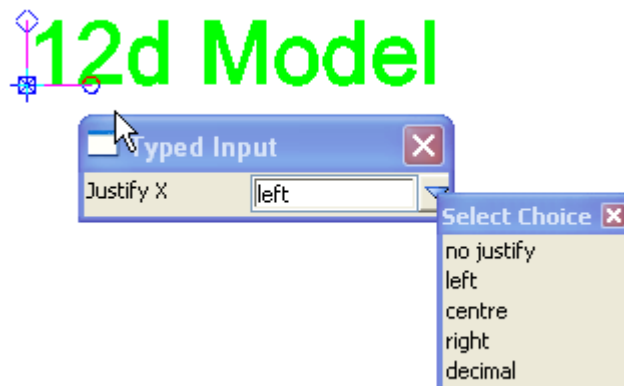
For information about text and the definition of **angle**, go to the section [Text Definitions](#) in the chapter [Tools and Concepts](#).



Note - Some arithmetic expressions are supported in the **Rotation** typed input box (e.g. 10+90). See the section [Expressions in Bearing, Angle Panel Fields](#) for what is allowed in angle/bearing panel fields in the chapter [Tools and Concepts](#).

Change Text X Justification - Typing x

After typing **X**, a Justify X **Typed input** box appears with the current text x justification in it.

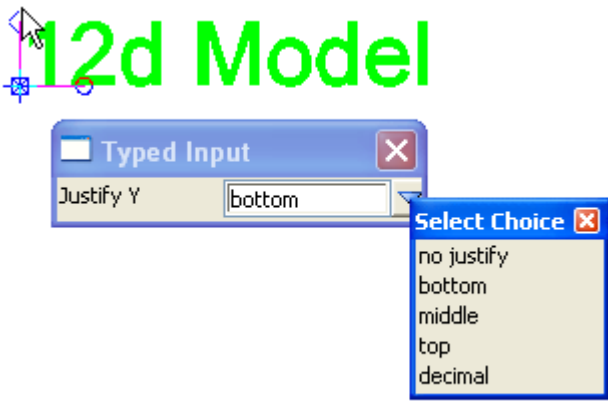


The new x justification for the text is typed into the Justify X input box followed by the <enter> key, or by selecting a justification from the **Select Choice** box which is brought up by clicking B1 on the choice button.

For information about text and the definition of **justification**, go to the section [Text Definitions](#) in the chapter [Tools and Concepts](#).

Change Text Y Justification - Typing y

After typing **y**, a Justify Y **Typed input** box appears with the current text y justification in it.



The new y justification for the text is typed into the Justify Y input box followed by the <enter> key, or by selecting a justification from the **Select Choice** box which is brought up by clicking B1 on the choice button.

For information about text and the definition of **justification**, go to the section [Text Definitions](#) in the chapter [Tools and Concepts](#).

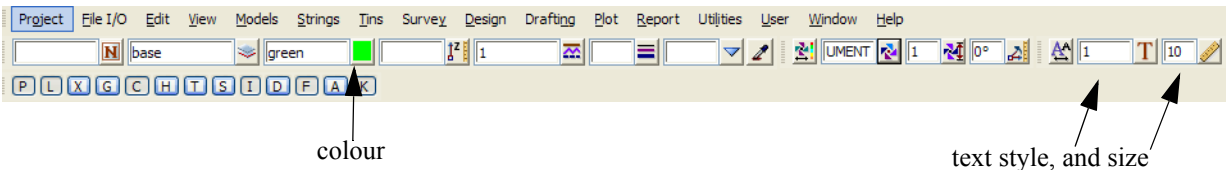
Reset Text Parameters to Defaults - Typing d

After typing **d**, some of the text parameters are set back to their default values.

That is for a:

Text String, Vertex Text and Segment Text:

- Text style is set to the Text style in the Cad Text Controlbar
- Colour is reset to the colour in the Cad Controlbar
- Size is set to the size in the Cad Text Controlbar
- Angle is set to 0r
- Offset is set to 0
- Raise is set to 0
- X Factor is set to 1
- X Justification is set to left
- Y Justification is set to bottom
- Model stays the same



For information about text definitions, go to the section [Text Definitions](#) in the chapter [Tools and Concepts](#).

Change Focus to the Next Text in String - Pressing right arrow key (->)

For vertex text on a super string, pressing **->**, moves the focus of the edit commands to the vertex text on the next vertex of the super string. If the text is on the last vertex, pressing **->** does nothing.

For segment text on a super string, pressing **->**, moves the focus of the edit commands to the segment text on the next segment of the super string. If the text is on the last segment, pressing **->** does nothing.

For information about text definitions, go to the section [Text Definitions](#) in the chapter [Tools and Concepts](#).

Change Focus to the Previous Text in String - Pressing left arrow key (<-)

When editing vertex text on a super string, pressing **<-**, moves the focus of the edit commands to the vertex text on the **previous** vertex of the super string. If the text is on the first vertex, pressing **<-** does nothing. If Autopan is on, the selected vertex text is made the centre of the active plan view.

When editing segment text on a super string, pressing **<-**, moves the focus of the edit commands to the segment text on the **previous** segment of the super string. If the text is on the first segment, pressing **<-** does nothing. If Autopan is on, the selected segment text is made the centre of the active plan view.

For information about text definitions, go to the section [Text Definitions](#) in the chapter [Tools and Concepts](#).

Toggle Lock - Typing l

Typing **l** toggles locking the vertex on and off.

When vertex lock is on, the vertex grip can not be selected and used to move the position of the string vertex.

When the screen message area reads (l) lock **(l)lock**, this means that vertex lock is off (unlocked) and typing **l** locks it.

When the screen message area reads un(l) lock **un(l)lock**, this means that the vertex is locked and typing **l** unlocks it.

For information about the vertex text grip, go to the section [Text Grips](#) in the chapter [Tools and Concepts](#).

For information about text definitions, go to the section [Text Definitions](#) in the chapter [Tools and Concepts](#).

Toggle Autopan - Typing p

Typing **p** toggles autopan on and off.

When editing vertex text on a super string and **Autopan** is **on**, pressing **->** or **<-**, moves the focus of the edit commands to the vertex text on the next/previous vertex of the super string, and the selected vertex text is made the centre of the active plan view.

When editing segment text on a super string and **Autopan** is **on**, pressing **->** or **<-**, moves the focus of the edit commands to the vertex text on the next/previous segment of the super string, and the selected segment text is made the centre of the active plan view.

When vertex lock is on, the vertex grip can not be selected and used to move the position of the string vertex.

When the screen message area reads `auto(p)an` `auto(p)an`, this means that autopan is off and typing **p** turns autopan on.

When the screen message area reads `no auto(p)an` `no auto(p)an`, this means that autopan is on and typing **p** turns it off.

For information about text definitions, go to the section [Text Definitions](#) in the chapter [Tools and Concepts](#).

Show Other Line of Options - Typing m

There are too many *Edit* options to fit onto one line of the screen message and two lines of options are required. Typing **m** toggles between the two lines of options.

```
<[J] Pick grip point or (v)ertex, (c)olour, (s)tyle, ( ) (t)ext, (h)eight, (w)factor, (n)ew, (f)inish, (m)ore...> [picks][fast][Menu]
```

Output Window

```
<[J] (o)ffset, (r)aise, (a)ngle, (x)justify, (y)justify, (d)efault, (->)next, (<-)previous, (m)ore..., (l)ock, no auto(p)an> [picks][fast][Menu]
```

Output Window

Finish the Create/Edit - Typing f

Typing **f** exits the create/edit text option.

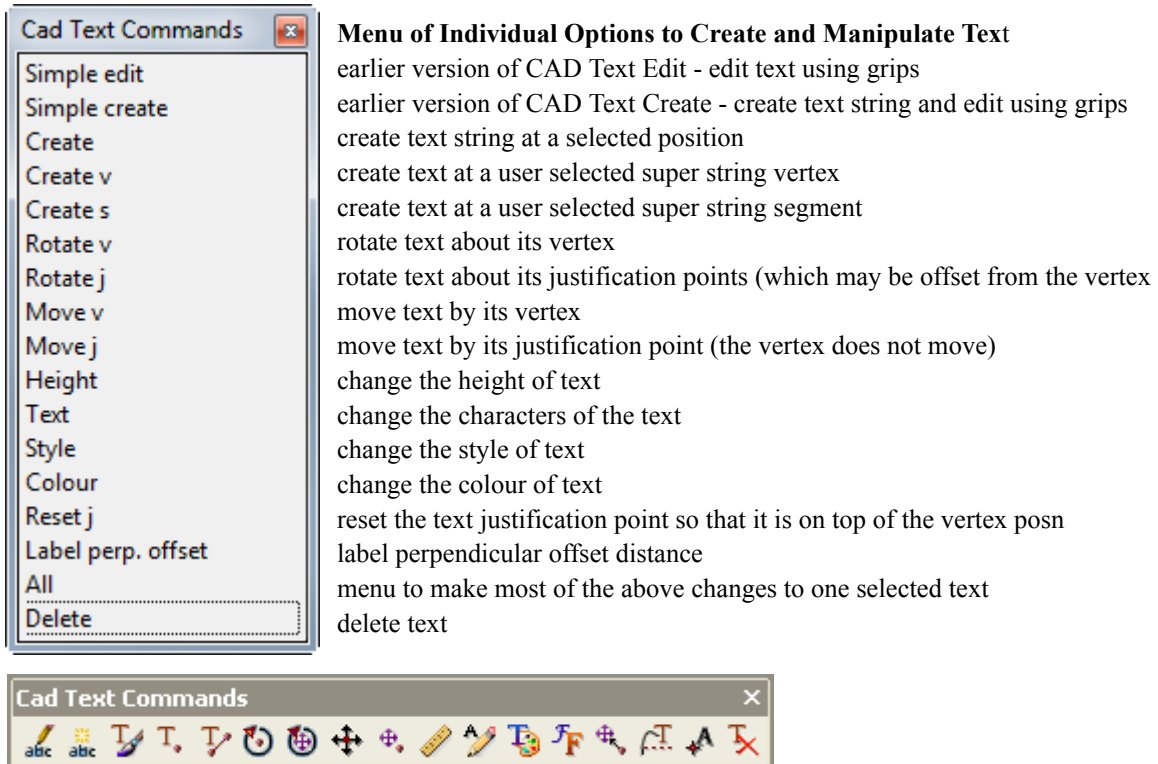


CAD Text Commands

The *Cad Text Commands* do just one text modification at a time but once one selected text has been modified, another text can then be selected to have the same type of modification.

So the CAD Text Commands perform the same modification on progressively selected texts whereas the CAD Text Create and CAD Text Edit options perform any of the modifications on the one selected text.

The Cad text commands walk-right menu is




For the option *Simple edit*, go to

Simple create
Create
Create v
Centre s
Rotate v
Rotate j
Move v
Move j
Height
Text
Style
Colour
Reset j
Label perp. offset
All
Delete

[Simple Text Edit](#)
[Simple Text Create](#)
[Text Create](#)
[Create Text on Vertex of Super String](#)
[Text Create on Segment of Super Strings](#)
[Rotate Text around Vertex](#)
[Rotate Text about the Justification Point](#)
[Move the Text Vertex Point](#)
[Move the Text Justification Point](#)
[Height of Text](#)
[Change Text](#)
[Style of Text](#)
[Text Colour](#)
[Reset Text Justification Point](#)
[Label Perpendicular Offset](#)
[All Text Edits](#)
[Text Delete](#)

Simple Text Edit

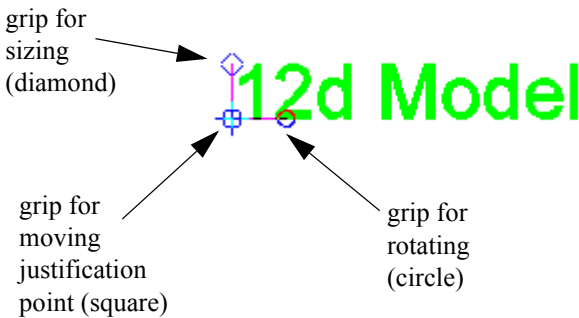
Position of option on menu: Strings =>CAD =>Text =>Commands =>Simple edit
or by selection of appropriate icon from the toolbar. 

This option edits text strings, and text on super string vertices or segments, using grips to quickly define the mode of editing (sizing, rotating or moving the justification point).

On selecting Simple edit, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

When the text to be edited is selected, grips for size, rotating and moving the justification point are displayed. The appropriate grip is then selected for quick editing.



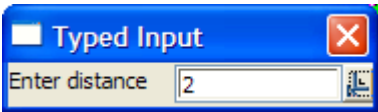
Size Grip (diamond):

If the Size grip is selected, the text size is dynamically adjusted by moving the cursor. The size of the text is displayed as part of the Enter height prompt in the message area.

The text size is set when a position is accepted.

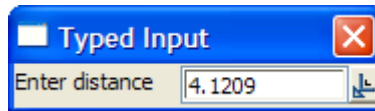


An exact text size can be entered by hitting the <space bar> or by starting to type a size. This brings up the Enter distance typed input box. The size is typed in and the <enter> key pressed



To return to dynamic sizing without entering a distance, simply select the X on the top of the input box. The box will disappear and dynamic sizing will resume.

If the text is being dynamically sized, the current size of the text can be displayed by pressing the d key which brings up the Enter distance typed input box with the current text size in it.



The size can be modified and the value used by pressing the <enter> key.

To return to dynamic sizing without entering a distance, simply select the **X** on the top of the input box.

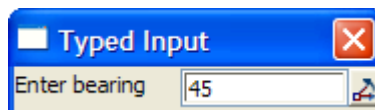
Rotate Grip (circle):

If the **Rotate grip** is selected, the text bearing is dynamically adjusted by moving the cursor. The bearing of the text is displayed as part of the *Enter bearing* prompt in the message area.

The text bearing is set when a position is accepted.

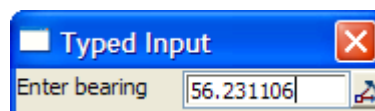


An **exact** bearing can be entered by hitting the <space bar> or by starting to type a bearing. This brings up the **Enter bearing** typed input box. The *bearing* is typed in and the <enter> key pressed



To return to dynamic rotating without entering a bearing, simply select the **X** on the top of the input box. The box will disappear and dynamic sizing will resume.

If the text is being dynamically rotated, the **current** bearing of the text can be displayed by pressing the **d** key which brings up the **Enter bearing** typed input box with the *current* text bearing in it.



The *bearing* can be modified and the value used by pressing the <enter> key.

To return to dynamic rotation without entering a bearing, simply select the **X** on the top of the input box.

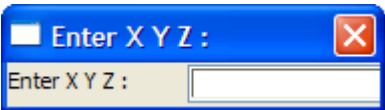
Justification Grip (square):

If the **Justification grip** is selected, the text justification point is dynamically adjusted by moving the cursor. The (x,y) position of the text is displayed in the message area.

The text justification point is set when a position is accepted.



An **exact** coordinate can be entered by hitting the <space bar> or by starting to type a coordinate. This brings up the **Enter X Y Z** typed input box. The *x and y coordinates* are typed in, separated by a space, and the <enter> key pressed.



To return to dynamic moving without entering a coordinate, simply select the **X** on the top of the input box. The box will disappear and dynamic moving will resume.

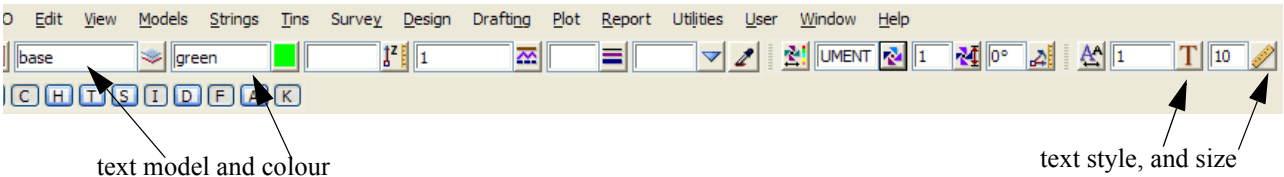
Simple Text Create

Position of option on menu: Strings =>CAD =>Text =>Simple create

or by selection of appropriate icon from the toolbar. 

This option creates text strings and then displays grips to quickly allow editing of text size, rotation and justification point.

The text style and height are taken from the **Text controlbar** and the model and colour from the **CAD controlbar** (see [CAD, Symbol and Text Controlbars](#), [Symbol Controlbar](#) and [CAD Controlbar](#)).



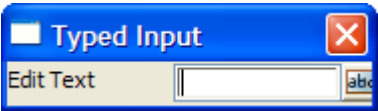
The text will be placed with the vertex and justification point at the selected position.

After defining one piece of text, the option restarts so that another of text can be defined. Picking Cancel from the Pick Ops menu, hitting <esc> or selecting another option terminates the option.

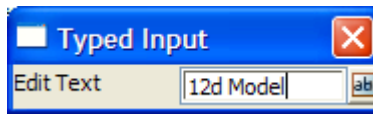
On selecting **Simple create**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

An insertion point for the text is selected and accepted and an **Enter text** typed input box is then displayed on the screen.

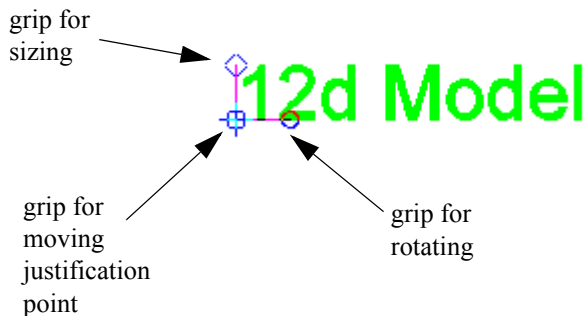


The text is typed into the box and the <enter> key pressed.



The text will be placed with the vertex and justification point at the selected position and using values such as colour, model, text height and text style given in the **CAD controlbar** and **Text controlbar** (See [CAD, Symbol and Text Controlbars](#))

When the text is displayed, grips for quick editing of size, rotation and moving of the justification point are also shown. The appropriate grip can then be selected for quick editing. For details on using the grips, go to the section [Simple Text Create](#).



Text Create

Position of option on menu: Strings =>CAD =>Text =>Create

or by selection of appropriate icon from the toolbar. 

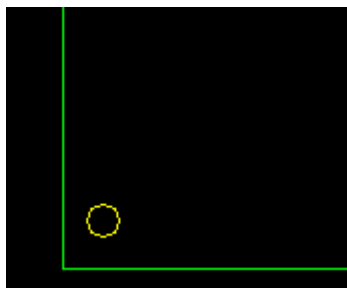
This option creates text strings at a selected insertion point (a cursor snap is valid).

After defining one piece of text, the option restarts so that another piece of text can be defined. Picking Cancel from the Pick Ops menu, hitting <esc> or selecting another option terminates the option.

On selecting **Create**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

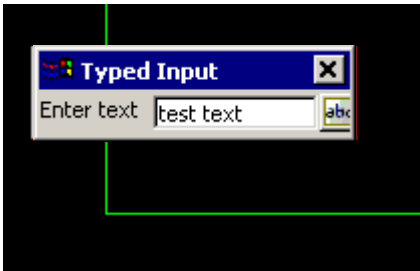
STEP 1:

An insertion point is selected and accepted. The text will be placed relative to the insertion point given other parameters such as justification, as defined in the textstyle data panel

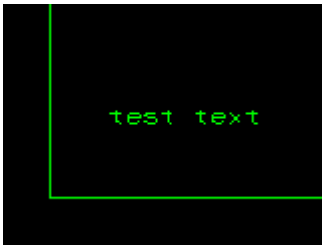


STEP 2:

The actual text is entered into the text input box followed by the enter key.



STEP 3:
The text is created using the specified settings.



Create Text on Vertex of Super String

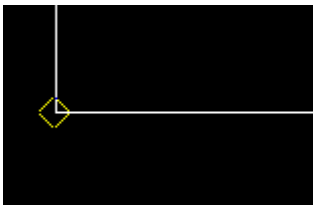
Position of option on menu: Strings =>CAD =>Text =>Create v
or by selection of appropriate icon from the toolbar.

This option creates text at a vertex of a super string. One piece of text is allowed per super string vertex, so if this option is used on existing vertex text, the existing value is displayed in the text input box.

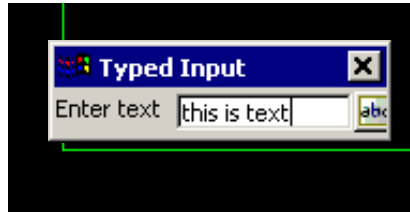
After defining one piece of text, the option restarts so that another piece of text can be defined. Picking Cancel from the Pick Ops menu, hitting <esc> or selecting another option terminates the option.

On selecting Create v, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:
An insertion point is selected and accepted. The point snap is forced on so that a vertex can be selected. The text will be placed relative to the insertion point given other parameters such as justification, as defined in the textstyle data panel



STEP 2:
The actual text is entered into the text input box followed by the Enter key.

**STEP 3:**

The text is created using the specified settings.

Picking Cancel from the Pick Ops menu, hitting <esc> or selecting another option terminates the option.



Text Create on Segment of Super Strings

Position of option on menu: Strings =>CAD =>Text =>Create s

or by selection of appropriate icon from the toolbar. 

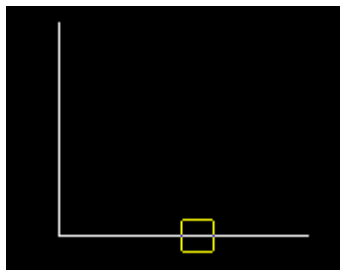
This option creates text at the mid point of a selected super string segment. One piece of text is allowed per super string segment, so if this option is used on existing segment text, the existing value is displayed in the text input box.

After defining one piece of text, the option restarts so that another piece of text can be defined. Picking Cancel from the Pick Ops menu, hitting <Esc> or selecting another option terminates the option.

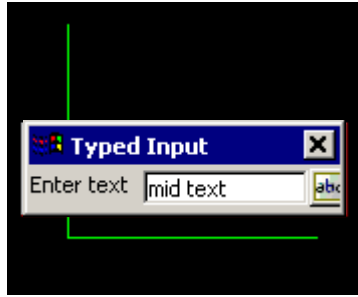
On selecting **Create s**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

A super string segment is selected and accepted. The line snap is forced on so that a segment can be selected. The text will be placed relative to the insertion point which is the midpoint of the segment given other parameters such as justification, as defined in the textstyle data panel

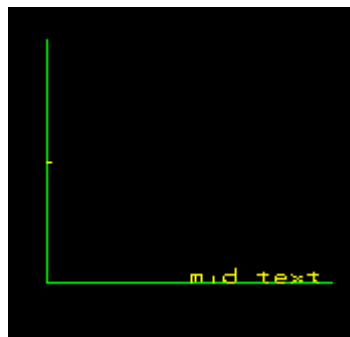
**STEP 2:**

The actual text is entered into the text input box followed by the Enter key.

**STEP 3:**

The text is created using the specified settings.

Picking Cancel from the Pick Ops menu, hitting <Esc> or selecting another option terminates the option.

**Rotate Text around Vertex**

Position of option on menu: Strings =>CAD =>Text =>Rotate v

or by selection of appropriate icon from the toolbar. 

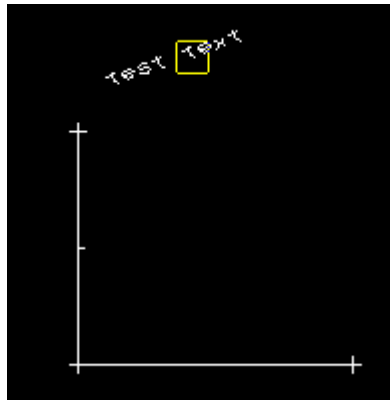
This option rotates text about its vertex. This applies to text strings, super string segment or vertex text and 4d string vertex text. For super string segment text, the vertex is taken to be the mid point of the segment.

After defining one piece of text, the option restarts so that another piece of text can be defined. Picking **Cancel** from the **Pick Ops** menu, hitting <Esc> or selecting another option terminates the option.

On selecting **Rotate v**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

A text string to be rotated is selected and accepted.

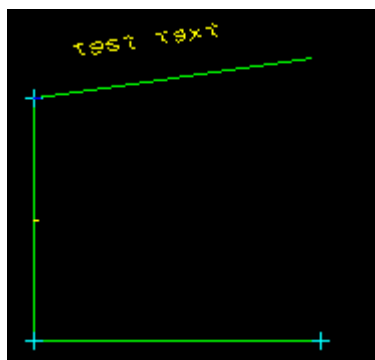
**STEP 2:**

The rotation bearing (the final bearing of the text) is specified by selection and acceptance of a point with the mouse or by entry into an input box followed by the enter key. To bring up the input box start typing or press the space bar. The value is entered into the input box followed by the enter key.

Note: The typed bearing is not relative but absolute. i.e. the value given will not rotate the existing text by that amount, rather it will reposition the text at that bearing.

The line drawn represents the bearing value and changes with movement of the mouse. If the user wants to see what the current value of the bearing is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to specify the bearing or the input box can be closed and the rubber banding (graphically changing) of the angle continued.

Note: The Page up and page down keys can be used when the input angle box comes up to add or subtract intervals of 90 degrees.

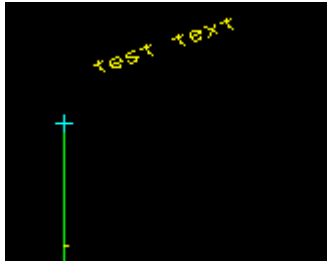


This option also allows the definition of the bearing by the selection of the 2nd point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next. The example shown below is the perpendicular case.

STEP 3:

The text is rotated to the specified bearing.

Picking Cancel from the Pick Ops menu, hitting <Esc> or selecting another option terminates the option.



Rotate Text about the Justification Point

Position of option on menu: Strings =>CAD =>Text =>Rotate j

or by selection of appropriate icon from the toolbar. 

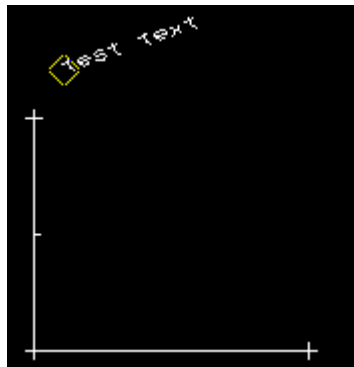
This option rotates text about its justification point. Note that the vertex point and the justification point do not coincide when either the raise or offset for the text is not zero.

Note: The typed bearing is not relative but absolute. i.e. the value given will not rotate the existing text by that amount, rather it will reposition the text at that bearing.

On selecting **Rotate j**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

The text to be rotated is selected and accepted.

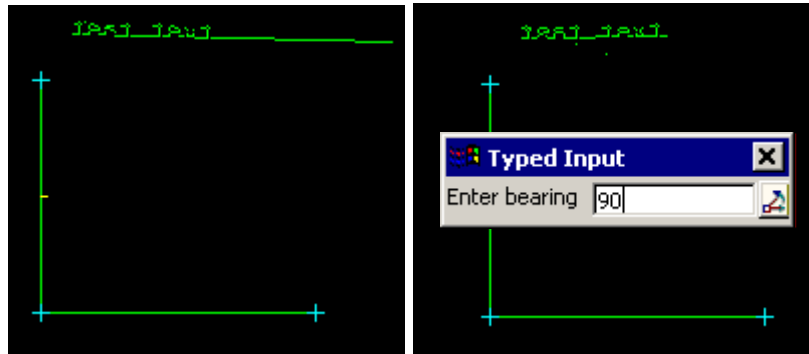


STEP 2:

The rotation bearing (the final bearing of the text) is specified by selection and acceptance of a point with the mouse or by entry into an angle box followed by the enter key. To bring up the angle box start typing or press the space bar. The value is entered into the input box followed by the enter key.

The line drawn represents the bearing value and changes with movement of the mouse. If the user wants to see what the current value of the bearing is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to specify the bearing or the input box can be closed and the rubber banding (graphically changing) of the bearing continued.

Note: The Page up and page down keys can be used when the bearing input box comes up to add or subtract intervals of 90 degrees.

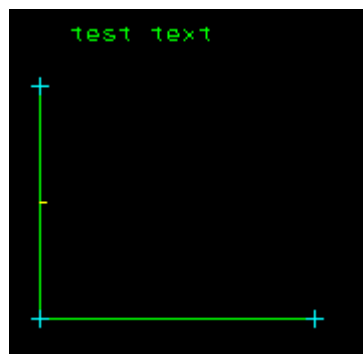


This option also allows the definition of the bearing by the selection of the 2nd point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next. The example shown below is the perpendicular case.

STEP 3:

The text is rotated to the specified bearing.

Picking Cancel from the Pick Ops menu, hitting <Esc> or selecting another option terminates the option.



Move the Text Justification Point

Position of option on menu: Strings =>CAD =>Text =>Move j

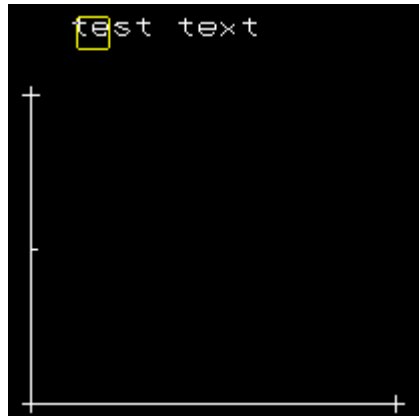
or by selection of appropriate icon from the toolbar. 

This option moves the text justification point, and hence the text with it.

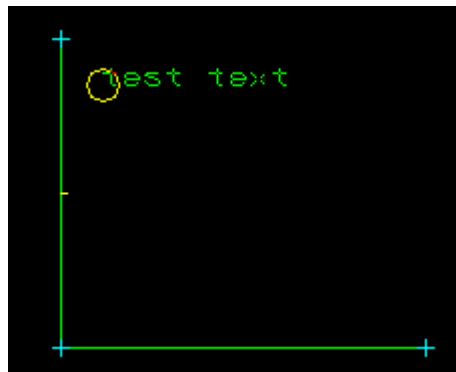
On selecting **Move j**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

The text to be moved is selected and accepted.

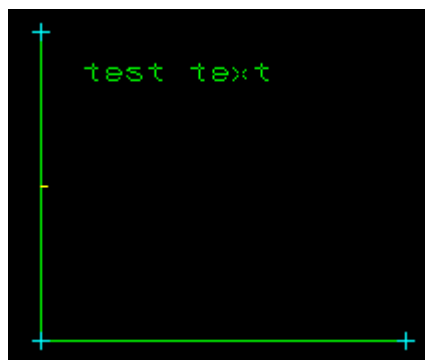
**STEP 2:**

The new position for the text is selected and accepted.

**STEP 3:**

The text is moved to the new position.

Picking Cancel from the Pick Ops menu, hitting <Esc> or selecting another option terminates the option.

**Move the Text Vertex Point**

Position of option on menu: Strings =>CAD =>Text =>Move v

or by selection of appropriate icon from the toolbar. 

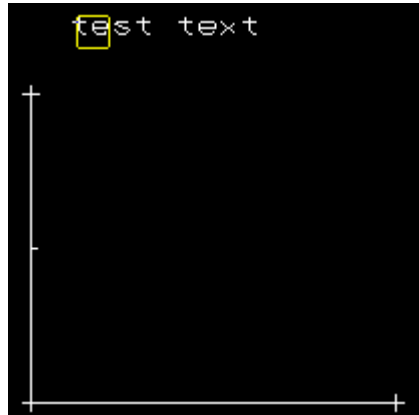
This option moves the vertex that vertex text is attached to, and hence moves the text with it. The option works for text strings, vertex text for super strings and 4d string but will **not** work for segment text where there is no actual vertex at the mid segment position where the segment text

is initially placed.

On selecting **Move v**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

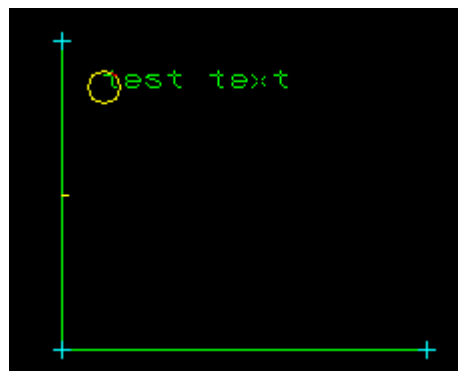
STEP 1:

The vertex text to be moved is selected and accepted.



STEP 2:

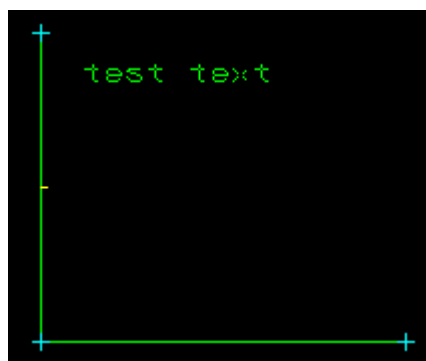
The new position for the vertex and the text is selected and accepted.



STEP 3:

The vertex and the vertex text is moved to the new position.

Picking **Cancel** from the **Pick Ops** menu, hitting <Esc> or selecting another option terminates the option.



Height of Text

Position of option on menu: Strings =>CAD =>Text =>Height

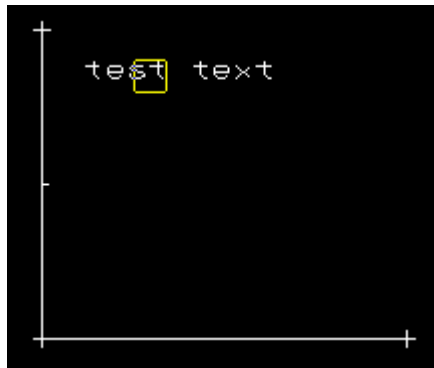
or by selection of appropriate icon from the toolbar. 

This option changes the height of text.

On selecting **Height**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

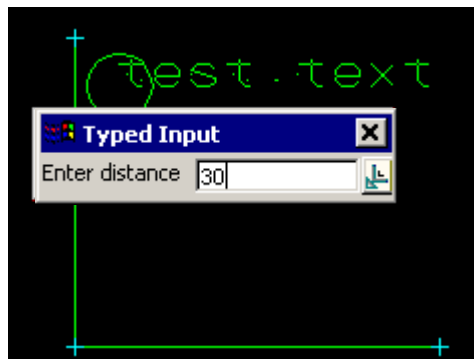
The text of which the height is to be changed is selected and accepted.



STEP 2:

A height for the text is given either by selection with the mouse or by typing a value. To type a value, simply start typing and the input box for the height will appear. Alternatively you can press the space bar to bring up the input box. The value is entered into the input box followed by the enter key.

The circle drawn represents the height value and changes with movement of the mouse. If the user wants to see what the current value of the height is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to create the point or the input box can be closed and the rubber banding (graphically changing) of the circle continued.

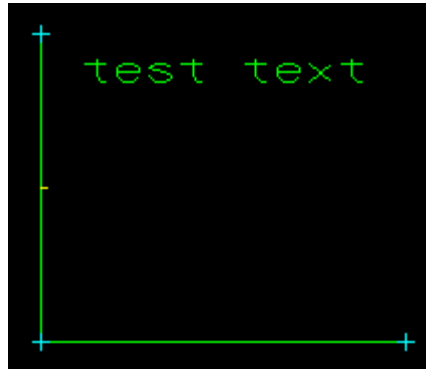


This option also allows the definition of the distance by the selection of the 2nd point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next.

STEP 3:

The text height is changed.

Picking Cancel from the Pick Ops menu, hitting <Esc> or selecting another option terminates the option.



Change Text

Position of option on menu: Strings =>CAD =>Text =>Text

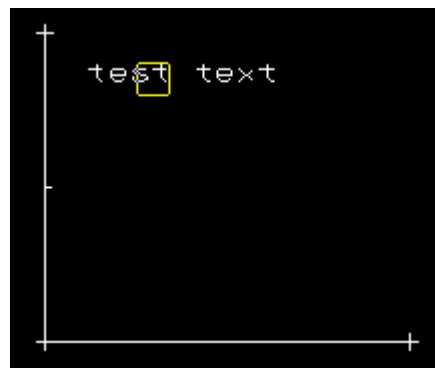
or by selection of appropriate icon from the toolbar. 

This option edits the characters of selected text.

On selecting Text, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

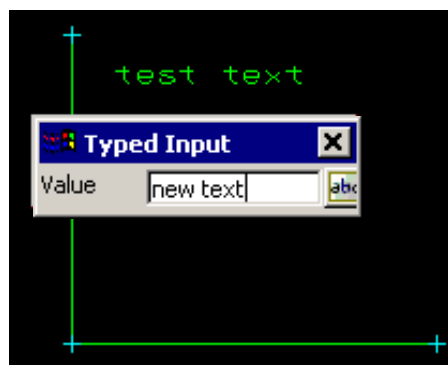
STEP 1:

The text to be changed is selected and accepted.



STEP 2:

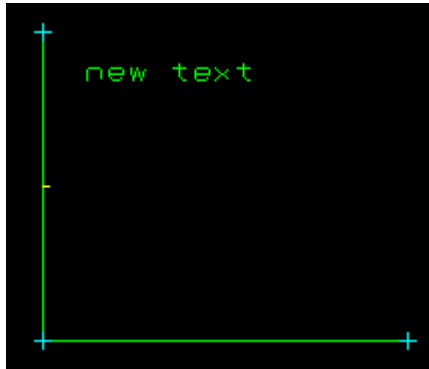
The new text is entered into the text input box followed by the Enter key.



STEP 3:

The text is changed.

Picking Cancel from the Pick Ops menu, hitting <Esc> or selecting another option terminates the option.



Style of Text

Position of option on menu: Strings =>CAD =>Text =>Style

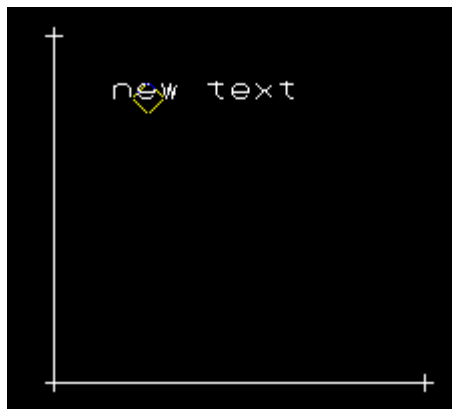
or by selection of appropriate icon from the toolbar. 

This option changes the textstyle of selected text.

On selecting *Style*, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

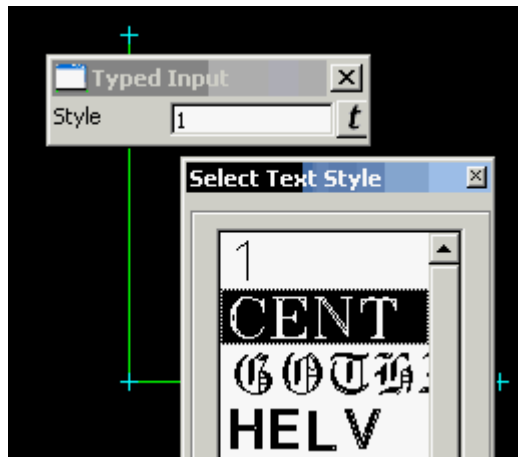
STEP 1:

The text to be changed is selected and accepted.



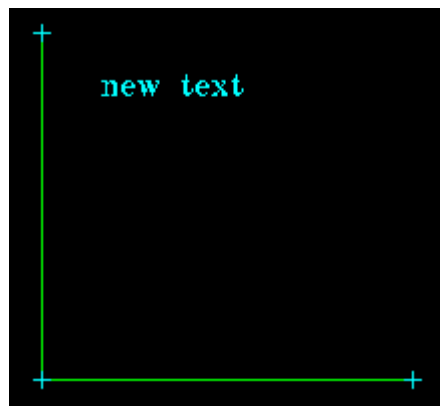
STEP 2:

The new textstyle is selected from the style pop-up list.

**STEP 3:**

The textstyle is changed.

Picking Cancel from the Pick Ops menu, hitting <Esc> or selecting another option terminates the option.

**Text Colour**

Position of option on menu: Strings =>CAD =>Text =>Colour

or by selection of appropriate icon from the toolbar. 

This option changes the colour of selected text.

On selecting **Colour**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

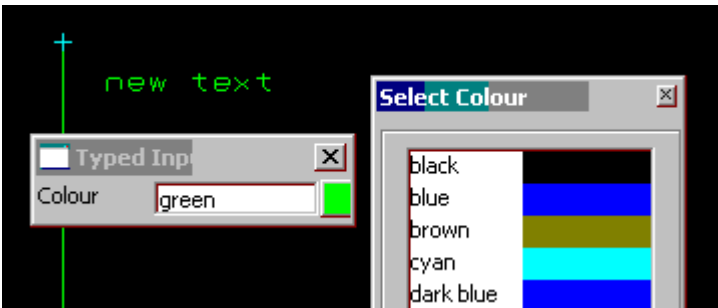
STEP 1:

The text to be changed is selected and accepted.



STEP 2:

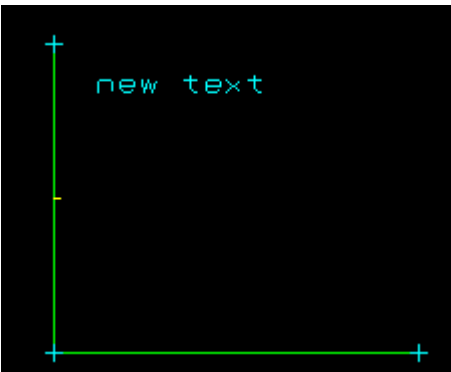
The new colour for the text is entered into the text input box or by selecting the colour square on the input box to bring up the select colour choice box followed by the enter key.



STEP 3:

The text colour is changed.

Picking Cancel from the Pick Ops menu, hitting <Esc> or selecting another option terminates the option.



Reset Text Justification Point

Position of option on menu: Strings =>CAD =>Text =>Reset j

or by selection of appropriate icon from the toolbar.

This option resets the text justification point back to being the same as the vertex for vertex text, and to the segment mid point for segment text. That is, the offset and raise for the selected text are both set to zero.

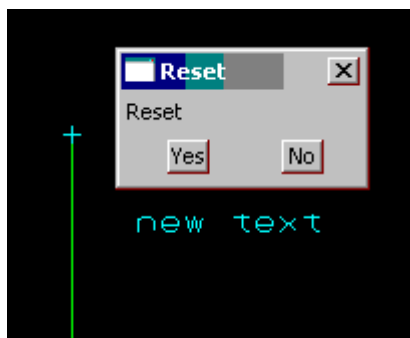
On selecting **Reset j**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

The text to be changed is selected and accepted.

**STEP 2:**

A warning message is shown giving the user the option of resetting the justification point or not.

**STEP 3:**

The text is reset if accepted.



Label Perpendicular Offset

Position of option on menu: Strings =>CAD =>Text =>Label perp. Offset

or by selection of appropriate icon from the toolbar. 

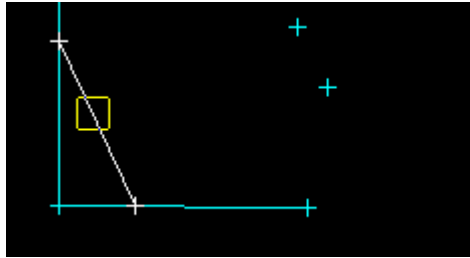
This option creates a perpendicular line from a selected segment to a selected position, and creates text with the value of the perpendicular distance between the segment and the selected position, on the line.

On selecting **Label perp. Offset**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

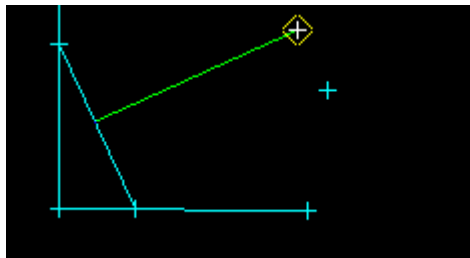
A string is selected and accepted.

After the string is accepted a perpendicular line will be displayed 'rubber banding' to the various solutions according to the position of the cursor. This will continue until a 2nd point is selected and accepted.



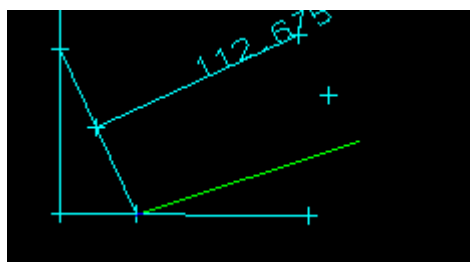
STEP 2:

Select a 2nd point and accept it.



STEP 3:

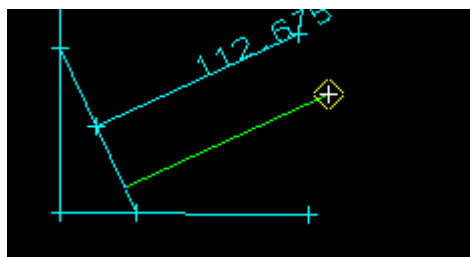
A perpendicular line is constructed between the accepted string and point. The length value of this line will be displayed in text. This text can be modified or changed using the other CAD Text options.



STEP 4:

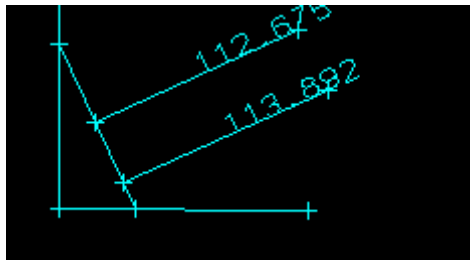
After the labelled perpendicular line is constructed, another perpendicular *rubber banding* line will be displayed. This will continue until the option is terminated (via the Esc key).

To create another labelled perpendicular line, select another point and accept it.



STEP 5:

Another labelled perpendicular line is constructed. Another perpendicular *rubber banding* line will be displayed. This will continue until the option is terminated (via the Esc key).

**All Text Edits**

Position of option on menu: Strings =>CAD =>Text =>All

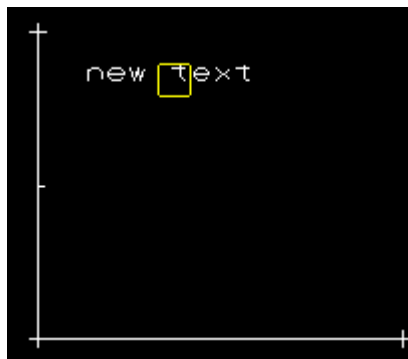
or by selection of appropriate icon from the toolbar. 

This option positions text using a menu made up of most of text edits already described.

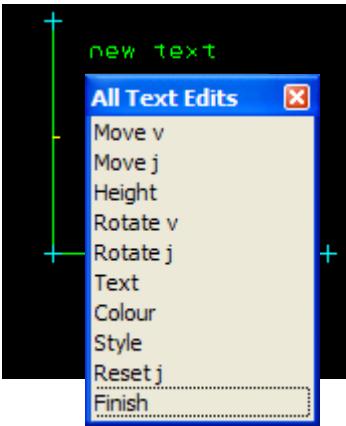
On selecting **All**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

The text to be changed is selected and accepted.

**STEP 2:**

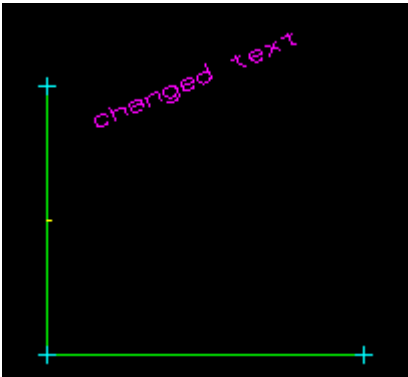
After the selection and acceptance of a piece of text, the positioning menu is shown. This also allows various other text editing functions such as colour, height and text.




STEP 3:

The user can select the appropriate option from the menu and make the changes. The menu remains active allowing a number of operations to be made in succession.

Picking Cancel from the Pick Ops menu, hitting <Esc> or selecting another option terminates the option.



Text Delete

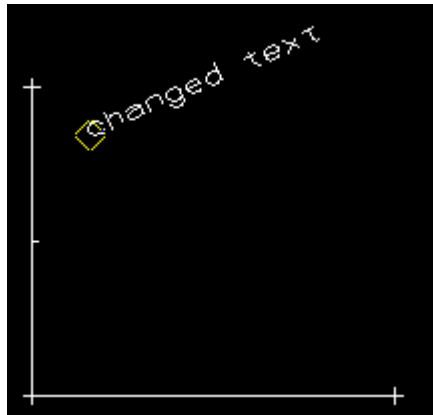
Position of option on menu: Strings =>CAD =>Text =>Delete
or by selection of appropriate icon from the toolbar. 

This option deletes selected text.

On selecting **Delete**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

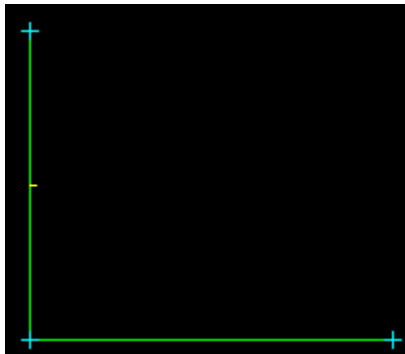
STEP 1:

The text to be deleted is selected and accepted.

**STEP 2:**

The selected text is deleted.

Picking **Cancel** from the **Pick Ops** menu, hitting <Esc> or selecting another option terminates the option.



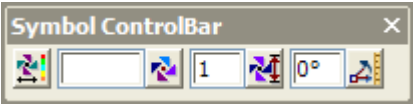
CAD Symbol

Position of option on menu: Strings =>CAD =>Symbol

Position of option on menu: Various toolbars

12d Model symbols are world styles at a vertex of a super string. The symbol is attached to a vertex (these are displayed when *Vertices* are toggle on in a plan view) and has a justification point, a rotation, a delta x and a delta y. The vertex and justification point only coincide if the delta x and delta y values are both zero.

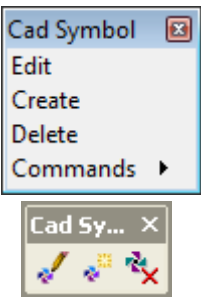
In some symbol options, the symbol *type*, *size* and *angle* are defined by the **Symbol Controlbar** and *model* and *colour* from the **CAD Controlbar** (for more information, go to the section [Symbol Controlbar](#)).



The *symbols* are defined in the **symbols.4d** file.

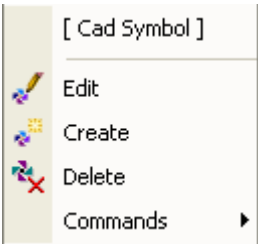
For more information on the control bars, go to the sections [Symbol Controlbar](#) and [CAD Controlbar](#).

The Cad Symbol walk-right menu is



Menu of Options to Create and Manipulate Symbols

- edit symbols using grips
- create symbols and edit using grips
- delete a symbol
- menu of individual Symbol options



For the option *Edit*, go to
Create
Delete
Commands

[Edit Symbol](#)
[Create Symbol](#)
[Symbol Delete](#)
[Cad Symbol Commands](#)

Create Symbol

Position of option on menu: Strings =>CAD =>Symbol =>Create

or by selection of appropriate icon from the toolbar.

For information about Symbol and its definitions, go to the section [Symbol Definitions](#) in the chapter [Tools and Concepts](#).

12d Model has two CAD symbol options **Create** and **Edit**. However both of these run the same option which starts up in different modes - **Create** is in the mode to create symbols on a super string vertex and **Edit** which edits existing symbols.

Once either CAD symbol option is started it is possible to change between the Create and Edit modes at any time.

The **Create** option creates a new super string with a symbol on the vertex, or create a symbol on an existing super string vertex which does not already have a symbol, and then displays a list

key commands in the screen message area, and grips on screen, to quickly allow editing of the symbol type, size, colour, rotation, angle, x and y offset etc.

After selecting the option, the **Pick position** message is displayed in the screen message area.

```
<[Pick position] (e)dit, (c)reate, (v)ertex> [picks][fast][Menu]
```

To go from Create to Edit mode, type **E** - go to [To Go from Create to Edit Mode - Typing e](#)

To create a symbol and a new super string, type **C** - go to [Creating a Symbol - Typing c](#)

To create vertex symbol, type **V** - go to [Creating Text at a Super String Vertex- Typing v](#)

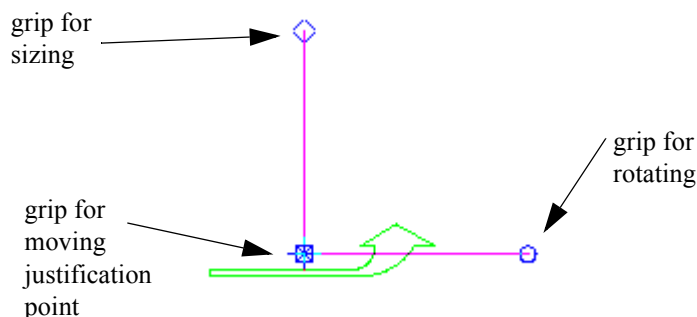
Creating a Symbol - Typing c

After typing **C**, the **Pick position** message is again displayed in the screen message area and the position of the symbol is then selected with the cursor.

```
<[Pick position] (e)dit, (c)reate, (v)ertex> [picks][fast][Menu]
```

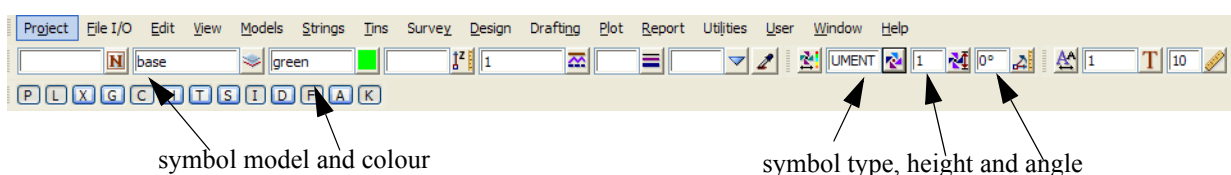
When the position is accepted a new one vertex super string is created with the symbol on it.

The super string vertex and symbol justification point is placed at that position. The x and y offset both zero.



When the symbol is displayed, grips for quick editing of height, rotation and moving of the justification point are also shown. The appropriate grip can then be selected for quick editing. For details on using the grips, go to the section [Symbol Grips](#) in the chapter [Tools and Concepts](#).

For the new symbol, the symbol name, height and angle are taken from the **Symbol controlbar** and the model and colour from the **CAD controlbar** (see [CAD, Symbol and Text Controlbars, Symbol Controlbar](#) and [CAD Controlbar](#)).



After the symbol is created, a list of typed options is then displayed in the screen message area.

```
<[J] Pick grip point or (v)ertex, (c)olour, (s)ymbol, (h)eight, (n)ew, (f)inish, (m)ore...> [picks][fast][Menu]
```

and if **m** is typed, the rest of the options are shown

```
<[J] offset (x), offset (y), rot(a)tion, (d)efault, (m)ore..., (l)ock, no auto(p)an> [picks][fast][Menu]
```

These option are the same as when editing existing symbols, and will be described in detail in the section [Edit Symbol](#).

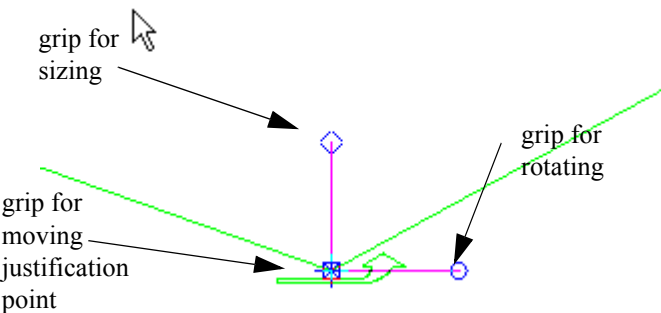
C is the default if nothing is typed.

Creating a Symbol at a Super String Vertex- Typing v

After typing **V**, the **Pick grip point** message is displayed in the screen message area and the vertex of the super string to place the symbol on is then selected with the cursor.

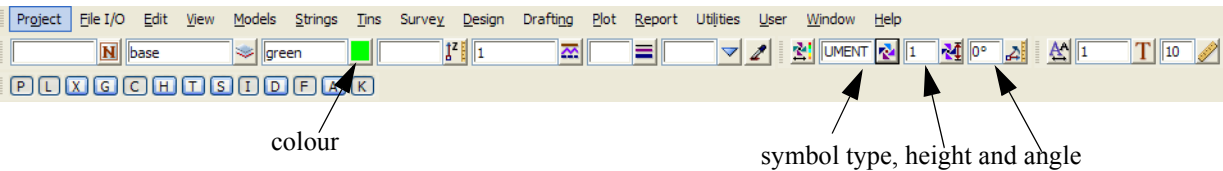
```
<[V] Pick grip point or (j)ustification, (c)olour, (s)ymbol, (h)eight, (n)ew, (f)inish, (m)ore...> [picks][fast][Menu]
```

The symbol and symbol justification point are placed at that vertex. The x and y offset both zero.



When the symbol is displayed, grips for quick editing of size, rotation, moving of the justification point and string vertex are also shown. The appropriate grip can then selected for quick editing. For details on using the grips, go to the section [Symbol Grips](#) in the chapter [Tools and Concepts](#).

For the new symbol, the symbol name, height and angle are taken from the **Symbol controlbar** and colour from the **CAD controlbar** (see [CAD, Symbol and Text Controlbars](#), [Symbol Controlbar](#) and [CAD Controlbar](#)). The created symbol will be part of the super string so no model is required.



After the vertex symbol is created, a list of typed options is then displayed in the screen message area.

```
<[V] Pick grip point or (j)ustification, (c)olour, (s)ymbol, (h)eight, (n)ew, (f)inish, (m)ore...> [picks][fast][Menu]
```

and if **m** is typed, the rest of the options are shown

```
<[V] offset (x), offset (y), rot(a)tion, (d)efault, (m)ore..., (l)ock, no auto(p)an, <-previous, ->next> [picks][fast][Menu]
```

These options are the same as when editing existing symbols, and will be described in detail in the section [Edit Symbol](#).

To Go from Create to Edit Mode - Typing e

After typing **e**, the **Pick Symbol** message is displayed in the screen message area.

```
<[Pick symbol] (e)dit, (c)reate, (v)ertex> [picks][fast][Menu]
```

This is the same as when selecting the Edit option from the CAD Symbol toolbar and will be described in detail in the section [Edit Symbol](#).

Edit Symbol

Position of option on menu: Strings =>CAD =>Symbol =>Edit

or by selection of appropriate icon from the toolbar.



For information about Symbol and its definitions, go to the section [Symbol Definitions](#) in the chapter [Tools and Concepts](#).

12d Model has two CAD symbol options **Create** and **Edit**. However both of these run the same option which starts up in different modes - **Create** is in the mode to create a new symbol, or a symbol on a super string vertex and **Edit** which edits existing symbols.

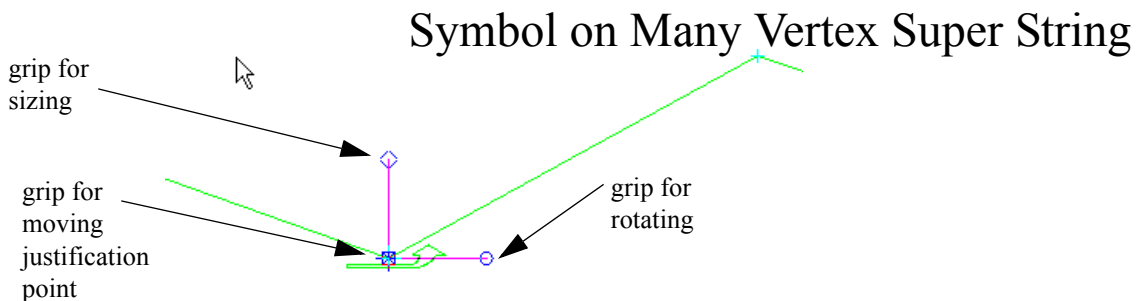
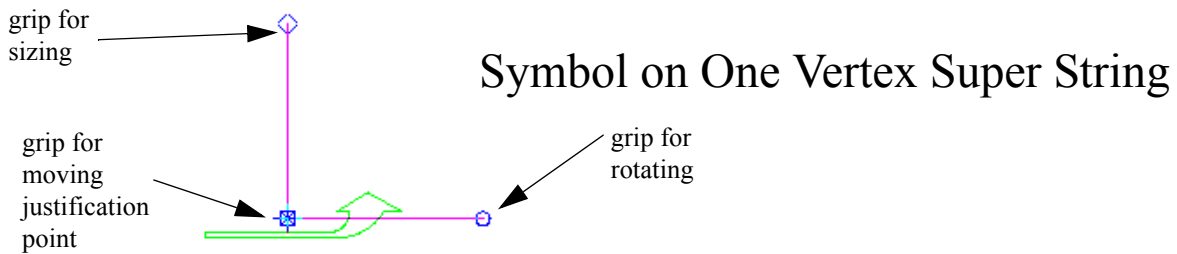
Once either CAD symbol option is started it is possible to change between the Create and Edit modes at any time.

After typing **e**, the **Pick symbol** message is displayed in the screen message area

```
<[Pick symbol] (e)dit, (c)reate, (v)ertex> [picks][fast][Menu]
```

and a symbol **s** then selected by the mouse for editing.

The selected symbol with the symbol edit grips is shown on screen, and a list of available typed commands in the screen message area to quickly allow editing of the symbol name, symbol size, colour, rotation, angle, x and y offset, justification point, vertex, etc.



Options displayed after selecting symbol

```
<[J] Pick grip point or (v)ertex, (c)olour, (s)ymbol, (h)eight, (n)ew, (f)inish, (m)ore...> [picks][fast][Menu]
```

and by typing **m**

```
<[J] offset (x), offset (y), rot(a)tion, (d)efault, (m)ore..., (l)ock, no auto(p)an> [picks][fast][Menu]
```

To change the symbol colour, type **C** - go to [Change Symbol Colour - Typing c](#)

To change the symbol name, type **S** - go to [Change Symbol Name - Typing s](#)

To change the symbol height, type **h** - go to [Change Symbol Height - Typing h](#)

To create/edit a new symbol, type **n** - go to [Create/Edit a New Symbol - Typing n](#)

To end the create/edit option, type **f** - go to [Finish the Create/Edit - Typing f](#)

To show the other line of options, type **m** - go to [Show Other Line of Options - Typing m](#)

To change the x offset, type **X** - go to [Change Offset x - Typing x](#)

To change the y offset, type **y** - go to [Change Offset y - Typing y](#)

To change the symbol angle, type **a** - go to [Change Symbol rotation - Typing a](#)

To reset some symbol values to their defaults, type **d** - go to [Reset Symbol Parameters to Defaults - Typing d](#)

To show the other line of options, type **m** - go to [Show Other Line of Options - Typing m](#)

To toggle vertex lock on and off, type **l** - go to [Toggle Lock - Typing l](#)

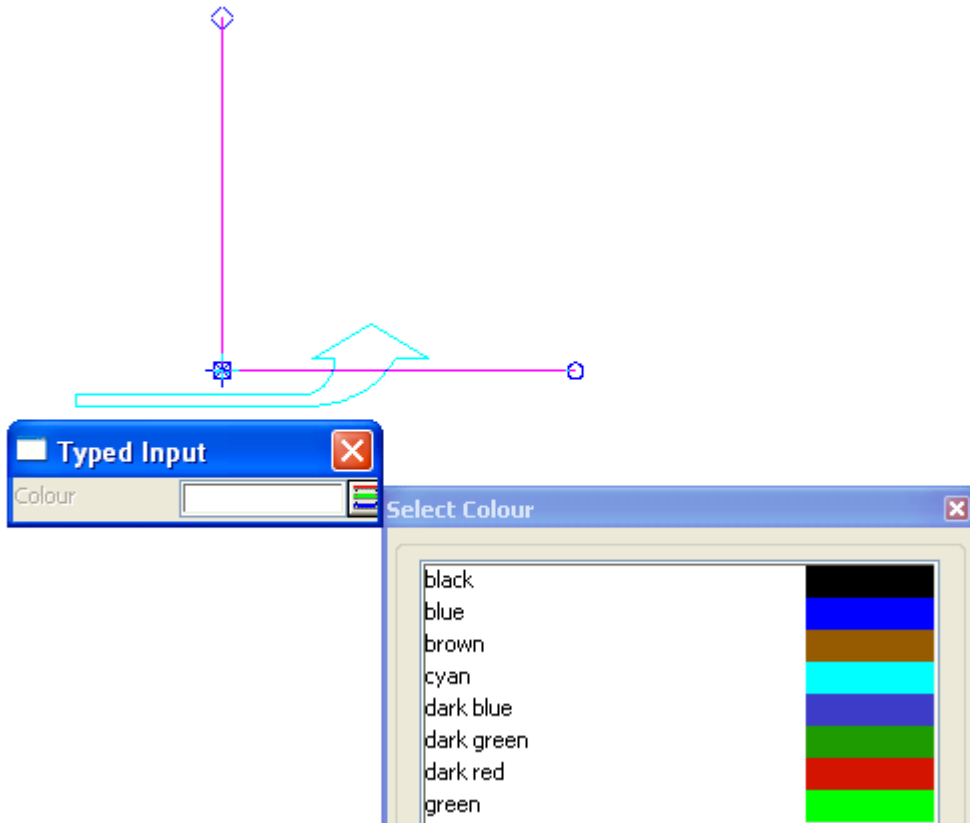
To toggle autopan on and off, type **p** - go to [Toggle Autopan - Typing p](#)


To change focus to the next symbol press **->** - go to [Change Focus to the Next Vertex in String - Pressing right arrow key \(->\)](#)

To change focus to the previous symbol, press **<-** - go to [Change Focus to the Previous Vertex in String - Pressing left arrow key \(<-\)](#)

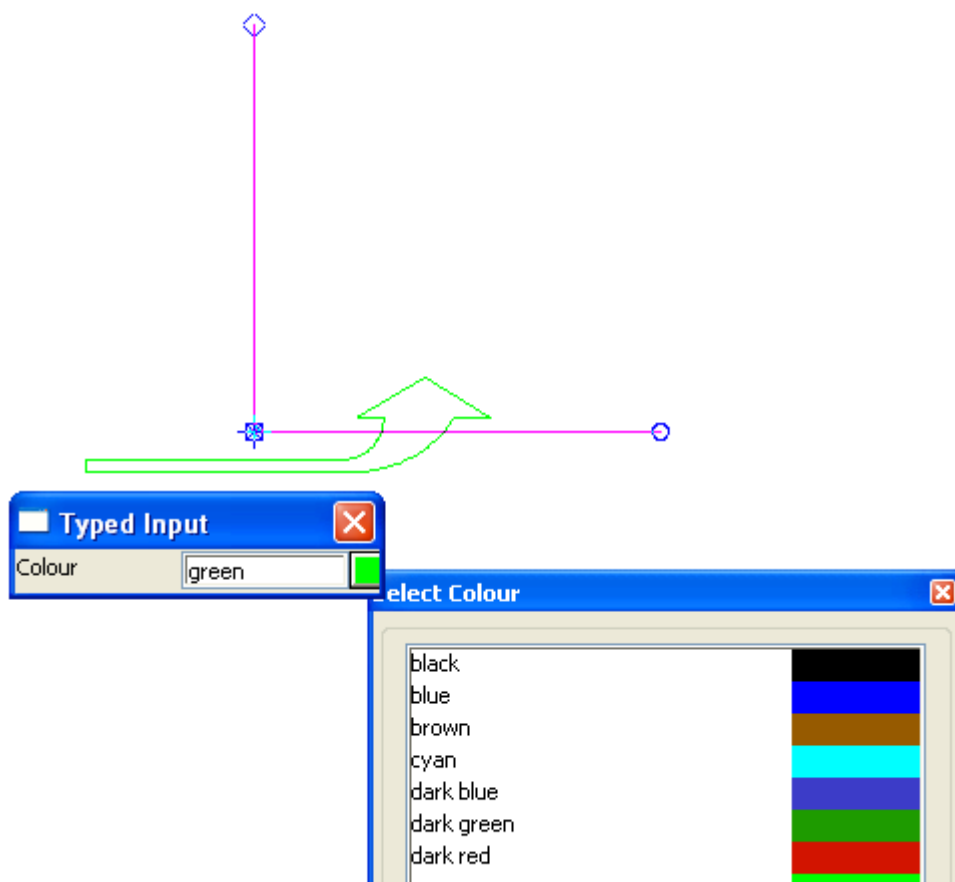
Change Symbol Colour - Typing c

After typing **C**, a Colour **Typed input** box appears on the screen.



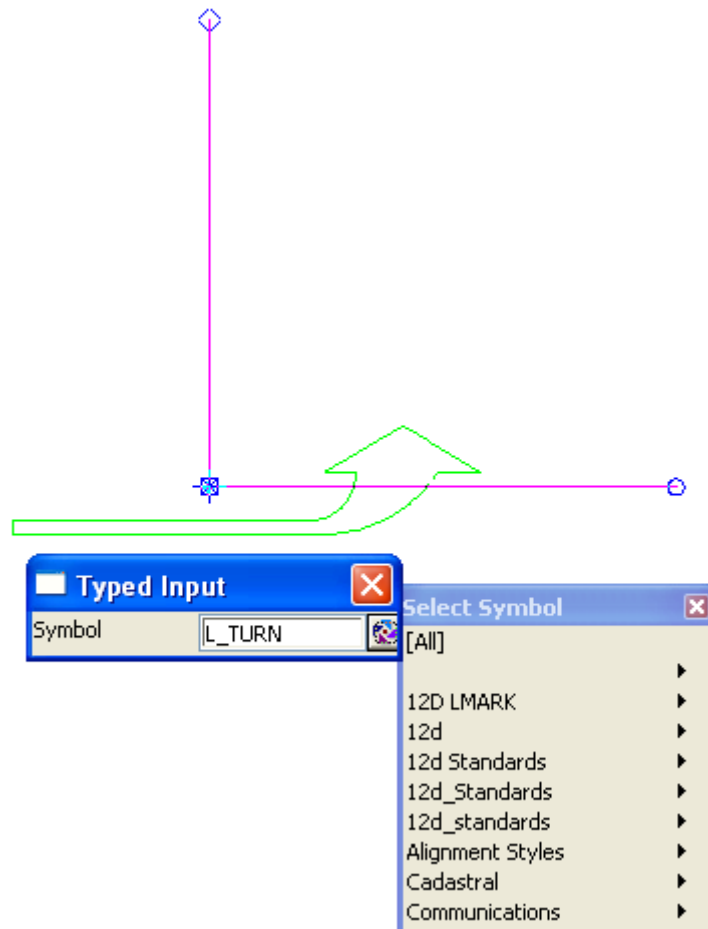
The new colour for the symbol is typed into the Typed input box followed by the <enter> key, or by selecting a colour from the **Select Colour** box which is brought up by clicking on the  colour button.


If the symbol has an existing colour, other then the default colour, typing **C** will display the Typed Input box with the current colour displayed.



Change Symbol Name - Typing s

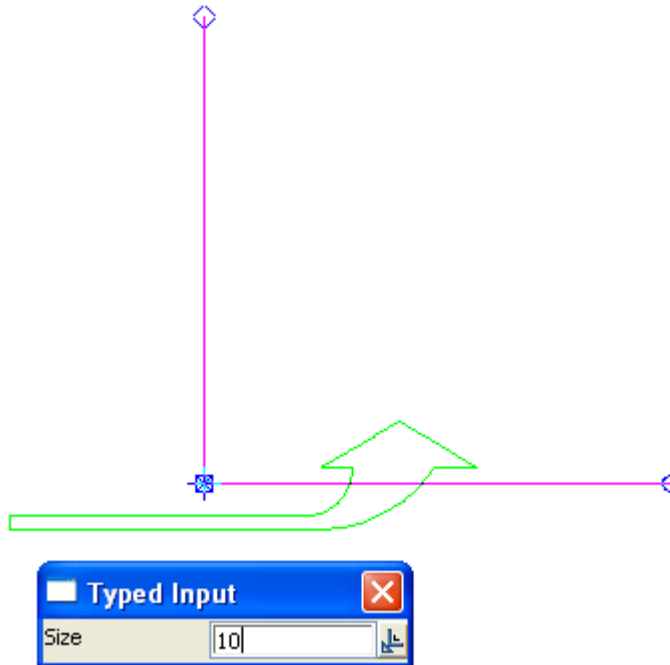
After typing **S**, a Symbol **Typed input** box appears with the current symbol style displayed.



The new style for the symbol is typed into the Style input box followed by the <Enter> key, or by selecting a style from the **Select Symbol** box which is brought up by clicking on the  style button.

Change Symbol Height - Typing h

After typing **h**, a Size **Typed input** box appears with the current symbol height in it.



The new height is typed into the Size **Typed input** box followed by the <Enter> key.

Note - Many arithmetic expressions are supported in the **Size** typed input box (eg 10+27). See the section [Expressions in Panel Fields](#) in the chapter [Tools and Concepts](#).

Create/Edit a New Symbol - Typing n

If the option was in **Edit** mode and **n** is typed, a new **Edit** is started (**e** mode). The **Pick symbol** message is displayed in the screen message area and another symbol is selected to edit.

```
<[Pick symbol] (e)dit, (c)reate, (v)ertex> [picks][fast][Menu]
```

Or a **new** symbol can be created by typing **C** or **V**. See the section [Create Symbol](#) for more information on **C** and **V**.

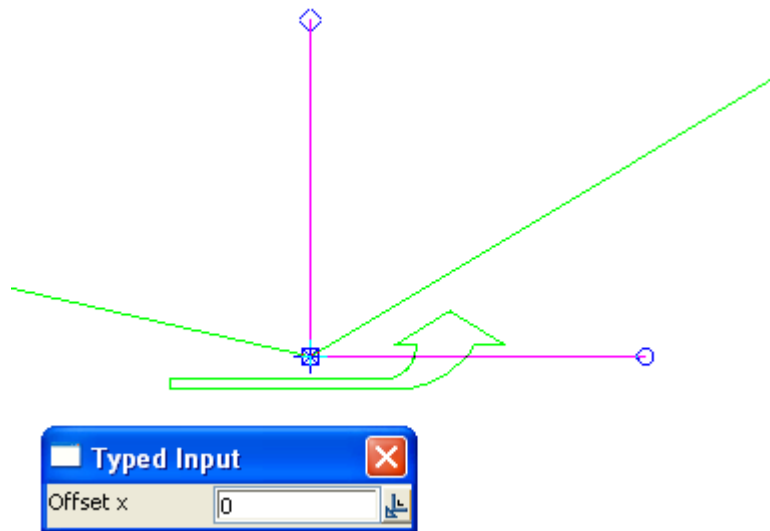
If the option was in **Create** mode and **n** is typed, a new **Create** is started in the **C** mode. The **Pick position** message is displayed in the screen message area and a new symbol is created.

```
<[Pick position] (e)dit, (c)reate, (v)ertex> [picks][fast][Menu]
```

Or a **new** vertex symbol can be created by typing **V**, or the **Edit** mode can be entered by typing **e**. See the section [Create Symbol](#) for more information on **C** and **V**.

Change Offset x - Typing x

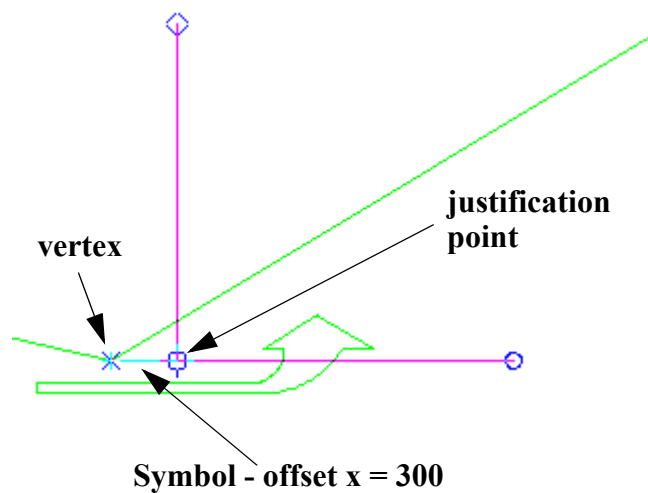
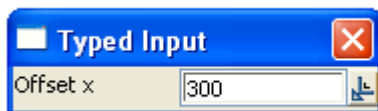
After typing **x**, an Offset x **Typed input** box appears with the current symbol x offset in it.



Symbol - offset x = 0

The new offset x is typed into the Offset x input box followed by the <Enter> key.

The symbol justification point will be offset x by the new amount



For information about Symbol and the definition of **offset**, go to the section [Symbol Definitions](#) in the chapter [Tools and Concepts](#).

Note - Many arithmetic expressions are supported in the **Offset** typed input box (eg 10+27). See the section [Expressions in Panel Fields](#) in the chapter [Tools and Concepts](#).

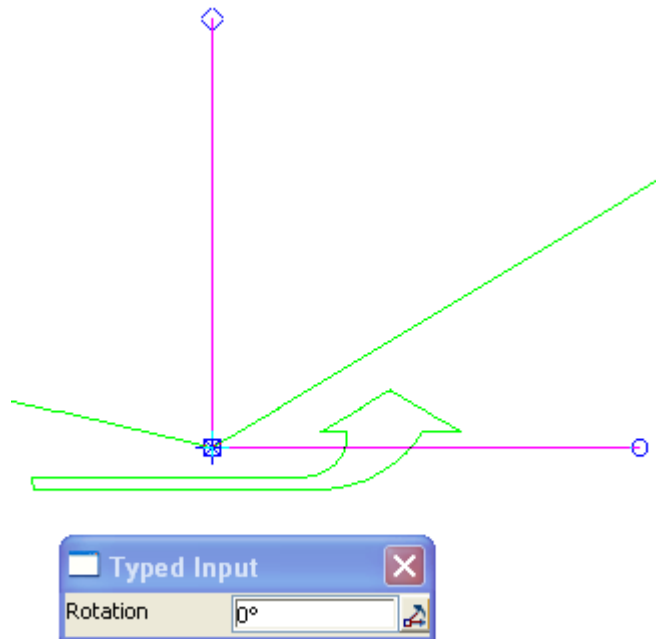
Change Offset y - Typing y

After typing **O**, an Offset y **Typed input** box appears with the current symbol offset in it.

Note - Many arithmetic expressions are supported in the **Offset** typed input box (eg 10+27). See the section [Expressions in Panel Fields](#) in the chapter [Tools and Concepts](#).

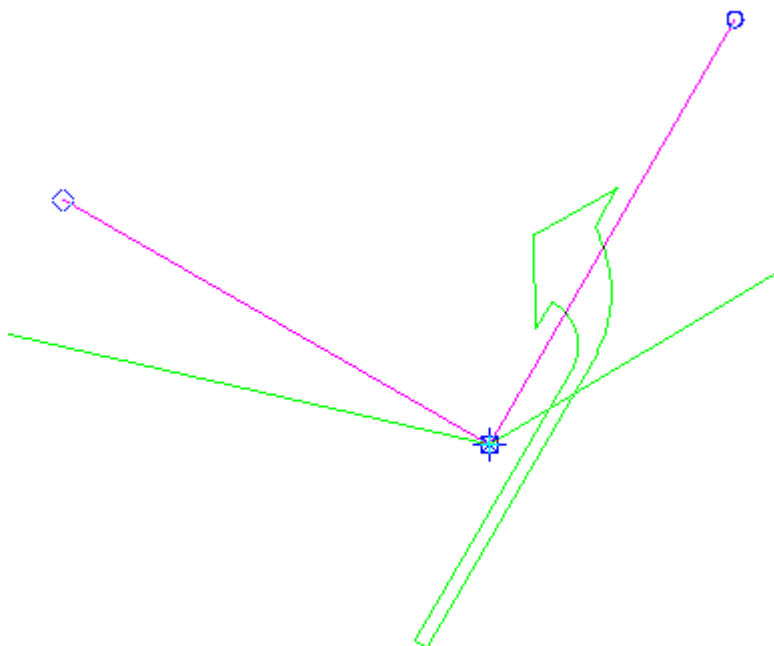
Change Symbol rotation - Typing a

After typing **a**, a Rotation **Typed input** box appears with the current symbol angle in it.

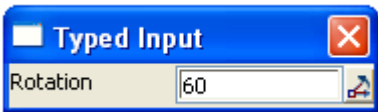


Symbol - angle rotation = 0

The new angle is typed into the Rotation **Typed input** box followed by the <Enter> key.
The direction of the symbol point will be rotated by the new amount.



Symbol - angle rotation= 60



For information about symbol and the definition of **angle rotation**, go to the section [Symbol Definitions](#) in the chapter [Tools and Concepts](#).

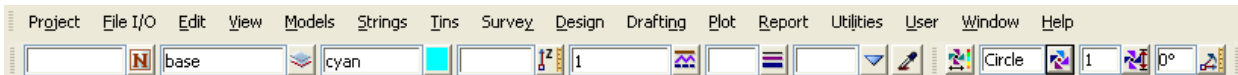
Note - Some arithmetic expressions are supported in the **Rotation** typed input box (eg 10+90). See the section [Expressions in Bearing, Angle Panel Fields](#) for what is allowed in angle/bearing panel fields in the chapter [Tools and Concepts](#).

Reset Symbol Parameters to Defaults - Typing d

After typing **d**, some of the symbol parameters are set back to their default values.

That is:

- Symbol type is set to the symbol in the Cad Symbol Controlbar
- Height is set to the height in the Cad Symbol Controlbar
- Angle is set to the angle in the Cad Symbol Controlbar
- Model is left as it is
- Colour is rest to the string colour.



symbol name, height and angle

The default symbol *type*, *height* and *angle* are defined by the **Symbol Controlbar** and *model* and *colour* from the **CAD Controlbar** (for more information, go to the section [Symbol Controlbar](#)).

For information about Symbol definitions, go to the section [Symbol Definitions](#) in the chapter [Tools and Concepts](#).

Change Focus to the Next Vertex in String - Pressing right arrow key (->)

For vertex symbol on a super string, pressing ->, moves the focus of the edit commands to the vertex symbol on the next vertex of the super string. If the symbol is on the last vertex, pressing -> does nothing.

For information about symbol definitions, go to the section [Symbol Definitions](#) in the chapter [Tools and Concepts](#).

Change Focus to the Previous Vertex in String - Pressing left arrow key (<-)


When editing vertex symbol on a super string, pressing <-, moves the focus of the edit commands to the vertex symbol on the **previous** vertex of the super string. If the symbol is on the first vertex, pressing <- does nothing. If Autopan is on, the selected vertex symbol is made the centre of the active plan view.

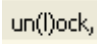
For information about symbol definitions, go to the section [Symbol Definitions](#) in the chapter [Tools and Concepts](#).

Toggle Lock - Typing l

Typing **l** toggles locking the vertex on and off.

When vertex lock is on, the vertex grip can not be selected and used to move the position of the string vertex.

When the screen message area reads (l) lock , this means that vertex lock is off (unlocked) and typing **l** locks it.

When the screen message area reads un(l) lock , this means that the vertex is locked and typing **l** unlocks it.

For information about the vertex symbol grip, go to the section [Symbol Grips](#) in the chapter [Tools and Concepts](#).

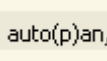
For information about symbol definitions, go to the section [Symbol Definitions](#) in the chapter [Tools and Concepts](#).

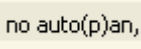
Toggle Autopan - Typing p

Typing **p** toggles autopan on and off.

When editing vertex symbol on a super string and **Autopan** is **on**, pressing -> or <-, moves the focus of the edit commands to the vertex symbol on the next/previous vertex of the super string, and the selected vertex symbol is made the centre of the active plan view.

When vertex lock is on, the vertex grip can not be selected and used to move the position of the string vertex.

When the screen message area reads auto(p)an , this means that autopan is off and typing **p** turns autopan on.

When the screen message area reads no auto(p)an , this means that autopan is on and typing **p** turns it off.

For information about symbol definitions, go to the section [Symbol Definitions](#) in the chapter [Tools and Concepts](#).

Show Other Line of Options - Typing m

There are too many *Edit* options to fit onto one line of the screen message and two lines of options are required. Typing **m** toggles between the two lines of options.

```
<[J] Pick grip point or (v)ertex, (c)olour, (s)ymbol, (h)eight, (n)ew, (f)inish, (m)ore...> [picks][fast][Menu]
```

```
<[J] offset (x), offset (y), rot(a)tion, (d)efault, (m)ore..., (l)ock, no auto(p)an> [picks][fast][Menu]
```

Finish the Create/Edit - Typing f

Typing **f** exits the create/edit symbol option.

Symbol Delete

Position of option on menu: Strings =>CAD =>Symbol =>Delete

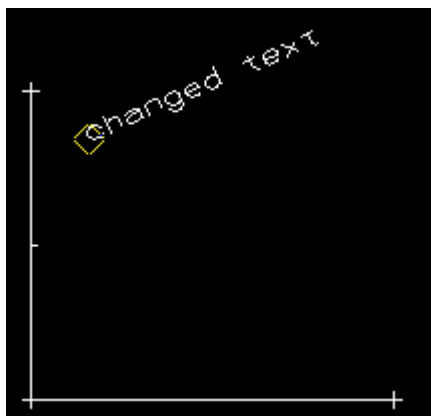
or by selection of appropriate icon from the toolbar. 

This option deletes symbols.

On selecting **Delete**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

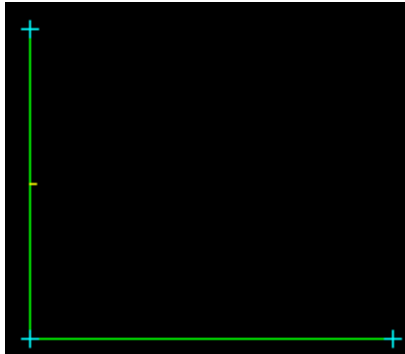
The Symbol to be deleted is selected and accepted.



STEP 2:

The selected Symbol is deleted.

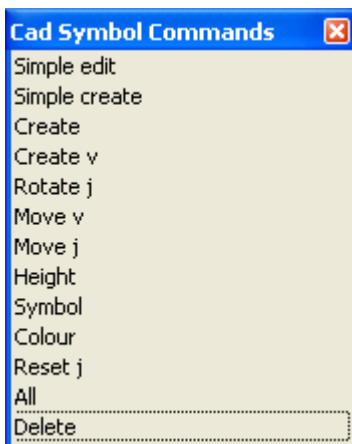
Picking Cancel from the Pick Ops menu, hitting <Esc> or selecting another option terminates the option.



Cad Symbol Commands

Position of option on menu: Strings =>CAD =>Symbol =>Commands

The Cad Symbol Commands walk-right menu is



Menu of Options to Create and Manipulate Symbols

edit symbols using grips
 create symbols and edit using grips
 create a symbol at a selected position - a one point string is created
 create a symbol at a user selected super string vertex
 rotate symbol about its justification pt (which may be offset from the vertex)
 move symbol by its vertex
 move symbol by its justification point (the vertex does not move)
 change the height of a symbol
 change the symbol
 change the colour of a symbol
 reset the symbol justification point so that it is on top of the vertex posn
 menu to make most of the above changes to one selected symbol
 delete a symbol

For the option *Simple edit*, go to

Simple create

Create

Create v

Rotate j

Move v

Move j

Height

Symbol

Colour

Reset j

All

Delete

[Simple Symbol Edit](#)

[Simple Symbol Create](#)

[Create Symbol](#)

[Create Symbol at the Vertex of a Super String](#)

[Rotate Symbol about the Justification Point](#)

[Move the Symbol Vertex Point](#)

[Move the Symbol Justification Point](#)

[Height of Symbol](#)

[Change Symbol](#)

[Symbol Colour](#)

[Reset the Symbol Justification Point](#)

[All Symbol Edits](#)

[Symbol Delete](#)

Simple Symbol Edit

Position of option on menu: Strings =>CAD =>Symbol =>Commands=>Simple edit

or by selection of appropriate icon from the toolbar. 

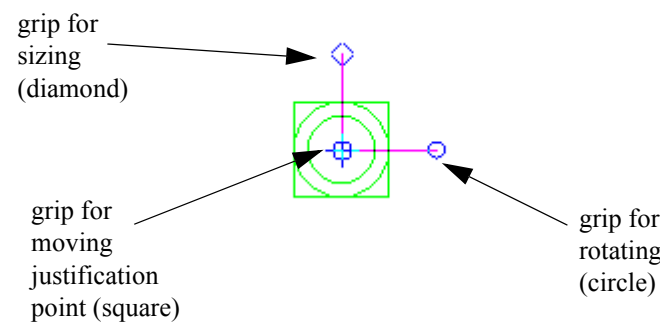
This option edits symbols using grips to quickly define the mode of editing (sizing, rotating or

moving the justification point).

On selecting **Simple edit**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

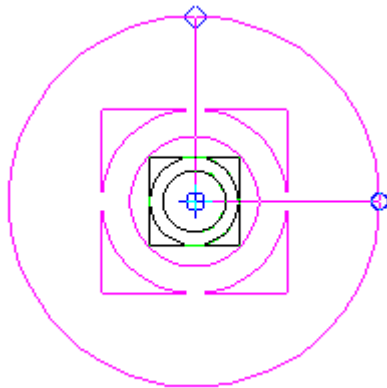
When the symbol to be edited is selected, grips for size, rotating and moving the justification point are displayed. The appropriate grip is then selected for quick editing.



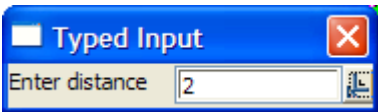
Size Grip (diamond):

If the **Size grip** is selected, the symbol size is dynamically adjusted by moving the cursor. The size of the symbol is displayed as part of the *Enter height* prompt in the message area.

The symbol size is set when a position is accepted.

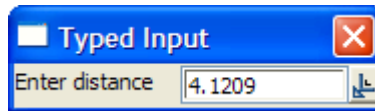


An **exact** symbol size can be entered by hitting the <space bar> or by starting to type a size. This brings up the **Enter distance** typed input box. The size is typed in and the <enter> key pressed.



To return to dynamic sizing without entering a distance, simply select the **X** on the top of the input box. The box will disappear and dynamic sizing will resume.

If the symbol is being dynamically sized, the **current** size of the symbol can be displayed by pressing the **d** key which brings up the **Enter distance** typed input box with the current dynamic symbol size in it.



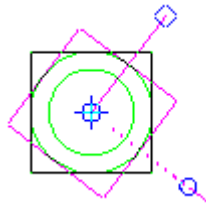
The size can be modified and the value used by pressing the <Enter> key.

To return to dynamic sizing without entering a distance, simply select the **X** on the top of the input box.

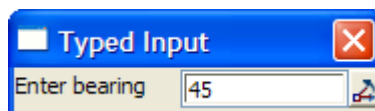
Rotate Grip (circle):

If the **Rotate grip** is selected, the symbol bearing is dynamically adjusted by moving the cursor. The bearing of the symbol is displayed as part of the *Enter bearing* prompt in the message area.

The symbol bearing is set when a position is accepted.

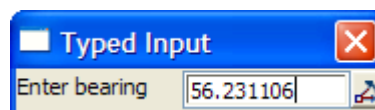


An **exact** bearing can be entered by hitting the <space bar> or by starting to type a bearing. This brings up the **Enter bearing** typed input box. The *bearing* is typed in and the <Enter> key pressed.



To return to dynamic rotating without entering a bearing, simply select the **X** on the top of the input box. The box will disappear and dynamic sizing will resume.

If the symbol is being dynamically rotated, the **current** bearing of the symbol can be displayed by pressing the **d** key which brings up the **Enter bearing** typed input box with the *current* symbol bearing in it.



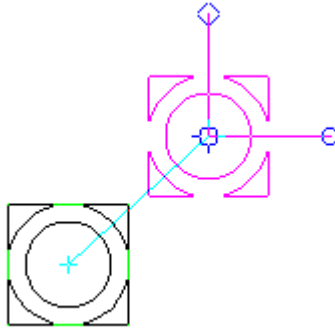
The *bearing* can be modified and the value used by pressing the <Enter> key.

To return to dynamic rotation without entering a bearing, simply select the **X** on the top of the input box.

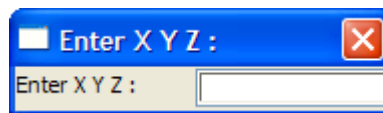
Justification Grip (square):

If the **Justification grip** is selected, the symbol justification point is dynamically adjusted by moving the cursor. The (x,y) position of the symbol is displayed in the message area.

The symbol justification point is set when a position is accepted.



An **exact** coordinate can be entered by hitting the <space bar> or by starting to type a coordinate. This brings up the **Enter X Y Z** typed input box. The *x and y coordinates* are typed in, separated by a space, and the <Enter> key pressed.



To return to dynamic moving without entering a coordinate, simply select the **X** on the top of the input box. The box will disappear and dynamic moving will resume.

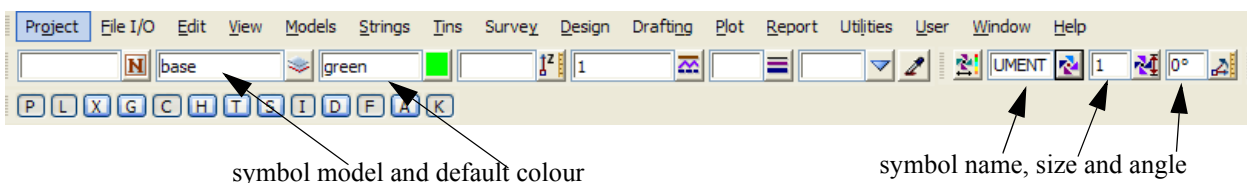
Simple Symbol Create

Position of option on menu: **Strings =>CAD =>Symbol =>Commands=>Simple create**

or by selection of appropriate icon from the toolbar.

This option creates symbols and then displays grips to allow quick editing of symbol size, rotation and justification point.

The symbol and symbol height and symbol angle are taken from the **Symbol controlbar** (See [CAD, Symbol and Text Controlbars](#)) and the model and colour (if the symbol does not have an inbuilt colour) from the **CAD controlbar** (see [CAD, Symbol and Text Controlbars, Symbol Controlbar](#) and [CAD Controlbar](#)).



The symbol will be placed with the vertex and justification point at the selected position.

After defining one symbol, the option restarts so that another symbol can be defined. Picking **Cancel** from the **Pick Ops** menu, hitting <Esc> or selecting another option terminates the option.

On selecting **Simple create**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

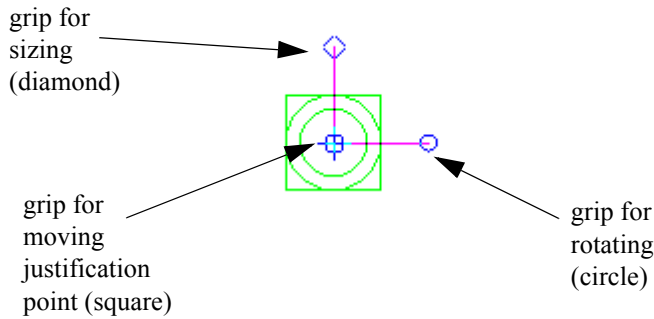
STEP 1:

An insertion point for the symbol is selected and accepted, the symbol is displayed on the screen.

Warning - if no symbol appears, then there is probably no symbol selected in the **Symbol** controlbar.

When the symbol is displayed, grips for quick editing of size, rotation and moving of the

justification point are also shown. The appropriate grip can then be selected for quick editing. For details on using the grips, go to the section [Simple Symbol Edit](#).



Create Symbol

Position of option on menu: Strings =>CAD =>Symbol =>Commands=>Create

or by selection of appropriate icon from the toolbar. 

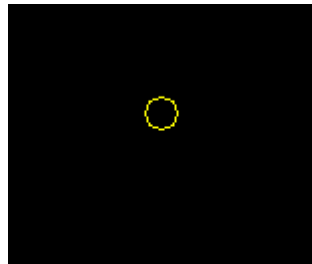
This option creates a symbol (as a one vertex super string) at a selected point (a cursor snap is valid).

After defining a symbol, the option restarts so that another symbol can be defined. Picking **Cancel** from the **Pick Ops** menu, hitting <esc> or selecting another option terminates the option.

On selecting **Create**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

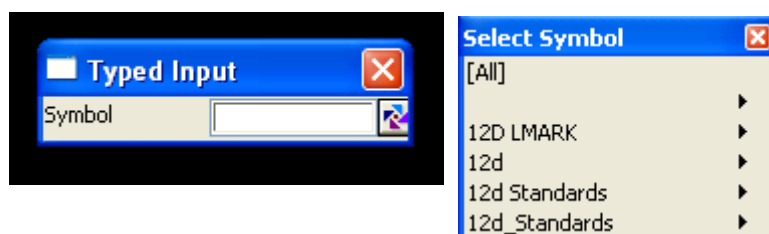
STEP 1:

An insertion point is selected and accepted. A one vertex super string is created and the symbol placed at that vertex. The symbol is placed relative to the insertion point given in the symbol definition (See symbols.4d file).



STEP 2:

The symbol style (name) is entered into the input box or selected from the select symbol choice box. The choice box is opened by pressing the symbol icon on the right of the input box. A valid symbol type can be found by walking right on the symbol menu

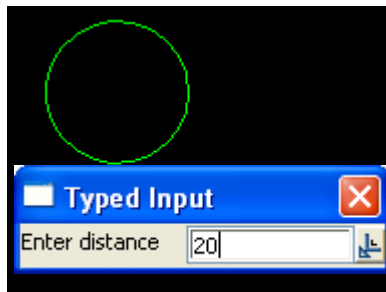


STEP 3:

A symbol size is given either by selection with the mouse or by typing a value. To type a value, simply start typing and the input box for the size will appear. The user can also press the space bar to bring up the input box. The value is entered into the input box followed by the enter key.

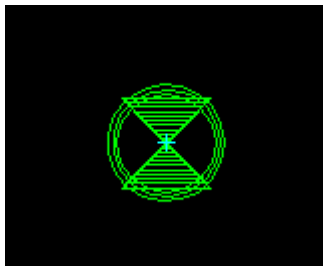
The circle drawn represents the size value and changes with movement of the mouse. If the user wants to see what the current value of the height is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to create the symbol or the input box can be closed and the rubber banding (graphically changing) of the circle continued.

This option also allows the definition of the size by the selection of a point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next.



STEP 4:

The symbol is created together with a point super string at the selected point.



Create Symbol at the Vertex of a Super String

Position of option on menu: Strings =>CAD =>Symbol =>Commands=>Create v

or by selection of appropriate icon from the toolbar.



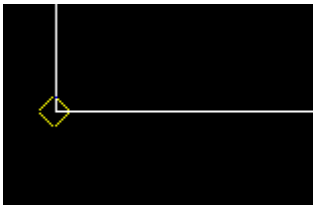
This option creates a symbol at a vertex of a super string. One symbol is allowed per super string vertex, so if this option is used on existing vertex symbol, the existing value is displayed in the symbol input box.

After defining a symbol, the option restarts so that another symbol can be defined. Picking Cancel from the Pick Ops menu, hitting <esc> or selecting another option terminates the option.

On selecting **Create v**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

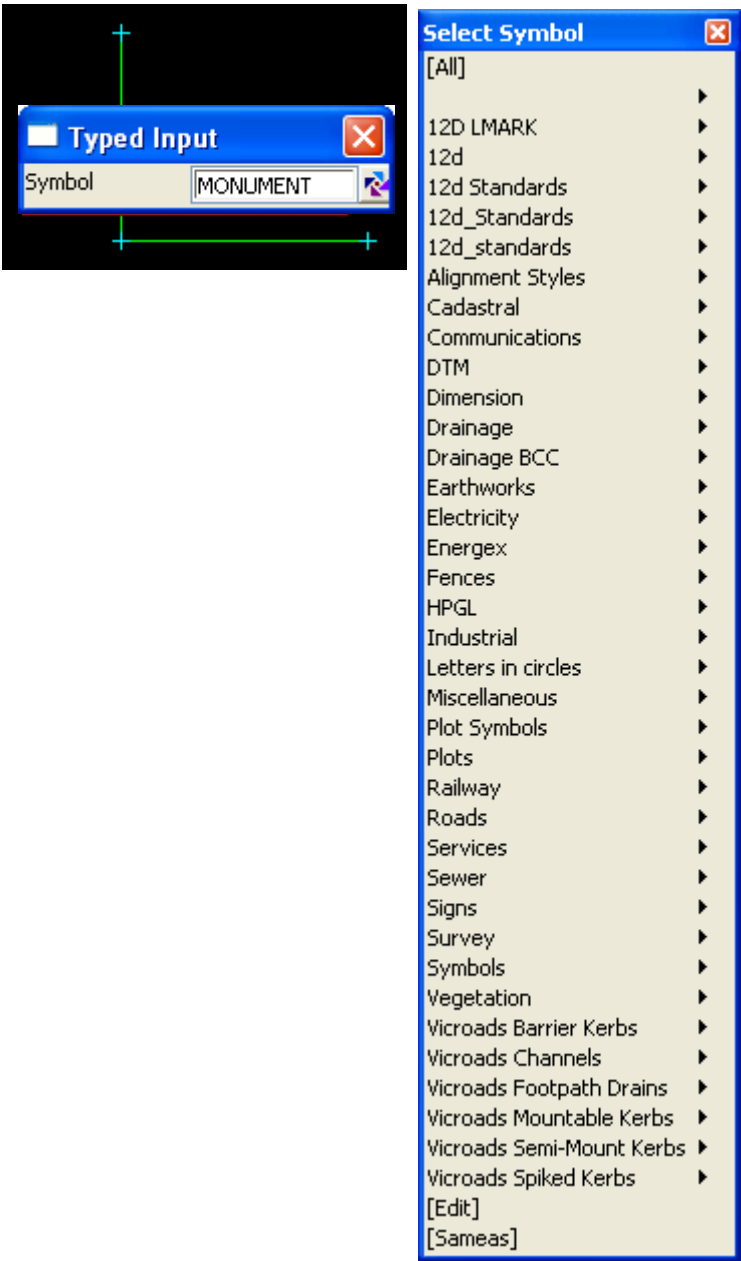
STEP 1:

An insertion point is selected and accepted. The point snap is forced on so that a vertex can be selected. The Symbol will be placed relative to the insertion point given other parameters such as justification, as defined in the symbol definition.



STEP 2:

The symbol style is entered into the input box or selected from the select symbol choice box. The choice box is opened by pressing the symbol icon on the right of the input box. A valid symbol type can be found by walking right on the symbol menu



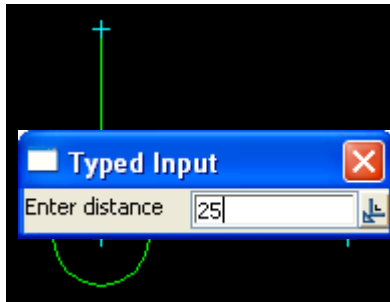
STEP 3:

A symbol size is given either by selection with the mouse or by typing a value. To type a value, simply start typing and the input box for the size will appear. The user can also press the space

bar to bring up the input box. The value is entered into the input box followed by the enter key.

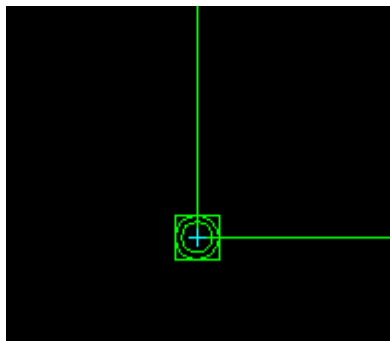
The circle drawn represents the size value and changes with movement of the mouse. If the user wants to see what the current value of the height is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to create the symbol or the input box can be closed and the rubber banding (graphically changing) of the circle continued.

This option also allows the definition of the size by the selection of a point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next.



STEP 4:

The symbol is created at the vertex of the super string.



Rotate Symbol about the Justification Point

Position of option on menu: Strings =>CAD =>Symbol =>Commands=>Rotate j

or by selection of appropriate icon from the toolbar. 

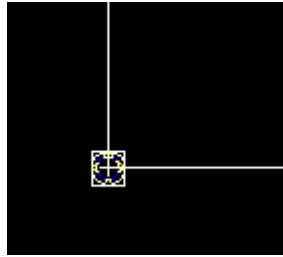
This option rotates a symbol about its justification point. The vertex point and the justification point often do not coincide. This occurs when non zero value is specified for either the x or y offset.

Note: The typed bearing is not relative but absolute. i.e. the value given will not rotate the existing symbol by that amount, rather it will reposition the symbol at that bearing.

On selecting **Rotate j**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

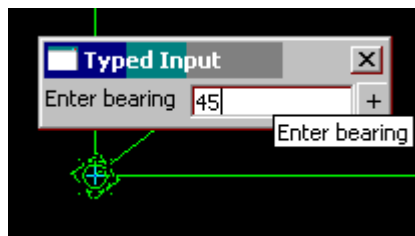
The Symbol to be rotated is selected and accepted.

**STEP 2:**

The rotation bearing (the final bearing of the symbol) is specified by selection and acceptance of a point with the mouse or by entry into an angle box followed by the enter key. To bring up the angle box start typing or press the space bar. The value is entered into the input box followed by the enter key.

The line drawn represents the bearing value and changes with movement of the mouse. If the user wants to see what the current value of the bearing is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to specify the bearing or the input box can be closed and the rubber banding (graphically changing) of the bearing continued.

Note: The **Page up** and **page down** keys can be used when the bearing input box comes up to add or subtract intervals of 90 degrees.

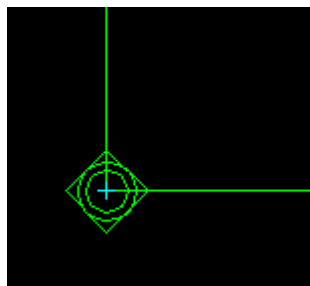


This option also allows the definition of the bearing by the selection of the 2nd point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next. The example shown below is the perpendicular case.

STEP 3:

The Symbol is rotated to the specified bearing.

Picking Cancel from the Pick Ops menu, hitting <esc> or selecting another option terminates the option.



Move the Symbol Justification Point

Position of option on menu: Strings =>CAD =>Symbol =>Commands=>Move j

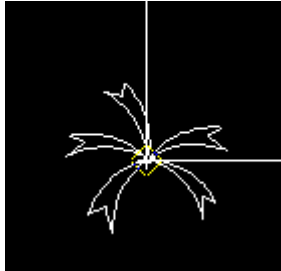
or by selection of appropriate icon from the toolbar. 

This option moves a symbol by moving its justification point.

On selecting **Move j**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

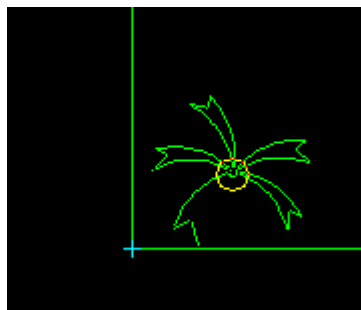
STEP 1:

The Symbol to be moved is selected and accepted.



STEP 2:

The new position for the Symbol is selected and accepted.



STEP 3:

The Symbol moves to the new position.

Picking Cancel from the Pick Ops menu, hitting <esc> or selecting another option terminates the option.

Move the Symbol Vertex Point

Position of option on menu: Strings =>CAD =>Symbol =>Commands=>Move v

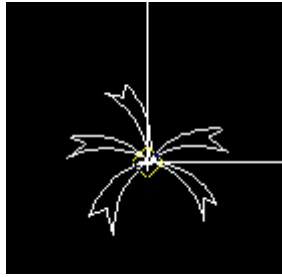
or by selection of appropriate icon from the toolbar. 

This option moves a symbol by moving the vertex that the symbol is attached to. Hence the symbol and the justification point for the symbol will move.

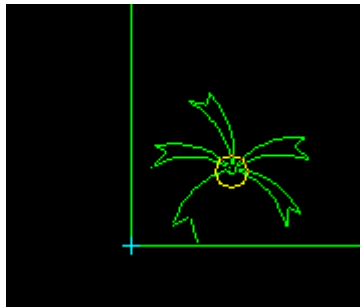
On selecting **Move V**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

The Symbol to be moved is selected and accepted.

**STEP 2:**

The new position for the vertex of the Symbol is selected and accepted.

**STEP 3:**

The Symbol moves to the new position.

Picking Cancel from the Pick Ops menu, hitting <esc> or selecting another option terminates the option.

Height of Symbol

Position of option on menu: Strings =>CAD =>Symbol =>Commands=>Height

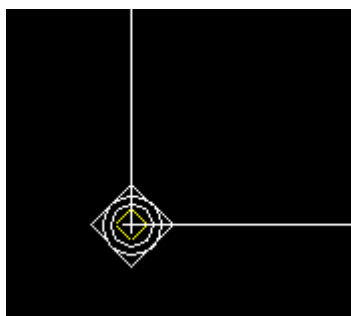
or by selection of appropriate icon from the toolbar. 

This option changes the height of a symbol.

On selecting **Height**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

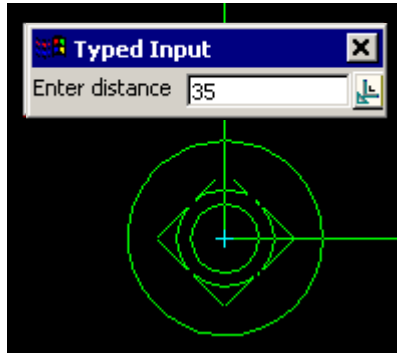
The Symbol of which the height is to be changed is selected and accepted.

**STEP 2:**

A height for the Symbol is given either by selection with the mouse or by typing a value. To type a value, simply start typing and the input box for the height will appear. Alternatively you can press the space bar to bring up the input box. The value is entered into the input box followed by

the enter key.

The circle drawn represents the height value and changes with movement of the mouse. If the user wants to see what the current value of the height is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to create the point or the input box can be closed and the rubber banding (graphically changing) of the circle continued.

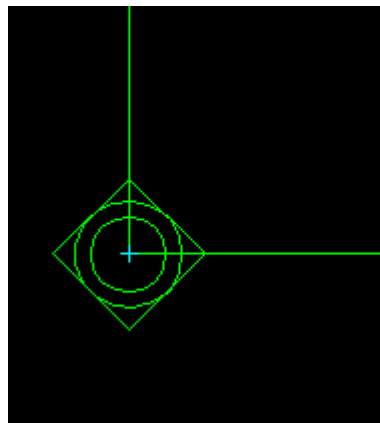


This option also allows the definition of the distance by the selection of the 2nd point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next.

STEP 3:

The Symbol height is changed.

Picking Cancel from the Pick Ops menu, hitting <esc> or selecting another option terminates the option.



Change Symbol

Position of option on menu: Strings =>CAD =>Symbol =>Commands=>Symbol

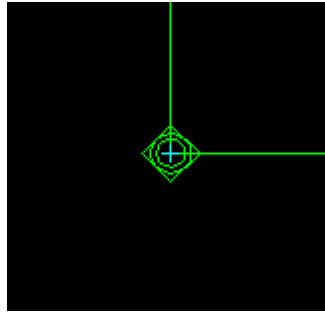
or by selection of appropriate icon from the toolbar. 

This option changes the actual symbol defined at a super string vertex.

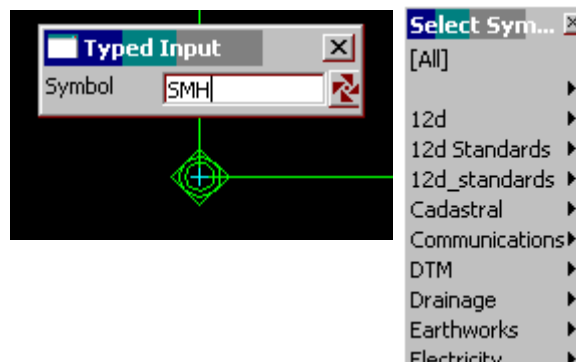
On selecting **Symbol**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

The Symbol to be changed is selected and accepted.

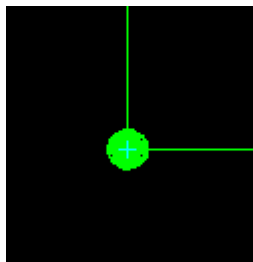
**STEP 2:**

The symbol style is entered into the input box or selected from the select symbol choice box. The choice box is opened by pressing the symbol icon on the right of the input box. A valid symbol type can be found by walking right on the symbol menu

**STEP 3:**

The Symbol is changed.

Picking Cancel from the Pick Ops menu, hitting <esc> or selecting another option terminates the option.



Symbol Colour

Position of option on menu: Strings =>CAD =>Symbol =>Commands=>Colour

or by selection of appropriate icon from the toolbar. 

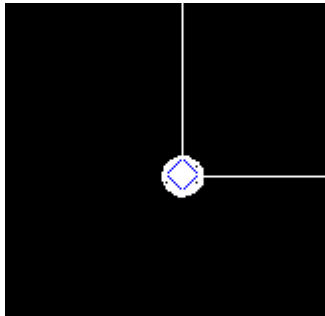
This option changes the default colour of a symbol.

Important Note: if the symbol has inbuilt colours, changing the default colour will not change the symbols displayed colours. For this case, the definition of the symbol itself will need to be changed.

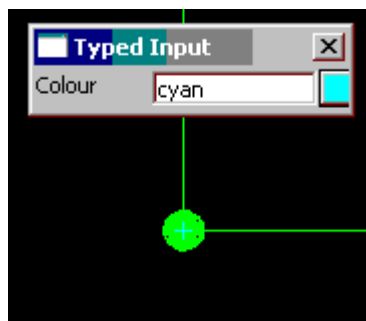
On selecting **Colour**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

The symbol to have the default colour changed is selected and accepted.

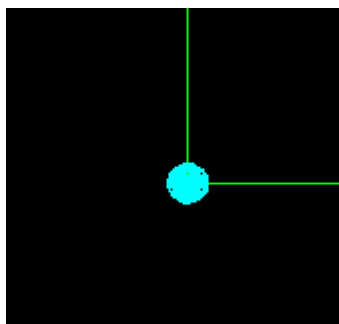
**STEP 2:**

The new colour for the Symbol is entered into the Symbol input box or by selecting the colour square on the input box to bring up the select colour choice box followed by the enter key.

**STEP 3:**

The Symbol colour is changed.

Picking Cancel from the Pick Ops menu, hitting <esc> or selecting another option terminates the option.



Reset the Symbol Justification Point

Position of option on menu: Strings =>CAD =>Symbol =>Commands=>Reset j

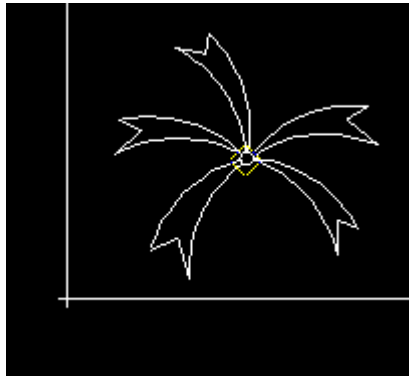
or by selection of appropriate icon from the toolbar. 

This option resets justification point of a selected symbol. That is, the x and y offsets for the justification point are set to zero.

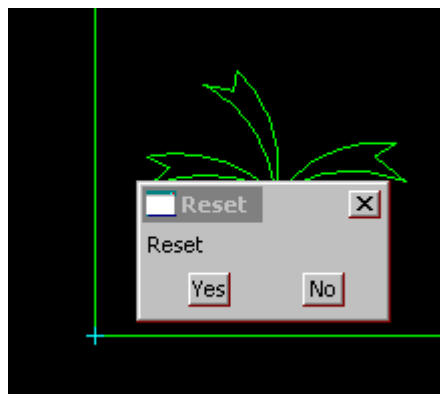
On selecting **Reset j**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

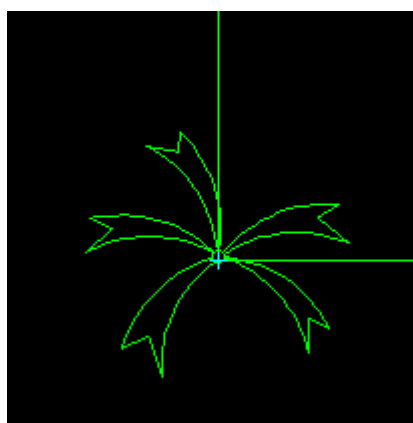
The Symbol to be changed is selected and accepted.

**STEP 2:**

A warning message is shown giving the user the option of resetting the justification point or not.

**STEP 3:**

The symbol is reset if accepted.



All Symbol Edits

Position of option on menu: Strings =>CAD =>Symbol =>Commands=>All

or by selection of appropriate icon from the toolbar. 

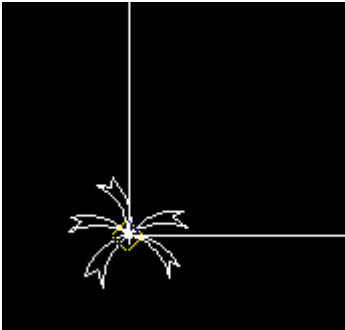
This option allows a number of symbol editing options to be done in succession using a menu

made up of many of the options defined above.

On selecting **All**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

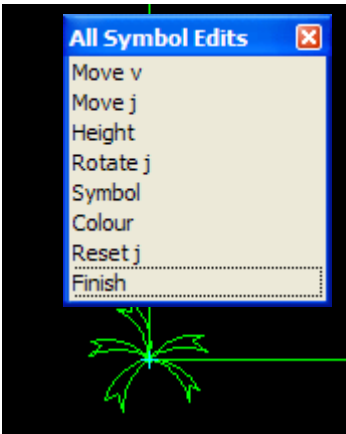
STEP 1:

The Symbol to be changed is selected and accepted.



STEP 2:

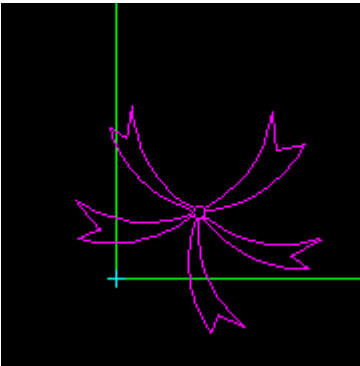
After the selection and acceptance of a symbol, the positioning menu is shown. This also allows various other symbol editing functions such as colour, height and rotate.



STEP 3:

The user can select the appropriate option from the menu and make the changes. The menu remains active allowing a number of operations to be made in succession.

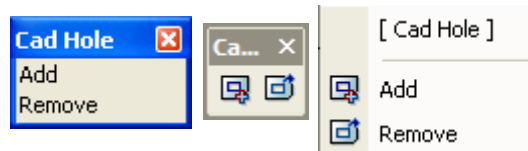
Picking Cancel from the Pick Ops menu, hitting <esc> or selecting another option terminates the option.



CAD Hole

Position of option on menu: Strings =>CAD =>Hole

The Cad Hole walk-right menu is



For the option *Add*, go to
Remove

[Add Holes](#)
[Remove Holes](#)

Add Holes

Position of option on menu: Strings =>CAD =>Hole =>Add

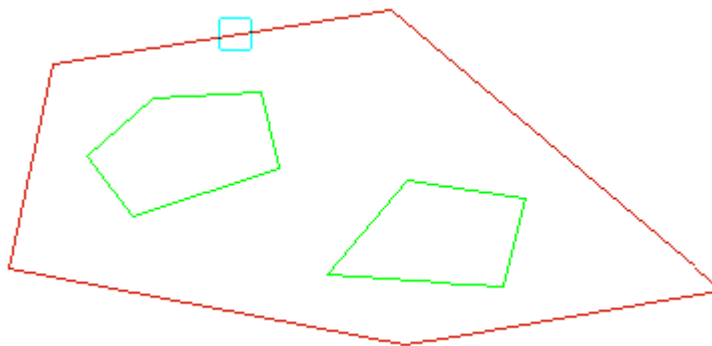
or by selection of appropriate icon from the toolbar. 

This option adds holes to a polygon.

On selecting **Add holes**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

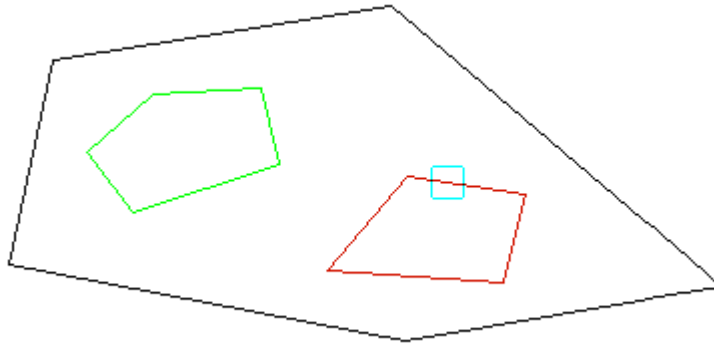
First select the parent string. That is the polygon that is to have holes added to it.



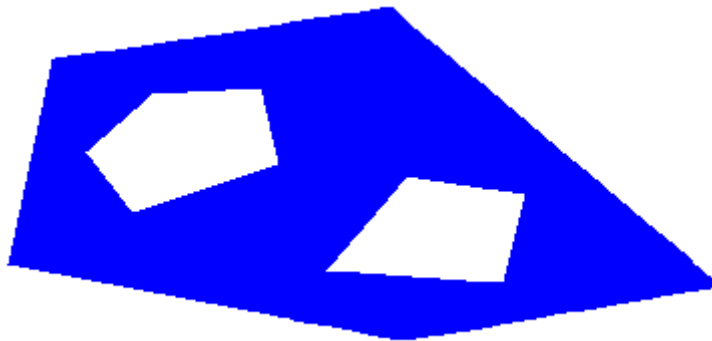
STEP 2:

Then select the polygons that are to be the holes in the parent polygon (the child strings).

The selection of holes is terminated by pressing the <esc> key.



It is easier to see the result by colour filling the parent polygon.



Remove Holes

Position of option on menu: Strings =>CAD =>Hole =>Remove

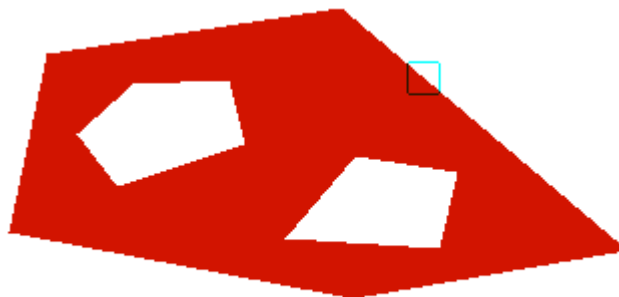
or by selection of appropriate icon from the toolbar. 

This option removes all holes from a polygon with holes.

On selecting **Remove holes**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

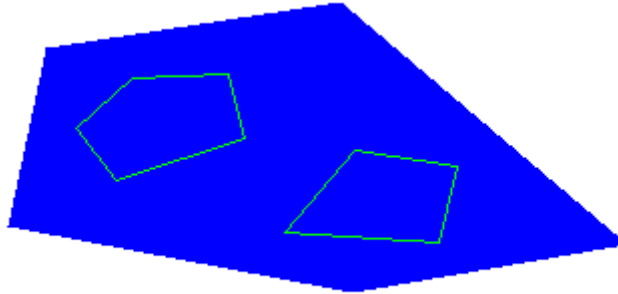
STEP 1:

Select the parent string. That is the polygon that contains holes.



STEP 2:

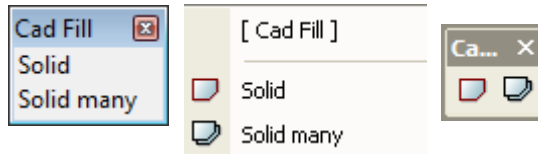
On selecting and accepting the string, all holes are removed from the string. Super strings are created for each of the hole boundaries.



CAD Fill

Position of option on menu: Strings =>CAD =>Fill

The Fill walk-right menu is



For the option *Solid*, go to
Solid many

[Solid Fill](#)
[Solid Fill Many Strings](#)

Solid Fill

Position of option on menu: Strings =>CAD =>Fill =>Solid

or by selection of appropriate icon from the toolbar. 

This option fills a super string with a user defined colour and blend.

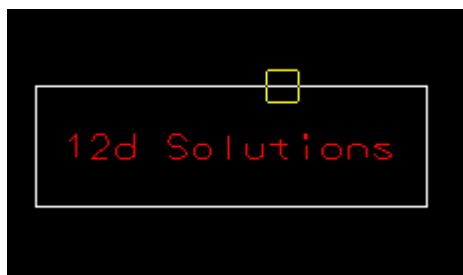
On selecting **Solid Fill**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:


Select and accept a string.

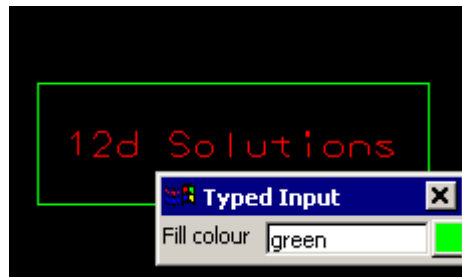
If the string selected is an enclosed shape, then the filled area is simply the closed shape. If the string isn't closed (such as two perpendicular lines), for the purposes of this option, the string will be temporarily closed and closed area coloured.

Note: If the string selected is a straight line, then its area is zero. When the colour fill of a line is completed, the line will simply disappear. This is because there is no area to colour.

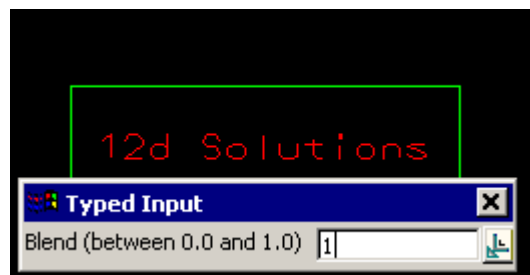
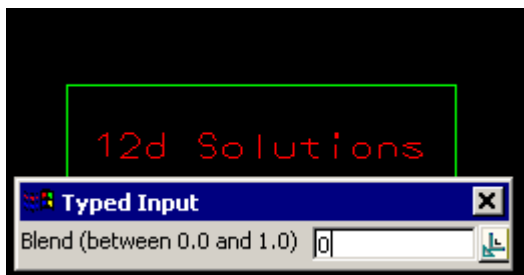


STEP 2:

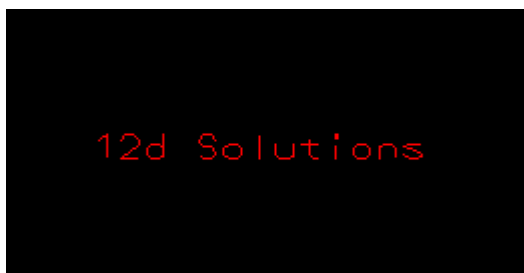
After the string is accepted, the **Fill Colour** Input box will appear. Type the name of the required colour into the Input box and press the enter key. The browse button  on the Input box can be used to define the blend by measuring existing elements.

**STEP 3:**

After the colour is accepted, the Blend Input box will appear. This selection determines the transparency of the filled colour. A value between 0 (totally opaque) and 1 (totally transparent) must be selected.

**STEP 4:**

The selected super string is then filled.



Blend 0



Blend 1

Solid Fill Many Strings

Position of option on menu: Strings => CAD => Fill => Solid many


or by selection of appropriate icon from the toolbar. 

This option fills many selected super strings with the same user defined colour and blend.

On selecting **Solid fill many**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

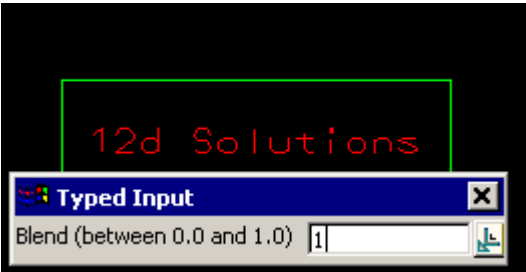
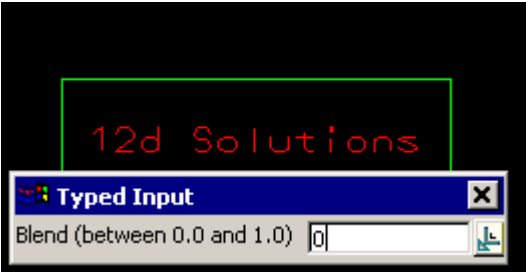
After selecting the option, the **Fill Colour** Input box is displayed.

Type the name of the required colour into the Input box and press the enter key. The browse button  on the Input box can be used to define the blend by measuring existing elements.



STEP 2:

After the colour is accepted, the **Blend** Input box will appear. This selection determines the transparency of the filled colour. A value between 0 (totally opaque) and 1(totally transparent) must be selected.

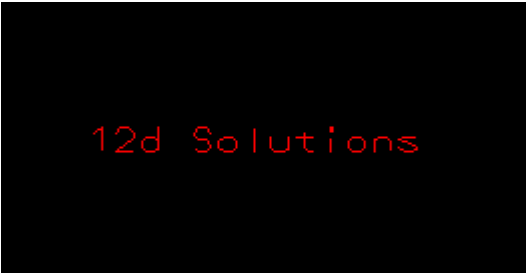


STEP 3:

Select and accept a string and the string is coloured filled.



The selected super string is then filled.



Blend 0



Blend 1

Then select and accept the next string to fill and the same colour and blend is used to colour fill the next string

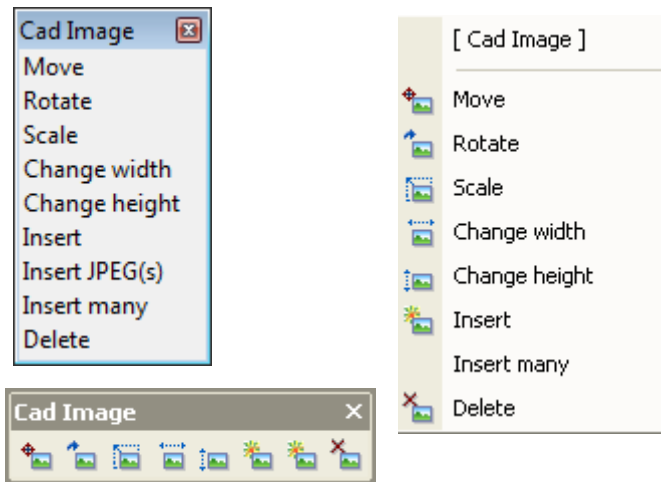
If the string selected is an enclosed shape, then the filled area is simply the closed shape. If the string isn't closed (such as two perpendicular lines), for the purposes of this option, the string will be temporarily closed and closed area coloured.

Note: If the string selected is a straight line, then its area is zero. When the colour fill of a line is completed, the line will simply disappear. This is because there is no area to colour.

CAD Image

Position of option on menu: Strings =>CAD =>Image

The Cad Image walk-right menu is



For the option *Move*, go to

Rotate

Scale

Change width

Change height

Insert

Insert JPEG(s)

Insert many

Delete

[Move Image](#)

[Rotate Image](#)

[Scale Image](#)

[Change Width](#)

[Change Height](#)

[Insert Image](#)

[Insert JPEG\(s\)](#)

[Insert Many](#)

[Delete Image](#)

Move Image

Position of option on menu: Strings =>CAD =>Image =>Move

or by selection of appropriate icon from the toolbar. 

This option moves an inserted image by modifying the x and y offset for the image. The vertex that the image is attached to does not move.

On selecting **Move Image**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

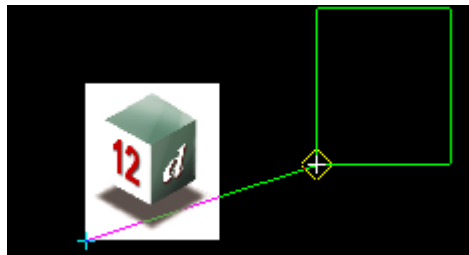
STEP 1:

Select the vertex that the image is attached to.

Note: The position of the image is defined **relative to the vertex**. To select the image, the **vertex** that the image is attached to **must be selected**. The image itself can not be picked.

**STEP 2:**

After a vertex of an image is accepted, an outline of the image is displayed and moves with the position of the cursor. This will continue until the new position is selected and accepted.



Select the new position and accept it.

The cursor position can be selected with the mouse or entered via the keyboard. To enter a position with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the <enter> key.

STEP 3:

The image is then displayed at its new position.



Note: The **CAD Move Image** option only moves **the image offset relative to the vertex**. Use the option **CAD Move** to **move the vertex** (and the corresponding image moves with it).

Rotate Image

Position of option on menu: Strings =>CAD =>Image =>Rotate

or by selection of appropriate icon from the toolbar. 

This option rotates an image around its justification point.

On selecting **Rotate Image**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

Select the vertex that the image is attached to.

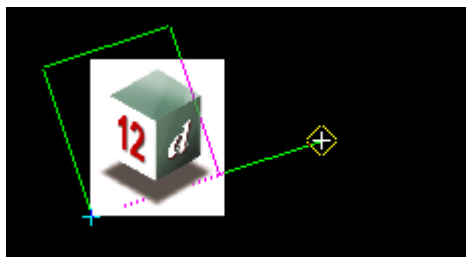
Note: The position of the image is defined **relative to the vertex**. To select the image, the **vertex**

that the image is attached to **must be selected**. The image itself can not be picked.



STEP 2:

After the vertex of an image is accepted, an outline of the image is displayed. The outline is rotated dynamically as the position of the cursor changes. This will continue until a final position is selected and accepted.



Select the new rotated position and accept it.

The cursor position can be selected with the mouse or entered via the keyboard. To enter a position with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the <enter> key.

STEP 3:

The rotated image is then displayed.



Scale Image

Position of option on menu: Strings =>CAD =>Image =>Scale

or by selection of appropriate icon from the toolbar. 

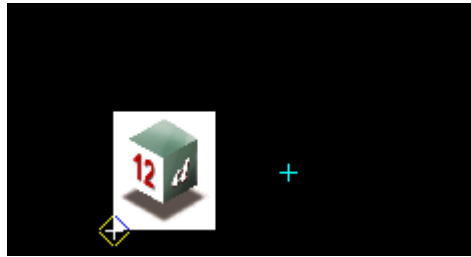
This option changes the size of an image.

On selecting **Scale Image**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

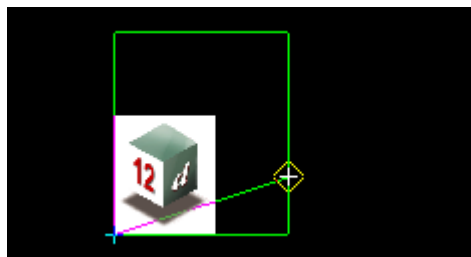
Select the **vertex** that the image is attached to.

Note: The position of the image is defined **relative to the vertex**. To select the image, the **vertex** that the image is attached to **must be selected**. The image itself can not be picked.



STEP 2:

After the vertex of an image is accepted, an outline of the image is displayed. The size of the outline is determined by the position of the cursor. Both the height and the width of the image increase/decrease in the same ratio so that the image is not distorted.



Select the new size as given by the cursor position, and accept it.

The cursor position can be selected with the mouse or entered via the keyboard. To enter a position with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the <enter> key.

STEP 3:

The scaled image is then displayed.



Change Width

Position of option on menu: Strings => CAD => Image => Change width

or by selection of appropriate icon from the toolbar. 

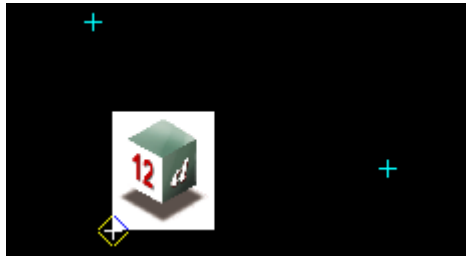
This option is user to increase or decrease the width of an image. The height of the image is not changed so the images will be stretched.

On selecting **Width Image**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

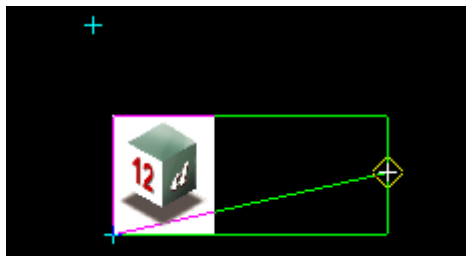
Select the **vertex** that the image is attached to.

Note: The position of the image is defined **relative to the vertex**. To select the image, the **vertex** that the image is attached to **must be selected**. The image itself can not be picked.



STEP 2:

After the vertex of an image is accepted, the outline of the image is displayed. The width of the outline is determined by the position of the cursor. Whilst the height remains constant, the width of the outline increases and decreases dynamically as the position of the cursor changes.



Select the new width as given by the cursor position, and accept it.

The cursor position can be selected with the mouse or entered in via the keyboard. To enter a position with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the <enter> key.

STEP 3:

The image with the new width is then displayed.



Change Height

Position of option on menu: Strings => CAD => Image => Change height

or by selection of appropriate icon from the toolbar. 

This option allows the user to increase or decrease the height of an image. The width of the image is not changed so the images will be stretched.

On selecting **Height Image**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

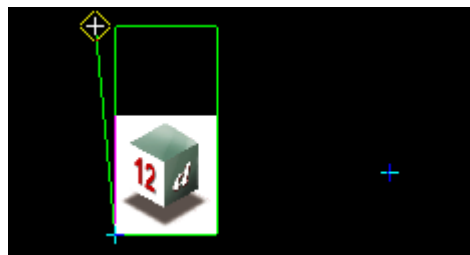
STEP 1:

Select the **vertex** that the image is attached to.

Note: The position of the image is defined **relative to the vertex**. To select the image, the **vertex** that the image is attached to **must be selected**. The image itself can not be picked.

**STEP 2:**

After the vertex of an image is accepted, the outline of the image is displayed. The height of the outline is determined by the position of the cursor. Whilst the width remains constant, the height of the outline increases and decreases dynamically as the position of the cursor changes.



Select the new height as given by the cursor position, and accept it.

The cursor position can be selected with the mouse or entered in via the keyboard. To enter a position with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the <enter> key.

STEP 3:

The image with the new height is then displayed.

**Insert Image**

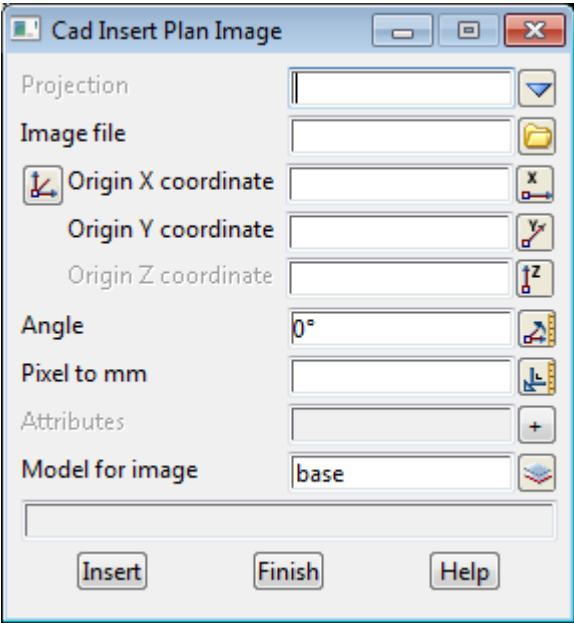
Position of option on menu: Strings =>CAD =>Image =>Insert

or by selection of appropriate icon from the toolbar. 

This option takes a user selected image file and creates a super string vertex with the image inserted at that vertex.

If the file type is JPEG and it includes the EXIF and GPS information, the information is loaded into attributes for the image.

On selecting **Insert**, the **Cad Insert Plan Image** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Format	input box		BMP, DIB, ECW, GIF, JPEG JPEG 2000, PNG, TGA TIFF, 12D
<i>select the type of image file to insert. If the file type is JPEG and it includes the EXIF and GPS information, the information is loaded into attributes for the image and they can be examined by clicking '+' next to the Attributes field.</i>			
Image file	input box		
<i>Select the image filename to be inserted into the project.</i>			
X/Y co-ordinate	XY Pick button		
<i>select the x/y co-ordinate for origin (bottom left corner) of the image.</i>			
Origin X coordinate	input box		
<i>enter the x coordinate for the bottom left of the image.</i>			
Origin Y coordinate	input box		
<i>enter the y coordinate for the bottom left of the image.</i>			
Pixel to mm	input box		
<i>the units for images are pixels (width and height). The pixel width and height of the image are multiplied by the Pixel to mm (mm being millimetres) value to give width and height size in world unit (metres) which is needed when inserting the image.</i>			
Attributes			
<i>when JPEG is selected for the Format and the JPEG file includes the EXIF and GPS information, the information is loaded into attributes for the image. The attributes can be looked at by clicking on the '+',</i>			

Model for image input box

select the model for the image to be inserted into.

Insert button

*when all the fields have been entered, the **Insert** button creates an image from the selected file.*

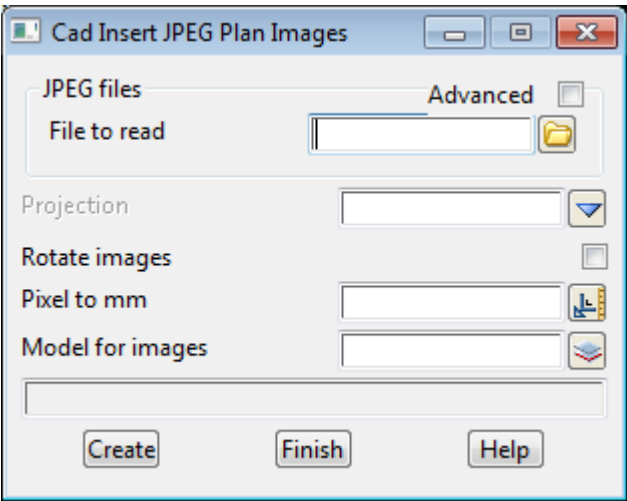
Insert JPEG(s)

Cad_Insert_JPEG_Plan_ImagesPosition of option on menu: Strings =>CAD =>Image =>Insert JPEG(s)

This option is for reading in JPEG files which must include EXIF and GPS information. This information is then used to position the image.

If a Projection is selected by the user, then it is used to convert the lat/long of the GPS values to the XYZ co-ordinates. If no Projection is given, then the co-ordinates are left as lat/long.


On selecting **Insert JPEG(s)**, the **Cad Insert JPEG Plan Images** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Advanced	tick box	not ticked	
<i>clicking Advanced brings up a grid to allow the user to enter many JPEG files.</i>			
File to read	file box		available *.jpg files
<i>the JPEG files to read in and create images from. The JPEG file must include EXIF and GPS information, which is used to position the image. If Projection is not blank, then it is used to convert the lat/long of the GPS values to the XYZ co-ordinates. If Projection is blank, then the co-ordinates are left as lat/long.</i>			
Projection	choice box		
<i>if a Project Projection is set, then it is placed in the Projection field. This can be changed to any other projection. The projection is used to convert the lat/long of the GPS values to the XYZ co-ordinates. If no projection is set, then the co-ordinates are left as lat/long.</i>			
Rotate images	tick box	not ticked	
<i>if ticked, the rotate value from the EXIF will be used to rotate the image.</i>			
Pixel to mm	input box		
<i>the units for images are pixels (width and height). The pixel width and height of the image are multiplied by the Pixel to mm (mm being millimetres) value to give width and height size in world unit (metres) which is needed when inserting the image.</i>			
Model for images	input box		
<i>the model for the image to be inserted into.</i>			
Create	button		
<i>when all the fields have been entered, the Create button creates images from the selected files.</i>			

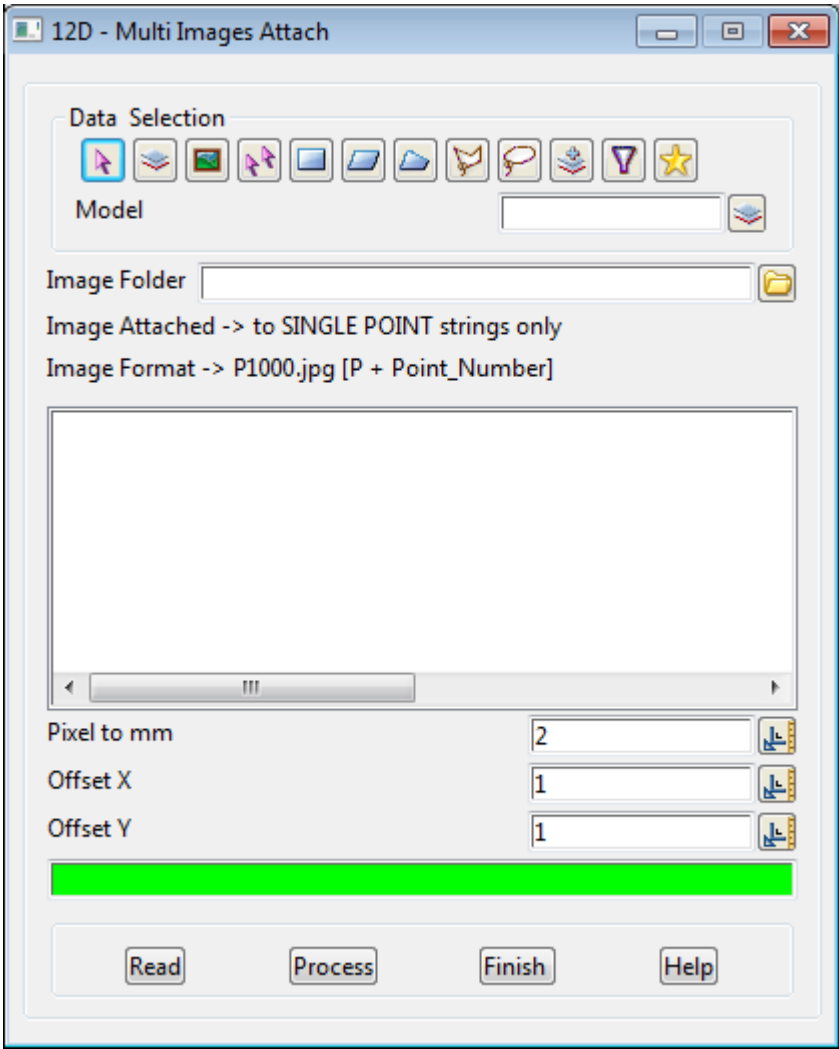
Insert Many

Position of option on menu: Strings =>CAD =>Image =>Insert Many
or by selecting the icon from the Cad Images toolbar. 

This option allows the attachment of an image to a selection of super point strings.
As shown on the panel, the images are to be stored in a directory folder and must be in the following format.

Image Format: P1000.jpg [P + point number]

Note: Attachment to Single Point super strings only



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
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Data source type		Model	
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data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data source	input	
--------------------	-------	--

source of data to be processed.

Image Folder	directory	select folder
<i>browse for a folder containing the images (folder only)</i>		
Pixel to mm	measure box	At Point, Point to Point, String from Point, String to Point
<i>scale factor for image (check pixel size first)</i>		
Offset X	measure box	At Point, Point to Point, String from Point, String to Point
<i>image offset in the x direction from point</i>		
Offset Y	measure box	At Point, Point to Point, String from Point, String to Point
<i>image offset in the y direction from point</i>		
Read	button	
<i>searches the image folder for the jpg images and displays them in the list box above</i>		
Process	button	
<i>attaches the image to appropriate point</i>		

Delete Image

Position of option on menu: Strings =>CAD =>Image =>Delete
or by selection of appropriate icon from the toolbar. 

This option deletes an image.

On selecting **Delete Image**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

Select the **vertex** that the image is attached to.

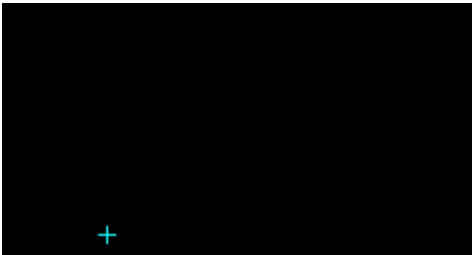
Note: The position of the image is defined **relative to the vertex**. To select the image, the **vertex** that the image is attached to **must be selected**. The image itself can not be picked.



STEP 2:

When the selected image is accepted, it is then deleted.

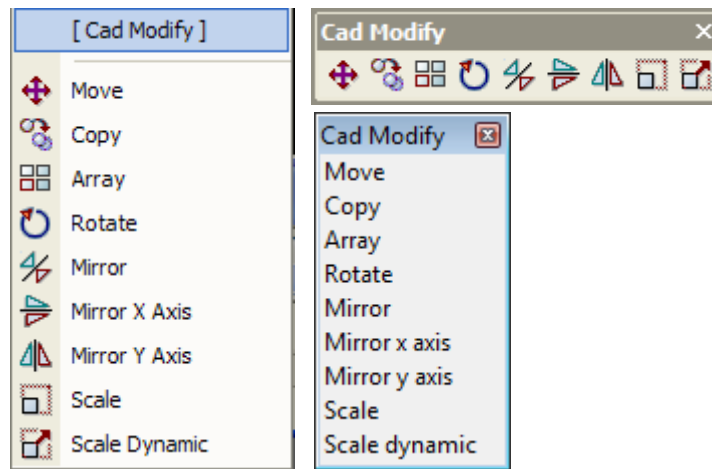
Note that the **vertex** that the image was attached to is not deleted.



CAD Modify

Position of option on menu: Strings =>CAD =>Modify

The **Modify** walk-right menu is



For the option *Move*, go to

Copy

Array

Rotate

Mirror

Mirror x axis

Mirror y axis

Scale

Scale dynamic

[CAD Move](#)

[CAD Copy](#)

[CAD Array](#)

[CAD Rotate](#)

[CAD Mirror](#)

[CAD Mirror X Axis](#)

[CAD Mirror Y Axis](#)

[CAD Scale](#)

[CAD Scale Dynamic](#)

CAD Move

Position of option on menu: Strings =>CAD =>Modify =>Move

or by selection of appropriate icon from the toolbar. 

This option moves a selected string.

On selecting **Move**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the *12d Model* application window.

For **CAD Multipick Move**, go straight to Step 2.

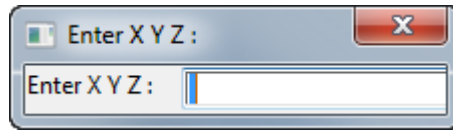
STEP 1:

A super string or circle is picked.

STEP 2:

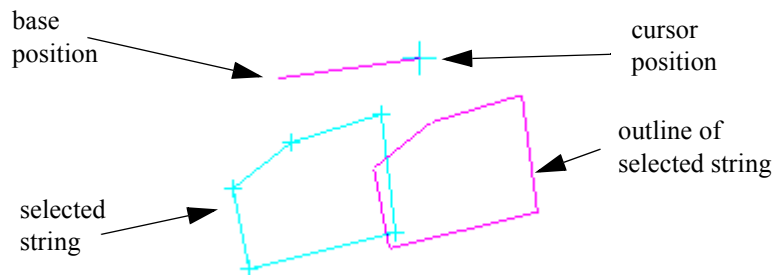
A base position is picked and then an outline of the selected string will be drawn and moved with the cursor, plus a line will be drawn from the base position to the current cursor position.

NOTE: If the <Spacebar> or any other key is pressed, an **Enter X Y Z** typed input box is displayed on the screen.



X, Y and Z are entered, separated by a space, and <Enter> accepts the values and removes the **Enter X Y Z** box from the screen. If values are not going to be typed in, clicking **X** on the top right-hand corner of the **Enter X Y Z** box removes the box from the screen and the option returns to selecting the base position by moving the cursor.

Note: The base position is not required to lie on the string itself.



STEP 3:

A final cursor position is selected which defines a distance and direction from the base position to the final position.

STEP 4:

On accepting the final position, the selected super string is moved by the determined distance and direction.

CAD Copy

Position of option on menu: Strings =>CAD =>Modify =>Copy

or by selection of appropriate icon from the toolbar. 

This option copies a super string.

On selecting **Copy**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

For **CAD Multipick Copy**, go straight to Step 2.

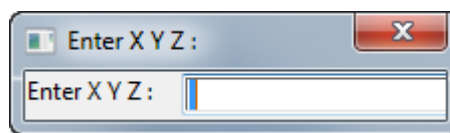
STEP 1:

Select a super string.

STEP 2:

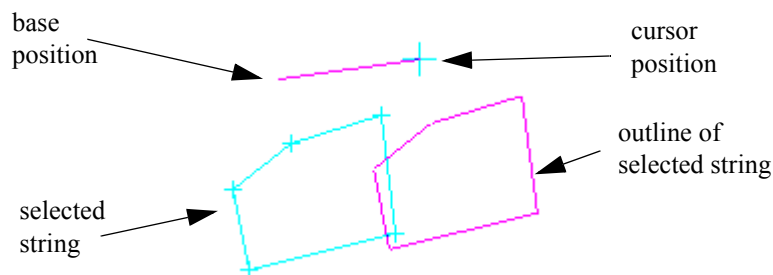
A base position is picked and then an outline of the selected string will be drawn and moved with the cursor, plus a line will be drawn from the base position to the current cursor position.

NOTE: If the <Spacebar> or any other key is pressed, an **Enter X Y Z** typed input box is displayed on the screen.



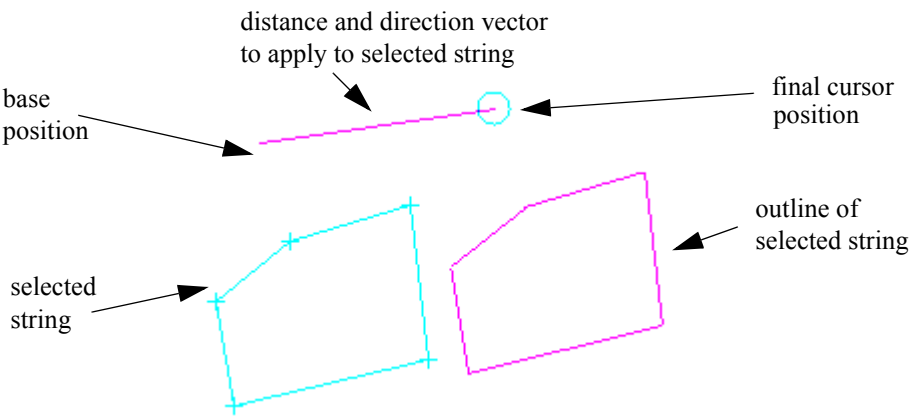
X, Y and Z are entered, separated by a space, and <Enter> accepts the values and removes the **Enter X Y Z** box from the screen. If values are not going to be typed in, clicking on **X** on the top right-hand corner of the **Enter X Y Z** box removes the box from the screen and the option returns to selecting the base position by moving the cursor.

Note: The base position is not required to lie on the string itself.



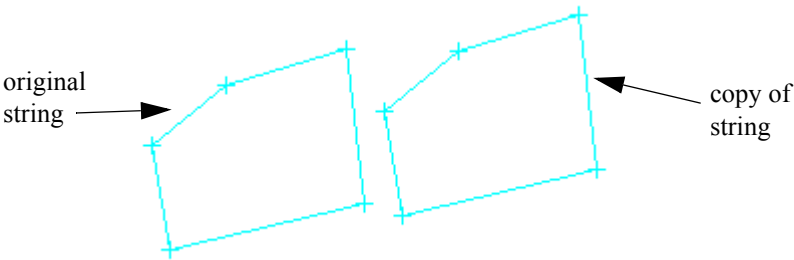
STEP 3:

A final cursor position is selected which defines a distance and direction from the base position to the final position.




STEP 4:

On accepting the final position, a copy of the selected super string is moved by the determined distance and direction.

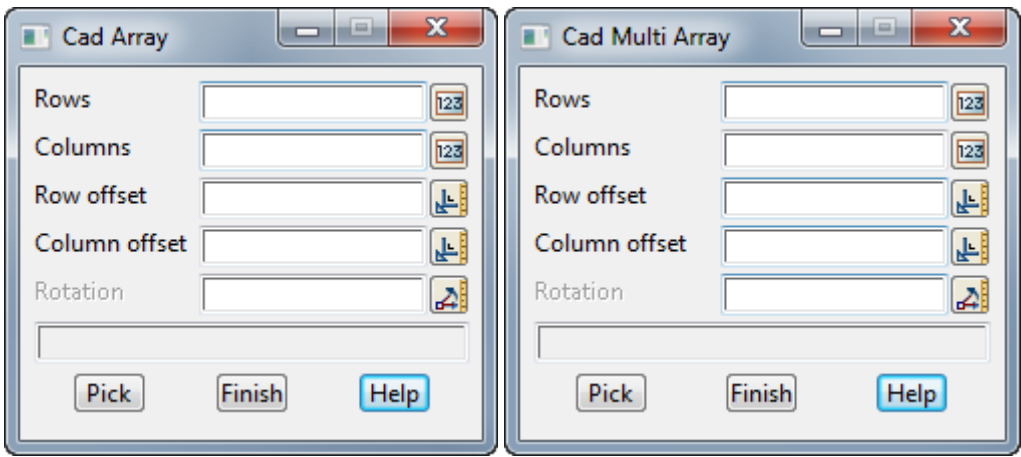


CAD Array

Position of option on menu: Strings =>CAD =>Modify =>Array
or by selection of appropriate icon from the toolbar. 

This option copies a super string a number of times. The Multipick Array option works in the same way once the *Multipick* set is selected.

On selecting **Array**, either the **Cad Array** panel (for CAD Array) or the **CAD Multi Array** panel (for CAD Multipick Array) is displayed.

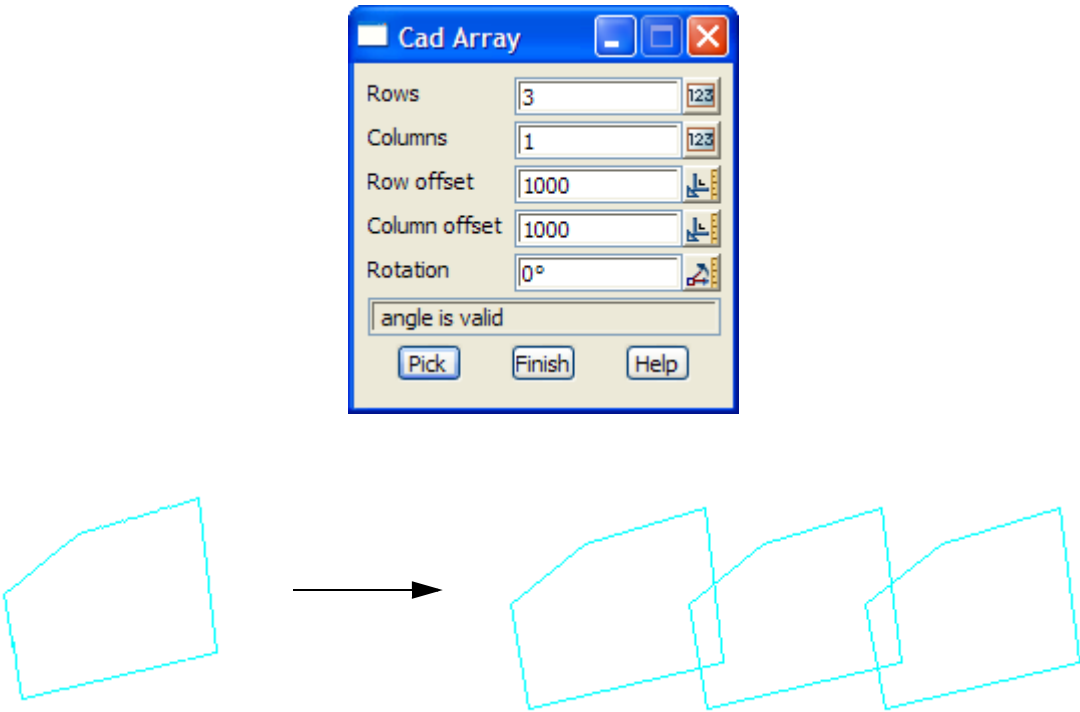


The fields and buttons used in the panel have the following functions.


Field Description	Type	Defaults	Pop-Up
Rows <i>number of rows</i>	Input box		
Columns <i>number of columns</i>	Input box		
Row offset <i>distance between the rows</i>	Input box		
Column offset <i>distance between the columns</i>	Input box		
Rotation <i>the angle to use for the rows and columns of copies</i>	angle box		
Pick <i>pick the super string to copy and when it is accepted the super string is copied</i>	button		

STEPS:

Fill in the fields in the **Cad Array** panel, click **Pick** and select the super string to copy.



CAD Rotate

Position of option on menu: Strings =>CAD =>Modify =>Rotate
or by selection of appropriate icon from the toolbar. 

This option rotates a super string.

On selecting **Rotate**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

For **CAD Multipick Rotate**, go straight to Step 2.

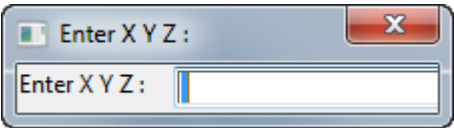
STEP 1:

Select the super string to rotate.

STEP 2:

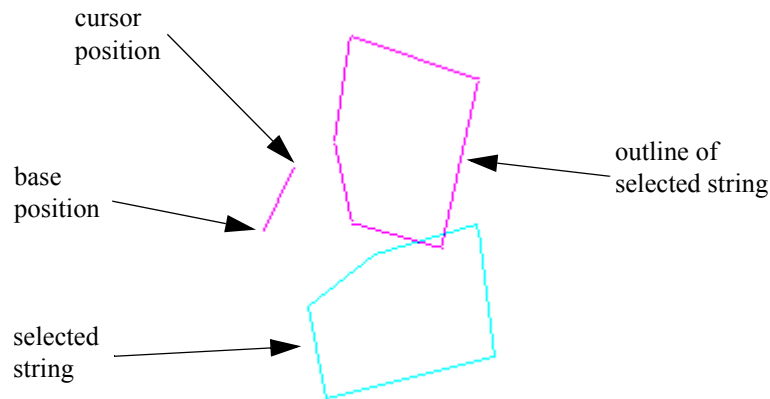
A base position is picked and then an outline of the selected string is drawn and rotated around the base position with the cursor, plus a line will be drawn from the base position to the current cursor position.

NOTE: If the <Spacebar> or any other key is pressed, an **Enter X Y Z** typed input box is displayed on the screen.



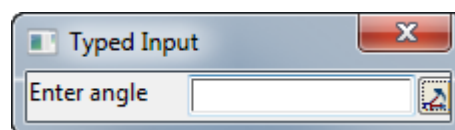
X, Y and Z are entered, separated by a space, and <Enter> accepts the values and removes the **Enter X Y Z** box from the screen. If values are not going to be typed in, clicking on **X** on the top right-hand corner of the **Enter X Y Z** box removes the box from the screen and the option returns to selecting the base position by moving the cursor.

Note: The base position is not required to lie on the string itself.



When the line has an angle of 0 degrees (bearing of 90 degrees), the outline will be on top of the selected string (*i.e.* there is no rotation). As the line rotates around the base position, the outline rotates around the base position. This rotation will continue until the final point is selected and accepted.

NOTE: If the <Spacebar> or any other key is pressed, an **Enter Angle Typed Input** box is displayed on the screen.

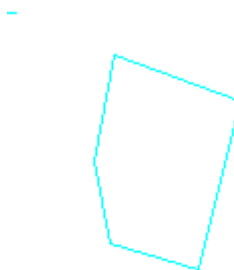


An angle (measured counter-clockwise from the positive X-axis and in [HP Notation](#)) can be typed in and <Enter> will accept the value and remove the **Typed Input** box from the screen. If a value is not going to be typed in, clicking on **X** on the top right-hand corner of the **Typed Input** box removes the box from the screen and the option returns to selecting the rotation by moving the cursor.

STEP 3:

A final cursor position is selected which defines the rotation about the base position.

On accepting the final position, or after an angle has been entered, the selected string is rotated around the base position through the defined angle.



CAD Mirror

Position of option on menu: Strings =>CAD =>Modify =>Mirror

or by selection of appropriate icon from the toolbar.

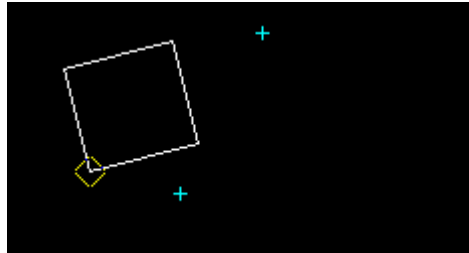
This option creates a mirrored image of a selected string.

On selecting **Mirror**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

For **CAD Multipick Mirror**, go straight to Step 2.

STEP 1:

Select a super string to mirror.

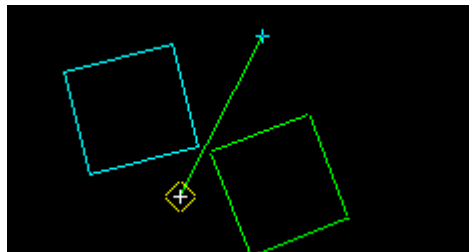


STEP 2:

Select the 1st point of the mirror axis.

The 1st point is selected with the mouse or entered via the keyboard. To enter a point with the keyboard, simply start typing or press the space bar to bring up the **X Y Z Input** box. Type the coordinates into the **XYZ Input** box and press the <Enter> key.

After the 1st point is accepted a line will be drawn from the 1st point to the position of the cursor. This line forms the mirroring axis. The outline of the reflected image will be dynamically displayed according to the changing cursor position.



STEP 3:

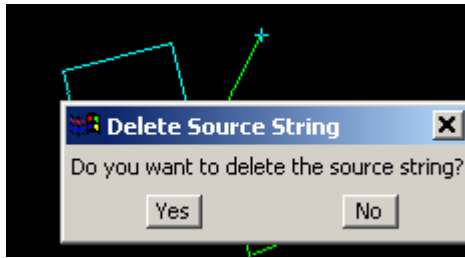
Select and accept the 2nd point of the mirror axis.

STEP 4:

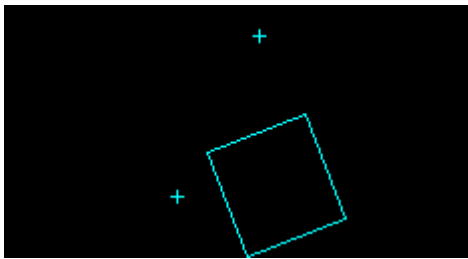
For **CAD Mirror**, after the base point is accepted, the **Delete Source String** box will appear.

Select **Yes** if you want the original super string to be deleted when the new mirrored string is constructed.

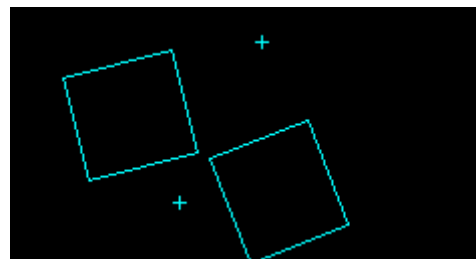
Select **No** if you want the original super string to remain when the new mirrored string is constructed.

**STEP 5:**

The selected super string will be mirrored using the information given.



Delete the source string



Don't delete the source string

For **CAD Multipick Mirror**, the original strings are always deleted.

CAD Mirror X Axis

Position of option on menu: Strings =>CAD =>Modify =>Mirror X axis

or by selection of appropriate icon from the toolbar. 

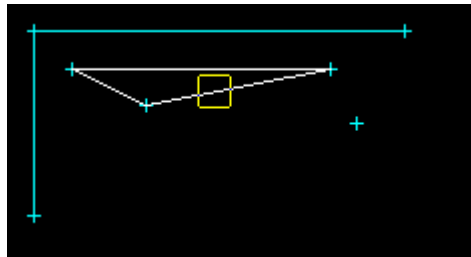
This option mirrors a string through the X axis.

On selecting **Mirror X Axis**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

For **CAD Multipick Mirror X axis**, go straight to Step 2.

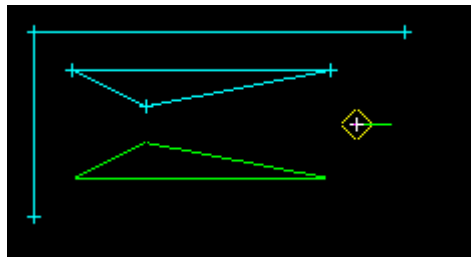
STEP 1: Picking a string

Select a super string to mirror through the X axis.



STEP 2:

After the string is accepted the position of the cursor on the Y axis determines the position of the mirror (which runs parallel to the X axis). As the cursor moves along the Y axis, a reflection of the selected string will be dynamically displayed. This will continue until a final position is selected, thus determining the mirror axis.



Select the final Y-position of the mirror X-axis.

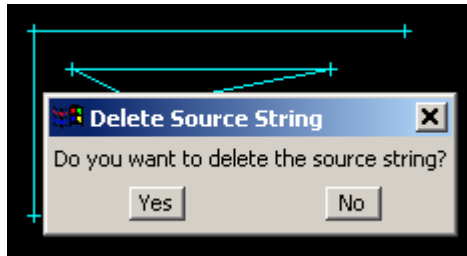
The final position is selected with the mouse or entered via the keyboard. To enter a base point with the keyboard, simply start typing or press the <Spacebar> to bring up the **Enter X Y Z** box. Type the coordinates into the **Enter X Y Z** box and press the <Enter> key.

STEP 3:

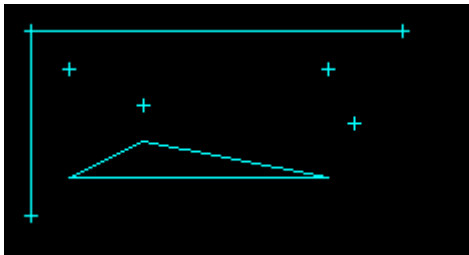
For **CAD Mirror X axis**, after the final position is accepted, a **Delete Source String** box will appear.

Select **Yes** if you want the original super string to be deleted when the new mirrored string is constructed.

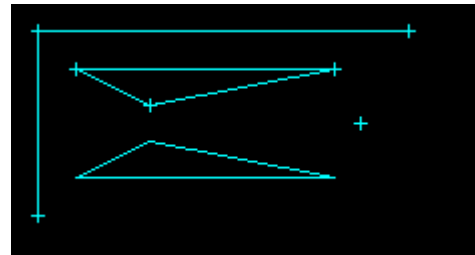
Select **No** if you want the original super string to remain when the new mirrored string is constructed.

**STEP 4:**

The selected super string will be mirrored using the information given.



Delete the source string



Don't delete the source string

For **CAD Multipick Mirror X axis**, the original strings are always deleted.

CAD Mirror Y Axis

Position of option on menu: Strings =>CAD =>Modify =>Mirror Y Axis

or by selection of appropriate icon from the toolbar. 

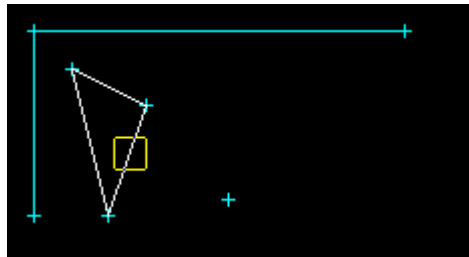
This option mirrors a string through the Y axis.

On selecting **Mirror Y Axis**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

For **CAD Multipick Mirror Y Axis**, go straight to Step 2.

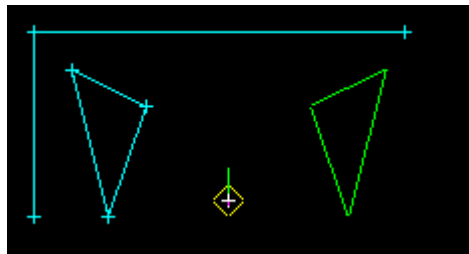
STEP 1:

Select a super string to mirror through the Y axis.



STEP 2:

After the string is accepted the position of the cursor on the X axis determines the position of the mirror (which runs parallel to the Y axis). As the cursor moves along the X axis, a reflection of the selected string will be dynamically displayed. This will continue until a final position is selected, thus determining the mirror axis.



Select the final X-position of the mirror Y-axis.

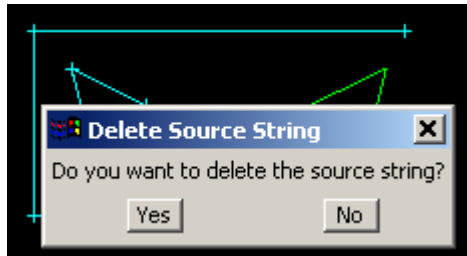
The final position is selected with the mouse or entered via the keyboard. To enter a base point with the keyboard, simply start typing or press the <Spacebar> to bring up the **Enter X Y Z** box. Type the coordinates into the **Enter X Y Z** box and press the <Enter> key.

STEP 3:

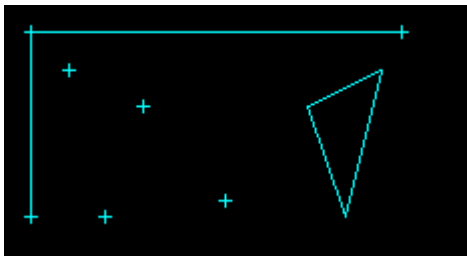
After the final position is accepted, a **Delete Source String** box will appear.

Select **Yes** if you want the original super string to be deleted when the new mirrored string is constructed.

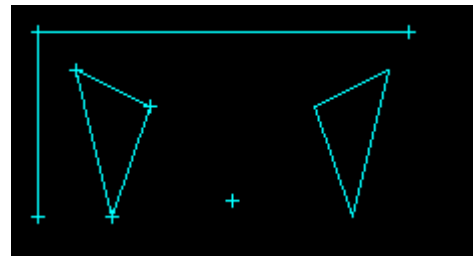
Select **No** if you want the original super string to remain when the new mirrored string is constructed.

**STEP 4:**

The selected super string will be mirrored using the information given.



Delete the source string



Don't delete the source string

CAD Scale

Position of option on menu: Strings =>CAD =>Modify =>Scale

or by selection of appropriate icon from the toolbar. 

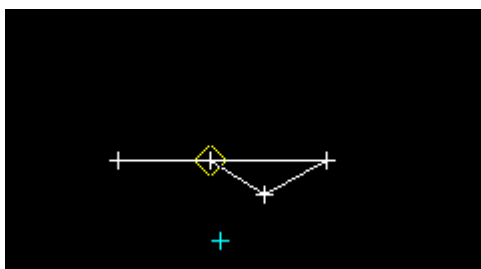
This option increases or decreases the size of a string by a given scale about a user selected origin. Go to [Scale About an Origin](#) for the definition of scaling.

On selecting **Scale**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.


For **CAD Multipick Scale**, go straight to Step 2.

STEP 1:

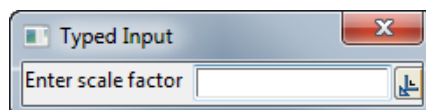
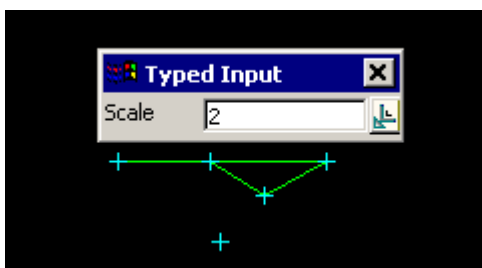
Select a super string to scale.



STEP 2:

After a string is accepted, the **Scale** Typed Input box will appear. Type the desired scale factor into the input box and press the <Enter> key. The browse button  on the Input box can be used to define the scale by measuring existing elements.

Note: the Scale/Scale Factor can be positive or negative.



STEP 3:

After a scale value has been entered the user is required to select the position of the origin.

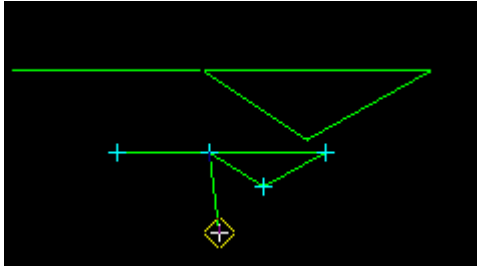
An origin position can be selected with the mouse or entered via the keyboard.

To enter an origin position with the keyboard, simply start typing or press the space bar to bring up the **Enter X Y Z** box. Type the coordinates into the **Enter X Y Z** box and press the <Enter> key.

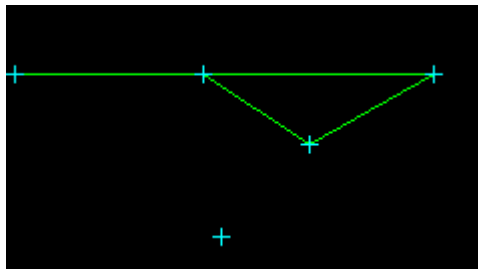
If the position of the origin is given by the cursor, the position of the scaled highlighted string moves dynamically as the position of the origin changes as the cursor moves. The final selected origin position establishes the location of the scaled string relative to the original selected string.

The dimensions of the highlighted string are defined by the Scale value.

For example, if you selected a scale of **2**, the distance between the cursor and a point on the highlighted string would be double the distance between the cursor and the corresponding point on the original super string.

**STEP 4:**

After the final position has been accepted, the original string will be removed and the newly scaled highlighted string constructed.



CAD Scale Dynamic

Position of option on menu: Strings =>CAD =>Modify =>Scale Dynamic

or by selection of appropriate icon from the toolbar. 

This option dynamically increases or decreases the size of a string.

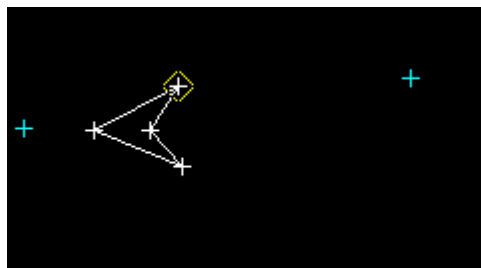
This option dynamically increases or decreases the size of a string about a user selected origin by selecting a point to define the scale factor. Go to [Scale About an Origin](#) for the definition of scaling.

On selecting **Scale Dynamic**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

For **CAD Multipick Scale Dynamic**, go straight to Step 2.

STEP 1:

Select a super string to scale.

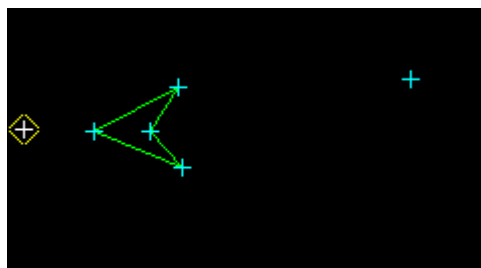


STEP 2:

An Origin point is required to be defined. An Origin point can be selected with the mouse or entered in via the keyboard.

To enter an Origin point with the keyboard, simply start typing or press the space bar to bring up the **Enter X Y Z** box. Type the coordinates into the **Enter X Y Z** box and press the <Enter> key.

To enter the origin by the cursor, simply select and accept the required origin position.



STEP 3:

For **CAD Scale Dynamic**:

After an Origin point has been accepted, the cursor then defines the Projection point.

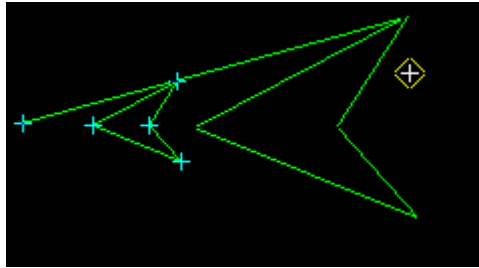
Note: the Projection Point is the cursor position dropped perpendicularly onto the line from the origin through the original point selected on the string.

The scale factor is taken to be the ratio of the distance from the projection point to the origin and the distance from the original point selected on the string to the origin.

That is,

Scale factor = (the distance from the projection point to the origin) divided by (the distance from the original point selected on the string to the origin)

The highlighted string is projected from the Origin point to the Projection point (which is being defined by the cursor).



For CAD Multipick Scale Dynamic:

After an Origin point has been accepted, a Start Scale Position is selected.

`<Pick start scale position> [picks][fast][Menu]`

After that the cursor then dynamically defines the End Scale position.

`<Pick end scale position> [picks][fast][Menu]`

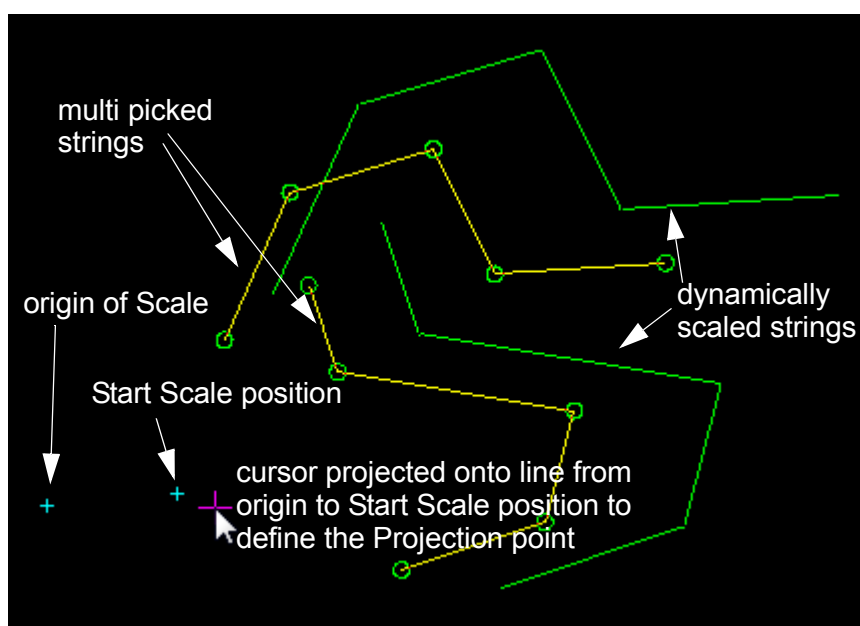
For Multipick, the Projection Point is the End Scale position dropped perpendicularly onto the line from the origin through the Start Scale position.

The scale factor is taken to be the ratio of the distance from the Projection Point to the origin and the distance from the Start Scale position to the origin.

That is,

Scale factor = (the distance from the Projection Point to the origin) divided by (the distance from the Start Scale position to the origin)

The highlighted strings are projected from the Origin point using the scale factor dynamically defined by the cursor (and hence the Projection point).



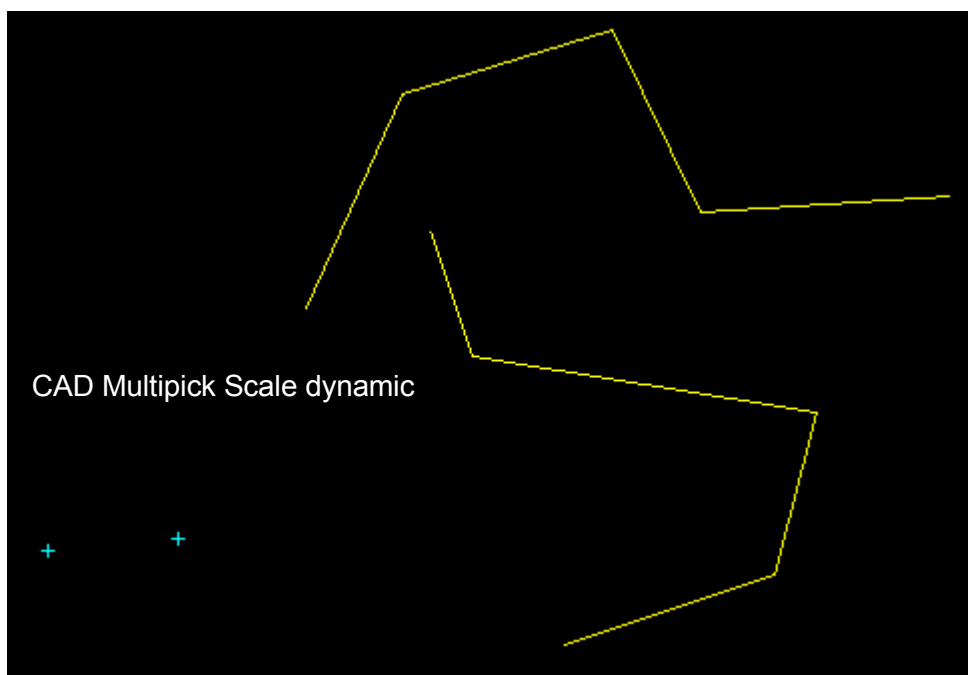
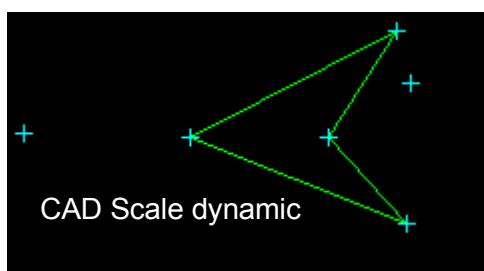
Hence for both the CAD Scale Dynamic and the CAD Multipick Scale Dynamic, the size and position of the highlighted string will move dynamically as the position of the Projection point moves with the cursor.

The highlighted string will increase in size if the cursor moves the Projection point further from the Origin than the original string point/Start Scale position, or decrease in size if the cursor moves the Projection point closer to the Origin than the original string point/Start Scale position.

This will continue until a Projection point is accepted.

STEP 4:

After the Projection point has been accepted, the new scaled strings are created and the original strings deleted.

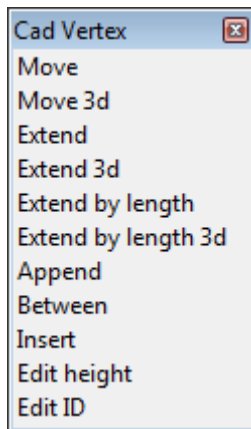


CAD Vertex

Position of option on menu: Strings =>CAD =>Vertex

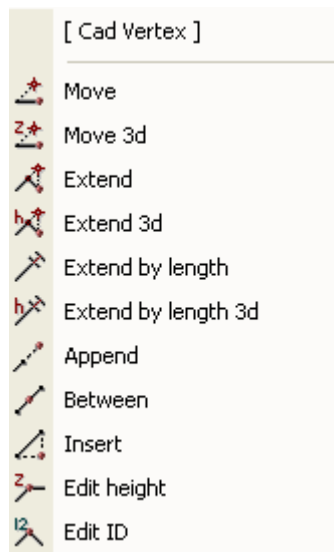
This section of documentation is a work in progress and will be updated in subsequent releases.

The Cad Vertex walk-right menu is



Menu of Options to Move Vertices

move a vertex
 move a vertex and modify its height
 move a vertex along its segment - keep the same height
 move a vertex along its segment - interpolate/extrapolate the height
 move a vertex by a given chainage distance along a segment - keep height
 move a vertex a given chainage dist along a segment - extrapolate height
 append a vertex to an existing string
 create a vertex on the segment joining two adjacent vertices of a string
 insert a vertex between two adjacent vertices of a string
 edit the height of a vertex
 edit the point (vertex) ID



These options allow the editing of vertices on super strings.

For the option *Move*, go to

Move 3d
Extend
Extend 3d
Extend by length
Extend by length 3d
Append
Between
Insert
Edit height
Edit ID

[Move a Vertex while Keeping its Height](#)
[Move a Vertex and Modify its Height](#)
[Extend a Vertex while Keeping its Height](#)
[Extend Segment and Extrapolating Heights](#)
[Extend Segment by Length and Keeping Height](#)
[Extend Segment by Length and Extrapolating Heights](#)
[Append a Vertex](#)
[New Vertex on a Segment \(Between Two Vertices\)](#)
[Insert a Vertex](#)
[Change Height of a Vertex](#)
[Edit ID](#)

Move a Vertex while Keeping its Height

Position of option on menu: Strings =>CAD =>Vertex =>Move
or by selection of appropriate icon from the toolbar.

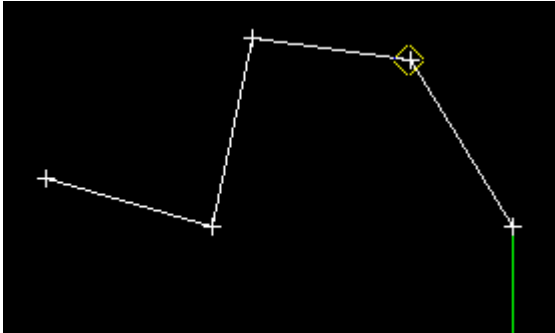


This option moves the vertex of a super string. The height of the vertex is not modified.

On selecting **Move**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

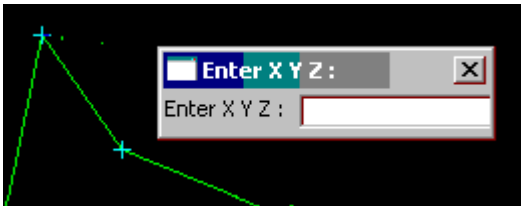
STEP 1:

A vertex on a super string is selected and accepted.



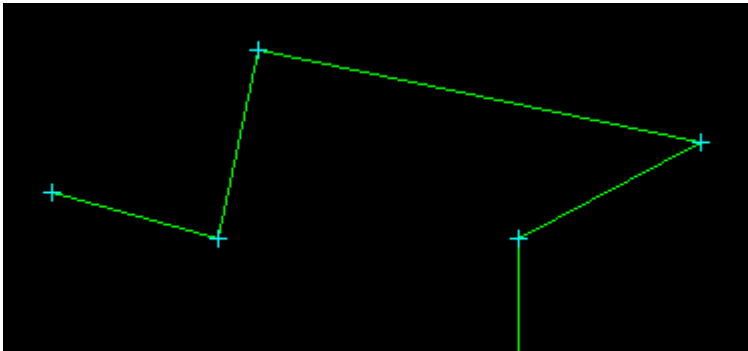
STEP 2:

The position of the selected vertex moves with the cursor until the final position of the vertex is selected and accepted. Alternatively, the user can type in the final coordinate of the vertex by the using the **Enter XYZ** box. This box is brought up by simply typing a value or by pressing the space bar.



STEP 3:

The selected vertex is moved to the new position.



Move a Vertex and Modify its Height

Position of option on menu: Strings =>CAD =>Vertex =>Move 3d
or by selection of appropriate icon from the toolbar.

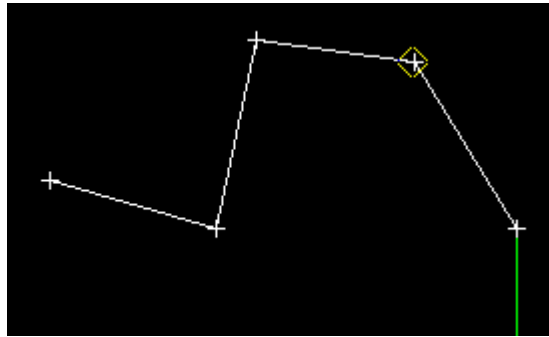


This option moves the vertex of a super string and the height of the vertex is taken from the height of the final selected position.

On selecting **Move 3d**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

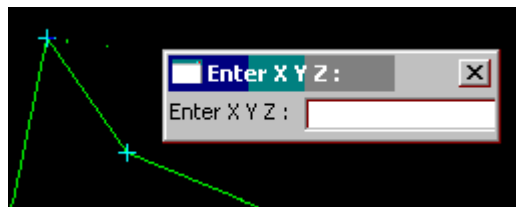
STEP 1:

A vertex on a super string is selected and accepted.



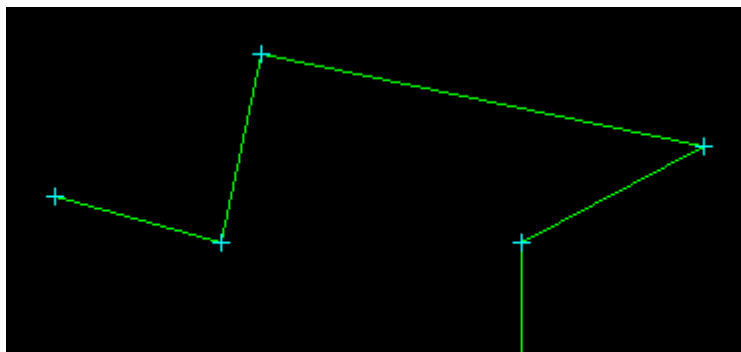
STEP 2:

The position of the selected vertex moves with the cursor until the final position of the vertex is selected and accepted. Alternatively, the user can type in the final coordinate of the vertex by the using the **Enter XYZ** box. This box is brought up by simply typing a value or by pressing the space bar.



STEP 3:

The selected vertex is moved to the new position and takes on the height of the string it is snapped to, or the Z value entered into the **Enter XYZ** box.



Extend a Vertex while Keeping its Height

Position of option on menu: Strings =>CAD =>Vertex =>Extend

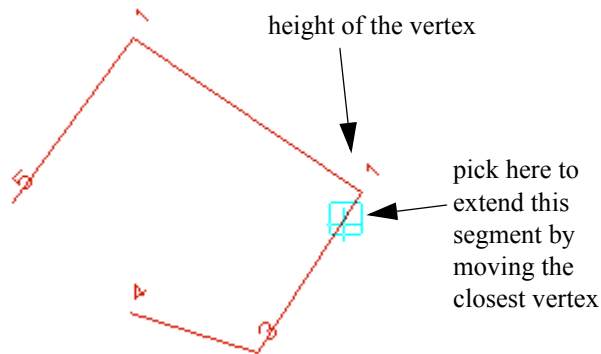
or by selection of appropriate icon from the toolbar. 

This option extends (or shortens) a segment by moving a vertex along the segment joining the vertex to its neighbouring vertex. The height of the vertex is not modified.

On selecting **Extend**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

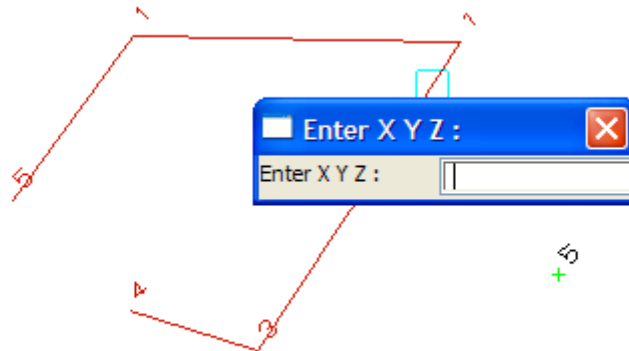
STEP 1:

Most vertices are on two segments so it is necessary to indicate which segment is to be extended, This is done by selecting **not the vertex**, but by selecting **on the segment** that is to be extended, close to the vertex to be moved.



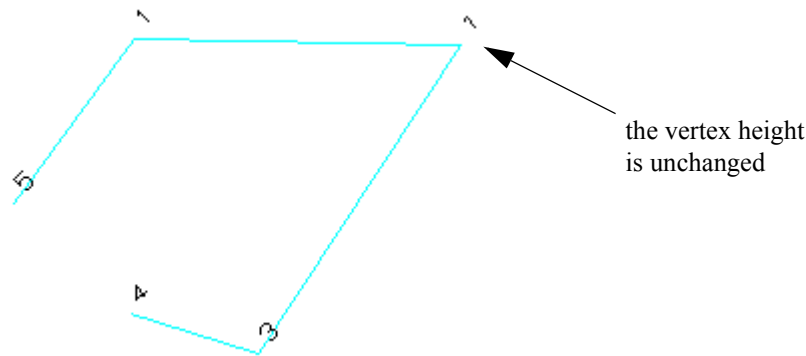
STEP 2:

As the cursor is moved, the string is redrawn reflecting the changing position of the moved vertex. The final position of the vertex is selected and accepted. Alternatively, the user can type in the final coordinate of the moved vertex into the **Enter XYZ** box. This box is brought up by simply typing a value or by pressing the space bar.



STEP 3:

The selected vertex is moved to the new position. The height of the vertex is not changed.



Extend Segment and Extrapolating Heights

Position of option on menu: Strings =>CAD =>Vertex =>Extend 3d

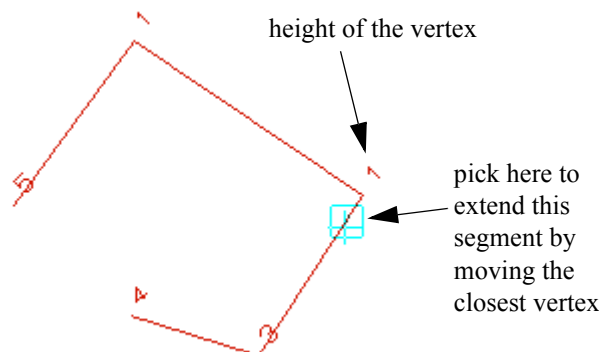
or by selection of appropriate icon from the toolbar. 

This option extends (or shortens) a segment by moving a vertex along the segment joining the vertex to its neighbouring vertex. The height of the vertex is extrapolated.

On selecting **Extend 3d**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

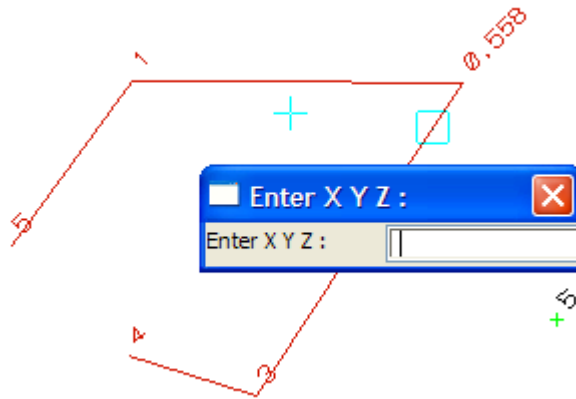
Most vertices are on two segments so it is necessary to indicate which segment is to be extended, This is done by selecting **not the vertex**, but by selecting **on the segment** that is to be extended, close to the vertex to be moved.



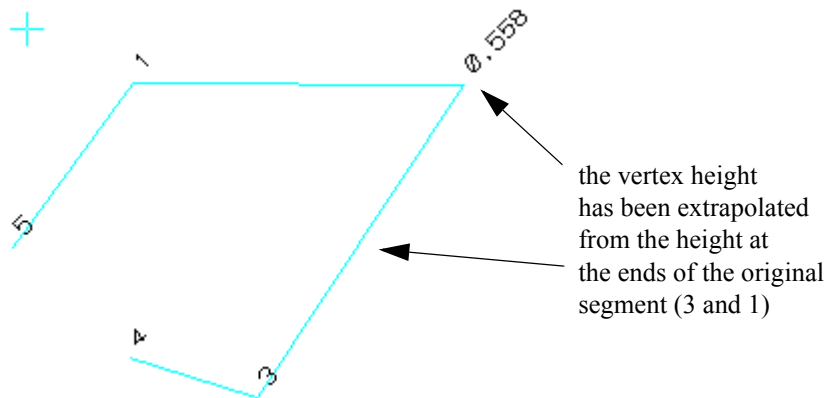
STEP 2:

As the cursor is moved, the string is redrawn reflecting the changing position of the moved vertex. The final position of the vertex is selected and accepted. Alternatively, the user can type in the final coordinate of the moved vertex into the **Enter XYZ** box. This box is brought up by simply typing a value or by pressing the space bar.

The point selected is moved to the cursor position in a rubber banding fashion. The final position of the point is selected and accepted. Alternatively, the user can enter the final coordinate value of the moved point by the Enter XYZ box. This box can be brought into view by simply typing a value or by pressing the space bar.

**STEP 3:**

The selected vertex is moved to the new position. The height of the vertex has been extrapolated from the heights at either end of the original segment.



Extend Segment by Length and Keeping Height

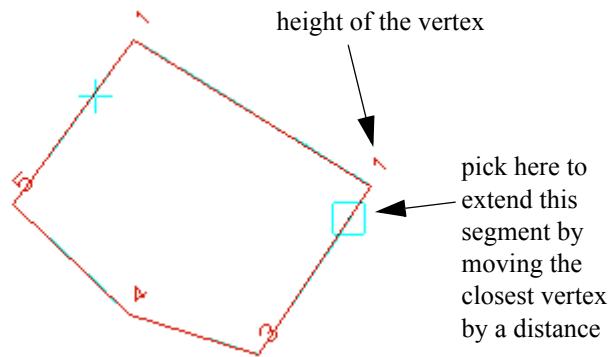
Position of option on menu: Strings =>CAD =>Vertex =>Extend by length
or by selection of appropriate icon from the toolbar.

This option extends (or shortens) a segment by moving a vertex along the segment joining the vertex to its neighbouring vertex by a user defined distance. The height of the vertex is not modified.

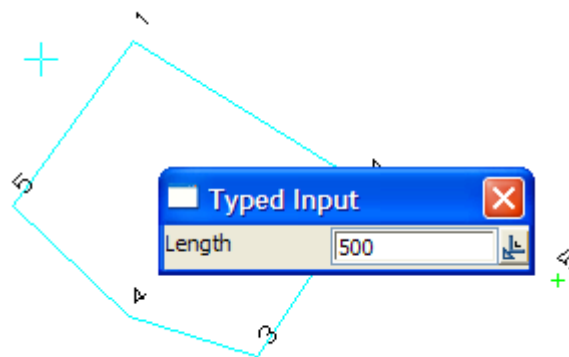
On selecting **Extend by length**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

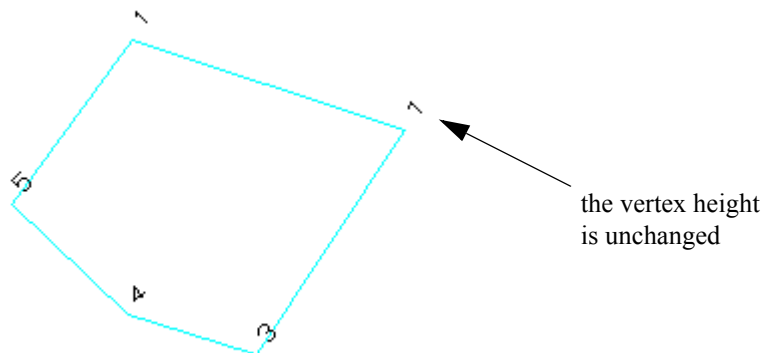
Most vertices are on two segments so it is necessary to indicate which segment is to be extended, This is done by selecting **not the vertex**, but by selecting **on the segment** that is to be extended, close to the vertex to be moved.

**STEP 2:**

The user enters the distance to extend the segment. This value is positive in the direction that the string was created.

**STEP 3:**

The point selected is moved to the new position and the string topology maintained.



Extend Segment by Length and Extrapolating Heights

Position of option on menu: Strings =>CAD =>Vertex =>Extend by length 3d

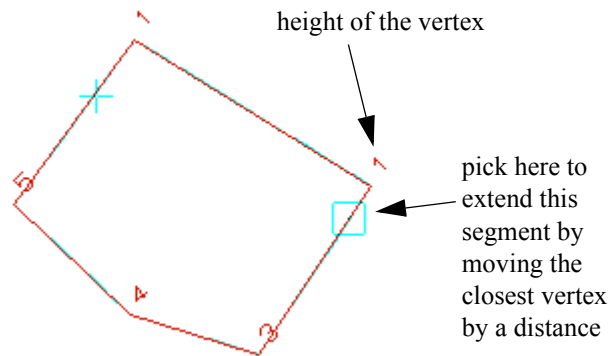
or by selection of appropriate icon from the toolbar. 

This option extends (or shortens) a segment by moving a vertex along the segment joining the vertex to its neighbouring vertex by a user defined distance. The height of the vertex is extrapolated modified.

On selecting **Extend by length 3d**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

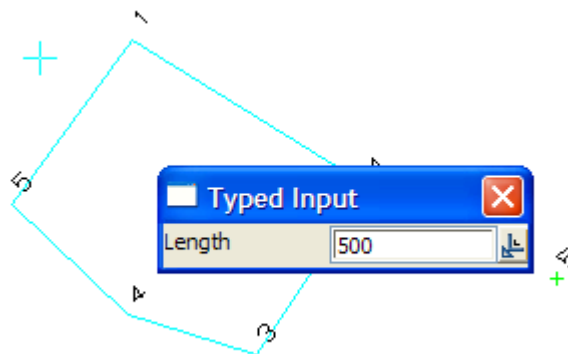
STEP 1:

Most vertices are on two segments so it is necessary to indicate which segment is to be extended, This is done by selecting **not the vertex**, but by selecting **on the segment** that is to be extended, close to the vertex to be moved.



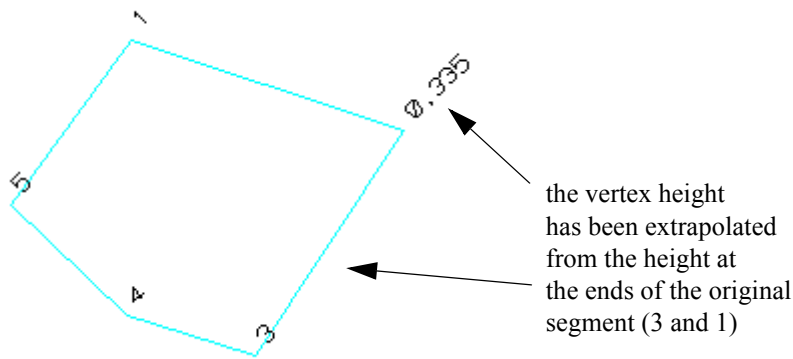
STEP 2:

The user enters the length value for which the point is to be extended by. This value is positive in the direction that the string was created.



STEP 3:

The point selected is moved to the new position and the height adjusted according to the grade of the extended segment.



Append a Vertex

Position of option on menu: Strings =>CAD =>Vertex =>Append

or by selection of appropriate icon from the toolbar. 

This option adds vertices to an existing super string.

On selecting **Append**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

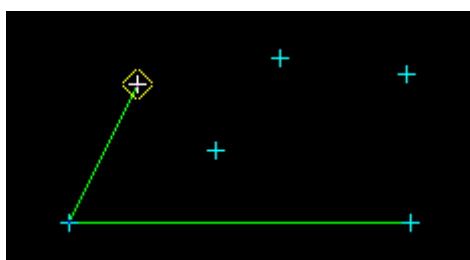
STEP 1:

Select a string by picking near the end of the string that vertices are to be added to (added to the beginning of the string - prepend, or added to the end of the string - append).



STEP 2:

After the string is accepted, a line is drawn from the end of the string to the current cursor position.

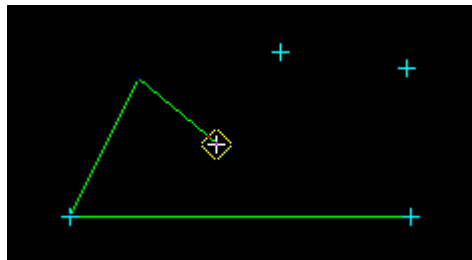


Select the position for the new vertex.

STEP 3:

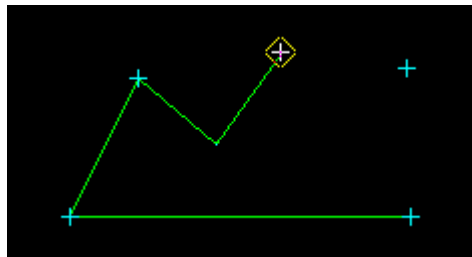
After the new vertex is accepted, a line is drawn from that vertex to the current cursor position.

That is, the process of adding points is repeated.

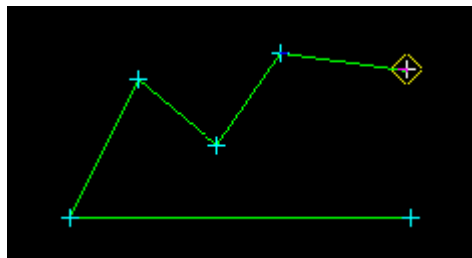


STEP 4:

This step should be repeated until the required number of vertices has been added.



STEP 5:



STEP 6:

After the required number of vertices have been added, the option is terminated for this string by pressing the <Esc> key.

New Vertex on a Segment (Between Two Vertices)

Position of option on menu: Strings =>CAD =>Vertex =>Between

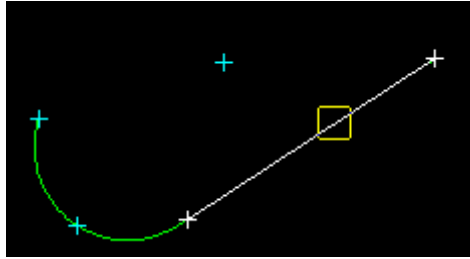
or by selection of appropriate icon from the toolbar. 

This option adds a vertex to a string but it is constrained to be on an existing segment of the string. The height of the vertex is interpolated from the heights at the end of the segment.

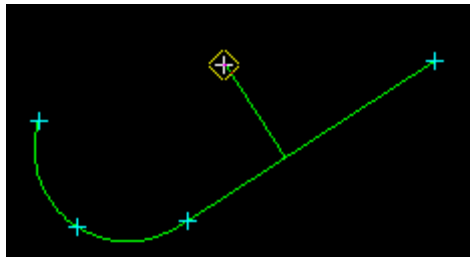
On selecting **Between**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

Select the string on the segment of the string that is to have a vertex added to it. The new vertex will be constrained to be on the segment.

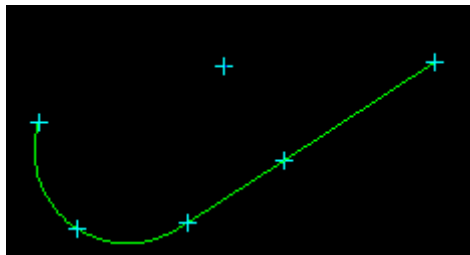
**STEP 2:**

After the segment is accepted, a perpendicular line is drawn from the selected segment of the string to the position of the cursor.

**STEP 3:**

A position is selected with the mouse or typed in via the keyboard and the new vertex is created by **dropping** the position **perpendicularly** onto the segment.

Note - to enter via the keyboard, simply start typing or press the space bar to bring up the **Enter XYZ** Input box. Type the coordinates into the XYZ Input box and press the enter key.

**Insert a Vertex**

Position of option on menu: Strings =>CAD =>Vertex =>Insert

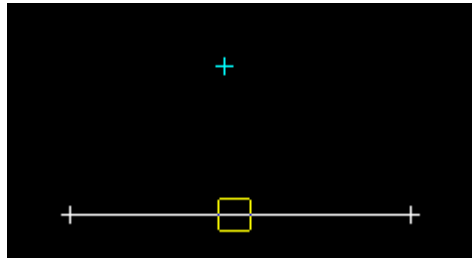
or by selection of appropriate icon from the toolbar. 

This option inserts a vertex into a string between two adjacent vertices but it is constrained to be on the existing segment joining the vertices. The height of the vertex is taken from the final selected position.

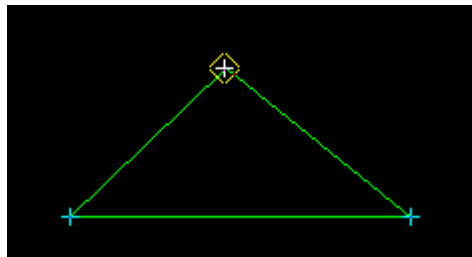
On selecting **Insert**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

Select the string on the segment of the string that is to have a vertex added to it. The new vertex is **not** constrained to be on the segment.

**STEP 2:**

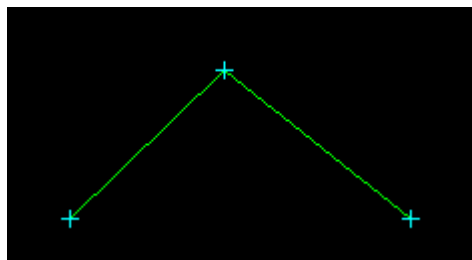
After a string is accepted, two lines will be drawn from the cursor position to either end of the selected segment.

**STEP 3:**

A final position is selected with the mouse or typed in via the keyboard and the new vertex is created at the final position.

Once the new vertex is created the original segment is no longer drawn.

Note - to enter via the keyboard, simply start typing or press the space bar to bring up the **Enter XYZ** Input box. Type the coordinates into the XYZ Input box and press the enter key.



Change Height of a Vertex

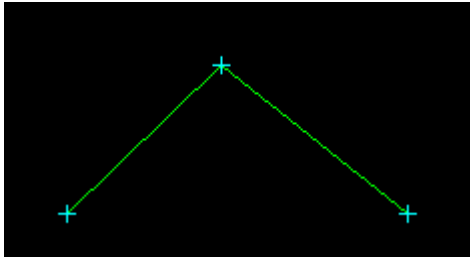
Position of option on menu: Strings =>CAD =>Vertex =>Edit height

or by selection of appropriate icon from the toolbar. 

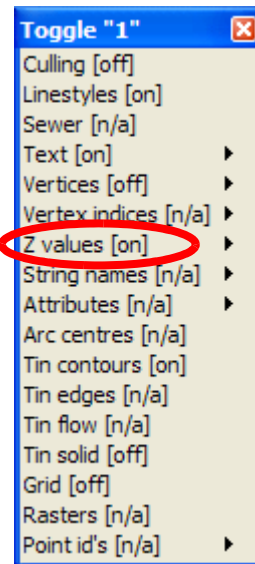
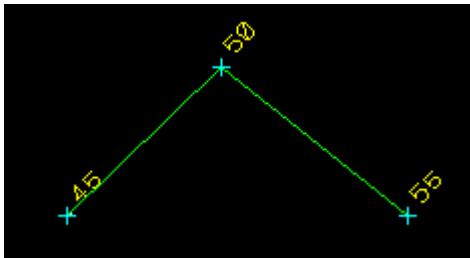
This option changes the height (z value) of a vertex.

On selecting **Edit height**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:



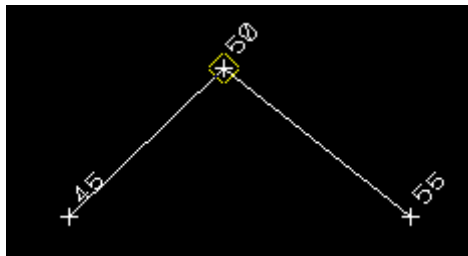
To see the effects of this option, use the **Toggle** menu to toggle on **Z values**. The height of each vertex (z value) is then displayed on the plan view so any modification to the height will be visible.



STEP 2:


Select a vertex with either the mouse or via the keyboard.

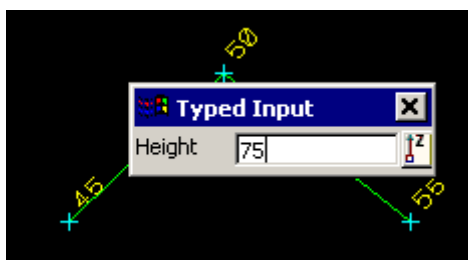
Note - to enter via the keyboard, simply start typing or press the space bar to bring up the **Enter XYZ** Input box. Type the coordinates into the **Enter XYZ** Input box and press the <Enter> key.



STEP 3:

After a point is accepted, the **Height** input box will appear with the current height displayed in it.

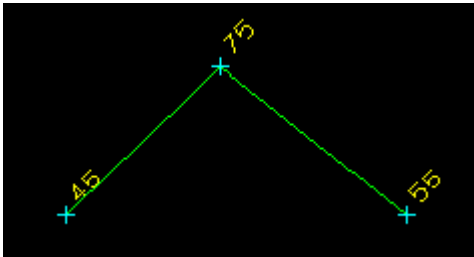
Type the new height (z value) of the vertex into the **Height** input box and press the <Enter> key. The browse button  on the Input box can also be used to define the point's height.




STEP 4:

The height (z value) of selected point will have changed to the new value.

If z values have been turned on, the new value will be displayed in the view.

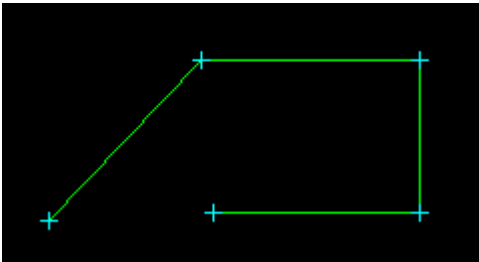


Edit ID

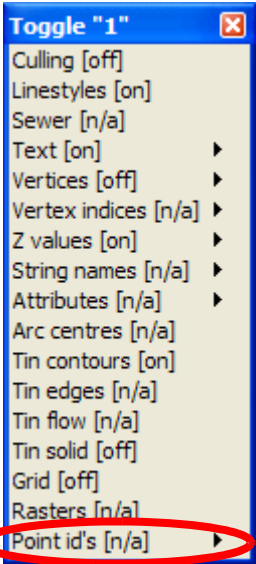
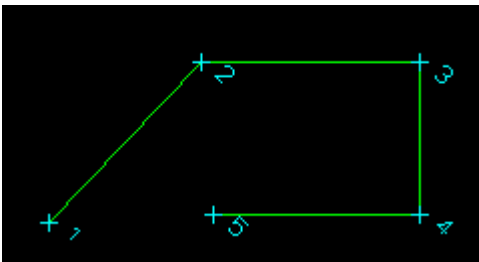
Position of option on menu: Strings =>CAD =>Vertex =>Edit ID
or by selection of appropriate icon from the toolbar. 

This option changes the point id of the vertex of a super string.
On selecting **Edit ID**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

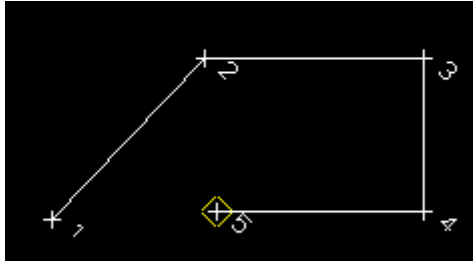


To see the effects of this option, use the **Toggle** menu to toggle on **Point id's**. The Point id of each vertex is then displayed on the plan view so any modification to the point id will be visible.

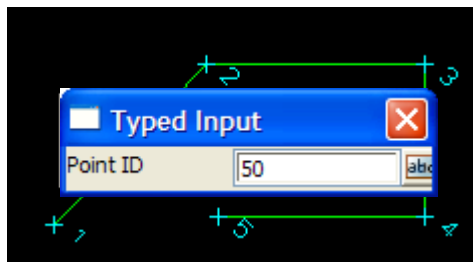


STEP 2:

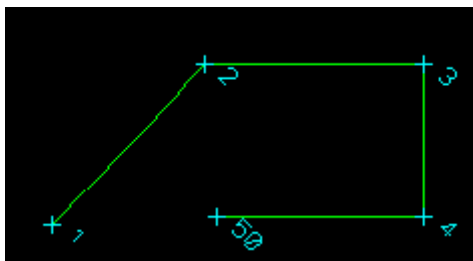
Select a vertex with either the mouse or via the keyboard.
Note - to enter via the keyboard, simply start typing or press the space bar to bring up the **Enter XYZ** Input box. Type the coordinates into the **Enter XYZ** Input box and press the Enter key.

**STEP 3:**

After the vertex is accepted, the **Point ID** input box will appear. Type the point id into the input box and press the Enter key.

**STEP 4:**

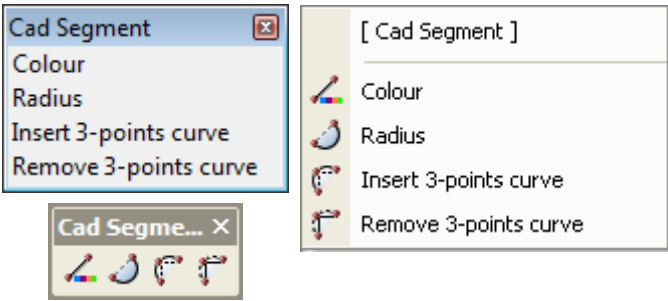
The point id of selected vertex is changed to the new value. If Point id's have been turned on, the new value will be displayed in the view.



CAD Segment

Position of option on menu: Strings =>CAD =>Segment

The Cad Segment walk-right menu is




For the option *Colour*, go to
Radius
Insert 3-points curve
Remove 3-points curve

[Colour](#)
[Radius](#)
[Insert 3-points curve](#)
[Remove 3-points curve](#)

Colour

Position of option on menu: Strings =>CAD =>Cad Segment =>Colour

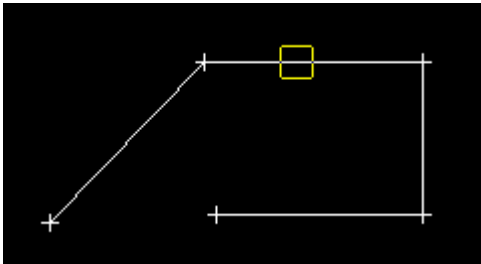
or by selection of appropriate icon from the toolbar. 

This option changes the colour of a selected segment.


On selecting **Segment colour**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

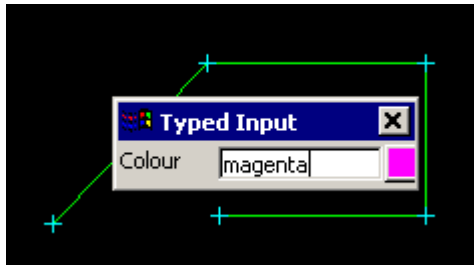
STEP 1:

Select the segment of the super string that is to have a colour change.

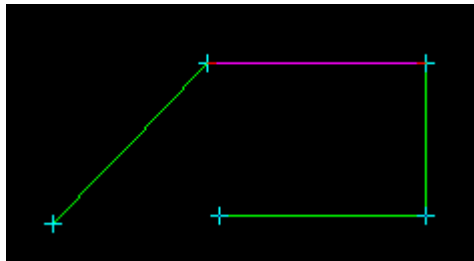


STEP 2:


After the segment is accepted, the **Colour** Input box will appear. Type the desired colour into the Input box and press the enter key. Alternatively you can select a colour from a list by clicking the browse button  on the Input box.

**STEP 3:**

The colour of the selected segment is drawn in the new colour.

**Radius**

Position of option on menu: Strings =>CAD =>Cad Segment =>Radius

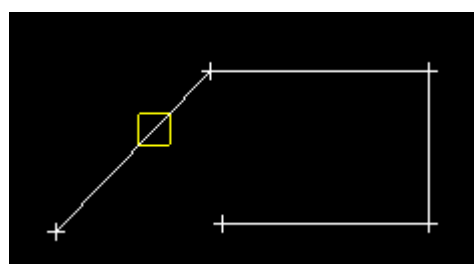
or by selection of appropriate icon from the toolbar. 


This option changes the radius of a segment.

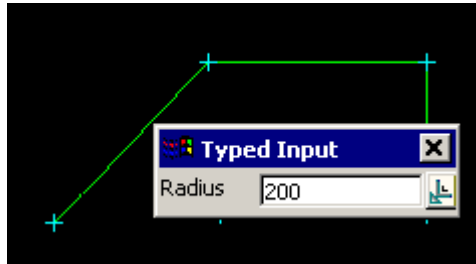
On selecting **Segment radius**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

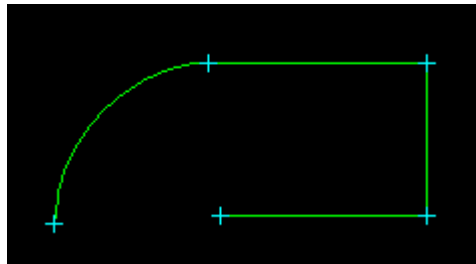
Select the segment of the super string that is to have a change of radius.

**STEP 2:**

After the segment is accepted, the **Radius** box will appear. Type the desired radius into the Input box and press the enter key. The browse button  on the Input box can be used to define the radius by measuring existing elements.

**STEP 3:**

The selected segment is then drawn with the new radius.

**Insert 3-points curve**

Position of option on menu: Strings =>CAD =>Cad Segment =>Insert 3-points curve

or by selection of appropriate icon from the toolbar. 

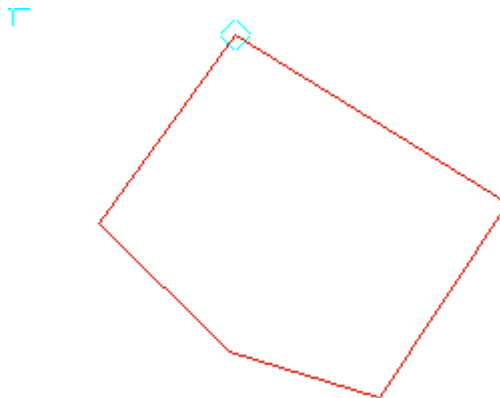
This option allows the creation of a 3 point curve using 2 existing segments.

On selecting **Insert 3pt curve**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

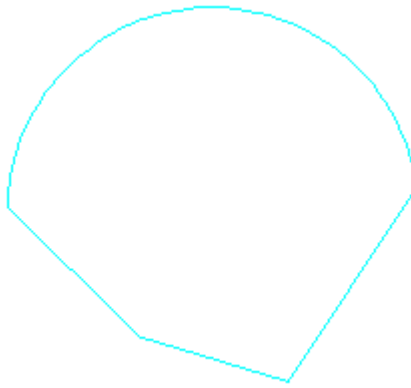
STEP 1:

Select a vertex of a super string a vertex with a segment on either side, or segment of a super string.

If a **vertex** is selected, that vertex will be the middle vertex of the constructed 3 point curve. If a **segment** is selected, the closest vertex will become the **middle** vertex of the 3 point curve.


**STEP 2:**

After the vertex or segment is selected and accepted, an arc is through the three vertices is calculated and its radius used for the tow segments on either side of the vertex.



Remove 3-points curve

Position of option on menu: Strings =>CAD =>Cad Segment =>Remove 3-points curve

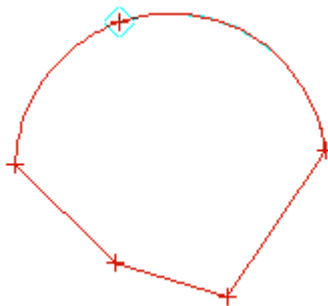
or by selection of appropriate icon from the toolbar. 

This option removes the arcs from either side of a selected vertex. If a segment is selected, the closest vertex is used and the arcs removed from either side of the vertex,

On selecting **Remove 3pt curve**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

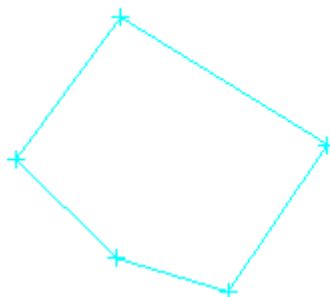
STEP 1:

Select a vertex of a super string with arcs on one or two sides of the vertex.



STEP 2:

After the vertex is selected and accepted, arc on either side will removed (the radius is set to zero). Two line segments are then drawn.

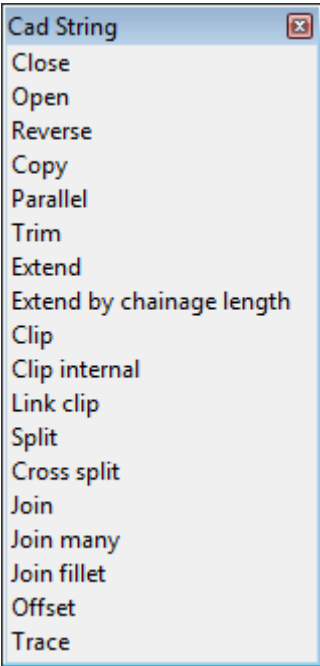


CAD Edit Strings

Position of option on menu: Strings =>CAD =>String

These options are currently under development.

The Cad String walk-right menu is



Menu of Options to Edit Strings

- close a string
- open a string
- reverse the direction of a string
- copy a string
- parallel a string
- trim a string back to a selected string
- extend a string until it cuts a selected string
- extend a string by a typed chainage length
- clip a string and keep the outer strings
- clip a string and keep the internal string
- deletes the selected link from the string (making two strings)
- split a string
- splits two strings where they first intersect each other
- join two strings
- join many strings
- fillet and join
- string parallel and more
- trace over parts of strings to form a new string



For the option *Close*, go to

- | | |
|----------------------------------|--------------------------------------------------------|
| <i>Open</i> | Close String |
| <i>Reverse</i> | Open String |
| <i>Copy</i> | Reverse a String |
| <i>Parallel</i> | Copy a String |
| <i>Trim</i> | Parallel a String |
| <i>Extend</i> | Trim a String |
| <i>Extend by chainage length</i> | Extend a String |
| <i>Clip</i> | Extend String by Chainage Length |
| <i>Clip internal</i> | Clip String |
| <i>Link clip</i> | Delete an Internal Section of a String |
| <i>Split</i> | Delete a Segment |
| <i>Cross split</i> | Split String |
| <i>Join</i> | Split Crossing Strings |
| <i>Join many</i> | Join String |
| <i>Join fillet</i> | Join String Many |
| <i>Offset</i> | Join Fillet |
| <i>Trace</i> | Offset |
| | Trace |

Close String

Position of option on menu: Strings =>CAD =>String=>Close

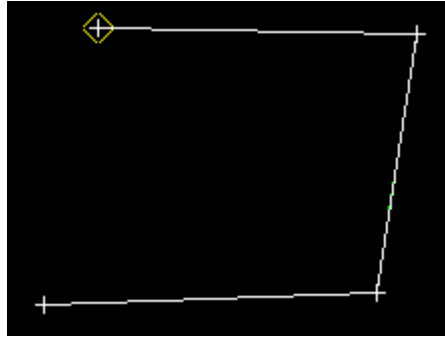
or by selection of appropriate icon from the toolbar. 

This option closes an open string.

On selecting **Close**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

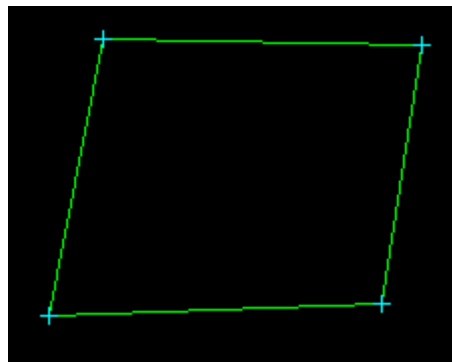
An open string is selected and accepted.



STEP 2:

The string is closed

After closing of a string, the option restarts so that another string can be selected. Picking Cancel from the Pick Ops menu, hitting <esc> or selecting another option terminates the option.



Open String

Position of option on menu: Strings =>CAD =>String=>Open

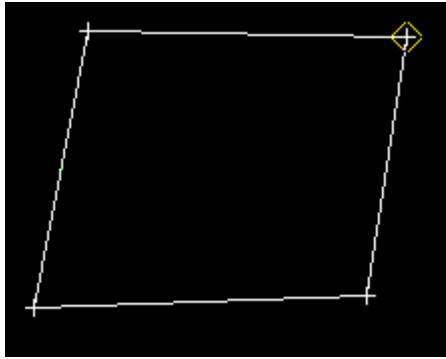
or by selection of appropriate icon from the toolbar. 

This option opens a closed string.

On selecting **Open**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

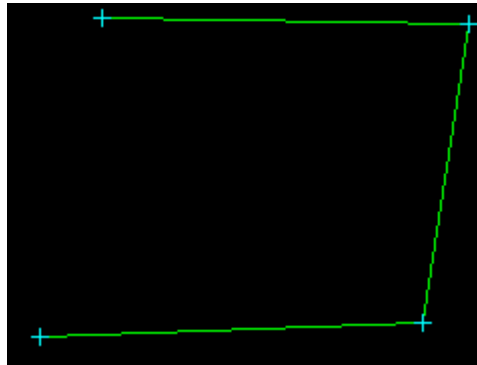
A closed string is selected and accepted.

**STEP 2:**

The string is opened by deleting the last segment of the closed string.

Note - this may not be where the string was selected.

After opening of a string, the option restarts so that another string can be selected. Picking Cancel from the Pick Ops menu, hitting <esc> or selecting another option terminates the option.

**Reverse a String**

Position of option on menu: Strings =>CAD =>String=>Reverse

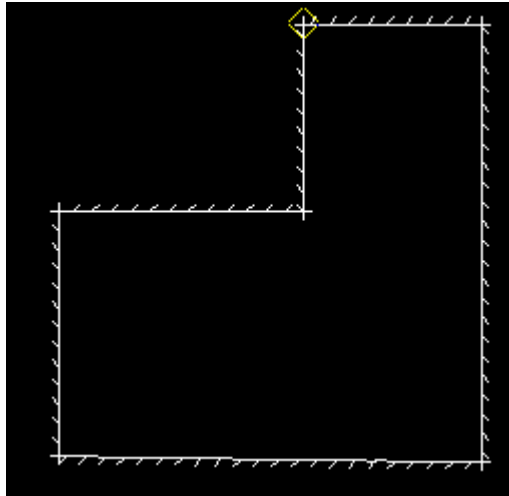
or by selection of appropriate icon from the toolbar. 

This option reverses the direction of a string

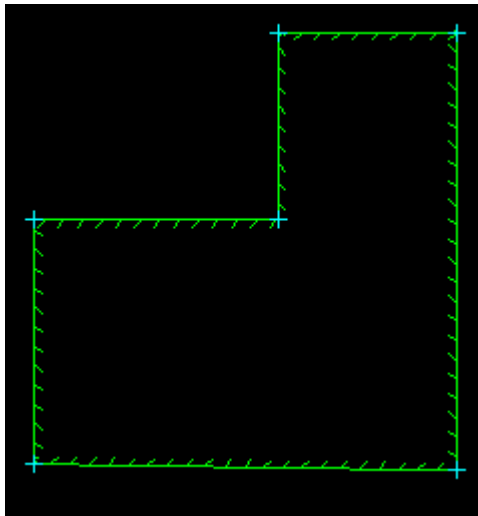
On selecting **Reverse**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

A string is selected and accepted.

**STEP 2:**

The string is reversed.



After reversing of a string, the option restarts so that another string can be selected. Picking **Cancel** from the **Pick Ops** menu, hitting <esc> or selecting another option terminates the option.

Copy a String

Position of option on menu: Strings =>CAD =>String=>Copy

or by selection of appropriate icon from the toolbar. 

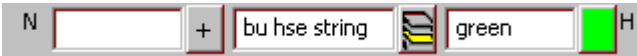
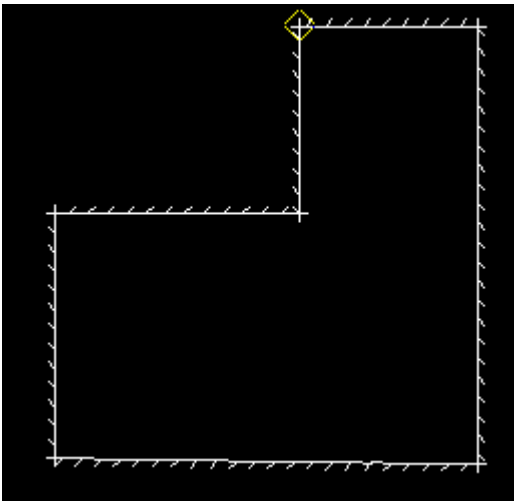
This option copies a string. The copied strings takes its attributes from the **Cad Control Bar**.

Copy is particularly helpful in backing up strings.

On selecting **Copy**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

A string is selected and accepted. The copied string will take on the values in the control bar at the time of accepting.



STEP 2:

A copy of the original string will be saved into the model **bu hse string**.

Parallel a String

Position of option on menu: Strings =>CAD =>String=>Parallel

or by selection of appropriate icon from the toolbar. 

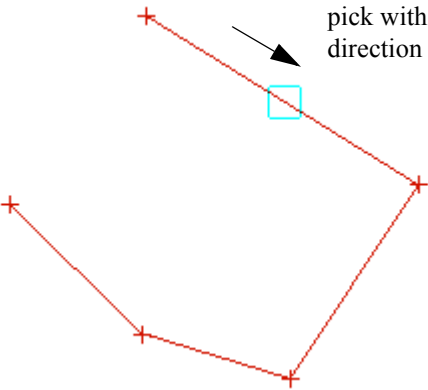
This option parallel a string by a given to a selected string.

Note that if there are arcs in the string, the string can not be paralleled by a distance that would collapse the arcs.

On selecting **Parallel**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

The string to parallel is picked with direction. The direction determines what it means to parallel to the right or left of the string.

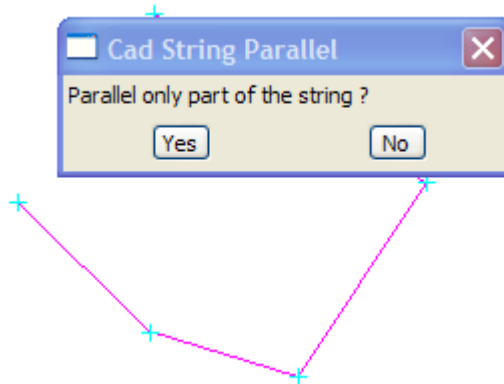


STEP 2:

The parallel option can be applied to **all** of the selected string or only **part** of the string.

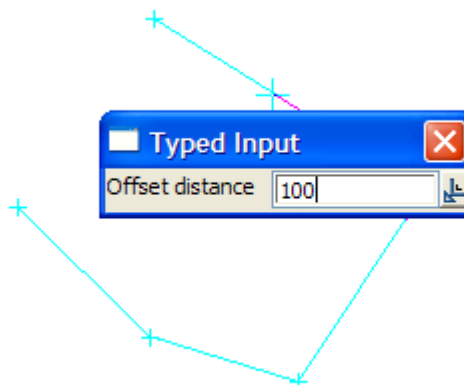
After the string is selected, a panel is displayed asking if only part of the string is to be paralleled.

If only part of the string is to be paralleled (i.e. **yes** selected) the user picks the start and end positions of where the string is to be paralleled. This does not necessarily have to be at the end of the segments as the user can select a position anywhere on the segment to define these values. If the whole string is to be paralleled the user should select **no**.



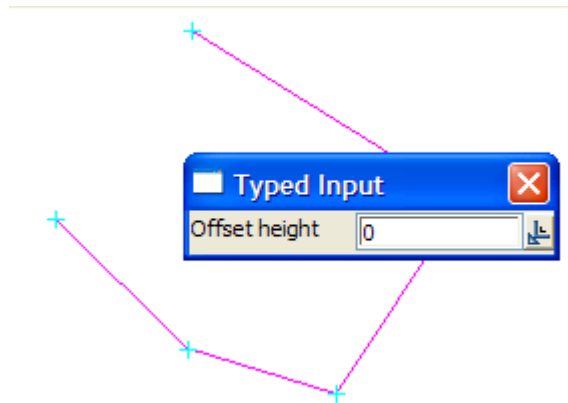
STEP 3:

The user is prompted for the parallel distance. Positive distance is to the right of the selected string. Negative to the left.

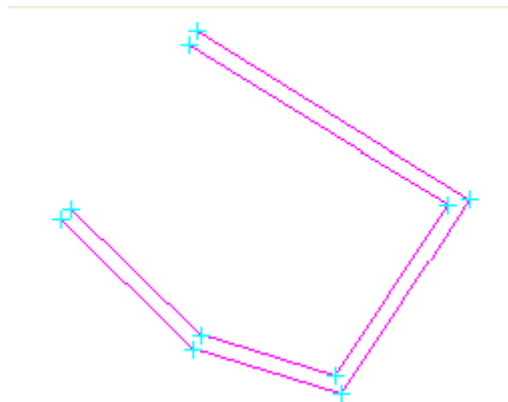


STEP 4:

The user is prompted for the offset height. This height value will be added to the selected string values to produce the heights for the paralleled string.

**STEP 5:**

The paralleled string is then generated using the supplied information.

**Trim a String**

Position of option on menu: Strings =>CAD =>String=>Trim

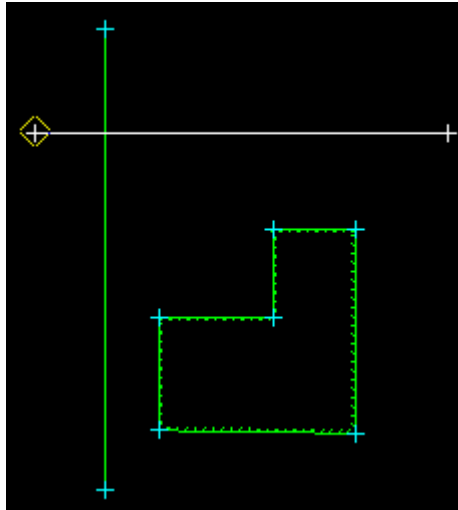
or by selection of appropriate icon from the toolbar. 

This option trims a string to another nominated cutting string.

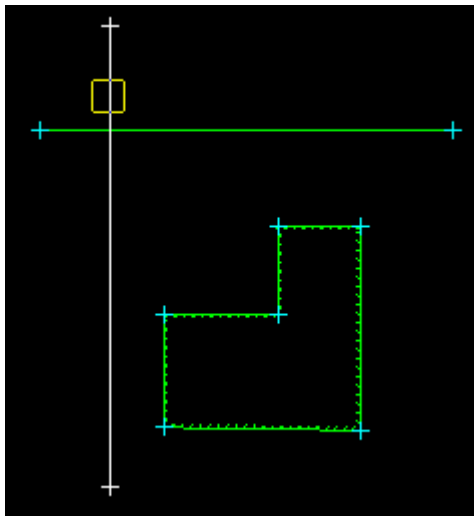
On selecting **Trim**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

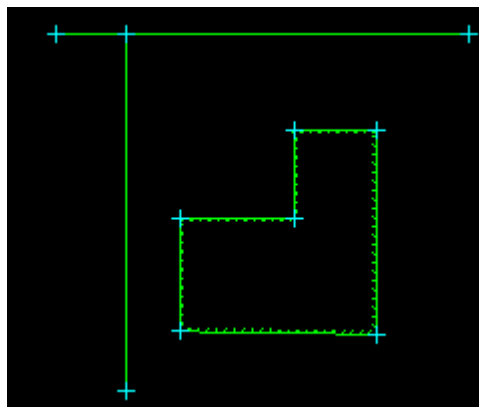
The cutting string which will be used to define the trim extent is selected and accepted.

**STEP 2:**

The string to trim is selected. The position of the pick relative to the cutting string will dictate which part of the string will be trimmed. In this case, the selection is above the cutting string and so the trim will be of the top part of the string.

**STEP 3:**

The string is trimmed.



Extend a String

Position of option on menu: Strings =>CAD =>String=>Extend

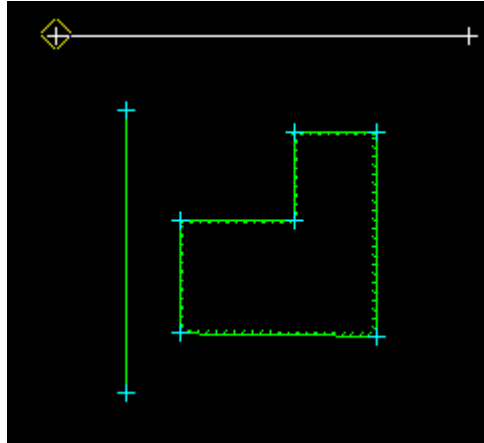
or by selection of appropriate icon from the toolbar. 

This option extends a string to a another nominated string.

On selecting **Extend**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

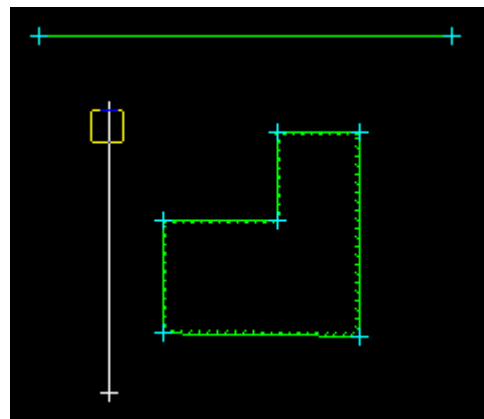
STEP 1:

The string to extend to is selected and accepted.



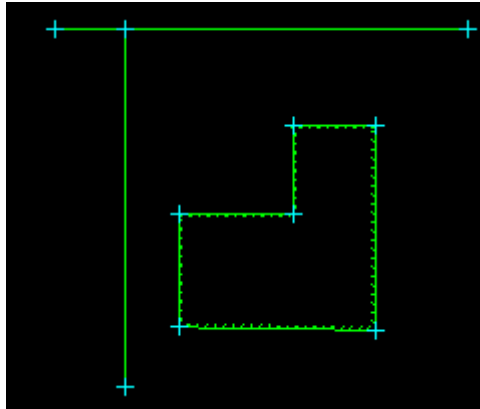
STEP 2:

The string to extend **to** selected and accepted



STEP 3:

The string is extended.



Extend String by Chainage Length

Position of option on menu: Strings =>CAD =>String=>Extend by chainage length

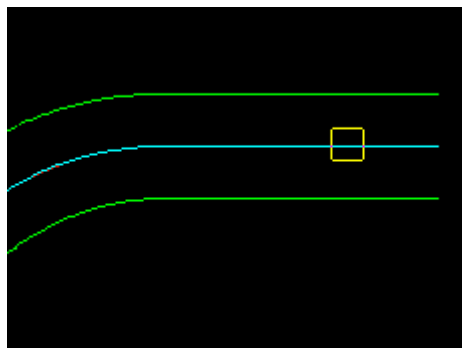
or by selection of appropriate icon from the toolbar. 

This option extends a string by a given chainage value.

On selecting **Extend by chainage length**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

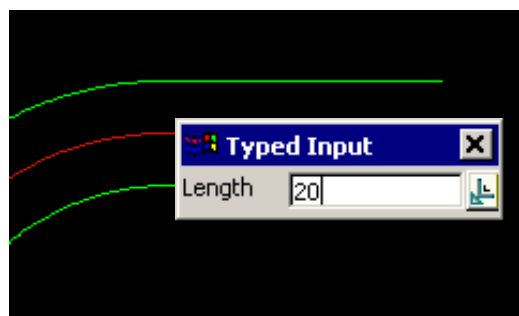
STEP 1:

The string to extend is selected and accepted.



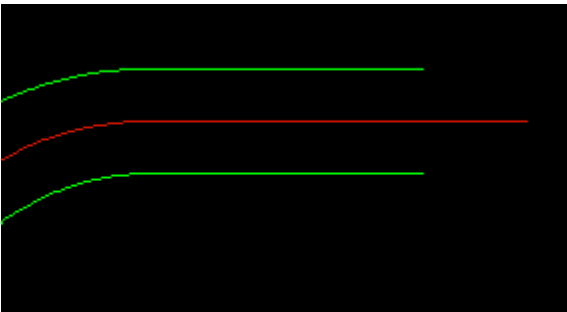
STEP 2:

The chainage length to extend the string is entered into the **Length** input Box. Positive is in the direction of the string. Negative in the opposite direction of the string.



STEP 3:

The string is extended by the given chainage amount.



Clip String

Position of option on menu: Strings =>CAD =>String=>Clip
or by selection of appropriate icon from the toolbar.

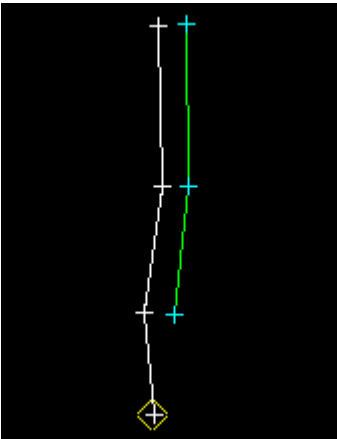


This option deletes part of a string.

On selecting **Clip**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

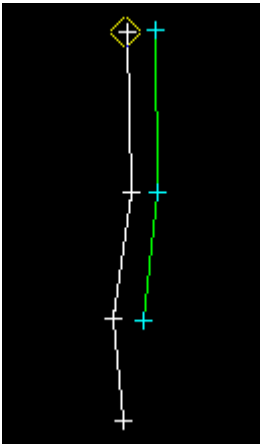
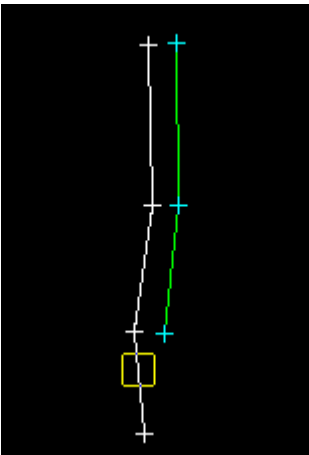
The string to be clipped is selected and accepted.



STEP 2:

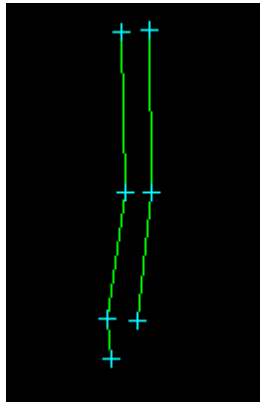
The first and second positions defining what part of the string is to **remain** are selected and accepted.

The positions do not have to be at vertices but can be anywhere on segments



STEP 3:

The string is clipped.



Delete an Internal Section of a String

Position of option on menu: Strings =>CAD =>String=>Clip internal

or by selection of appropriate icon from the toolbar. 

This option deletes an internal part of a string and leaves the two end sections.

On selecting **Clip internal**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

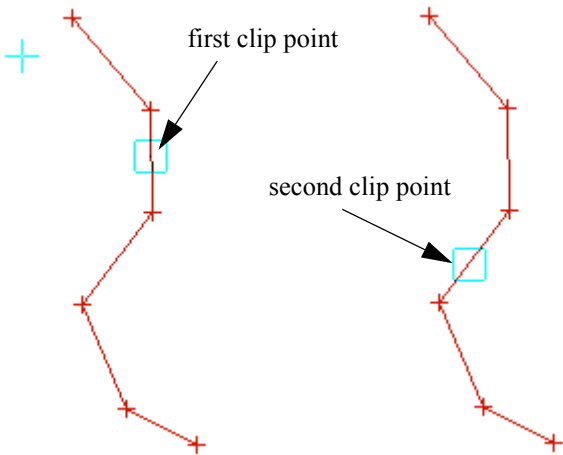
The string to be clipped is selected and accepted.

**STEP 2:**

The first and second position defining what part of the string is to **remain** is selected and accepted. This does not necessarily have to be at the end of the segments as the user can select a position anywhere on the segment to define these values.

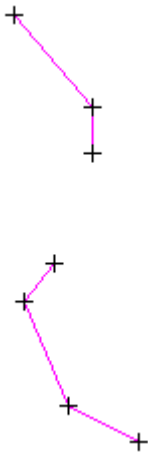
The first and second positions defining what part of the string is to be **deleted** are selected and accepted.

The positions do not have to be at vertices but can be anywhere on the segments




STEP 3:

The part of the string between the two selected clip points is deleted leaving two strings.



Delete a Segment

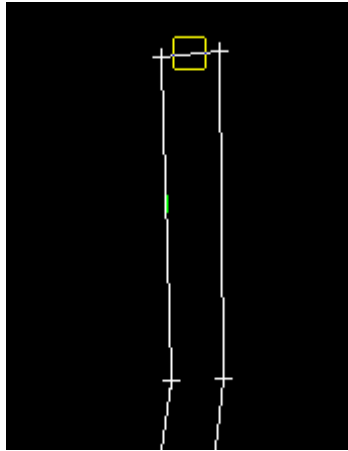
Position of option on menu: Strings =>CAD =>String=>Link clip
or by selection of appropriate icon from the toolbar. 

This option deletes a segment from a string.

On selecting **Link clip**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

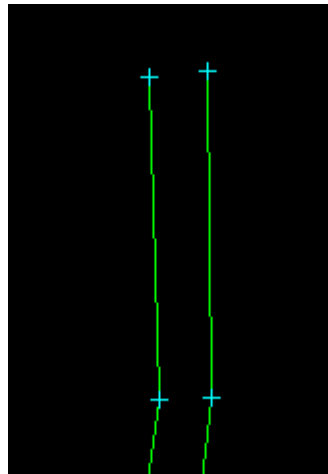
STEP 1:

The **segment** to be deleted is selected and accepted.

**STEP 2:**

The selected segment is deleted.

Note - unless the selected string was a closed string, two strings are produced.

**Split String**

Position of option on menu: Strings =>CAD =>String=>Split

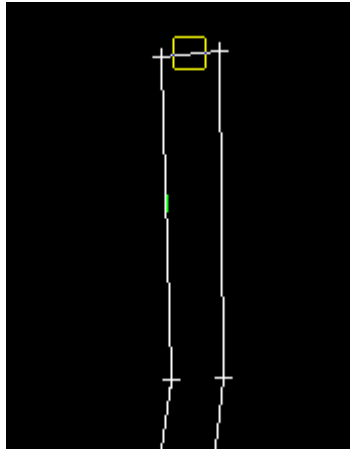
or by selection of appropriate icon from the toolbar. 

This option splits one string into two strings at a given split position.

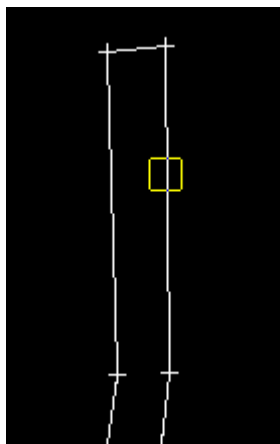
On selecting **Split**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

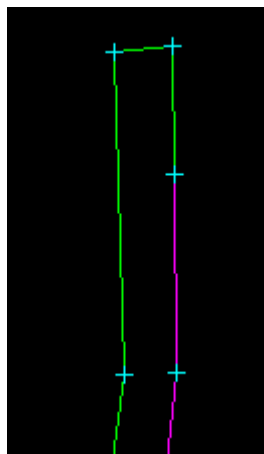
The string to be split is selected and accepted.


**STEP 2:**

The split position is selected and accepted.

**STEP 3:**

The split is made at the position selected. If no vertex exists at that position, a vertex is created.

**Split Crossing Strings**

Position of option on menu: Strings =>CAD =>String=> Cross split
or by selection of appropriate icon from the toolbar. 

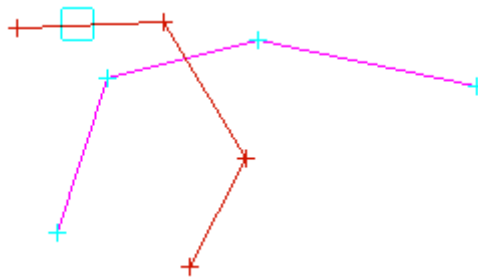
This option splits two crossing strings at the position of their crossing.

If there are multiple intersections between the two strings, then it splits the strings at the intersection that is the shortest distance to a pick position.

On selecting **Cross split**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

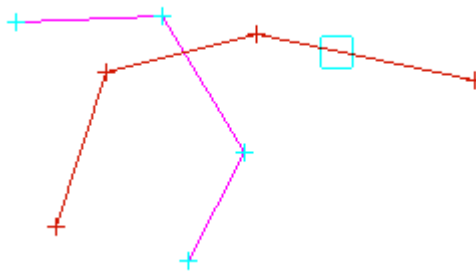
STEP 1:

Pick the first string.



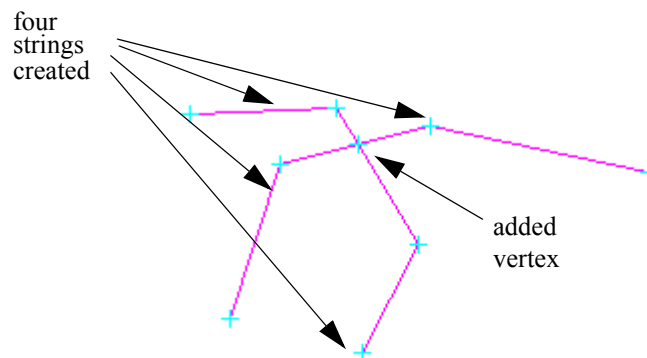
STEP 2:

Pick the second string.




STEP 3:

The two strings are then split where the strings crossed (at the intersection that is the shortest distance to a pick position). This will create four strings.



Join String

Position of option on menu: Strings =>CAD =>String=>Join
or by selection of appropriate icon from the toolbar. 

This option joins two super strings together at their end points.

There are four possible ways of joining the strings and the required case is determined by picking the strings with direction.

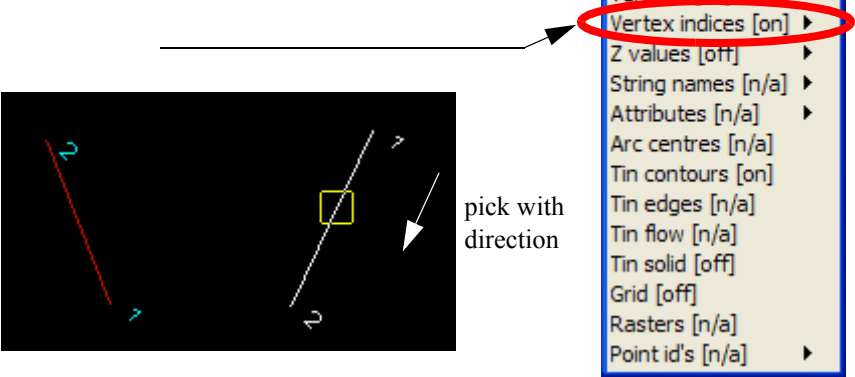
On selecting the **Join** option, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

Select and accept a super string *with direction*.

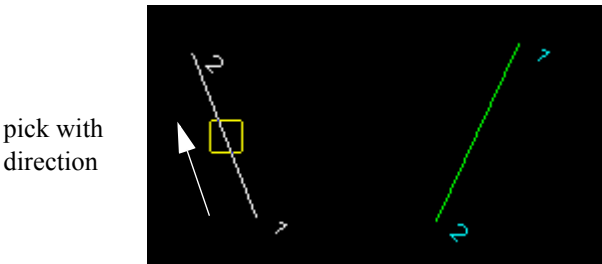
For notes on picking strings with direction, see [Picking with Direction](#) in the chapter [Tools and Concepts](#).

Note: *Vertex indices* can be displayed by toggling the option on the Toggle Menu.



STEP 2:

Select and accept another super string *with direction*.



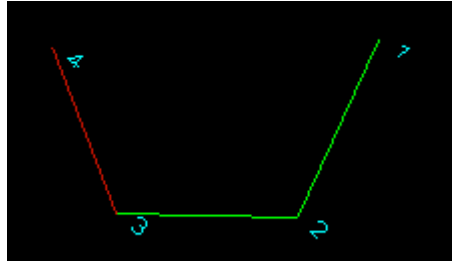
STEP 3:

The head of the first string (as determined by the picking direction) is then joined to the tail of the second string (as determined by the picking direction).

After the strings are joined, the vertex indices will change since the order of the vertices in the string is now different.

The colour of the constructed line is adopted from first selected super string. The colour of the second string will remain unchanged.

Note: The constructed line and selected strings are stored in the model of the first selected string.



Join String Many

Position of option on menu: Strings =>CAD =>String=>Join many

or by selection of appropriate icon from the toolbar.

This option joins many strings together. Picking with direction is used to specify which ends of the strings are joined.

On selecting the **Join many** option, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

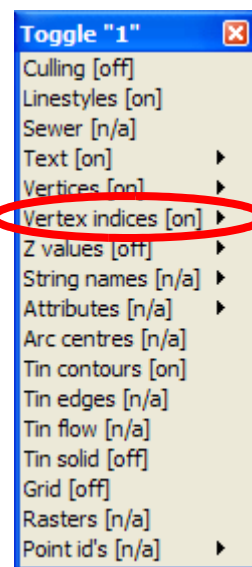
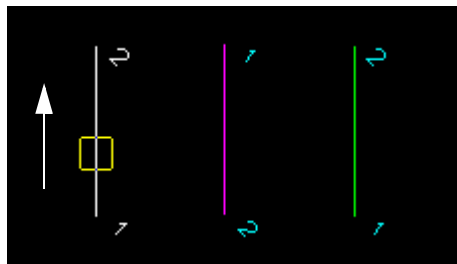
STEP 1:

Pick a super string *with direction*.

For notes on picking strings with direction, see [Picking with Direction](#) in the chapter [Tools and Concepts](#).

Note: The **Vertex indices** can be displayed by toggling the option on the Toggle Menu.

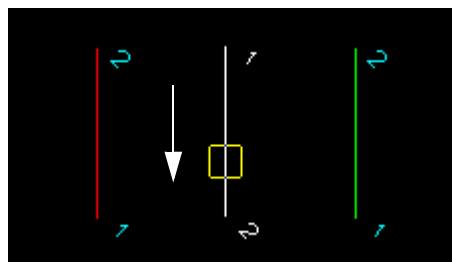
pick with
direction



STEP 2:

Select and accept another super string, again picking *with direction*.

pick with
direction



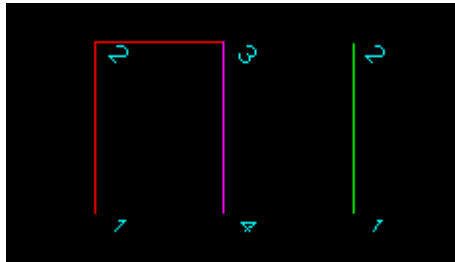
STEP 3:

The **head** of the first string is then joined to the **tail** of the second string. What is the head or tail

of the strings is determined by the *picking direction*.

After the strings are joined, the vertex indices to reflect the new order of the vertices in the string. The colour of the constructed segment will be the same as that of the first selected super string. The colour of the second string will remain unchanged.

Note: The constructed segment and selected strings are stored in the model which contains the 1st selected string.

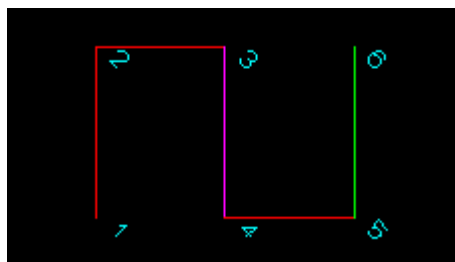
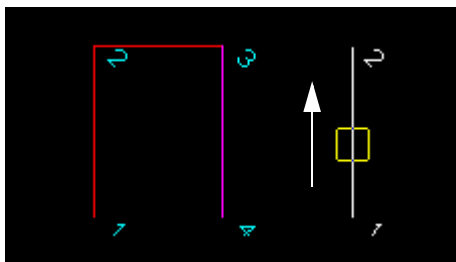


STEP 4:

The *Join Many* option joins extra strings to the already selected (and joined) strings. The user may continue selecting additional strings to join together by select and accept additional super strings by picking with direction.

This option can be terminated by the user with the **Esc** key.

Note: Each further construction line adopts the same colour as the 1st selected string. Both the constructed line and selected strings are stored in the model which contains the first selected string.



Join Fillet

Position of option on menu: Strings =>CAD =>String=>Join fillet

or by selection of appropriate icon from the toolbar. 

This option fillets, trims and joins strings.

There are eight possible ways of filleting the strings and the required case is determined by picking the strings with direction and by the sign of the radius.

On selecting the **Join strings** option, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

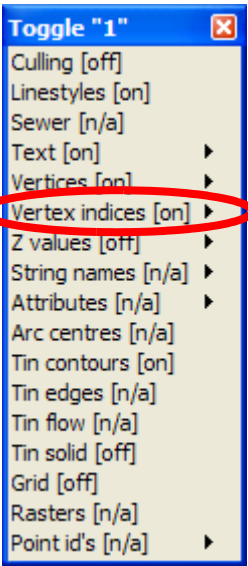
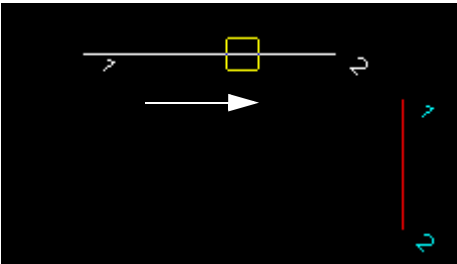
STEP 1:

Pick a super string *with direction*.

For notes on picking strings with direction, see [Picking with Direction](#) in the chapter [Tools and Concepts](#).

Note: The Vertex indices can be displayed by toggling the option on the Toggle Menu.

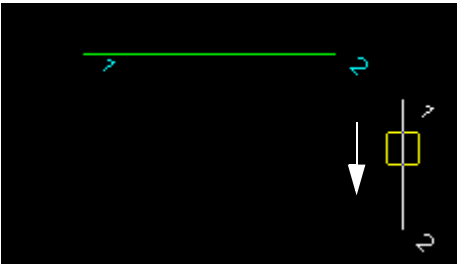
pick with
direction




STEP 2:

Select and accept another super string, again picking *with direction*.

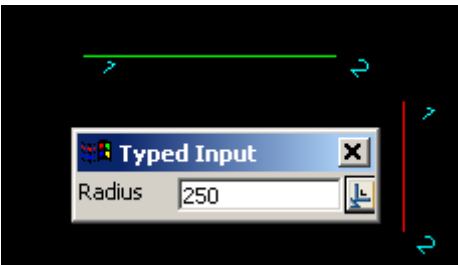
pick with
direction



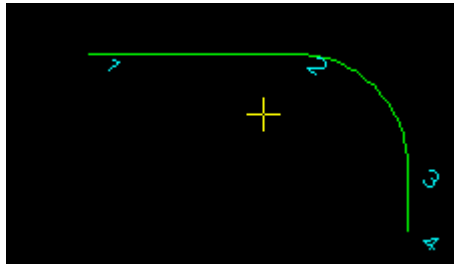
STEP 3:

After the second super string is accepted, the **Radius** input box will appear. Type the *fillet radius* into the input box and press the Enter key. The browse button  on the input box can be used to define the fillet radius by measurement of existing elements.

Note: A **positive** fillet radius value will curve to the right, where as a **negative** fillet radius will curve to the left.



A fillet arc with the radius is constructed and joined to the two strings and the ends of the two strings are automatically trimmed back to the arc.



The vertex indices will change to accommodate the new vertices in the string. The colour of the constructed line and 2nd selected string adopts the colour of the 1st selected super string.

Note: The constructed arc and selected strings are stored in the model of the first selected string.

Offset

Position of option on menu: Strings =>CAD =>String =>Offset

or by selection of appropriate icon from the toolbar.



This option allows the user to create "parallel" strings, *i.e.* creating a string that is offset by a given distance from a selected string.

There are five possible ways of offsetting the strings as well as options for offsetting full strings or partial strings.

The string to offset is selected by picking with direction, and the offset distance is negative to offset to the left of the pick direction and positive to offset to the right of the pick direction.

On selecting the **Offset** option, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

e.g.

```
<[N][J] Pick string to offset or type (n)ormal, (p)artial, (j)oin, (i)ntersect, (f)illet, (d)ual, (c)lip> [picks][fast][Menu]
```

The letters in the square brackets indicate which offset modes are currently selected.

For example, [N][J] at the front indicates that (n)ormal and (j)oin are the selected options.

For the option *N* for (n)ormal, go to

P for (p)artial

J for (j)oin

I for (i)ntersect

F for (f)illet

D for (d)ual

C for (c)lip

[Typing N for \(n\)ormal](#)

[Typing P for \(p\)artial](#)

[Typing J for \(j\)oin](#)

[Typing I for \(i\)ntersect](#)

[Typing F for \(f\)illet](#)

[Typing D for \(d\)ual](#)

[Typing C for \(c\)lip](#)

Typing N for (n)ormal

Typing **N** or **n** for (n)ormal causes the **whole string to be offset**.

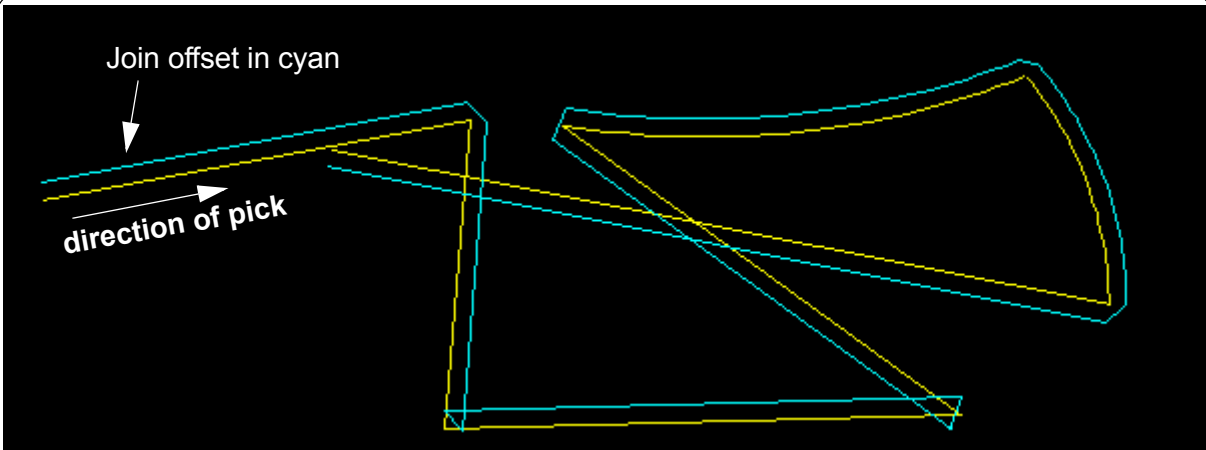
Note - the other choice is Partial when only part of a string is offset.

When **N** is typed, the first character in the square brackets changes to [N].

Continue to the next mode [Typing P for \(p\)artial](#) or to the beginning of the Offset documentation [Offset](#).

Typing J for (j)oin

For **Join**, each segment of the selected string is offset by the given distance and the end points of adjacent offset segments are joined together.

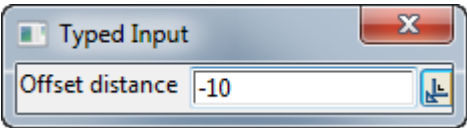


Offset Join with Offset Distance of -10

So when **J** or **j** is typed, the second character in the square brackets changes to **[J]** and the string to offset is then selected by picking with direction.

<[N][J] Pick string to offset or type (n)ormal, (p)artial, (j)oin, (i)ntersect, (f)illet, (d)ual, (c)lip> [picks][fast][Menu]

After the string is selected, the **Offset distance** typed input box is placed on the screen and the distance to offset is typed into the box followed by the <Enter> key.



NOTE: The offset distance is negative to offset to the left of the pick direction and positive to offset to the right of the pick direction.

The selected string is then offset.

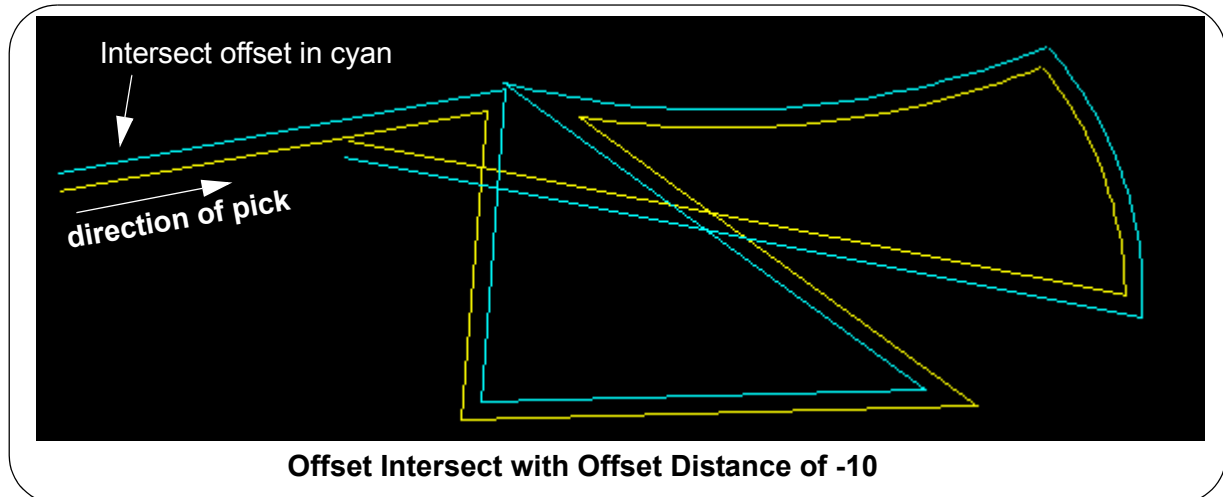
After the string is offset, the mode can be changed or left the same and another string selected to offset using the new mode(s).

The option is terminated by pressing the <Esc> key or by clicking **X** on the top right corner of the **Offset distance** typed input box.

Continue to the next mode [Typing I for \(i\)ntersect](#) or to the beginning of the Offset documentation [Offset](#).

Typing I for (i)ntersect

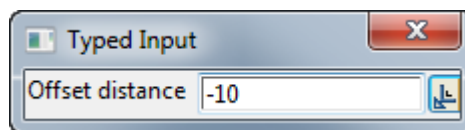
For **Intersect**, each segment of the selected string is offset by the given distance and the ends of adjacent offset segments are extended or contracted so that they intersect.



So when **I** or **i** is typed, the second character in the square brackets changes to **[I]** and the string to offset is then selected by picking with direction.

```
<[N][I] Pick string to offset or type (n)ormal, (p)artial, (j)oin, (i)ntersect, (f)illet, (d)ual, (c)lip> [picks][fast][Menu]
```

After the string is selected, the **Offset distance** typed input box is placed on the screen and the distance to offset is typed into the box followed by the <Enter> key.



NOTE: The offset distance is negative to offset to the left of the pick direction and positive to offset to the right of the pick direction.

The selected string is then offset.

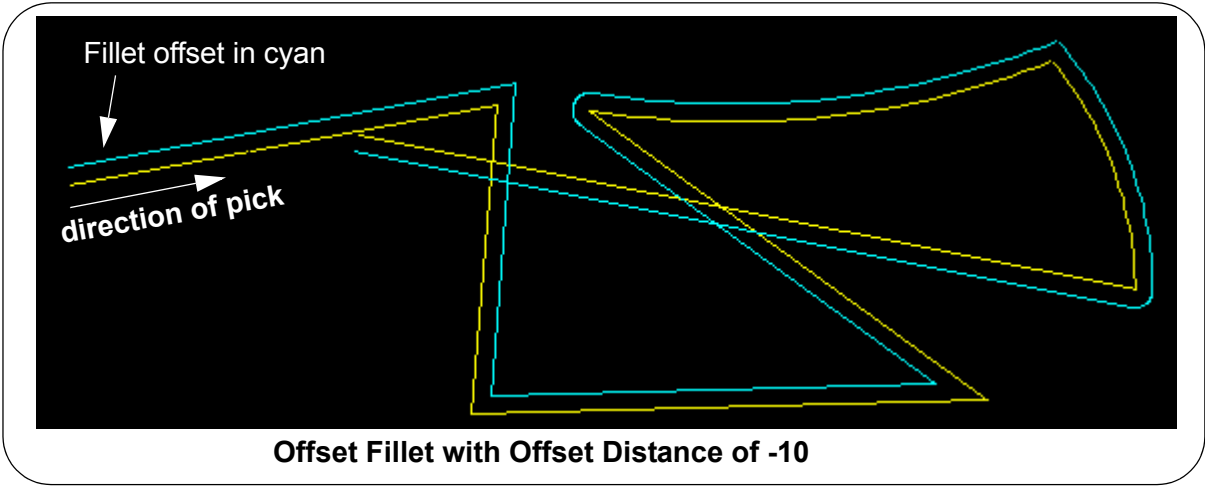
After the string is offset, the mode can be changed or left the same and another string selected to offset using the new mode(s).

The option is terminated by pressing the <Esc> key or by clicking **X** on the top right corner of the **Offset distance** typed input box.

Continue to the next mode [Typing F for \(f\)illet](#) or to the beginning of the Offset documentation [Offset](#).

Typing F for (f)illet

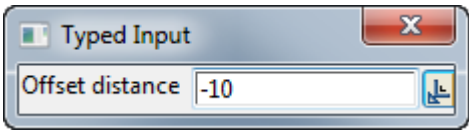
For **Fillet**, each segment of the selected string is offset by the given distance and the ends of adjacent offset segments are extended or contracted so they intersect. If the change of direction between adjacent segments is greater than 180 degrees, an arc is used instead of an intersect of the two segments.



So when **F** or **f** is typed, the second character in the square brackets changes to **[F]** and the string to offset is then selected by picking with direction.

<[N][F] Pick string to offset or type (n)ormal, (p)artial, (j)oin, (i)ntersect, (f)illet, (d)ual, (c)lip> [picks][fast][Menu]

After the string is selected, the **Offset distance** typed input box is placed on the screen and the distance to offset is typed into the box followed by the <Enter> key.



NOTE: The offset distance is negative to offset to the left of the pick direction and positive to offset to the right of the pick direction.

The selected string is then offset.

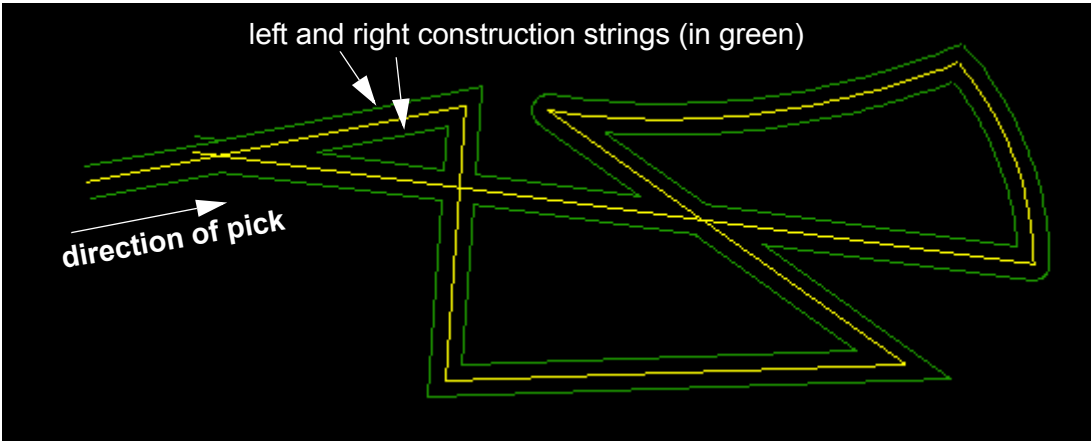
After the string is offset, the mode can be changed or left the same and another string selected to offset using the new mode(s).

The option is terminated by pressing the <Esc> key or by clicking **X** on the top right corner of the **Offset distance** typed input box.

Continue to the next mode [Typing D for \(d\)ual](#) or to the beginning of the Offset documentation [Offset](#).

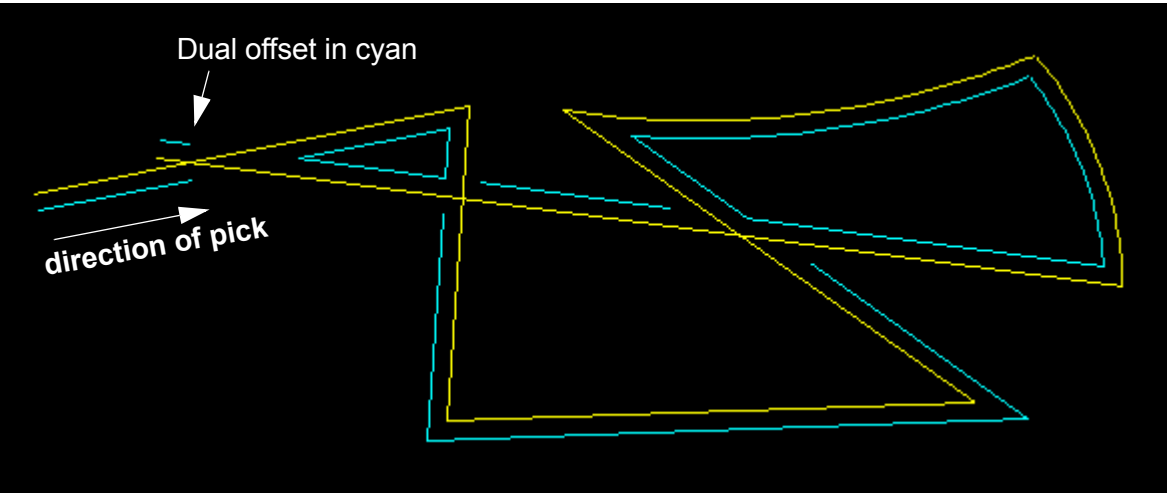
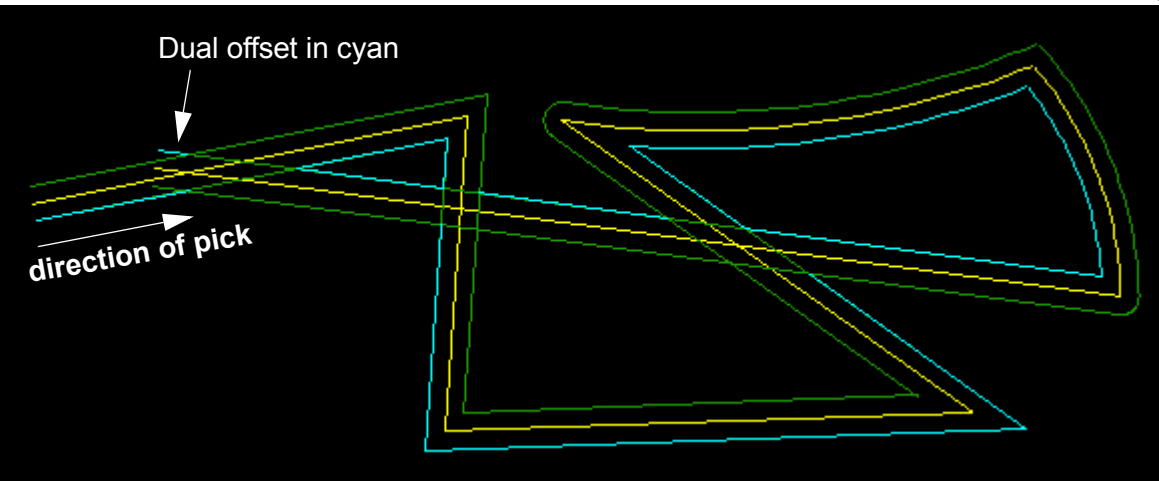
Typing D for (d)ual

For **Dual**, *construction* strings are created by offset fillets to both the left and right with the given offset distance.



Construction Strings for Offset Dual with Offset Distance of 10

Then the **Offset Dual** is created for the given offset distance but the created string **does not cut** either of the two left and right offset construction strings.



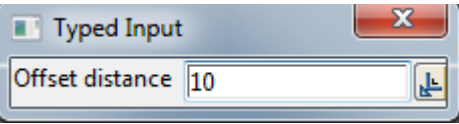
Offset Dual with Offset Distance of 10

More than one string may be created by the **Dual** option.

So when **D** or **d** is typed, the second character in the square brackets changes to [D] and the string to offset is then selected by picking with direction.

<[N][D] Pick string to offset or type (n)ormal, (p)artial, (j)oin, (i)ntersect, (f)illet, (d)ual, (c)lip> [picks][fast][Menu]

After the string is selected, the **Offset distance** typed input box is placed on the screen and the distance to offset is typed into the box followed by the <Enter> key.



NOTE: The offset distance is negative to offset to the left of the pick direction and positive to offset to the right of the pick direction.

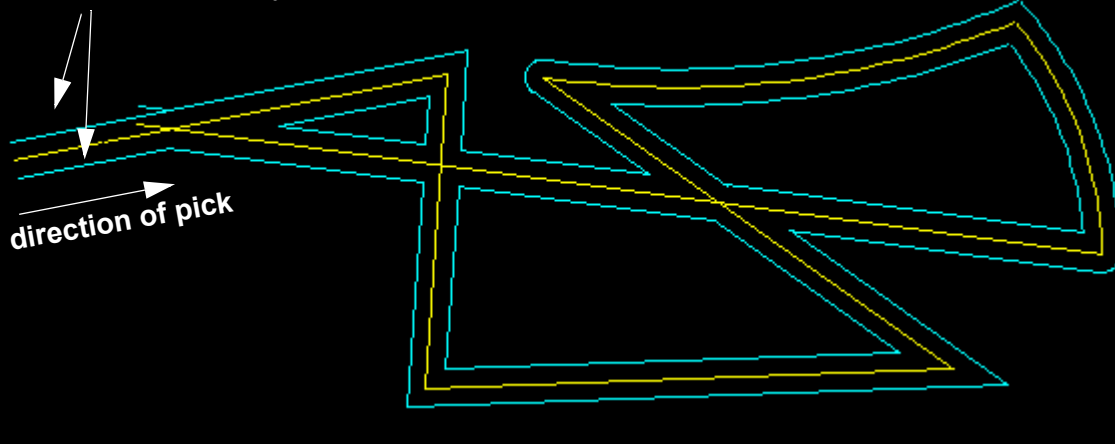
The selected string is then offset.

After the string is offset, the mode can be changed or left the same and another string selected to offset using the new mode(s).

The option is terminated by pressing the <Esc> key or by clicking **X** on the top right corner of the **Offset distance** typed input box.

NOTE: Running the Dual offset command twice, one with an offset and then again with the negative of the offset (-offset)

Two Dual offsets in cyan - one with offset_value and the other -offset_value

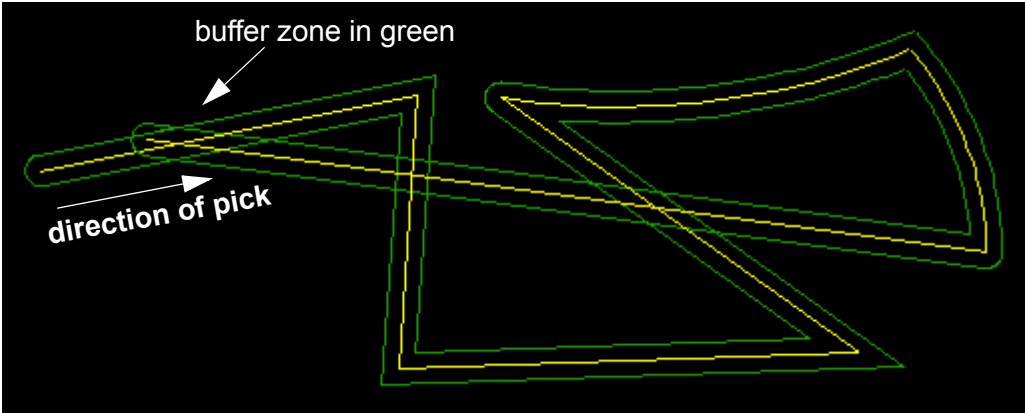


Two Offset Duals with Offset Distance of 10 and -10

Continue to the next mode [Typing C for \(c\)lip](#) or to the beginning of the Offset documentation [Offset](#).

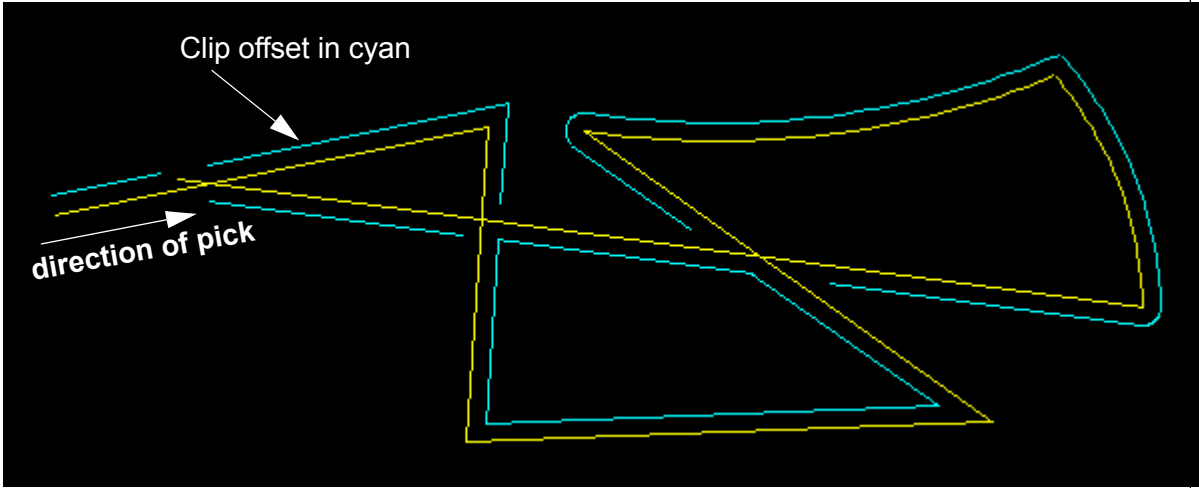
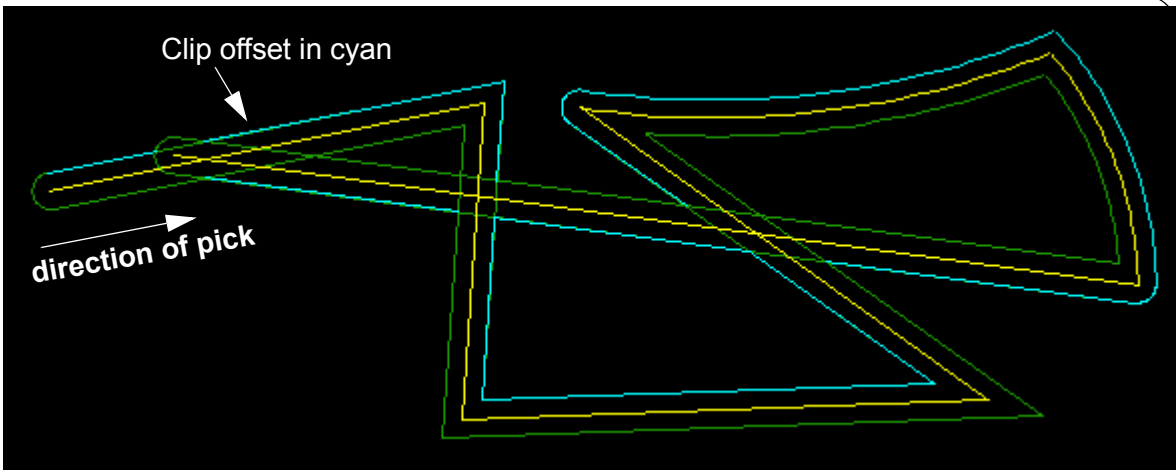
Typing C for (c)lip

For **Clip**, *construction* strings are created as for the Dual option by offsetting the selected string to both the left and right by the given offset distance as an offset fillet and a buffer zone defined by the construction strings and end caps with radius equal to the offset distance at each end of the selected string.



Buffer Zone for Offset Clip with Offset Distance of -10

Then the **Offset Clip** is created for the given offset distance, but it **does not cut** the buffer zone for the selected string.



Offset Clip with Offset Distance of -10

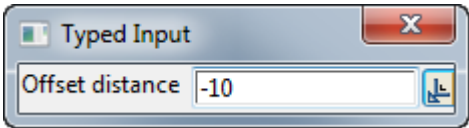
More than one string may be created by the **Clip** option.

So a Clip is like the Dual option except everything is removed from the buffer zone.

So when **C** or **c** is typed, the second character in the square brackets changes to [C] and the string to offset is then selected by picking with direction.

```
<[N][C] Pick string to offset or type (n)ormal, (p)artial, (j)oin, (i)ntersect, (f)illet, (d)ual, (c)lip> [picks][fast][Menu]
```

After the string is selected, the **Offset distance** typed input box is placed on the screen and the distance to offset is typed into the box followed by the <Enter> key.



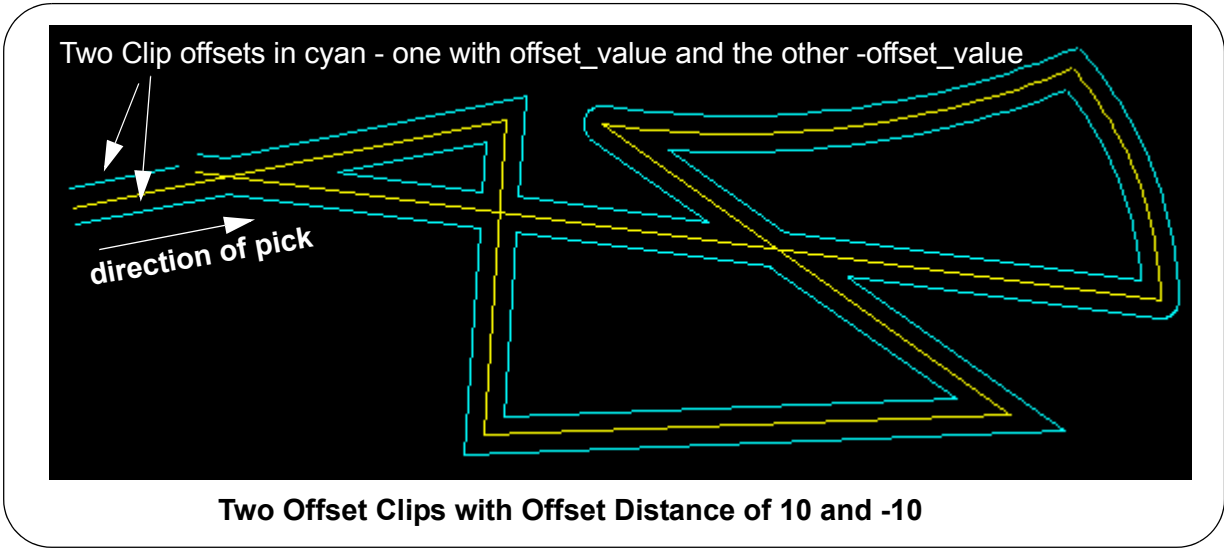
NOTE: The offset distance is negative to offset to the left of the pick direction and positive to offset to the right of the pick direction.

The selected string is then offset.

After the string is offset, the mode can be changed or left the same and another string selected to offset using the new mode(s).

The option is terminated by pressing the <Esc> key or by clicking **X** on the top right corner of the **Offset distance** typed input box.

NOTE: Running the Clip offset command twice, one with an offset and then again with the negative of the offset (-offset)



Continue to the first mode [Typing N for \(n\)ormal](#) or to the beginning of the Offset documentation [Offset](#).

Typing P for (p)artial

Selecting **P** for (p)artial allows for a **part** of the string to be offset.

When **P** or **p** is typed, the first character in the square brackets changes to [P].

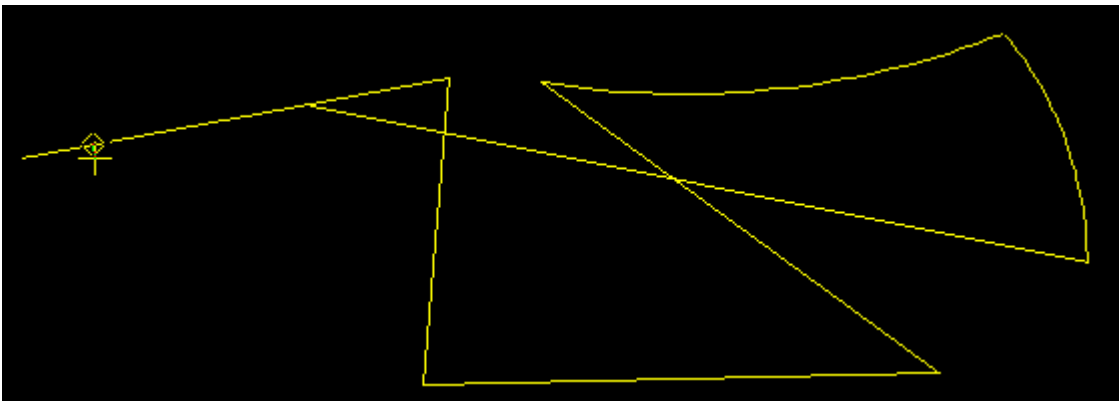
e.g.

<[P][I] Pick string to offset or type (n)ormal, (p)artial, (j)oin, (i)ntersect, (f)illet, (d)ual, (c)lip> [picks][fast][Menu]

After **P** is typed, the two positions on the string are selected to indicate the subsection of the string that is to be offset.

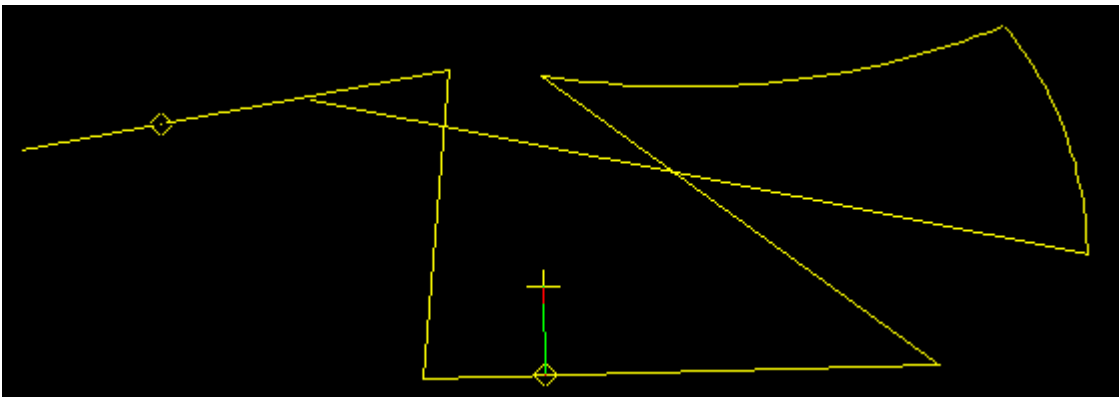
STEP 1:

Pick your first position. This does not have to be on the string to offset because it will be dropped perpendicular onto the string to give the first point of the partial offset.



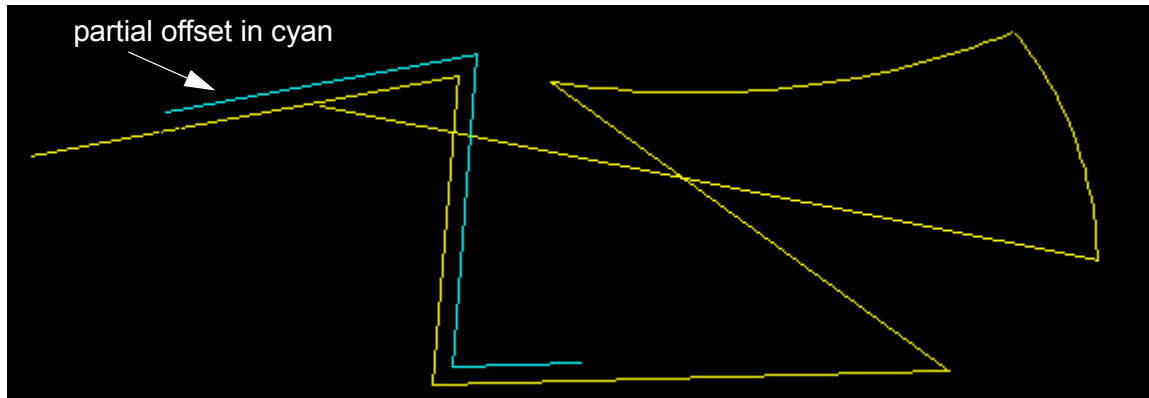
STEP 2:

Pick your second position. This does not have to be on the string to offset because it will be dropped perpendicular onto the string to give the second point of the partial offset.



STEP 3:

After accepting the second position, the part of the string between the two dropped positions is offset.



After the string is offset, the mode can be changed or left the same and another string selected to offset using the new mode(s).

The option is terminated by pressing the <Esc> key or by clicking **X** on the top right corner of the **Offset distance** typed input box.

Continue to the next mode [Typing J for \(j\)oin](#) or to the beginning of the Offset documentation [Offset](#).

Trace

Position of option on menu: Strings =>CAD =>String =>Trace

or by selection of appropriate icon from the toolbar. 

This option allows the user to create a new string by

(a) creating points as in a normal string

and/or

(b) selecting parts of existing string to copy and make part of the new string (i.e. tracing over part of an existing string)

and/or

(c) closing the new string

On selecting the **Trace** option, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** screen message area at the bottom of the window.

e.g.

```
<[P] Pick point to append or (t)race, (c)lose> [picks][fast][Menu]
```

The letter in the square brackets indicate which trace mode is currently selected.

For example, [T] at the front indicates that (t)race mode is selected

For the option *P* for (p)ick go to

T for (t)race

C for (c)lose

[Typing N for \(n\)ormal](#)

[Typing P for \(p\)artial](#)

[Typing J for \(j\)oin](#)

Typing P for (p)ick

Typing P or p for pick means that new vertices of the string will be created in the normal way for a string editor, and the created vertices are appended to the end of the new string being created.

When **P** or **p** is typed, the first character in the square bracket changes to [P].

e.g.

```
<[P] Pick point to append or (t)race, (c)lose> [picks][fast][Menu]
```

Points are then created for the new string by the normal pick and accept.

The option is terminated by pressing the <Esc> key.

Continue to the next mode [Typing T for \(t\)race](#) or to the beginning of the Trace documentation [Trace](#).

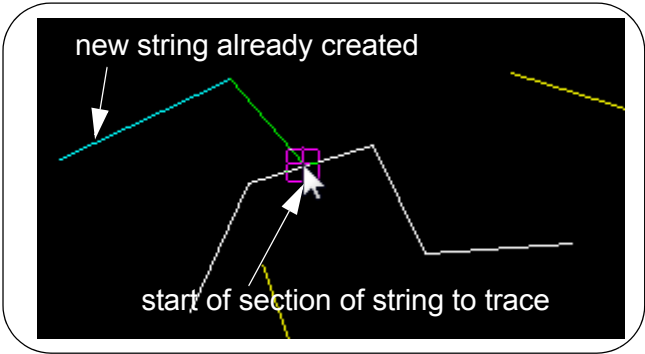
Typing T for (t)race

For **Trace**, an part of an existing string is selected to copy and make part of the new string. That is, part of an existing string is traced over to form part of the new string.

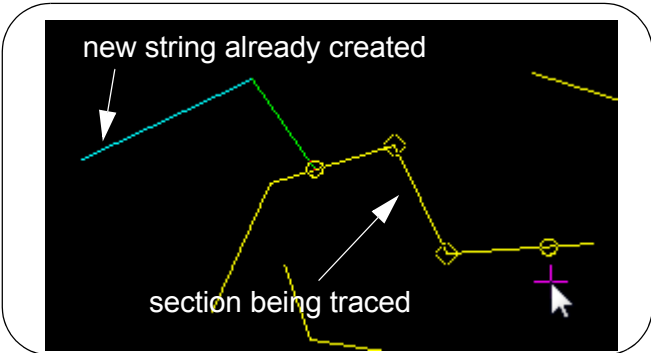
When **T** or **t** is typed, the second character in the square brackets changes to [T]

```
<[T] Select start point to trace or (p)ick, (c)lose> [picks][fast][Menu]
```

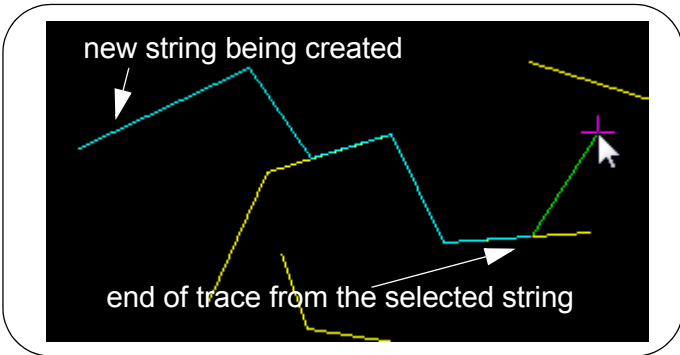
and the string to trace over is then selected by picking the string at the start position of the section of the string to trace over.



The cursor is then moved along the sting in the direction of the trace. Vertices on the traced section are displayed as diamonds and a non-vertex start on the string of the trace is shown as a circle.



The final position of the trace on the string is then selected and the traced portion is copied to the string being created.



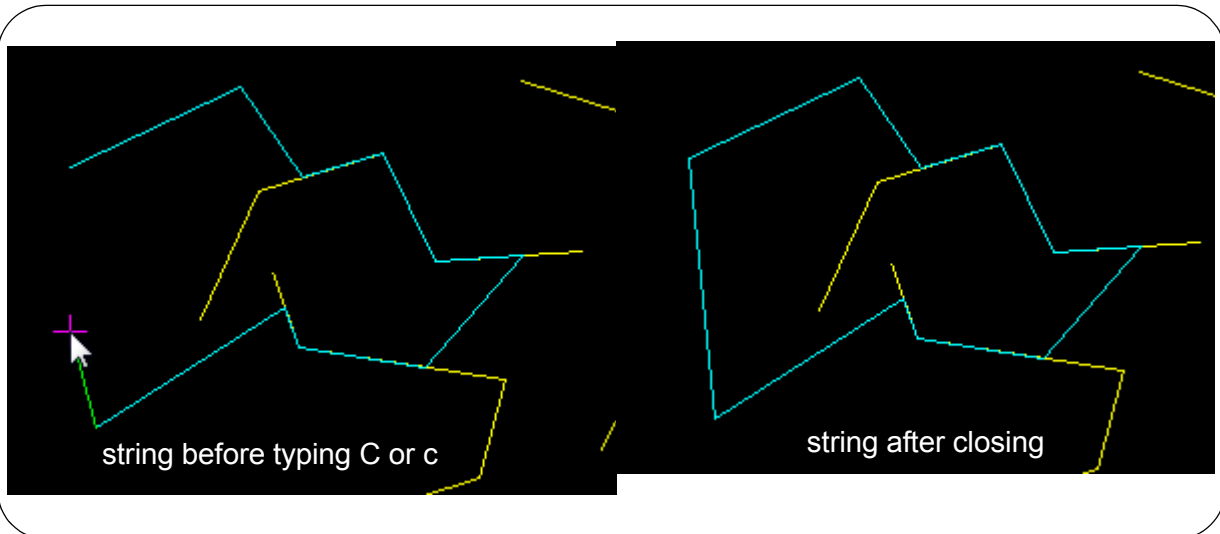
Another string can then be selected to trace over, or P or C typed to change modes.

The option is terminated by pressing the <Esc> key.

Continue to the next mode [Typing C for \(c\)lose](#) or to the beginning of the Trace documentation [Trace](#).

Typing C for (c)lose

Typing **C** or **c** will **Close** the string and ends the creation of the new string.

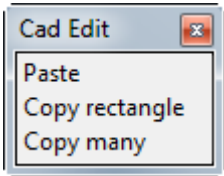


A new Trace option then begins.

The option is terminated by pressing the <Esc> key.

Go to the beginning of the Trace documentation [Trace](#).

CAD Edit



For the option *Paste*, please go to
Copy rectangle
Copy many

[Paste](#)
[12d Copy Rectangle](#)
[12d Copy Many](#)

Paste

Pastes the 12d Ascii data from the clipboard into the current view in 12d.

12d Copy Rectangle

In the chosen view select the first point and then drag the cursor to visualise your desired rectangle. When the second point is accepted, the data inside the rectangle is copied to the clipboard in 12d Ascii format, ready for pasting into an open 12d project. The data is copied into models of the same model names as the original data.

12d Copy Many

Data is copied to the clipboard by selecting data from the **Data to Copy** field and then selecting **Copy**.

On selecting the **Copy many** option, a **Cad 12d Copy** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Data to Copy

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Model

model box

select the data from the specified model.

Copy

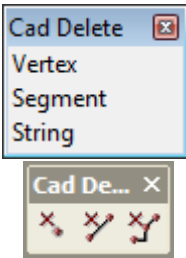
button

Copies the selected data to the clipboard in 12d ascii format.

CAD Delete

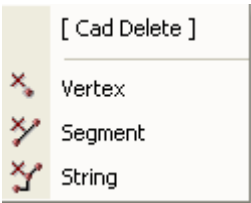
Position of option on menu: Strings =>CAD =>Delete

The Cad Delete walk-right menu is



Menu of Options to Delete Vertices, Segments and Strings

delete a vertex
delete a segment
delete a string



For the option *Vertex*, go to
Segment
String

[Delete Vertices](#)
[Delete Segments](#)
[Delete Strings](#)

Delete Vertices

Position of option on menu: Strings =>CAD =>Delete =>Points

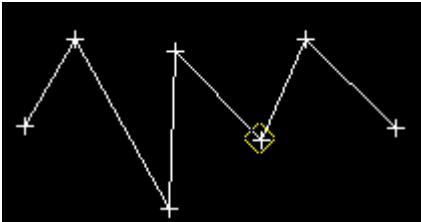
or by selection of appropriate icon from the toolbar. 

This option deletes vertices of super strings.

On selecting **Points**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

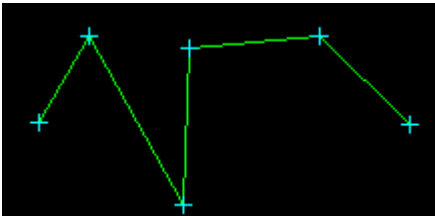
STEP 1:

The vertex to be deleted is selected and accepted (This must be a super string).



STEP 2:

The vertex point is deleted and the string redrawn.



Delete Segments

Position of option on menu: Strings =>CAD =>Delete =>Segments

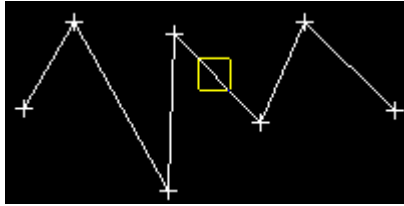
or by selection of appropriate icon from the toolbar. 

This option deletes segments of super strings.

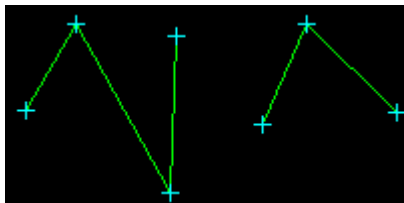
On selecting **Segments**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

The segment to be deleted is selected and accepted.

**STEP 2:**

The segment is deleted leaving two separate strings in this case.



Delete Strings

Position of option on menu: Strings =>CAD =>Delete =>Strings

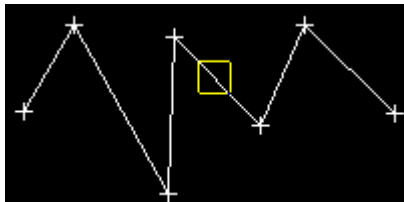
or by selection of appropriate icon from the toolbar. 

This option deletes selected strings. The string type does not specifically have to be a super string.

On selecting **Strings**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

STEP 1:

The string to be deleted is selected and accepted.

**STEP 2:**

The string is deleted.

Delete Selection of Strings

Position of option on menu: Strings =>CAD =>Delete =>Selection

or by selection of appropriate icon from the toolbar. 

This option allows the deleting of selected objects specified in a source box. For help on this

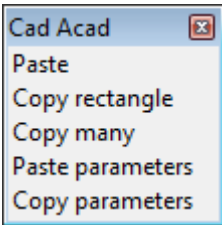
option see [Delete](#).

On selecting the **Delete** option, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the **12d Model** application window.

Cad Acad

Position of option on menu: Strings =>CAD =>Acad

The Cad Acad walk-right menu is



For the option *Paste*, go to
Copy rectangle
Copy many
Paste parameters
Copy parameters

[Paste](#)
[Copy rectangle](#)
[Copy many](#)
[Paste parameters](#)
[Copy parameters](#)

Paste

Pastes the Dwg/Dxf data from the clipboard into the current view in 12d.

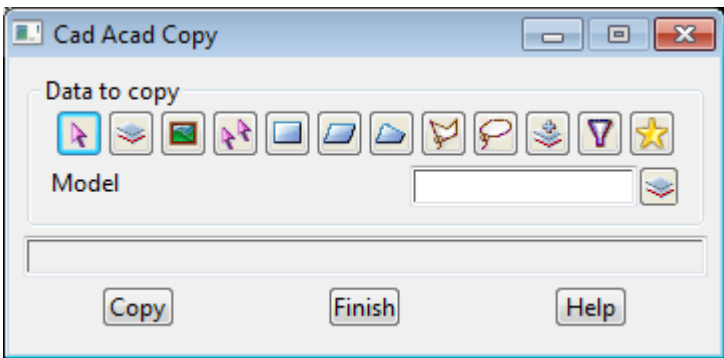
Copy rectangle

In the chosen view select the first point and then drag the cursor to visualise your desired rectangle. When the second point is accepted, the data inside the rectangle is copied to the clipboard for pasting.

Copy many

Data is copied to the clipboard by selecting data from the **Data to Copy** field and then selecting **Copy**.

Selecting the **Copy many** option, brings up the **Cad Acad Copy** panel.



The fields and buttons used in the panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Data to Copy

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

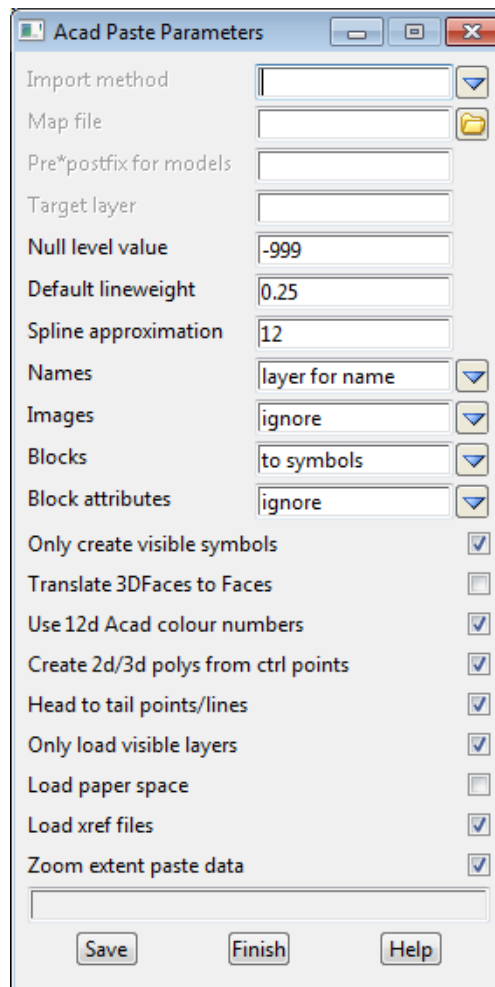
Model model box
select the data from the specified model.

Copy button
Copies the selected data to the clipboard.

Paste parameters

The parameters for this panel are the same as parameters in the **Read DWG/DXF Data** panel.

Selecting **Paste parameters** brings up the **Acad Paste Parameters** panel:

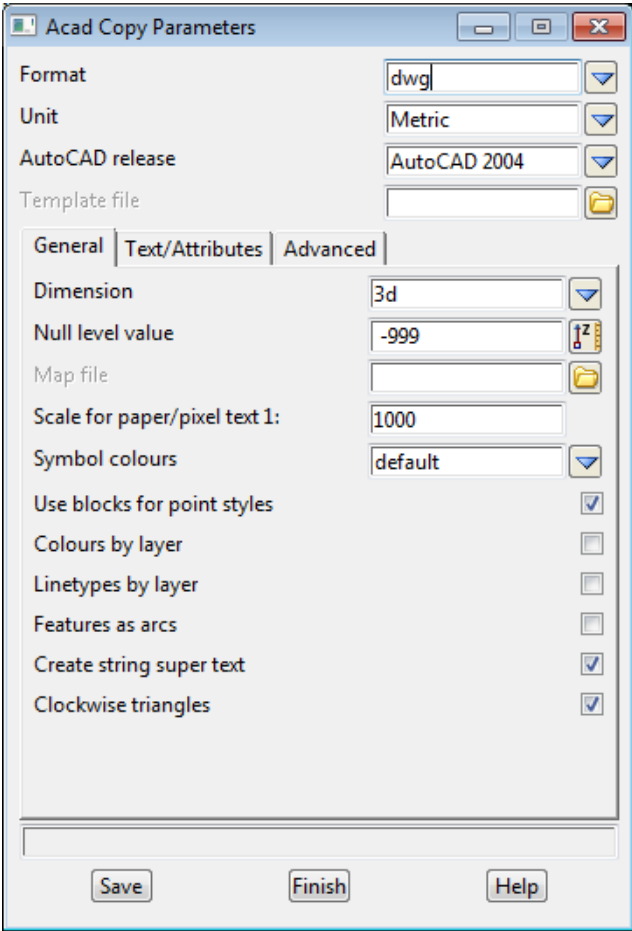


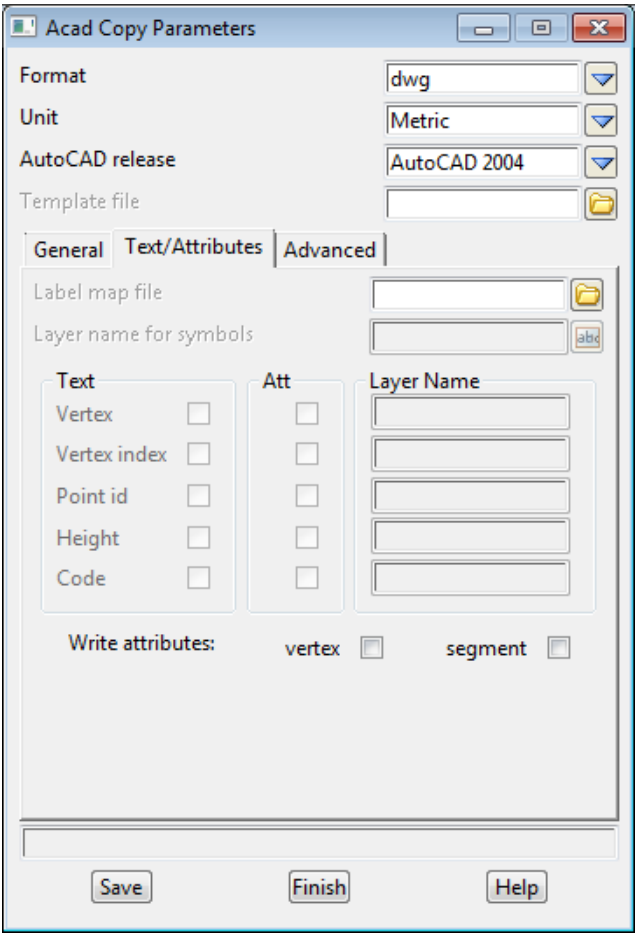
For more information please go to [DWG/DXF Input](#) in the section [Data Input](#)

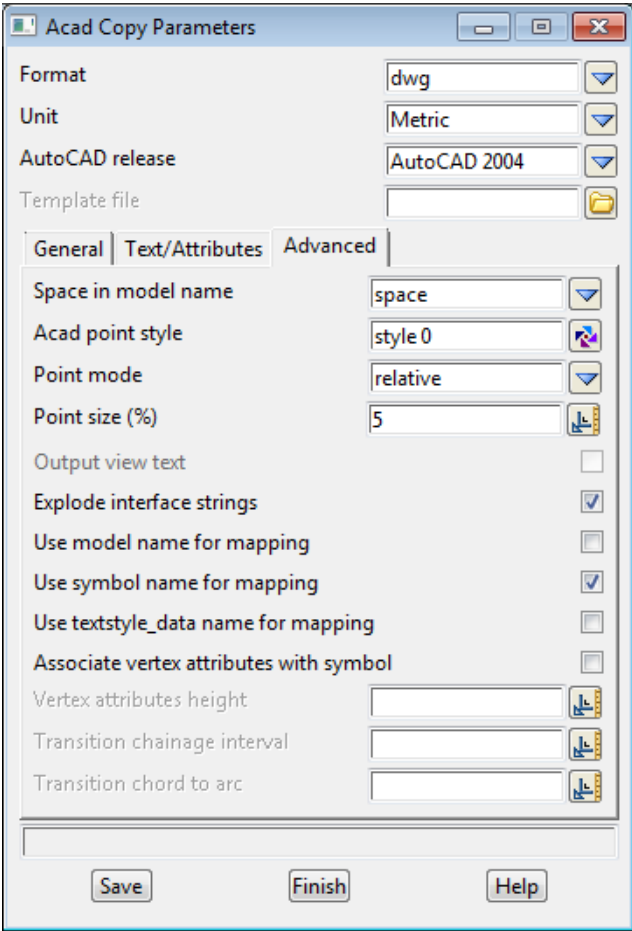
Copy parameters

The parameters for this panel are the same as parameters in the **Write DWG/DXF file for** panel.

Selecting **Copy parameters** brings up the **Acad Copy Parameters** panel:







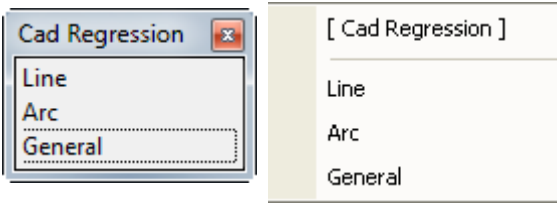
For more information please go to [DWG/DXF/DXB Output](#) in the section [Data Output](#)

CAD Regression

Position of option on menu: Strings =>CAD =>Regression

This section of documentation is a work in progress and will be updated in subsequent releases.

The Cad Regression walk-right menu is



For the option *Line*, go to
Arc
General

[Line](#)
[Arc](#)
[General](#)

Line

This section of documentation is a work in progress and will be updated in subsequent releases.

Arc

This section of documentation is a work in progress and will be updated in subsequent releases.

General

This section of documentation is a work in progress and will be updated in subsequent releases.

Create

Position of option on menu: Strings =>Create

The **Create** option is used to produce **new** strings. If a string already exists, the **Editor** option is used to modify it.

The **Create** walk-right menu contains options to create 2d, 3d, 4d, super alignment, circles, arcs, feature, pipe, polyline, super and text strings.

Each string type has its own special information so by choosing the appropriate type to be created, only information needed for that type of string is asked for.

Note that the 2d, 3d, 4d, pipe and polyline strings are actually super strings but automatically set some of the properties of the super string. For example a 2d string is a super string with just one constant z-value. Any of these strings can be made a full super string by clicking on the *Advanced Mode* icon in the string editor.

Once a string has been created, it can be converted to most of the other string types using the string **Convert** option.

To create a new string of the same type and with similar header information as an existing string, the **same as** option is selected from the **String Create** menu.

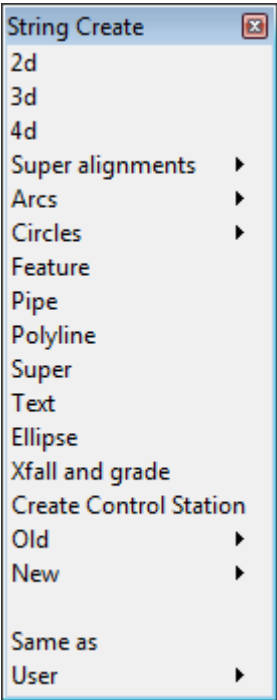
Notes

- 1. Depending on its breakline (point-line) type, a string with default style ("1") is displayed with crosses at each of its vertex (point type) or with straight lines joining the vertices (line type).

Linestyles can be defined that drawn lines between the points even though the breakline type is **point**.

- 2. The string vertices are also called intersection points (IP's).

The **String Create** walk-right menu is



The string creation process is similar for each string type and for editing strings as well.
For the option *2d*, go to [Create - 2d Super](#)

<i>3d</i>	Create - 3d Super
<i>4d</i>	Create - 4d Super
<i>Super alignment</i>	Super Alignments
<i>Arcs</i>	Create Arcs
<i>Circles</i>	Create - Circles
<i>Feature</i>	Create - Feature
<i>Pipe</i>	Create - Pipe Super
<i>Polyline</i>	Create - Polyline Super
<i>Super</i>	Create - Super
<i>Text</i>	Create - Text
<i>Ellipse</i>	Create - Ellipse
<i>Xfall and grade</i>	String by Xfall and Grade in the chapter Design
<i>Control stations</i>	Create - Control Stations
<i>Old</i>	Old
<i>New</i>	New
<i>Same as</i>	Create - Same As

Create - 2d Super

Position of option on menu: Strings =>Create =>2d

A **2d super string** is a *super string* with the restriction that it has:

- (a) vertices of (x,y) co-ordinates joined by straight segments only
- (b) One z-value for the entire string

That is, a 2d string consists of a series of (x,y) vertices joined only by straight segments, and all with the same z-value (height). 2d strings are often referred to as “contour strings” because contours are the most common example of a string with a constant height.

The **Many strings** tick-box is used when more than one string of the same type is to be created. If **many strings** is set to *tick*, when the current string creation is **Finished** or **Quit**, a new **Create Super 2d String** panel is placed on the screen with the same information in it as the string just created. If any of the information needs to be modified for the new string, simply change it in the **Create Super 2d String** panel fields before selecting the **Create** button for the new string. Hence a new string of the same type can be created without going back to the **Create** menu.

The **Same as** button is used to obtain information from an existing string (not necessarily of the same type) and pipe it into the name, model, colour, type, linestyle, weight of the **Create Super 2d String** panel.

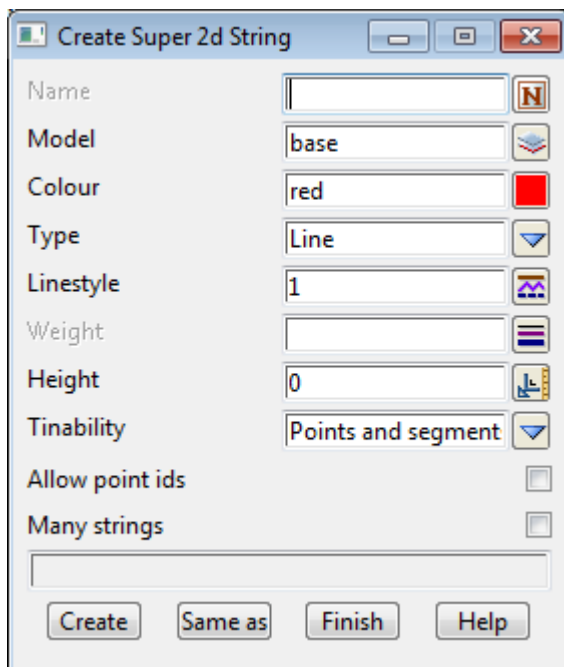
From **12d Model 8** onwards, the default is to create **2d super strings** rather than the **2d strings** used up to **12d Model 7**. A **2d super string** is a *super string* with **Constant height**. That is, there is only one z-value for the entire string. The advantage is using a **2d super string** is that all the CAD options will work for it, vertices and segments can be assigned tinability and it can have point id's for setout.

The older *2d string* create options are still available under

Strings =>Create =>Old

(go to the section [Create - 2d \(pre V8\)](#))

On selecting 2d the **Create Super 2d String** panel is displayed.



The default values for the panel fields are taken from the **CAD Controlbar** (see [CAD, Symbol and Text Controlbars](#))

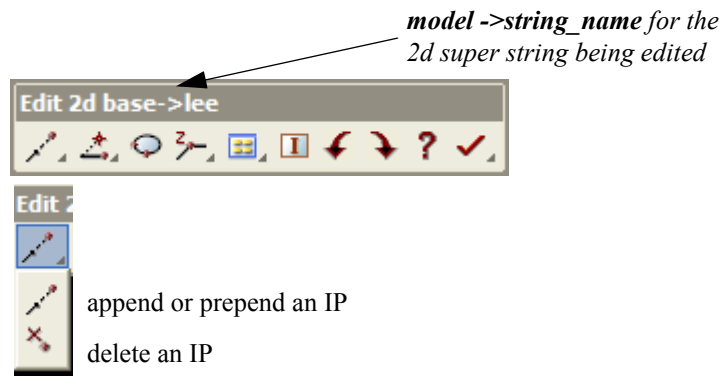
To **create a new 2d super string** (a **2d super string** is a *super string* with the **constant height** flag set on), the panel fields are filled in and the **Create** button selected.

The fields and buttons used in the **Create Super 2d String** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name <i>the name of the new string</i>	input	from CAD controlbar	
Model <i>name of the model that the new string is in</i>	model box	from CAD controlbar	available models
Colour <i>the colour of the new string</i>	colour box	from CAD controlbar	available colours
Type <i>breakline type (point-line type) of the string</i>	choice box	line	line, point
Linestyle <i>line style of the string</i>	input	from CAD controlbar	available line styles
Weight <i>thickness of the string</i>	input	from CAD controlbar	
Height <i>for a 2d super string, there is only one height (z-value) for the entire string.</i>	input	from CAD controlbar	
Tinability <i>if Vertices and segments, all the vertices and segments of the string are set to tinable. If Vertices only, all the vertices are set to tinable and the segments to not tinable. If Not tinable, all the vertices or segments are set to not tinable.</i>	choice box	Points and segments	Points and segments Points only Not tinable
Allow point ids <i>if ticked, the 2d super string can have point ids for each vertex. If not ticked, the 2d super string will not have point ids. This can be reversed if point ids are required in the future.</i>	tick box		
Many strings <i>if ticked then after the current string is finished, a new create panel is placed on the screen with all the same values for the panel fields as the current string.</i>	tick box		
Create <i>After the Create button is chosen, the Edit 2d menu is displayed.</i>	button		
Same as <i>After the Same as button is chosen, another string is selected and information about it is used for the fields in this panel.</i>	button		
Finish <i>end the option, don't proceed to the edit stage.</i>	button		

Start Edit - 2d Super

On selecting the **Create** button in the **Create Super 2d String** panel the **Edit 2d** menu is placed on the screen. The **Edit 2d** menu for a *2d super string* is



To create a new *2d super string*, select the **Append** icon.

The **Append** option is used to add vertices to either end of an existing string, or in the case of a new string, places the first vertex and then begins appending vertices to the first vertex.

For all 2d strings, a cross is then drawn in each plan view that the string's model is on, and the cross follows the cursor around the screen. If the string's model is **not** added to any plan view, the model is automatically added to **all** plan views.

After the cross is on the screen (moving with the cursor), clicking LB and accepting with MB selects the **first** vertex of the string (using the appropriate snaps).

The string is then drawn from the first vertex to the cursor position, which represents the second vertex of the string. Clicking LB and accepting with MB selects the second string vertex and the process repeats for subsequent string vertices.

Now that the string is created, all the edit option on the string's **Edit 2d** menu are usable.

The options in the **Edit 2d** menu are not only used for placing the initial vertices of the string, but for editing the string once it is created. Since the **Append** and other options in the **Edit 2d** menu are identical to the options used when editing an existing string, they will be discussed in detail in the string **Editor** section.

For full information in the 2d Editor, go to the section [Edit 2d](#)

Create - 3d Super

Position of option on menu: Strings =>Create =>3d

A 3d super string consists of a series of (x,y,z) vertices, joined only by straight segments.

The difference between a 2d and a 3d string is that for a 3d string, the z-value (height) can vary at each string vertex, whereas a 2d string has a constant height for the entire string. Hence a 2d string is simply a special case of a 3d string where the heights at all the vertices are the same.

Creating and editing a 3d string is very similar to a 2d string. The only major difference is that a height is required at each string vertex.

The **Many strings** tick-box is used when more than one string of the same type is to be created, If **many strings** is set to *tick*, when the current string creation is **Finished** or **Quit**, a new **Create Super 3d String** panel is placed on the screen with the same information in it as the string just created. If any of the information needs to be modified for the new string, simply change it in the **Create Super 3d String** panel fields before selecting the **Create** button for the new string. Hence a new string of the same type can be created without going back to the **Create** menu.

The **Same as** button is used to obtain information from an existing string (not necessarily of the same type) and pipe it into the name, model, colour, type, linestyle and weight of the **Create Super 3d String** panel.

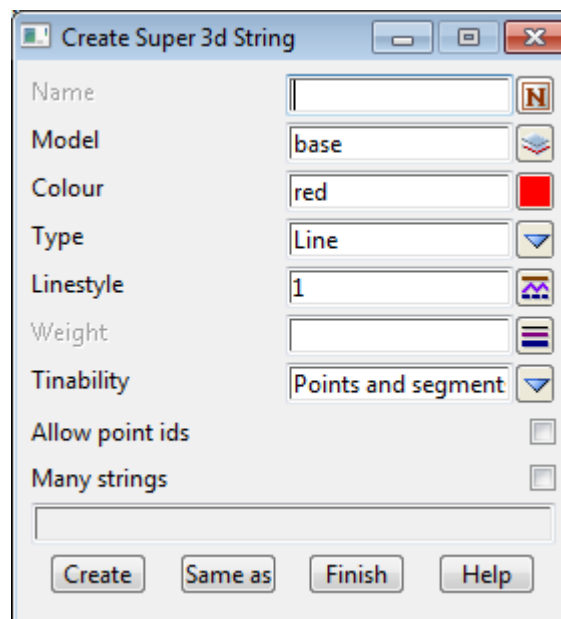
From **12d Model 8** onwards, the default is to create **3d super strings** rather than the **3d strings** used up to **12d Model 7**. The advantage is using a **3d super string** is that all the CAD options will work for it, vertices and segments can be assigned tinability and it can have point id's for setout.

The older **3d string** create option is still available under

Strings =>Create =>Old

(go to the section [Create - 3d \(pre V8\)](#))

On selecting the 3d option, the **Create Super 3d String** panel is displayed.



The default values for the panel fields are taken from the **CAD Controlbar** (see [CAD. Symbol and Text Controlbars](#))

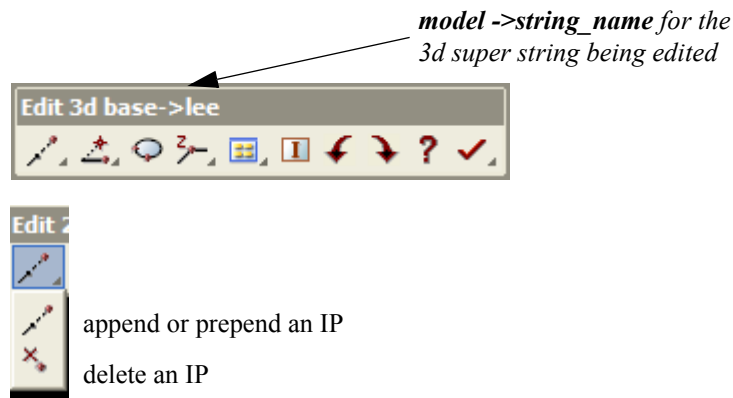
To **create a new 3d super string**, the panel fields are filled in and the **Create** button selected.

The fields and buttons used in the **Create Super 3d String** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name <i>the name of the new string</i>	input	from CAD controlbar	
Model <i>name of the model that the new string is in</i>	model box	from CAD controlbar	available models
Colour <i>the colour of the new string</i>	colour box	from CAD controlbar	available colours
Type <i>breakline type (point-line type) of the string</i>	choice box	line	line, point
Linestyle <i>line style of the string</i>	input	from CAD controlbar	available line styles
Weight <i>thickness of the string</i>	input	from CAD controlbar	
Tinability	choice box	Points and segments	Points and segments Points only Not tinable
<i>if Vertices and segments, all the vertices and segments of the string are set to tinable. If Vertices only, all the vertices are set to tinable and the segments to not tinable. If Not tinable, all the vertices or segments are set to not tinable.</i>			
Allow point ids <i>if ticked, the super string can have point ids for each vertex. If not ticked, the super string will not have point ids. This can be reversed if point ids are required in the future.</i>	tick box		
Many strings <i>if ticked then after the current string is finished, a new create panel is placed on the screen with all the same values for the panel fields as the current string.</i>	tick box		
Create <i>after the Create button is chosen, the Edit 3d menu is displayed</i>	button		
Same as <i>after the Same as button is chosen, another string is selected and information about it is used for the fields in this panel</i>	button		
Finish <i>end the option, don't proceed to the edit stage</i>	button		

Start Edit - 3d Super

On selecting the **Create** button in the **Create Super 3d String** panel the **Edit 3d** menu is placed on the screen. The **Edit 3d** menu for a *3d super string* is



To create a new *3d super string*, select the **Append** icon.

The **Append** option is used to add vertices to either end of an existing string, or in the case of a new string, places the first vertex and then begins appending vertices to the first vertex.

For all 3d strings, a cross is then drawn in each plan view that the string's model is on, and the cross follows the cursor around the screen. If the string's model is **not** added to any plan view, the model is automatically added to **all** plan views.

After the cross is on the screen (moving with the cursor), clicking LB and accepting with MB selects the **first** vertex of the string (using the appropriate snaps).

The string is then drawn from the first vertex to the cursor position, which represents the second vertex of the string. Clicking LB and accepting with MB selects the second string vertex and the process repeats for subsequent string vertices.

Now that the string is created, all the edit option on the string's **Edit 3d** menu are usable.

The options in the **Edit 3d** menu are not only used for placing the initial vertices of the string, but for editing the string once it is created. Since the **Append** and other options in the **Edit 3d** menu are identical to the options used when editing an existing string, they will be discussed in detail in the string **Editor** section.

For full information in the 3d Editor, go to the section [Edit 3d](#)

Create - 4d Super

Position of option on menu: Strings =>Create =>4d

A 4dsuper string consists of a series of (x,y,z) co-ordinates joined only by straight segments, and a text label at each vertex.

Creating and editing a 4d string is very similar to a 3d string.- the major difference is that a height **and** a text label is required at each string vertex.

The **Many strings** tick-box is used when more than one string of the same type is to be created, If **many strings** is set to *tick*, when the current string creation is **Finished** or **Quit**, a new **Create Super 4d String** panel is placed on the screen with the same information in it as the string just created. If any of the information needs to be modified for the new string, simply change it in the **Create Super 4d String** panel fields before selecting the **Create** button for the new string. Hence a new string of the same type can be created without going back to the **Create** menu.

The **Same as** button is used to obtain information from an existing string (not necessarily of the same type) and pipe it into the name, colour, model, type, linestyle and weight of the **Create Super 4d String** panel.

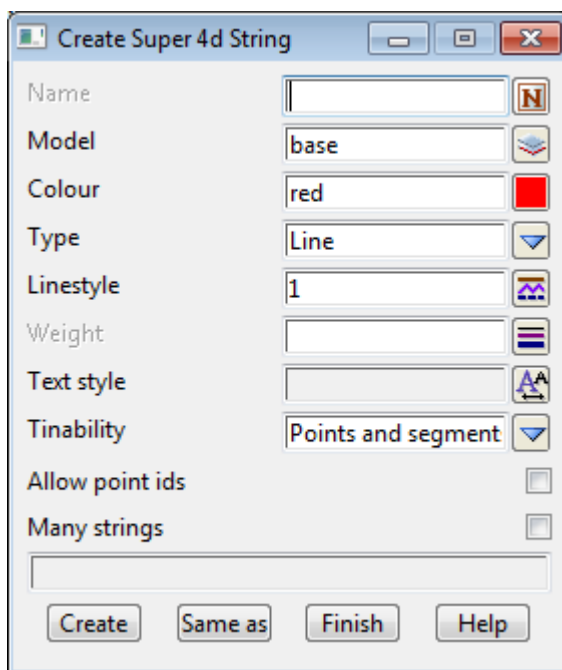
From **12d Model 8** onwards, the default is to create **4d super strings** rather than the **4d strings** used up to **12d Model 7**. The advantage of using a **4d super string** is that all the CAD options will work for it, vertices and segments can be assigned tinability and it can have point id's for setout.

The older **4d string** create option is still available under

Strings =>Create =>Old

(go to the section [Create - 4d \(Pre V8\)](#))

On selecting the **4d** option, the **Create Super 4d String** panel is displayed.



The default values for the panel fields are taken from the **CAD Controlbar** (see [CAD, Symbol and Text Controlbars](#))

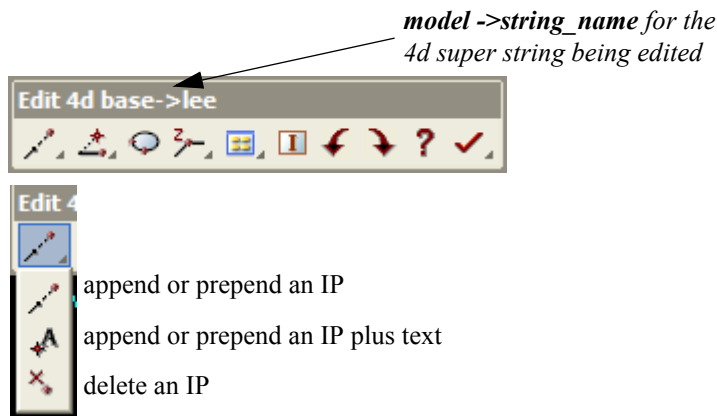
To **create a new 4d super string**, the panel fields are filled in and the **Create** button selected.

The fields and buttons used in the **Create Super 4d String** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name <i>the name of the new string</i>	input	from CAD controlbar	
Model <i>name of the model that the new string is in</i>	model box	from CAD controlbar	available models
Colour <i>the colour of the new string</i>	colour box	from CAD controlbar	available colours
Type <i>breakline type (point-line type) of the string</i>	choice box	line	line, point
Linestyle <i>line style of the string</i>	linestyle box	from CAD controlbar	available line styles
Weight <i>thickness of the string</i>	input	from CAD controlbar	
Text style <i>textstyle to use for text</i>	textstyle box		
Tinability	choice box	Points and segments	Points and segments Points only Not tinable
<i>if Vertices and segments, all the vertices and segments of the string are set to tinable. If Vertices only, all the vertices are set to tinable and the segments to not tinable. If Not tinable, all the vertices or segments are set to not tinable.</i>			
Allow point ids <i>if ticked, the super string can have point ids for each vertex. If not ticked, the super string will not have point ids. This can be reversed if point ids are required in the future.</i>	tick box		
Many strings <i>if ticked then after the current string is finished, a new create panel is placed on the screen with all the same values for the panel fields as the current string.</i>	tick box		
Create <i>after the Create button is chosen, the Edit 4d menu is displayed</i>	button		
Same as <i>after the Same as button is chosen, another string is selected and information about it is used for the fields in this panel</i>	button		
Finish <i>end the option, don't proceed to the edit stage</i>	button		

Start Edit - 4d Super

On selecting the **Create** button in the **Create Super 4d String** panel the **Edit 4d** menu is placed on the screen. The **Edit 4d** menu for a *4d super string* is



To create a new *4d super string*, select the **Append** or **Append + Text** icon.

The **Append** and or **Append + Text** option are used to add vertices to either end of an existing string, or in the case of a new string, places the first vertex and then begins appending vertices to the first vertex. **Append + Text** also asks for text at each vertex.

For all 4d strings, a cross is then drawn in each plan view that the string's model is on, and the cross follows the cursor around the screen. If the string's model is **not** added to any plan view, the model is automatically added to **all** plan views.

After the cross is on the screen (moving with the cursor), clicking LB and accepting with MB selects the **first** vertex of the string (using the appropriate snaps).

If **Append + text** was selected, the user will then be prompted for the text to be placed at that vertex.

The string is then drawn from the first vertex to the cursor position, which represents the second vertex of the string. Clicking LB and accepting with MB selects the second string vertex and the process repeats for subsequent string vertices.

Now that the string is created, all the edit option on the string's **Edit 4d** menu are usable.

The options in the **Edit 4d** menu are not only used for placing the initial vertices of the string, but for editing the string once it is created. Since the **Append** and other options in the **Edit 4d** menu are identical to the options used when editing an existing string, they will be discussed in detail in the string **Editor** section.

For full information in the 4d Editor, go to the section [Edit 4d](#)

Super Alignments

Position of menu: Strings =>Create =>Super alignments

The **Super Alignment** walk-right menu contains options to create a super alignment string, plus options to created/edit labelling and information styles, and design standards and templates.

Super alignments	
Super alignment	create super alignment
Label styles	create/edit a super alignment label style
Info styles	create/edit a style for super alignment information panel
Design standards	define design standards
Design templates	create/edit a design template using selections from Design Standards
Import legacy design	read in V9 design tables

For the option <i>Super alignment</i> , go to	Create - Super Alignment
<i>Label styles</i>	Super Alignment Style
<i>Info styles</i>	Super Alignment Info Styles
<i>Design standards</i>	Design Standards
<i>Design templates</i>	Design Templates
<i>Import legacy design</i>	Import Legacy Design

Create - Super Alignment

Position of option on menu: Strings =>Create =>Super Alignments =>Super alignments

A super alignment string is defined by specifying both its horizontal and vertical geometry.

If the user does not have the **Alignment Module**, then the **super alignment** acts like the pre-V10 **alignment** string and consists of only horizontal and vertical intersection points consisting of leading transitions-arc-trailing transition for each horizontal intersection point, and parabolas or arcs on the intersection points for vertical geometry. The resultant elements are linked tangentially to form the horizontal and vertical geometry. The intersection points and the tangent points can be moved.

If the user has the **Alignment Module** then the **Super Alignment** includes IP constructions but also allows much more complicated parametric design.

The Horizontal Geometry of a Super Alignment is made up of **parts**, which may be as simple as a straight line between two points or an arc with a given centre and radius, or a horizontal intersection point with given leading and trailing transitions or the **parts** can be very complicated where for example the points of a line are defined by the offset intersection of the two arcs from other strings.

Often a horizontal part is **not** fully defined (parts are classified as fixed which are fully defined, floating which have one degree of freedom and free which have two degrees of freedom) and the extra restriction that the horizontal parts must be linked tangentially is necessary to fully defined the horizontal geometry. The horizontal geometry is then said to be **solved**.

Once solved, the horizontal geometry simply consists of linked known segments of types lines, arcs and transition, and so can be drawn in a plan view.

So the horizontal geometry is made up of the constructive definitions called **parts**, and if the horizontal geometry solves, it also contains the resultant **horizontal segments**.

Similarly the Vertical Geometry is made up of **parts**, which are made up of simple or complicated combinations of straight lines, arcs or a parabolas. Again the extra restriction that the vertical parts must be linked tangentially is often necessary to fully defined the vertical geometry. The vertical geometry is then said to be **solved** and the solved vertical geometry simply consists of linked known segments of types lines, arcs and parabolas, and so can be drawn in a section view.

So the vertical geometry is made up of the constructive definitions called **parts**, and if the vertical geometry solves, it also contains the resultant **vertical segments**.

Important Note

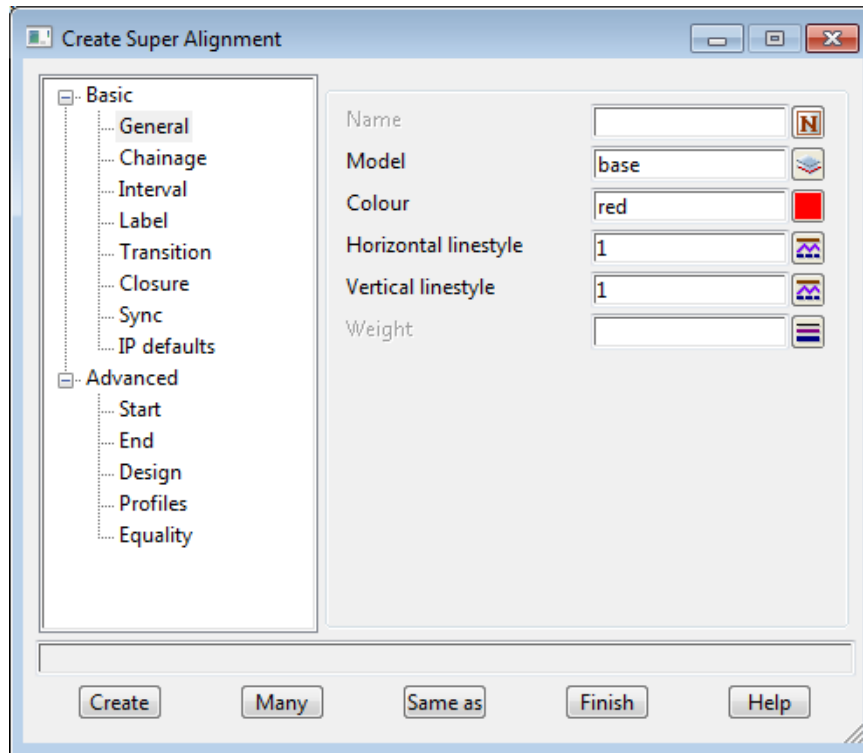
The horizontal and vertical parts of a super alignment are only displayed when the super alignment is being edited. When the super alignment is not being edited, the solved segments are displayed and any unsolved parts are displayed as red crosses.

For more information on Super Alignments and Parts, see [Placing Parts for Super Alignments](#).

Notes:

1. vertical geometry can only be added to an **existing** super alignment string. That is, to a string with some horizontal geometry.
2. for both the alignment and super alignment, the horizontal geometry is defined in a **plan** view and the vertical geometry in a **section** view.

On selecting the **Super Alignment** option, the **Create Super Alignment** panel is displayed.

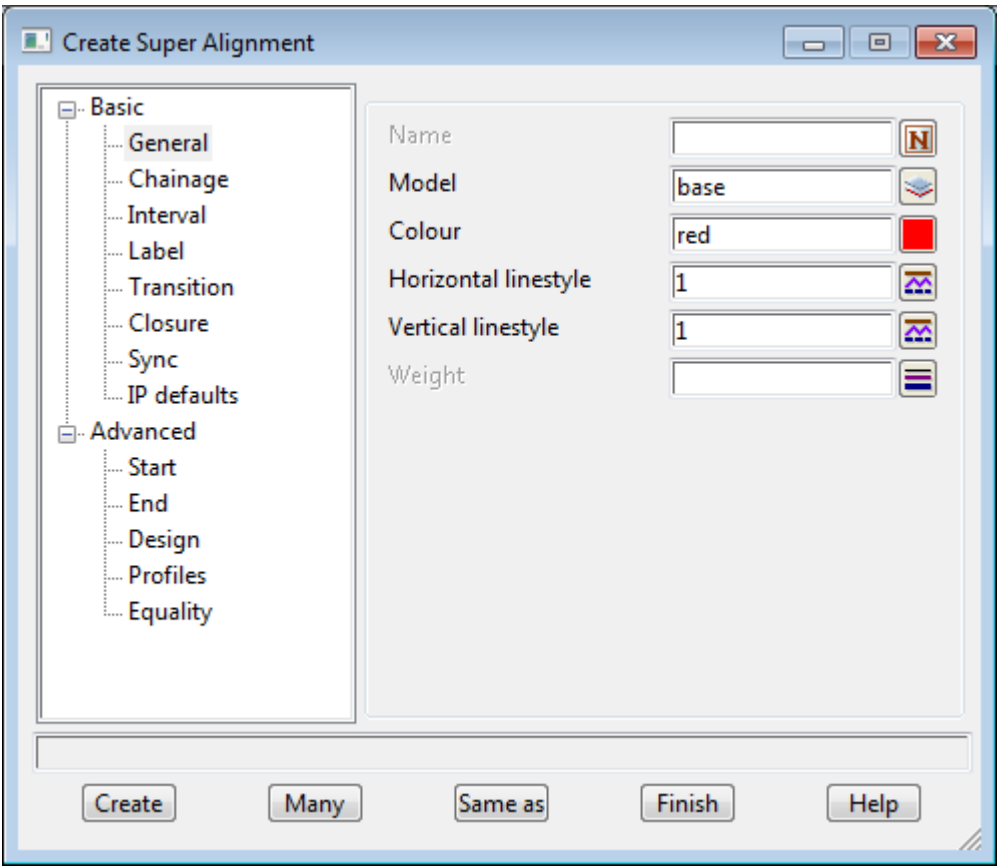


To create a new super alignment string, the name, model, colour, etc. of the new string are entered into the appropriate fields for each branch on the tree on the left-hand side of the panel, and the **Create** or **Many** button selected.

For information on each branch and the buttons (Create, Many, Same as), and starting to edit after selecting the **Create** or **Many** button, go to:

- [Basic > General branch](#)
- [Basic > Chainage branch](#)
- [Basic > Interval branch](#)
- [Basic > Label branch](#)
- [Basic > Transition branch](#)
- [Basic > Closure branch](#)
- [Basic > Sync branch](#)
- [Basic > IP defaults branch](#)
- [Advanced > Start branch](#)
- [Advanced > End branch](#)
- [Advanced > Design branch](#)
- [Advanced > Profiles branch](#)
- [Advanced > Equality branch](#)
- [Advanced > Chain branch \(not yet implemented\)](#)
- [Buttons at Bottom](#)
- [Start Edit - Super Alignment](#)

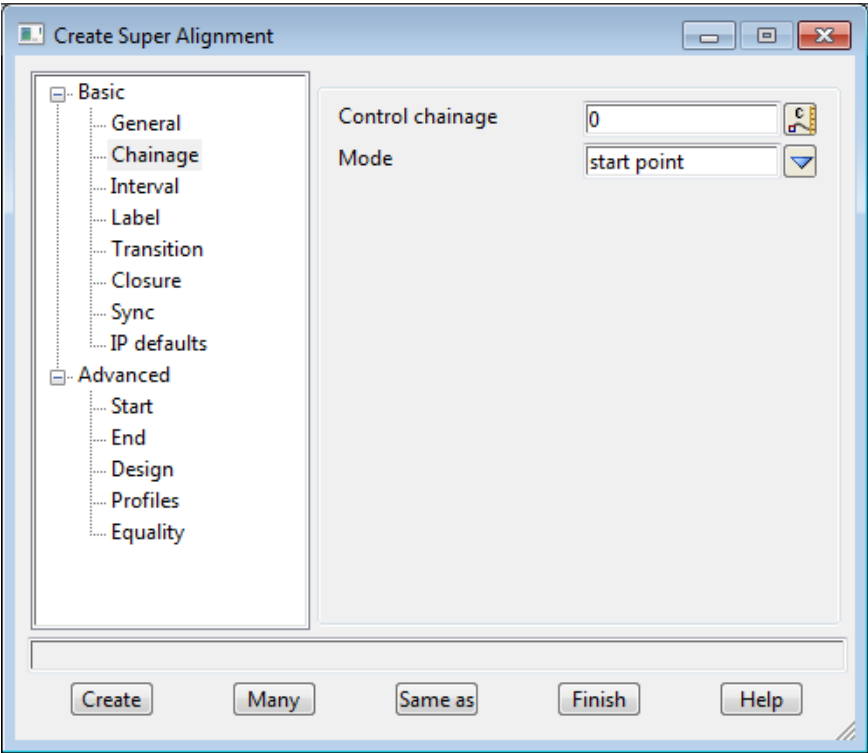
Basic > General branch



The fields and buttons used in the **Basic > General** branch of the **Create Super Alignment** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name <i>the name of the new string</i>	name box	from CAD controlbar	available names
Model <i>name of the model that the new string is in</i>	model box	from CAD controlbar	available models
Colour <i>the colour of the new string. Note that the super alignment may not appear to have this colour if a Label style is set. The Label can define different colours to parts of the super alignment.</i>	colour box	from CAD controlbar	available colours
Horizontal Linestyle <i>linestyle of the string when displayed on a Plan view</i>	linestyle box	from CAD controlbar	available linestyles
Vertical Linestyle <i>linestyle of the string when profiled on a Section view</i>	linestyle box	from CAD controlbar	available linestyles
Weight <i>thickness of the string when plotted</i>	weight box	from CAD controlbar	

Basic > Chainage branch



The fields and buttons used in the **Basic > Chainage** branch of the **Create Super Alignment** panel have the following functions.

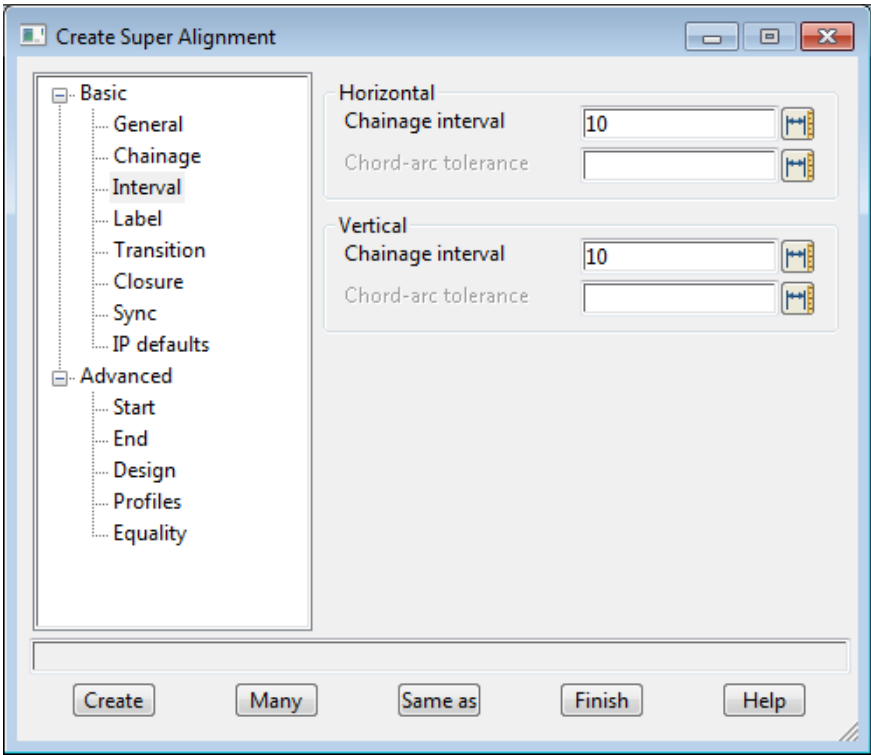
Field Description	Type	Defaults	Pop-Up
Control chainage	measure box	0	Measure Point/String from point
<i>defines the control chainage for the horizontal geometry. What this value refers to depends on the Mode.</i>			
Mode	choice box		start point end point control point start part end part

*if **start point**, the **Control chainage** value is applied to the start of the usable horizontal geometry.
If **end point**, the **Control chainage** value is applied to the end of the usable horizontal geometry.
If **control point**, a user given control point is dropped perpendicularly onto the horizontal geometry and that position is given the **Control chainage** value.*

Control point X/Y coordinate select x, y box
coordinates of the control point

*If **start part**, the **Control chainage** value is applied to the start of the first part of horizontal geometry, even if it is invisible.
If **end part**, the **Control chainage** value is applied to the end of the last part of horizontal geometry, even if it is invisible.*

Basic > Interval branch

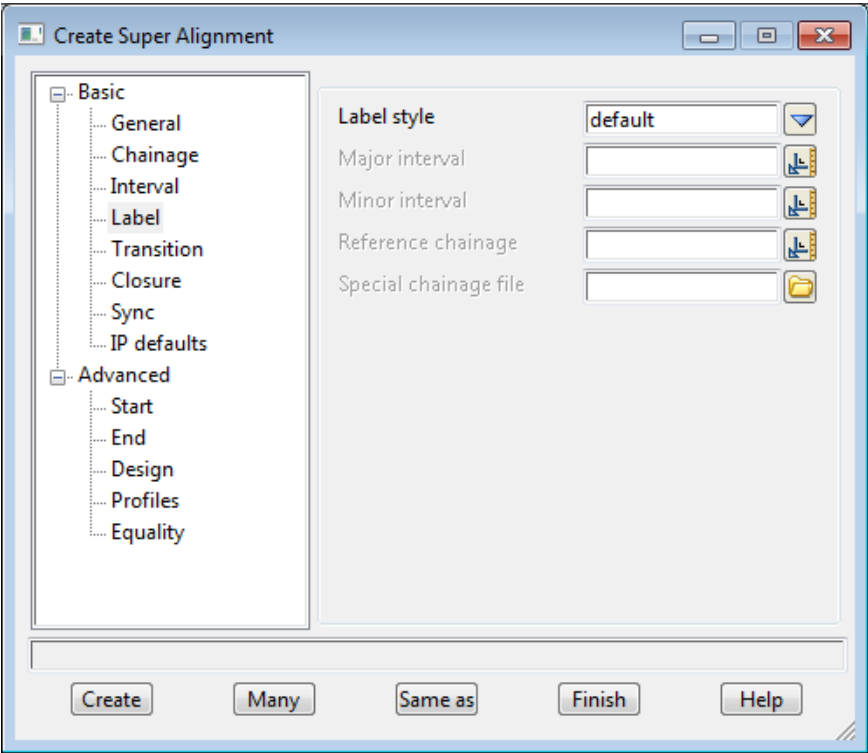


The fields and buttons used in the **Basic > Interval** branch of the **Create Super Alignment** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Horizontal Chainage interval <i>horizontal chainage interval for the string</i> <i>If blank, the default is 10.</i>	measure box		Point to point/String to point
Horizontal Chord to arc tol <i>horizontal chord to arc tolerance to use for any arcs and transitions</i> <i>If blank, the default is 0.1.</i>	measure box		Point to point/String to point
Vertical Chainage interval <i>vertical chainage interval for the string</i> <i>If blank, the default is 10.</i>	measure box		Point to point/String to point
Vertical Chord to arc tol <i>vertical chord to arc tolerance to use for any parabolas or circular curves.</i> <i>If blank, the default is 0.1.</i>	measure box		Point to point/String to point

***Note:** the horizontal and vertical intervals and chord to arc tolerances are used when the super alignment is approximated by straights in three dimensions.*

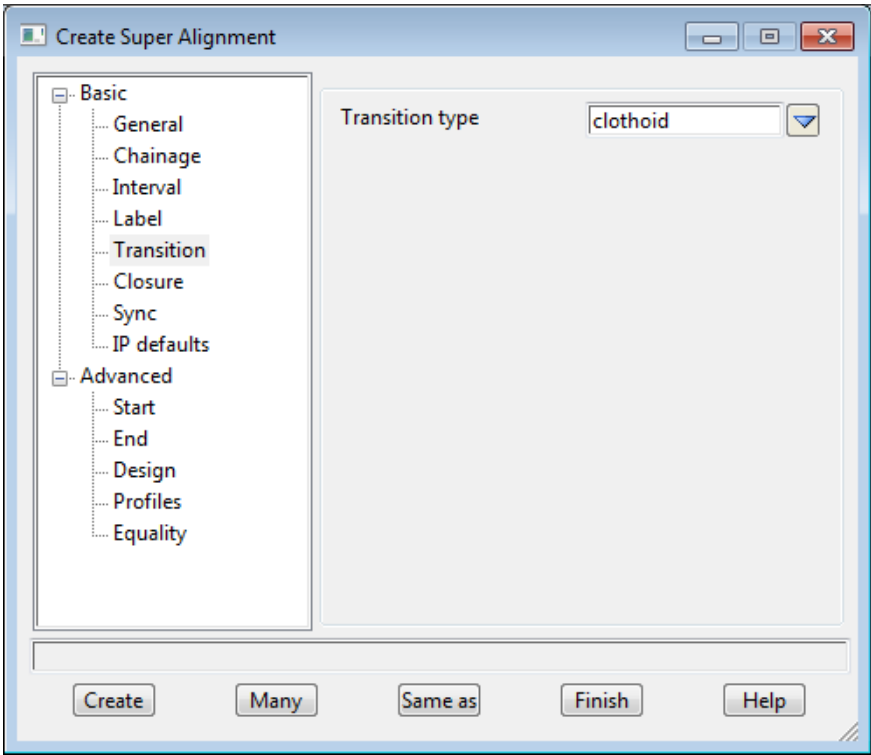
Basic > Label branch



The fields and buttons used in the **Basic > Label** branch of the **Create Super Alignment** panel have the following functions.

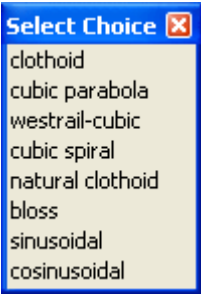
Field Description	Type	Defaults	Pop-Up
Label style	choice box	default	available label styles
<i>The super alignment style controls the way the super alignment draws and highlights on the screen.</i>			
<i>For more information please go to the section Super Alignment Style</i>			
Label Major Chainage interval	measure box		
<i>major chainage interval to use for labelling</i>			
<i>If blank, the default is 10.</i>			
Label Minor Chainage interval	measure box		
<i>minor chainage interval to use for labelling</i>			
Label Reference chainage interval	measure box		
<i>reference value for the chainage labelling intervals</i>			
Label Special chainage file	file box		available *.spc files
<i>file of special chainages for labelling</i>			
<i>Note: the labelling of the super alignment is given by the Label style on the General tab.</i>			
<i>For more information please go to the section Super Alignment Style</i>			

Basic > Transition branch



The fields and buttons used in the **Basic > Transition** branch of the **Create Super Alignment** panel have the following functions.

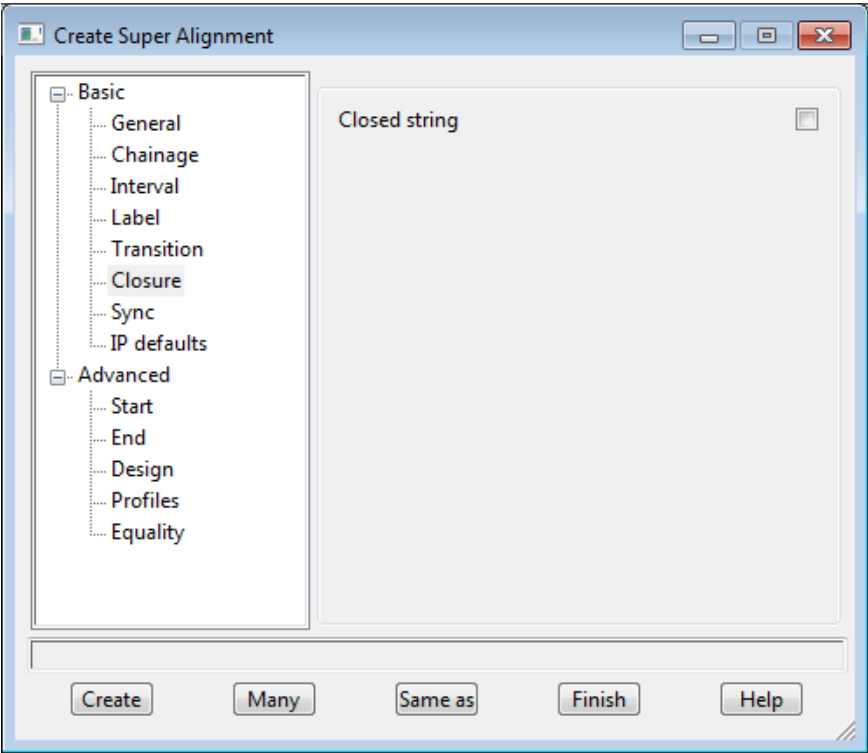
Field Description	Type	Defaults	Pop-Up
Transition type	choice box	clothoid	



transition (for example clothoid) to be used for this super alignment string.

For more information see [Transitions and Spirals File](#) in the chapter [Setting Up and Configuring 12d](#).

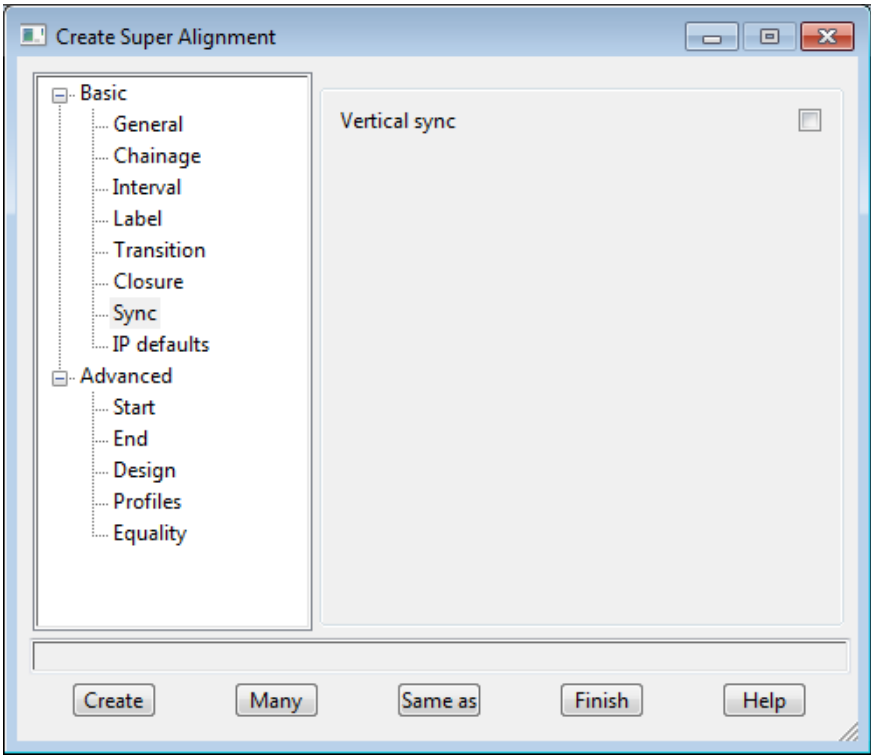
Basic > Closure branch



The fields and buttons used in the **Basic > Closure** branch of the **Create Super Alignment** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Closed string	tick box	not ticked	
<i>if ticked, the super alignment is automatically closed</i>			

Basic > Sync branch



The fields and buttons used in the **Basic > Sync** branch of the **Create Super Alignment** panel have the following functions.

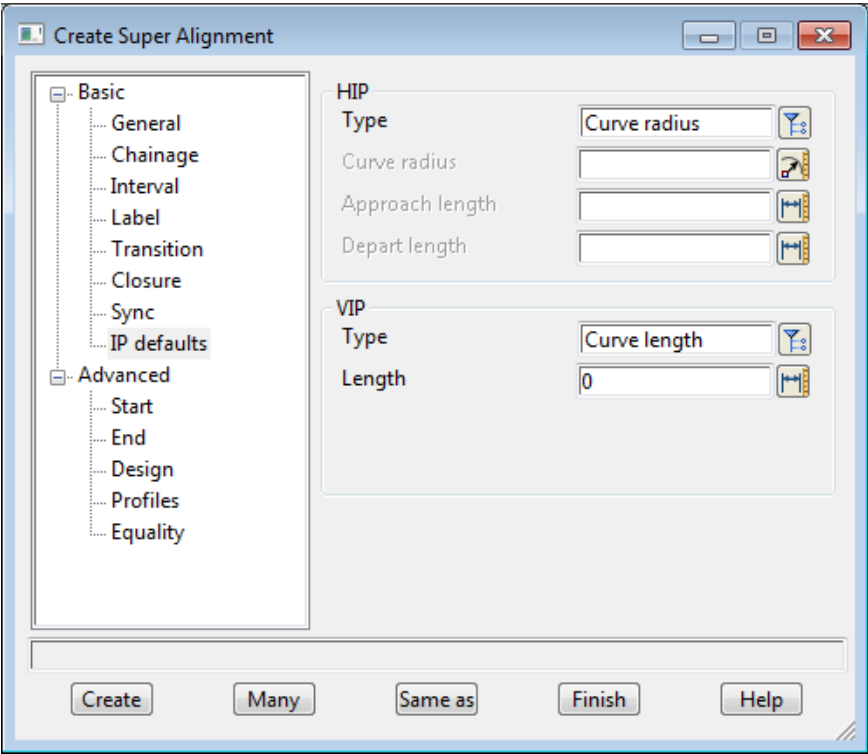
Field Description	Type	Defaults	Pop-Up
Vertical sync	tick box	not ticked	

*if **ticked**, when the horizontal geometry is modified, an attempt is made to modify the chainage position of the vertical geometry so that it remains locked to the same parts of the horizontal geometry as before the horizontal geometry was modified.*

*If **not ticked**, after horizontal geometry is modified, the vertical geometry will possibly be moved in relation to the horizontal geometry because the (x,y) position for a given chainage will change.*

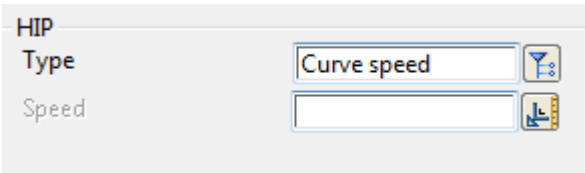
Basic > IP defaults branch

the **IP Defaults** branch defines the types of **HIPs** and **VIPs** that are placed when laying down horizontal and vertical geometry.



The fields and buttons used in the **Basic > IP defaults** branch of the **Create Super Alignment** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
HIP type	choice box	Curve radius	Curve speed/radius/length
<p><i>The default HIP type given to any placed HIPs. The default for the panel is a Curve radius with blank Curve radius, Approach and Depart length. That is, just a HIP with no curve or transitions on it.</i></p> <p><i>If Curve speed, any new HIP being created will be a Speed IP with the speed specified in the Speed field.</i></p>			



If the **Speed** field is blank, the default alignment speed is used.

If **Curve radius**, any new HIP being created will be a Radius IP with the radius of the arc on the HIP specified in the **Curve Radius** field. Optional approaching and departing transitions can also be defined in the **Approach length** and **Depart length** fields.

HIP

Type

Curve radius

Curve radius

Approach length

Depart length

Curve radius

If the **Curve Radius** field is non-zero, an arc of the given value is placed on the HIP.

If the **Curve Radius** field is blank, the HIP won't have an arc associated with it.

If the **Approach length** field is non-zero, then a leading transition of the given value is placed on the HIP. If there is a non-zero value then there must also be a non-zero **Curve Radius** value.

If the **Depart length** field is non-zero, then a trailing transition of the given value is placed on the HIP. If there is a non-zero value then there must also be a non-zero **Curve Radius** value.

Note - if either the **Approach length** or **Depart length** fields are non zero then there must be a non zero **Curve radius**.

If the HIP is defined by **Curve radius**, then as the HIP is moved around, the values in the Curve radius definition are held for the HIP. That is, the radius of the arc and the transition lengths are kept constant and the length of the arc is modified.

If **Curve length**, any new HIP being created will be a Length IP with the length specified in the **Curve length** field.

HIP

Type

Curve length

Curve length

Curve length

If the **Curve length** field is blank, the HIP will have an arc of length zero.

If the HIP is defined by **Curve length**, then as the HIP is moved around, the arc length is held for the arc on the HIP and arc radius is modified.

VIP type

choice box

Curve length

Curve speed/radius/length
Asymmetric

The default VIP type given to any placed VIPs. The default for the panel is a **Curve length** with a **Length** of 0.

If **Curve speed**, any new VIP being created will be a Speed IP with the speed specified in the **Speed** field.

VIP

Type

Curve speed

Speed

Curve speed

If the **Speed** field is blank, the default alignment speed is used.

If **Curve radius**, any new VIP being created will be a Radius IP with the radius specified in the **Radius** field.

The screenshot shows a dialog box titled 'VIP'. It has a 'Type' dropdown menu set to 'Curve radius'. Below it is a 'Radius' text input field. There are two checkboxes: 'Circular curve' and 'Kvalue', both of which are currently unchecked. To the right of the input fields and checkboxes are two small icons: a funnel icon and a double-headed arrow icon.

If the **Radius** field is blank, the VIP won't have an parabola/arc associated with it. The value in the Radius field can be a k-value for a parabola, an effective radius (100 x k-value) for a parabola, or the radius of an arc.

If the **Kvalue** tick box is ticked, a parabola is placed on the VIP and the k-value of the parabola is the value in the **Radius** field.

If the **Circular curve** tick box is ticked, an arc is placed on the VIP and the radius of the arc is the value in the **Radius** field.

If **neither** Kvalue or Circular curve is ticked, a parabola is placed on the VIP and the effective radius of the parabola is the value in the **Radius** field.

If the VIP is defined by **Curve radius**, then as the VIP is moved up or down, the values in the Curve radius definition is held for the VIP. That is, the radius or k-value will be kept constant and the length of the parabola/arc is varied.

If **Curve length**, any new VIP being created will be a parabolic Length IP with the length specified in the **Length** field.

The screenshot shows a dialog box titled 'VIP'. It has a 'Type' dropdown menu set to 'Curve length'. Below it is a 'Length' text input field. There are two small icons to the right of the input field: a funnel icon and a double-headed arrow icon.

If the **Length** field is 0, then just the VIP will be drawn with no parabola on it.

If the **Length** field is blank, the VIP will be associated with an parabola of maximum length.

If the VIP is defined by **Curve length**, then as the VIP is moved up or down, the length of the parabola given in the Curve Length definition is held for the VIP. That is, the length is kept constant and the radius/k-value of the parabola is varied.

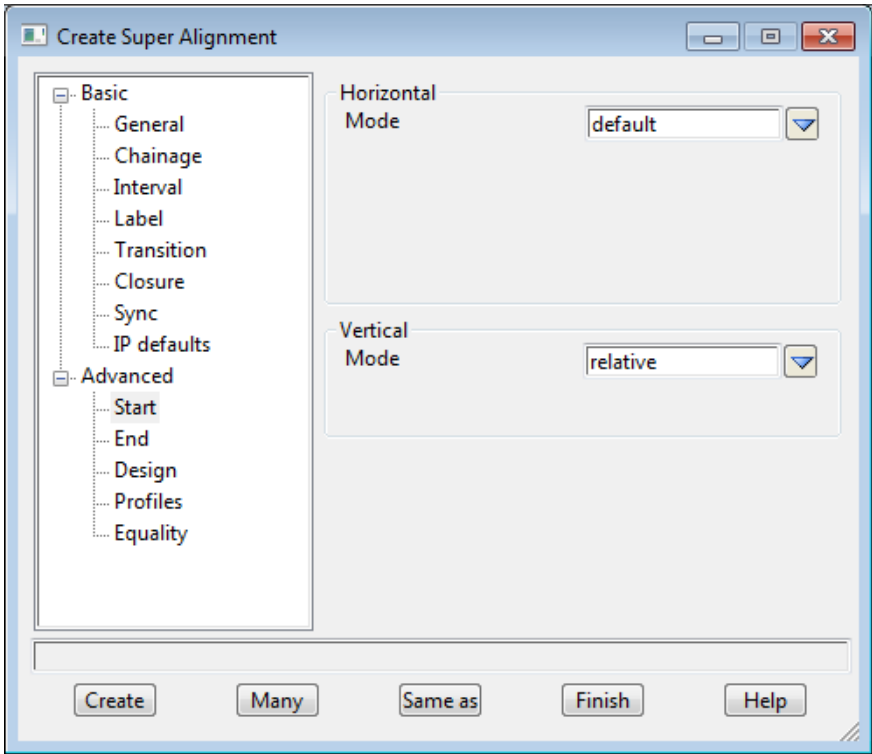
If **Asymmetric**, any new VIP being created will have parabolas of the combined lengths of **Approach length** and **Depart length**.

The screenshot shows a dialog box titled 'VIP'. It has a 'Type' dropdown menu set to 'Asymmetric'. Below it are two text input fields: 'Approach length' and 'Depart length'. Each input field has a small double-headed arrow icon to its right.

If the VIP is defined by **Asymmetric**, then as the VIP is moved up or down, the Approach and Depart Lengths of the parabolas given in the Asymmetric definition are held for the VIP. That is, the lengths are kept constant and the radius/k-value of the parabolas are varied.

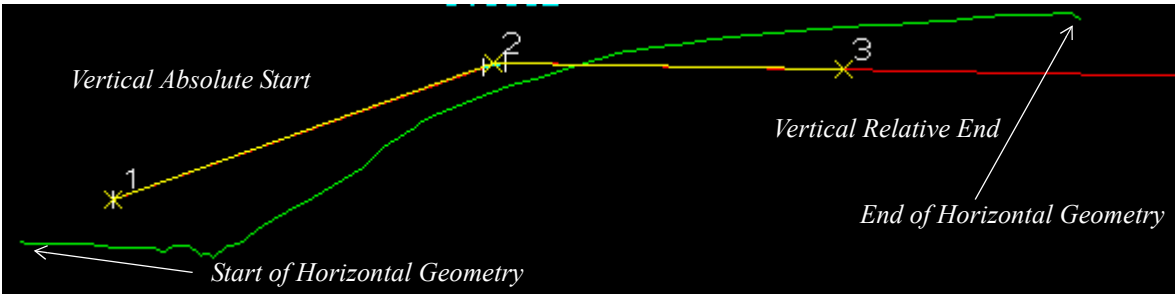
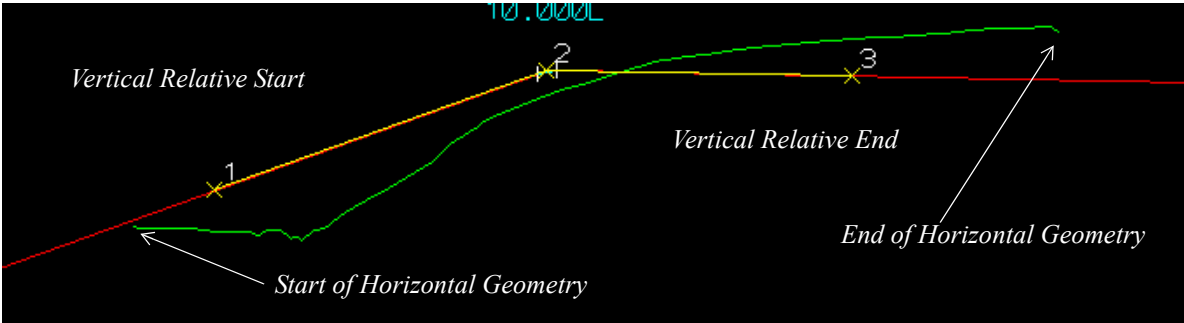
Advanced > Start branch

the **Start** branch defines where the usable horizontal and vertical geometry starts for the super alignment. Note that the super alignment can have more horizontal and vertical geometry than is actually used.



The fields and buttons used in the **Advanced > Start** branch of the **Create Super Alignment** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Start Horizontal mode	choice box		default segment point
<i>specifies how the start of the usable horizontal geometry is defined.</i>			
<i>If default, the beginning of the first visible horizontal part is the start of the usable horizontal geometry.</i>			
<i>If segment, a user selected segment of the horizontal geometry is the start of the usable horizontal geometry.</i>			
<i>If point, a user selected position is dropped perpendicularly onto the super alignment to define the start of the usable horizontal geometry.</i>			
Start Control point X/Y coordinate	select x, y box		
<i>used in the segment and point cases of the Start Horizontal mode.</i>			
Start Vertical mode	choice box		absolute relative chainage
<i>specifies how the start of the usable vertical geometry is defined.</i>			
<i>If absolute, the beginning of the first visible vertical part is the start of the usable vertical geometry.</i>			
<i>If relative, the chainage of the start of the usable horizontal geometry is used as the start of the usable vertical geometry. If the beginning of the defined vertical geometry is after this chainage, then the first segment is extrapolated back to the required chainage.</i>			

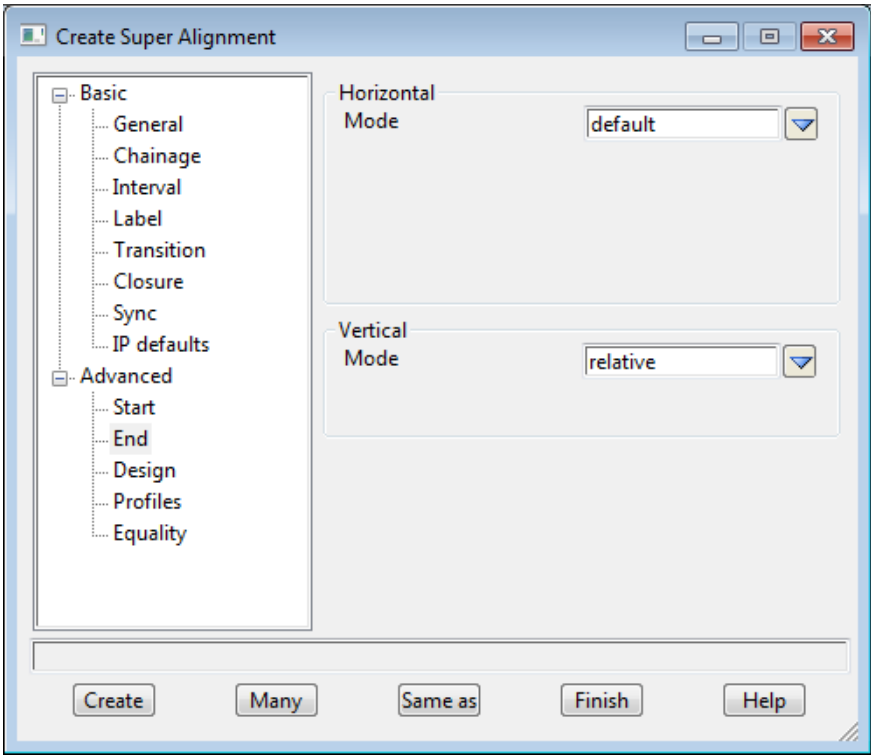


If *chainage*, a user given chainage defines the start of the usable vertical geometry.

Chainage	measure box	available measures
used in the <i>chainage</i> case of the <i>Start Vertical mode</i> .		

Advanced > End branch

the **End** branch defines where the usable horizontal and vertical geometry ends for the super alignment. Note that the super alignment can have more horizontal and vertical geometry than is actually used.



The fields and buttons used in the **Advanced > End** branch of the **Create Super Alignment** panel have the following functions.

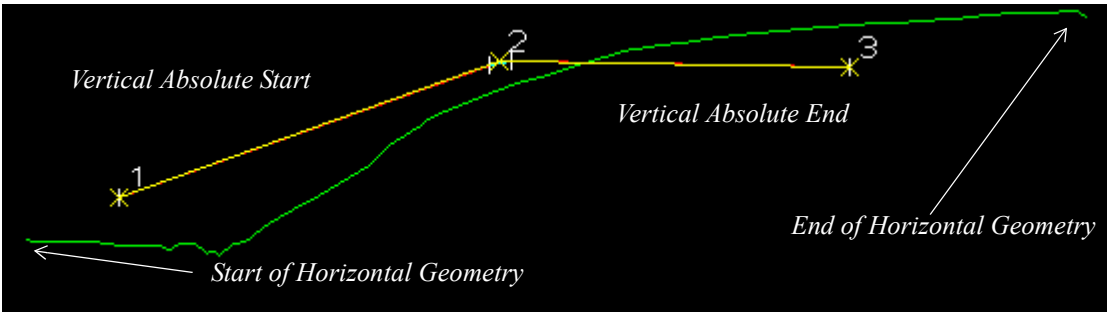
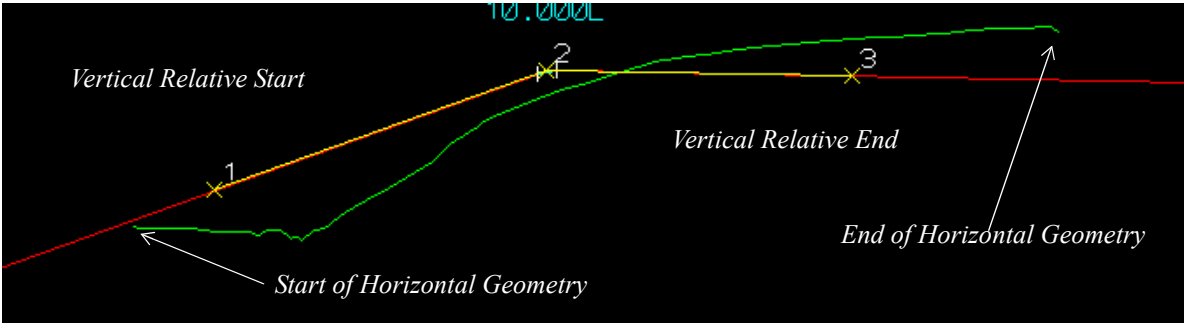
Field Description	Type	Defaults	Pop-Up
End Horizontal mode	choice box		default segment point

specifies how the end of the usable horizontal geometry is defined.
*If **default**, the end of the last visible horizontal part is the end of the usable horizontal geometry.*
*If **segment**, a user selected segment of the horizontal geometry is the end of the usable horizontal geometry.*
*If **point**, a user selected position is dropped perpendicularly onto the super alignment to define the end of the usable horizontal geometry.*

End Control X/Y coordinate select x, y box
*used in the **segment** and **point** cases of the **End Horizontal mode**.*

End Vertical mode	choice box	absolute relative chainage
--------------------------	------------	----------------------------------

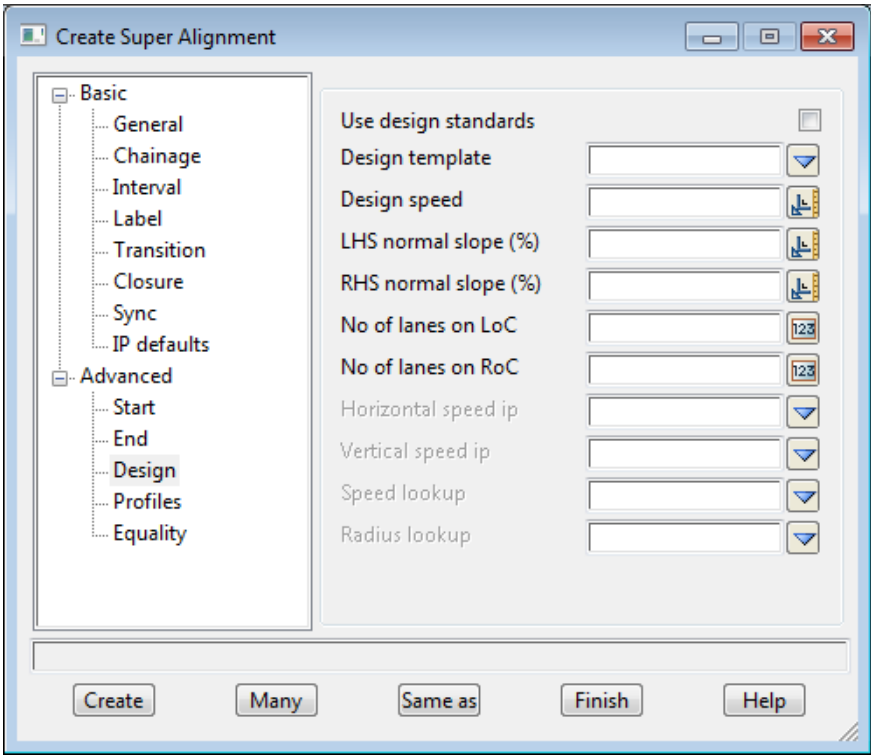
specifies how the end of the usable vertical geometry is defined.
*If **absolute**, the end of the last visible vertical part is the end of the usable vertical geometry.*
*If **relative**, the chainage of the end of the usable horizontal geometry is used as the end of the usable vertical geometry. If the end of the defined vertical geometry is **before** this chainage, then the last segment is extrapolated to the required chainage.*



If **chainage**, a user given chainage defines the end of the usable vertical geometry.

Chainage	measure box	available measures
used in the chainage case of the End Vertical mode .		

Advanced > Design branch



the **Design** branch is only used if a design template has been set up and is to be used for automatically inserting curves and transition curves in horizontal geometry, apply super elevation and widening, and automatically inserting vertical curves in the vertical geometry.

The fields and buttons used in the **Advanced > Design** branch of the **Create Super Alignment** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use design standards	tick box	not ticked	
<i>if ticked, the selected design template is used when creating horizontal and vertical geometry. If not ticked, no design template is used with Alignment speed elements.</i>			
Design template	choice box		available design templates
<i>Design template to use when creating horizontal and vertical geometry. For more information see Design Templates.</i>			
Design speed			*.design files
<i>the general design speed for the road. This is used with the design template when creating horizontal and vertical geometry. This can be over written by Speed IPs.</i>			
LHS normal slope (%)			
RHS normal slope (%)			
No of lanes on LoC			
<i>number of lanes on the left of the centreline. The number of lanes can be zero.</i>			
No of lanes on RoC			
<i>number of lanes on the right of the centreline. The number of lanes can be zero.</i>			
Horizontal speed IP	choice box		minimum

maximum

For *Alignment speed* and *Curve speed HIPs*.

If **minimum**, when an arc is automatically placed on an HIP using the design table, the arc with the smallest radius for the design speed is used.

If **maximum**, when an arc is automatically placed on an HIP using the design table, the arc with the largest radius for the design speed is used.

Vertical speed IP

choice box

minimum
maximum

For *Alignment speed* and *Speed VIPs*.

If **minimum**, when a parabola is automatically placed on an VIP using the design table, the parabola with the smallest kvalue for the design speed is used.

If **maximum**, when a parabola is automatically placed on an VIP using the design table, the parabola with the largest kvalue for the design speed is used.

Speed lookup

choice box

ceiling
floor
round up
round down

Different method to achieve the actual speed from the speed table.

If **ceiling**, then the design speed is the upper speed from the table.

If **floor**, then the design speed is the lower speed from the table.

If **round up**, the speed will be the upper speed from the table when the calculated speed is greater than or equal to the half way speed. Otherwise it will be the lower speed.

If **round down**, the speed will be the lower speed from the table when the calculated speed is less than or equal to the half way speed. Otherwise it will be the upper speed.

Radius lookup

choice box

ceiling
floor
round up
round down
interpolate

Different method to achieve the actual radius from the radius table.

If **ceiling**, then the design radius is the upper radius from the table.

If **floor**, then the design radius is the lower radius from the table.

If **round up**, the radius will be the upper radius from the table when the calculated radius is greater than or equal to the half way radius. Otherwise it will be the lower radius.

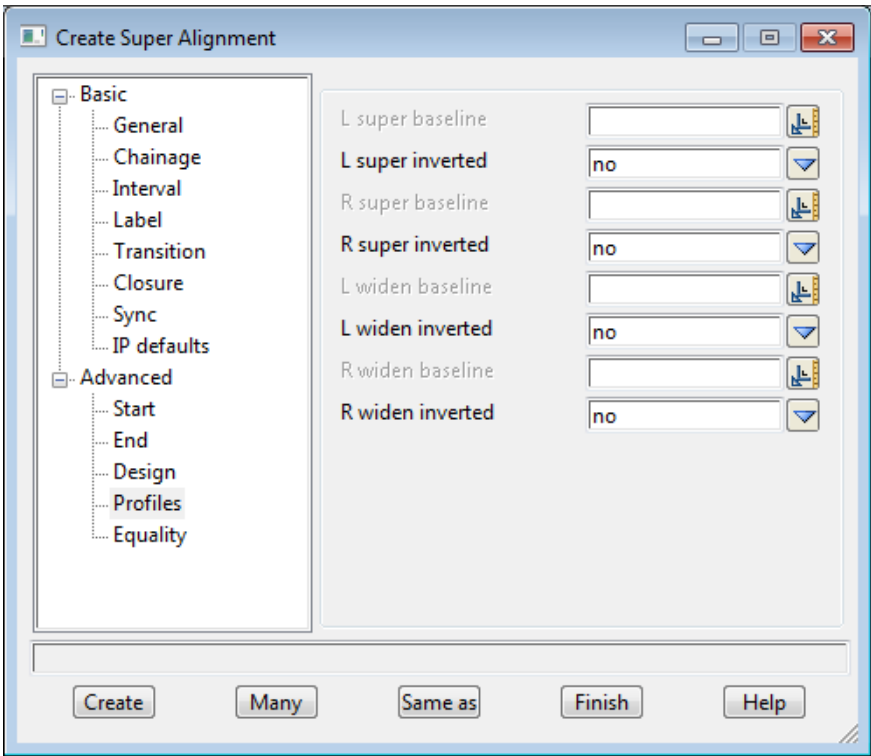
If **round down**, the radius will be the lower radius from the table when the calculated radius is less than or equal to the half way radius. Otherwise it will be the upper radius.

If **interpolate**, the radius is the calculated based on the specified speed.

For *non speed HIPs only* (that is, not *Alignment speed* or *Curve speed HIPs*).

The radius has been defined by the user and LJG?

Advanced > Profiles branch



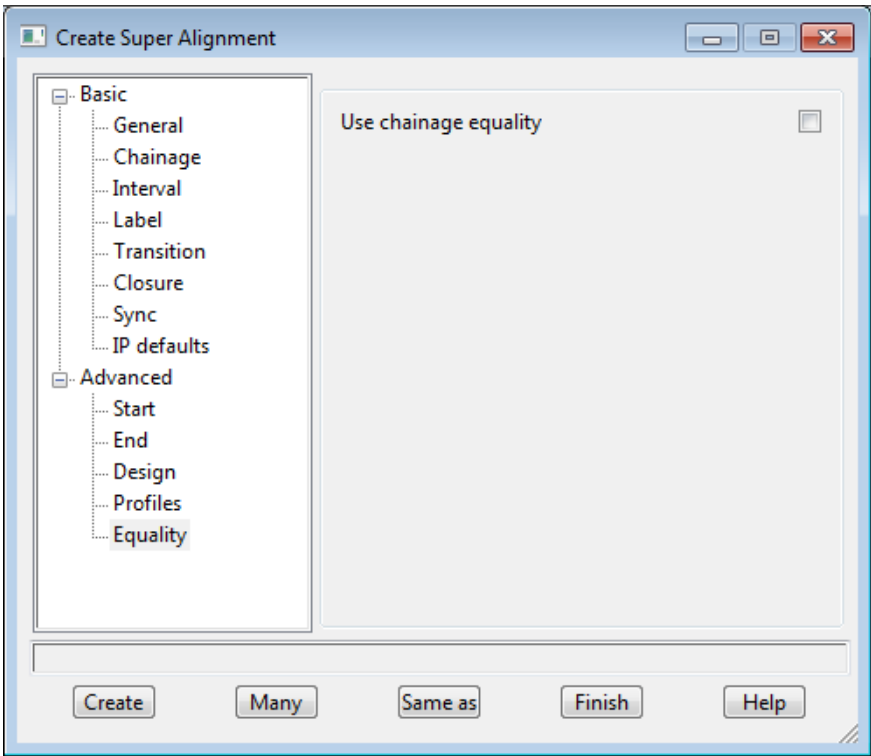
The fields and buttons used in the **Advanced > Profiles** branch of the **Create Super Alignment** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
L super baseline <i>the left super elevation diagram will be drawn at this Z value in the Section view</i>	measure box		available measures
L super inverted <i>if no, positive super elevation is drawn above the left super baseline and negative super elevation is drawn below the left super baseline. This is the default.</i> <i>if yes, positive super elevation is drawn below the left super baseline and negative super elevation is drawn above the left super baseline, i.e. the diagram is turned upside down</i>	choice box	no	yes, no
R super baseline <i>the right super elevation diagram will be drawn at this Z value in the Section view</i>	measure box		available measures
R super inverted <i>if no, positive super elevation is drawn above the right super baseline and negative super elevation is drawn below the right super baseline. This is the default.</i> <i>if yes, positive super elevation is drawn below the right super baseline and negative super elevation is drawn above the right super baseline, i.e. the diagram is turned upside down</i>	choice box	no	yes, no
L widen baseline <i>the left widening diagram will be drawn at this Z value in the Section view</i>	measure box		available measures
L widen inverted <i>if no, widening is drawn above the left widen baseline. Widening is always positive (or zero). This is the default.</i> <i>if yes, positive widening is drawn below the left widen baseline, i.e. the diagram is turned upside down</i>	choice box	no	yes, no

R widen baseline measure box available measures
the right widening diagram will be drawn at this Z value in the Section view

R widen inverted choice box no yes, no
*if **no**, widening is drawn above the right widen baseline. Widening is always positive (or zero). This is the default.*
*if **yes**, positive widening is drawn below the right widen baseline, i.e. the diagram is turned upside down*

Advanced > Equality branch



The fields and buttons used in the **Advanced > Equality** branch of the **Create Super Alignment** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use chainage equality	tick box	not ticked	
<i>if ticked, chainage equalities can be defined and the automatic labelling of the string will use the equalities.</i>			

Advanced > Chain branch (not yet implemented)

The fields and buttons used in the **Advanced > Chain** branch of the **Create Super Alignment** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Chain file <i>the chain parameter file to run every time the super alignment is resolved/recalced. For more information see the section Chains in the book Utilities.</i>	file box		available *.chain files
Run chain after set	tick box	not ticked	

Buttons at Bottom**Create** button

*when only one super alignment is to be created, click on the **Create** button. The **Edit Super Alignment** toolbar is displayed.*

Many button

*when more than one super alignment is to be created using the same set-up information, then click on the **Many** button. **Edit Super Alignment** toolbar is displayed.*

*After the editing for this string is finished, a new **Create Super Alignment** panel is placed on the screen with the same values for the panel fields as the string just created.*

*Hence new super alignments can be created (by clicking on the **Create** or **Many** button) without having to go back to the **String Create** menu.*

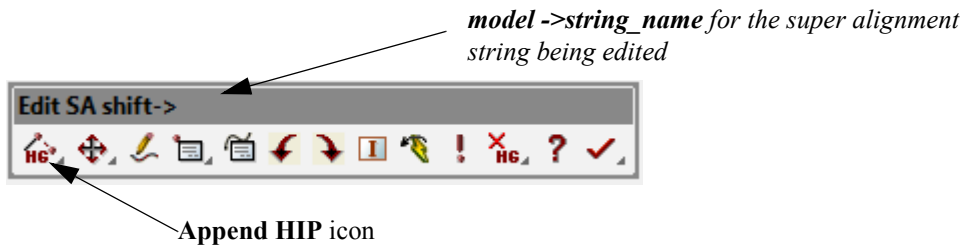
*If no more super alignments are to be created, click on the **Finish** button*

Same as button

*after the **Same as** button is chosen, another string is selected and information about it is used to fill in fields for this panel*

Start Edit - Super Alignment

After selecting the **Create** or **Many** button, the **Super Alignment** toolbar is created and placed on the screen.



To create a new Super Alignment, select the **Append HIP** icon.

The **Append HIP** simply creates horizontal intersection points (HIPs) that are joined by a straight segments.

For Appending HIPs, a cross is then drawn in each plan view that the string's model is on, and the cross follows the cursor around the screen. If the string's model is **not** added to any plan view, the model is automatically added to **all** plan views.

After the cross is on the screen (moving with the cursor), clicking LB and accepting with MB selects the **first** HIP of the string (using the appropriate snaps).

The string is then drawn from the first HIP to the cursor position, which represents the second HIP of the string. Clicking LB and accepting with MB selects the second string HIP and the process repeats for subsequent string HIPs.

Now that the string is created, all the edit option on the string's **Edit SA** toolbar are usable.

The options in the **Edit SA** toolbar are not only used for placing the initial HIPs of the string, but for editing the super alignment once it is created. Since the **Append HIP** and other options in the **Edit SA** toolbar are identical to the options used when editing an existing string, they will be discussed in detail in the **Editor** section.

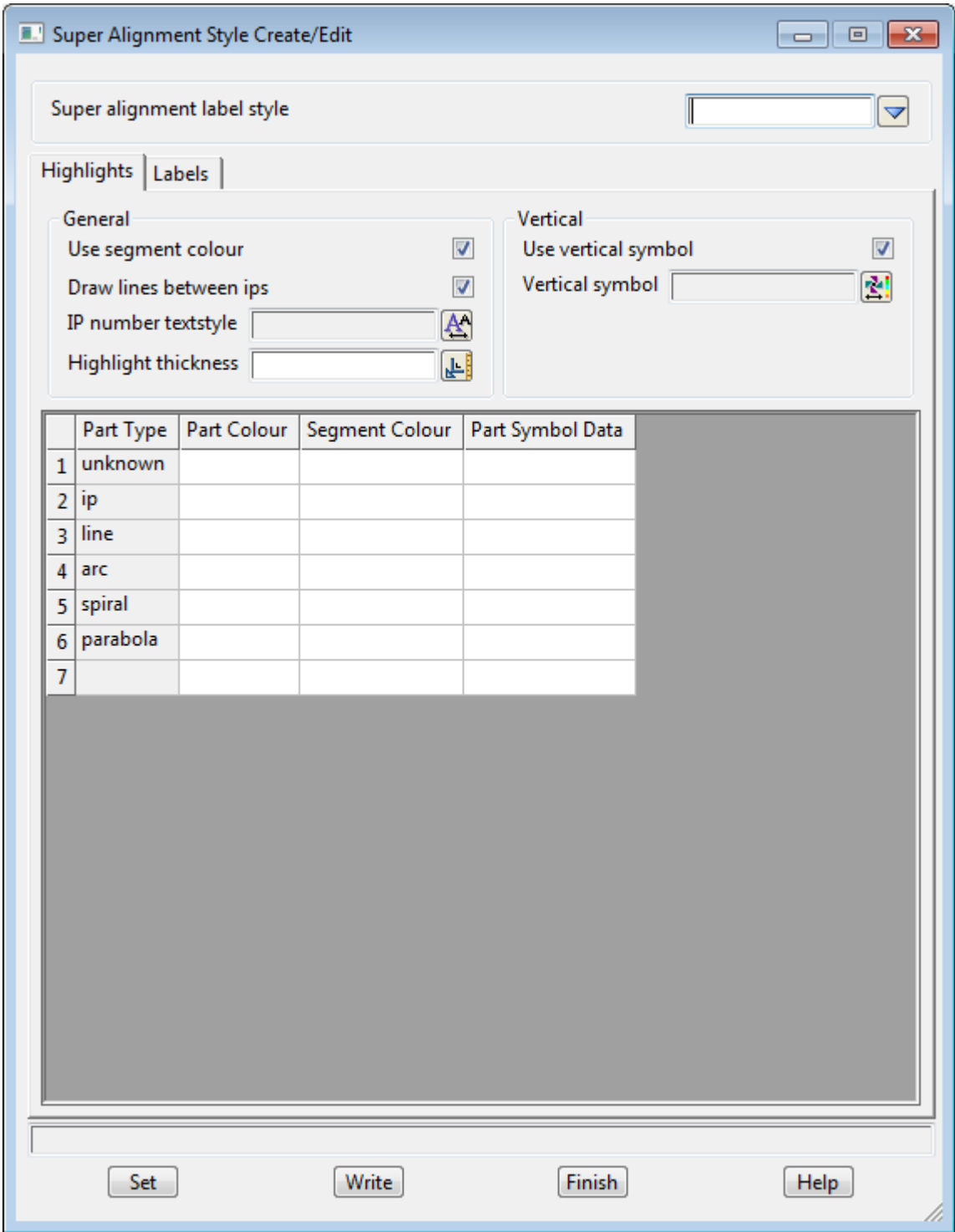
For full information on the Super Alignment Editor, go to the section [Edit Super Alignment](#)

Super Alignment Style

Position of option on menu: Strings =>Create =>Super alignments =>Super alignment style

The super alignment label styles control the way that the super alignment draws on the screen and when it is being edited.

Selecting Super alignment style displays the **Super Alignment Style Create/Edit** panel.



For the tab **Highlights** go to [Highlights tab](#)

For the tab **Labels** go to [Highlights Table](#)

For the **Buttons at the bottom** go to [Buttons at Bottom](#)

The fields and buttons used in the **Super Alignment Style Create/Edit** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Super alignment label style	choice box	design styles defined in astyles.4d	
<i>all the information in the panel refers to the selected labelling style. Note - the labelling styles are stored in the file astyles.4d.</i>			

Highlights tab

the definition of how to show the horizontal and vertical parts of the super alignment and also how to colour and label the segments when in and

Use segment colour tick box
*if **ticked**, each of the segment types are drawn in the colour given in the Highlights table given below (when the super alignment is on any view).*

Draw lines between IPs tick box
*if **ticked**, lines are drawn between intersection points (IPs).*

IP number textstyle textstyle box
the textstyle used to draw IP numbers in Plan and Section views.

Highlight thickness input
line thickness in pixels

Use vertical symbols tick box
*if **ticked**, vertical symbols are drawn when the super alignment is profiled on a Section view.*

Vertical symbol symbol box
the symbol to use for common points between segments in the Section views.

Highlights Table

*the definition of the segments that make up the definition of the part (part colour and part symbol for the fixed points) and the colour of the solved segments as a result of the part definition.
Defined for ip, line, arc, spiral (transition), parabola and unknowns.*

Part type
the part type - unknown, ip, line, arc, spiral (transition), parabola

Part colour colour box
*the definition of the part is only shown when in the edit mode.
When the string is being edited, the segments of the part are drawn in these colours.
For ip, this is the colour of the cross at the ip.
For line/arc/spiral/parabola, this is the colour of any line/arc/spiral/parabola segment.*

Segment colour colour box
*the resulting segments defined by the part are drawn in these colours.
for ip, this is the colour of the cross at the ip
line/arc/spiral/parabola, this is the colour of any line/arc/spiral/parabola segment*

Part symbol data symbol box
*when a string is being edited, the fixed points of the parts are displayed with these symbols.
for ip, the symbol at the ip of a part.
For line/arc/spiral/parabola, this is the symbols of the fixed points of any line/arc/spiral/parabola in*

the part. For example, if an arc is defined by going through three points, the three points will be drawn with the symbol for Part type arc.

Labels tab

on a plan view, the definition of what text, symbols and decimal places (precision) should be used in labelling tangent points, crest and sag points, major and minor intervals, segment radii and lengths, and special chainages.

Super Alignment Style Create/Edit

Super alignment label style

Highlights

Labels

General

Use labels

☒

Use equality zone

☐

Use reading angle

☐

Reading angle

Unsolved label

Unsolved textstyle

Precision

Direction type

String name

Textstyle

Name at start

☒

Name at end

☐

Name at interval

	Tangent Type	Use	Symbol Data	Prefix*postfix	Textstyle Data	Precision
1	unknown	<input type="checkbox"/>		optional		optional
2	curve-spiral	<input type="checkbox"/>		optional		optional
3	spiral-curve	<input type="checkbox"/>		optional		optional
4	tangent-curve	<input type="checkbox"/>		optional		optional
5	curve-tangent	<input type="checkbox"/>		optional		optional
6	tangent-spiral	<input type="checkbox"/>		optional		optional
7	spiral-tangent	<input type="checkbox"/>		optional		optional
8	common tangent	<input type="checkbox"/>		optional		optional
9	spiral-spiral	<input type="checkbox"/>		optional		optional
10	interval	<input type="checkbox"/>		optional		optional
11	vert. unknown	<input type="checkbox"/>		optional		optional
12	vert. tangent-curve	<input type="checkbox"/>		optional		optional
13	vert. curve-tangent	<input type="checkbox"/>		optional		optional
14	vert. common-tangent	<input type="checkbox"/>		optional		optional

Set

Write

Finish

Help

The fields and buttons used in the **Super Alignment Style Create/Edit** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use labels	tick box		
<i>if ticked, labels are automatically drawn when the super alignment is on a Plan view.</i>			
Use equality zone	tick box		
<i>if ticked and chainage equalities exist in the super alignment, the chainage intervals are relative to the beginning of the zone it is in.</i>			
Use reading angle	tick box		
<i>if ticked and the angle of the label relative to the Reading angle is over 180 degrees, the label will be flipped.</i>			
Reading angle	input		
<i>the angle to take as a base line for reading text. The angle is in HP Notation and is measured from the x axis in a counter clockwise direction.</i>			
Unsolved label	text box		
<i>the text label to use when a part is not solved. It is placed in the middle of the unsolved segment.</i>			
Unsolved textstyle	textstyle data box		
<i>the textstyle of the unsolved text label</i>			
Precision	input		
<i>the number of decimal places to use in the chainage labels</i>			
Direction type	choice box		none, at start, each segment
<i>how to draw the string direction symbol which is given in row 18 of the table below (horz. direction)</i>			
<i>If none, no direction symbol is drawn.</i>			
<i>If at start, a single direction symbol is drawn at the start of the string</i>			
<i>If each segment, a direction symbol is drawn at the middle of each segment of the string</i>			
String name textstyle	textstyle data box		
<i>the textstyle to use for drawing the name of the string</i>			
Name at start	tick box		
<i>if tick, draw the name of the string at the start of the string.</i>			
<i>If not ticked, no string name is drawn at the start of the string.</i>			
Name at end	tick box		
<i>if tick, draw the name of the string at the end of the string.</i>			
<i>If not ticked, no string name is drawn at the end of the string.</i>			
Name at interval	double box		
<i>if not blank, the name of the string is drawn at this chainage interval along the string, excluding the start and the end of the string.</i>			

Label Type Table

For each label type in the table, the Use flag is ticked if it is to be drawn, and if it is drawn, the symbol is given in the Symbol Data column, text is prefixed/postfixed as given in the Pre*Postfix column, the text used the textstyle data given in the Textstyle Data column with the number of decimal places given in the Precision column.
There are twenty four (24) types:

unknown - when it is not any of the other horizontal critical points
curve-spiral - the tangent point between an arc and a transition. Eg CS
spiral-curve - the tangent point between a transition and an arc. Eg SC
tangent-curve - the tangent point between a straight line and an arc. Eg TC
curve-tangent - the tangent point between an arc and a straight line. Eg CT

tangent-spiral - the tangent point between a straight line and a transition. Eg TS

spiral-tangent - the tangent point between a transition and a straight line. Eg ST

common tangent - the tangent point between two arcs. Eg CTP

spiral-spiral - the tangent point between two transitions Eg SS

interval - the chainage label at the major interval

vert. unknown - when it is not any of the other vertical critical points

vert. tangent-curve - the tangent point between a straight grade and a vertical curve (parabola or an arc). Eg VTC

vert. curve- tangent- - the tangent point between a vertical curve (parabola or an arc) and a straight grade. Eg VCT

vert. common tangent - the tangent point between two vertical curves. Eg VCTP

crest - a vertical crest (local maximum) point. Eg CREST

sag - a vertical sag (local minimum) point. Eg SAG

special chainages - chainages from a special chainage file given in the Special chainage file field in the Basic Label section of the Super Alignment Properties

horz. direction - the direction symbol of the string

minor interval - the chainage label at the minor interval

k post equality - label the k posts equations. Eg 15 Km 998 = 16 Km

internal equality - label the internal equality equation Eg 17 Km 500 = 17 Km 600

segment radius - label the radius of an arc segment Eg R 500.0

segment length - label the length of a segment Eg L 500.0

segment bearing - label the bearing of a segment in dms format Eg 125 30 20

Buttons at Bottom

Set button

*clicking the **Set** button means that for this session, all the definitions in the panel will be used for the style given in the **Super alignment label style** field. Unless the **Write** button is used to write the values out to the **astyles.4d** file, the values will be lost when the project is exited.*

Write button

*clicking the **Write** button writes out all the values in this panel to the **astyles.4d** file as the style given in the **Super alignment label style** field*

Note

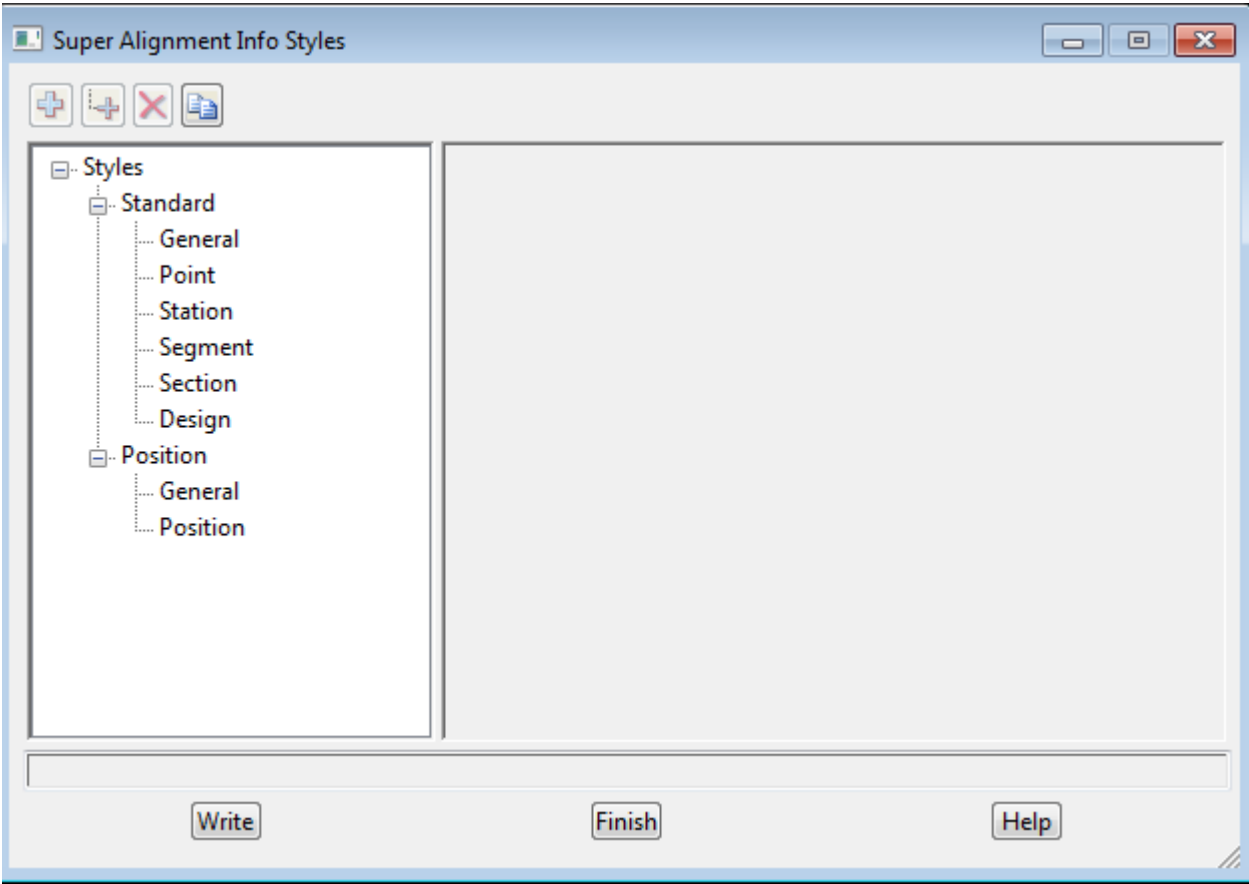
The new Super alignment label style is not used until a resolve is done on the super alignment string.

Super Alignment Info Styles

Position of option on menu: Strings =>Create =>Super alignments =>Info style

The *super alignment info styles* control what information is displayed in the **Super Alignment Info** panel brought up by the [Super Alignment Info](#) option on the SA Tools menu or toolbar.

Selecting Super alignment info displays the **Super Alignment Info Styles** panel.



Design Standards

Position of option on menu: Strings =>Create =>Super alignments =>Design standards

The **design standards** sets up numerous standard tables for

- (a) horizontal speed (speed_standards)

defines for various speeds, the use of horizontal arcs and transition curves, super elevation for various numbers of lanes.

- (b) horizontal widening (widening_standards)

defines the road widening for various lane widths, speeds and curve radii.

- (c) horizontal small deflection (small_deflection_standards)

- (d) vertical crest (crest_standards)

defines for crest curves the k-values of allowed parabolas for different speeds

- (e) vertical sag (sag_standards)

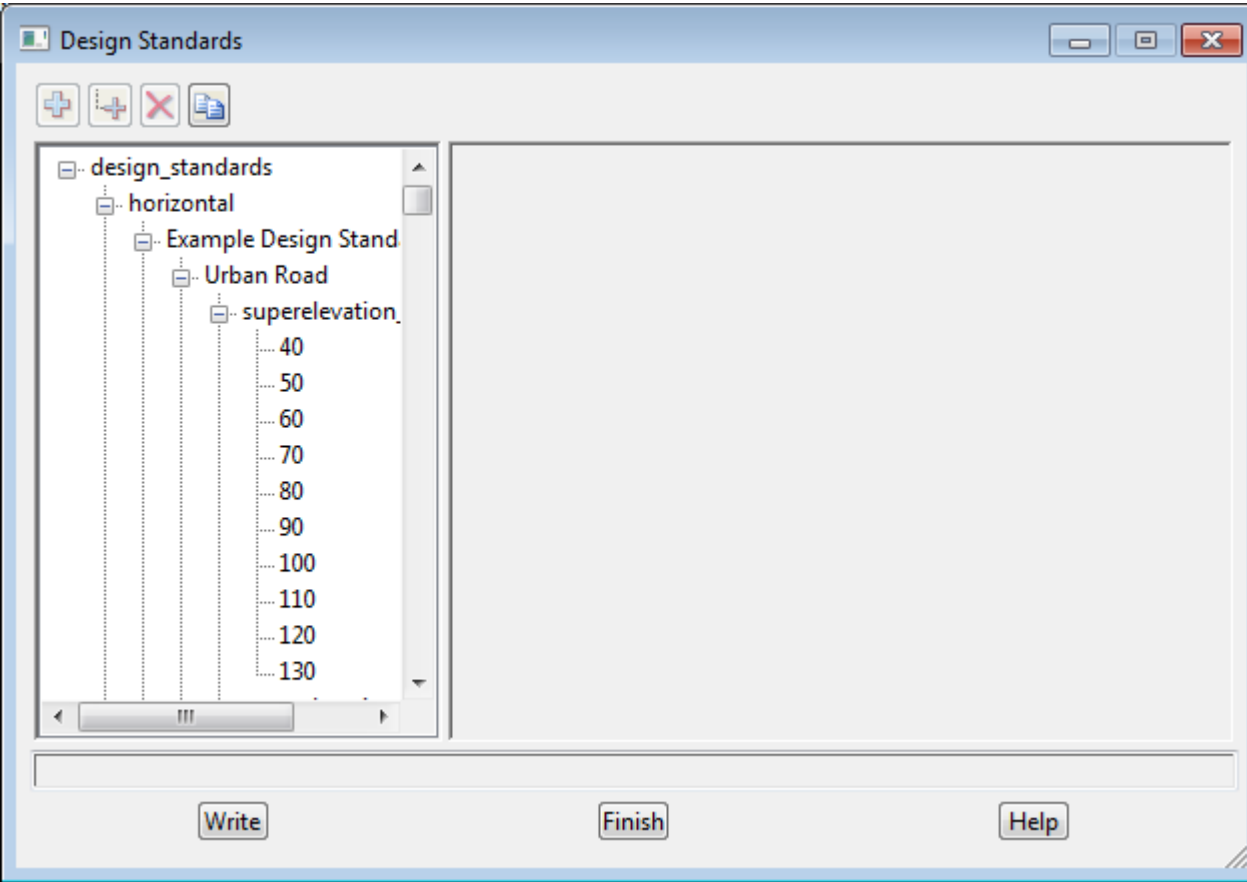
defines for sag curves the k-values of allowed parabolas for different speeds

For each of the five types of tables, specific tables of values are set up by the user for each of the different design scenarios that the user will undertake. Each specific table is given a name, and the names must be unique within each of the five types of tables.

The tables are written to a file (design_standards.xml) which is then read in whenever a project is opened.

The tables in the design standards file are used in the option Strings =>Create =>Super alignments =>Design templates to define **Design Templates** (see [Design Templates](#)), and when a super alignment is created, **one Design Template** is selected for use with that super alignment (see the section [Advanced > Design branch](#) from [Create - Super Alignment](#)).

Selecting Design standards displays the **Design Standards** panel.



DOCO TO GO INTO DEFINITIONS OF DESIGN PARAMETERS

Ease-off

choice box

none
maximum
by length

method of transitioning between minimum and maximum super elevation.

If **none**, no transition is done.

If **maximum**, maximum back to back curves are added to the super diagram between the minimum and maximum super elevation and are used to transition the super.

*If by length, the ease off distance is given by the **Ease off length** value.*

Ease-off length

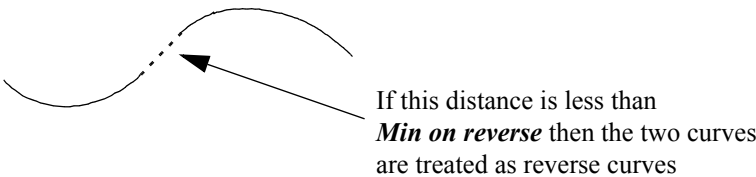
input

*the length of the ease off for the transition of super elevation when the **by length** method is selected*

Min on reverse

input

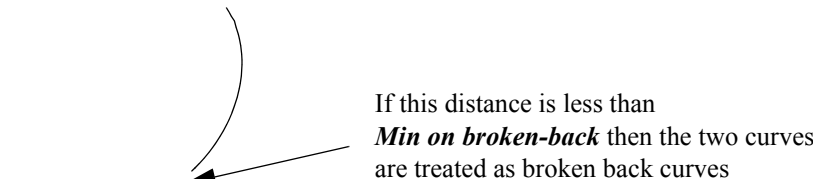
*if the chainage distance between two curves of opposite sign is less than the **Minimum on reverse** value then the two curves are treated as reverse curves when applying the design rules.*



Plan View

Min on broken back input

if the chainage distance between two curves of the same sign is less than the **Minimum on broken-back** value then the two curves are treated as broken-back curves when applying the design rules.



Plan View

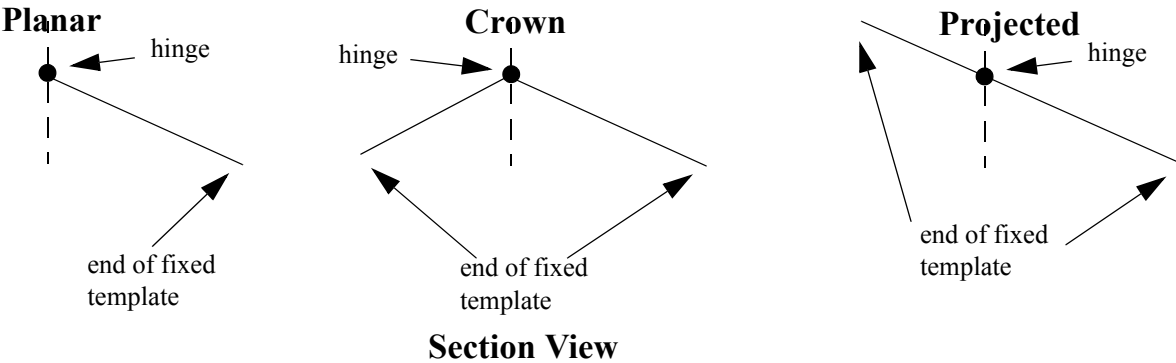
FROM V9 DOCO

Slope type choice box planar
crowned
projected

If **planar**, then the design table is only applied for half of the road (from the hinge string to the end of the fixed template). The side used is given by **Highside**.

If **crowned**, then the design table is used for each side of the roads (from the left most fixed template to the hinge string, and from the hinge string to the right most fixed template).

If **projected**, then the design table is first applied to half of the road given by **Highside** (from the hinge string to the end of the fixed template). Then the grade from the **Highside** is projected through the hinge string and used on the other side of the road.



Highside choice box left edge left edge, right edge
*used if the **Slope type** is planar or projected to define the higher side of the road pavement.*



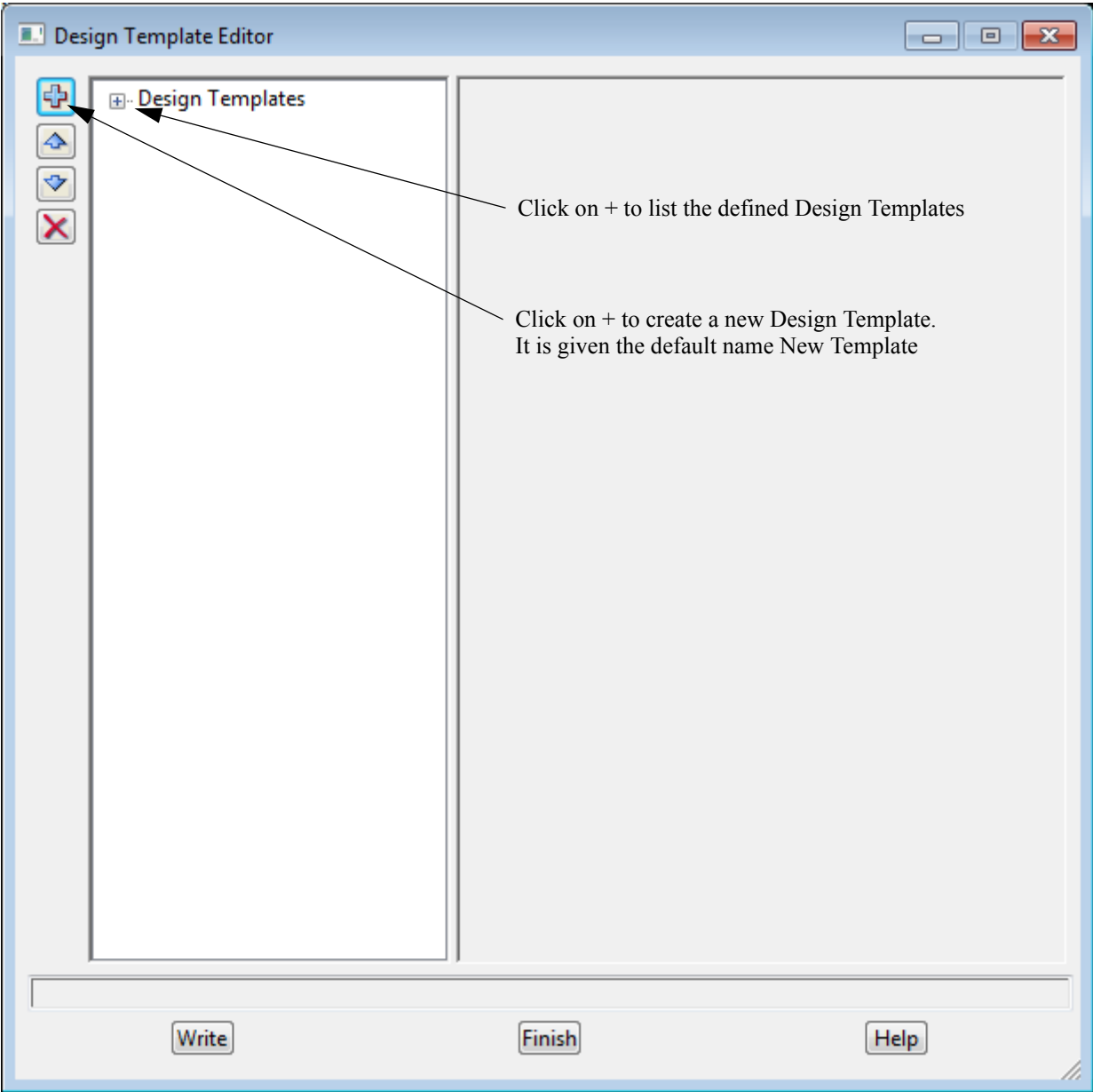
Design Templates

Position of option on menu: Strings =>Create =>Super alignments =>Design templates

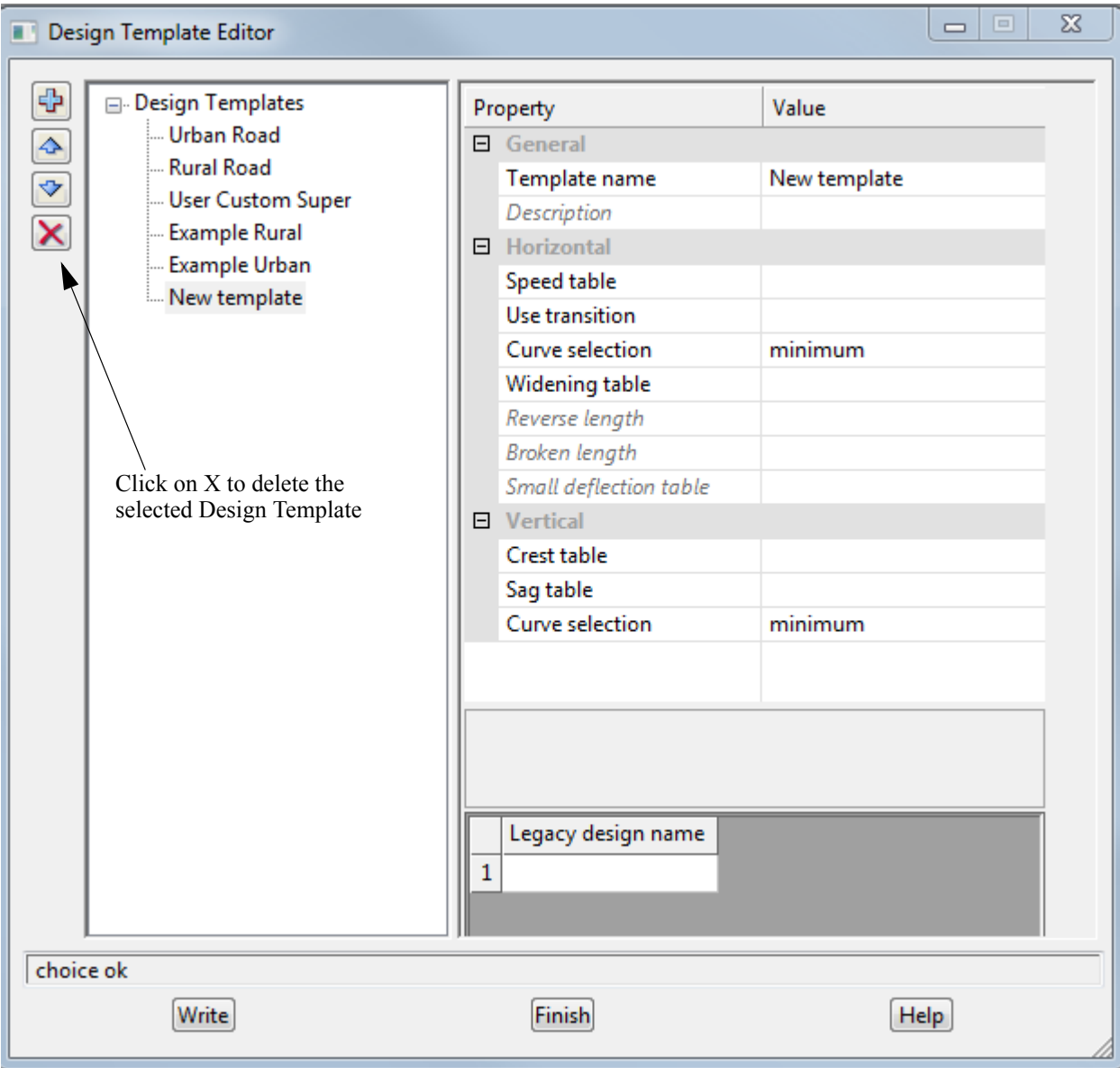
The **Design Templates** option is used to create Design Templates (each with a unique name) that have one of each of the five design table types (horizontal speed, horizontal widening, horizontal small deflection, vertical crest, vertical sag) that have been defined by the Strings =>Create =>Super alignments =>Design standards option (see [Design Standards](#)), plus whether curve transitions are allowed, whether minimum or maximum curve radii are used, and reverse and broken back curve lengths.

When a super alignment is created, **one Design Template** is selected for use with that super alignment (see the section [Advanced > Design branch](#) from [Create - Super Alignment](#)).

Selecting Design templates displays the **Design Template Editor** panel.



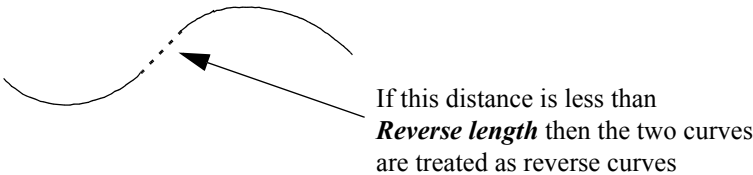
Clicking on the + in front of **Design Templates** will list all the design templates that are in the *design_templates.xml* file currently be used in the **12d Model** project.



The fields and buttons used in the **Design Template Editor** panel when creating a new *Design Template*, or when clicking on an existing *Design Template*, have the following functions.

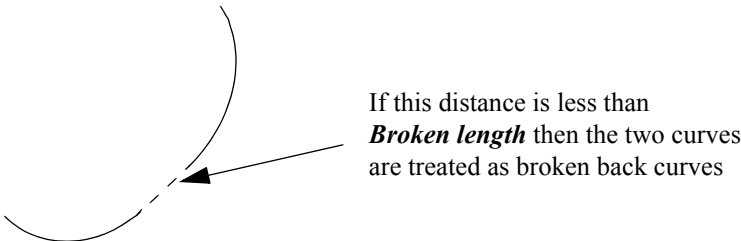
Field Description	Type	Defaults	Pop-Up
Template name	text box		
<i>the name of the Design Template. This can not be blank and must be unique amongst the list of Design Templates. The default name is New Template and this can be changed by typing a new name into this field.</i>			
Description	text box		
<i>a description for this Design Template. This can be blank.</i>			
Speed table	choice box		list of speed_standards
<i>the name of the Speed Table to use. This is selected from the all the speed_standards defined in the Design Standards file (design_standards.xml) being used for the project.</i>			
User transitions	yes/no box		
<i>if yes, transition curves are allowed in the horizontal geometry. If no, transition curves are not allowed in the horizontal geometry.</i>			

Curve selection	choice box	minimum	minimum. maximum
<i>if minimum and more than one horizontal curve radius exists for the speed, the minimum curve radius is used.</i>			
<i>If maximum and more than one horizontal curve radius exists for the speed, the maximum curve radius is used.</i>			
Widening table	choice box	list of widening_standards	
<i>the name of the Widening Table to use. This is selected from the all the widening_standards defined in the Design Standards file (design_standards.xml) being used for the project.</i>			
Reverse length	input		
<i>if the chainage distance between two curves of opposite sign is less than the Reverse length value then the two curves are treated as reverse curves when applying the design rules.</i>			



Plan View

Broken length	input	
<i>if the chainage distance between two curves of the same sign is less than the Broken length value then the two curves are treated as broken-back curves when applying the design rules.</i>		



Plan View

Small deflection table	choice box	list of small_deflection_standards	
<i>the name of the Small Deflection Table to use. This is selected from the all the small_deflection_standards defined in the Design Standards file (design_standards.xml) being used for the project.</i>			
Crest table	choice box	list of crest_standards	
<i>the name of the Crest Table to use. This is selected from the all the crest_standards defined in the Design Standards file (design_standards.xml) being used for the project.</i>			
Sag table	choice box	list of sag_standards	
<i>the name of the Sag Table to use. This is selected from the all the sag_standards defined in the Design Standards file (design_standards.xml) being used for the project.</i>			
Curve selection	choice box	minimum	minimum. maximum
<i>if minimum and more than one vertical curve k-value exists for the speed, the minimum curve k-value is used.</i>			
<i>If maximum and more than one vertical curve k-value exists for the speed, the maximum curve k-value</i>			

is used.

Buttons at Bottom

Write button

*clicking the **Write** button writes out all the Design Templates defined in this panel to the **design_templates.xml** file.*

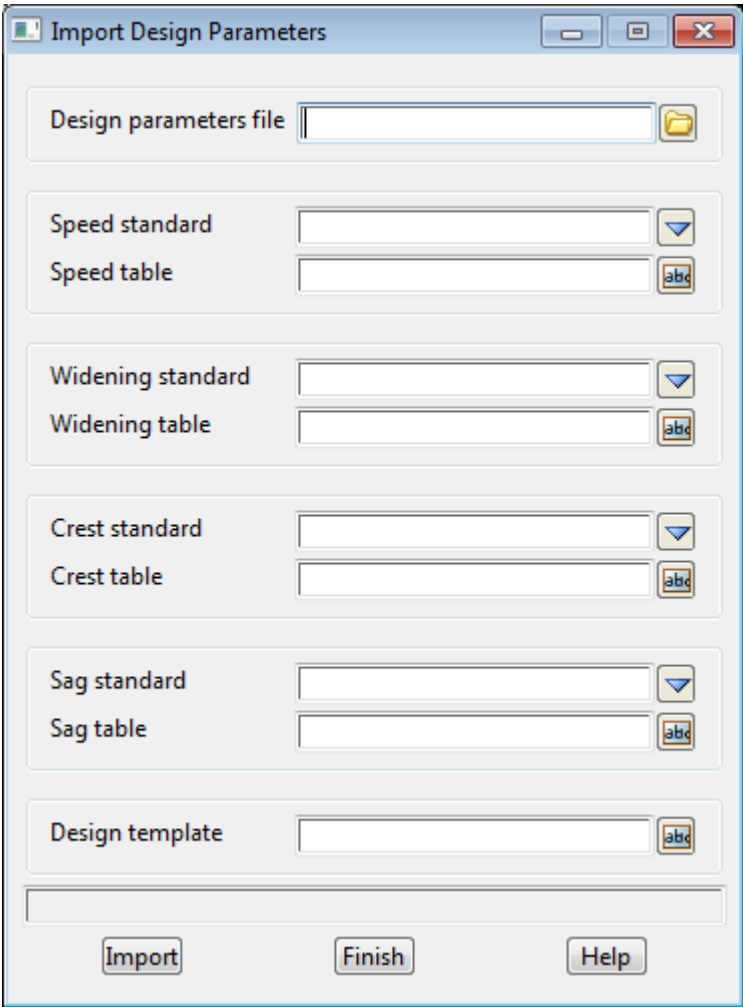
Import Legacy Design

Position of option on menu: Strings =>Create =>Super alignments =>Import legacy design

The **Import legacy design** option reads a **12d Model 9 Design Parameter File** and converts it to a **Design Template** for use in **12d Model 10**.

Note:

Selecting **Import legacy design** displays the **Import Design Parameters** panel.



Selecting a **Design parameters file** will read in the selected **.design** file and populate fields in the panel.

Import Design Parameters

Design parameters file

SLIB\Example_Urban.design

Speed standard

Speed table

Example Urban

Widening standard

Widening table

Example Urban

Crest standard

Crest table

Example Urban

Sag standard

Sag table

Example Urban

Design template

Example Urban

invalid speed standard

Import

Finish

Help

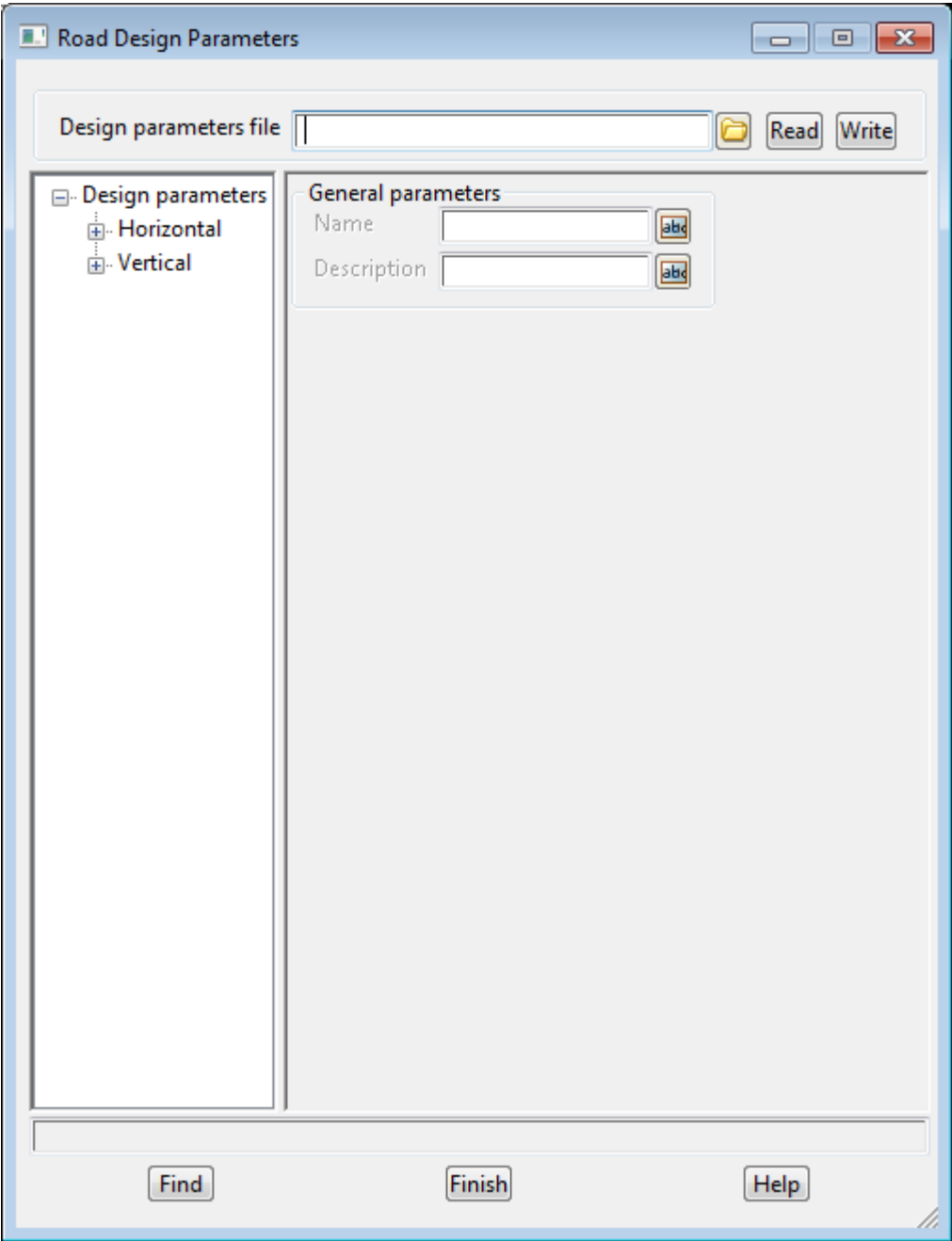
Define Design Parameters - from V9

Position of option on menu: Strings =>Create =>Super alignments =>Design parameters

This was superseded in 12d Model 10 by Design Tables and Design Templates.

The **design parameters table** defines the use arcs, transition curves, parabolas, super elevation and road widening for given design speeds. The table is used to use by a super alignment in conjunction with user supplied information given in the **Design** tab of the super alignment.

Selecting Design parameters displays the **Road Design Parameters** panel.



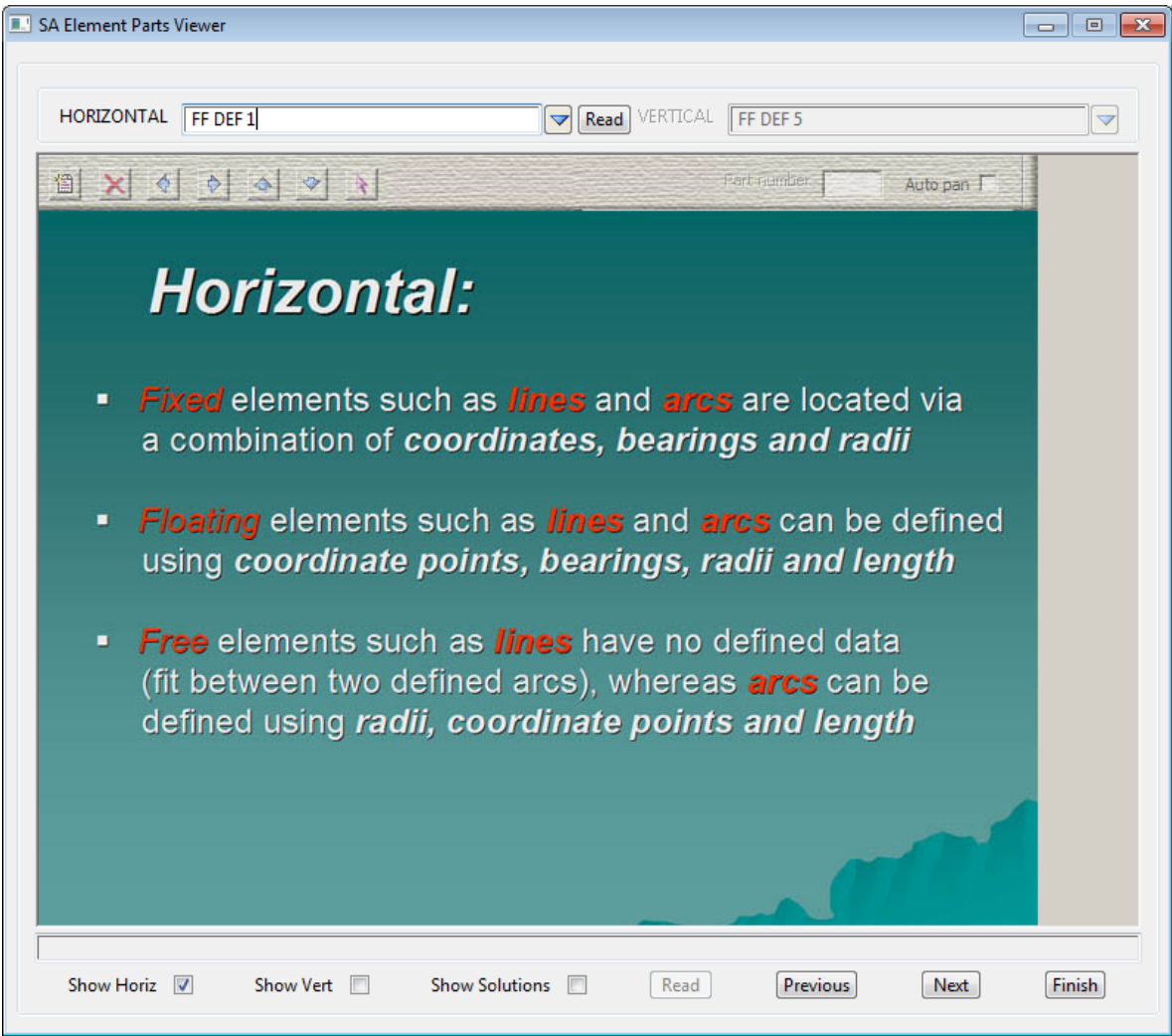
SA Element Parts Viewer

Position of option on menu: Super Alignment Toolbar=>Help



This option displays and explains all the parts in both horizontal and vertical, available in the Super Alignment.

Examples from the library can be read in for editing.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Horizontal	choice box		various
Quick selection of Horizontal parts			

Vertical choice box various

Quick selection of Vertical parts

Read Both button

*Will read in 12d ascii examples of all the parts. Most include vertical parts that are similar to their horizontal counter parts.
A plan view is created, called "SA Examples", and a model called "12D HOR ELEMENTS" is added to the plan view.*

Show Horiz tick box

If ticked, allows the explanation and viewing of all horizontal parts

Show Vert tick box

If ticked, allows the explanation and viewing of all vertical parts

Show Solutions tick box

If ticked, allows the viewing of examples that can be read in

Read button

*Will read in 12d ascii examples of Super Alignments. Most include vertical geometry.
A plan view is created, called "SA Examples", and a model in the format "12D SA EXAMPLE 1" is added to the plan view.*

Previous button

Step backward through examples

Next button

Step forward through examples

Super to SA Element Convert

Position of option on menu: Road Toolbar

This option is used to convert super strings that may have come in from other software.

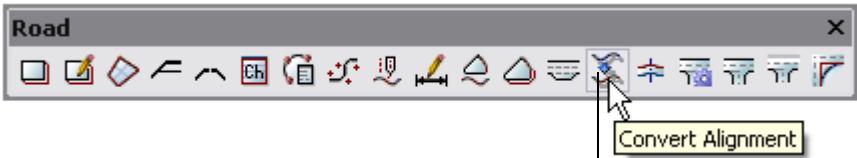
The conversion will attempt to create a Super Alignment made up in the horizontal of element parts.

The parts will mainly include at least one fixed part followed by floating parts of varying types (lines and arcs).

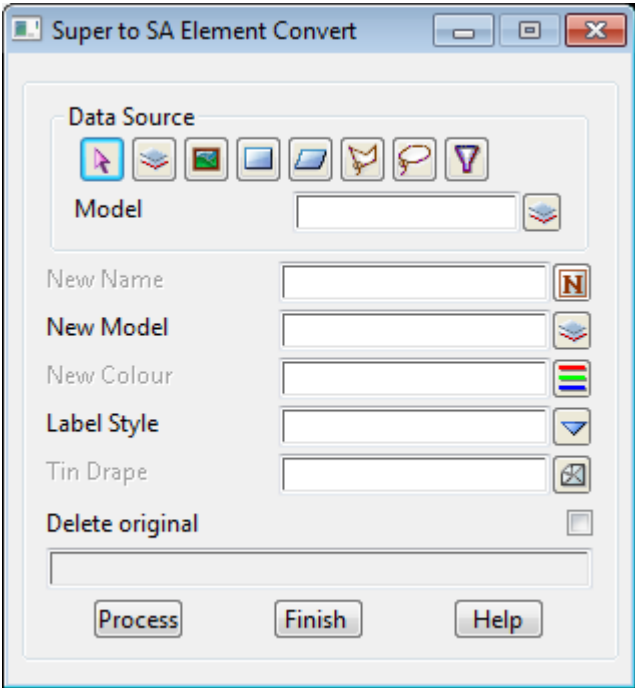
A label style can be set and a tin set in the vertical as a drape computerator.

Note: If the original string had a geometry error (non-tangential arcs e.g.), then the resulting Super Alignment will show an error.

The error however will be easy to find as any parts prior to the error, will still show as solved.



Selecting the convert alignment option brings up the Super to SA Element Convert panel.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type	Model
-------------------------	-------

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data source	input
--------------------	-------

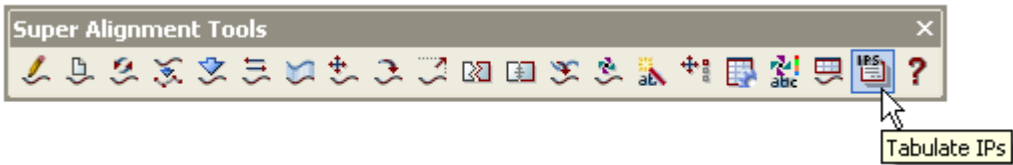
source of data to be processed.

New name	name box	select name
<i>if non-blank, then the name of the selected strings will be changed to the name given in the new name field.</i>		
Model	model box	select model
<i>model name for converted data</i>		
New colour	input	available colours
<i>if non-blank, then the colour of the selected strings will be changed to the colour given in the new colour field.</i>		
Label style	choice box	full various
<i>Astyles for Super alignments</i>		
Tin Drape		tin select
<i>if non-blank, then the tin is used as a vertical draped points computator for all converted strings</i>		
Delete original	tick box	tick
<i>If ticked, delete original strings</i>		
Process	Button	
<i>runs the option</i>		

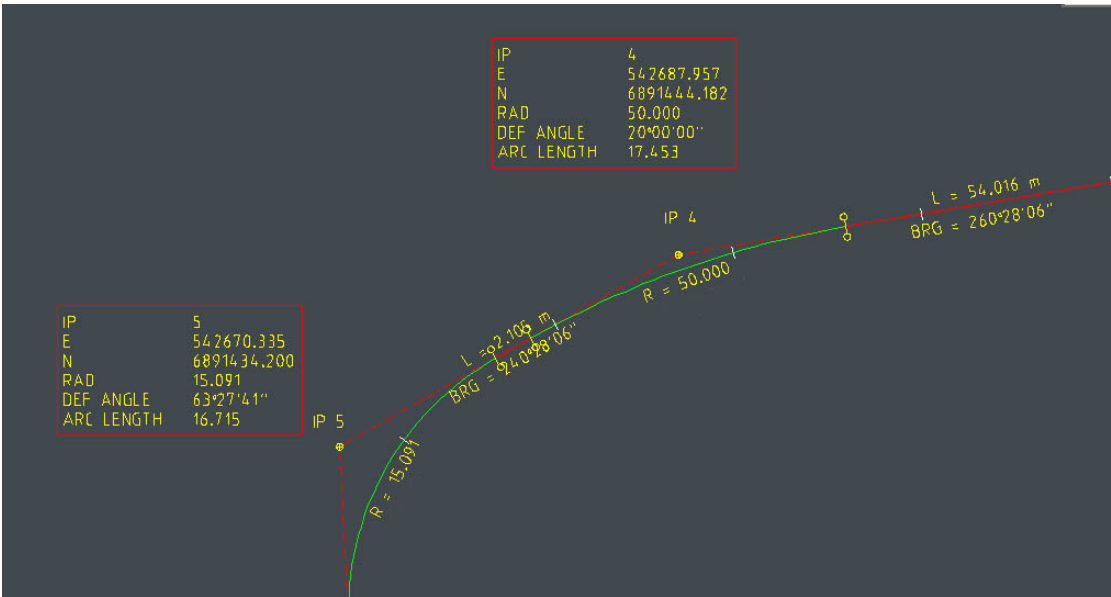


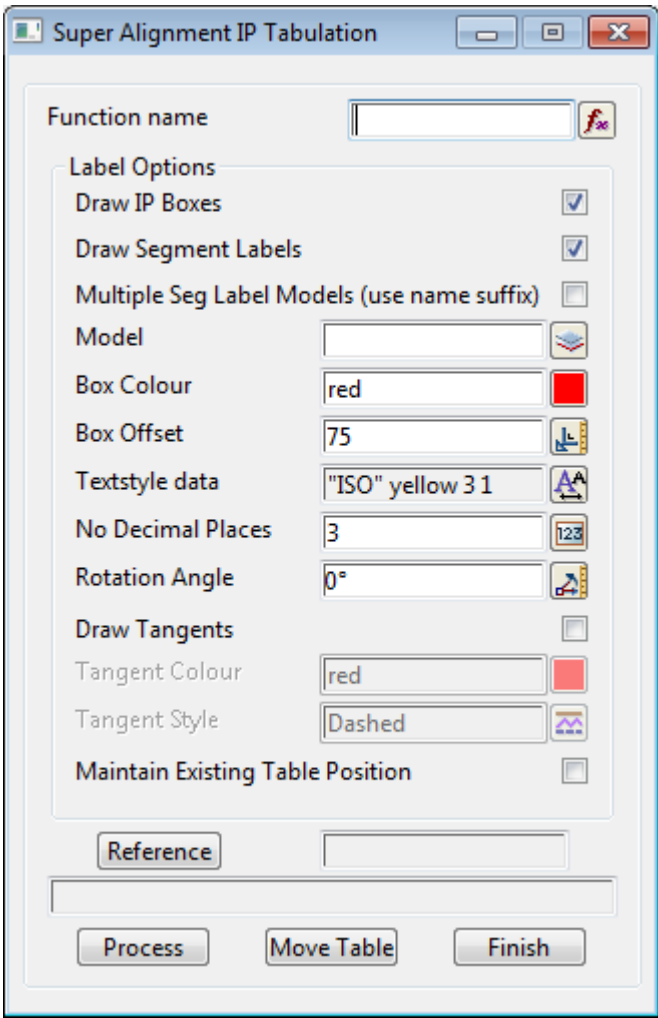
Super Alignment IP Tabulation

Position of option on menu: Super Alignment Toolbar=>Super Alignment IP tabulation



This option tabulates a Super Alignment by placing individual information boxes at each calculated IP position.





The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Function Name <i>name for use in recalc or chains</i>	function box		select function
Label Options			
Draw IP Boxes <i>If ticked, create info boxes for all IP points</i>	tick box		
Draw Segment Labels <i>If ticked, create segment labels</i>	tick box		
Multiple Seg Label Models (use name suffix) <i>If ticked, create and label all segment parameters Segment labels can be created and placed on individual models, using the name type as a suffix</i> <i>Tabulation Model + "Radius" Tabulation Model + "Arc Length" Tabulation Model + "Length"</i>	tick box		

Tabulation Model + "Bearing"
Tabulation Model + "IP"
Tabulation Model + "Spiral"
Tabulation Model + "Tangents"

Note: Some of the segment labels have been superseded by the Super Alignment

Model <i>model name for tabulation</i>	model box		select model
Box Colour <i>the colour of the IP Info boxes</i>	input	red	available colours
Box Offset <i>Distance to place the IP Info boxes from the IP</i>	measures box	75	At Point, Point to Point, String from Point, String to Point)
Textstyle Data <i>text parameters for all text options</i>	input		
No Decimal Places <i>Number of decimals for text</i>	input	3	
Rotation Angle <i>Rotation angle if view rotated</i>	input	0	
Draw Tangents <i>If ticked, tangent lines to be drawn at IPs</i>	tick box		
Tangent Colour <i>the colour for the tangent lines</i>	input	red	available colours
Tangent Style <i>the linestyle for the tangent lines</i>	input	dashed	available styles
Maintain Existing Table Position <i>If ticked, maintain IP Box positions during re-run of function</i>	tick box		
Reference <i>Super Alignment selection only</i>	string select		
Process <i>Creates the function and runs</i>	button		
Move Table <i>Select IP Tabulation Box to move for clarity (esc or right mouse button to cancel)</i>	button		

Create Arcs

Position of menu: Strings =>Create =>Arcs

The Create arcs option is used to create 12d Model arcs.

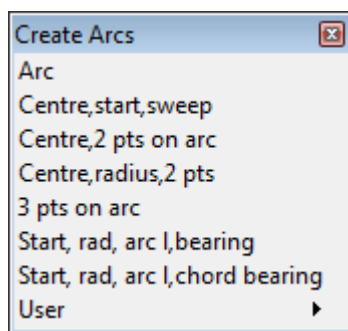
A 12d Model **arc** consists of a radius, a centre point, and a start and end point on the arc.

The radius can be positive or negative. If the radius is positive, the arc is drawn from the start-point to the end-point in a clockwise direction. If the radius is negative, the arc is drawn from the start-point to the end-point in counter-clockwise direction.

The height at the start point and at the end point can be different. In that case, the arc is still a plan arc but the z- value varies linearly from the start point to the end point as one moves around the arc. Hence the 12d Model arc string is actually a **helix** with its centre-line perpendicular to the xy-plane.

For convenient 12d Model includes a variety of methods for creating arcs.

On selecting the Arcs option, the Create arcs menu is displayed giving all the different methods for creating arcs.



Each option in the Create arcs menu fires up its own special panel to collect the necessary information for defining the arc.

The mouse is used to select the special points required for the arc and circle definitions. For example, in the arc - 3 points on arc option, the three points are selected using the mouse.

Unlike the other strings created under **strings=>create**, the arc can be created immediately without needing any options from the arc editors.

Consequently, after an arc is defined, the create panel is not removed and is left on the screen to create another arc. Any information that needs modifying is changed in the **arc** panel and is used for the new create.

New arcs are created until either the panel is removed by selecting the **finish** or **[X]** button, or the create terminated by selecting **cancel** from the **pick ops** menu in which case the panel will be left on the screen. In the last case, the **arc** button is then used to begin a new create sequence.

Each of the methods for creating arcs will now be described.

For the option Arc, go to

<i>Arc</i>	Create - Arc
<i>Centre,start,sweep</i>	Create Arc - Centre Point, Start Point and Sweep
<i>Centre,2 pts on arc</i>	Create Arc - Centre Point, Start and End Points
<i>Centre,radius,2 pts</i>	Create Arc - Centre, Radius, Start and End Points
<i>3 pts on arc</i>	Create Arc - Three Points on Arc

Start, rad, arc l, bearing [Create Arc - Start Point, Radius, Arc Length and Start Bearing](#)

Start, rad, arc l, chord bearing [Create Arc - Start Point, Radius, Arc Length and Chord Bearing](#)

Create - Arc

Position of option on menu: Strings =>Create =>Arcs =>Create Arcs

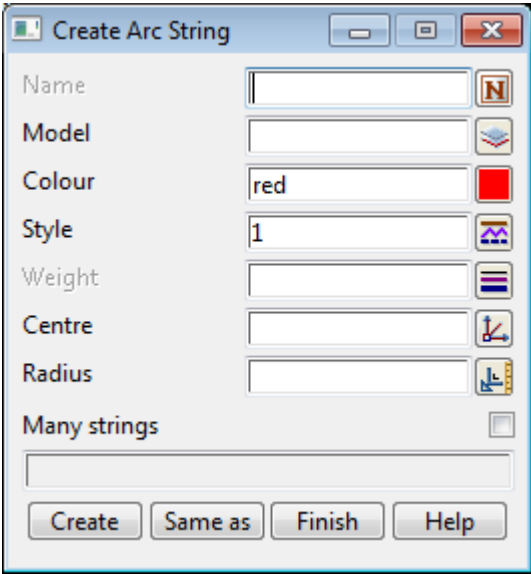
Arcs and circles are normally created using the strings=>create=> arcs OR strings=>create=> circles menu. Please see the documentation on that option for creating arcs and circles.

This option is a special arc creator so that a menu exists if the strings=>create=>same as option is used on an arc. It creates an arc with an initial sweep angle of 360 degrees.

The **Many strings** tick-box is used when more than one string of the same type is to be created, If **many strings** is set to *tick*, when the current string creation is **Finished** or **Quit**, a new **Create Arc String** panel is placed on the screen with the same information in it as the string just created. If any of the information needs to be modified for the new string, simply change it in the **Create Arc String** panel fields before selecting the **Create** button for the new string. Hence a new string of the same type can be created without going back to the **Create** menu.

The **Same as** button is used to obtain information from an existing string (not necessarily of the same type) and pipe it into the name, colour, model, style breakline type and height field of the **Create Arc String** panel.

After selecting the option, the **Create arc string** panel is displayed.



The new fields and buttons used in the **create arc string** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name <i>the name of the new string.</i>	input		
Model <i>name of the model that the new string is in.</i>	input		available models
Colour <i>the colour of the new string.</i>	input	default colour	available colours
Style <i>line style of the string.</i>	input	1	available line styles
Weight <i>thickness of the string.</i>	input	0	

Centre	input	xyz ops menu
<i>co-ordinates of the centre of the arc.</i>		
Radius	input	
<i>the radius for the arc.</i>		
Many strings	tick	
<i>if ticked then after the current string is finished, a new create panel is placed on the screen with all the same values for the panel fields as the current string.</i>		
Create	button	
<i>After the create button is chosen, the arc edit menu and arc edit info panel are displayed.</i>		
Same as	button	
<i>After the same as button is chosen, another string is selected and information about it is used for the fields in this panel.</i>		

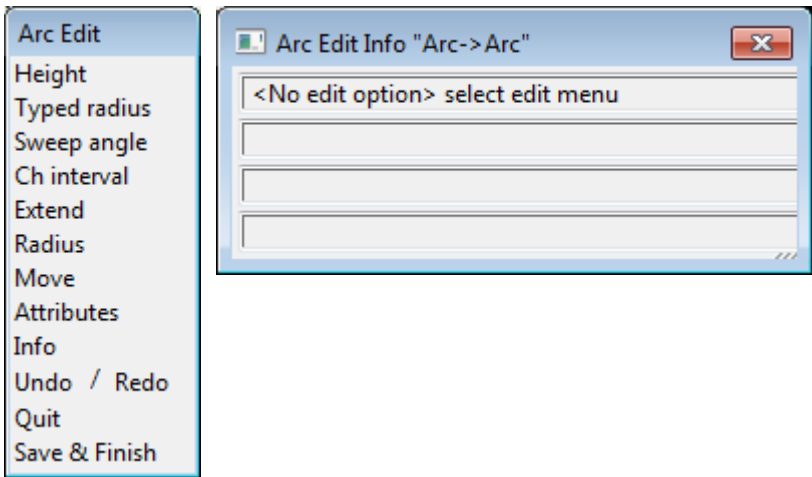
Note - the centre co-ordinates can either be typed into the **centre** panel field, or if LB is clicked on **[+]** for the **centre** panel field, the xyz ops menu comes up and the **pick xyz** option used to select a point as the arc centre.

Continue to the next section [Create Arc - Centre Point, Start Point and Sweep](#) or go back to [Create Arcs](#).

Start Edit - Arc

Unlike the other string creates, on selecting the **Create** button the arc string is immediately created with a sweep angle of 360 degrees. The **arc edit** menu and **arc edit info** panel are also placed on the screen at the same time

The **arc edit** menu and **arc edit info** panel for an arc string are



For full information in the Arc Editor, go to the section [Arc Edit](#)

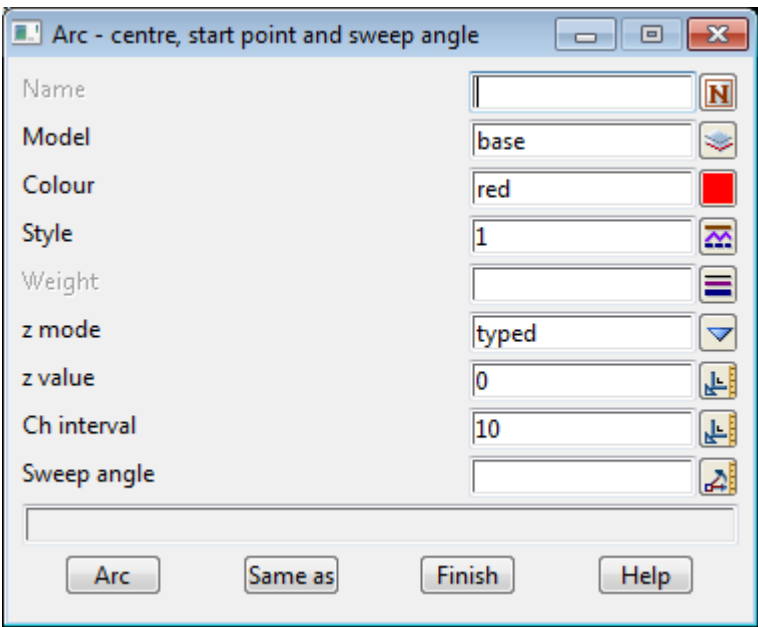
Create Arc - Centre Point, Start Point and Sweep

Position of option on menu: Strings =>Create =>Arcs =>Centre,Start,Sweep

This option defines an arc by selecting a centre point, the start point of the arc and the sweep angle of the arc. The sweep angle is measured in the **clockwise** direction.

The radius is calculated by the option and is simply the distance between the centre and start points. The arc end point is also automatically calculated using the known points, radius and sweep angle.

After selecting the option, the **arc - centre, start point and sweep angle** panel is displayed.



To **create** an arc, the name, colour, model, chainage interval and sweep angle are entered into the appropriate fields and then the centre point and start point of the arc are selected with the cursor. The arc is then created using the information provided in the panel.

The new fields and buttons used in the **arc - centre, start point and sweep angle** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name <i>the name of the new string.</i>	input		
Model <i>name of the model that the new string is in.</i>	input		available models
Colour <i>the colour of the new string.</i>	input	default colour	available colours
Style <i>line style of the string.</i>	input	1	available line styles
Weight <i>thickness of the string.</i>	input	0	
z mode <i>the method of specifying the z-value for the end points of the arc. It can be typed in or taken from the z-value of the selected end points.</i>	input	typed	snap, typed
z value <i>if the z mode method is typed, then the height (z-value) of the end points is the value in the field.</i>	input	0	
Ch interval <i>the chainage interval used when a chord approximation is needed for the arc.</i>	input	10	
Sweep angle <i>sweep angle for the arc - Note: clockwise is positive for sweep angles</i>	input		
Arc <i>The arc button is used to begin a new create if the previous one was cancelled.</i>	button		
Same as <i>After the same as button is chosen, another string is selected and information about it is used for the fields in this panel.</i>	button		

Panel Messages

Next step messages sent to the screen message area when selecting and accepting the centre point

<Arc centre> [picks][][menu]
<Arc centre> [picks][accepts][menu]

When selecting the start point of the arc

<Arc start> [picks][][menu]
<Arc start> [picks][accepts][menu]

Continue to the next section [Create Arc - Centre Point, Start and End Points](#) or go back to [Create Arcs](#).

Create Arc - Centre Point, Start and End Points

Position of option on menu: Strings =>Create =>Arcs =>Centre, 2 pts on arc

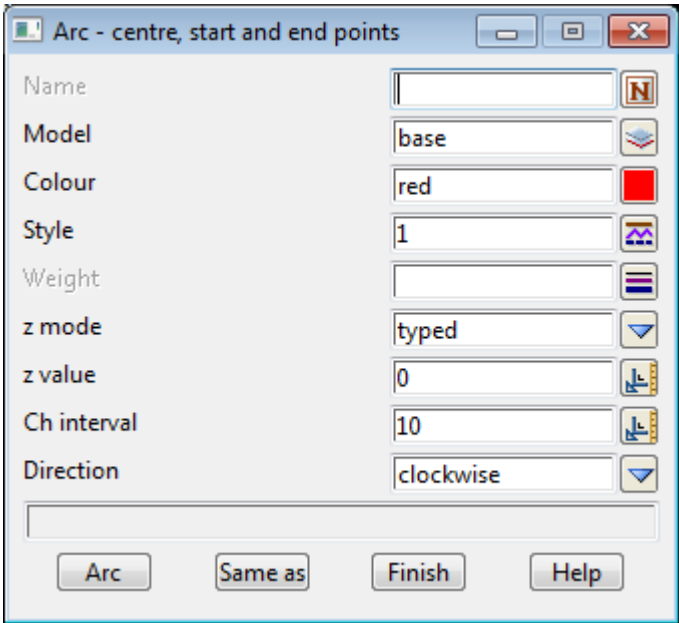
This option defines an arc by selecting a centre point, a start and end points for the arc and the direction (clockwise, anti-clockwise) that the arc travels in. The radius is calculated by the option

and is simply the distance between the centre and start points.

It is difficult to choose the end point correctly so that it lies exactly on the arc since it only occurs when the distance between the centre and selected end point is exactly the radius of the arc.

Hence, the selected end point and arc direction is used to determine the sweep angle from the start point to the “end point to centre point” line. This is enough information to define the arc. The real end point is then calculated so that it **lies** on the arc.

After selecting the option, the **arc - centre, start and end points** panel is displayed.



To **create** an arc, the name, colour, model, chainage interval and direction are entered into the appropriate fields and then the centre point, start and end points of the arc selected with the cursor. The arc is then created using the information provided in the panel.

The fields and buttons used in the **arc - centre, start and end points** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name <i>the name of the new string.</i>	input		
Model <i>name of the model that the new string is in.</i>	input		available models
Colour <i>the colour of the new string.</i>	input	default colour	available colours
Style <i>line style of the string.</i>	input	1	available line styles
Weight <i>thickness of the string.</i>	input	0	
z mode <i>the method of specifying the z-value for the end points of the arc. It can be typed in or taken from the z-value of the selected end points.</i>	input	typed	snap, typed
z value <i>if the z mode method is typed, then the height (z-value) of the end points is the value in the field.</i>	input	0	

Ch interval	input	10	
the chainage interval used when a chord approximation is needed for the arc.			
Direction	input	clockwise	clockwise, anti-clockwise
the direction for the arc			
Arc	button		
The arc button is used to begin a new create if the previous one was cancelled.			
Same as	button		
After the same as button is chosen, another string is selected and information about it is used for the fields in this panel.			

Panel Messages

Next step messages sent to the screen message area when selecting and accepting the centre point

```
<Arc centre> [picks][ ][menu]
<Arc centre> [picks][accepts][menu]
```

When selecting the start point of the arc

```
<Arc start> [picks][ ][menu]
<Arc start> [picks][accepts][menu]
```

When selecting the end point of the arc

```
<Arc end> [picks][ ][menu]
<Arc end> [picks][accepts][menu]
```

Continue to the next section [Create Arc - Centre, Radius, Start and End Points](#) or go back to [Create Arcs](#).

Create Arc - Centre, Radius, Start and End Points

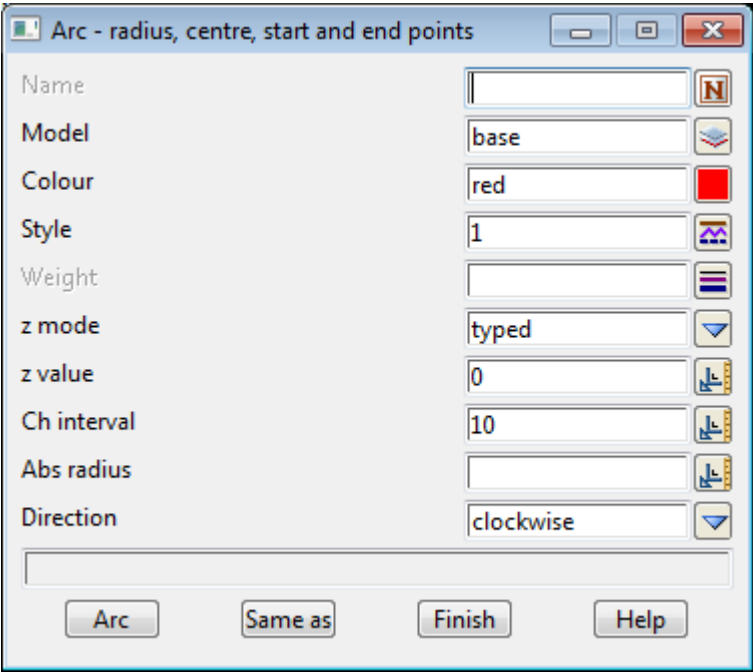
Position of option on menu: Strings =>Create =>Arcs =>Centre, radius, 2pts

This option defines an arc by the user setting a radius and direction of arc and then selecting the centre, start and end points for the arc.

Since the radius is given exactly, it is difficult to choose the start and end points so that they lie exactly on the arc. This only occurs when the distance between the centre and selected start and end points is exactly the radius of the arc.

Hence, the selected start point is dropped perpendicularly onto the arc to give the real start point. Similarly, for the real end point.

After selecting the option, the **arc - radius, centre, start and end points** panel is displayed.



To **create** an arc, the name, colour, model, chainage interval, radius and direction are entered into the appropriate fields and then the centre point, start and end points of the arc selected with the cursor. The arc is then created using the information provided in the panel.

The fields and buttons used in the **arc - radius, centre, start and end points** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name <i>the name of the new string.</i>	input		
Model <i>name of the model that the new string is in.</i>	input		available models
Colour <i>the colour of the new string.</i>	input	default colour	available colours
Style <i>line style of the string.</i>	input	1	available line styles
Weight <i>thickness of the string.</i>	input	0	
z mode <i>the method of specifying the z-value for the end points of the arc. It can be typed in or taken from the z-value of the selected end points.</i>	input	typed	snap, typed
z value <i>if the z mode method is typed, then the height (z-value) of the end points is the value in the field.</i>	input	0	
Ch interval <i>the chainage interval used when a chord approximation is needed for the arc.</i>	input	10	
Abs radius <i>the absolute radius of the arc.</i>	input		

Direction	input	clockwise	clockwise, anti-clockwise
-----------	-------	-----------	------------------------------

the direction for the arc

Arc button

*The **arc** button is used to begin a new create if the previous one was cancelled.*

Same as button

*After the **same as** button is chosen, another string is selected and information about it is used for the fields in this panel.*

Panel Messages

Next step messages sent to the screen message area when selecting and accepting the centre point

<Arc centre> [picks][][menu]
<Arc centre> [picks][accepts][menu]

When selecting the start point of the arc

<Arc start> [picks][][menu]
<Arc start> [picks][accepts][menu]

When selecting the end point of the arc

<Arc end> [picks][][menu]
<Arc end> [picks][accepts][menu]

Continue to the next section [Create Arc - Three Points on Arc](#) or go back to [Create Arcs](#).

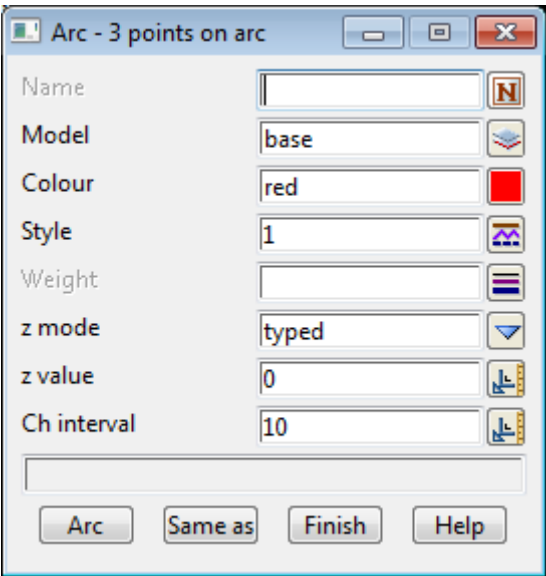
Create Arc - Three Points on Arc

Position of option on menu: Strings =>Create =>Arcs =>3 pts on arc

This option defines an arc by selecting three points that lie on the arc.

The selected arc points are the start point, a point between the start and end point, and the end point. The three points must be selected in that order.

After selecting the option, the **arc - 3 points on arc** panel is displayed.



To **create** an arc, the name, colour, model and chainage interval are entered into the appropriate fields and then three points - start point, point between the start and end point, and the end point- which lie on the arc are selected with the cursor.

After the three points are picked, the arc is created using the information provided in the panel.

After a arc is defined, the option does not terminate. Another arc can be created by simply modifying any of the information that needs changing in the **arc - 3 points on arc** panel and then selecting three points on a new arc.

The fields and buttons used in the **arc - 3 points on arc** panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Name	<i>the name of the new arc.</i>	input		
Model	<i>name of the model that the new arc is in.</i>	input		available models
Colour	<i>the colour of the new arc.</i>	input	default colour	available colours
Style	<i>line style of the arc.</i>	input	1	available line styles
Weight	<i>thickness of the string.</i>	input	0	
z mode	<i>the method of specifying the z-value for the arc. It can be typed in or taken from the z-value of the selected end points.</i>	input	typed	snap, typed
z value	<i>if the z mode method is typed, then the height (z-value) of the end points is the value in the field.</i>	input	0	
Ch interval	<i>the chainage interval used when a chord approximation is needed for the arc.</i>	input	10	
Arc	<i>The arc button is used to begin a new create if the previous one was cancelled.</i>	button		
Same as	<i>After the same as button is chosen, another string is selected and information about it is used for the fields in this panel.</i>	button		

Panel Messages

- Next step messages sent to the screen message area when selecting and accepting the start point
 - <Arc start> [picks][][menu]
 - <Arc start> [picks][accepts][menu]
- When selecting and accepting the second point
 - <Point on arc> [picks][][menu]
 - <Point on arc> [picks][accepts][menu]
- When selecting and accepting the end point
 - <End of arc> [picks][][menu]
 - <End of arc> [picks][accepts][menu]

Continue to the next section [Create Arc - Start Point, Radius, Arc Length and Start Bearing](#) or go back to [Create Arcs](#).

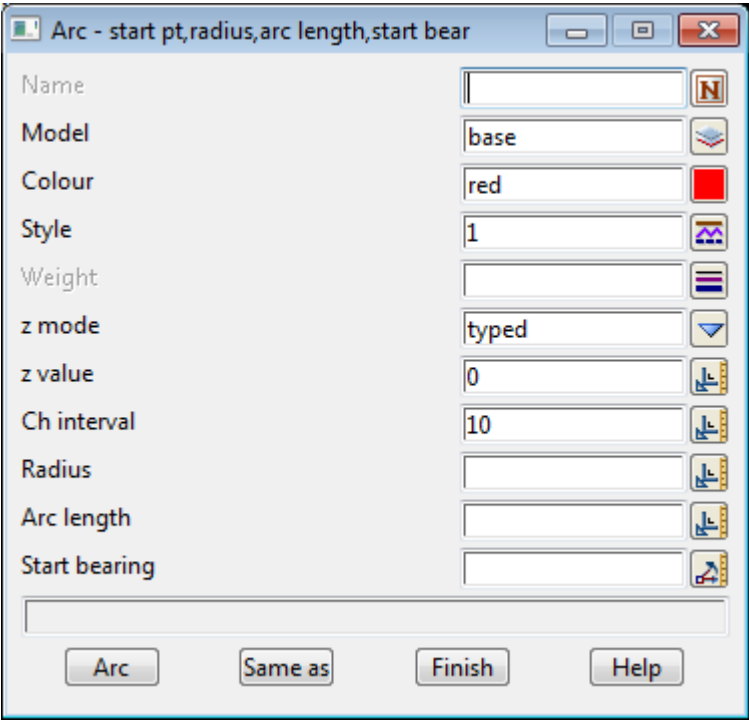
Create Arc - Start Point, Radius, Arc Length and Start Bearing

Position of option on menu: Strings =>Create =>Arcs =>Start, rad, arc, bear

This option defines an arc by giving the radius, the arc length and start bearing and then selecting a start point for the arc.

This is enough information for the option to calculate the centre and end points and the direction of the arc, and hence, fully define the arc.

After selecting the option, the **arc - start pt, radius, arc length, start bear** panel is displayed.



To **create** an arc, the name, colour, model, chainage interval, radius, arc length and start bearing are entered into the appropriate fields and then the start point of the arc selected with the cursor. The arc is then created using the information provided in the panel.

The new fields and buttons used in the **arc - start pt, radius, arc length, start bear** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name <i>the name of the new string.</i>	input		
Model <i>name of the model that the new string is in.</i>	input		available models
Colour <i>the colour of the new string.</i>	input	default colour	available colours
Style <i>line style of the string.</i>	input	1	available line styles
Weight <i>thickness of the string.</i>	input	0	
z mode <i>the method of specifying the z-value for the end points of the arc. It can be typed in or taken from the z-value of the selected end points.</i>	input	typed	snap, typed
z value <i>if the z mode method is typed, then the height (z-value) of the end points is the value in the field.</i>	input	0	

Ch interval input 10
the chainage interval used when a chord approximation is needed for the arc.

Radius input
radius of the arc.

Arc length input
length of the arc from the start to the end point.

Start bearing input
bearing of the tangent to the arc at the start point.

Arc button
*The **arc** button is used to begin a new create if the previous one was cancelled.*

Same as button
*After the **same as** button is chosen, another string is selected and information about it is used for the fields in this panel.*

Panel Messages

Next step messages sent to the screen message area when selecting the start point of the arc
 <Arc start> [picks][][menu]
 <Arc start> [picks][accepts][menu]

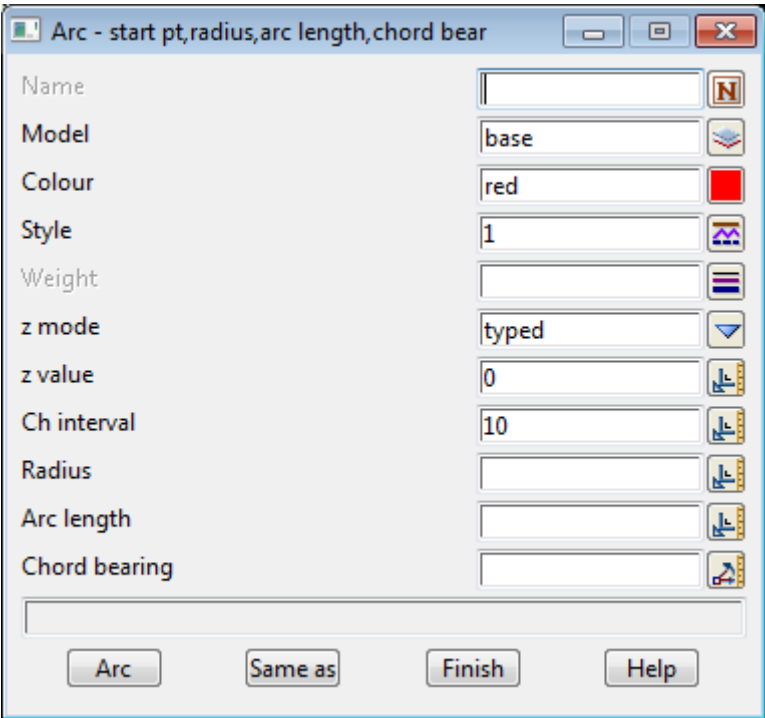
Continue to the next section [Create Arc - Start Point, Radius, Arc Length and Chord Bearing](#) or go back to [Create Arcs](#).

Create Arc - Start Point, Radius, Arc Length and Chord Bearing

Position of option on menu: Strings =>Create =>Arcs =>Start, rad, arc, ch bear

This option defines an arc by giving the radius, the arc length and chord bearing and then selecting a start point for the arc. This is enough information for the option to calculate the centre and end points and the direction of the arc, and hence, fully define the arc.

After selecting the option, the **arc - start pt, radius, arc length, chord bear** panel is displayed.



To **create** an arc, the name, colour, model, chainage interval, radius, arc length and chord bearing are entered into the appropriate fields and then the start point of the arc selected with the cursor. The arc is then created using the information provided in the panel.

The new fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name <i>the name of the new string.</i>	input		
Model <i>name of the model that the new string is in.</i>	input		available models
Colour <i>the colour of the new string.</i>	input	default colour	available colours
Style <i>line style of the string.</i>	input	1	available line styles
Weight <i>thickness of the string.</i>	input	0	
z mode <i>the method of specifying the z-value for the end points of the arc. It can be typed in or taken from the z-value of the selected end points.</i>	input	typed	snap, typed
z value <i>if the z mode method is typed, then the height (z-value) of the end points is the value in the field.</i>	input	0	
Ch interval <i>the chainage interval used when a chord approximation is needed for the arc.</i>	input	10	
Radius <i>radius of the arc.</i>	input		
Arc length <i>length of the arc from the start to the end point.</i>	input		
Chord bearing <i>bearing of the chord to the arc at the start point.</i>	input		
Arc <i>The arc button is used to begin a new create if the previous one was cancelled.</i>	button		
Same as <i>After the same as button is chosen, another string is selected and information about it is used for the fields in this panel.</i>	button		

Panel Messages

Next step messages sent to the screen message area when selecting the start point of the arc

```
<Arc start> [picks][ ][menu]
<Arc start> [picks][accepts][menu]
```

Go back to [Create Arcs](#).

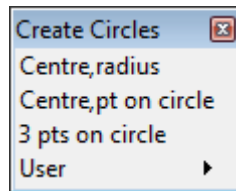
Create - Circles

Position of menu: Strings =>Create =>Circles

The create circles option is used to create **12d** Model circles.

A **12d** Model **circle** has no start and end points but is defined by a centre point and a radius. The circle has a constant height (z-value).

For convenient **12d** Model includes a variety of methods for creating circles. On walking-right on the **circles** option, the **create circles** menu is displayed giving all the different methods for creating circles.



For Centre, radius, go to
 Centre, pt on circle
 3 pts on circle

[Create Circle - Centre Point, Radius](#)

[Create Circle - Centre Point, Point on Circle](#)

[Create Circle - Three Points on Circle](#)

Each option in the **create circles** menu fires up its own special panel to collect the necessary information for defining the circle.

The mouse is used to select the special points required for the circle definitions. For example, the **circle - centre, radius** option required the value of the radius to be entered into the **circle - centre point, radius** panel and the centre point is selected using the cursor.

Unlike the other strings created under **strings=>create**, the circles can be created immediately without needing any options from the circle editor. Consequently, after a circle is defined, the create panel is not removed and is left on the screen to create another circle. Any information that needs modifying is changed in the **circle** panel and is used for the new create.

New circles are created until either the panel is removed by selecting the **finish** or **[X]** button, or the create terminated by selecting **cancel** from the **pick ops** menu in which case the panel will be left on the screen. In the last case, the **circle** button is then used to begin a new create sequence.

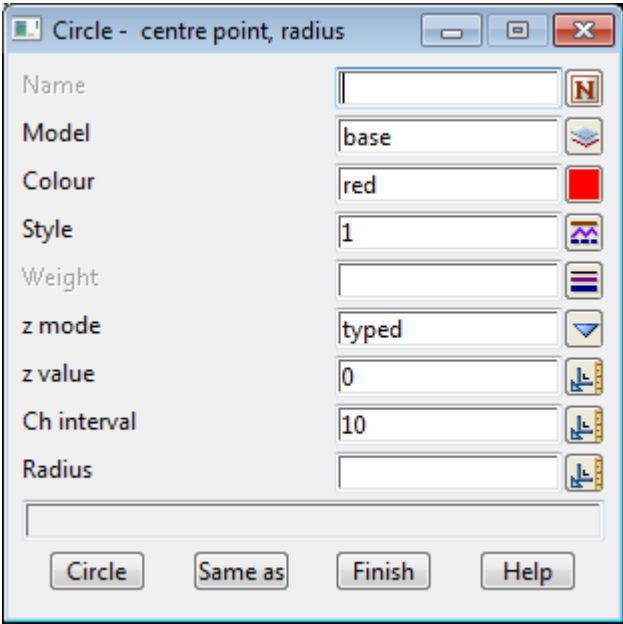
Each of the methods for creating circles and arcs will now be described.

Create Circle - Centre Point, Radius

Position of option on menu: Strings =>Create =>Circles =>Centre, radius

This option defines a circle by supplying a typed radius and selecting a centre point with the mouse

After selecting the option, the **circle - centre point, radius** panel is displayed.



To **create** a circle, the name, colour, model, chainage interval and radius are entered into the appropriate fields and the centre point selected with the cursor. The circle is then created using the information provided in the panel.

The new fields and buttons used in the **circle - centre point, radius** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name <i>the name of the new string.</i>	input		
Model <i>name of the model that the new string is in.</i>	input		available models
Colour <i>the colour of the new string.</i>	input	default colour	available colours
Style <i>line style of the string.</i>	input	1	available line styles
Weight <i>thickness of the string.</i>	input	0	
z mode <i>the method of specifying the z-value for the circle. It can be typed in or taken from the z-value of the selected centre point.</i>	input	typed	snap, typed
z value <i>if the z mode method is typed, then the height (z-value) of the circle is the value in the field.</i>	input	0	
Ch interval <i>the chainage interval used when a chord approximation is needed for the circle.</i>	input	10	
Radius <i>the radius for the circle.</i>	input	10	

Circle button

The *circle* button is used to begin a new create if the previous one was cancelled.

Same as button

After the **same as** button is chosen, another string is selected and information about it is used for the fields in this panel.

Panel Messages

Next step messages sent to the screen message when selecting and accepting the centre point are

<Circle centre> [picks][][][menu]

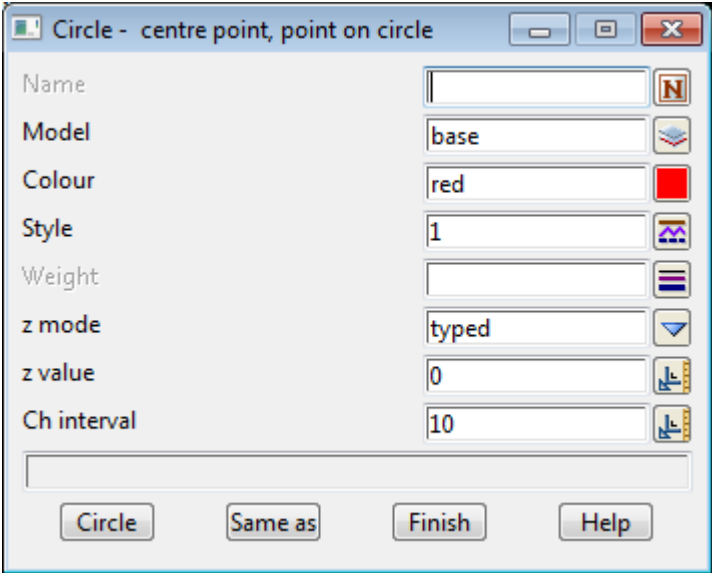
<Circle centre> [picks][accepts][menu]

Create Circle - Centre Point, Point on Circle

Position of option on menu: Strings =>Create =>Circles =>Centre, pt on circle

This option defines a circle by selecting a centre point and a point on the circle. The radius is automatically calculated by the option and is simply the distance between the two selected points.

After selecting the option, the **circle - centre point, point on circle** panel is displayed.



To **create** a circle, the name, colour, model and chainage interval are entered into the appropriate fields and the centre point and a point on the circle selected with the cursor. Then the circle is created using the information provided in the panel.

The new fields and buttons used in the **circle - centre point, point on circle** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name <i>the name of the new string.</i>	input		
Model <i>name of the model that the new string is in.</i>	input		available models
Colour <i>the colour of the new string.</i>	input	default colour	available colours

Style <i>line style of the string.</i>	input	1	available line styles
Weight <i>thickness of the string.</i>	input	0	
z mode <i>the method of specifying the z-value for the circle. It can be typed in or taken from the z-value of the selected centre point.</i>	input	typed	snap, typed
z value <i>if the z mode method is typed, then the height (z-value) of the circle is the value in the field.</i>	input	0	
Ch interval <i>the chainage interval used when a chord approximation is needed for the circle.</i>	input	10	
Circle <i>The circle button is used to begin a new create if the previous one was cancelled.</i>	button		
Same as <i>After the same as button is chosen, another string is selected and information about it is used for the fields in this panel.</i>	button		

How to Use the Panel to Create a Circle

- (a) The panel fields are filled in with the appropriate data for use in defining the circle.
- (b) The mouse is then used to select the centre point for the circle.

Messages sent to the screen message area when selecting and accepting the centre point

```
<Circle centre> [picks][ ][menu]
<Circle centre> [picks][accepts][menu]
```

When selecting a point on the circle

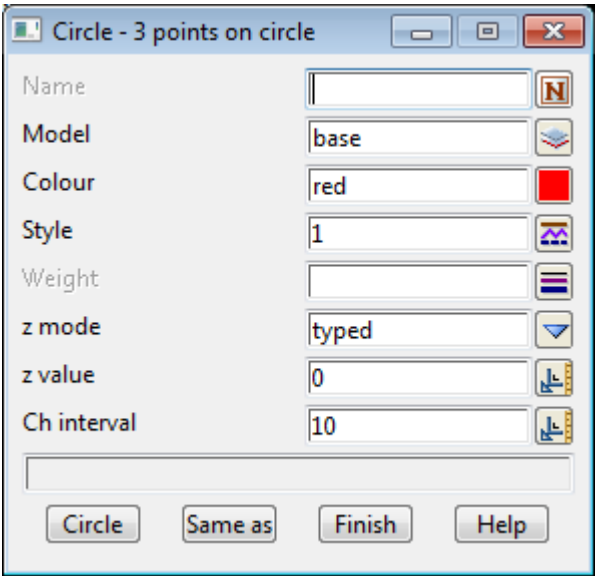
```
<Point on circle> [picks][ ][menu]
<Point on circle> [picks][accepts][menu]
```

Create Circle - Three Points on Circle

Position of option on menu: Strings =>Create =>Circles =>3 pts on circle

This option defines a circle by selecting three points that all lie on the circle. The radius and centre point are automatically calculated by the option.

After selecting the option, the **circle - 3 points on circle** panel is displayed.



To **create** a circle, the name, colour, model and chainage interval are entered into the appropriate fields and then three points which lie on the circle are selected with the cursor. The circle is then created using the information provided in the panel.

The fields and buttons used in the **circle - 3 points on circle** panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Name	<i>the name of the new string.</i>	input		
Model	<i>name of the model that the new string is in.</i>	input		available models
Colour	<i>the colour of the new string.</i>	input	default colour	available colours
Style	<i>line style of the string.</i>	input	1	available line styles
Weight	<i>thickness of the string.</i>	input	0	
z mode	<i>the method of specifying the z-value for the circle. It can be typed in or taken from the z-value of the selected centre point.</i>	input	typed	snap, typed
z value	<i>if the z mode method is typed, then the height (z-value) of the circle is the value in the field.</i> <i>if the z mode method is typed, then the height (z-value) of the circle is the value in the field.</i>	input	0	
Ch interval	<i>the chainage interval used when a chord approximation is needed for the circle.</i>	input	10	
Circle	<i>The circle button is used to begin a new create if the previous one was cancelled.</i>	button		
Same as	<i>After the same as button is chosen, another string is selected and information about it is used for the fields in this panel.</i>	button		

Panel Messages

Next step messages sent to the screen message area when selecting and accepting the 1st point

<First point on circle> [picks][][menu]

<First point on circle> [picks][accepts][menu]

When selecting and accepting the second point

<Second point on circle> [picks][][menu]

<Second point on circle> [picks][accepts][menu]

When selecting and accepting the third point

<Third point on circle> [picks][][menu]

<Third point on circle> [picks][accepts][menu]

Create - Feature

Position of option on menu: Strings =>Create =>Feature

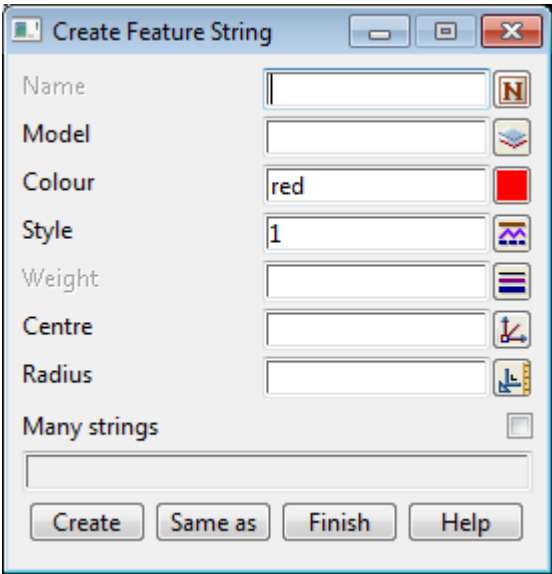
A feature string consists of a centre point (x,y,z) and a user given radius.

The difference between a circle and a feature string is that for a feature string the **centre point** is considered to be a valid (x,y,z) point but all the points on the circumference of the feature string are null values. Feature strings can be used to represent objects such as trees.

The **Many strings** tick-box is used when more than one string of the same type is to be created, If **many strings** is set to *tick*, when the current string creation is **Finished** or **Quit**, a new **Create Feature String** panel is placed on the screen with the same information in it as the string just created. If any of the information needs to be modified for the new string, simply change it in the **Create Feature String** panel fields before selecting the **Create** button for the new string. Hence a new string of the same type can be created without going back to the **Create** menu.

The **Same as** button is used to obtain information from an existing string (not necessarily of the same type) and pipe it into the name, colour, model, style breakline type and height field of the **Create Feature String** panel.

After selecting the option, the **Create feature string** panel is displayed.



The new fields and buttons used in the **create feature string** panel have the following functions.

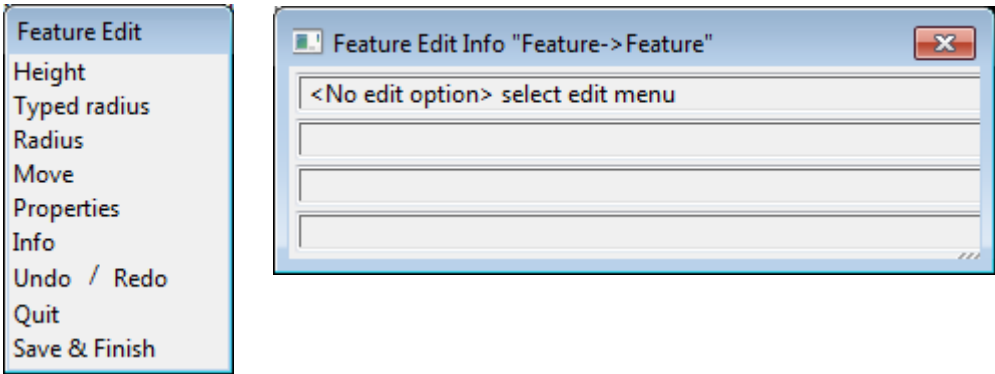
Field Description	Type	Defaults	Pop-Up
Name <i>the name of the new string.</i>	input		
Model <i>name of the model that the new string is in.</i>	input		available models
Colour <i>the colour of the new string.</i>	input	default colour	available colours
Style <i>line style of the string.</i>	input	1	available line styles
Weight <i>thickness of the string.</i>	input	0	

Centre	input	xyz ops menu
<i>co-ordinates of the centre of the feature.</i>		
Radius	input	
<i>the radius for the feature.</i>		
Many strings	tick	
<i>if ticked then after the current string is finished, a new create panel is placed on the screen with all the same values for the panel fields as the current string.</i>		
Create	button	
<i>After the create button is chosen, the feature edit menu and feature edit info panel are displayed.</i>		
Same as	button	
<i>After the same as button is chosen, another string is selected and information about it is used for the fields in this panel.</i>		

Note - the centre co-ordinates can either be typed into the **centre** panel field, or if LB is clicked on **[+]** for the **centre** panel field, the xyz ops menu comes up and the **pick xyz** option can be used from it to select a point as the arc centre.

Start Edit - Feature

Like the arc creates, on selecting the **Create** button the feature string is immediately created. The **feature edit menu** and **feature edit info panel** are also placed on the screen at the same time
The **feature edit menu** and panel for a feature string are



For full information in the Feature Editor, go to the section [Feature Edit](#)

Create - Pipe Super

Position of option on menu: Strings =>Create =>Pipe

A pipe super string is the same as a 3d string except that the pipe string also has a diameter hence the options for creating and editing a pipe string are almost the same as for a 3d string.

The main difference is that the pipe diameter can be modified in the Properties panel for the string.

The **Many strings** tick-box is used when more than one string of the same type is to be created, If **many strings** is set to *tick*, when the current string creation is **Finished** or **Quit**, a new **Create Super Pipe String** panel is placed on the screen with the same information in it as the string just created. If any of the information needs to be modified for the new string, simply change it in the **Create Super Pipe String** panel fields before selecting the **Create** button for the new string. Hence a new string of the same type can be created without going back to the **Create** menu.

The **Same as** button is used to obtain information from an existing string (not necessarily of the same type) and pipe it into the name, colour, model, type, linestyle style, weight, diameter and tinability fields of the **Create Super Pipe String** panel.

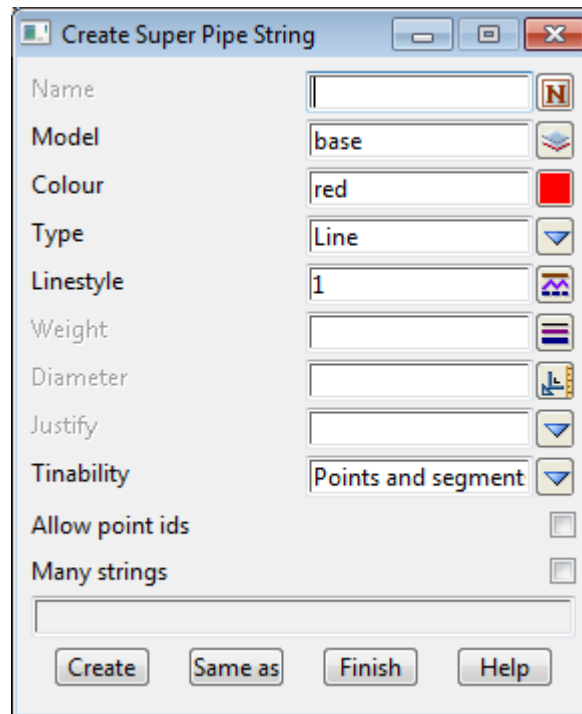
From **12d Model 8** onwards, the default is to create **super pipe strings** rather than the **pipe strings** used up to **12d Model 7**. The advantage of using a **pipe super string** is that all the CAD options will work for it, vertices and segments can be assigned tinability and it can have point id's for setout.

The older *pipe string* create option is still available under

Strings =>Create =>Old

(go to the section [Create - Pipe \(Pre V8\)](#))

On selecting the **Pipe** option, the **Create Super Pipe String** panel is displayed.



The default values for the panel fields are taken from the **CAD Controlbar** (see [CAD, Symbol and Text Controlbars](#))

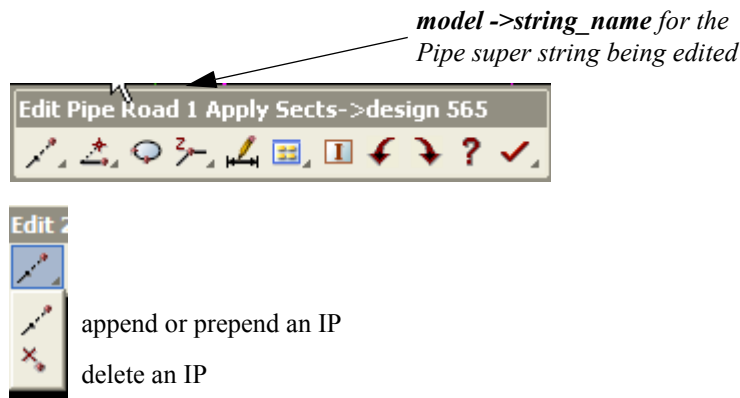
To **create a new pipe super string**, the panel fields are filled in and the **Create** button selected.

The fields and buttons used in the **Create Super Pipe String** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name <i>the name of the new string</i>	input	from CAD controlbar	
Model <i>name of the model that the new string is in</i>	model box	from CAD controlbar	available models
Colour <i>the colour of the new string</i>	colour box	from CAD controlbar	available colours
Type <i>breakline type (point-line type) of the string</i>	choice box	line	line, point
Linestyle <i>line style of the string</i>	input	from CAD controlbar	available line styles
Weight <i>thickness of the string</i>	input	from CAD controlbar	
Diameter <i>diameter of the pipe</i>	input	0	
Justify <i>justification of the pipe with respect to the co-ordinates given for the pipe string.</i>	input	invert	invert, centre, overt
Tinability	choice box	Points and segments	Points and segments Points only Not tinable
<i>if Vertices and segments, all the vertices and segments of the string are set to tinable. If Vertices only, all the vertices are set to tinable and the segments to not tinable. If Not tinable, all the vertices or segments are set to not tinable.</i>			
Allow point ids <i>if ticked, the super string can have point ids for each vertex. If not ticked, the super string will not have point ids. This can be reversed if point ids are required in the future.</i>	tick box		
Many strings <i>if ticked then after the current string is finished, a new create panel is placed on the screen with all the same values for the panel fields as the current string.</i>	tick box		
Create <i>after the Create button is chosen, the Edit Pipe menu is displayed</i>	button		
Same as <i>after the Same as button is chosen, another string is selected and information about it is used for the fields in this panel</i>	button		
Finish <i>end the option, don't proceed to the edit stage</i>	button		

Start Edit - Pipe Super

On selecting the **Create** button in the **Create Super Pipe String** panel the **Edit Pipe** menu is placed on the screen. The **Edit Pipe** menu for a *pipe super string* is



To create a new *pipe super string*, select the **Append** icon.

The **Append** option is used to add vertices to either end of an existing string, or in the case of a new string, places the first vertex and then begins appending vertices to the first vertex.

For all pipe strings, a cross is then drawn in each plan view that the string's model is on, and the cross follows the cursor around the screen. If the string's model is **not** added to any plan view, the model is automatically added to **all** plan views.

After the cross is on the screen (moving with the cursor), clicking LB and accepting with MB selects the **first** vertex of the string (using the appropriate snaps).

The string is then drawn from the first vertex to the cursor position, which represents the second vertex of the string. Clicking LB and accepting with MB selects the second string vertex and the process repeats for subsequent string vertices.

Now that the string is created, all the edit options on the string's **Edit Pipe** menu are usable.

The options in the **Edit Pipe** menu are not only used for placing the initial vertices of the string, but for editing the string once it is created. Since the **Append** and other options in the **Edit Pipe** menu are identical to the options used when editing an existing string, they will be discussed in detail in the string **Editor** section.

For full information in the Pipe Editor, go to the section [Edit Pipe](#)

Create - Polyline Super

Position of option on menu: Strings =>Create =>Polyline

A polyline string is similar to a 3d string except that it can have either straight lines or arcs joining the (x,y,z) vertices of the string. The arcs are plan arcs with possibly a different z at either end and the z values are linearly interpolated between the end points. Hence in a long section, the end vertices are joined by straight lines for both line and arc segments of the polyline.

Creating and editing a polyline string is very similar to a 3d string. The only major difference is that a radius is required at each string segment (a radius of 0 means no arc, just a straight line).

The **Many strings** tick-box is used when more than one string of the same type is to be created, If **many strings** is set to *tick*, when the current string creation is **Finished** or **Quit**, a new **Create Super Polyline String** panel is placed on the screen with the same information in it as the string just created. If any of the information needs to be modified for the new string, simply change it in the **Create Super Polyline String** panel fields before selecting the **Create** button for the new string. Hence a new string of the same type can be created without going back to the **Create** menu.

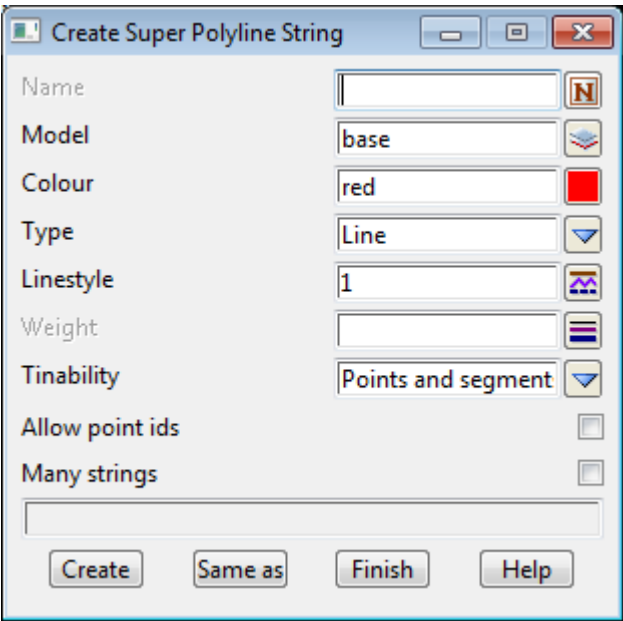
The **Same as** button is used to obtain information from an existing string (not necessarily of the same type) and pipe it into the name, colour, model, type, linestyle style and weight fields of the **Create Super Polyline String** panel.

From **12d Model 8** onwards, the default is to create **super polyline strings** rather than the **polyline strings** used up to **12d Model 7**. The advantage is using a **super polyline string** is that all the CAD options will work for it, vertices and segments can be assigned tinability and it can have point id's for setout.

The older *pipe string* create option is still available under

Strings =>Create =>Old (go to the section [Create - Polyline \(Pre V8\)](#))

On selecting the **Polyline** option, the **Create Super Polyline String** panel is displayed.



The default values for the panel fields are taken from the **CAD Controlbar** (see [CAD, Symbol and Text Controlbars](#))

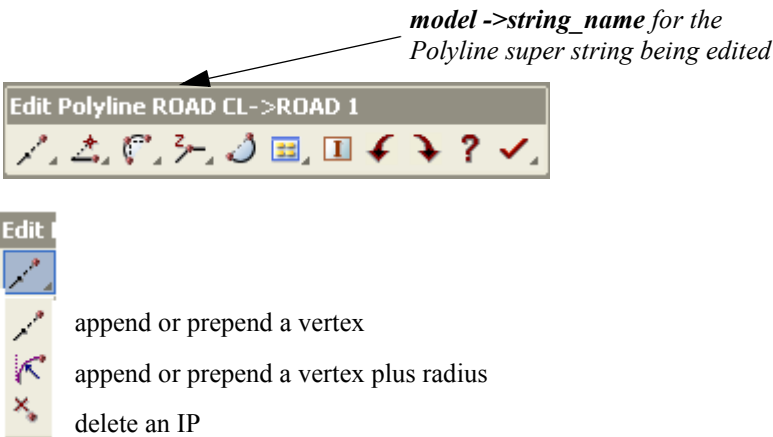
To **create a new polyline super string**, the panel fields are filled in and the **Create** button selected.

The fields and buttons used in the **Create Super Polyline String** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name <i>the name of the new string</i>	input	from CAD controlbar	
Model <i>name of the model that the new string is in</i>	model box	from CAD controlbar	available models
Colour <i>the colour of the new string</i>	colour box	from CAD controlbar	available colours
Type <i>breakline type (point-line type) of the string</i>	choice box	line	line, point
Linestyle <i>line style of the string</i>	input	from CAD controlbar	available line styles
Weight <i>thickness of the string</i>	input	from CAD controlbar	
Tinability	choice box	Points and segments	Points and segments Points only Not tinable
<i>if Vertices and segments, all the vertices and segments of the string are set to tinable. If Vertices only, all the vertices are set to tinable and the segments to not tinable. If Not tinable, all the vertices or segments are set to not tinable.</i>			
Allow point ids <i>if ticked, the super string can have point ids for each vertex. If not ticked, the super string will not have point ids. This can be reversed if point ids are required in the future.</i>	tick box		
Many strings <i>if ticked then after the current string is finished, a new create panel is placed on the screen with all the same values for the panel fields as the current string.</i>	tick box		
Create <i>after the Create button is chosen, the Edit Polyline menu is displayed</i>	button		
Same as <i>after the Same as button is chosen, another string is selected and information about it is used for the fields in this panel</i>	button		
Finish <i>end the option, don't proceed to the edit stage</i>	button		

Start Edit - Polyline Super

On selecting the **Create** button in the **Create Super Polyline String** panel the **Edit Polyline** menu is placed on the screen. The **Edit Polyline** menu for a *polyline super string* is



To create a new polyline string, the user must select one of the two append options (**Append** or **Append + radius**) on the **Append** drop-down toolbar on the **Edit Polyline** toolbar. The **Append** option simply creates vertices which are joined by a straight segment whereas the **Append + radius** creates vertices with a radius for the segment.

The **Append** options are used to add vertices to either end of an existing string, or in the case of a new string, places the 1st vertex and then begins appending vertices to the 1st vertex.

For all polyline strings, a cross is then drawn in each plan view that the string's model is on, and the cross follows the cursor around the screen. If the string's model is **not** added to any plan view, the model is automatically added to **all** plan views.

After the cross is on the screen (moving with the cursor), clicking LB and accepting with MB selects the **1st** vertex of the string (using the appropriate snaps).

If **Append + radius** was selected, the user will then be prompted for the radius of the segment being placed.

The string is then drawn from the 1st vertex to the cursor position, which represents the second vertex of the string. Clicking LB and accepting with MB selects the second string vertex and the process repeats for subsequent string vertices.

The options in the **Edit Polyline** menu are not only used for placing the initial vertices of the string, but for editing the string once it is created. Since the **Append** and other options in the **Edit Polyline** menu are identical to the options used when editing an existing string, they will be discussed in detail in the string **Editor** section.

For full information in the Polyline Editor, go to the section [Edit Polyline](#)

Create - Super

Position of option on menu: Strings =>Create =>Super

A super string is a combination and generalisation of a 4d string, a pipe string and a polyline string.

A super strings consists of a series of (x,y) vertices, plus it can have either straight lines or arcs joining the vertices of the string.

At each vertex, the super string has:

- height
- text
- visibility
- tinability (contourability)
- point number
- symbol
- user defined attributes

For each segment, the super string has:

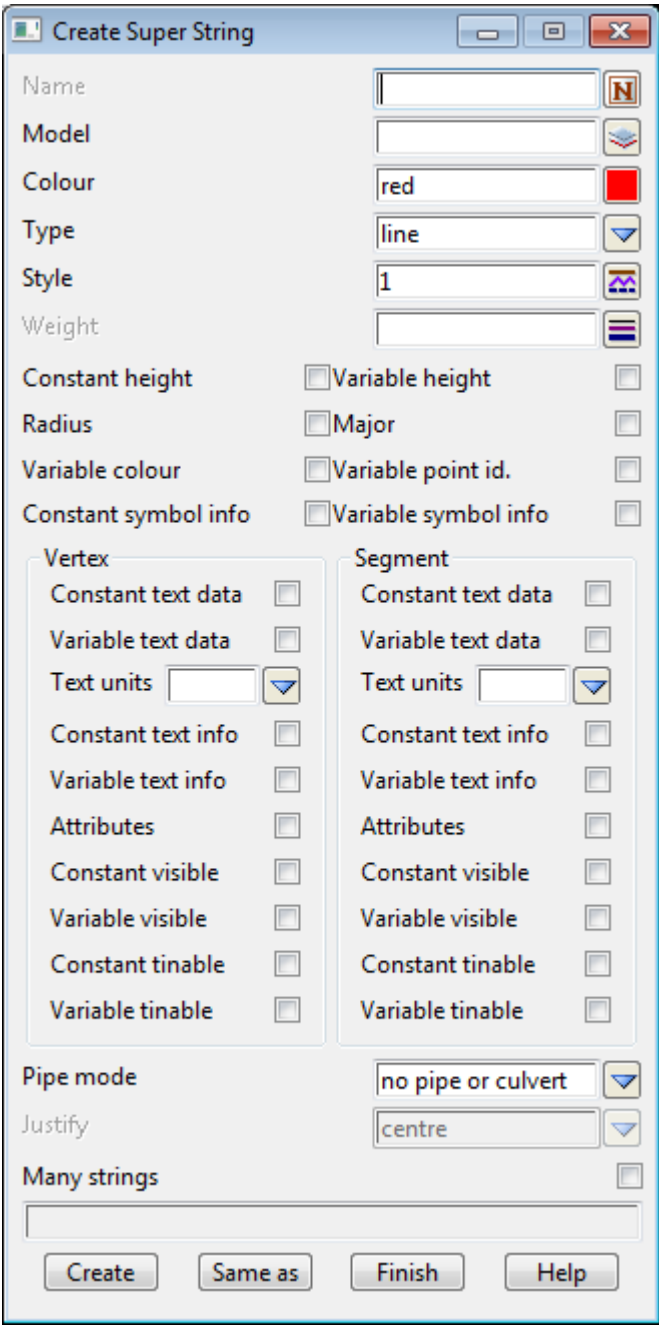
- plan radius
- colour
- text
- tinability (breakline)
- pipe diameter or box dimensions
- visibility
- user defined attributes

Creating and editing a super string is very similar to a polyline string in that a radius is can be given at each string segment (a radius of 0 means no arc, just a straight line), and also like a 4d string in that there can be text at each vertex. However there are many more choices about what is defined for each vertex and segment of the super string.

The **Many strings** tick-box is used when more than one string of the same type is to be created, If **many strings** is set to *tick*, when the current string creation is **Finished** or **Quit**, a new **Create Super String** panel is placed on the screen with the same information in it as the string just created. If any of the information needs to be modified for the new string, simply change it in the **Create Super String** panel fields before selecting the **Create** button for the new string. Hence a new string of the same type can be created without going back to the **Create** menu.

The **Same as** button is used to obtain information from an existing string (not necessarily of the same type) and pipe it into the name, colour, model, style breakline type and height field of the **Create Super String** panel.

On selecting the **Super string** option, the **Create Super String** panel is displayed.



To **create** a new super string, the name, colour, model, point-line type and linestyle of the new string are entered into the appropriate fields, plus settings any required settings in the tick boxes, and the **create** button selected.

The new fields and buttons used in the **create pipe string** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name <i>the name of the new string.</i>	input		
Model <i>name of the model that the new string is in.</i>	input		available models

Colour	input	default colour	available colours
<i>the colour of the new string.</i>			
Style	input	1	available line styles
<i>line style of the string.</i>			
Weight	input	0	
<i>thickness of the string.</i>			

Height choice

There are three choice for height: no height at all, one height for the entire string (for example a 2d string), or a different height for each vertex (for example, a 3d string).

Constant height	tick box	Variable height	tick box
<i>no height at all -</i>		Constant height not ticked and Variable height not ticked.	
<i>one height for the entire string -</i>		Constant height ticked and Variable height not ticked.	
<i>a different height for each vertex -</i>		Constant height not ticked and Variable height ticked.	

Radius choice

There are only two choices for radius: no radius at all or a different radius for each vertex. For example, each segment of a polyline can have a different radius.

Radius	tick box	Major	tick box
<i>no radius at all -</i>		Radius not ticked and Major not ticked.	
<i>a different radius for each vertex -</i>		Radius ticked and Major ticked.	

Note: the radius is a signed value and in the direction of travel along the arc, a negative radius means the arc bends to the left and a positive radius means the arc bends to the right. This is still not enough to uniquely define the arc and it can be a minor major arc (turns through less than or equal to 180 degrees), or a major arc (turns through more than 180 degrees). The Major flag is 0 for a minor arc and 1 for a major arc.

Colour choice

There can be one colour for the entire string, or each segment can have its own colour.

Colour	tick box
<i>if not ticked, there is only one colour for the entire string and it is the colour in the colour field.</i>	
<i>If ticked, there is a different colour for each segment.</i>	

Point id choice

There can be no point ids or a different point id at each vertex.

Variable point id	tick box
<i>if not ticked, there is no point ids for the string.</i>	
<i>If ticked, there is a different point id for each segment.</i>	

Symbol choice

There are three choice for symbols: no symbols at all, one symbol for the entire string, or a different symbols at each vertex.

Constant symbol info	tick box	Variable symbol info	tick box
<i>no symbol at all -</i>		Constant symbol info not ticked and Variable symbol info not ticked	
<i>one symbol for the entire string -</i>		Constant symbol info ticked and Variable symbol info not ticked	
<i>a different symbol for each vertex -</i>		Constant symbol info not ticked and Variable symbol info ticked	

Vertex:

Vertex Text Data choice

There are three choices for vertex text data at a vertex:

Constant text data	tick box	Variable text data	tick box
<i>no text data at all -</i>		Constant text data not ticked and Variable text data not ticked.	
<i>the same text data for all vertices of the string -</i>		Constant text data ticked and Variable text data not	

ticked.
a different text data for each vertex - Constant text data not ticked and Constant text data ticked.

Text units choice box paper, world, device,
screen (device), pixels (device)

if paper, the text units are millimetres on a plot.
if world, the text units are in world units.
if device, the units are in pixels.
if screen (device), same as device.
if pixels (device), same as device.

Vertex Text info choice

There are three choices for vertex text info at a vertex:

Constant text info tick box **Variable text info** tick box
no text info at all - Constant text info not ticked and Variable text info not ticked.
the same text info for all vertices of the string - Constant text info ticked and Variable text info not ticked.
a different text info for each vertex - Constant text info not ticked and Constant text info ticked.

Vertex Attribute choice

There can be no attributes at any vertex, or any number of attributes at each vertex.

Attributes tick box
if not ticked, there are not attributes on any vertex.
If ticked, there is any number of attributes at each vertex.

Vertex Visibility choice

There are thee choices for tinability for vertices: all vertices are visible, all vertices are visible, each vertex has its own visibility setting.

Constant visible tick box **Variable visible** tick box
all vertices visible Constant visible not ticked and Variable visible not ticked.
all vertices are visible Constant visible ticked and Variable visible not ticked.
a different visibility for each vertex - Constant visible not ticked and Variable visible ticked.

Vertex Tinable choice

There are thee choices for tinability for vertices: use default type (point or line), vertices are not tinable, all vertices are tinable, each vertex has its own tinability setting.

Constant tinable tick box **Variable tinable** tick box
use default type (point or line) Constant tinable not ticked and Variable tinable not ticked.
all vertex are tinable - Constant tinable ticked and Variable tinable not ticked.
a different tinability for each vertex - Constant tinable not ticked and Variable tinable ticked.

Segment:

Segment Text Data choice

There are three choices for segment text data on a segment:

Constant text data tick box **Variable text data** tick box
no text data on a segment at all - Constant text data not ticked and Variable text data not ticked.
same text data for all segments of the string - Constant text data ticked and Variable text data not ticked.
a different text data for each segment - Constant text data not ticked and Constant text data ticked.

Text units choice box paper, world, device,
screen (device), pixels (device)

if paper, the text units are millimetres on a plot.
if world, the text units are in world units.
if device, the units are in pixels.

if screen (device), same as device.
if pixels (device), same as device.

Segment Text info choice

There are three choices for text info for text on a segment:

Constant text info	tick box	Variable text info	tick box
<i>no text info at all -</i>			
<i>Constant text info not ticked and Variable text info not ticked.</i>			
<i>same text info for all segments of the string-Constant text info ticked and Variable text info not ticked.</i>			
<i>a different text info for each segment -</i>			
<i>Constant text info not ticked and Constant text info ticked.</i>			

Segment Attribute choice

There can be no attributes on any segment, or any number of attributes on each segment.

Attributes	tick box
<i>if not ticked, there are no attributes on any segment.</i>	
<i>If ticked, there are any number of attributes on each segment.</i>	

Segment Visibility choice

There are thee choices for visibility for segments: all visible, all segment are visible, each segment has its own visibility setting.

Constant visible	tick box	Variable visible	tick box
<i>all segments visible by default</i>			
<i>Constant visible not ticked and Variable visible not ticked.</i>			
<i>all segments are visible</i>			
<i>Constant visible ticked and Variable visible not ticked.</i>			
<i>a different visibility for each segment -</i>			
<i>Constant visible not ticked and Variable visible ticked.</i>			

Segment Tinable choice

There are thee choices for tinability for segment: use type (line or point), all segments are tinable, each segment has its own tinability setting.

Constant tinable	tick box	Variable tinable	tick box
<i>use default type (point or line)</i>			
<i>Constant tinable not ticked and Variable tinable not ticked.</i>			
<i>all segments are tinable -</i>			
<i>Constant tinable ticked and Variable tinable not ticked.</i>			
<i>a different tinability for each segment -</i>			
<i>Constant tinable not ticked and Variable tinable ticked.</i>			

Pipe choice

There are five choice: the string is a
constant pipe string and has one diameter for the entire string
a variable pipe string and can have a different diameter for each segment
a constant culvert string and has the one width and height for each segment
a variable culvert string and can have a different width and height for each segment
or the string has no diameter or width and height for any segment.

Pipe mode	choice box	no pipe or culvert pipe entire string pipe each segment culvert entire string culvert each segment
------------------	------------	----------------------------------------------------------------------------------------------------------------

if pipe entire string, there is one diameter for all segments in the string.
if pipe each segment, there is a diameter for each segments of the string.
if culvert entire string, there is one width and a height of a box for all segments in the string.
if culvert each segment, there is a different width and height for each segment.
if no pipe or culvert, there is no diameter; or any width and height box for any segment.

Justify	choice box	Invert, centre, obvert
<i>The Justify choice box is only active if Pipe mode is NOT no pipe or culvert.</i>		
<i>If invert, the coordinates of the vertices are on the top of the pipe/culvert.</i>		
<i>If centre, the coordinates of the vertices are in the centre of the pipe/culvert.</i>		
<i>If obvert, the coordinates of the vertices are at the bottom of the pipe/culvert.</i>		

Many strings tick

if ticked then after the current string is finished, a new create panel is placed on the screen with all the same values for the panel fields as the current string.

Create button

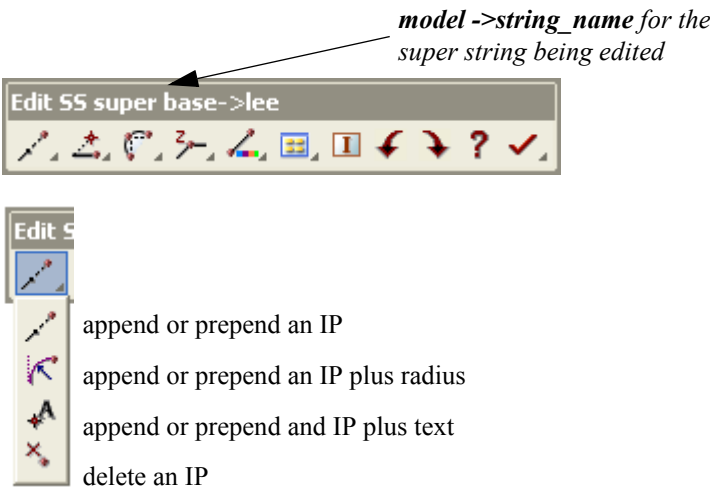
*After the **create** button is chosen, the **super edit** menu and **super edit info** panel are displayed.*

Same as button

*After the **same as** button is chosen, another string is selected and information about it is used for the fields in this panel.*

Start Edit - Super String

On selecting the **Create** button in the **Create Super String** panel the **Super Edit** menu and **Super Edit Info** panels are placed on the screen.



To create a new super string, select the **Append** or **Append + radius** or **Append + text** icons.

The **Append** and **Append + text** options simply creates vertices that are joined by a straight segments. **Append + text** also asks for text at each vertex.

The **Append + radius** create vertices with a radius for the segment.

For all super strings, a cross is then drawn in each plan view that the string's model is on, and the cross follows the cursor around the screen. If the string's model is **not** added to any plan view, the model is automatically added to **all** plan views.

After the cross is on the screen (moving with the cursor), clicking LB and accepting with MB selects the **first** vertex of the string (using the appropriate snaps).

If **Append + radius** was selected, the user will then be prompted for the radius of the segment being placed.

If **Append + text** was selected, the user will then be prompted for the text to be placed at the vertex.

The string is then drawn from the first vertex to the cursor position, which represents the second vertex of the string. Clicking LB and accepting with MB selects the second string vertex and the process repeats for subsequent string vertices.

Now that the string is created, all the edit option on the string's **Super Edit** menu are usable.

The options in the **Super Edit** menu are not only used for placing the initial vertices of the string,

but for editing the string once it is created. Since the **Append** and other options in the **Super Edit** menu are identical to the options used when editing an existing string, they will be discussed in detail in the string **Editor** section.

For full information in the Super Editor, go to the section [Edit Super](#)

Create - Text

Position of option on menu: Strings =>Create =>Text

A text string consists of

- (a) the text
- (b) an (x,y) position for the text
- (c) a text style
- (d) a justification
- (e) the height of the text in pixels, paper or world units
- (f) the x factor and slant of the text
- (g) the colour of the text
- (h) the angle to write the text at

The default text style uses a non-proportional font but user defined fonts can be proportional or non-proportional.

The justification of the text with respect to text string's (x,y) position is user specified.

The text angle is measured in a counter- clockwise direction with respect to the horizontal axis.

For more information on text definitions, go to the section [Text Definitions](#) in the chapter [Tools and Concepts](#).

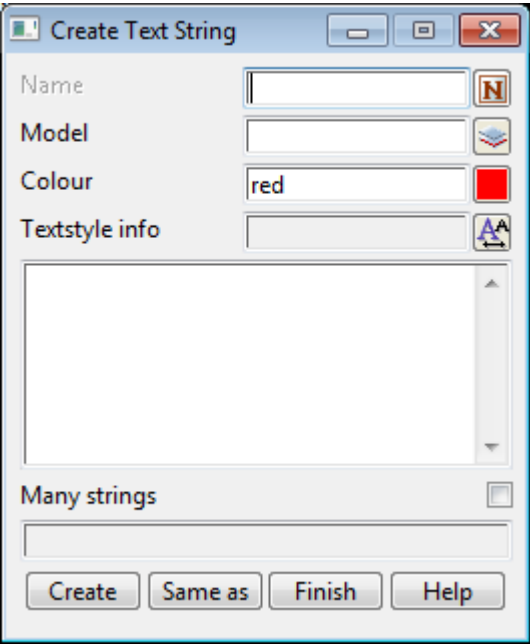
Note - deleting text

Text is deleted as a normal string with the picking point at the text string's definition point. The relationship of the definition point and the text depends on the text offset and justification

The **Many strings** tick-box is used when more than one string of the same type is to be created, If **many strings** is set to *tick*, when the current string creation is **Finished** or **Quit**, a new **Create Text String** panel is placed on the screen with the same information in it as the string just created. If any of the information needs to be modified for the new string, simply change it in the **Create Text String** panel fields before selecting the **Create** button for the new string. Hence a new string of the same type can be created without going back to the **Create** menu.

The **Same as** button is used to obtain information from an existing string (not necessarily of the same type) and pipe it into the name, colour, model, style breakline type and height field of the **Create Text String** panel.

On selecting the **Text string** option, the **Create text string** panel is displayed.



To **create** a new text string, the name, model, colour and actual text of the new string are entered into the appropriate fields, and the textstyle info such as height, offset, justification, angle are entered by clicking on the Textstyle info box. The **create** button is then selected.

The new fields and buttons used in the **create text string** panel have the following functions.

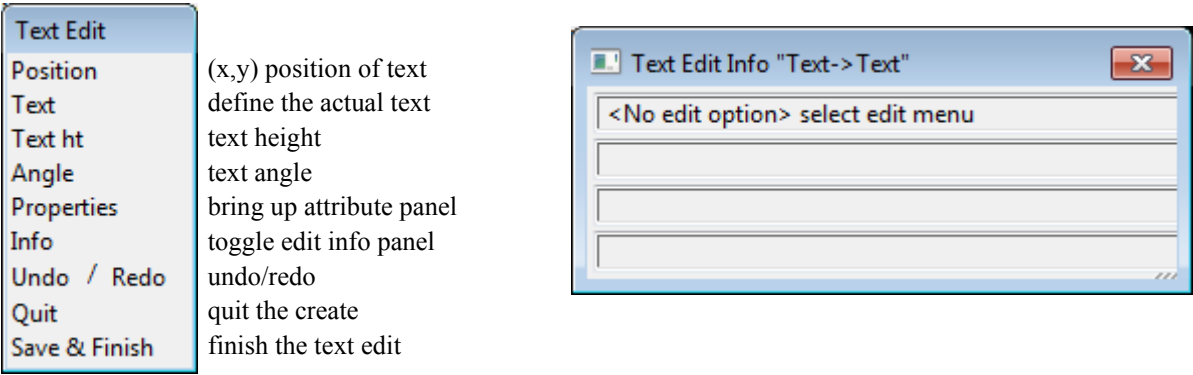
Field	Description	Type	Defaults	Pop-Up
Name	<i>the name of the new string.</i>	name box		
Model	<i>name of the model that the new string is in.</i>	model box		available models
Colour	<i>the colour of the new string.</i>	colour box	default colour	available colours
Textstyle info	<i>textstyle information.</i>	textstyle info box		
Text	<i>the actual text.</i>	multi-line text box		
Many strings	<i>if ticked then after the current string is finished, a new create panel is placed on the screen with all the same values for the panel fields as the current string.</i>	tick box	not ticked	
Create	<i>After the create button is chosen, the text edit menu and text edit info panel are displayed.</i>	button		
Same as	<i>After the same as button is chosen, another string is selected and information about it is used for the fields in this panel.</i>	button		

Start Edit - Text

On selecting the **create** button in the **create text string** panel the **text edit** menu and **text edit info**

panel are placed on the screen.

The **text edit** menu for a text string is and the **text edit** panel is



To creating a new text string, the user must first select the **Position** option from the **Text edit** menu. Then after selecting a position, the text is created and displayed (if the model is on the view).

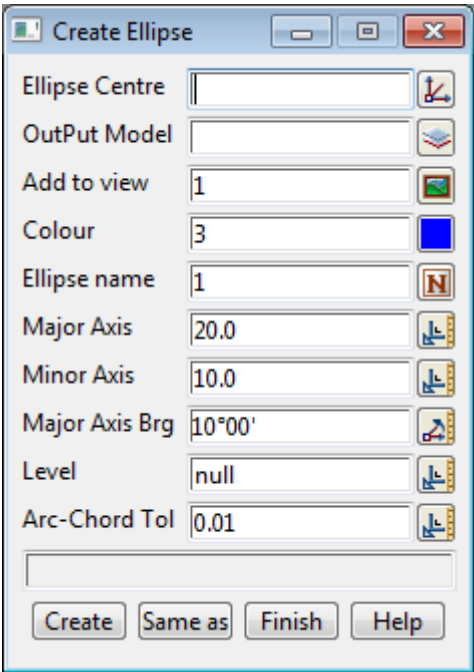
For full information in the Text Editor, go to the section [Text Edit](#)

Create - Ellipse

Position of option on menu: Strings =>Create =>Ellipse

.This option creates a super string of points along the ellipse defined in the panel. The frequency of points is determined by a user defined chord-to-arc tolerance.

After selecting the **Ellipse** option, the **Create Ellipse** panel is displayed.



Field Description	Type	Defaults	Pop-Up
Ellipse centre <i>centre of the ellipse</i>	model select		
OutPut model <i>name of the model to place put the ellipse string in</i>	model box		available models
Add to view <i>add the model to the given view</i>	view select	1	
Colour <i>the colour of the new string.</i>	colour box	default colour	available colours
Ellipse name <i>the name of the new string.</i>	name mapping box		names in name mapping file
Major Axis <i>the length of the major axis of the ellipse</i>	measure box	20	
Minor Axis <i>the length of the minor axis of the ellipse</i>	measure box	10	
Major Axis Brg <i>bearing of the major axis of the ellipse</i>	measure box		
Level <i>z-value for the points on the ellipse</i>	measure box	null	

Arc-Chord Tol	measure box	0.01
<i>the chord to arc tolerance to use for deciding how often to create points around the ellipse</i>		
Create	button	
<i>after the Create button is chosen, a string of points around the ellipse is created</i>		
Same as	button	
<i>after the same as button is chosen, another string is selected and information about it is used for the fields in this panel.</i>		

Create - Control Stations

Position of option on menu: Strings =>Create =>Create Control Station

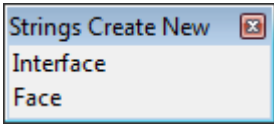
This option is documented in Survey =>Extras =>Create Control stations in the section [Create Control Stations](#) in the chapter [Survey](#)

New

Position of option on menu: Strings =>Create =>New

This section of documentation is a work in progress and will be updated in subsequent releases.

The New walk-right menu contains options *Interface* and *Face*.



For the option *Interface*, go to
Face

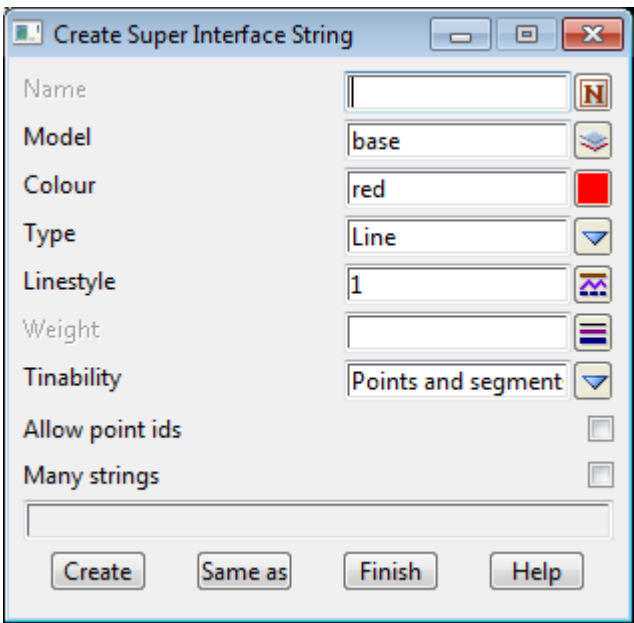
[Interface](#)
[Face](#)

Interface

Position of option on menu: Strings =>Create =>New =>Interface

This section of documentation is a work in progress and will be updated in subsequent releases.

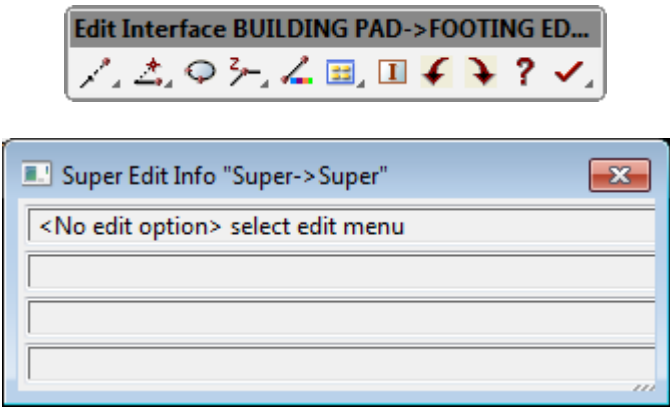
On selecting the *Interface* option, the Create Super Interface String panel is displayed.



The fields and buttons used in the **Create Super Interface String** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name	input		
Model	model box		available models
Colour	colour box		available colours
Type	choice box	line	point, line
Linestyle	input	from CAD controlbar	available line styles
Weight	input	from CAD controlbar	
Tinability	choice box	Points and segments	Points and segments Points only Not tinable
Allow point ids	tick box		
Many strings	tick box		
Create	button		
Same as	button		

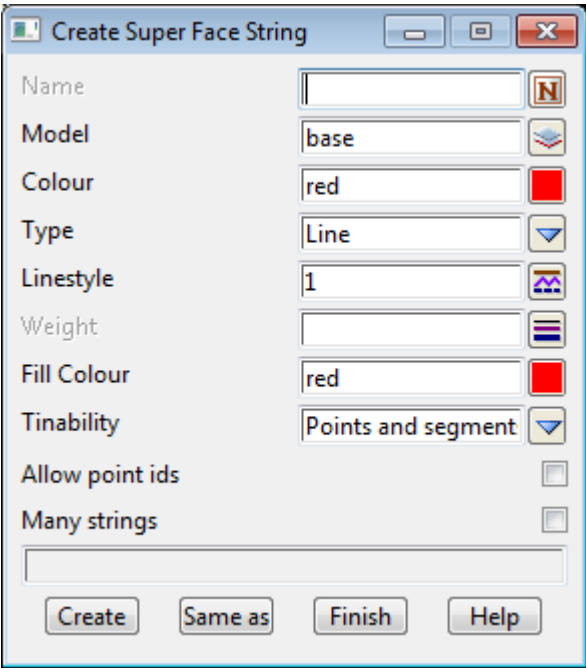
Once the **Create** button has been pressed, the **Edit Interface** toolbar and **Super edit Info** panel appears on the screen, containing the list of available edit options for the Super Interface String.



Face

Position of option on menu: Strings ==>Create ==>New ==>Face

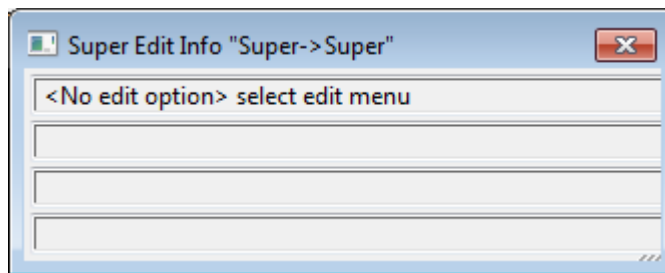
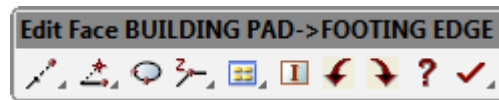
This section of documentation is a work in progress and will be updated in subsequent releases.
On selecting the **Face** option, the **Create Super Face String panel** is displayed.



The fields and buttons used in the **Create Super Face String panel** have the following functions.

Field Description	Type	Defaults	Pop-Up
Name	input		
Model	model box		available models
Colour	colour box		available colours
Type	choice box	line	point, line
Linestyle	input	from CAD controlbar	available line styles
Weight	input	from CAD controlbar	
Fill Colour	colour box		available colours
Tinability	choice box	Points and segments	Points and segments Points only Not tinable
Allow point ids	tick box		
Many strings	tick box		
Create	button		
Same as	button		

Once the **Create** button has been pressed, the **Edit Face** toolbar and **Super edit Info** panel appears on the screen, containing the list of available edit options for the Super Face String

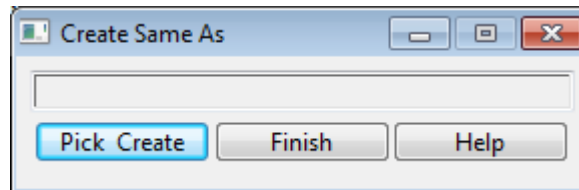


Create - Same As

Position of option on menu: Strings =>Create =>Same as

The **same as** option is used to create a new string of the same type and with similar header information as an existing string.

On selecting the **same as** create option, the **create same as** panel is displayed.



After selecting the option, the option is already running and waiting for a string to be selected.

Once a string is selected from a view, a new **create nd string** panel of the same type as the selected string and with all the header information from the selected string, is displayed on the screen.

The user then proceeds as a normal create string option.

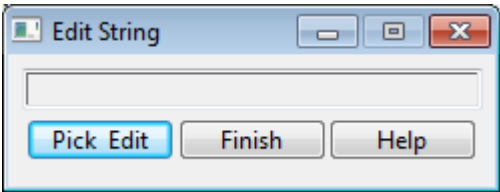
If the pick is terminated by clicking RB to get up the **pick ops** menu and selecting **cancel** from it, the option can be started again by selecting the **pick & create** button.

Editor

Position of option on menu: Strings =>Editor

The string editor is used for modifying any of the **12d Model** strings.

After selecting the **editor** option, the **edit string** panel is placed on the screen to record any error messages.



The option is already in **pick** mode (the **pick & edit** button only needs to be selected if the pick was cancelled) and the user simply picks and accepts the string to be edited. From the picked string's type, the editor is able to determine the appropriate editor and placed on the screen.

Each string type has its own edit operations which will now be discussed in detail.

Note - if the **edit** menu is deleted from the screen using the **menu delete** option, it can be raised again by clicking RB in any view.

For the option *2d*, go to

3d

4d

Arcs

Circles

Feature

Edit Pipe

Edit Polyline

Super

Super Alignment

Text

[Edit 2d](#)

[Edit 3d](#)

[Edit 4d](#)

[Arc Edit](#)

[Circle Edit](#)

[Feature Edit](#)

[Edit Pipe](#)

[Edit Polyline](#)

[Edit Super](#)

[Edit Super Alignment](#)

[Text Edit](#)

For the old string options:

2d, go to

3d - old

4d - old

Alignment

Pipe - old

Polyline - old

[2d Edit - Old.](#)

[3d Edit - Old](#)

[4d Edit - Old](#)

[Alignment Edit](#)

[Pipe Edit - Old](#)

[Polyline Edit - Old](#)

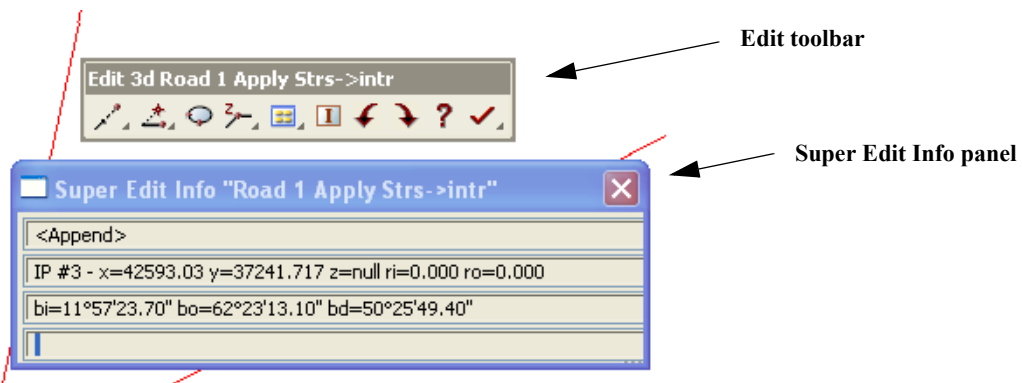
Please continue to the next section [Super String Edit - Common Information](#).

Super String Edit - Common Information

nd edit menu

After selecting the string to be edited, the toolbar containing the list of available edit options (the string's **Edit nd** menu) is placed on the screen. If **Display edit info** is ticked on in the **Default** panel (**Project =>Management =>Defaults**), an information panel, (the string's **Edit nd info** panel) is also displayed.

For example, the **Edit String** menu and **Super Edit Info** panel for a 3d super string are

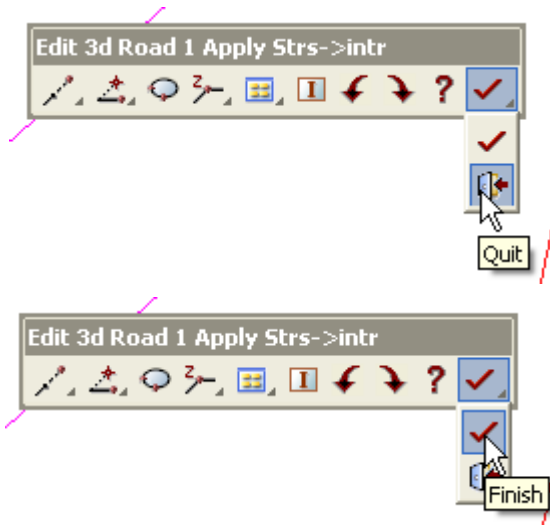


Most of the options chosen from the **Edit nd** menus repeat until cancelled by the user. That is, the option remains in force and can be applied repeatedly until terminated by the user.



For example, if the **Delete** option is selected, any number of vertices can be deleted from the chosen string without re-selecting the **Delete** option. For full information on the **Delete** option, go to the section [Delete](#)

To select a new edit nd option, simply select the option from the **Edit nd** toolbar. The current option is automatically terminated and the new option begins.



An option is also terminated when the entire string editing option is ended by selecting either the **Quit** or **Finish** button in the **Edit nd** menu.

Notes

1. Depending on its breakline (point-line) type, a string with default style ("1") is displayed with crosses at each of its vertices (point type) or with straight lines joining the vertices (line type). Linestyles can be defined that drawn lines between the vertices even though the breakline type is **point**.
2. The string vertices are called intersection points (IPs).
3. The string **Super Edit Info** panel will not automatically appear if **Display edit info** is set to **off** in the **System Settings** tab of the **Project =>Management =>Defaults** panel.

See [Delete](#)
[Move](#)
[Insert](#)
[Between](#)
[Extend](#)
[Open/Close](#)
[Properties](#)
[Info](#)
[Undo/Redo](#)
['? Help](#)
[Quit](#)
[Finish](#)
[Typed input](#)

Delete



The delete option is used to delete selected vertices from the string.

The vertex to be deleted is picked (LB) and accepted (MB). When the vertex is accepted, it is **deleted**. The string, minus the deleted point, is then redrawn.

Once a vertex has been deleted, another vertex in the string can then be selected and deleted. Hence any number of vertices from the string can be deleted one after another.

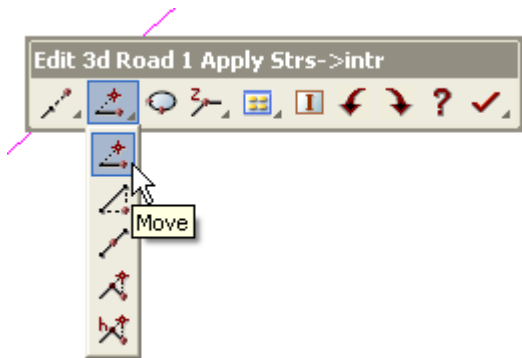
message area 1 <Delete>
Screen message area
 <Select a vertex to delete> [picks][fast][menu]

The delete option is terminated by selecting cancel from the pick ops menu or by selecting a new option from the **Edit nd** menu.

Typed input can be used to select a point for deletion.

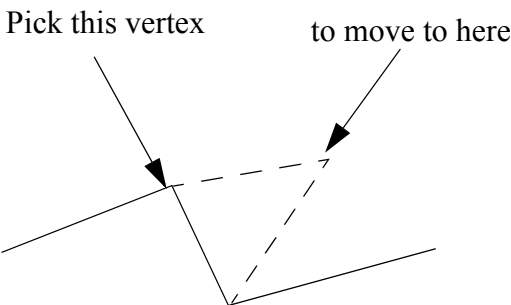
Move

The move option is for moving individual vertices (intersection points - IPs) of the string.



The move cycle consists of two steps:

- (a) selecting the vertex to move
- (b) selecting the new position for the vertex.



Step (a)

First the point to be moved is selected. The selected vertex will then move around the view and the string redrawn to show the change as the cursor is moved.

message area 1 <Move>

Screen message area

 <Pick vertex to move> [picks][fast][Menu

Step (b)

The current cursor position is selected as the new position for the vertex by selecting (LB) and accepting (MB). The vertex being moved is then anchored at the cursor position for the vertex, and the string redrawn.

message area 1 <Move>

Screen message area

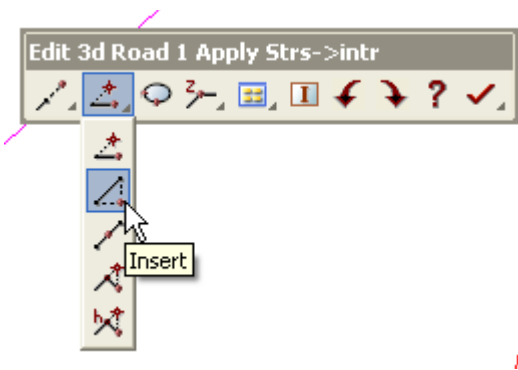
 <Pick new location of vertex> [picks][fast][menu]

Typed input can be used in either step.

Once the move cycle is completed and the vertex moved, the move option is still current and can be repeated for other vertices without having to re-select the **move** option.

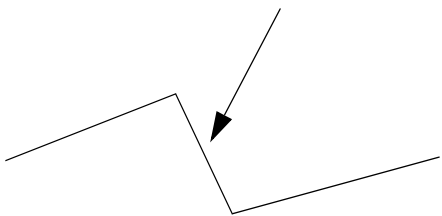
The **move** option is terminated by selecting **cancel** from the **pick ops** menu or by selecting a new **Edit nd** option.

Insert

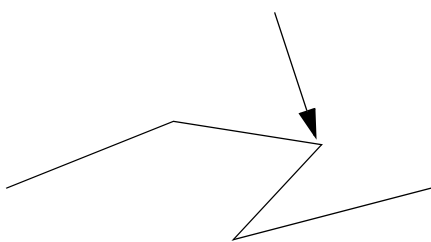


The **insert** option is designed to place a new vertex in a string between two adjacent vertices (note that the inserted point **does not** have to be on the segment joining the two vertices).

Select the two adjacent vertices by selecting the segment joining them



New vertex added at this location



Inserting a vertex, like moving a vertex, is a two step process.

Step (a) - selecting the vertices to be on either side of the new vertex by selected the segment
The two adjacent vertices are chosen by selecting the **segment** connecting the two vertices. Once the segment is selected, the new vertex is assumed to be at the current cursor position. As the cursor is moved, the string is redrawn reflecting the changing position of the inserted vertex.

message area 1 <Insert >
Screen message area
 <Pick position to insert vertex> [picks][fast][menu]

Step (b) - selecting the position for the new vertex

The position of the new vertex is selecting

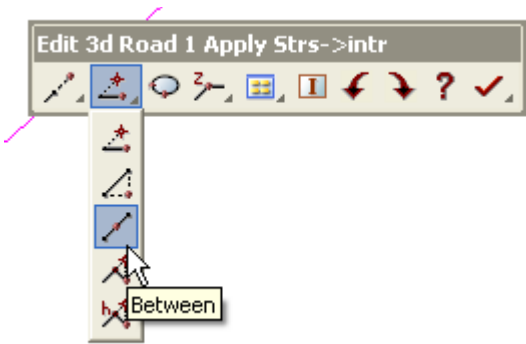
message area 1 <Insert >
Screen message area
 <Pick new location of vertex> [picks][fast][menu]

Once the insert cycle is completed and the vertex inserted, the insert option is still current and can be repeated for other insertions without having to re-select the **insert** option.

The **insert** option is terminated by selecting **Cancel** from the **Pick ops** menu or by selecting a new option from the **Edit nd** menu.

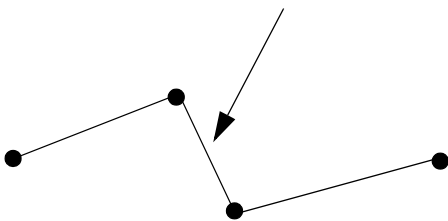
Typed input can be used in either step.

Between

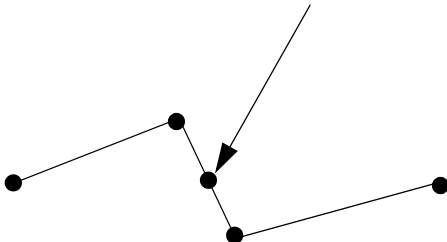


The **between** option is similar to the **insert** option except that the inserted vertex **does** have to be on the segment joining the two vertices. To accomplish this, the cursor position is projected onto the segment to give the new vertex position.

Select the segment that the new vertex must be on



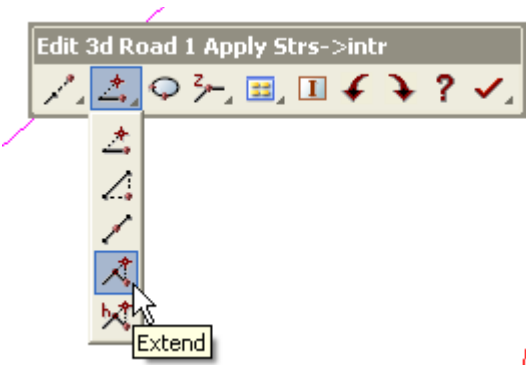
New vertex added at this location



● denotes a string vertex

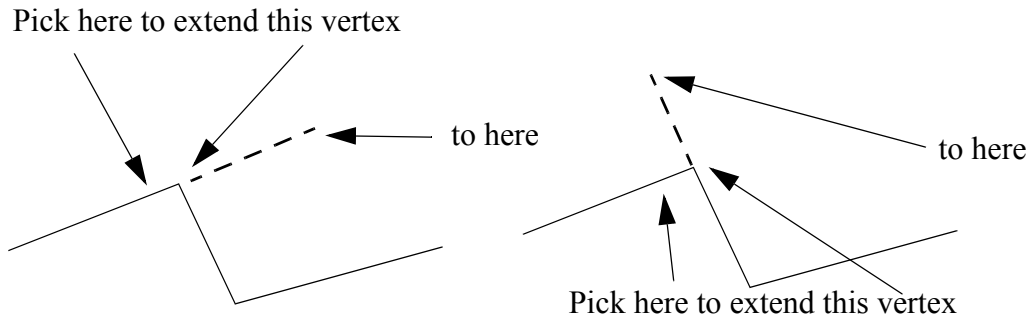
The **between** option is terminated by selecting **cancel** from the **pick ops** menu or by selecting a new option from the **Edit nd** menu.

Extend



The **extend** option is used to move a vertex along the line joining the vertex to its neighbouring vertex.

The **extend** option is used to move a vertex along the line joining the vertex to its neighbouring vertex.
That is, the bearing of the segment is kept constant and the vertex is moved along that segment either **towards** or **away** from its neighbouring vertex on the segment.



Extending, like moving a vertex, is a two step process.

Step (a) - selecting the segment and the vertex to be moved along that segment

The segment and the vertex to be moved are chosen in the one operation by picking (LB) and accepting (MB) at a co-ordinate point near the segment and close to the vertex to be moved along that segment.

Once the segment and vertex are selected, the new position of the selected vertex is assumed to be at the current cursor position projected along the selected segment.

As the cursor is moved, the string is redrawn reflecting the changing position of the moved vertex.

message area 1 <Extend>
Screen message area
 <Pick position to extend> [picks][fast][Menu]

Step (b) - selecting the final position for the vertex

The final position for the vertex is set to the projection of the selected cursor position onto the segment.

message area 1 <Extend>
Screen message area
 <Pick new location of vertex> [picks][fast][menu]

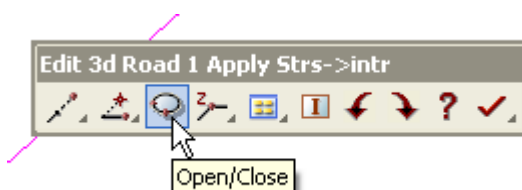
Once the extend is completed, the extend option is still current and can be repeated without re-selecting the extend option.

The **extend** option is terminated by selecting **cancel** from the **pick ops** menu or by selecting a new option from the **Edit nd** menu.

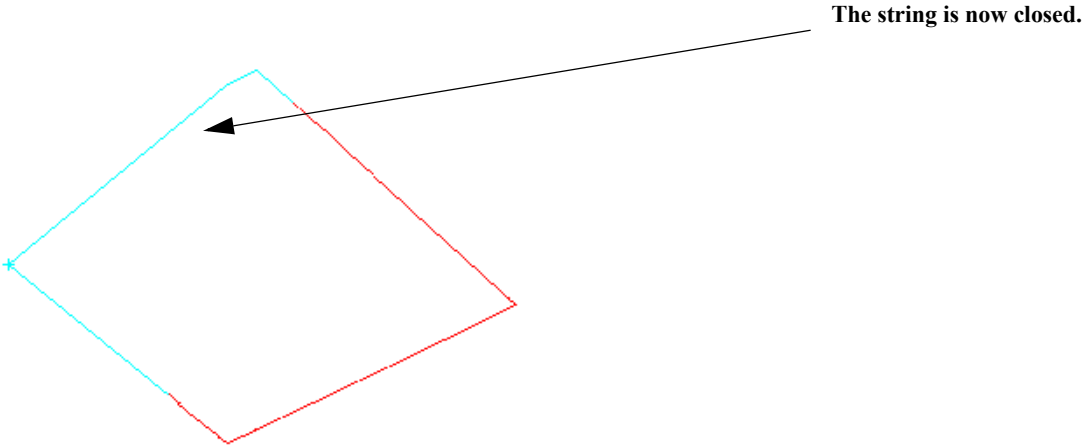
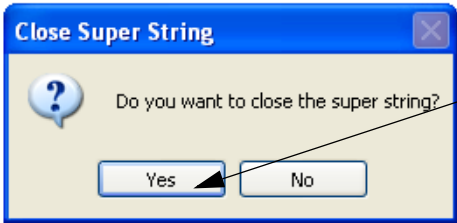
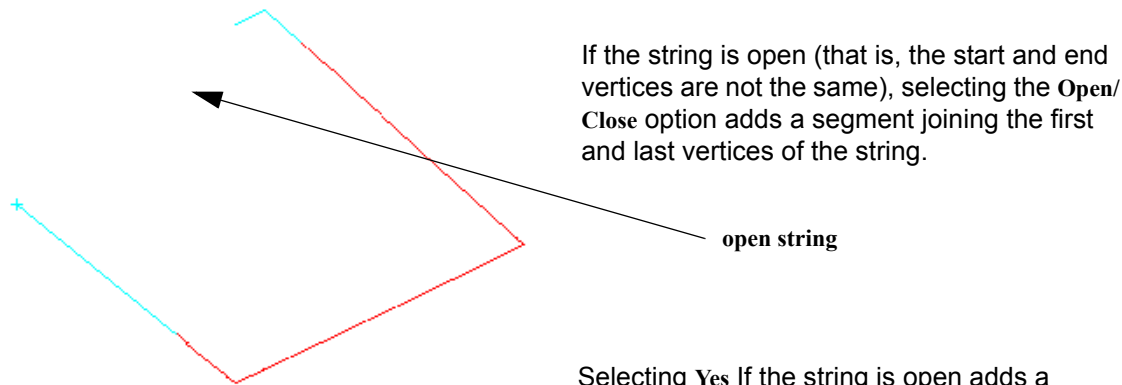
Typed input can be used in either step.

Note - Extend can be used on the end points of the string

Open/Close

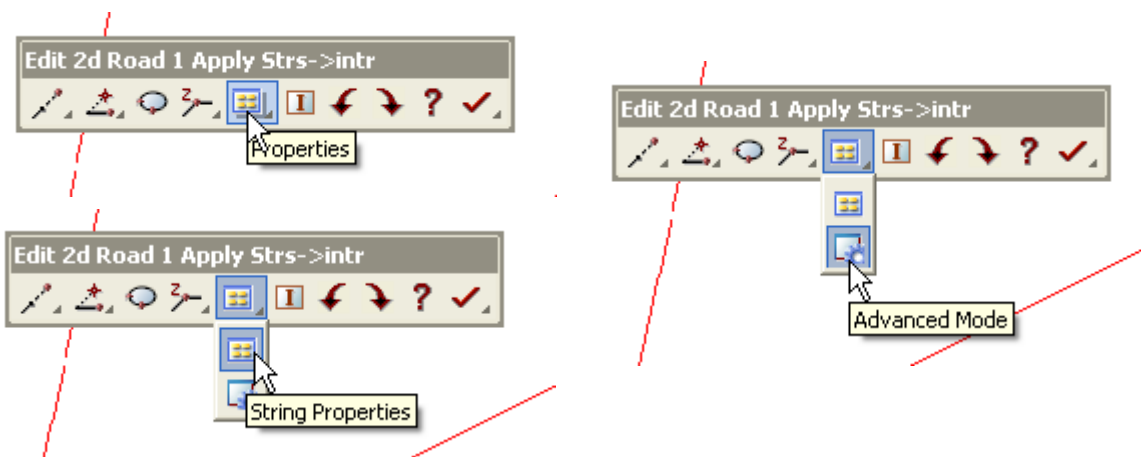


Toggles a string between **Open** and **Closed**.



If the string is closed (that is, there is a segment from the start to the end vertices), selecting the **Open/Close** option removes the last segment of the string.

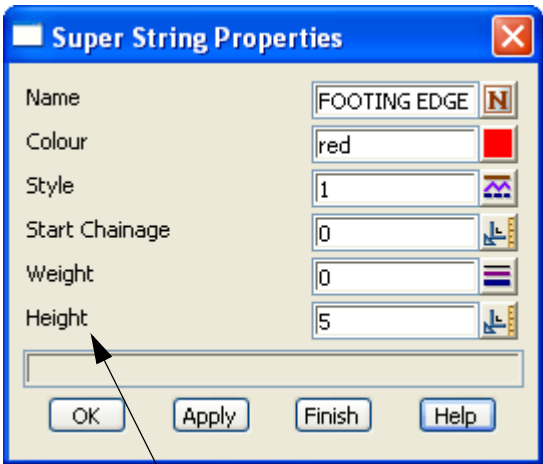
Properties



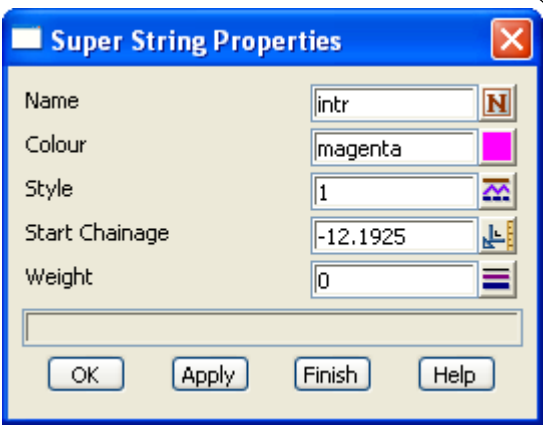
Selecting **Properties** brings up the **Super String Properties** panel which is used to modify the string's header information.

What is displayed in the **Super String Properties** panel depends on the type of the super string. That is, it depends on what properties of the super string have been enabled.

For example, **constant height** enabled means that there is only one height for the entire super string so height appears in the **Super String Properties** panel. If **variable height** is enabled, there is a height for each vertex and so height does not appear in the **Super String Properties** panel.

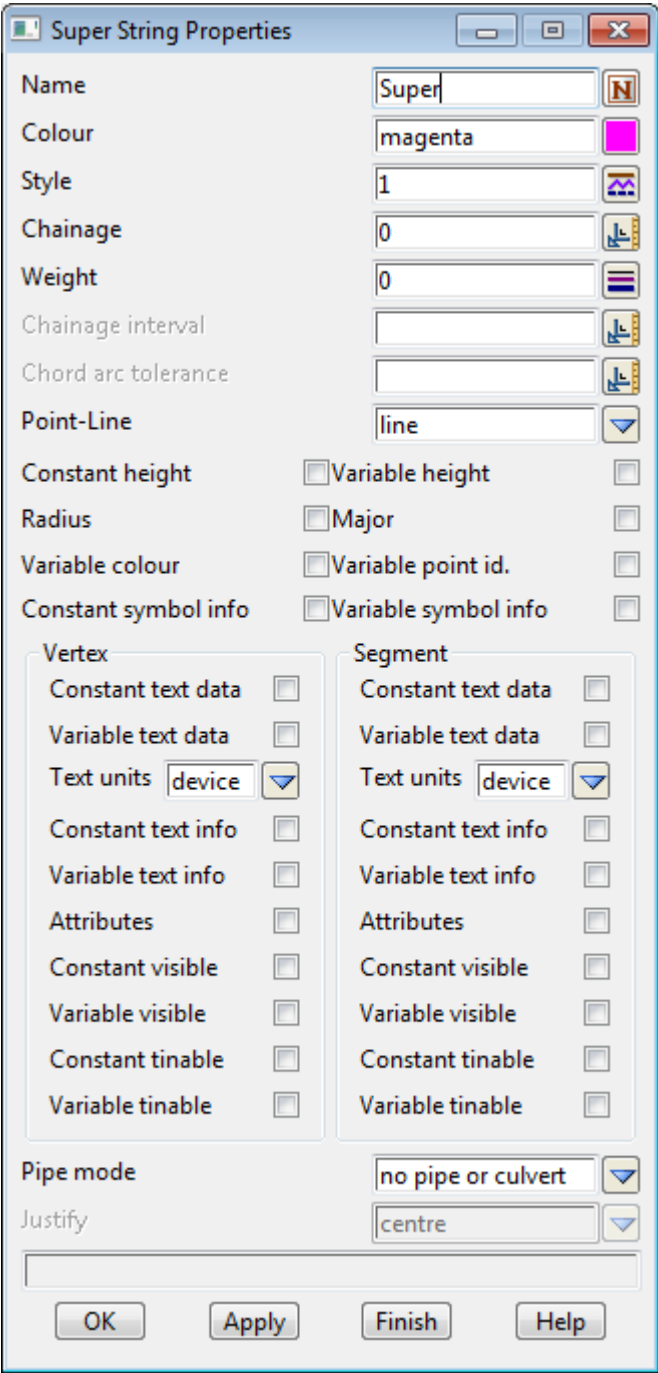


Height appears in the panel when **Constant height** is set for the super string (e.g. 2d super string)



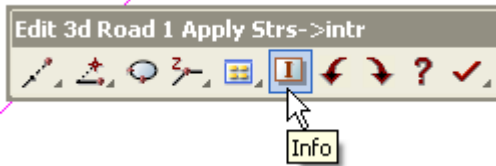
Height does not appear when **Variable height** is set for the super string (e.g. 3d super string)

In the **Advanced** mode, all the super string properties can be modified and so all possible super string fields are displayed in the **Super String Properties** panel.



The fields in the panels are similar to those in the **Create Super String** panels. The only new fields are the **OK** and **Apply** which are used in the normal way.

Info



Toggles the **Super Edit Info** panel on/off for the string.

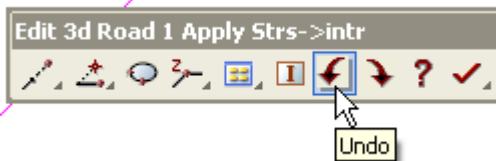
For more information on the Super Edit Info panel see [nd edit menu](#) in the section [Super String Edit - Common Information](#)

Undo/Redo

An **undo** and **redo** list is defined for each editor on the screen. That is, each editor has its own undo/redo lists. If an option is **undone**, it is added to the **redo** list so that it can be **redone**.

When the editor is exited by either **Quit** or **Finish**, the undo and redo lists are deleted and are no longer usable.

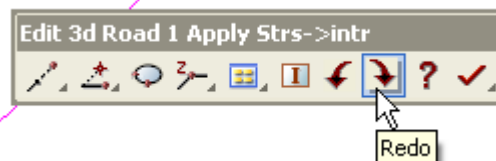
Undo



Undoes the last editor operation for this string and adds it to the top of the redo list.

Undoes the last editor operation for this string and adds it to the top of the redo list.

Redo



Redo the last editor operation that was undone for this string. Add the undone operation to the top of the undo list.

'?' Help



Help button to go to the Help topic for the panel.

See the earlier section [Super String Edit - Common Information](#) for general information about editing strings, the panel **Super Edit Info**, and the options, [Delete](#), [Insert](#), [Move](#), [Between](#), [Extend](#), [Open/Close](#), [Properties](#), [Info](#), [Undo](#), [Redo](#), ['?'](#) [Help](#), [Finish](#), [Quit](#) and [Typed input](#).

For the **Edit 2d** options not mentioned in [Super String Edit - Common Information](#) see [Edit 2d](#)

For the **Edit 3d** options not mentioned in [Super String Edit - Common Information](#) see [Edit 3d](#)

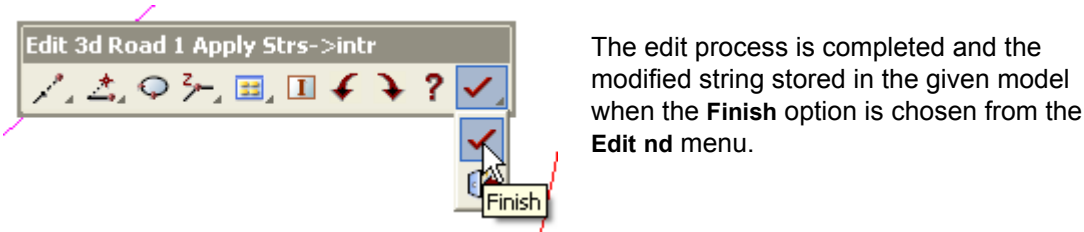
For the **Edit 4d** options not mentioned in [Super String Edit - Common Information](#) see [Edit 4d](#)

For the **Edit Super** options not mentioned in [Super String Edit - Common Information](#) see [Edit Super](#)

For the **Edit Pipe** options not mentioned in [Super String Edit - Common Information](#) see [Edit Pipe](#)

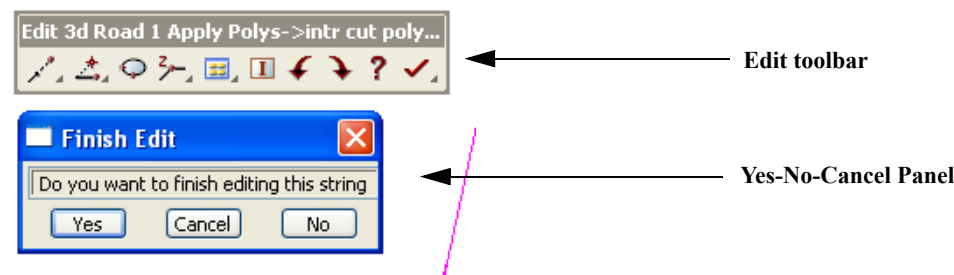
For the **Edit Polyline** options not mentioned in [Super String Edit - Common Information](#) see [Edit Polyline](#)

Finish



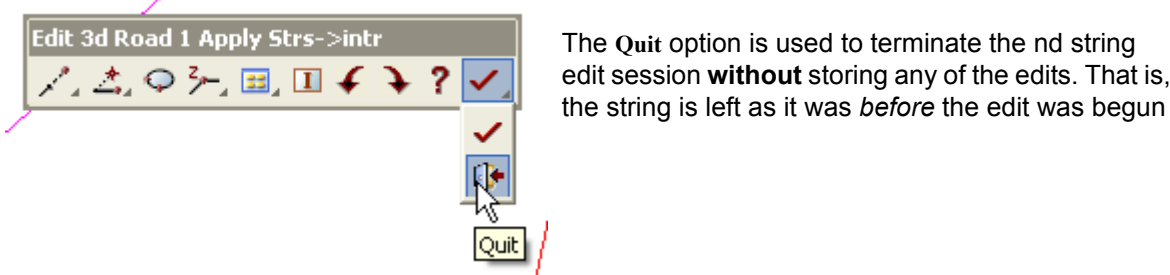
The edit process is completed and the modified string stored in the given model when the **Finish** option is chosen from the **Edit nd** menu.

After selecting the **Finish** option, a **Yes-No-Cancel** panel is displayed to confirm that the edit is to be ended. If **Yes** is selected, the edits will be stored.



Quit

Even after points are created for the new string, the create process can be **aborted** by selecting the **Quit** option from the **Edit nd** menu. The option then terminates and **no** string is created.



The **Quit** option is used to terminate the nd string edit session **without** storing any of the edits. That is, the string is left as it was *before* the edit was begun

After selecting the **Quit** option, a **Yes-No-Cancel** panel is displayed to confirm that the edit is to be ended. If **yes** is selected, the edits will be ignored and the unedited string kept.

Note that if it was a new string being created, the option terminates by **Quit** and **no** string is created.

Typed input

Typed input can be used wherever a select is required to obtain a co-ordinate. For example an (x,y), (x, y, z) or (chainage, height).

To start typed input, start typing, and a special typed-input box appears on the screen

If the focus is on a Plan or Perspective view, then an **Enter X Y Z** box comes up when you are placing horizontal geometry for an alignment or super alignment, or vertices for all other string types. If you are creating vertical geometry for an alignment or super alignment and the focus is on a Section view, then a **Enter Ch Ht** box appears.

These are also called the *XYZ typed input box* and the *Chainage Height typed input box* respectively.



An <enter> terminates the typed input and the entered values taken as the position of the required point. The typed-input box then disappears.

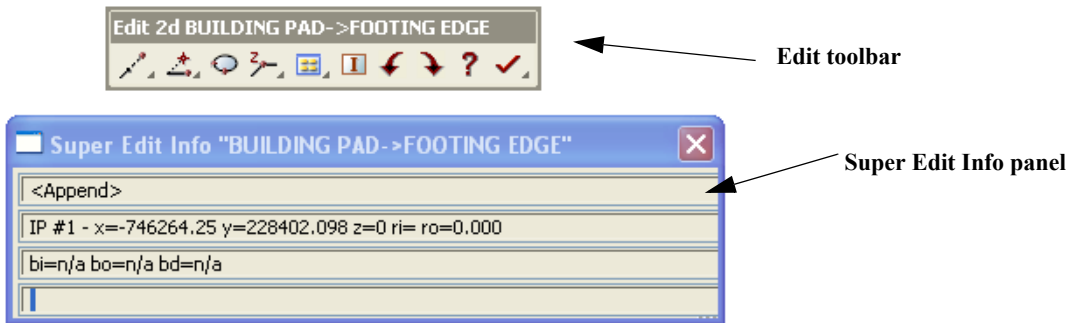
If the user wishes to **abort** the typed input and return to mouse input, simply select the **[X]** button on the typed input box or type <enter> with no values in the typed input box.

Please continue to the next section [Edit 2d](#).

Edit 2d

Position of option on menu: Strings =>Editor

On picking a 2d string, the Edit 2d toolbar is placed on the screen. If **Display edit info** is ticked on in the **Default** panel (**Project =>Management =>Defaults**), an information panel, (the string's **Super Edit Info** panel) is also displayed.

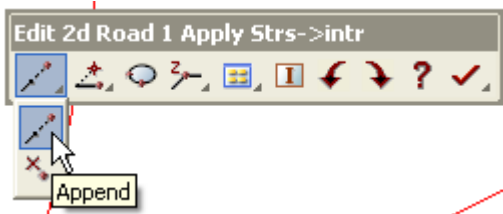


See the earlier section [Super String Edit - Common Information](#) for general information about editing strings, the panel **Super Edit Info**, and the options, [Delete](#), [Insert](#), [Move](#), [Between](#), [Extend](#), [Open/Close](#), [Properties](#), [Info](#), [Undo](#), [Redo](#), [Quit](#), ['? Help](#), [Finish](#) and [Typed input](#).

Each **Edit 2d** option not mentioned in the earlier section [Super String Edit - Common Information](#) will now be described.

- See [2d - Append](#)
- [2d - Height](#)
- [2d - Height \(Nav\)](#)
- [2d Properties](#)

2d - Append

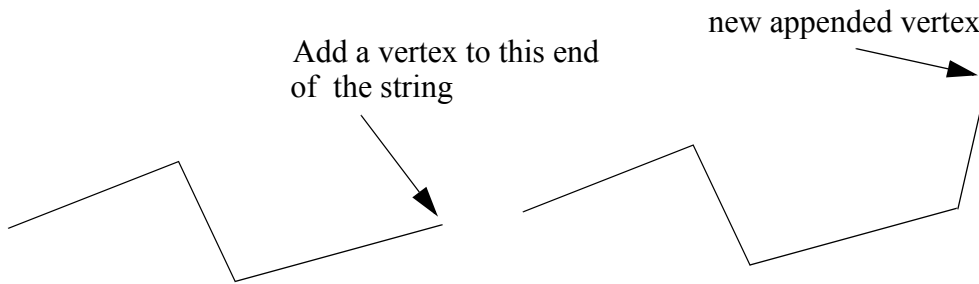


The **append** option is used to

- create the 1st vertex in a new string
- or , to append a new vertex to the end of the string
- or to prepend a new vertex to the beginning of the string.

In this option, both appending and prepending will be referred to as *appending*.

Existing 2d Strings



Appending a vertex is a two step process.

Step (a) - For an existing string - selecting the end of the string to append the vertex to.

After the **Append** option has been selected, the end of the string to append the vertex to is selected. Once the string end is selected, the new intersection point is assumed to be at the current cursor position. As the cursor is moved, the string is redrawn reflecting the changing position of the appended intersection point

message area 1 <Append>
 Screen message area
 <Pick end to append to> [picks][fast][menu]

Step (b) - selecting the position for the new appended vertex.

The position of the new appended vertex is set to the current cursor position by picking (LB) and accepting (MB).

message area 1 <Append>
 Screen message area
 <Pick location of vertex> [picks][fast][Menu]

Once a vertex has been appended to the string, the appended vertex is considered to be the selected string end and a new step (b) begins. The current cursor position indicates the new position for the next appended vertex.

Hence a **series** of string vertices is easily entered by first selecting the string end that the new vertices are to be appended to (step (a)) and then moving the cursor to the position of each new vertex and selecting them in turn (step (b)).

Once the move cycle is completed and the vertex moved, the move option is still current and can be repeated for other vertices without having to re-select the **move** option.

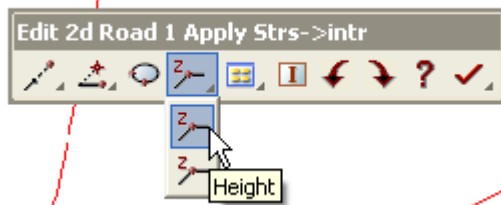
The **Append** option is terminated by selecting **Cancel** from the **Pick Ops** menu or by selecting a new **Edit 2d** option.

New 2d String

For creating a new string, the cursor is used to select the 1st vertex of the string. The option then continues as if appending to an existing 2d string where the end vertex has already been selected.

Typed input can be used in either step.

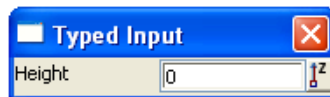
2d - Height



The **height** option is used to modify the height (z value) of the 2d string.

After the height option is chosen, a height **typed input** box is displayed on the screen with the string's current height (z value).

The height typed-input box looks like:

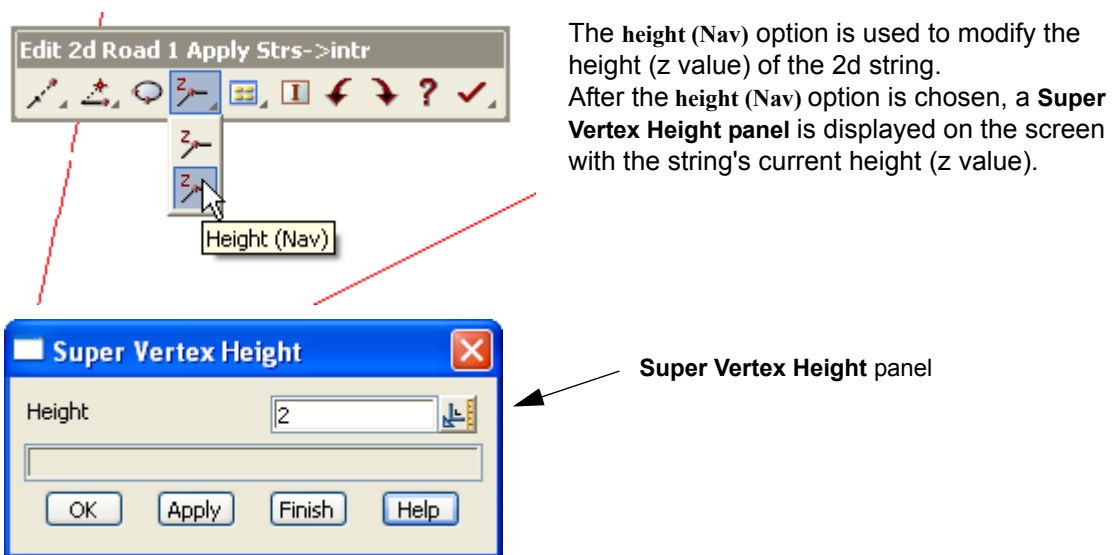


The height is entered into the typed-input box, terminated by <enter>. The entered value is taken as the height of the 2d string and the string redrawn with the new height. The typed-input box then disappears.

The height option automatically terminates and a new option is selected from the **Edit 2d**.

Note - all the points in a 2d string have the same height. Height (Nav)

2d - Height (Nav)



To change the height of the selected string, enter the value into the height field and press **ok** or **apply**. The entered value is then taken as the height of the 2d string and the string redrawn with the new height.

Note - all the points in a 2d string have the same height.

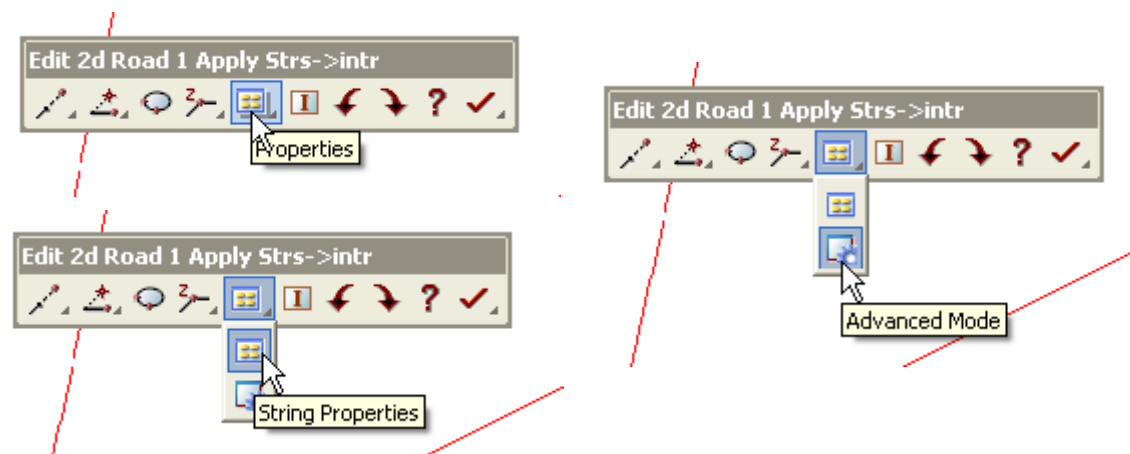
The fields and buttons used in the **Super Vertex Height** panel have the following functions.

Height	input	height of vertex/string
	<i>the height used for the entire string.</i>	

OK/Apply button

OK sets the string with the value in the panel field and removes the panel. **Apply** set the string with the value in the panel field and leaves the panel on the screen.

2d Properties

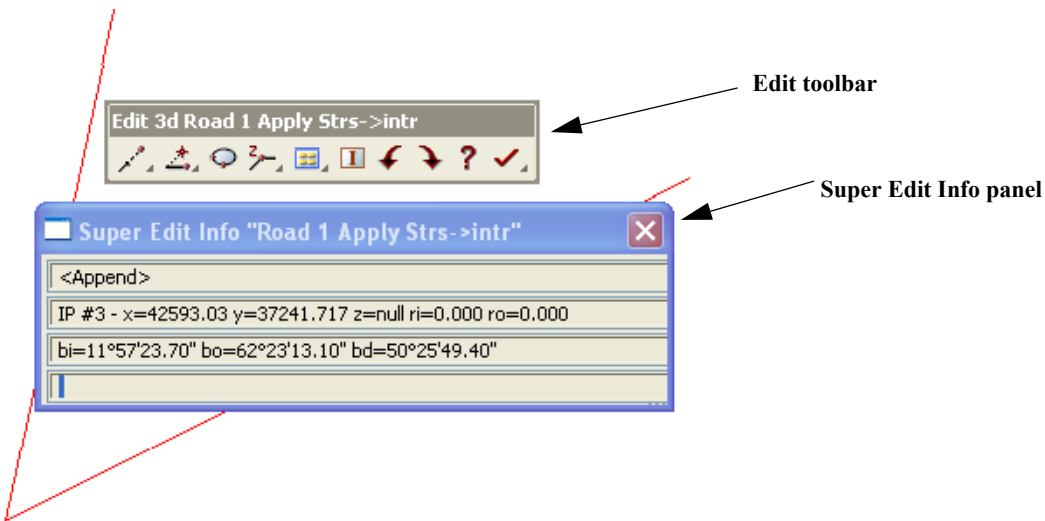


For information on the **Super String Properties** panel, go to [Properties](#)

Edit 3d

Position of option on menu: Strings =>Editor

On picking a 3d string, the Edit 3d toolbar is placed on the screen. If **Display edit info** is ticked on in the **Default** panel (Project =>Management =>Defaults), an information panel, (the string's **Super Edit Info** panel) is also displayed.



Each option in the **Edit 3d** menu will now be described.

See [3d - Append](#)

[3d - Extend and Extend ht](#)

[3d - Height](#)

[3d - Height \(Nav\)](#)

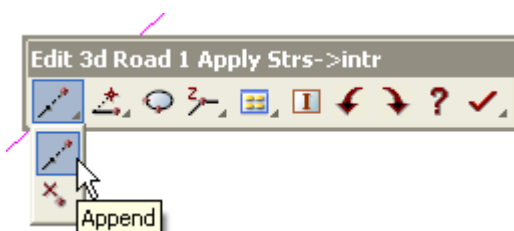
[3d Properties](#)

The difference between a 2d and a 3d string is that all points in a 2d string have the same z-value, whereas for a 3d string, each point can have a different z-value.

Hence most of the options in the **Edit 3d** menu are similar to the **Edit 2d** options of the same name, and only the differences for each option will be discussed. The **Edit 2d** options are given in the section [Edit 2d](#)

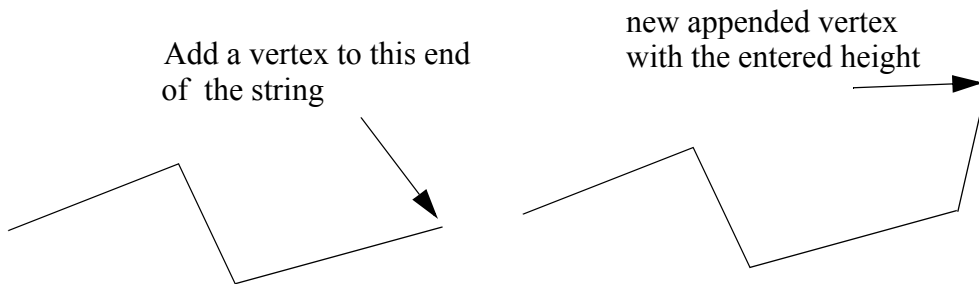
See the earlier section [Super String Edit - Common Information](#) for general information about editing strings, the panel **Super Edit Info**, and the options, [Delete](#), [Insert](#), [Move](#), [Between](#), [Extend](#), [Open/Close](#), [Properties](#), [Info](#), [Undo](#), [Redo](#), [Quit](#), ['? Help](#), [Finish](#) and [Typed input](#).

3d - Append

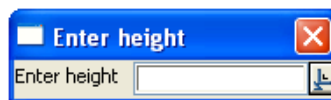


The **Append** operation for a 3d string is similar to that for a 2d string except that a height (z-value) is required for each new vertex.

Since in most cases, it would be tiresome to ask for a height every time a vertex is added, the entry of a new height is controlled by the **height** toggle in the **snaps** menu. If **height** is toggled to on, then every time a vertex is placed or moved an **enter height** typed-input box is displayed on the screen.



The enter height typed-input box looks like:

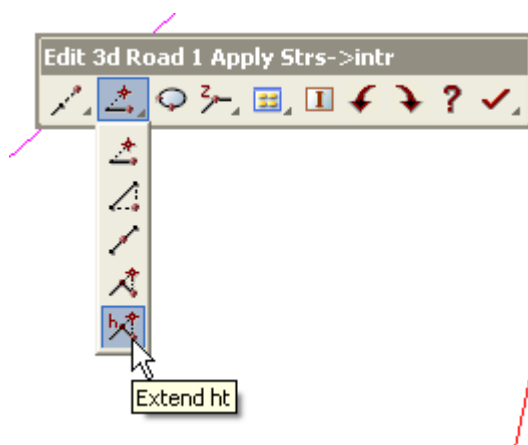


The height is entered into the typed-input box, terminated with <enter>. The entered value is taken as the height of the 3d string vertex and the string redrawn with the new height at the vertex. The typed-input box then disappears.

When the enter height box is placed on the screen, it will already have a value in it depending on the circumstances preceding the operation.

For example, if a vertex or segment was snapped to, the height at that vertex or segment will be displayed in the box.

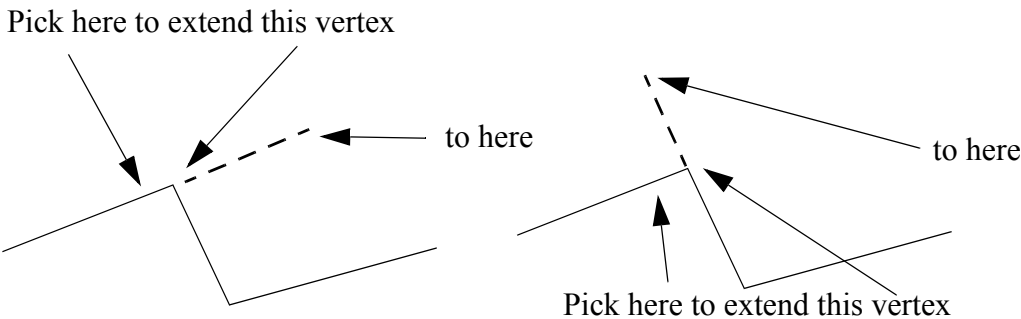
3d - Extend and Extend ht



The **Extend ht** option is used to move a vertex along the line joining the vertex to its neighbouring vertex plus the z-value is interpolated from the z-values at either end of the segment.

The **Extend ht** option is similar to the **Extend** option except that the z-value of the moved vertex is modified by linearly interpolating the z-value from the original vertices at the end of the selected segment.

Most vertices are the end vertex of two segments and the extension could be along either segment. The vertex and the segment to extend along are both selected at the same time by picking on the segment to extend along, near the vertex to extend.

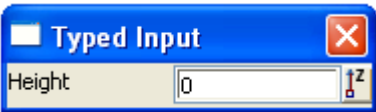


3d - Height

The **height** option is used to modify the height (z value) of any vertex in the string.

After the height option is chosen, the user must select which vertex is going to have its height modified.

After the vertex has been selected, a **Height** typed-input box is displayed on the screen with the vertex's current height (z value).



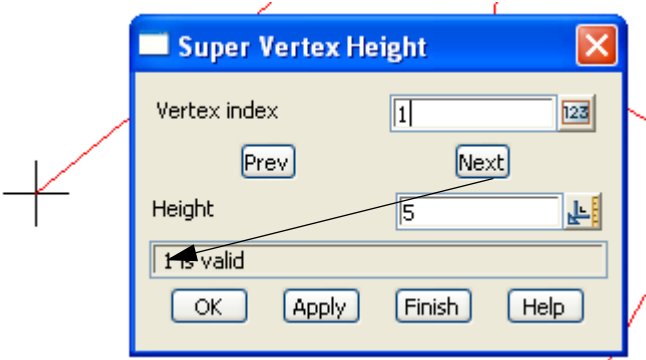
The height is entered into the typed-input box, terminated with <enter>. The entered value is taken as the height of the vertex in the 3d string and the string redrawn with the new height at that point. The typed-input box then disappears.

The **height** option is terminated on selecting **cancel** from the **pick ops** menu or by selecting a new option from the **Edit 3d** menu.

3d - Height (Nav)

As soon as **Height (Nav)** is chosen, a **Super Vertex Height** panel is displayed on the screen with the string's current height (z value) in the **Height** field.

The **Super Vertex Height** panel is used to set the height value for vertices.



When the **Super Vertex Height** panel appears on the screen, the **vertex index** field is the vertex index of the selected vertex, with its associated height in the **Height** field of the panel. To select another vertex to alter, the vertex to modify is selected by typing the vertex index into the **Vertex**

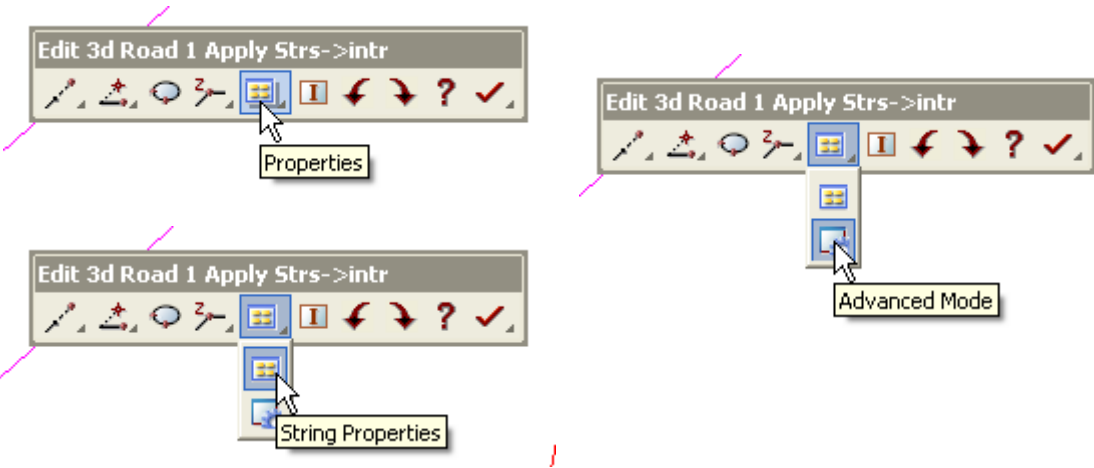
index field or by selecting **Prev** or **next** to switch to another vertex. The selected vertex is highlighted on the string and its *vertex index*, and *height* are written to the appropriate panel fields in the **Super Vertex Height** panel. The values can be changed and either **OK** or **Apply** the changed value to the vertex.

Another vertex can then be selected or the **Prev** and **Next** buttons used to move to adjacent vertices.

The fields and buttons used in the **Super Vertex Height** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Vertex index <i>if a vertex is selected, then its vertex index is displayed in this field. An index can also be typed in and any information in the panel will then be applied to that vertex if OK or Apply is selected.</i>	input	selected vertex	
Prev <i>move to the previous vertex (predecessor). The information for the previous vertex is displayed in the panel fields.</i>	button		
Next <i>move to the next vertex (successor). The information for the next vertex is displayed in the panel fields.</i>	button		
Height <i>the height used for the vertex or for the entire string.</i>	input	height of vertex/string	
OK/Apply <i>for the vertex being edited, OK sets the vertex/string with the values in the panel fields and removes the panel. Apply sets the vertex/string with the values in the panel fields and leaves the panel on the screen.</i>	button		

3d Properties



For information on the **Super String Properties** panel, go to [Properties](#)

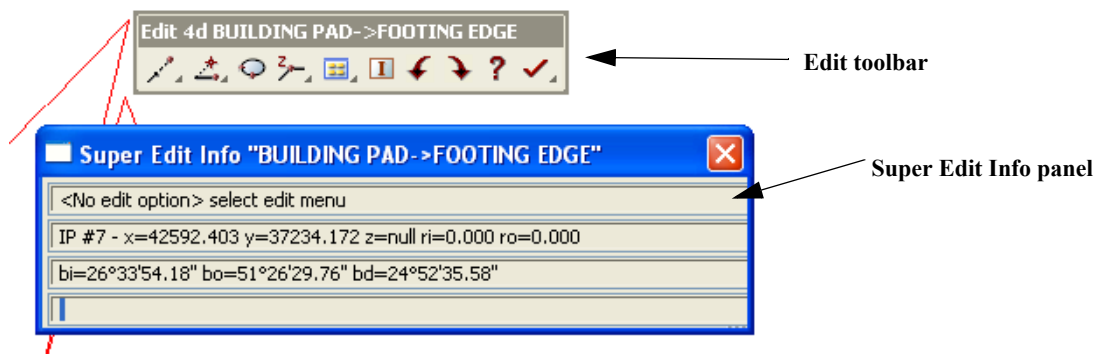
Edit 4d

Position of option on menu: Strings =>Editor

A **4d super string** is a *super string* with the restriction that it has:

- (a) vertices of (x,y,z) co-ordinates joined by straight segments only
- (b) Text at each vertex
- (c) All text has the same height, rotation etc. So it is controlled by the one Text Style for the entire string

On picking a 4d string, the **Edit 4d** toolbar is placed on the screen. If **Display edit info** is ticked on in the **Default** panel (**Project =>Management =>Defaults**), an information panel, (the string's **Super Edit Info** panel) is also displayed.



Only the options **append**, **Append + Text**, **text**, **size** and **angle** will be described in detail since all the other options are similar to the equivalent 3d string option (see the section [Edit 3d](#)).

See the earlier section [Super String Edit - Common Information](#) for general information about editing strings, the panel **Super Edit Info**, and the options, [Delete](#), [Insert](#), [Move](#), [Between](#), [Extend](#), [Open/Close](#), [Properties](#), [Info](#), [Undo](#), [Redo](#), [Quit](#), ['? Help](#), [Finish](#) and [Typed input](#).

See [4d - Append +Text](#)

[4d - Height](#)

[4d - Height \(Nav\)](#)

[4d - Text \(Nav\)](#)

[4d - Text Info](#)

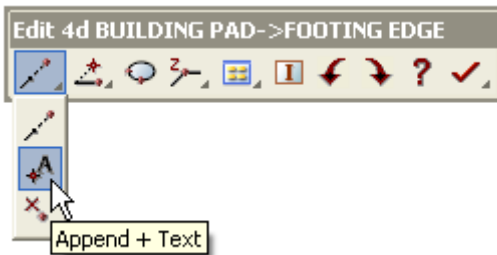
[4d Properties](#)

4d - Append +Text



The **append** operation for a 4d string is similar to the 3d string case except that a height and an optional text label is required for each new vertex.

Since in many cases a text label is not required at every vertex of a 4d string, there is an append option that asks for text at every vertex (**Append + Text**) and another that does not ask (**Append**).



Append + text is a three step process.

Step (a) - For an existing string - selecting the end of the string to append the vertex and text to.

After the **Append + text** option has been selected, the end of the string to append the vertex to is selected. Once the string end is selected, the new intersection point is assumed to be at the current cursor position. As the cursor is moved, the string is redrawn reflecting the changing position of the appended intersection point

message area 1 <Append + Text>
Screen message area
 <Pick end to append to> [picks][fast][menu]

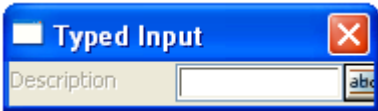
Step (b) - selecting the position for the new appended vertex.

The position of the new appended vertex is set to the current cursor position by picking (LB) and accepting (MB).

message area 1 <Append + Text>
Screen message area
 <Pick location of vertex> [picks][fast][Menu]

Step (c) - Creating a text label for the vertex.

Once the new appended vertex is set to the current cursor position a **Description** typed-input box is displayed on the screen.



message area 1 <Append + Text>
Screen message area
 <Super edit> [[]][Menu]

Type the description into the typed-input box, finishing with <enter> and the typed-input box then disappears.

The appended vertex is now considered to be the selected string end and a new step (b) begins. The current cursor position indicates the new position for the next appended vertex.

Hence a **series** of string vertices is easily entered by first selecting the string end that the new vertices are to be appended to (step (a)) and then moving the cursor to the position of each new vertex and selecting them in turn (setup (b)).

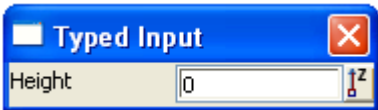
The **append** option is terminated on selecting **cancel** from the **pick ops** menu or by selecting a new option from the **Edit 4d** menu.

4d - Height

The **height** option is used to modify the height (z value) of any vertex in the string.

After the height option is chosen, the user selects which vertex is going to have its height modified.

After the vertex has been selected, a **Height** typed-input box is displayed on the screen with the vertex current height (z value).



The height is entered into the typed-input box, terminated with <enter>. The entered value is taken as the height of the vertex in the 4d string and the string redrawn with the new height at that vertex. The typed-input box then disappears.

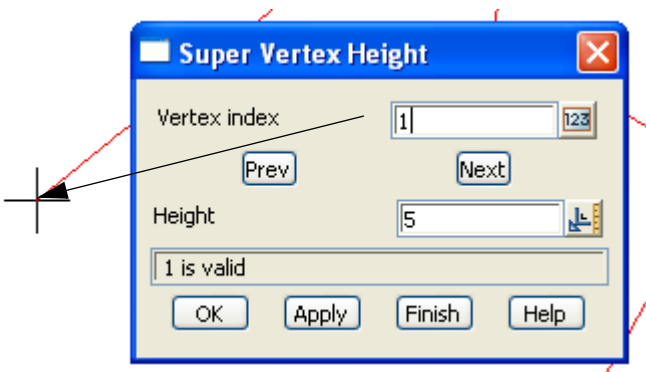
Another vertex can then be selected for modifying its height.

The **height** option is terminated on selecting **cancel** from the **pick ops** menu or by selecting a new option from the **Edit 4d** menu.

4d - Height (Nav)

Selecting **Height (Nav)** brings up the **Super Vertex Height** panel with the height at the first vertex of the string displayed.

The **Super Vertex Height** panel is used to set the height value for any vertex of the string.



Any vertex can then be selected by clicking on the number icon at the end of the Vertex index panel field and selecting the required vertex, or by typing in its Vertex index and pressing <Enter>, or by using the **Prev** and **Next** buttons used to move to adjacent vertices until the required vertex is selected.

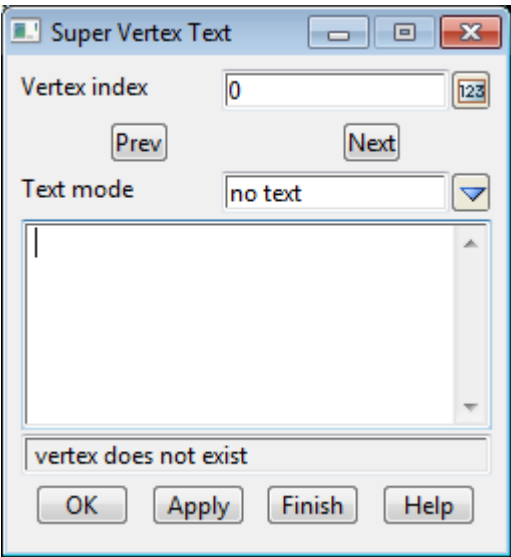
When the vertex to modify is selected, the vertex is highlighted on the string and its *vertex index*, and *height* are displayed in the appropriate panel fields in the **Super Vertex Height** panel. The new vertex height is stored by clicking either **OK** or **Apply**.

The fields and buttons used in the **Super Vertex Height** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Vertex index	input	selected vertex	
<i>if a vertex is selected, then its vertex index is displayed in this field. An index can also be typed in and any information in the panel will then be applied to that vertex if OK or Apply is selected.</i>			
Prev	button		
<i>move to the previous vertex (predecessor). The information for the previous vertex is displayed in the panel fields.</i>			
Next	button		
<i>move to the next vertex (successor). The information for the next vertex is displayed in the panel fields.</i>			
Height	input	height of vertex/string	
<i>the height used for the selected vertex.</i>			
OK/Apply	button		
<i>for the vertex being edited, OK sets the vertex/string with the values in the panel fields and removes the panel. Apply sets the vertex/string with the values in the panel fields and leaves the panel on the screen.</i>			

4d - Text (Nav)

Selecting **Text (Nav)** brings up the **Super Vertex Text** panel with the text at the first vertex of the string displayed. The **Super Vertex Text** panel is used to set the text for any vertex of the string.



Any vertex can then be selected by clicking on the number icon at the end of the **Vertex index** panel field and selecting the required vertex, or by typing in its Vertex index and pressing <Enter>, or by using the **Prev** and **Next** buttons used to move to adjacent vertices until the required vertex is selected.

When the vertex to modify is selected, the vertex is highlighted on the string and its *vertex index* and *vertex text* are displayed in the appropriate panel fields in the **Super Vertex Text** panel. The new vertex text is stored by clicking either **OK** or **Apply**.

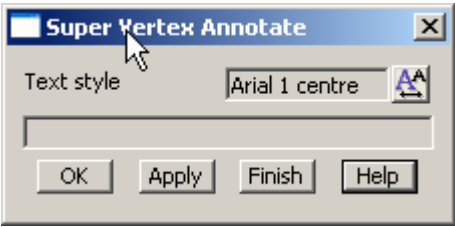
The fields and buttons used in the **Super Vertex Text** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Vertex index	input	selected vertex	
<i>if a vertex is selected, then its vertex index is displayed in this field. A number can also be typed in and any information in the panel will then be applied to that vertex if OK or Apply is selected.</i>			
Prev	button		
<i>move to the previous vertex (predecessor). The information for the previous vertex is displayed in the panel fields.</i>			
Next	button		
<i>move to the next vertex (successor). The information for the next vertex is displayed in the panel fields.</i>			
Text mode	choice box		no text, entire string, each vertex
<i>if no text, there is no text for the vertex.</i>			
<i>if entire string, then the string has the same text for each vertex.</i>			
<i>if each vertex, then each vertex has a separate text value.</i>			
Text	input	text of vertex/string	
<i>the text used for the vertex.</i>			
OK/Apply	button		
<i>for the vertex being edited, OK sets the vertex/string with the values in the panel fields and removes the panel. Apply sets the vertex/string with the values in the panel fields and leaves the panel on the screen.</i>			

4d - Text Info

For a 4d super string, the size, colour, slant, offset etc of vertex text is all the same and is controlled by the **Text Style** for the 4d super string.

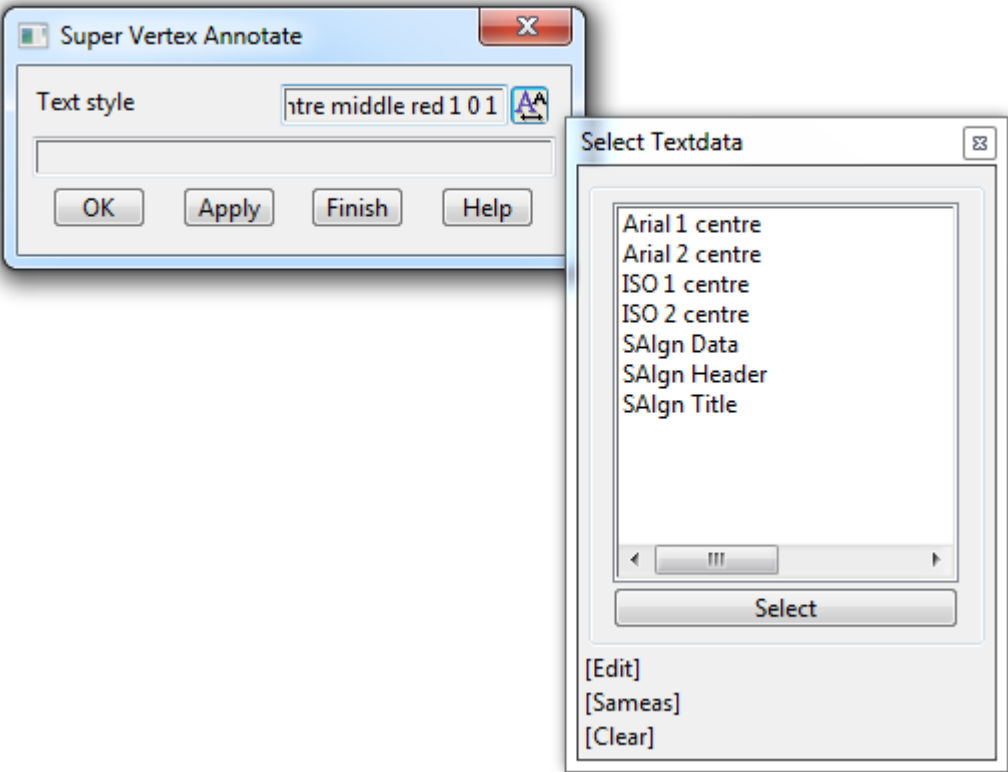
Selecting **Text Info** brings up the **Super Vertex Annotate** panel with the text style for the string displayed.

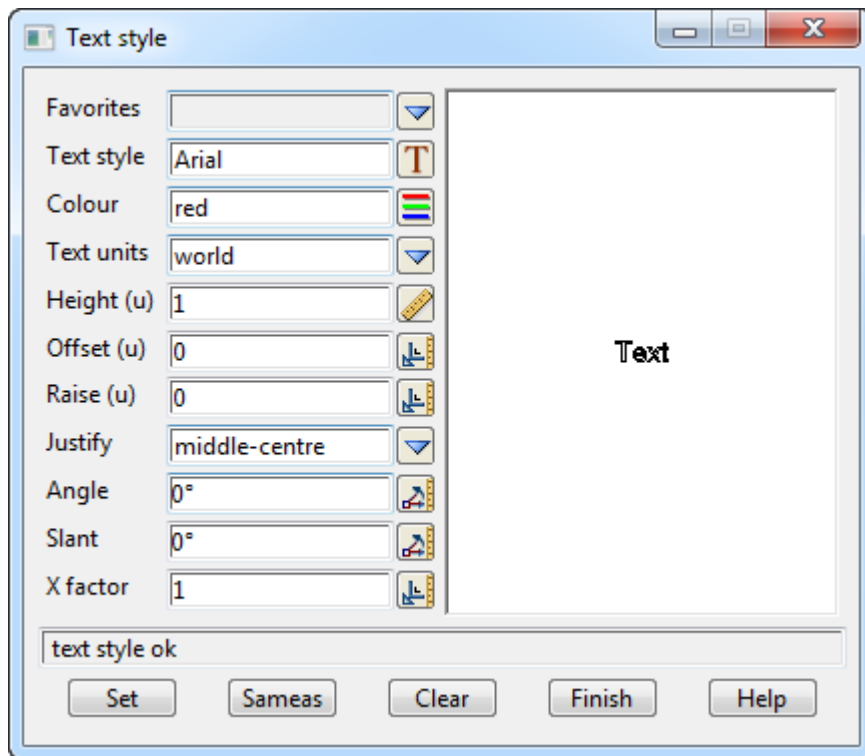


The fields and buttons used in the **Super Vertex Annotate** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Text style	text style box	string's text style	available text styles
<i>the text style string. This can be modified to change the values for all the text on the 4d string.</i>			
Prev	button		
<i>move to the previous vertex (predecessor). The information for the previous vertex is displayed in the panel fields.</i>			
OK/Apply	button		
<i>for the string being edited, OK sets the text style for the string and removes the panel. Apply sets the text style for the string and leaves the panel on the screen.</i>			

To modify any of the values of the **Text Style**, click on the **Text style** icon at the end of the **Text style** panel field to bring up the **Select Textdata** panel, and then select **[Edit]**.





To change any of the values in the **Text Style** panel:

1. Modify the value in the Text Style panel and then click on **Set** and **Finish**. The panel will then close.
2. Click on **Apply** or **OK** in the **Super Vertex Annotate** panel.

Modifying the Text Height

All the text labels in the 4d string have the same height.

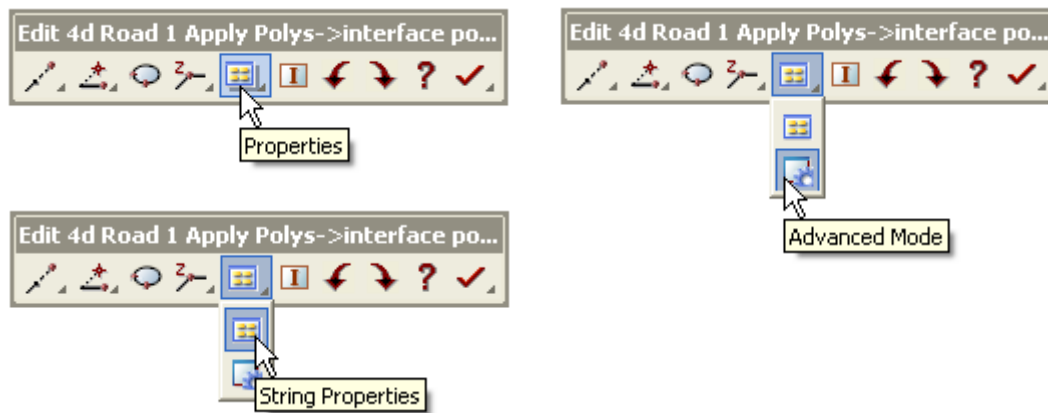
The height of all the text is modified by changing the **Height (u)** in the **Text Style Info** for the string (see [4d - Text Info](#))

Modifying the Text Angle

All the text labels in the 4d string are drawn rotated about their defining string point with the **same** rotation angle. The angle, in degrees, is measured in a counter-clockwise direction about the horizontal axis.

The angle of all the text is modified by changing the **Angle** in the **Text Style Info** for the string (see [4d - Text Info](#))

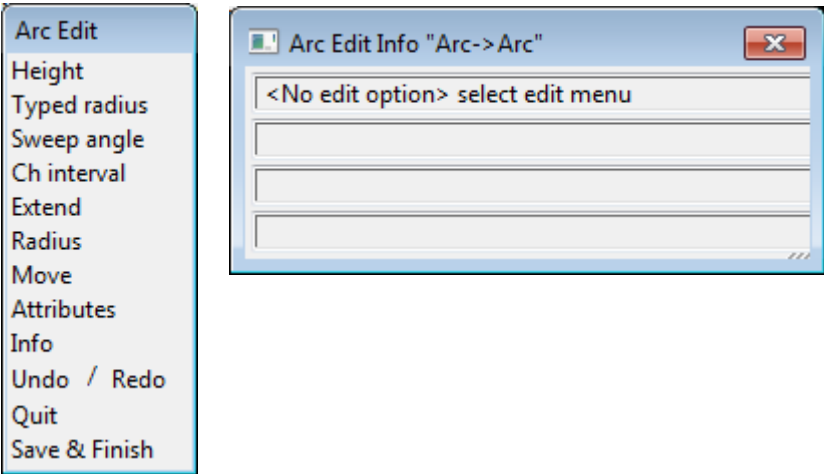
4d Properties



For information on the **Super String Properties** panel, go to [Properties](#)

Arc Edit

On picking an arc string, the **arc edit** menu and **arc edit info** panel are placed on the screen.



Each option in the **arc edit** menu will now be described.

See the earlier section [Super String Edit - Common Information](#) for general information about editing strings.

Height

The **height** option is used to define the z-value at the start or end point of the arc.

The z-value at any point on the arc is an interpolation on arc length of the values at the end points. Hence, the arc is an arc in plan only - in three dimensions, it is a **helix**.

Height is a two step process.

Step (a) - selecting the start or end point of the arc

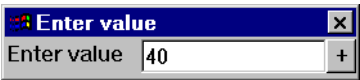
After picking **height**, the end point of the arc whose height is to be modified is selected.

message area 1 <Height of arc>
Screen message area
 <Select point to change height> [picks][][menu]
 <Select point to change height> [picks][accepts][menu]

Step (b) - entering the new height

After the start or end point of the arc is selected, an **enter value** typed-input box is placed on the screen with the points current height displayed in it.

The **enter value** typed-input box looks like:



The new height for the point is entered into the typed-input box, terminated with <enter>. The typed-input box then disappears.

The **height** option repeats until cancelled by the user by either bringing up the **pick ops** menu and selecting **cancel** or by selecting a new option from the **arc edit** menu.

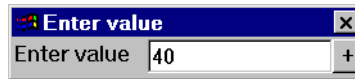
If, after bringing up the **pick ops** menu, it is decided to continue with the height option, simply select the **restart** option from the **pick ops** menu and the **pick ops** menu will disappear leaving the **height** option still current.

Typed Radius

The **typed radius** option is used to modify the radius of the selected arc.

After the **typed radius** option is chosen, an **enter value** typed-input box is placed on the screen with the arcs current radius displayed in it.

The **enter value** typed-input box looks like:



The arc radius is entered into the typed-input box, terminated with <enter>. The entered value is taken as the radius of the arc and the arc is redrawn with its new radius.

The typed-input box then disappears.

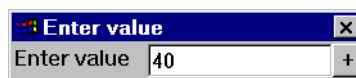
The **typed radius** option is automatically terminated and a new option needs to be selected from the **arc edit** menu.

Sweep Angle

The **sweep angle** option is used to modify the sweep angle of the selected arc.

After the **sweep angle** option is chosen, an **enter value** typed-input box is placed on the screen with the arcs current sweep angle displayed in it.

The **enter value** typed-input box looks like:



The arc sweep angle is entered into the typed-input box, terminated with <enter>. The entered value is taken as the sweep angle of the arc and the arc is redrawn with its new sweep angle.

The typed-input box then disappears.

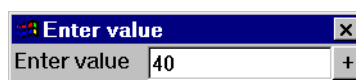
The **sweep angle** option is automatically terminated and a new option needs to be selected from the **arc edit** menu.

Chainage interval

The **ch interval** option is used to modify the chainage interval of the selected arc.

After the **ch interval** option is chosen, an **enter value** typed-input box is placed on the screen with the arcs current chainage interval displayed in it.

The **enter value** typed-input box looks like:



The new chainage interval is entered into the typed-input box, terminated with <enter>. The entered value is taken as the chainage interval of the arc and the arc is redrawn with its new chainage interval.

The typed-input box then disappears.

The **ch interval** option is automatically terminated and a new option needs to be selected from the **arc edit** menu.

Move End

The **move end** option is used to re-position either the start or the end point of the arc.

Move end is a two step process.

Step (a) - selecting the start or end point of the arc

After selecting the **move end** option, the end point to be move is selected.

```
message area 1      <Move End>
Screen message area
    <Select point to move> [picks][ ][menu]
    <Select point to move> [picks][accepts][menu]
```

Step (b) - selecting the new position for the end point

After selecting the end point to move, the new position for the end point is selected.

```
message area 1      <Move End>
Screen message area
    <Select final position of point> [picks][ ][menu]
    <Select final position of point> [picks][accepts][menu]
```

The **move end** option repeats until cancelled by the user by either bringing up the **pick ops** menu and selecting **cancel** or by selecting a new option from the **arc edit** menu.

If, after bringing up the **pick ops** menu, it is decided to continue with the **move end** option, simply select the **restart** option from the **pick ops** menu and the **pick ops** menu will disappear leaving the **move end** option still current.

Radius

The **radius** option is used to change the radius of the arc by leaving the centre point alone and re-positioning a point on the arc. The new position for the point will define a new radius for the arc.

Radius is a two step process.

Step (a) - selecting the point on the arc to move

After selecting the **radius** option, the point on the arc to be moved is selected.

```
message area 1      <Radius>
Screen message area
    <Select point to move> [picks][ ][menu]
    <Select point to move> [picks][accepts][menu]
```

Step (b) - selecting the new position for the point

After selecting the point to move, the new position for the point is selected.

```
message area 1      <Radius>
Screen message area
    <Select final position of point> [picks][ ][menu]
    <Select final position of point> [picks][accepts][menu]
```

The **radius** option repeats until cancelled by the user by either bringing up the **pick ops** menu and selecting **cancel** or by selecting a new option from the **arc edit** menu.

If, after bringing up the **pick ops** menu, it is decided to continue with the **radius** option, simply select the **restart** option from the **pick ops** menu and the **pick ops** menu will disappear leaving the **radius** option still current.

Move

The **move** option is used to change the position of the entire arc by selecting and moving the arc centre or any point on the arc.

Move is a two step process.

Step (a) - selecting the point on the arc to move

After selecting the **move** option, the point on the arc to move is selected.

```
message area 1      <Move>
Screen message area
    <Select point to move> [picks][ ][menu]
    <Select point to move> [picks][accepts][menu]
```

Step (b) - selecting the new position for the point

After selecting the point to move, the new position for the point is selected.

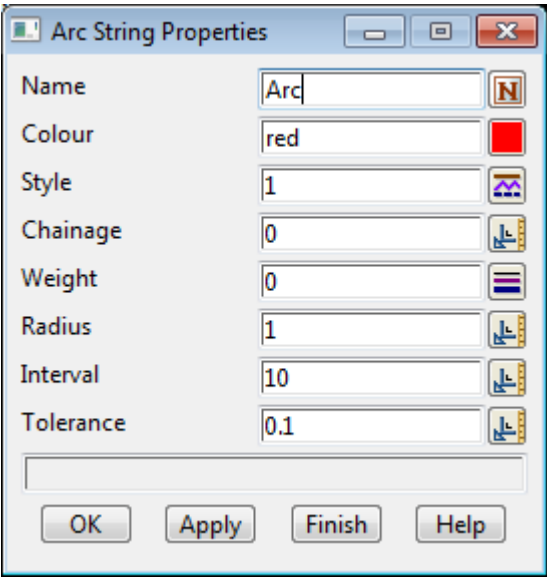
```
message area 1      <Move>
Screen message area
    <Select final position of point> [picks][ ][menu]
    <Select final position of point> [picks][accepts][menu]
```

The **Move** option repeats until cancelled by the user by either bringing up the **Pick ops** menu and selecting **Cancel** or by selecting a new option from the **Arc edit** menu.

If, after bringing up the **Pick ops** menu, it is decided to continue with the **move** option, simply select the **restart** option from the **Pick ops** menu and the **Pick ops** menu will disappear leaving the **move** option still current.

Properties

Selecting **Properties** brings up the **Arc String Properties** panel which is used to modify the string's header information.



The fields in this panel are similar to those in the **create arc string** panel and the arc editor options. The only new field is

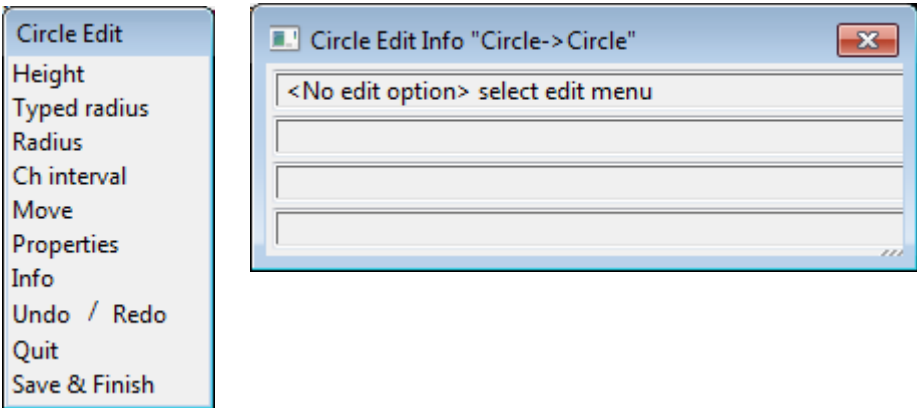
Field Description	Type	Defaults	Pop-Up
OK/Apply	button		

*for the string being edited, **OK** sets the string with the values in the panel fields and removes the panel.*

Apply sets the string with the values in the panel fields and leaves the panel on the screen.

Circle Edit

On picking a circle string, the **circle edit** menu and **circle edit info** panel are placed on the screen.



Each option in the **circle edit** menu will now be described.

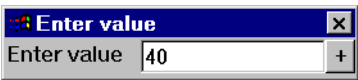
See the earlier section [Super String Edit - Common Information](#) for general information about editing strings.

Height

The **height** option is used to define the z-value for the entire circle.

After selecting the **height** option, an enter value typed-input box is placed on the screen with the circles current height displayed in it.

The enter value typed-input box looks like:



The new height for the circle is entered into the typed-input box, terminated with <enter>.

The typed-input box then disappears.

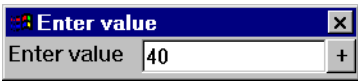
The **height** option is automatically terminated and a new option needs to be selected from the **circle edit** menu.

Typed Radius

The **typed radius** option is used to modify the radius of the selected circle.

After the **typed radius** option is chosen, an enter value typed-input box is placed on the screen with the circles current radius displayed in it.

The enter value typed-input box looks like:



The circle radius is entered into the typed-input box, terminated with <enter>. The entered value is taken as the radius of the circle and the circle redrawn with its new radius.

The typed-input box then disappears.

The **typed radius** option is automatically terminated and a new option needs to be selected from the **circle edit** menu.

Radius

The **radius** option is used to change the radius of the circle by leaving the centre point alone and re-positioning a point on the circle. The new position for the point will define a new radius for the circle.

Radius is a two step process.

Step (a) - selecting the point on the circle to move

After selecting the **radius** option, the point on the circle to be moved is selected.

message area 1 <Radius>

Screen message area

<Select point to move> [picks][][menu]

<Select point to move> [picks][accepts][menu]

Step (b) - selecting the new position for the point

After selecting the point to move, the new position for the point is selected.

message area 1 <Radius>

Screen message area

<Select final position of point> [picks][][menu]

<Select final position of point> [picks][accepts][menu]

The **radius** option repeats until cancelled by the user by either bringing up the **pick ops** menu and selecting **cancel** or by selecting a new option from the **circle edit** menu.

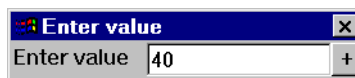
If, after bringing up the **pick ops** menu, it is decided to continue with the **radius** option, simply select the **restart** option from the **pick ops** menu and the **pick ops** menu will disappear leaving the **radius** option still current.

Chainage Interval

The **ch interval** option is used to modify the chainage interval of the selected circle.

After the **ch interval** option is chosen, an **enter value** typed-input box is placed on the screen with the circles current chainage interval displayed in it.

The enter value typed-input box looks like:



The new chainage interval is entered into the typed-input box, terminated with <enter>. The entered value is taken as the chainage interval of the circle.

The typed-input box then disappears.

The **ch interval** option is automatically terminated and a new option needs to be selected from the **circle edit** menu.

Move

The **move** option is used to change the position of the entire circle by selecting and moving the circle centre or any point on the circle.

Move is a two step process.

Step (a) - selecting the point on the circle to move

After selecting the **move** option, the point on the circle to move is selected.

```
message area <Move>
Screen message area
    <Select point to move> [picks][ ][menu]
    <Select point to move> [picks][accepts][menu]
```

Step (b) - selecting the new position for the point

After selecting the point to move, the new position for the point is selected.

```
message area 1 <Move>
Screen message area
    <Select final position of point> [picks][ ][menu]
    <Select final position of point> [picks][accepts][menu]
```

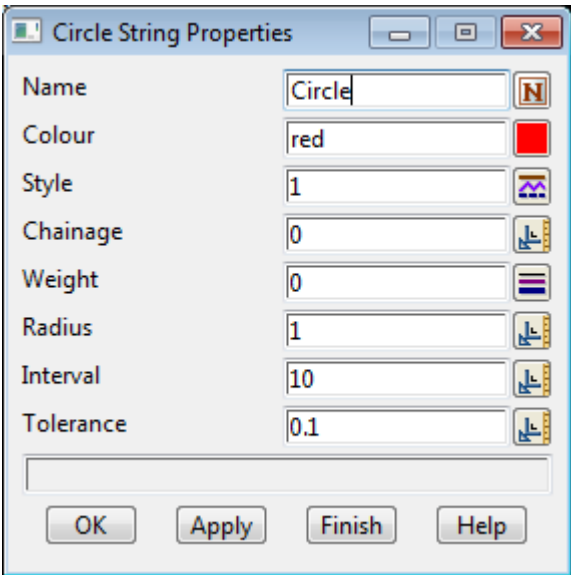
The **move** option repeats until cancelled by the user by either bringing up the **pick ops** menu and selecting **cancel** or by selecting a new option from the **circle edit** menu.

If, after bringing up the **pick ops** menu, it is decided to continue with the **move** option, simply select the **restart** option from the **pick ops** menu and the **pick ops** menu will disappear leaving the **move** option still current.

Note - the centre point of the circle can be selected and moved with the **move** option.

Properties

Selecting **Properties** brings up the **Circle String Properties** panel which is used to modify the string's header information.



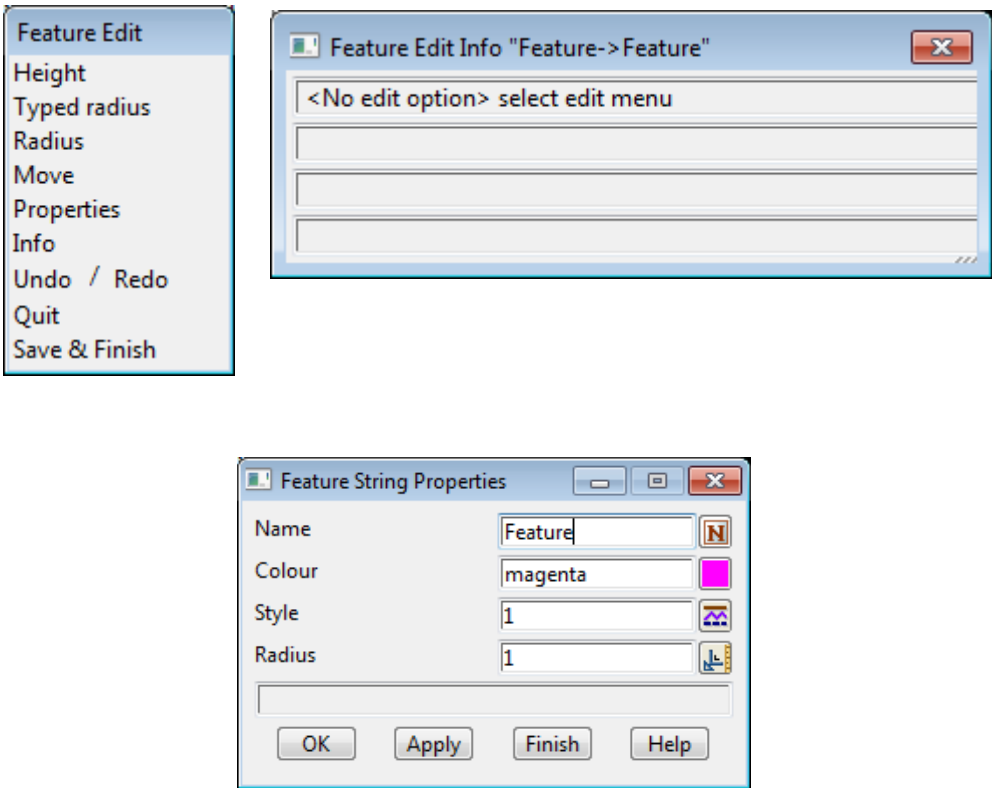
The fields in this panel are similar to those in the **create circle string** panel and the circle editor options. The only new field is

Field Description	Type	Defaults	Pop-Up
Set	button		

for the circle being edited, set all the items in the **circle string Properties** panel to the values given in the panel.

Feature Edit

On picking a feature string, the **feature edit** menu and panel are placed on the screen.



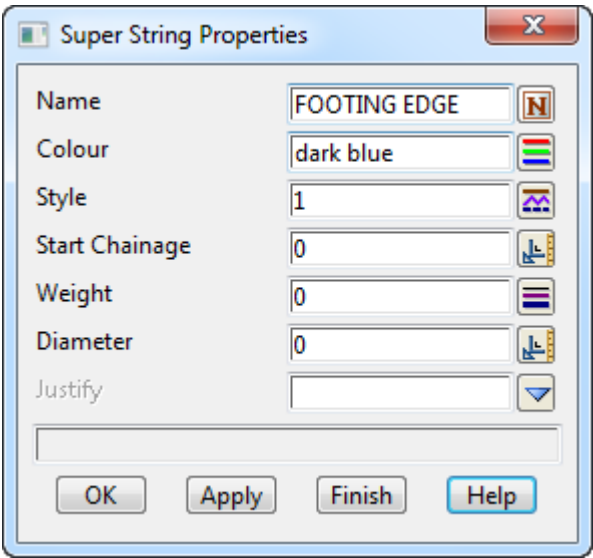
Each option in the **feature edit** menu is identical to those from the **circle edit** menu and will not be described again. See the section [Circle Edit](#)

See the earlier section [Super String Edit - Common Information](#) for general information about editing strings.

Edit Pipe

Position of option on menu: Strings =>Editor

On picking a **pipe** string, the **Edit Pipe** toolbar is placed on the screen. If **Display edit info** is ticked on in the **Default** panel (**Project =>Management =>Defaults**), an information panel, (the string's **Super Edit Info** panel) is also displayed.



The fields in this panel are similar to those in the **create pipe string** panel and the 3d string editor options. The only new field is

Field Description	Type	Defaults	Pop-Up
Diameter	real box		
Justify	choice box		invert, centre, obvert

The **diameter** field is used to modify the diameter of the pipe string.
Note - the default pipe string has only one diameter for the entire string, however by using the Advanced mode, the pipe string can be turned into a more general super string where each segment can have its own diameter; or can be a box culvert rather than a pipe.

The **Justify** field is used to modify the justification of the pipe string.
Note - the default pipe string has only one justification for the entire string, however by using the Advanced mode, the pipe string can be turned into a more general super string where each segment can have its own justification.

OK/Apply button

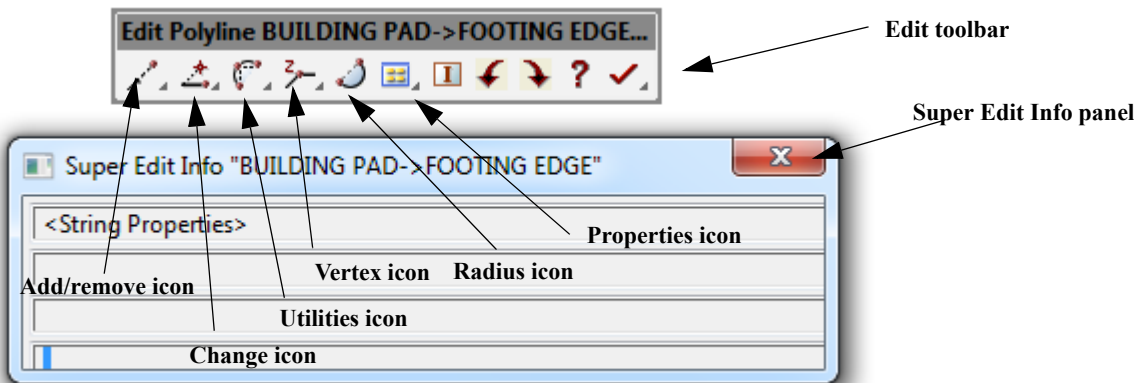
for the string being edited, **OK** sets the string with the values in the panel fields and removes the panel.
Apply sets the string with the values in the panel fields and leaves the panel on the screen.

Edit Polyline

Position of option on menu: Strings =>Editor

On picking a **Polyline** string, the **Edit Polyline** toolbar is placed on the screen. If **Display edit info** is ticked on in the **Default** panel (Project =>Management =>Defaults), an information panel, (the string's **Super Edit Info** panel) is also displayed.

On picking a polyline string, the **polyline edit** menu and **polyline edit info** panel are placed on the screen.



The major difference between a **polyline** and a 3d string is that a polyline string can have an arc instead of a line joining adjacent string vertices. Hence most of the options in the **Edit Polyline** toolbar are similar to the **Edit 3d** options of the same name, and only the differences for each option will be discussed. See the section [Edit 3d](#) for information on the 3d string editor.

See the earlier section [Super String Edit - Common Information](#) for general information about editing strings.

For the option *Add/ Remove Toolbar* go to

- Change Toolbar
- Utilities Toolbar
- Vertex Toolbar
- Radius Toolbar
- Properties Toolbar
- Info Toolbar
- Undo Toolbar
- Redo Toolbar
- Help Toolbar
- Finish Toolbar

[Add/Remove Toolbar](#)

[Change Toolbar](#)

[Utilities Toolbar](#)

[Radius](#)

[Properties toolbar](#)

[Super String Edit - Common Information](#)

[Super String Edit - Common Information](#)

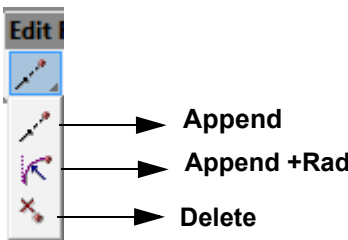
[Super String Edit - Common Information](#)

[Super String Edit - Common Information](#)

[Super String Edit - Common Information](#)

Add/Remove Toolbar

The **Add/remove** toolbar is



The **Append/Prepend** options allow for simply adding vertices, or adding vertices plus radii for the

segments.

Append

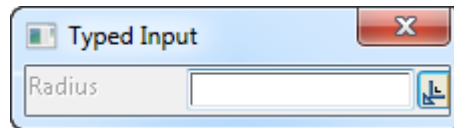
For the cases when no arc is required, the **Append** option simply places vertices.

Append + Radius

If an arc radius is required for every segment of the super string, there is an **Append + Radius** option that asks for the radius for every segment.

If the **Append + Radius** option is selected, then before each vertex is appended, a **Radius** typed-input box is placed on the screen.

The **Radius** typed-input box looks like



The radius is entered into the typed-input box, terminated with <enter>. The entered value is taken as the radius of the arc to the next vertex and the arc will be drawn correctly as the cursor is moved to the next vertex.

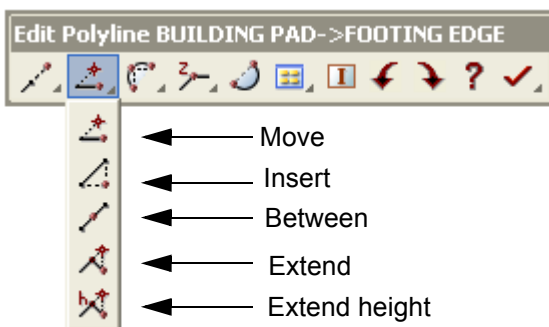
A **radius** value of **0** is taken to mean no arc.

The height question for each point is toggled on/off in the snaps menu just as it was for a 3d string.

The **Append** options are terminated by selecting **Cancel** from the **Pick Ops** menu or by selecting a new option from the **Edit polyline** toolbar

Go to the next section [Change Toolbar](#)

Change Toolbar



The **Extend ht** option is used to move a vertex along the line joining the vertex to its neighbouring vertex plus the z-value is interpolated from the z-values at either end of the segment.

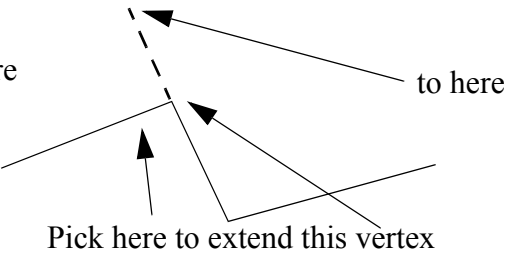
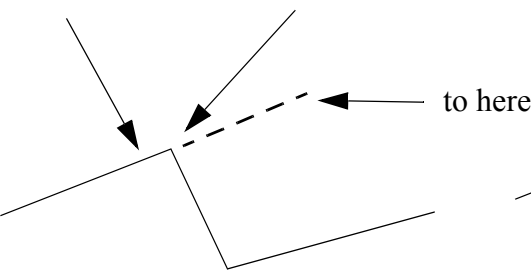
The **Move**, **Insert** and **Between** options are the same as for a 3d string.

There are two **Extend** options for a polyline string - **Extend** that is identical to the 3d string case where the z-value of the point being extended is kept constant, and a second option, **Extend ht** where the z-value of the point being extended is linearly interpolated by the extension distance.

Most vertices are the end vertex of two segments and the extension could be along either segment. The vertex and the segment to extend along are both selected at the same time by

picking on the segment to extend along, near the vertex to extend. The segment to extend can be a straight or an arc segment.

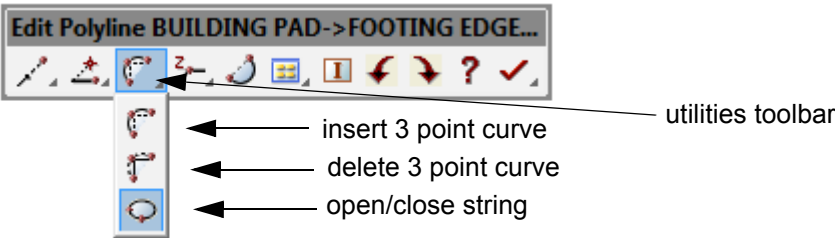
Pick here to extend this vertex



Go to the next section [Utilities Toolbar](#)

Utilities Toolbar

The **utilities** toolbar contains a number of useful miscellaneous option for the polyline string. The menu is



Each of the new options will now be discussed.

Ins 3 Point Curve

The **Ins 3 Pt Curve** option is used to insert a curve through three adjacent vertices.

After selecting the option, the middle vertex of the three adjacent vertices is selected.

When the vertex is accepted, the radius required to fit a curve through the vertex and the two adjacent vertices is calculated, and this radius is then applied to the segments joining the adjacent vertices.

Del 3 Point Curve

The **del 3 pt curve** option is used to delete the curves on either side of a vertex.

After selecting the option, a vertex is selected and when the vertex is accepted, the radii of the segments on either side are set to zero.

Hence the curves on either side of the vertex are effectively removed.

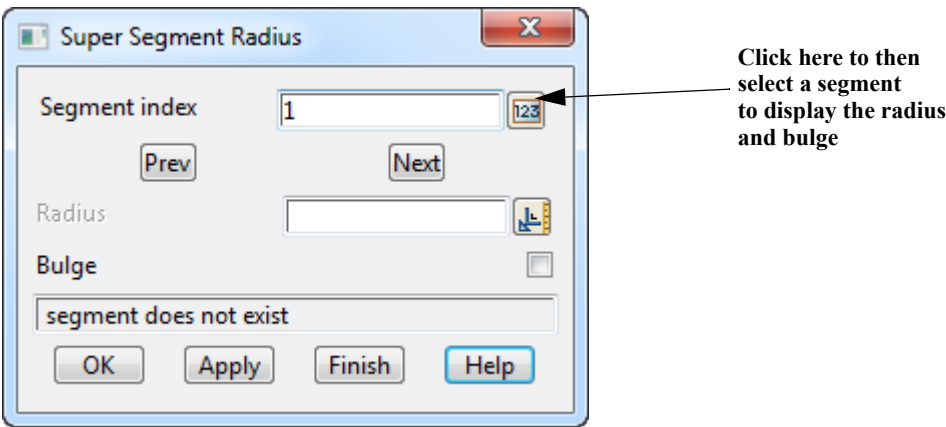
Open/Close

Toggles the string between being open and closed.

Go to the next section [Radius](#)

Radius

Selecting **Radius** icon brings up the **Super Segment Radius** panel which is used to modify the radius of any arc/line joining adjacent polyline points.



The panel displays the arc radius and bulge setting for segment 1 and the next/previous buttons can be used to display the values for any segment.

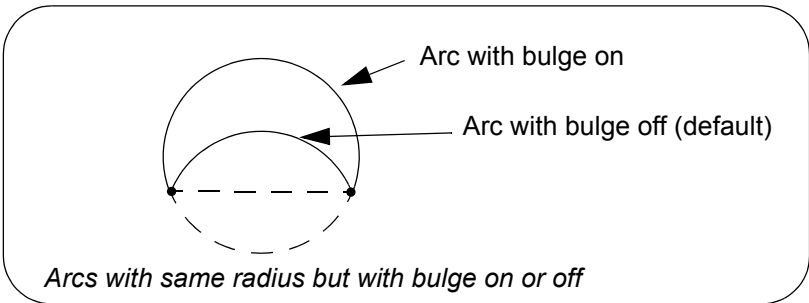
A particular segment can be selected by clicking on the value box for the **Segment index** field and then picking the segment. The current arc radius and bulge for the segment are displayed.

New values can then be entered into the panel field and the arc modified by selecting the **OK** or **Apply** button.

If the radius is positive, the arc is drawn from the start point to the next point on the polyline in a clockwise direction. If the radius is negative, the arc is drawn from the start point to the next point on the polyline in a counter-clockwise direction.

For a given radius (positive or negative), there are two possible cases for the arc- one where the arc is less than a semi-circle, the other when the arc is greater than a semi-circle.

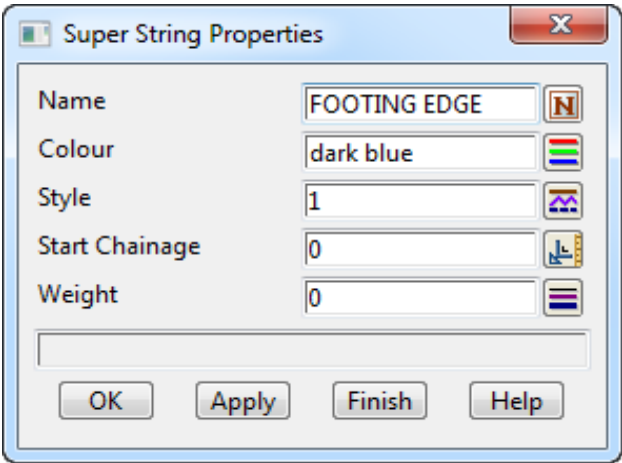
If **bulge** is ticked, the larger arc is used. The default is **bulge** turned off.



Go to the next section [Properties toolbar](#)

Properties toolbar

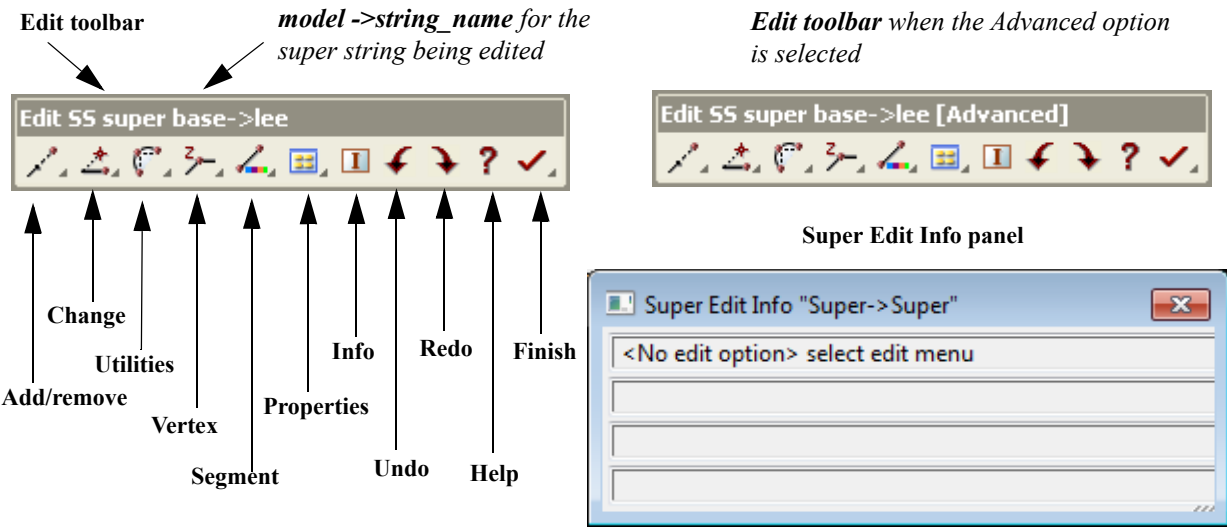
Selecting the **Properties** icon brings up the **Polyline String Properties** toolbar which is used to modify the string's header information.



The fields in this panel are the same as for a 3d string.

Edit Super

On picking a super string, the **Super Edit** menu and **Super Edit Info** panel are placed on the screen.



The super string is similar to a polyline string in that it can have an arc instead of a line joining adjacent string points. Hence most of the options in the **super edit** menu are similar to the **polyline edit** options of the same name, and only the differences for each option will be discussed.

See the earlier section [Super String Edit - Common Information](#) for general information about editing strings.

For the option Add/ Remove Toolbar go to

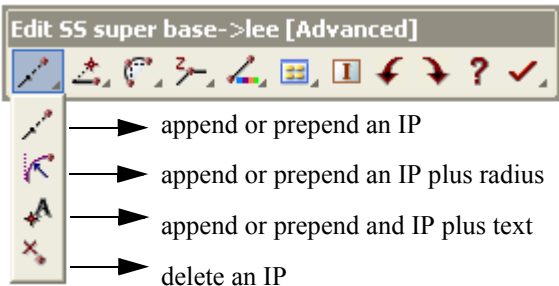
- Change Toolbar
- Utilities Toolbar
- Vertex Toolbar
- Segment Toolbar
- Properties Toolbar
- Info Toolbar
- Undo Toolbar
- Redo Toolbar
- Help Toolbar
- Finish Toolbar

[Add/Remove Toolbar](#)
[Change Toolbar](#)
[Utilities Toolbar](#)
[Vertex Toolbar](#)
[Segment Toolbar](#)

[Super String Edit - Common Information](#)
[Super String Edit - Common Information](#)
[Super String Edit - Common Information](#)
[Super String Edit - Common Information](#)
[Super String Edit - Common Information](#)

Add/Remove Toolbar

The **Add/Remove** toolbar is



The **Append/Prepend** options allow for simply adding vertices, or adding a vertex plus a radius for the segment, or adding vertices and text for each vertex.

Append

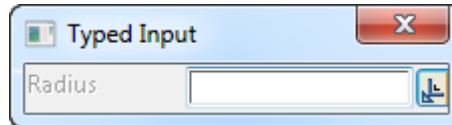
For the cases when no arc or text is required, the **Append** option simply places vertices.

Append + Radius

If an arc radius is required for every segment of the super string, there is an **Append + Radius** option that asks for the radius for every segment.

If the **Append + Radius** option is selected, then before each vertex is appended, a **radius** typed-input box is placed on the screen.

The radius typed-input box looks like



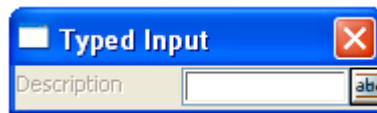
The radius is entered into the typed-input box, terminated with <enter>. The entered value is taken as the radius of the arc to the next super string vertex and the arc will be drawn correctly as the cursor is moved to the next vertex.

A **radius** value of **0** is taken to mean **no arc**.

Append + Text

If text is required at every vertex of the super string, there the **Append + Text** option that asks for the text at every vertex.

When **Append + Text** is selected, then before each vertex is appended, a **Description** typed-input box is placed on the screen.



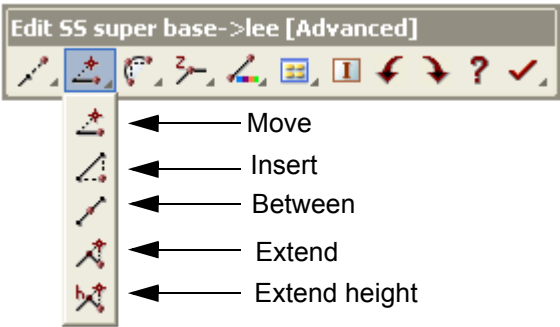
The text is entered into the typed-input box, terminated with <enter> and the entered text is taken as the vertex text,

The height question for each vertex is toggled on/off in the snaps menu just as it was for a polyline string.

The **Append** options are terminated by selecting **Cancel** from the **Pick Ops** menu or by selecting a new option from the **Super Edit** toolbar

Go to the next section [Change Toolbar](#)

Change Toolbar



The **Extend ht** option is used to move a vertex along the line joining the vertex to its neighbouring vertex plus the z-value is interpolated from the z-values at either end of the segment.

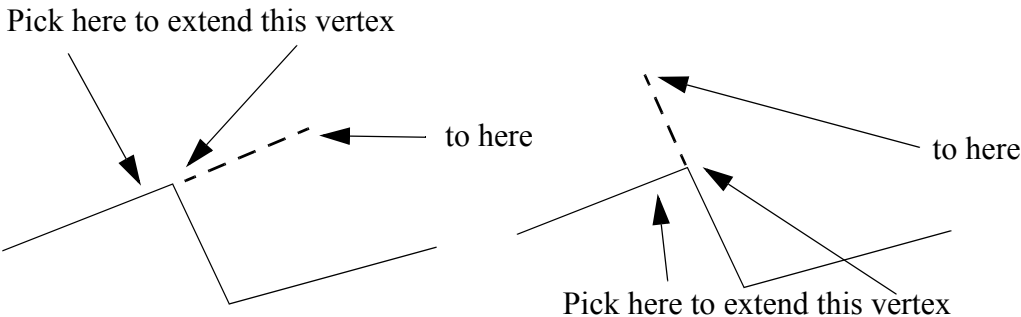
Move, Insert and Between

The **Move**, **Insert** and **Between** options are the same as for a 3d string. See

Extend and Extend Height

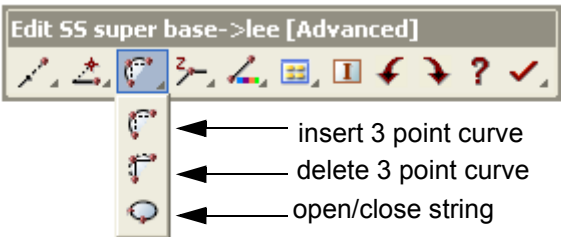
There are two **Extend** options for a super string - **Extend** that is identical to the 3d string case where the z-value of the point being extended is kept constant, and a second option, **Extend ht** where the z-value of the point being extended is linearly interpolated by the extension distance (either along the straight or arc segment).

Most vertices are the end vertex of two segments and the extension could be along either segment. The vertex and the segment to extend along are both selected at the same time by picking on the segment to extend along, near the vertex to extend. The segment to extend can be a straight or an arc segment.



Please continue to the next section [Utilities Toolbar](#).

Utilities Toolbar



Insert 3 Point Curve

The **Ins 3 Pt Curve** option is used to insert a curve through three adjacent vertices.

After selecting the option, the middle vertex of the three adjacent vertices is selected.

When the vertex is accepted, the radius required to fit a curve through the vertex and the two adjacent vertices is calculated, and this radius is then applied to the segments joining the adjacent vertices.

Delete 3 Point Curve

The **del 3 pt curve** option is used to delete the curves on either side of a vertex.

After selecting the option, a vertex is selected and when the vertex is accepted, the radii of the segments on either side are set to zero.

Hence the curves on either side of the vertex are effectively removed.

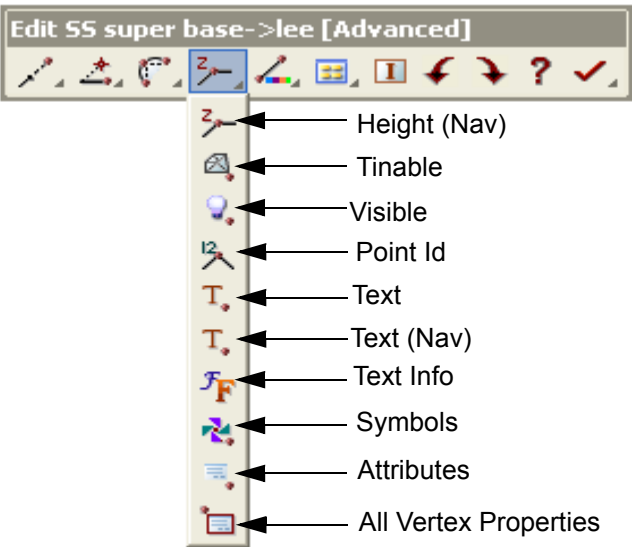
Open/Close

Toggles the string between being open and closed.

Please continue to the next section [Vertex Toolbar](#).

Vertex Toolbar

The **Vertex** toolbar contains options to modify information at any vertex of the super string.



For the option *Height (Nav)* go to

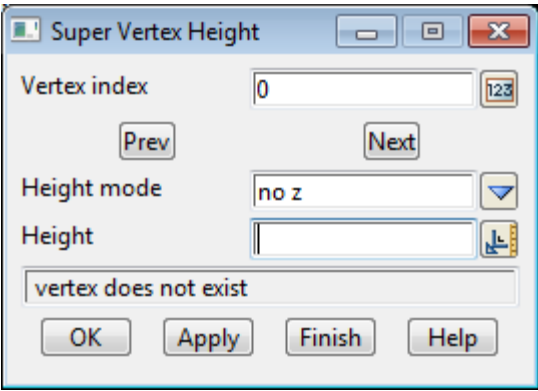
- Tinable*
- Visible*
- Point Id*
- Text*
- Text (Nav)*
- Text Info*
- Symbols*
- Attributes*
- All vertex properties*

- [Height \(Nav\)](#)
- [Tinable](#)
- [Visible](#)
- [Point Id](#)
- [Text](#)
- [Text \(Nav\)](#)
- [Text Info](#)
- [Symbols](#)
- [Attributes](#)
- [All Vertex Properties](#)

Height (Nav)

Selecting **Height (Nav)** brings up the **Super Vertex Height** panel which is used to set the height

value for vertices.



As soon as **Height (Nav)** is chosen, the height information for the first vertex is shown.

A particular vertex can be selected by first clicking on the icon at the end of the **Vertex index** field, and then selecting the required vertex, or by typing a number into the **Vertex index** field and pressing <enter>.

Similarly the **Prev** and **Next** buttons can be used to move to adjacent vertices.

When a vertex is selected, its *vertex number*, *height mode* and *height* are written to the appropriate panel fields.

if any panel fields are modified, selecting either **OK** or **Apply** will store the new information for the vertex.

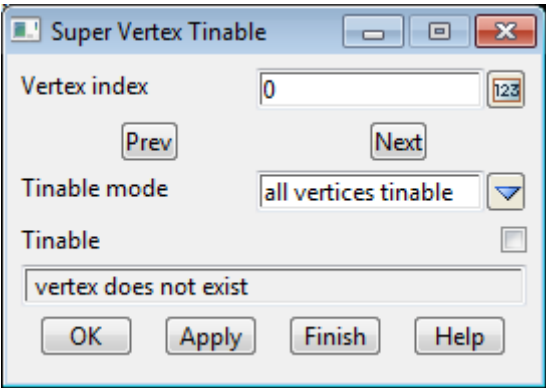
The fields and buttons used in the **Super Vertex Height** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Vertex index <i>if a vertex is selected, then its vertex number is displayed in this field.</i>	number box	selected vertex	
Prev <i>move to the previous vertex (predecessor). The information for the new vertex is displayed in the panel fields.</i>	button		
Next <i>move to the next vertex (successor). The information for the new vertex is displayed in the panel fields.</i>	button		
Height mode <i>if no z, there is no z value for the vertex.</i> <i>if entire string, then the string has the same z value for each vertex.</i> <i>if each vertex, then each vertex has a separate z value.</i>	choice box		no z, entire string, each vertex
Height <i>the height used for the vertex or for the entire string.</i>	input	height of vertex/string	
OK/Apply <i>for the vertex being edited, OK sets the vertex with the values in the panel fields and removes the panel.</i> <i>Apply sets the vertex with the values in the panel fields and leaves the panel on the screen.</i>	button		

Please continue to the next section [Tunable](#)

Tunable

Selecting **Tinable** brings up the **Super Vertex Tinable** panel which is used to set the tinability information for vertices.



As soon as **Tinable** is chosen, the tinability information for the first vertex is shown.
A particular vertex can be selected by first clicking on the icon at the end of the **Vertex index** field, and then selecting the required vertex, or by typing a number into the **Vertex index** field and pressing <enter>.
Similarly the **Prev** and **Next** buttons can be used to move to adjacent vertices.

When a vertex is selected, its *tinability* information is written to the appropriate panel fields.
if any panel fields are modified, selecting either **OK** or **Apply** will store the new information for the vertex.

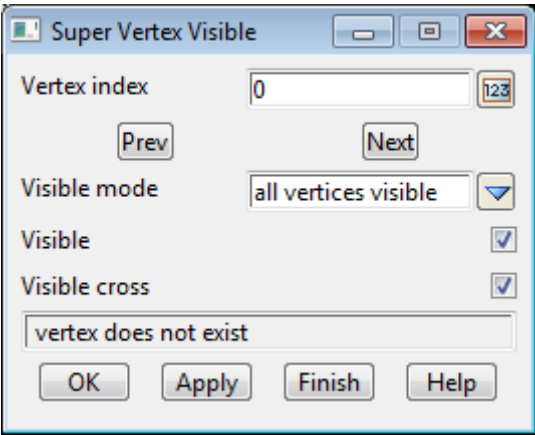
The fields and buttons used in the **Super Vertex Tinable** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Vertex Index	number box	selected vertex	
<i>if a vertex is selected, then its vertex number is displayed in this field.</i>			
Prev	button		
<i>move to the previous vertex (predecessor). The information for the new vertex is displayed in the panel fields.</i>			
Next	button		
<i>move to the next vertex (successor). The information for the new vertex is displayed in the panel fields.</i>			
Tinable mode	choice box		all vertices tinable all vertices not tinable each vertex
<i>if all vertices tinable, all vertices are included in a triangulation.</i>			
<i>if all vertices not tinable, no vertices are included in a triangulation.</i>			
<i>if each vertex, then each vertex has a separate tinability value.</i>			
Tinable	tick box		
<i>if ticked, the vertex is tinable. That is, it is included in tins.</i>			
<i>if not ticked, then the vertex is ignored when triangulating.</i>			
OK/Apply	button		
<i>for the vertex being edited, OK sets the vertex/string with the values in the panel fields and removes the panel. Apply sets the vertex/string with the values in the panel fields and leaves the panel on the screen.</i>			

Please continue to the next section [Visible](#)

Visible

Selecting **Visible** brings up the **Super Vertex Visible** panel which is used to set the visibility flag for vertices.



As soon as **Visible** is chosen, the visibility information for the first vertex is shown.

A particular vertex can be selected by first clicking on the icon at the end of the **Vertex index** field, and then selecting the required vertex, or by typing a number into the **Vertex index** field and pressing <enter>.

Similarly the **Prev** and **Next** buttons can be used to move to adjacent vertices.

When a vertex is selected, its *visibility* information is written to the appropriate panel fields.

if any panel fields are modified, selecting either **OK** or **Apply** will store the new information for the vertex.

The fields and buttons used in the **Super Vertex Visible** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Vertex index	number box	selected vertex	
<i>if a vertex is selected, then its vertex number is displayed in this field.</i>			
Prev	button		
<i>move to the previous vertex (predecessor). The information for the new vertex is displayed in the panel fields.</i>			
Next	button		
<i>move to the next vertex (successor). The information for the new vertex is displayed in the panel fields.</i>			
Visible mode	choice box		all vertices visible visibility for entire string visibility for each vertex
<i>if all vertices visible, all vertices are visible.</i>			
<i>if visibility for the entire string, the Visible and Visible cross setting is used for all vertices in the string.</i>			
<i>if visibility each vertex, then each vertex has its own Visible and Visible cross setting.</i>			

Visible tick box

*if **ticked**, the vertex is visible.
if **not ticked**, then the vertex is invisible.*

Visible cross tick box

*if **ticked**, when it is a point string, a cross is drawn at each vertex.
if **not ticked**, when it is a point string, no cross is drawn at each vertex.*
***Note** - this is important when there is a symbol at the vertex. In that case, the vertex needs to be visible so that the symbol is drawn, but the standard cross drawn at vertices is not wanted.*

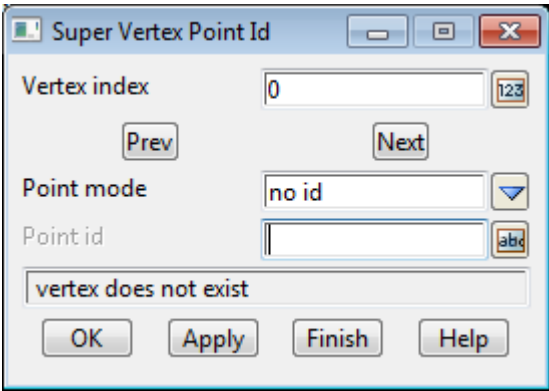
OK/Apply button

*for the vertex being edited, **OK** sets the vertex/string with the values in the panel fields and removes the panel. **Apply** sets the vertex/string with the values in the panel fields and leaves the panel on the screen.*

Please continue to the next section [Point Id](#)

Point Id

Selecting **Point Id** brings up the **Super Vertex Point Id** panel which is used to set the point IDs for vertices.



As soon as **Point Id** is chosen, the Point id information for the first vertex is shown.
A particular vertex can be selected by first clicking on the icon at the end of the **Vertex index** field, and then selecting the required vertex, or by typing a number into the **Vertex index** field and pressing <enter>.
Similarly the **Prev** and **Next** buttons can be used to move to adjacent vertices.

When a vertex is selected, its *Point id* information written to the appropriate panel fields.
if any panel fields are modified, selecting either **OK** or **Apply** will store the new information for the vertex.

The fields and buttons used in the **Super Vertex Point Id** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Vertex index	number box	selected vertex	
<i>if a vertex is selected, then its vertex number is displayed in this field.</i>			
Prev	button		
<i>move to the previous vertex (predecessor). The information for the new vertex is displayed in the panel</i>			

fields.

- Next** button
move to the next vertex (successor). The information for the new vertex is displayed in the panel fields.
- Point id mode** choice box no ids, each vertex
*if **no ids**, there are no Point ids for any vertex.*
*if **each vertex**, then each vertex has a Point id.*
- Point id** text box point id of vertex
the point id for the vertex.
- OK/Apply** button
*for the vertex being edited, **OK** sets the vertex/string with the values in the panel fields and removes the panel. **Apply** sets the vertex/string with the values in the panel fields and leaves the panel on the screen.*

Please continue to the next section [Text](#)

Text

As soon as **Text** is chosen, the Vertex Select is running and the message

<Pick vertex to set text> [Picks][Accept][Menu]

is displayed in the screen message area.

The vertex to have its text modified is then selected and the **Description** typed-input box is displayed on the screen with the current text for the vertex in it.

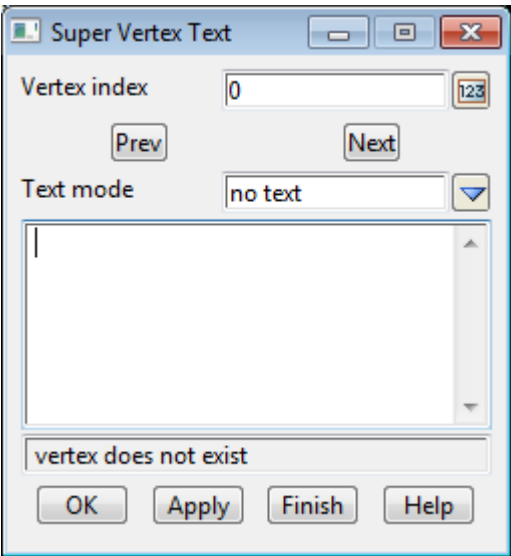


To modify the vertex text, type the new text into the **Description** typed-input box, finishing with <enter> and the vertex text is updated and the typed-input box.

Please continue to the next section [Text \(Nav\)](#)

Text (Nav)

Selecting **Text (Nav)** brings up the **Super Vertex Text** panel which is used to set the text for vertices.



As soon as **Text (Nav)** is chosen, the vertex text for the first vertex is shown.

A particular vertex can be selected by first clicking on the icon at the end of the **Vertex index** field, and then selecting the required vertex, or by typing a number into the **Vertex index** field and pressing <enter>.

Similarly the **Prev** and **Next** buttons can be used to move to adjacent vertices.

When a vertex is selected, its vertex *text* is written to the appropriate panel fields.

if any panel fields are modified, selecting either **OK** or **Apply** will store the new information for the vertex.

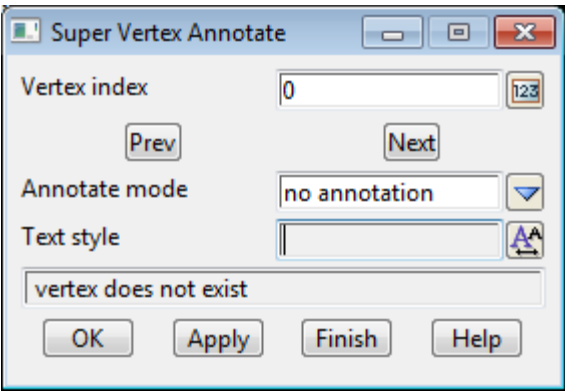
The fields and buttons used in the **Super Vertex Text** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Vertex Index	input	selected vertex	
<i>if a vertex is selected, then its vertex number is displayed in this field.</i>			
Prev	button		
<i>move to the previous vertex (predecessor). The information for the new vertex is displayed in the panel fields.</i>			
Next	button		
<i>move to the next vertex (successor). The information for the new vertex is displayed in the panel fields.</i>			
Text mode	input		no text, entire string, each vertex
<i>if no text, there is no text for any vertex.</i>			
<i>if entire string, then the string has the same text for each vertex.</i>			
<i>if each vertex, then each vertex has a separate text value.</i>			
Text	input	text of vertex/string	
<i>the text used for the vertex or for the entire string.</i>			
OK/Apply	button		
<i>for the vertex being edited, OK sets the vertex/string with the values in the panel fields and removes the panel. Apply sets the vertex/string with the values in the panel fields and leaves the panel on the screen.</i>			

Please continue to the next section [Text Info](#)

Text Info

Selecting **Text info** brings up the **Super Vertex Annotate** panel which is used to set the annotation styles for the text at vertices.



As soon as **Text info** is chosen, the text annotation information for the first vertex is shown.

A particular vertex can be selected by first clicking on the icon at the end of the **Vertex index** field, and then selecting the required vertex, or by typing a number into the **Vertex index** field and pressing <Enter>.

Similarly the **Prev** and **Next** buttons can be used to move to adjacent vertices.

When a vertex is selected, its *text annotation* information is written to the appropriate panel fields.

if any panel fields are modified, selecting either **OK** or **Apply** will store the new information for the vertex.

The fields and buttons used in the **Super Vertex Annotate** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Vertex Index	input	selected vertex	
<i>if a vertex is selected, then its vertex number is displayed in this field.</i>			
Prev	button		
<i>move to the previous vertex (predecessor). The information for the new vertex is displayed in the panel fields.</i>			
Next	button		
<i>move to the next vertex (successor). The information for the new vertex is displayed in the panel fields.</i>			
Annotate mode	input	no annotation, entire string, each vertex	
<i>if no annotation, then the text at the vertex is not displayed.</i>			
<i>if entire string, then the same annotation settings are used for each vertex.</i>			
<i>if each vertex, then each vertex has separate annotations settings.</i>			
Text style	input	1	available text styles
<i>text annotation for the text at the vertex.</i>			

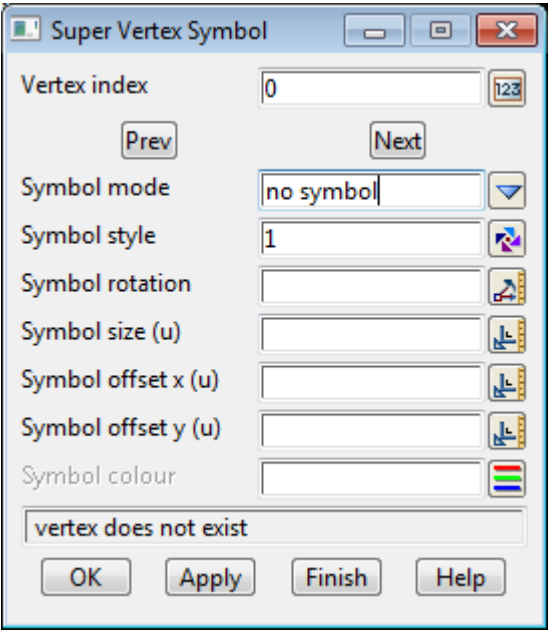
OK/Apply button

for the vertex being edited, **OK** sets the vertex/string with the values in the panel fields and removes the panel. **Apply** sets the vertex/string with the values in the panel fields and leaves the panel on the screen.

Please continue to the next section [Symbols](#)

Symbols

Selecting **Symbols** brings up the **Super Vertex Symbol** panel which is used to set symbols and their display parameters at vertices.



As soon as **Symbols** is chosen, the symbol annotation information for the first vertex is shown.

A particular vertex can be selected by first clicking on the icon at the end of the **Vertex index** field, and then selecting the required vertex, or by typing a number into the **Vertex index** field and pressing <Enter>.

Similarly the **Prev** and **Next** buttons can be used to move to adjacent vertices.

When a vertex is selected, its *symbol* information is written to the appropriate panel fields.

if any panel fields are modified, selecting either **OK** or **Apply** will store the new information for the vertex.

The fields and buttons used in the **Super Vertex Symbol** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Vertex index	input	selected vertex	

if a vertex is selected, then its vertex number is displayed in this field.

Prev button

move to the previous vertex (predecessor). The information for the new vertex is displayed in the panel fields.

Next button

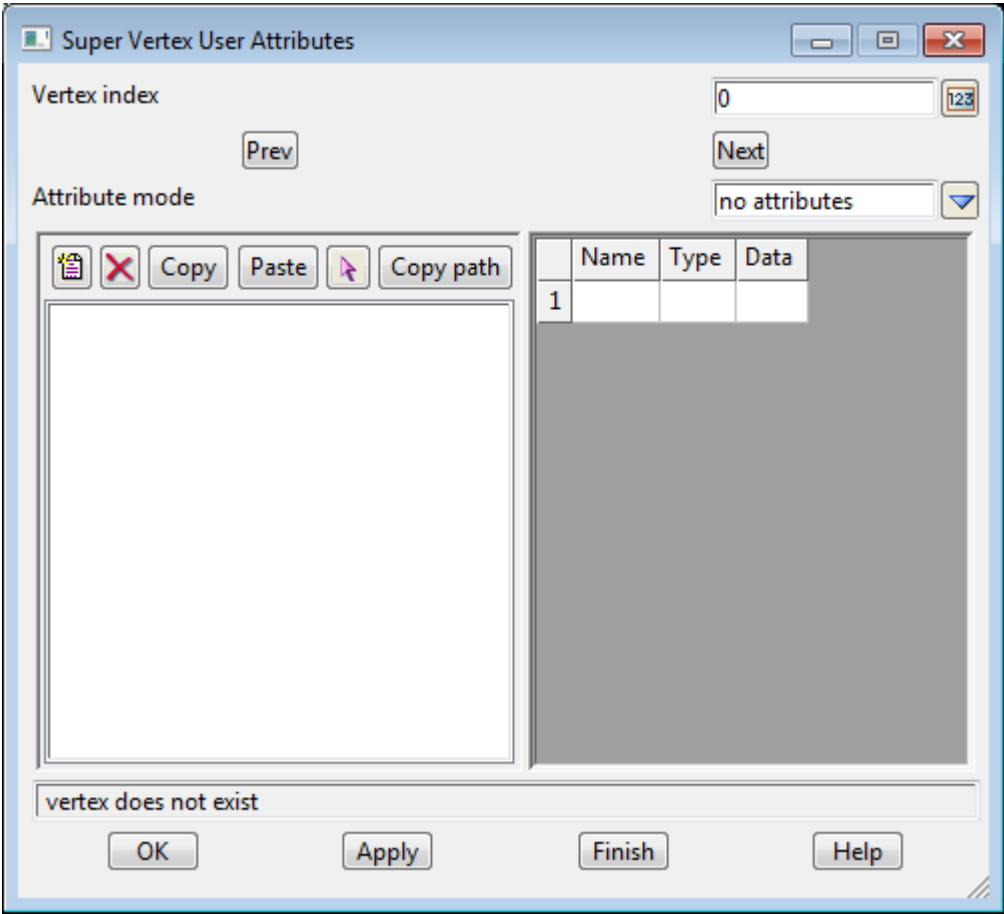
move to the next vertex (successor). The information for the new vertex is displayed in the panel fields.

Symbol mode	input		no symbol, entire string, each vertex
<i>if no symbol, then there is no symbol at any vertex.</i>			
<i>if entire string, then the same symbol and settings are used for each vertex.</i>			
<i>if each vertex, then each vertex has separate symbols and settings.</i>			
Symbol style	symbol box	1	available symbols
<i>symbol at the vertex</i>			
Symbol rotation	angle box		
<i>rotation angle of the symbol (measured from the positive x-axis in the counter-clockwise direction).</i>			
Symbol size (u)	real box		
<i>size of the symbol (in units for the symbol).</i>			
Symbol offset x (u)	real box	0	
<i>distance (in units for the symbol) to offset the symbol in the x direction from its (x,y) placement position.</i>			
Symbol offset y (u)	real box	0	
<i>distance (in units for the symbol) to offset the symbol in the y direction from its (x,y) placement position.</i>			
Symbol colour	input		available colours
<i>colour of the symbol if none is defined in the symbol definition</i>			
OK/Apply	button		
<i>for the vertex being edited, OK sets the vertex/string with the values in the panel fields and removes the panel. Apply sets the vertex/string with the values in the panel fields and leaves the panel on the screen.</i>			

Please continue to the next section [Attributes](#)

Attributes

Selecting **Attributes** brings up the **Super Vertex User Attributes** panel which is used to display and edit user defined attributes at vertices of the super string.



As soon as **Attribute** is chosen, the attribute information for the first vertex is shown.

A particular vertex can be selected by first clicking on the icon at the end of the **Vertex index** field, and then selecting the required vertex, or by typing a number into the **Vertex index** field and pressing <Enter>.

Similarly the **Prev** and **Next** buttons can be used to move to adjacent vertices.

When a vertex is selected, its *attribute* information is written to the appropriate panel fields.

if any panel fields are modified, selecting either **OK** or **Apply** will store the new information for the vertex.

- The fields and buttons used in the **Super Vertex User Attributes** panel have the following functions.
- | Field Description | Type | Defaults | Pop-Up |
|------------------------------------------------------------------------------------------------------------------------|--------|-----------------|--------|
| Vertex index | input | selected vertex | |
| <i>if a vertex is selected, then its vertex number is displayed in this field.</i> | | | |
| Prev | button | | |
| <i>move to the previous vertex (predecessor). The information for the new vertex is displayed in the panel fields.</i> | | | |
| Next | button | | |
| <i>move to the next vertex (successor). The information for the new vertex is displayed in the panel fields.</i> | | | |

Attribute mode choice box no attributes, each vertex
*if **no attributes**, then no vertices have user attributes.*
*if **each vertex**, then each vertex can have user attributes.*

Name/Type/Data Grid

Name input
name for the user attribute. This must be unique for all attributes at this vertex.

Type choice box integer, real, text
type of the attribute.

Data input
value for the attribute.

OK/Apply button
*for the vertex being edited, **OK** sets the vertex with the values in the panel fields and removes the panel.*
***Apply** sets the vertex with the values in the panel fields and leaves the panel on the screen.*

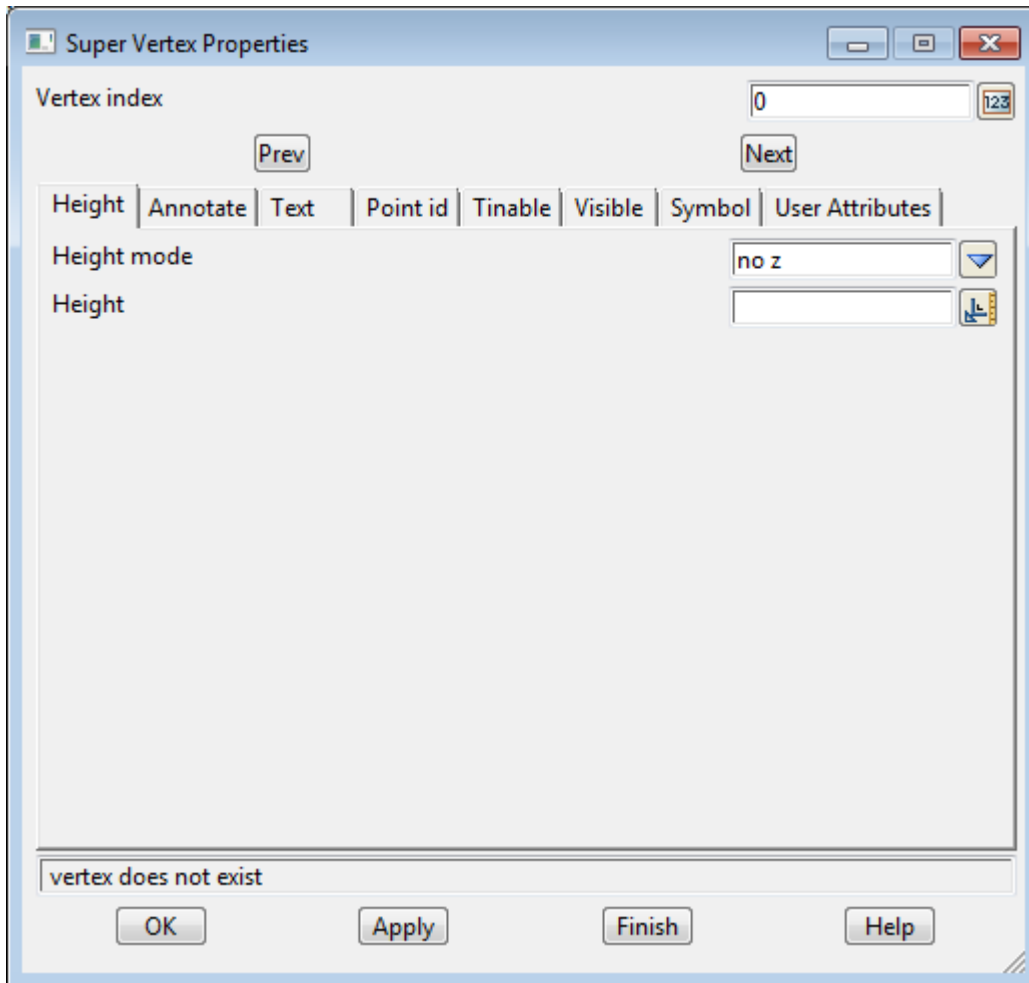
Please continue to the next section [All Vertex Properties](#)

All Vertex Properties

Selecting **All properties** brings up the **Super Vertex Properties** panel which is used to display all the properties for a vertex.

This option is also available from the *Strings* menu

Position of option on menu: Strings =>Properties =>Vertex (all)



As soon as **All vertex properties** is chosen, the height information for the first segment is shown in the panel. Clicking on the various tabs will show the various vertex information for the first vertex.

A particular vertex can be selected by first clicking on the icon at the end of the **Vertex index** field, and then selecting the required vertex, or by typing a number into the **Vertex index** field and pressing <Enter>.

Similarly the **Prev** and **Next** buttons can be used to move to adjacent vertices.

When a vertex is selected, its *attribute* information is written to the appropriate tabs and panel fields.

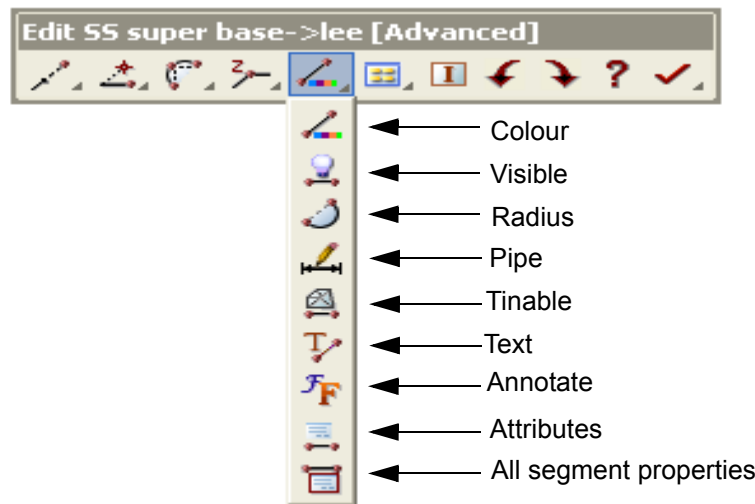
If any panel fields are modified, selecting either **OK** or **Apply** will store the new information for the vertex.

The fields in each of the tabs for the **Super Vertex Properties** panel have already been described in the other options on the Vertex Toolbar. See [Vertex Toolbar](#).

For information on the Segment Toolbar, please continue to the next section [Segment Toolbar](#).

Segment Toolbar

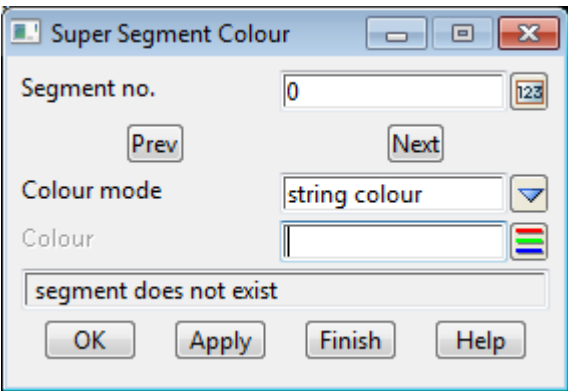
The **Segment** toolbar contains options to modify information at any segment of the super string.



For the option <i>Colour</i> go to	Colour
<i>Visible</i>	Visible
<i>Radius</i>	Radius
<i>Pipe</i>	Pipe
<i>Tinable</i>	Tinable
<i>Text</i>	Text
<i>Annotate</i>	Annotate
<i>Attributes</i>	Attributes
<i>All segment properties</i>	All Segment Properties

Colour

Selecting **Colour** brings up the **Super Segment Colour** panel which is used to set the colour of the string segments.



As soon as **Colour** is chosen, the colour information for the first segment is shown.

A particular segment can be selected by first clicking on the icon at the end of the **Segment index** field, and then selecting the required segment, or by typing a number into the **Segment index** field and pressing <Enter>.

Similarly the **Prev** and **Next** buttons can be used to move to adjacent segments.

When a segment is selected, its *colour* information is written to the appropriate panel fields.
if any panel fields are modified, selecting either **OK** or **Apply** will store the new information for the segment.

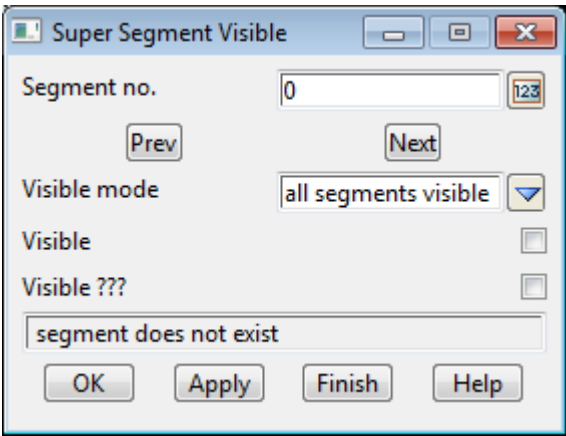
The fields and buttons used in the **Super Segment Colour** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Segment index	number box	selected vertex	
<i>if a segment is selected, then its segment index is displayed in this field.</i>			
Prev	button		
<i>move to the previous segment (predecessor). The information for the new segment is displayed in the panel fields.</i>			
Next	button		
<i>move to the next segment (successor). The information for the next new is displayed in the panel fields.</i>			
Colour mode	choice box		string colour, each segment
<i>if string colour, then all the segments in the string have the same colour.</i>			
<i>If each segment, then each segment has a separate colour.</i>			
Colour	colour box	colour of segment/string	available colours
<i>the colour used for the segment or for the entire string.</i>			
OK/Apply	button		
<i>for the segment being edited, OK sets the segment/string with the values in the panel fields and removes the panel. Apply sets the segment/string with the values in the panel fields and leaves the panel on the screen.</i>			

Please continue to the next section [Visible](#)

Visible

Selecting **Visible** brings up the **Super Segment Visible** panel which is used to set the visibility flag for segments.



As soon as **Visible** is chosen, the visibility information for the first segment is shown.
A particular segment can be selected by first clicking on the icon at the end of the **Segment index** field, and then selecting the required segment, or by typing a number into the **Segment index** field and pressing <Enter>.
Similarly the **Prev** and **Next** buttons can be used to move to adjacent segments.

When a segment is selected, its *visibility* information is written to the appropriate panel fields. if any panel fields are modified, selecting either **OK** or **Apply** will store the new information for the segment.

The fields and buttons used in the **Super Segment Visible** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Segment index	number box	selected vertex	
<i>if a segment is selected, then its segment index is displayed in this field.</i>			
Prev	button		
<i>move to the previous segment (predecessor). The information for the new segment is displayed in the panel fields.</i>			
Next	button		
<i>move to the next segment (successor). The information for the next new is displayed in the panel fields.</i>			
Visible mode	choice box		all segments visible visibility for entire string visibility for each segment
<i>if all segments visible, all segments are visible.</i>			
<i>if visibility for the entire string, the Visible and Visible ??? setting is used for all vertices in the string.</i>			
<i>if visibility each segment, then each vertex has its own Visible and Visible ??? setting.</i>			
Visible	tick box		
<i>if ticked, the segment is visible.</i>			
<i>if not ticked, then the segment is invisible.</i>			
Visible ???	tick box		
<i>if ticked,</i>			
<i>if not ticked,.</i>			
OK/Apply	button		
<i>for the segment being edited, OK sets the segment/string with the values in the panel fields and removes the panel. Apply sets the segment/string with the values in the panel fields and leaves the panel on the screen.</i>			

Please continue to the next section [Radius](#)

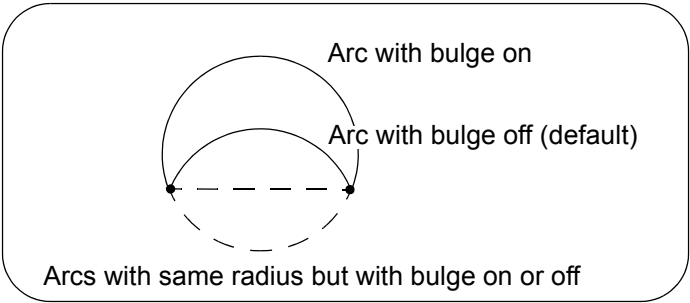
Radius

When viewed in plan, the segments of a super string can be joined by string lines or arcs. If the radius is positive, the arc is drawn from the start vertex to the end vertex of the segment in a clockwise direction. If the radius is negative, the arc is drawn from the start vertex to the end vertex on the segment in a counter-clockwise direction.

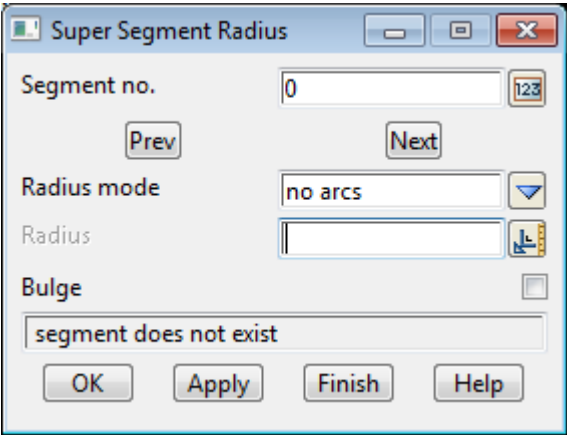
For a given radius (positive or negative), there are two possible cases for the arc- one where the arc is less than a semi-circle, the other when the arc is greater than a semi-circle.

If bulge is turned *on*, the larger arc is used. The default is bulge turned off.

A zero radius is interpreted to be a just a straight line segment with no arc.



Selecting **Radius** brings up the **Super Segment Radius** panel which is used to set the plan radius of the segment.



As soon as **Radius** is chosen, the radius information for the first segment is shown.

A particular segment can be selected by first clicking on the icon at the end of the **Segment index** field, and then selecting the required segment, or by typing a number into the **Segment index** field and pressing <Enter>.

Similarly the **Prev** and **Next** buttons can be used to move to adjacent segments.

When a segment is selected, its *radius* information is written to the appropriate panel fields.

if any panel fields are modified, selecting either **OK** or **Apply** will store the new information for the segment.

The fields and buttons used in the **Super Segment Radius** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Segment index	number box	selected vertex	
<i>if a segment is selected, then its segment index is displayed in this field.</i>			
Prev	button		
<i>move to the previous segment (predecessor). The information for the new segment is displayed in the panel fields.</i>			
Next	button		
<i>move to the next segment (successor). The information for the new segment is displayed in the panel fields.</i>			

Radius mode choice box no arcs, each segment
*if **no arcs**, then no segments have a diameter (that is, they are all line segments).*
*If **each segment**, then each segment has a radius.*

Radius real box 0
radius of the segment arc. A radius of 0 mean no arc.

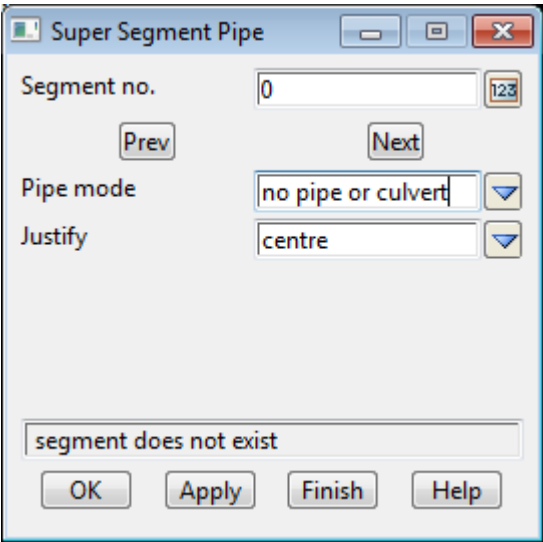
Bulge tick box
*if **ticked**, the larger arc is used.*
if not-ticked, the smaller arc is used.

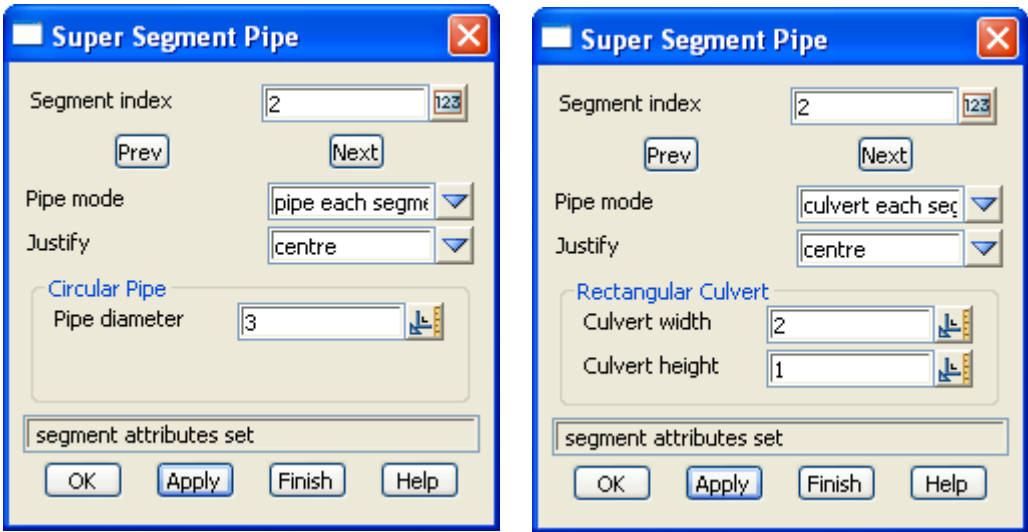
OK/Apply button
*for the segment being edited, **OK** sets the segment/string with the values in the panel fields and removes the panel. **Apply** sets the segment/string with the values in the panel fields and leaves the panel on the screen.*

Please continue to the next section [Pipe](#)

Pipe

The segments of a super string can have either a pipe or box cross section, or none.
Selecting **Pipe** brings up the **Super Segment Pipe** panel which is used to set the pipe mode and size for the string segments.





As soon as **Pipe** is chosen, the pipe information for the first segment is shown.

A particular segment can be selected by first clicking on the icon at the end of the **Segment index** field, and then selecting the required segment, or by typing a number into the **Segment index** field and pressing <Enter>.

Similarly the **Prev** and **Next** buttons can be used to move to adjacent segments.

When a segment is selected, its *pipe* information is written to the appropriate panel fields.

if any panel fields are modified, selecting either **OK** or **Apply** will store the new information for the segment.

The fields and buttons used in the **Super Segment Pipe** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Segment index	number box	selected vertex	
<i>if a segment is selected, then its segment index is displayed in this field.</i>			
Prev	button		
<i>move to the previous segment (predecessor). The information for the new segment is displayed in the panel fields.</i>			
Next	button		
<i>move to the next segment (successor). The information for the new segment is displayed in the panel fields.</i>			
Pipe mode	choice box		no pipe or culvert pipe entire string pipe each segment culvert entire string culvert each segment

if no pipe or culvert, there is no pipe or culvert for the segment.

If pipe entire string, then all the segments in the string are pipes and have the same diameter.

If pipe each segment, then each segment is a pipe and can have a different diameter.

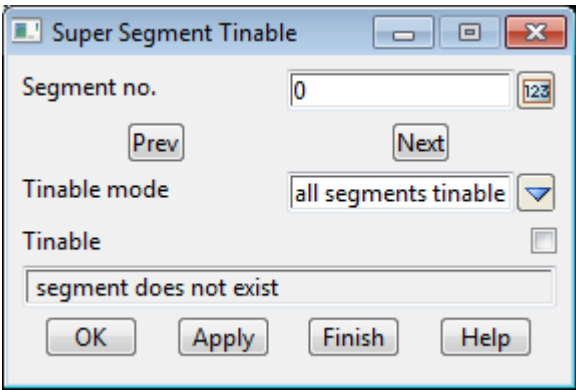
If culvert entire string, then all the segments in the string are culverts and have the same width and height.

If culvert each segment, then each segment is a culvert and can have a different width and height.

Justify	choice box	invert, centre, overt
<i>justification of the pipe/culvert with respect to the co-ordinates given for the vertices of the super string.</i>		
Pipe diameter	real box	
<i>diameter of the pipe in world units.</i>		
Culvert width	real box	
<i>width of the culvert section in world units.</i>		
Culvert height	real box	
<i>height of the culvert section in world units.</i>		
OK/Apply	button	
<i>for the segment being edited, OK sets the segment/string with the values in the panel fields and removes the panel. Apply sets the segment/string with the values in the panel fields and leaves the panel on the screen.</i>		
Please continue to the next section Tinable		

Tinable

Selecting Segment=>Tinable brings up the **Super Segment Tinable** panel which is used to set the tinable flag for segments.



As soon as **Tinable** is chosen, the tinability information for the first segment is shown.

A particular segment can be selected by first clicking on the icon at the end of the **Segment index** field, and then selecting the required segment, or by typing a number into the **Segment index** field and pressing <enter>.

Similarly the **Prev** and **Next** buttons can be used to move to adjacent segments.

When a segment is selected, its *tinability* information is written to the appropriate panel fields.

if any panel fields are modified, selecting either **OK** or **Apply** will store the new information for the segment.

The fields and buttons used in the **Super Segment Tinable** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Segment index	number box	selected vertex	
<i>if a segment is selected, then its segment index is displayed in this field.</i>			

- Prev

button

move to the previous segment (predecessor). The information for the new segment is displayed in the panel fields.
- Next

button

move to the next segment (successor). The information for the next new is displayed in the panel fields.
- Tinable mode

choice box

all segments tinable

all segments not tinable

each segment

if **all segments tinable**, all segments are included as break lines in a triangulation.

if **all segments not tinable**, no segments are included as break lines in a triangulation.

if **each segment**, then each segment has a separate tinability value.
- Tinable

tick box

if **ticked**, the segment is used as a break line in a triangulation. That is, the triangulation process tries to preserve the segment as a side of a triangle in the tin.

if **not ticked**, then the segment is used as a break line when triangulating.

Note - for a tinable segment to be used as a breakline, the vertex at the segment ends must also be tinable.
- OK/Apply

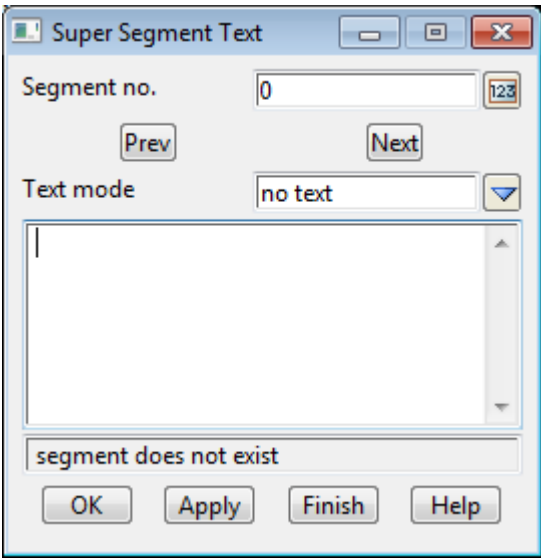
button

for the segment being edited, **OK** sets the segment/string with the values in the panel fields and removes the panel. **Apply** sets the segment/string with the values in the panel fields and leaves the panel on the screen.

Please continue to the next section [Text](#)

Text

Selecting Segment=>Text brings up the **Super Segment Text** panel which is used to set the text for segments.



As soon as **Text** is chosen, the segment text for the first segment is shown.

A particular segment can be selected by first clicking on the icon at the end of the **Segment index** field, and then selecting the required segment, or by typing a number into the **Segment index** field and pressing <enter>.

Similarly the **Prev** and **Next** buttons can be used to move to adjacent segments.

When a segment is selected, its *segment text* is written to the appropriate panel fields.
if any panel fields are modified, selecting either **OK** or **Apply** will store the new information for the segment.

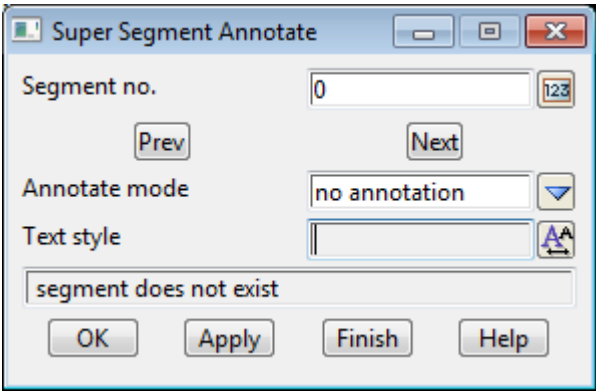
The fields and buttons used in the **Super Segment Text** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Segment index <i>if a segment is selected, then its segment index is displayed in this field.</i>	number box	selected vertex	
Prev <i>move to the previous segment (predecessor). The information for the new segment is displayed in the panel fields.</i>	button		
Next <i>move to the next segment (successor). The information for the next new is displayed in the panel fields.</i>	button		
Text mode <i>if no text, there is no text for the segment.</i> <i>if entire string, then the string has the same text for each segment.</i> <i>if each segment, then each segment has a separate text value.</i>	choice box		no text, entire string, each segment
Text <i>the text used for the segment or for the entire string.</i>	text box	text of segment/string	
OK/Apply <i>for the segment being edited, OK sets the segment/string with the values in the panel fields and removes the panel. Apply sets the segment/string with the values in the panel fields and leaves the panel on the screen.</i>	button		

Please continue to the next section [Annotate](#)

Annotate

Selecting **Annotate** brings up the **Super Segment Annotate** panel which is used to set the annotation styles for the text at segments.



As soon as **Annotate** is chosen, the annotation information for the first segment is shown.
A particular segment can be selected by first clicking on the icon at the end of the **Segment index** field, and then selecting the required segment, or by typing a number into the **Segment index** field and pressing <enter>.
Similarly the **Prev** and **Next** buttons can be used to move to adjacent segments.

When a segment is selected, its *annotation* information is written to the appropriate panel fields. if any panel fields are modified, selecting either **OK** or **Apply** will store the new information for the segment.

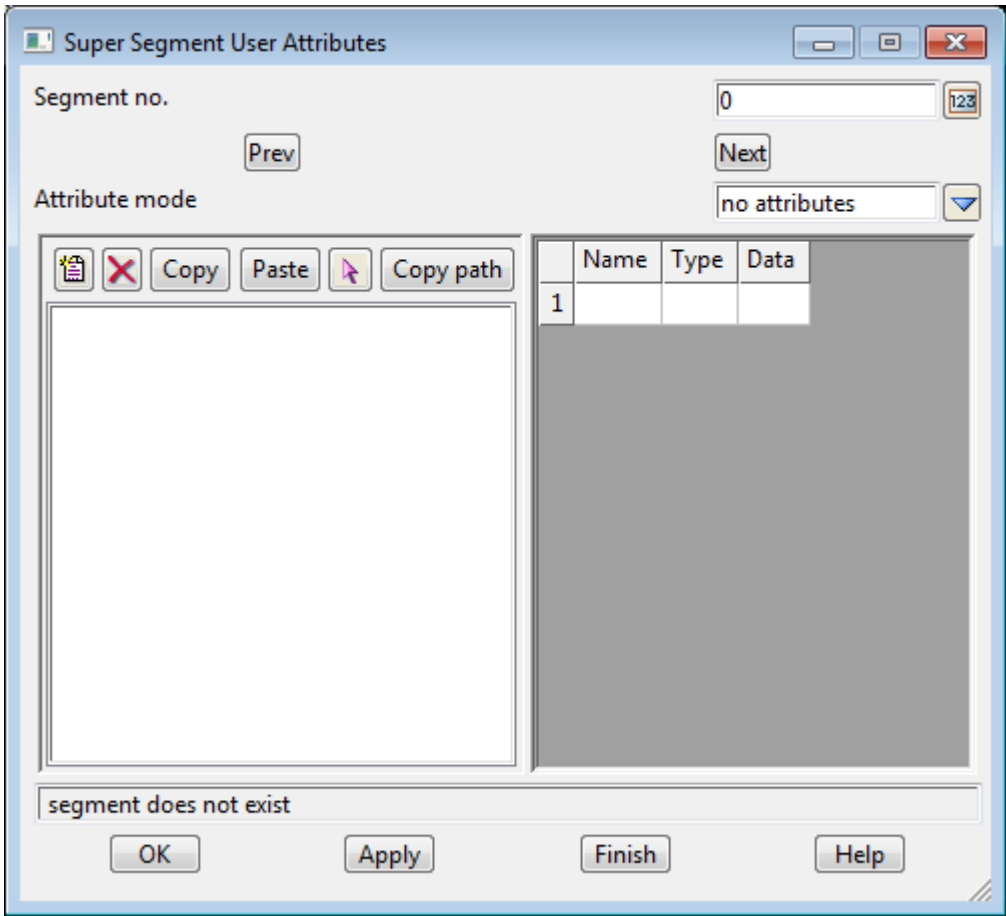
The fields and buttons used in the **Super Segment Annotate** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Segment index	number box	selected vertex	
<i>if a segment is selected, then its segment index is displayed in this field.</i>			
Prev	button		
<i>move to the previous segment (predecessor). The information for the new segment is displayed in the panel fields.</i>			
Next	button		
<i>move to the next segment (successor). The information for the new segment is displayed in the panel fields.</i>			
Annotate mode	choice box	no annotation, entire string, each segment	
<i>if no annotation, then the text at the segment is not displayed.</i>			
<i>if entire string, then the same annotation settings are used all each segments and the Text style information is given in the Text style field.</i>			
<i>if each segment, then each segment has separate annotations settings and the Text style information for each segment is given in the Text style field.</i>			
Text style	textstyle data box		
<i>textstyle information.</i>			
OK/Apply	button		
<i>for the segment being edited, OK sets the segment/string with the values in the panel fields and removes the panel. Apply sets the segment/string with the values in the panel fields and leaves the panel on the screen.</i>			

Please continue to the next section [Attributes](#)

Attributes

Selecting **Attributes** brings up the **Super Segment User Attributes** panel which is used to display and edit user defined attributes at segments of the super string.



As soon as **Attributes** is chosen, the attributes for the first segment are shown.

A particular segment can be selected by first clicking on the icon at the end of the **Segment index** field, and then selecting the required segment, or by typing a number into the **Segment index** field and pressing <Enter>.

Similarly the **Prev** and **Next** buttons can be used to move to adjacent segments.

When a segment is selected, its *attribute* information is written to the appropriate panel fields. if any panel fields are modified, selecting either **OK** or **Apply** will store the new information for the segment.

The fields and buttons used in the **Super Segment User Attributes** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Segment index	number box	selected vertex	
<i>if a segment is selected, then its segment index is displayed in this field.</i>			
Prev	button		
<i>move to the previous segment (predecessor). The information for the new segment is displayed in the panel fields.</i>			
Next	button		
<i>move to the next segment (successor). The information for the new segment is displayed in the panel fields.</i>			

Attribute mode choice box no attributes, each segment

*if **no attributes**, then no segments have user attributes.*

*if **each segment**, then each segment can have user attributes.*

Name/Type/Data Grid

Name input

name for the user attribute. This must be unique for all attributes at this segment.

Type choice box integer, real, text

type of the attribute.

Data Grid grid

values for the attributes.

OK/Apply button

*for the segment being edited, **OK** sets the segment with the values in the panel fields and removes the panel. **Apply** sets the segment with the values in the panel fields and leaves the panel on the screen.*

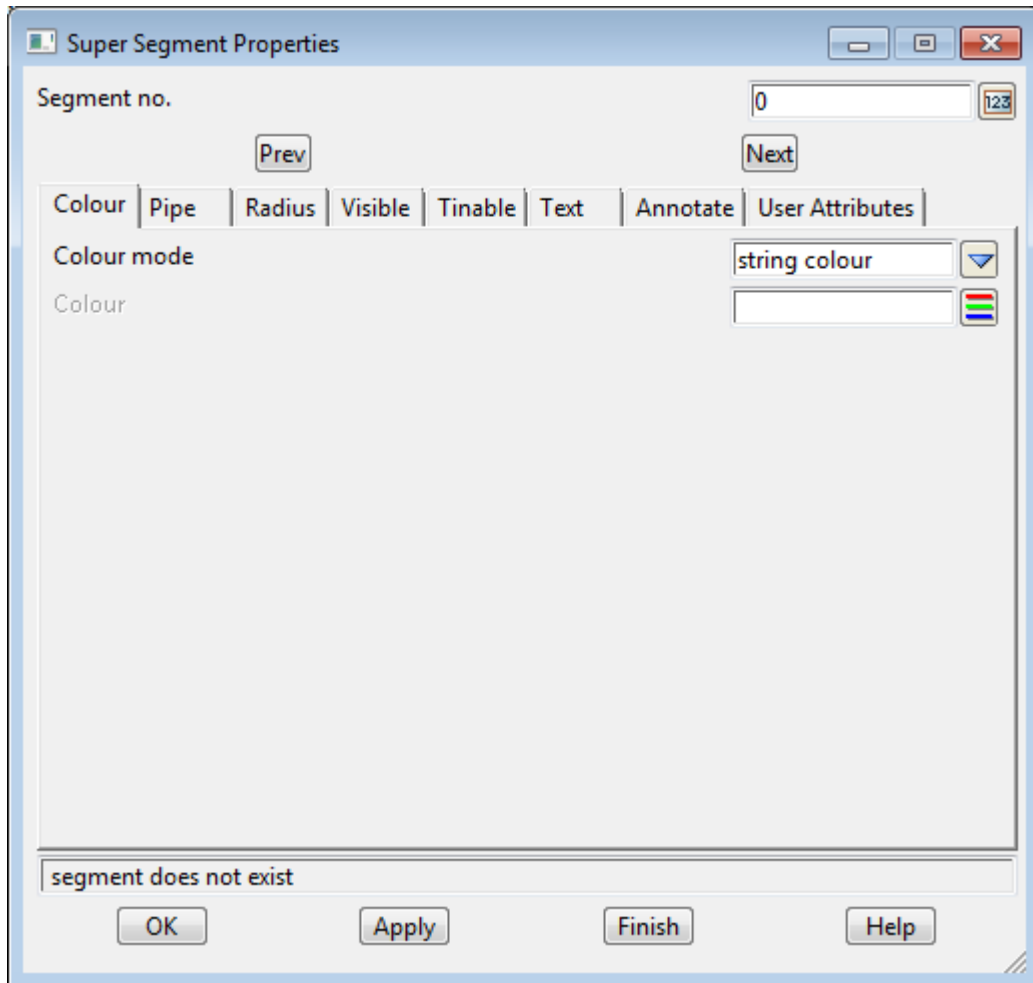
Please continue to the next section [All Segment Properties](#)

All Segment Properties

Selecting **All properties** brings up the **Super Segment Properties** panel which is used to display all the properties of a segment.

This option is also available from the *Strings* menu

Position of option on menu: Strings =>Properties =>Segment (all)



As soon as **All segment properties** is chosen, the colour information for the first segment is shown. Clicking on the various tabs will show the various segment information for the first segment.

A particular segment can be selected by first clicking on the icon at the end of the **Segment index field**, and then selecting the required segment.

When the segment to modify is selected, its *segment index* and all other *information* are written to the appropriate panel fields.

Another segment can then be selected or the **Prev** and **Next** buttons used to move to adjacent segments and display data for that segment.

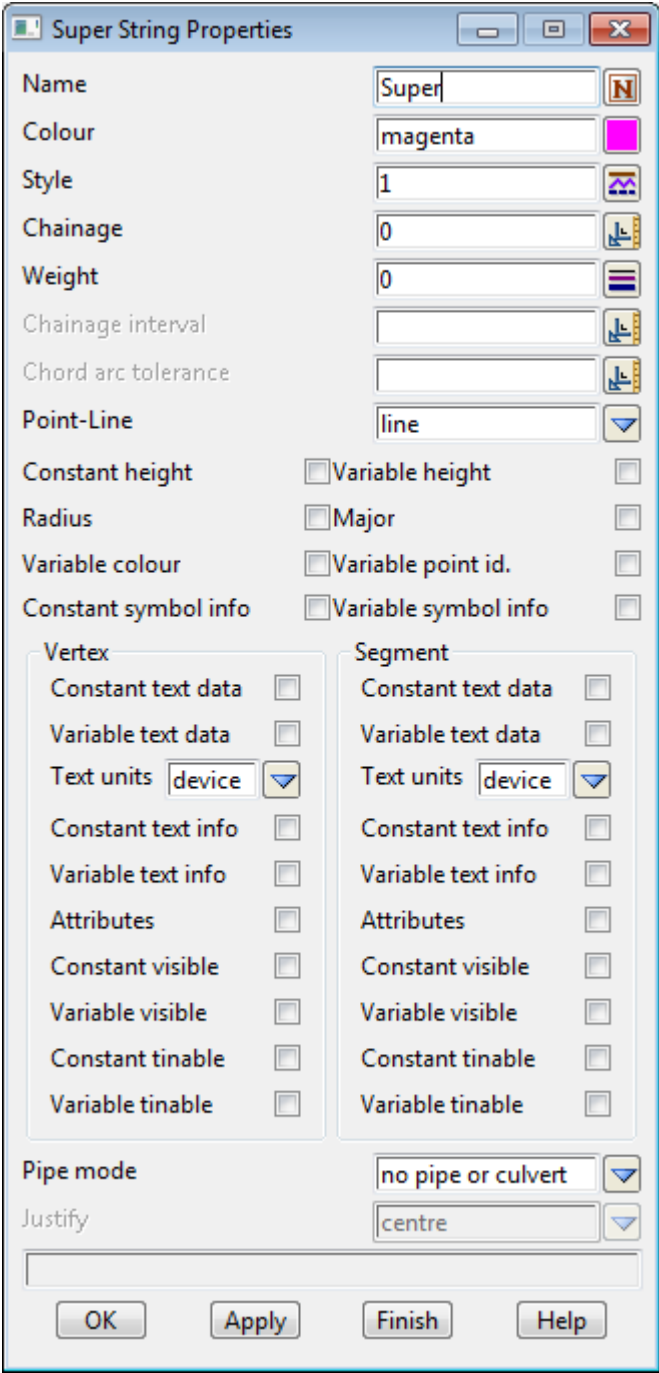
After any panel fields are modified, selecting either **OK** or **Apply** will change the information for the segment.

The fields in each of the tabs for the **Super Segment Properties** panel have already been described in the other options on the Segment Toolbar. See [Segment Toolbar](#).

For information on the Properties Toolbar, please continue to the next section [Properties Toolbar](#)

Properties Toolbar

Selecting **Properties** brings up the **Super String Properties** panel which is used to modify the string’s header information.



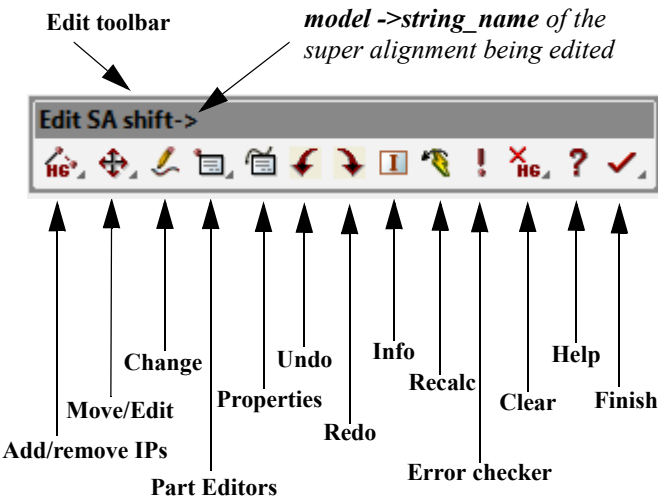
The fields in this panel are similar to those in the **Create Super String** panel and the Super String Editor options. The only new field is

Field Description	Type	Defaults	Pop-Up
OK/Apply	button		

*for the string being edited, **OK** sets the string with the values in the panel fields and removes the panel. **Apply** sets the string with the values in the panel fields and leaves the panel on the screen.*

Edit Super Alignment

On picking a super alignment, the Super Alignment Edit menu is placed on the screen.

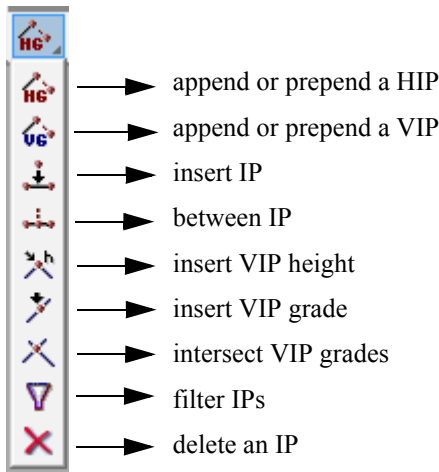


For the option Add/ Remove toolbar go to
Move/Edit toolbar
Change icon
Part Editors toolbar
Properties toolbar
Undo icon
Redo icon
Info icon
Recalc icon
Error Checker icon
Clear toolbar
Help icon
Finish toolbar

- [SA - Add/Remove IPs Toolbar](#)
- [SA - Move/Edit Toolbar](#)
- [SA - Change Icon](#)
- [SA - Part Editors Toolbar](#)
- [SA - Super Alignment Properties Icon](#)
- [SA - Undo and Redo Icons](#)
- [SA - Undo and Redo Icons](#)
- [SA - Info Icon](#)
- [SA - Recalc Icon](#)
- [SA - Error Checker Icon](#)
- [SA - Clear Toolbar](#)
- [SA - Help Icon](#)
- [SA - Finish Toolbar](#)

SA - Add/Remove IPs Toolbar

The **Add/Remove IPs** toolbar is



The **Append** operations for a super alignment string are similar to the 2d string case except that there are separate **Append** options for the horizontal and vertical geometry of the string.

For the option *Append HIP* go to [SA - Append/Prepend HIP - Horizontal Geometry](#)
For the option *Append VIP* go to [SA - Append/Prepend VIP - Vertical Geometry](#)

The **Insert IP**, **Between IP** and **Delete IP** work on the horizontal geometry if used on a plan view, and if used on a section view that the super alignment is profiled on, they work on the vertical geometry.

For the option *Insert IP* go to [SA - Insert IP](#)
For the option *Between IP* go to [SA - Between IP](#)
For the option *Delete IP* go to [SA - Delete IP](#)

For the option *Insert VIP Height*, go to [SA - Insert VIP Height](#)
For the option *Insert VIP Grade* go to [SA - Insert VIP Grade](#)
For the option *Intersect VIP Grades* go to [SA - Intersect VIP Grades](#)
For the option *Filter IPs* go to [SA - Filter IPs](#)
For the option *Delete an IP* go to [SA - Delete IP](#)

SA - Append/Prepend HIP - Horizontal Geometry

The **Append HIP** option is used in a plan view to create the first horizontal intersection point (HIP) in a new super alignment string and then append further HIPs, or for an existing super alignment string to append news HIPs to the end of the string, or to new HIPs to the beginning of the string. In this option, both appending and prepending will be referred to as Appending.

Existing Super Alignment

Appending an HIP is a two step process.

Step (a) - selecting the end to Append the HIP to.

After picking **Append HIP**, the end of the string to append the point to is selected. Once the string end is selected, the new HIP is assumed to be at the current cursor location. As the cursor is moved, the string is redrawn reflecting the changing position of the appended intersection point

screen message area <Pick end to append to> [picks][fast][Menu>

Step (b) - selecting the position for the new appended HIP.

The position of the new appended HIP is set to the current cursor position by picking (LB) and accepting (MB).

screen message area <Pick IP location or (r)elative, (b)earing/distance> [picks][fast][Menu

Once an HIP has been appended to the string, the appended HIP is considered to be the selected string end and a new Append cycle begins. That is, stage (a) is already set up. The current cursor position indicates the new position of the next appended HIP.

Hence a **series** of HIPs is easily entered by first selecting the string end in a plan view that the new points are to be appended to (step (a)) and then moving the cursor to the position of each new point in turn and selecting it.

Typed input: **r** for relative, **b** for bearing-distance can be used in either step.

New Super Alignment

When the **Append HIP** option is selected, a cross will appear on any plan views that have the super alignment string's model on them.

screen message area <Pick start IP location> [picks][fast][Menu>

The first HIP is then selected by the standard pick (LB) and accept (MB).

The option then continues as if appending to an existing super alignment string where the end HIP has already been accepted.

Typed input: **r** for relative, **b** for bearing-distance can be used in either step.

The **Append HIP** option is terminated by either pressing RB to bring up the **Pick Ops** menu and selecting **Cancel** or by selecting a new option from the **Edit SA** toolbar.

If, after bringing up the **Pick Ops** menu, it is decided to continue with the **Append HIP** option, simply select the **Restart** option from the **Pick Ops** menu and the **Pick Ops** menu will disappear leaving the **Append HIP** option still current.

SA - Append/Prepend VIP - Vertical Geometry

The **Append HIP** option is used in a **section** view to create vertical geometry for a super alignment that **must already have some horizontal geometry**. The existing super alignment needs to be the **primary** string on the section view. That is, it is the string **profiled** on the section view that is going to be used to create the vertical geometry. This can be achieved by using either the **VG edit** or the **Profile** option from the section view menu

Note: on a section view, the option **Utilities =>VG edit** takes the selected super alignment and profiles it on the section view and also opens the **SA Editor** for the string.

The **Append HIP** option can the first vertical intersection point (VIP) in an existing super alignment string that has **no vertical geometry**, and then appends further VIPs, or for an existing super alignment string **with vertical geometry**, OR appends new VIPs to the end or the beginning of the vertical geometry of the string. In this option, both appending and prepending will be referred to as Appending.

Existing Vertical Geometry

Appending a VIP point is almost the same as for a HIP except that the co-ordinate system is (chainage,height) rather than (x,y) values.

Appending an VIP is a two step process.

Step (a) - selecting the end to Append the VIP to.

After picking **Append VIP**, the end of the vertical geometry to append the point to is selected in the section view. Once the vertical geometry end is selected, the new VIP is assumed to be at the current cursor location and as the cursor is moved, the string is redrawn reflecting the changing

position of the appended VIP

screen message area <Pick end to append to> [picks][fast][Menu>

Step (b) - selecting the position for the new appended HIP.

The position of the new appended VIP is set to the current cursor position by picking (LB) and accepting (MB).

screen message area <Pick IP location or (r)elative, (g)rade/height> [picks][fast][Menu

Once a VIP has been appended to the string, the appended VIP is considered to be the selected vertical geometry end and a new Append cycle begins. That is, stage (a) is already set up. The current cursor position in the section view indicates the new position of the next appended VIP.

Typed input: **r** for relative, **g** for grade-height can be used in either step.

Hence a **series** of VIPs is easily entered by first selecting the vertical geometry end that the new points are to be appended to (step (a)) and then moving the cursor to the position of each new point in turn and selecting them in.

New Vertical Geometry

Creating the **first VIP** is similar to the first HIP.

When the **Append VIP** option is selected, a cross will appear on any section views that have the super alignment string profiled on them.

screen message area <Pick start IP location> [picks][fast][Menu>

The first VIP is then selected by the standard pick (LB) and accept (MB).

The option then continues as if appending to an existing vertical geometry where the end point has already been accepted.

Typed input: **r** for relative, **g** for grade-height can be used in either step.

The **Append VIP** option is terminated by either pressing RB to bring up the **Pick Ops** menu and selecting **Cancel** or by selecting a new option from the **Edit SA** toolbar.

If, after bringing up the **Pick Ops** menu, it is decided to continue with the **Append VIP** option, simply select the **Restart** option from the **Pick Ops** menu and the **Pick Ops** menu will disappear leaving the **Append VIP** option still current.

SA - Insert IP

The **Insert** option is designed to place a new HIP or VIP between two adjacent IPs.

Insert IP works on the horizontal or the vertical geometry depending on whether a plan or section view is used for the editing.

The inserted IP does not have to be on the line joining the two intersection points - the **Between IP** option is used to guarantee that the IP is on the IP-IP line.

Inserting an IP is a two step process.

Step (a) - selecting the IP's to be on either side of the new intersection point

The two adjacent IPs are chosen by selecting the **line** connecting the two intersection points. Once the line is selected, the new IP is assumed to be at the current cursor position. As the cursor is moved, the string is redrawn reflecting the changing position of the inserted IP.

For horizontal and vertical inserts

screen message area <Pick position to insert point> [picks][fast][Menu>

Step (b) - selecting the position for the new IP

The position of the new IP is set to the current cursor position by picking (LB) and accepting

(MB).

screen message area <Pick final position of point> [picks][fast][Menu>

Once the insert cycle is completed and the IP inserted, the Insert IP option is still current and can be repeated for other insertions (in either plan or section views) without having to re-select the Insert IP option.

The **Insert IP** option is terminated by selecting **Cancel** from the **Pick Ops** menu or by selecting a new option from the **Edit SA** toolbar.

If, after bringing up the **Pick Ops** menu, it is decided to continue with the **Insert IP** option, simply select the **Restart** option from the **Pick Ops** menu and the **Pick Ops** menu will disappear leaving the **Insert IP** option still current.

SA - Between IP

The **Between IP** option is similar to the **Insert IP** option (see [SA - Insert IP](#)) except the inserted point **does** have to be **on the line** joining the two IPs. To accomplish this, the cursor position is automatically projected onto the IP-IP line to give the new IP position.

The **Between IP** option is terminated by selecting **Cancel** from the **Pick Ops** menu or by selecting a new option from the **Edit SA** toolbar.

If, after bringing up the **Pick Ops** menu, it is decided to continue with the **Between IP** option, simply select the **Restart** option from the **Pick Ops** menu and the **Pick Ops** menu will disappear leaving the **Between IP** option still current.

SA - Insert VIP Height

The **Insert VIP Height** option is used to insert a vertical intersection point (VIP) into the super alignment by clicking on the super alignment in either plan or section view to select the chainage that the VIP is to be inserted at, and then giving the height for the VIP.

So inserting the VIP is a two step process.

Step (a) - selecting the chainage for the VIP to inserted

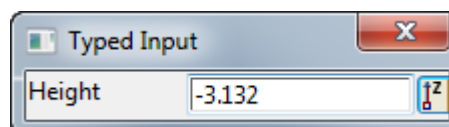
After selecting **Insert VIP Height**, a chainage to insert the new VIP at is selected by picking (LB) and accepting (MB) at that position on the super alignment.

For horizontal and vertical inserts

screen message area <Select point to add VIP> [picks][fast][Menu>

Step (b) - giving the height for the new VIP

After the chainage of the new VIP is selected, a **Height** Typed Input box is placed on the screen with the height of the super alignment at the selected chainage already displayed.



The required value is type into the **Height** Typed Input box and <Enter>.

The **Height** Typed Input box is removed from the screen and the new VIP inserted into the super alignment.

Once the Insert VIP cycle is completed and the VIP inserted, the **Insert VIP Height** is still current and can be repeated for other insertions (in either plan or section views) without having to re-select the **Insert VIP Height** option.

The **Insert VIP Height** option is terminated by selecting **Cancel** from the **Pick Ops** menu or by selecting a new option from the **Edit SA** toolbar.

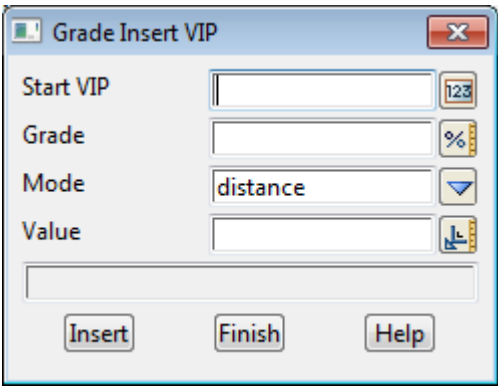
If, after bringing up the **Pick Ops** menu, it is decided to continue with the **Insert VIP Height** option, simply select the **Restart** option from the **Pick Ops** menu and the **Pick Ops** menu will disappear leaving the **Insert VIP Height** option still current.

SA - Insert VIP Grade

The **Insert VIP Grade** option inserts a vertical intersection point (VIP) at a given grade from an existing VIP.

The new VIP position is given by either a distance from the picked VIP or at given chainage on the super alignment.

After selecting **Insert VIP Grade**, the **Grade Insert VIP** panel is displayed.



The fields and buttons used in the panel have the following functions.

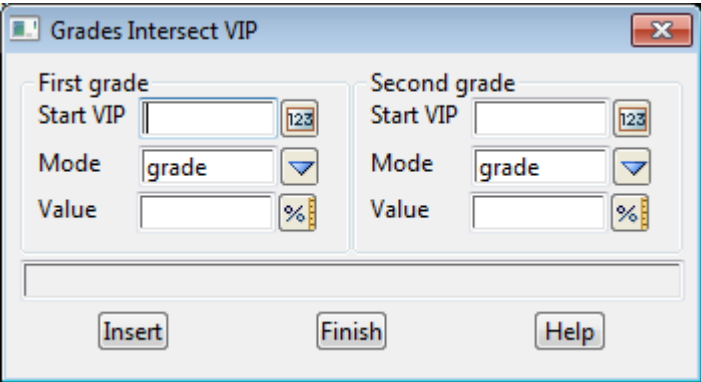
Field Description	Type	Defaults	Pop-Up
Start VIP	VIP number box		
<i>the VIP number whose (chainage, height) position is used to start the Grade Insert from.</i>			
<i>The number can either be typed in, or if MB is clicked in the panel field, a VIP can be selected from a section view and its VIP number is piped into the Start VIP field.</i>			
Grade	measure x-fall box		
<i>percent grade to be used.</i>			
Note	<i>positive is up when going in the direction of increasing chainage and negative is up when going in the direction of decreasing chainage.</i>		
Mode	choice	distance	distance, chainage
<i>if distance, the new VIP is inserted at the (chainage) distance given in the Value field from the start VIP, but with height determined by going with the given grade from the start VIP.</i>			
<i>If chainage, the new VIP is inserted at the chainage given in the value field but with height determined by going with the given grade from the start VIP.</i>			
Insert	button		
<i>insert the new VIP into the alignment string.</i>			

SA - Intersect VIP Grades

The **Intersect VIP Grades** option inserts a VIP which is given by intersecting lines of given grades from two existing VIPs in the (chainage,height) plane.

The grades are either typed in or calculated by giving another VIP that the line goes through.

After selecting the option, the **Grades Intersect VIP** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

First Grade

Start VIP	input
------------------	-------

the VIP number whose (chainage,height) position is the start of a line.

*The VIP number can either be typed in, or if MB is clicked in the panel field, a VIP can be selected from a section view and its VIP number is piped into the **Start VIP** field.*

Mode	choice	grade	grade, VIP #
-------------	--------	-------	--------------

*if **grade**, the field **Value** is a percent grade and a line is defined as going through the start VIP and with the given grade.*

*If **VIP #**, the field is **End VIP** and is the number of a VIP and a line is defined as going through the start VIP and this End VIP.*

***Note for grades** **positive** is **up** when going in the direction of **increasing chainage** and **negative** is **up** when going in the direction of **decreasing chainage**.*

Value or End VIP	input
-------------------------	-------

*if **mode** is **grade**, the box is called **Value** and the value is a percent grade.*

*if **mode** is **VIP #**, the box is called **End VIP** and the value is the number of a VIP.*

*For **End VIP**, The VIP number can either be typed in, or if MB is clicked in the panel field, a VIP can be selected from a section view and its VIP number is piped into the **End VIP** field.*

Second Grade

Start VIP	input
------------------	-------

the VIP number whose (chainage,height) position is the start of a line.

*The VIP number can either be typed in, or if MB is clicked in the panel field, a VIP can be selected from a section view and its VIP number is piped into the **Start VIP** field.*

Mode	choice	grade	grade, VIP #
-------------	--------	-------	--------------

*if **grade**, the field **Value** is a percent grade and a line is defined as going through the start VIP and with the given grade.*

*If **VIP #**, the field is **End VIP** and is the number of a VIP and a line is defined as going through the start VIP and this End VIP.*

*Note for grades positive is **up** when going in the direction of **increasing chainage** and
negative is **up** when going in the direction of **decreasing chainage**.*

Value or End VIP input

*if **mode** is grade, the box is called **Value** and the value is a percent grade.*

*if **mode** is VIP #, the box is called **End VIP** and the value is the number of a VIP.*

*For **End VIP**, The VIP number can either be typed in, or if MB is clicked in the panel field, a VIP can be selected from a section view and its VIP number is piped into the **End VIP** field.*

Insert button

calculate in (chainage,height) space the intersection of the two lines given above and insert it as a new VIP into the super alignment.

SA - Filter IPs

The **Filter IPs** option tries to remove redundant HIPs and VIPs. That is, IP's that are very close to one another, or extra IPs on a straight line.

The extra IPs are often created when data is loaded from a CAD package and the elements are not tangential.

The **Filter IPs** option terminates after it is run and then a new option needs to be selected from the **Edit SA** toolbar.

SA - Delete IP

The **Delete IP** option is used to delete HIPs or VIPs points from the super alignment.

After picking **Delete IP**, any selected IP in the string is deleted. The string, minus the deleted IP, is redrawn after each deletion.

Once an IP has been deleted, another IP in the selected string can be deleted. Hence any number of the IPs can be deleted, one after another.

A HIP is deleted if the IP is chosen from a plan view and a VIP deleted if the IP is selected from a section view.

For HIP and VIP deletes

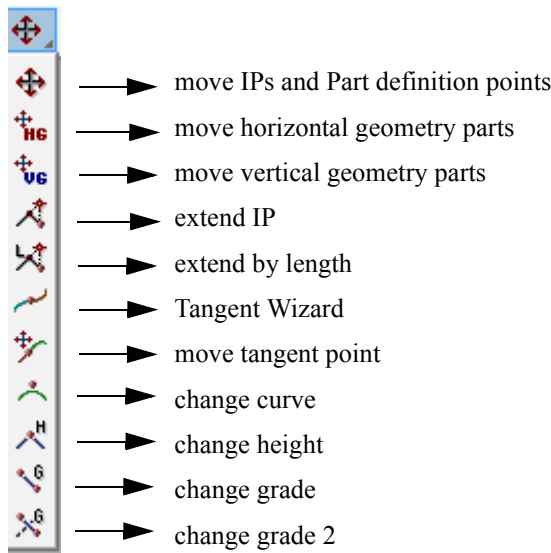
screen message area <Pick point to delete> [picks][fast][Menu>

The **Delete IP** option is terminated by selecting **Cancel** from the **Pick Ops** menu or by selecting a new option from the **Edit SA** toolbar.

If, after bringing up the **Pick Ops** menu, it is decided to continue with the **Delete IP** option, simply select the **Restart** option from the **Pick Ops** menu and the **Pick Ops** menu will disappear leaving the **Delete IP** option still current.

SA - Move/Edit Toolbar

The **Move/Edit** toolbar is



The **Move IP**, **Move Tangent** and **Extend IP** work on the horizontal geometry if used in a plan view and if used in a section view that the super alignment is profiled on, they work on the vertical geometry.

For the option *Move IP* go to
 Move HG parts
 Move VG parts
 Extend IP
 Extend by length
 Tangent Wizard
 Move Tangent
 Change curve
 Change height
 Change grade
 Change grade 2

[SA - Move](#)
[SA - Move HG Parts](#)
[SA - Move VG Parts](#)
[SA - Extend IP](#)
[SA - Extend by Length](#)
[SA - Tangent Wizard](#)
[SA - Move Tangent Point](#)
[SA - Change Curve](#)
[SA - Change Height](#)
[SA - Change Grade](#)
[SA - Change Grade 2](#)

SA - Move

The **Move** option allows the user to move

individual HIPs or Horizontal Parts definition points if the points are selected in a plan view

individual VIPs or Vertical Parts definition points if the points are selected in a section view
that the super alignment is profiled on.

The **Move** cycle consists of two steps:

- (a) selecting the point to be moved
- (b) selecting the new position for the point.

Step (a)

First the point to be moved is selected. The selected point will then move around the view as the cursor is moved. The IPs/Parts recalculate and redraw as the point is moved.

screen message area <Pick point to move> [picks][fast][Menu>

Step (b)

The current cursor position is selected as the new position for the point by picking (LB) and accepting (MB). The point being moved is then anchored at the cursor position and the string redrawn.

screen message area <Pick final position of point> [picks][fast][Menu>

Once the **Move** cycle is completed and the point moved, the **Move** option is still current and can be repeated for other points without having to re-select the **Move** option.

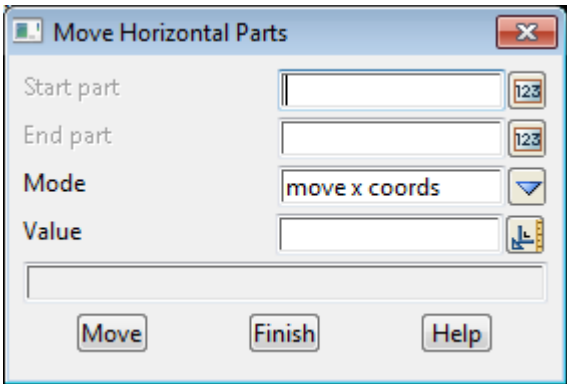
The **Move** option is terminated by selecting **Cancel** from the **Pick Ops** menu or by selecting a new option from the **Edit SA** toolbar.

If, after bringing up the **Pick Ops** menu, it is decided to continue with the **Move** option, simply select the **Restart** option from the **Pick Ops** menu and the **Pick Ops** menu will disappear leaving the **Move** option still current.

SA - Move HG Parts

Move HG Parts translates the X or the Y coordinates for a given range of Horizontal Parts in the super alignment being edited.

Clicking on the Move HG Parts icon brings up the Move Horizontal Parts panel.



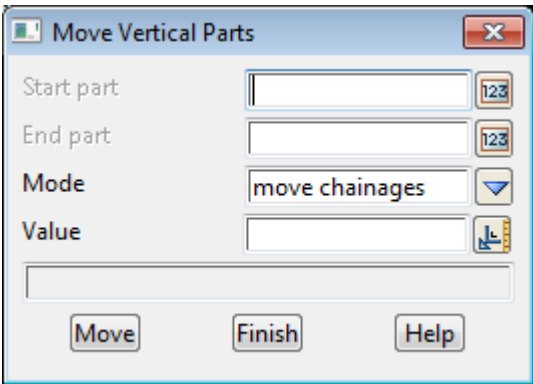
The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Start part <i>the number of the Part in the Horizontal Geometry to start translating in x or y. Clicking MB in the field or RB on the number icon brings up the Same as picker and a Horizontal Part from the super alignment can be selected from a plan view and the Part Number will be piped into the field.</i>	input box		
End part <i>the number of the Part in the Horizontal Geometry to end the translating in x or y. Clicking MB in the field or RB on the number icon brings up the Same as picker and a Horizontal Part from the super alignment can be selected from a plan view and the Part Number will be piped into the field.</i>	input box		
Mode <i>if Mode is move x coords, the x coordinates of all the parts from the Start part to End part are translated by Value. if Mode is move y coords, the y coordinates of all the parts from the Start part to End part are translated by Value.</i>	choice box	move x coords, move y coords	
Value <i>the distance to move the coordinates.</i>	measure box		Measure X or Measure Y
Move <i>move the specified coordinates for the given range of Horizontal Parts.</i>	button		

SA - Move VG Parts

Move VG Parts translates the chainages or the heights for a given range of Vertical Parts in the super alignment being edited.

Clicking on the Move VG Parts icon brings up the Move Vertical Parts panel.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Start part <i>the number of the Part in the Vertical Geometry to start translating in chainage or height. Clicking MB in the field or RB on the Number icon brings up the Same as picker and a Vertical Part from the super alignment can be selected from a section view, and the Part Number piped into the field.</i>	input box		
End part <i>the number of the Part in the Vertical Geometry to end the translating in chainage or height. Clicking MB in the field or RB on the Number icon brings up the Same as picker and a Vertical Part from the super alignment can be selected from a section view and the Part Number will be piped into the field.</i>	input box		
Mode <i>if Mode is move chainages, the chainage coordinates of all the parts from the Start part to End part are translated by Value.</i> <i>if Mode is move heights, the height coordinates of all the parts from the Start part to End part are translated by Value.</i>	choice box	move x coords, move y coords	
Value <i>the distance to move the coordinates</i>	measure box		Measure Chainage or Measure Z
Move <i>move the specified coordinates for the given range of Vertical Parts</i>	button		

SA - Move Tangent Point

The **Move Tangent** option allows the user to move

individual horizontal tangent points in a plan view if the horizontal tangent point (HTP) is part of an HIP with a curve on it but no approaching or departing transitions.

individual vertical tangent points in a section view that the super alignment is profiled on if the vertical tangent point (VTP) is part of a VIP with a parabola or curve on it.

The **Move Tangent** cycle consists of two steps:

- (a) selecting the tangent point (TP) to be moved
- (b) selecting the new position for the TP.

Step (a)

First the tangent point to be moved is selected. The selected point will then move around the view as the cursor is moved.

If a horizontal tangent point is selected, the string will be redrawn with the HTP moved to the cursor position and the circular curve radius will be modified appropriately.

If a vertical tangent point is selected, the string will be redrawn with the VTP moved to the cursor position and the vertical curve modified appropriately.

screen message area <Pick tangent to extend> [picks][fast][Menu>

Step (b)

The current cursor position is selected as the new position for the point by picking (LB) and accepting (MB). The tangent being moved is then anchored at the cursor position and the string redrawn.

screen message area <Pick final position of tangent> [picks][fast][Menu>

Once the Move Tangent cycle is completed and the TP moved, the **Move Tangent** option is still current and can be repeated for other tangent points without having to re-select the **Move Tangent** option.

The **Move Tangent** option is terminated by selecting **Cancel** from the **Pick Ops** menu or by selecting a new option from the **Edit SA** toolbar.

If, after bringing up the **Pick Ops** menu, it is decided to continue with the **Move Tangent** option, simply select the **Restart** option from the **Pick Ops** menu and the **Pick Ops** menu will disappear leaving the **Move Tangent** option still current.

SA - Extend IP

The **Extend IP** option is used to move an IP along the line joining the IP to its neighbouring IP.

That is, in a plan view, the bearing of the HIP-HIP line is kept constant and the intersection point is moved along that line either **towards** or **away** from its neighbouring intersection point on the HIP-HIP line.

In a section view, the grade of the VIP-VIP line is kept constant and the vertical intersection point is moved along that line either **towards** or **away** from its neighbouring intersection point on the VIP-VIP line.

Extending, like moving an IP, is a two step process.

Step (a) - selecting the IP-IP line and the IP to be moved along that line

The IP-IP line **and** the intersection point to be moved are chosen in the one operation by selecting a position near the IP-IP line and close to the intersection point to be moved along that line.

screen message area <Pick point to extend> [picks][fast][Menu>

Once the line and IP are selected, the new position of the selected IP is assumed to be at the current cursor position projected perpendicularly onto the IP-IP line. As the cursor is moved, the string is redrawn reflecting the changing position of the moved IP.

Step (b) - selecting the final position for the IP

The current cursor position is selected as the new position for the IP by picking (LB) and accepting (MB). The final position for the intersection point is set to the projection of the selected cursor position onto the IP-IP line.

screen message area <Pick final position of point> [picks][fast][Menu>

Once the **Extend IP** is completed, the extend option is still current and can be repeated without re-selecting the **Extend IP** option.

The **Extend IP** option is terminated by selecting **Cancel** from the **Pick Ops** menu or by selecting a new option from the **Edit SA** toolbar.

If, after bringing up the **Pick Ops** menu, it is decided to continue with the **Extend IP** option, simply select the **Restart** option from the **Pick Ops** menu and the **Pick Ops** menu will disappear leaving the **Extend IP** option still current.

Note - **Extend IP** can be used on the end points of the horizontal or vertical geometry of a super alignment string.

SA - Extend by Length

The **Extend by length** option is used to move a horizontal IP or vertical IP by a given length along the line joining the IP to its neighbouring IP.

A horizontal IP is modified in a plan view and the bearing of the HIP-HIP line is kept constant and the intersection point is moved by a given length along that line either **towards** or **away** from its neighbouring intersection point on the HIP-HIP line.

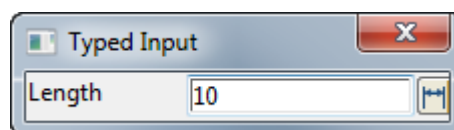
A vertical IP is modified in a section view and the grade of the VIP-VIP line is kept constant and the vertical intersection point is moved along that line either **towards** or **away** from its neighbouring intersection point on the VIP-VIP line.

To modify a horizontal IP, the string is edited in a plan view. To modify a vertical IP, the string is edited in a section view.

The IP-IP line **and** the intersection point to be moved are chosen in the one operation by selecting a position near the IP-IP line and close to the intersection point to be moved along that line.

screen message area <[F]orward: pick IP to extend, (or [B]ackward)> [picks][fast][Menu]

Once the line and IP are selected, a **Length Typed Input** box is displayed and the required length typed into the box and <Enter> pressed.



The IP then moves to its new position.

Note: When in Forward mode, the IP moves along the selected segment. When in Backward mode, the IP moves along the segment on the other side of the selected IP.

The default is Forward. To select Backward mode, type 'B'. To select Forward mode, type 'F'.

Once the **Extend by length** is completed, the extend option is still current and can be repeated without re-selecting the **Extend by length** option.

The **Extend by length** option is terminated by selecting **Cancel** from the **Pick Ops** menu or by selecting a new option from the **Edit SA** toolbar.

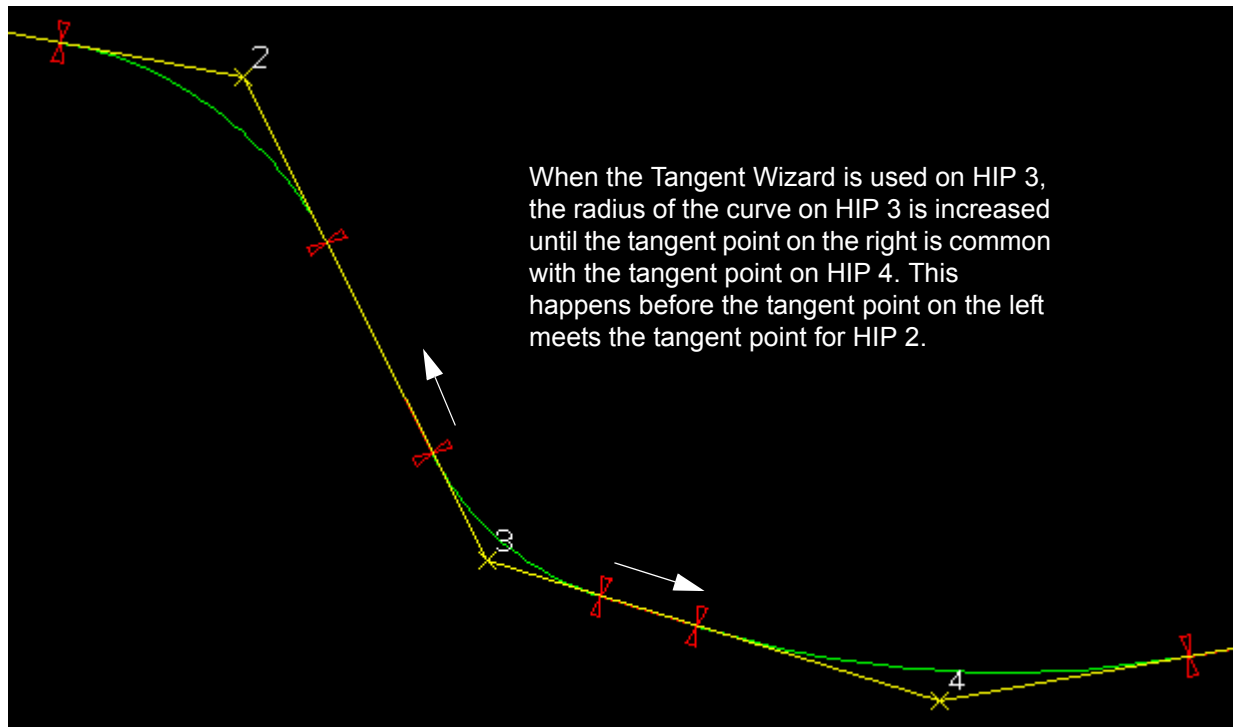
If, after bringing up the **Pick Ops** menu, it is decided to continue with the **Extend by length** option, simply select the **Restart** option from the **Pick Ops** menu and the **Pick Ops** menu will disappear leaving the **Extend by length** option still current.

Extend by length can be used on the end points of the horizontal or vertical geometry of a super alignment string.

SA - Tangent Wizard

The **Tangent Wizard** works for a HIP defined with just an arc on it and no transitions, or a VIP with a parabola or curve defined on it.

If a suitable HIP or VIP is selected, the **Tangent Wizard** modifies the curve/parabola on the selected HIP/VIP so that a common curve-curve tangent point is created on at least one side of the HIP/VIP.



When the **Tangent Wizard** run successfully, the **Tangent Wizard** option is still current and can be repeated without re-selecting **Tangent Wizard**. If an incorrect IP is selected, the **Tangent Wizard** terminates and an option needs to be selected from the **Edit SA** toolbar.

The **Tangent Wizard** option is terminated by selecting **Cancel** from the **Pick Ops** menu or by selecting a new option from the **Edit SA** toolbar.

If, after bringing up the **Pick Ops** menu, it is decided to continue with the **Tangent Wizard** option, simply select the **Restart** option from the **Pick Ops** menu and the **Pick Ops** menu will disappear leaving the **Tangent Wizard** option still current.

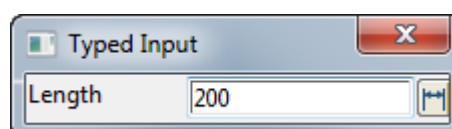
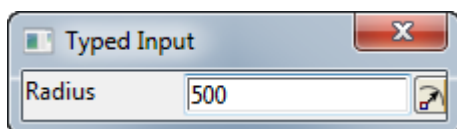
SA - Change Curve

The **Change Curve** option is used to change the defining value for the horizontal curve (radius or length) of a curve on a horizontal intersection point, or the defining value for the vertical curve (length, k-value or radius) on a vertical intersection point.

After selecting **Change Curve**:

screen message area <Pick IP to change curve info> [picks][fast][Menu>

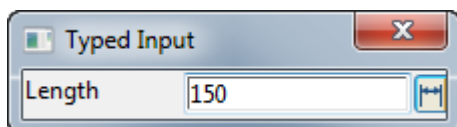
If an HIP is selected from a plan view, the value defining the horizontal curve (radius or length) on the HIP is displayed.



The required Radius (or Length) is typed into the Typed Input box and <Enter> pressed.

The HIP is given the new value and the Typed Input box is removed from the screen.

If an VIP is selected from a section view that the super alignment is profiled on, the value defining the vertical curve (length, k-value or length) on the VIP is displayed.



The required Length (or k value or Length) is typed into the Typed Input box and <Enter> pressed.

The VIP is given the new value and the Typed Input box is removed from the screen.

Once the curve value is changed, the **Change Curve** is still current and can be repeated for other IPs in the super alignment without having to re-select the **Change Curve** option.

The **Change Curve** option is terminated by selecting **Cancel** from the **Pick Ops** menu or by selecting a new option from the **Edit SA** toolbar.

If, after bringing up the **Pick Ops** menu, it is decided to continue with the **Change Curve** option, simply select the **Restart** option from the **Pick Ops** menu and the **Pick Ops** menu will disappear leaving the **Change Curve** option still current.

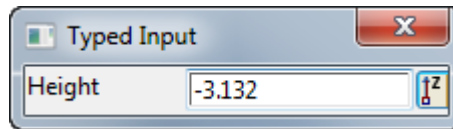
SA - Change Height

The **Change Height** option is used to change the height of an existing vertical intersection point (VIP).

After selecting **Change Height**, a VIP is selected from a section view that the super alignment is profiled on:

screen message area <Pick IP to change height> [picks][fast][Menu>

After the VIP is selected, a **Height** Typed Input box is placed on the screen with the height of the selected VIP already displayed.



The required height is typed into the **Height** Typed Input box and <Enter> pressed.

The **Height** Typed Input box is removed from the screen and the VIP is given the new height.

Once the height is changed, the **Change Height** is still current and can be repeated for other VIPs in the super alignment without having to re-select the **Change Height** option.

The **Change Height** option is terminated by selecting **Cancel** from the **Pick Ops** menu or by selecting a new option from the **Edit SA** toolbar.

If, after bringing up the **Pick Ops** menu, it is decided to continue with the **Change Height** option, simply select the **Restart** option from the **Pick Ops** menu and the **Pick Ops** menu will disappear leaving the **Change Height** option still current.

SA - Change Grade

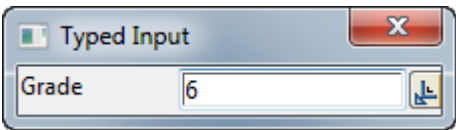
The **Change Grade** option is used to change the grade of the line between two consecutive vertical intersection points (VIPs) by moving the VIP at the selected end of the line up or down to achieve the given grade.

Note that the **chainage** position of the VIP remains the same and the **grade on both sides** of the moved VIP change.

After selecting **Change Grade**, the line joining consecutive VIP is **picked with direction** from a section view that the super alignment is profiled on

screen message area <Pick grade to change> [picks][fast][Menu>

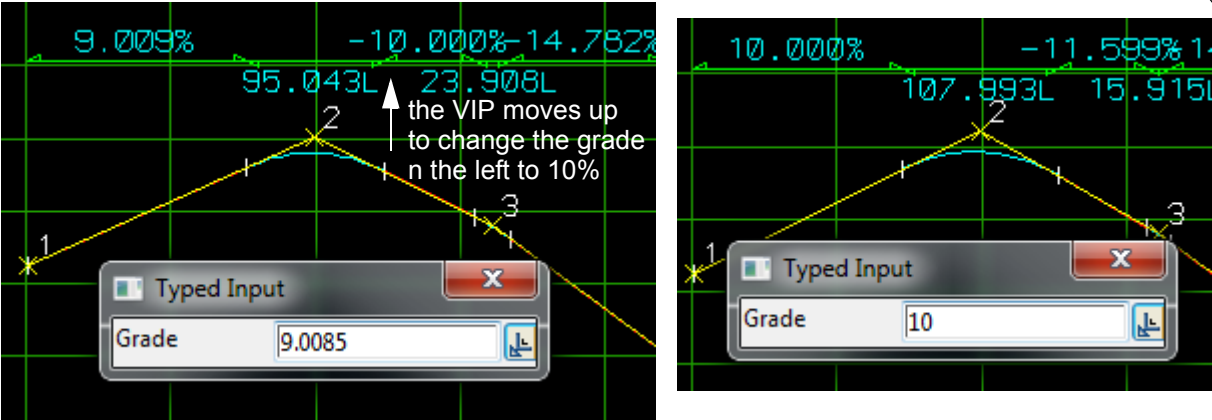
After the VIP is selected, a **Grade** Typed Input box is placed on the screen with the grade of the selected line, measured from left to right, is already displayed.



Note: going from left to right in the section view (that is, increasing chainage), **positive** grade is **up** and **negative** grade is **down**.

If the **line was picked with direction going from left to right** in the section view (increasing chainage), then the position of the **VIP at the left end of the line is kept constant** and the line is graded with the new grade and the **height of the VIP at the right end of the line is modified** so that it sits on the new graded line. The **chainage** of the VIP is kept **constant**. That is, the VIP just moves up or down until the new grade is reached.

The **Grade** Typed Input box is removed from the screen.



Change Grade: The line going from VIP 1 to VIP 2 with direction going from left to right. VIP 2 is moved up to give the new grade for the line between VIP 1 and VIP 2

If the **line was picked with direction going from right to left** in the section view (decreasing chainage), then the position of the VIP at the **right end of the line is kept constant** and the line is graded with the new grade and the **height of the VIP at the left end of the line is modified** so that it sits on the new graded line. The **chainage** of the VIP is kept **constant**. That is, the VIP just moves up or down until the new grade is reached.

The **Grade** Typed Input box is removed from the screen.

Once the grade is changed, the **Change Grade** is still current and can be repeated for other lines between VIPs in the super alignment without having to re-select the **Change Grade** option.

The **Change Grade** option is terminated by selecting **Cancel** from the **Pick Ops** menu or by selecting a new option from the **Edit SA** toolbar.

If, after bringing up the **Pick Ops** menu, it is decided to continue with the **Change Grade** option, simply select the **Restart** option from the **Pick Ops** menu and the **Pick Ops** menu will disappear leaving the **Change Grade** option still current.

SA - Change Grade 2

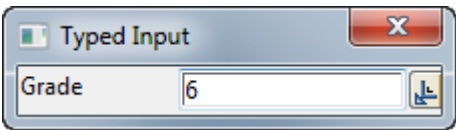
The **Change Grade 2** option is used to change the grade of the line between two consecutive vertical intersection points (VIPs) by sliding the VIP at the selected end of the line along the VIP-VIP line on the other side of the VIP so that the grade of the other line is not modified.

Note that the **chainage** position of the VIP changes and only the **grade on the selected line** of the moved VIP changes.

After selecting **Change Grade**, the line joining consecutive VIP is **picked with direction** from a section view that the super alignment is profiled on

screen message area <Pick grade to change> [picks][fast][Menu>

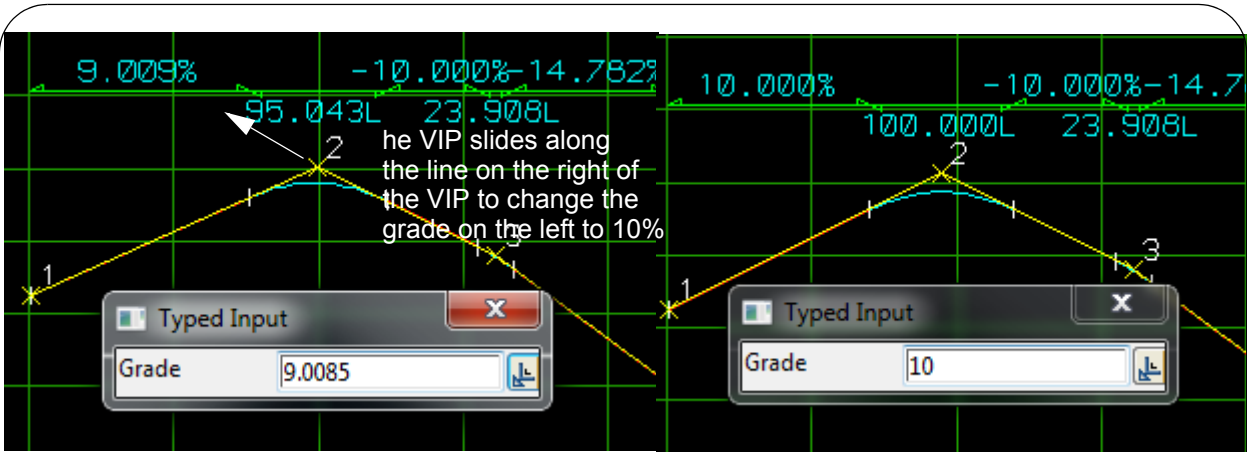
After the VIP is selected, a **Grade** Typed Input box is placed on the screen with the grade of the selected line, measured from left to right, is already displayed.



Note: going from left to right in the section view (that is, increasing chainage), **positive** grade is **up** and **negative** grade is **down**.

If the **line was picked with direction going from left to right** in the section view (increasing chainage), then the position of the **VIP at the left end of the line is kept constant** and the line is graded with the new grade by **sliding the VIP at the right end of the line** along the VIP-VIP line on the other side of the VIP to keep that grade constant. So the **grade on the other side** of the VIP is kept **constant**. That is, the VIP slides up or down the other line until the new grade is reached.

The **Grade** Typed Input box is removed from the screen.



Change Grade 2: The line going from VIP 1 to VIP 2 with direction going from left to right. VIP 2 is slid along the line between VIP2 and VIP 3 (keeping its grade constant) to give the new grade for the line between VIP 1 and VIP 2

If the **line was picked with direction going from right to left** in the section view (decreasing chainage), then the position of the **VIP at the right end of the line is kept constant** and the line is graded to the new grade by **sliding the VIP at the left end of the line** along the VIP-VIP line on the other side of the VIP to keep that grade constant. So the **grade on the other side** of the VIP is kept **constant**. That is, the VIP slides up or down the other VIP-VIP line until the new grade is reached.

The **Grade** Typed Input box is removed from the screen.

Once the grade is changed, the **Change Grade 2** is still current and can be repeated for other lines between VIPs in the super alignment without having to re-select the **Change Grade 2** option.

The **Change Grade 2** option is terminated by selecting **Cancel** from the **Pick Ops** menu or by selecting a new option from the **Edit SA** toolbar.

If, after bringing up the **Pick Ops** menu, it is decided to continue with the **Change Grade 2** option, simply select the **Restart** option from the **Pick Ops** menu and the **Pick Ops** menu will disappear leaving the **Change Grade 2** option still current.

SA - Change Icon

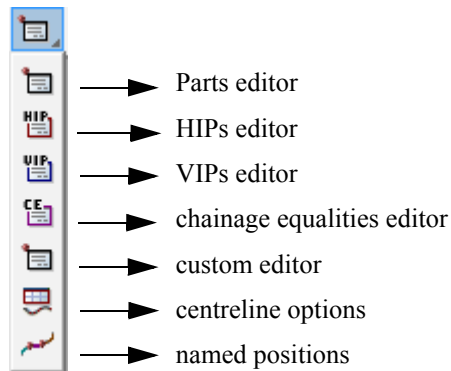
The **Change** icon is



Selecting this icon allows the user to change the radius of arcs placed by Parts.

SA - Part Editors Toolbar

The **Part Editors** toolbar is



For the option *Parts Editor*, go to

HIPs Editor

VIPs Editor

Chainage Equalities Editor

Custom Editor

Centreline Options

Named Positions

[SA - Parts Editor](#)

[SA - HIPs Editor](#)

[SA - VIPs Editor](#)

[SA - Chainage Equalities Editor](#)

[SA - Custom Superelevation and Widening Editor](#)

[SA - Centreline Options](#)

[SA - Named Positions](#)

SA - Parts Editor

Placing a super alignment consists of:

- (a) defining the horizontal geometry consisting of lines, arcs, transitions and tapers
- (b) defining the vertical geometry consisting of lines, parabolas and arcs.

A simple way to create horizontal and vertical geometry for the super alignment is by using horizontal intersection points (HIPs) with arcs and transitions (eg spirals), and vertical intersection points (VIP's) with parabolas or arcs for placing the vertical geometry.

However the super alignment also allows for more **complex construction methods** to define the lines, arcs and transitions (the horizontal elements) that within **12d Model** are be grouped together to make up the Parts of the horizontal geometry.

For example, a horizontal line is defined to be a given parallel offset of a selected line segment from another string. Or a more complex part such **Free Arc with Known Radius** that consists of the three elements: an arc of a known radius plus a leading and a trailing transition.

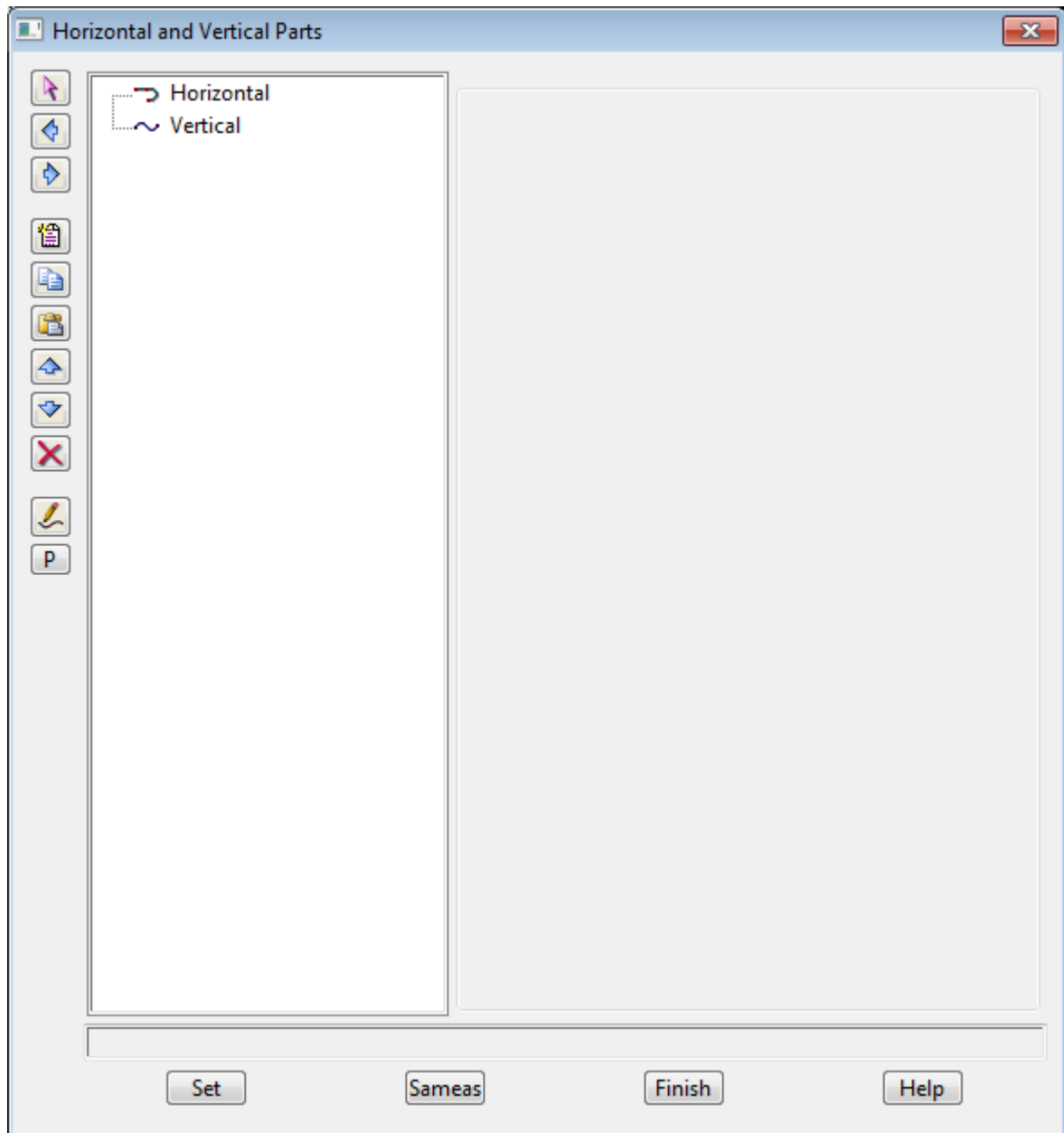
Similarly more **complex construction methods** are available to define the lines, parabolas and arcs (the vertical elements) that are grouped together within **12d Model** to make up the Parts of the vertical geometry.

Some of the Parts definitions have some degree of freedom in the definition of the elements in the Parts, and the sequencing and types of the Parts, plus the condition that, if possible, each element is tangential to the adjacent elements, allows **12d Model** to calculate and solve for some unknowns in the Part definitions that make up the super alignment.

For example, if a **Free Arc with Known Radius** placed between two known lines then the tangentiality condition means that the position of the **Free Arc with Known Radius** (arc and two transitions) is uniquely defined as a arc and leading and trailing transitions on the intersection point of the two lines. Or just a fillet between the two lines if the two transitions have zero length.

For more information on placing parts, fixed and floating parts and solving, go to [Placing Parts for Super Alignments](#).

The general creating and editing of the horizontal and vertical Parts inside **12d Model** is done in the **Horizontal and Vertical Parts** panel and this is brought up by clicking on the on the **Parts Editor** icon.



See [Icons on the Horizontal and Vertical Parts Panel](#)

See [Creating and Editing a Part](#)

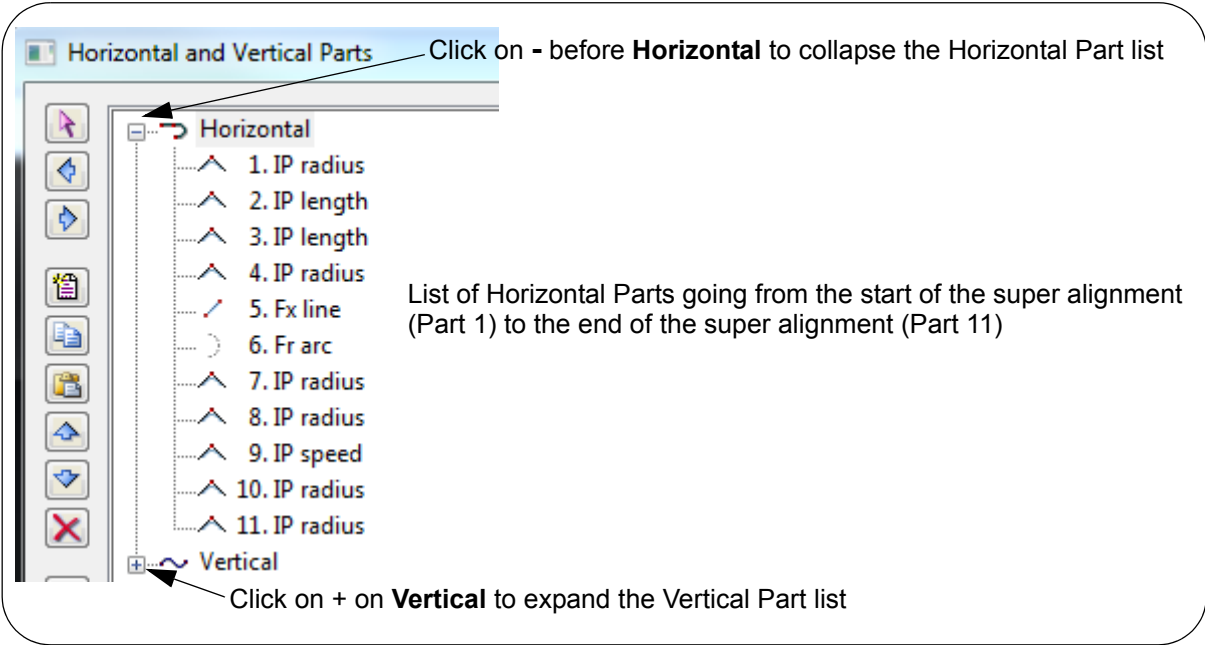
See [Types of Horizontal Parts](#)

See [Types of Vertical Parts](#)

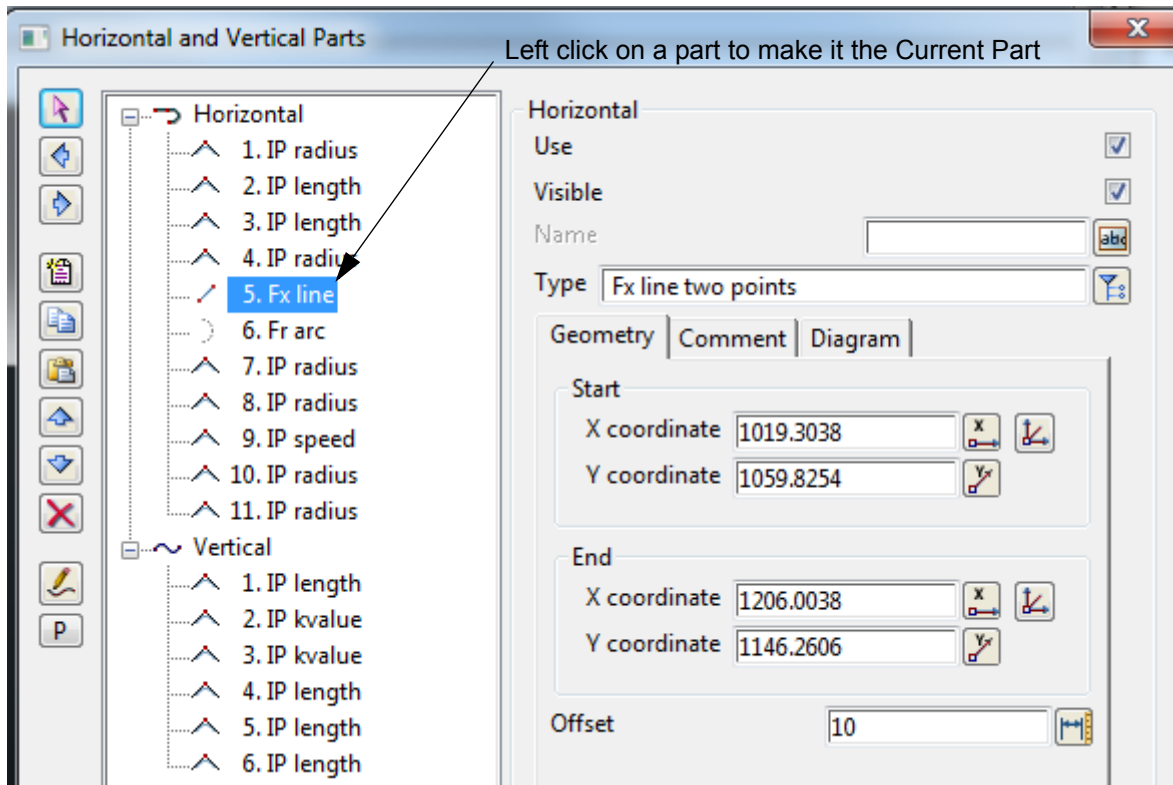
Icons on the Horizontal and Vertical Parts Panel

If there are any existing horizontal parts in the super alignment, then a + will appear to the left of **Horizontal** in the tree. Similarly if there are any existing vertical parts then a + will appear next to **Vertical** in the tree.

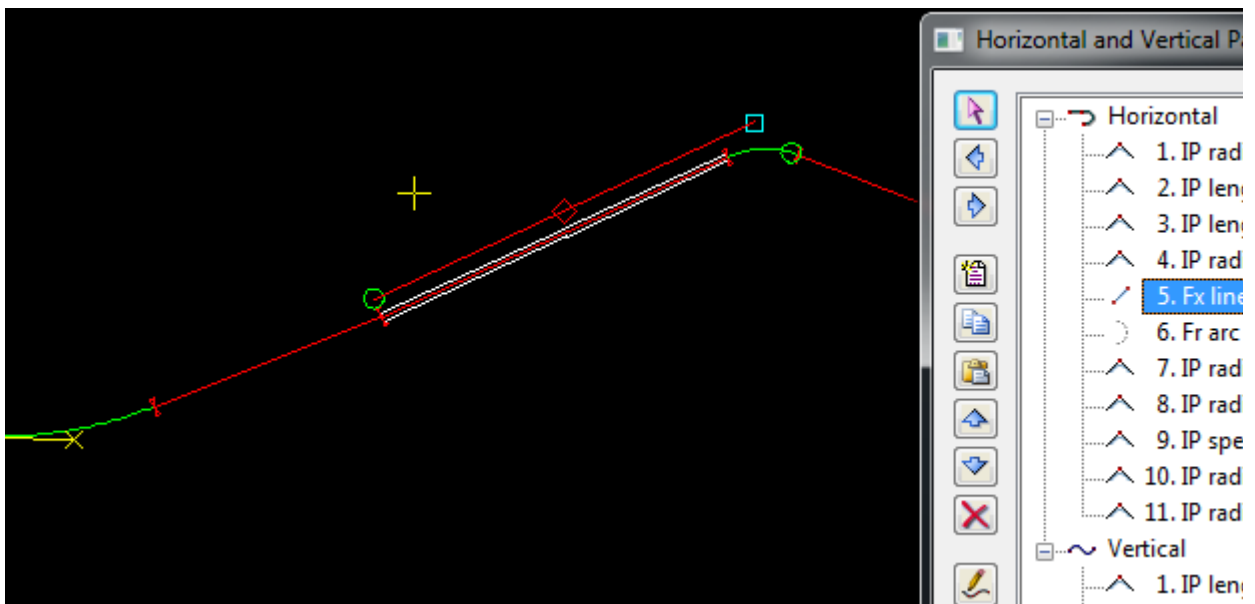
Clicking on the + next to **Horizontal/Vertical** will then list all the horizontal/vertical parts in order from the start of the super alignment to the end of the super alignment.



To make a Part the **current Part being edited**, simply **Left click on the Part** in the expanded list and the selected Part will be highlighted and the information about the part displayed on the right hand side of the panel.



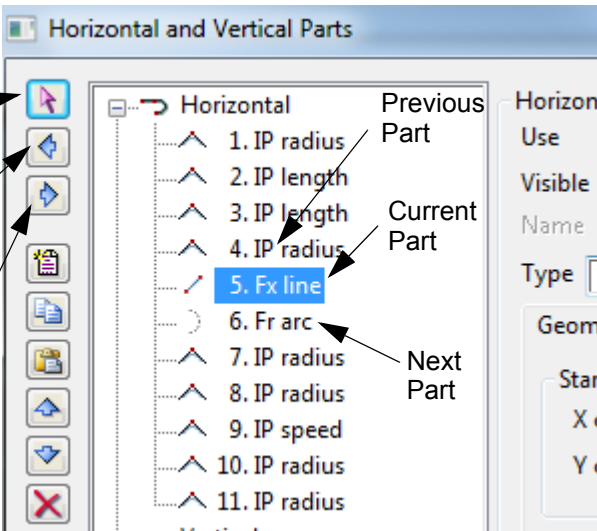
The selected part will also highlight in any Plan views the super alignment is on if it is a Horizontal Part, or any Section views that the super alignment is profiled on if it is a Vertical Part.



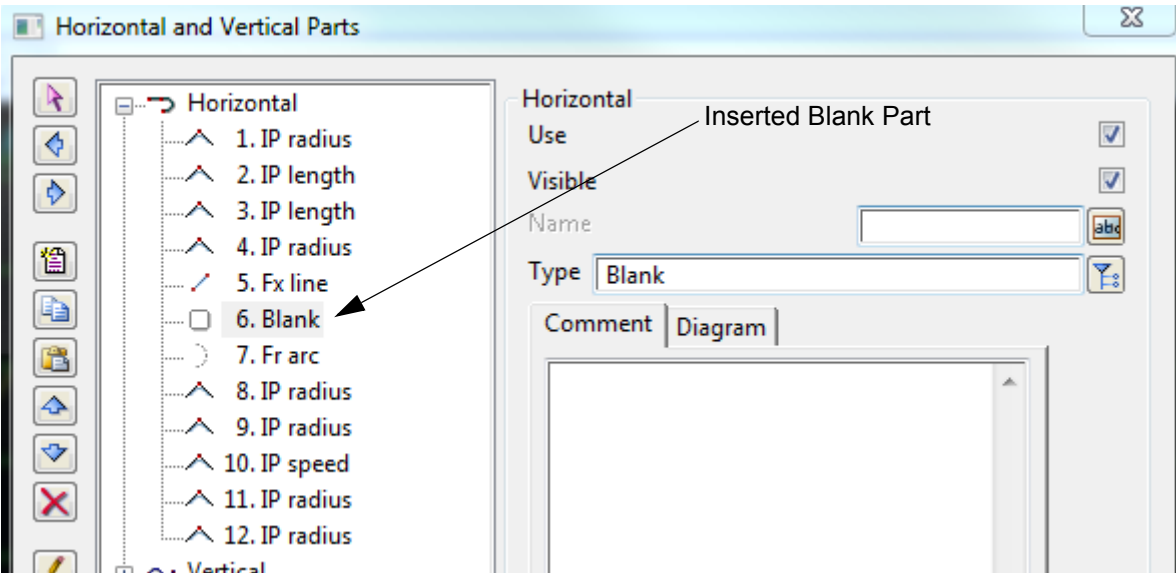
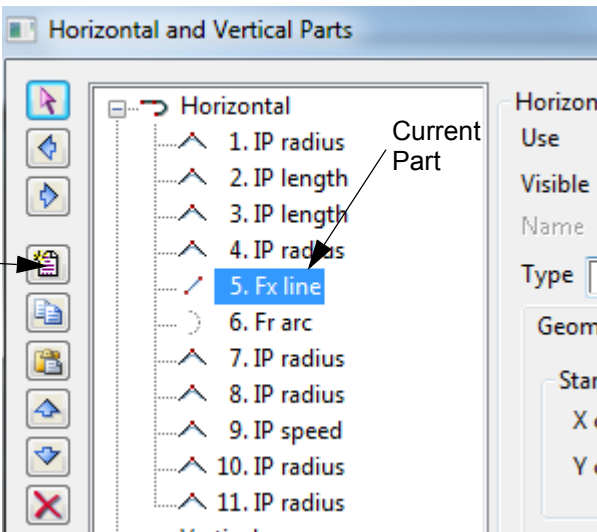
A Part can be selected from a Plan or Section View using the **Pick** icon. The selected part then becomes the current Part for editing

Clicking on the **Previous** icon makes the previous part in the list the current Part for editing

Clicking on the **Next** icon makes the following part in the list the current Part for editing



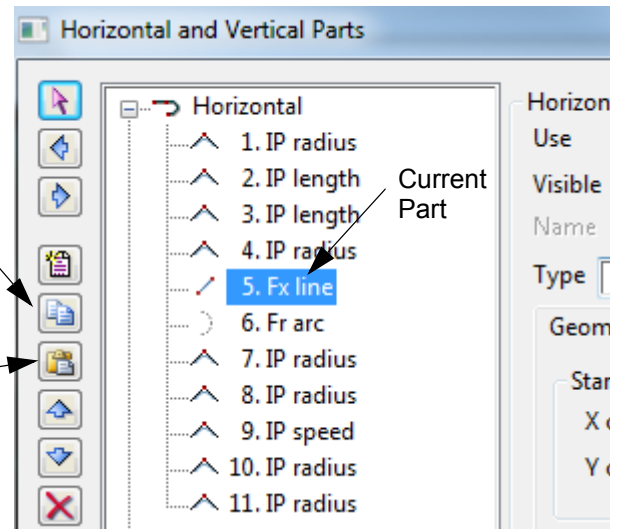
A new Blank Part is inserted after the current Part by clicking on the **Insert** icon.



The current Part can be copied by clicking on the **Copy** icon.

The part that the copied Part is to be inserted after is then made the current Part (by Picking, clicking on the Part in the Editor etc)

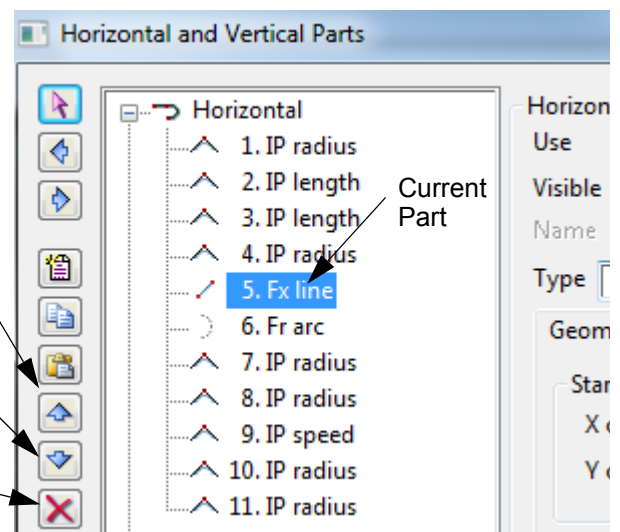
And clicking on the **Paste** icon then inserts the copied part **after** the current Part.



The current Part is moved one place closer to the start of the list by clicking on the **Move up** icon.

The current Part is moved one place down towards the bottom of the list by clicking on the **Move down** icon.

The current Part is deleted by clicking on the **Delete** icon.

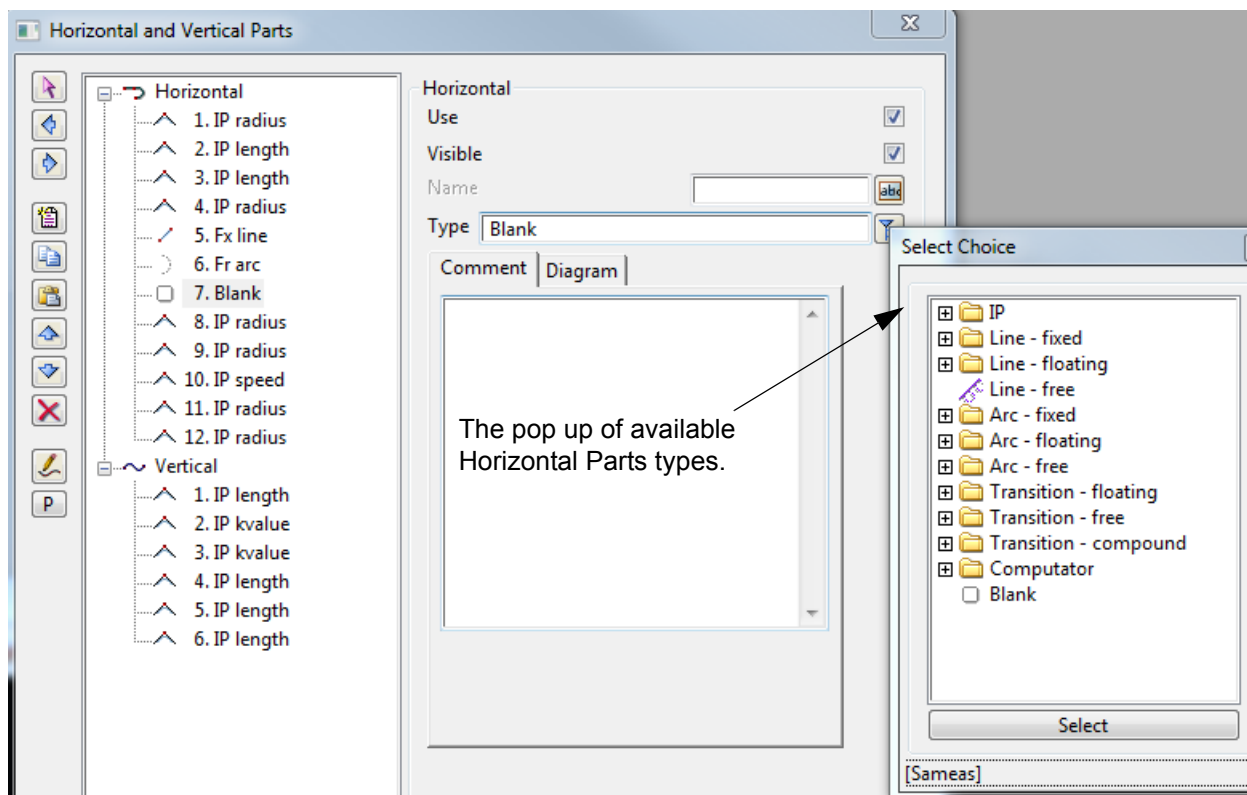


Creating and Editing a Part

A **new Part** is **created** by **Inserting** a new Blank Part and then clicking on the **Type** choice box to get the list of available Parts. After choosing a Part, the information required to define the selected part is displayed on the right hand side of the **Horizontal and Vertical Parts** panel. The required information is filled in and then the **Set** button at the bottom of the panel is clicked to create the new Part.

An **existing Part** can be **edited** by selecting it to make it the current Part which will display its defining information on the right hand side of the **Horizontal and Vertical Parts** panel. Any required changes to the information are made and then click on the **Set** button at the bottom of the panel to update the Part.

An **existing Part** can be **changed to a different type of Part** by selecting it to make it the current Part, then click on the **Type** choice box and select the new Type for the Part from the pop-up list.



The list of the available Horizontal and Vertical Parts for **Type** are given below with links to the full definition of each Part.

Types of Horizontal Parts

See [Horizontal IPs](#)

See [Horizontal Lines - Fixed](#)

See [Horizontal Lines - Floating](#)

See [Horizontal Lines - Free](#)

See [Horizontal Arcs - Fixed](#)

See [Horizontal Arcs - Floating](#)

See [Horizontal Arcs - Free](#)

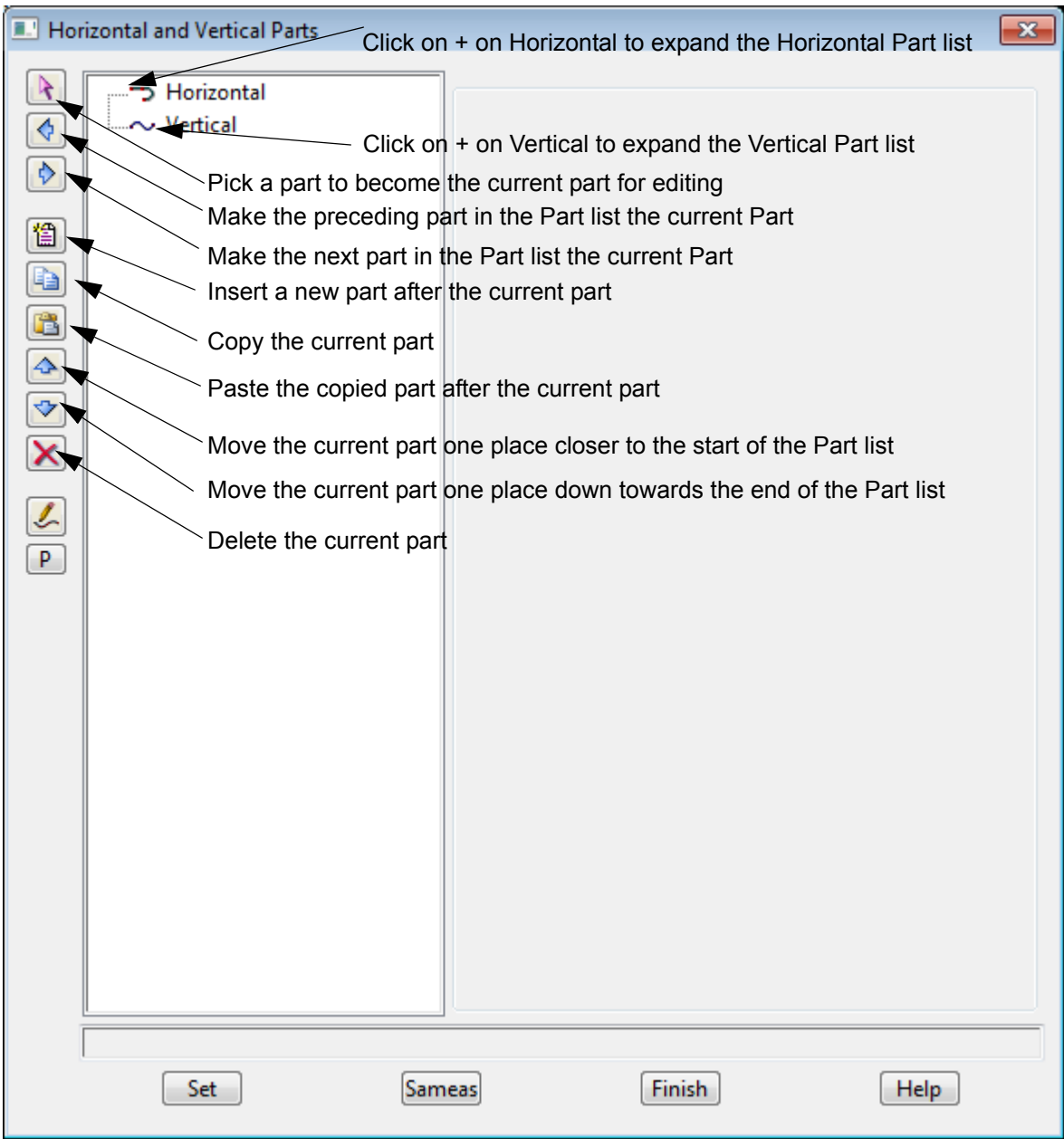
See [Horizontal Transitions - Floating](#)

See [Horizontal Transitions - Free](#)

See [Horizontal Transitions - Compound](#)

Types of Vertical Parts

- See [Vertical IPs](#)
- See [Vertical Lines - Fixed](#)
- See [Vertical Lines - Floating](#)
- See [Vertical Lines - Free](#)
- See [Vertical Parabolas - Fixed](#)
- See [Vertical Parabolas - Floating](#)
- See [Vertical Parabolas - Free](#)
- See [Vertical Arcs - Fixed](#)
- See [Vertical Arcs - Floating](#)
- See [Vertical Arcs - Free](#)

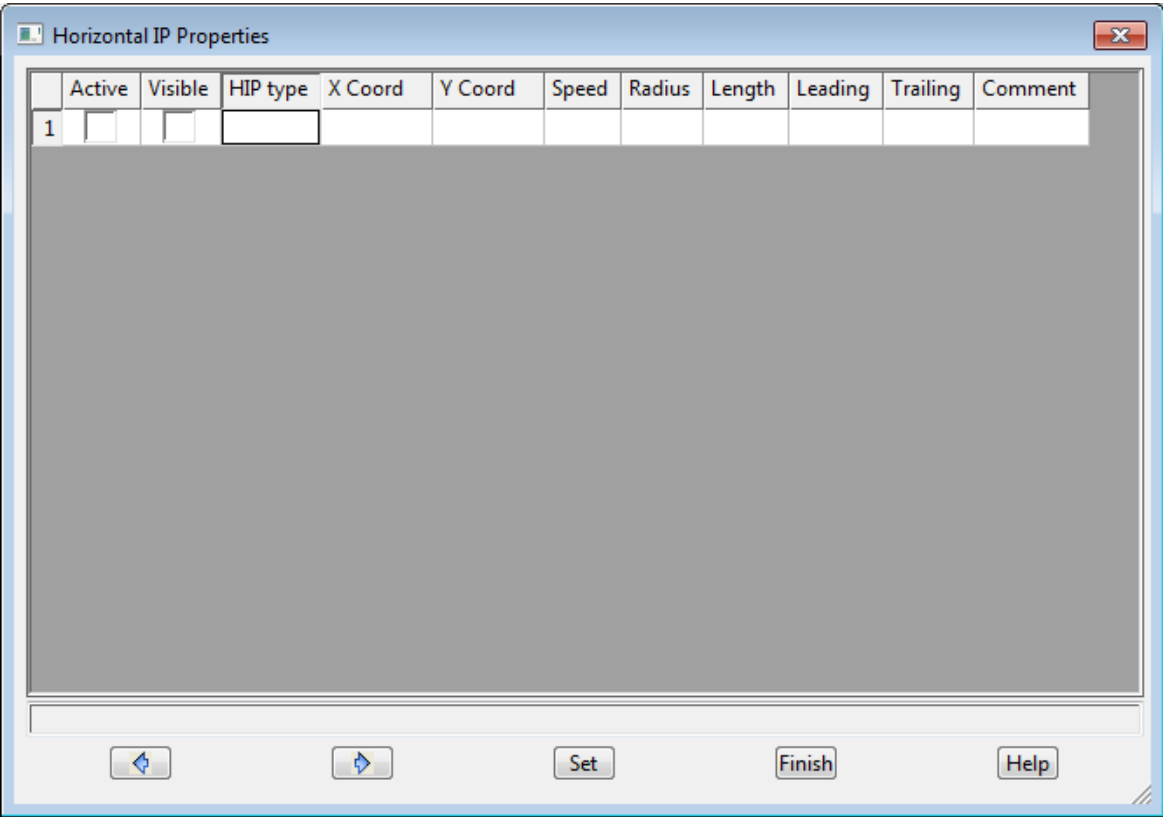


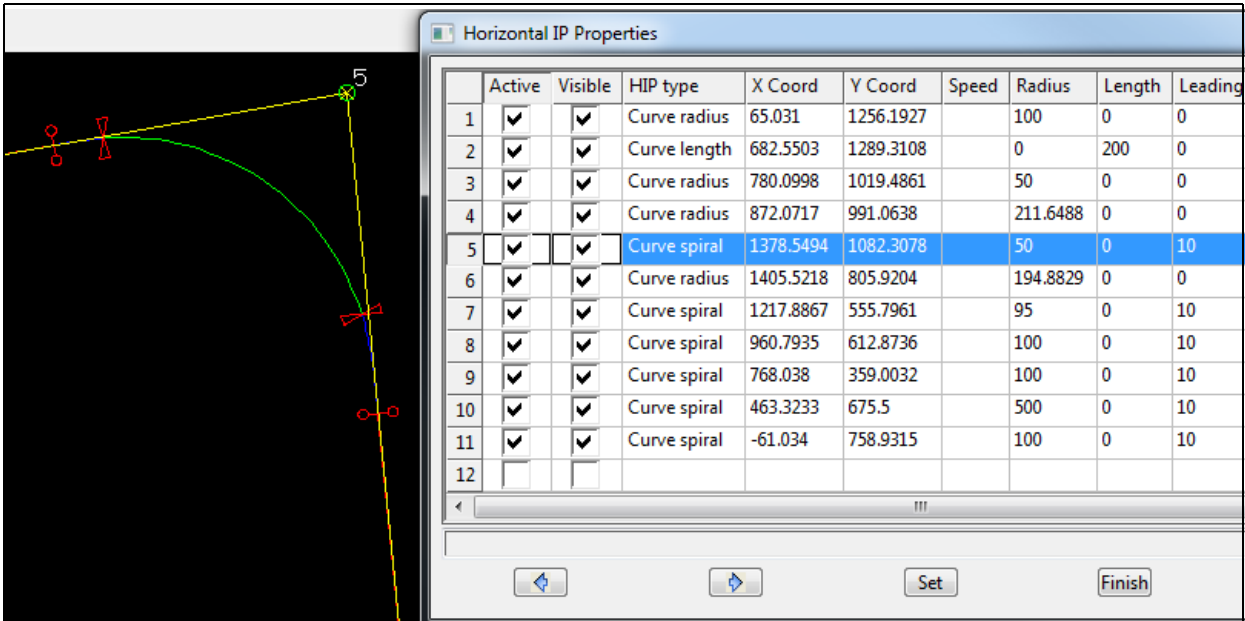
For definitions of the horizontal and vertical elements, go to [Placing Parts for Super Alignments](#)

SA - HIPs Editor

If the horizontal geometry of the super alignment consists of only HIP's (that is, no horizontal parts) then clicking on **HIPs Editor** brings up the **Horizontal IP Properties** panel which lists all the HIP's in the super alignment showing how the curves on the HIP are defined and the values for the HIP and accompanying arcs and transitions (spirals).

The **Horizontal IP Properties** panel is:





Super Alignment Profiled on a Plan View

Table of HIP Information

Clicking on the row number in the table draws a green circle around the corresponding HIP in any plan views where the HIP is visible.

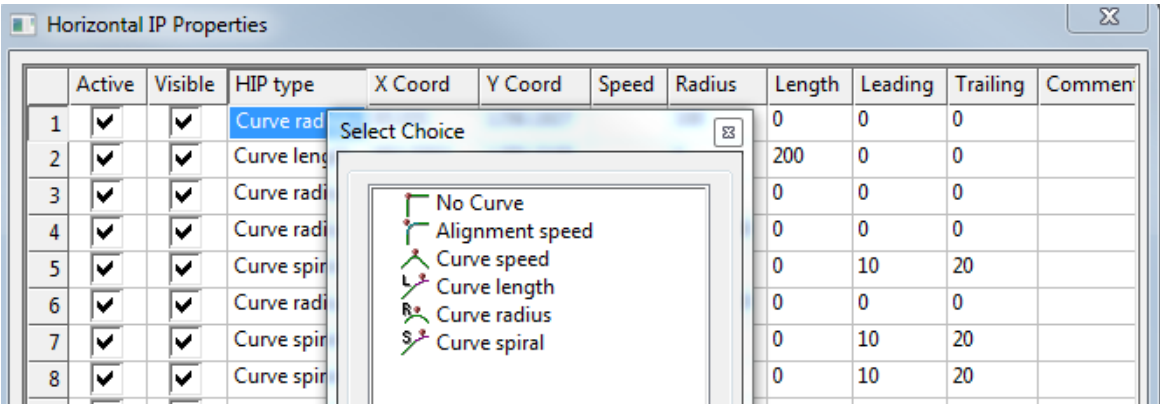
The **Left arrow** and **Right arrow** moves the highlighting to the previous HIP and next HIP respectively.

If **Active** is ticked for a row then that **HIP** is used in the super alignment.
If **Active** is not ticked for a row then that **HIP** is not used in the super alignment.

If **Visible** is ticked for a row then the curve at the **HIP** is used in the super alignment.
If **Visible** is not ticked for a row then the curve at the **HIP** is not used in the super alignment.

Warning: the **row number** will **not** be the same as the **HIP numbers** shown on a plan view if there are HIP's that are **not Active**.

The **HIP type** can be modified by clicking RB in the **HIP Type** column for the HIP to be modified to bring up the choices for the HIP.



When the **HIP Type** is changed, the new information can be typed into the appropriate cells for that HIP and then the **Set** button is pressed to make the change.

Note: if the entire line is already highlighted, you will need to first click LB in the appropriate **HIP Type** cell to get focus just on that cell and then click RB. If a pop-up with **Browse** comes up,

select **Browse** to get the **HIP Type** choices.

Any of the values in the other columns **X Coord**, **Y Coord**, **Speed**, **Radius**, **Length**, **Leading**, **Trailing** and **Comment** can be modified and the **Set** button pressed to use the new values (if they are appropriate for the **HIP Type**).

Note:

Length is the length of the arc when the **HIP Type** is *Curve length*

Speed is the design speed for the curves at the **HIP Type** is *Curve speed*.

Radius is the radius of the arc when **HIP Type** is *Curve radius* or *Curve spiral*.

Leading is the length of the leading transition (spiral) when **HIP Type** is *Curve spiral*.

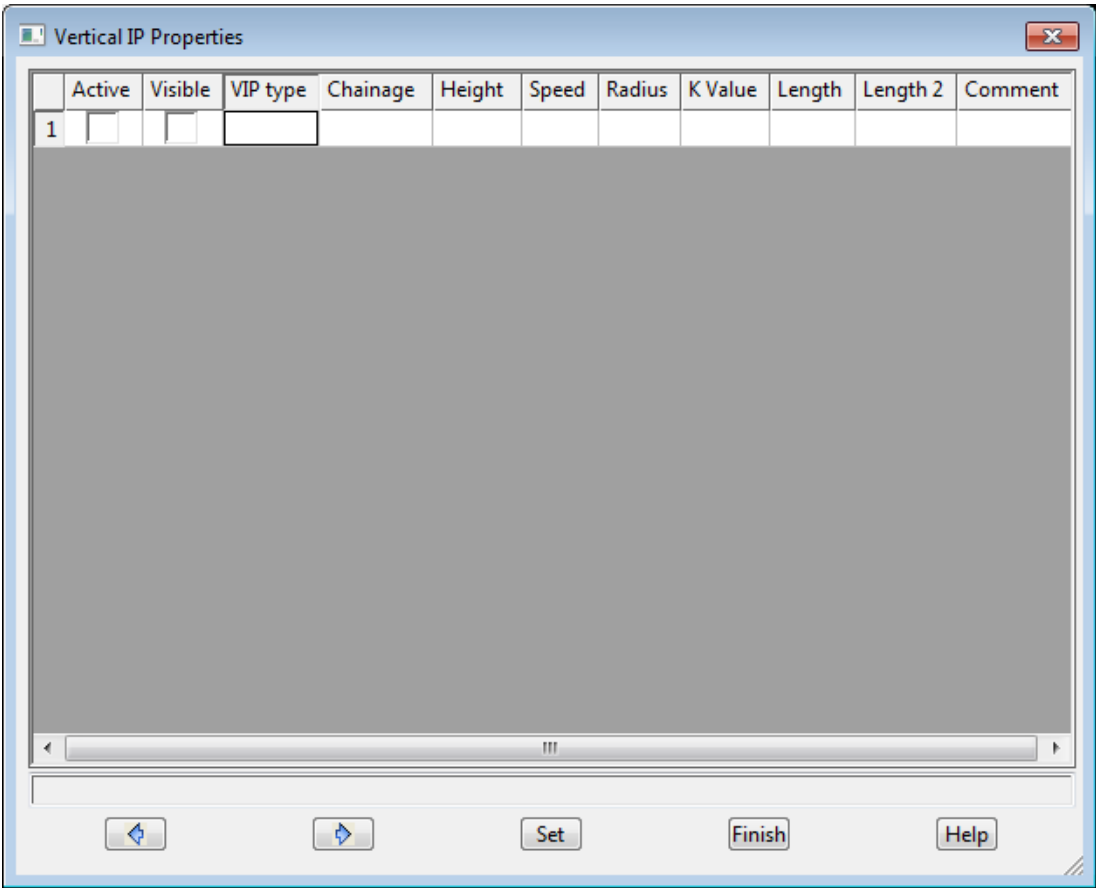
Trailing is the length of the trailing transition (spiral) when **HIP Type** is *Curve spiral*.

Warning: the *not Active* HIP's are still listed in the HIP table but the labelling of the HIP's on a plan view does not include them so in that case, the line number in the **Horizontal IP Properties** panel is not the same as the HIP number displayed on a plan view.

SA - VIPs Editor

If the vertical geometry of the super alignment consists of only VIPs (that is, no vertical parts) then clicking on **VIPs Editor** brings up the **Vertical IP Properties** panel which lists all the VIP's in the super alignment showing how the parabolas, asymmetric parabolas and arcs on the VIP are defined and the values for the VIP and accompanying parabolas and arcs.

The **Vertical IP Properties** is:



and when there is VIP information to display, looks like:

	Active	Visible	VIP type	Chainage	Height	Speed	Radius	K Value	Length	Length 2	Comment
1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Length	0.9657	-7.6827		0	0	0		
2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Kvalue	199.463	12.167		0	5	0		
3	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Kvalue	322.4306	-2.1147		0	5	0		
4	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Asymmetric	513.69	-30.3861		0	0	150	75	
5	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Circular arc	778.9741	-3.8577		500	0	0		
6	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Length	1148.8236	-30.3087		0	0	100		
7	<input type="checkbox"/>	<input type="checkbox"/>									

Super Alignment Profiled on a Section View

Table of VIP Information

Clicking on the row number in the table draws a green circle around the corresponding HIP in any plan views where the HIP is visible.

The **Left arrow** and **Right arrow** moves the highlighting to the previous VIP and next VIP respectively.

If **Active** is *ticked* for a row then that **VIP** is used in the super alignment.

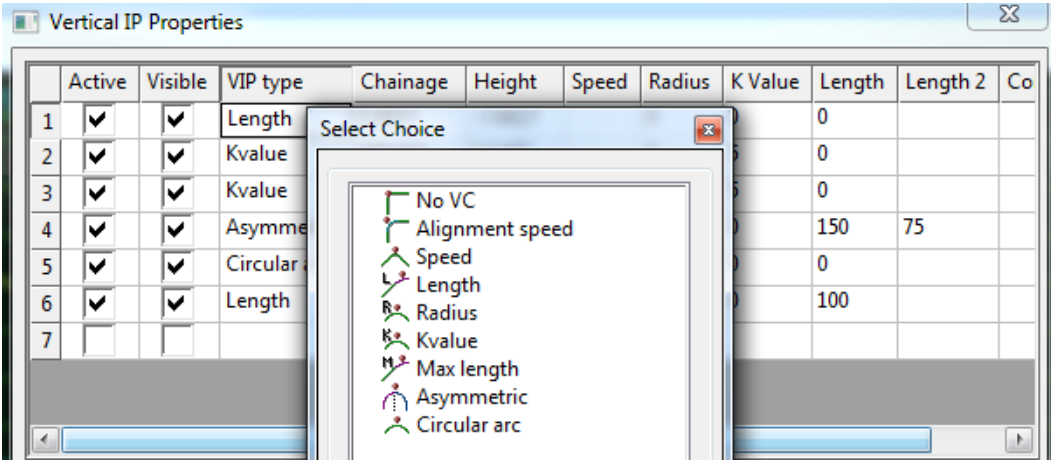
If **Active** is *not ticked* for a row then that **VIP** is **not** used in the super alignment.

If **Visible** is *ticked* for a row then the curve at the **VIP** is used in the super alignment.

If **Visible** is *not ticked* for a row then the curve at the **VIP** is not used in the super alignment.

Warning: the **row number** will **not** be the same as the **VIP numbers** shown on a section view if there are VIP's that are **not Active**.

The **VIP type** can be modified by clicking RB in the **VIP Type** column for the VIP to be modified to bring up the choices for the VIP.



When the **VIP Type** is changed, the new information can be typed into the appropriate cells for that VIP and then the **Set** button is pressed to make the change.

Note: if the entire line is already highlighted, you will need to first click LB in the appropriate **VIP Type** cell to get focus just on that cell and then click RB. If a pop-up with **Browse** comes up, select **Browse** to get the **HIP Type** choices.

Any of the values in the other columns **Chainage**, **Height**, **Speed**, **Radius**, **K Value**, **Length**, **Length2** and **Comment** can be modified and the **Set** button pressed to use the new values (if they are appropriate for the **VIP Type**).

Note:

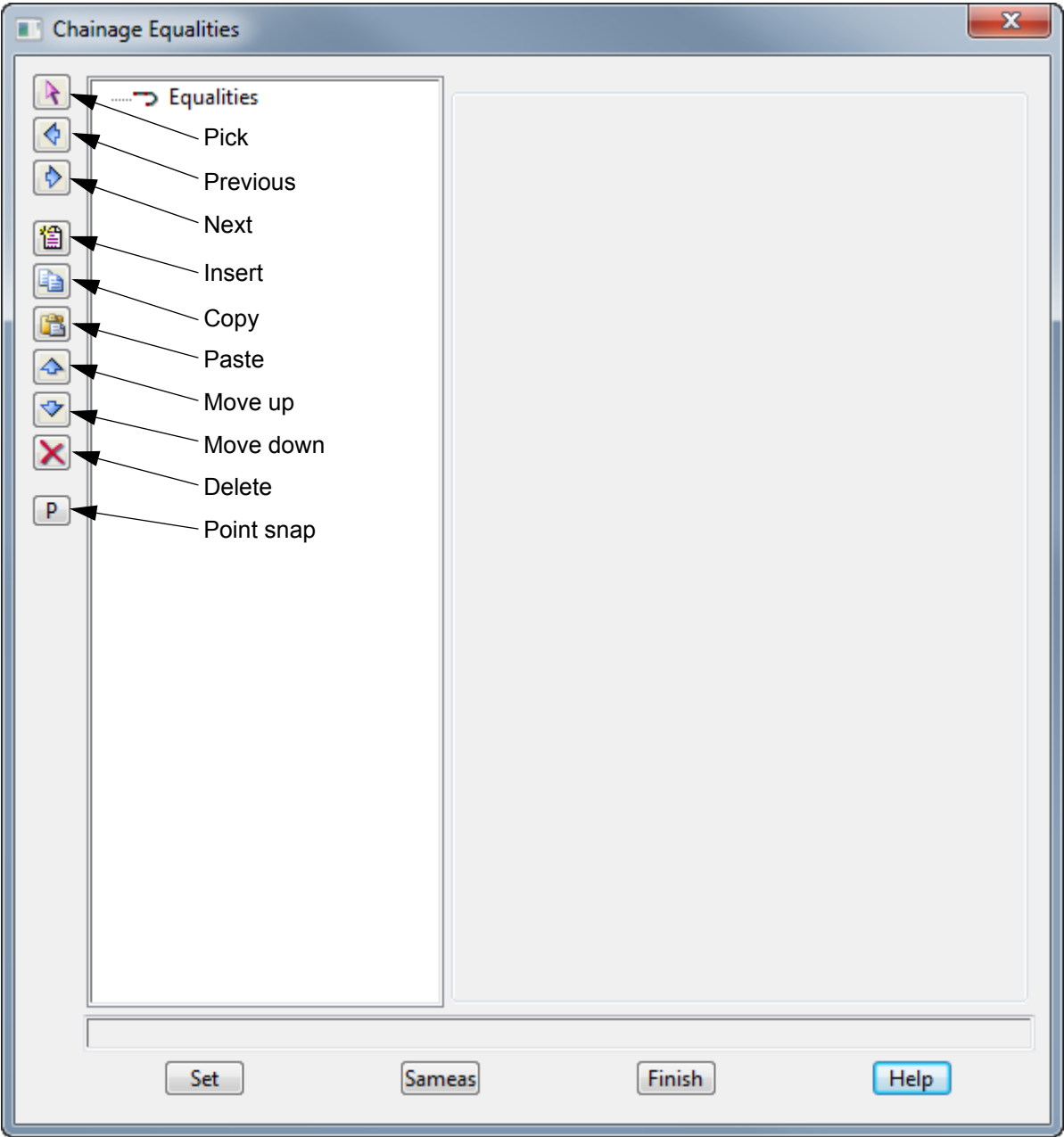
- Length** is the length of the parabola when the **VIP Type** is *Length*
- Length** and **Length2** are the lengths for an Asymmetric parabola when **VIP Type** is *Asymmetric*
- Speed** is the design speed for the parabola when **VIP Type** is *Speed*.
- Radius** is the radius of the arc when **VIP Type** is *Circular arc* or the effective radius for a parabola when **VIP Type** is *Radius*.
- K Value** is the K value for the parabola when **HIP Type** is *K value*.

Warning: the *not Active* are still listed in the VIP table but the labelling of the VIP's on a section view does not include them so in that case, the line number in the **Vertical IP Properties** panel is **not** the same as the VIP number displayed on a section view.

SA - Chainage Equalities Editor

This section of documentation is a work in progress and will be updated in subsequent releases.

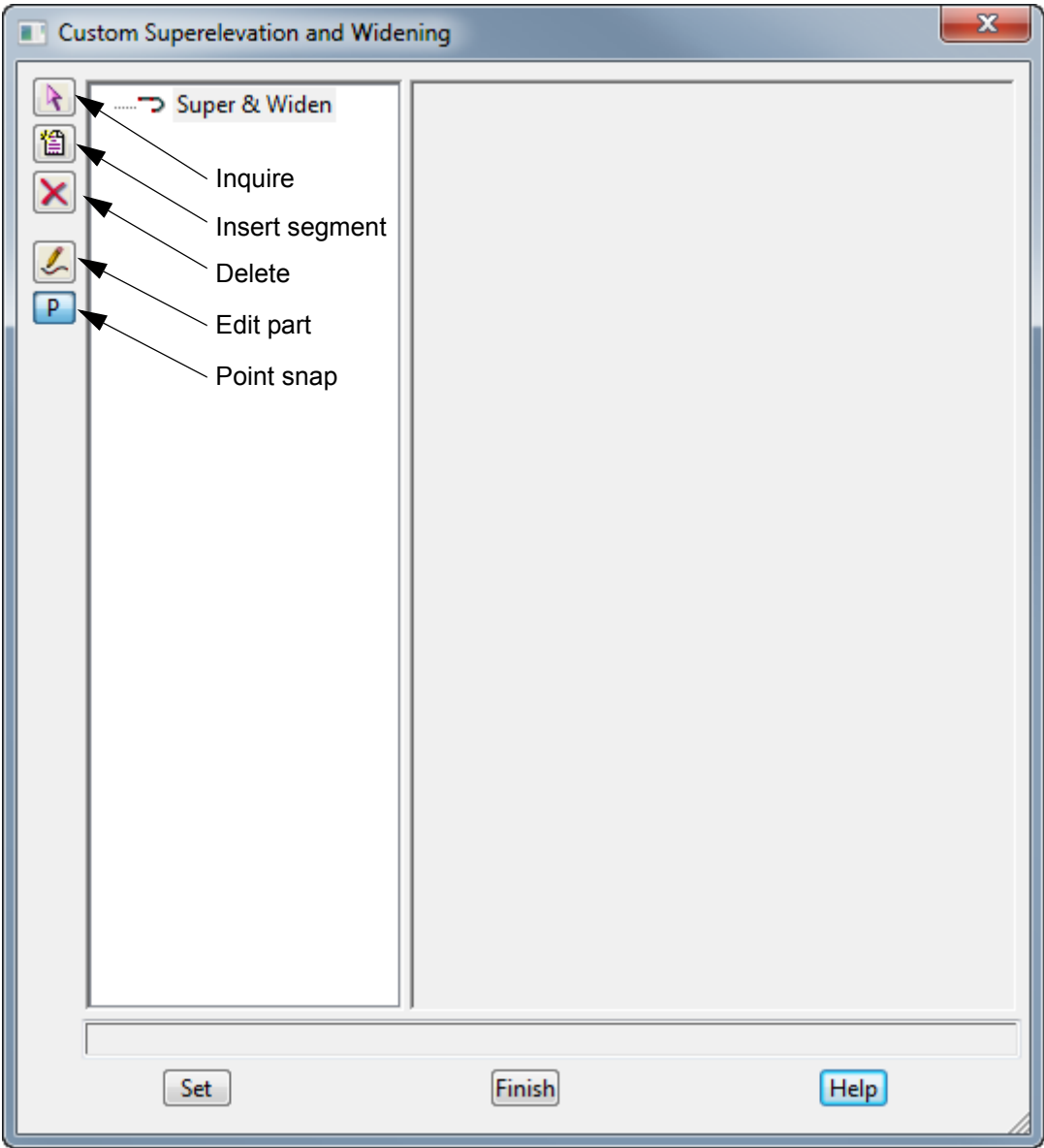
If **Use chainage equality** is ticked in the **Advanced > Equality** section of the **Properties** for the super alignment, then the **Chainage Equalities** panel is displayed.



SA - Custom Superelevation and Widening Editor

This section of documentation is a work in progress and will be updated in subsequent releases.

If **Use design standards** is ticked in the **Advanced > Design** section of the **Properties** for the super alignment, then the **Custom Superelevation and Widening** panel is displayed.

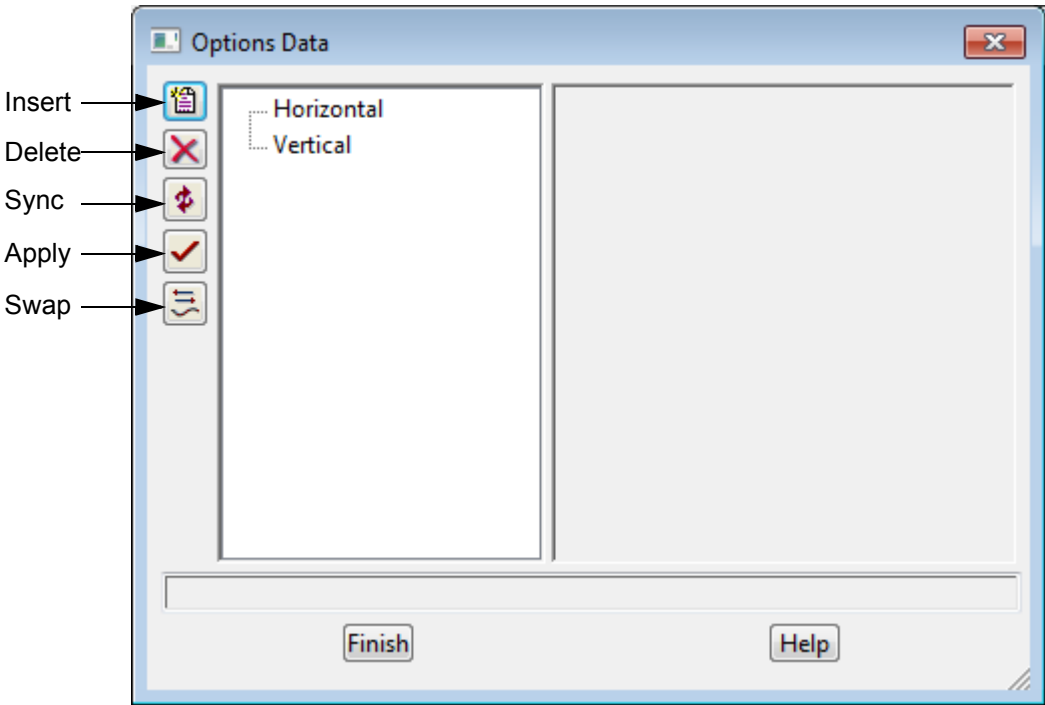


SA - Centreline Options

At any time, a copy of the current horizontal or vertical geometry can be made and stored under an Option name.

So an Option is like a backup (safe copy) of the current horizontal or vertical geometry and can be restored as the super alignment geometry at a later time.

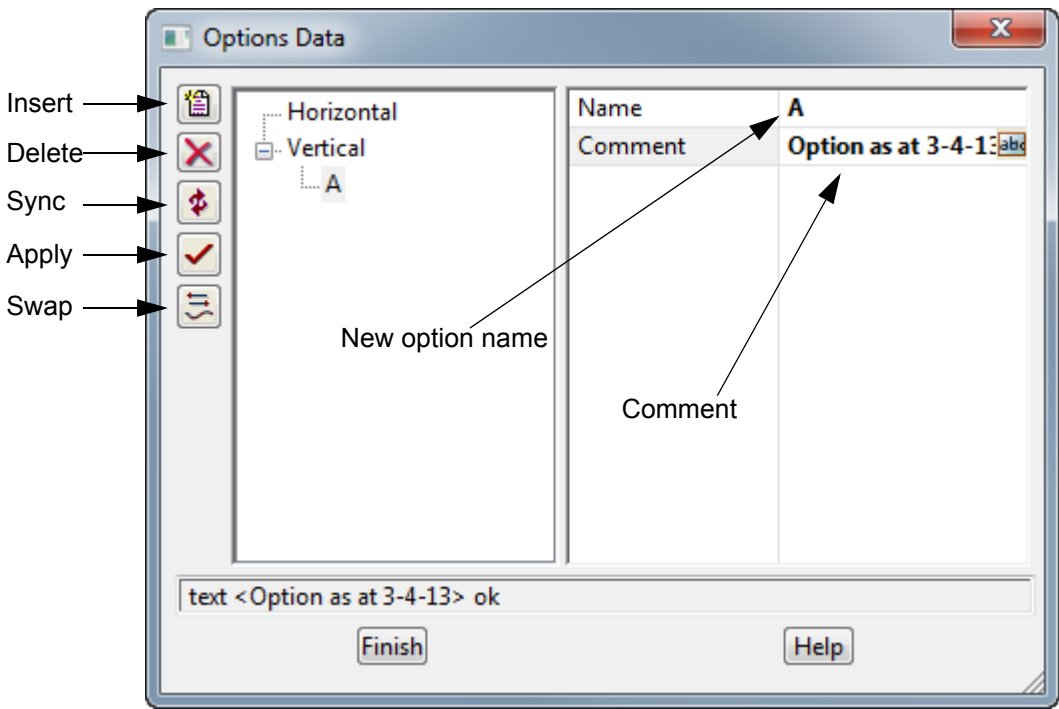
Clicking **Centreline Options** brings up the **Options Data** panel.



Insert

If the **Horizontal/Vertical** branch is highlighted and **Insert** clicked, a new Option is created under Horizontal/Vertical with the default name Horizontal/Vertical, and a copy of the current horizontal/vertical geometry of the super alignment is stored with the new option.

Name and **Comment** can be modified and are changed when <Enter> is pressed.



Delete

If the **Horizontal/Vertical** Option is highlighted and **Delete** clicked, then the Option is deleted.

Sync

If the **Horizontal/Vertical** Option is highlighted and **Sync** clicked, the horizontal/vertical geometry of the Option is deleted and replaced by the current horizontal/vertical geometry of the super alignment. That is, the Option geometry is taken from the super alignment.

Apply

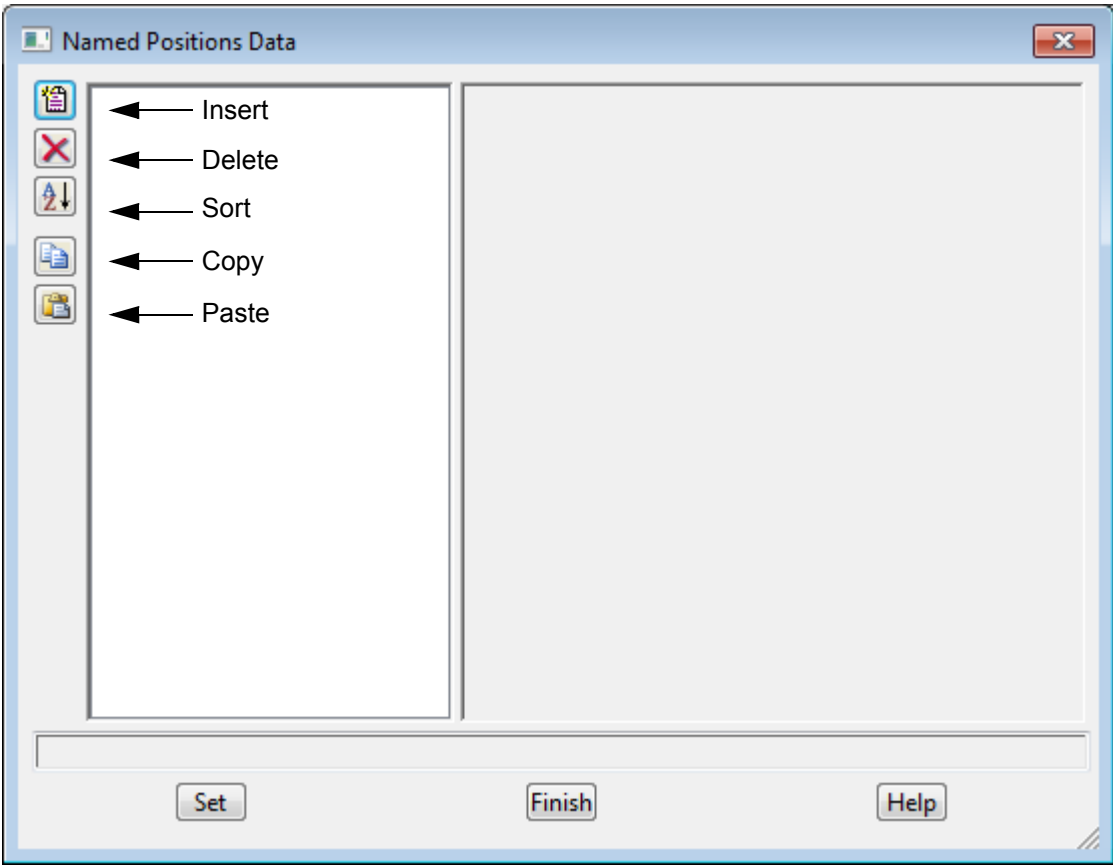
If the **Horizontal/Vertical** branch is highlighted and **Apply** clicked, the horizontal/vertical geometry of the super alignment is deleted and replaced by the horizontal/vertical geometry of the Option. That is, the super alignment geometry is taken from the Option.

Swap

If the **Horizontal/Vertical** branch is highlighted and **Swap** clicked, the current horizontal/vertical geometry of the super alignment is replaced by the horizontal/vertical geometry of the Option and the horizontal/vertical geometry of the Option is replaced by the current horizontal/vertical geometry of the super alignment. That is, the two geometries are swapped.


SA - Named Positions

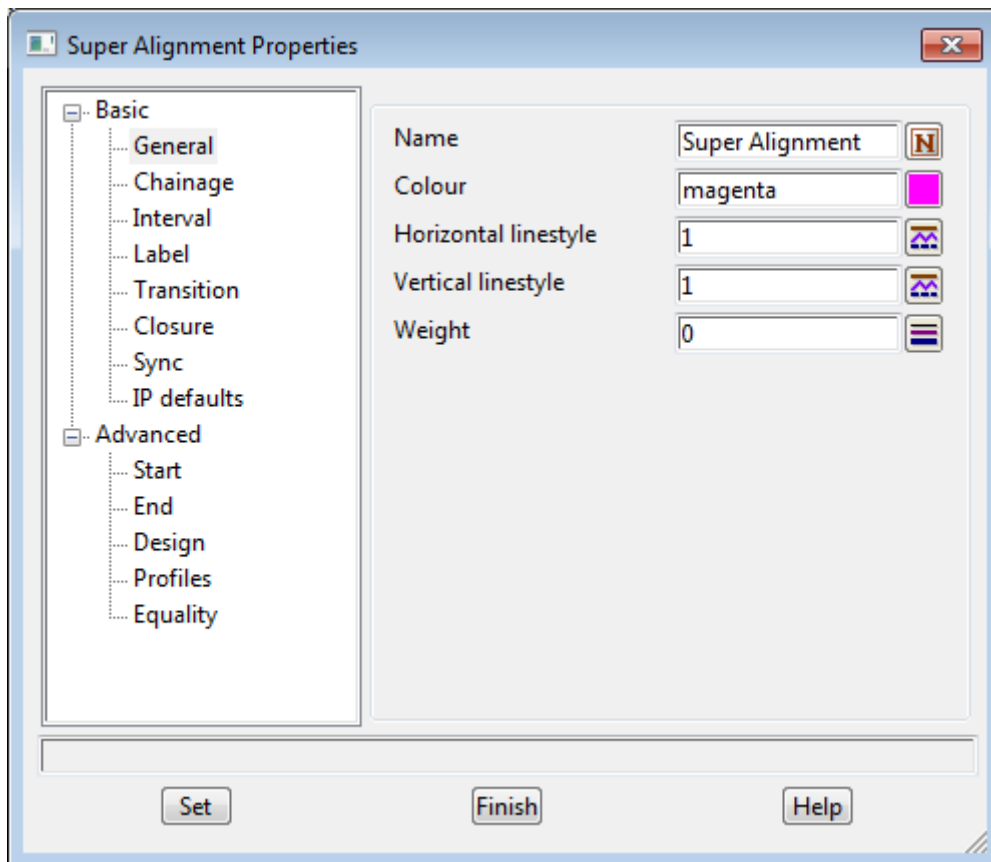
This section of documentation is a work in progress and will be updated in subsequent releases.
Clicking **Named Positions** brings up the **Named Positions Data** panel.



SA - Super Alignment Properties Icon



Selecting **Properties**  displays the **Super Alignment Properties** panel



The information in the **Super Alignment Properties** panel is the same as for the **Create Super Alignment** panel.

The only difference is that the **Set** button only exists on the **Super Alignment Properties** panel and if **any changes** are made to the values on any branch, then the **Set** button must be clicked before leaving that branch to modify the values for the string.

WARNING: this means that you must click on **Set** after modifying each branch - you can't change values on a number of branches and then click **Set**.

See [Create - Super Alignment](#) for details on all the fields and values in the branches of this panel.

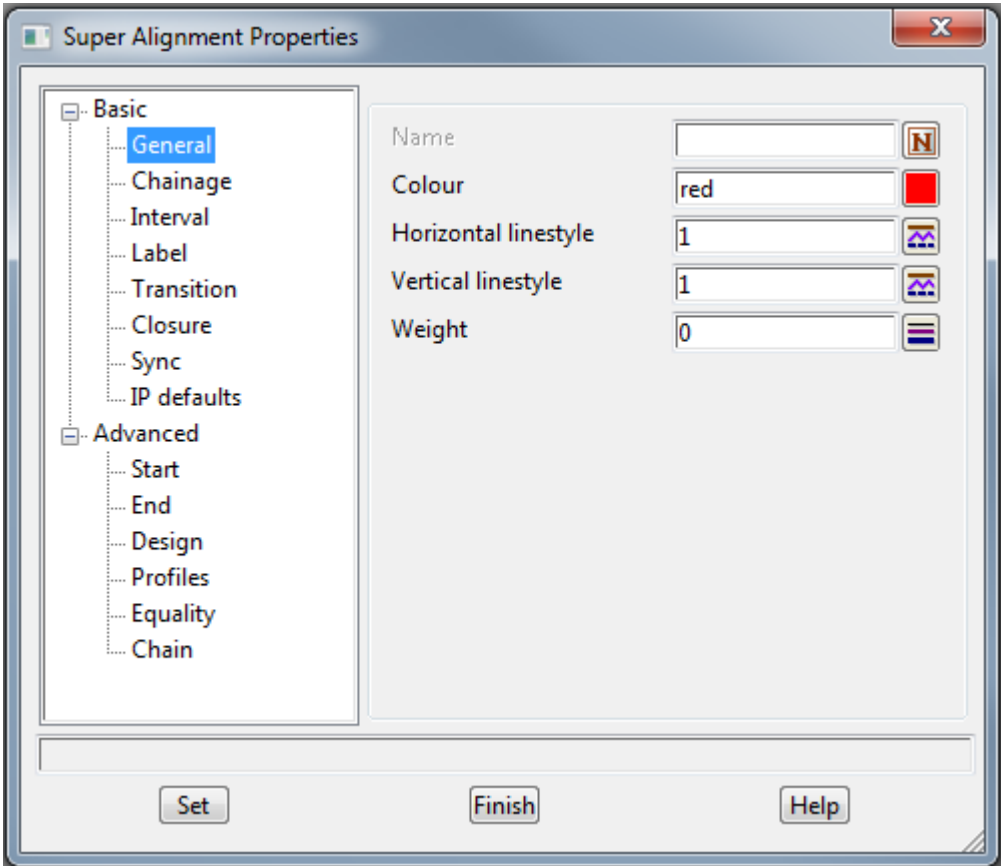
For information on each branch, go to:

[Basic > General branch](#)

[Basic > Chainage branch](#)

- [Basic > Interval branch](#)
- [Basic > Label branch](#)
- [Basic > Transition branch](#)
- [Basic > Closure branch](#)
- [Basic > Sync branch](#)
- [Basic > IP defaults branch](#)
- [Advanced > Start branch](#)
- [Advanced > End branch](#)
- [Advanced > Design branch](#)
- [Advanced > Profiles branch](#)
- [Advanced > Equality branch](#)
- [Advanced > Chain branch](#)

Basic > General branch



The information in the **Basic >General** branch is the same as for the **Basic >General** branch of the **Create Super Alignment** panel.

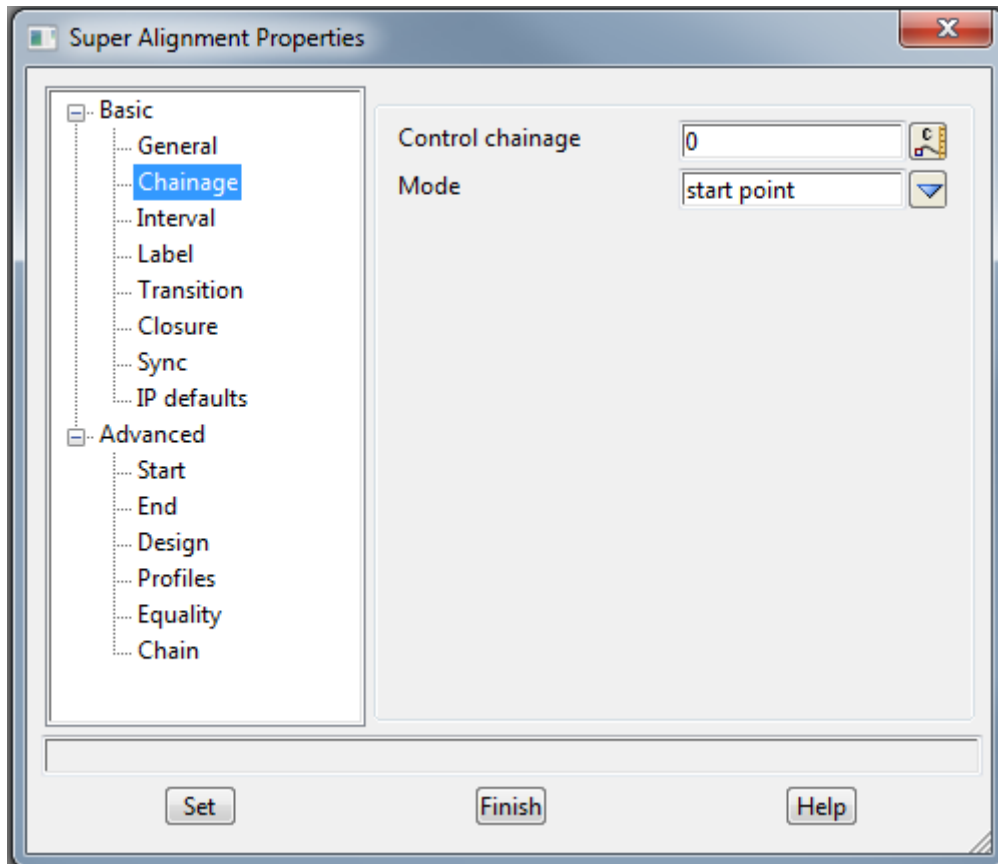
The only difference is that the **Set** button only exists on the **Super Alignment Properties** panel and if **any changes** are made to the values on the **Basic >General** branch, then the **Set** button must be clicked before leaving the **Basic >General** branch to modify the values for the string.

WARNING: this means that you must click on **Set** after modifying each branch - you can't change values on a number of branches and then click **Set**.

See [Basic > General branch](#) for details on all the fields and values in the **Basic >General**

branch.

Basic > Chainage branch



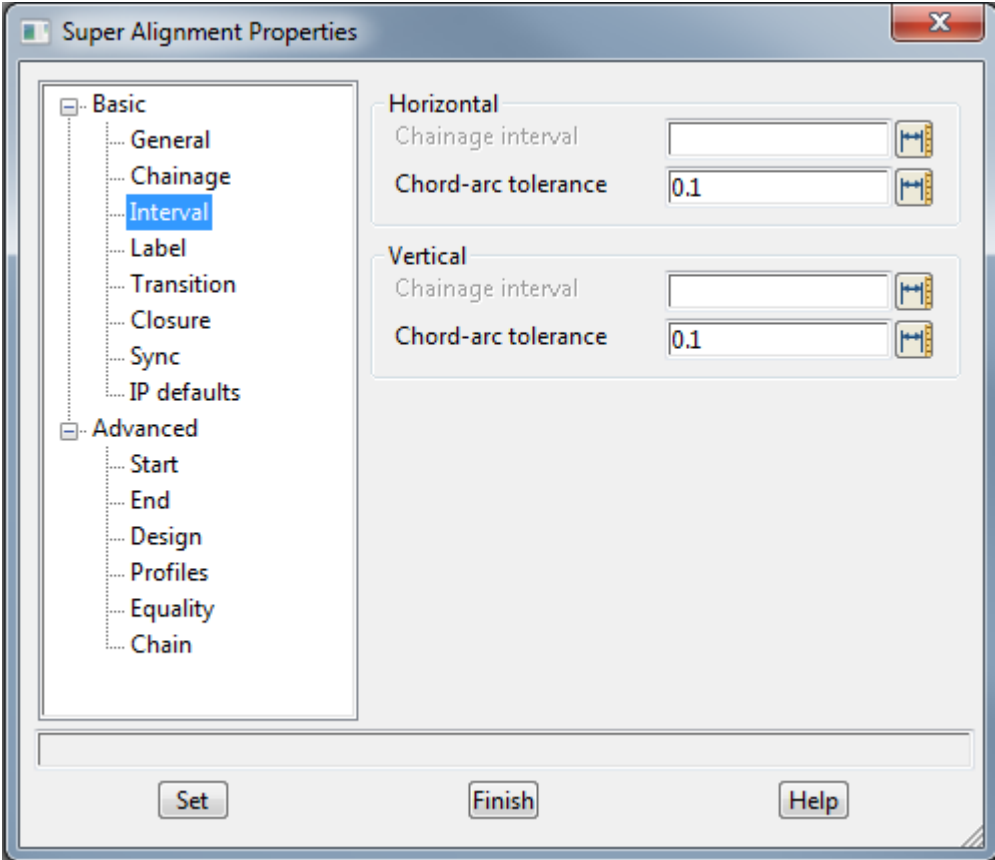
The information in the **Basic >Chainage** branch is the same as for the **Basic >Chainage** branch of the **Create Super Alignment** panel.

The only difference is that the **Set** button only exists on the **Super Alignment Properties** panel and if **any changes** are made to the values on the **Basic >Chainage** branch, then the **Set** button must be clicked before leaving the **Basic >Chainage** branch to modify the values for the string.

WARNING: this means that you must click on **Set** after modifying each branch - you can't change values on a number of branches and then click **Set**.

See [Basic > Chainage branch](#) for details on all the fields and values in the **Basic >Chainage** branch.

Basic > Interval branch

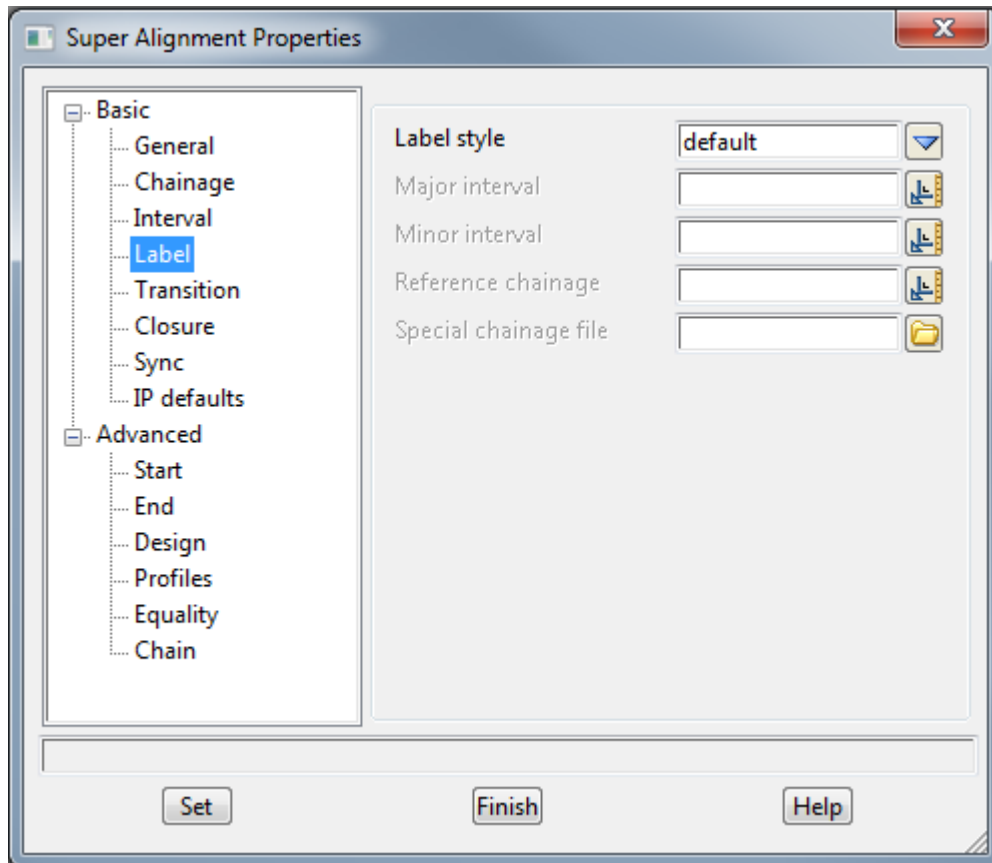


The information in the **Basic >Interval** branch is the same as for the **Basic >Interval** branch of the **Create Super Alignment** panel.

The only difference is that the **Set** button only exists on the **Super Alignment Properties** panel and if **any changes** are made to the values on the **Basic >Interval** branch, then the **Set** button must be clicked before leaving the **Basic >Interval** branch to modify the values for the string.

WARNING: this means that you must click on **Set** after modifying each branch - you can't change values on a number of branches and then click **Set**.

See [Basic > Interval branch](#) for details on all the fields and values in the **Basic >Interval** branch.

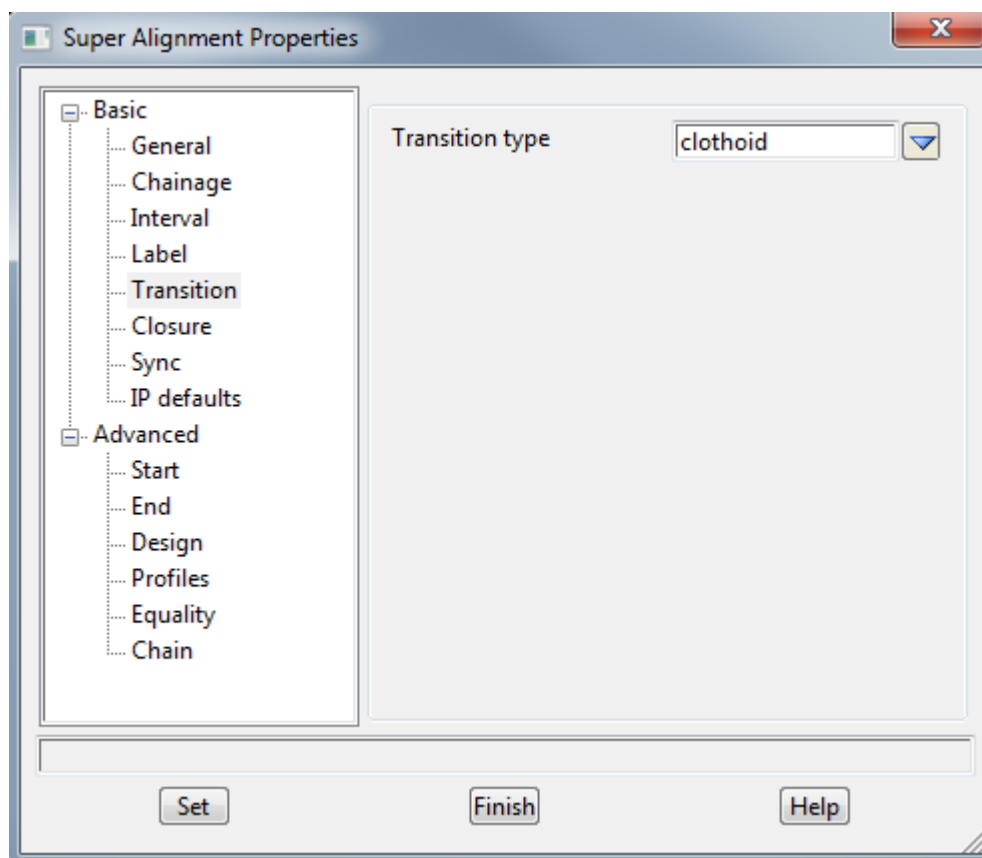
Basic > Label branch

The information in the **Basic >Label** branch is the same as for the **Basic >Label** branch of the **Create Super Alignment** panel.

The only difference is that the **Set** button only exists on the **Super Alignment Properties** panel and if **any changes** are made to the values on the **Basic >Label** branch, then the **Set** button must be clicked before leaving the **Basic >Label** branch to modify the values for the string.

WARNING: this means that you must click on **Set** after modifying each branch - you can't change values on a number of branches and then click **Set**.

See [Basic > Label branch](#) for details on all the fields and values in the **Basic >Label** branch.

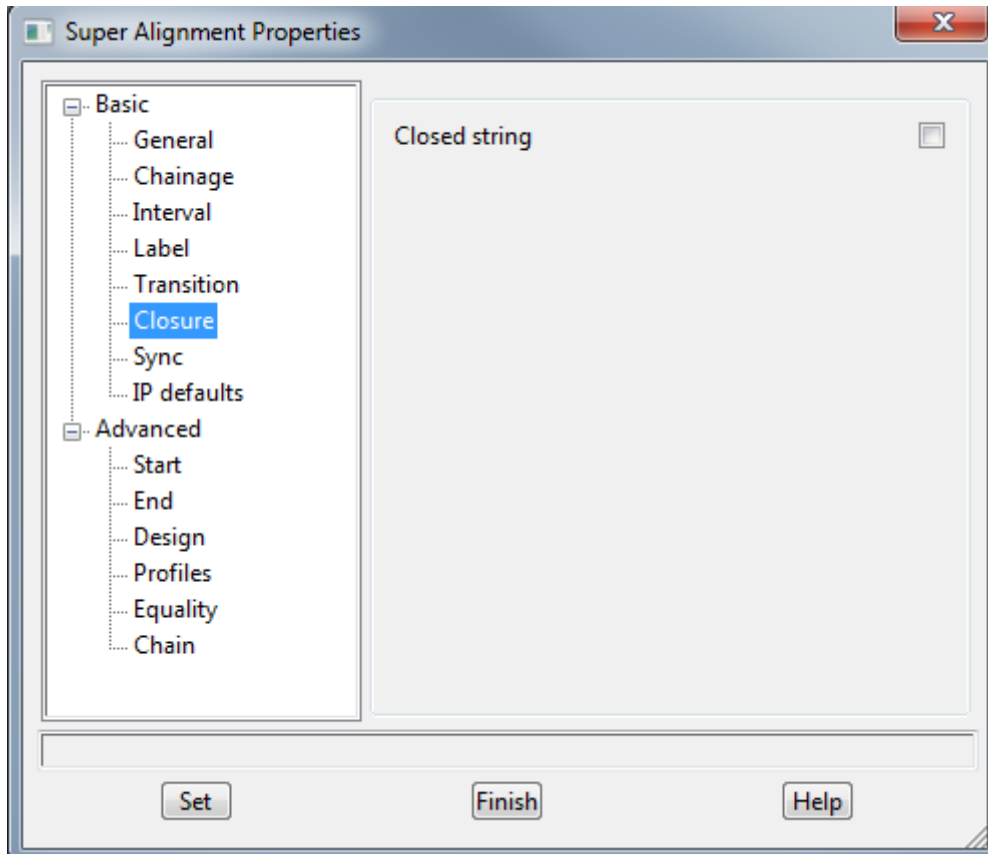
Basic > Transition branch

The information in the **Basic >Transition** branch is the same as for the **Basic >Transition** branch of the **Create Super Alignment** panel.

The only difference is that the **Set** button only exists on the **Super Alignment Properties** panel and if **any changes** are made to the values on the **Basic >Transition** branch, then the **Set** button must be clicked before leaving the **Basic >Transition** branch to modify the values for the string.

WARNING: this means that you must click on **Set** after modifying each branch - you can't change values on a number of branches and then click **Set**.

See [Basic > Transition branch](#) for details on all the fields and values in the **Basic >Transition** branch.

Basic > Closure branch

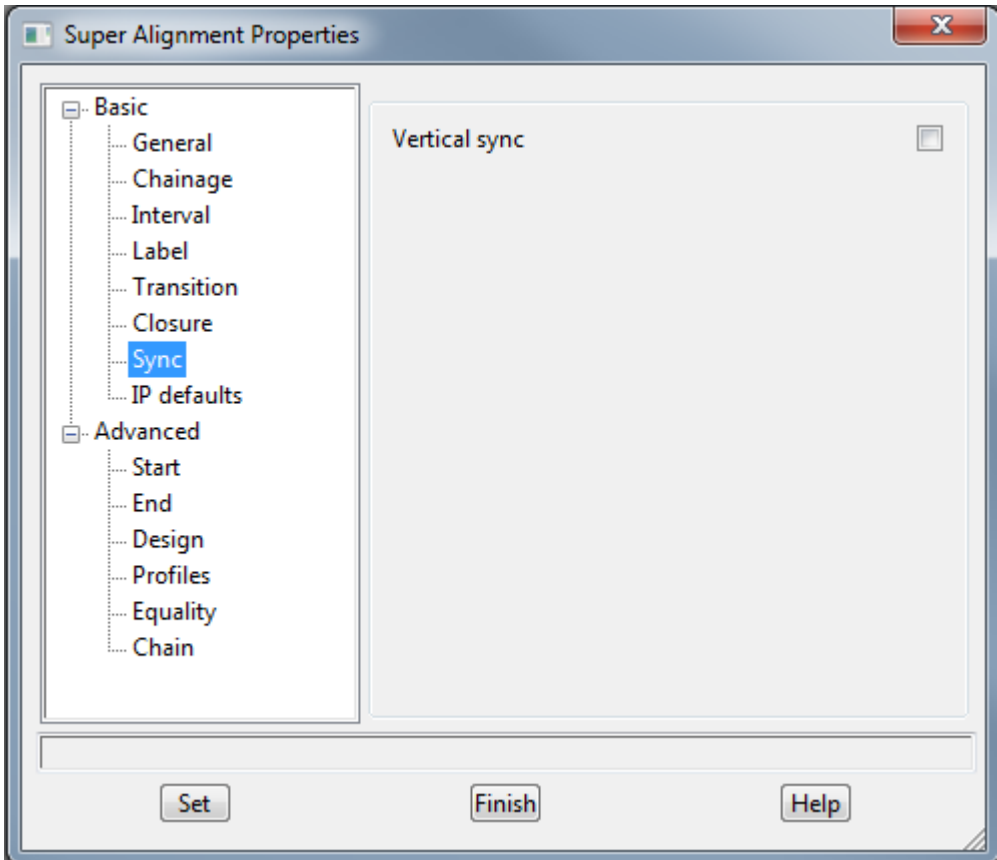
The information in the **Basic > Closure** branch is the same as for the **Basic > Closure** branch of the **Create Super Alignment** panel.

The only difference is that the **Set** button only exists on the **Super Alignment Properties** panel and if **any changes** are made to the values on the **Basic > Closure** branch, then the **Set** button must be clicked before leaving the **Basic > Closure** branch to modify the values for the string.

WARNING: this means that you must click on **Set** after modifying each branch - you can't change values on a number of branches and then click **Set**.

See [Basic > Closure branch](#) for details on all the fields and values in the **Basic > Closure** branch.

Basic > Sync branch

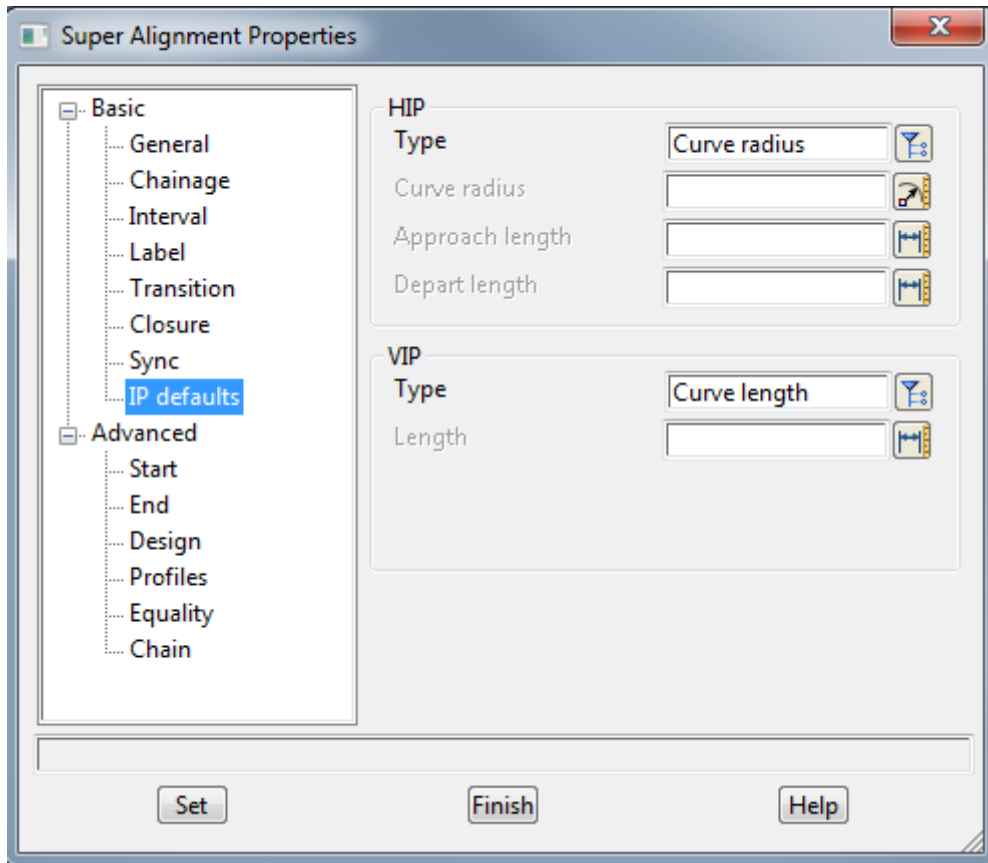


The information in the **Basic >Sync** branch is the same as for the **Basic >Sync** branch of the **Create Super Alignment** panel.

The only difference is that the **Set** button only exists on the **Super Alignment Properties** panel and if **any changes** are made to the values on the **Basic >Sync** branch, then the **Set** button must be clicked before leaving the **Basic >Sync** branch to modify the values for the string.

WARNING: this means that you must click on **Set** after modifying each branch - you can't change values on a number of branches and then click **Set**.

See [Basic > Sync branch](#) for details on all the fields and values in the **Basic >Sync** branch.

Basic > IP defaults branch

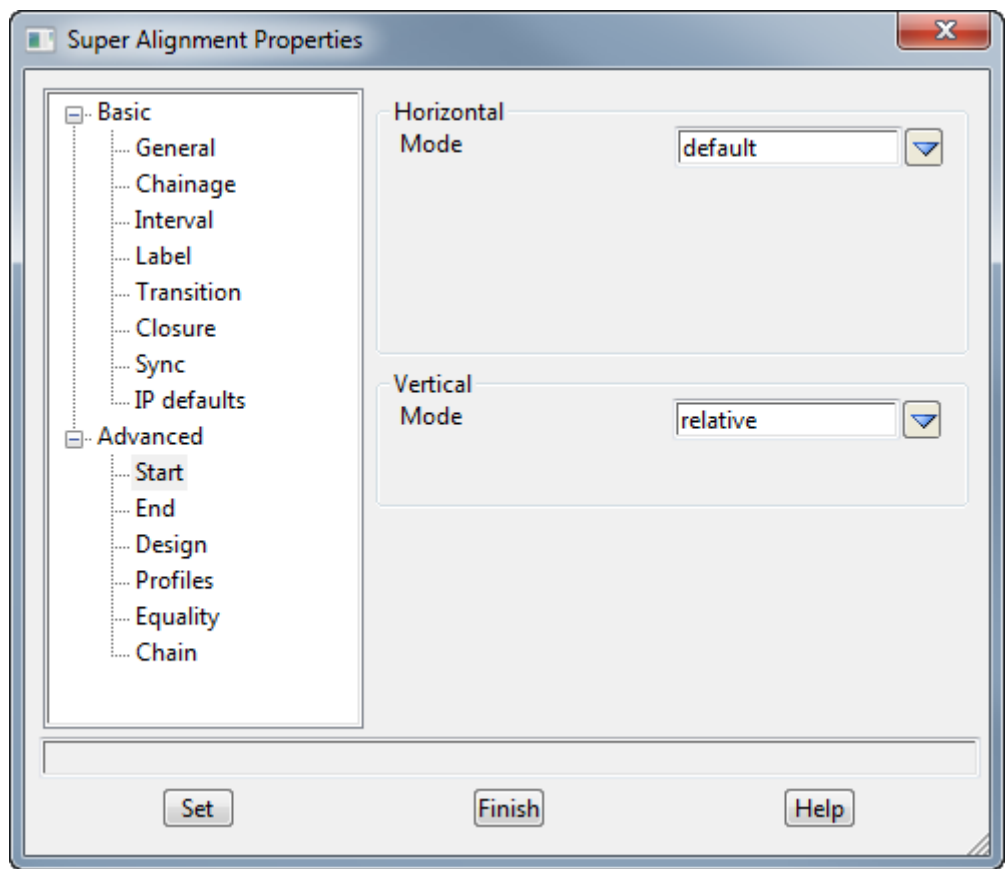
The information in the **Basic >IP defaults** branch is the same as for the **Basic >IP defaults** branch of the **Create Super Alignment** panel.

The only difference is that the **Set** button only exists on the **Super Alignment Properties** panel and if **any changes** are made to the values on the **Basic >IP defaults** branch, then the **Set** button must be clicked before leaving the **Basic >IP defaults** branch to modify the values for the string.

WARNING: this means that you must click on **Set** after modifying each branch - you can't change values on a number of branches and then click **Set**.

See [Basic > IP defaults branch](#) for details on all the fields and values in the **Basic >IP defaults** branch.

Advanced > Start branch

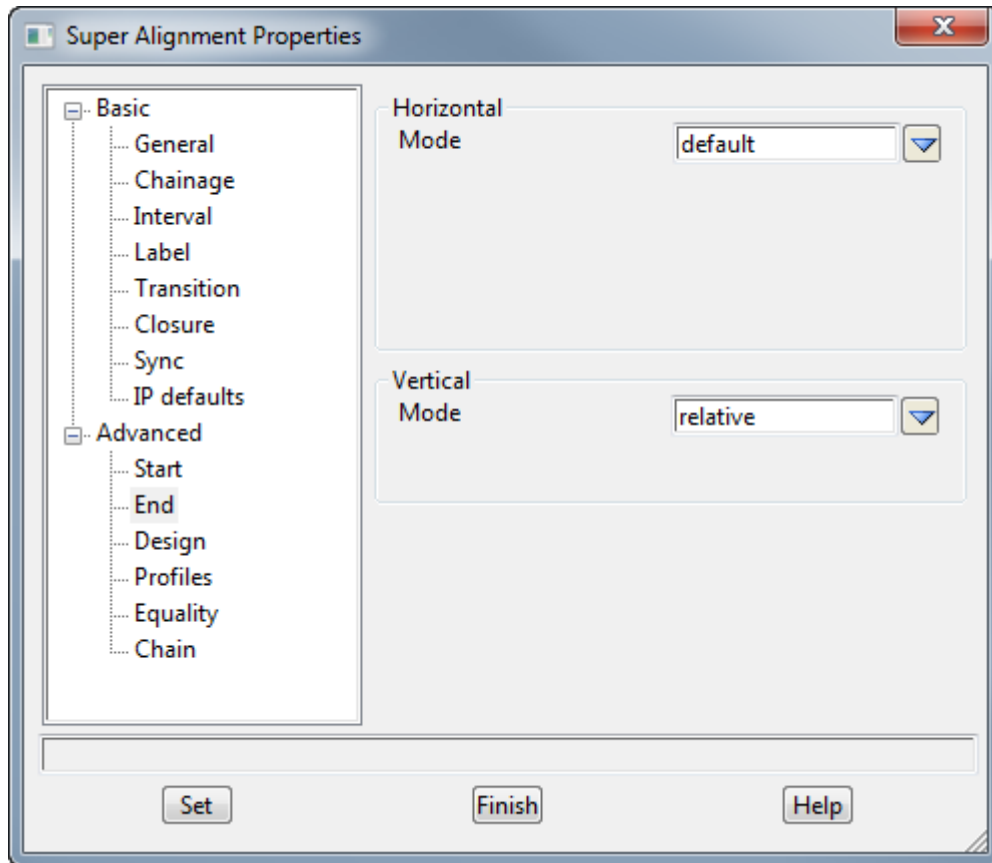


The information in the **Advanced >Start** branch is the same as for the **Advanced >Start** branch of the **Create Super Alignment** panel.

The only difference is that the **Set** button only exists on the **Super Alignment Properties** panel and if **any changes** are made to the values on the **Advanced >Start** branch, then the **Set** button must be clicked before leaving the **Advanced >Start** branch to modify the values for the string.

WARNING: this means that you must click on **Set** after modifying each branch - you can't change values on a number of branches and then click **Set**.

See [Advanced > Start branch](#) for details on all the fields and values in the **Advanced >Start** branch.

Advanced > End branch

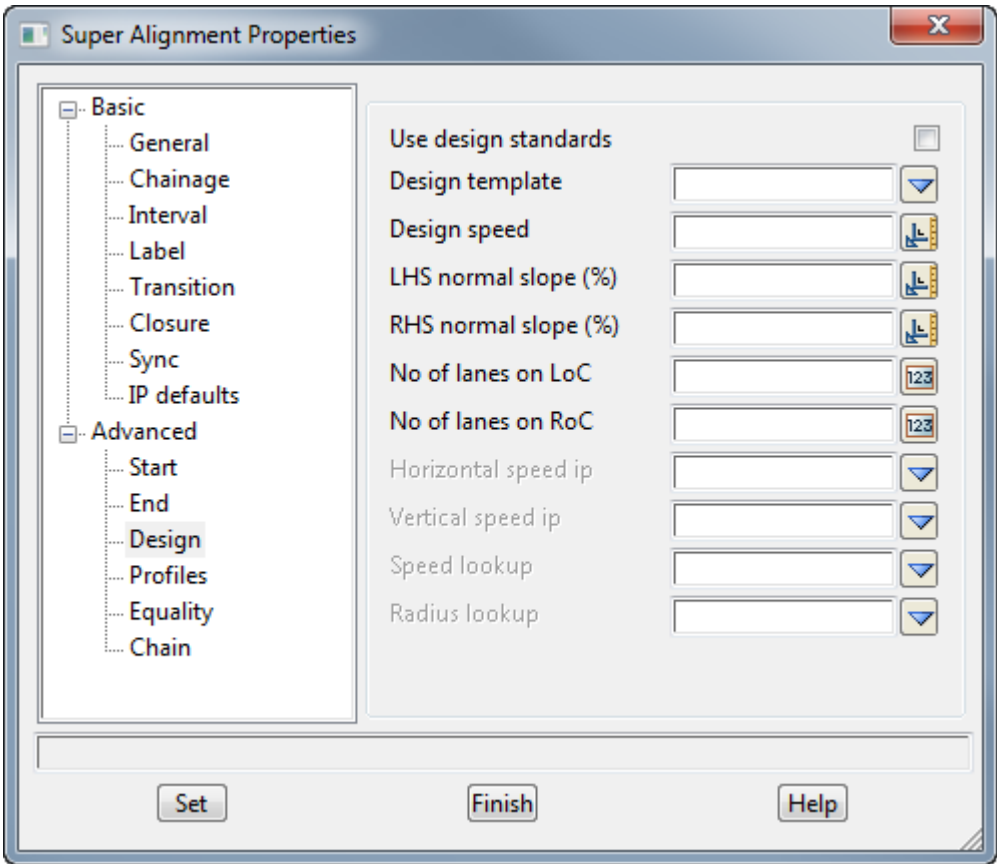
The information in the **Advanced >End** branch is the same as for the **Advanced >End** branch of the **Create Super Alignment** panel.

The only difference is that the **Set** button only exists on the **Super Alignment Properties** panel and if **any changes** are made to the values on the **Advanced >End** branch, then the **Set** button must be clicked before leaving the **Advanced >End** branch to modify the values for the string.

WARNING: this means that you must click on **Set** after modifying each branch - you can't change values on a number of branches and then click **Set**.

See [Advanced > End branch](#) for details on all the fields and values in the **Advanced >End** branch.

Advanced > Design branch

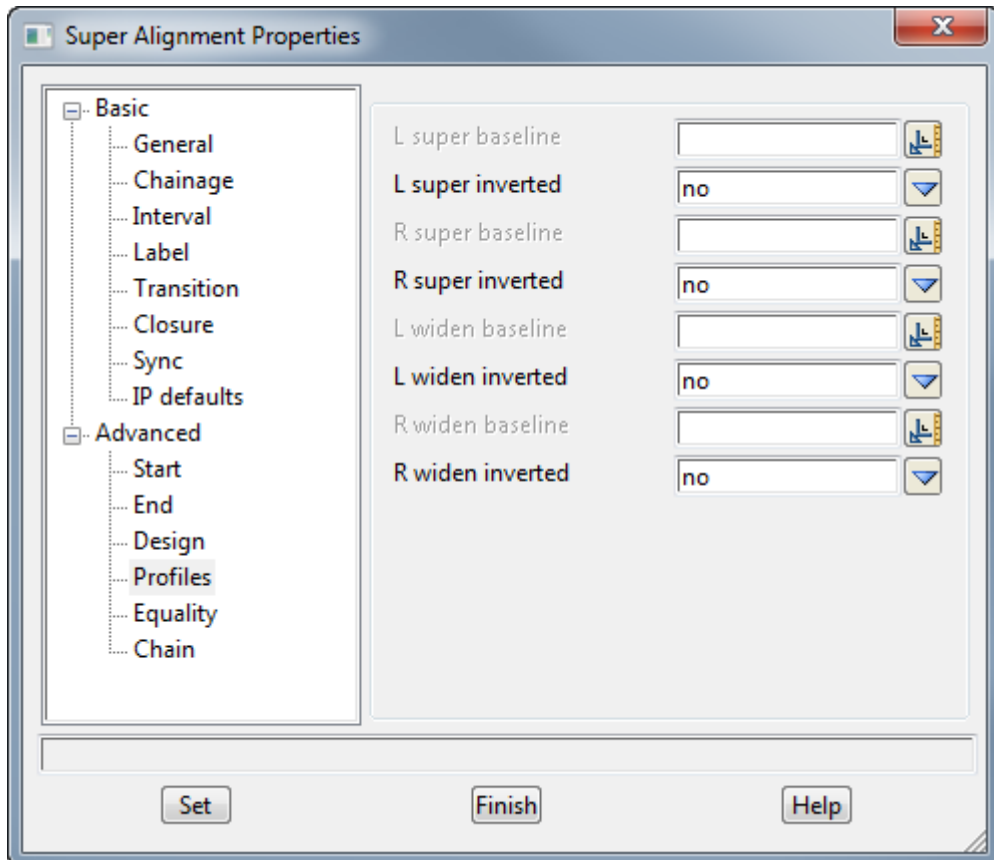


The information in the **Advanced >Design** branch is the same as for the **Advanced >Design** branch of the **Create Super Alignment** panel.

The only difference is that the **Set** button only exists on the **Super Alignment Properties** panel and if **any changes** are made to the values on the **Advanced >Design** branch, then the **Set** button must be clicked before leaving the **Advanced >Design** branch to modify the values for the string.

WARNING: this means that you must click on **Set** after modifying each branch - you can't change values on a number of branches and then click **Set**.

See [Advanced > Design branch](#) for details on all the fields and values in the **Advanced >Design** branch.

Advanced > Profiles branch

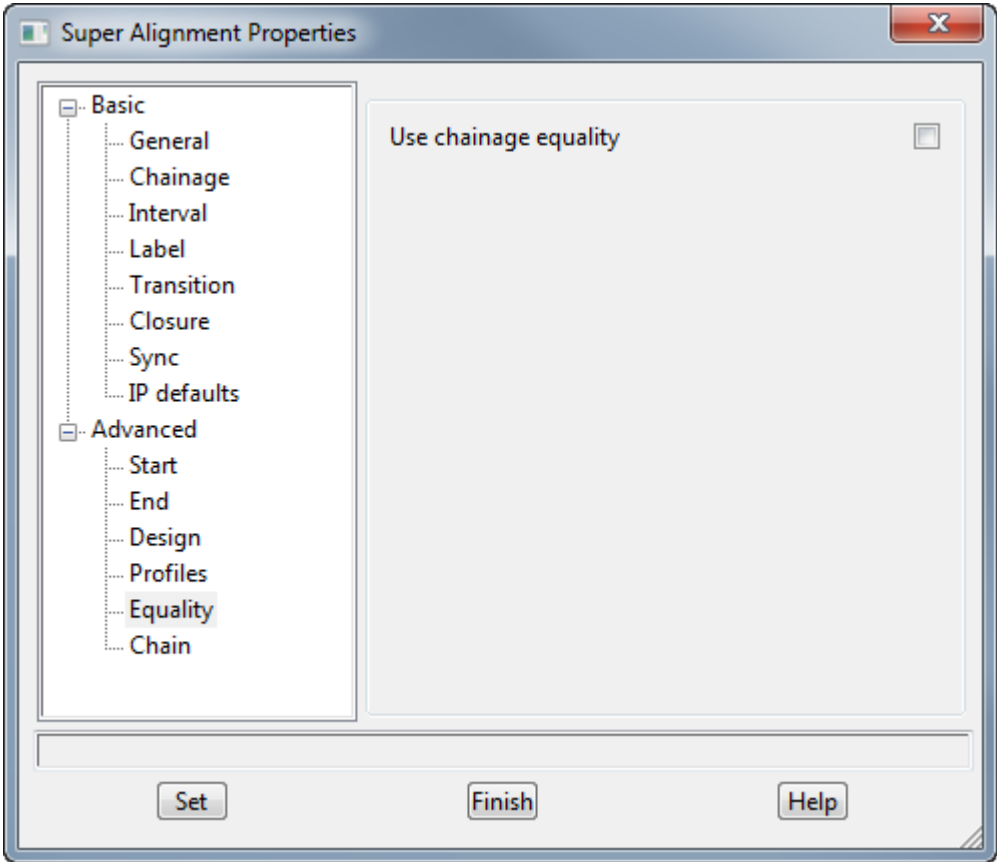
The information in the **Advanced > Profiles** branch is the same as for the **Advanced > Profiles** branch of the **Create Super Alignment** panel.

The only difference is that the **Set** button only exists on the **Super Alignment Properties** panel and if **any changes** are made to the values on the **Advanced > Profiles** branch, then the **Set** button must be clicked before leaving the **Advanced > Profiles** branch to modify the values for the string.

WARNING: this means that you must click on **Set** after modifying each branch - you can't change values on a number of branches and then click **Set**.

See [Advanced > Profiles branch](#) for details on all the fields and values in the **Advanced > Profiles** branch.

Advanced > Equality branch

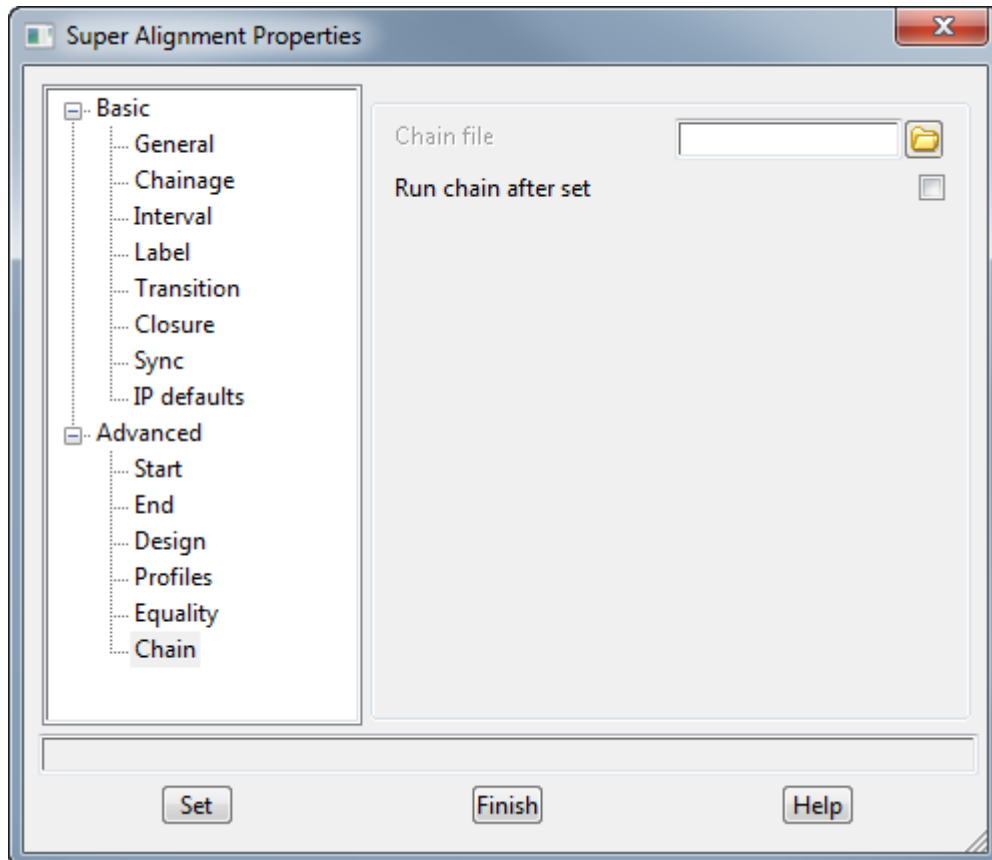


The information in the **Advanced >Equality** branch is the same as for the **Advanced >Equality** branch of the **Create Super Alignment** panel.

The only difference is that the **Set** button only exists on the **Super Alignment Properties** panel and if **any changes** are made to the values on the **Advanced >Equality** branch, then the **Set** button must be clicked before leaving the **Advanced >Equality** branch to modify the values for the string.

WARNING: this means that you must click on **Set** after modifying each branch - you can't change values on a number of branches and then click **Set**.

See [Advanced > Equality branch](#) for details on all the fields and values in the **Advanced >Equality** branch.

Advanced > Chain branch

The information in the **Advanced >Chain** branch is the same as for the **Advanced >Chain** branch of the **Create Super Alignment** panel.

The only difference is that the **Set** button only exists on the **Super Alignment Properties** panel and if **any changes** are made to the values on the **Advanced >Chain** branch, then the **Set** button must be clicked before leaving the **Advanced >Chain** branch to modify the values for the string.

WARNING: this means that you must click on **Set** after modifying each branch - you can't change values on a number of branches and then click **Set**.

See [Advanced > Chain branch \(not yet implemented\)](#) for details on all the fields and values in the **Advanced >Chain** branch.

SA - Undo and Redo Icons

An **Undo** and **Redo** list is defined for **each** Editor open on the screen. That is, each open Editor has its own Undo/Redo lists.

As each option is performed in an open Editor, the reverse of the option is added to the Editors Undo list. Hence an option can be **undone** (reversed) by immediately clicking on the **Undo** icon.

Note: the **Undo** icon is.



If an option is **undone**, it is added to the **Redo** list so that it can be **redone**.

So clicking on the **Undo** icon undoes the last Editor operation for this super alignment and adds it to the top of the Redo list

Note: the **Redo** icon is



Clicking on the **Redo** icon redoes the last Editor operation that was **undone** for this super alignment and the undone operation is added to the top of the Undo list.

Important Note: as each option is added to an Undo or Redo list, the options already on the list are pushed down and none of the options pushed down can be undone/redone until all the options above it have been undone/redone. So both the Undo and Redo lists are last in, first out lists.

So the order in the Undo/Redo lists is important and can not be altered.

When the Editor is exited by either **Quit** or **Finish**, the undo and redo lists are deleted and are no longer usable.

SA - Info Icon

The **Info** icon is



and clicking on the **Info** icon brings up the **Super Alignment Info** panel (see [Super Alignment Info](#)).

Super Alignment Info

Selection

Style	Default
Chainage	0
Dynamic	on

General

Model	XX
Name	
Style	default
Length	3463.852

Position

Xcoord	65.031
Ycoord	1256.193
Level	
Angle	3.0412
Grade	

SA - Recalc Icon

The **Recalc** icon is



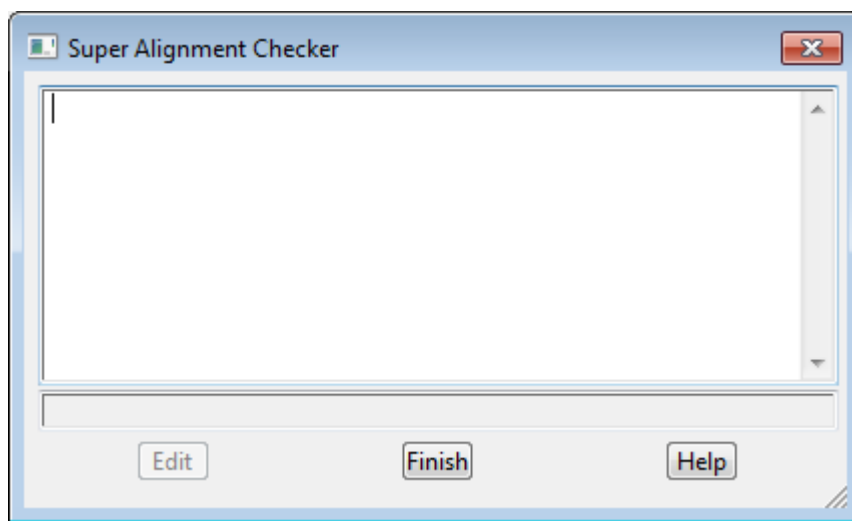
and clicking on the **Recalc** icon does a *recalc* for the super alignment.

SA - Error Checker Icon

The **Error Checker** icon is



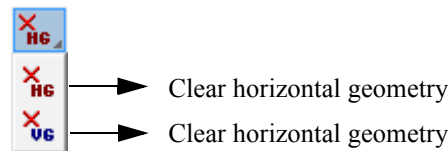
and clicking on the **Error Checker** icon brings up the **Super Alignment Checker** panel and runs the SA checking routines.



Warning: This options is still under development.

SA - Clear Toolbar

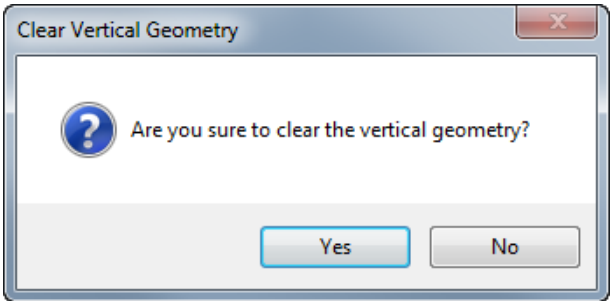
The **Clear** toolbar is



The **Clear VG** and **Clear HG** options are used to delete all the horizontal and/or vertical geometry points in the super alignment string.

SA - Clear VG

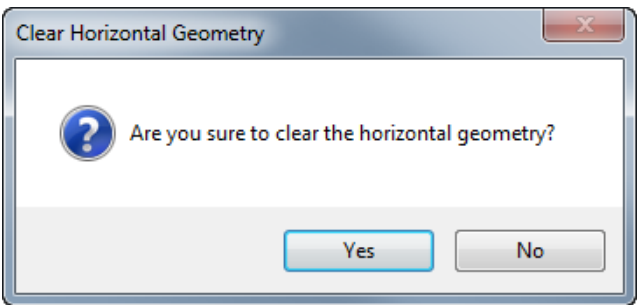
The **Clear VG** option removes all the vertical geometry from the string.
The horizontal geometry still exists plus all the other string properties (model, name, colour and type).



After a **Clear VG**, the vertical geometry can be re- entered using the SA Edit options.

SA - Clear HG

The **Clear HG** option removes all the horizontal **and** vertical geometry from the string.
The string still exists and keeps its other properties such as model, name, colour and type.



After a **Clear HG**, the horizontal and vertical geometry can be re- entered using the SA Edit options.

SA - Help Icon

The **Help** icon is

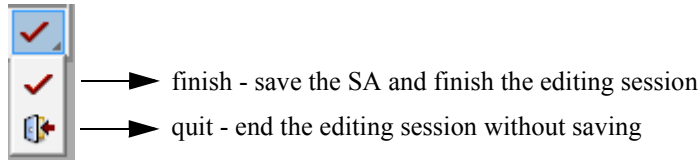


Clicking on **Help** icon opens the context sensitive Help and jumps to this section.

For more information on the super alignment options, see [Edit Super Alignment](#).

SA - Finish Toolbar

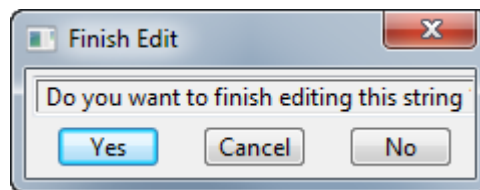
The **Finish** toolbar is



SA - Finish

When editing of the super alignment is completed, **Finish** is used to save the modifications and exit the SA Editor.

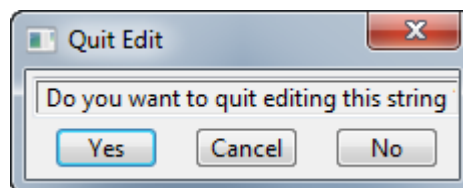
After selecting **Finish**, a **Yes-No-Cancel** panel is displayed to confirm that the edit session has ended and all the edits are to be kept. If **Yes** is selected, the edits will be stored and the SA Editor exited.



SA - Quit

At any time the Editing process can be **aborted** and all the edits thrown away by selecting the **Quit** option. That is, the super alignment is left as it was before the *Edit* was begun.

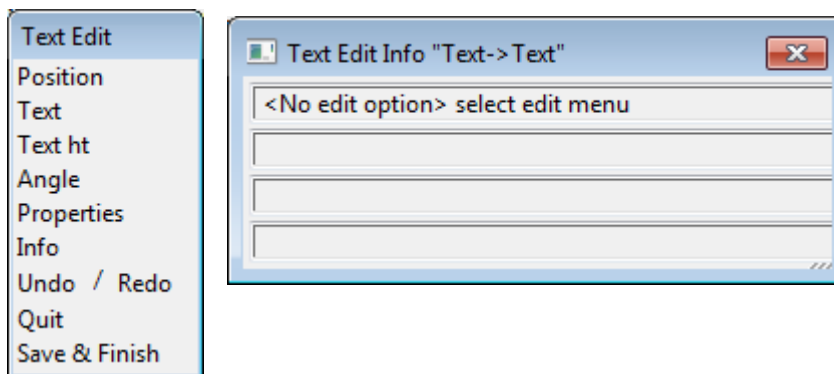
After selecting **Quit**, a **Yes-No-Cancel** panel is displayed to confirm that the edit is to be terminated. If **Yes** is selected, the edits will be ignored and the original unedited super alignment kept.



Note that if it was a new string being created, the Editor is terminated by **Quit** and **no** string is created.

Text Edit

On picking a text string, the **text edit** menu and the panel are placed on the screen.



Each option in the **text edit** menu will now be described.

See the earlier section [Super String Edit - Common Information](#) for general information about editing strings.

Position

The **position** option is used to place the text string for the first time and to re-position (move) an existing text string.

Position is a one step process.

After selecting the **position** option, the new position for the text is selected. The text is then redrawn at the new position.

message area 1 <Position>

Screen message area

<Select point position> [picks][][menu]

<Select point position> [picks][accepts][menu]

The **position** option repeats until cancelled by the user by either bringing up the **pick ops** menu and selecting **cancel** or by selecting a new option from the **text edit** menu.

If, after bringing up the **pick ops** menu, it is decided to continue with the position option, simply select the **restart** option from the **pick ops** menu and the **pick ops** menu will disappear leaving the **position** option still current.

Typed input can be used at any stage

Text

The **text** option is used to modify the text of the text string.

After the **text** option is chosen, an enter text typed-input box is placed on the screen with the string's current text displayed in it.

The enter text typed-input box looks like:



The text is entered into the typed-input box, terminated with <enter>. The entered value is taken as the text of the text string and the string redrawn with the new text. The typed-input box then disappears.

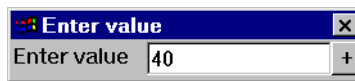
The **text** option automatically terminates and a new option needs to be selected from the **text edit** menu.

Text ht

The **text ht** option is used to modify the height of the text in the text string.

After the **text ht** option is chosen, an **enter value** typed-input box is placed on the screen with the string's current text height displayed in it.

The enter value typed-input box looks like:



The text height is entered into the typed-input box, terminated with <enter>. The entered value is taken as the height of the text in the text string and the string redrawn with the new height.

The typed-input box then disappears.

The **height** option is automatically terminated and a new option needs to be selected from the **text edit** menu.

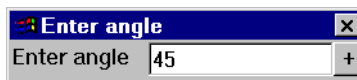
Angle

The **angle** option is used to modify the angle that the text in the text string is drawn at.

The text angle is measured in a counter-clockwise direction with respect to the horizontal axis.

After the **angle** option is chosen, an **enter angle** typed-input box is placed on the screen with the string's current text angle displayed in it.

The enter angle typed-input box looks like:



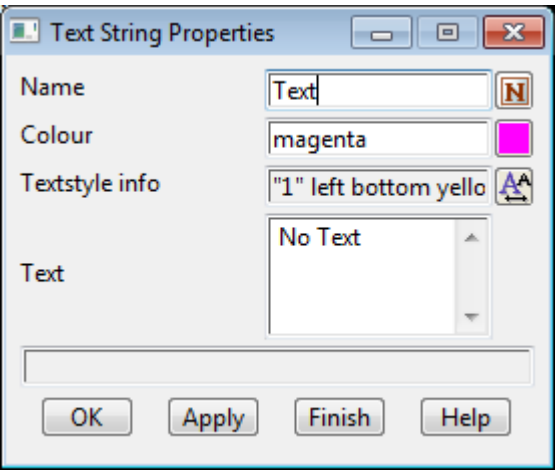
The text angle is entered into the typed-input box, terminated with <enter>. The entered value is taken as the angle of the text in the text string and the string redrawn with the new angle.

The typed-input box then disappears.

The **angle** option is automatically terminated and a new option needs to be selected from the **text edit** menu.

Properties

Selecting **Properties** brings up the **Text String Properties** panel which is used to modify the string's header information.



Field Description	Type	Defaults	Pop-Up
Name <i>the name of the string.</i>	name box		
Colour <i>the colour of the string.</i>	colour box	default colour	available colours
Textstyle info <i>textstyle information.</i>	textstyle info box		
Text <i>the actual text.</i>	multi-line text box		
OK/Apply	buttons	<i>for the string being edited, OK sets the string with the values in the panel fields and removes the panel. Apply sets the string with the values in the panel fields and leaves the panel on the screen.</i>	

Points Edit

Position of menu: Strings => Points Edit

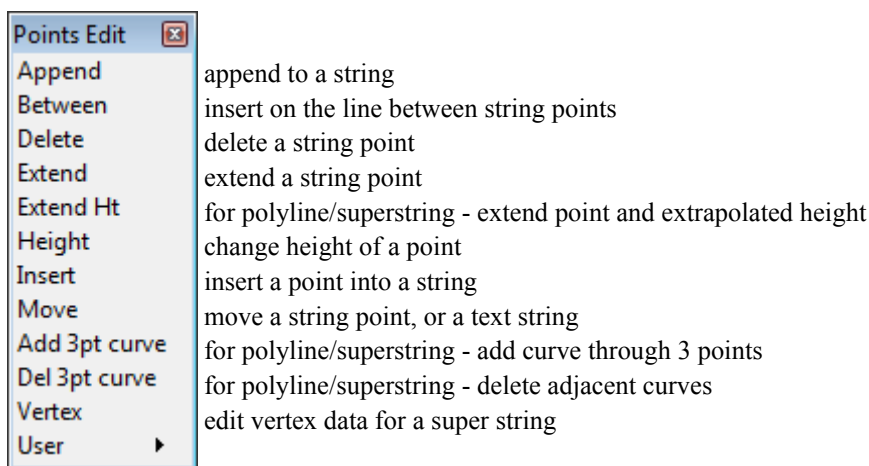
The points operations available in the **Points edit** menu are similar to the create/edit options.

However, in the **Points edit** options, the user does not begin by picking the particular string to be edited. Instead, the required option is selected followed by the point to be modified from any string.

The option can then be applied to another point on that or any other string, or another point operation chosen, and applied to any point.

If the user wants to make a large number of point edits to the one string, the **editor** option discussed in the last section is the easiest option to use. However, if a number of strings are going to be edited with the same operation or a selection of operations, then the **points edit** option is more suitable.

After selecting the **Points edit** option, the **Points edit** menu is displayed.



Each of the options performs the same work as the option of the same name in the **Edit string** option.

The individual options in the **Points Edit** menu will now be discussed in detail.

For the option *Append*, go to

Between

Delete

Extend

Extend Ht

Height

Insert

Move

Add 3pt curve

Del 3pt curve

Vertex

[Append Point](#)

[Between Point](#)

[Delete Point](#)

[Extend Point](#)

[Extend Height](#)

[Height](#)

[Insert Point](#)

[Move Point](#)

[Add 3 Point Curve](#)

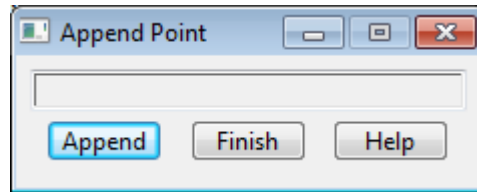
[Delete 3 Point Curve](#)

[Edit Vertex](#)

Append Point

Position of option on menu: Strings =>Points Edit => Append

The **append** option adds additional points to the end of a string. On selecting the **Append** option, an **append point** panel is displayed.



The message area of this panel informs the user of any error messages.

Once in the **append** option, the particular end of the string to append points to is selected using the standard LB and MB pick and accept sequence.

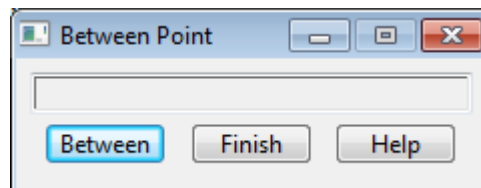
The points to be appended are then selected. The option keeps adding points to the selected string until the **pick ops** menu is brought up using RB and **cancel** is selected.

After the *append* has been completed, the option repeats. That is, the user is asked to select another string to append to. This continues until **finish** or **[X]** is selected from the **append point** panel.

Between Point

Position of option on menu: Strings =>Points Edit => Between

On selecting the **between** option, a **between point** panel is displayed.



The message area of this panel informs the user of any error messages.

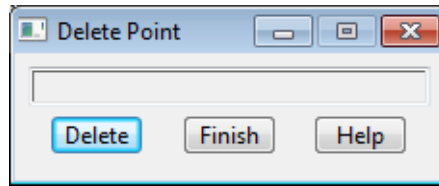
Once in the **between** option, the particular segment to insert a point on is selected using the standard LB and MB pick and accept sequence. The position of the point to insert is then selected and accepted.

After the *between* has been completed, the option repeats. That is, the user is asked to select another segment to insert a point on. This continues until **finish** or **[X]** is selected from the **between point** panel.

Delete Point

Position of option on menu: Strings =>Points Edit => Delete

On selecting the **delete** option, a **delete point** message panel is displayed.



The message area of this panel informs the user of any error messages.

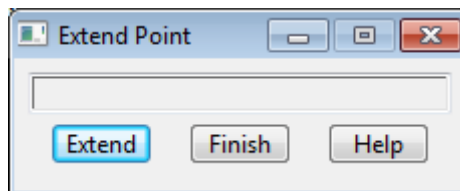
Once in the **delete** option, the particular point to delete is selected using the standard LB and MB pick and accept sequence. When the point is accepted, it is deleted.

After the *delete* has been completed, the option repeats. That is, the user is asked to select another point to delete (the point can be on any string). This continues until **finish** or **[X]** is selected from the **delete point** panel.

Extend Point

Position of option on menu: Strings =>Points Edit => Extend

On selecting the **extend** option, a **extend point** panel is displayed.



The message area of this panel informs the user of any error messages.

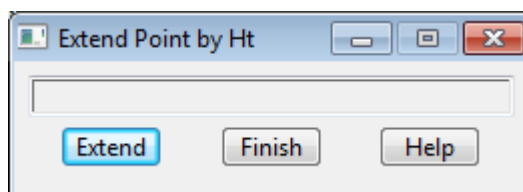
Once in the **extend** option, the particular point on a segment to extend is selected by picking the segment near to the point using the standard LB and MB pick and accept sequence. The position of the point is then moved along the segment until the final position is selected and accepted.

After the *extend* has been completed, the option repeats. That is, the user is asked to select another segment to extend a point on. This continues until **finish** or **[X]** is selected from the **extend point** panel.

Extend Height

Position of option on menu: Strings =>Points Edit => Extend Ht

The extend point by height option is similar to the extend option except that the z-value of the moved point is modified by linearly interpolating the z-value from the original points at the end of the selected segment. On selecting the **extend by ht** option, an **extend point by ht** panel is displayed.



The message area of this panel informs the user of any error messages.

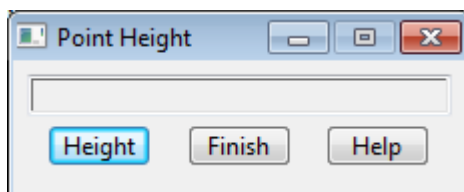
Once in the **extend point by ht** option, the particular point on a segment to extend is selected by picking the segment near to the point using the standard LB and MB pick and accept sequence. The position of the point is then moved along the segment until the final position is selected and accepted. The z-value of the moved point is the linear interpolation of the selected segment.

After the *extend point by ht* has been completed, the option repeats. That is, the user is asked to select another segment to extend a point on. This continues until **finish** or **[X]** is selected from the **extend point by ht** panel.

Height

Position of option on menu: Strings =>Points Edit => Height

On selecting the **height** option, a **point height** panel is displayed.



The message area of this panel informs the user of any error messages.

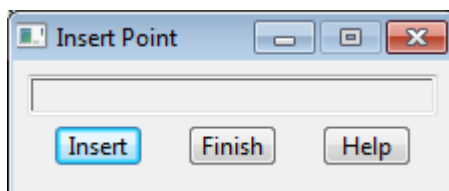
Once in the **height** option, the particular point to modify the height for is selected using the standard LB and MB pick and accept sequence. When the point is accepted, the height existing height is displayed in a **height** box which can be modified and accepted by typing <enter>.

After the *height* has been completed, the option repeats. That is, the user is asked to select another point to modify the height for (the point can be on any string). This continues until **finish** or **[X]** is selected from the **point height** panel.

Insert Point

Position of option on menu: Strings =>Points Edit => Insert

On selecting the **insert** option, an **insert point** message panel is displayed.



The message area of this panel informs the user of any error messages.

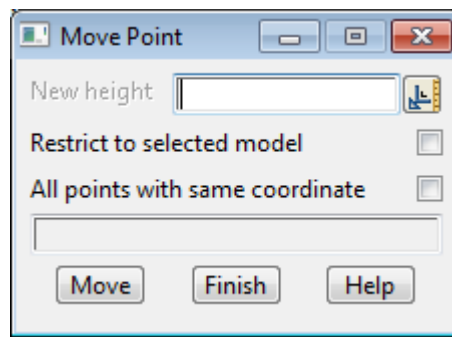
Once in the **insert** option, the particular segment to identify the two points to insert the point is selected using the standard LB and MB pick and accept sequence. The position of the point to insert is then selected and accepted.

After the *insert* has been completed, the option repeats. That is, the user is asked to select another segment to insert a point on. This continues until **finish** or **[X]** is selected from the **insert point** panel.

Move Point

Position of option on menu: Strings =>Points Edit => Move

On selecting the **move** option, a **move point** panel is displayed.



The message area of this panel informs the user of any error messages. There are similar panels for each of the other **points edit** options.

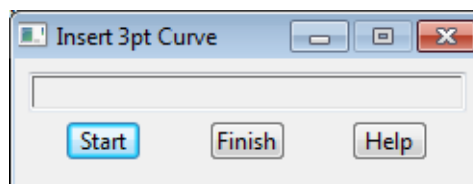
Once in the **move** option, the particular point to move is selected using the standard LB and MB pick and accept sequence. The position that the point is to be moved to is then selected and accepted.

After the move has been completed, the option repeats. That is, the user is asked to select another point to move (the point can be on any string). This continues until **finish** or **[X]** is selected from the **move point** panel.

Add 3 Point Curve

Position of option on menu: Strings => Points Edit => Add 3pt Curve

On selecting the **add 3pt curve** option, a **insert 3pt curve** panel is displayed.



The message area of this panel informs the user of any error messages.

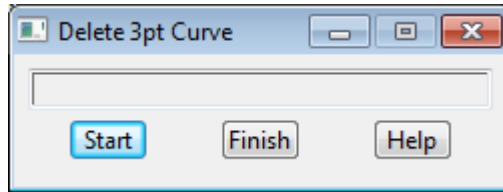
Once in the **add 3pt curve** option, the middle point of the three points of the super string to fit a curve for, is selected using the standard LB and MB pick and accept sequence. When the point is accepted, the curve is fitted between it and the left and right adjacent points of the super string.

After the **add 3pt curve** has been completed, the option repeats. That is, the user is asked to select another point to add a curve to (the point can be on any super string). This continues until **finish** or **[X]** is selected from the **insert 3pt curve** panel.

Delete 3 Point Curve

Position of option on menu: Strings => Points Edit => Del 3pt Curve

On selecting the **del 3pt curve** option, a **delete 3pt curve** panel is displayed.



The message area of this panel informs the user of any error messages.

Once in the **Delete 3pt curve** option, a vertex from a super string is selected using the standard LB and MB pick and accept sequence and if there is curves on both sides of the vertex, the radii are removed and the vertices are joined by straight line segments.

After the *Delete 3pt curve* has been completed, the option repeats. That is, the user is asked to select another point on a super string to remove the curves on either side (the point can be on any super string). This continues until **finish** or **[X]** is selected from the **Delete 3pt curve** panel.

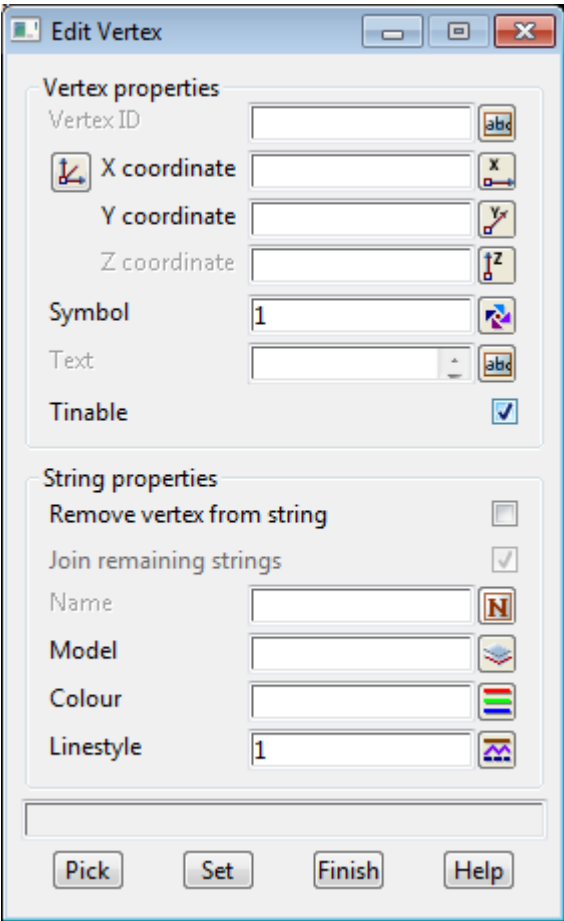
Edit Vertex

Position of option on menu: Strings =>Points Edit => Vertex

The Edit Vertex option allows the quick editing of the co-ordinates, vertex id, symbol, vertex text and tinability of a selected string vertex.

The name, model, colour and linestyle, which are string properties, can also be modified however the user has the choice of modifying the string properties for the entire string, or have the option remove the selected vertex from the string and only give the string properties to the newly created one vertex string. If a vertex is removed from the string, the adjacent vertices of the removed vertex can be joined.

On selecting the Vertex option, a **Edit Vertex** panel is displayed.



The **Edit Vertex** option is already running and a super string vertex is selected.

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Vertex properties			
Vertex id	input		
<i>the vertex id (point number) for the selected vertex. Change this to the required value.</i>			
X coordinate			Measure X panel
<i>the x coordinate (easting) of the selected vertex. Change this to the required value.</i>			
Y coordinate			Measure Y panel
<i>the y coordinate (northing) of the selected vertex. Change this to the required value.</i>			

Z coordinate		Measure Z panel
<i>the y coordinate (elevation) of the selected vertex. Change this to the required value.</i>		
Symbol	symbol box	available symbols
<i>the symbol on the selected vertex. Change this to the required symbol.</i>		
Text	input	
<i>the text on the selected vertex. Change this to the required text.</i>		
Tinable	tick box	
<i>ticked if the selected vertex is tinable. Change if required.</i>		

String/New vertex properties

Remove vertex from string	tick box	
<i>tick if the selected vertex is to be removed from its current string.</i>		
Join remaining points	tick box	
<i>only setable if Remove vertex from string is ticked.</i>		
<i>If ticked then the vertices on either side of the removed vertex are joined.</i>		
<i>If not ticked then the original string will be broken into two strings when the vertex is removed.</i>		

Name	input	
<i>the name of the string containing the selected vertex. Change this to the required name.</i>		
Model	model box	available models
<i>the model of the string containing the selected vertex. Change this to the required model.</i>		
Colour	colour box	available colours
<i>the colour of the string containing the selected vertex. Change this to the required colour.</i>		
Linestyle	linestyle box	
<i>the linestyle of the string containing the selected vertex. Change this to the required linestyle.</i>		

Pick	button	
<i>chose Pick and then select the vertex to be edited.</i>		
Set	button	
<i>apply the values in the panel to the selected vertex. Pick is still active so that another vertex can be selected.</i>		

Strings Edit

Position of menu: Strings => Strings Edit

The **Strings edit** option contains operations to be applied, not to individual points of a string, but to entire strings.

After selecting the **Strings edit** option, the **Strings edit** menu is displayed.

Strings Edit	
Change	change string colour, type, name or model
Clip	delete or keep part of a string
Close	connect the first and last points
Delete	delete a string
Duplicate	duplicate a string
Join	join two strings to form one string
Join many	join many strings to form one string
Link clip	delete a string link
Open	disconnect the first and last points
Parallel	parallel the string
Reverse	reverse the order of string points
Split	split a string into two strings
Translate	translate a string to a new position
Textdata info	change the text information
Arc to chords	create inner and outer chords for an arc
Segment strings	segment a super string
Corner splays	create corner splay
Surrounding polygon	form polygon from lines and arcs
User	

The individual options in the **Strings edit** menu will now be discussed in detail.

For the option *Change*, go to

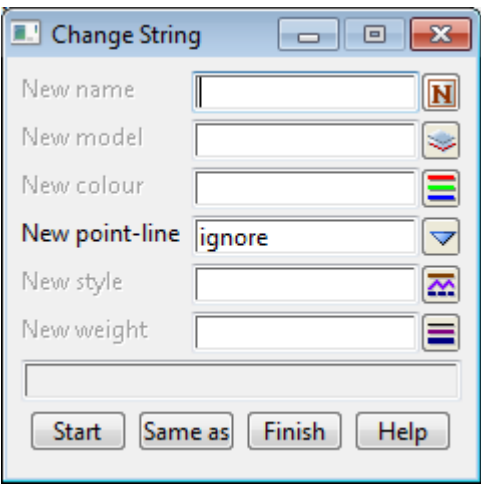
<i>Change</i>	Change
<i>Clip</i>	Clip
<i>Close</i>	Close
<i>Delete</i>	Delete
<i>Duplicate</i>	Duplicate
<i>Join</i>	Join
<i>Join many</i>	Join Many
<i>Link clip</i>	Link Clip
<i>Open</i>	Open
<i>Parallel</i>	Parallel
<i>Reverse</i>	Reverse
<i>Split</i>	Split
<i>Translate</i>	Translate
<i>Textdata info</i>	Textdata Info
<i>Arc to chords</i>	Arc to Chords
<i>Segment strings</i>	Segment Strings
<i>Corner splays</i>	Corner Splays
<i>Surrounding polygon</i>	Surrounding Polygon

Change

Position of option on menu: Strings =>Strings Edit =>Change

The **Change** option can be used to change the mode, colour, style, name and point-line type of a string.

On selecting the **Change** option, the **Change string** panel is displayed.



The **Change** option is already in progress and if a string is selected, the model, colour, style, name and point-line type are changed according to the fields in the **change string** panel.

The fields and buttons used in the panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
New name	<i>if non-blank, the name of the selected string will be changed to the name given in the new name field.</i>	input		
New model	<i>if non-blank, the selected string will be moved to the model given in the new model field.</i>	input		available models
New colour	<i>if non-blank, the colour of the selected string will be changed to the colour given in the new colour field.</i>	input		available colours
New point-line	<i>if non-blank, the breakline type of the selected string will be changed to the type given in the new point-line field (point or line type).</i>	input		point, line
New style	<i>if non-blank, the style of the selected string will be changed to the name given in the new style field.</i>	input		

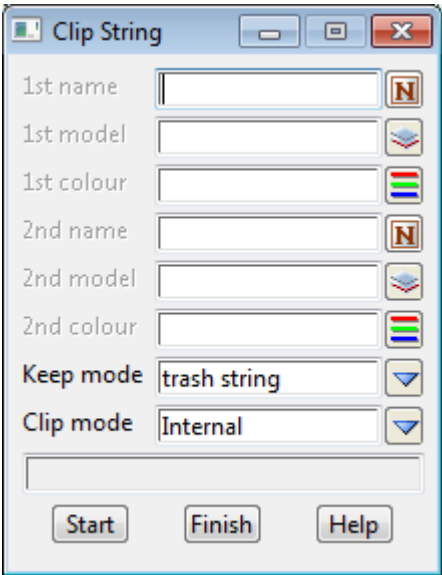
Please continue to the next section [Clip](#).

Clip

Position of option on menu: Strings =>Strings Edit =>Clip

The **Clip** option can be used to delete or keep part of a string.

On selecting the Clip option, the **Clip string** panel is displayed.



After selecting the **clip** option, the user is asked to select the string to be clipped. The user is then asked to select two points on the string to define the section to be clipped.

Depending on the **clip mode**, either

- (a) a new string is created from the section of the string between the two points
- (b) two new strings are created by deleting the section of the string between the two points
- (c) one new string is created by deleting the section of the string between the two points and then joining the two selected points.

If the 1st name, 1st model and/or 1st colour panel fields are non-blank, the values are used for the 1st half of the clipped string. Otherwise the values of the original string are used for the 1st half of the string.

If the 2nd name, 2nd model and/or 2nd colour panel fields are non-blank, the values are used for the second half of the clipped string. Otherwise the values of the original string are used for the second half of the string.

If the **keep mode** is set to

- keep string**, the original string is kept
- trash string**, the original string is moved to the trash model
- delete string**, the original string will be deleted.

Hence, the fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
1st name	input		
<i>if blank, the first half of the clipped string is given the name of the original string.</i> <i>If non-blank, the first half of the clipped string is given the name in the 1st name field.</i>			
1st model	input		available models
<i>if blank, the first half of the clipped string is placed in the same model as the original selected string.</i> <i>If non-blank, the first half of the clipped string is placed in the model given in the 1st model field.</i>			

1st colour	input	available colours
<i>if blank, the first half of the clipped string is given the colour of the original string.</i> <i>If non-blank, the first half of the clipped string is given the colour specified in the 1st colour field.</i>		
2nd name	input	
<i>if blank, the second half of the clipped string is given the name of the original string.</i> <i>If non-blank, the second half of the clipped string is given the name in the 2nd name field.</i>		
2nd model	input	available models
<i>if blank, the second half of the clipped string is placed in the same model as the original selected string.</i> <i>If non-blank, the second half of the clipped string is placed in the model given in the 2nd model field.</i>		
2nd colour	input	available colours
<i>if blank, the second half of the clipped string is given the colour of the original string.</i> <i>If non-blank, the second half of the clipped string is given the colour specified in the 2nd colour field.</i>		
Keep mode	input	keep string delete, keep, trash string
<i>if delete string, the string selected to be clipped is deleted.</i> <i>keep string, the selected string is not deleted.</i> <i>trash string, the string selected to be clipped is moved to the trash model.</i>		
Clip mode	input	internal internal, external, join external
<i>if internal, a new string is created from the section of string between the two selected points.</i> <i>external, two new strings are created by deleting the section of the string between the two points.</i> <i>join external, one new string is created by deleting the section of the string between the two points and then joining the two selected points.</i>		

How to Use the Panel and Panel Messages

- (a) Enter the new model, colour and name for the first and second parts of the clipped string.
- (b) The string to be clipped is selected.
- (c) The points to be used as the clipped point are then selected.
- (d) The section of the string is then clipped between the selected points and depending on the **clip mode**, the selected string is then clipped or the clipped section kept.

Please continue to the next section [Close](#).

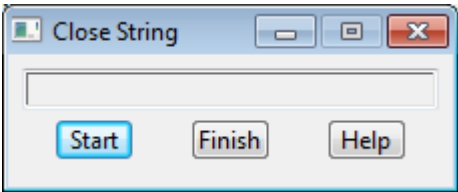
Close

Position of option on menu: Strings =>Strings Edit =>Close

A closed string is simply a string whose 1st and last points are the same.

The `close` string option adds to the end of the string, a point that is identical to the 1st string point. This then forms a closed string.

On selecting the `close` option, the **close string** panel is displayed.



The `close` option is already in progress and if a string is selected, it is closed.

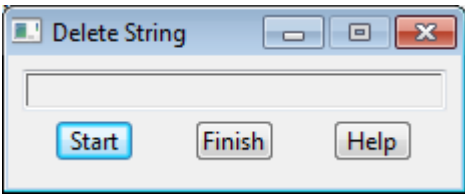
Please continue to the next section [Delete](#).

Delete

Position of option on menu: Strings =>Strings Edit =>Delete

Entire strings can be deleted from the model using the **Delete** option.

On selecting the **Delete** string option, the **Delete string** panel is displayed.



The **delete** option is already in progress and if a string is selected (LB) and accepted (MB), it is deleted

If the **trash mode** in the **trash defaults** panel is set to **trash string**, the original string is not deleted but moved to the trash model.

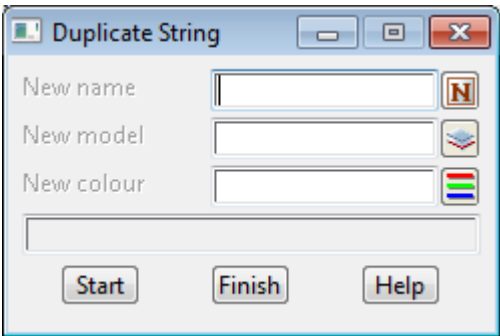
Please continue to the next section [Duplicate](#).

Duplicate

Position of option on menu: Strings =>Strings Edit =>Duplicate

The **duplicate** option is used to make a copy of the string with the option of giving the duplicate string a new model, colour and/or name.

On selecting the **duplicate** option, the **duplicate string** panel is displayed.



The **duplicate** option is already is progress and if a string is selected, then a copy of the string will be created and possibly given a new model, colour or name depending on the fields in the **duplicate string** panel.

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
New name	input		

if the **new name** field is blank, the duplicate string has the same name as the original string. If the

new name field is non-blank, then the duplicate string is given the name in the **new name** field.

New model

input

available models

*if **new model** is blank, the duplicate string is placed in the same model as the original string. If the **new model** field is non-blank, then the duplicate string is placed in the model given in the **new model** field.*

New colour

input

available colours

*if the **new colour** field is blank, the duplicate string has the same colour as the original string. If the **new colour** field is non-blank, then the duplicate string is given the colour specified in the **new colour** field.*

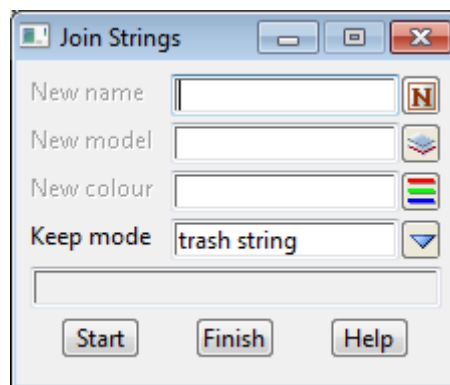
Please continue to the next section [Join](#).

Join

Position of option on menu: Strings =>Strings Edit =>Join

The **Join** option is used to create a new string by joining two existing strings together.

On selecting the **Join** option, the **Join strings** panel is displayed.



After selecting the **Join** option, the user is asked to select in turn the two strings that make up the joined string.

First, the string that will become the first half of the new joined string is selected with the direction that the string will have as the first half of the new string.

Next, the string that will become the second half of the new joined string is selected with the direction that the string will have as the second half of the new string.

The end of the first selected directed string and the beginning of the second selected directed string are joined to form the new joined string.

If the model, colour and/or name panel fields are non-blank, their values are used for the new joined string. Otherwise the values from the first selected string are used for the joined string.

If the **keep mode** is set to

- keep string**, the original strings are kept
- trash string**, the original strings are moved to the trash model
- delete string**, the original strings are deleted.

Hence, the fields and buttons used in this panel have the following functions.

Field Description

Type

Defaults

Pop-Up

New name

input

*if the **new name** field is blank, the joined string is given the name of the first selected string. If the **new name** field is non-blank, the joined string is given the name in the **new name** field.*

New model	input	available models
<i>if new model is blank, the joined string is placed in the same model as the first selected string. If the new model field is non-blank, the joined string is placed in the model given in the new model field.</i>		
New colour	input	available colours
<i>if the new colour field is blank, the joined string is given the colour of the first selected string. If the new colour field is non-blank, then the joined string is given the colour specified in the new colour field.</i>		
Keep mode	input	keep strings delete string, keep strings
<i>if delete string, the selected strings selected are deleted.</i>		
<i>keep string, the selected strings are not deleted.</i>		
<i>trash string, the strings selected to be joined are moved to the trash model.</i>		

How to Use the Panel

- (a) Enter the new model, colour and name for the joined string.
- (b) The 1st string is selected by picking it with the required direction.
- (c) The string to be joined to the 1st selected string is selected by picking it with the required direction.
- (d) The last point of the 1st directed string and the 1st point of the second directed string are joined to create a new string with model, colour, name as specified in the **join strings** panel.

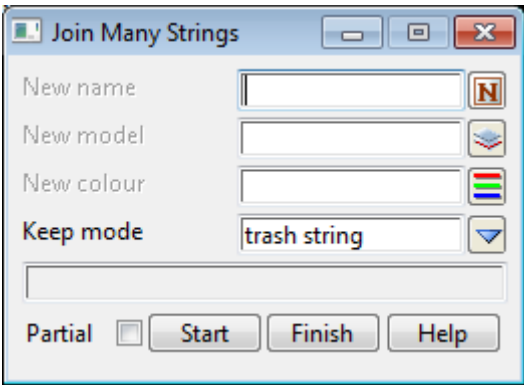
Please continue to the next section [Join Many](#).

Join Many

Position of option on menu: Strings =>Strings Edit =>Join many

The **Join many** option is used to create a new string by joining two or more existing strings, or parts or strings, together.

On selecting the **Join many** option, the **Join many strings** panel is displayed.



After selecting the **Join many** option, the user is asked to select in turn the strings that will make up the joined string. Using the partial mode, parts of strings can be joined.

First, the string that will become the first part of the new joined string is selected with the direction that the string will have as the first part of the new string.

If partial is **set (tick)**, two points are then picked on the string and only the part of the string between the picked points is used in the join.

Next, the strings that will become the subsequent parts of the new joined string are selected in order with the direction that the strings will have in the new joined string.

Again, whenever partial is **set (tick)**, two points are picked on the selected string and only the

part of the string between the picked points is used in the join.

The end of each selected directed string (or partial string) is joined to the beginning of the subsequent selected directed string (or partial string) when forming the joined string.

If the name, model and/or colour panel fields are non-blank, their values are used for the new joined string. Otherwise the values from the first selected string are used for the joined string.

If the **keep mode** is set to

- keep string**, the original strings are kept
- trash string**, the original strings are moved to the trash model
- delete string**, the original strings are deleted.

Hence, the fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
New name	input		
<i>if blank, the joined string is given the name of the first selected string.</i>			
<i>If non-blank, the joined string is given the name in the new name field.</i>			
New model	input		available models
<i>if blank, the joined string is placed in the same model as the first selected string.</i>			
<i>If non-blank, the joined string is placed in the model given in the new model field.</i>			
New colour	input		available colours
<i>if blank, the joined string is given the colour of the first selected string.</i>			
<i>If non-blank, the joined string is given the colour specified in the new colour field.</i>			
Keep mode	input	keep strings	delete strings, keep strings
<i>if delete string, the selected strings are deleted.</i>			
<i>keep string, the selected strings are not deleted.</i>			
<i>trash string, the strings selected to be joined are moved to the trash model.</i>			
Partial	tick		
<i>if ticked, two points are then picked on the string and only the part of the string between the picked points is used in the join.</i>			
<i>if not ticked, no extra points are required and the entire string is used.</i>			

How to Use the Panel and Panel Messages

- (a) Enter the new model, colour and name for the joined string.
- (b) The first string to be joined is then selected by picking the required string with the required direction, plus two points to restrict the string if partial is set on.
- (c) The second and subsequent strings to be joined are then selected (or partial string if partial is set on) in order and with the required direction.
- (d) The last point of each directed string is connected to the first point of the subsequent directed string to create a new joined string. The model, colour and name as specified in the **join many strings** panel are used for the new string.

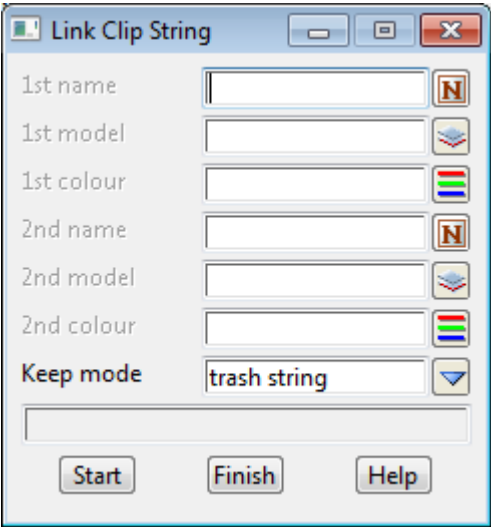
Please continue to the next section [Link Clip](#).

Link Clip

Position of option on menu: Strings =>Strings Edit =>Link clip

The **link clip** option can be used to **delete** the link joining two adjacent vertices of a string.

On selecting the link clip option, the **link clip string** panel is displayed.



After selecting the **link clip** option, the user selects the link of the string to be clipped. On acceptance, the selected link is deleted from the string, thus creating two new strings.

If the 1st name, 1st model and/or 1st colour panel fields are non-blank, the values are used for the first half of the link clipped string. Otherwise the values of the original string are used for the first half of the string.

If the 2nd name, 2nd model and/or 2nd colour panel fields are non-blank, the values are used for the second half of the link clipped string. Otherwise the values of the original string are used for the second half of the string.

If the **keep mode** is set to

- keep string**, the original string is kept
- trash string**, the original string is moved to the trash model
- delete string**, the original string will be deleted.

Hence, the fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
1st name	input		
<i>if blank, the first half of the clipped string is given the name of the original string.</i> <i>If non-blank, the first half of the clipped string is given the name in the 1st name field.</i>			
1st model	input		available models
<i>if blank, the first half of the clipped string is placed in the same model as the original selected string.</i> <i>If non-blank, the first half of the clipped string is placed in the model given in the 1st model field.</i>			
1st colour	input		available colours
<i>if blank, the first half of the clipped string is given the colour of the original string.</i> <i>If non-blank, the first half of the clipped string is given the colour specified in the 1st colour field.</i>			
2nd name	input		
<i>if blank, the second half of the clipped string is given the name of the original string.</i> <i>If non-blank, the second half of the clipped string is given the name in the 2nd name field.</i>			
2nd model	input		available models
<i>if blank, the second half of the clipped string is placed in the same model as the original selected string.</i> <i>If non-blank, the second half of the clipped string is placed in the model given in the 2nd model field.</i>			
2nd colour	input		available colours
<i>if blank, the second half of the clipped string is given the colour of the original string.</i> <i>If non-blank, the second half of the clipped string is given the colour specified in the 2nd colour field.</i>			

Keep mode input keep string delete, keep, trash string

if delete string, the string selected to be clipped is deleted.
keep string, the selected string is not deleted.
trash string, the string selected to be clipped is moved to the trash model.

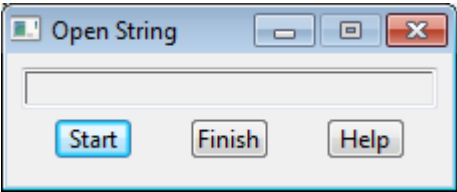
Please continue to the next section [Open](#).

Open

Position of option on menu: Strings =>Strings Edit =>Open

A closed string is opened by removing the last point of the string.

On selecting the **open** option, the **open string** panel is displayed.



The **open** option is already in progress and if a closed string is selected, it is opened.

Please continue to the next section [Parallel](#).

Parallel

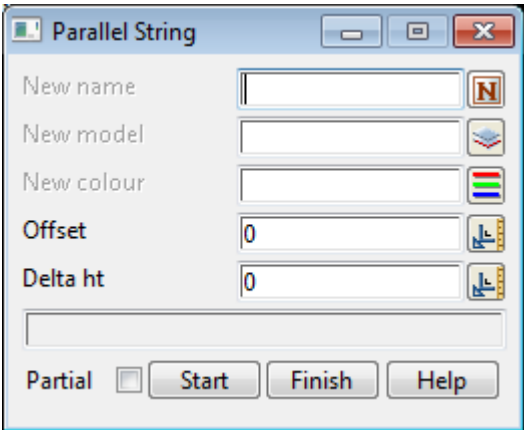
Position of option on menu: Strings =>Strings Edit =>Parallel

Strings, or parts of strings, can be translated perpendicularly to either the left or right using the **parallel** option. The z-values of the string can also be adjusted by a constant value.

The difference between a **translate** and a **parallel** is that for a straight **translate**, the translation vector is the same for the whole string. In a **parallel**, the translation is at right angles to each link of the string and hence the translation direction varies along the string.

For example, the edge of a road is a parallel of the centre-line, not a copy of the centre-line.

On selecting the **parallel** option, the **Parallel String** panel is displayed.



The user is then asked to select the string to parallel.

If partial is **not set**, the string is copied parallel through the distance given in the offset field.

If partial is **set (tick)**, two points are then picked on the string and only the part of the string

between the picked points is copied parallel through the distance given in the offset field.

The value in the **delta ht** field is then added to the z-values of the string.

The direction imposed upon the string when selecting it is used to determine what is the left and right side of the string in the **parallel** operation.

A positive offset parallels the string to the right with respect to the direction of picking. A negative offset parallels to the left with respect to the direction of picking.

Hence, the fields and buttons used in the **parallel string** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
New name <i>if blank, the paralleled string is given the name of the original string.</i> <i>If non-blank, the parallel string is given the name in the new name field.</i>	input		
New model <i>if blank, the paralleled string is placed in the same model as the original selected string.</i> <i>If non-blank, the paralleled string is placed in the model given in the new model field.</i>	input		available models
New colour <i>if blank, the paralleled string is given the colour of the original string.</i> <i>If non-blank, the paralleled string is given the colour specified in the new colour field.</i>	input		available colours
Offset <i>distance (in world units) that the string will be copied parallel through. A positive distance denotes that the string will be paralleled to the right of the original string.</i>	input		
Delta ht <i>value to add to the z-values of the string.</i>	input		
Partial <i>if ticked, two points are then picked on the string and only the part of the string between the picked points is used in the parallel.</i> <i>if no ticked, no extra points are required and the entire string is used.</i>	tick		

How to Use the Panel

- (a) Enter the new model, colour and name for the paralleled string.
- (b) Enter the offset distance for the parallel - left and right is determined by picking direction.
- (c) Enter the height to add to the string's z-values in the delta ht field.
- (d) The selected string (or partial string if partial is set on) is then copied parallel as required.

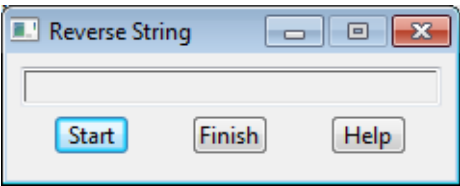
Please continue to the next section [Reverse](#).

Reverse

Position of option on menu: Strings =>Strings Edit =>Reverse

The reverse string option simply reverses the order of the points in a string.

On selecting the reverse option, the **reverse string** panel is displayed.



After selecting the **reverse** option, the user simply picks (LB) the string that is to have its point order reversed and on acceptance (MB) of the string, the reversing takes place.

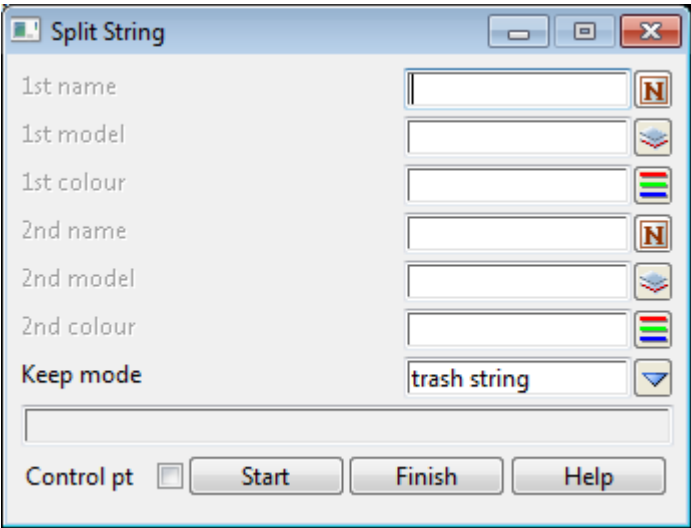
Please continue to the next section [Split](#).

Split

Position of option on menu: Strings =>Strings Edit =>Split

The **Split** option is used to create two new strings by splitting an existing string about a selected point on the string.

On selecting the **Split** option, the **Split string** panel is displayed.



If **control point** is set **off**, after selecting the **split** option, the user is asked to select the string and the selection point is **also** used as a split point. Hence the one point is used to select the string and as the split point.

If **control point** is set **on**, the user is asked to select the string to split and then pick the point that is dropped perpendicularly onto the selected string as the point on the string to be used as a split point. Hence the **string select** and the **split point** are selected separately.

Two strings are then created by splitting the chosen string about the split point.

If the 1st name, 1st model and/or 1st colour panel fields are non- blank, the values are used for the first half of the split string. Otherwise the values of the original string are used for the first half of the string.

If the 2nd name, 2nd model and/or 2nd colour panel fields are non-blank, the values are used for the second half of the split string. Otherwise the values of the original string are used for the second half of the string.

If the **keep mode** is set to
keep string, the original string is kept
trash string, the original string is moved to the trash model
delete string, the original string will be deleted.

Hence, the fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
1st name <i>if blank, the first half of the split string is given the name of the original string.</i> <i>If non-blank, the first half of the split string is given the name in the 1st name field.</i>	input		
1st model <i>if blank, the first half of the split string is placed in the same model as the original selected string.</i> <i>If non-blank, the first half of the split string is placed in the model given in the 1st model field.</i>	input		available models
1st colour <i>if blank, the first half of the split string is given the colour of the original string.</i> <i>If non-blank, then the first half of the split string is given the colour specified in the 1st colour field.</i>	input		available colours
2nd name <i>if blank, the second half of the split string is given the name of the original string.</i> <i>If non-blank, the second half of the split string is given the name in the 2nd name field.</i>	input		
2nd model <i>if blank, the second half of the split string is placed in the same model as the original selected string.</i> <i>If non-blank, the second half of the split string is placed in the model given in the 2nd model field.</i>	input		available models
2nd colour <i>if blank, the second half of the split string is given the colour of the original string.</i> <i>If non-blank, then the second half of the split string is given the colour specified in the 2nd colour field.</i>	input		available colours
Keep mode <i>if delete string, the string selected to be split is deleted.</i> <i>keep string, the selected string is not deleted.</i> <i>trash string, the string selected to be split is moved to the trash model.</i>	input	keep string	delete, keep, trash string
Control pt <i>If ticked, the user is asked to select the string to split and then pick the point that is dropped perpendicularly onto the selected string as the point on the string to be used as a split point.</i> <i>If not ticked, the user is asked to select the string and the selection point is also used as a split point.</i>	tick		

How to Use the Panel and Panel Messages

- (a) Enter the new model, colour and name for the first and second parts of the split string.
- (b) If control is on, the string is selected and then the split point is selected.
If control is off, the string is selected and the same point is to be used as the split point.
- (c) The chosen string is then split about the split point and the two halves given models, colours and names as defined by the split string panel.

Please continue to the next section [Translate](#).

Translate

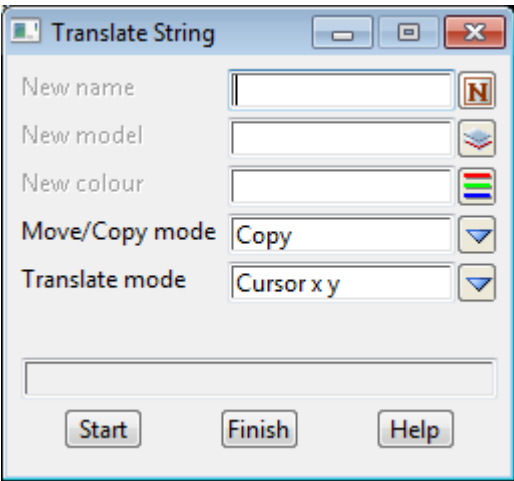
Position of option on menu: Strings =>Strings Edit =>Translate

Entire strings can be translated in the x,y and z directions using the **translate** option.

The translated string can either be moved or copied to its new translated position.

The difference between a **copy** or a **move** is simply that if a string is copied, a copy of the string is translated and the original string left untouched, whereas for a move, the actual string is moved from its original position to the new translated position.

On selecting the **Translate** option, the **Translate string** panel is displayed.



The selected string is translated by using the cursor to select a position on the string (the before point) and then selecting the position (not necessarily on a string) that the point will be translated to (after point).

Hence the translate operation requires two positions - a before and an after point - for the translation to be defined.

The first position (the before point) is selected using the normal select procedures. The second position (the after point) depends entirely on the **translate mode**.

If the **translate mode** is set to

cursor x y z OR **cursor x y**

the cursor is used to not only select the string point but also to indicate where it is to be moved/ copied to.

typed x y z

the second point has the absolute coordinates given in the **x y z** field.

typed dx dy dz

the second point is defined relative to the first point by the adding the dx dy dz given in the **dx dy dz** field.

Selected strings will be translated until the option is finished.

The fields and buttons used in the **translate** panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
New name	<i>if blank, the string is given the name of the original string. If non-blank, the string is given the name in the new name field.</i>	input		
New model	<i>if blank, the string is placed in the same model as the original selected string. If non-blank, the string is placed in the model given in the New model field.</i>	input		available models
New colour	<i>if blank, the string is given the colour of the original string. If non-blank, then the string is given the colour specified in the new colour field.</i>	input		available colours

Translate mode	input	cursor xy	cursor xy, cursor xyz, typed xyz, typed dxdydz
-----------------------	-------	-----------	---------------------------------------------------

see comments about translate mode in the general description of move/copy

x y z	input
--------------	-------

*if **Translate mode** is **Typed x y z** then this field appears and the position on the string where the string was selected is translated to this co-ordinate.*

dx dy dz	input
-----------------	-------

*if **Translate mode** is **Typed dx dy dz** then this field appears and the selected string is translated by the given dx dy dz.*

Move/copy mode	input	move	copy, move
-----------------------	-------	------	------------

*if the mode is set to **move**, the string is translated as defined in the panel fields and the original string is deleted. If the mode is **copy**, the original string is left alone.*

How to Use the Panel and Panel Messages

- (a) Enter the new model, colour and name for the translated string.
- (b) The string to be translated and its “before” point is chosen.
- (c) The “after” point is chosen according to the translate mode.
- (d) The selected string is then translated (moved or copied) as required.

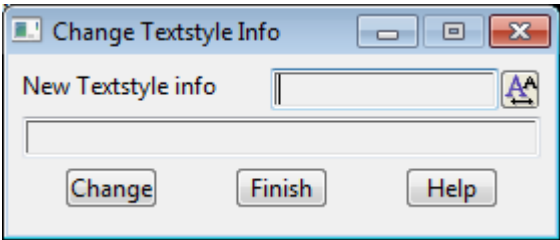
Please continue to the next section [Textdata Info](#).

Textdata Info

Position of option on menu: Strings =>Strings Edit =>Textdata info

The **Textdata info** option is used to change the information about the text for a text string, super strings and text for 4d strings.

Selecting the option, the **Change Textstyle Info** panel:



The parameters for the textstyle information are set and then any selected string is given the new textstyle parameters. If any of the parameters are left blank, then that parameter is not modified for the selected string.

To define the Textstyle info parameters, click on the text button and then the **edit** button.

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
New textstyle info	textstyle data		
<i>textstyle information to use for the selected strings.</i>			
Change	button		
<i>selected strings will have their text modified by the parameters in the new textstyle info field.</i>			

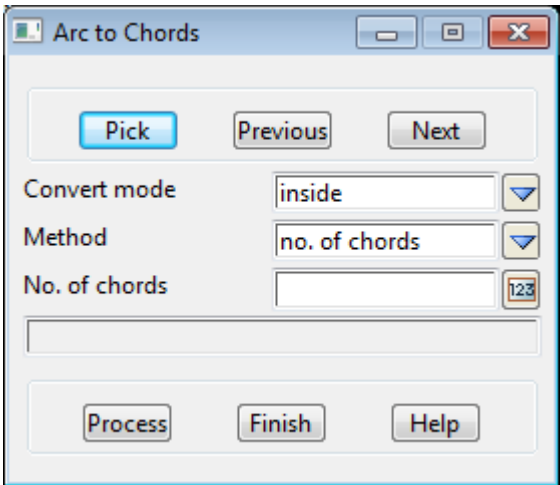
Arc to Chords

Position of option on menu: Strings =>Strings Edit =>Arc to chords

The *Arc to Chord* option works on a super string and creates inside or outside chords for any arc segments in the super string.

The number of chords created can be defined by giving the number of chords required, a chord length to use for each chord, or an arc to chord tolerance.

On selecting the **Arc to chords** option, the **Arc to Chords** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick <i>select the super string to edit.</i>	button		
Previous <i>move to the previous segment of the super string.</i>	button		
Next <i>move to the next segment of the super string.</i>	button		
Convert mode <i>create the chords on the inside or the outside of the arc.</i>	choice box	inside	inside outside
Method <i>method for creating the chord.</i>	choice box	no. of chords	no. of chords chord length arc to chord tolerance
No. of Chords, Chord length, Arc to chord tolerance <i>value to use with the Method.</i>			
Process <i>create chords for the selected segment of the super string.</i>	button		

Segment Strings

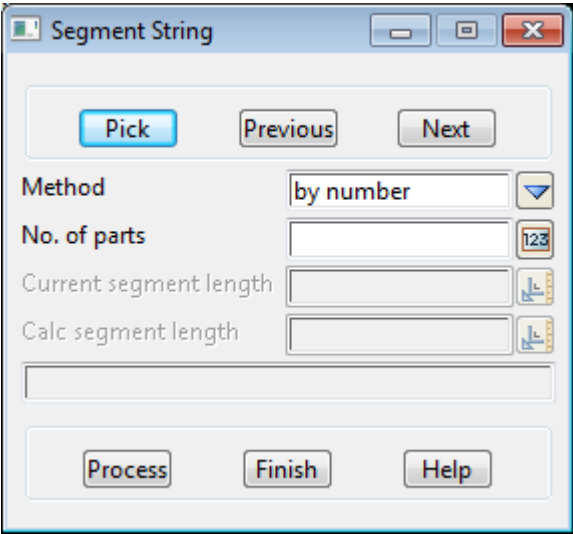
Position of option on menu: Strings =>Strings Edit =>Segment string

The *Segment string* option works on a super string and inserts extra points on an arc or line segment of the super string to break it into smaller arc or line segments.

The number of arcs/lines created can be controlled by specifying either

- (a) the number of sub-segments required
- (b) a single sub-segment length to break the start of the segment into that length
- (c) a sub-segment length to break the segment into as many sub-segments of that length as possible.

On selecting the *Segment strings* option, the **Segment String** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Pick		button		
-------------	--	--------	--	--

select the super string to edit.

Previous		button		
-----------------	--	--------	--	--

move to the previous segment of the super string.

Next		button		
-------------	--	--------	--	--

move to the next segment of the super string.

Method	choice box	by number	by number one distance by distance
---------------	------------	-----------	------------------------------------------

method for creating the sub-segments.

*by number - the segment is broken into **No of parts** equal segments*

*one distance - the segment is broken into two parts with the first part having the length **Distance** (which end will depend on the direction that the segment was selected).*

*by distance - the segment is broken into as many sub-segments of length **Distance** as possible (which end the division starts at depends on the direction that the segment was selected).*

No of parts, Distance	
------------------------------	--

*value to use with the **Method**.*

Current segment length	output only
-------------------------------	-------------

length of the currently selected segment of the super string.

Calc segment length	output only
----------------------------	-------------

calculated length of the segment that will be created.

Process	button
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create sub-segments for the selected segment of the super string.

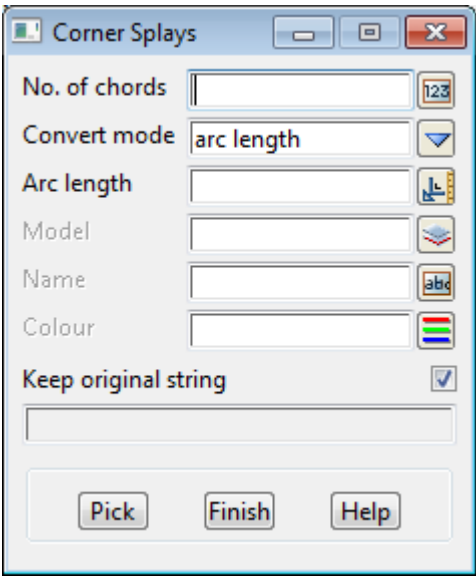
Corner Splays

Position of option on menu: Strings =>Strings Edit =>Corner splays

The *Corner splays* option works on a super string and creates splays between two adjacent straight segments.

The number of chords created can be defined by giving the number of sub-segments required, one sub-segment length to beak of the segment or a sub-segment length to beak the segment into as many sub-segments as possible.

On selecting the **Corner splays** option, the **Corner splays** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
No of chords			
<i>value to use with the Method.</i>			
Convert mode	choice box	arc length	arc length arc radius chord length total chords length tangent length
<i>method for creating the corner splays.</i>			
Arc length, Arc radius, Chord length, Total chords length, tangent length			
<i>value to use with the Convert mode.</i>			
Name	input		
<i>the name of the new string.</i>			
Model	input		available models
<i>name of the model that the new string is in.</i>			
Colour	input	default colour	available colours
<i>the colour of the new string.</i>			
Keep original string	tick box	tick	
<i>if ticked, the original string is not modified and a new string is created with the corner splays. If not ticked, the original string is modified.</i>			

Pick

button

select a super string and the splays will be created.

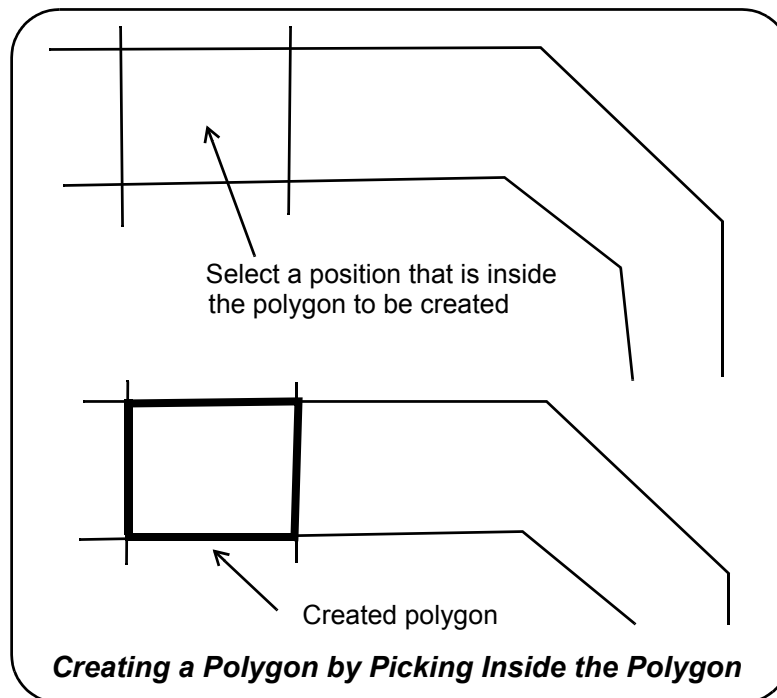
Surrounding Polygon

Position of option on menu: Strings =>Strings Edit =>Surrounding polygon

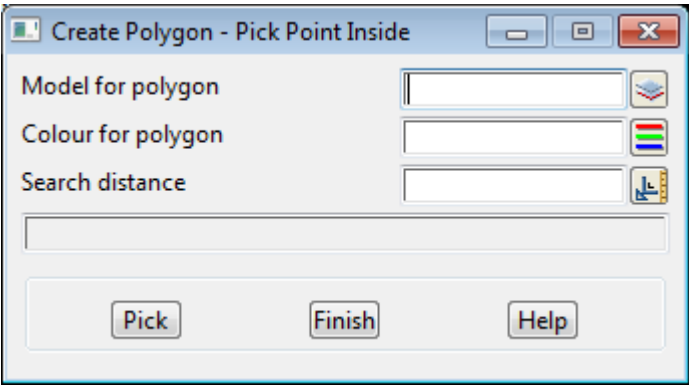
The *Surrounding polygon* option works on all the super strings on the view surrounding a selected position (point) and, if possible, creates a closed polygon from parts of the strings surrounding the selected point.

A straight line must be able to be drawn from the selected point to the lines/arcs that could be used in the surrounding strings.

This option creates a lot/polygon by a picking inside a collection of strings and the lot/polygon is created from the closest strings to the picked position. The picked position must be selected so that all sides of the lot/polygon can be "seen" from the picked position. That is, a straight line can be drawn from the picked position to the lot/polygon side without cutting any other segment.



On selecting the Surrounding polygon option, the **Create Polygon - Pick Point Inside** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name <i>the name of the new created polygon.</i>	input		
Model <i>model for the created polygon.</i>	input		available models
Colour <i>colour for the created polygon.</i>	input	default colour	available colours
Pick	button		
<i>pick a position on a view and the surrounding polygon will be created from all the super strings on the view.</i>			

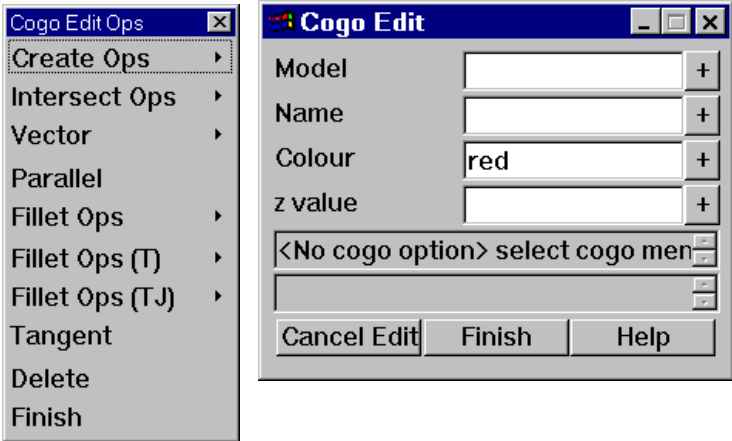
Cogo

Position on menu: Strings =>Cogo

Note: This option is no longer available.

The Cogo (co-ordinate geometry) options provide methods of constructing points, lines and arcs from a variety of operations such as picking, filleting, intersecting and finding tangents.

Selecting the cogo option creates the Cogo edit ops menu and the Cogo edit panel.



The options in the **cogo edit ops** menu all create either a point, string or arc and the **cogo edit** panel remains on the screen for each of the menu options and provides the string properties for any created objects.

All of the options chosen from the **Cogo edits ops** menu and its sub-menus repeat until cancelled by the user. That is, the option remains in force and can be applied repeatedly until terminated by the user.

The name of the current selected option is displayed in the first message area of the **cogo edit** panel.

To select a new **Cogo edits ops** option, simply select the new option from the **Cogo edit ops** menu or sub-menus. The current option is automatically terminated and the new option begun.

An option is also terminated when either the **cancel** or **finish** button is selected in the **Cogo edit** panel, or **finish** is elected from the **Cogo edit ops** menu.

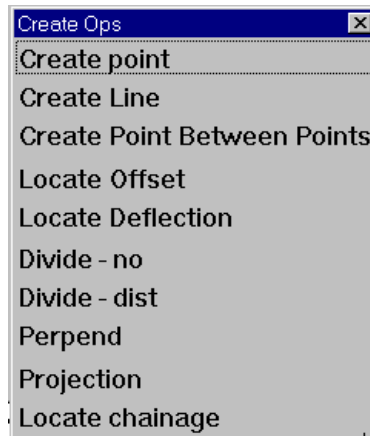
Each of the options in the **Cogo edit ops** menu will now be discussed.

For the option <i>Create ops</i> , go to	Create Ops
<i>Intersect ops</i>	Intersect Ops
<i>Vector</i>	Vector
<i>Parallel</i>	Parallel
<i>Fillet ops</i>	Fillet Ops
<i>Fillet ops (T)</i>	Fillet Ops (T)
<i>Fillet ops (TJ)</i>	Fillet Ops (TJ)
<i>Tangent</i>	Tangent

Please continue to the next section [Create Ops](#).

Create Ops

The **Create ops** walk-right menu is



Each of the options in the **Create Ops** menu will now be discussed.

For the option *Create point*, go to

Create line

Create point between points

Locate offset

Locate deflection

Divide - no

Divide - dist

Perpedn

Projection

Locate chainage

[Create Point](#)

[Create Line](#)

[Create Point Between Points](#)

[Locate Offset](#)

[Locate Deflection](#)

[Divide - Number](#)

[Divide - Distance](#)

[Perpendicular](#)

[Projection](#)

[Locate Chainage](#)

Create Point

After selecting the **Create point** option, the user simply selects a point using the normal picking sequence.

The point will be created with name, colour and model from the **cogo edit** panel.

If no z-value is given in the **cogo edit** panel, then a null z-value is used.

If **height snap** is on and the point is created by snapping to an existing point or line, the z-value for the point is taken from the snapped point or if tin snap is on, from the underlying triangulation. The snapped z-value will be displayed in an enter height typed input box.

If required, this value can be modified by typing into the enter height box. If the box is empty, the z-value is taken from the **cogo edit** panel. If no value exists in the **cogo edit**, an error message **please specify z value** is displayed in the **cogo edit** message area.

The z-value in the enter height box is accepted by entering a <enter> in the box. The enter height box then disappears.

Screen message area

<<Create Point> Select position for point> [picks][][][menu]

Create Line

After selecting the **create line** option, the user simply selects two points to be the end points of the line using the normal picking sequence.

The line will be created with **name**, **colour** and **model** from the **cogo edit** panel.

If either end point is created by snapping to an existing point or line, the z-value for the point is taken from the snapped point or if tin snap is on, from the underlying triangulation. If no z-value exists, the z-value is taken from the **cogo edit** panel.

If height snap is on, the snapped z-value will be displayed in an enter height typed input box.

If required, this value can be modified by typing into the enter height box. If the box is empty, the z-value is taken from the **cogo edit** panel. If no value exists in the **cogo edit**, an error message **please specify z value** is displayed in the **cogo edit** message area.

The z-value in the enter height box is accepted by entering a <enter> in the box. The enter height box then disappears.

Screen message area

```
<<Create Line> Select 1st point on line> [picks][ ][menu]  
<<Create Line> Select 2nd point on line> [picks][ ][menu]
```

Create Point Between Points

The **create point between points** option allows the user to select two point to act as the end points of a line and then create a new point a user supplied given distance along that line.

After selecting the **create point between points** option, the user simply selects two points to act as the end points of the line using the normal picking sequence.

An enter distance from 1st point box is then displayed on the screen and the user simply enters the appropriate distance into the box, terminated with a <enter>. The box then disappears.

The point is then created with name, colour and model and **z-value** from the **cogo edit** panel.

If no z-value exists in the panel, no point is created.

Screen message area

```
<<Between> Select 1st point> [picks][ ][menu]  
<<Between> Select 2nd point> [picks][ ][menu]  
<Between> Enter distance from 1st point [caret][ ][menu] select a button
```

Locate Offset

The **locate offset** option is used to create a point at a given perpendicular offset distance from a user defined point on a selected item.

The point on the item to offset from is determined by picking a control point on the item and projecting along the item by a given distance.

Hence the **locate offset** option needs

- (a) a selected item
- (b) a control point
- (c) a projection distance
- (d) an offset distance

After selecting the **locate offset** option, the user picks the item to project along using the normal picking sequence. The direction imparted when picking the item determines the sense for direction along the item and offset left and right.

Next a control point on the item is picked.

A distance along item box is then displayed on the screen and the user enters the appropriate distance into the box, terminated with a <enter>. The box then disappears. A positive distance is in the picking direction of the item.

Finally an offset distance box is displayed on the screen. The user enters the appropriate offset distance into the box, terminated with a <enter>. The box then disappears. A positive offset is to the right of the item when moving in the picking direction of the item.

The appropriate point is then created with **name**, **colour**, **model** and **z-value** from the **cogo edit** panel.

If no z-value exists in the panel, no point is created.

Screen message area

```
<<Locate Offset> Select item to project along> [picks][ ][menu]
<<Locate Offset> Select control point> [picks][ ][menu]
<Locate Offset> distance along item [caret][ ][menu] select a button
<Locate Offset> offset distance [caret][ ][menu] select a button
```

Locate Deflection

The **locate deflection** option is used to create a point at a given deflection angle and distance from a user defined point on a selected item.

The **locate deflection** option is very similar to the **locate offset** option except instead of going out perpendicular to the item, the user provides a deflection angle. Hence the **locate offset** is a special case of the **locate deflection** option when the deflection angle is ninety degrees.

The point on the item to offset from is determined by picking a control point on the item and projecting along the item by a given distance.

Hence the **locate deflection** option needs

- (a) a selected item
- (b) a control point
- (c) a projection distance
- (d) a deflection angle
- (e) a deflection distance

After selecting the **locate offset** option, the user picks the item to project along using the normal picking sequence. The direction imparted when picking the item determines the sense for direction along the item and offset left and right.

Next a control point on the item is picked.

Boxes for the distance along item, deflection angle and deflection distance are then (sequentially) displayed on the screen and the user enters the appropriate values into each box, terminated with a <enter>. The box then disappears.

A positive distance is in the picking direction of the item and a positive angle is an angle to the right of the item when moving in the picking direction of the item.

The appropriate point is then created with **name**, **colour**, **model** and **z-value** from the **cogo edit** panel.

If no z-value exists in the panel, no point is created.

Screen message area

```
<<Locate Deflection> Select item to project along> [picks][ ][menu]
<<Locate Deflection> Select control point> [picks][ ][menu]
<Locate Deflection> distance along item [caret][ ][menu] select a button
<Locate Deflection> deflection distance [caret][ ][menu] select a button
```

<Locate Deflection> deflection angle [caret][][menu] select a button

Divide - Number

The **divide - nos** option is used to place points at positions which would divide an arc or a line into an equal number of pieces.

For example, if the option was used to show how and an arc could be divided into seven pieces, points would be placed at the six division marks. No point is placed at the start or end of the arc. Hence, the start and end points plus the division points divide the arc into the required number of divisions.

Since the option will only divide an arc or a line, when an item is selected only the picked line or arc sub-element of the item will be divided.

On selecting the **divide - nos** option, the user picks the item to divide using the normal picking sequence.

A no of divisions box is then displayed on the screen and the user enters the required number of divisions into the box, terminated with a <enter>. The box then disappears.

A point string is then created containing points at each of the required division positions. The string has the **name**, **colour**, **model** and **z-value** from the **cogo edit** panel.

Screen message area

```
<<Divide by #> Select item to divide> [picks][ ][menu]  
<Divide by #> no division [caret][ ][menu] select a button
```

Divide - Distance

The **divide - dist** option is used to place points at positions which would divide an arc or a line into pieces of a given distance.

Note - unless the arc or line is exactly divisible by the distance, the last division will be smaller than the required distance.

Since the option will only divide an arc or a line, when an item is selected only the picked line or arc sub-element of the item will be divided.

On selecting the **divide - dist** option, the user picks the item to divide using the normal picking sequence.

A distance box is then displayed on the screen and the user enters the required distance for each division into the box, terminated with a <enter>. The box then disappears.

A point string is then created containing points at each of the required division positions. The string has the **name**, **colour**, **model** and **z-value** from the **cogo edit** panel.

Screen message area

```
<<Divide by distance> Select item to divide> [picks][ ][menu]  
<Divide by #> distance [caret][ ][menu] select a button
```

Perpendicular

The **perpend** option is used to create the point which is the perpendicular projection of a selected point onto a selected line or arc.

Since the option can only drop a point onto an arc or a line, when the item is selected to project onto, only the picked line or arc sub-element of the item is used.

On selecting the **perpend** option, the user picks the point to drop perpendicularly.

The item to drop perpendicularly onto is then selected.

The point representing the perpendicular projection of the chosen point onto the selected item is then created. The created point has the **name**, **colour**, **model** and **z-value** from the **cogo edit** panel.

Screen message area

```
<<Perpend> Select point to drop> [picks][ ][menu]
<<Perpend> Select item to drop onto> [picks][ ][menu]
```

Projection

The **projection** option is used to create a point which is given distance along a line or arc.

Since the option can only project a point along an arc or a line, when the item is selected to project along, only the picked line or arc sub-element of the item is used.

On selecting the **projection** option, the user picks the item to project along.

A distance box is then displayed on the screen and the user enters the appropriate projection distance into the box, terminated with a <enter>. The box then disappears. A positive distance is in the picking direction of the item.

The point representing the projected point along the selected item is then created using the **name**, **colour**, **model** and **z-value** from the **cogo edit** panel.

Screen message area

```
<<Projection> Select item to project along> [picks][ ][menu]
<Projection> distance [caret][ ][menu] select a button
```

Locate Chainage

The **locate chainage** option is used to create a point at a given chainage on a selected string.

On selecting the **locate chainage** option, the user picks the item to locate the chainage on.

A locate chainage box is then displayed on the screen and the user enters the appropriate chainage into the box, terminated with a <enter>. The box then disappears.

A point at the given chainage on the selected item is then created using the **name**, **colour**, **model** and **z-value** from the **cogo edit** panel.

Screen message area

```
<<Locate chainage> Select item to locate on> [picks][ ][menu]
<Locate chainage> chainage [caret][ ][menu] select a button
```

Please continue to the next section [Intersect Ops.](#)

Intersect Ops

The **Intersection** options are for finding various intersections of lines and arcs.

Most of intersect cases can have more than one solution. For example, the intersection of a line with an arc.

To easily distinguish between the cases, 12d Model uses the sense of direction implied when picking items to determine which case was required by the user.

The **Intersect ops** walk-right menu is



Each of the options in the **Intersect Ops** menu will now be discussed.

For the option *Intersect*, go to

Create line

intersect offset

Bearings intersect

2 pts 2 dists

[Intersect](#)

[Create Line](#)

[Intersect Offset](#)

[Bearings Intersect](#)

[Two Points, Two Distances](#)

Intersect

The **Intersect** option creates a point at the intersection of lines and arcs.

That is, it will find the intersection of

(a) a line with a line

(b) a line with an arc

or

(c) an arc with an arc

After selecting the **Intersect** option, the user simply selects the two items to intersect using the normal picking sequence.

If an intersect exists, a point is created at the intersection with **name**, **colour**, **model** and **z-value** from the **Cogo edit** panel.

If no z-value exists in the panel, no point is created.

When there is more than one possible solution, the order of picking and the directions imparted when picking the items are used to determine which solution is required.

Since the option will only intersect arcs and lines, when an item is selected only the picked line or arc sub-element of the item is used in the intersect.

Screen message area

<<Intersect> Select 1st item to intersect> [picks][][menu]

<<Intersect> Select 2st item to intersect> [picks][][menu]

Intersect Offset

Like the **Intersect** option, **Intersect offset** is for creating points at the intersection of lines and arcs.

However, before the line or arc is used, it is offset by a user supplied distance.

Hence the intersection is between displaced lines and arcs.

A practical example of **intersect offset** is for finding the position of a manhole in a subdivision which is three metres from one property line and two metres from the culdesac arc.

After selecting the **intersect** option, the user selects the first item to intersect using the normal picking sequence.

A 1st offset box is then displayed on the screen and the user enters the appropriate offset for the first line into the box, terminated with a <enter>. The box then disappears. A positive offset is to the right of the item when moving in the picking direction of the item.

The second item to intersect is then selected and a 2nd offset box is displayed on the screen for the user to enter the offset for the second line.

If an intersect exists for the two offset items, a point is created at the intersection with **name**, **colour**, **model** and **z-value** from the **cogo edit** panel.

If no z-value exists in the panel, no point is created.

As in the **intersect** option, when more than one solutions is possible, the order of picking and the directions imparted when picking the items are used to determine which solution is required.

Since the option will only intersect arcs and lines, when an item is selected only the picked line or arc sub-element of the item is used in the intersect.

Screen message area

```
<<Intersect Offset> Select 1st item to intersect> [picks][ ][menu]
<Intersect Offset> 1st offset [caret][ ][menu] select a button
<<Intersect Offset> Select 2st item to intersect> [picks][ ][menu]
<Intersect Offset> 2nd offset [caret][ ][menu] select a button
```

Bearings Intersect

The **Bearings intersect** option finds the intersect of the lines going through two user selected points at user supplied bearings.

Hence the option will calculate the point that is at given bearings from two selected points

After selecting the **bearings intersect** option, the user selects the first point using the normal picking sequence.

A bearing 1 box is then displayed on the screen and the user enters the bearing for the line through the point into the box, terminated with a <enter>. The box then disappears. The bearing is entered in degrees, minutes and seconds.

The second point is then selected and a bearing 2 box is displayed on the screen for the user to enter the bearing for the line through the second point.

The intersection of the two lines is then calculated and if it exists, a point is created at the intersection with **name**, **colour**, **model** and **z-value** from the **cogo edit** panel.

If no z-value exists in the panel, no point is created.

Note

The selected points do not have to be actual points in a point string. Any snap or cursor position is a valid **point** for the option

Screen message area

```
<<Bearings Intersect> Select 1st point> [picks][ ][menu]
<Bearings Intersect> bearing 1 [caret][ ][menu] select a button
<<Bearings Intersect> Select 2nd point> [picks][ ][menu]
<Bearings Intersect> bearing 2 [caret][ ][menu] select a button
```

Two Points, Two Distances

The **2 pts 2 dists** option find the point that given distances from two user selected points.

This problem is equivalent to finding the intersection of two circles centred on the points and with radii the same as the distances.

When there is more than one solution, the solution to the right of the line joining the two points is used. (the direction of the line is from the first point to the second point). To obtain the other solution, simply select the points in the opposite order.

After selecting the **2 pts 2 dists** option, the user selects the first point using the normal picking sequence.

A 1st distance box is then displayed on the screen and the user enters the distance that the new point is from the selected point into the box, terminated with a <enter>. The box then disappears.

The second point is then selected and a 2nd distance box is displayed on the screen for the user to enter the distance to the second point.

The point that is the required distances from the two points is created with **name**, **colour**, **model** and **z-value** from the **cogo edit** panel. If no z-value exists in the panel, no point is created.

Note

The selected points do not have to be actual points in a point string. Any snap or cursor position is a valid **point** for the option

Screen message area

```
<<Locate 2 pts 2 dists> Select 1st point> [picks][ ][menu]
<Locate 2 pts 2 dists> 1st distance [caret][ ][menu] select a button
<<Locate 2 pts 2 dists> Select 2nd point> [picks][ ][menu]
<Locate 2 pts 2 dists> 2nd distance [caret][ ][menu] select a button
```

Please continue to the next section [Vector](#).

Vector

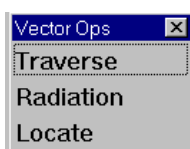
The **vector** options are for creating points which are a given as at a given vector from another point.

The default definition of the vector is as (bearing, distance) but other combinations such as (angle, distance), relative (x,y) and absolute (x,y) are possible using normal typed input.

The methods for creating the new points are

- (a) locate - create a new point using a vector
- (b) radiation - the points created are all a vector from the initial point selected
- (c) traverse - the last point created becomes the next point to work from

The **vector** walk-right menu is



Each of the options in the **Vector Ops** menu will now be discussed.

For the option *Traverse*, go to [Traverse](#)

<i>Radiation</i>	Radiation
<i>Intersect offset</i>	Intersect Offset
<i>Locate</i>	Locate

Locate

In the **locate** option, a point is selected and a vector supplied to produce a new point which is the vector away from the initial point.

The sequence is then repeated by selecting another point and giving another vector.

After selecting the **locate** option, the user simply selects the point to be used using the normal picking sequence.

A bearing distance box is then displayed on the screen and the user enters the required bearing and distance (separated by a space) into the box, terminated with a <enter>. The box then disappears.

A new point is then created which is the given bearing and distance from the selected point. The new point is given the **name**, **colour**, **model** and **z-value** from the **cogo edit** panel. If no z-value exists in the panel, the given z-value could be nonsense.

The sequence of picking a point and giving a vector is then repeated.

The option terminates when another cogo option is selected or the **cancel** button is selected on the **cogo edit** panel.

Screen message area

```
<<Locate> Select point> [picks][ ][menu]
<Locate> bearing distance [caret][ ][menu] select a button
```

Radiation

In the **radiation** option, a point is selected and a vector supplied to produce a new point which is the vector away from the initial point.

After selecting the **radiation** option, the user simply selects the point to be used using the normal picking sequence.

A bearing distance box is then displayed on the screen and the user enters the required bearing and distance (separated by a space) into the box, terminated with a <enter>.

A new point is then created which is the given bearing and distance from the selected point. The new point is given the **name**, **colour**, **model** and **z-value** from the **cogo edit** panel. If no z-value exists in the panel, the given z-value could be nonsense.

The bearing distance box remains on the screen.

If another value is entered into the box (or the previous one left) terminated by a <enter>, a new point is created which is the new given bearing and distance from the original selected point.

The option terminates when another cogo option is selected or the **cancel** button is selected on the **cogo edit** panel.

Screen message area

```
<<Radiation> Select point> [picks][ ][menu]
<Radiation> bearing distance [caret][ ][menu] select a button
```

Traverse

In the **traverse** option, an initial point is chosen and a vector supplied to produce a new point which is the vector away from the initial point.

The created point is then taken to be the start point for the next sequence of creating a new point by a vector.

After selecting the **traverse** option, the user simply selects the first point to be used using the normal picking sequence.

A bearing distance box is then displayed on the screen and the user enters the required bearing and distance (separated by a space) into the box, terminated with a <enter>.

A new point is then created which is the given bearing and distance from the selected point.

The new point is given the **name**, **colour**, **model** and **z-value** from the **cogo edit** panel. If no z-value exists in the panel, the given z-value could be nonsense.

The bearing distance box remains on the screen.

If another value is entered into the box (or the previous one left) terminated by a <enter>, a new point is created which is the given bearing and distance from the last created point.

Hence, the last created point takes the place of the original selected point.

The option terminates when another cogo option is selected or the **cancel** button is selected on the **cogo edit** panel.

Screen message area

```
<<Traverse> Select point> [picks][ ][menu]  
<Traverse> bearing distance [caret][ ][menu] select a button
```

Please continue to the next section [Parallel](#).

Parallel

Items can be translated perpendicularly to either the left or right using the parallel option (also known as a copy parallel operation).

After selecting the **parallel** option, the user simply selects the item to paralleled using the normal picking sequence.

A offset box is then displayed on the screen and the user enters the required offset distance into the box, terminated with a <enter>. The box then disappears. A positive offset is to the right of the item when moving in the picking direction of the item.

A new item is then created which is a copy parallel of the selected item by the given offset distance. The new item has the **name**, **colour** and **model** from the **cogo edit** panel.

The option terminates when another cogo option is selected or the **cancel** button is selected on the **cogo edit** panel.

Screen message area

```
<<Parallel> Select item to parallel> [picks][ ][menu]  
<Parallel> offset> [caret][ ][menu] select a button
```

Please continue to the next section [Fillet Ops](#).

Fillet Ops

The **fillet** options are for creating an arc between lines and arcs.

That is, it will try and fit an arc between

(a) two lines

- (b) a line and an arc
- or
- (c) two arcs

The created arc is determined by tangents from the items it is a fillet for and another piece of information such as a radius or a start point.

Since the option can only fillet between arcs and lines, when an item is selected only the picked line or arc sub-element of the item is used in the fillet.

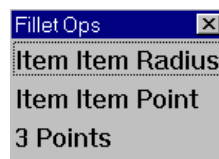
Most fillet cases can have more than one solution. For example, the fillet of a given radius between two lines can have up to four solutions.

To easily distinguish between the cases, **12d** Model uses the order of picking and the sense of direction implied when picking the items to determine which case was required by the user.

The direction is used as follows -

the arc comes off the first item in the direction that the first item is picked and lands on the second in the direction that the second item is picked.

The **fillet ops** walk-right menu is



Each of the options in the **Fillet Ops** menu will now be discussed.

For the option *Item Item Radius*, go to
 Item Item Point
 3 points

[Fillet Item Item Radius](#)
[Fillet Item Item Point](#)
[Fillet Three Points](#)

Fillet Item Item Radius

This fillet option creates an arc of a user given radius between two user selected items.

After selecting the **fillet item item radius** option, the user selects the first item to be used in the fillet using the normal picking sequence.

Next the second item to be used in the fillet is selected.

An enter radius box is then displayed on the screen and the user types the appropriate radius for the fillet into the box, terminated with a <enter>. The box then disappears.

A positive radius implies that the arc travels in a clockwise direction and a negative radius for an arc travelling in an anti-clockwise direction.

If a fillet exists for the two items and the radius, an fillet arc is created with **name**, **colour**, **model** and **z-value** from the **cogo edit** panel.

If no z-value exists in the panel, no arc is created.

Screen message area

```
<<Fillet by radius> Select 1st item> [picks][ ][menu]
<<Fillet by radius> Select 2nd item> [picks][ ][menu]
<Fillet by radius> Enter radius [caret][ ][menu] select a button
```

Fillet Item Item Point

This fillet option creates an arc between two user selected items starting at a user defined control point.

After selecting the **fillet item item pt** option, the user selects the first item to be used in the fillet using the normal picking sequence.

Next the second item to be used in the fillet is selected.

Finally, a point is selected to act as the starting point for the fillet. This point, called the control point, must lie on the first item selected. If the selected point doesn't lie on the first item, the selected point is projected perpendicularly onto the item and the projected point used as the control point.

If a fillet exists for the two items and the control point, a fillet arc is created with **name**, **colour**, **model** and **z-value** from the **cogo edit** panel.

If no z-value exists in the panel, a null z-value is used.

Screen message area

```
<<Fillet by start point> Select 1st item> [picks][ ][menu]
<<Fillet by start point> Select 2nd item> [picks][ ][menu]
<<Fillet by start point> Select start point> [picks][ ][menu]
```

Fillet Three Points

This option creates an arc between three user selected points.

After selecting the **fillet 3 pts** option, the user selects the three points one after another using the normal picking sequence.

The three arc points must be selected in the order

- (a) the start point
- (b) a point between the start and end point
- (c) the end point

If an arc does exist containing the three points, it will be unique including its direction. The arc will be created with **name**, **colour**, **model** and **z-value** from the **cogo edit** panel.

If no z-value exists in the panel, a null z-value is used.

Screen message area

```
<<Fillet 3 points> Select 1st item> [picks][ ][menu]
<<Fillet 3 points> Select 2nd item> [picks][ ][menu]
<<Fillet 3 points> Select start point> [picks][ ][menu]
```

Please continue to the next section [Fillet Ops \(T\)](#).

Fillet Ops (T)

The **fillet (T)** options are the almost identical to the fillet options.



The only difference is that after the fillet arc is created, the original items are trimmed back to the start and end of the arc.

The trimmed items are not joined to the fillet arc.

The original strings obey the trash defaults from the `utilities=>defaults=>trash defaults` option.

That is, if the trash mode is set to *keep string*, the original strings are untouched.

delete string,

deleted.

trash string,

moved to the trash model.

For information on the fillet options, see the section [Fillet Ops](#)

For the option *Item Item Radius*, please go to the section [Fillet Item Item Radius](#).

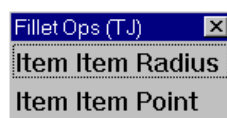
Item Item Point

[Fillet Item Item Point](#).

Please continue to the next section [Fillet Ops \(TJ\)](#).

Fillet Ops (TJ)

The **fillet (TJ)** options are the almost identical to the fillet and fillet (T) options.



The only difference is that after the fillet arc is created, the original items are trimmed back to the start and end of the arc and the three items joined to form a new item.

That is, the trimmed items are joined to the fillet arc.

The original strings obey the trash defaults from the `Utilities=>Defaults=>Trash defaults` option.

That is, if the trash mode is set to *keep string*, the original strings are untouched.

delete string,

deleted.

trash string,

moved to the trash model.

For information on the fillet options, see the section [Fillet Ops](#)

For the option *Item Item Radius*, please continue to the section [Fillet Item Item Radius](#).

Item Item Point

[Fillet Item Item Point](#).

Please continue to the next section [Tangent](#).

Tangent

The **tangent** option creates tangent lines between point and arcs.

That is, tangents can be defined between

(a) a point and an arc

(b) two arcs

or

(c) two points - simply a line between the two points

Since the option can only fillet between points and arcs, when an item is selected, only the picked sub-arc of the item is used as an arc.

Most tangent cases can have more than one solution. For example, two tangents from a point to an arc.

To easily distinguish between the cases, **12d Model** uses the order of picking the items and the sense of direction implied when picking an arc to determine which case was required by the user.

After selecting the **tangent** option, the user selects the first item to be used in the tangent calculations using the normal picking sequence.

Next the second item to be used is selected.

If a tangent line exists between the two items selected, a line string is created with **name**, **colour**, **model** and **z-value** from the **cogo edit** panel.

If no z-value exists in the panel, a null z-value is used for the line.

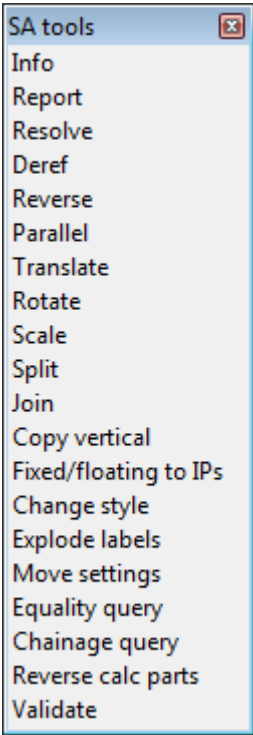
Screen message area

```
<<Tangent> Select 1st item> [picks][ ][menu]  
<<Tangent> Select 2nd item> [picks][ ][menu]
```


SA Tools

Position of Menu: Strings =>SA Tools

The SA Tools walk-right menu is



- information about a super alignment
- create a report on a super alignment
- resolve a super alignment
- dereference a super alignment
- reverse the super alignment direction
- parallel a super alignment
- translate a super alignment
- rotate a super alignment
- scale a super alignment
- split a super alignment
- join two super alignments
- copy the vertical geometry between super alignments
- convert fixed/floating to IPs
- change the style for super alignments
- explode the labelling to text and lines
- setting to lock the movement of IPs
- inquire about chainage equalities
- inquire about chainages
- make construction parts from super alignment segments
- run validation on a super alignment

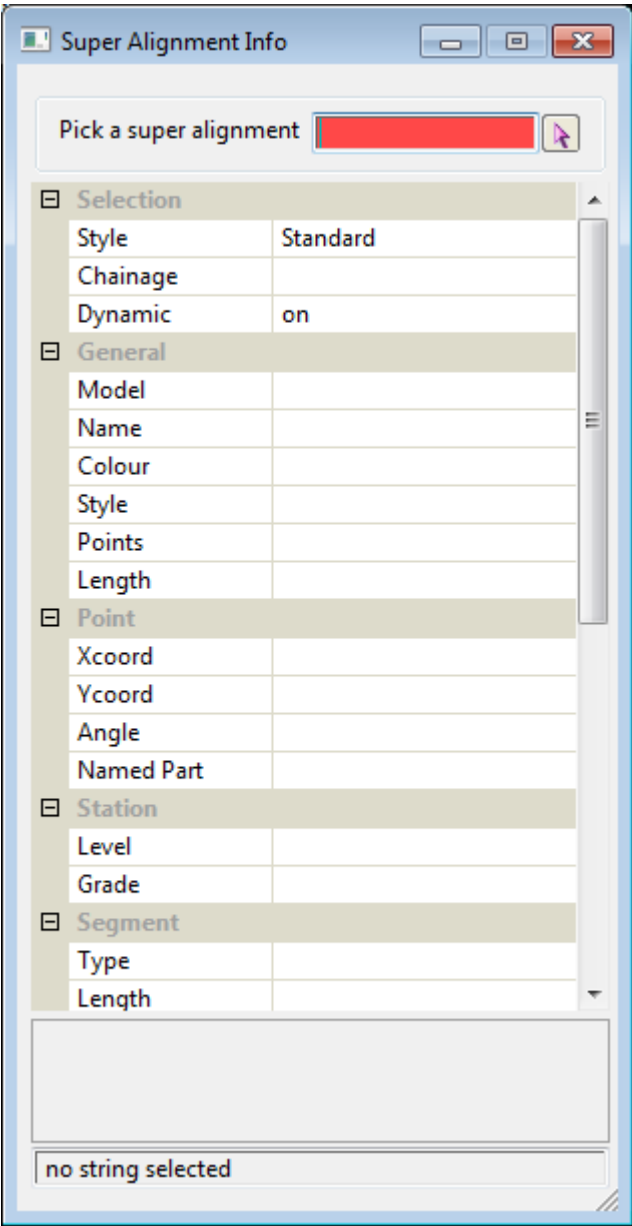
<i>Info</i>	Super Alignment Info
<i>Report</i>	Super Alignment Report
<i>Resolve</i>	Resolve a Super Alignment
<i>Deref</i>	Dereference Super Alignments
<i>Reverse</i>	Reverse Super Alignment
<i>Parallel</i>	Parallel a Super Alignment
<i>Translate</i>	Translate Super Alignment
<i>Rotate</i>	Rotate Super Alignment
<i>Scale</i>	Scale Super Alignment
<i>Split</i>	Split a Super Alignment
<i>Join</i>	Joining Two Super Alignments
<i>Copy vertical</i>	Copy Vertical Geometry
<i>Fixed/floating to IPs</i>	Convert Fixed/Floating Elements to IPs
<i>Change style</i>	Change the Styles for Selected Super Alignments
<i>Explode labels</i>	Explode the Super Alignments Labelling
<i>Move settings</i>	Constrain the Movement of Super Alignment Points
<i>Equality query</i>	Equality Query
<i>Chainage query</i>	Chainage Query
<i>Reverse calc parts</i>	Reverse Calc Parts
<i>Validate</i>	Validate Super Alignment

Super Alignment Info

Position of option on menu: Strings =>SA tools =>Info

This section of documentation is a work in progress and will be updated in subsequent releases.

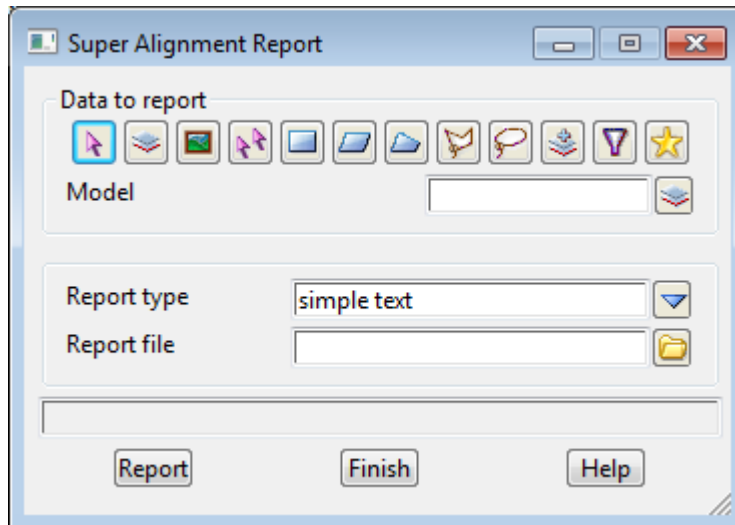
Selecting Info displays the **Super Alignment Info** panel.



Super Alignment Report

Position of option on menu: Strings =>SA tools =>Report

Selecting Report displays the **Super Alignment Report** panel.



For more information, please see [Super Alignment Report](#).

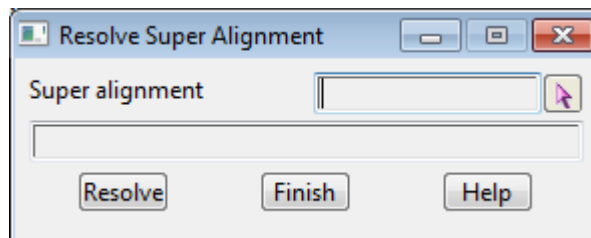
Resolve a Super Alignment

Position of option on menu: **Strings =>SA Tools =>Resolve**

When a super alignment is created using **computators**, the super alignment is defined with **references** to other strings. If the referenced strings are modified, then the super alignment will not automatically reflect the changes in the referenced strings.

Resolve forces the string to be resolved using the current position and properties of any referenced strings.

Selecting **Resolve** displays the **Resolve Super Alignment** panel.



The new fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Super alignment	string select		
<i>select a super string to resolve.</i>			
Resolve	button		
<i>after the Resolve button is clicked, the super alignment is resolved using the new properties of any referenced strings.</i>			

Dereference Super Alignments

Position of option on menu: Strings =>SA Tools =>Deref

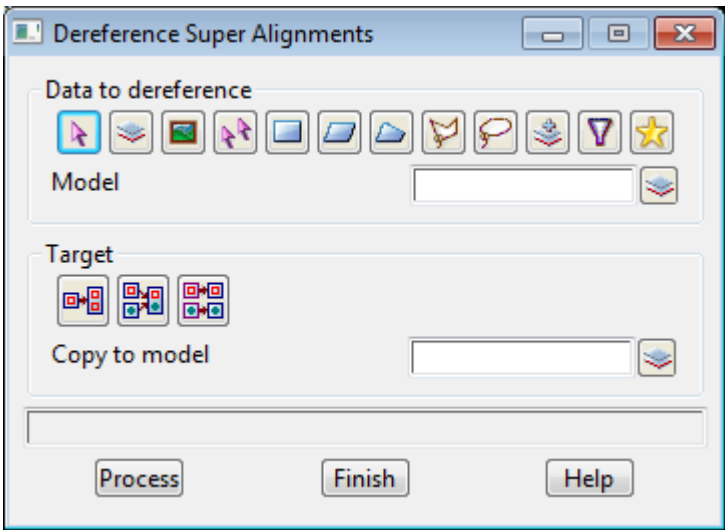
When a super alignment is created using **computators**, the super alignment is defined with **references** to other strings.

Dereferencing removes the *references* to other strings in a super alignment, and inserts copies of the referenced string in its place. Hence a dereferenced string looks like the original string, but it no longer has links to any other strings.

The **Deref** option copies the original string, and *dereferences* the copied string.

So after running **Deref** there are no longer any references to other strings in the copy of the super alignment.

Selecting **Deref** displays the **Dereference Super Alignments** panel.



The fields and buttons used in the panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Data to dereference			Model	
	<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data info		input		
	<i>extra information required for the Data source.</i>			
Target type				
	<i>Data target type - where to put the processed strings. For a full description go to Data Target in the chapter Tools and Concepts</i>			
Target info		input		
	<i>extra information required for the target. Only the Copy Targets are allowed.</i>			
Process		button		
	<i>after the Process button is clicked, the selected strings are copied and dereferenced.</i>			

Dereference a Super Alignment

Position of option on menu: Super Alignment Toolbar =>Deref

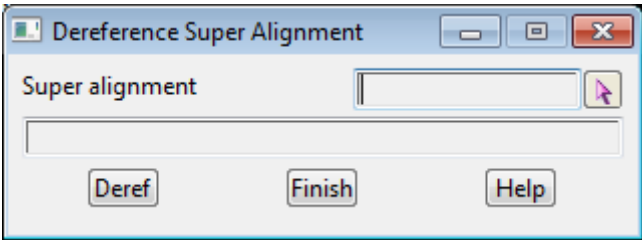
When a super alignment is created using **computators**, the super alignment is defined with **references** to other strings.

Dereferencing removes the *references* to other strings in a super alignment, and inserts copies of the referenced string in its place. Hence a dereferenced string looks like the original string, but it no longer has links to any other strings.

The **Deref** option copies the original string, and *dereferences* the copied string.

So after running **Deref** there are no longer any references to other strings in the copy of the super alignment.

Selecting **Deref** from the Super Alignment Toolbar displays the **Dereference Super Alignment** panel.



The new fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Super alignment	string select		
<i>selects the string to dereference.</i>			
Deref	button		
<i>after the Deref button is clicked, the selected string is copied and dereferenced.</i>			

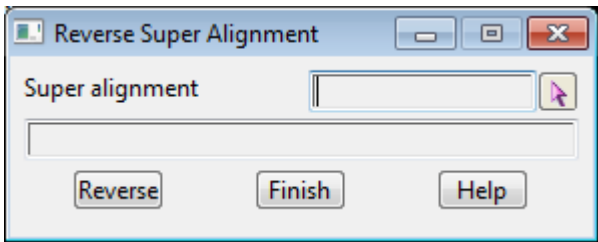
Reverse Super Alignment

Position of option on menu: Strings =>SA Tools =>Reverse

Reverse creates a copy of the selected super alignment, and then reverses the direction of the copied super alignment.

If there are any computators in the super alignment, the copy of the super alignment will be dereferenced before being reversed.

Selecting Reverse displays the **Reverse Super Alignment** panel.



The new fields and buttons used in the panel have the following functions.

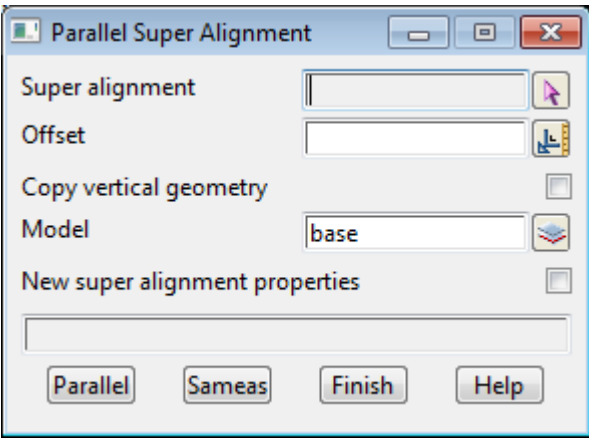
Field Description	Type	Defaults	Pop-Up
Super alignment	string select		
<i>select the super alignment to copy and reverse the direction of the copied string</i>			
Reverse	button		
<i>after the Reverse button is clicked, the direction of the copied super alignment is reversed.</i>			

Parallel a Super Alignment

Position of option on menu: Strings =>SA Tools =>Parallel

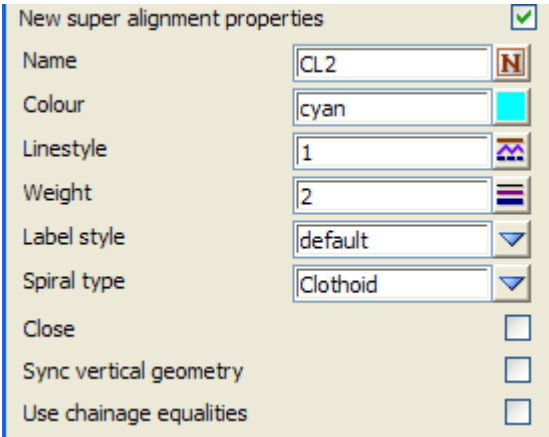
Parallel parallels the horizontal geometry of a super alignment by a user given offset.

Selecting **Parallel** displays the **Parallel Super Alignment** panel.



The new fields and buttons used in the panel have the following functions.

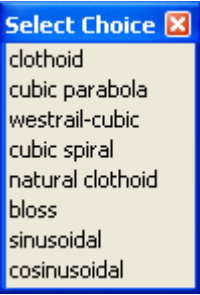
Field Description	Type	Defaults	Pop-Up
Super alignment <i>select a super alignment to parallel</i>	string select		
Offset <i>distance to offset the selected super alignment</i>	input		
Model <i>if not blank, the model for the paralleled string. If blank, the model is the same as the selected string.</i>	model box		available models
New super alignment properties <i>if ticked, the panel is expanded to show all the properties that can be set for the new paralleled string.</i>	tick box		



Extra panel fields when
New super alignment properties
is ticked on

Name <i>the name of the new string</i>	input	from CAD controlbar
--------------------------------------------------	-------	---------------------

Colour	input	from CAD controlbar	available colours
<i>the colour of the new string</i>			
Linestyle	linestyle box	from CAD controlbar	available line styles
<i>line style of the string</i>			
Weight	input		
<i>thickness of the string</i>			
Label style	choice box	default	available label styles
<i>The super alignment style controls the way the super alignment draws and highlights on the screen.</i>			
<i>For more information please go to the section Super Alignment Style</i>			
Transition type	input	clothoid	clothoid, cubic parabola westrail-cubic, cubic spiral natural clothoid, blossom sinusoidal, cosinusoidal
<i>transition (for example clothoid spiral) to be used for this super alignment string. For more information see Transitions and Spirals File in the chapter Setting Up and Configuring 12d.</i>			



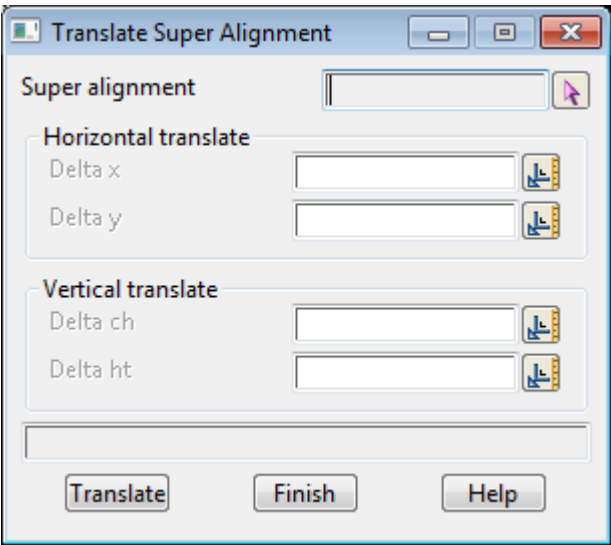
Chain file	file
<i>The chain parameter file to run every time the super alignment is resolved/recalced.</i>	
<i>For more information see the section Chains in the book Utilities</i>	
Close	tick box
<i>if ticked, the super alignment is automatically closed.</i>	
Sync vertical geometry	tick box
<i>if ticked, when the horizontal geometry is modified, an attempt is made to modify the chainage position of the vertical geometry so that remains locked to the same parts of the horizontal geometry as before the horizontal geometry was modified.</i>	
<i>If not ticked, after horizontal geometry is modified, the vertical will possibly be moved in relation to the horizontal geometry because the (x,y) position for a given chainage will change.</i>	
Use chainage equalities	tick box
<i>if ticked, chainage equalities can be defined and the automatic labelling of the string will use the equalities.</i>	
Parallel	button
<i>after the Parallel button is clicked, a dereferenced copy of the horizontal geometry of the super alignment is paralleled. The vertical geometry is deleted.</i>	
Same as	button
<i>after clicking Same as and then select a string. All the picked string properties will be loaded into the panel fields.</i>	

Translate Super Alignment

Position of option on menu: Strings =>SA Tools =>Translate

Translate copies the selected super alignment, and then dereferences and translates the copied string.

Selecting Translate displays the **Translate Super Alignment** panel.



The new fields and buttons used in the panel have the following functions.

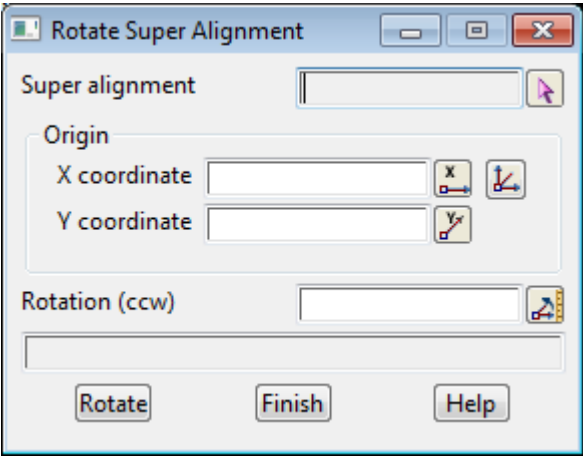
Field Description	Type	Defaults	Pop-Up
Super alignment <i>select the super alignment to translate</i>	string select		
Horizontal translate <i>Delta x, Delta y: the x/y amounts to translate the string</i>			
Vertical translate <i>Delta ch, Delta z: the chainage/z amounts to translate the string</i>			
Translate <i>after the Translate button is clicked, the selected string is copied, and the copied string is translated.</i>	button		

Rotate Super Alignment

Position of option on menu: Strings =>SA Tools =>Rotate

Rotate copies the selected super alignment, and then dereferences and rotates the copied string about a user defined origin.

Selecting Rotate displays the **Rotate Super Alignment** panel.



The new fields and buttons used in the panel have the following functions.

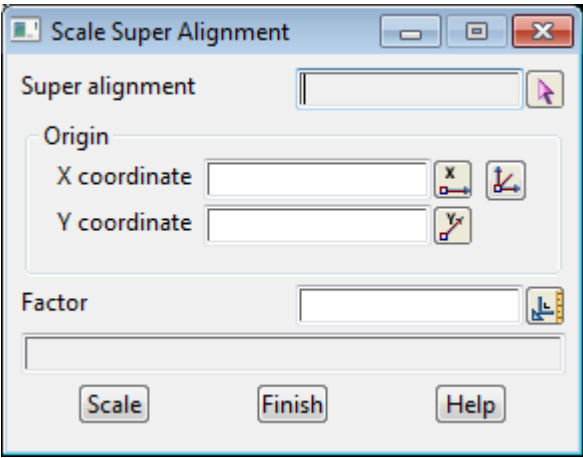
Field Description	Type	Defaults	Pop-Up
Super alignment	string select		
<i>select the super alignment to copy and rotate the copied string</i>			
Origin			xyz ops
<i>select the centre (origin) of the rotation. The origin can be changed at any time.</i>			
Rotation	string select		
<i>the clockwise angle in dms to rotate through.</i>			
Rotate	button		
<i>after the Rotate button is clicked, the selected string is copied, and the copied string is rotated about the origin.</i>			

Scale Super Alignment

Position of option on menu: Strings =>SA Tools =>Scale

Scale copies the selected super alignment, and then dereferences and scales the copied string about a user defined origin.

Selecting Scale displays the **Scale Super Alignment** panel.

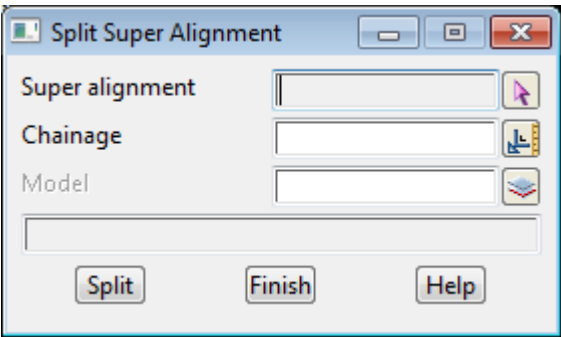


The new fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Super alignment <i>select the super alignment to copy and scale</i>	string select		
Origin <i>select the origin to scale about. The origin can be changed at any time.</i>			xyz ops
Factor <i>amount to scale the copy of the super alignment by.</i>			
Scale <i>after the Scale button is clicked, the selected string is copied, and the copied string then scaled about the origin.</i>	button		

Split a Super Alignment

Position of option on menu: Strings =>SA Tools =>Split
Split copies and splits the copy of the super alignment at a user given chainage.
Selecting Split displays the **Split Super Alignment** panel.



The new fields and buttons used in the panel have the following functions.

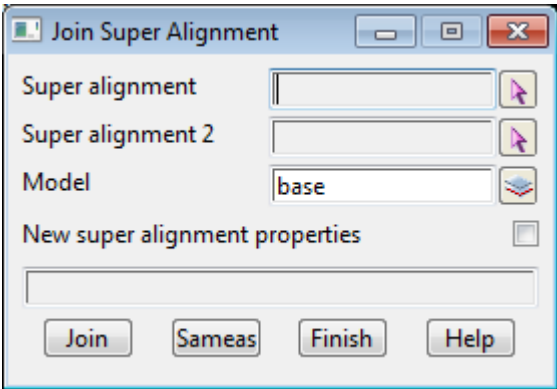
Field Description	Type	Defaults	Pop-Up
Super alignment <i>select a super alignment to split</i>	string select		
Chainage <i>chainage to split the super alignment at</i>	input		
Model <i>if not blank, model for the split string</i> <i>If blank, use the model of the selected string</i>	model box		available models
Split <i>after the Split button is clicked, the super alignment is copied and split at the given chainage.</i>	button		

Joining Two Super Alignments

Position of option on menu: Strings =>SA Tools =>Join

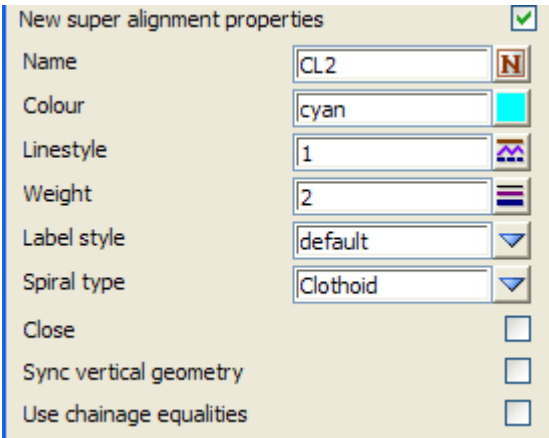
Join joins two super alignments at their ends to make a new super alignment.

Selecting **Join** displays the **Join Super Alignment** panel.



The new fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Super alignment <i>select a super alignment to join</i>	string select		
Super alignment 2 <i>select a super alignment to join to the first selected super alignment</i>	string select		
Model <i>if not blank, model for the joined string</i> <i>If blank, use the model of the selected string for the joined string.</i>	model box		available models
New super alignment properties <i>if ticked, the panel is expanded to show all the properties that can be set for the new joined string.</i>	tick box		



Extra panel fields when
New super alignment properties
is ticked on

Join	button	<i>after the Join button is clicked, a new super alignments is created by joining the two super alignments</i>
Same as	button	<i>after clicking Same as and then select a string. All the picked string properties will be loaded into the</i>

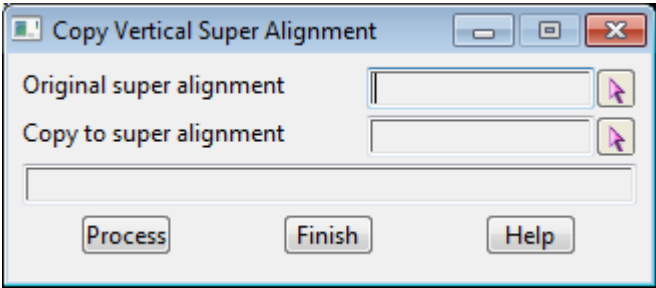
panel fields.

Copy Vertical Geometry

Position of option on menu: Strings =>SA Tools =>Copy vertical

Copies the vertical geometry from one super alignment to another super alignment. This will not work for a super alignment with computators.

Selecting **Copy vertical** displays the **Copy Vertical Super Alignment** panel.



The new fields and buttons used in the panel have the following functions.

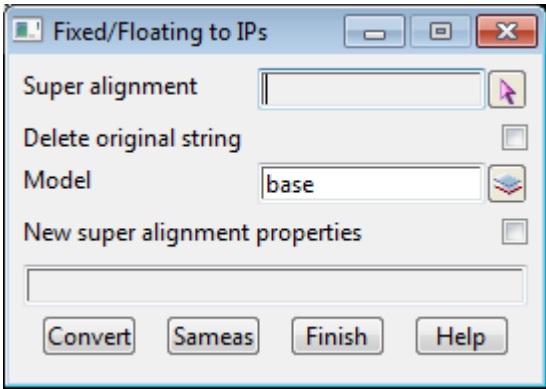
Field Description	Type	Defaults	Pop-Up
Original super alignment	string select		
<i>select the super alignment to copy vertical geometry from</i>			
Copy to super alignment	string select		
<i>select the super alignment to copy vertical geometry to</i>			
Process	button		
<i>after the Process button is clicked, the vertical geometry is copied from the original alignment to the second super alignment.</i>			

Convert Fixed/Floating Elements to IPs

Position of option on menu: Strings =>SA Tools =>Fixed/floating to IPs

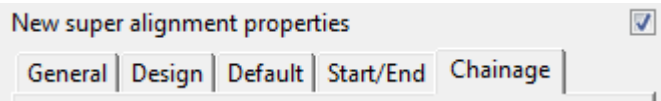
Fixed/floating to IPs converts the fixed and floating elements of the horizontal and vertical geometry to horizontal and vertical intersection points joins with arcs and transitions for HIPs and parabolas or vertical arcs for VIPs.

Selecting Fixed/floating to IPs displays the **Fixed/floating to IPs** panel.



The new fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Super alignment <i>select a super alignment to convert</i>	string select		
Tolerance <i>when the string is converted, the new IP string may be slightly different to the original string. The underlying vertices of the original and new strings are compared and if they differ by the given tolerance value, then a warning is given.</i> <i>If blank, the tolerance is 0.001 (1 mm)</i>	real box		
Delete original string <i>if ticked, the original super alignment is deleted after the conversion is successful</i>	tick box		
Model <i>if not blank, model for the converted string.</i> <i>If blank, use the model of the selected string for the converted string.</i>	model box		available models
New super alignment properties <i>if ticked, the panel is expanded to show all the properties that can be set for the new converted string.</i>	tick box		



Extra panel fields when **New super alignment properties** is ticked.

The tabs are the same as when Creating a Super Alignment - go to [On selecting the Super Alignment option, the Create Super Alignment panel is displayed.](#)

Please note that under **New Super Alignment properties => General Tab Many Strings** is not applicable to **Fixed/Floating to IPs**.

Convert button

*after the **Convert** button is clicked, a new super alignments is created by converting all the elements to IPs*

Same as button

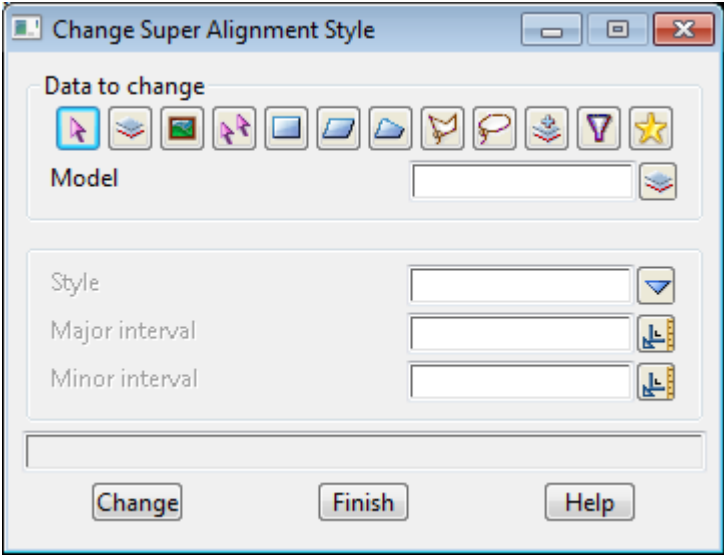
*after clicking **Same as** and then select a string. All the picked string properties will be loaded into the panel fields.*

Change the Styles for Selected Super Alignments

Position of option on menu: Strings =>SA Tools =>Change style

Change style changes the super alignment style for all the selected super alignments.

Selecting Change style displays the **Change Super Alignment Style** panel.



The new fields and buttons used in the panel have the following functions.

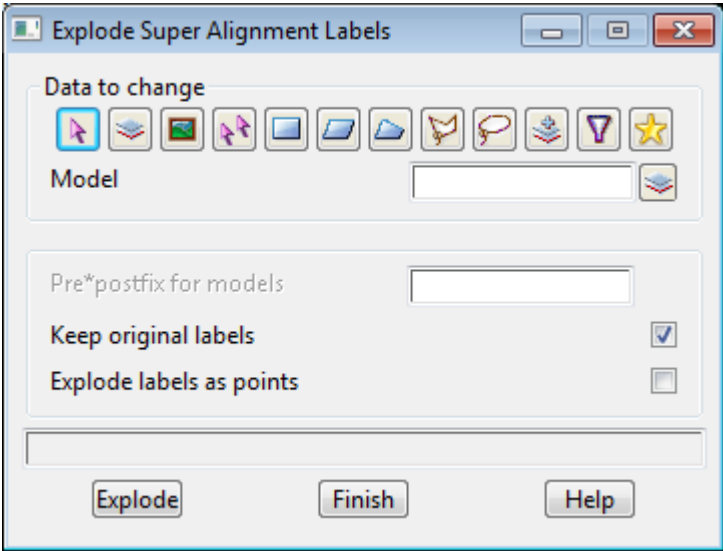
Field	Description	Type	Defaults	Pop-Up
Data source type			Model	
	data selection type - for a full description go to Data Source in the chapter Tools and Concepts			
Data source		input		
	source of data to be processed.			
Style		SA style box		available SA styles
	super alignment style to apply to all the selected super alignments			
Change		button		
	after the Change button is clicked, all the selected super alignments are given the super alignment style			

Explode the Super Alignments Labelling

Position of option on menu: Strings =>SA Tools =>Explode labels

Explode labels creates text and lines from the automatic labelling of the selected super alignments.

Selecting Explode labels displays the **Explode Super Alignment Labels** panel.



The new fields and buttons used in the panel have the following functions.

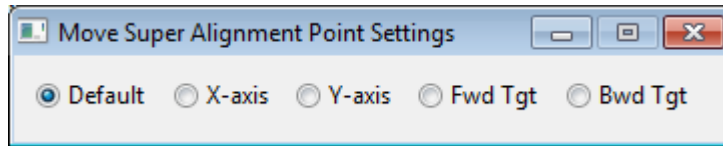
Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source	input		
<i>source of data to be processed.</i>			
pre*postfix for models	text		
<i>the models for the text are the model name containing the super alignment, with prefixing and postfixing as given by this field</i>			
Keep original labels	tick box		
<i>if not ticked, the label style of the original strings are modified to no labels</i>			
Explode labels as points	tick box		
<i>if ticked, the labels are created as single point super strings with the label as vertex text. If not ticked, the labels are created in the one super string with the text as vertex text.</i>			
Explode	button		
<i>create text strings for all the text in the automatic labels of the selected super alignments</i>			

Constrain the Movement of Super Alignment Points

Position of option on menu: Strings =>SA Tools =>Move settings

Move settings constrains the movement of horizontal and vertical intersection points for any super alignment being edited.

Selecting Move settings displays the **Move Super Alignment Point Settings** panel.



The buttons are radio buttons - that is, only one can be selected:

Default

allows any movement in the selected HIP or VIP point

X-axis

constrains an HIPs to only move along the x-axis. That is, the y coordinate is fixed.

Constrains a VIPs to only move along the chainage-axis. That is, the height coordinate is fixed.

Y-axis

constrains an HIPs to only move along the y-axis. That is, the x coordinate is fixed.

Constrains a VIPs to only move along the height-axis. That is, the chainage coordinate is fixed.

Fwd Tgt

constrains an HIPs to only move along the incoming straight to the HIP.

Constrains a VIPs to only move along the incoming straight to the VIP.

Bwd Tgt

constrains an HIPs to only move along the outgoing straight from the HIP.

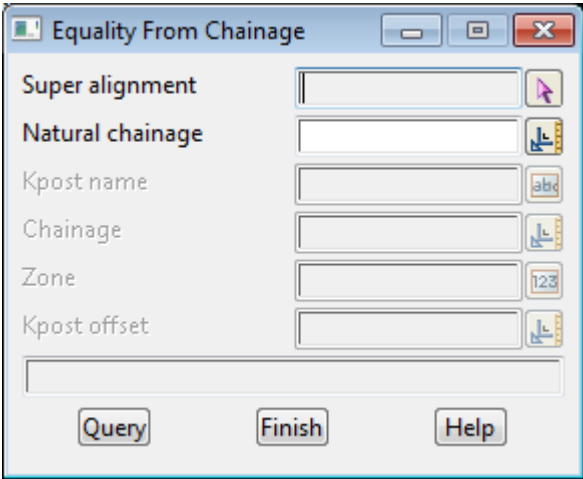
Constrains a VIPs to only move along the outgoing straight from the VIP.

Equality Query

Position of option on menu: Strings =>SA Tools =>Equality query

Displays the Kpost name, offset from Kpost and Zone of the Kpost for a selected position on a super alignment.

Selecting **Equality query** displays the **Equality From Chainage** panel.



The new fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Super alignment	string select		
<i>select the super alignment to display the Kpost name, Offset and Zone for</i>			

Chainage			
<i>the raw chainage to calculate the Kpost name, Offset and Zone at. When the super alignment is first selected, the raw chainage of the selected position is written to the Chainage box.</i>			

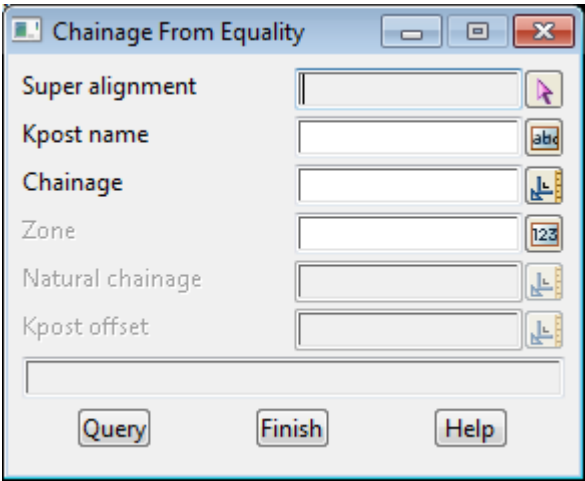
Query	button		
<i>after the Query button is clicked, the vertical geometry is copies from the original alignment to the second super alignment.</i>			

Chainage Query

Position of option on menu: Strings =>SA Tools =>Chainage query

For a user given Kpost name, offset from Kpost and Zone, this option displays the raw chainage of that point.

Selecting Chainage query displays the **Chainage From Equality** panel.



The new fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Super alignment	string select		
<i>select the super alignment to get the raw chainage for</i>			
Kpost name			
<i>name of a Kpost on the selected string</i>			
Offset			
<i>offset from the Kpost</i>			
Zone			
<i>Kpost zone</i>			
Query	button		
<i>after the Query button is clicked, the raw chainage of the point given by the Kpost name, Offset from Kpost and Zone.</i>			

Reverse Calc Parts

Position of option on menu: Strings =>SA Tools =>Reverse calc parts

A super alignment is made up of the methods for constructing each part of the super alignment (one set for the horizontal geometry and another set for the vertical geometry), and if the methods are consistent, then they define a string of tangential segments which defines the super alignment in plan and in section.

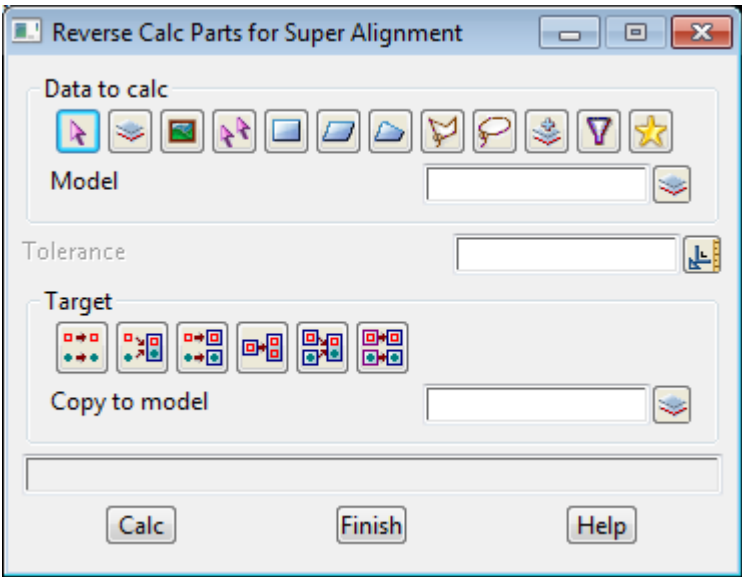
In plan the segments can be lines, arcs or transitions. In section the segments are lines, arcs or parabolas. Normally the segments are tangential to each other.

Sometimes a super alignment is missing the construction parts and only consists of the underlying segments. Then the super alignment can not be edited since there are no methods defining the string.

The **Reverse Calc Parts** option takes a super alignment consisting only of segments, and tries to build construction methods for the super alignment. If it is successful, then the super alignment can then be edited.

Note - the segments should be tangential to each other but if that is not the case, the option will try and move the vertices by a user defined tolerance to find a tangential solution.

Selecting **Reverse calc parts** displays the **Reverse Calc Parts For Super Alignment** panel.



The new fields and buttons used in the panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Data source type			Model	
-------------------------	--	--	-------	--

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data source		input		
--------------------	--	-------	--	--

source of data to be processed.

Tolerance		Measure box		
------------------	--	-------------	--	--

the segments need to be tangential to each other for the reverse calculation of parts to work. If segments are not tangential, the vertices will be moved by up to the given Tolerance to make them tangential. There is a warning if the resultant super alignment can't solve.

Target type

Data target type - where to put the processed strings. For a full description go to [Data Target](#) in the chapter [Tools and Concepts](#)

Target info input

extra information required for the target.

Calc button

*after the **Calc** button is clicked, the option tries to create calculation parts for any super alignments with only segments and no calculation parts.*

Validate Super Alignment

Position of option on menu: Strings =>SA tools =>Validate

This section of documentation is a work in progress and will be updated in subsequent releases.

Selecting Validate displays the **Super Alignment Parts Validation** panel.

Super Alignment Parts Validation

Data Selection

Model

Options

View display for selection highlighting

Validation Report <csv format>

SA Parts Validation Report.csv

Full Data Report

Grid Item Report

Defaults

Horizontal Parts

	Part No	SA Part Type	Reference Model->Name (SH) Denotes model is Shared	Ref Exists	ID's	Model Name
1				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Vertical Parts

	Part No	SA Part Type	Reference Model/Name	Ref Exists	ID's	Model Name
1				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

SA List

Next

Save as Super

Finish

Help

Convert

Position of option on menu: Strings =>Convert

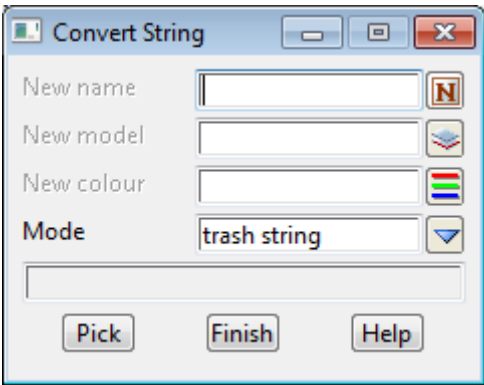
The **Convert** option is used to create a new string of possibly a different string type from a chosen string.

Since not all string conversion are possible, or even make sense (for example, converting a 3d string to a text string), the list of defined conversion depends on the type of the string chosen for conversion.

After selecting the string to convert, a menu containing the possible conversions is raised and the required conversion selected from it.

After the type of conversion is selected, a string Properties panel containing the attribute information for the new string is displayed and can be used to modify any properties of the new string.

After selecting the **Convert** option, the **Convert String** panel is placed on the screen.



If a new name, model or colour is required for the converted string, the new data is entered into the **Convert String** panel. If a change isn't required, leave the appropriate panel field blank.

The **Convert** option is already in progress and if a string is selected and accepted, a menu containing all the available conversions for that particular string type is displayed.

For example, for each string type the choices are:

Convert 2d String to	Convert 3d String to	Convert 4d String to	Convert Super Alignment String to
2d String	2d String	2d String	2d String
3d String	3d String	3d String	3d String
4d String	4d String	4d String	Interface
Interface	Interface	Interface	Alignment
Alignment	Alignment	Alignment	Super Alignment
Super Alignment	Super Alignment	Super Alignment	Pipeline
Pipe String	Pipe String	Pipe String	Polyline
Pipeline	Pipeline	Pipeline	Super
Polyline	Polyline	Polyline	Super 2d
Super	Super	Super	Super arc
- try again -	- try again -	- try again -	- try again -



After selecting the conversion to be made, a new string of the selected type is created and given the model, colour and name according to the fields in the **Convert String** panel.

The **Properties** panel for the new string is also displayed and hence any of the strings properties can be modified for the new string.

The fields and buttons used in the **Convert String** panel have the following functions.

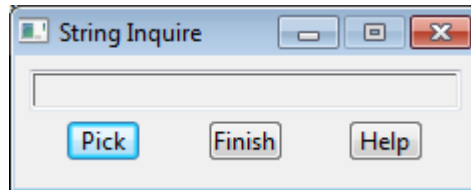
Field	Description	Type	Defaults	Pop-Up
New name		input		
	<i>If blank, the converted string is given the same name as the original string.</i>			
	<i>If non-blank, then the converted string is given the name in the new name field.</i>			
New model		input		available models
	<i>if blank, the converted string is placed in the same model as the original string.</i>			
	<i>If non-blank, then the converted string will be placed in the model given in the new model field.</i>			
New colour		input		available colours
	<i>if blank, the converted string is given the same colour as the original string.</i>			
	<i>If non-blank, then the converted string is given the colour in the new colour field.</i>			
Mode		input	keep string	keep, delete, trash string
	<i>if delete string, the string selected to be converted is deleted.</i>			
	<i>keep string, the selected string is not deleted.</i>			
	<i>trash string, the string selected to be converted is moved to the trash model.</i>			

Inquire

Position of option on menu: Strings => Inquire

The **inquire** option is used to obtain information about a string displayed on the screen. The amount and type of information varies between string types.

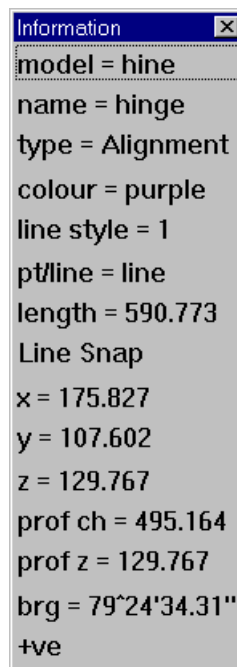
On selecting the **Inquire** option, the **String Inquire** panel is displayed.



The panel is used for any special messages and to end the option.

After selecting the **inquire** option, the strings are selected using the normal 12d Model selecting mechanism (LB to pick a string, MB to accept a string, RB for the **pick ops** menu). Whenever a string is picked, the information about the picked string is displayed on the screen in the **Information** menu.

An example of the **Information** menu for an Alignment string is



For more details on the **Information** menu, go to the section [String Information](#)

Any number of string inquiries can be made with the option by repeated use of the mouse buttons LB and MB to pick and accept strings.

The inquire option is terminated by either selecting the **Cancel** option from the **Pick Ops** menu (raised by clicking RB) or selecting **Finish** or **[X]** from the **String Inquire** panel.

String Information

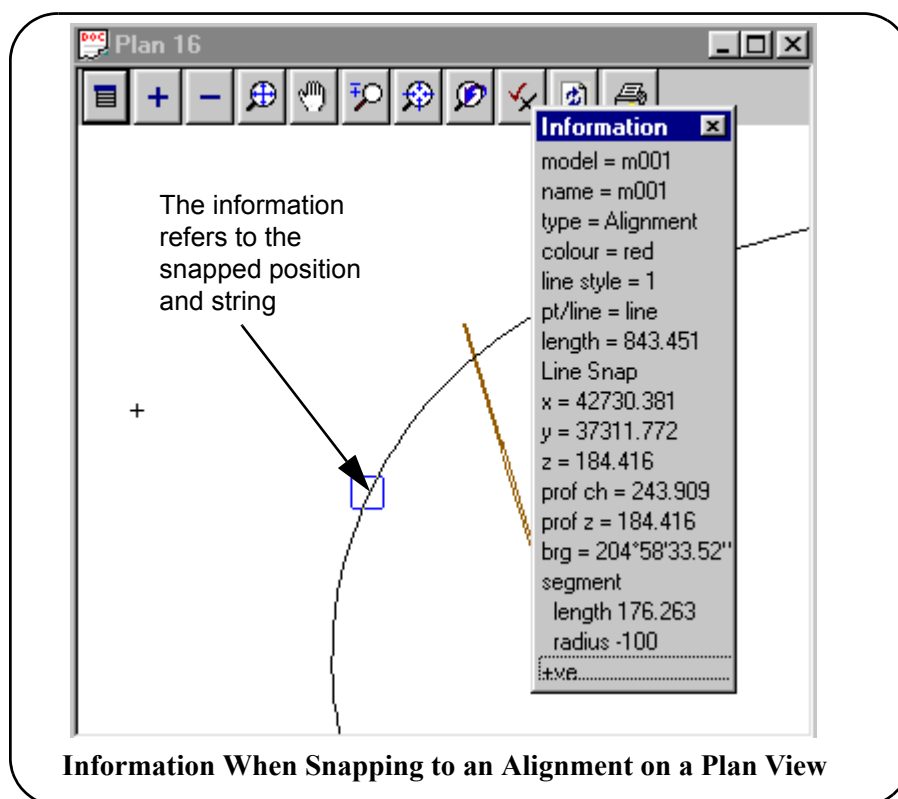
Whenever a string is picked, the information about the picked string is displayed on the screen in the **Information** menu

The **Information** menu displays different information depending on whether the string was picked in a Plan or Perspective view or in a Section view.

For a Plan or Perspective View

The details on the Information menu can include:

model =	- gives the model of the selected string
name =	- " name " " "
type =	- " type " " "
colour =	- " colour " " "
line style =	- " line style " " "
pt/line =	- " " breakline type " " "
# pts =	- " " number of points " " "
area =	- " " area if it is a closed string
length =	- " " length of the string
Snap type	- e.g. Line Snap, Point Snap
x =	- " " x co-ordinate of the selected position
y =	- " " y co-ordinate of the selected position
prof ch =	- " " chainage of the selected position on the string
prof z =	- " " z-value of the selected position on the string
brg =	- " instantaneous bearing of the selected position on the string
segment length	- " length of the string segment containing the selected position
+ve or -ve	- if the direction of the pick was the same as the direction of the string, then +ve is displayed otherwise the direction of the pick is opposite to the string direction and a -ve is displayed.



For a Section View

For a section view, the x-axis of the view is defined by the chainage along the string that is being profiled on the section view (the **profiled** string). The profiled string is displayed on the section view.

For any tins in models added to the section view, the sections through the tins along the profiled string are also displayed in the section view.

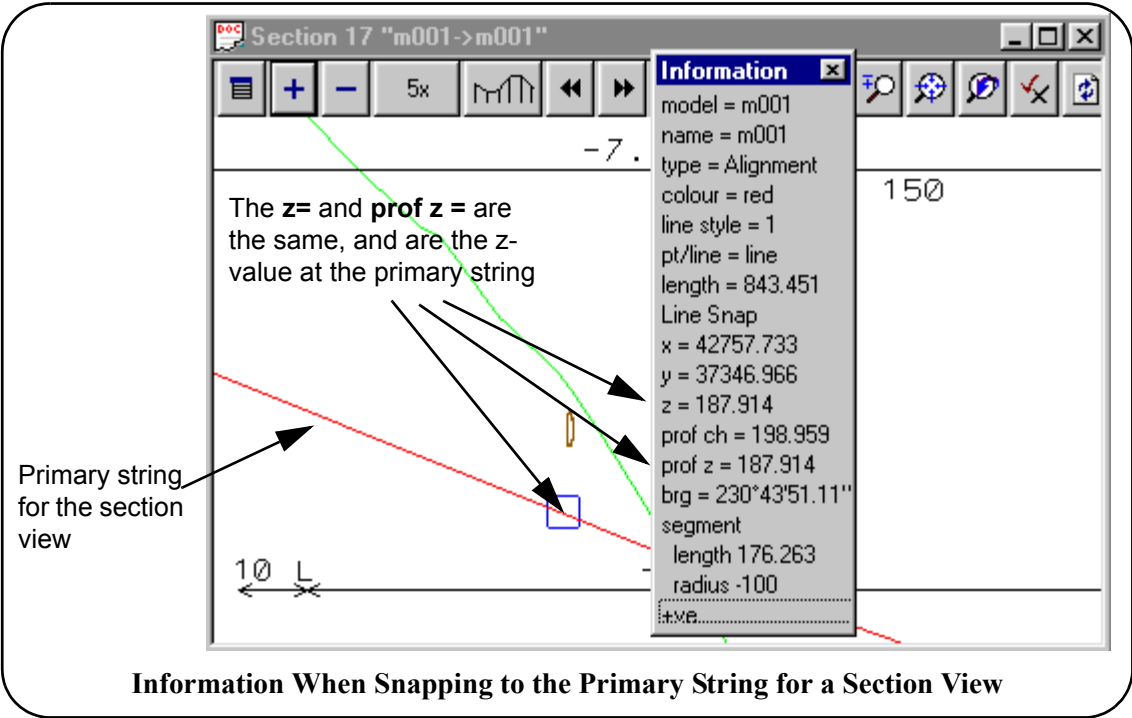
Finally, any parts of any strings in models added to the section view that are in the corridor defined for the section view are projected onto the section view and displayed.

The details on the Information menu can include:

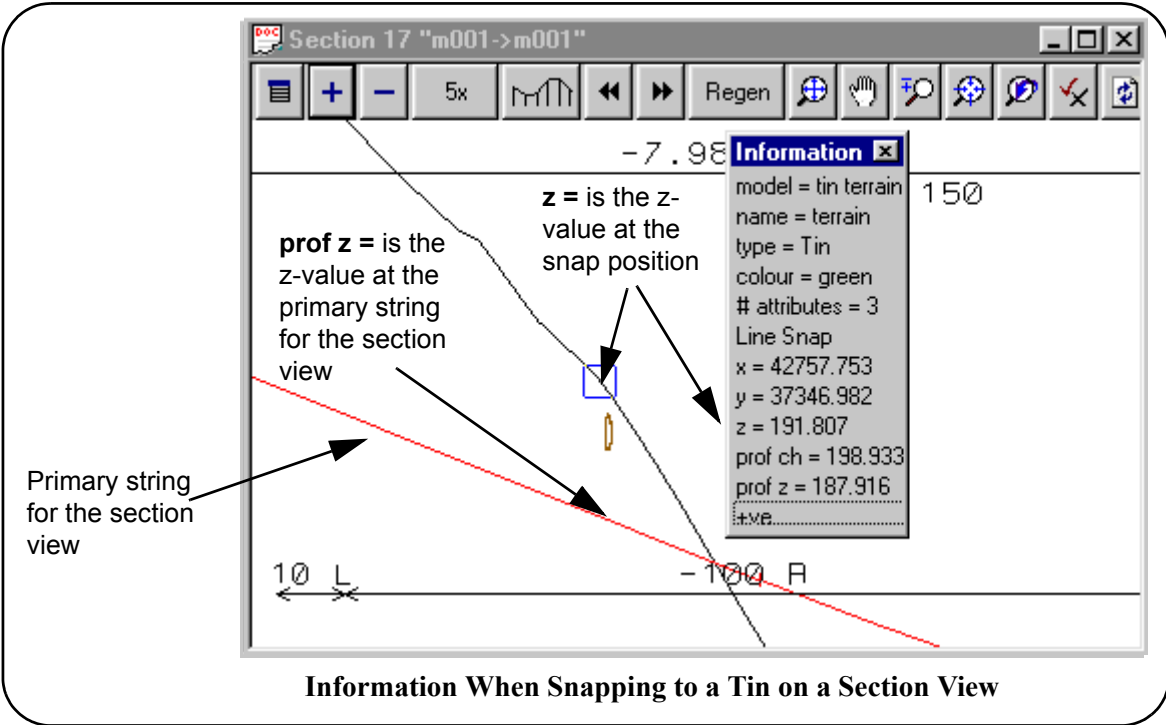
model =	- gives the model of the selected string
name =	- " name " " "
type =	- " type " " "
colour =	- " colour " " "
line style =	- " line style " " "
pt/line =	- " breakline type " " "
# pts =	- " number of points " " "
area =	- " area if it is a closed string
length =	- " length of the string
Snap type	- e.g. Line Snap, Point Snap
x =	- " x co-ordinate of the selected position
y =	- " y co-ordinate of the selected position
z =	- " z co-ordinate of the selected position
prof ch =	- " chainage of the <i>profiled</i> string at the selected position Note that this is not the chainage of the selected string unless the selected string is the profiled string
prof z =	- " " z-value of the <i>profiled</i> string at the profile chainage of the selected position Note that this is not the z of the selected position unless the selected string is the profiled string
brg =	- " instantaneous bearing of the selected position on the string
segment length	- " length of the string segment containing the selected position
+ve or -ve	- if the direction of the pick was the same as the direction of the string, then +ve is displayed otherwise the direction of the pick is opposite to the string direction and a -ve is displayed.

IMPORTANT NOTES

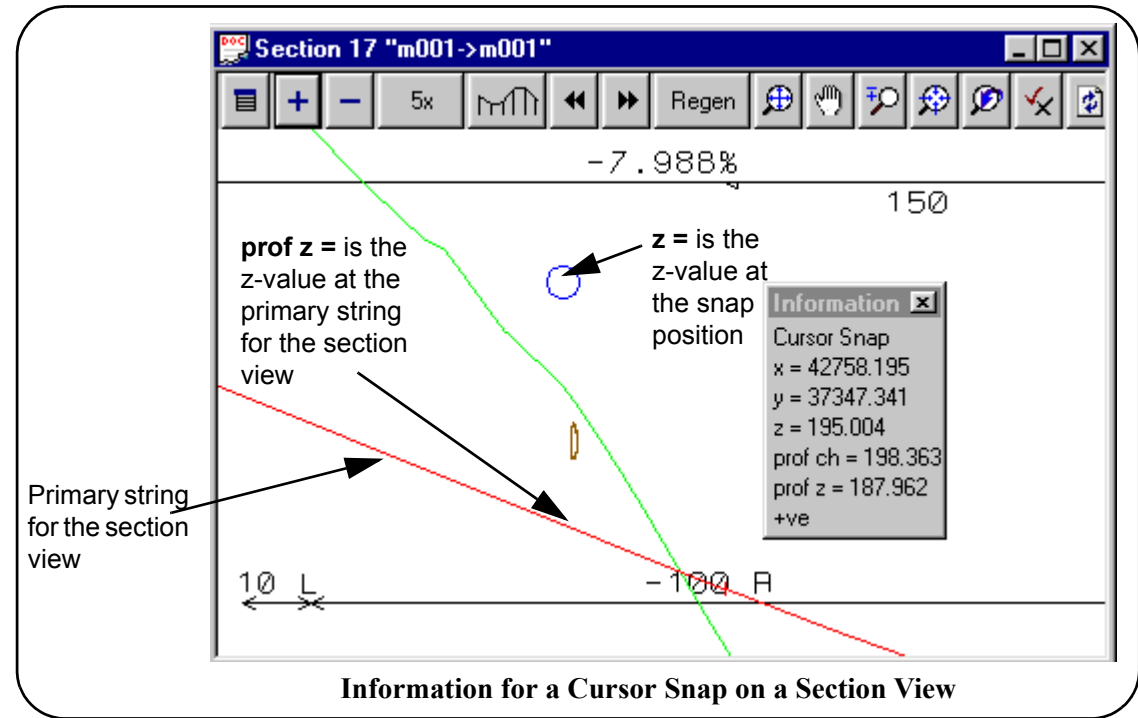
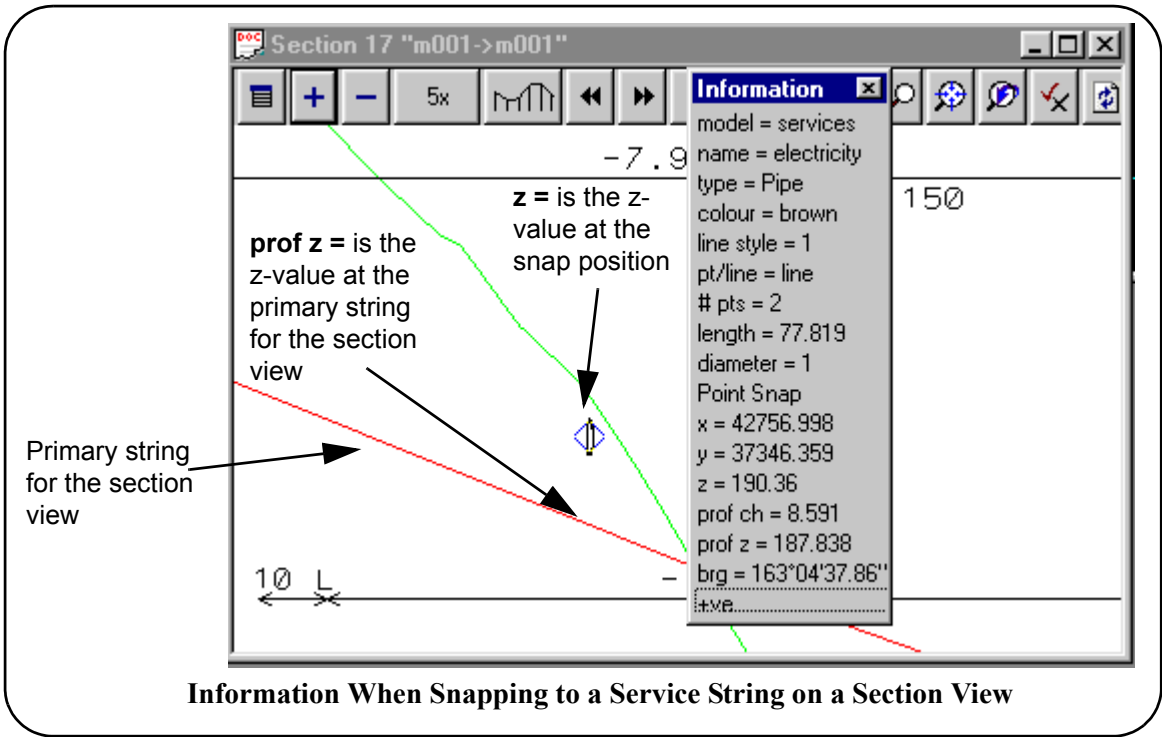
1. for a string selected on a section view, the "z =" value is the z co-ordinate of the selected position. The "**prof z** =" value is the z co-ordinate of the string profiled on the section view.
2. The "**prof ch** =" value is the chainage of the string profiled on the section view, not the chainage of the selected string.



Information When Snapping to the Primary String for a Section View



Information When Snapping to a Tin on a Section View

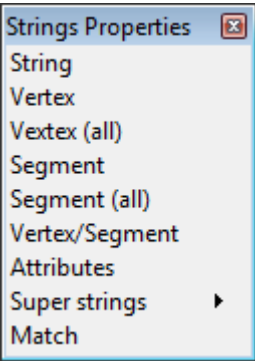


Properties

Position of menu: Strings =>Properties

The **Properties** walk-right menu contains options to obtain and/or modify the properties of any string displayed on the screen, or obtain and/or modify the vertices and segments of a super string.

The **Properties** walk-right menu is



For the option <i>String</i> , go to	<u>String</u>
<i>Vertex</i>	<u>Vertex</u>
<i>Vertex (all)</i>	<u>Vertex (all)</u>
<i>Segment</i>	<u>Segment</u>
<i>Segment (all)</i>	<u>Segment (all)</u>
<i>Vertex/Segment</i>	<u>Vertex/Segment</u>
<i>Attributes</i>	<u>Attributes</u>
<i>Super strings</i>	<u>Super Strings</u>
<i>Match</i>	<u>Match</u>

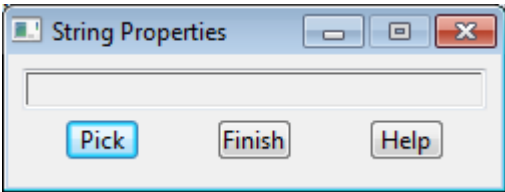
String

Position of option on menu: Strings =>Properties =>String

The **String** option obtains and/or modify property information about any string displayed on the screen.

For example, the string's name, colour and style are string properties. Each string type has its own particular set of properties.

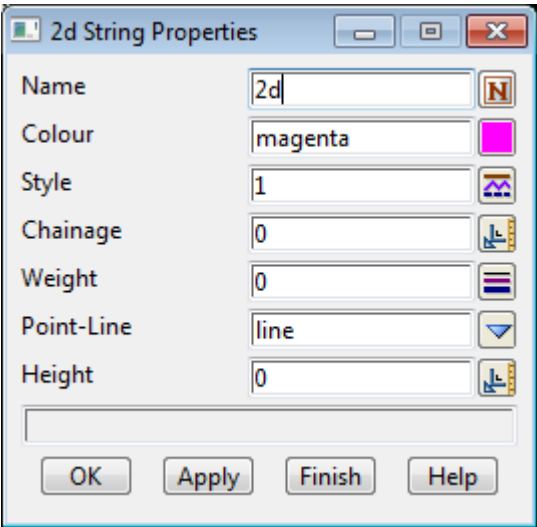
On selecting the **String** option, the **String Properties** panel is displayed.



The panel is only used for any special messages and to end the option.

The **String Properties** option is automatically in a pick mode and the user selects strings using the normal **12d** Model picking mechanism (LB to select a string, MB to accept a string, RB for the pick ops menu). Whenever a string is selected, the appropriate **Properties** panel for the string type is displayed on the screen with all the picked string's properties shown.

For example, for a 2d string, the **Properties** panel is



To modify any of the properties for the selected string, simply change the information in the appropriate panel field and select the **OK** or **Apply** button.

The **Properties** panel is also brought up by the **Properties** option on each string editor and the **Properties** panel have been shown for each string in the Editor section of the manual.

Please continue to the next section [Vertex](#).

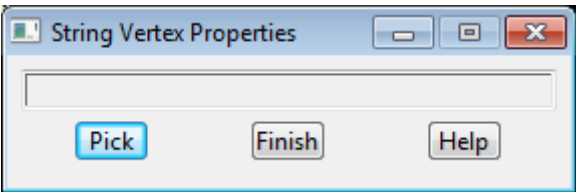
Vertex

Position of option on menu: Strings =>Properties =>Vertex

The **Vertex** option obtains and/or modify property information about the vertex of any super string displayed on the screen.

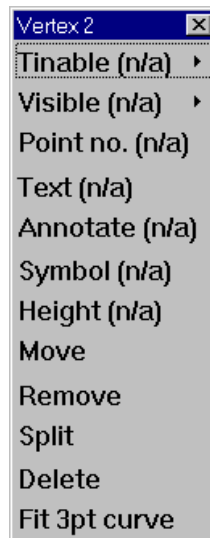
For example, the height, symbol, annotation, point no are all properties of a super string vertex.

On selecting the **Vertex** option, the **String Vertex Properties** panel is displayed.



The panel is only used for any special messages and to end the option.

The **String Vertex Properties** option is automatically in a pick mode and the user selects the *vertex* of a super string using the normal 12d Model picking mechanism. Whenever a *vertex* is selected, a **Vertex** menu showing the properties of the vertex is displayed on the screen.



To modify any of the properties for the selected vertex, simply click on the appropriate item on the **Vertex** menu and the appropriate panel will come up to modify the vertex property.

Please continue to the next section [Segment](#).

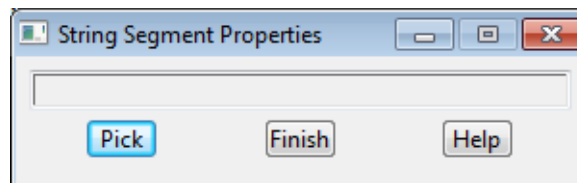
Segment

Position of option on menu: Strings => Properties => Segment

The **Segment** option obtains and/or modify property information about the segment of any super string displayed on the screen.

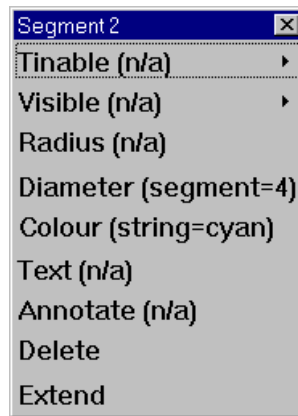
For example, the visibility, radius, colour, text are all properties of a super string segment.

On selecting the **Segment** option, the **String Segment Properties** panel is displayed.



The panel is only used for any special messages and to end the option.

The **String Segment Properties** option is automatically in a pick mode and the user selects the *segment* of a super string using the normal **12d** Model picking mechanism. Whenever a *segment* is selected, a **Segment** menu showing the properties of the segment is displayed on the screen.



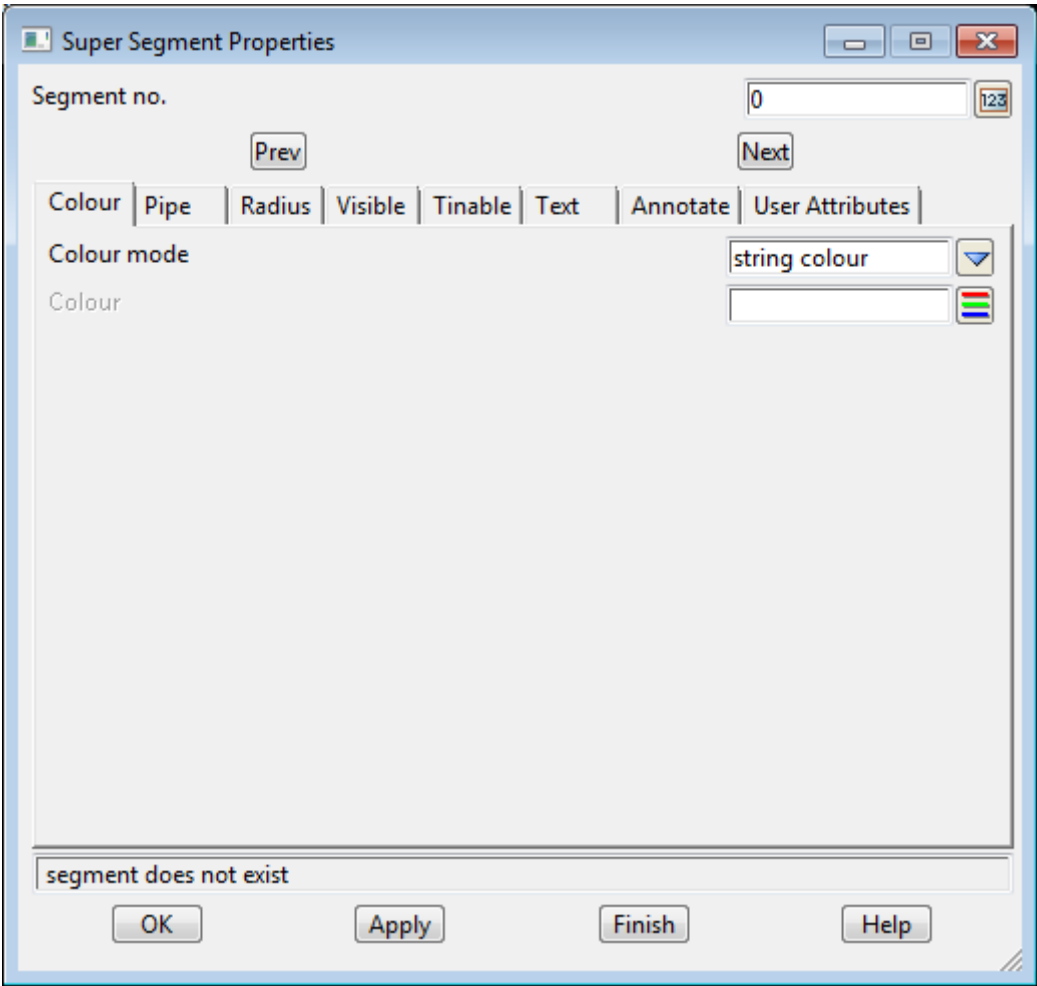
To modify any of the properties for the selected segment, simply click on the appropriate item on the **Segment** menu and the appropriate panel will come up to modify the segment property.

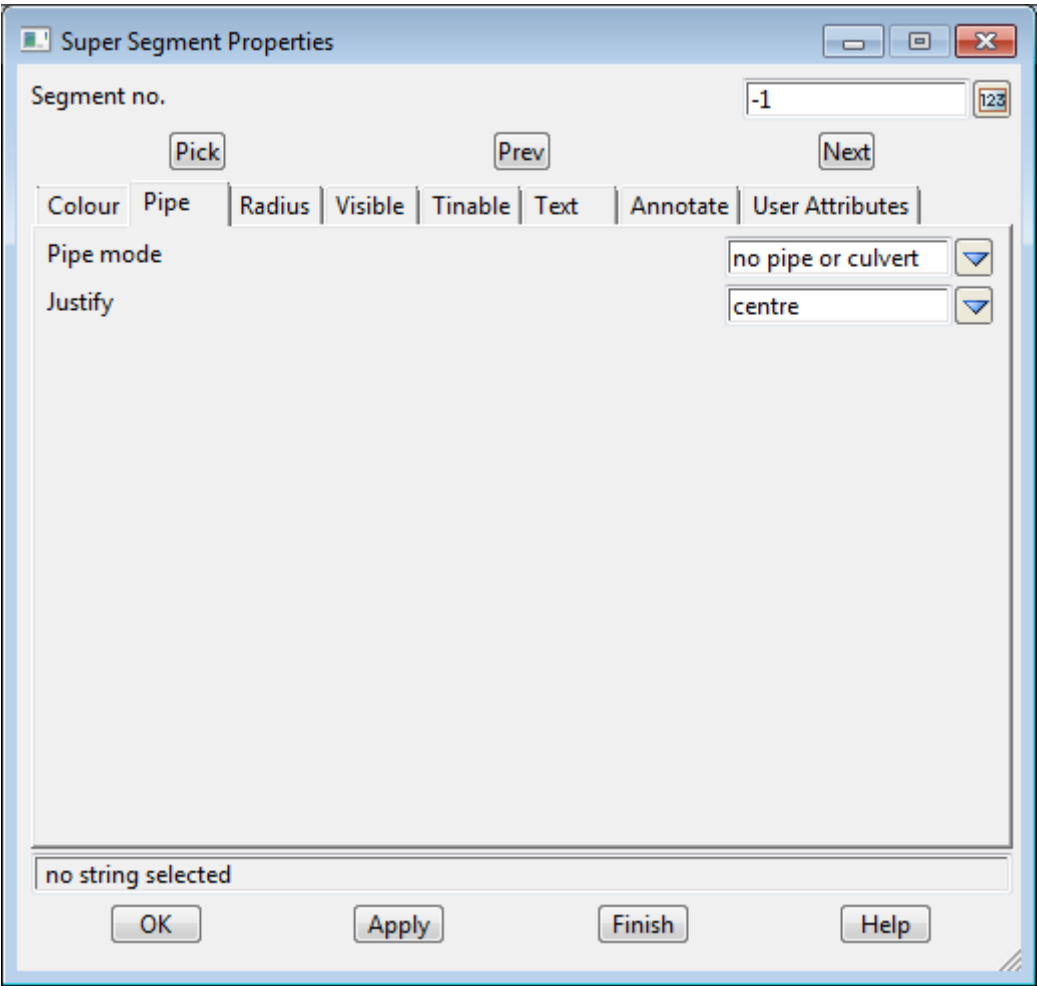
Please continue to the next section [Vertex/Segment](#).

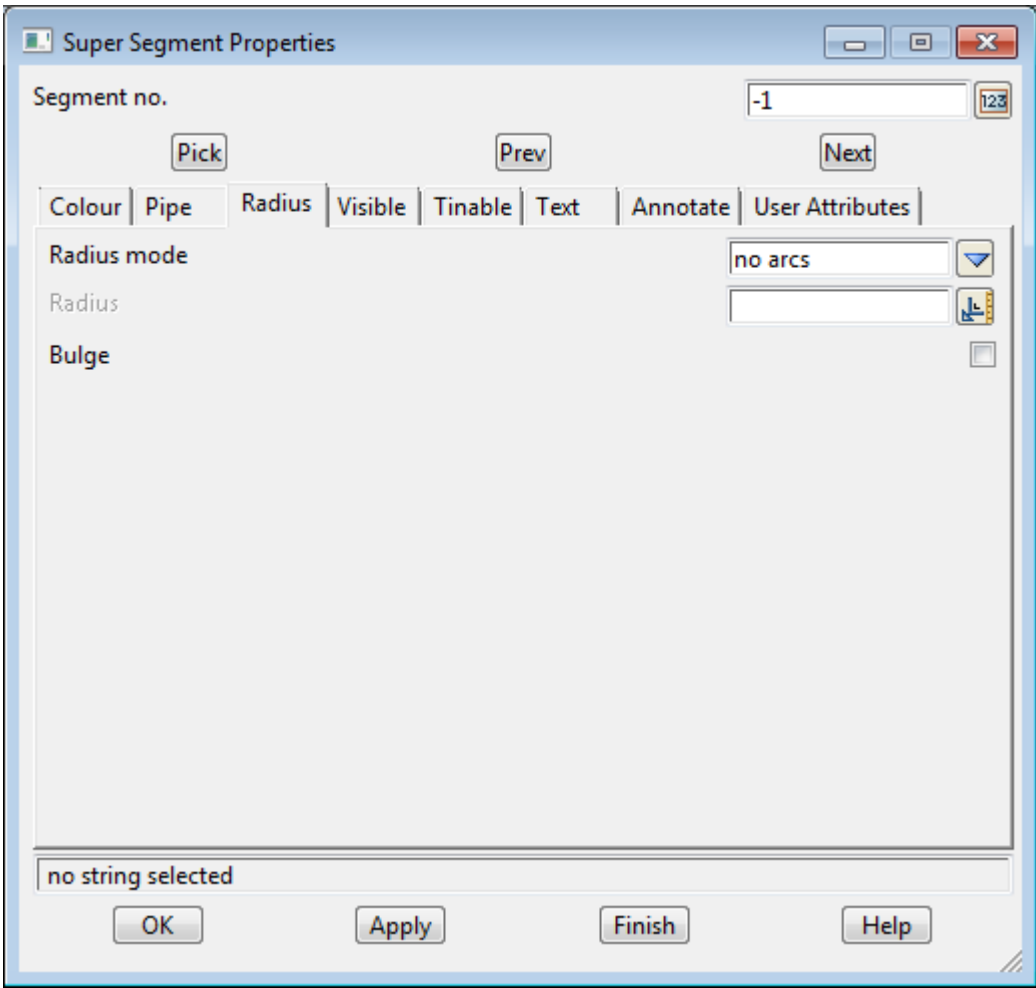
Segment (all)

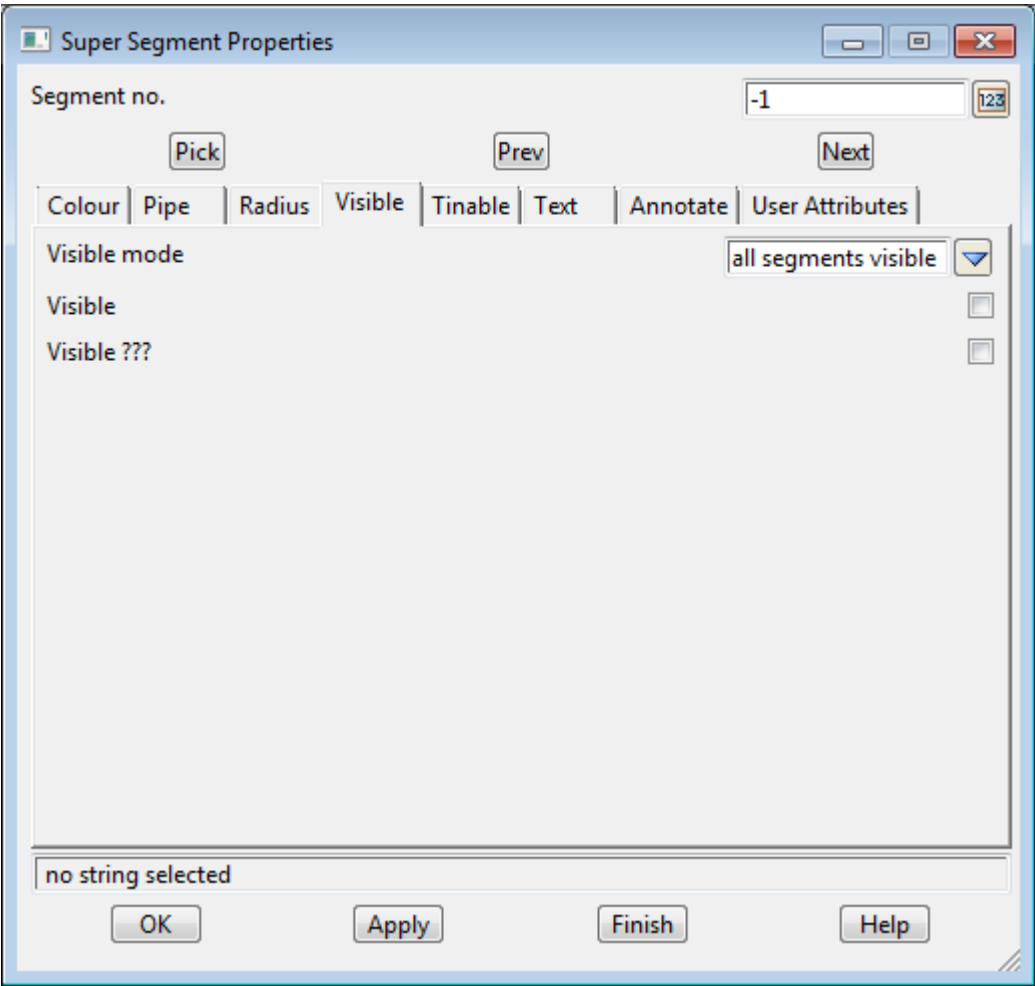
Position of option on menu: Strings =>Properties =>Segment (all)

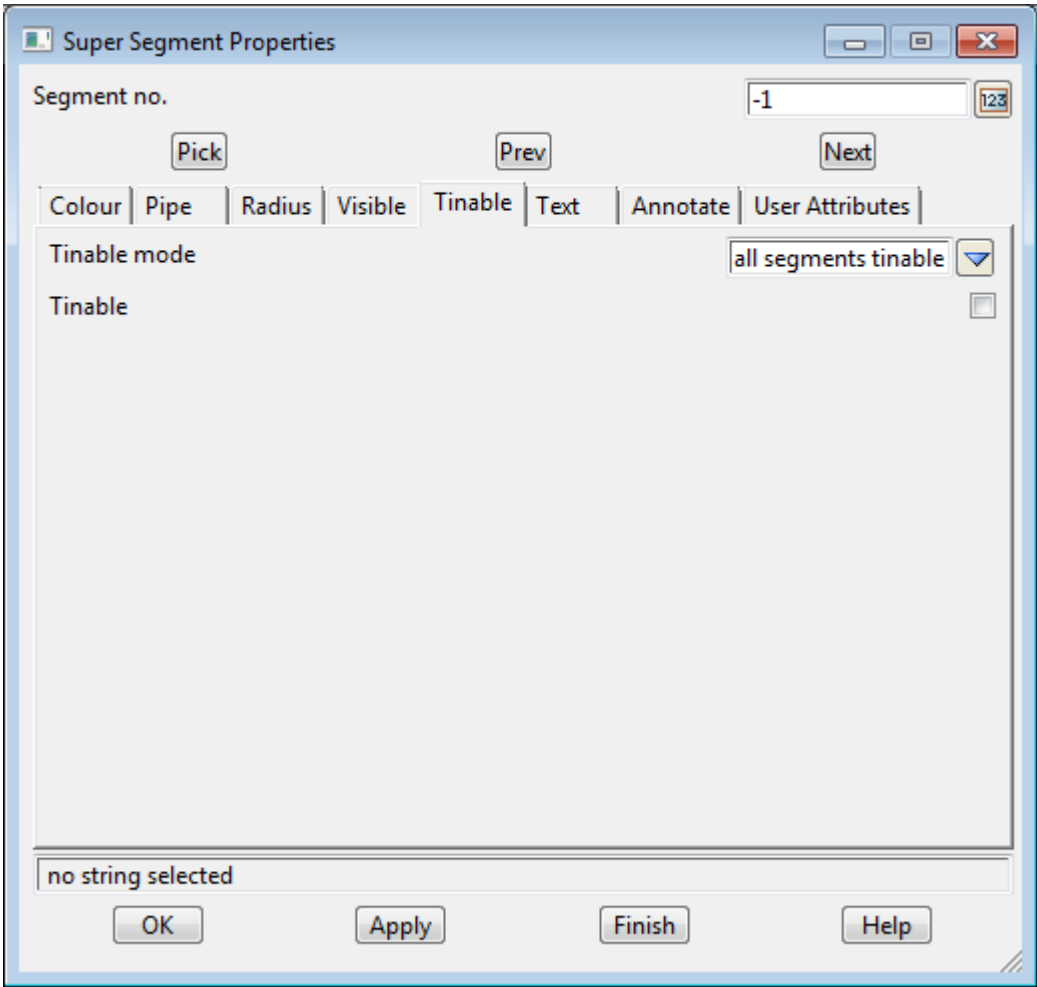
For more information please go to the section [All Segment Properties](#)

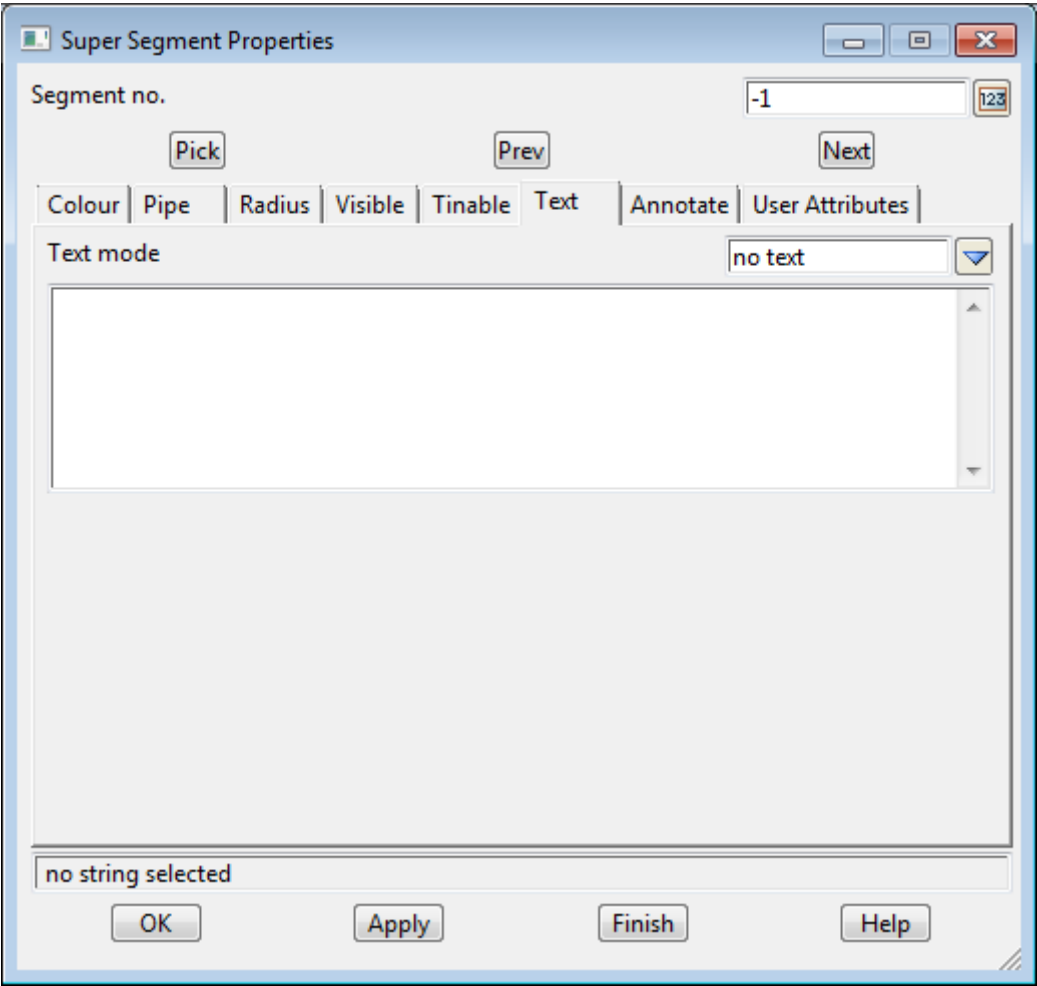


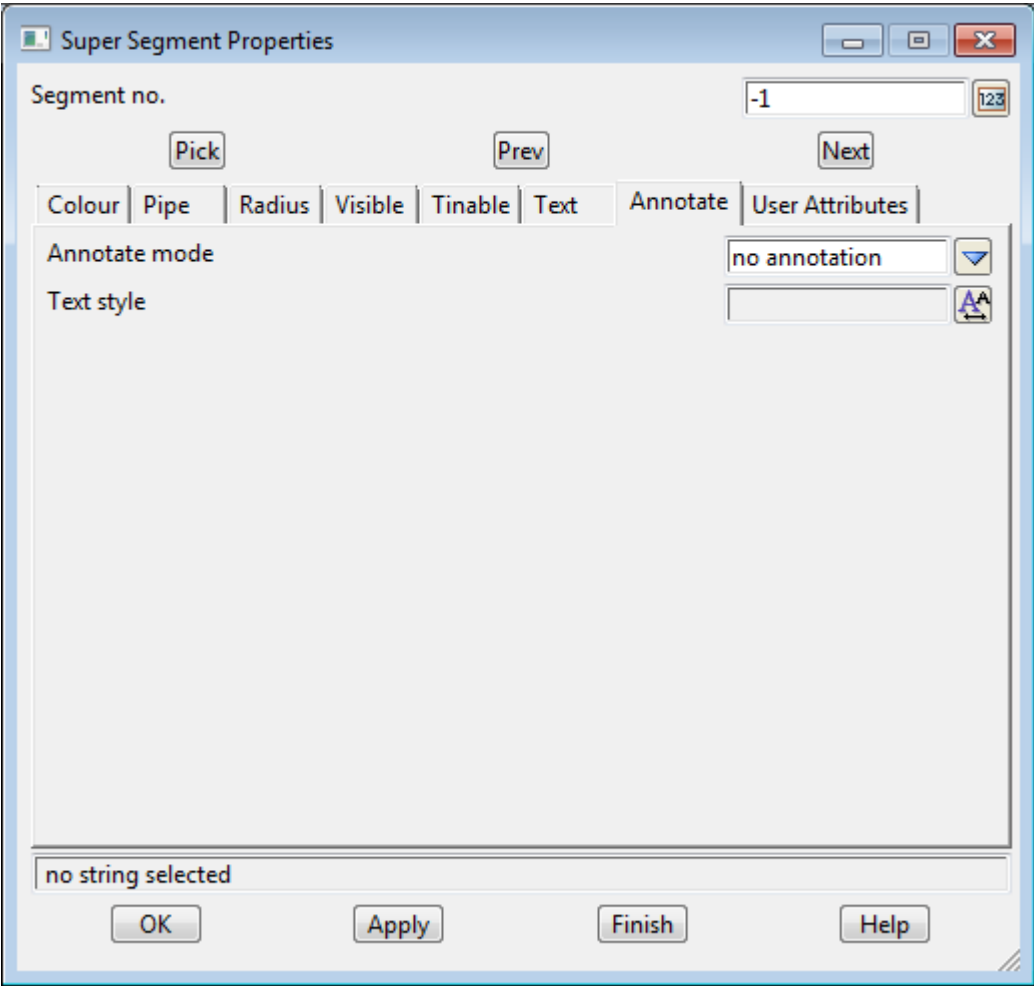


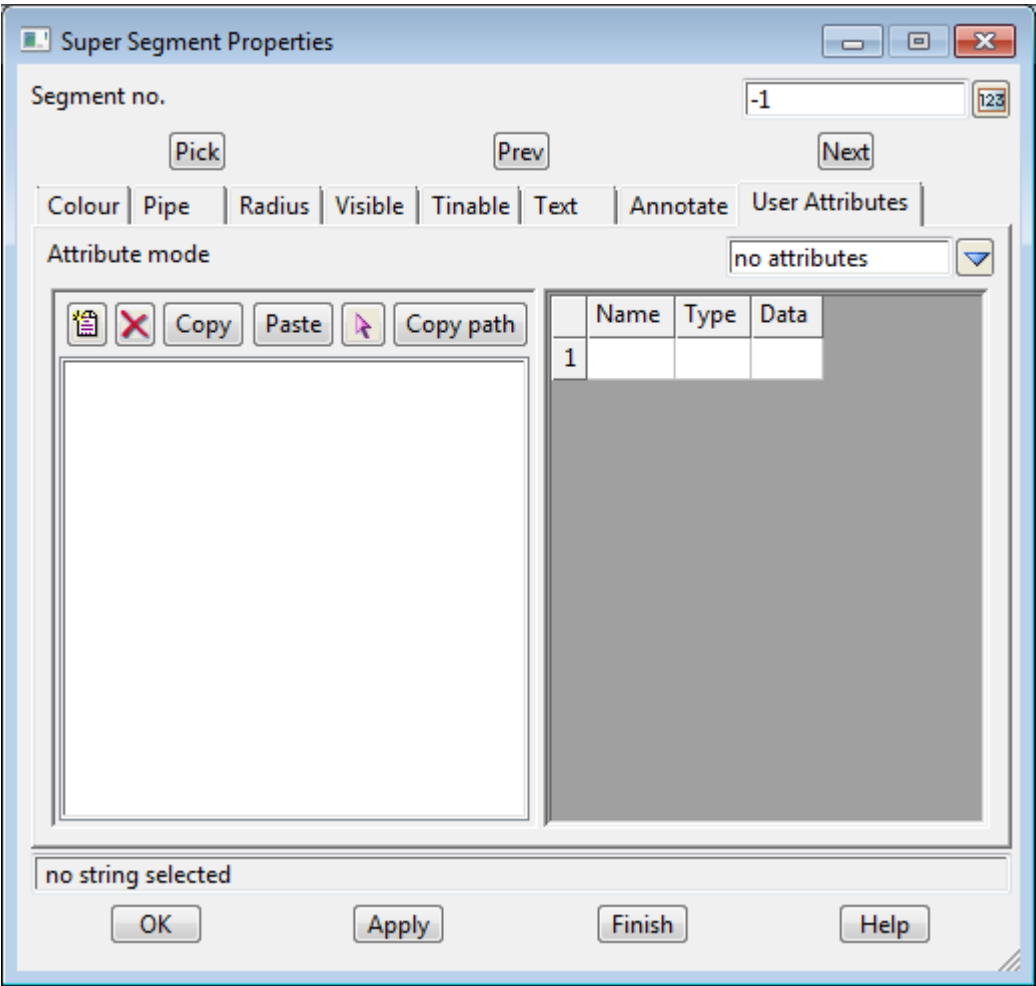








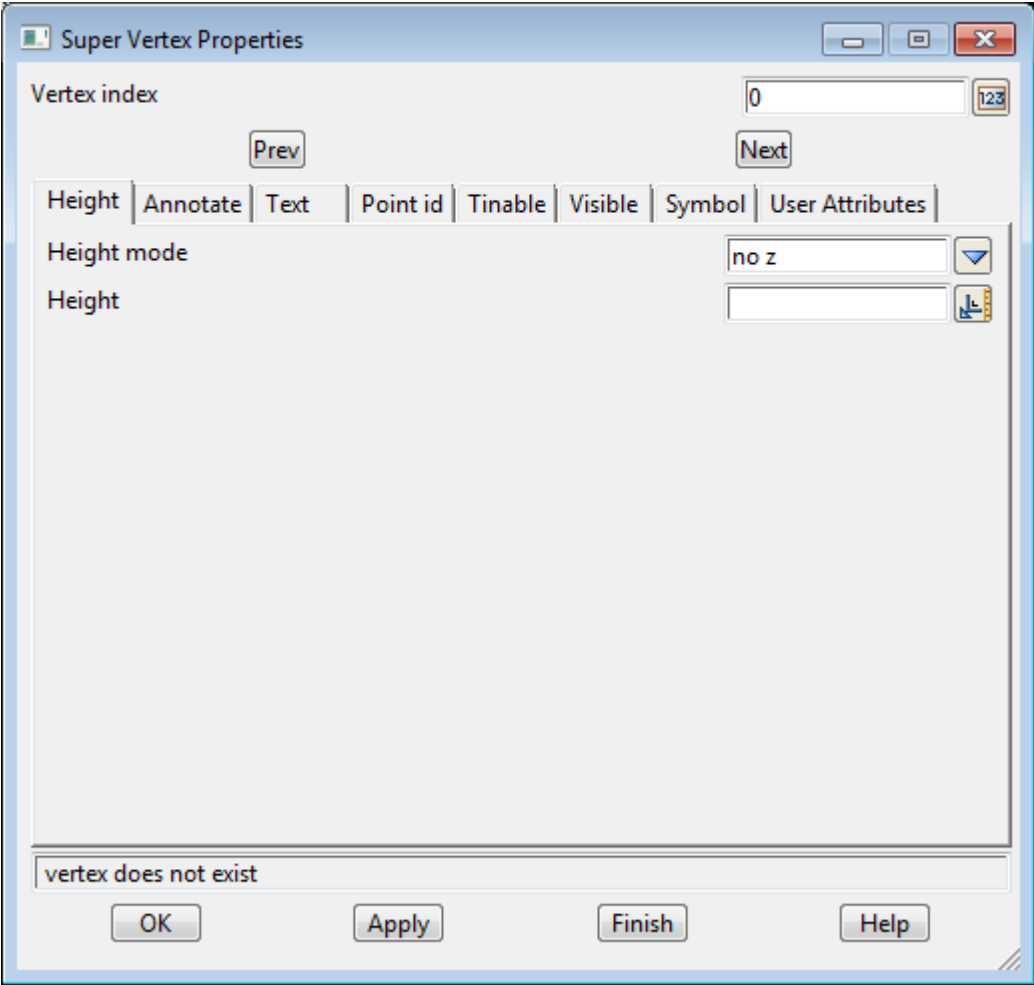


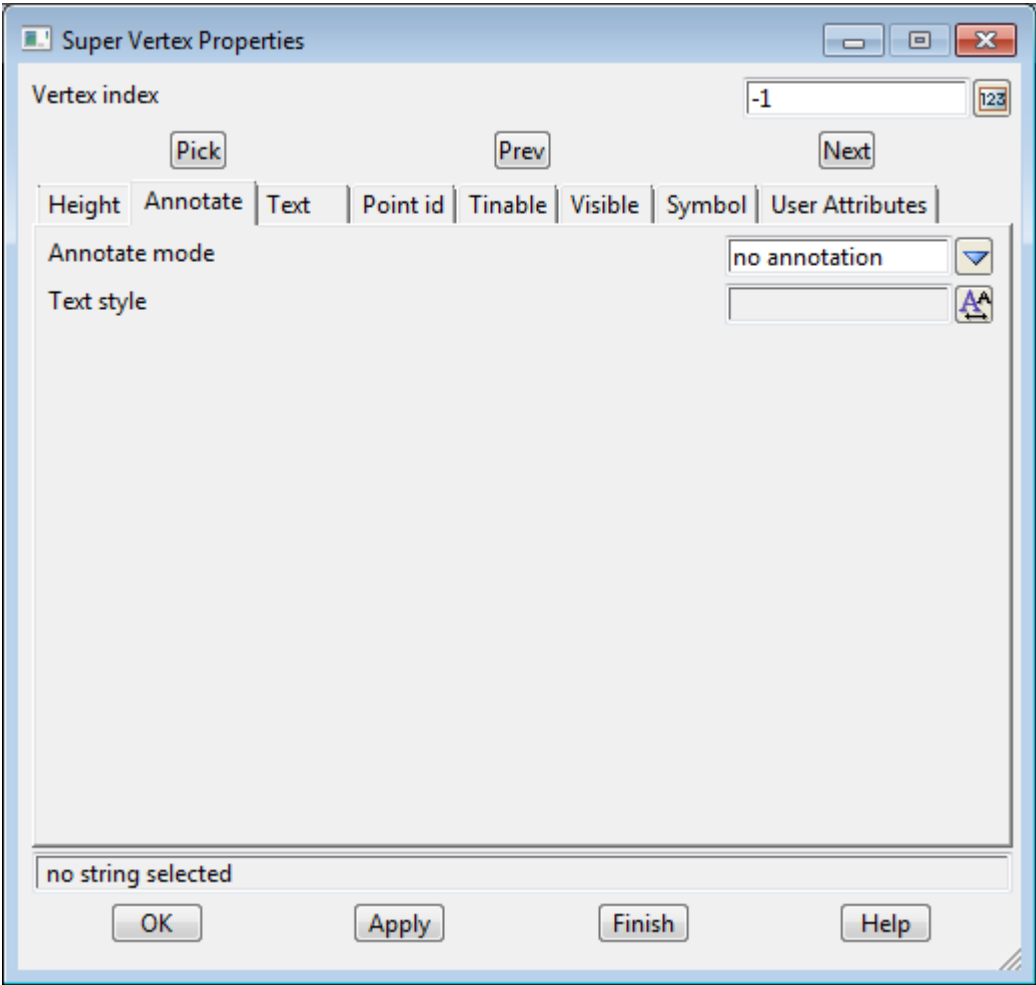


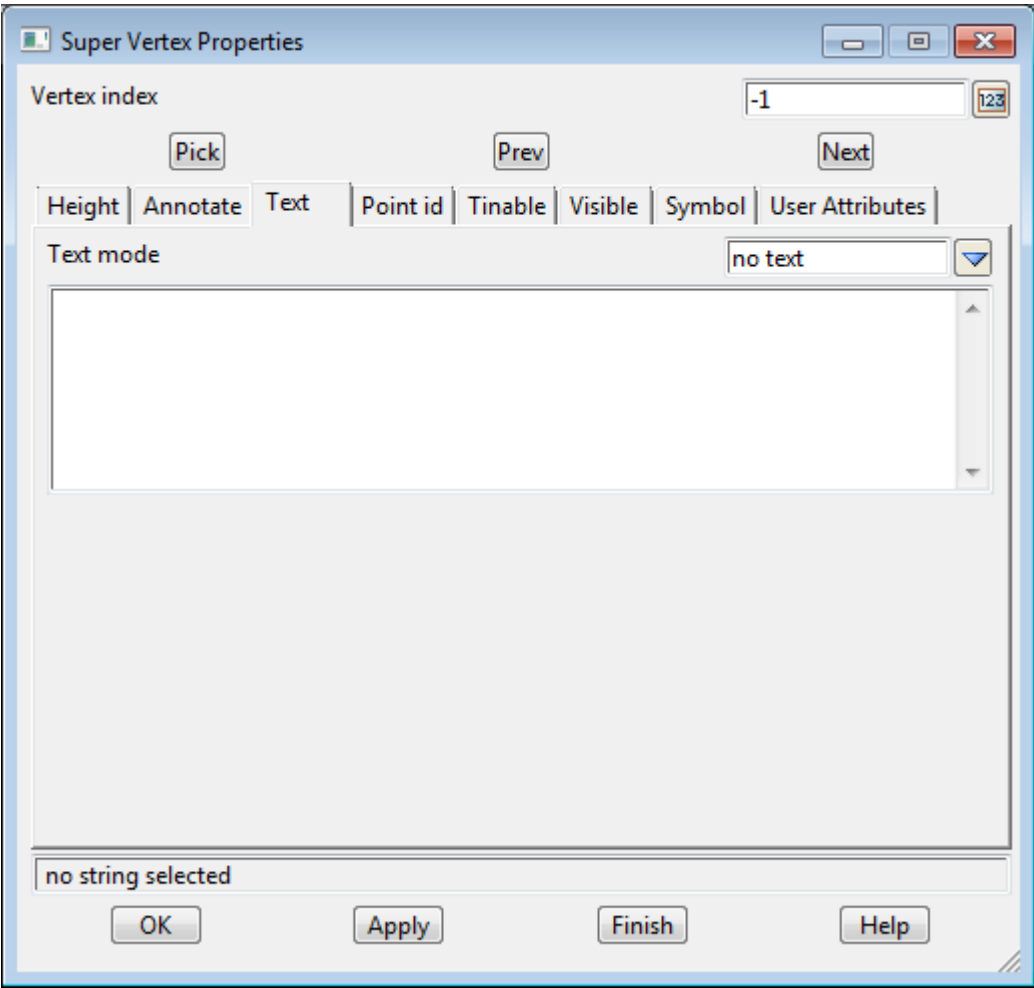
Vertex (all)

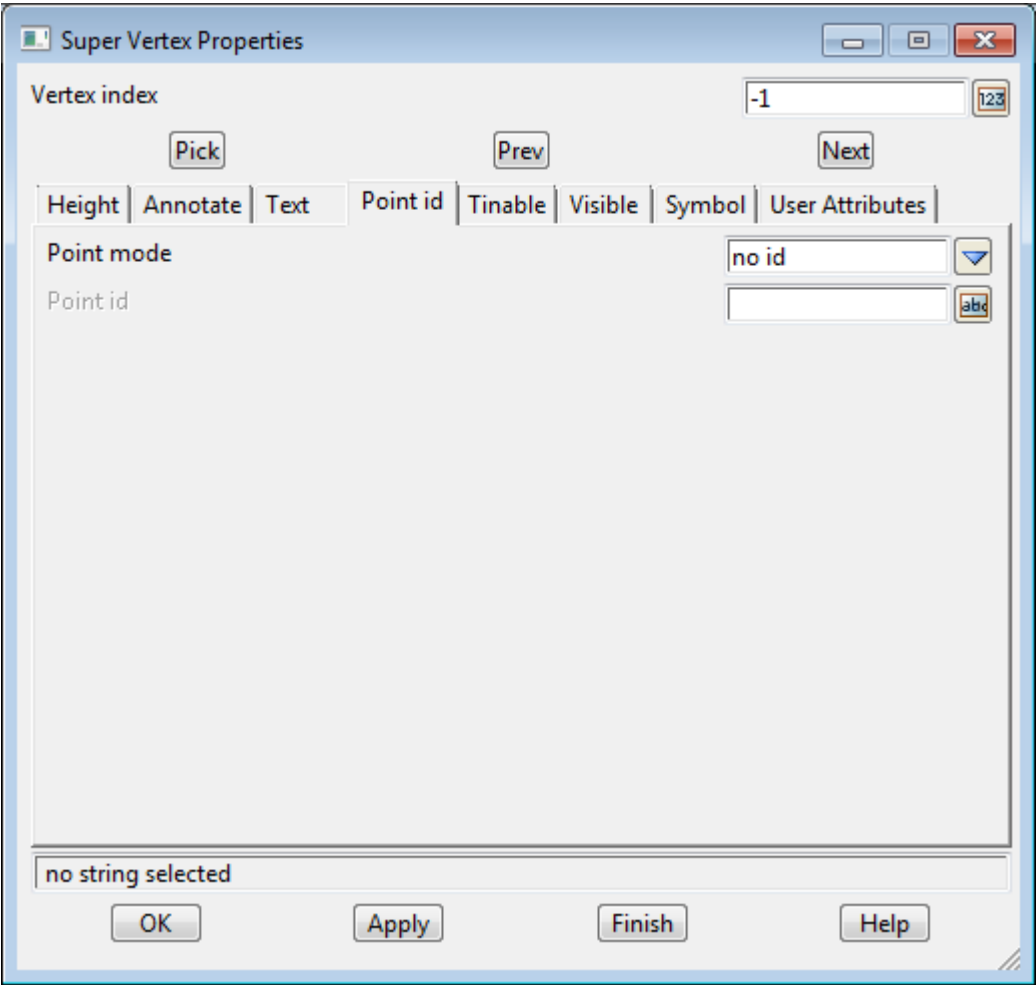
Position of option on menu: Strings =>Properties =>Vertex (all)

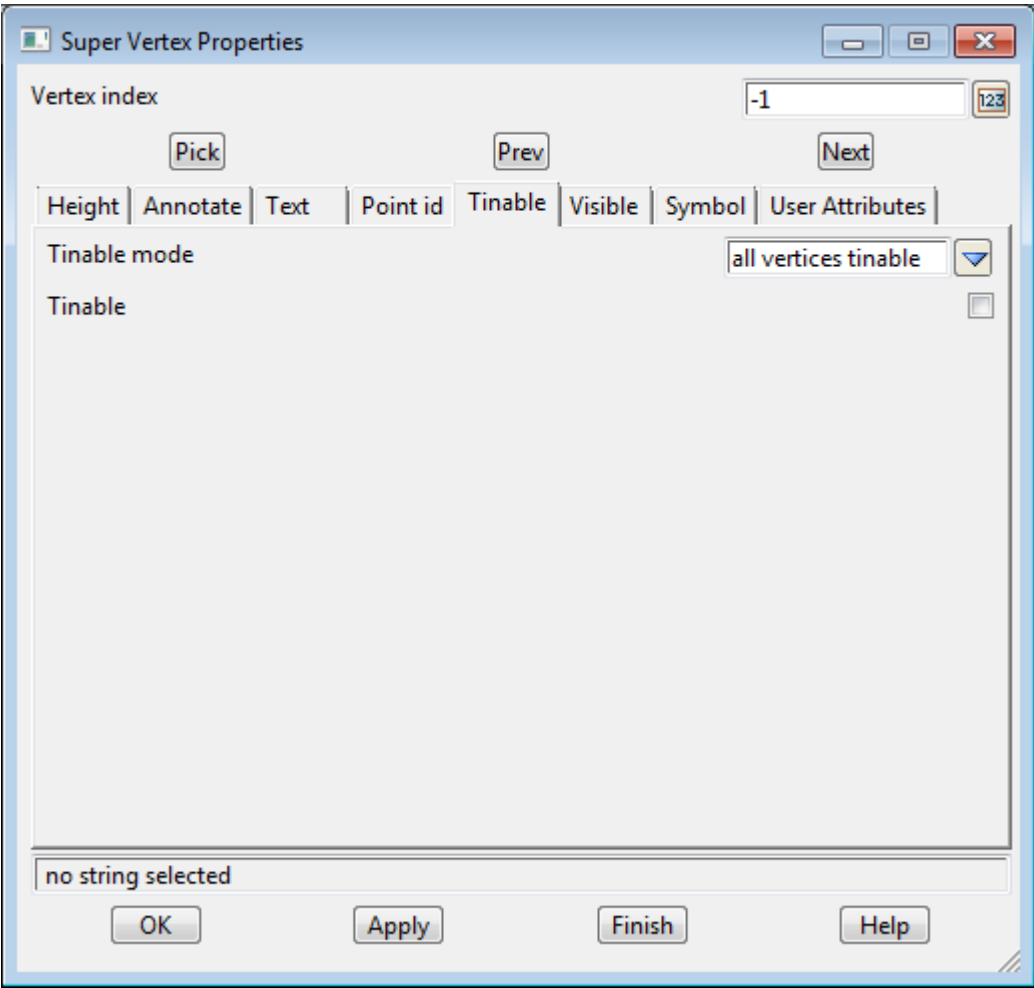
For more information please go to the section [All Vertex Properties](#)

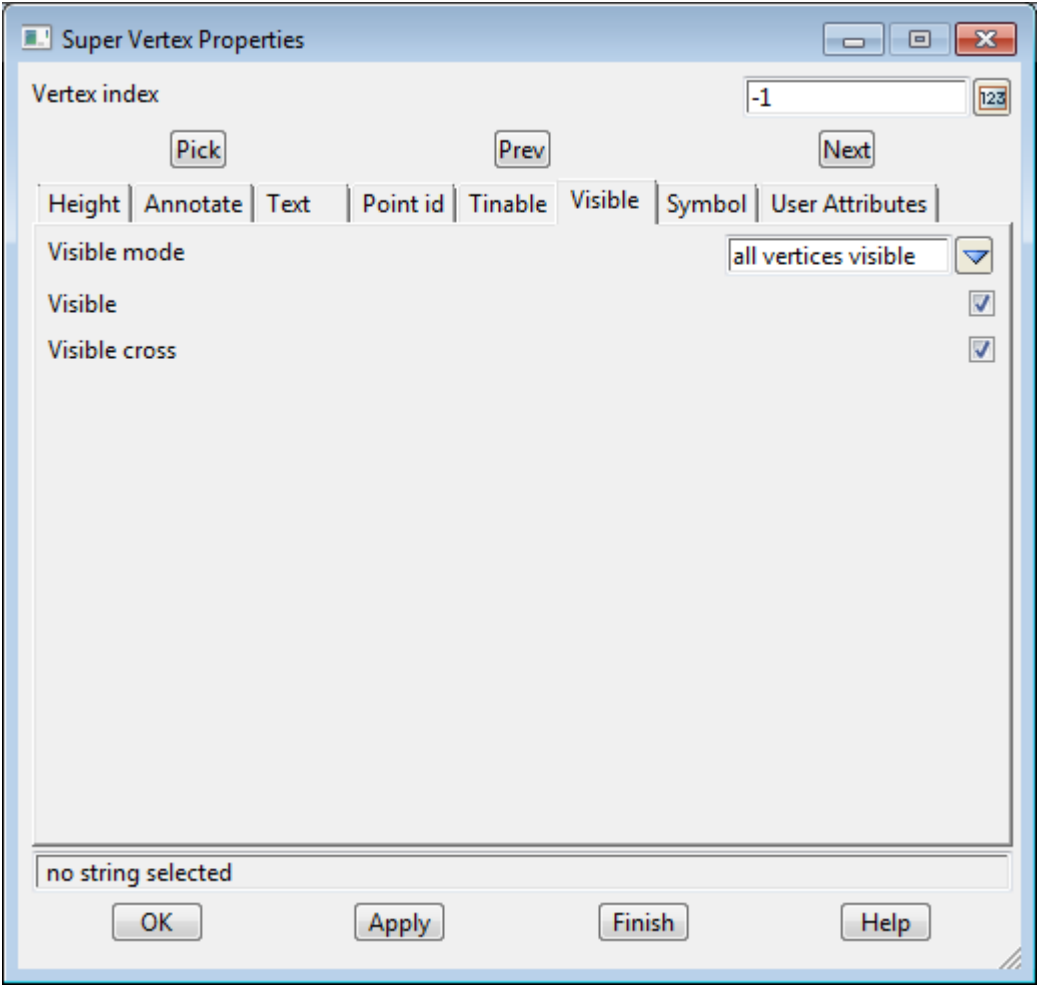


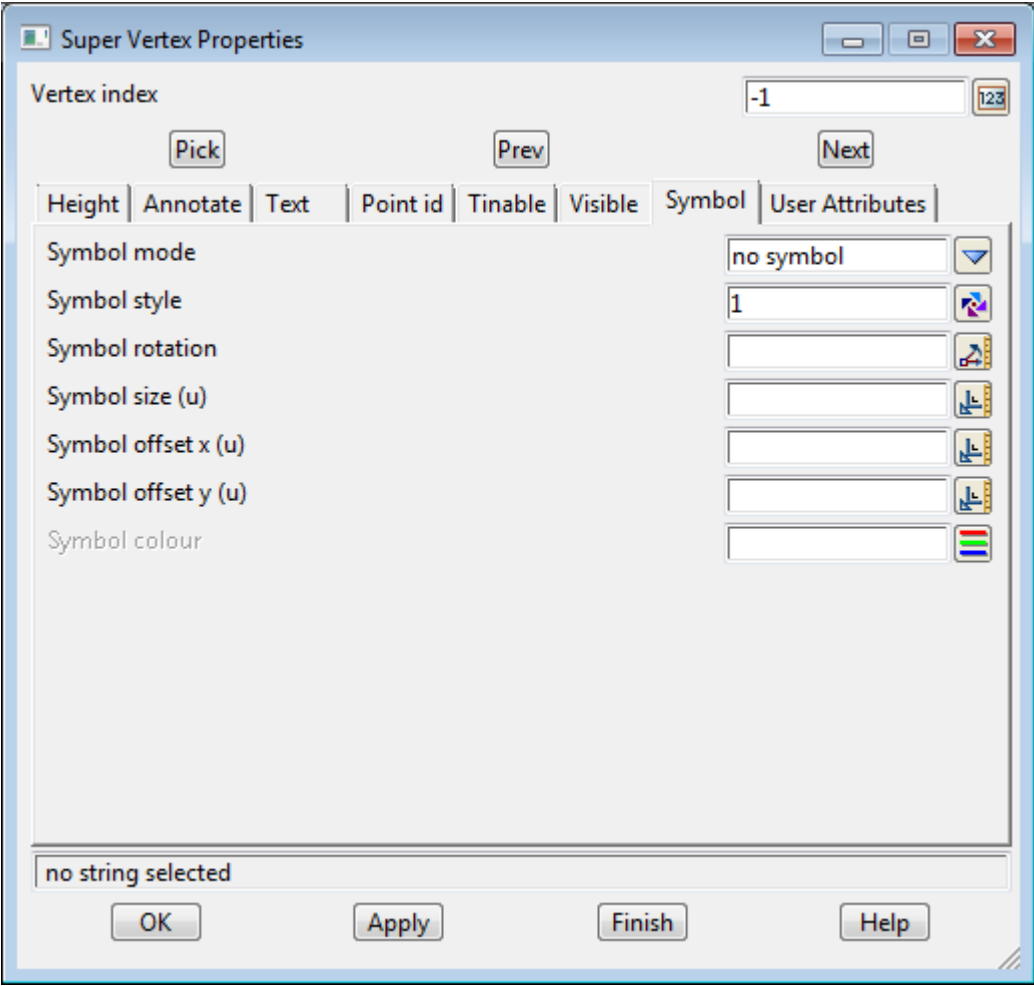


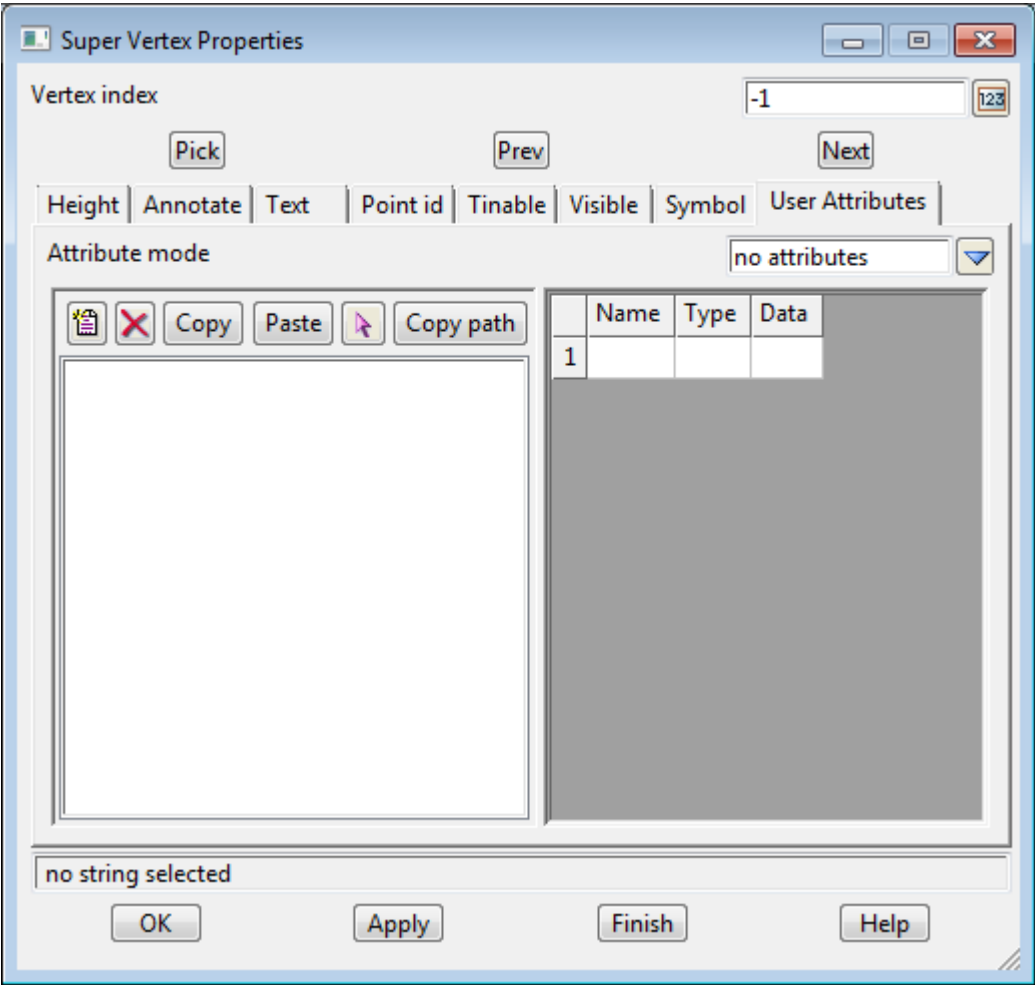












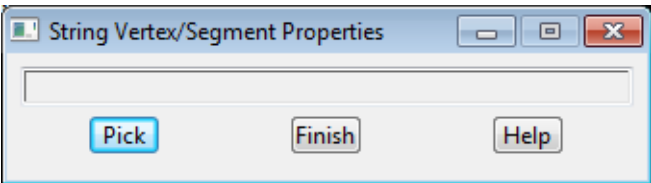
Vertex/Segment

Position of option on menu: Strings =>Properties =>Vertex/Segment

This option is a combination of the Vertex and Segment options already documented.

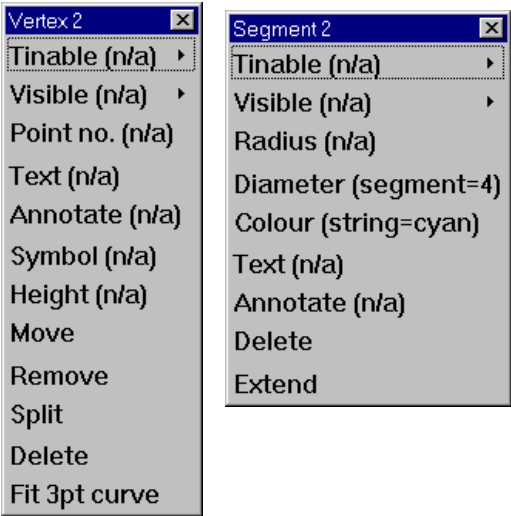
The **Vertex/ Segment** option obtains and/or modify property information about the vertex or segment of any super string displayed on the screen.

On selecting the **Vertex/Segment** option, the **String Vertex/Segment Properties** panel is displayed.



The panel is only used for any special messages and to end the option.

The **String Vertex/Segment Properties** option is automatically in a pick mode and the user selects either the *vertex* or the *segment* of a super string using the normal 12d Model picking mechanism. Whenever a *vertex* or *segment* is selected, the **Vertex** or **Segment** menu showing the properties of the selected vertex or segment is displayed on the screen.

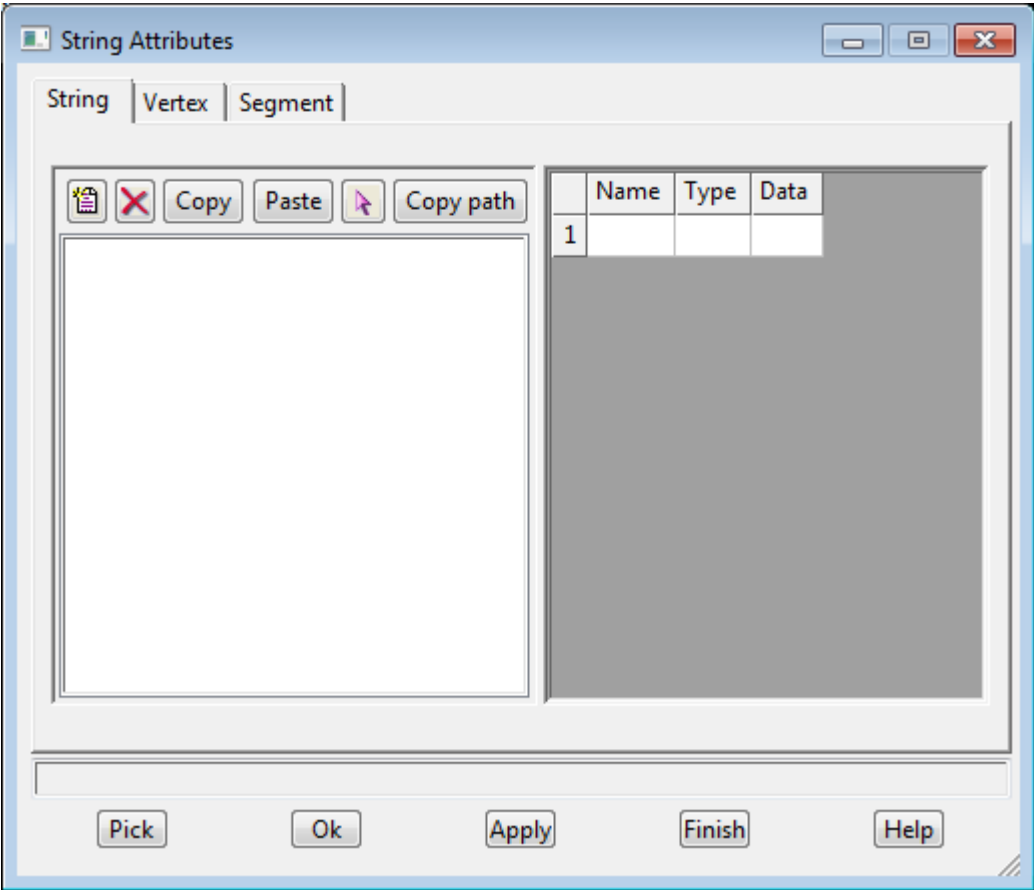


Attributes

Position of option on menu: String =>Properties =>Attributes

The **Attributes** options displays, creates and edits attributes for any strings in the project.

On selecting **Attributes**, the **String Attributes** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

String tab

this tab displays/edits the attributes that apply for the entire string. All string types have these.

Name

name of the string attribute

Type

integer, real, text

type of attribute - integer, real or text

Data

value for the string attribute

Segment tab

this tab displays/edits the attributes for each segment of a super string or pipe of a drainage or sewer string.

Segment no.

number of the segment of the string to display/edit attributes for

Prev

button

go to the previous segment of the string.

Next

button

go to the next segment of the string.

Name

name of the attribute for the segment

Type

integer, real, text

type of attribute - integer, real or text

Data

value for the attribute for the segment

Vertex tab

this tab displays/edits the attributes for each vertex of a super string or pit of a drainage or sewer string.

Vertex no.

number of the vertex of the string to display/edit attributes for

Prev

button

go to the previous vertex of the string.

Next

button

go to the next vertex of the string.

Name

name of the attribute for the vertex

Type

integer, real, text

type of attribute - integer, real or text

Data

value for the attribute for the vertex

Pick

button

pick the string to display/edit the attributes for

OK

button

set the attributes to the values in the panel and then exit the panel.

Apply

button

set the attributes to the values in the panel but don't exit the panel.

Super Strings

Position of menu: Strings =>Properties =>Super strings

Position of menu: Utilities =>Super strings

These options change many of the super string properties.

The Super strings walk-right menu is:

Super Strings	
Chainage interval	set/reset the chainage interval and chord/arc tolerance
Visible	set visibility flags to constant/variable or clear the flag
Compress	compress a super string
Tinable	set tinability to constant/variable or clear the flag
Fills	set fill styles for the string
Symbol	define symbols constant/each vertex or have no symbols
Segment colour	set a colour for every segment in the super string
Height	set the height(s) of the super string
Attribute	clear the super string attributes for the string, vertex and/or segment
Vertex id	set the Vertex IDs to sequential numbers or clears the existing vertex IDs
Pipe/culvert	ss segments can have a diameter or a box cross-section
Radius	clear any segment radii
Segment geometry	clear any segment geometry
Text	set or clear vertex and segment text and annotations
Convert same start/end point strings	convert strings with same start and end points to closed super strings
User	

For the option *Chainage interval*, go to

<i>Visible</i>	Chainage Interval
<i>Compress</i>	Visible
<i>Tinable</i>	Compress
<i>Fills</i>	Tinable
<i>Symbol</i>	Fills
<i>Segment colour</i>	Symbol
<i>Height</i>	Segment Colour
<i>Attribute</i>	Height
<i>Vertex id</i>	Attribute
<i>Pipe/culvert</i>	Vertex ID
<i>Radius</i>	Pipe/Culvert
<i>Segment geometry</i>	Radius
<i>Text</i>	Segment Geometry
<i>Convert same start/end points strings</i>	Text
	Same Start/End Point Strings

Chainage Interval

Position of option on menu: Strings =>Properties =>Super strings =>Chainage interval

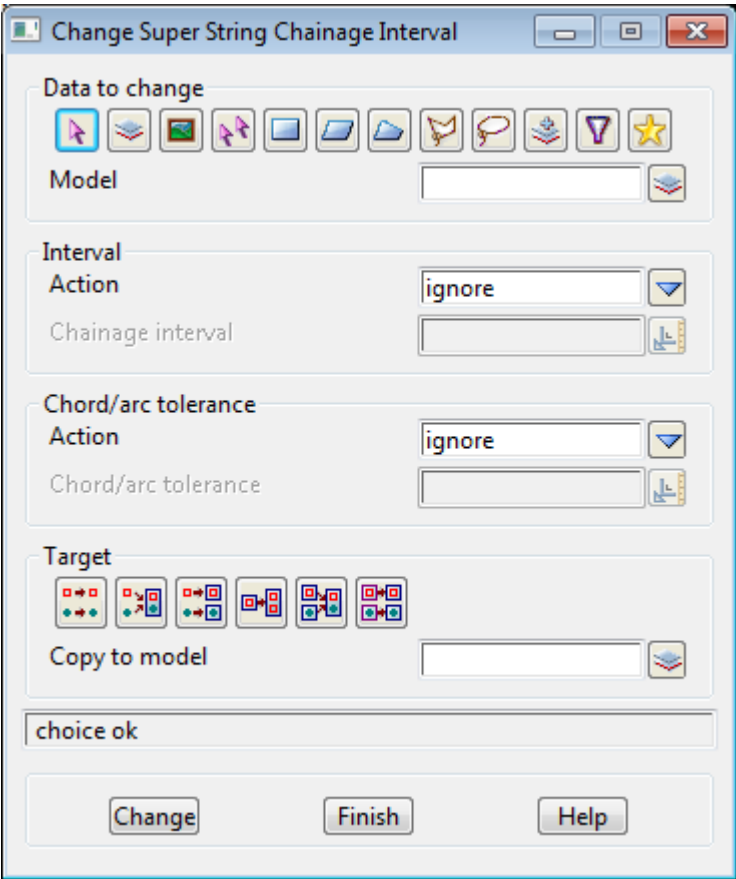
Position of option on menu: Utilities =>Super strings =>Chainage interval

A super string has one *chainage interval* value for the entire string. If the value is non-zero, then any line segments of the string are subdivided by the chainage interval when the super string is used in triangulations.

A super string also has one *arc-chord tolerance* value for the entire string. If the value is non-zero, then any curved segments are subdivided by the arc-chord tolerance when used in triangulations.

The **Chainage interval** option can set the *chainage interval* value and/or the *chord-to-arc tolerance* value for selected super strings.

On selecting the **Chainage interval** option, the **Change Super String Chainage Interval** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Data source type			Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>				
Data source		input		
<i>source of data to be processed.</i>				
Interval tab				
Action		choice box	ignore	set, clear, ignore
<i>if set, set the chainage intervals of the selected super strings to the value in Chainage interval.</i>				

*If **clear**, set all the selected super strings to not use a chainage interval.*
*If **ignore**, don't modify the chainage interval of the selected super strings.*

Chainage interval input
the chainage interval to use for a super string.

Chord/arc tolerance tab

Action choice box ignore set, clear, ignore
*if **set**, set the chord/arc tolerance of the selected super strings to the value in **Chord/arc tolerance**.*
*If **clear**, set all the selected super strings to not use a chord/arc tolerance.*
*If **ignore**, don't modify the chord/arc tolerance of the selected super strings.*

Chord/arc tolerance input
the chord/arc tolerance to use for a super string.

Target type
Data target type - where to put the processed strings. For a full description go to [Data Target](#) in the chapter [Tools and Concepts](#)

Target info input
extra information required for the target.

Change button
process the selected strings

Visible

Position of option on menu: Strings =>Properties =>Super strings =>Visible

Position of option on menu: Utilities =>Super strings =>Visible

For selected super strings, the **Visible** option can set the flags that determine how visibility is defined for a super string.

Segment visibility can

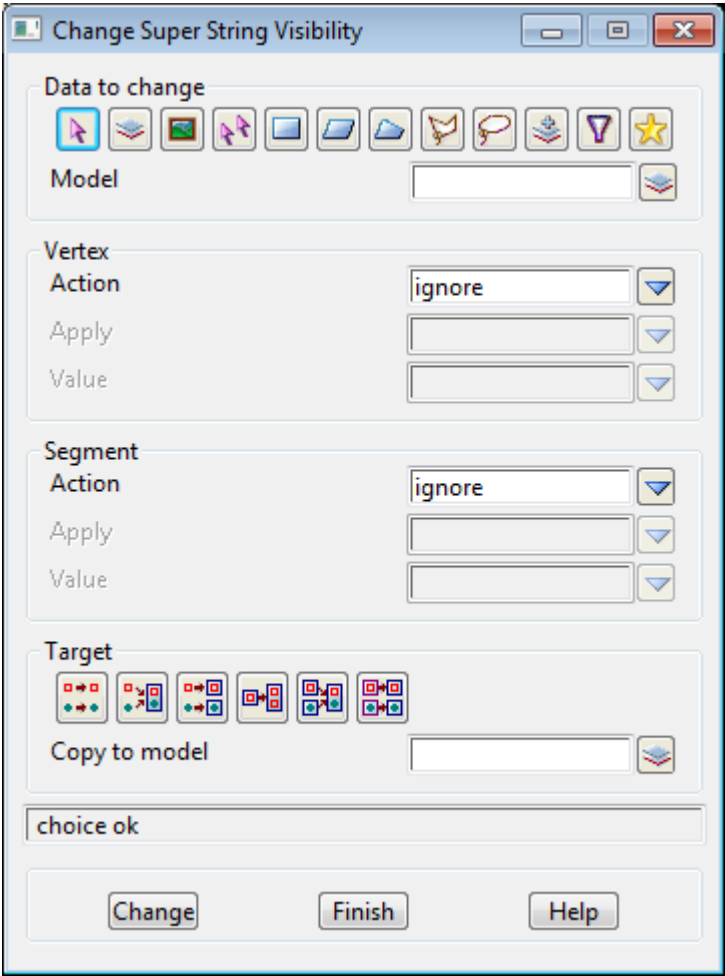
- (a) be not setable at all for the string - it is always visible
- (b) have one setting for the entire string - visible only
- (c) have separate settings for each segment (and all set to visible)

Similarly, vertex visibility can

- (a) be not setable at all for the string - it is always visible
- (b) have one setting for the entire string - visible only
- (c) have separate settings for each segment (and all set to visible).

The **Visible** option allows any of the above cases to be set up for the selected super strings.

On selecting the **Visible** option, the **Change Super String Visibility** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	

Data source input
source of data to be processed.

Action	choice box	ignore	set, clear, ignore
	<i>if set, the vertex visibility can be allowed to be a constant for all vertices in the string, or to be different for each vertex in the string.</i>		
	<i>If clear, the vertex visibility flags are removed for the string and the string vertices are always visible.</i>		
	<i>If ignore, don't modify the visibility flags for the vertices of the string.</i>		

*If **Action** is **set**, then the **Apply** field is used.*
*If **Apply** is **constant**, the string has only one visibility flag and it applies to all vertices in the string. It is set to visible.*
*If **Apply** is **variable**, each vertex in the string has its own visibility flag and each flag is set to visible.*

Action	choice box	ignore	set, clear, ignore
	<i>if set, the segment visibility can be allowed to be a constant for all segments in the string, or to be different for each segment in the string.</i>		
	<i>If clear, the segment visibility are removed for the string and the string segments are always visible.</i>		
	<i>If ignore, don't modify the visibility flags for segments of the string.</i>		

*if **Action** is **set**, then the **Apply** field is used.*
*If **Apply** is **constant**, the string has only one visibility flag and it applies to all segments in the string It is set to visible*
*If **Apply** is **variable**, each segment in the string has its own visibility flag and each flag is set to visible.*

Data target type - where to put the processed strings. For a full description go to [Data Target](#) in the chapter [Tools and Concepts](#)

Change button
process the selected strings.

Compress

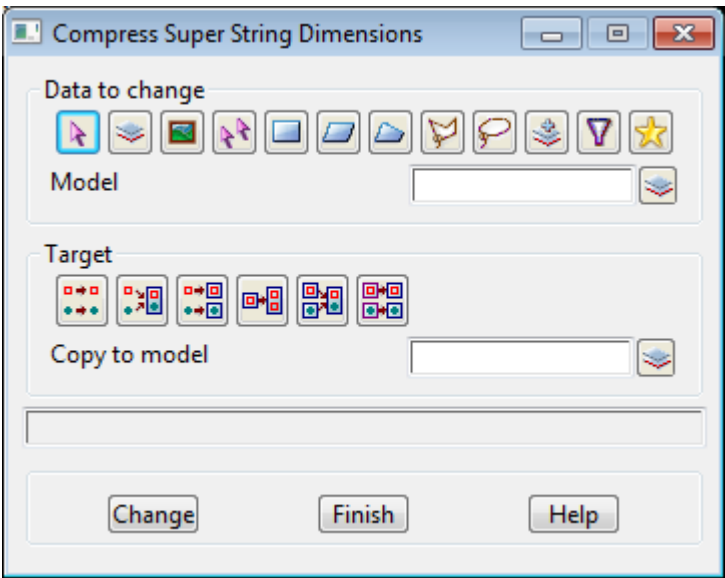
Position of option on menu: Strings =>Properties =>Super strings =>Compress

Position of option on menu: Utilities =>Super strings =>Compress

The compress option removes any super string dimensions that are not needed. For example, dimensions such radius, variable z etc. that are not being used in the string are removed.

This reduces the storage required for the super string.

On selecting the **Compress** option, the **Compress Super String Dimensions** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Data source type			Model	
	<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source		input		
	<i>source of data to be processed.</i>			
Target type				
	<i>Data target type - where to put the processed strings. For a full description go to Data Target in the chapter Tools and Concepts</i>			
Target info		input		
	<i>extra information required for the target.</i>			
Change		button		
	<i>process the selected strings</i>			

Tinable

Position of option on menu: Strings =>Properties =>Super strings =>Tinable

Position of option on menu: Utilities =>Super strings =>Tinable

For selected super strings, the Tinable option can set the flags that determine how tinability is defined for a super string and can also set whether segments or vertices are tinable or not.

Segment tinability can

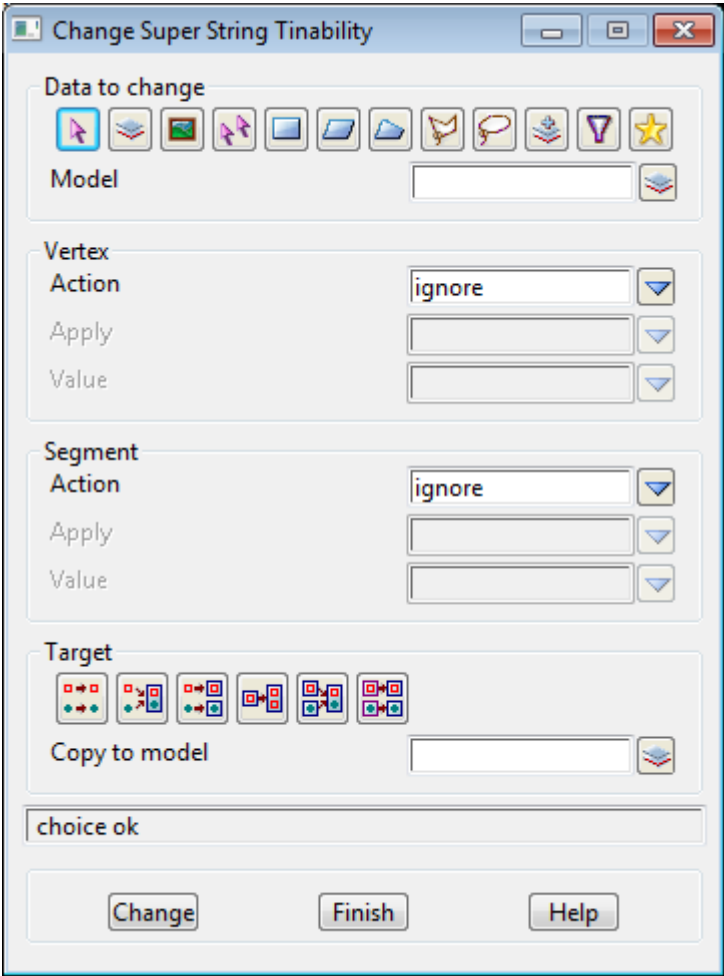
- (a) be not setable at all for the string - it is always tinable
- (b) have one setting for the entire string
- (c) have separate settings for each segment.

Similarly, vertex tinability can

- (a) be not setable at all for the string - it is always tinable
- (b) have one setting for the entire string
- (c) have separate settings for each segment.

The Tinable option allows any of the above cases to be set up for the selected super strings.

On selecting the Tinable option, the **Change Super String Tinability** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Data source type			Model	

data source *input*
source of data to be processed.

Action	choice box	ignore	set, clear, ignore
	<i>if set, the vertex tinability can be allowed to be a constant for all vertices in the string, or to be different for each vertex in the string.</i>		
	<i>If clear, the vertex tinability can not be modified for the string and the string vertices are always tinable.</i>		
	<i>If ignore, don't modify the tinability flags for the vertices of the string.</i>		

*If **Action** is **set**, then the **Apply** field is used.*
*If **Apply** is **constant**, the string has only one tinability flag and it applies to all vertices in the string. The tinability flag it is set to the value in the **Value** field.*
*If **Apply** is **variable**, each vertex in the string has its own tinability flag. The tinability flag it is set to the value in the **Value** field.*

if *Value* is **on**, then the tinalbe flag is set to **tinalbe**.
If *Value*' is **off**, then the tinalbe flag is set to **not tinalbe**.

Action	choice box	ignore	set, clear, ignore
	<i>if set, the segment tinability can be allowed to be a constant for all segments in the string, or to be different for each segment in the string.</i>		
	<i>If clear, the segment tinability can not be modified for the string and the string segments are always tinable.</i>		
	<i>If ignore, don't modify the tinability flags for segments of the string.</i>		

*if **Action** is **set**, then the **Apply** field is used.*
*If **Apply** is **constant**, the string has only one tinability flag and it applies to all segments in the string. The tinability flag it is set to the value in the **Value** field.*
*If **Apply** is **variable**, each segment in the string has its own tinability flag. The tinability flag it is set to the value in the **Value** field*

if *Value* is **on**, then the tinnable flag is set to **tinable**.
If *Value* is **off**, then the tinnable flag is set to **not tinable**.

Data target type - where to put the processed strings. For a full description go to [Data Target](#) in the chapter [Tools and Concepts](#)

extra information required for the target.

```
process the selected strings
```

Fills

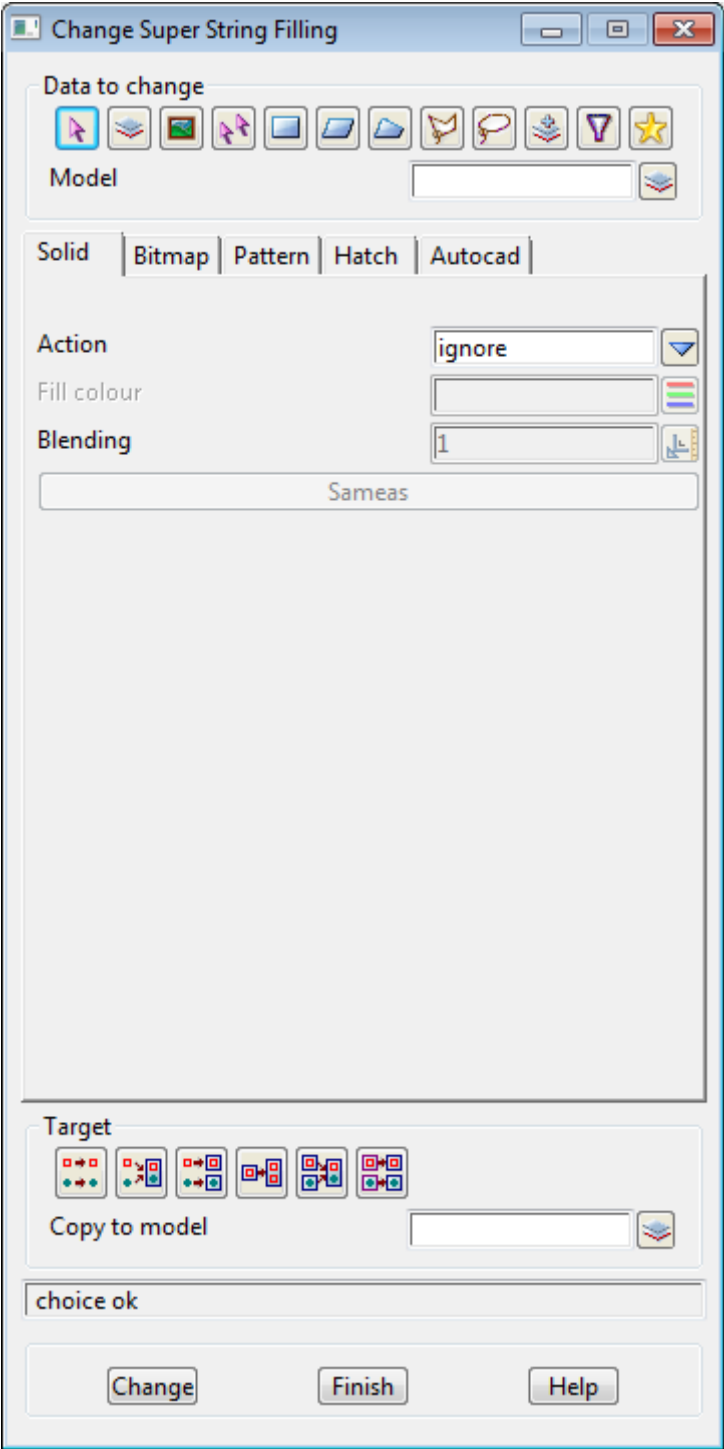
Position of option on menu: Strings =>Properties =>Super strings =>Fills

Position of option on menu: Utilities =>Super strings =>Fills

For selected super strings, the **Fills** option can set the flags that determine how filling is defined for a super string. If the string is not closed, the first and last vertices are joined to define the region to fill.

A string can have zero, one or more types of fills from the types solid, bitmap, pattern, hatch and Autocad.

On selecting the **Fill** option, the **Change Super String Filling** panel is displayed.



The fields and buttons used in the panel have the following functions.

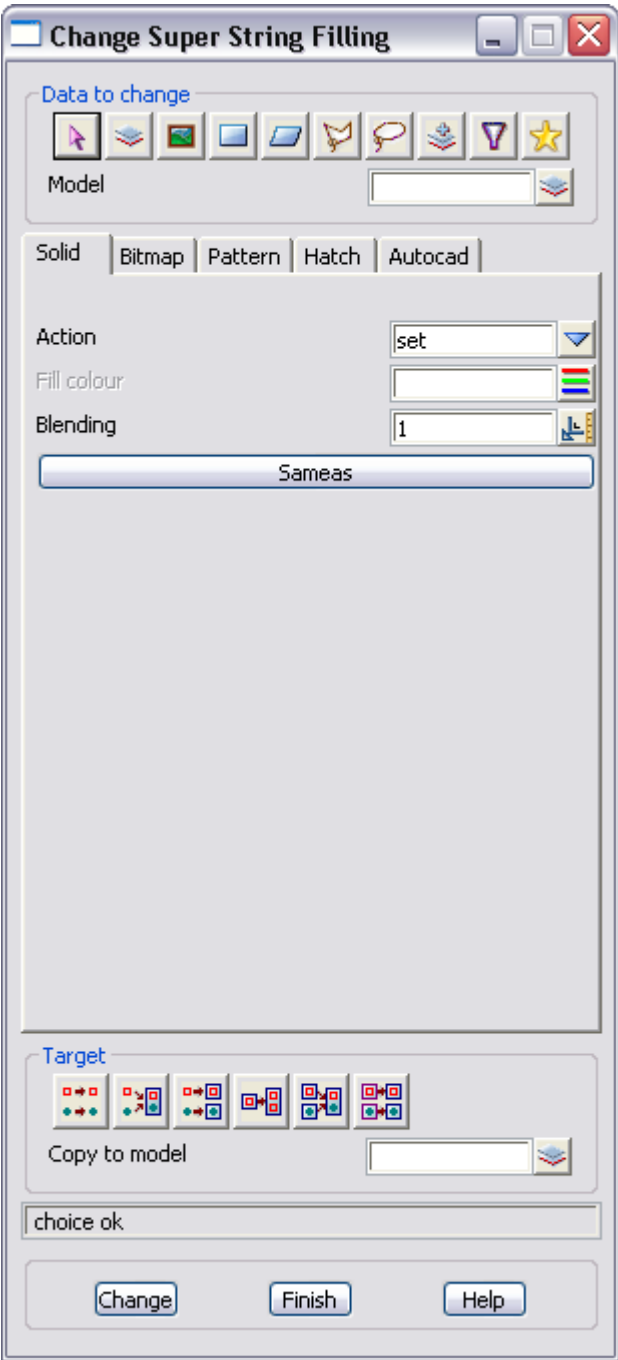
Field Description	Type	Defaults	Pop-Up
Data to change		Model	

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Solid, Bitmap, Pattern, Hatch and Autocad Tabs

each tab defines how that type of fill is applied to the string. Zero, one or more fill types can be applied to a string. Each tab will now be described.

Solid Tab



The fields and buttons used in the panel have the following functions.

Action choice box ignore set, clear, ignore

*if **set**, this type of fill is set for the string.*
*If **clear**, this type of fill is turned off for the string.*
*If **ignore**, don't modify this type of fill for the string.*

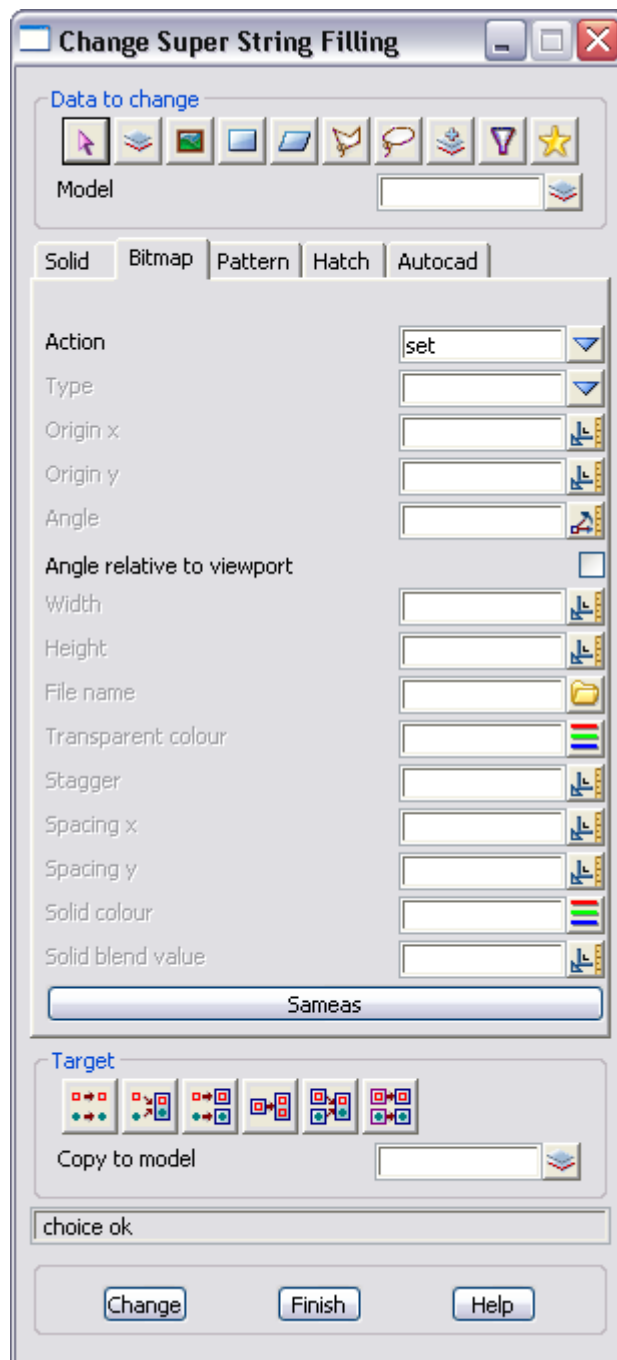
Fill colour colour box

The colour used to fill the super string. If the super string is not closed, the fill will apply as if the super string was closed.

Blending input

The blend value is used for the solid fill. This value is between 0.0 and 1.0 and controls the amount of transparency of the fill.
if blank, the blend value of 1.0 is assumed.

Bitmap Tab



The fields and buttons used in the panel have the following functions.

Action	choice box	ignore	set, clear, ignore
---------------	------------	--------	--------------------

*if **set**, this type of fill is set for the string.*

If **clear**, this type of fill is turned off for the string.

*If **ignore**, don't modify this type of fill for the string.*

Type	choice box	device, world, paper
------	------------	----------------------

The units of size. This means the bitmap can be drawn with either world size, paper size (mm) or device size.

Origin X input

The x co-ordinate of the origin point of the repeated pattern.

Origin Y input

The y co-ordinate of the origin point of the repeated pattern.

Angle	angle
--------------	-------

The orientation of the bitmap pattern relative to the x axis measured in the anti-clockwise direction in dms.

Angle relative to view tick box

*This field controls whether the Angle is relative to the x axis or to the plotting x axis.
if the value is ticked and we are plotting, **Angle** is measured relative to the x axis of the plot rotation.
if not ticked, **Angle** is always absolute to the world x axis.*

Height input

The height of the bitmap in the selected units.

File name	file box	.bmp
------------------	----------	------

The bitmap file to be used for filling. Only BMP files are currently supported.

Transparent colour colour box **Select Colour pop up**

The transparency colour within the bitmap. This means any pixel of this colour within the bitmap is not drawn.

Stagger

if non blank, this field allows each alternate row of bitmaps to be staggered (or offset) by the specified value. Stagger is measured in the selected units along the x axis in the rotated system. If blank, there a Stagger of 0.0 is assumed.

Spacing X input

The distance in the selected units along the x axis in the rotated system between each instance of the bitmap.

Spacing Y

The distance in the selected units along the y axis in the rotated system between each instance of the bitmap.

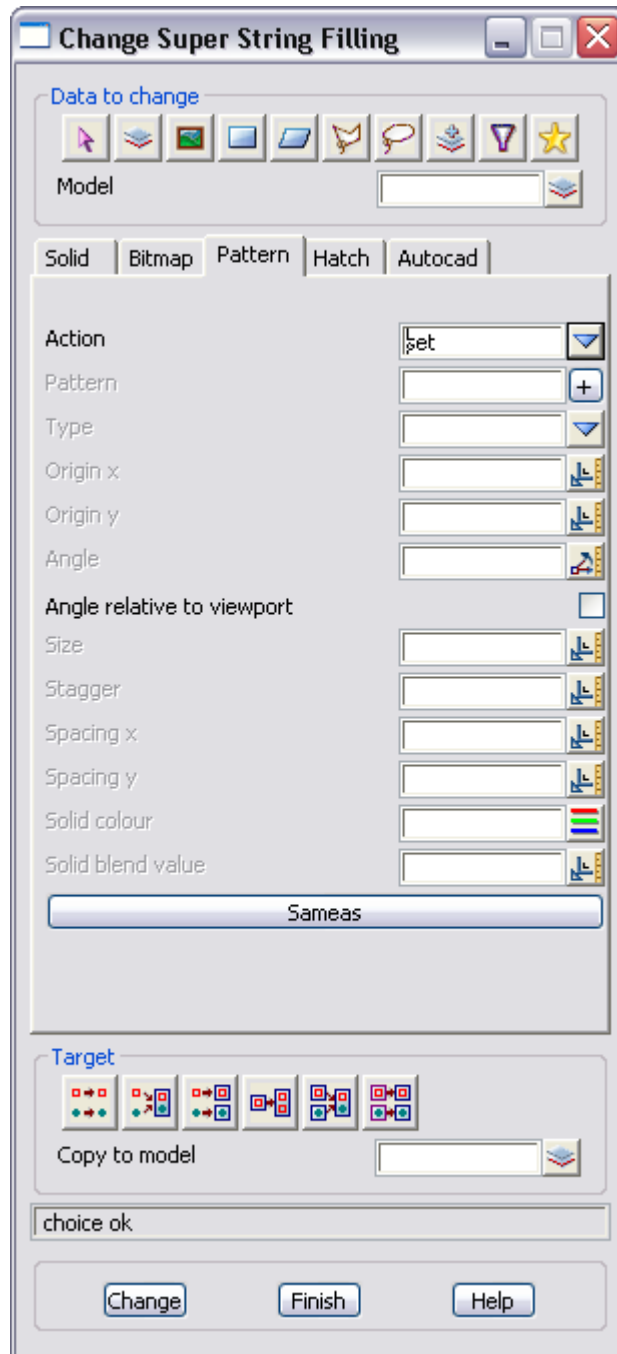
Solid colour colour box **Select Colour** pop up

*if non blank, when the bitmaps become too small to be legible, the super string is solid filled instead with **Solid colour**.*

Solid blend value input

if non blank, and **Solid Colour** is specified, the solid fill is drawn with transparency. The blend value is between 0.0 and 1.0 and controls the transparency of the solid colour.

Pattern Tab



The fields and buttons used in the panel have the following functions.

Action	choice box	ignore	set, clear, ignore
---------------	------------	--------	--------------------

*if **set**, this type of fill is set for the string.*

*If **clear**, this type of fill is turned off for the string.*

If ignore, don't modify this type of fill for the string.

Pattern select pattern pop up

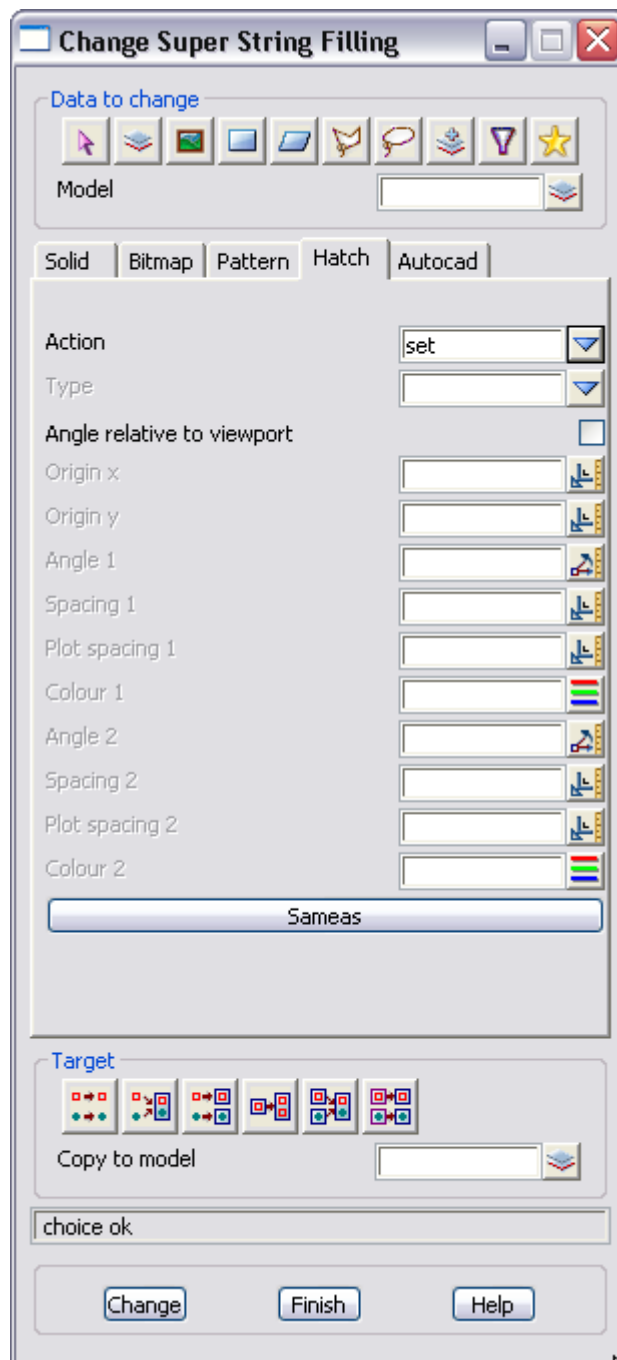
The pattern name to be applied. These patterns are defined via `patterns.12d`

For more information on the 12d pattern definition please go to the section [12d Patterns File](#) in the

chapter [Special File Formats](#)

Type	choice box	device, world, paper
<i>The units of size. This means the pattern can be drawn with either world size, paper size (mm) or device size.</i>		
Origin X	Input	
<i>The x co-ordinate of the origin point of the repeated pattern.</i>		
Origin Y	Input	
<i>The y co-ordinate of the origin point of the repeated pattern.</i>		
Angle	angle	
<i>The orientation of the pattern relative to the x axis measured in the anti-clockwise direction in dms.</i>		
Angle relative to view	tick box	
<i>This field controls whether the Angle is relative to the x axis or to the plotting x axis. if the value is ticked and we are plotting, Angle is measured relative to the x axis of the plot rotation. if not ticked, Angle is always absolute to the world x axis.</i>		
Size	input	
<i>The size of the pattern in the selected units.</i>		
Stagger	input	
<i>if non blank, this field allows each alternate row of patterns to be staggered (or offset) by the specified value. Stagger is measured in the selected units along the x axis in the rotated system. If blank, there a Stagger of 0.0 is assumed.</i>		
Spacing X	input	
<i>The distance in the selected units along the x axis in the rotated system between each instance of the pattern.</i>		
Spacing Y	input	
<i>The distance in the selected units along the y axis in the rotated system between each instance of the pattern.</i>		
Solid colour	colour box	Select Colour pop up
<i>if non blank, when the patterns become too small to be legible, the super string is solid filled instead with Solid colour</i>		
Solid blend value	input	
<i>if non blank, and Solid Colour is specified, the solid fill is drawn with transparency. The blend value is between 0.0 and 1.0 and controls the transparency of the solid colour.</i>		

Hatch



The fields and buttons used in the panel have the following functions.

Action	choice box	ignore	set, clear, ignore
---------------	------------	--------	--------------------

*if **set**, this type of fill is set for the string.*

If **clear**, this type of fill is turned off for the string.

*If **ignore**, don't modify this type of fill for the string.*

Type	choice box	device, world, paper
------	------------	----------------------

The units of size. This means the bitmap can be drawn with either world size, paper size (mm) or device size.

Angle relative to view tick box

This field controls whether the Angle is relative to the x axis or to the plotting x axis.

if the value is ticked and we are plotting, **Angle** is measured relative to the x axis of the plot rotation.
if not ticked, **Angle** is always absolute to the world x axis.

Origin X Input

The x co-ordinate of the anchor point of the repeated pattern.

Origin Y Input

The y co-ordinate of the anchor point of the repeated pattern.

Angle 1 angle

The first orientation of the hatch pattern relative to the x axis measured in the anti-clockwise direction in dms.

Spacing 1 input

*The first distance in the units selected in Type between the lines drawn at **Angle 1**.*

Plot spacing 1 input

*The first distance in the units selected in Type between the lines drawn at **Angle 1** except it is the value used when you are plotting to or doing a plot of the super string containing the fill.
if the field is blank it uses the **Spacing 1** value.*

Colour 1 colour box

Select Colour pop up

*The colour of all the lines drawn at **Angle 1**.*

Angle 2 angle

The second orientation of the hatch pattern relative to the x axis measured in the anti-clockwise direction in dms.

Spacing 2 input

*The second distance in the units selected in Type column between the lines drawn at **Angle 2**.*

Plot spacing 2 input

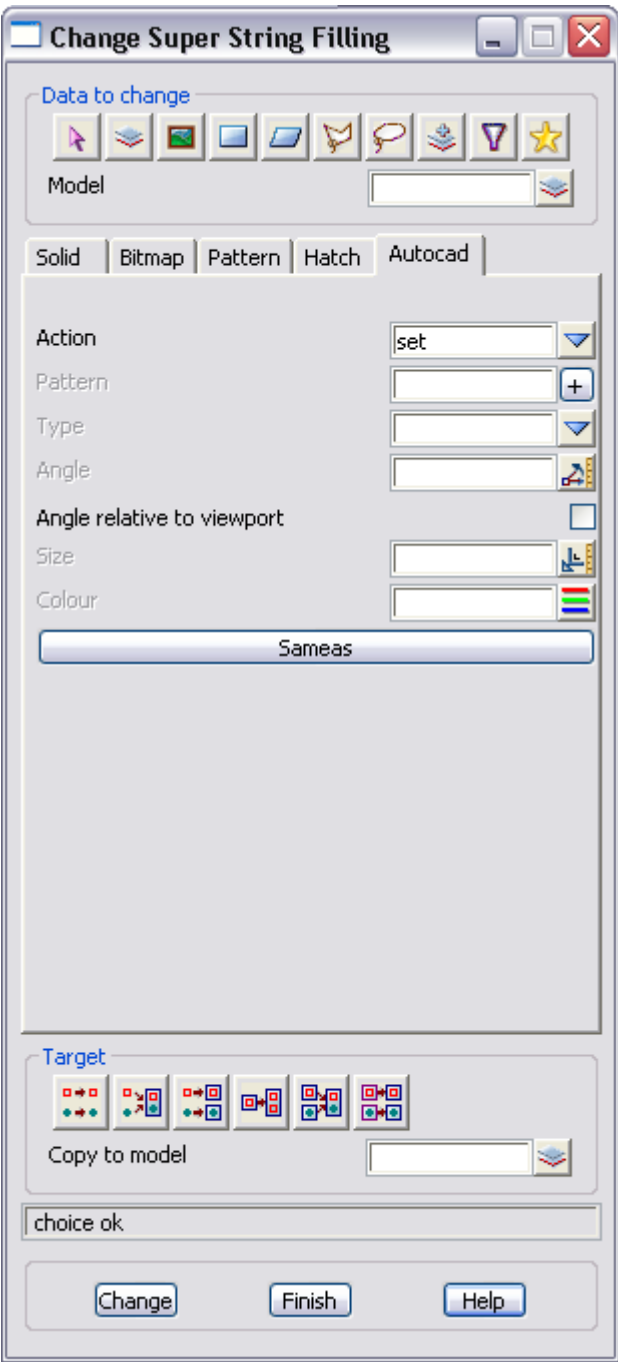
*The first distance in the units selected in Type between the lines drawn at **Angle 2** except it is the value used when you are plotting to or doing a plot of the super string containing the fill.
if the field is blank it uses the **Spacing 2** value.*

Colour 2 colour box

Select Colour pop up

*The colour of all the lines drawn at **Angle 2**.*

Autocad



The fields and buttons used in the panel have the following functions.

Action choice box ignore set, clear, ignore
*if **set**, this type of fill is set for the string.*
*If **clear**, this type of fill is turned off for the string.*
*If **ignore**, don't modify this type of fill for the string.*

Pattern select autocad pattern pop up
The autocad pattern name to be applied. These patterns are defined via acad.pat.
This is an autocad file.

Type choice box device, world, paper
The units of size. This means the bitmap can be drawn with either world size, paper size (mm) or device size.

Angle angle
The orientation of the pattern relative to the x axis measured in the anti-clockwise direction in dms.

Angle relative to view tick box
*This field controls whether the Angle is relative to the x axis or to the plotting x axis.
if the value is ticked and we are plotting, **Angle** is measured relative to the x axis of the plot rotation.
if not ticked, **Angle** is always absolute to the world x axis.*

Size input
The size of the pattern in the selected type.

Colour colour box **Select Colour** pop up
The colour of the pattern

Action choice box ignore set, clear, ignore
*if **set**, this type of fill is set for the string.
If **clear**, this type of fill is turned off for the string.
If **ignore**, don't modify this type of fill for the string.*

Target type
Data target type - where to put the processed strings. For a full description go to [Data Target](#) in the chapter [Tools and Concepts](#)

Target info input
extra information required for the target.

Change button
process the selected strings

Symbol

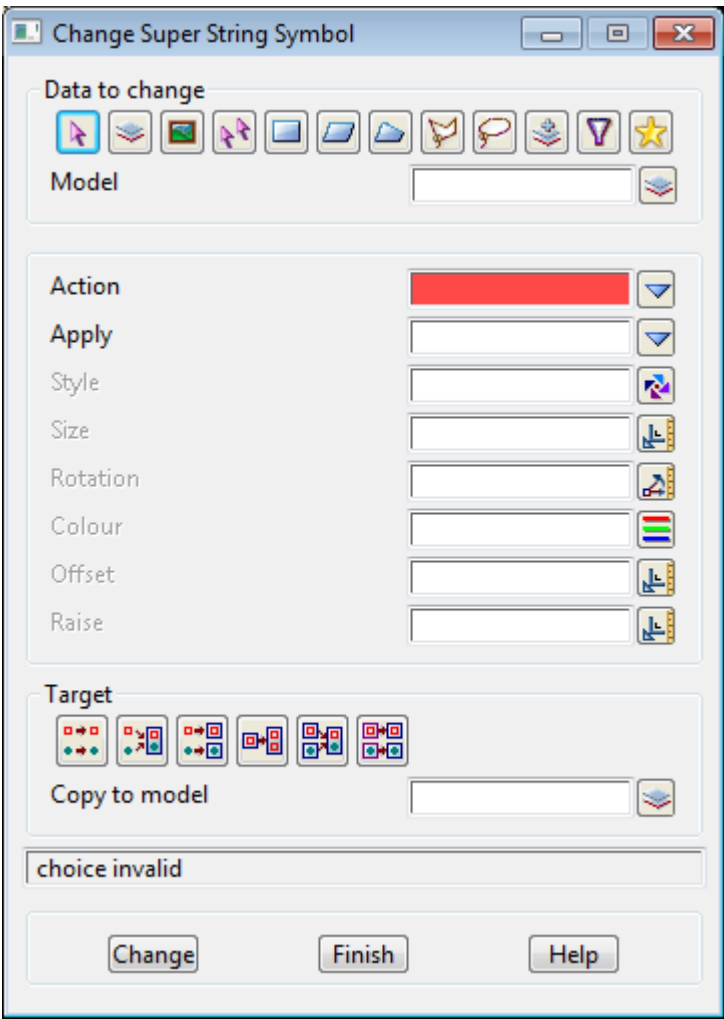
Position of option on menu: Strings =>Properties =>Super strings =>Symbol

Position of option on menu: Utilities =>Super strings =>Symbol

For selected super strings, the **symbols** option can set the flags that determine how symbols are defined for a super string.

A super string can have no symbols, a constant symbol definition for the entire string or different symbol definitions at each vertex.

On selecting the **symbol** option, the **Change Super String Symbols** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Data source type			Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>				
Data source		input		
<i>source of data to be processed.</i>				
Action		choice box	ignore	set, clear, ignore
<i>if set, a symbol can be constant for all vertices in the string, or can be different for each vertex in the string.</i>				
<i>If clear, there are no symbols for the string.</i>				
<i>If ignore, don't modify the symbol flags for the vertices of the string.</i>				

Apply	choice box	constant, variable
<i>if Action is set, then the Apply field is used.</i>		
<i>If Apply is constant, the string has only one symbol and it used for each vertices in the string. It is set to visible.</i>		
<i>If Apply is variable, each vertex in the string has its own symbol.</i>		
Symbol	symbol box	
<i>symbol to be used.</i>		
Size		
<i>size of the symbol.</i>		
Rotation	angle box	
<i>angle to rotation the symbol - positive is counter-clockwise.</i>		
Colour	colour box	
<i>colour for the symbol (if the symbol has no imbedded colours).</i>		
Offset		
<i>distance the centre of the symbol is from the vertex.</i>		
Raise		
<i>distance the centre of the symbol is raised off the line through the vertex with the given angle.</i>		
Target type		
<i>Data target type - where to put the processed strings. For a full description go to Data Target in the chapter Tools and Concepts</i>		
Target info	input	
<i>extra information required for the target.</i>		
Change	button	
<i>process the selected strings</i>		

Segment Colour

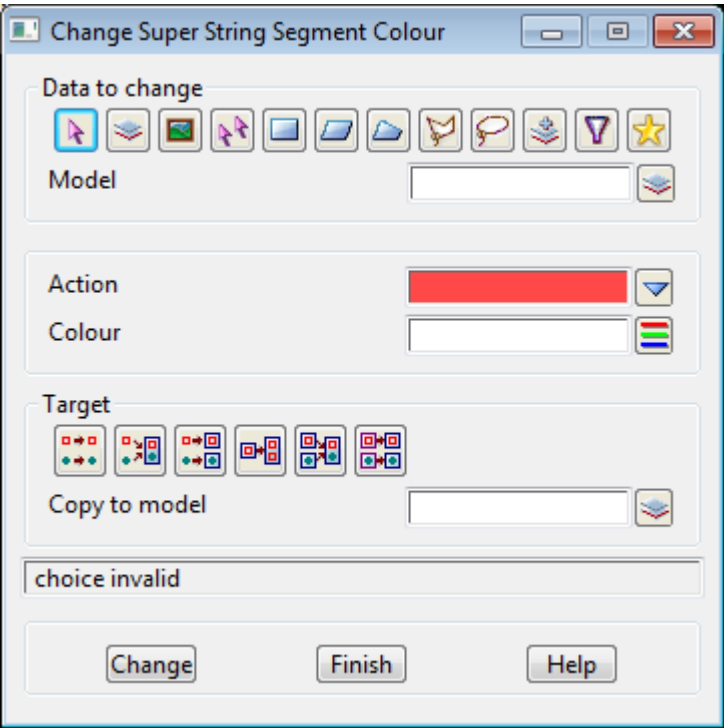
Position of option on menu: Strings =>Properties =>Super strings =>Segment colour

Position of option on menu: Utilities =>Super strings =>Segment colour

A super string has a default colour used for the entire string and segment colours setable for each segment which override the string colour for that segment.

The Segment colour option can set a segment colour for every segment in the super string or clear all the set segment colours so that the default string colour is used.

On selecting the Segment colour option, the Change Super String Segment Colour panel is displayed.



The fields and buttons used in the panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Data source type

Model

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data source

input

source of data to be processed.

Action

choice box

set, clear

*if **set**, each segment colour is set to the colour in the **Colour** box.*

*If **clear**, any segment colours are removed and each segment set to having no segment colour.*

Colour

colour box

*if Action is **set**, then every segment is set to this colour.*

Target type

Data target type - where to put the processed strings. For a full description go to [Data Target](#) in the chapter [Tools and Concepts](#)

Target info

input

extra information required for the target.

Change button
process the selected strings

Height

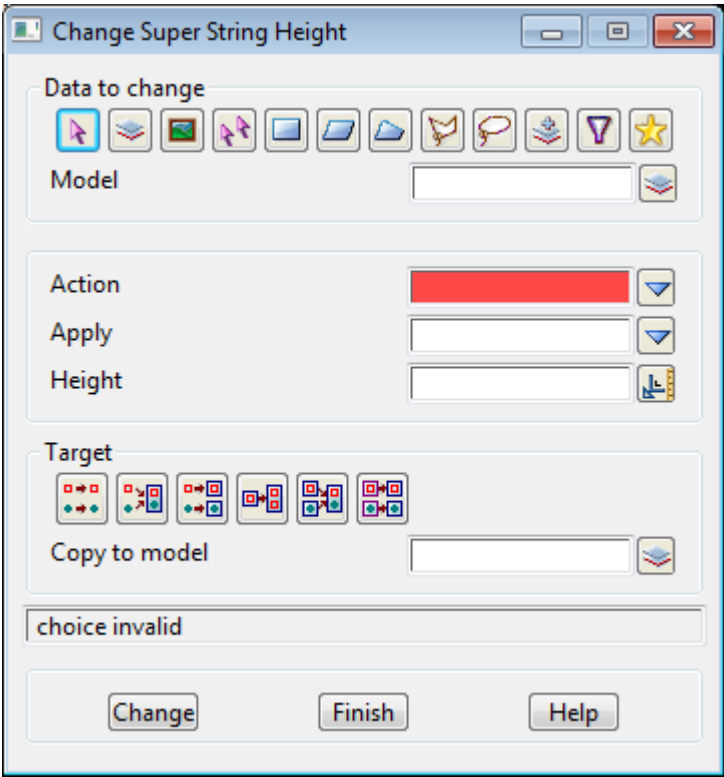
Position of option on menu: Strings =>Properties =>Super strings =>Height

Position of option on menu: Utilities =>Super strings =>Height

A super string can have the one height that is used for every vertex in the super string (constant height) or it can have a different height at each vertex.

The **Height** option can set the super string to either having a constant height or to allow each vertex to have independent heights.

On selecting the **Height** option, the **Change Super String Height** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source	input		
<i>source of data to be processed.</i>			
Action	choice box	ignore	set, clear
<i>if set, the string height can be a constant for the entire string, or to be different for each vertex in the string.</i>			
<i>If clear, the entire string and each vertex has no height.</i>			
Apply	choice box		constant, variable
<i>if Action is set, then the Apply field is used.</i>			
<i>If Apply is constant, the string has only one height and no vertex has its own height. The height for the string is set to the height in the Height field.</i>			
<i>If Apply is variable, each vertex in the string is set to have has its own height and it is set to the value in the Height field.</i>			
Height			

*if Action is **set**, then either the entire string or every vertex is set to this height.*

Target type

Data target type - where to put the processed strings. For a full description go to [Data Target](#) in the chapter [Tools and Concepts](#)

Target info

input

extra information required for the target.

Change

button

process the selected strings

Attribute

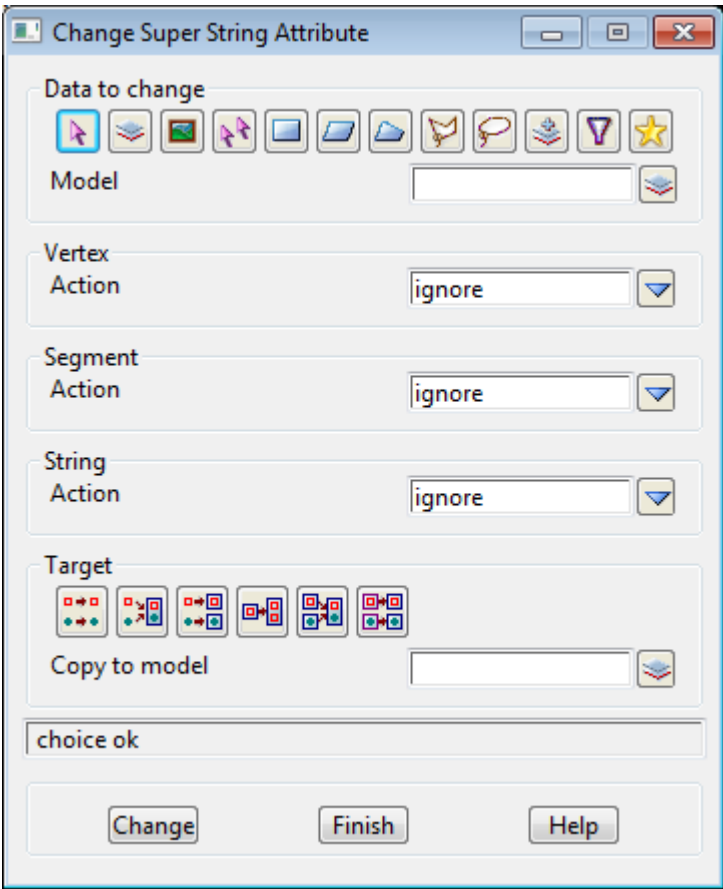
Position of option on menu: Strings =>Properties =>Super strings =>Attribute

Position of option on menu: Utilities =>Super strings =>Attribute

A super string can have independent attributes for the entire string, independent attributes for each segment and for each vertex.

The **Attributes** option can clear the super string attributes for the entire string, each vertex and/or each segment.

On selecting the **Attributes** option, the **Change Super String Attributes** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source	input		
<i>source of data to be processed.</i>			
Vertex Action	choice box	ignore	ignore, clear
<i>if clear, the attributes are cleared at each vertex.</i>			
<i>If ignore, nothing is done for the vertex attributes.</i>			
Segment Action	choice box	ignore	ignore, clear
<i>if clear, the attributes are cleared on each segment.</i>			
<i>If ignore, nothing is done for the segment attributes.</i>			
String Action	choice box	ignore	ignore, clear
<i>if clear, the string attributes are cleared.</i>			

*If **ignore**, nothing is done for the string attributes.*

Target type

Data target type - where to put the processed strings. For a full description go to [Data Target](#) in the chapter [Tools and Concepts](#)

Target info

input

extra information required for the target.

Change

button

process the selected strings.

Vertex ID

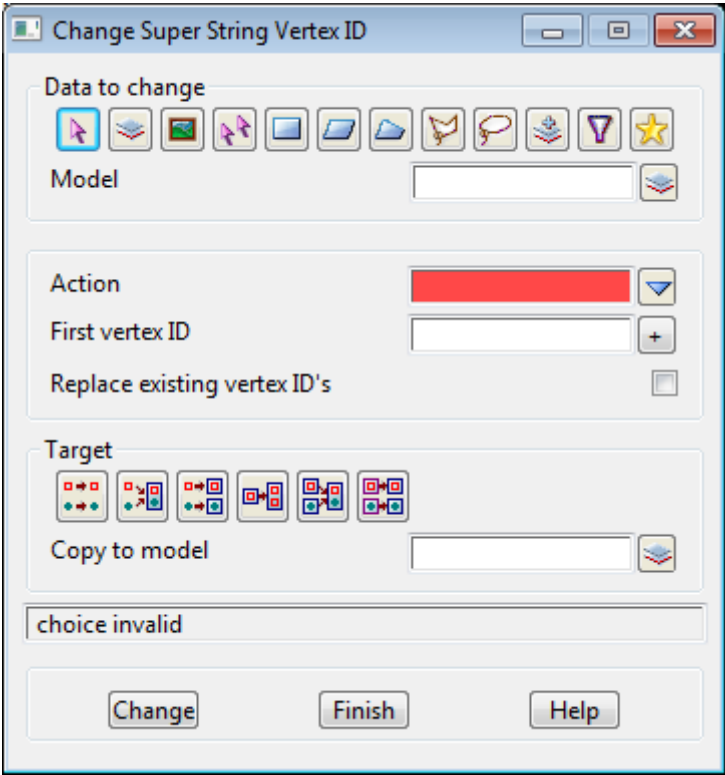
Position of option on menu: Strings =>Properties =>Super strings =>Vertex id

Position of option on menu: Utilities =>Super strings =>Vertex id

A super string has a *Vertex id* for each vertex.

The *Vertex id* option can set the Vertex IDs to sequential numbers (optionally ignoring existing Vertex ids) or clear all the existing vertex IDs for the super string.

On selecting the *Vertex id* option, the **Change Super String Vertex ID** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source	input		
<i>source of data to be processed.</i>			
Action	choice box		set, clear
<i>if clear, the vertex ids are cleared at each vertex.</i>			
<i>If set, the vertex id's are given sequential numbers starting with the number given in First vertex id field.</i>			
First vertex id			
<i>if Action is set, the vertex id's start with this value.</i>			
Replace existing vertex id's	tick box		
<i>if ticked, any vertex with an existing vertex is not given a new vertex id.</i>			
<i>If not ticked, all vertices are given new vertex ids.</i>			
Target type			
<i>Data target type - where to put the processed strings. For a full description go to Data Target in the chapter Tools and Concepts</i>			

Target info input
 extra information required for the target.

Change button
 process the selected strings.

Pipe/Culvert

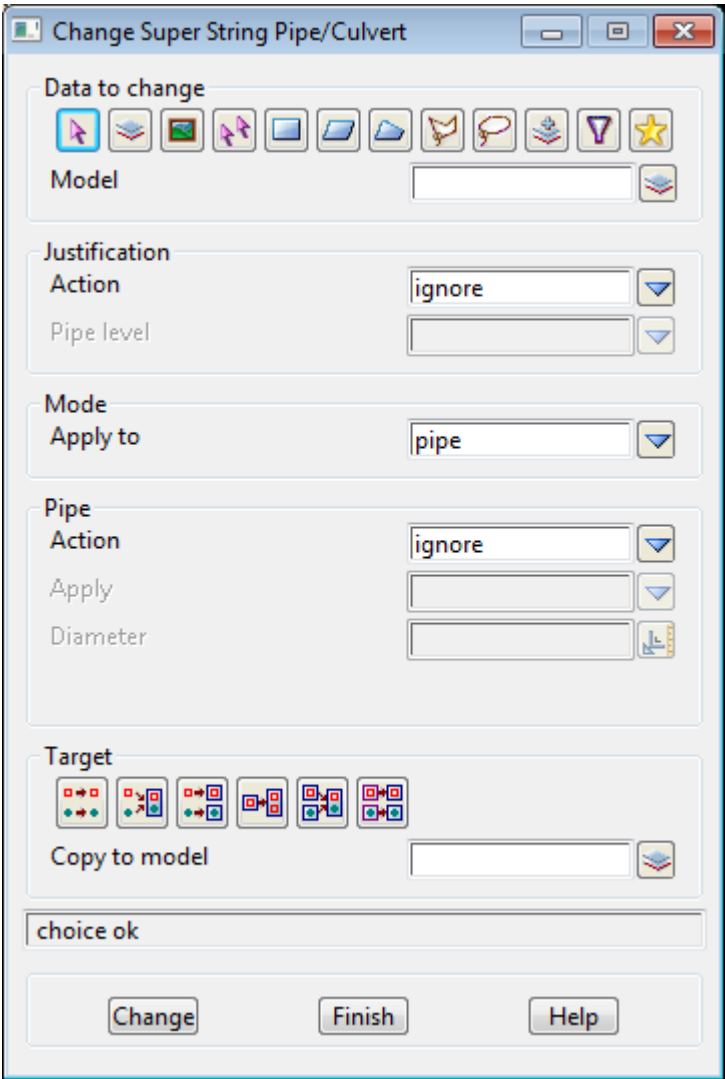
Position of option on menu: Strings =>Properties =>Super strings =>Pipe/culvert

Position of option on menu: Utilities =>Super strings =>Pipe/culvert

Each segment of a super string can have a diameter or a rectangular cross-section (box culvert).

This option can define or clear the pipe diameter, width and ehight, and justification.

On selecting the Pipe/culvert option, the Change Super String Pipe/Culvert panel is displayed.



The fields and buttons used in the panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Data source type			Model	
-------------------------	--	--	-------	--

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data source	input			
--------------------	-------	--	--	--

source of data to be processed.

Justification

Action	choice box		set, clear, ignore	
---------------	------------	--	--------------------	--

*if **set**, the string justification is set to the type given in the **Pipe level** field.*

*If **clear**, the string justification information is cleared.*

If **ignore**, nothing is done to the string justification.

Pipe level

if **Action** is **set**, the string justification is set to this value.

Mode

Apply to choice box pipe, culvert

if **pipe**, the next section of the panel has fields for setting pipe information.

if **culvert**, the next section of the panel has fields for setting culvert information.

Pipe - when Mode is Pipe

Action choice box set, clear, ignore

if **set**, then the **Pipe Apply** field specifies how the pipe information is modified.

If **clear**, the pipe information is cleared at each segment.

If **ignore**, nothing is done to the pipe information.

Apply choice box constant, variable

if **Pipe Action** is **set**, then the **Apply** field is used.

If **Apply** is **constant**, the string has only one diameter and no segment has its own diameter. The diameter for the string is set to the value in the **Diameter** field.

If **Apply** is **variable**, each segment in the string is set to have has its own diameter and it is set to the value in the **Diameter** field.

Diameter

diameter for each pipe segment.

Culvert - when Mode is Culvert

Action choice box set, clear, ignore

if **set**, then the **Culvert Apply** field specifies how the culvert information is modified.

If **clear**, the culvert information is cleared at each segment.

If **ignore**, nothing is done to the culvert information.

Apply choice box constant, variable

if **Culvert Action** is **set**, then the **Apply** field is used.

If **Apply** is **constant**, the string has only one width and height and no segment has its own width and height. The width and height for the string is set to the values in the **Width** and **Height** fields.

If **Apply** is **variable**, each segment in the string is set to have has its own width and height and they are set to the values in the **Width** and **Height** fields.

Width/Height

width/height for each culvert segment.

Target type

Data target type - where to put the processed strings. For a full description go to [Data Target](#) in the chapter [Tools and Concepts](#)

Target info input

extra information required for the target.

Change button

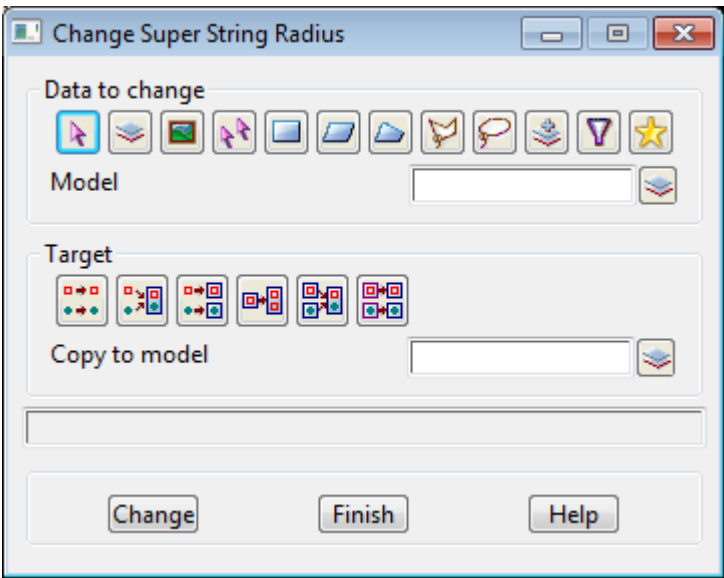
process the selected strings.

Radius

Position of option on menu: Strings =>Properties =>Super strings =>Radius

Position of option on menu: Utilities =>Super strings =>Radius

The Radius option clears any segment radii.

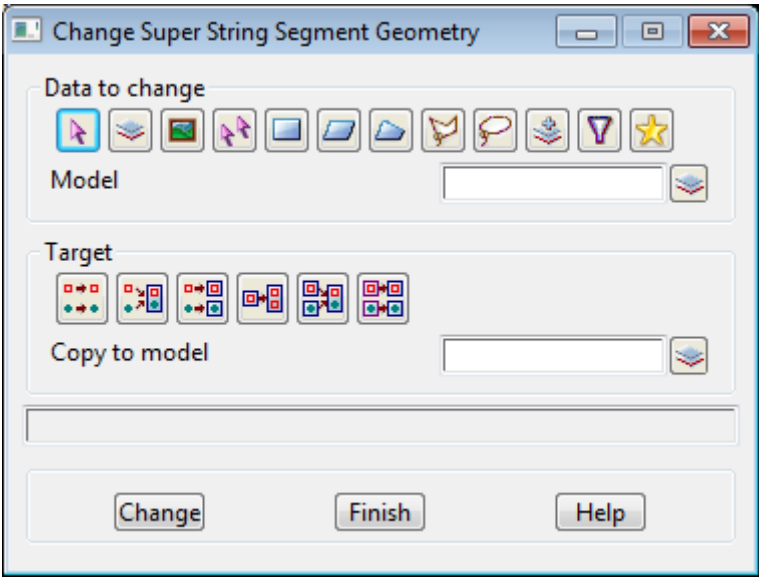


Segment Geometry

Position of option on menu: Strings =>Properties =>Super strings =>Segment geometry

Position of option on menu: Utilities =>Super strings =>Segment geometry

The Segment geometry option clears any segment geometry.



Text

Position of option on menu: Strings =>Properties =>Super strings =>Text

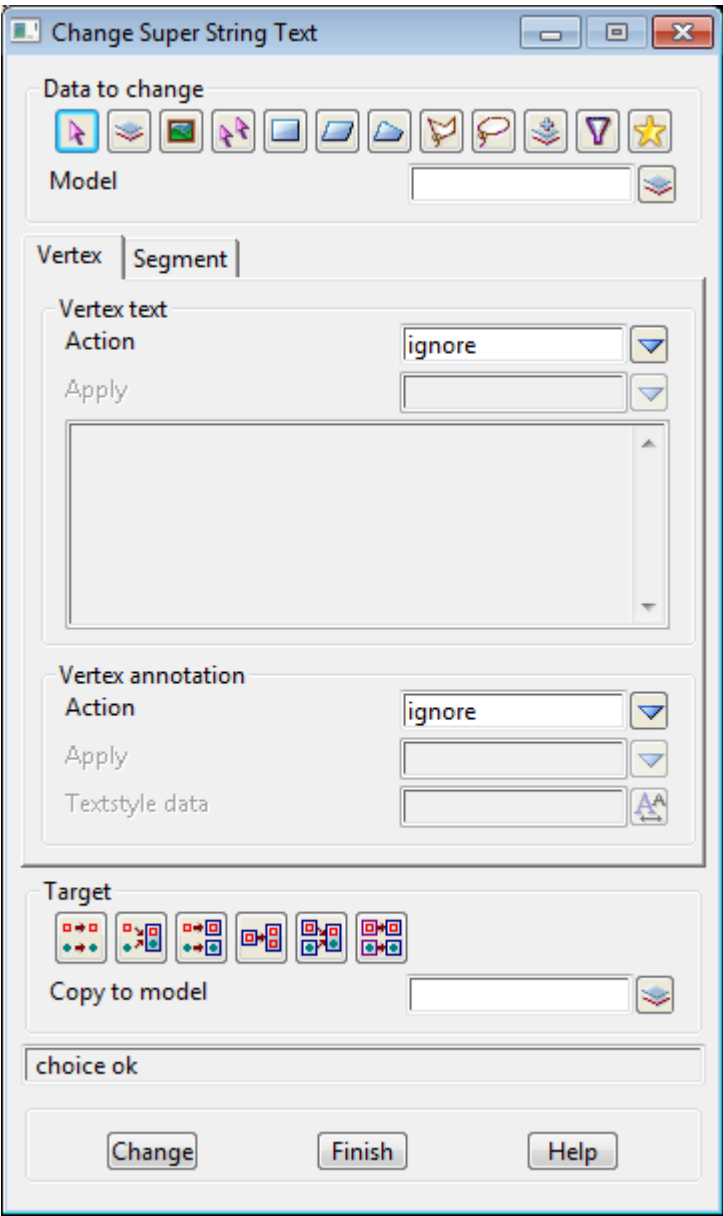
Position of option on menu: Utilities =>Super strings =>Text

This section of documentation is a work in progress and will be updated in subsequent releases.

Each vertex and segment of a super string can have its own text.

The **Text** option can set, clear the vertex or segment text and/or textstyle data for the super string.

On selecting the **Text** option, the **Change Super String Text** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source	input		

source of data to be processed.

Model	model box	available models
-------	-----------	------------------

Vertex tab

Vertex text

Action	choice box	ignore	set, clear, ignore
--------	------------	--------	--------------------

if **set**, the vertex text can be a constant for the entire string, or to be different for each vertex in the string.

If **clear**, the vertex text is cleared.

If **ignore**, nothing is done to the vertex text.

Apply	choice box	constant, variable
-------	------------	--------------------

if **Action** is **set**, then the **Apply** field is used.

If **Apply** is **constant**, the string has only one vertex text value and no vertex has its own vertex text. The vertex text for the string is set to the text in the **Text** field.

If **Apply** is **variable**, each vertex in the string is set to have has its own text and it is set to the value in the **Text** field.

Text

if **Action** is **set**, then either the entire string or every vertex text is set to this value.

Vertex annotation

Action	choice box	ignore	set, clear, ignore
--------	------------	--------	--------------------

if **set**, the vertex textstyle data can be a constant for the entire string, or to be different for each vertex in the string.

If **clear**, the vertex textstyle data is cleared.

If **ignore**, nothing is done to the vertex textstyle data.

Apply	choice box	constant, variable
-------	------------	--------------------

if **Action** is **set**, then the **Apply** field is used.

If **Apply** is **constant**, the string has only one vertex textstyle data and no vertex has its own vertex textstyle data. The vertex textstyle data for the string is set to the text in the **Textstyle data** field.

If **Apply** is **variable**, each vertex in the string is set to have has its own textstyle data and it is set to the value in the **Textstyle data** field.

Textstyle data

if **Action** is **set**, then the vertex textstyle data is set to this value.

Segment tab

Segment text

Action

Apply

Segment annotation

Action

Apply

Textstyle data

Target type

Data target type - where to put the processed strings. For a full description go to [Data Target](#) in the chapter [Tools and Concepts](#)

Target info	input
-------------	-------

extra information required for the target.

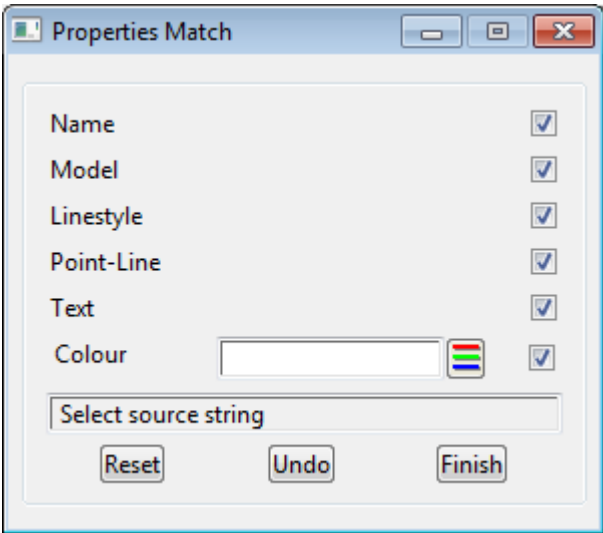
Change button
process the selected strings.

Match

Position of option on menu: Strings =>Properties =>Match

The **Match** option obtains information from a selected string and uses that to set information on another selected string.

On selecting the **Match** option, the **Properties Match** panel is displayed.



The **properties match** option is automatically in a pick mode for selecting the string whose properties you wish mimic (source string).

After the source string is selected, the values of the property from the source string are filled in on the panel and tick boxes turned on for each property. The tick boxes can be turned off if that property is not to be modified on the selected strings. The strings to change are then selected one after another.

If a new set of properties is required, selecting the **Reset** button is used to select a new source string.

The fields and buttons in this panel have the following functions.

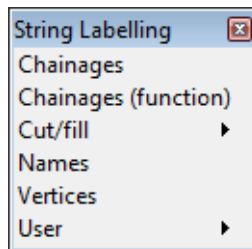
Field	Description	Type	Defaults	Pop-Up
Name		tick box	tick	
	<i>if ticked, set the name of the selected string to the value displayed in the Name field.</i>			
Model		tick box	tick	
	<i>if ticked, set the model of the selected string to the value displayed in the Model field.</i>			
Linestyle		tick box	tick	
	<i>if ticked, set the model of the selected string to the value displayed in the Linestyle field.</i>			
Point-Line		tick box	tick	
	<i>if ticked, set the model of the selected string to the value displayed in the Point-Line field.</i>			
Text		tick box	tick	
	<i>if ticked, set the textstyle and height of a selected string to the values displayed in the Text field.</i>			
Colour		tick box	tick	
	<i>if ticked, set the colour of the selected string to the value displayed in the Colour field.</i>			
Reset		button		
	<i>Select a new source string to set the values of the properties on the panel.</i>			

Label

Position of menu: Strings => Properties => Label

The **Label** menu contains options to label string chainages, create tadpoles for cut and fill, label string vertices with their x, y, z or point numbers and names.

The **Label** walk-right menu is



For the option *Chainages*, go to

[Label Chainages](#)

Chainages (function)

[Chainages \(function\)](#)

Cut/fill

[Label Cut/Fill](#)

Names

[Label Names](#)

Vertices

[Label Vertices](#)

Label Chainages

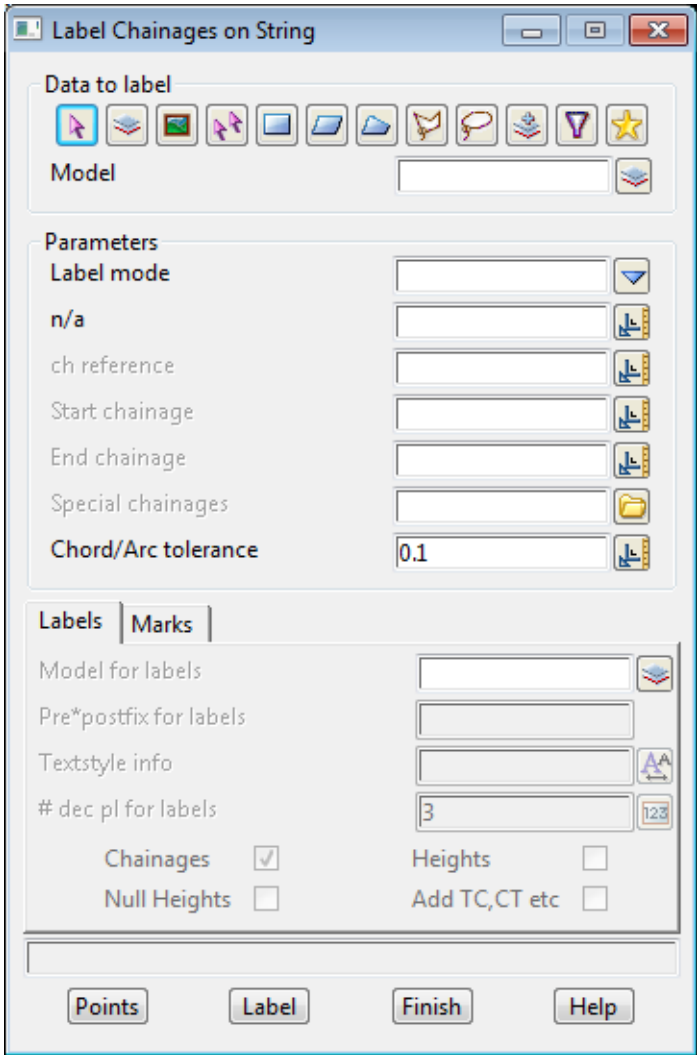
Position of option on menu: Strings => Label => Chainages

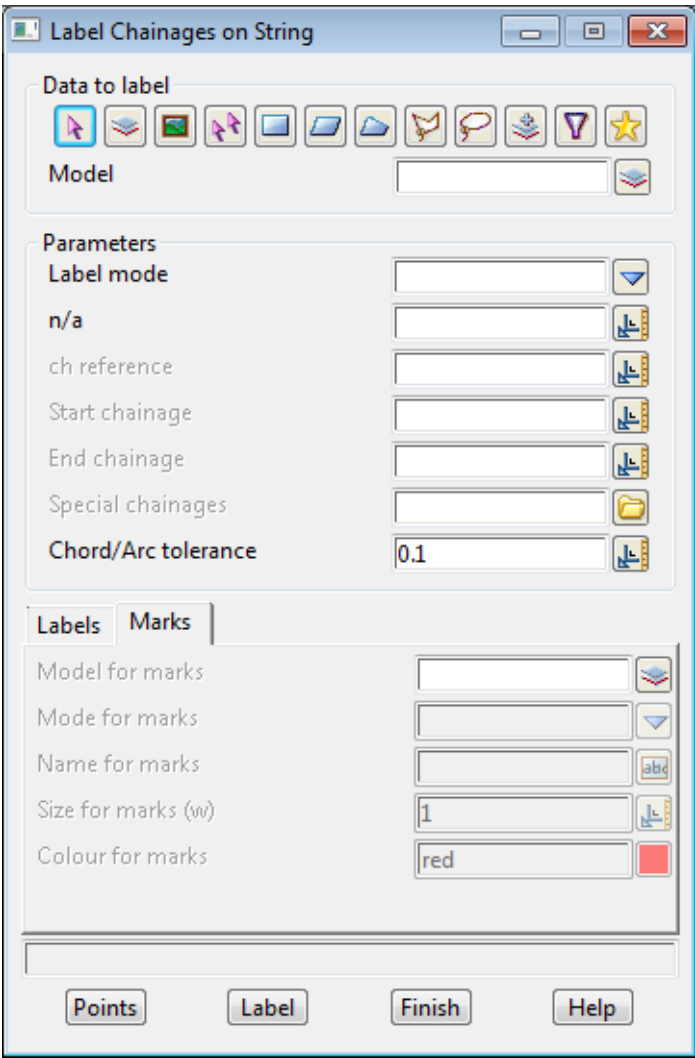
The **Label chainages** option is used to create text at regular chainages and special points on a string such as horizontal and vertical tangent points, crest and sag points and user selected points. It can also create tick marks at selected chainages.

The user has control over the label height, colour, angle, offset and the number of decimal places displayed, plus the size and colour of the tick marks.

As well as being used for labelling centre-lines, this option is used in conjunction with the sewer option to created special labels for sewer long section plots.

On selecting the **Label chainages** option, the **Label chainages on string** panel is displayed.





Individual points can be labelled by selecting them after picking the **Points** button.

The **marks** button brings up the **label chainages on string (marks)** panel which is used to place marks at the chosen chainages.

The fields and buttons used in the **label chainages on string** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type			
<i>data source type.</i>			
Data source			
<i>data source for strings to label.</i>			
Label mode	input		regular interval, regular interval plus end pts end points only horizontal TPs, vertical TPs, horizontal discontinuities vertical discontinuities all discontinuities, crests/sags

all horizontal points

type of labelling required.

Ch interval or n/a input
the regular interval to use for labelling points.

Ch reference input 0
the chainages to be labelled are integer multiples of the chainage interval added to the reference chainage. For example, if the reference chainage is 23.2 and the chainage interval 10, the chainages 3.2, 13.2, 23.2, 33.2 etc. will be labelled.

Start chainage input
if non-blank, the string chainage to start labelling from.
If blank, start at the beginning of the string.

End chainage input
if non-blank, the string chainage to end the labelling at.
If blank, go to the end of the selected string.

Special chainage input
file of special chainages to create labels at.

Chord/arc tolerance input default chord/arc tolerance
the chord to arc tolerance to use on the strings being labelled for determining how many points are labelled around horizontal curves.

Labels tab

Model for labels model box available models
if **non-blank**, labels are generated and placed in this model.
If **blank**, no labels are created (but tick marks may be).

Pre*postfix for labels input
the beginning and ending of the label to be given at each point. Spaces are significant. This uses the standard 12d method of pre-text*post-text. That is, 'Ch * m' would add 'Ch ' before the value and ' m' after the label.

Textstyle info textstyle box 1 available textstyle data
textstyle data to use when creating the labels.

dec pl for labels input 0
number of decimal places used in the labels.

Chainages tick tick
if **ticked**, the chainage of each point is appended to the label stem to create the label for the point.
If **not ticked**, only the label stem is used as the label.

Heights tick
if **ticked**, the height of each point is used in the label for the point.
If **not ticked**, heights are not used in the label.

Null heights tick
if **ticked** and the height of a point null, (**null**) is used in the label for the point.
If **not ticked**, null heights are not used in the label.

Add TC, CT etc. tick
if **ticked** and labelling an alignment string, the critical point types are used in the label for the point.
If **not ticked**, critical point types are not used in the label.

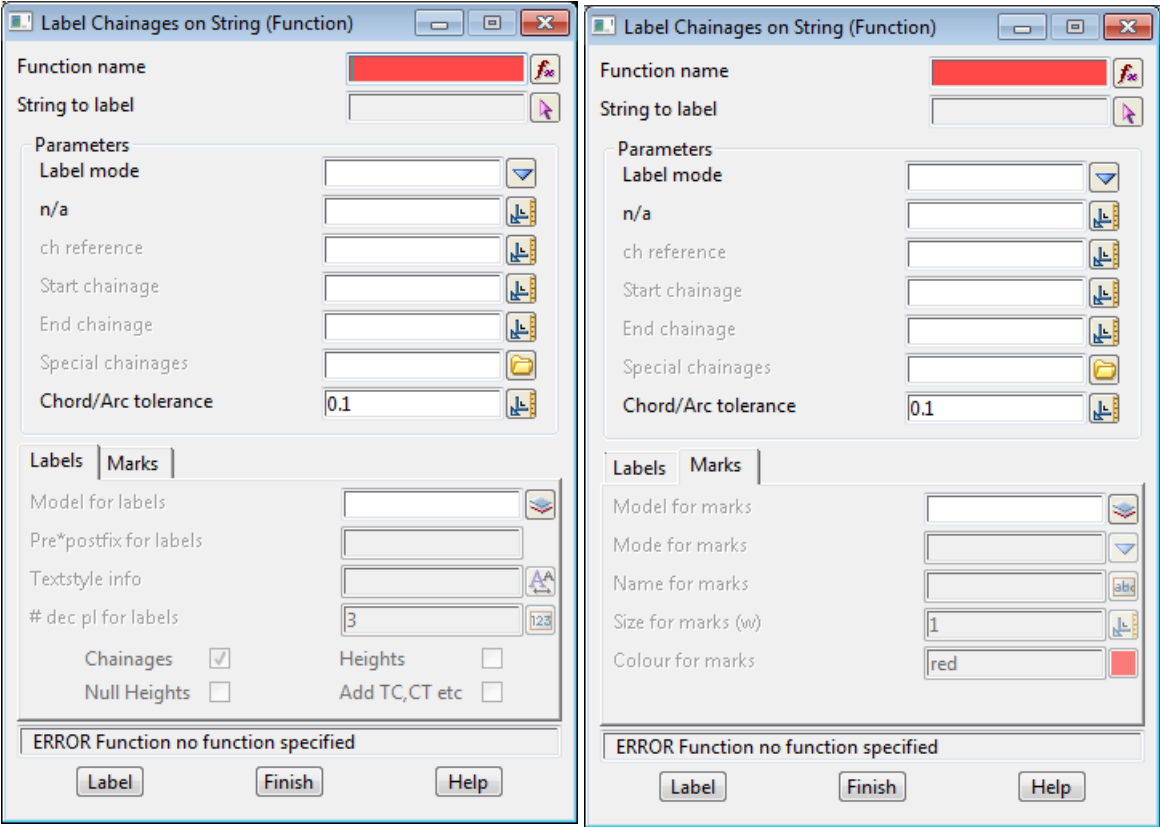
Marks tab

Model for marks	input	available models	
<i>if non-blank, tick marks are generated according to the label mode and placed in this model. If blank, no tick marks are created.</i>			
Mode for marks	input	ticks centred	ticks on lhs, ticks on rhs, ticks centred
<i>mode for the tick marks.</i>			
Name for marks	input	1	
<i>name to give the tick marks (mainly used for mapping files)</i>			
Size for marks (w)	input	1	
<i>size in world units for the tick marks</i>			
Colour for marks	input	orange	available colours
<i>colour of the tick marks.</i>			
Points	button		
<i>pick individual positions to label with a label stem and chainage (if the chainages field is set to tick).</i>			
Label	button		
<i>label the selected strings as specified by the label mode, mode for marks and other fields in the panel.</i>			

Chainages (function)

Position of option on menu: Strings =>Label => Chainages (function)

The parameters for this panel are identical to **Label Chainages on String**, however instead of selecting data source for labels this option will create a function associated with a specified string.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Function name <i>The name of the function to run.</i>	function box		select function
String to label <i>The string to label.</i>	string select		
For more information on this panel and its fields and buttons, please go to Label Chainages .			
Please continue to the next section Label Cut/Fill .			

Label Cut/Fill

Position of menu: Strings =>Label => Cut/Fill

The **cut/fill** menu contains options to create cut and fill tick marks between selected strings.

The options can generate standard tadpoles, tick marks or use user specified model as the tick symbol.

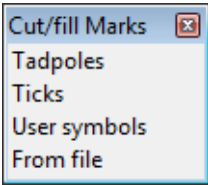
For each option, a **reference** string is selected which defines the chainages used for labelling cut/fill. The cut/fill symbols are drawn perpendicular to the reference string.

Two strings, **str1** and **str2** are selected for labelling.

The tick symbols are drawn at right angles to the reference string at a user specified chainage going between the two strings, **str1** and **str2**, from the higher string point to the lower string point (which string is higher or lower may vary along the strings). The tick symbol is repeated at the given chainage interval.

The tick symbol is drawn as a **percentage** of the **distance from the high point to the low point** between the two strings, **str1** and **str2** and this percentage is specified separately for the odd and even numbered ticks.

The **cut/fill** walk-right menu is



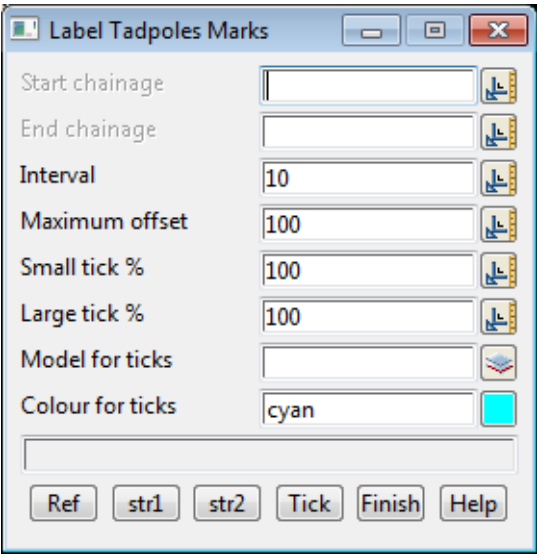
For the option <i>Tadpoles</i> , go to	Tadpoles
<i>Ticks</i>	Ticks
<i>User symbols</i>	User Symbols
<i>From file</i>	From File

Tadpoles

Position of option on menu: Strings =>Label => Cut/Fill => Tadpoles

The **Tadpoles** option is used to generate tadpole symbols between two strings.

On selecting the **Tadpoles** option, the **Label tadpoles marks** panel is displayed.



The fields and buttons in this panel are used as follows

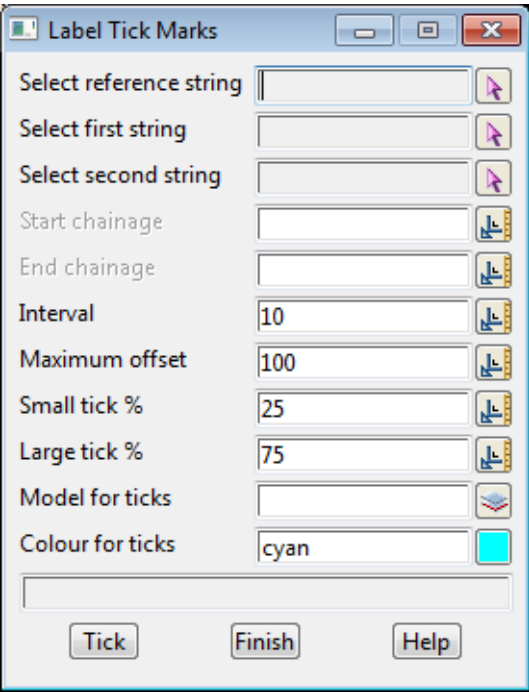
Field Description	Type	Defaults	Pop-Up
Start chainage <i>if non-blank, the reference string chainage to start creating tadpoles from. if blank, the reference string start chainage is used.</i>	input		
End chainage <i>if non-blank, the reference string chainage to end the tadpoles at. if blank, the reference string end chainage is used.</i>	input		
Interval <i>the chainage interval to use for creating tadpoles.</i>	input	10	
Maximum offset <i>the maximum distance to search from the reference string to find strings str1 and str2.</i>	input	100	
Small tick% <i>the percentage of the distance between the two strings, str1 and str2, that is taken up by the odd numbered tadpoles.</i>	input	100	
Large tick% <i>the percentage of the distance between the two strings, str1 and str2, that is taken up by the even numbered tadpole.</i>	input	100	
Model for ticks <i>the models for the tadpoles to placed into.</i>	input		available models
Colour for ticks <i>the colour for the tadpoles.</i>	input	cyan	available colours
Ref/Str1/Str <i>the selected string is used as the reference/str1/str2 string.</i>	button		

Ticks

Position of option on menu: Strings =>Label => Cut/Fill => Ticks

The ticks option is used to generate ticks (straight lines) between two strings.

On selecting the **ticks** option, the **label tick marks** panel is displayed.



The fields and buttons in this panel are used in exactly the same way as for the **label tadpoles marks** panels. The only difference is that the defaults for the **small tick %** and **large tick %** panel fields are 25 and 75 respectively.

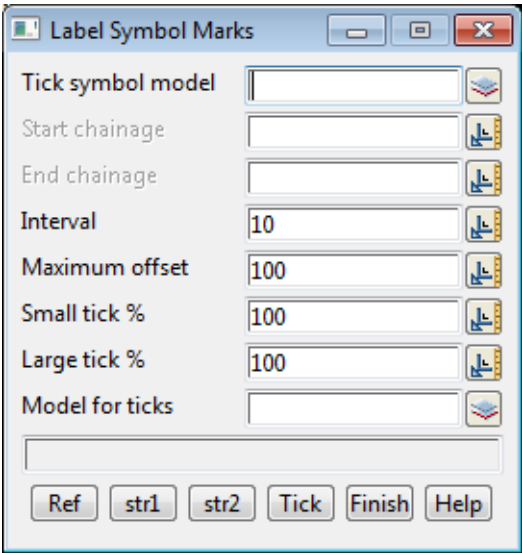
User Symbols

Position of option on menu: Strings =>Label => Cut/Fill => User symbols

The user symbols option uses a given model, the **tick symbol model**, as the symbol to drawn between the low and high points on the two strings.

The **tick symbol model** is aligned so that the model origin is at the high string point and the model's positive x-axis goes from the high string point to the low string point.

On selecting the ticks option, the **label tick marks** panel is displayed.



The fields and buttons in this panel are used in exactly the same way as for the **label tadpoles marks** panels except that a **tick symbol model** panel field is used to specify the symbol to be drawn for the cut/fill tick marks.

Field Description	Type	Defaults	Pop-Up
Tick symbol model	input		available models
<i>the model to be used as the tick mark symbols.</i>			

From File

Position of option on menu: Strings =>Label => Cut/Fill => From file

This is the same option as Drafting =>Create cut/fill symbols

Please go to the section [Label Cut/Fill](#) in the Chapter [Drafting](#).

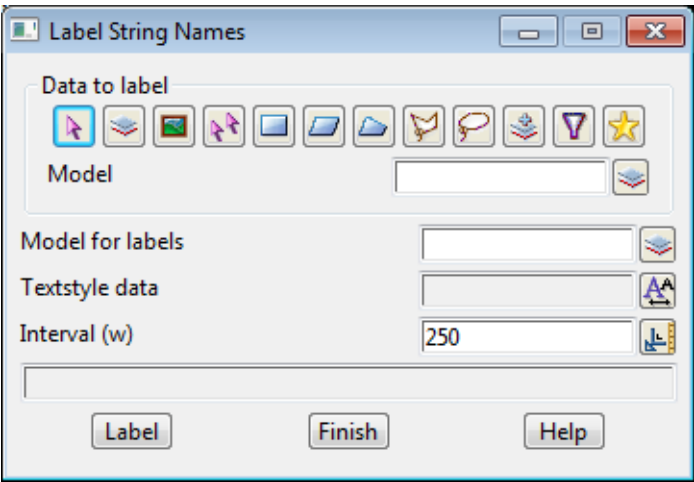
Label Names

Position of option on menu: Strings => Label => Names

The **label names** option is used to label individual strings or all the strings in a model, with their string names.

The user has control over the label height, colour, and the distance between the labels.

On selecting the **label names** option, the **label string names** panel is displayed.



By using the **pick** button, individual strings can be labelled using the values in the panel fields. The **model to label** field is ignored.

If the **label** button is selected, then all the strings in the model given by the **model to label** field will be labelled according to the parameters in the panel fields.

The fields and buttons used in the **label names** panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Data source type

data source type.

Data source

data source for strings to label.

Textstyle data

input

textstyle information.

Interval (w)

input

250

chainage interval in world units between the labels.

Label

button

*label all the strings in the model given in the **model to label** field.*

Please continue to the next section [Label Vertices](#).

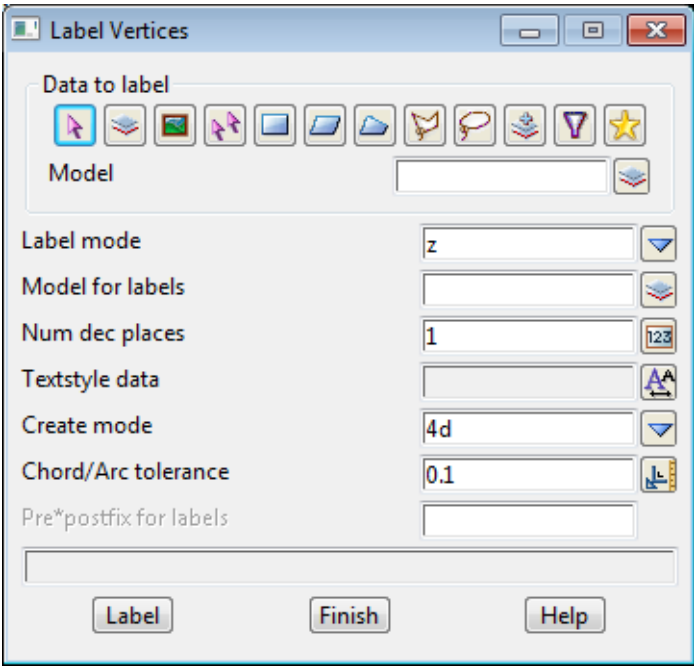
Label Vertices

Position of option on menu: Strings =>Label => Vertices

The **Label vertices** option can be used to label the x, y, z, z no nulls, point numbers, id-pt no, name and descriptions of strings selected by the data source.

The user has control over the label height, colour, the number of decimal places, the distance between the labels, the distance the label is from the point position, and the angle to draw the label at.

On selecting the **Label vertices** option, the **Label vertices** panel is displayed.



Individual strings can be labelled by using the **pick** button and then selecting the strings, to be labelled using the values in the panel fields. The **string model** field is ignored.

If the **label** button is selected, then all the strings in the model given by the **string model** field will be labelled according to the parameters in the panel fields.

The fields and buttons used in the label strings panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Data source type	<i>data source type.</i>			
Data source	<i>data source for strings to label.</i>			
Label mode		input	z	x,y,z, point number, Vertex no x and y id-vertex no z no nulls name
	<i>type of labelling required - x, y, z, point number, vertex no. for each point in the string.</i>			
String model		input		available models
	<i>name of the model containing the strings to be labelled. Not used with the pick button.</i>			

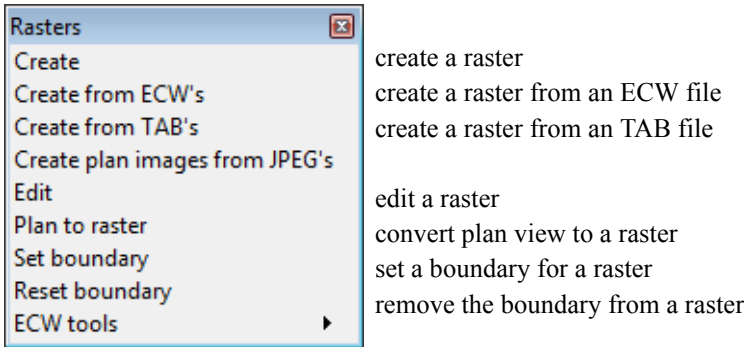
Model for labels	input		available models
<i>name of the model to place the labels in.</i>			
Num dec places	input	0	0,1,2,3,4,5
<i>number of decimal places used in the x,y,z labels.</i>			
Textstyle data	input		
<i>textstyle information.</i>			
Create mode	input	4d	4d, text
<i>if 4d, the vertex labels for the one string are placed in a 4d string.</i>			
<i>text, the vertex labels are created as individual text strings.</i>			
Chord/arc tolerance	input	default chord/arc tolerance	
<i>the chord to arc tolerance to use on any alignment string being labelled for determining how many points are labelled around horizontal curves.</i>			
Label	button		
<i>label all the strings in the model given in the string model field.</i>			

Rasters

Position of menu: Strings =>Rasters

The Rasters menu contains options for working with rasters.

The Rasters walk-right menu is



For the option <i>Create</i> go to	Create a Raster
<i>Create from ECW's</i>	Create Rasters from ECW Files
<i>Create from TAB's</i>	Create Rasters from TAB Files
<i>Create plan images from JPEG's</i>	Create Plan Images from JPEG Files
<i>Edit</i>	Edit a Raster
<i>Plan to raster</i>	Create Raster from Plan View in the chapter View Menus
<i>Set boundary</i>	Set a Boundary for a Raster
<i>Reset boundary</i>	Reset the Boundary for a Raster
<i>ECW tools</i>	ECW Tools - Not Supported!

Create a Raster

Position of option on menu: Strings =>Rasters =>Create

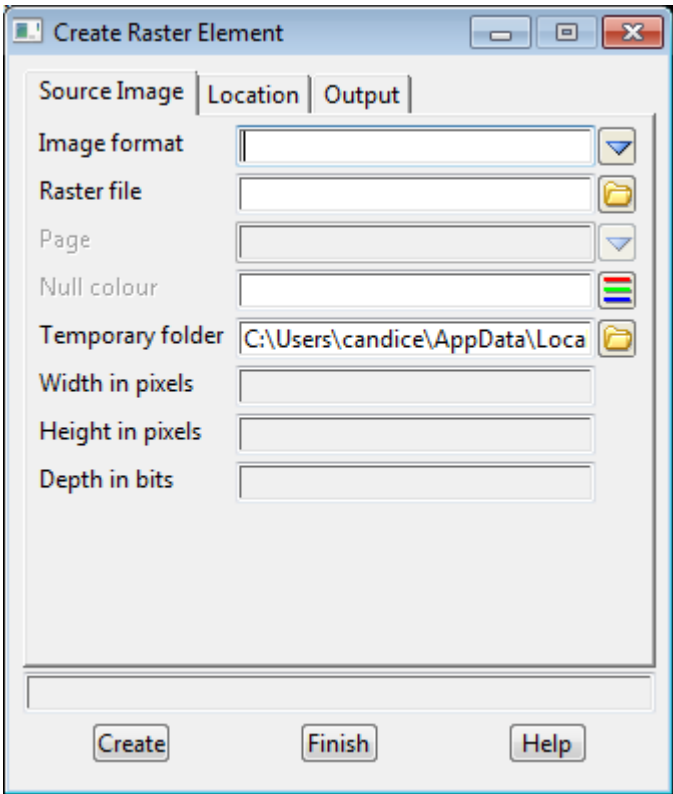
A raster element consists of a raster image and positioning information for the raster so that it can be mapped into world units.

A raster element is added to a model just like any other string but for convenience it is suggested that no other strings are in the same model as a raster.

To help speed up drawing on a view, there is toggle for displaying/not displaying rasters on plan views.

Raster Restrictions

- (a) The Raster file must have read/write permission
 - (b) Rasters are only supported on Win 2000 and above.
- Selecting **Create** brings up the **Create Raster Element** panel.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Source Image tab			
Image format	choice box		BMP, DIB, GIF ECW, JPEG, JPEG 2000 PNG, TGA, TIFF
<i>format that the original image is in. Non ECW rasters must be 24 bit colour.</i>			
Raster file	file box		
<i>name of the original raster image. The file must have read/write access and be 24 bit colour.</i>			
Page			
<i>page number of the raster when the format can contain more than one image (e.g. in a TIFF)</i>			
Null colour	colour box		available colours
<i>colour when there is no pixel in the raster</i>			
Temporary folder	file box	c:\temp	select folder
<i>folder to use as a temporary storage area whilst converting the raster to the 12d raster format. The temporary folder needs to have enough free disk space to convert the largest of the rasters to bmp format.</i>			
Width/Height in pixels	output only		
<i>the width/height in pixels of the selected raster</i>			
Depth in bits	output only		
<i>display the colour depth of the source data</i>			
Projection	output only		
<i>display the projection of the source data if available</i>			

Location tab

The location tab supplies the information for positioning the raster in world units in **12d Model**. Most rasters formats, other than ECW or Geotiff, do not include this information so it must be supplied by other means, either in a file or by typing in a world origin, anticlockwise rotation angle and world width and height.

Data format	choice box	Raw details	Raw Details, Autocad scr file ESRI world, Geo Tiff, Mapinfo tab
--------------------	------------	-------------	-----------------------------------------------------------------------

if **Raw details**, the location details are typed into the **World Location Details** section as rotation, world origin, world width and height.

If **Autocad scr file**, the location details are taken from the scr file given in **Location file**. An Autocad scr file gives the world co-ordinates of the corners of the raster starting in the bottom left hand corner; bottom right hand corner; top left hand corner and top right hand corner. An example of a scr file is:

line
22109.639,148090.695
23109.639,148090.695
22109.639,149090.695
23109.639,149090.695

If **ESRI world**, the location details are taken from the **ESRI world** file given in **Location file**. An **ESRI world** file gives the xscale, row rotation, column rotation, yscale, x origin and y origin. For use with 12d, the row and column rotations must be the same and yscale = - xscale.

If **Geo Tiff**, the Location details are taken from the geotiff file given in **Location file** panel field.

If **Mapinfo Tab**, the location details are taken from the Mapinfo tab file given in **Location file**.

Location file	file box
----------------------	----------

file with the location details

Anticlockwise rotation	angle box
-------------------------------	-----------

the world rotation of the raster.

X/Y co-ordinate	real box
------------------------	----------

the world x/y co-ordinate of the left hand bottom corner of the raster.

World width/height	real box
---------------------------	----------

the width/height in world units of the raster.

Output tab

the parameters for the created 12d raster.

Output size	output
--------------------	--------

an estimate of the amount of disk space the raster will use in **12d Model**

Fastest drawing speed	input
------------------------------	-------

only if raster is less than 24 bit depth - if selected, the raster is converted to a 24 bit image.

Minimum disk space	input
---------------------------	-------

only if raster is less than 24 bit depth - if selected, the raster is not converted to a 24 bit image and hence will take up less disk space. However it is converted at drawing time and so will be slower to display than a 24 bit image.

Name for raster	input
------------------------	-------

the name for the raster

Model for raster	input	available models
-------------------------	-------	------------------

name of the model for the raster element

Show border	tick	tick	
<i>if tick then the border of the raster element is displayed</i>			
Colour for border	input	default colour	available colours
<i>the colour of the border for the raster</i>			
Tin	tin box		available tins
<i>if non blank, this tin is tagged with this raster so the raster is used for draping on the tin when the tin is used in visualisations</i>			
Create	button		
<i>after the Create button is chosen, the raster element is created.</i>			

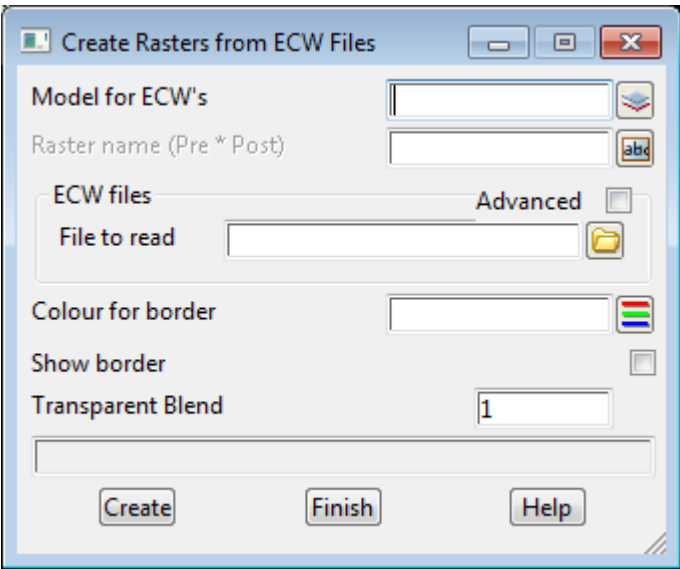


Create Rasters from ECW Files

Position of option on menu: Strings =>Rasters =>Create from ECWs

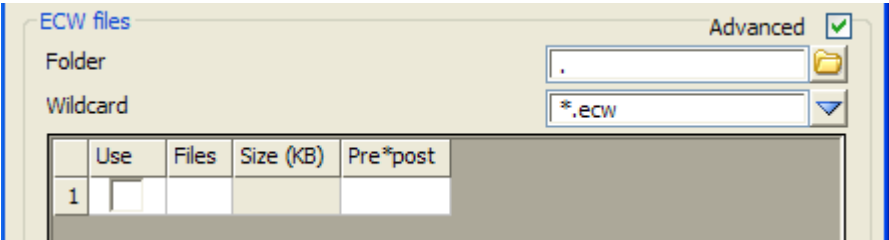
This option attaches one or more ECW files to a model.

Selecting **Create from ECWs** brings up the **Create Rasters from ECW Files** panel.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Model for ECWs <i>name of the model to hold the new ECW rasters</i>	input		available models
Raster name (Pre*post) <i>if not blank, pre*post text to use for the name of the raster(s) from the ECW file(s) (see Pre*Postfix Panel Fields for information on using pre*postfix)</i>	text input		
ECW files			
Advanced <i>if not ticked, File To Read is visible.</i>	tick box	not ticked	
File to read <i>name of the ECW file to attach to the model</i>	file box		*.ecw files
Advanced <i>if ticked, the File To Read field is replaced by a grid to allow multiple ECW files to be read in, is opened. A wild card is used to select all the files to be read in.</i>	tick box		



Folder folder box

*folder to search for files using the **Wild card***

Wildcard choice box *.ecw, *

wild card to use in search for files in the given folder

Grid

The following fields are repeated for every row.

Use tick box

if ticked, read in the file on this row

Files output

name of the file found in the folder

Size output

file size

Colour for border colour box

colour for the border around the raster

Show border tick box

if ticked, the border will be visible

Transparent Blend

The degree of opacity, 1 = opaque, 0.1 = very transparent

Create button

*after the **Read** button is chosen, the raster elements are created.*

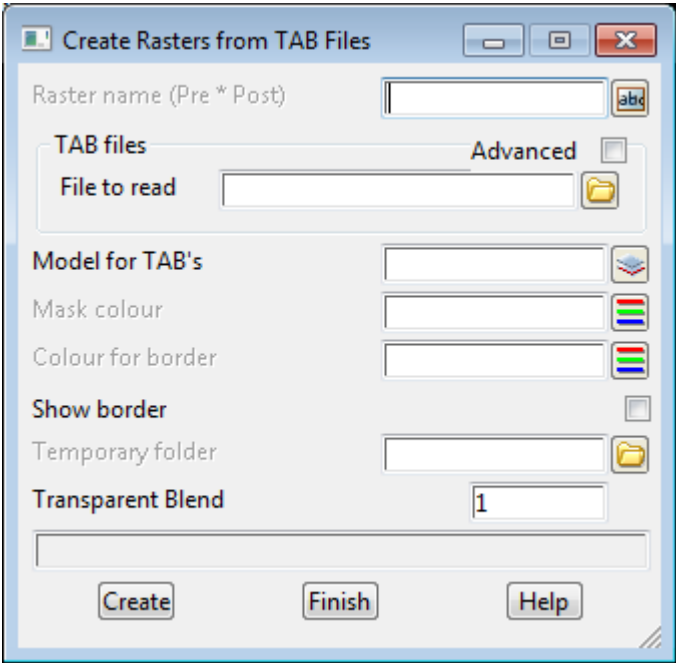


Create Rasters from TAB Files

Position of option on menu: Strings =>Rasters =>Create from TAB's

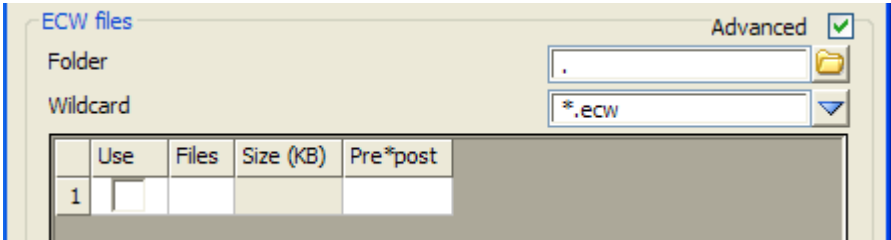
This option reads one or more rasters as define by TAB files and places them in a model.

Selecting Create from TAB's brings up the **Create Rasters from TAB Files** panel.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Raster name (Pre*post)	text input		
<i>if not blank, pre*post text to use for the name of the raster(s) from the ECW file(s) (see Pre*Postfix Panel Fields for information on using pre*postfix)</i>			
TAB files			
Advanced	tick box	not ticked	
<i>if not ticked, File To Read is visible.</i>			
File to read	file box		*.tab files
<i>name of the TAB file to attach to the model</i>			
Advanced	tick box		
<i>if ticked, the File To Read field is replaced by a grid to allow multiple TAB files to be read in, is opened. A wild card is used to select all the files to be read in.</i>			



Folder folder box

folder to search for files using the **Wild card**

Wildcard choice box *.tab, *

wild card to use in search for files in the given folder

Grid

The following fields are repeated for every row.

Use tick box
if ticked, read in the file on this row

Files output
name of the file found in the folder

Size output
file size

Model for TAB's input available models
name of the model for the rasters defined by the TAB files

Mask colour colour box available colours
colour when there is no pixel in the raster

Colour for border input default colour available colours
the colour of the border for the raster

Show border tick tick
if ticked then the border of the raster element is displayed

Temporary folder file box c:\temp select folder
folder to use as a temporary storage area whilst converting the raster to the 12d raster format. The temporary folder needs to have enough free disk space to convert the largest of the rasters to bmp format.

Transparent Blend
The degree of opacity, 1 = opaque, 0.1 = very transparent

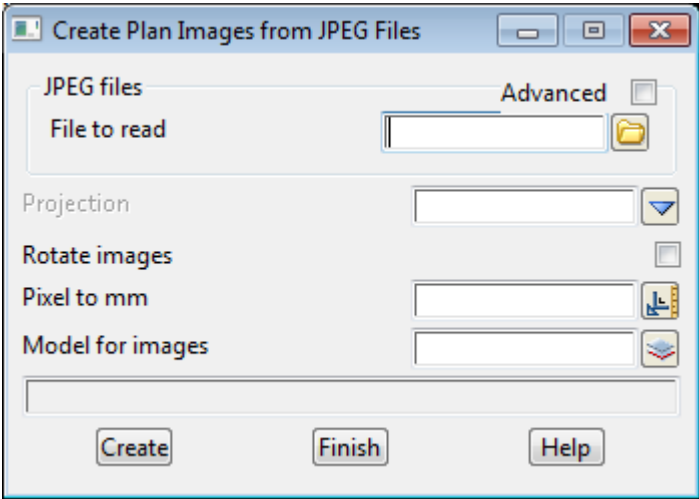
Create button
after the **Read** button is chosen, the raster elements are created.

Create Plan Images from JPEG Files

Position of option on menu: Strings =>Rasters =>Create plan images from JPEG's

This section of documentation is a work in progress and will be updated in subsequent releases.

Selecting **Create plan images from JPEG's** brings up the **Create Plan Images from JPEG Files** panel.



The fields and buttons used in the panel have the following functions.

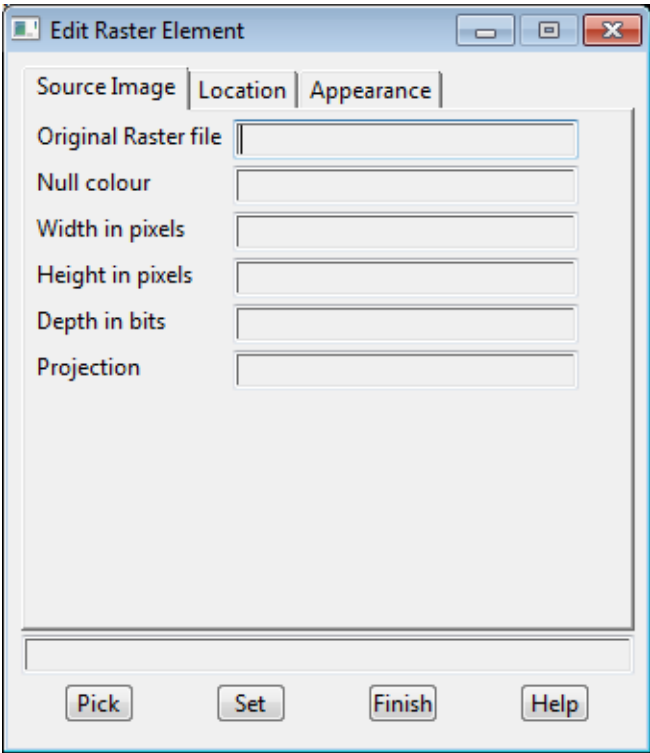
Field Description	Type	Defaults	Pop-Up
File to read <i>name of the JPEG file to attach to the model</i>	file box		*.jpg files
Advanced <i>if ticked, the File To Read field is replaced by a grid to allow multiple JPEG files to be read in, is opened. A wild card is used to select all the files to be read in.</i>	tick box		
Projection	choice box		
Rotate images	tick box		
Pixel to mm	measure box		
Model for images	model box		available models

Edit a Raster

Position of option on menu: Strings =>Rasters =>Edit

The Edit option modifies the properties of any raster displayed in a **12d Model** view.

Selecting Edit brings up the **Edit Raster Element** panel.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Source Image tab			
Original raster file <i>file that the raster originally came from</i>	output		
Null colour <i>colour when there is no pixel in the raster</i>	colour box		available colours
Width/Height in pixels <i>the width/height in pixels of the selected raster</i>	output only		
Depth in bits <i>display the colour depth of the raster</i>	output only		
Projection <i>display the original projection of the raster (if available)</i>	output only		
Location tab			
<i>When the raster is selected, the raw details for the raster (or ECW details) are displayed. The location details can then be modified and hence how the raster is positioned in world units in 12d Model is modified.</i>			

Data format	choice box	Raw details	Raw Details, Autocad scr file ESRI world, Geo Tiff, Mapinfo tab
--------------------	------------	-------------	-----------------------------------------------------------------------

*if **Raw details**, the location details are typed into the **World Location Details** section as rotation, world origin, world width and height.*

*If **Autocad scr file**, the location details are taken from the scr file given in **Location file**. An Autocad scr file gives the world co-ordinates of the corners of the raster starting in the bottom left hand corner; bottom right hand corner; top left hand corner and top right hand corner. An example of a scr file is:*

```
line
22109.639,148090.695
23109.639,148090.695
22109.639,149090.695
23109.639,149090.695
```

*If **ESRI world**, the location details are taken from the ESRI world file given in **Location file**. An ESRI world file gives the xscale, row rotation, column rotation, yscale, x origin and y origin. For use with 12d, the row and column rotations must be the same and yscale = - xscale.*

*If **Geo Tiff**, the Location details are taken from the geotiff file given in **Location file** panel field.*

*If **Mapinfo Tab**, the location details are taken the Mapinfo tab file given in **Location file**.*

Location file	file box
----------------------	----------

file with the location details

Anticlockwise rotation	angle box
-------------------------------	-----------

the world rotation of the raster

X/Y co-ordinate	real box
------------------------	----------

the world x/y co-ordinate of the bottom left hand corner of the raster

World width/height	real box
---------------------------	----------

the width/height in world units of the raster

Appearance tab

Name for raster	input
------------------------	-------

the name of the raster element

Model for raster	input	available models
-------------------------	-------	------------------

model for the raster element.

Show border	tick	tick
--------------------	------	------

if ticked then the border of the raster element is displayed

Colour for border	input	default colour	available colours
--------------------------	-------	----------------	-------------------

the colour of the border for the raster element

Buttons at Bottom

Pick	button
-------------	--------

select the raster element to edit by clicking on the border of the raster. The details for the selected raster are then displayed in the panel.

Set	button
------------	--------

give the raster element the new values from the panels fields

NOTE: A raster is **deleted** by using the string *Delete* option. The raster is selected for deleting by picking on the border of the raster.

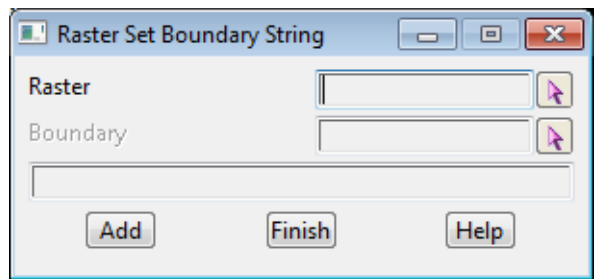


Set a Boundary for a Raster

Position of option on menu: Strings =>Rasters =>Set boundary

The **Set boundary** option defines a boundary polygon for the raster. Only the parts of the raster inside the boundary polygon are displayed. The boundary polygon can have holes.

Selecting **Set boundary** brings up the **Raster Set Boundary String** panel.



The fields and buttons used in the panel have the following functions.

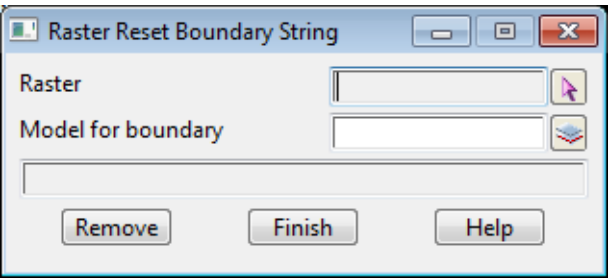
Field Description	Type	Defaults	Pop-Up
Raster	raster select box		
<i>select the raster to have a drawing polygon set for it</i>			
Boundary	string select box		
<i>select a polygon</i>			
Add	button		
<i>add the selected polygon as a boundary polygon for the selected raster</i>			

Reset the Boundary for a Raster

Position of option on menu: Strings =>Rasters =>Reset boundary

The **Reset boundary** option removes the boundary polygon from a raster.

Selecting **Remove boundary** brings up the **Raster Reset Boundary String** panel.



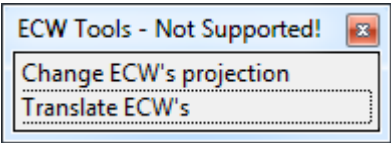
The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Raster	raster select box		
<i>select the raster to have its drawing polygon removed</i>			
Model for boundary	model box		available models
<i>model to place the removed boundary polygon in</i>			

Remove button
remove the boundary polygon from the selected raster

ECW Tools - Not Supported!

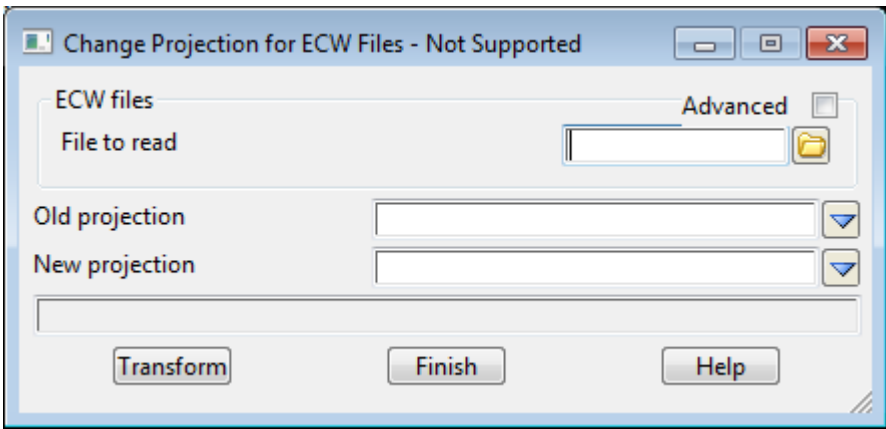
Position of option on menu: Strings =>Rasters =>ECW tools
Selecting ECW tools brings up the ECW tools -Not Supported! menu.
This section of documentation is a work in progress and will be updated in subsequent releases.



For the option Change ECW's projection go to [Change ECWs Projection](#)
Translate ECW's [Translate ECWs](#)

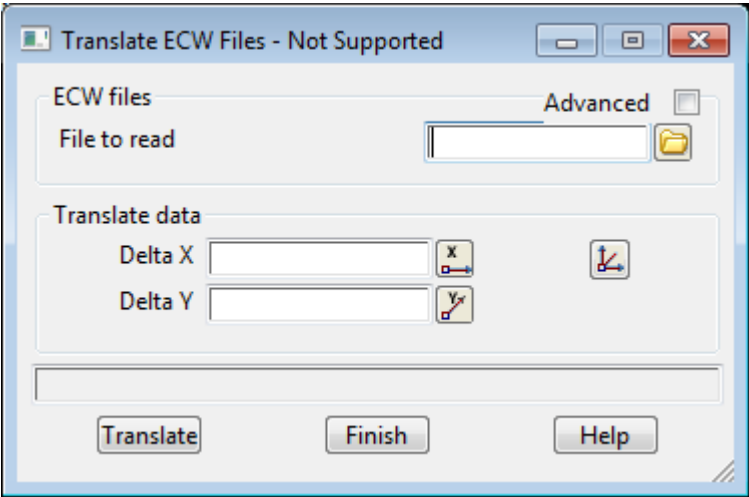
Change ECWs Projection

Position of option on menu: Strings =>Rasters =>ECW tools=> Change ECW's Projection
Selecting Change ECW's Projection brings up the Change Projection for ECW Files - Not Supported panel.
This section of documentation is a work in progress and will be updated in subsequent releases.



Translate ECWs

Position of option on menu: Strings =>Rasters =>ECW tools=> Translate ECW's
Selecting Translate ECW's brings up the Translate ECW Files - Not Supported panel.
This section of documentation is a work in progress and will be updated in subsequent releases.

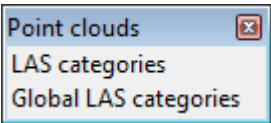


Point Clouds

Position of menu: Strings =>Point clouds

This section of documentation is a work in progress and will be updated in subsequent releases.

The **Point clouds** walk-right menu is



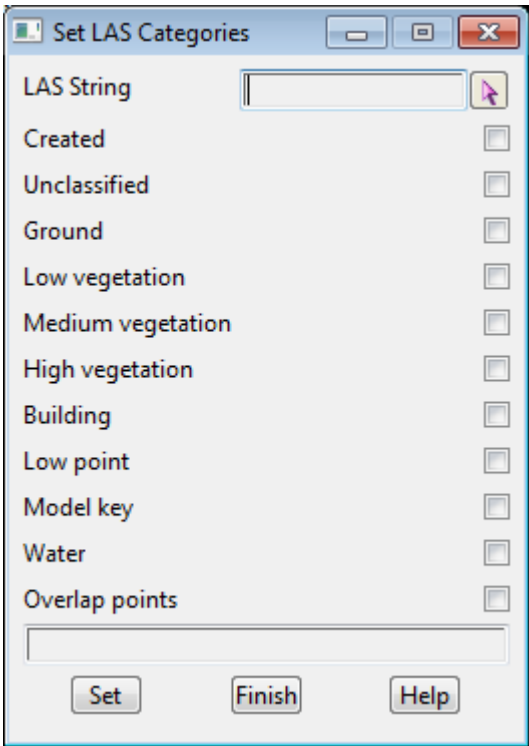
For the option LAS categories go to [Set LAS Categories](#)
Global LAS categories [Global Set LAS Categories](#)

Set LAS Categories

Position of option on menu: Strings =>Point clouds =>LAS Categories

This section of documentation is a work in progress and will be updated in subsequent releases.

Selecting **LAS Categories** fires up the **Set LAS Categories** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
LAS String	string select		

Created	tick box
Unclassified	tick box
Ground	tick box
Low vegetation	tick box
Medium vegetation	tick box
High vegetation	tick box
Building	tick box
Low point	tick box
Model key	tick box
Water	tick box
Overlap points	tick box
Set	button

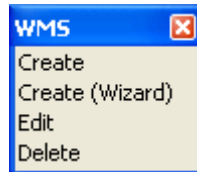
Medium vegetation	tick box
High vegetation	tick box
Building	tick box
Low point	tick box
Model key	tick box
Water	tick box
Overlap points	tick box
Set	button

WMS

Position of option on menu: File I/O =>WMS

Position of option on menu: Strings =>WMS

The WMS walk-right menu containing these options is:



For the option *Create* go to
Create (Wizard)
Edit
Delete

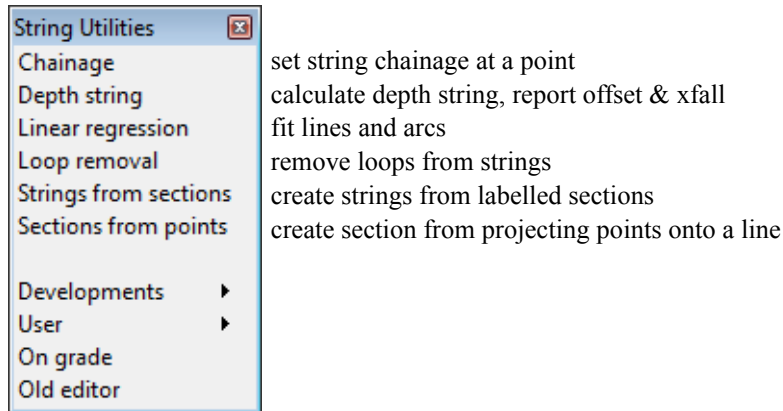
[Download from a WMS](#) in the chapter [File I/O](#)
[WMS Wizard](#) in the chapter [File I/O](#)
[Edit a WMS Image](#) in the chapter [File I/O](#)
[Delete a WMS Image](#) in the chapter [File I/O](#)

Utilities

Position of menu: Strings => Utilities

The **Utilities** menu contains miscellaneous options involving strings.

The **Utilities** walk-right menu is



For the option *Chainage* go to

Depth string

Linear regression

Loop removal

Strings from sections

Sections from points

Developments

On grade

Old editor

[Chainage.](#)

[Depth String](#)

[Linear Regression](#) in the chapter [Survey](#)

[Loop Removal](#)

[Strings from Sections](#)

[Sections from Points](#) in the chapter [Design](#)

[Developments](#)

[On Grade](#)

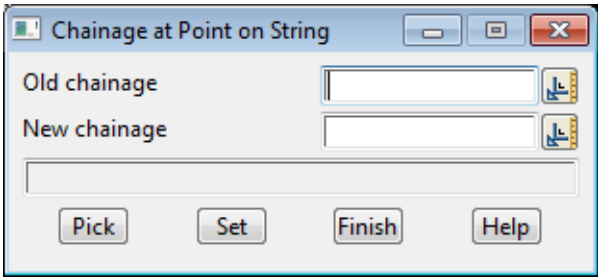
[Old Editor](#)

Chainage

Position of option on menu: Strings =>Utilities =>Chainage

The **chainage** menu option allows the user to specify the start chainage for a string by specifying what the chainage will be at a selected point on the string. The string's start chainage is then adjusted so that the point has the given chainage.

Selecting **chainage** fires up the **chainage at point on string** panel.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Old chainage	<i>reports the initial chainage of the dropped point</i>	output		
New chainage	<i>the new chainage for the dropped point.</i>	input		
Pick	<i>two objects to pick - pick the string to modify the chainage at a point and then pick a point which will be dropped onto the selected string to give the point that will have its chainage modified. The existing chainage on the string of the dropped point is then written to the old chainage panel field.</i>	button		
Set	<i>on selecting set, the start chainage is modified so that the chainage at the picked point is the value in the new chainage field. The old chainage field is then updated with the new chainage.</i>	button		

Please continue to the next section [Depth String](#).

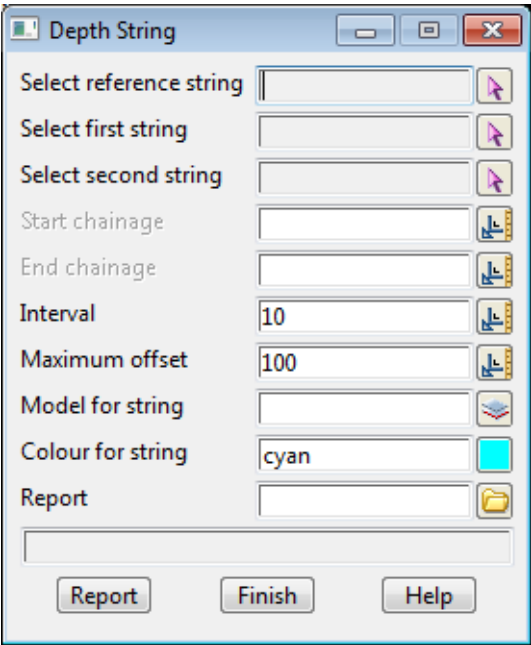
Depth String

Position of option on menu: Strings =>Utilities =>Depth string

The **depth string** option calculates the horizontal and vertical offsets and the cross-fall between two strings and then creates and/or reports on the string.

A reference string is selected which is used to define chainages. Lines perpendicular to the reference string are taken at regular chainages and intersected (in plan) with the first and second strings. The horizontal and vertical offsets and the cross-fall between the two strings are calculated at the intersection points.

On selecting the **Depth string** option, the **Depth string** panel is displayed.



The fields and buttons in this panel are used as follows

Field Description	Type	Defaults	Pop-Up
Start/End chainage	input		
<i>if blank, the start/end chainage of the reference string is used. if non-blank, the given chainage is used as the start/end chainage.</i>			
Interval	input		
<i>chainage interval to calculate values at.</i>			
Maximum offset	input		
<i>if non-blank, the maximum distance to search from the reference string to find the 1st and 2nd strings.</i>			
Model for string	input		available models
<i>if non-blank, a depth string is created and placed in this model.</i>			
Colour for string	input		available colours
<i>the colour for the depth string.</i>			
Report file	input		*.rpt
<i>if non-blank, the file for the offset and cross-fall report</i>			

Ref/1st/2nd button
select the reference/first/second string.

Report button
calculate a depth string and produce an offset and cross-fall report on it.

Please continue to the next section [Linear Regression](#).

Linear Regression

Position of option on menu: Strings =>Utilities =>Linear regression

Position of option on menu: Survey =>Extras =>Linear regression

This option is documented in [Linear Regression](#) in the chapter [Survey](#).

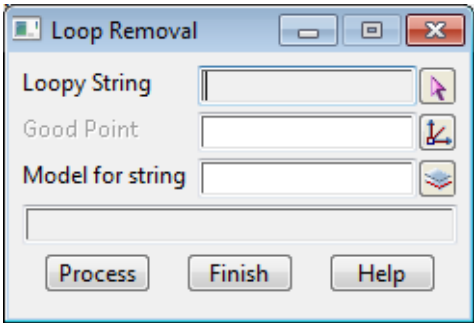
Please continue to the next section [Loop Removal](#).

Loop Removal

Position of option on menu: Strings =>Utilities =>Loop removal

The **loop removal** option tries to remove loops from strings by adding points where the string self intersects and removing the loops at those points. The level of the added points are the mean of the self intersect points.

Selecting **loop removal** fires up the **loop removal** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Loopy string <i>pick the string to try and remove loops from.</i>	string select		
Good point <i>If the automatic loop removal is incorrect, pick a good point on the string.</i>	xyz box		
Model for string <i>model for the processed string to go to.</i>	model box		available models
Process <i>try and remove string points from the loops in the string.</i>	button		

Please continue to the next section [Strings from Sections](#).

Strings from Sections

Position of option on menu: Strings =>Utilities =>Strings from sections

The **strings from sections** option creates strings by joining the common named points on successive 4d strings (usually generated as sections). This option is documented under

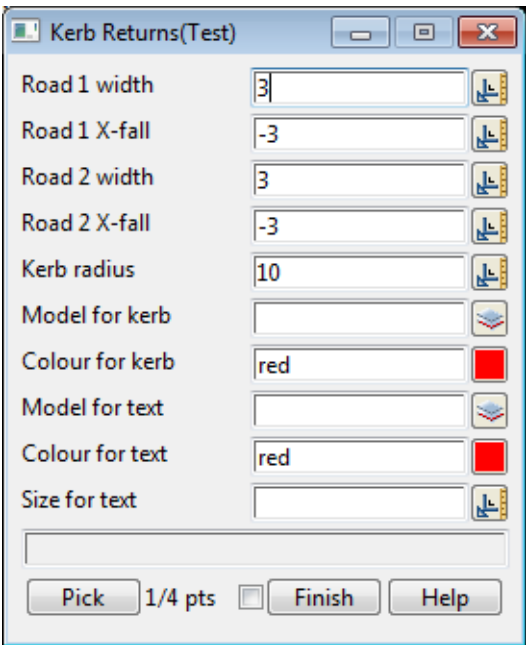
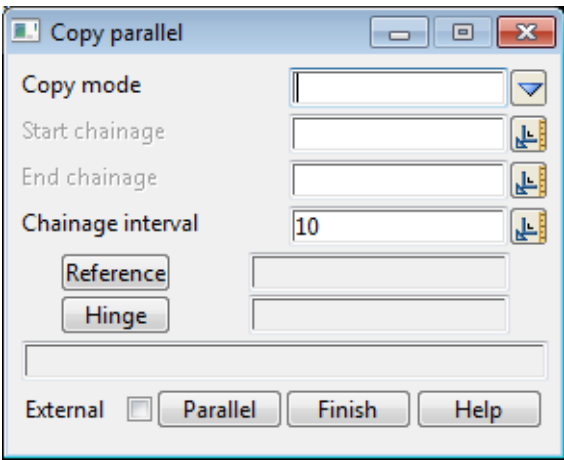
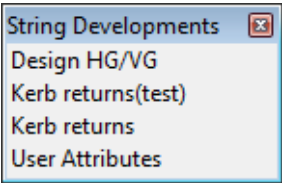
Design => X-Sections => Strings from Sections

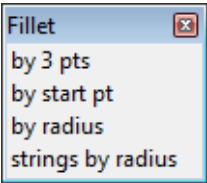
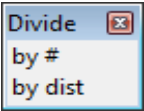
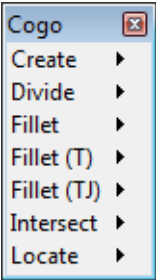
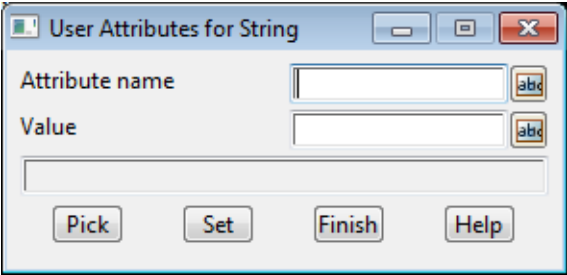
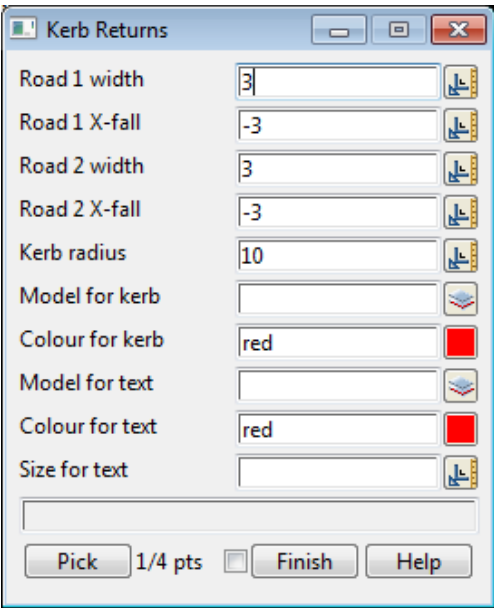
Please go to the section [Strings from Sections](#) in the Chapter [Design](#).

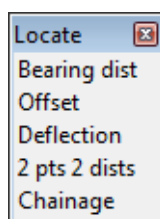
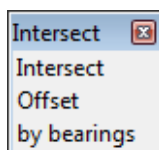
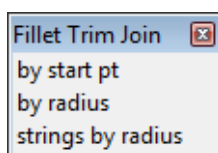
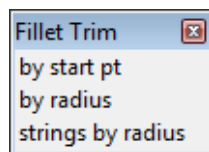
Developments

Position of menu: Strings =>Utilities =>Developments

Some of the options under **string utilities** are still under development, or are being phased out (Cogo (trial)) and won't be documented or released until future versions of 12d Model. The current options on the *Developments* menu are







On Grade

Position of option on menu: Survey =>Extras =>On grade

Position of option on menu: Strings =>Utilities =>On grade

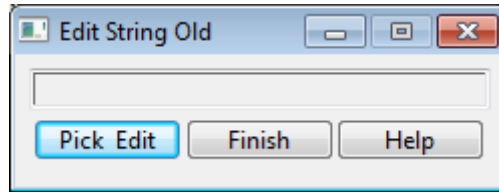
For Information on this option please go to [On Grade](#) in the section [Extras](#)

Old Editor

Position of option on menu: Strings =>Utilities =>Old Editor

This section of documentation is a work in progress and will be updated in subsequent releases.

Selecting **Old editor** brings up the **Edit String Old** panel.

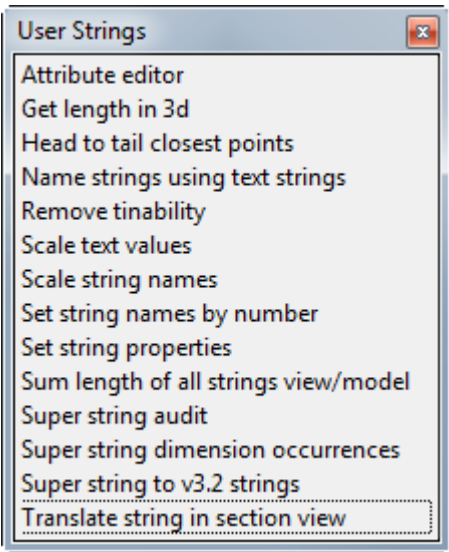


User

Position of option on menu: Strings =>User

The walk-right menu **Strings =>User** has extra macro options. These could be from 12d Solutions or users.

The **User Strings** walk-right menu is



Edit the top 10 attributes
Calculates 3d length

For the option *Attribute Editor*, go to

- Get length in 3d*
- Head to tail closest points*
- Name strings using text strings*
- Remove tinability*
- Scale text values*
- Scale string names*
- Set string names by number*
- Set string properties*
- Sum length of all strings view/model*
- Super string audit*
- Super string dimension occurrences*
- Super string to v3.2 strings*
- Translate string in section view*

- [Attribute Editor](#)
- [Length in 3d](#)
- [XXX Head to Tail Closest Points](#)
- [XXX Name Section Strings by Picking Text](#)
- [XXX Remove Tinability](#)
- [XXX Scale Text Values](#)
- [XXX Scale String Names](#)
- [XXX Set String Names by Number](#)
- [XXX String Operations](#)
- [Total Length of Strings](#)
- [XXX Super String Dimension Occurrences](#)
- [XXX Super String Dimension Occurrences](#)
- [XXX Transform V4 to V3.2](#)
- [XXX Section Move](#)

Attribute Editor

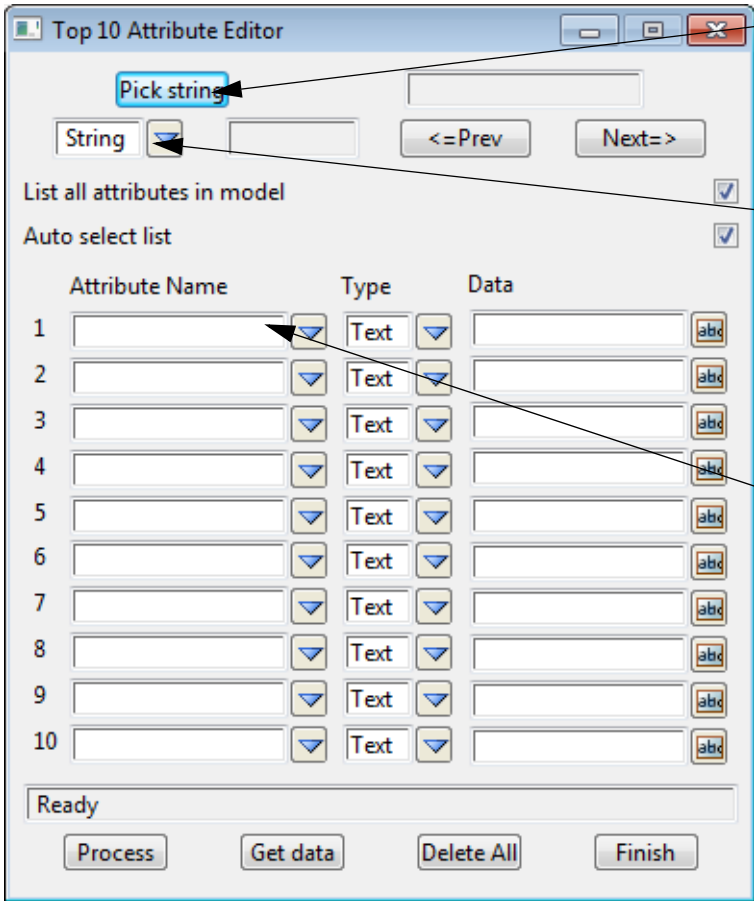
On selecting the **Attribute editor**, the **Top 10 Attribute Editor** panel is displayed.

This option displays ten (10) attributes of type string, vertex or segment for a selected string.

This option was written before the **Strings =>Properties =>Attributes** editor existed and was mainly used for editing drainage data. For more documentation, go to [Attribute Editor](#).

Most of the detailed catchment data is stored within 12d as user defined attributes. These attributes are automatically created by 12d when required but you are free to change them or

add more as desired. The attributes may be exported to a spreadsheet and edited and then imported back into 12d or edited inside 12d using this panel.



First Select **Pick** to select the string that contains the user attributes (the drainage string). The strings will be highlighted in white when they are selected.

All catchment data is store with the pits in drainage strings. To access the pit attributes, select the drop down icon and then select **Pit**. A circle will be drawn around the pit selected. **Next** and **Prev** will now move you from pit to pit.

Select the drop down icon and then select the **Attribute Name** from the list of existing user defined attributes. These attributes include all of the attributes in the model that the string exists in.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
pick string <i>used to pick the initial string in a model</i>	button		
string-pit-pipe <i>select the type of attribute to be displayed. Pit and pipe attributes are only available for drainage strings.</i>	choice box		string, pit, pipe
attribute name <i>3 top 10 attributes lists are maintained (pit, pipe and string). The attributes that you can select from are all of the attributes that exist on all of the strings in the model. If the attribute does not exist for the string/pit/pipe that you are displaying the data field will display Not found.</i>	input box		
type <i>for existing attributes this will display Text, Real or Integer. When defining a new attribute select the type of data to be stored in the attribute</i>	choice box		Text, Real, Integer
data	input box		

the data stored in the attribute is displayed/edited/created in this field.

<= prev	button
<i>move to next</i>	<i>string in the model</i>
	<i>pit on the string</i>
	<i>pipe on the string</i>

next =>	button
<i>move to next</i>	<i>string in the model</i>
	<i>pit on the string</i>
	<i>pipe on the string</i>

process	button
<i>updates the attributes displayed in the dialogue.</i>	

Notes:

First select Pick to select the string that contains the user attributes. All catchment data is stored with the pits in drainage strings. The strings will be highlighted in white when they are selected.

To access the pit attributes **LB** this field then select **Pit**. A circle will be drawn around the pit selected.

LB the **Attribute Name** field and then select from the list of existing user defined attributes. These attributes include all of the attributes in the model that the string exists in. They may not be defined for the string you are editing. If the string does not have that attribute defined **not found** will be displayed in the **Data** field.

To change the value for the attribute enter the new value in the **data** field. If the attribute does not exist, deleting the **not found** text and adding data will create it. The following message will be displayed whenever you are creating a new attribute.

For more documentation on setting the attributes for this option, go to [Attribute Editor](#)

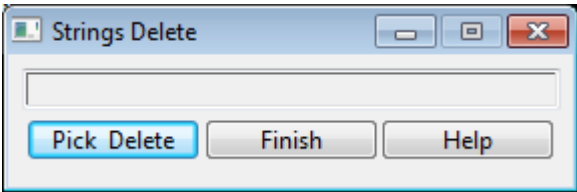
Delete

Position of option on menu: Strings =>Delete

Entire strings can be deleted from **12d Model** using the **delete** option.

Any number of strings can be deleted by successively selecting the strings.

On selecting the **delete** string option, the **strings delete** panel is displayed.



Field Description	Type	Defaults	Pop-Up
Pick & Delete	button		
<i>any selected strings are deleted.</i>			
<i>The cycle is terminated by clicking RB to raise the pick ops menu and selecting cancel from it.</i>			

Old String Create and Editors

Old

Position of option on menu: Strings =>Create =>Old

These old options are the string creation options that were available before **12d Model 8** was released.

The **Create** option is used to produce **new** strings. If a string already exists, the **Editor** option is used to modify it.

The **Create** walk-right menu contains options to create 2d, 3d, 4d, alignment, super alignment, circles, arcs, feature, pipe, polyline, super and text strings.

Each string type has its own special information so by choosing the appropriate type to be created, only information needed for that type of string is asked for.

Once a string has been created, it can be converted to most of the other string types using the string **Convert** option.

To create a new string of the same type and with similar header information as an existing string, the **same as** option is selected from the **String Create** menu.

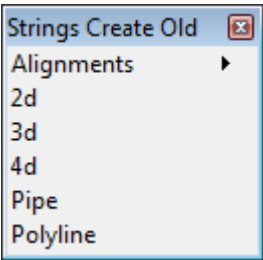
Notes

1. Depending on its breakline (point-line) type, a string with default style ("1") is displayed with crosses at each of its vertex (point type) or with straight lines joining the vertices (line type).

Linestyles can be defined that drawn lines between the points even though the breakline type is **point**.

2. The string vertices are also called intersection points (IP's).

The **String Create Old** walk-right menu is



The string creation process is similar for each string type and for editing strings as well.

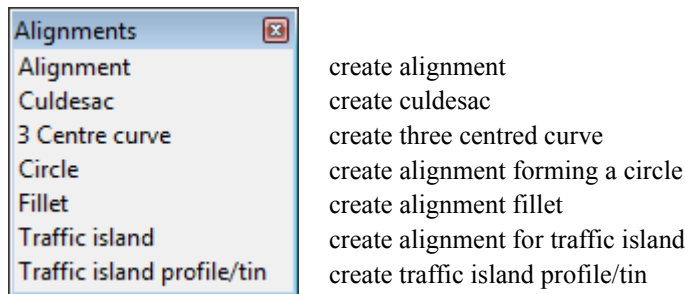
For the option <i>Alignments</i> , go to	Alignments
2d	Create - 2d (pre V8)
3d	Create - 3d (pre V8)
4d	Create - 4d (Pre V8)
Pipe	Create - Pipe (Pre V8)
Polyline	Create - Polyline (Pre V8)

Alignments

Position of menu: Strings =>Create =>Old =>Alignments

The **Alignment** walk-right menu contains options to create an alignment string, plus quick methods of creating an alignment string with horizontal geometry already created for culdesacs, circles

and fillets.



For the option *Alignment*, go to

Culdesac

3 centre curve

Circle

Fillet

Traffic island

Traffic island profile/tin

[Create - Alignment.](#)

[Create - Culdesac](#)

[Create - three centre curve](#)

[Create - circle](#)

[Create - fillet](#)

[Create Traffic Island](#)

[Traffic Island Profile/Tin](#)

Create - Alignment

Position of option on menu: Strings =>Create =>Old =>Alignments =>Alignment

An alignment string is defined by specifying both its horizontal and vertical geometry.

The horizontal geometry consists of a series of (x,y) points (called horizontal intersection points) with circular curves and transition spirals applied to the intersection points.

Vertical geometry also consists of a series of points but they are defined with respect to the plan length of the string (chainage) and height. Hence, the vertical geometry is defined by a series of (chainage,height) points (called vertical intersection points) and either parabolic or circular curves applied to the vertical intersection points.

The horizontal geometry is defined in a plan view and the vertical geometry in a section view.

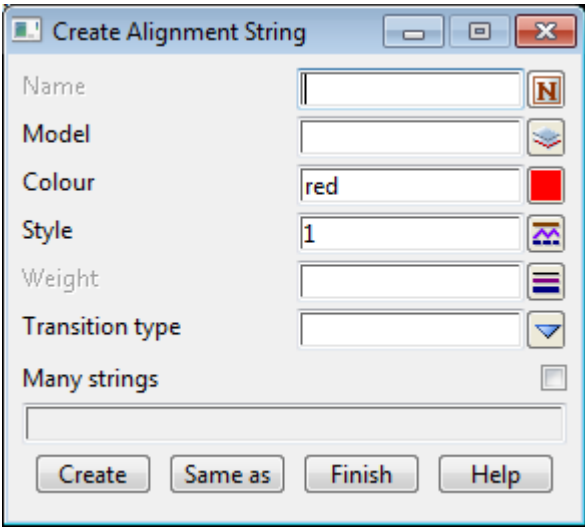
Alignment strings are often referred to as "centre-line strings" because road centre-lines are common examples of alignment strings.

Note vertical geometry can only be added to an **existing** string.

The **Many strings** tick-box is used when more than one string of the same type is to be created, If **many strings** is set to *tick*, when the current string creation is **Finished** or **Quit**, a new **Create Alignment String** panel is placed on the screen with the same information in it as the string just created. If any of the information needs to be modified for the new string, simply change it in the **Create Alignment String** panel fields before selecting the **Create** button for the new string. Hence a new string of the same type can be created without going back to the **Create** menu.

The **Same as** button is used to obtain information from an existing string (not necessarily of the same type) and pipe it into the name, colour, model, style breakline type and height field of the **Create Alignment String** panel.

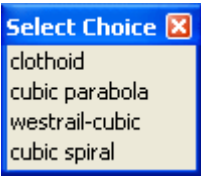
On selecting the **Alignment string** option, the **Create Alignment String** panel is displayed.



To create a new alignment string, the name, model, colour, style and transition spiral type of the new string are entered into the appropriate fields and the **Create** button selected.

The new fields and buttons used in the **Create Alignment String** panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Name	<i>the name of the new string.</i>	input		
Model	<i>name of the model that the new string is in.</i>	input		available models
Colour	<i>the colour of the new string.</i>	input	default colour	available colours
Style	<i>line style of the string.</i>	input	1	available line styles
Weight	<i>thickness of the string.</i>	input	0	
Transition type	<i>transition (for example clothoid spiral) to be used for this alignment string. For more information see Transitions and Spirals File in the chapter Setting Up and Configuring 12d.</i>	input	clothoid	clothoid, cubic parabola westrail-cubic, cubic spiral



Many strings tick
if ticked then after the current string is finished, a new create panel is placed on the screen with all the same values for the panel fields as the current string.

Create button

*After the **create** button is chosen, the **alignment edit** menu and **alignment edit info** panel are displayed.*

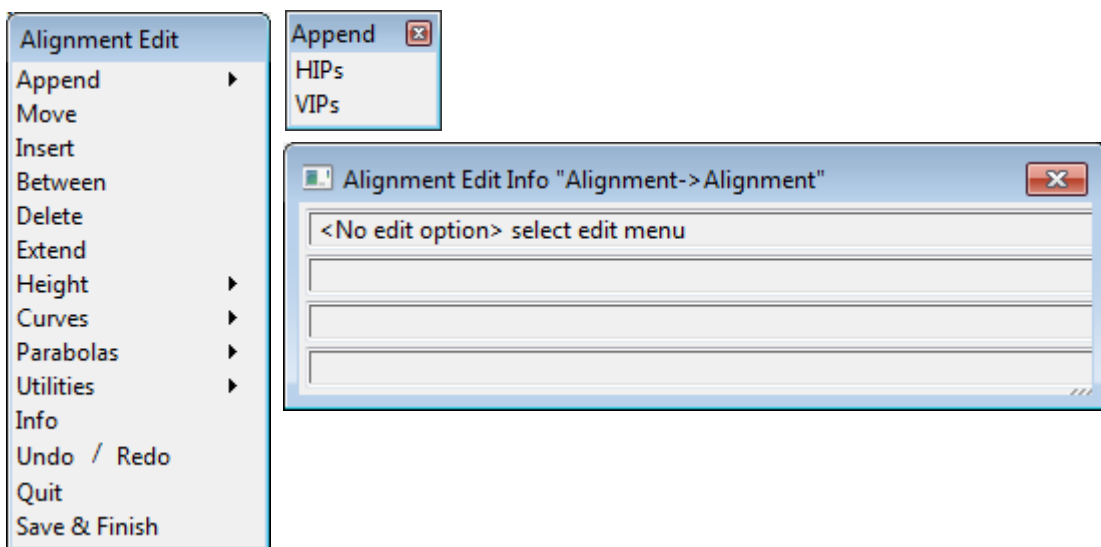
Same as button

*After the **same as** button is chosen, another string is selected and information about it is used for the fields in this panel.*

Alignment Edit

Selecting the **create** button in the **create alignment string** panel the **alignment edit** menu and **alignment edit info** panel are placed on the screen.

The **alignment edit** menu and **alignment edit info** panel for an alignment string are



To begin creating an alignment string, the user must select the **Append=>HIPs** option from the **Alignment Edit** menu and start placing points in a plan view.

To create a new alignment string, select the **Append => HIPs** option from the **Alignment Edit** menu.

The **Append =>HIPs** option is used to add horizontal intersection points to either end of an existing alignment string, or in the case of a new string, places the 1st point and then begins appending points to the 1st point.

For all alignment strings, a cross is then drawn in each plan view that the string's model is on, and the cross follows the cursor around the screen. If the string's model is **not** added to any plan view, the model is automatically added to **all** plan views.

After the cross is on the screen (moving with the cursor), clicking LB and accepting with MB selects the **1st** vertex of the string (using the appropriate snaps).

The string is then drawn from the 1st vertex to the cursor position, which represents the second vertex of the string. Clicking LB and accepting with MB selects the second string vertex and the process repeats for subsequent string vertices.

Now that the string is created, all the edit option on the string's **Alignment Edit** menu are usable.

The options in the **Alignment Edit** menu are not only used for placing the initial vertices of the string, but for editing the string once it is created. Since the **Append** and other options in the **Alignment edit** menu are identical to the options used when editing an existing string, they will be discussed in detail in the string **Editor** section.

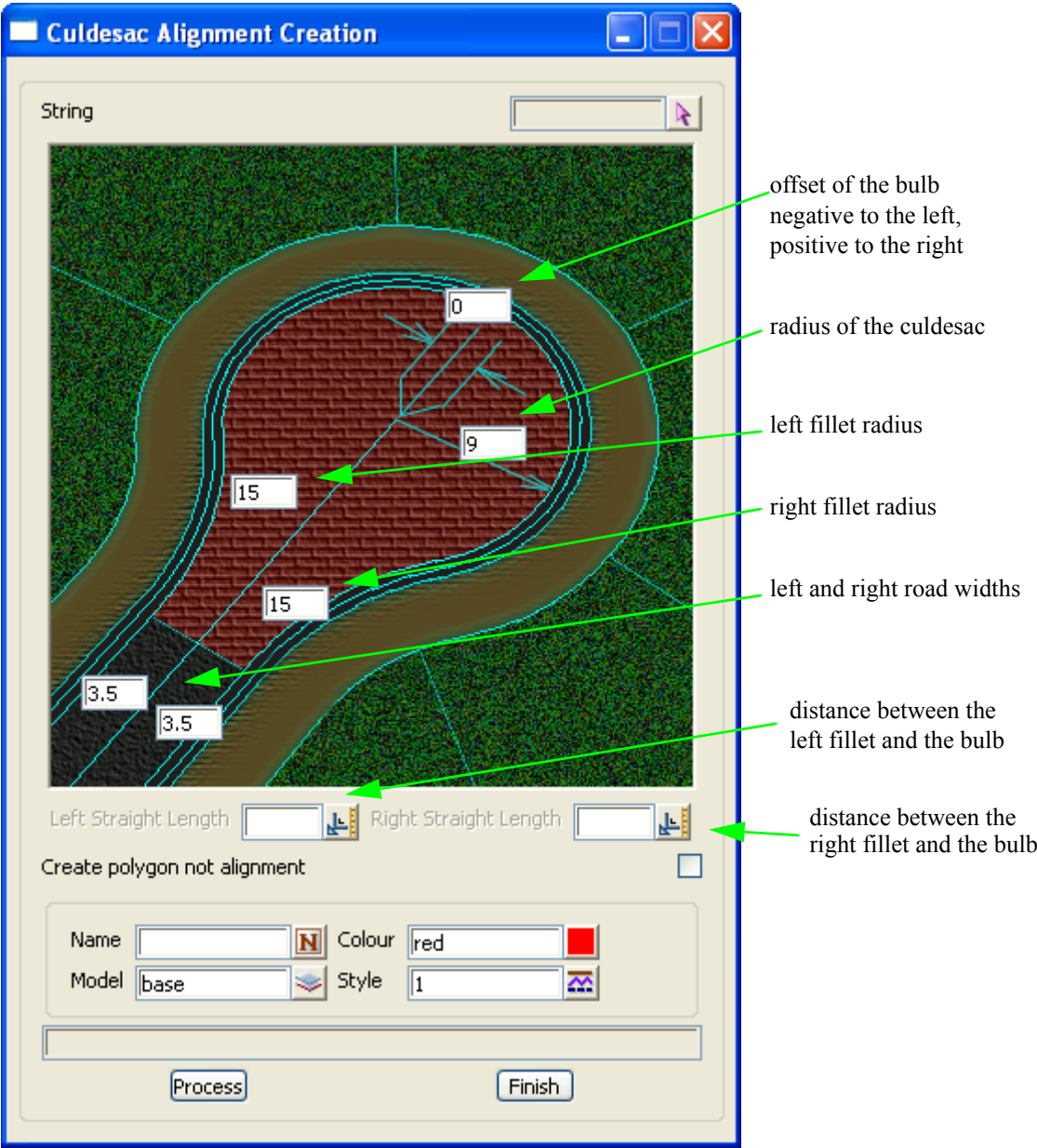
For full information on the Alignment Editor, go to the section [Alignment Edit](#)

Create - Culdesac

Position of option on menu: Strings =>Create =>Old =>Alignments =>Culdesac

Create an alignment string for a culdesac for user defined road widths, culdesac radius and offset. No vertical geometry is defined.

On selecting the Culdesac option, the Culdesac Alignment Creation panel is displayed.



The position of the panel fields indicate what the values are for. Tool tips appear when the cursor is passed over the panel fields.

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Offset	input box		
<i>offset of the centre of the culdesac bulb. Use a negative value if the offset is to the left, positive if the offset is to the right.</i>			

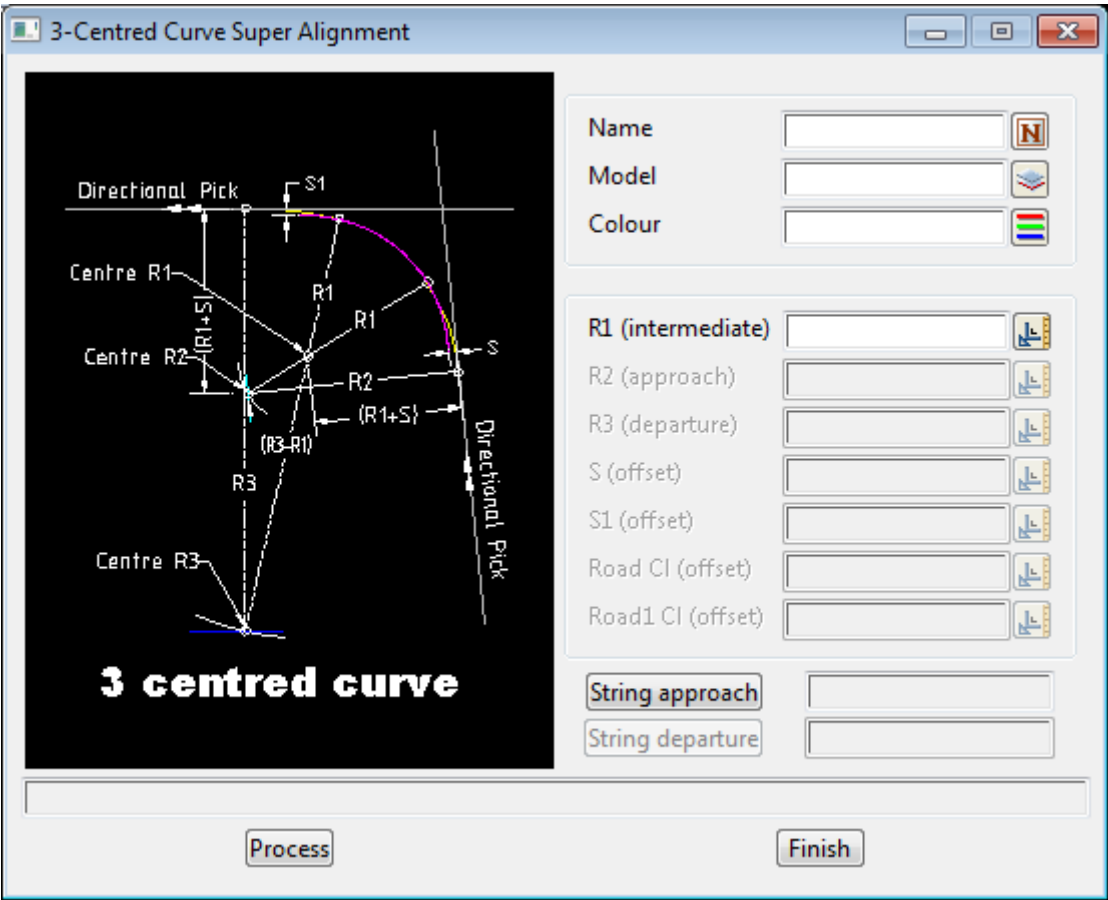
- Radius** input box
radius of the culdesac bulb
- Left/Right fillet radii** input box
radii for the left and right fillets from the roads to the culdesac bulb.
- Left/Right road widths** input box
left and right widths of the road.
- Name/Model/Colour/Style** input box
name/model/colour/style of the created alignment string.
- Select** string select
select with direction the string to create the culdesac for.
- Preview** string select
draw the culdesac with the given parameters in the panel draw box.
- Process** button
create the alignment string
- Undo** button
undo the last alignment string created whilst the panel has been active.

Create - three centre curve

Position of option on menu: Strings =>Create =>Old =>Alignments =>3 Centre Curve

Create an alignment string for a three centred curve for user defined parameters and selected strings.

On selecting the 3 centre curve option, the 3 centred curve construction panel is displayed.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Name/Model/Colour/Style	input box		
<i>name/model/colour/style of the created alignment string.</i>			
R1 (intermediate)	input box		
<i>radius of the intermediate curve. If a value is entered and <enter> typed, values for R2, R3, S and S1 are computed and place in the appropriate fields</i>			
R2 (approach)	input box		
<i>radius of the approach curve.</i>			
R3 (departure)	input box		
<i>radius of the departure curve.</i>			
S (offset)	input box		
<i>approach offset.</i>			
S1 (offset)	input box		

departure offset.

Kerb line approach string select
select the approach string

Kerb line departure string select
select the departure string

Process button
create the alignment string

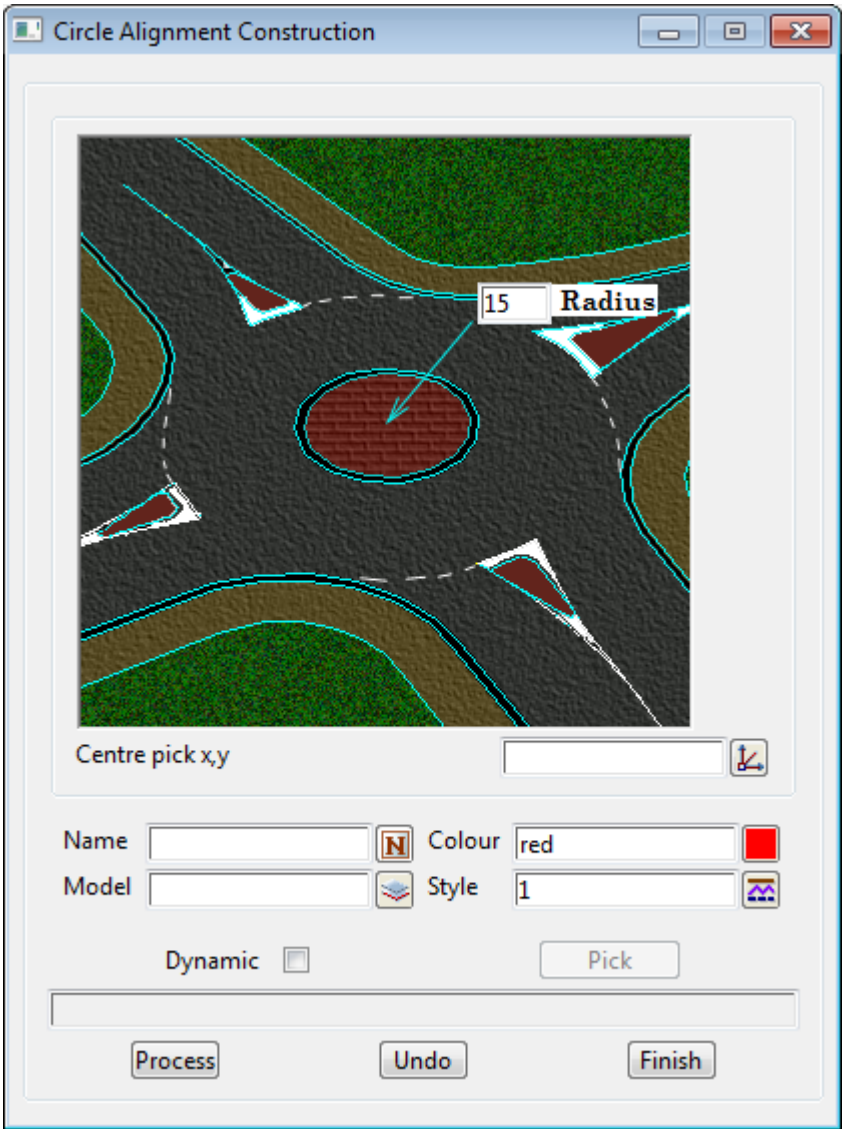
Undo button
undo the last alignment string created whilst the panel has been active.

Create - circle

Position of option on menu: Strings =>Create =>Old =>Alignments =>Circle

Create an alignment string for a circle with a for user radius and selected centre or with a dynamic mode set, selected centre and interactively positioned circumference.

On selecting the curve option, the circle alignment construction panel is displayed.



The diagram indicates what the panel fields are for. Tool tips appear when the cursor is passed over the panel.fields.

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Radius <i>the radius of the circle.</i>	input box		
Centre pick x,y <i>if Dynamic in not ticked, select the centre of the circle.</i>	x,y,z box		
Name/Model/Colour/Style	input box		

name/model/colour/style of the created alignment string.

Dynamic tick box

*if not ticked, then the **Centre pick x,y** and **radius** fields are used to define the circle.*

*if ticked, then the **Pick** button is used to select the centre and then the cursor is taken to be on the circle to dynamically define the radius.*

Pick button

pick the circle centre when in dynamic mode.

Process button

create the alignment string.

Undo button

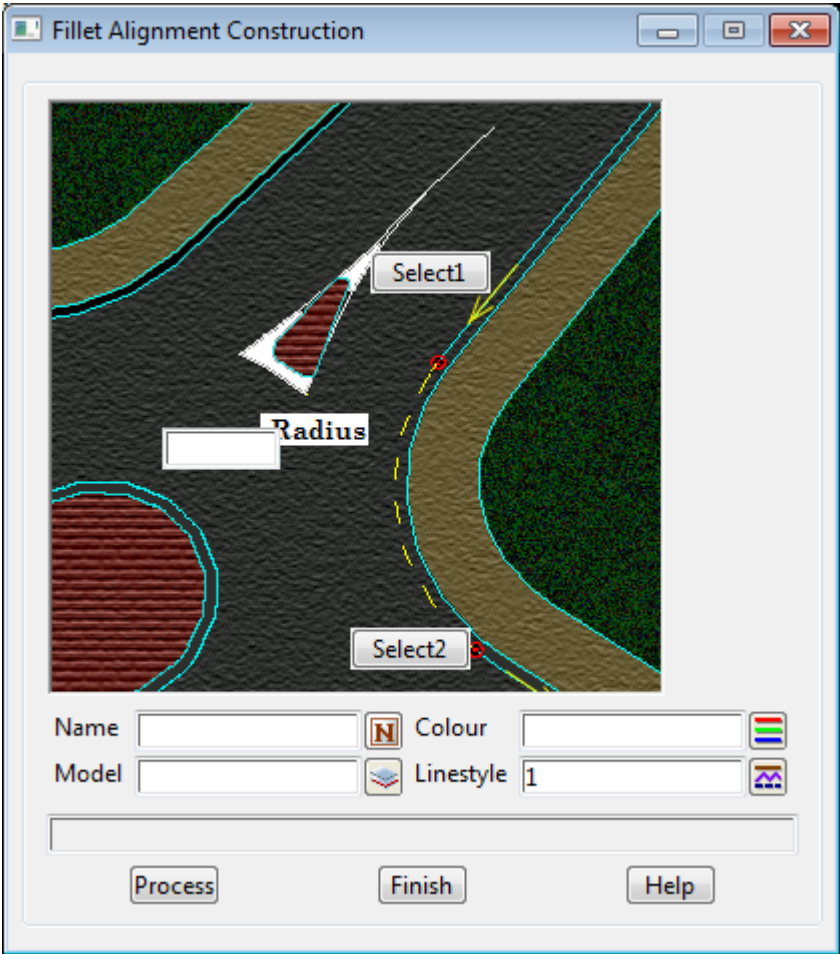
undo the last alignment string created whilst the panel has been active.

Create - fillet

Position of option on menu: Strings =>Create =>Old =>Alignments =>Fillet

Create an alignment string for a fillet with a for user radius and selected in and out strings.

On selecting the fillet option, the fillet alignment construction panel is displayed.



The diagram indicates what the panel fields are for. Tool tips appear when the cursor is passed over the panel.fields.

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Select 1 <i>select the approach string. Pick with direction.</i>	string select		
Radius <i>the radius of the fillet.</i>	input box		
Select 2 <i>select the departure string. Pick with direction.</i>	string select		
Name/Model/Colour/Style <i>name/model/colour/style of the created alignment string.</i>	input box		
Process <i>create the alignment string.</i>	button		

Undo button

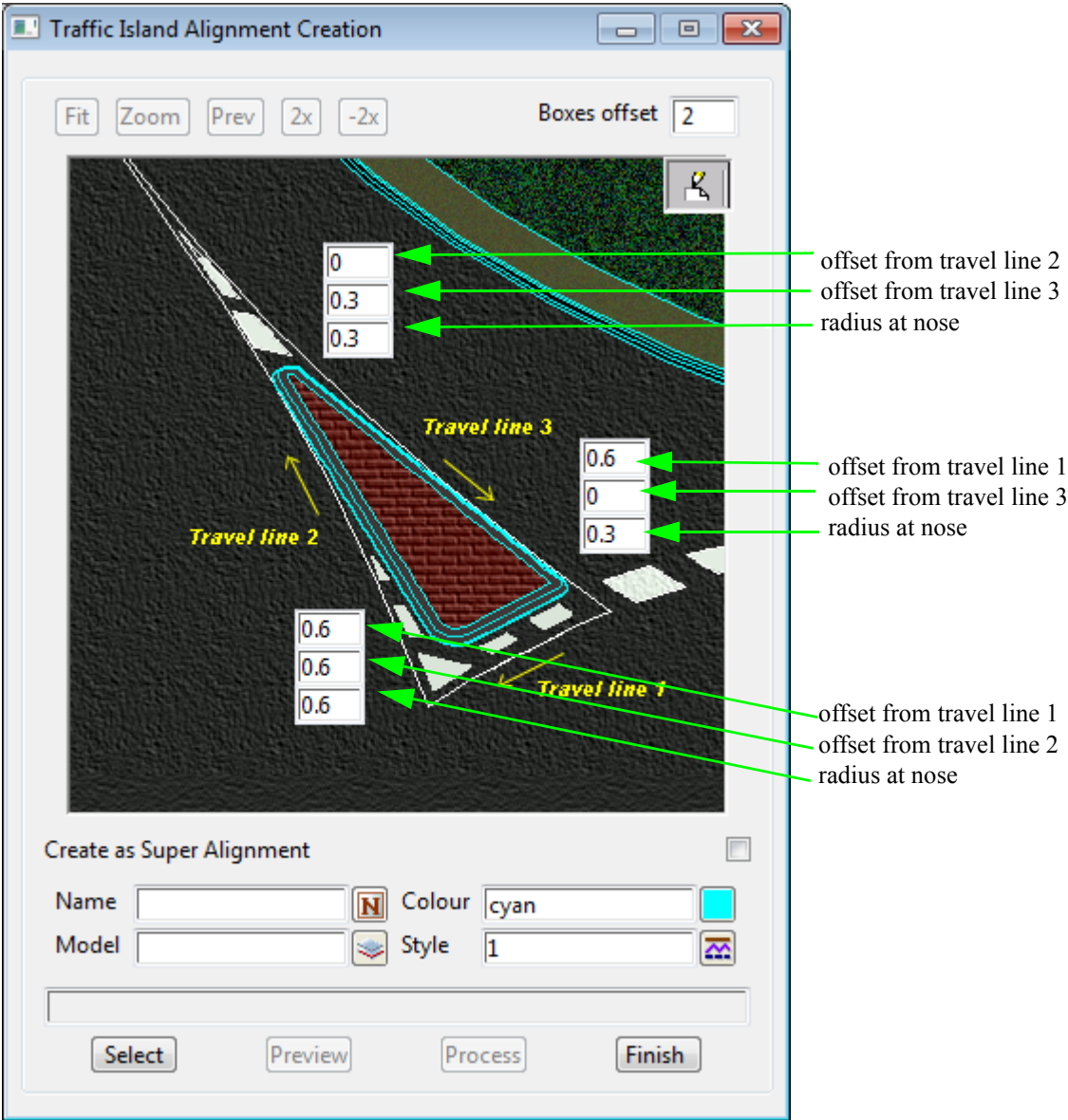
undo the last alignment string created whilst the panel has been active.

Create - Traffic Island

Position of option on menu: Strings =>Create =>Old =>Alignments =>Traffic Island

Create an alignment string for a traffic island between user selected strings and with user defined offsets from the strings and nose radii. No vertical geometry is defined.

On selecting the traffic island option, the traffic island alignment creation panel is displayed.



The position of the panel fields indicate what the values are for. Tool tips appear when the cursor is passed over the panel fields.

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Offset from travel lines	input box		
<i>offset distance from the selected travel lines.</i>			
Radius at nose	input box		
<i>radius of the corner of the traffic island between the selected travel lines.</i>			

Name/Model/Colour/Style input box

name/model/colour/style of the created alignment string.

Select strings select

select in order and with direction, the three strings to use in creating the traffic island. Terminate by clicking RB and selecting cancel from the pick ops menu.

Preview string select

draw the traffic island with the given parameters in the panel draw box.

Process button

create the alignment string

Undo button

undo the last alignment string created whilst the panel has been active.

Create - 2d (pre V8)

Position of option on menu: Strings =>Create =>Old =>2d

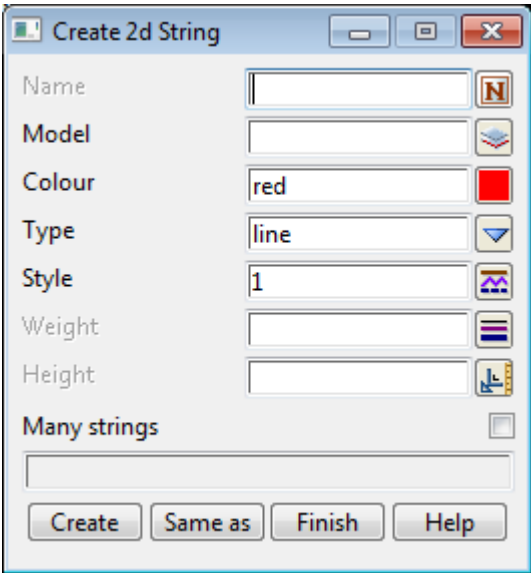
A 2d string consists of a series of (x,y) vertices all with the same z-value (height). 2d strings are often referred to as “contour strings” because contours are the most common example of a string with a constant height.

The **Many strings** tick-box is used when more than one string of the same type is to be created, If **many strings** is set to *tick*, when the current string creation is **Finished** or **Quit**, a new **Create 2d String** panel is placed on the screen with the same information in it as the string just created. If any of the information needs to be modified for the new string, simply change it in the **Create 2d String** panel fields before selecting the **Create** button for the new string. Hence a new string of the same type can be created without going back to the **Create** menu.

The **Same as** button is used to obtain information from an existing string (not necessarily of the same type) and pipe it into the name, colour, model, style, breakline type and height field of the **Create 2d String** panel.

From **12d Model 8** onwards, the default is to create **2d super strings** rather than the **2d strings** used up to **12d Model 7**. A **2d super string** is a **super string** with **Constant height**. That is, there is only one z-value for the entire string. The advantage of using a **2d super string** is that all the CAD options will work for it and it can be given point id's for setout.

On selecting the 2d string option, the **create 2d string** panel is displayed.



The default values for the panel fields are taken from the **CAD Controlbar** (see [CAD, Symbol and Text Controlbars](#))

To **create a new** 2d string, the name, colour, model, point-line type and height of the new string are entered into the appropriate fields and the **Create** button selected.

The new fields and buttons used in the **create 2d string** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name <i>the name of the new string.</i>	input		
Model <i>name of the model that the new string is in.</i>	input		available models

Colour <i>the colour of the new string.</i>	input	default colour	available colours
Type <i>breakline type (point-line type) of the string.</i>	input	line	line, point
Style <i>line style of the string.</i>	input	1	available line styles
Weight <i>thickness of the string.</i>	input	0	
Height <i>height (z-value) of the entire string.</i>	input		
Many strings <i>if ticked then after the current string is finished, a new create panel is placed on the screen with all the same values for the panel fields as the current string.</i>	tick		
Create <i>After the create button is chosen, the 2d edit menu and 2d edit info panel are displayed.</i>	button		
Same as <i>After the same as button is chosen, another string is selected and information about it is used for the fields in this panel.</i>	button		
Finish <i>end the option, don't proceed to the edit stage.</i>	button		

2d Edit for New String

On selecting the **Create** button in the **Create 2d String** panel the **2d edit** menu and **2d Edit Info** panel are placed on the screen.

The **2d edit** menu for a 2d string is and the **2d edit info** panel is

2d Edit

Append

Move

Insert

Between

Delete

Extend

Height

Open

Close

Properties

Info

Undo / Redo

Quit

Save & Finish

append or prepend an IP

move an IP

insert an IP

insert IP on line joining IPs

delete an IP

extend an IP

modify the string's z-value

open a closed string

close a string

bring up Properties panel

toggle edit info panel

undo/redo

quit the create

finish the 2d create

2d Edit Info "2d->2d"

<No edit option> select edit menu

To create a new 2d string, select the **Append** option from the **2d Edit** menu.

The **Append** option is used to add points to either end of an existing string, or in the case of a new string, places the 1st point and then begins appending points to the 1st point.

For all 2d strings, a cross is then drawn in each plan view that the string's model is on, and the cross follows the cursor around the screen. If the string's model is **not** added to any plan view, the model is automatically added to **all** plan views.

After the cross is on the screen (moving with the cursor), clicking LB and accepting with MB selects the **1st** vertex of the string (using the appropriate snaps).

The string is then drawn from the 1st vertex to the cursor position, which represents the 2nd vertex of the string. Clicking LB and accepting with MB selects the second string vertex and the process repeats for subsequent string vertices.

Now that the string is created, all the edit option on the string's **2d Edit** menu are usable.

The options in the **2d Edit** menu are not only used for placing the initial vertices of the string, but for editing the string once it is created. Since the **Append** and other options in the **2d Edit** menu are identical to the options used when editing an existing string, they will be discussed in detail in the string **Editor** section.

For full information in the 2d Editor, go to the section [2d Edit - Old](#)

Create - 3d (pre V8)

Position of option on menu: Strings =>Create =>Old =>3d

A 3d string consists of a series of (x,y,z) points.

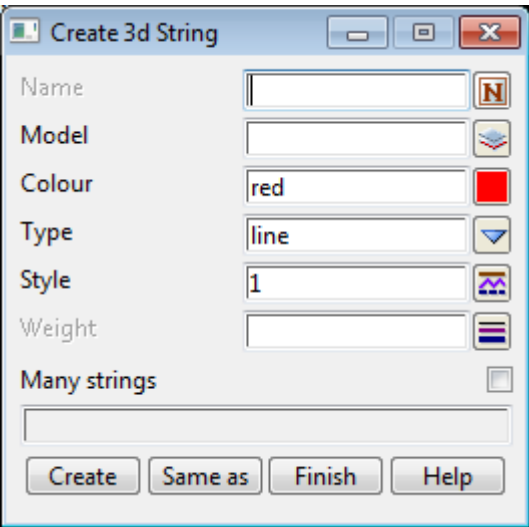
The difference between a 2d and a 3d string is that for a 3d string, the z-value (height) can vary at each string point, whereas a 2d string has a constant height for the entire string. Hence a 2d string is simply a special case of a 3d string where the heights at all the points are the same.

Creating and editing a 3d string is very similar to a 2d string. The only major difference is that a height is required at each string point.

The **Many strings** tick-box is used when more than one string of the same type is to be created, If **many strings** is set to *tick*, when the current string creation is **Finished** or **Quit**, a new **Create 3d String** panel is placed on the screen with the same information in it as the string just created. If any of the information needs to be modified for the new string, simply change it in the **Create 3d String** panel fields before selecting the **Create** button for the new string. Hence a new string of the same type can be created without going back to the **Create** menu.

The **Same as** button is used to obtain information from an existing string (not necessarily of the same type) and pipe it into the name, colour, model, style breakline type and height field of the **Create 3d String** panel.

On selecting the 3d string option, the **create 3d string** panel is displayed.



To **create** a new 3d string, the name, colour, model and point-line type of the new string are entered into the appropriate fields and the **create** button selected.

To **create** a new 2d string, the name, colour, model, point-line type and height of the new string are entered into the appropriate fields and the **Create** button selected.

The new fields and buttons used in the **create 3d string** panel have the following functions.

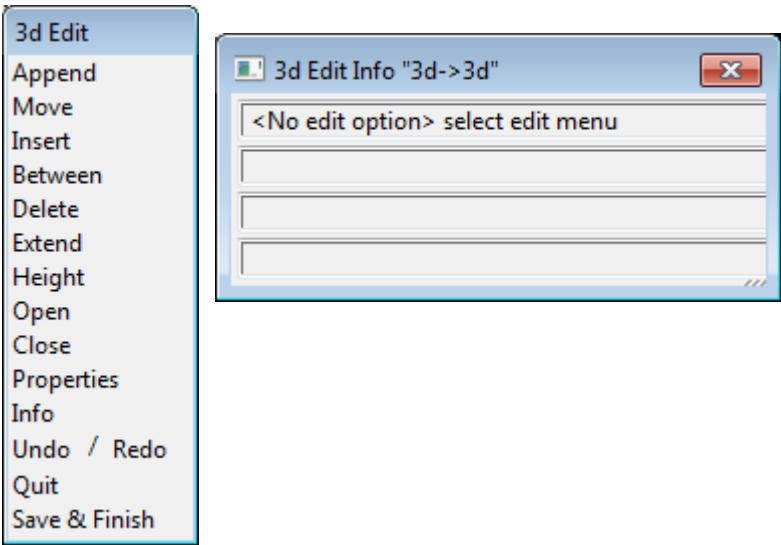
Field Description	Type	Defaults	Pop-Up
Name <i>the name of the new string.</i>	input		
Model <i>name of the model that the new string is in.</i>	input		available models
Colour <i>the colour of the new string.</i>	input	default colour	available colours

Type	input	line	line, point
breakline type (point-line type) of the string.			
Style	input	1	available line styles
line style of the string.			
Weight	input	0	
thickness of the string.			
Many strings	tick		
if ticked then after the current string is finished, a new create panel is placed on the screen with all the same values for the panel fields as the current string.			
Create	button		
After the create button is chosen, the 3d edit menu and 3d edit info panel are displayed.			
Same as	button		
After the same as button is chosen, another string is selected and information about it is used for the fields in this panel.			

3d Edit

Selecting the **create** button in the **create 3d string** panel the **3d edit** menu and **3d edit info** panel are placed on the screen.

The **3d edit** menu and panel for a 3d string are



To create the new 3d string, select the **Append** option from the **3d Edit** menu.

The **Append** option is used to add points to either end of an existing string, or in the case of a new string, places the 1st point and then begins appending points to the 1st point.

For all 3d strings, a cross is then drawn in each plan view that the string's model is on, and the cross follows the cursor around the screen. If the string's model is **not** added to any plan view, the model is automatically added to **all** plan views.

After the cross is on the screen (moving with the cursor), clicking LB and accepting with MB selects the **1st** vertex of the string (using the appropriate snaps).

The string is then drawn from the 1st vertex to the cursor position, which represents the second vertex of the string. Clicking LB and accepting with MB selects the second string vertex and the process repeats for subsequent string vertices.

Now that the string is created, all the edit option on the string's **3d Edit** menu are usable.

The options in the **3d Edit** menu are not only used for placing the initial vertices of the string, but for editing the string once it is created. Since the **Append** and other options in the **3d edit** menu are identical to the options used when editing an existing string, they will be discussed in detail in the string **Editor** section.

For full information in the 3d Editor, go to the section [3d Edit - Old](#)

Create - 4d (Pre V8)

Position of option on menu: Strings =>Create =>4d

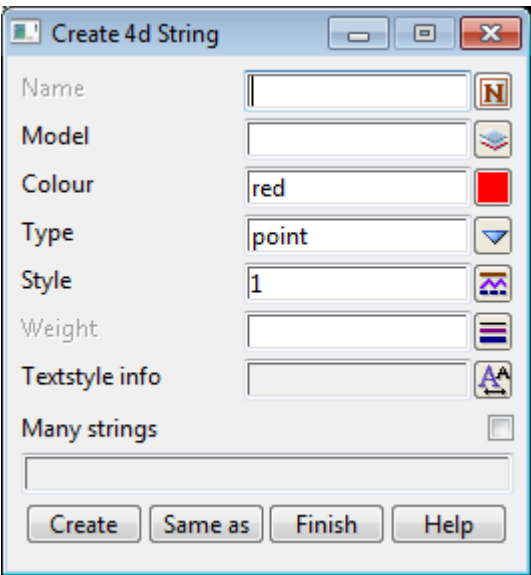
A 4d string consists of a series of (x,y,z) points and a text label at each point.

Creating and editing a 4d string is very similar to a 3d string.- the major difference is that a height and a text label is required at each string point.

The **Many strings** tick-box is used when more than one string of the same type is to be created, If **many strings** is set to *tick*, when the current string creation is **Finished** or **Quit**, a new **Create 4d String** panel is placed on the screen with the same information in it as the string just created. If any of the information needs to be modified for the new string, simply change it in the **Create 4d String** panel fields before selecting the **Create** button for the new string. Hence a new string of the same type can be created without going back to the **Create** menu.

The **Same as** button is used to obtain information from an existing string (not necessarily of the same type) and pipe it into the name, colour, model, style breakline type and height field of the **Create 4d String** panel.

On selecting the **4d string** option, the **create 4d string** panel is displayed.



To **create** a new 4d string, the name, colour, model, point-line type, text size and units, offset, justification and angle for the new string are entered into the appropriate fields and the **create** button selected.

The new fields and buttons used in the **create 4d string** panel have the following functions.

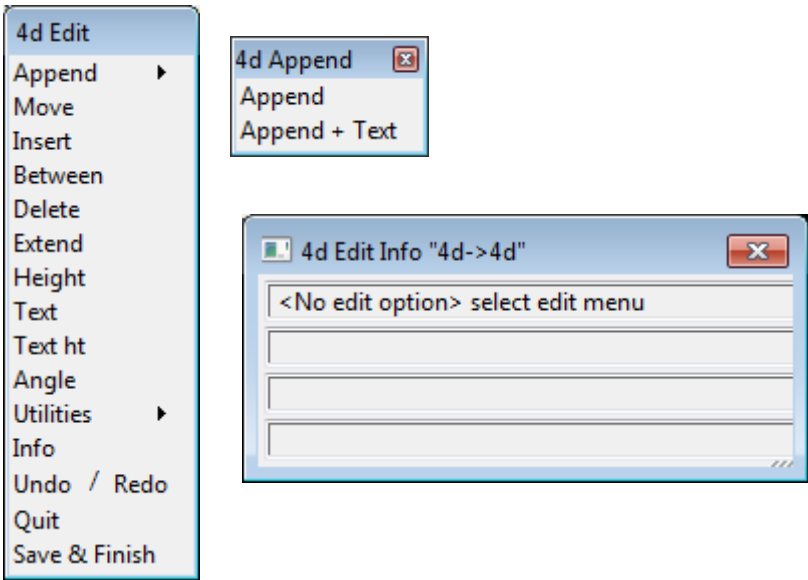
Field Description	Type	Defaults	Pop-Up
Name <i>the name of the new string.</i>	input		
Model <i>name of the model that the new string is in.</i>	input		available models
Colour <i>the colour of the new string.</i>	input	default colour	available colours
Type <i>breakline type (point-line type) of the string.</i>	input	line	line, point

Style <i>line style of the string.</i>	input	1	available line styles
Weight <i>thickness of the string.</i>	input	0	
Textstyle info <i>textstyle information.</i>	input		
Many strings <i>if ticked then after the current string is finished, a new create panel is placed on the screen with all the same values for the panel fields as the current string.</i>	tick		
Create <i>After the create button is chosen, the 4d edit menu and 4d edit info panel are displayed.</i>	button		
Same as <i>After the same as button is chosen, another string is selected and information about it is used for the fields in this panel.</i>	button		

4d Edit

Selecting the **create** button in the **create 4d string** panel the **4d edit** menu and **4d edit info** panel are placed on the screen.

The **4d edit** menu and panel for a 4d string are



To create a new 4d string, the user must select one of the two Append options on the **Append** walk-right of the **4d Edit** menu which has options to simply create points or to create points and text at the points.

The **Append** and **Append + text** options are used to add points and text (in a plan view) to either end of an existing string, or in the case of a new string, places the 1st point and text and then begins appending points and text to the 1st point.

For all 4d strings, a cross is then drawn in each plan view that the string's model is on, and the cross follows the cursor around the screen. If the string's model is **not** added to any plan view, the model is automatically added to **all** plan views.

After the cross is on the screen (moving with the cursor), clicking LB and accepting with MB

selects the **1st** vertex of the string (using the appropriate snaps).

If **Append + text** was selected, the user will then be prompted for the text to be placed at that points.

The string and text is then drawn from the 1st vertex to the cursor position, which represents the second vertex of the string. Clicking LB and accepting with MB selects the second string vertex and the process repeats for subsequent string vertices.

Now that the string is created, all the edit option on the string's **4d Edit** menu are usable.

The options in the **4d Edit** menu are not only used for placing the initial vertices of the string, but for editing the string once it is created. Since the **Append** and other options in the **4d edit** menu are identical to the options used when editing an existing string, they will be discussed in detail in the string **Editor** section.

For full information in the 4d Editor, go to the section [4d Edit - Old](#)

Create - Pipe (Pre V8)

Position of option on menu: Strings =>Create =>Old =>Pipe

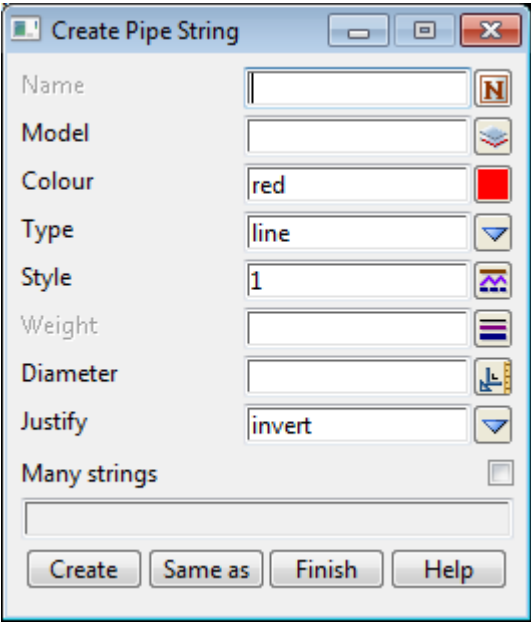
A pipe string is the same as a 3d string except that the pipe string also has a diameter hence the options for creating and editing a pipe string are almost the same as for a 3d string.

The main difference is that there are no options to open and close a pipe string and there is an additional option for modifying the pipe diameter.

The **Many strings** tick-box is used when more than one string of the same type is to be created, If **many strings** is set to *tick*, when the current string creation is **Finished** or **Quit**, a new **Create Pipe String** panel is placed on the screen with the same information in it as the string just created. If any of the information needs to be modified for the new string, simply change it in the **Create Pipe String** panel fields before selecting the **Create** button for the new string. Hence a new string of the same type can be created without going back to the **Create** menu.

The **Same as** button is used to obtain information from an existing string (not necessarily of the same type) and pipe it into the name, colour, model, style breakline type and height field of the **Create Pipe String** panel.

On selecting the **Pipe string** option, the **Create Pipe String** panel is displayed.



To **create** a new pipe string, the name, colour, model, point-line type and diameter of the new string are entered into the appropriate fields and the **create** button selected.

The new fields and buttons used in the **create pipe string** panel have the following functions.

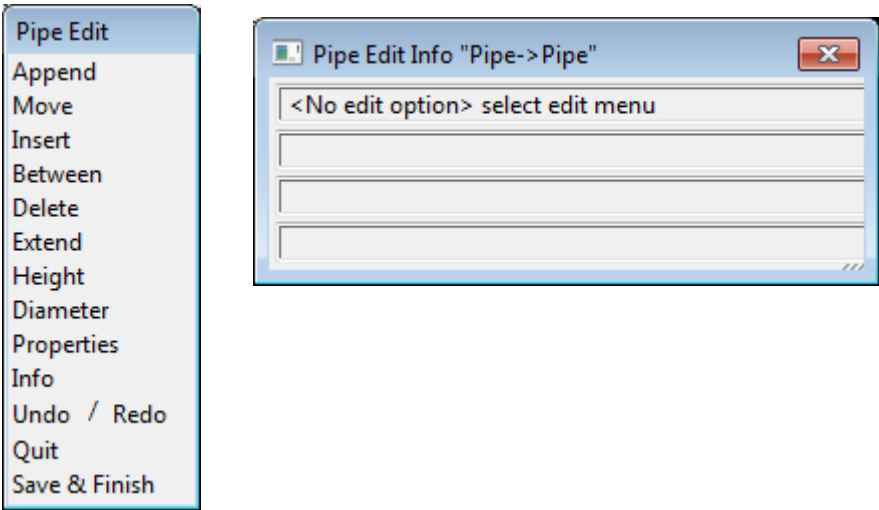
Field Description	Type	Defaults	Pop-Up
Name <i>the name of the new string.</i>	input		
Model <i>name of the model that the new string is in.</i>	input		available models
Colour <i>the colour of the new string.</i>	input	default colour	available colours
Style <i>line style of the string.</i>	input	1	available line styles

Weight <i>thickness of the string.</i>	input	0	
Diameter <i>diameter of the pipe</i>	input	0	
Justify <i>justification of the pipe with respect to the co-ordinates given for the pipe string.</i>	input	invert	invert, centre, overt
Many strings <i>if ticked then after the current string is finished, a new create panel is placed on the screen with all the same values for the panel fields as the current string.</i>	tick		
Create <i>After the create button is chosen, the pipe edit menu and pipe edit info panel are displayed.</i>	button		
Same as <i>After the same as button is chosen, another string is selected and information about it is used for the fields in this panel.</i>	button		

Pipe Edit

On selecting the **Create** button in the **Create Pipe String** panel the **Pipe Edit** menu and **Pipe Edit info** panel are placed on the screen.

The **Pipe Edit** menu and panel for a pipe string are



To create a new pipe string, select the **Append** option from the **Pipe Edit** menu.

The **Append** option is used to add points to either end of an existing string, or in the case of a new string, places the 1st point and then begins appending points to the 1st point.

For all pipe strings, a cross is then drawn in each plan view that the string's model is on, and the cross follows the cursor around the screen. If the string's model is **not** added to any plan view, the model is automatically added to **all** plan views.

After the cross is on the screen (moving with the cursor), clicking LB and accepting with MB selects the **1st** vertex of the string (using the appropriate snaps).

The string is then drawn from the 1st vertex to the cursor position, which represents the second vertex of the string. Clicking LB and accepting with MB selects the second string vertex and the process repeats for subsequent string vertices.

Now that the string is created, all the edit option on the string's **Pipe Edit** menu are usable.

The options in the **Pipe Edit** menu are not only used for placing the initial vertices of the string, but for editing the string once it is created. Since the **Append** and other options in the **Pipe Edit** menu are identical to the options used when editing an existing string, they will be discussed in detail in the string **Editor** section.

For full information in the Pipe Editor, go to the section [Pipe Edit - Old](#)

Create - Polyline (Pre V8)

Position of option on menu: Strings =>Create =>Old =>Polyline

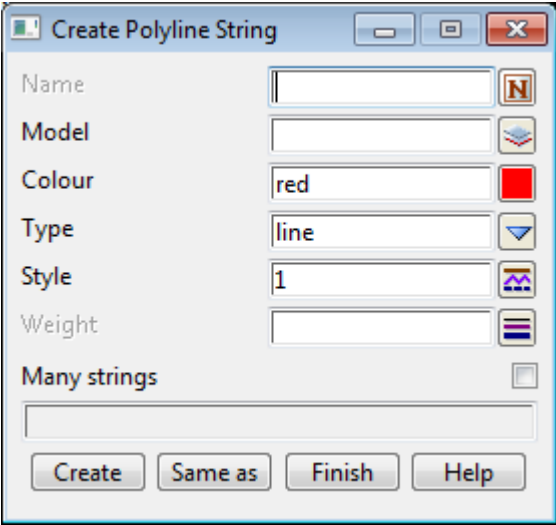
A polyline string is similar to a 3d string except that it can have either straight lines or arcs joining the (x,y,z) points of the string. The arcs are plan arcs with possibly a different z at either end and the z values are linearly interpolated between the end points. Hence in a long section, the end points are joined by a straight lines for both line and arc segments of the polyline.

Creating and editing a polyline string is very similar to a 3d string. The only major difference is that a radius is required at each string segment (a radius of 0 means no arc, just a straight line).

The **Many strings** tick-box is used when more than one string of the same type is to be created, If **many strings** is set to *tick*, when the current string creation is **Finished** or **Quit**, a new **Create Polyline String** panel is placed on the screen with the same information in it as the string just created. If any of the information needs to be modified for the new string, simply change it in the **Create Polyline String** panel fields before selecting the **Create** button for the new string. Hence a new string of the same type can be created without going back to the **Create** menu.

The **Same as** button is used to obtain information from an existing string (not necessarily of the same type) and pipe it into the name, colour, model, style breakline type and height field of the **Create Polyline String** panel.

On selecting the **polyline string** option, the **create polyline string** panel is displayed.



To **create** a new polyline string, the name, colour, model, point-line type and linestyle of the new string are entered into the appropriate fields and the **create** button selected.

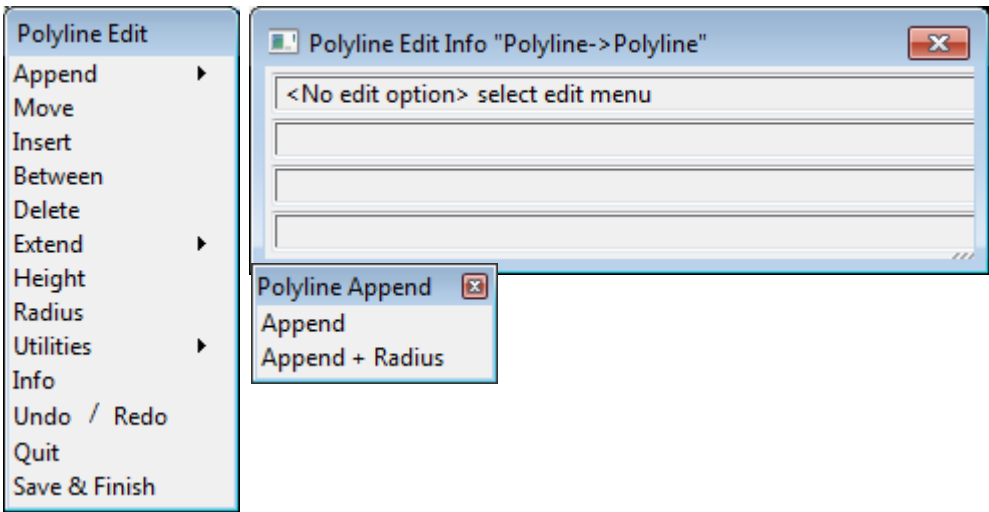
The new fields and buttons used in the **create pipe string** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name <i>the name of the new string.</i>	input		
Model <i>name of the model that the new string is in.</i>	input		available models
Colour <i>the colour of the new string.</i>	input	default colour	available colours
Style <i>line style of the string.</i>	input	1	available line styles

Weight	input	0
<i>thickness of the string.</i>		
Many strings	tick	
<i>if ticked then after the current string is finished, a new create panel is placed on the screen with all the same values for the panel fields as the current string.</i>		
Create	button	
<i>After the create button is chosen, the polyline edit menu and polyline edit info panel are displayed.</i>		
Same as	button	
<i>After the same as button is chosen, another string is selected and information about it is used for the fields in this panel.</i>		

Polyline Edit

Selecting the **create** button in the **create polyline string** panel the **polyline edit** menu and **polyline edit info** panels are placed on the screen.



To create a new polyline string, the user must select one of the two append options (**Append** or **Append + radius**) on the **Append** walk-right of the **Polyline Edit** menu. The which **Append** option to simply creates points which are joined by a straight segment whereas the **Append + radius** create points with a radius for the segment.

The **Append** options are used to add points to either end of an existing string, or in the case of a new string, places the 1st point and then begins appending points to the 1st point.

For all polyline strings, a cross is then drawn in each plan view that the string's model is on, and the cross follows the cursor around the screen. If the string's model is **not** added to any plan view, the model is automatically added to **all** plan views.

After the cross is on the screen (moving with the cursor), clicking LB and accepting with MB selects the **1st** vertex of the string (using the appropriate snaps).

If **Append + radius** was selected, the user will then be prompted for the radius of the segment being placed.

The string is then drawn from the 1st vertex to the cursor position, which represents the second vertex of the string. Clicking LB and accepting with MB selects the second string vertex and the process repeats for subsequent string vertices.

Now that the string is created, all the edit option on the string's **Polyline Edit** menu are usable.

The options in the **Polyline Edit** menu are not only used for placing the initial vertices of the string,

but for editing the string once it is created. Since the **Append** and other options in the **Polyline Edit** menu are identical to the options used when editing an existing string, they will be discussed in detail in the string **Editor** section.

For full information in the Polyline Editor, go to the section [Polyline Edit - Old](#)

Alignment Edit

Position of option on menu: Strings =>Editor

An alignment string is defined by specifying the horizontal and vertical geometry as separate operations.

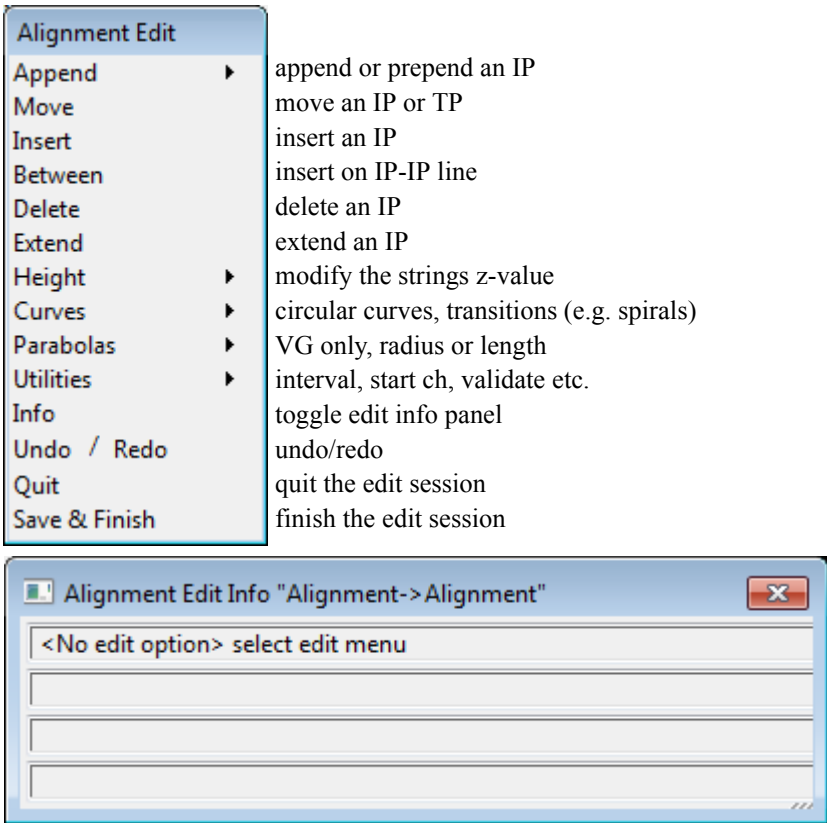
The **horizontal geometry** consists of a series of (x,y) points (called horizontal intersection points, **HIP**'s) and circular curves and transitions (eg clothoid spiral) applied to the intersection points.

Vertical geometry also consists of a series of points but they are defined with respect to the plan length of the string (chainage) and height. Hence, the vertical geometry is defined by a series of (chainage,height) points called vertical intersection points (**VIP**'s) and parabolic or circular curves applied to the vertical intersection points.

The horizontal geometry is defined in a plan view and the vertical geometry in a section view. Hence the alignment string editor can edit information for the string on both plan and section views.

Since a section view is only defined in relation to a specific string (called the primary string for the section view), the vertical geometry of the picked string can only be edited in a section view if the string is the primary string for that section view. That is, the string can only be edited on a section view if the string being edited is profiled on that section view.

On selecting an alignment string, the **alignment edit** menu and the **alignment edit info** are placed on the screen.



Most of the options are applicable to either horizontal or vertical geometry. The meaning of the option depends on whether the string is being edited in a plan or a section view. Hence the description of the option will often need to be split into its separate action on horizontal or vertical geometry.

See the earlier section [Super String Edit - Common Information](#) for general information about

editing strings.

Each option will now be discussed in detail.

Go to [Alignment Append](#)

Go to [Alignment Move](#)

Go to [Alignment Insert](#)

Go to [Alignment Between](#)

Go to [Alignment Delete](#)

Go to [Alignment Extend](#)

Go to [Alignment Height](#)

Go to [Alignment Curves](#)

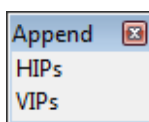
Go to [Alignment Parabolas](#)

Go to [Alignment Utilities](#)

Alignment Append

The **append** operation for an alignment string is similar to the 3d string case except that there are separate append options for the horizontal and vertical geometry of the string.

The **append** walk-right is



Append HIPs - Horizontal Geometry

The **append=>HIPs** option in a plan view is used to create the 1st horizontal point in a new alignment string, to append a new horizontal intersect point to the end of the string or to prepend a new horizontal intersection point to the beginning of the string. In this option, both appending and prepending will be referred to as appending.

Existing Alignment String

Appending a point is a two step process.

Step (a) - selecting the end to append the point to.

After picking **append=>HIPs**, the end of the string to append the point to is selected. Once the string end is selected, the new intersection point is assumed to be at the current cursor position. As the cursor is moved, the string is redrawn reflecting the changing position of the appended intersection point

message area 1	<Append Points>
message area 2	IP point number, x, y, z co-ords of IP
message area 3	bearing-in, bearing out, bearing difference for an IP
message area 4	select final position - after pick
Screen message area	
	<Select string end to append to> [picks][][menu]
	<Select string end to append to> [picks][accepts][menu]

Step (b) - selecting the position for the new appended point.

A cross indicates where the cursor currently is. The position of the new appended point is set to the current cursor position by picking (LB) and accepting (MB).

message area 1	<Append Points>
message area 2	IP point number, x, y, z co-ords of IP
message area 3	bearing-in, bearing out, bearing difference for closest IP

message area 4 select final position - before pick
Screen message area
 <Select final position of point> [picks][][menu]
 <Select final position of point> [picks][accepts][menu]

Once an intersection point has been appended to the string, the appended intersection point is considered to be the selected string end and a new append cycle begins. That is, stage (a) is already set up. The current cursor position indicates the new position of the next appended intersection point.

Hence a **series** of string points is easily entered by first selecting the string end that the new points are to be appended to (step (a)) and then moving the cursor to the position of each new point in turn and selecting them in turn.

Typed input can be used in either step.

The **append** option is terminated by either bringing up the **pick ops** menu and selecting **cancel** or by selecting a new option from the **alignment edit** menu.

If, after bringing up the **pick ops** menu, it is decided to continue with the append option, simply select the **restart** option from the **pick ops** menu and the **pick ops** menu will disappear leaving the append option still current.

New Alignment String

When the **append=>HIPs** option is selected, a cross will appear on any plan views that have the alignment string's model on them.

The first horizontal intersection point is then selected by the standard pick (LB) and accept (MB).

The option then continues as if appending to an existing alignment string where the end point has already been accepted.

Append VIPs - Vertical Geometry

The **append=>VIPs** option is used to create and edit the vertical geometry of the picked string if the string is a **primary** string on any section view. This can be achieved by using either the **VG edit** or the **profile** option from the section view **view=>utilities** menu.

Vertical geometry can only be defined for a string with **existing** horizontal geometry.

On a section view, **Append=>VIPs** is used to create the first vertical intersection point in an existing string, to append a new vertical intersect point to the end of the string or to prepend a new vertical intersection point to the beginning of the string. In this option, both appending and prepending will be referred to as appending.

Existing Vertical Geometry

Appending a vertical point is the same as for a horizontal intersection point except that the co-ordinate system is (chainage,height) rather than (x,y) values and the information messages displayed in the **alignment edit info** panel show chainage, height and percentage grade rather than x,y,z and bearings.

For example -

message area 1	<Append Points>
message area 2	VIP point number, chainage,height of VIP
message area 3	curve length, %grade-in, %grade-out, grade difference for an VIP
message area 4	edit finished - before pick select final position - after pick

New Vertical Geometry

Creating the **1st vertical intersection point** (VIP) in a string is similar to the 1st horizontal IP.

When the **append=>VIPs** option is selected, a cross will appear on any section views that have the alignment string profiled on them.

The 1st vertical intersection point is then selected by the standard pick (LB) and accept (MB).

The option then continues as if appending to an existing vertical geometry where the end point has already been accepted.

Typed input can be used at any stage of the append.

Alignment Move

The **move** option allows the user to move

- (a) individual horizontal intersection points (HIPs)
- (b) individual tangent points (HTPs) if their is no transition on the HIP.
- (c) individual vertical intersection points or tangent points (VIPs or VTPs).

move acts on the horizontal geometry if the point to move is selected in a plan view, or the vertical geometry if the point to move is selected in a section view.

Move - Horizontal Geometry

The **move** option in a plan view is for moving individual horizontal intersection points (HIP's) or horizontal tangent points (HTPs) of the string.

The move cycle consists of two steps:

- (a) selecting the point to be moved
- (b) selecting the new position for the point.

Step (a)

First the horizontal intersection or tangent point to be moved is selected. The selected point will then move around the view as the cursor is moved.

If a **horizontal intersection point** is selected, the string will be redrawn with the intersection point moved to the cursor position and the circular curve radius and transition lengths left constant.

A **horizontal tangent point** only occurs on a line connecting two adjacent horizontal intersection points (the HIP-HIP line). Hence, a horizontal tangent point can only move along its HIP-HIP line. Moving a horizontal tangent point actually means that the **radius** of the circular curve at the tangent point is **modified** so that the new position of the point is still a tangent point on the HIP-HIP line for the new circular curve.

To guarantee that the new position for the tangent point is on the HIP-HIP line, the cursor position is automatically projected perpendicularly onto the HIP-HIP line to give the new tangent point.

message area 1	<Move Point>
message area 2	IP point number, x, y co-ords of IP, radius, start spiral, end spiral
message area 3	bearing-in, bearing out, bearing difference for the inserted IP
message area 4	select final position - after pick
Screen message area	
	<Select point to move> [picks][][menu]
	<Select point to move> [picks][accepts][menu]

Step (b)

The current cursor position (or its projection for a HTP) is selected as the new position for the point by picking (LB) and accepting (MB). The point being moved is then anchored at the cursor position for the HIP (or at the projected point for a HTP), and the string redrawn.

message area 1	<Move Point>
message area 2	IP point number, x, y co-ords of IP, radius, start spiral, end spiral
message area 3	bearing-in, bearing out, bearing difference for the inserted IP
message area 4	select final position - before pick, edit finished - after pick
Screen message area	
	<Select final position of point> [picks][][menu]
	<Select final position of point> [picks][accepts][menu]

Typed input can be used in either step

Once the move cycle is completed and the point moved, the move option is still current and can be repeated for other points without having to re-select the move option.

move is terminated by selecting **cancel** from the **pick ops** menu or by selecting a new **alignment edit** option.

Move - Vertical Geometry

The **move** option is used in a section view to move individual vertical intersection points (VIP's) or vertical tangent points (VTP's).

The move cycle consists of two steps:

- (a) selecting the point to be moved
- (b) selecting the new position for the point.

Step (a)

First the vertical intersection or tangent point to be moved is selected. The selected point will then move around the view as the cursor is moved.

If a **vertical intersection point** (VIP) is selected, the string will be redrawn with the vertical intersection point moved to the cursor position and the parabolic curve length or the circular curve radius left constant.

A **vertical tangent point** (VTP) only occurs on a line connecting two adjacent vertical

intersection points (the VIP-VIP line). Hence, a vertical tangent point can only move along its VIP-VIP line. Moving a vertical tangent point actually means that the **length** of the parabolic curve at the vertical tangent point is **modified** so that the new position of the point is still a vertical tangent point on the VIP-VIP line for the new parabolic curve.

To guarantee that the new position for the vertical tangent point is on the VIP-VIP line, the cursor position is automatically projected perpendicularly onto the VIP-VIP line to give the new vertical tangent point.

message area 1	<Move Point>
message area 2	VIP point number, ch, ht co-ords of VIP
message area 3	VC length, %grade-in, %grade-out, grade diff for the moved VIP
message area 4	select final position - after pick
Screen message area	
	<Select point to move> [picks][][menu]
	<Select point to move> [picks][accepts][menu]

Step (b)

The current cursor position (or its projection for a VTP) is selected as the new position for the point by selecting (LB) and accepting (MB). The point being moved is then anchored at the cursor position for an VIP (or at the projected point for a VTP), and the string redrawn.

message area 1	<Move Point>
message area 2	VIP point number, ch, ht co-ords of VIP
message area 3	VC length, %grade-in, %grade-out, grade diff for the moved VIP
message area 4	select final position - before pick, edit finished - after pick
Screen message area	
	<Select final position of point> [picks][][menu]
	<Select final position of point> [picks][accepts][menu]

Typed input can be used in either step.

Once the move cycle is completed and the point moved, the **move** option is still current and can be repeated for other points without having to re-select the move option.

The **move** option is terminated by selecting **cancel** from the **pick ops** menu or by selecting a new **alignment edit** option.

Alignment Insert

The **insert** option is designed to place a new intersection point in a string between two adjacent intersection points. The inserted point does not have to be on the line joining the two intersection points - the **between** option is used to guarantee that the IP is on the IP-IP line.

Inserting a point, like moving a point, is a two step process.

Step (a) - selecting the IP's to be on either side of the new intersection point

The two adjacent intersection points are chosen by selecting the **line** connecting the two intersection points. Once the line is selected, the new IP is assumed to be at the current cursor position. As the cursor is moved, the string is redrawn reflecting the changing position of the inserted IP.

Like the **move** option, the **insert** works on the horizontal or the vertical geometry depending on whether a plan or section view is used to select the connecting line.

For horizontal inserts

message area 1	<Insert Point>
message area 2	IP point number, x, y co-ords of IP, radius, start spiral, end spiral
message area 3	bearing-in, bearing out, bearing difference for the inserted IP
message area 4	select final position - after pick
Screen message area	

<Select line to insert on> [picks][][menu]
 <Select line to insert on> [picks][accepts][menu]

For vertical inserts

message area 1	<Insert Point>
message area 2	VIP point number, Ch, Ht co-ords of VIP
message area 3	VC length, %grade-in, %grade-out, grade diff for the moved VIP
message area 4	select final position - after pick
Screen message area	
	<Select line to insert on> [picks][][menu]
	<Select line to insert on> [picks][accepts][menu]

Step (b) - selecting the position for the new intersection point

The position of the new intersection point is set to the current cursor position by picking (LB) and accepting (MB).

horizontal

message area 1	<Insert Point>
message area 2	IP point number, x, y co-ords of IP, radius, start spiral, end spiral
message area 3	bearing-in, bearing out, bearing difference for the inserted IP
message area 4	select final position - before pick, edit finished - after pick
Screen message area	
	<Select final position of point> [picks][][menu]
	<Select final position of point> [picks][accepts][menu]

vertical

message area 1	<Insert Point>
message area 2	VIP point number, Ch, Ht co-ords of VIP
message area 3	VC length, %grade-in, %grade-out, grade diff for the moved VIP
message area 4	select final position - before pick, edit finished - after pick
Screen message area	
	<Select final position of point> [picks][][menu]
	<Select final position of point> [picks][accepts][menu]

Once the insert cycle is completed and the point inserted, the insert option is still current and can be repeated for other insertions without having to re-select the insert option.

The **insert** option is terminated by selecting **cancel** from the **pick ops** menu or by selecting a new option from the **alignment edit** menu.

Typed input can be used in either step.

Alignment Between

The **between** option is similar to the **insert** option except the inserted point **does** have to be on the line joining the two intersection points. To accomplish this, the cursor position is automatically projected onto the IP-IP line to give the new IP point position.

The **between** option is terminated by selecting **cancel** from the **pick ops** menu or by selecting a new option from the **alignment edit** menu.

Alignment Delete

The **delete** option is used to delete intersection points from the string.

After picking the delete option, any selected intersection point in the string is deleted. The string, minus the deleted point, is redrawn after each deletion.

Once an intersection point has been deleted, another intersection point in the selected string can be selected for deletion. Hence any number of the string points can be deleted one after another.

A horizontal intersection point is deleted if the point is chosen from a plan view and a vertical intersection point deleted if the point is selected from a vertical view.

For horizontal deletes

message area 1	<Delete Points>
message area 2	IP point number, x, y co-ords of IP, radius, start spiral, end spiral
message area 3	bearing-in, bearing out, bearing difference for the inserted IP
Screen message area	
	<Select point to delete> [picks][][menu]
	<Select point to delete> [picks][accepts][menu]

For vertical deletes

message area 2	VIP point number, Ch, Ht co-ords of VIP
message area 3	VC length, %grade-in, %grade-out, grade diff for the moved VIP
Screen message area	
	<Select point to delete> [picks][][menu]
	<Select point to delete> [picks][accepts][menu]

The delete option is terminated by selecting **cancel** from the **pick ops** menu or by selecting a new option from the **alignment edit** menu.

Typed input can be used to select a point for deletion.

Alignment Extend

The **extend** option is used to move an intersection point along the line joining the intersection point to its neighbouring intersection point.

That is, in a plan view, the bearing of the HIP-HIP line is kept constant and the intersection point is moved along that line either **towards** or **away** from its neighbouring intersection point on the HIP-HIP line.

In a section view, the grade of the VIP-VIP line is kept constant and the vertical intersection point is moved along that line either **towards** or **away** from its neighbouring intersection point on the VIP-VIP line.

Extending, like moving a point, is a two step process.

Step (a) - selecting the IP-IP line and the IP to be moved along that line

The IP-IP line and the intersection point to be moved are chosen in the one operation by selecting a co- ordinate point near the IP-IP line and close to the intersection point to be moved along that line.

Once the line and IP are selected, the new position of the selected IP is assumed to be at the current cursor position projected perpendicularly onto the IP-IP line. As the cursor is moved, the string is redrawn reflecting the changing position of the moved IP.

For horizontal extends

message area 1	<Extend Point>
message area 2	IP point number, x, y co-ords of IP, radius, start spiral, end spiral
message area 3	bearing-in, bearing out, bearing difference for the inserted IP
message area 4	select final position - after pick
Screen message area	
	<Select line to extend> [picks][][menu]
	<Select line to extend> [picks][accepts][menu]

For vertical extends

message area 1	<Extend Point>
message area 2	VIP point number, Ch, Ht co-ords of VIP
message area 3	VC length, %grade-in, %grade-out, grade diff for the moved VIP

message area 4 select final position - after pick
 Screen message area
 <Select line to extend> [picks][][menu]
 <Select line to extend> [picks][accepts][menu]

Step (b) - selecting the final position for the intersection point

The final position for the intersection point is set to the projection of the current cursor position onto the IP-IP line.

horizontal -

message area 1 <Extend Points>
 message area 2 IP point number, x, y co-ords of IP, radius, start spiral, end spiral
 message area 3 bearing-in, bearing out, bearing difference for the inserted IP
 message area 4 select final position - before pick, edit finished- after pick
 Screen message area
 <Select final position of point> [picks][][menu]
 <Select final position of point> [picks][accepts][menu]

vertical

message area 1 <Extend Points>
 message area 2 VIP point number, Ch, Ht co-ords of VIP
 message area 3 VC length, %grade-in, %grade-out, grade diff for the moved VIP
 message area 4 select final position - before pick, edit finished- after pick
 Screen message area
 <Select final position of point> [picks][][menu]
 <Select final position of point> [picks][accepts][menu]

Once the extend is completed, the extend option is still current and can be repeated without re-selecting the extend option.

The **extend** option is terminated by selecting **cancel** from the **pick ops** menu or by selecting a new option from the **alignment edit** menu.

Typed input can be used in either step.

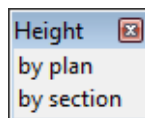
Note - **Extend** can be used on the end points of the string

Alignment Height

The **height** option is used to insert and/or modify the height of a vertical intersection point in a plan view, or to modify the height of a vertical intersection point in a section view.

Hence the height option is unique - it only affects the vertical geometry of the string but can be used in a plan or section view.

The **height** walk-right is



By Plan - Height in a Plan View

In a plan view, the **height=>by plan** option is used to create a **vertical intersection point** of a given height, or modify the height of an existing vertical point, at a selected plan position on the string.

After the **height** option is chosen, the user selects a position on the string in a plan view. The use of point and line snap will important for selecting the correct position.

If a vertical intersection point already exists at the chainage of the selected position, it will be selected for modification. Otherwise a new vertical intersection point will be inserted into the vertical geometry at the chainage of the selected position.

A **new height** typed-input box is then displayed on the screen with the vertical intersection point's current height (z value).

The **new height** typed-input box looks like:



The height is entered into the typed-input box, terminated with <Enter>. The entered value is taken as the new height of the vertical intersection point in the alignment.

The typed-input box then disappears.

By Section - Height in a Section View

In a section view, the **height=>by section** option can only be used to modify the height of an **existing** vertical intersection point.

After the **height** option is chosen, the user selects the vertical intersection point that will have its height modified from a section view. After selecting the VIP, a **new height** typed-input box is displayed on the screen with the point's current height (z value).

The **new height** typed-input box looks like:



The height is entered into the typed-input box, terminated with <enter>. The entered value is taken as the new height of the vertical intersection point in the alignment string and the string redrawn with the new height at that point.

The typed-input box then disappears.

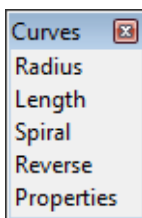
For either **height=>by plan** or **height=>by section**, the **height** option is terminated on selecting **cancel** from the **pick ops** menu or by selecting a new option from the **alignment edit** menu.

Alignment Curves

The **curves** option allows the user to

- (a) add a circular curve of a specified radius or curve length to a horizontal intersection point
- (b) add start and end transition (eg spiral) to an intersection point with and existing circular curve
- (c) add a circular curve of a specified radius or curve length to a vertical intersection point

The **Curves** walk-right menu is



The **radius** option is used to create or modify the radius of a circular curve at a horizontal or vertical intersection point. **radius** acts on the horizontal geometry if the point is selected in a plan

view, or the vertical geometry if the point is selected in a section view.

Similarly the **length** option is used to set a circular curve by giving its total curve length rather than the radius. **length** acts on the horizontal geometry if the point is selected in a plan view, or the vertical geometry if the point is selected in a section view.

The **spiral** option is for adding transitions to a **horizontal intersection point with a curve already on it**.

Radius

In a plan view, the **radius** option is used to **add** a circular curve to an intersection point with no curve or to **modify** the radius of the circular curve if one already exists.

In a section view, the **radius** option is used to **add** a circular curve to an intersection point with no curve or to **modify** the radius of a circular curve if one already exists.

Radius is a two step process.

Step (a) - selecting the intersection point

First the intersection point whose curve is to be modified is selected.

For horizontal radius

message area 1	<Radius>
message area 2	IP point number, x, y co-ords of IP, radius, start spiral, end spiral
message area 3	bearing-in, bearing out, bearing difference for the inserted IP

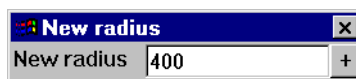
For vertical radius

message area 1	<Radius>
message area 2	VIP point number, Ch, Ht co-ords of VIP
message area 3	radius, %grade-in, %grade-out, grade diff for the moved VIP
message area 4	enter value- after pick
Screen message area	
	<Select point to change radius> [picks][][menu]
	<Select point to change radius> [picks][accepts][menu]

Step (b) - entering the new radius

after an intersection point is chosen, a **new radius typed-input box** is displayed on the screen with either the intersection point's current curve radius or, if no curve exists, zero.

The new radius typed-input box looks like:



The radius is entered into the typed-input box, terminated with <enter>. The entered value is taken as the radius of the curve at that intersection point and the string redrawn with the new curve. The typed-input box then disappears.

If an existing curve is to be **removed** from an intersection point, enter the value zero into the new radius typed-input box.

horizontal

message area 1	<Radius>
message area 2	IP point number, x, y co-ords of IP, radius, start spiral, end spiral
message area 3	bearing-in, bearing out, bearing diff for the inserted IP
message area 4	enter value - before value entered edit finished- after value entered

vertical

message area 1	<Radius>
message area 2	VIP point number, Ch, Ht co-ords of VIP

message area 3	radius, %grade-in, %grade-out, grade diff for the moved VIP
message area 4	enter value - before value entered edit finished- after value entered

Like most of the other **alignment edit** options, after a radius has been modified the option is still current and another intersection point can be chosen to have its curve radius modified.

The **radius** option is terminated by selecting a different **alignment edit** option.

Length

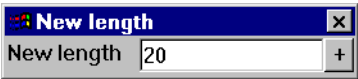
Although the circular curve on an intersection point is stored as a radius, it is possible to define the radius indirectly by giving the total curve length by using the **length** option.

The option works in plan or section views.

To use **length**, first select the intersection point to add a new circular curve to, or to modify the existing curve.

A new length **typed-input box** is then displayed on the screen with either the current curve length, or if no curve exists, zero.

The new length typed-input box looks like:



The total curve length is entered into the typed-input box, terminated with <enter>. The entered value is taken as the new curve length. The typed-input box then disappears.

If an existing circular curve is to be **removed**, zero is entered into the new length typed-input box.

Like most of the other **alignment edit** options, after the **length** has been modified the option is still current and another IP can be chosen to have its curve modified.

The **length** option is terminated by selecting a different **alignment edit** option.

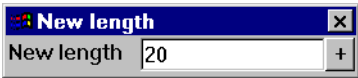
WARNING - when **length** is used, the equivalent radius is computed and stored with the curve. If the IP is moved, the **radius** is kept **constant** and the total curve **length** is **modified**.

Spiral

In a plan view, the **spiral** option is used to **add** a start or end transitions (eg spirals) to a curve on an intersection point, or to **modify** an existing transition. Spiral does not work on a section view.

After picking **spiral**, select the end of the curve to add a new transition to, or the existing transition to be modified. A new length **typed-input box** is displayed on the screen with either the current transition length, or zero if no transition exists.

The new length typed-input box looks like:



The transition length is entered into the typed-input box, terminated with <enter>. The entered value is taken as the new transition length. The typed-input box then disappears.

If an existing transition is to be **removed**, zero is entered into the new length typed-input box.

Like most of the other **alignment edit** options, after the **spiral** has been modified the option is still current and another curve can be chosen to have its transitions modified.

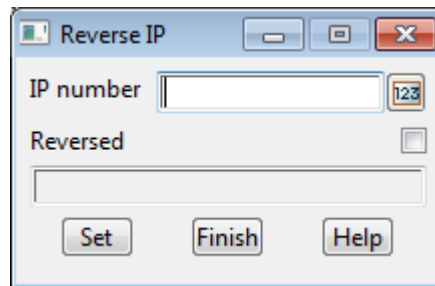
The **spiral** option is terminated by selecting a different **alignment edit** option.

Reverse

12d Model normally creates a curve on the side of the IP that has the smallest angle. The sign of the radius (positive or negative) is automatically determined by **12d Model**.

The **Reverse** option creates a circular curve that is the part left over from the standard curve.

On selecting **Reverse**, the **Reverse IP** panel is displayed.



The HIP is chosen by either typing in the HIP number in the **IP number** field, or by clicking on the **123** button and then selecting the HIP.

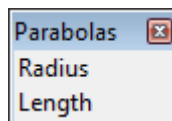
To change the curve from reversed/not reversed, simply tick on/off the **Reversed** tick box and then click on **Set**.

Alignment Parabolas

The **parabolas** option is for adding, removing or modifying parabolic curves to the **vertical geometry**. It allows the user to

- (a) add a parabolic curve of a given curve length to a vertical intersection point
- (b) add a parabolic curve of a given effective radius to a vertical intersection point

The **parabolas** walk-right menu is



The **radius** option is used to set a parabolic curve of given effective radius to a vertical intersection point.

The **length** option is used to set a parabolic curve of a given curve length to a vertical intersection point.

Note - the option only works on the vertical geometry if the VIP is selected in a section view. Points cannot be selected in any other view.

Radius

In a section view, the **radius** option is used to **add** a parabolic curve to an intersection point with no curve or to **modify** the radius of the parabolic curve if one already exists.

Radius is a two step process.

Step (a) - selecting the intersection point

First the intersection point whose parabola is to be modified is selected.

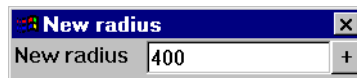
message area 1	<Radius>
message area 2	VIP point number, Ch, Ht co-ords of VIP
message area 3	VC length, %grade-in, %grade-out, grade diff for the moved VIP

message area 4 enter value- after pick
 Screen message area
 <Select point to change radius> [picks][][menu]
 <Select point to change radius> [picks][accepts][menu]

Step (b) - entering the new radius

After an intersection point is chosen, a **new radius typed-input box** is displayed on the screen with either the intersection point's current parabolic radius or, if no parabola exists, the last value entered into the radius typed-input box.

The new radius typed-input box looks like:



The radius is entered into the typed-input box, terminated with <enter>. The entered value is taken as the radius of the parabola at that intersection point and the string redrawn with the new parabola. The typed-input box then disappears.

If an existing parabola is to be **removed** from an intersection point, enter the value zero into the radius typed-input box.

message area 1	<Radius>
message area 2	VIP point number, Ch, Ht co-ords of VIP
message area 3	VC length, %grade-in, %grade-out, grade diff for the moved VIP
message area 4	enter value - before value entered edit finished- after value entered

Like most of the other **alignment edit** options, after the radius has been modified the option is still current and another intersection point can be chosen to have its parabolic radius modified.

The **radius** option is terminated by selecting a different **alignment edit** option.

WARNING - when **radius** is used, the equivalent parabolic length is computed and stored with the curve. If the VIP is moved, the **parabolic length** is kept **constant** and the **effective radius** is **modified**.

Length

The **length** option is used to **add** a parabolic curve to a vertical intersection point with no curve or to **modify** the length of the parabolic curve if one already exists.

Adding or modifying curve length is a two step process.

Step (a) - selecting the vertical intersection point

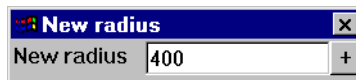
First the vertical intersection point whose parabola is to be modified is selected.

message area 1	<Length>
message area 2	VIP point number, Ch, Ht co-ords of VIP
message area 3	VC length, %grade-in, %grade-out, grade diff for the moved VIP
message area 4	edit finished - before pick enter value - after pick
Screen message area	
	<Select point to change length> [picks][][menu]
	<Select point to change length> [picks][accepts][menu]

Step (b) - entering the new curve length

After a VIP is selected, a **new length typed-input box** is displayed on the screen with the point's current parabolic curve length.

The new length typed-input box looks like



The curve length is entered into the typed-input box, terminated with <enter>. The entered value is taken as the length of the parabolic curve at that vertical intersection point and the string redrawn with the new curve. The typed-input box then disappears.

If an existing parabola is to be **removed** from a vertical intersection point, enter the value zero into the curve length typed-input box.

message area 1 <Length>

message area 2 VIP point number, Ch, Ht co-ords of VIP

message area 3 VC length, %grade-in, %grade-out, grade diff for the moved VIP

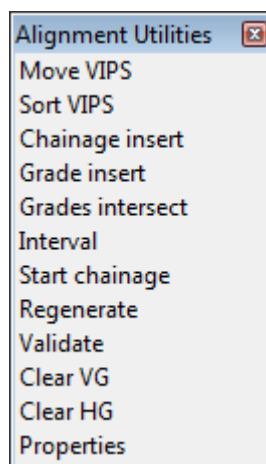
message area 4 enter value- before value entered edit finished- after value entered

Like most of the other **alignment edit** options, after the parabolic curve length has been modified the option is still current and another vertical intersection point can be chosen to have its parabola modified.

The **length** option is terminated by selecting a different **alignment edit** option.

Alignment Utilities

The **Utilities** walk-right menu contains a number of useful miscellaneous option for the alignment string. The menu is

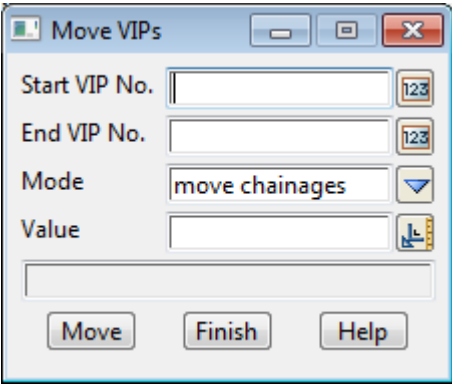


Each of the options will now be discussed.

Move VIPS

The **Move VIPS** option is for moving a range of vertical intersection points (VIPs) by a chainage or an elevation increment.

After selecting the option, the **Move VIPS** panel is displayed.

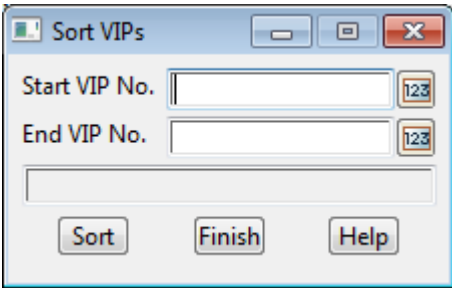


The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Start VIP No.	input		
the VIP number of the 1st VIP in the range to be moved. If blank, then 1.			
End VIP No.	input		
the VIP number of the last VIP in the range to be moved.If blank, then the last VIP.			
Mode	input	move chainage	move chainage move hts
if move chainage , the chainage of all the points in the specified range are incremented by the given value. If move hts , the heights (elevations) of all the points in the specified range are incremented by the given value.			
Value	input	0	
value to increment either the chainage or the height for all the VIPs in the specified range.			
Move	button		
move the VIPs in the range given by the start and end ip field by the chainage or height given in the value field.			

Sort VIPs

The **sort VIPs** option is for sorting VIP's into increasing chainage order.
After selecting the option, the **sort VIPs** panel is displayed.



The fields and buttons used in the panel have the following functions.

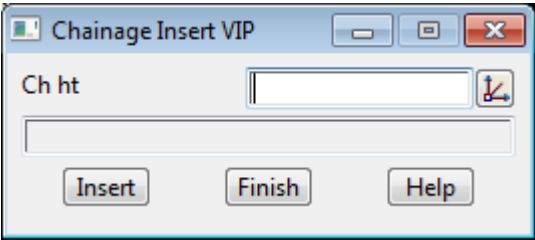
Field Description	Type	Defaults	Pop-Up
Start VIP No.	input		
if not blank, the VIP number of the 1st VIP in the range to be sorted. If blank, then 1.			

End VIP No. input
 the VIP number of the last VIP in the range to be sorted. If blank, then the last VIP.

Sort button
 sort the VIPs in the range given by the start and end ip field into chainage order.

Chainage Insert

The **chainage insert** option inserts a vertical intersection point (VIP) at a given chainage and height. After selecting the option, the **chainage insert VIP** panel is displayed.

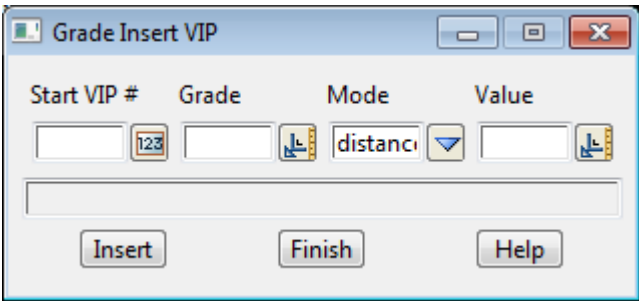


The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Ch ht	input		
<i>the chainage and height of the VIP to insert - separate values by spaces.</i>			
Insert	button		
<i>insert the VIP point given in the Ch ht field into the alignment string.</i>			

Grade Insert

The **grade insert** option inserts a VIP at a given grade from an existing VIP. The new VIP position is given by either a distance from the picked VIP or at given chainage.
After selecting the option, the **grade insert VIP** panel is displayed.

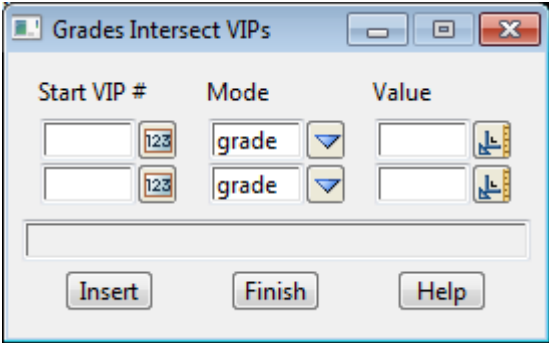


The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Start VIP #	input		
the VIP number whose position is used to start the grade insert from.			
Grade	input		
percent grade to be used.			
Note	positive is up when going in the direction of increasing chainage and negative is up when going in the direction of decreasing chainage .		
Mode	choice	distance	distance, chainage
if distance , the new VIP is inserted at the given grade and distance (given in the value field) from the start VIP.			
if chainage , the new VIP is inserted at the chainage (given in the value field but having the given grade from the start VIP.			
Insert	button		
insert the new VIP into the alignment string.			

Grades Intersect

The **grades intersect** option inserts a VIP which is given by intersecting lines of given grades from two existing VIPs. The grades are either typed in or calculated by giving another VIP that the line goes through.
After selecting the option, the **Grades Intersect VIPs** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Start VIP # <i>the VIP number which is used in defining a line.</i>	input		
Mode <i>if grade, the field value is a percent grade and a line is defined as going through the start VIP and with the given grade.</i> <i>if VIP #, the field value is the number of a VIP and a line is defined as going through the start VIP and this VIP.</i> <i>Note for grades positive is up when going in the direction of increasing chainage and negative is up when going in the direction of decreasing chainage.</i>	choice	grade	grade, VIP #
Value <i>if mode is grade, value is a percent grade.</i> <i>if mode is VIP #, value is the number of a VIP.</i>	input		
Insert <i>calculate the point which is the intersection of the two lines and insert it as a new VIP into the alignment string.</i>	button		

Interval

Each alignment string has a chainage interval that is used to define regular points along the string. The chainage interval is used for approximation the alignment in operations such as triangulating and applying templates to an alignment string.

After selecting the option, an **enter value** typed-input box is displayed on the screen with the string's current chainage interval placed in it.

The new chainage interval is entered into the typed-input box, terminated with <enter>. The typed-input box then disappears.

The **interval** option terminates after use.

Start Chainage

Each alignment string has a start chainage which can be positive, negative or zero.

After selecting the option, an **enter value** typed-input box is displayed on the screen with the string's current start chainage in it.

The new start chainage is entered into the typed-input box, terminated with <enter>. The typed-input box then disappears.

When a new start chainage is entered, the vertical intersection points are automatically moved so that they retain their same relative chainage with respect to the start point on the alignment.

The **start chainage** option terminates after use.

Regenerate

If the horizontal geometry of an alignment string is modified, then the profile through any triangulations would also change. Hence, if the alignment string being edited was profiled on any section views, then the profile would be need to be recalculated after any horizontal geometry changes.

On selecting the **regenerate** option, **any** section view that has the alignment string being edited as its primary string (that is, as the string defining the chainage for the section view) is automatically re-profiled.

Hence the **regenerate** option is equivalent to running the **regenerate** option for each section view with the edited alignment string as its primary string.

Validate

When constructing horizontal and vertical geometry, it is possible to end of with invalid constructs such as overlapping tangent points.

On selecting the **validate** option, the alignment string will be checked for

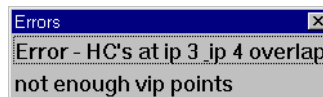
horizontal geometry checks

- s at least two horizontal intersection points
- s no co-incident horizontal intersection points
- s no overlapping horizontal tangent points

vertical geometry checks

- s at least two vertical intersection points
- s no co-incident vertical intersection points
- s no overlapping vertical tangent point
- s vertical intersection points chainages are in ascending order

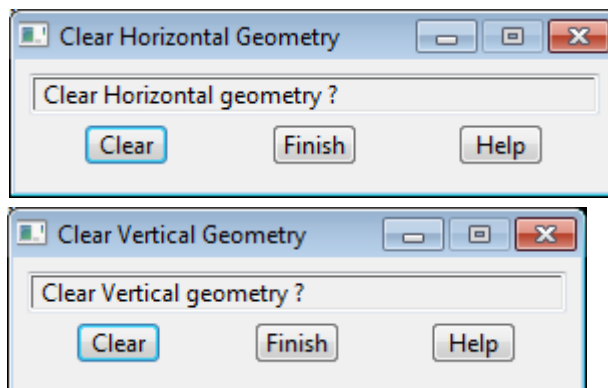
If any errors occur, an **errors** menu is placed on the screen.



The **errors** menu remains on the screen and only disappears when either the **[X]** is picked or one of the error messages is picked with LB.

Note - the **validate** option is automatically run when the edit is finished.

Clear VG and Clear HG



The **Clear VG** and **Clear HG** options are used to delete all the horizontal and/or vertical intersection points in the string.

The **Clear VG** option removes all the vertical geometry from the string.

The horizontal geometry still exists plus all the other string properties (model, name, colour and type).

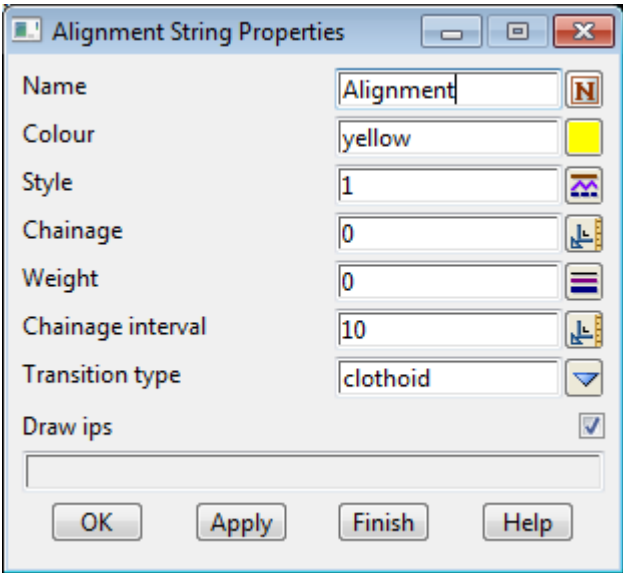
The **Clear HG** option removes all the horizontal and vertical geometry from the string.

The string still exists and keeps its other properties such as model, name, colour and type.

After a **Clear**, the horizontal or vertical geometry can be re- entered using the edit options.

Properties

Selecting **Properties** brings up the **Alignment String Properties** panel which is used to modify the string’s header information.



The fields in this panel are similar to those in the **Create Alignment String** panel and the alignment string editor options. The only new field is

Field Description	Type	Defaults	Pop-Up
Draw ips	tick	tick	
<i>if tick, the horizontal and vertical intersection points are draw on plan and section views.</i>			
<i>If not tick, the ips are not draw on the plan and section views.</i>			

OK/Apply	button
<i>for the string being edited, OK sets the string with the values in the panel fields and removes the panel.</i>	
Apply sets the string with the values in the panel fields and leaves the panel on the screen.	

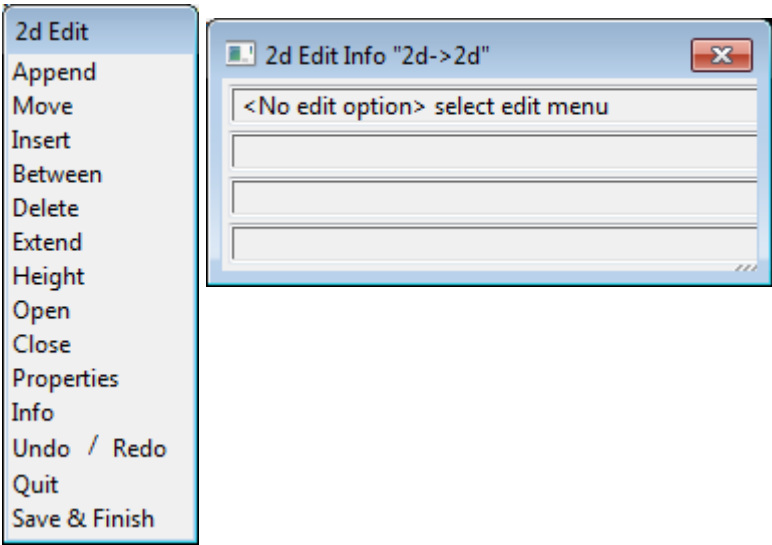
Finish

The **finish** option is used to terminate the alignment string edits. After selecting the **Finish** option, the string is checked for overlapping horizontal or vertical tangent points and any errors reported.

2d Edit - Old

Position of option on menu: Strings =>Editor

On picking a 2d string, the 2d edit menu and the 2d edit info panel are placed on the screen.



See the earlier section [Super String Edit - Common Information](#) for general information about editing strings.

Each option in the 2d edit menu will now be described.

Append

The **append** option is used to create the 1st point in a new string, to append a new intersect point to the end of the string or to prepend a new intersection point to the beginning of the string. In this option, both appending and prepending will be referred to as appending.

Existing 2d Strings

Appending a point is a two step process.

Step (a) - selecting the end to append the point to.

After the **append** option has been selected, the end of the string to append the point to is selected. Once the string end is selected, the new intersection point is assumed to be at the current cursor position. As the cursor is moved, the string is redrawn reflecting the changing position of the appended intersection point

message area 1	<Append Points>
message area 2	IP point number, x, y, z co-ords of IP
message area 3	bearing-in, bearing out, bearing difference for an IP
message area 4	select final position- after pick
Screen message area	
	<Select string end to append to> [picks][][menu]
	<Select string end to append to> [picks][accepts][menu]

Step (b) - selecting the position for the new appended point.

A cross indicates where the cursor currently is. The position of the new appended point is set to the current cursor position by picking (LB) and accepting (MB).

message area 1	<Append Points>
message area 2	IP point number, x, y, z co-ords of IP

message area 3	bearing-in, bearing out, bearing difference for closest IP
message area 4	select final position- before pick
Screen message area	
	<Select final position of point> [picks][][menu]
	<Select final position of point> [picks][accepts][menu]

Once a point has been appended to the string, the appended point is considered to be the selected string end and a new append cycle begins. That is, stage (a) is already set up. The current cursor position indicates the new position for the next appended point.

Hence a **series** of string points is easily entered by first selecting the string end that the new points are to be appended to (step (a)) and then moving the cursor to the position of each new point and selecting them in turn.

Typed input can be used in either step.

The **append** option is terminated by either bringing up the **pick ops** menu and selecting **cancel** or by selecting a new option from the **2d edit** menu.

If, after bringing up the **pick ops** menu, it is decided to continue with the append option, simply select the **restart** option from the **pick ops** menu and the **pick ops** menu will disappear leaving the append option still current.

New 2d String

For creating a new string, the cursor is used to select the 1st point of the string. The option then continues as if appending to an existing 2d string where the end point has already been selected.

Move

The **move** option is for moving individual points (intersection points - IP's) of the string.

The move cycle consists of two steps:

- (a) selecting the point to be moved
- (b) selecting the new position for the point.

Step (a)

First the point to be moved is selected. The selected point will then move around the view and the string redrawn to show the change as the cursor is moved.

message area 1	<Move Point>
message area 2	IP point number, x, y, z co-ords of IP
message area 3	bearing-in, bearing out, bearing difference for the closest IP
message area 4	select final position- after pick
Screen message area	
	<Select point to move> [picks][][menu]
	<Select point to move> [picks][accepts][menu]

Step (b)

The current cursor position is selected as the new position for the point by selecting (LB) and accepting (MB). The point being moved is then anchored at the cursor position for the IP, and the string redrawn.

message area 1	<Move Point>
message area 2	IP point number, x, y, z co-ords of IP
message area 3	bearing-in, bearing out, bearing difference for the moved IP
message area 4	select final position- before pick, edit finished- after pick
Screen message area	
	<Select final position of point> [picks][][menu]
	<Select final position of point> [picks][accepts][menu]

Typed input can be used in either step.

Once the move cycle is completed and the point moved, the move option is still current and can be repeated for other points without having to re-select the **move** option.

The **move** option is terminated by selecting **cancel** from the **pick ops** menu or by selecting a new **2d edit** option.

Insert

The **insert** option is designed to place a new intersection point in a string between two adjacent intersection points (note that the inserted point **does not** have to be on the line joining the two intersection points).

Inserting a point, like moving a point, is a two step process.

Step (a) - selecting the IP's to be on either side of the new intersection point

The two adjacent intersection points are chosen by selecting the **line** connecting the two intersection points. Once the line is selected, the new IP is assumed to be at the current cursor position. As the cursor is moved, the string is redrawn reflecting the changing position of the inserted IP.

message area 1	<Insert Point>
message area 2	IP point number, x, y, z co-ords of IP
message area 3	bearing-in, bearing out, bearing difference for closest IP
message area 4	select final position- after pick
Screen message area	
	<Select line to insert on> [picks][][menu]
	<Select line to insert on> [picks][accepts][menu]

Step (b) - selecting the position for the new intersection point

The position of the new intersection point is selecting

message area 1	<Insert Point>
message area 2	IP point number, x, y, z co-ords of IP
message area 3	bearing-in, bearing out, bearing difference for the inserted IP
message area 4	select final position - before pick, edit finished - after pick
Screen message area	
	<Select final position of point> [picks][][menu]
	<Select final position of point> [picks][accepts][menu]

Once the insert cycle is completed and the point inserted, the insert option is still current and can be repeated for other insertions without having to re-select the **insert** option.

The **insert** option is terminated by selecting **cancel** from the **pick ops** menu or by selecting a new option from the **2d edit** menu.

Typed input can be used in either step.

Between

The **between** option is similar to the **insert** option except that the inserted point **does** have to be on the line joining the two intersection points. To accomplish this, the cursor position is projected onto the IP-IP line to give the new IP point position.

The **between** option is terminated by selecting **cancel** from the **pick ops** menu or by selecting a new option from the **2d edit**.

Delete

The **delete** option is used to delete selected intersection points from the string.

The point to be deleted is picked (LB) and accepted (MB). When the point is accepted, it is **deleted**. The string, minus the deleted point, is then redrawn.

Once a point has been deleted, another point in the string can then be selected and deleted. Hence any number of points from the string can be deleted one after another.

```
message area 1 <Delete Points>
message area 2      IP point number, x, y, z co-ords of IP
message area 3      bearing-in, bearing out, bearing difference for closest IP
message area 5
Screen message area
      <Select point to delete> [picks][ ][menu]
      <Select point to delete> [picks][accepts][menu]
```

The **delete** option is terminated by selecting **cancel** from the **pick ops** menu or by selecting a new option from the **2d edit** menu.

Typed input can be used to select a point for deletion.

Extend

The **extend** option is used to move an intersection point along the line joining the intersection point to its neighbouring intersection point.

That is, the bearing of the IP-IP line is kept constant and the intersection point is moved along that line either **towards** or **away** from its neighbouring intersection point on the IP-IP line.

Extending, like moving a point, is a two step process.

Step (a) - selecting the IP-IP line and the IP to be moved along that line

The IP-IP line and the intersection point to be moved are chosen in the one operation by picking (LB) and accepting (MB) a co-ordinate point near the IP-IP line and close to the intersection point to be moved along that line.

Once the line and intersection point (IP) are selected, the new position of the selected IP is assumed to be at the current cursor position projected perpendicularly onto the IP-IP line.

As the cursor is moved, the string is redrawn reflecting the changing position of the moved IP.

```
message area 1      <Extend Point>
message area 2      IP point number, x, y, z co-ords of IP
message area 3      bearing-in, bearing out, bearing difference for closest IP
message area 4      select final position- after pick
Screen message area
      <Select line to extend> [picks][ ][menu]
      <Select line to extend> [picks][accepts][menu]
```

Step (b) - selecting the final position for the intersection point

The final position for the intersection point is set to the projection of the selected cursor position onto the IP-IP line.

```
message area 1      <Extend Points>
message area 2      IP point number, x, y, z co-ords of IP
message area 3      bearing-in, bearing out, bearing difference for closest IP
message area 4      select final position - before pick, edit finished - after pick
Screen message area
      <Select final position of point> [picks][ ][menu]
      <Select final position of point> [picks][accepts][menu]
```

Once the extend is completed, the extend option is still current and can be repeated without re-

selecting the **extend** option.

The **extend** option is terminated by selecting **cancel** from the **pick ops** menu or by selecting a new option from the **2d edit** menu.

Typed input can be used in either step.

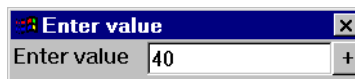
Note - Extend can be used on the end points of the string

Height

The **height** option is used to modify the height (z value) of the 2d string.

After the height option is chosen, an **enter value** typed-input box is displayed on the screen with the string's current height (z value).

The enter value typed-input box looks like:



The height is entered into the typed-input box, terminated by <enter>. The entered value is taken as the height of the 2dstring and the string redrawn with the new height. The typed-input box then disappears.

The height option automatically terminates and a new option is selected from the **2d edit**.

Note - all the points in a 2d string have the same height.

Open

If the string is closed (that is, the end points have the same x and y values), selecting the **open** option removes the last point of the string.

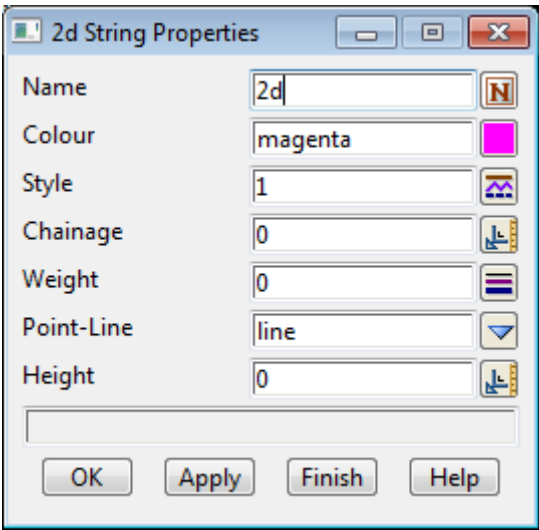
If the string is not closed, the **open** option does nothing.

Close

Selecting the **close** option adds a point to the end of the string with the same co-ordinate values as the 1st point in the string.

Properties

Selecting **Properties** brings up the **2d String Properties** panel which is used to modify the string's header information.



The fields in this panel are similar to those in the **Create 2d String** panel and the 2d string editor options. The only new field is

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

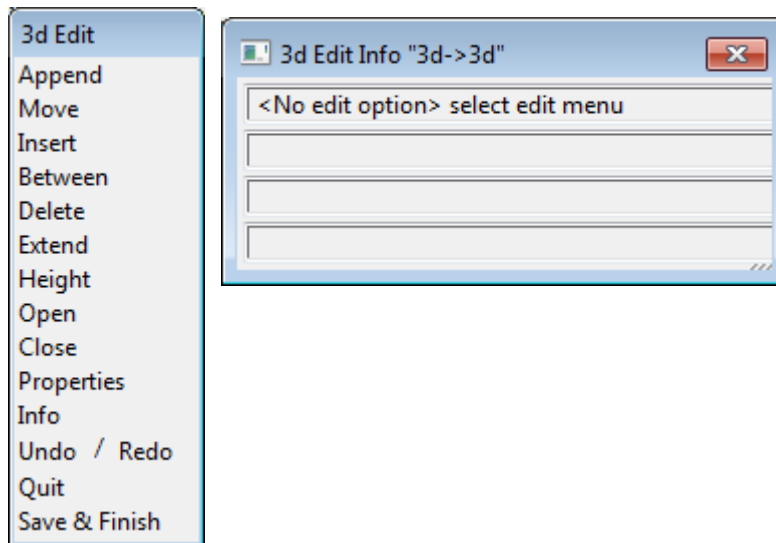
Set	button		
------------	--------	--	--

*for the 2d string being edited, set all the items in the **2d String Properties** panel to the values given in the panel.*

3d Edit - Old

Position of option on menu: Strings => Editor

On picking a 3d string, the **3d edit** menu and **3d edit info** panel are placed on the screen.



The difference between a 2d and a 3d string is that all points in a 2d string have the same z-value, whereas for a 3d string, each point can have a different z-value.

Hence most of the options in the **3d edit** menu are similar to the **2d edit** options of the same name, and only the differences for each option will be discussed. The *2d Edit* options are given in the section [Edit 2d](#)

See the earlier section [Super String Edit - Common Information](#) for general information about editing strings.

Append

The **append** operation for a 3d string is similar to that for a 2d string except that a height (z-value) is required for each new point.

Since in most cases, it would be tiresome to ask for a height every time a point is added, the entry of a new height is controlled by the **height** toggle in the **snaps** menu. If **height** is toggled to on, then every time a point is placed or moved an **enter height** typed-input box is displayed on the screen.

The enter height typed-input box looks like:



The height is entered into the typed-input box, terminated with <enter>. The entered value is taken as the height of the 3d string point and the string redrawn with the new height at the point. The typed-input box then disappears.

When the enter height box is placed on the screen, it will already have a value in it depending on the circumstances preceding the operation.

For example, if a point or line was snapped to, the height at that point or line will be displayed in the box.

Height

The **height** option is used to modify the height (z value) of any point in the string.

After the height option is chosen, the user must select which point is going to have its height modified.

After the point has been selected, an **New height** typed-input box is displayed on the screen with the point's current height (z value).

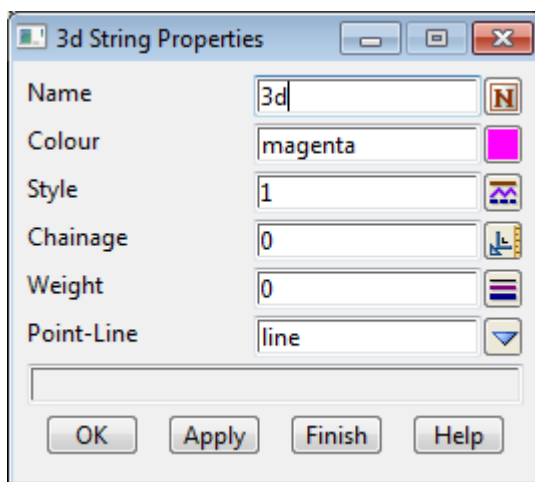


The height is entered into the typed-input box, terminated with <enter>. The entered value is taken as the height of the point in the 3d string and the string redrawn with the new height at that point. The typed-input box then disappears.

The **height** option is terminated on selecting **cancel** from the **pick ops** menu or by selecting a new option from the **3d edit** menu.

Properties

Selecting **Properties** brings up the **3d String Properties** panel which is used to modify the string's header information.



The fields in this panel are similar to those in the **create 3d string** panel and the 3dd string editor options. The only new field is

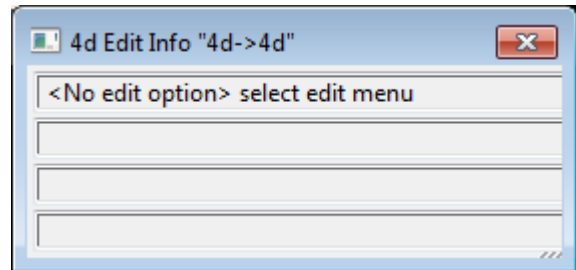
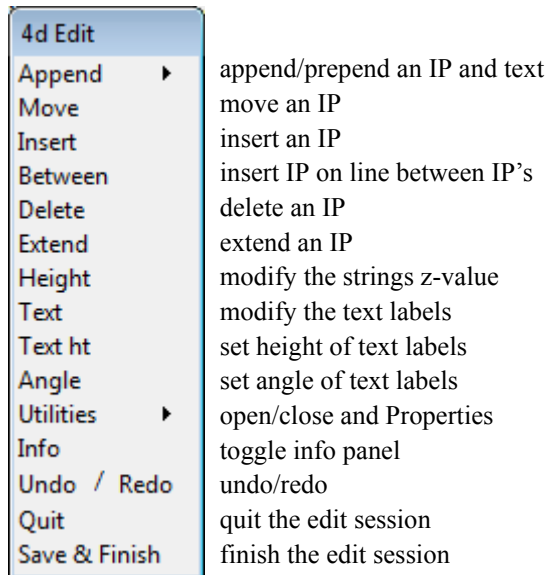
Field Description	Type	Defaults	Pop-Up
OK/Apply	button		

*for the string being edited, **OK** sets the string with the values in the panel fields and removes the panel. **Apply** sets the 3d string with the values in the panel fields and leaves the panel on the screen.*

4d Edit - Old

Position of option on menu: Strings => Editor

On picking a 4d string, the 4d edit menu and 4d edit info panel are placed on the screen.



Only the options append, text, size and angle will be described in detail since all the other options are similar to the equivalent 3d string option (see the section [Edit 3d](#)).

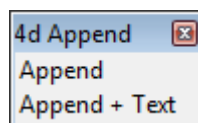
See the earlier section [Super String Edit - Common Information](#) for general information about editing strings.

Append

The **append** operation for a 4d string is similar to the 3d string case except that a height and an optional text label is required for each new point.

Since in many cases a text label is not required at every point of a 4d string, there is an append option that asks for text at every point and another that does not ask.

The 4d **append** walk-right is



The **height** question for each point is toggled on or off in the snaps menu just as it was for a 3d string.

The **append** option is terminated on selecting **cancel** from the **pick ops** menu or by selecting a new option from the 4d edit menu.

Text

The **text** option is used to modify the text label of any point in the 4d string.

After the **text** option is chosen, the user must select which point is going to have its text label modified. Once the point has been selected, an **enter text** typed-input box is displayed on the screen with the point's current text label placed in it.

The new text label is entered into the typed-input box, terminated with <enter>. The entered

value is taken as the text label of the point in the 4d string and the string redrawn with the new text at that point. The typed-input box then disappears.

The **text** option is terminated on selecting **cancel** from the **pick ops** menu or by selecting a new option from the **4d edit** menu.

Text ht

All the text labels in the 4d string have the same height (given in pixel or world units). The **text ht** option is used to modify this text label height.

After selecting the option, an **enter value** typed-input box is displayed on the screen with the string's current text label height placed in it.

The new text label height is entered into the typed-input box, terminated with <enter>.

The entered value is taken as the text label height for all the points in the 4d string and the string redrawn using the new height. The typed-input box then disappears.

The **text ht** option automatically terminates after use.

Angle

All the text labels in the 4d string are drawn rotated about their defining string point with the same rotation angle. The angle, in degrees, is measured in a counter-clockwise direction about the horizontal axis.

The **angle** option is used to modify the text rotation angle.

After selecting the option, an **enter value** typed-input box is displayed on the screen with the string's current text rotation angle placed in it.

The new text rotation angle is entered into the typed-input box, terminated with <enter>.

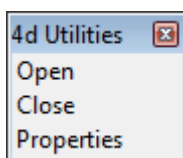
The entered value is taken as the text rotation angle for all the points in the 4d string and the string redrawn using the new angle. The typed-input box then disappears.

The **angle** option automatically terminates after use.

Utilities

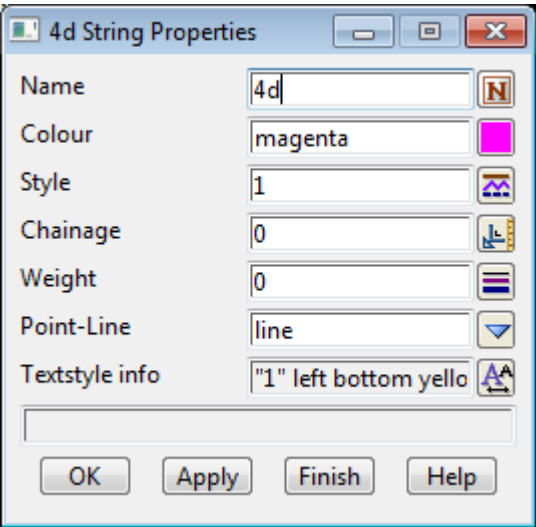
Position of option on menu: **Strings =>Editor**

The **4d utilities** walk-right is



Properties

Selecting **Properties** brings up the **4d String Properties** panel which is used to modify the string's header information.



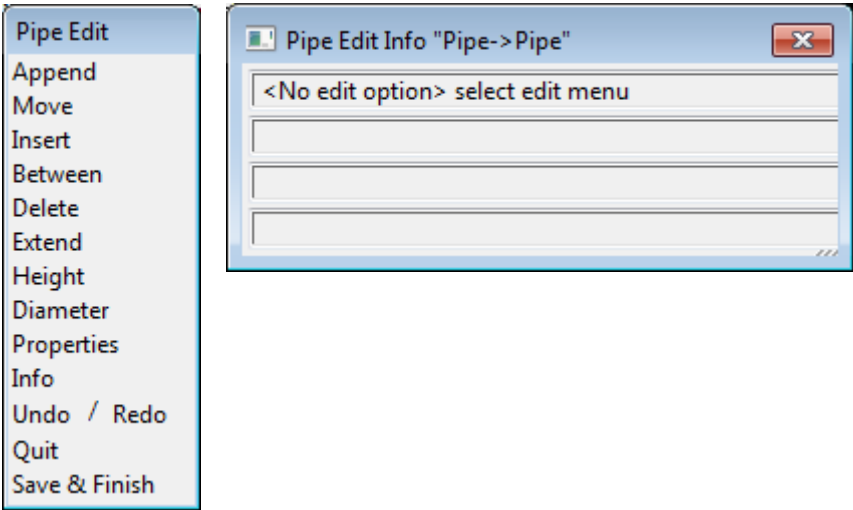
The fields in this panel are similar to those in the **create 4d string** panel and the 4d string editor options. The only new field is

Field Description	Type	Defaults	Pop-Up
OK/Apply	button		

*for the string being edited, **OK** sets the string with the values in the panel fields and removes the panel. **Apply** sets the string with the values in the panel fields and leaves the panel on the screen.*

Pipe Edit - Old

On picking a pipe string, the pipe edit menu and panel are placed on the screen.



The only difference between a 3d and a pipe string is that the pipe string has a diameter. Hence most of the options in the **pipe edit** menu are similar to the **3d edit** options of the same name, and only the **diameter** and **Properties** options need to be discussed. See the section [Edit 3d](#) for information on the 3d string editor.

See the earlier section [Super String Edit - Common Information](#) for general information about editing strings.

Diameter

The **diameter** option is used to modify the diameter of the pipe string.

After the **diameter** option is chosen, an enter value typed-input box is displayed on the screen with the string's current diameter.

The enter value typed-input box looks like:



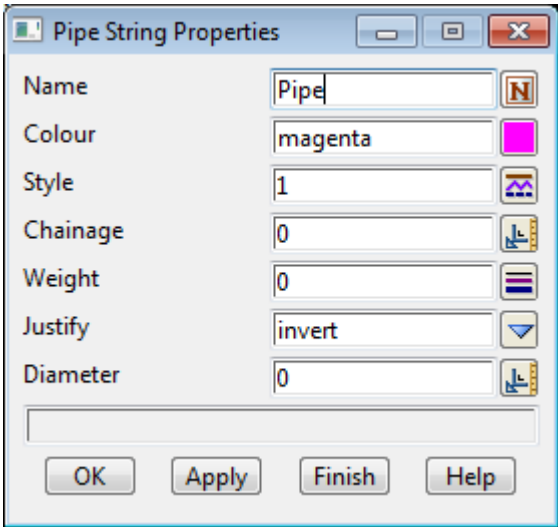
The diameter is entered into the typed-input box, terminated with <enter>. The entered value is taken as the diameter of the pipe string. The typed-input box then disappears.

The **diameter** option automatically terminates and a new option is selected from the **pipe edit** menu.

Note - the pipe string has only one diameter for the entire string.

Properties

Selecting **Properties** brings up the **Pipe String Properties** panel which is used to modify the string's header information.

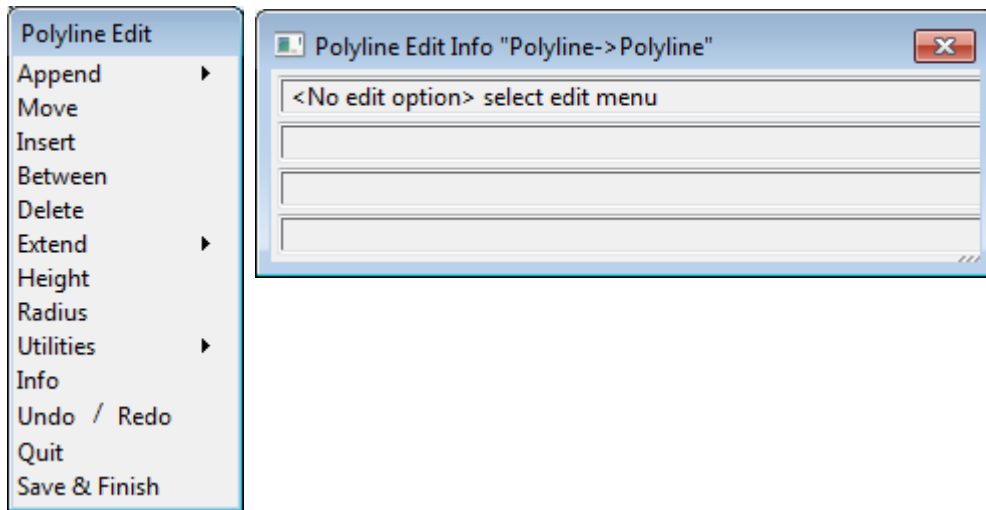


The fields in this panel are similar to those in the **create pipe string** panel and the 3d string editor options. The only new field is

Field Description	Type	Defaults	Pop-Up
OK/Apply	button		
<i>for the string being edited, OK sets the string with the values in the panel fields and removes the panel.</i>			
<i>Apply sets the string with the values in the panel fields and leaves the panel on the screen.</i>			

Polyline Edit - Old

On picking a polyline string, the **polyline edit** menu and **polyline edit info** panel are placed on the screen.



The major difference between a polyline and a 3d string is that a polyline string can have an arc instead of a line joining adjacent string points. Hence most of the options in the **polyline edit** menu are similar to the **3d edit** options of the same name, and only the differences for each option will be discussed. See the section [Edit 3d](#) for information on the 3d string editor.

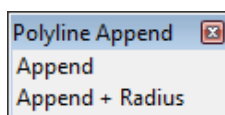
See the earlier section [Super String Edit - Common Information](#) for general information about editing strings.

Append

The **append** operation for a polyline string is similar to the 3d string case except that an arc radius can be given for each new line segment.

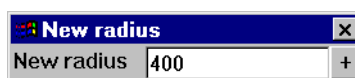
Since in many cases an arc radius is not required at every segment of a polyline string, there is an append option that asks for the radius at every point and another that does not ask.

The **append** walk-right is



If the **append + radius** option selected, then before each point is appended, an enter radius typed-input box is placed on the screen.

The enter radius typed-input box looks like



The radius is entered into the typed-input box, terminated with <enter>. The entered value is taken as the radius of the arc to the next polyline string point and the arc will be drawn correctly as the cursor is moved to the next point.

A **radius** value of **0** is taken to mean no arc.

The height question for each point is toggled on/off in the snaps menu just as it was for a 3d

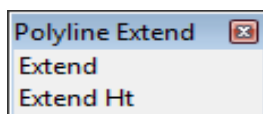
string.

The **append** option is terminated on selecting **cancel** from the **pick ops** menu or by selecting a new option from the **polyline edit** menu

Extend

There are two **extend** options for a polyline string - **extend=>extend** that is identical to the 3d string case where the z-value of the point being extended is kept constant, and a second option, **extend=>extend ht** where the z-value of the point being extended is linearly interpolated by the extension distance.

The **extend** walk-right is



Extend

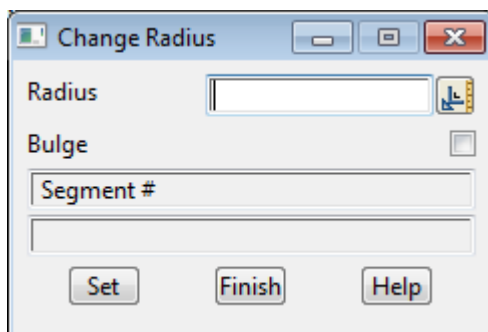
extend=>extend that is identical to the 3d string case where the z-value of the point being extended is kept constant.

Extend by ht

extend=>extend ht not only moves the point but also linearly interpolates the z-value of the point being extended.

Radius

Selecting **radius** brings up the **change radius** panel which is used to modify the radius of any arc/line joining adjacent polyline points.



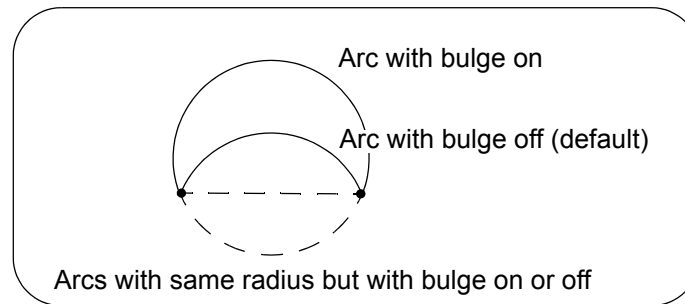
After selecting the **radius** option, the user selects the arc/straight to be modified and the current arc radius and bulge setting will be displayed in the **change radius** panel.

New values can then be entered and the arc modified by selecting the **set** button.

If the radius is positive, the arc is drawn from the start point to the next point on the polyline in a clockwise direction. If the radius is negative, the arc is drawn from the start point to the next point on the polyline in a counter-clockwise direction.

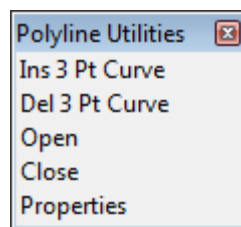
For a given radius (positive or negative), there are two possible cases for the arc- one where the arc is less than a semi-circle, the other when the arc is greater than a semi-circle.

If bulge is turned on, the larger arc is used. The default is bulge turned off.



Utilities

The **utilities** walk-right menu contains a number of useful miscellaneous options for the polyline string. The menu is



Each of the new options will now be discussed.

Ins 3 Pt Curve

The **Ins 3 Pt Curve** option is used to insert a curve through three adjacent polyline points.

After selecting the option, the middle IP of the three adjacent polyline points is selected.

When the IP is accepted, the radius required to fit a curve through the IP and the two adjacent IP's is calculated, and this radius is then applied to the segments joining the adjacent IP's.

Del 3 Pt Curve

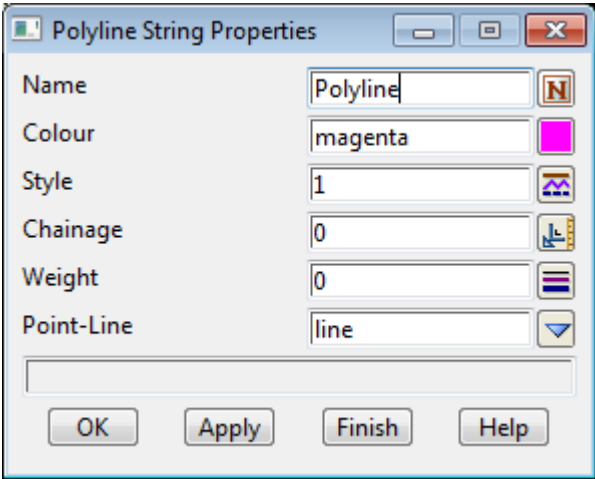
The **del 3 pt curve** option is used to delete the curves on either side of a polyline point.

After selecting the option, an IP is selected and when the IP is accepted, the radii of the segments on either side are set to zero.

Hence the curves on either side of the IP are effectively removed.

Properties

Selecting **Properties** brings up the **Polyline String Properties** panel which is used to modify the string's header information.



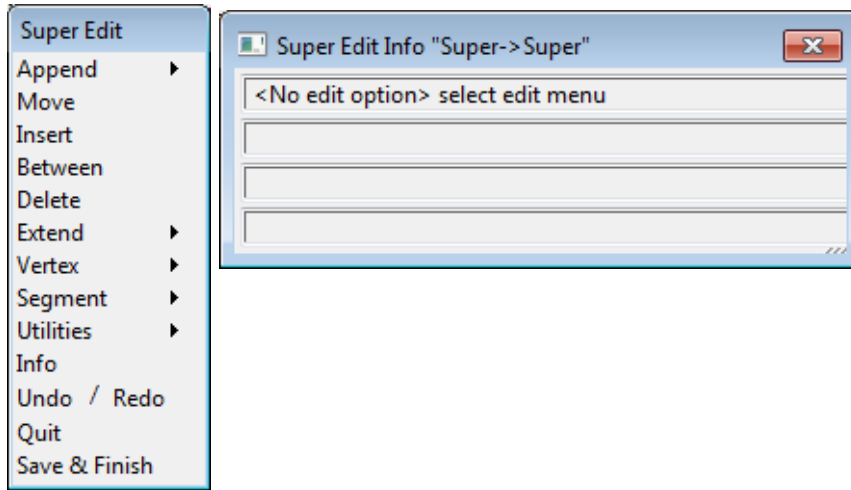
The fields in this panel are similar to those in the **create polyline string** panel and the polyline string editor options. The only new field is

Field Description	Type	Defaults	Pop-Up
OK/Apply	button		

*for the string being edited, **OK** sets the string with the values in the panel fields and removes the panel. **Apply** sets the string with the values in the panel fields and leaves the panel on the screen.*

Super Edit - Old

On picking a super string, the **Super Edit** menu and **Super Edit Info** panel are placed on the screen.



The super string is similar to a polyline string in that it can have an arc instead of a line joining adjacent string points. Hence most of the options in the **super edit** menu are similar to the **polyline edit** options of the same name, and only the differences for each option will be discussed.

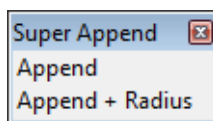
See the earlier section [Super String Edit - Common Information](#) for general information about editing strings.

Append

The **Append** operation for a super is the same as the polyline case and an arc radius can be given for each new line segment.

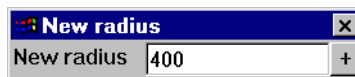
Since in many cases an arc radius is not required at every segment of a super string, there is an append option that asks for the radius at every point and another that does not ask.

The **append walk-right** is



If the **Append + Radius** option selected, then before each vertex is appended, an enter radius typed-input box is placed on the screen.

The enter radius typed-input box looks like



The radius is entered into the typed-input box, terminated with <enter>. The entered value is taken as the radius of the arc to the next super string vertex and the arc will be drawn correctly as the cursor is moved to the next vertex.

A **radius** value of **0** is taken to mean **no arc**.

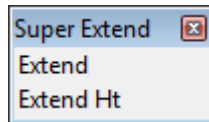
The height question for each vertex is toggled on/off in the snaps menu just as it was for a polyline string.

The **Append** option is terminated on selecting **Cancel** from the **Pick Ops** menu or by selecting a new option from the **Super Edit** menu

Extend

There are two **extend** options for a polyline string - **Extend=>Extend** that is identical to the 3d string case where the z-value of the point being extended is kept constant, and a second option, **Extend=>Extend Ht** where the z-value of the point being extended is linearly interpolated by the extension distance.

The **Extend** walk-right is



Extend

Extend=>Extend that is identical to the 3d string case where the z-value of the point being extended is kept constant.

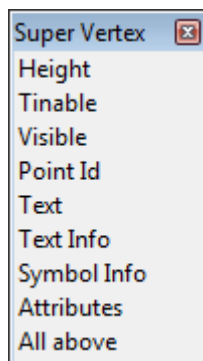
Extend by Ht

Extend=>Extend Ht not only moves the point but also linearly interpolates the z-value of the point being extended.

Vertex

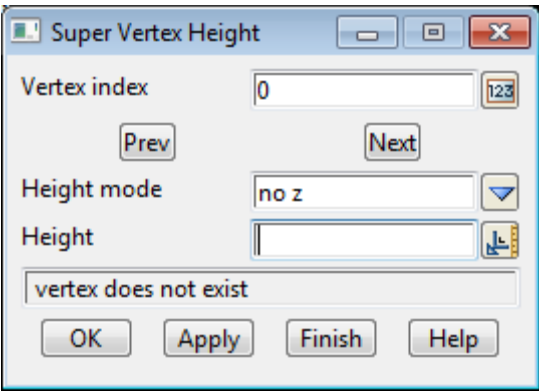
The **Vertex** menu contains options to modify information at any vertex of the super string.

The **Vertex** walk-right is



Height

Selecting **Vertex=>Height** brings up the **Super Vertex Height** panel which is used to set the height value for vertices.



As soon as **Height** is chosen, a `<Select vertex> [Picks][Menu]` message is written to the **Status Bar** and vertices can be selected.

When the vertex to modify is selected, its *vertex number*, *height mode* and *height* are written to the appropriate panel fields. The values and modes can be changed and either **OK** or **Apply** selected to change the values of the vertex.

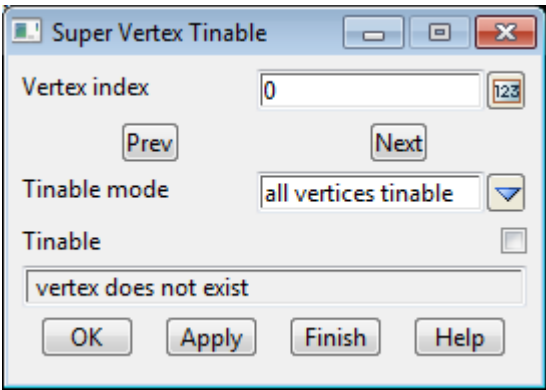
Another vertex can then be selected or the **Prev** and **Next** buttons used to move to adjacent vertices.

The fields and buttons used in the **Super Vertex Height** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Vertex no.	input	selected vertex	
<i>if a vertex is selected, then its vertex number is displayed in this field. A number can also be typed in and any information in the panel will then be applied to that vertex if OK or Apply is selected.</i>			
Prev	button		
<i>move to the previous vertex (predecessor). The information for the previous vertex is displayed in the panel fields.</i>			
Next	button		
<i>move to the next vertex (successor). The information for the next vertex is displayed in the panel fields.</i>			
Height mode vertex	input		no z, entire string, each
<i>if no z, there is no z value for the vertex.</i>			
<i>if entire string, then the string has the same z value for each vertex.</i>			
<i>if each vertex, then each vertex has a separate z value.</i>			
Height	input	height of vertex/string	
<i>the height used for the vertex or for the entire string.</i>			
OK/Apply	button		
<i>for the vertex being edited, OK sets the vertex/string with the values in the panel fields and removes the panel. Apply sets the vertex/string with the values in the panel fields and leaves the panel on the screen.</i>			

Tinable

Selecting **Vertex=>Tinable** brings up the **Super Vertex Tinable** panel which is used to set the tinable flag for vertices.



As soon as **Tenable** is chosen, a `<Select vertex> [Picks][Menu]` message is written to the **Status Bar** and vertices can be selected.

When the vertex to modify is selected, its *vertex number* and *tenable flag* are displayed in the panel. The *tenable flag* can be changed and either **OK** or **Apply** selected to change the *tenable flag* of the vertex.

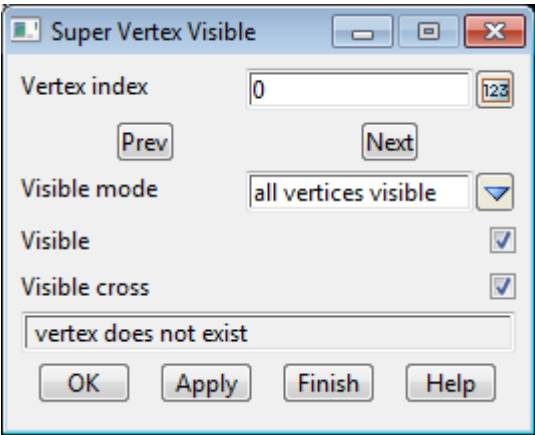
Another vertex can then be selected or the **Prev** and **Next** buttons used to move to adjacent vertices.

The fields and buttons used in the **Super Vertex Tenable** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Vertex no.	input	selected vertex	
<i>if a vertex is selected, then its vertex number is displayed in this field. A number can also be typed in and any information in the panel will then be applied to that vertex if OK or Apply is selected.</i>			
Prev	button		
<i>move to the previous vertex (predecessor). The information for the previous vertex is displayed in the panel fields.</i>			
Next	button		
<i>move to the next vertex (successor). The information for the next vertex is displayed in the panel fields.</i>			
Tenable	tick		
<i>if ticked, the vertex is included in tins. if not ticked, then the vertex is ignored when triangulating.</i>			
OK/Apply	button		
<i>for the vertex being edited, OK sets the vertex/string with the values in the panel fields and removes the panel. Apply sets the vertex/string with the values in the panel fields and leaves the panel on the screen.</i>			

Visible

Selecting **Vertex=>Visible** brings up the **Super Vertex Visible** panel which is used to set the visibility flag for vertices.



As soon as **Visible** is chosen, a `<Select vertex> [Picks][Menu]` message is written to the **Status Bar** and vertices can be selected.

When the vertex to modify is selected, its *vertex number* and *visibility flag* are displayed in the panel. The visibility flag can be changed and either **OK** or **Apply** selected to change the visibility flag of the vertex.

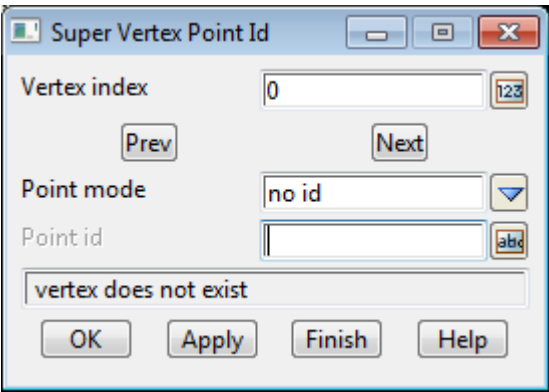
Another vertex can then be selected or the **Prev** and **Next** buttons used to move to adjacent vertices.

The fields and buttons used in the **Super Vertex Visible** panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Vertex no.	<i>if a vertex is selected, then its vertex number is displayed in this field. A number can also be typed in and any information in the panel will then be applied to that vertex if OK or Apply is selected.</i>	input	selected vertex	
Prev	<i>move to the previous vertex (predecessor). The information for the previous vertex is displayed in the panel fields.</i>	button		
Next	<i>move to the next vertex (successor). The information for the next vertex is displayed in the panel fields.</i>	button		
Visible	<i>if ticked, the vertex is visible. if not ticked, then the vertex is invisible.</i>	tick		
OK/Apply	<i>for the vertex being edited, OK sets the vertex/string with the values in the panel fields and removes the panel. Apply sets the vertex/string with the values in the panel fields and leaves the panel on the screen.</i>	button		

Point no

Selecting **Vertex=>Point no** brings up the **Super Vertex Point Number** panel which is used to set the point numbers for vertices.



As soon as **Point no** is chosen, a **<Select vertex> [Picks][Menu]** message is written to the **Status Bar** and vertices can be selected.

When the vertex to modify is selected, its *vertex number* and *point number* are displayed in the panel. The point number can be changed and either **OK** or **Apply** selected to change the point number of the vertex.

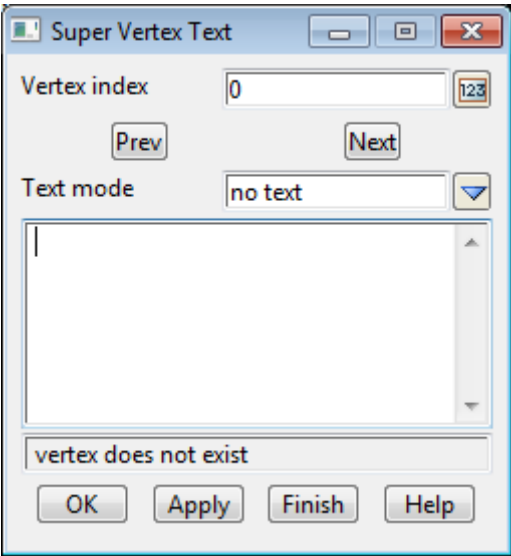
Another vertex can then be selected or the **Prev** and **Next** buttons used to move to adjacent vertices.

The fields and buttons used in the **Super Vertex Visible** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Vertex no.	input	selected vertex	
<i>if a vertex is selected, then its vertex number is displayed in this field. A number can also be typed in and any information in the panel will then be applied to that vertex if OK or Apply is selected.</i>			
Prev	button		
<i>move to the previous vertex (predecessor). The information for the previous vertex is displayed in the panel fields.</i>			
Next	button		
<i>move to the next vertex (successor). The information for the next vertex is displayed in the panel fields.</i>			
Point no.	input	point no of vertex	
<i>the point number used for the vertex.</i>			
OK/Apply	button		
<i>for the vertex being edited, OK sets the vertex/string with the values in the panel fields and removes the panel. Apply sets the vertex/string with the values in the panel fields and leaves the panel on the screen.</i>			

Text

Selecting **Vertex=>Text** brings up the **Super Vertex Text** panel which is used to set the text for vertices.



As soon as Text is chosen, a `<Select vertex> [Picks][Menu]` message is written to the **Status Bar** and vertices can be selected.

When the vertex to modify is selected, its *vertex number*, *text mode* and *text* are written to the appropriate panel fields. The values and modes can be changed and either **OK** or **Apply** selected to change the values of the vertex.

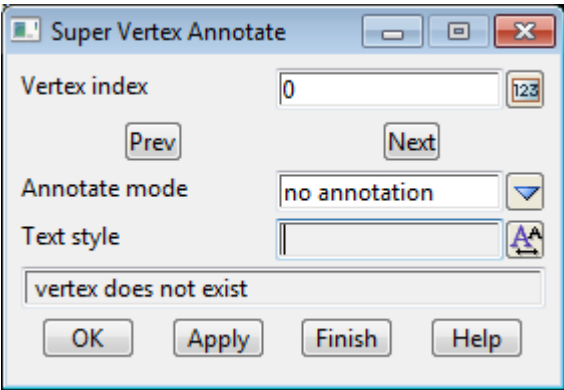
Another vertex can then be selected or the **Prev** and **Next** buttons used to move to adjacent vertices.

The fields and buttons used in the **Super Vertex Text** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Vertex no.	input	selected vertex	
<i>if a vertex is selected, then its vertex number is displayed in this field. A number can also be typed in and any information in the panel will then be applied to that vertex if OK or Apply is selected.</i>			
Prev	button		
<i>move to the previous vertex (predecessor). The information for the previous vertex is displayed in the panel fields.</i>			
Next	button		
<i>move to the next vertex (successor). The information for the next vertex is displayed in the panel fields.</i>			
Text mode	input		no text, entire string, each vertex
<i>if no text, there is no text for the vertex.</i>			
<i>if entire string, then the string has the same text for each vertex.</i>			
<i>if each vertex, then each vertex has a separate text value.</i>			
Text	input	text of vertex/string	
<i>the text used for the vertex or for the entire string.</i>			
OK/Apply	button		
<i>for the vertex being edited, OK sets the vertex/string with the values in the panel fields and removes the panel. Apply sets the vertex/string with the values in the panel fields and leaves the panel on the screen.</i>			

Text Info

Selecting `Vertex=>Text info` brings up the **Super Vertex Annotate** panel which is used to set the annotation styles for the text at vertices.



As soon as **Text info** is chosen, a **<Select vertex> [Picks][Menu]** message is written to the **Status Bar** and vertices can be selected.

When the vertex to modify is selected, its *vertex number*, *annotate mode* and *annotation information* are written to the appropriate panel fields. The values and modes can be changed and either **OK** or **Apply** selected to change the values of the vertex.

Another vertex can then be selected or the **Prev** and **Next** buttons used to move to adjacent vertices.

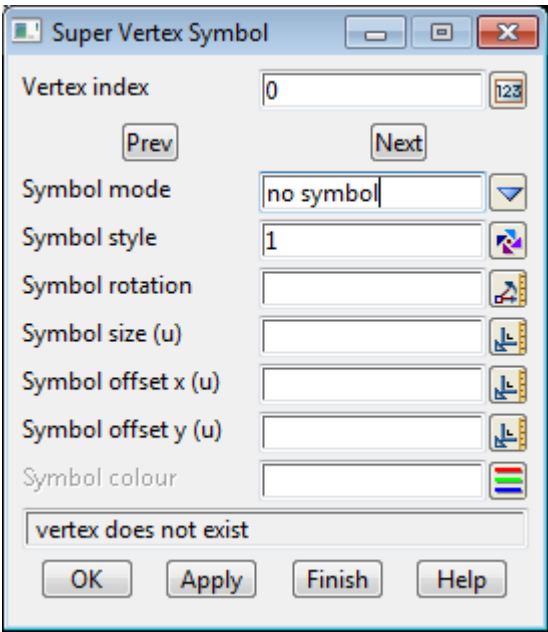
The fields and buttons used in the **Super Vertex Annotate** panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Vertex no.	<i>if a vertex is selected, then its vertex number is displayed in this field. A number can also be typed in and any information in the panel will then be applied to that vertex if OK or Apply is selected.</i>	input	selected vertex	
Prev	<i>move to the previous vertex (predecessor). The information for the previous vertex is displayed in the panel fields.</i>	button		
Next	<i>move to the next vertex (successor). The information for the next vertex is displayed in the panel fields.</i>	button		
Annotate mode	<i>if no annotation, then the text at the vertex is not displayed. if entire string, then the same annotation settings are used for each vertex. if each vertex, then each vertex has separate annotations settings.</i>	input		no annotation, entire string, each vertex
Text style	<i>text style for the text at the vertex.</i>	input	1	available text styles
Text units	<i>units for the height of the text.</i>	input	pixels	pixels, world
Height (u)	<i>height of the text (in text units).</i>	input		
X factor	<i>x factor of the text.</i>	input	1	
Offset (u)	<i>distance (in text units) to offset the text from its (x,y) placement position.</i>	input	0	
Raise (u)	<i>distance (in text units) to raise the text above the line for its (x,y) placement position.</i>	input	0	

Justify	input	bottom-left	bot-left/cent/right, mid-left/cent/right top-left/cent/right
<i>text justification (about the offset position).</i>			
Angle	input		
<i>angle of the text.</i>			
Slant	input	0	
<i>slant, in degrees, of the text.</i>			
Colour	input		available colours
<i>colour of the text.</i>			
OK/Apply	button		
<i>for the vertex being edited, OK sets the vertex/string with the values in the panel fields and removes the panel. Apply sets the vertex/string with the values in the panel fields and leaves the panel on the screen.</i>			

Symbol Info

Selecting Vertex=>Symbol info brings up the **Super Vertex Symbol** panel which is used to set symbols and their display parameters at vertices.



As soon as **Symbol info** is chosen, a **<Select vertex> [Picks][Menu]** message is written to the **Status Bar** and vertices can be selected.

When the vertex to modify is selected, its *vertex number*, *symbol mode* and *symbol information* are written to the appropriate panel fields. The values and modes can be changed and either **OK** or **Apply** selected to change the values for the vertex.

Another vertex can then be selected or the **Prev** and **Next** buttons used to move to adjacent vertices.

The fields and buttons used in the **Super Vertex Symbol** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Vertex no.	input	selected vertex	

if a vertex is selected, then its vertex number is displayed in this field. A number can also be typed in

and any information in the panel will then be applied to that vertex if **OK** or **Apply** is selected.

Prev button
move to the previous vertex (predecessor). The information for the previous vertex is displayed in the panel fields.

Next button
move to the next vertex (successor). The information for the next vertex is displayed in the panel fields.

Symbol mode input no symbol, entire string, each vertex
if **no symbol**, then there is no symbol at the vertex.
if **entire string**, then the same symbol and settings are used for each vertex.
if **each vertex**, then each vertex has separate symbols and settings.

Symbol style input 1 available line styles
line style for the symbol at the vertex.

Symbol rotation input
rotation angle of the symbol.

Symbol size (u) input
size of the symbol (in xxx units).

Symbol offset (u) input 0
distance (in xxx units) to offset the symbol from its (x,y) placement position.

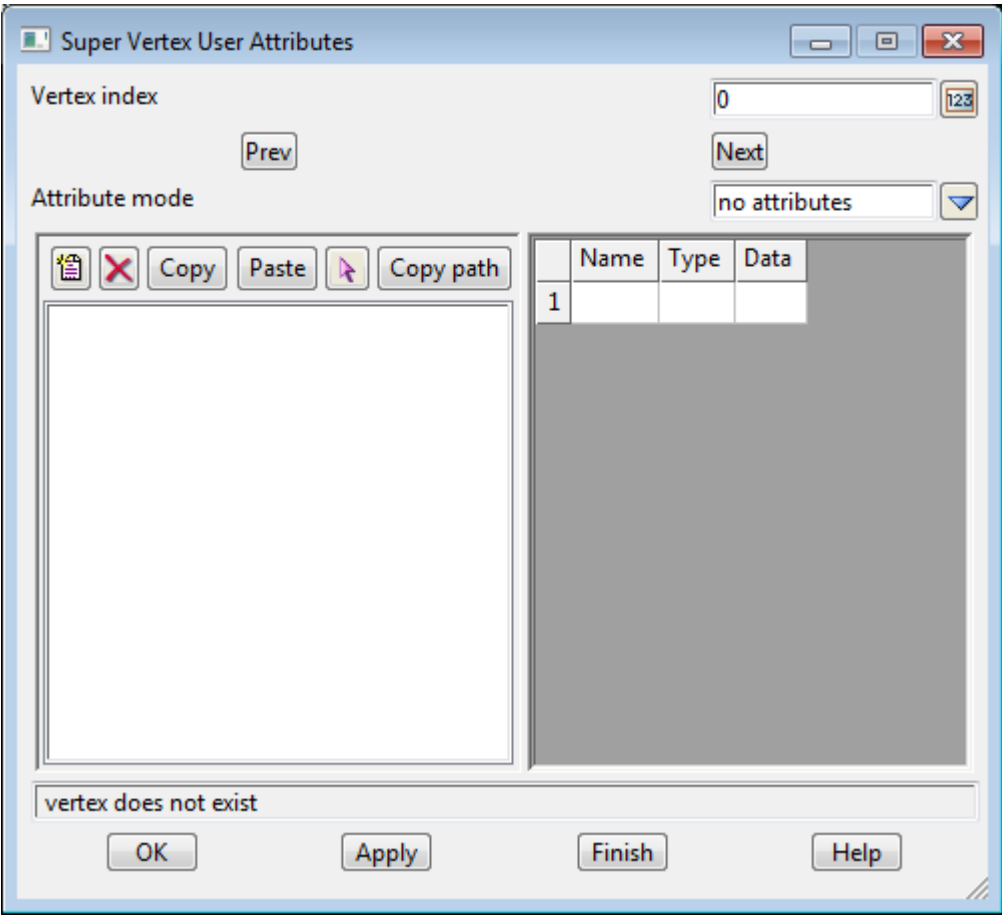
Symbol raise (u) input 0
distance (in xxx units) to raise the symbol above the line for its (x,y) placement position.

Symbol colour input available colours
colour of the symbol if none is defined in the symbol definition

OK/Apply button
for the vertex being edited, **OK** sets the vertex/string with the values in the panel fields and removes the panel. **Apply** sets the vertex/string with the values in the panel fields and leaves the panel on the screen.

Attributes

Selecting Vertex=>Attributes brings up the **Super Vertex User Attributes** panel which is used to display and edit user defined attributes at vertices of the super string.



The **Prev** and **Next** buttons are used to cycle through and display the attributes for each vertex in the super string in the *Name/Type/Data* grid.

The data in the *Name/Type/Data* grid can be deleted, modified or added to and then updated for the vertex using the **OK** or **Apply** button.

The fields and buttons used in the **Super Vertex User Attributes** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Vertex no.	input	selected vertex	
<i>when the option starts, the user attributes for the first vertex is displayed. The Next and Prev buttons will move onto other vertices. Also a number can be typed into the field and any information in the panel will then be applied to that vertex if OK or Apply is selected. Typing <Enter> after entering a number will go to that vertex number and display the attributes.</i>			
Prev	button		
<i>move to the previous vertex (predecessor). The information for the previous vertex is displayed in the panel fields.</i>			
Next	button		
<i>move to the next vertex (successor). The information for the next vertex is displayed in the panel fields.</i>			
Attribute mode	choice box		no attributes, each vertex
<i>if no attributes, then no vertices have user attributes.</i>			
<i>if each vertex, then each vertex can have user attributes.</i>			

Name/Type/Data Grid

Name	input	
	name for the user attribute. This must be unique for all attributes at this vertex.	
Type	choice box	integer, real, text
	type of the attribute.	
Data	input	
	value for the attribute.	

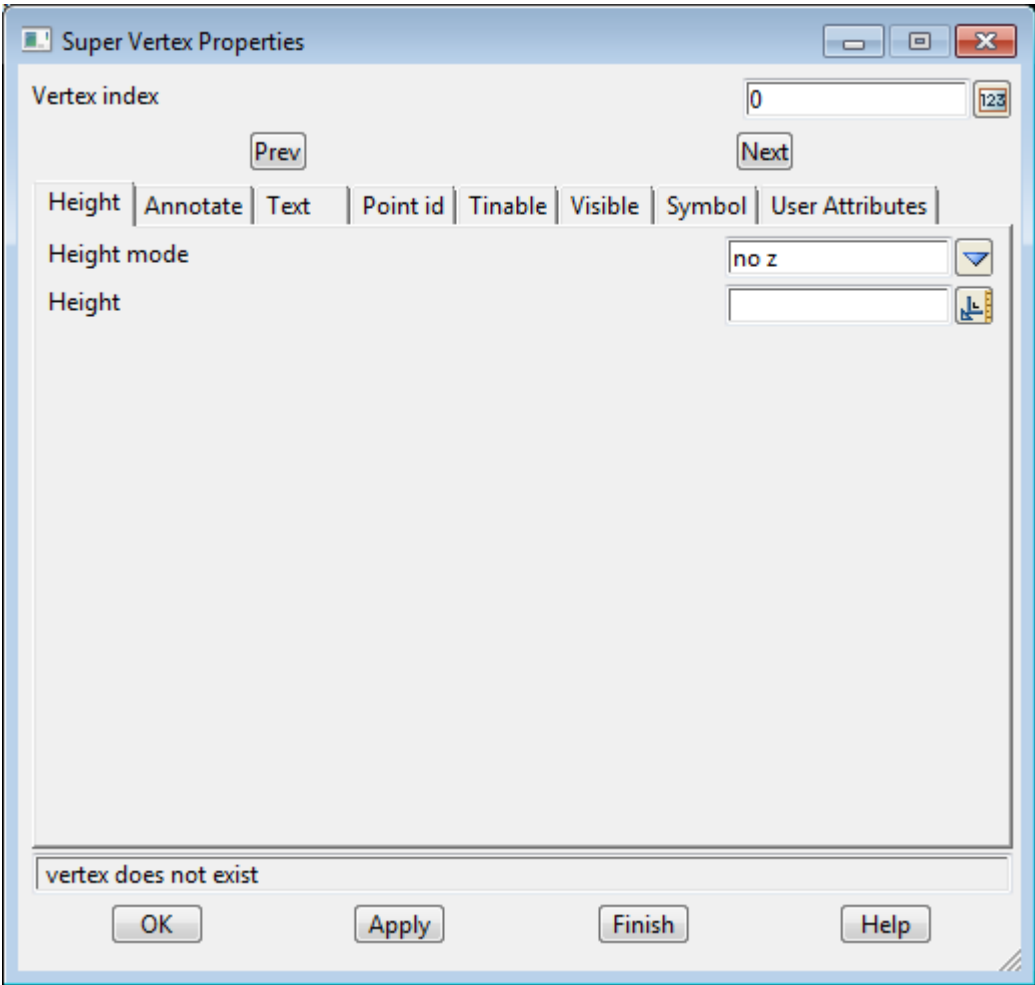
OK/Apply button
for the vertex being edited, **OK** sets the vertex with the values in the panel fields and removes the panel. **Apply** sets the vertex with the values in the panel fields and leaves the panel on the screen.

Vertex - All above

Selecting Vertex=>All above brings up the **Super Vertex Properties** panel which is used to display all the properties for a vertex.

This option is also available from the *Strings* menu

Position of option on menu: Strings =>Properties =>Vertex (all)



As soon as All above is chosen, a <Select vertex> [Picks][Menu] message is written to the **Status Bar** and vertices can be selected.

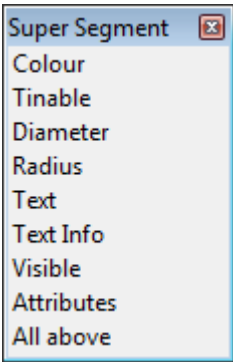
When the vertex to modify is selected, its *vertex number* and all other *information* are written to the appropriate panel fields. The values and modes can be changed and either **OK** or **Apply** selected to change the values for the vertex.

The fields in the **Super Vertex Properties** panel have already been described in the other Vertex options and so will not be described again.

Please continue to the next section [Segment Toolbar](#).

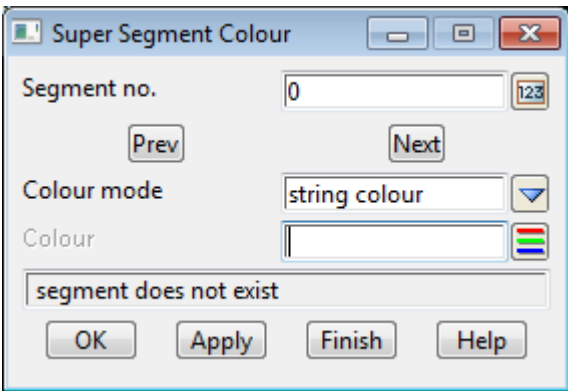
Segment

The **Segment** menu contains options to modify information at any segment of the super string.
The **Segment** walk-right is



Colour

Selecting **Segment=>Colour** brings up the **Super Segment Colour** panel which is used to set the colour of the string segments.



As soon as **Colour** is chosen, a **<Select segment> [Picks]]][Menu]** message is written to the **Status Bar** and segments can be selected.

When the segment to modify is selected, its *segment number*, *colour mode* and *colour* are written to the appropriate panel fields. The values and modes can be changed and either **OK** or **Apply** selected to change the values of the segment.

Another segment can then be selected or the **Prev** and **Next** buttons used to move to adjacent segments. The appropriate segment highlights when the **Prev** and **Next** buttons are used.

The fields and buttons used in the **Super Segment Colour** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Segment no.	input	selected vertex	
<i>if a segment is selected, then its segment number is displayed in this field. A number can also be typed</i>			

in and any information in the panel will then be applied to that segment if **OK** or **Apply** is selected.

Prev button
move to the previous segment (predecessor). The information for the previous segment is displayed in the panel fields.

Next button
move to the next segment (successor). The information for the next segment is displayed in the panel fields.

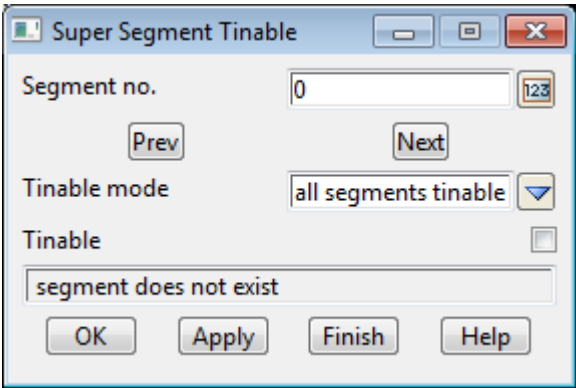
Colour mode input string colour, each segment
if **no z**, there is no z value for the vertex.
if **string colour**, then all the segments in the string have the same colour.
if **each segment**, then each segment has a separate colour.

Colour input colour of segment/string available colours
the colour used for the segment or for the entire string.

OK/Apply button
for the segment being edited, **OK** sets the segment/string with the values in the panel fields and removes the panel. **Apply** sets the segment/string with the values in the panel fields and leaves the panel on the screen.

Tinable

Selecting Segment=>Tinable brings up the **Super Segment Tinable** panel which is used to set the tinable flag for segments.



As soon as **Tinable** is chosen, a <Select segment> [Picks][Menu] message is written to the **Status Bar** and vertices can be selected.

When the segment to modify is selected, its *segment number* and *tinable flag* are displayed in the panel. The tinable flag can be changed and either **OK** or **Apply** selected to change the tinable flag of the segment.

Another segment can then be selected or the **Prev** and **Next** buttons used to move to adjacent segments.

The fields and buttons used in the **Super Segment Tinable** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Segment no.	input	selected segment	
if a segment is selected, then its segment number is displayed in this field. A number can also be typed in and any information in the panel will then be applied to that segment if OK or Apply is selected.			
Prev	button		
move to the previous segment (predecessor). The information for the previous segment is displayed in			

the panel fields.

- Next

button

move to the next segment (successor). The information for the next segment is displayed in the panel fields.
- Tinable

tick

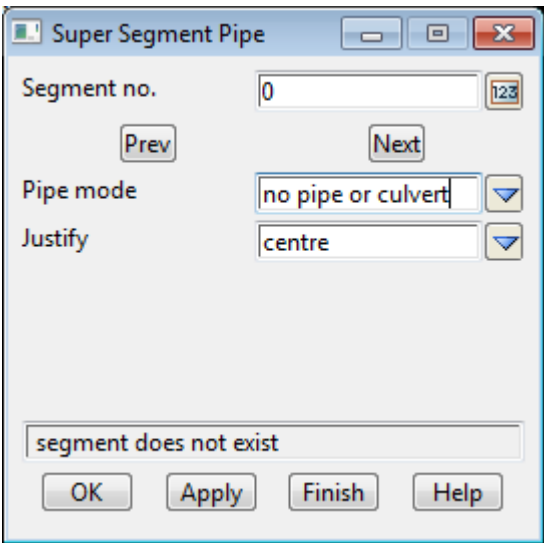
if *ticked*, the triangulation process tries to preserve the segment as a side of a triangle in the tin.
- OK/Apply

button

for the segment being edited, **OK** sets the segment/string with the values in the panel fields and removes the panel. **Apply** sets the segment/string with the values in the panel fields and leaves the panel on the screen.

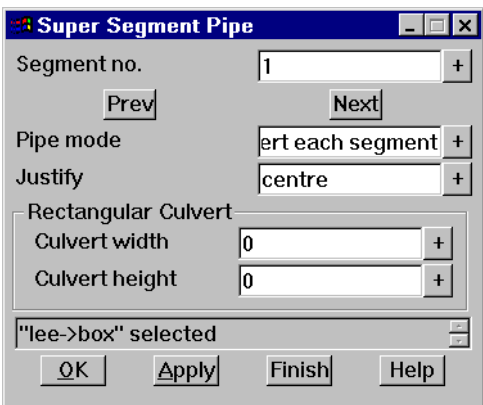
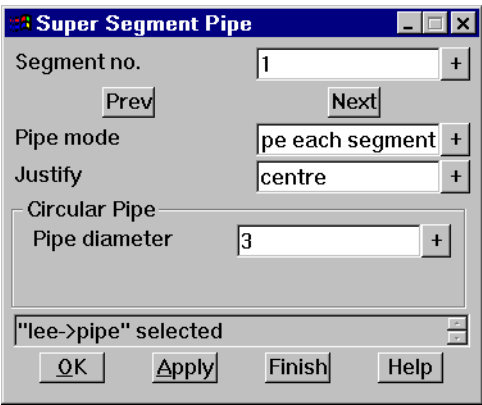
Diameter

The segments of a super string can have either a pipe or box cross section, or none. Selecting Segment=>Diameter brings up the **Super Segment Pipe** panel which is used to set the pipe mode and size for the string segments.



As soon as **Diameter** is chosen, a **<Select segment> [Picks][Menu]** message is written to the **Status Bar** and segments can be selected.

When the segment to modify is selected, its *segment number*, *pipe mode* and *information* are written to the appropriate panel fields and the **Super Segment Pipe** panel will change depending on whether it was a pip or box cross-section for the string.



After any panel fields are modified, selecting either **OK** or **Apply** will change the pipe information for the segment.

Another segment can then be selected or the **Prev** and **Next** buttons used to move to adjacent segments. The appropriate segment highlights when the **Prev** and **Next** buttons are used.

The fields and buttons used in the **Super Segment Pipe** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Segment no.	input	selected vertex	
<i>if a segment is selected, then its segment number is displayed in this field. A number can also be typed in and any information in the panel will then be applied to that segment if OK or Apply is selected.</i>			
Prev	button		
<i>move to the previous segment (predecessor). The information for the previous segment is displayed in the panel fields.</i>			
Next	button		
<i>move to the next segment (successor). The information for the next segment is displayed in the panel fields.</i>			
Pipe mode	input		no pipe or box pipe entire string pipe each segment box entire string box each segment
<i>if no pipe or box, there is no z value for the vertex.</i>			
<i>if string colour, then all the segments in the string have the same colour.</i>			
<i>if each segment, then each segment has a separate colour.</i>			
Justify	input		invert, centre, overt
<i>justification of the pipe/box with respect to the co-ordinates given for the vertices of the super string.</i>			
<i>rotation angle of the symbol.</i>			
Pipe diameter	input		
<i>diameter of the pipe in world units.</i>			
Box width	input		
<i>width of the box section in world units.</i>			
Box height	input		
<i>height of the box section in world units.</i>			
OK/Apply	button		
<i>for the segment being edited, OK sets the segment/string with the values in the panel fields and removes the panel. Apply sets the segment/string with the values in the panel fields and leaves the panel on the screen.</i>			

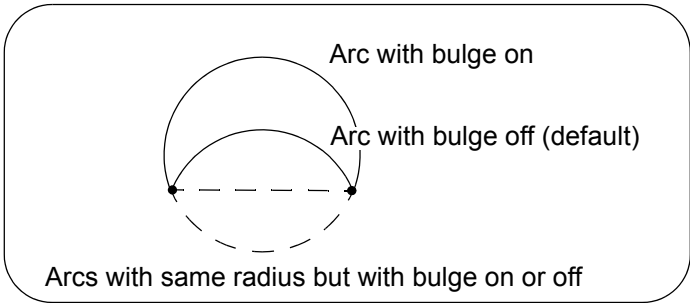
Radius

When viewed in plan, the segments of a super string can be joined by string lines or arcs. If the radius is positive, the arc is drawn from the start vertex to the end vertex of the segment in a clockwise direction. If the radius is negative, the arc is drawn from the start vertex to the end vertex on the segment in a counter-clockwise direction.

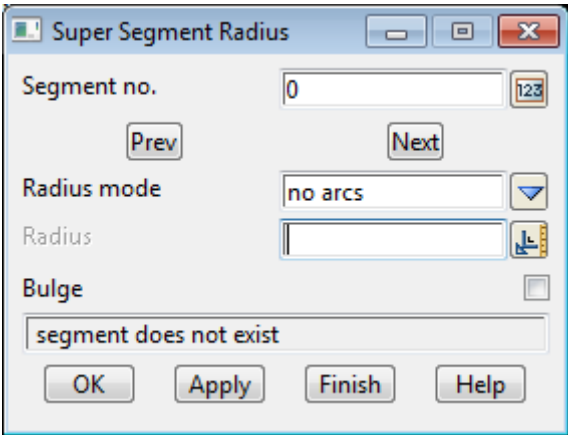
For a given radius (positive or negative), there are two possible cases for the arc- one where the arc is less than a semi-circle, the other when the arc is greater than a semi-circle.

If bulge is turned on, the larger arc is used. The default is bulge turned off.

A zero radius is interpreted to be a just a straight line segment with no arc.



Selecting **Segment=>Radius** brings up the **Super Segment Radius** panel which is used to set the plan radius of the segment.



As soon as **Radius** is chosen, a **<Select segment> [Picks][Menu]** message is written to the **Status Bar** and segments can be selected.

When the segment to modify is selected, its *segment number*, *radius* and *bulge* are written to the appropriate panel fields. The values and modes can be changed and either **OK** or **Apply** selected to change the values of the segment.

Another segment can then be selected or the **Prev** and **Next** buttons used to move to adjacent segments. The appropriate segment highlights when the **Prev** and **Next** buttons are used.

The fields and buttons used in the **Super Segment Radius** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Segment no.	input	selected vertex	
<i>if a segment is selected, then its segment number is displayed in this field. A number can also be typed in and any information in the panel will then be applied to that segment if OK or Apply is selected.</i>			
Prev	button		
<i>move to the previous segment (predecessor). The information for the previous segment is displayed in the panel fields.</i>			
Next	button		
<i>move to the next segment (successor). The information for the next segment is displayed in the panel fields.</i>			
Colour mode	input		string colour, each segment
<i>if no z, there is no z value for the vertex.</i>			
<i>if string colour, then all the segments in the string have the same colour.</i>			

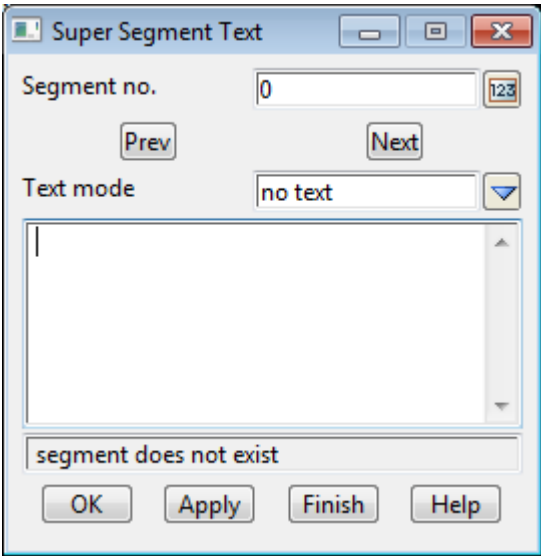
if each segment, then each segment has a separate colour.

Radius tick
if ticked, the larger arc is used.
if not-ticked, the smaller arc is used.

Bulge input 0
radius of the segment arc. A radius of 0 mean no arc.

OK/Apply button
for the segment being edited, **OK** sets the segment/string with the values in the panel fields and removes the panel. **Apply** sets the segment/string with the values in the panel fields and leaves the panel on the screen.

Text
Selecting Segment=>Text brings up the **Super Segment Text** panel which is used to set the text for segments.



As soon as Text is chosen, a <Select segment> [Picks][Menu] message is written to the **Status Bar** and vertices can be selected.

When the segment to modify is selected, its *segment number*, *text mode* and *text* are written to the appropriate panel fields. The values and modes can be changed and either **OK** or **Apply** selected to change the values of the segment.

Another segment can then be selected or the **Prev** and **Next** buttons used to move to adjacent segments.

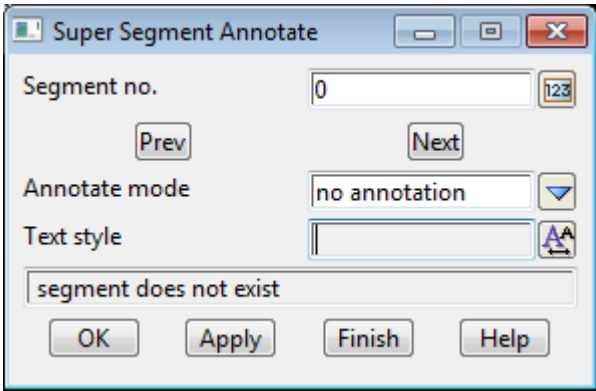
The fields and buttons used in the **Super Segment Text** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Segment no.	input	selected vertex	
if a segment is selected, then its segment number is displayed in this field. A number can also be typed in and any information in the panel will then be applied to that segment if OK or Apply is selected.			
Prev	button		
move to the previous segment (predecessor). The information for the previous segment is displayed in the panel fields.			

Next	button	
<i>move to the next segment (successor). The information for the next segment is displayed in the panel fields.</i>		
Text mode	input	no text, entire string, each segment
<i>if no text, there is no text for the segment.</i>		
<i>if entire string, then the string has the same text for each segment.</i>		
<i>if each segment, then each segment has a separate text value.</i>		
Text	input	text of segment/string
<i>the text used for the segment or for the entire string.</i>		
OK/Apply	button	
<i>for the segment being edited, OK sets the segment/string with the values in the panel fields and removes the panel. Apply sets the segment/string with the values in the panel fields and leaves the panel on the screen.</i>		

Text Info

Selecting Segment=>Text info brings up the **Super Segment Annotate** panel which is used to set the annotation styles for the text at segments.



As soon as Text info is chosen, a <Select segment> [Picks][Menu] message is written to the **Status Bar** and segments can be selected.

When the segment to modify is selected, its *segment number*, *annotate mode* and *annotation information* are written to the appropriate panel fields. The values and modes can be changed and either **OK** or **Apply** selected to change the values of the segment.

Another segment can then be selected or the **Prev** and **Next** buttons used to move to adjacent segments.

The fields and buttons used in the **Super Segment Annotate** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Segment no.	input	selected vertex	
<i>if a segment is selected, then its segment number is displayed in this field. A number can also be typed in and any information in the panel will then be applied to that segment if OK or Apply is selected.</i>			
Prev	button		
<i>move to the previous segment (predecessor). The information for the previous segment is displayed in the panel fields.</i>			
Next	button		
<i>move to the next segment (successor). The information for the next segment is displayed in the panel fields.</i>			

Annotate mode input no annotation, entire string, each segment

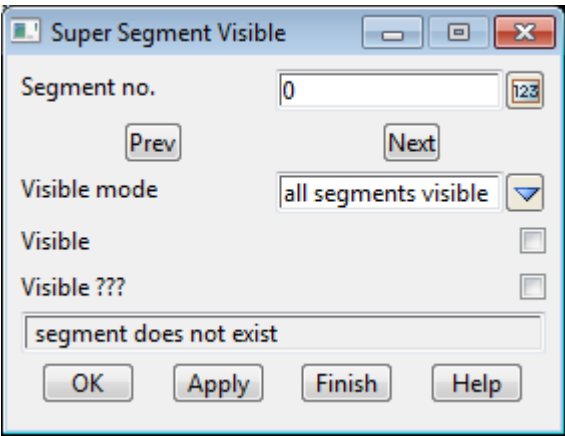
*if **no annotation**, then the text at the segment is not displayed.
if **entire string**, then the same annotation settings are used for each segment.
if **each vertex**, then each segment has separate annotations settings.*

Textstyle info input
textstyle information.

OK/Apply button
*for the segment being edited, **OK** sets the segment/string with the values in the panel fields and removes the panel. **Apply** sets the segment/string with the values in the panel fields and leaves the panel on the screen.*

Visible

Selecting Segment=>Visible brings up the **Super Segment Visible** panel which is used to set the visibility flag for segments.



As soon as **Visible** is chosen, a **<Select segment> [Picks][Menu]** message is written to the **Status Bar** and segments can be selected.

When the segment to modify is selected, its *segment number* and *visibility flag* are displayed in the panel. The visibility flag can be changed and either **OK** or **Apply** selected to change the visibility flag of the segment.

Another segment can then be selected or the **Prev** and **Next** buttons used to move to adjacent segments.

The fields and buttons used in the **Super Segment Visible** panel have the following functions.

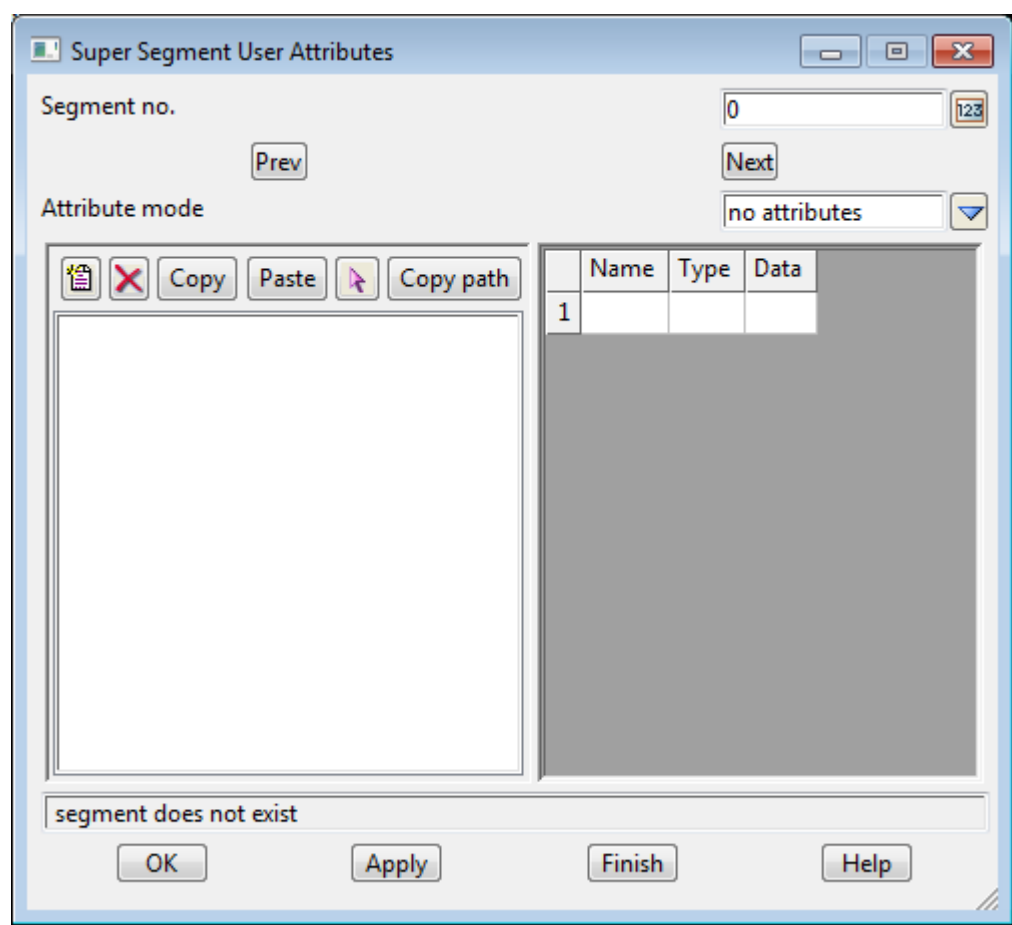
Field Description	Type	Defaults	Pop-Up
Segment no.	input	selected vertex	
<i>if a segment is selected, then its segment number is displayed in this field. A number can also be typed in and any information in the panel will then be applied to that segment if OK or Apply is selected.</i>			
Prev	button		
<i>move to the previous segment (predecessor). The information for the previous segment is displayed in the panel fields.</i>			
Next	button		
<i>move to the next segment (successor). The information for the next segment is displayed in the panel fields.</i>			

Visible tick
*if **ticked**, the segment is visible.*
*if **not ticked**, then the segment is invisible.*

OK/Apply button
*for the segment being edited, **OK** sets the segment/string with the values in the panel fields and removes the panel. **Apply** sets the segment/string with the values in the panel fields and leaves the panel on the screen.*

Attributes

Selecting **Segment=>Attributes** brings up the **Super Segment User Attributes** panel which is used to display and edit user defined attributes at segments of the super string.



The **Prev** and **Next** buttons are used to cycle through and display the attributes for each segment in the super string in the *Name/Type/Data* grid.

The data in the *Name/Type/Data* grid can be deleted, modified or added to and then updated for the segment using the **OK** or **Apply** button.

The fields and buttons used in the **Super Segment User Attributes** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Segment no.
*when the option starts, the user attributes for the first segment is displayed. The **Next** and **Prev** buttons will move onto other segments. Also a number can be typed into the field and any information in the panel will then be applied to that segment if **OK** or **Apply** is selected. Typing <Enter> after entering a number will go to that segment number and display the attributes.*

Prev	button	
<i>move to the previous segment (predecessor). The information for the previous segment is displayed in the panel fields.</i>		
Next	button	
<i>move to the next segment (successor). The information for the next segment is displayed in the panel fields.</i>		
Attribute mode	choice box	no attributes, each segment
<i>if no attributes, then no segments have user attributes.</i>		
<i>if each segment, then each segment can have user attributes.</i>		

Name/Type/Data Grid

Name	input	
<i>name for the user attribute. This must be unique for all attributes at this segment.</i>		
Type	choice box	integer, real, text
<i>type of the attribute.</i>		
Data	input	
<i>value for the attribute.</i>		

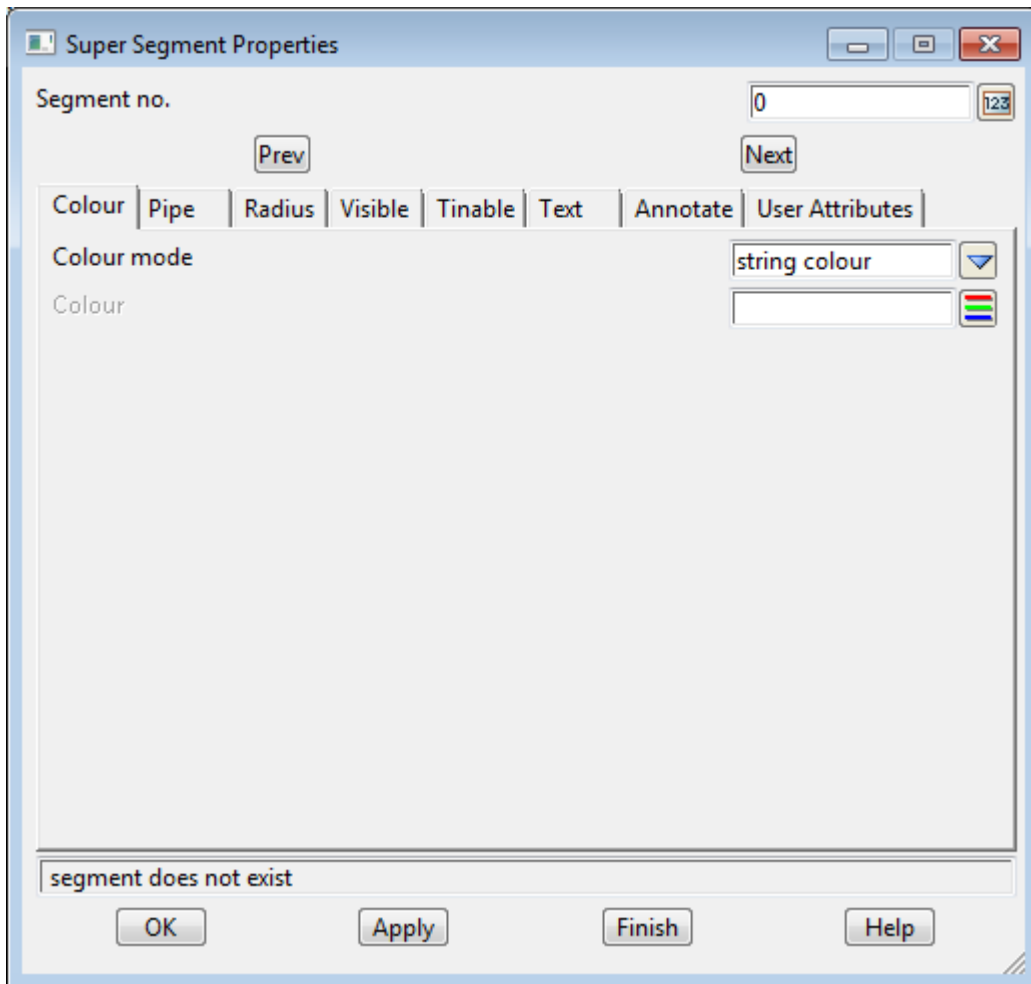
OK/Apply	button	
<i>for the segment being edited, OK sets the segment with the values in the panel fields and removes the panel. Apply sets the segment with the values in the panel fields and leaves the panel on the screen.</i>		

Segment - All above

Selecting Segment=>All above brings up the **Super Segment Properties** panel which is used to display all the properties of a segment.

This option is also available from the *Strings* menu

Position of option on menu: Strings =>Properties =>Segment (all)



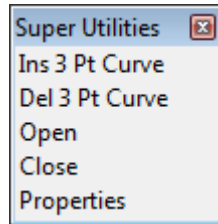
As soon as **All above** is chosen, a `<Select segment> [Picks][Menu]` message is written to the **Status Bar** and segments can be selected.

When the segment to modify is selected, its *segment number* and all other *information* are written to the appropriate panel fields. The values and modes can be changed and either **OK** or **Apply** selected to change the values for the segment.

The fields in the **Super Segment Properties** panel have already been described in the other Segment options and so will not be described again.

Utilities

The **Utilities** walk-right menu contains a number of useful miscellaneous option for the super string. The menu is



Each of the new options will now be discussed.

Ins 3 Pt Curve

The **Ins 3 Pt Curve** option is used to insert a curve through three adjacent super string vertices.

After selecting the option, the middle vertex of the three adjacent super string vertices is selected.

When the vertex is accepted, the radius required to fit a curve through the vertex and the two adjacent vertices is calculated, and this radius is then applied to the segments joining the adjacent vertices.

Del 3 Pt Curve

The **del 3 pt curve** option is used to delete the curves on either side of a super string vertex.

After selecting the option, a vertex is selected and when the vertex is accepted, the radii of the segments on either side are set to zero.

Hence the curves on either side of the vertex are effectively removed.

Open

If the string is closed, selecting the **open** option removes the segment between the 1st and last vertex of the super string.

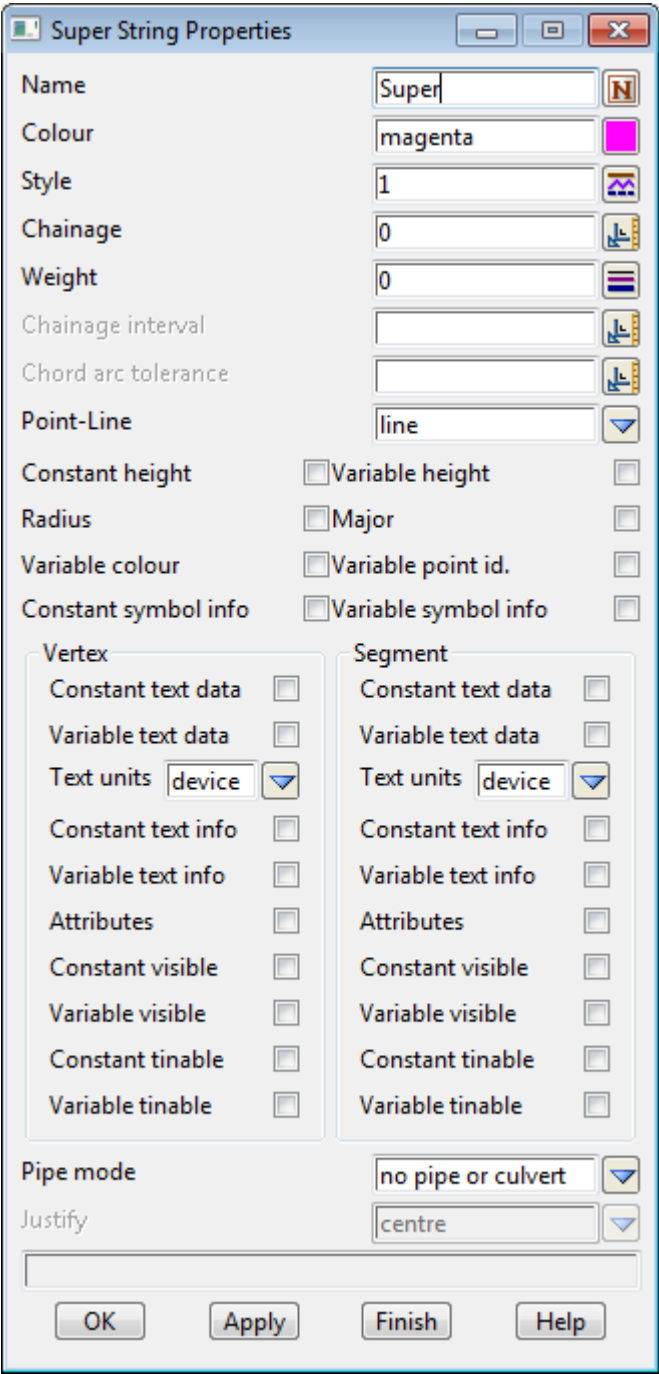
If the string is not closed, the **open** option does nothing.

Close

Selecting the **close** option adds a segment between the 1st and the last vertices of the super string. Note that unlike other strings, no extra vertices are added.

Properties

Selecting **Properties** brings up the **Super String Properties** panel which is used to modify the string's header information.



The fields in this panel are similar to those in the **Create Super String** panel and the Super String Editor options. The only new field is

Field Description	Type	Defaults	Pop-Up
OK/Apply	button		

for the string being edited, **OK** sets the string with the values in the panel fields and removes the panel. **Apply** sets the string with the values in the panel fields and leaves the panel on the screen.



17 Triangles

Position of menu: Tins

A **tin** (triangulated irregular network) is an accurate method of representing surfaces, especially those described by strings. **12d** Model uses tins in most operations involving surfaces. For example, contouring, interfacing and volume calculations.

Unlike strings, tins can be in more than one model, or even no model at all. However, to be displayed in a view or used for profiling on a section view, tins need to be in at least one model. It is suggested that each tin be in its own model called "tin tin_name". This makes it easy to know the model a tin is in, and also to see which models contain tins and obtain lists of all tins.

The Triangles walk-right menu is

	on Main menu	on 12d Model menu and floating Triangles menu	
create floating menu Triangles			
	Tins	Tins	list of tins
	Tin info	Tin info	information on project tins
	Check breaklines	Check breaklines	check crossing breaklines
	Create	Create	triangulate a model or view, supertin
	Edit	Edit	modify model list etc. for tin
	Boundary	Boundary	construct tin boundary
	Colour	Colour	colour of tin, colour in polygon
	Contour	Contour	contouring hts, depths, labelling
	Drape	Drape	drape strings onto tin
	Tin analysis	Tin analysis	slope, aspect, viewshed etc.
	Inquire	Inquire	tin values at cursor position
	Null	Null	remove unwanted triangles
	Utilities	Utilities	various tin options
	Sections	Sections	creating x-sections, mesh, long sec
	Sharing	Sharing	tin sharing
	User	User	Triangles User menus
	Delete	Delete	delete tins from disk

Each of these options will now be discussed.

For the option *Tins*, go to

Tins info

Check breaklines

Create

Edit

Boundary

Colour

Contour

Drape

Tin analysis

Inquire

Null

Utilities

[Tins](#)

[Tin Info](#)

[Check Breaklines, Duplicate Vertices, Identicals](#)

[Create](#)

[Edit](#)

[Boundary](#)

[Colour](#)

[Contour](#)

[Drape](#)

[Tin Analysis](#)

[Inquire](#)

[Null](#)

[Utilities](#)

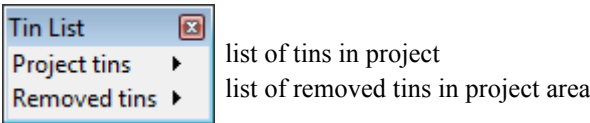
Sections	Sections
Sharing	Sharing
Delete	Delete

Tins

Position of menu: Tins=>Tins

The **tins** walk-right menu provides options to list all the tins in the project (project tins) and all the tins in the project area but not in the project (removed tins).

The **tins** walk-right menu is



For the option Project tins, go to [Project Tins](#)
Removed tins [Removed Tins](#)

Project Tins

Position of option on menu: Tins =>Tins => Project Tins

The **project tins** walk-right menu provides a list of all the tins in the project and there is a walk-right on each tin name showing what models the tin is in. If a tin name is selected from the list of tins, the **tin information** panel is fired up with the selected tin name already in the tin field.

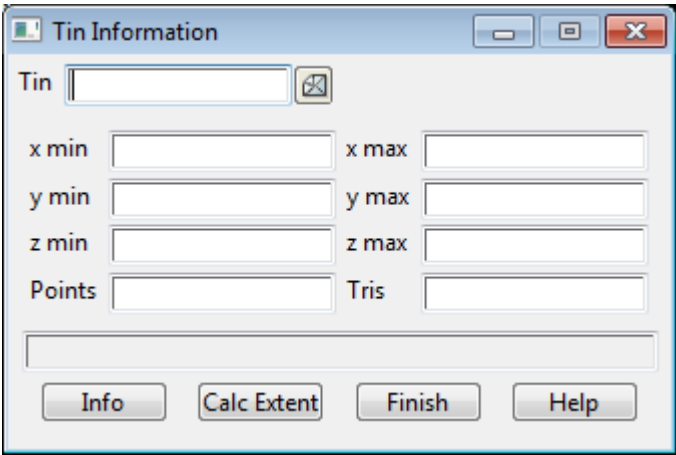
Removed Tins

Position of option on menu: Tins =>Tins => Removed Tins

The **removed tins** walk-right menu provides a list of all the tins in the project area that have been removed from the project (using the **removed from project** option).

Tin Info

Position of option on menu: Tins =>Tin info
Selecting tin info fires up the tin information panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Default	Pop-Up
Tin <i>input the name of the tin to get information on</i>	tin box		available tins
xmin, xmax	output		
ymin, ymax	output		
zmin, zmax <i>returns the tin x, y, z limits</i>	output		
Points <i>returns the number of points in the tin</i>	output		
Tris <i>returns the number of triangles in the tin</i>	output		
Info <i>get the information for the tin given in the tin field.</i>	button		
Calc Extent <i>recalculate the x, y, z bounding box for the tin given in the model field.</i>	button		

How to Use the Panel

The information for the tin given in the tin field is retrieved and placed in the appropriate panel fields when the tin name is piped into the tin field from the pop-ups, or an <enter> is entered after typing the tin name into the tin field, or on selecting the **info** button.

Check Breaklines, Duplicate Vertices, Identicals

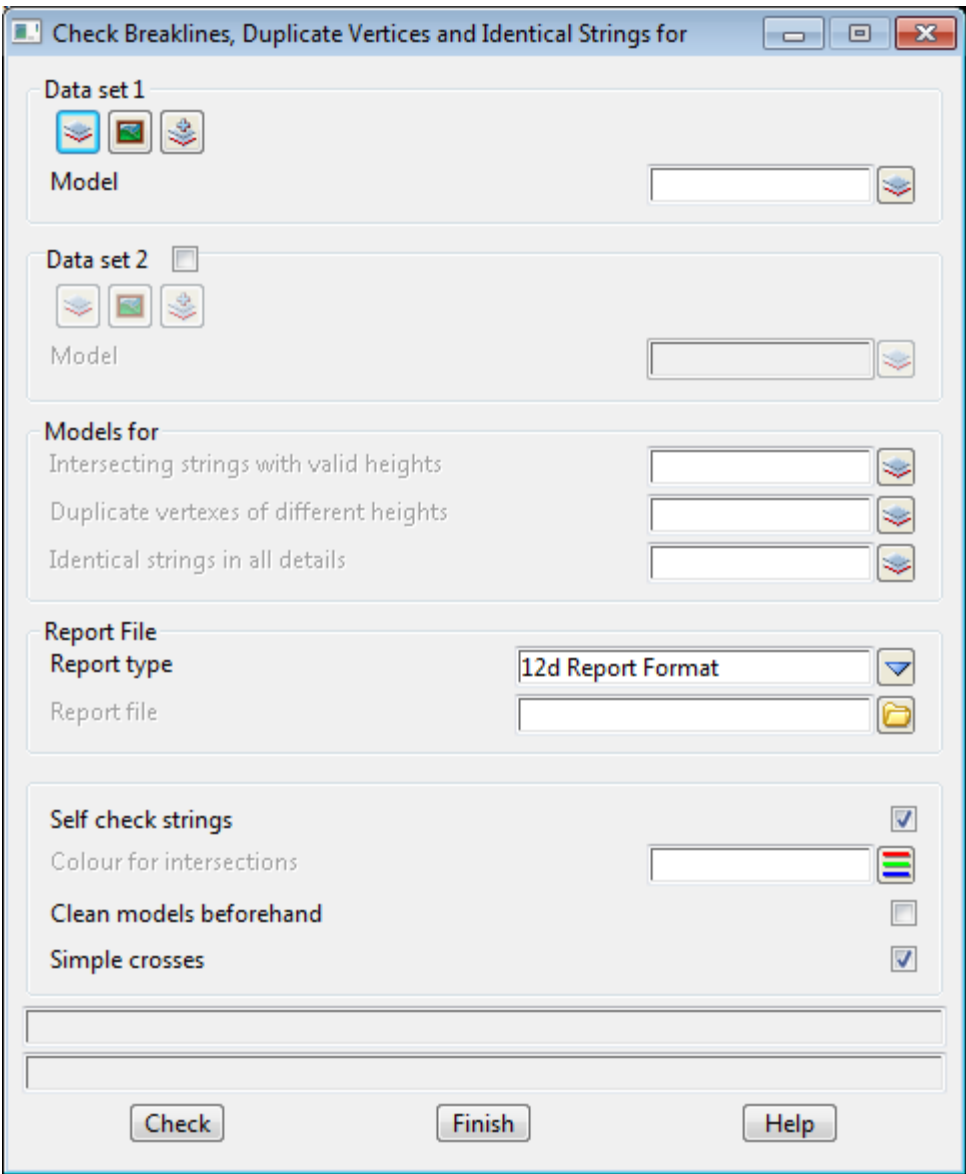
Position of option on menu: Tins =>Check breaklines
 Utilities =>A-G =>Check/clash =>Check breaklines

The **check breakline** option is used to test whether any of the line segments from any line strings in a model or view intersect (cross) the line segments from any other string in the model/view. This includes self intersections of strings.

The option also checks for any points with the same x and y coordinates (same plan position) but different z-values, and for totally duplicated strings (identicals).

Intelligent log lines are written to the output window for showing any crossing breaklines, duplicate vertices etc.

Selecting **Check breaklines** displays the **Check Breaklines, Duplicate Vertices and Identical Strings for** panel.



The fields and buttons in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data set 1			
<i>if Data set 2 is ticked off, then all the selected strings in Data set 1 are checked against all the other selected strings from Data set 1.</i>			
<i>If Data set 2 is ticked on, then all the selected strings in Data set 1 are checked against all the selected strings in Data set 2, BUT the strings in Data set 1 are not checked against each other and the strings in Data set 2 are not checked against each other.</i>			
Data set 1 source type		Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts.</i>			
Data set 1 source	input		
<i>data to be processed.</i>			
Data set 2			
<i>if Data set 2 is ticked off, then all the selected strings in Data set 1 are checked against all the other selected strings from Data set 1.</i>			
<i>If Data set 2 is ticked on, then all the selected strings in Data set 1 are checked against all the selected strings in Data set 2, BUT the strings in Data set 1 are not checked against each other and the strings in Data set 2 are not checked against each other.</i>			
Data set 2 source type		Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts.</i>			
Data set 2 source	input		
<i>data to be processed.</i>			
Intersecting strings with valid heights	model box		available models
<i>if non-blank, check for any crossing line segments and place either a copy of the crossing segments into the model given in this field or a diamond depending on the state of Simple crosses.</i>			
Duplicate vertices of different heights	model box		available models
<i>if non-blank, copies of any strings that are completely duplicated are placed in the model given in this field and circles are placed in this model at any duplicate points that aren't from an entire string.</i>			
Identical strings in all details	model box		available models
<i>if non-blank, the duplicates of any strings are moved to model given in this field. That is, if any strings are identical in all ways, then the second and subsequent identical strings are moved to the this model. This is especially for the case when a second copy of some data has been supplied.</i>			
Self check strings	tick box	tick	
<i>if ticked, a string is not check against itself for crossing breaklines etc.</i>			
<i>If not ticked, a string is not checked against itself for crossing breaklines. This speeds up processing.</i>			
Colour for intersections	colour box		available colours
<i>colour for the copies of the crossing segments.</i>			
Clean models beforehand	tick box	tick	
<i>if ticked, the models for intersecting string, duplicate points, identicals are cleaned before the option is run.</i>			
Report type	choice box		12d Report Format, original xml
<i>if 12d Report Format, the xml format is converted to the 12d Report Format for check breaklines</i>			
<i>if original xml, report is in xml format</i>			
Report file	file box		
<i>if non-blank, a report file of this name is created giving details of all the crossing breaklines and</i>			

duplicate plan points with different z-values.

Simple crosses

tick box

tick

*if **ticked**, create diamonds at the position where strings cross, otherwise create a string in the shape of a cross with parts of the crossing strings.*

Check

button

*after selecting the **check** button, all the strings in the model/view are tested for any crossing line segments or duplicate points. If requested, a report is generated.*
<esc> can be used to abort the checking option.

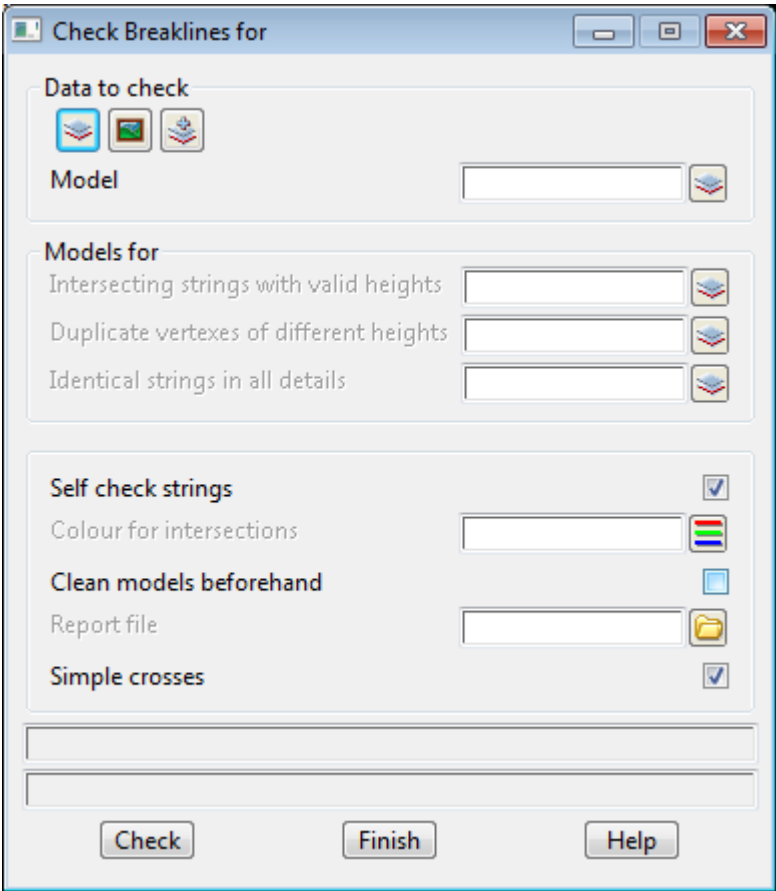
Check Breaklines - Old

Position of option on menu: Utilities =>Old =>Check breaklines

The **check breakline** option is used to test whether any of the line segments from any line strings in a model or view intersect (cross) the line segments from any other string in the model/view. This includes self intersections of strings.

The option also checks for any points with the same x and y co- ordinates (same plan position) but different z-values, and for totally duplicated strings.

On selecting **Check breaklines** option and then the appropriate **Data Source** in the panel, the **Check Breaklines for** panel is displayed.



The fields and buttons in the panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Data source type			Model	
	<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts.</i>			
Data source		input		
	<i>data to be processed.</i>			
Intersecting strings with valid heights		model box		available models
	<i>if non-blank, check for any crossing line segments and place either a copy of the crossing segments into the model given in this field or a diamond depending on the state of Simple crosses.</i>			
Duplicate vertices of different heights		model box		available models
	<i>if non-blank, copies of any strings that are completely duplicated are placed in the model given in this</i>			

field and circles are placed in this model at any duplicate points that aren't from an entire string.

Identical strings in all details model box available models

*if non-blank, the duplicates of any strings are **moved** to model given in this field. That is, if any strings are identical in all ways, then the second and subsequent identical strings are moved to the this model. This is especially for the case when a second copy of some data has been supplied.*

Self check strings tick box tick

*if ticked, a string is not check against itself for crossing breaklines etc.
If not ticked, a string is not checked against itself for crossing breaklines. This speeds up processing.*

Colour for intersections colour box available colours

colour for the copies of the crossing segments.

Clean models beforehand tick box tick

*if **ticked**, the models for intersecting string, duplicate points, identicals are cleaned before the option is run.*

Report file file box

if non-blank, a report file of this name is created giving details of all the crossing breaklines and duplicate plan points with different z-values.

Simple crosses tick box tick

*if **ticked**, create diamonds at the position where strings cross, otherwise create a string in the shape of a cross with parts of the crossing strings.*

Check button

*after selecting the **check** button, all the strings in the model/view are tested for any crossing line segments or duplicate points. If requested, a report is generated.*

<esc> can be used to abort the checking option.

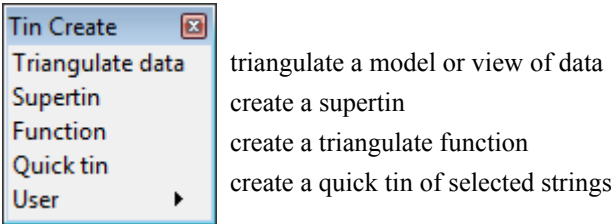
Create

Position of menu: Tins =>Create

The input data for a triangulation is either all the data in a selected model or all the data from all the models on a selected view or a list of models. The options for each method of selecting data are on the **Create** walk-right menu.

A SuperTin™ is a list of Tins and a Tin function creates a re-calc function name for an existing Tin. Each of these options are also on the **Create** walk-right menu.

The **Create** walk-right menu is



For the option <i>Triangulate data</i> , go to	Triangulate Data
<i>Supertin</i>	Create SuperTin™
<i>Function</i>	Function
<i>Quick tin</i>	Quick Tin

Triangulate Data

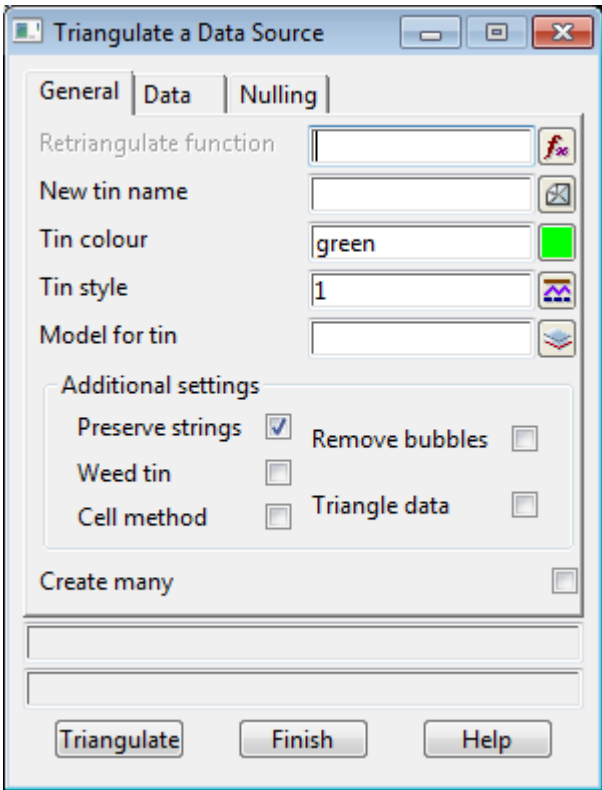
Position of option on menu: Tins =>Create =>Triangulate data

For simple jobs, the data to triangulate is all in the one model. However, it often occurs that the data one needs to triangulate is not in one model but is in the models displayed on a particular view.

The **Triangulate data source** option allows use to either select the data to triangulate from a single model, a list of models or to it uses the data points from all the models attached to a particular view, rather than the data from a particular model.

In each case, the models used in creating the triangulation are recorded so that the models can be easily retriangulated if any of the data changes.

Selecting **Triangulate data** displays the **triangulate a Data Source** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
General tab			
Retriangulate function	function box	box	
<i>if non blank, name of the tin function. The function can be recalcd to recreate a new tin from the current data in the models used to construct the original tin. This is optional.</i>			
New tin name	input		
<i>name of the tin created from the triangulation of the model/view.If <enter> is type after the name, the model for tin field is filled out with the name tin new_tin_name.</i>			
Tin colour	input	default tin colour	available colours
<i>colour to draw the triangles whenever they are displayed in a view. This is called the base tin colour. It is possible to change the colour of individual triangles so they are different to base tin colour.</i>			
Tin style	input	1	available line styles
<i>line style used for drawing sections through the tin on the section view.</i>			
Model for tin	input		available models
<i>if non-blank, the created tin will be added to the model given in this field. if blank, the name tin new_tin_name will be placed in the field when the triangulate button is selected.</i>			
Preserve strings	tick box	tick	
<i>if ticked, all strings with breakline type line or segment type tinable will be preserved as sides of triangles. Otherwise, all line strings or segments of type tinable will be treated as point strings for the triangulation.</i>			
Remove bubbles	tick box		

if *ticked*, post-processing occurs to try and stop all the points of a triangle coming from the same string. This helps prevent triangles with all three points coming from the one contour string and hence forming a flat triangle.

Weed tin tick box

if *ticked*, all duplicate points are removed from the tin database. This helps to reduce the size of the tin files if there was a large amount of duplicate data. This flag is automatically set to tick for triangle data.

Triangle data tick box

if *ticked*, then it is assumed the original data was triangles and 12d will ensure that the triangles produced by the triangulation exactly match (including null regions) the original triangle data. Weed tin is automatically set to tick if face data is set to tick.

Cell method tick box

if *ticked*, try to create the triangles in cells - an alternate method of ordering the data which is often faster when the data comes in lines rather than randomly.

Create many tick box

if *ticked*, once the tin has been triangulated, the panel will stay up so you can create another tin. If *not ticked*, after the tin has been created, the panel is replaced by a Retriangulate Tin panel so if there are any mods to be made, no time is wasted in needing to select the panel.

Data tab

Data source type Model

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#). For this option, only data types involving models can be used - model, view, model list and the models from a favourite.

Data source input

source of data is to be triangulated - only Model or View allowed for this option.

Data polygon string-select

if a string is selected as a data polygon, only string points that are inside the data polygon are used in the triangulation.
If no string is selected, then all the points in all the model/view are used in the triangulation.

Nulling tab

Apply nulling tick box

if *ticked*, null the resultant tin using Angle, Length, Combined angle and Combined length.

Angle angle box 5

if a triangle has an external side (that is not a breakline) with an angle on it less than Angle, then the triangle is nulled. The default value works most of the time.
If blank then no triangles are nulled by this test.

Length real value 100

if a triangle has an external side (that is not a breakline) greater than Length, the triangle is nulled.
If blank then no triangles are nulled by this test.

Combined angle angle box 60

Combined length real box 20

For the Combined case, a triangle is nulled if it:
has an external side (that is not a breakline) and the **sum** of the two angles on it is **less** than Combined angle (the default value works most of the time)

and

*has an external side (that is not a breakline) whose length is **greater** than Combined length. A suggested value is one third to one half of Length.*

If either Combined angle or Combined length is blank, then no triangles are nulled by this test.

Null polygon

string-select

if a string is selected as a null polygon, any triangle whose centroid is outside the null polygon is automatically nulled.

Triangulate

button

Triangulate the model/view given in the model/view to triangulate field. The created tin will be stored with the name given in the new tin name field. The tin will be the colour given in the tin colour field. If the model/view for tin field is non-blank, the created tin will be added to the model given in that field - if the model does not exist, it will be created.

Panel Messages

Progress messages - sent to the panel message area

no of points in model/view = *no. of points*

no. points pts *no. break lines* break lines

no. points pts *no. of secs* s *no. pts/s* *no. dup*

break lines finished. time taken = *secs*

Completion message - sent to the panel message area

average no of pts per sec = *no.*

<esc> can be used to abort the triangulation option.

Create SuperTin™

Position of option on menu: Tins =>Create =>Supertin

The SuperTin™ option is designed to create a super triangulation from other triangulations.

With SuperTins, existing triangulations can be combined to form the equivalent of a merged triangulation without having to completely re-build a merged model and retriangulating it.

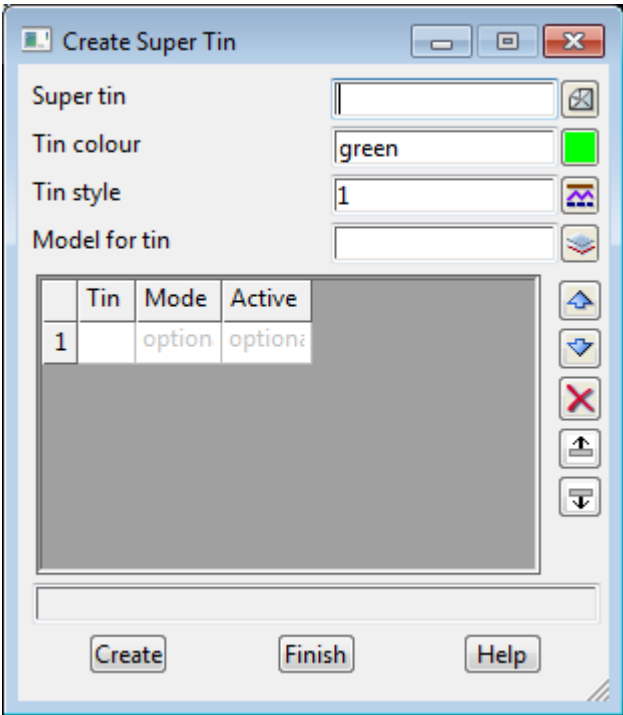
This means there are less steps in creating a SuperTin merged triangulation so a lot less time is required and there is less opportunity for errors. Also, if any of the component triangulations of the SuperTin are modified, then the SuperTin is also instantly modified.

The SuperTin is defined by a list of triangulations in increasing number order. Wherever two triangulations overlap, the triangulation of higher number takes precedence and is used to defined z-values and sections.

Hence, for any (x,y) point, the z-value on the SuperTin is defined to be the z-value from the triangulation of the highest number which is under the (x,y) point.

A section through a SuperTin is made up of the sections through the tin of highest number at each point along the section and so may involve more than one tin.

Selecting Supertin brings up the **Create Super Tin** panel.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Super tin	name of the tin created from the triangulation of the model/view.If <enter> is type after the name, the model for tin field is filled out with the name tin new_tin_name.	input		
Tin colour	the tin colour is used as the section colour when sectioning through the supertin.When displayed on plan or section views, the each tin making up the supertin is drawn in its own colour.	input	default tin colour	available colours
Tin style		input	1	available line styles

line style used for drawing sections through the SuperTin on the section view.

Model for tin	input	available models
----------------------	-------	------------------

if non-blank, the created SuperTin will be added to the model given in this field.
if blank, the name tin new_tin_name will be placed in the field when the **Create** button is selected.

Tin Grid

Tin	table	available tins
------------	-------	----------------

name of the tin to be included in the SuperTin. The order is critical since the higher number tins take precedence over the lower number tins.

Mode	replace, subtract
-------------	-------------------

Replace
where ever this tin exists, use it instead of any tins of a lower number in the Tin column of the grid.

Subtract
where ever this tin exists, all parts of the tins of a lower number in the Tin column, are removed. So where ever the tin exists, it creates holes in all the tins of a lower number.
An example would be a tin that is the position of many gully pits. Using this tin in subtract mode will punch holes in all the tins of a lower number in the Tin column. So in effect, it does a nulling that also nulls parts of triangles from the tins of a lower number.

Active
if yes, the tin is included in the supertin.
If no, the tin is not included in the supertin. So the tin can be taken out of the supertin without having to remove it from the Tin list.

Create	button
---------------	--------

create a SuperTin from the tins in the Tins to include table. The created SuperTin will be stored with the name given in the New tin name field.

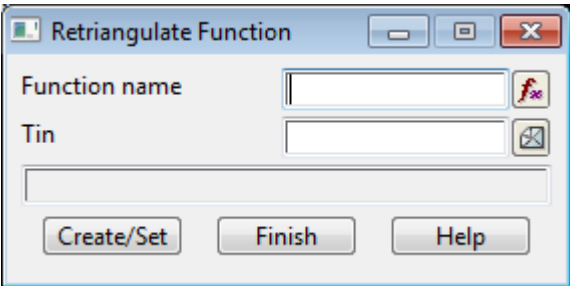
If there are no errors in creating the supertin, the panel then turns into a [Edit SuperTin](#) panel to allow any other edits to be made before finishing.

Function

Position of option on menu: Tins =>Create =>Function

The **function** option is used to construct a function which when recalced, will run a retriangulate on the tin. Since a function name can be given when a tin is first created, this option is rarely needed.

Selecting **function** displays the **Retriangulate Function** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
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Function name	input	available functions
the name to give to the retriangulate function.		
Tin	input	available tins
name of the tin to be retriangulated when the function is recalcd.		
Create/Set	button	
create or modify the retriangulate function.		

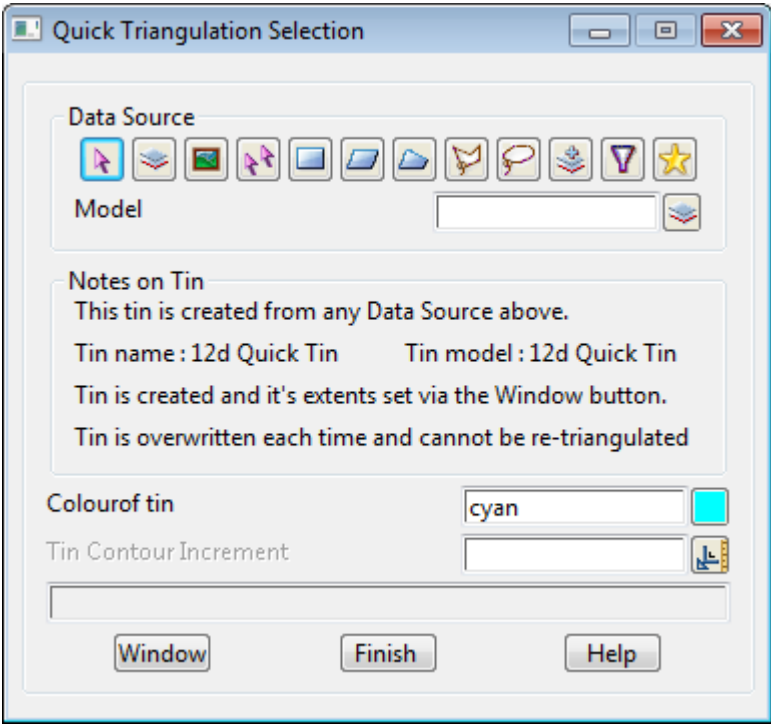
Quick Tin

Position of option on menu: Tins =>Create =>Quick tin

The **quick tin** option create a temporary tin from strings selected in a data source, and restricted to a user selected rectangular window. Contours of a user given increment can also be generated.

Each time the option is run, is creates a tin called **12d Quick Tin** in the model **12d Quick Tin** so the tin is over written each time the option is run.

Selecting **Quick tin** displays the **Quick Triangulation Selection** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
data selection type - for a full description go to Data Source in the chapter Tools and Concepts .			
Data source	input		
source of data is to be triangulated - only Model or View allowed for this option.			
Colour of tin	colour box		available colours
the colour or the tin, and any contours.			

Tin contour increment real value box

in non blank, contours are created at the given increment and displayed on the view where the Window is created. Fast contours are turned on for the view so contours are displayed for the tin.

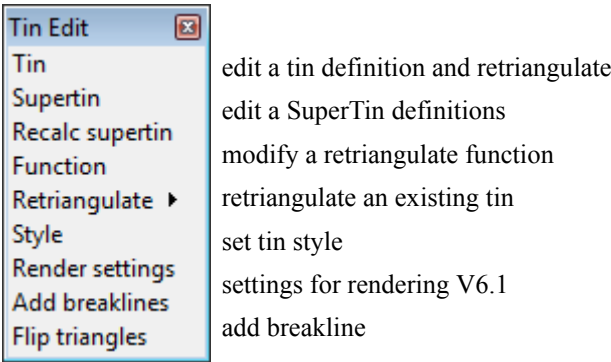
Window button

after clicking on Window, two corners to define a window are selected in a view. The tin for the selected data restricted to the Window is then created with the name 12d Quick Tin, added to the model 12d Quick Tin, and then the model added to the view that the Window was defined. Tin contours is also turned of for the view.

Edit

Position of menu: Tins =>Edit

Once a tin is created, it can be edited in a variety of ways. The **Edit** walk-right menu is



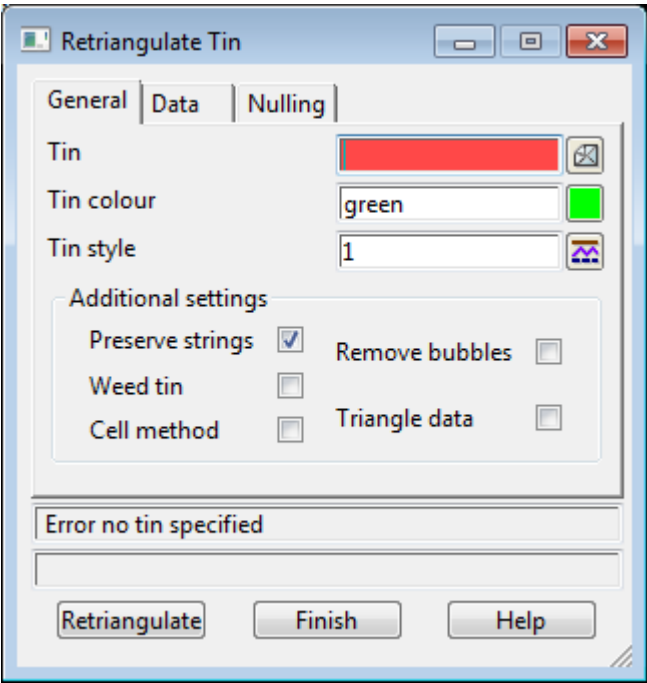
For the option <i>Tin</i> , go to	Edit a Tin
<i>Supertin</i>	Edit SuperTin
<i>Function</i>	Edit Tin Function
<i>Retriangulate</i>	Retriangulate
<i>Style</i>	Style
<i>Render settings</i>	Render Settings
<i>Add breaklines</i>	Add Breaklines
<i>Flip triangles</i>	Flip Triangles

Edit a Tin

Position of option on menu: Tins =>Edit =>Tin

When a tin is created, the settings and models used in the triangulation are recorded with the tin data. The **Edit => Tin** option can be used to modify the models and setting used to define the tin and then recreate the tin from the new models and settings.

Selecting **Edit => Tin** displays the **Retriangulate Tin** panel.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
General tab				
Tin		tin box	original tin name	
<i>name of the tin to be retriangulated. When the tin name is given, the list of models used for the tin and other settings, are displayed.</i>				
Tin colour		colour box	original colour	available colours
<i>original colour of the tin - this can be modified. Note that this only modifies the base tin colour and any triangles that have had their colour modified, will keep the modified colour.</i>				
Tin style		line style box	original line style	available line styles
<i>original line style of the tin - this can be modified.</i>				
Preserve strings		tick box	original setting	
<i>if ticked, all strings with breakline type line will be preserved as sides of triangles. Otherwise, all line strings will be treated as point strings for the triangulation.</i>				
Remove bubbles		tick box	original setting	
<i>if ticked, post-processing occurs to try and stop all the points of a triangle coming from the same string.</i>				
Weed tin		tick box	original setting	
<i>if ticked, all duplicate points all removed from the tin database.</i>				
Triangle data		tick box	original setting	
<i>if ticked, only triangles in the tin that are under the centroid of a string representing a triangle in the model/view are considered valid, all others are set to null. That is, any triangles not under the centroid of a string from the model/view will be set to null. This is extremely useful when the original string data represents triangles and it will ensure that the triangles produced by the triangulation will exactly match, including null regions, the original triangle data. Weed tin is automatically set to tick if face data is set to tick.</i>				

Cell method tick box original setting

*if **ticked**, try to create the triangles in cells - an alternate method of ordering the data for use when the triangulation takes too long by the non-cell method.*

Data tab

Model List models in the tin

list of models used to create the original tins. The models and the order can be modified.

Data polygon string-select original data polygon

*if a string is selected as a data polygon, only string points that are inside the data polygon are used in the triangulation.
If no string is selected, then all the points in all the models are used in the triangulation.*

Nulling tab

Apply nulling tick box original setting

*if **ticked**, null the resultant tin using Angle, Length, Combined angle and Combined length.*

Angle angle box original setting

*if a triangle has an external side (that is not a breakline) with an angle on it less than Angle, then the triangle is nulled. The default value works most of the time.
If blank then no triangles are nulled by this test.*

Length real value original setting

*if a triangle has an external side (that is not a breakline) greater than Length, the triangle is nulled.
If blank then no triangles are nulled by this test.*

Combined angle angle box original setting
Combined length real box original setting

*For the Combined case, a triangle is nulled if it:
has an external side (that is not a breakline) and the **sum** of the two angles on it is **less** than Combined angle (the default value works most of the time)
and
has an external side (that is not a breakline) whose length is **greater** than Combined length. A suggested value is one third to one half of Length.
If either Combined angle or Combined length is blank, then no triangles are nulled by this test.*

Null polygon string-select original null polygon

if a string is selected as a null polygon, any triangle whose centroid is outside the null polygon is automatically nulled.

Retriangulate button

The original tin is deleted and the data in the models to include table used to create a new triangulation which is given the original tin name. The settings in this panel are used for the retriangulation.

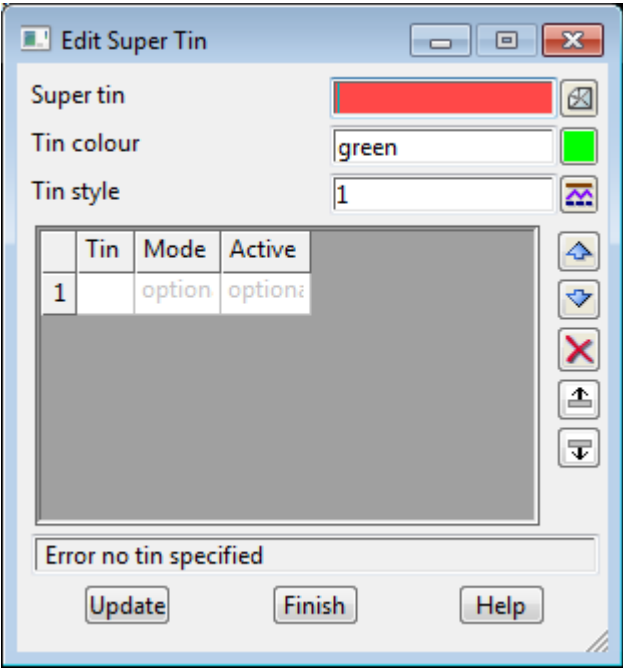
Edit SuperTin

Position of option on menu: Tins =>Edit =>Supertin

When a Supertin is created, the tins and settings used to create the SuperTin are recorded.

The **Edit=>Supertin** option modifies the tins and setting used to define the SuperTin.

On selecting the **edit=>supertin** option, the **edit super tin** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Super tin name <i>name of the SuperTin to be modified.</i>	sup tin box	original super tin name	existing Super Tins
Tin colour <i>original colour for drawing sections through the SuperTin - this can be modified.</i>	colour box	existing super tin colour	available colours
Tin style <i>original linestyle for drawing sections through the SuperTin - this can be modified.</i>	line style box	existing supertin style	available line styles

Tin Grid

Tin <i>name of the tin to be included in the SuperTin. The order is critical since the higher number tins take precedence over the lower number tins.</i>	table	available tins
Mode <i>Replace</i> <i>where ever this tin exists, use it instead of any tins of a lower number in the Tin column of the grid.</i> <i>Subtract</i> <i>where ever this tin exists, all parts of the tins of a lower number in the Tin column, are removed. So where ever the tin exists, it creates holes in all the tins of a lower number.</i> <i>An example would be a tin that is the position of many gully pits. Using this tin in subtract mode will</i>		replace, subtract

punch holes in all the tins of a lower number in the Tin column. So in effect, it does a nulling that also nulls parts of triangles from the tins of a lower number.

Active

if yes, the tin is included in the supertin.

If no, the tin is not included in the supertin. So the tin can be taken out of the supertin without having to remove it from the Tin list.

Update

button

update the SuperTin definition with the information in the above panel fields.

Edit Tin Function

Position of option on menu: Tins =>Edit =>Function

The `edit=>function` option is used to edit a tin function.

On selecting the `function` option, the **retriangulate function** panel is displayed which is the same as for the option `Tins =>Create =>Function` (see [Function](#)).

Retriangulate

Position of option on menu: Tins =>Edit =>Retriangulate

When a tin is created, the settings and models used in the triangulation are recorded with the tin data. The `retriangulate` option is used to recreate the tin from the same models and settings.

The `retriangulate` menu item operates two ways.

- (a) The **retriangulate** walk-right brings up the **tins** menu which is a list of all the existing tins. By choosing one of the tins from the **tins** menu, the tin is retriangulated.
- (b) If **retriangulate** itself is activated (by clicking LB when **retriangulate** is highlighted), the **retriangulate tin** panel appears. The **retriangulate tin** panel can be used to modify the tin definition and retriangulate the tin.

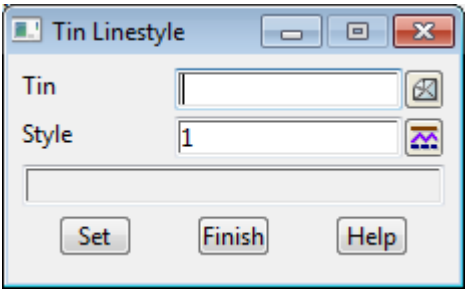
Style

Position of option on menu: Tins =>Edit =>Style

When a tin is created, it is given a linestyle (the tin linestyle) which is used for drawing the tin whenever it is profiled on a section view or plotted in long and cross section plots.

The `style` option is used to modify the tin linestyle.

On selecting the `style` option, the **tin linestyle** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin to modify the linestyle of.</i>	tin box		available tins
Style <i>linestyle for the tin.</i>	linestyle box	1	available linestyles
Set <i>set the tin linestyle to that given in the style panel field.</i>	button		

Render Settings

Position of option on menu: Tins =>Edit =>Render settings

Position of option on menu: Tins =>Visualiation =>Tin render settings

This option sets blending, texture mappings, raster draping, one/two sides, draping of polygons, text, billboards and images for triangles in a tin. It has already been documented as

Tins =>Visualiation =>Tin render settings

in the section [Tin Render Settings](#) in the chapter [View](#).

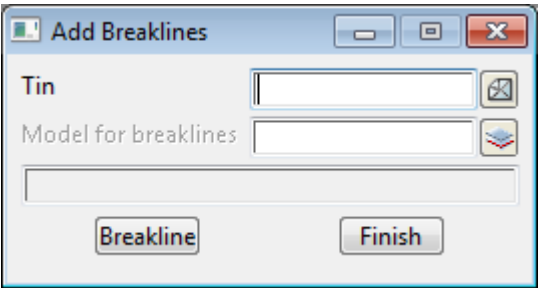
IMPORTANT NOTE: the **Visualisation** module is required for the *Tin Render Settings* to be used on a Perspective OpenGL view.

Add Breaklines

Position of option on menu: Tins =>Edit =>Add breaklines

This option allows extra breaklines joining existing vertices in the tin to be created. The new breaklines can be added to a model so that the results can be reproduced on a retriangulation.

Selecting Add breakline displays the **Add Breaklines** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin to add a breakline to.</i>	tin box		available tins
Model for breaklines <i>if non-blank, then as breaklines are created with this option, then the breakline is automatically added to this model so that the breakline modifications will try to be preserved on a retriangulation (this may not be possible with crossing breaklines).</i>	model box	1	available models
Breakline <i>add a breakline by clicking near the two vertices of the tin that are to be connected by a breakline (cursor snap will do). As each breakline is added, the triangles are rearranged. If fast contours are turned on, the effect will be immediate. Note that you can have fast contours and tin edges toggled on at the same time.</i>	button		

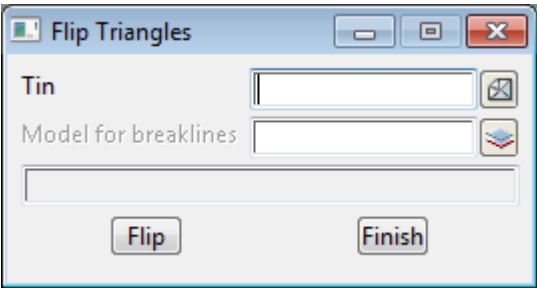
Flip Triangles

Position of option on menu: Tins =>Edit =>Flip triangles

This option works on a triangle side and if it is possible, it finds the two triangles with this common side, removes the common side and replaces it with a new common side which joins the non common triangle points in the original triangle. Note that this can't be done when the new side goes outside the two triangles.

A new breaklines can also be automatically added to a model so that the results can be reproduced on a retriangulation.

Selecting Flip triangles displays the **Flip Triangles** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin to add a breakline to.</i>	tin box		available tins
Model for breaklines <i>if non-blank, then as triangles are selected and flipped, then breaklines are automatically added to this model so that the flip modifications will try to be preserved on a retriangulation (this may not be possible with crossing breaklines).</i>	model box	1	available models
Flip <i>flip a triangle by clicking near the common edge (cursor snap will do). As each flip is done, the triangles are rearranged. If fast contours are turned on, the effect will be immediate. Note that you can have fast contours and tin edges toggled on at the same time.</i>	button		

Boundary

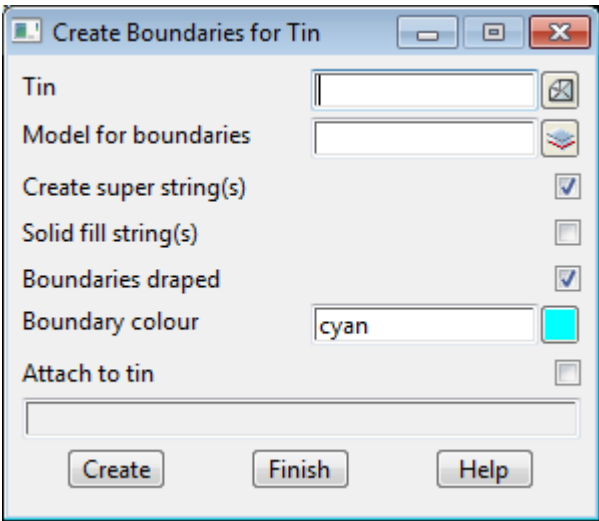
Position of option on menu: Tins =>Boundary

The **Boundary** option is used to construct the boundary strings for a tin, i.e. the strings going around the edges between the null and non-null triangles in the tin.

If the tin has holes (internal null regions), then there will be more than one boundary string created.

Often the boundary strings is used as a first step in creating a polygon to be used to null out further triangles not required in the tin.

Selecting **Boundary** displays the **Create Boundaries for Tin** panel.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Tin	<i>name of the tin (not a super tin) to calculate the boundary strings for.</i>	tin box		available tins
Model for boundaries	<i>the model to place the boundary strings in.</i>	model box		available models
Create super string(s)	<i>if ticked, the boundary strings are super strings. If not ticked, the boundary strings are 3d strings.</i>	tick box	ticked	
Solid fill string(s)	<i>if ticked, each of the boundaries is solid filled with the tin colour.</i>	tick box	not ticked	
Boundaries draped	<i>if ticked, the points of the boundary have the z-values from the tin. If not ticked, the z-value is set to 1.</i>	tick box	ticked	
Boundary colour	<i>the colour for the boundary strings.</i>	input	cyan	available colours
Attach to tin	<i>if ticked, the boundaries are remembered with the tin and when you have the 250M version of 12d Model and have Model Density turned on, if the density is such that the tin would only be drawn as</i>	tick box	not ticked	

a red rectangle, the boundaries are drawn instead of the red rectangle.

Create button

create the boundary polygons for the tin.

Colour

Position of menu: Tins =>Colour

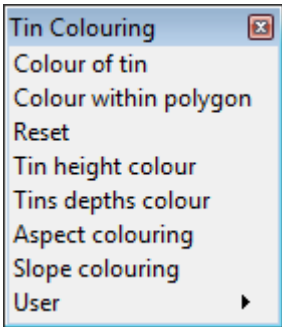
When a tin is created, all the triangles have the same colour (called the tin's **base** colour). This is the colour given by the user when creating the tin with the **Triangulate a Data Source** panel. The **base** colour can be changed at any time using the **colour of tin** option.

However, it often necessary to colour specific triangles in some other colour than the base colour. The option **Colour within polygon** is designed to do just that.

When the **Triangles** menu is torn off the main menu, the **Colour** menu item on it operates in two ways:

First, clicking on **Colour** without walking right brings up the **Colour of Tin** panel (see the next section). Secondly, the **Colour** walk-right brings up the **Tin Colouring** menu.

The **Tin Colouring** walk-right menu is

	
Colour of tin	change base colour of tin
Colour within polygon	colour triangles within a polygon
Reset	reset all triangles to base colour
Tin height colour	colour height ranges
Tins depths colour	colour depth ranges between two tins
Aspect colouring	colour aspect ranges
Slope colouring	colour slope ranges
User	

For the option *Colour of tin*, go to
Colour within polygon
Reset
Tin height colour
Tins depths colour
Aspect colouring
Slope colouring,

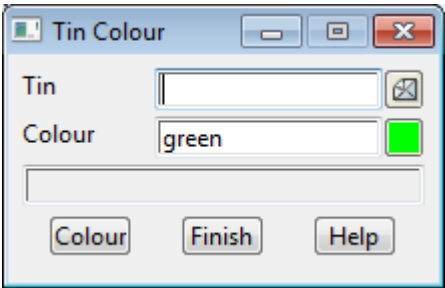
[Colour of Tin.](#)
[Colour Within Polygon](#)
[Reset](#)
[Tin Height Colour](#)
[Tins Depths Colour.](#)
[Aspect Colouring.](#)
[Slope Colouring.](#)

Colour of Tin

Position of option on menu: Tins =>Colour =>Colour of tin

A tin is given a base colour when it is originally constructed. The **colour of tin** option allows the user to change the base colour of the tin.

On selecting the **Colour of tin** option, the **Tin Colour** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin to have its base colour modified. The tin must exist in 12d Model. When the tin name is entered, the existing colour of the tin is displayed in the Colour panel field.</i>	tin box		available tins
Colour <i>the new base colour for the tin given.</i>	colour box	default tin colour	available colours
Colour <i>colour all the base triangles with the colour given in the Colour field.</i>	button		

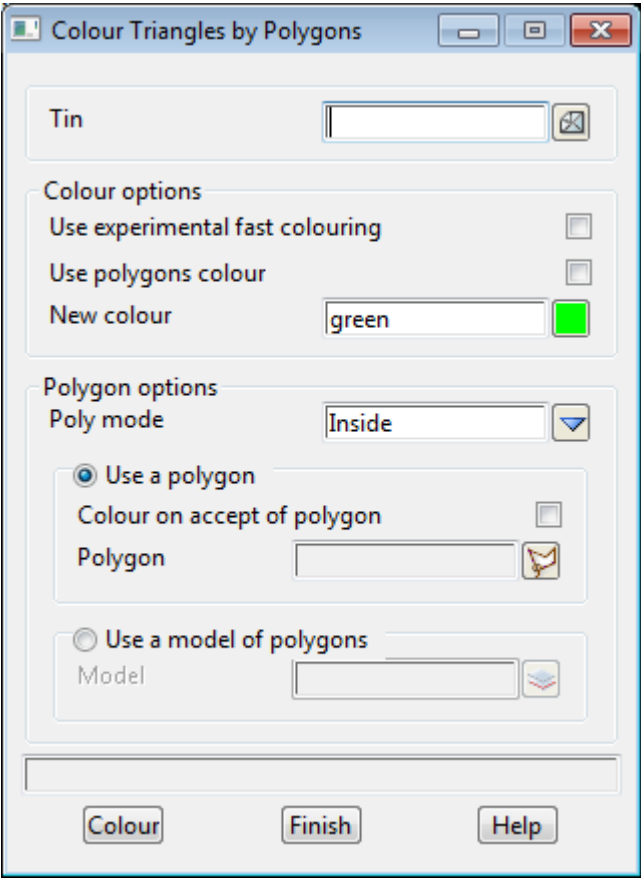
Colour Within Polygon

Position of option on menu: Tins =>Colour =>colour within polygon

Although a tin is given a base colour when constructed, it is useful to be able to change the colour of selected triangles. For example, in a design tin with a road and terrain, the road and the terrain could be displayed in different colours. This is particularly effective in shades.

The **colour within polygon** option allows the user to colour all the triangles whose centroids lie inside (or outside) a selected polygon, or for all the polygons in a given model, with either a user specified colour or the colour of each polygon. If a model of polygons is used, the polygons are processed in the order that they occur in the model. The option can be applied any number of times to a tin.

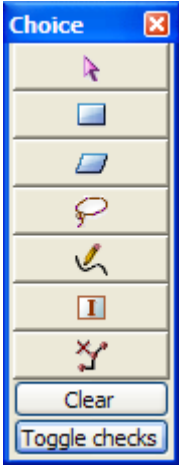
On selecting the **colour within polygon** option, the **colour triangles by polygons** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Tin		tin box		available tins
<i>name of the tin to have some of its triangles coloured. The tin must exist in 12d Model.</i>				
Use experimental fast colouring		tick box		
<i>if ticked, an experimental fast colouring algorithm is used.</i>				
Use polygons colour		tick box		
<i>if ticked, the colour of the polygons is used as the colour for the triangles.</i>				
New colour		input	default tin colour	available colours
<i>if Use polygons colour is not set to tick, this is the colour to set all the triangles within/out a polygon to.</i>				

Poly mode	choice	inside	inside, outside
<i>mode to select whether the triangles with centroids inside or outside the selected polygons are to be coloured.</i>			
Use a polygon	tick box		
<i>if ticked, then individual polygons are selected and the tin coloured within them.</i>			
Colour on accept of polygon	tick box		
<i>if ticked, then the colouring is done as soon as a polygon is accepted.</i>			
Polygon	polygon select		string pop-up



- this is used to*
- (a) select an individual string to use as a polygon for colouring*
 - (b) dynamically define a rectangle to use as a polygon for colouring*
 - (c) dynamically define a parallelogram to use as a polygon for colouring*
 - (d) dynamically define a lasso to use as a polygon for colouring*
 - (e) edit a string already selected with the polygon select*
 - (f) get information on a string already selected with the polygon select*
 - (g) delete a string already selected with the polygon select*
 - (h) clear any selection already made by the polygon select*
 - (i) toggle on/off the checks made the string selected by the polygon select*

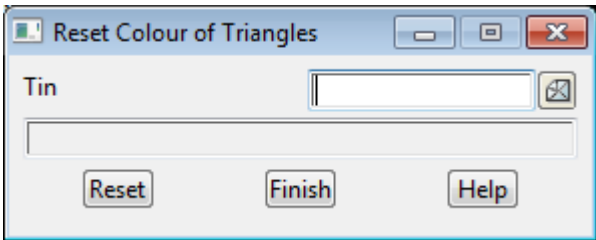
Use a model of polygons	tick box	
<i>if ticked, then all the polygons in the given model are used for colouring.</i>		
Model	model box	available models
<i>model of polygons which are used for selecting triangles to be coloured. Colour happens when the Colour button is selected.</i>		
Colour	button	
<i>for a model of polygons, each string in the Model of polygons is used to colour the triangles in the tin given in the tin field. If Colour on accept of polygon is off, colour within the selected string.</i>		

Reset

Position of option on menu: Tins =>Colour =>Reset

The **reset** option is used to change all the non base-coloured triangles in a tin back to the base colour.

On selecting the **reset** option, the **reset colour of triangles** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Tin		tin box		available tins
	<i>name of the tin to have any non base-coloured triangles reset to the base colour. The tin must exist in 12d Model.</i>			
Reset		button		
	<i>change any selectively coloured triangles back to the base colour.</i>			

Tin Height Colour

Position of option on menu: Tins =>Colour =>Tin height colour

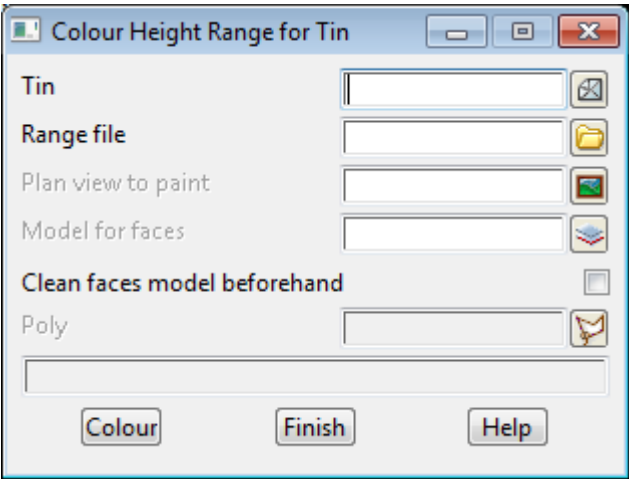
The **tin height colour** option is used to calculate height bands for the tin and colour a view and/or create faces for the height bands. The calculations can be restricted to within a user selected polygon, or if no polygon is selected, the entire tin is used.

The calculated heights and colours are given in a user supplied height range file. A plan view can be temporarily coloured on the height basis using the **range** file. The temporary colours will disappear next time the view is refreshed.

For permanency, the option can also create coloured faces with the appropriate range colour. The faces can be displayed on any plan view using a solid fill colour or a hatch pattern.

For more information on the height range file, see [Height Range File](#).

Selecting **Tin height colour** displays the **Colour Height Range for Tin** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin	tin box		available tins
<i>name of the tin to calculate the height ranges of the triangles and colour a view.</i>			
Range file	height range file box		*.hrf
<i>the user supplied range file is used to give the colour ranges for heights of the tin. See Height Range File.</i>			
Plan view to paint	view box		available views
<i>if non-blank, the given plan view will be painted according to the range colours given in the range file.</i>			
Model for faces	model box		available models
<i>if non-blank, faces will be created with colours according to the range colours given in the range file.</i>			
Clean faces model beforehand	tick box		
<i>if ticked, the model of faces is cleaned out before the option runs.</i>			
Poly	polygon-select		
<i>if selected, this string is used as the bounding polygon for the height calculations.</i>			
Colour	button		

On selecting this button, the heights of the triangles of the tin within the selected bounding polygon are calculated.

<esc> can be used to terminate the option during height calculations.



Tins Depths Colour

Position of option on menu: Tins =>Colour =>Tin depths colour

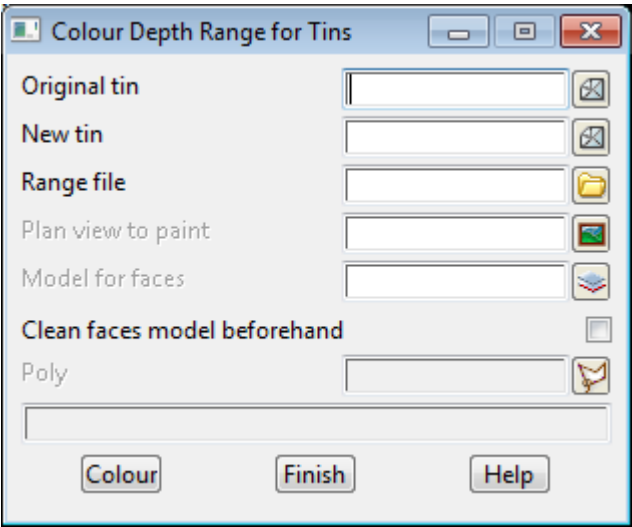
The **Tins depths colour** option calculates colour bands for the **depths** between two tins, and colours a view and/or create faces. The calculations can be restricted to within a user selected polygon, or if no polygon is selected, the common portions of the tins are used.

The calculated depths and colours are given in a user supplied depth range file. A plan view can be temporarily coloured on the depth basis using the **range** file. The temporary colours will disappear next time the view is refreshed.

For permanency, the option can also create coloured faces with the appropriate range colour. The faces can be displayed on any plan view using a solid fill colour or a hatch pattern.

For more information on the depth range file, see [Depth Range File](#).

On selecting the **Tins depths colour** option, the **Colour Depth Range for Tins** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Original/New tin <i>name of the original/new tin to colour depths between. Cut is when the new tin is below the original tin.</i>	tin box		available tins
Range file <i>the user supplied depth range file is used to give the colour ranges for depths. See Depth Range File.</i>	depth range file box		*.drf
Plan view to paint <i>if non-blank, the given plan view will be painted according to the range colours given in the range file.</i>	input		available views
Model for faces <i>if non-blank, faces will be created with colours according to the range colours given in the range file.</i>	input		available models
Clean faces model beforehand <i>if tick, the model of faces is cleaned out before the option runs.</i>	tick box		
Poly <i>if selected, this string is used as the bounding polygon for the depth calculations.</i>	polygon-select		
Colour	button		

colour the depths between the tins within the selected bounding polygon.

<esc> can be used to terminate the option during depth calculations.

Aspect Colouring

Position of option on menu: Tins =>Colour =>Aspect colouring

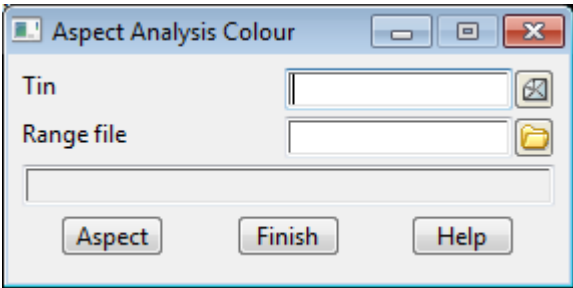
The **aspect colouring** option is used to colour the triangles according to the aspect (direction) of the triangles in the tin. An *aspect range file* is used to define the colour ranges.

Note that the actual colours of the triangles are changed - not a face model produced.

For more information on the aspect range file, see [Aspect Range File](#).

For each range in the file, the boundary strings for areas of common range can be created and also coloured faces that can be displayed on any plan view.

On selecting the **Aspect colouring** option, the **Aspect Analysis Colour** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin	tin box		available tins
<i>name of the tin for which the aspects of the triangles will be calculated and then the tin coloured.</i>			
Range file	aspect range file box		*.arf
<i>the user supplied range file is used to give the colour ranges for aspects to use to colour the triangles. See Aspect Range File.</i>			
Aspect	button		
<i>On selecting this button, the aspects of the triangles of the tin are calculated and the triangle coloured according to the range file.</i>			

<esc> can be used to terminate the option during aspect calculations.

Slope Colouring

Position of option on menu: Tins =>Colour =>Slope colouring

The **Slope colouring** option is used to colour the triangles in the tin according to the slope of the triangles. A slope range file is used to define the colour ranges.

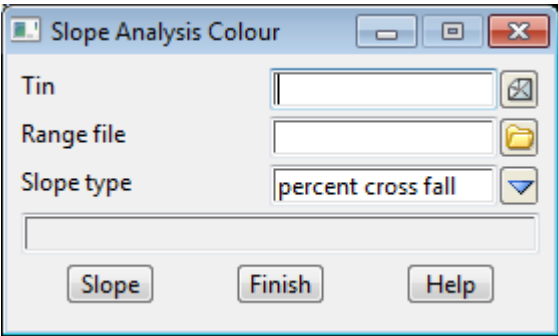
Note that the actual colours of the triangles are changed - not a face model produced.

For more information on the slope range file, see [Range Files](#).

The values can be percent cross fall, "1v in" slope or degrees (in 12d Model dms format).

The range_colour is used to colour all triangles in the tin satisfying the range.

On selecting the Slope colouring option, the **Slope Analysis Colour** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin	tin box		available tins
<i>name of the tin for which the slope of the triangles will be calculated and then the tin coloured.</i>			
Range file	slope range file		*.srf
<i>the user supplied range file is used to give the colour ranges for slopes to use to colour the triangles. See Range Files.</i>			
Slope type	input	percent cross fall	percent cross fall, degrees, 1v in
<i>the units used for slope in the range file.</i>			
Slope	button		
<i>On selecting this button, the slopes of the triangles of the tin are calculated and coloured according to the slope range file.</i>			
<esc> can be used to terminate the option during aspect calculations.			

Contour

Position of menu: Tins =>Contour
The tin contours walk-right menu is

Tin Contours

Contour, Smooth and Label

Change

Colour

Contour

Depth contours

Label

Smooth

create smooth and label contours

change colour/model

colour contours using a height range file

create contours

create depth contours

label contours

For the option *Contour, smooth and label*, go to

Change

Colour

Contour

Depth contours

Label

Smooth

[Contour, Smooth and Label](#)

[Change Contours](#)

[Colour](#)

[Contour](#)

[Depth Contours](#)

[Label Contours](#)

[Smooth](#)

For information on creating contours, go to the section [Creating, Smoothing and Labelling Contours](#).

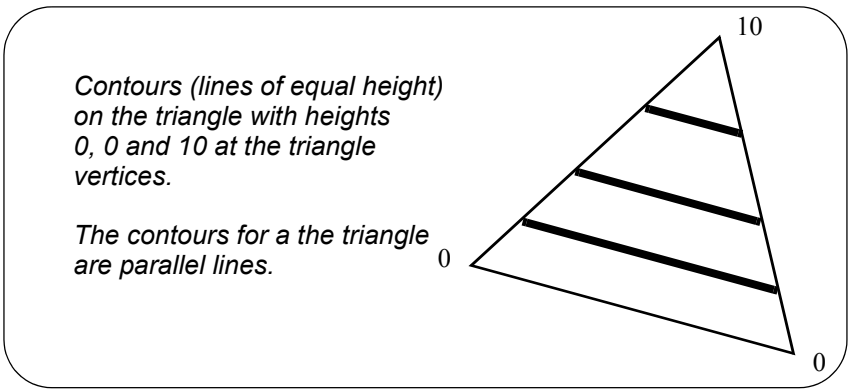
Creating, Smoothing and Labelling Contours

Creating Contours

Contours (or level lines) for a surface are the strings of constant height. Contours are often produced on maps and labelled with the height of the contours.

A 12d Model tin represents a surface in three dimensions and there is an option in 12d Model for producing the contours for the tin.

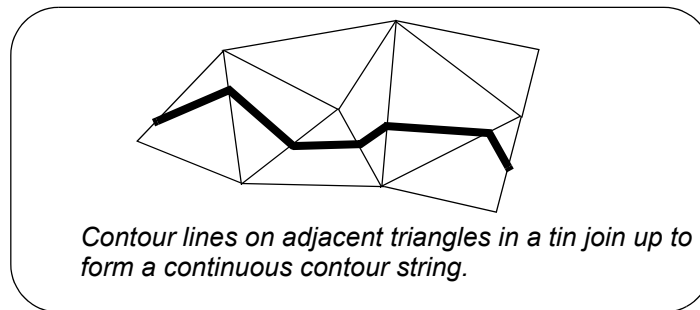
For a triangle in three dimensions, a string of constant height is actually a straight line across the triangle and the contour lines of different heights for a triangle are parallel lines.



Because triangles in a tin have common sides, a contour of a given height for one triangle will

connect to the contour of the same height in an adjacent triangle.

So the contour lines on adjacent triangles join up to form continuous contour strings, each segment of which is straight across a triangle.



The contours for a tin lie on the surface of the tin.

The options to create contours in **12d** Model has five parameters to define which contours are calculated. They are the

- minimum contour value
- maximum contour value
- contour increment
- contour reference
- bold increment

The elevation range over which the contours are to be produced is defined by the minimum and maximum contour values. If the minimum (maximum) value is not specified, the tin minimum (maximum) z-value is used.

The increment between successive contours is given by the contour increment.

For example, if contours are required every two metres from 100.0 metres to 200.0 metres, the parameters needed are

- contour minimum = 100.0
- contour maximum = 200.0
- contour increment = 2.0

This would be sufficient information to produce the contours

100.0, 102.0, 104.0... 198.0, 200.0.

However, **12d** Model also provides a parameter to allow the following contours to be produced

101.0, 103.0, 105.0 197.0, 199.0

For this and similar cases, the **contour reference** value is used.

When a contour reference value is specified, all the contour increments are taken from the contour reference value.

In the first example, the contour reference value is the default value of 0.0. In the second example, the contour reference value is 1.0.

If **major** (or **bold** or **index**) contours are required, the major contour increment is given a non-zero value. Major contours will be drawn at the integer multiples of the major increment instead of the standard contours.

For information on **labelling contours**, go to the section [Labelling Contours](#).

For information on **smoothing contours**, go to the section [Smoothing Contours](#).

Smoothing Contours

If the triangles in a tin, or sections of a tin, are large then the contours for that section of the tin may appear angular. Consequently some people like to **smooth** the contours to take out the angularity.

Be careful of smoothing because smoothing of contours produces strings that no longer sit on the triangulation.

12d Model smooths contours by apply a smoothing algorithm to each of the contour strings that were produced from the triangulation.

Two smoothing algorithms are available

- (a) Preserve string points - this method ensures that the smoothed contour goes through all the vertices from the original contour string.
- (b) Don't preserve string points - this method does not have to include the vertices from the original contours in the smoothed contour.

For information on **creating contours**, go to the section [Creating Contours](#).

For information on **labelling contours**, go to the section [Labelling Contours](#).

Labelling Contours

12d Model labels contours by placing text labels at user controlled distances along the contour string.

The position and frequency of the contour labels along a contour string is controlled by two parameters, the *start distance* and the *separation distance*.

The first contour label is placed at a chainage distance of *start distance* from the beginning on the contour and the labels are repeated at a chainage distance of *separation distance* from the previous contour label.

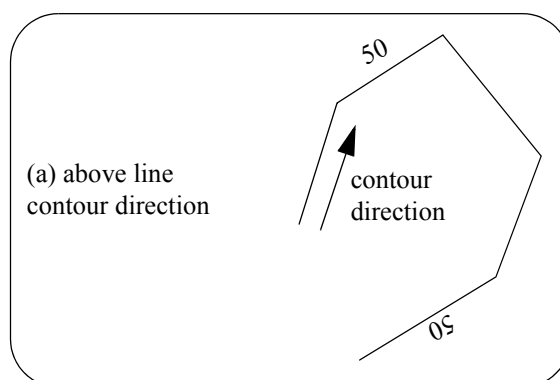
There is also a parameter to specify that contours are to be labelled at the start and the end regardless of the *start distance* and *separation distance*.

The number of decimal places used for the contour label is also user specified.

12d Model has seven methods for positioning the contour labels. They are the

- (a) above line contour direction

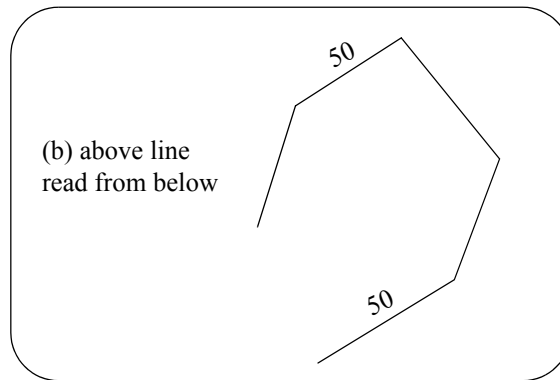
contour labels are created with the text parallel to the contours line and in the same direction as the contour string. The text is raised slightly above the contour string.



- (b) above line read from below

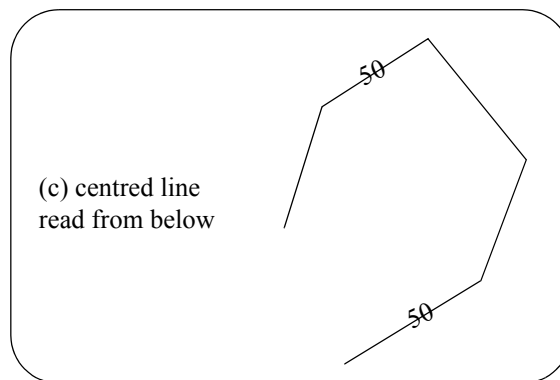
contour labels are created with the text parallel to the contour line and in the same direction as the

contour string but at an angle between -90 and $+90$ degrees. The text is raised slightly above the contour string.



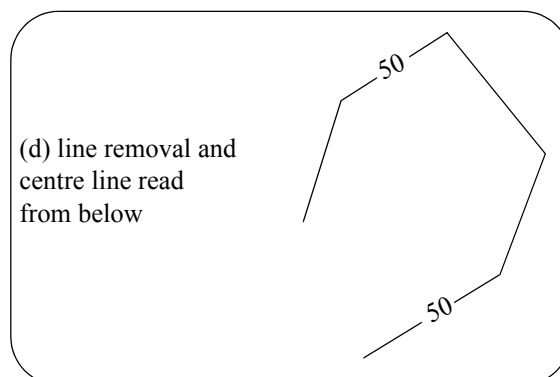
(c) centre line read from below

contour labels are created with the text parallel to the contour line and in the same direction as the contour string but at an angle between -90 and $+90$ degrees. The text is centred on the contour string so the contour string goes through the text.



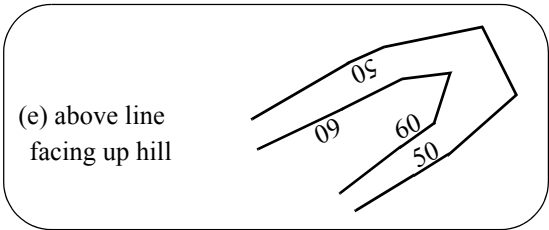
(d) line removal & centred line read from below

contour labels are created with the text parallel to the contour line and in the same direction as the contour string but at an angle between -90 and $+90$ degrees. The text is centred on the contour string so the contour string goes through the text. Also the contours are cut so that gaps are left for the labels.



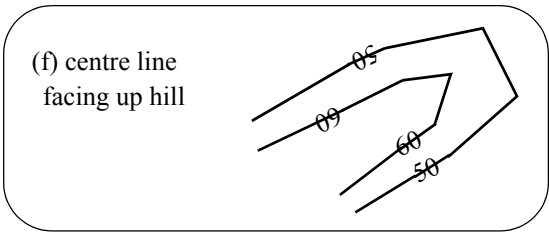
(e) above line facing up hill

contour labels are created with the text parallel to the contours line in the same direction as the contour string. The text is orientated so that it faces uphill. The text is raised slightly above the contour string.



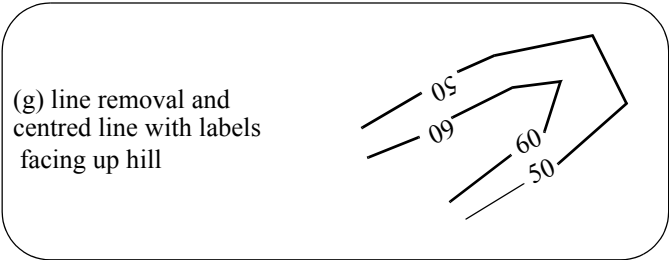
(f) centre line facing up hill

contour labels are created with the text parallel to the contours line in the same direction as the contour string. The text is orientated so that it faces uphill. The text is centred on the contour string so the contour string goes through the text.



(g) line removal & centred line facing up hill

contour labels are created with the text parallel to the contour line. The text is orientated so that it faces uphill. The text is centred on the contour string so the contour string goes through the text. Also the contours are cut so that gaps are left for the labels.



For information on **creating contours**, go to the section [Creating Contours](#).

For information on **smoothing contours**, go to the section [Smoothing Contours](#).

Contour, Smooth and Label

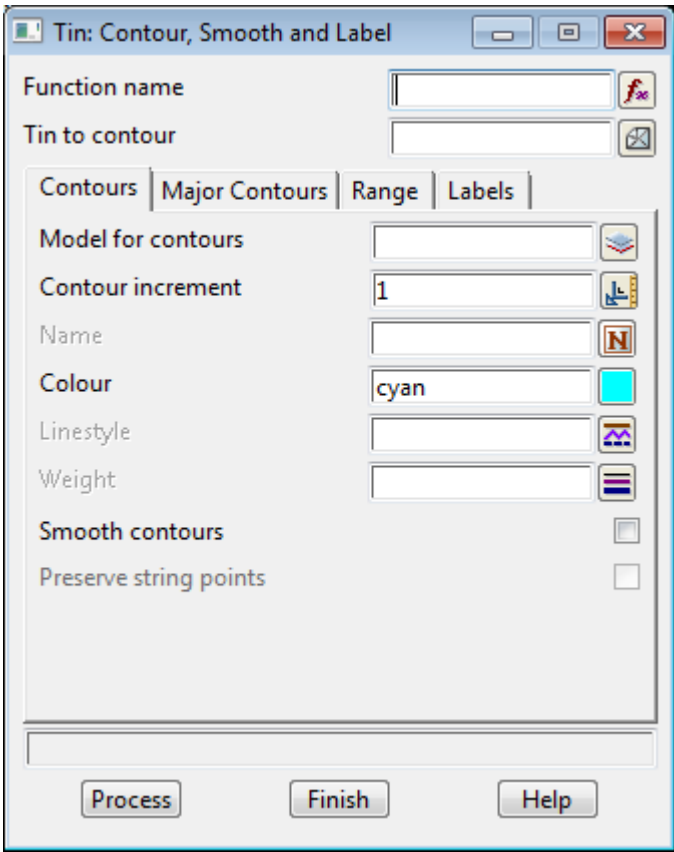
Position of option on menu: Tins =>Contour =>Contour, smooth and label

One method of visualizing tin data is with contours. In 12d Model, contour strings can be produced over any user defined elevation range and at any interval.

This option creates contours and can also smooth and label them. It is a function and so if a function is re-run it will remove any data from its last run.

For more information on contouring, smoothing and labelling in 12d Model, go to the section [Creating Contours](#)

Selecting Contour, smooth and label displays the **Contour, Smooth and Label** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Function name <i>name of the contour, smooth and label function.</i>	function box		available contour fns
Tin to contour <i>name of the tin to be contoured.</i>	input		available tins

Contours tab

Model for contours <i>name of the model to place the contours in.</i>	model box		available models
Contour increment	input	1.0	

increment between contoured values.

Name	input		
	<i>if non-blank, name to give the contour strings.</i>		
Colour	input	cyan	available colours
	<i>colour of the contours</i>		
Linestyle	input	1	available linestyles
	<i>linestyles for the contour strings.</i>		
Weight	input		
	<i>if non-blank, weight to give the contour strings.</i>		
Smooth contours	tick box		
	<i>if ticked, the contours are smoothed.</i>		
Preserve string points	tick box		
	<i>if ticked, then the smoothed string goes through the original vertices of the non smoothed contour strings.</i>		
	<i>If not ticked, then the smoothed strings do not have to include the vertices from the non-smoothed contours.</i>		

Major Contours tab

Create major contours	tick box		
	<i>if ticked, then major contours can be given a different name, colour, style, weight and model.</i>		
Model for major contours	model box		available models
	<i>if non blank, the name of the model to place the major contours in. If blank, the same model is used as for the ordinary contours.</i>		
Major contour increment	input	5.0	
	<i>increment for the major contours.</i>		
	<i>If blank or zero, then no bold contours are drawn. If non-zero, it must be an integer multiple of the contour increment.</i>		
Name	input		
	<i>if non-blank, name to give the major contour strings. If blank, the same name is used as for the ordinary contours.</i>		
Colour	input	off yellow	available colours
	<i>colour of the major contours. If blank, the same colour is used as for the ordinary contours.</i>		
Linestyle	input	1	available linestyles
	<i>if non blank, linestyles for the major contour strings. If blank, the same linestyle is used as for the ordinary contours.</i>		
Weight	input		
	<i>if non-blank, weight to give the major contour strings. If blank, the same weight is used as for the ordinary contours.</i>		

Range tab

Contour minimum	input	
	<i>minimum value of the z range to be contoured. If blank, the tin's minimum z-value is used.</i>	
Contour maximum	input	
	<i>maximum value of the z range to be contoured. If blank, the tin's maximum z-value is used.</i>	

Contour reference input 0

reference value for the contour increments.

Colour by range tick box

if ticked, then the contours are coloured according to a height range file rather than bold colour. See [Height Range File](#).

Height range file height range file box *.hrf

the range file used to colour the contours.

Interpolate colours tick box

*if **ticked**, the colour of the contour will be interpolated between the colour for the range and the colour for the next range in the height range file.*

*If **not ticked**, all contours in the same range in the height range file will have the same colour*

Colour text labels tick box

if ticked, then any contour height text is also coloured the same colour as the contour.

Labels tab

Label contours tick box

if ticked, then the contours are labelled.

Label major contours only tick box

if ticked, then only the major contours are labelled.

Model for labels model box available models

if non blank, the name of the model to place the contour labels in. If blank, the same model is used as for the contours.

Contour method choice box above line contour direction
above line read from below
centred line read from below
line removal and centred line read from below
above line facing uphill
centred line facing uphill
line removal & centred facing uphill

For information on each of the methods of labelling contours, go to the section [Labelling Contours](#).

Decimal places

number of decimal places used in the contour label.

Textstyle data 1 textstyle favourites

textstyle information to use for the contour labels.

Start dist (w) input 0

chainage distance to the first label on the string - world units

Separation (w) input 250

chainage interval between the labels - world units

Model of label lines model box available models

if non blank then instead of using the start distance and separation parameters to define where the contour labels are placed, the Model of label lines is used. In this case, a label is created where ever s string in the Model of label lines cuts a contour.

Label start and end tick box tick

if ticked, the start and end of the contours are labelled regardless of the values of start distance and separation.

Process

button

contour, smooth and label the tin given in the tin field and place the contours in the model given in the model field.

Change Contours

Position of option on menu: Tins =>Contour =>Change

The **Change** option is for changing the model and/or colour of contours with a given height interval.

The main purpose of the option is to separate contours to be used as index contours from other contours. For example, when contours are supplied by a third party and all the contours are in the same model with the same colour, **change contour colour** can move contours to be used as index contours to a different model and give them a different colour.

For this option the selection process for a Data source is extended.

After the data is selected as defined by the Data source, the two extra parameters, interval and reference, are used to further specify which contours are to be moved and/or coloured.

Only contour strings whose heights satisfy

$$\text{height} = \text{reference} + \text{integer} * \text{interval}$$

are selected.

For example, if the contours 5, 10, 15 etc. are required, the reference and interval would be

$$\text{reference} = 0$$

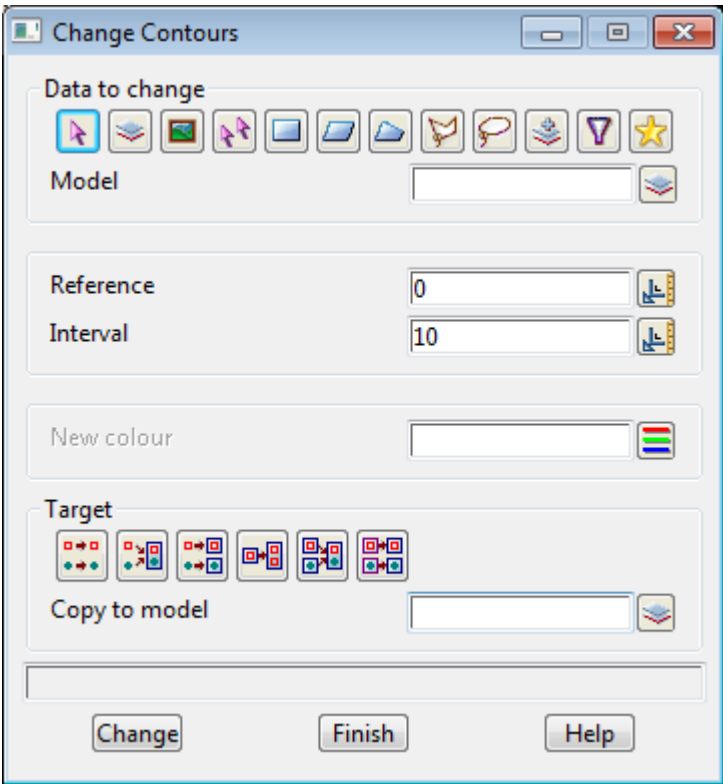
$$\text{interval} = 5$$

However, to modify the contours 6, 11, 16 etc., the required parameters are

$$\text{reference} = 1$$

$$\text{interval} = 5$$

Selecting **Change** displays the **Change Contours** panel.



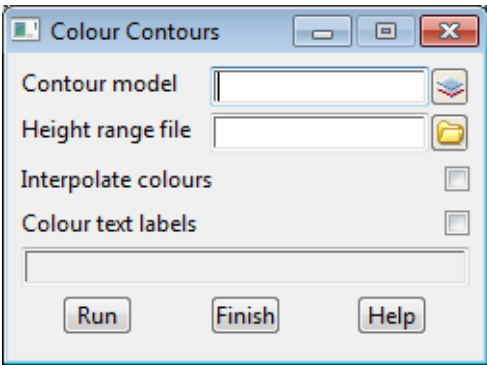
The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source	input		
<i>source of data to be processed.</i>			
Reference	input	0	
<i>the reference value to use to select contours.</i>			
Interval	input	10	
<i>the interval to use to select contours.</i>			
New colour	input		available colours
<i>if non-blank, then the colour of the selected strings will be changed to the colour given in the New colour field.</i>			
Target type			
<i>Data target type - where to put the processed strings. For a full description go to Data Target in the chapter Tools and Concepts</i>			
Target info	input		
<i>extra information required for the target.</i>			
Change	button		
<i>process the selected strings</i>			

Colour

Position of option on menu: Tins =>Contour =>Colour

The **Colour** option is used to colour contours in a model according to a selected height range file.
For more information on the height range file, see [Height Range File](#).
On selecting **Colour**, the **Colour Contours** panel is displayed.



The fields and buttons in this panel are used as follows

Field Description	Type	Defaults	Pop-Up
Contour model <i>model of contours to colour</i>	model box		available models
Height range file <i>height range file to specify the colour of the contour. See Height Range File.</i>	height range file box		.hrf files
Interpolate colours <i>if ticked, the colour of the contour will be interpolated between the colour for the range and the colour for the next range in the height range file. If not ticked, all contours in the same range in the height range file will have the same colour</i>	tick box		
Colour text labels <i>if ticked, any text labels in the model will also be coloured.</i>	tick box	tick	
Run <i>colour the contours and text according to the height range file.</i>	button		

Contour

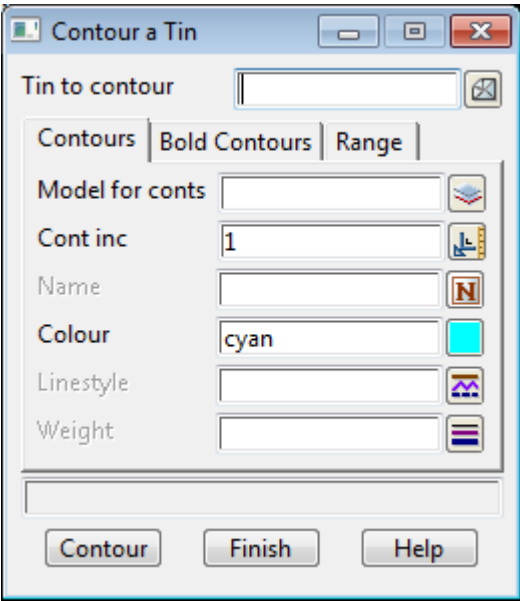
Position of option on menu: Tins =>Contour =>Contours

One method of visualizing tin data is with contours. In 12d Model, contour strings can be produced over any user defined elevation range and at any interval.

For more information on contouring in 12d Model, go to the section [Creating Contours](#)

The **contour** option can be applied to a tin any number of times. This may be necessary if the contour parameters vary over the total range to be contoured.

On selecting the **contour** option, the **contour a tin** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Tin to contour	<i>name of the tin to be contoured.</i>	tin box		available tins

Contours tab

Model for conts	<i>name of the model to place the contours in.</i>	model box		available models
Cont inc	<i>increment between contoured values.</i>	input	1.0	
Name	<i>if non-blank, name to give the contour strings.</i>	input		
Colour	<i>colour of the contours</i>	colour box	cyan	available colours
Linestyle	<i>linestyles for the contour strings.</i>	linestyle box	1	available linestyles
Weight	<i>if non-blank, weight to give the contour strings.</i>	weight box		

Bold Contours tab

Model for bolds	model box	available models	
<i>name of the model to place the bold contours in. If blank, the same model is used as for the ordinary contours.</i>			
Bold inc	input	5.0	
<i>increment for the bold contours.</i>			
<i>If blank or zero, then no bold contours are drawn. If non-zero, it must be an integer multiple of the contour increment</i>			
Name	input		
<i>if non-blank, name to give the bold contour strings.</i>			
Colour	colour box	cyan	available colours
<i>colour of the bold contours</i>			
Linestyle	input	1	available linestyles
<i>linestyles for the bold contour strings.</i>			
Weight	input		
<i>if non-blank, weight to give the bold contour strings.</i>			

Range tab

Cont min	input	
<i>minimum value of the z range to be contoured. If blank, the tin's minimum z-value is used.</i>		
Cont max	input	
<i>maximum value of the z range to be contoured. If blank, the tin's maximum z-value is used.</i>		
Cont ref	input	0.0
<i>reference value for the contour increments.</i>		

Contour	button
<i>contour the tin given in the tin field and place the contours in the model given in the model field. The contour range, contour increment and bold contour increment are used specify which contours are calculated.</i>	

Panel Messages

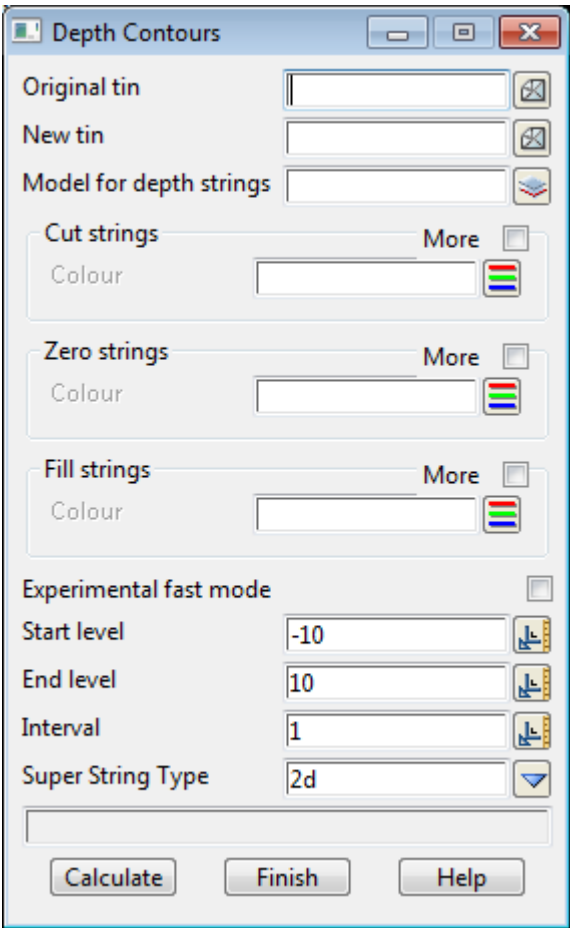
- Progress messages - sent to the panel message area
 - start contouring
 - contouring level z-value
 - Completion message - sent to the panel message area
 - finished contouring - no. contours
- <esc> can be used to abort the calculation of contours.

Depth Contours

Position of option on menu: Tins =>Contour =>Depth contours

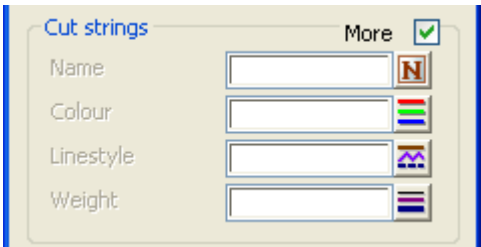
The **depth contours** option finds the contours lines for the difference between two tins. That is, it calculates the isopachs between the two tins.

Selecting **Depth contours** displays the **Depth Contours** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Original/New tin	tin box		available tins
<i>name of the original/new tin to contour between. Cut is when the new tin is below the original tin.</i>			
Model for depth strings	model box		available models
<i>name of the model to contain the depth strings.</i>			
Cut/Zero/Fill strings section	More tick box		
<i>if no tick then only the Colour panel field is displayed</i>			
Colour	colour box	cyan	available colours
<i>if non-blank, colour for the strings</i>			
<i>if tick then Name, Colour, Linestyle and Weight fields are displayed</i>			



Name	input		
<i>if non-blank, name to give the strings.</i>			
Colour	colour box	cyan	available colours
<i>if non-blank, colour for the strings</i>			
Linestyle	linestyle box	1	available linestyles
<i>linestyles for the strings.</i>			
Weight	weight box		
<i>if non-blank, weight to give the strings.</i>			
Start level	input	-10	
<i>the minimum depth to start the depth contours at.</i>			
End level	input	10	
<i>the maximum depth to calculate the depth contours to.</i>			
Interval	input	1	
<i>the interval between the depth contours.</i>			
Super string type	choice box	2d	2d, 3d original, 3d new
<i>If 2d, the created strings are 2d strings with a z-value equal to the depth.</i>			
<i>If 3d original, the depth strings are draped over the original tin to form 3d strings.</i>			
<i>If 3d new, the depth strings are draped over the new tin to form 3d strings.</i>			
Calculate	button		
<i>calculate the depth contours between two tins given in the panel fields. The resulting strings are added to the model given in the Model for depth strings field.</i>			

Label Contours

Position of option on menu: Tins =>Contour =>Label

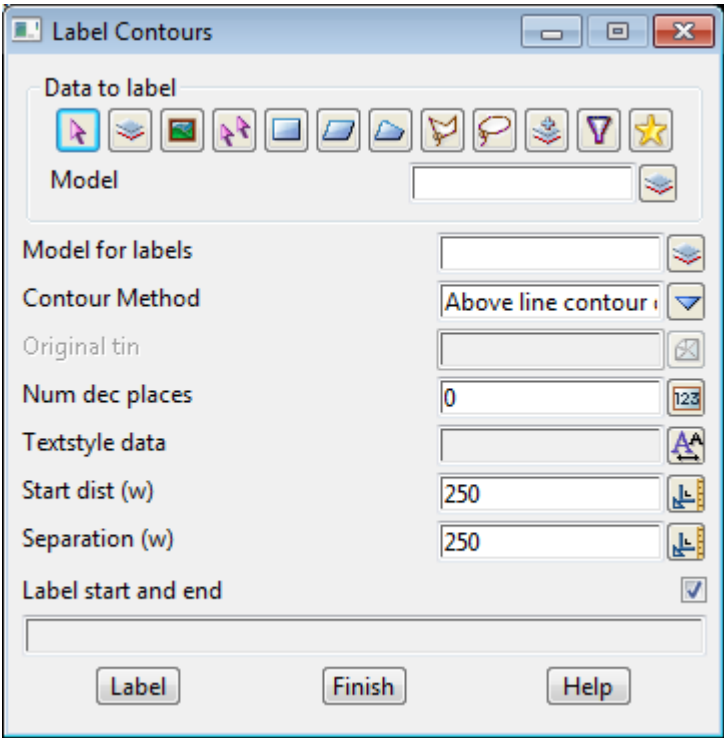
The **label contours** option can be used to label individual contour (2d) strings, or all the contour strings in a model.

The user has control over the label size, colour, number of decimal places, the distance between the labels and the distance to the first label on a string (start distance).

Note - this option cannot label fast contours. Contours strings must already exist or be generated using **Tins => Contour=> Contour, Smooth and Label** Or **Tins => Contour=> Contour**

For more information on labelling contours, go to the section [Labelling Contours](#).

On selecting the **label contours** option, the **label contours** panel is displayed.



When the **Label** button is selected, all the contour strings given by the data source field will be labelled according to the parameters in the panel fields.

The fields and buttons used in the **label contours** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type	Model		
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts.</i>			
Data source	input		
<i>source of data is to be triangulated - only Model or View allowed for this option.</i>			
Model for labels	model box		available models
<i>name of the model to place the contour labels in.</i>			
Label method	choice box		above line contour direction above line read from below centred line read from below

line removal and centred line read from below
above line facing uphill
centred line facing uphill
line removal & centred facing uphill

in all cases, contour labels are created and added to the model Model for contours.

For information on each of the methods of labelling contours, go to the section [Labelling Contours](#).

Original tin	tin box		available tins
<i>only needed for the "facing uphill" methods - name of the tin used to generate the contours. This is needed to calculate which direction is uphill.</i>			
Num dec places	input	1	0,1,2,3,4,5
<i>number of decimal places used in the contour label.</i>			
Textstyle data	textstyle data box	1	textstyle favourites
<i>textstyle information to use for the contour labels.</i>			
Start dist (w)	input	0	
<i>chainage distance to the first label on the string - world units</i>			
Separation (w)	input	250	
<i>chainage interval between the labels - world units</i>			
Pick	button		
<i>if a number of individual contour strings need to be labelled, the pick button is used. After pick is chosen, any strings selected are then labelled using the information in the panel fields. After labelling one string, another pick and label cycle automatically begins.</i>			
<i>The cycle is terminated by clicking RB to raise the pick ops menu and selecting cancel from it.</i>			
Label	button		
<i>label all the contour strings selected by the "Data to label" data source.</i>			

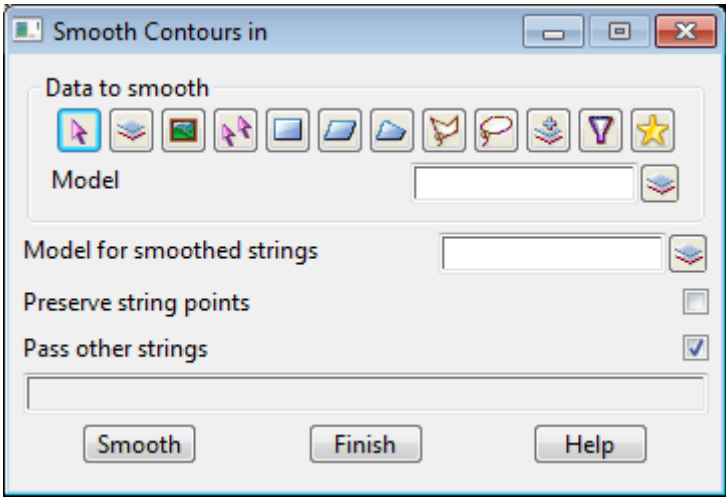
Smooth

Position of option on menu: Tins =>Contour =>Smooth

The **smooth** options are used to add extra points into a contour string (2d strings) to make a smoother string.

For more information on labelling contours, go to the section [Smoothing Contours](#).

Selecting **Smooth** displays the **Smooth Contours in** panel.



The fields and buttons in this panel are used as follows

Field	Description	Type	Defaults	Pop-Up
Data source type			Model	
	<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts.</i>			
Data source		input		
	<i>data source to be smoothed.</i>			
Model for smoothed strings		model box		available models
	<i>model for the smoothed strings to go to</i>			
Preserve string points		tick box		
	<i>if ticked, the smoothed contour will still contain all the original points. if not ticked, the smoothed contour may deviate from the original string points</i>			
Pass other strings		tick box	tick	
	<i>if ticked, any non-contour string is copied and added to the smoothed strings model.</i>			
Smooth		button		
	<i>smooth the selected contour (2d) strings.</i>			

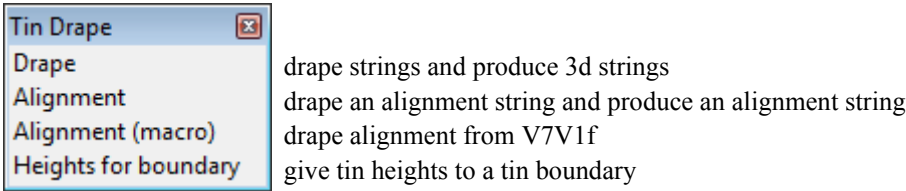
Drape

Position of menu: Tins =>Drape

The **drape** option sections along a string and creates a new 3d-string which sits over the original string in plan view (with line approximations for arcs and spirals) but with z-values taken from a triangulated surface (a tin).

The drape alignment option takes an alignment string and creates a new alignment string with the identical horizontal geometry and vertical intersection points with z-values taken from a tin.

The tin drape walk-right menu is



The options in the tin contours menu will now be discussed.

For the option <i>Drape</i> , go to	Drape
<i>Alignment</i>	Drape Alignment
<i>Alignment (macro)</i>	Drape Alignment (Macro)
<i>Heights for boundary</i>	Heights for Tin Boundary or Drape Using Closest Tin Node

Drape

Position of option on menu: Tins =>Drape =>Drape

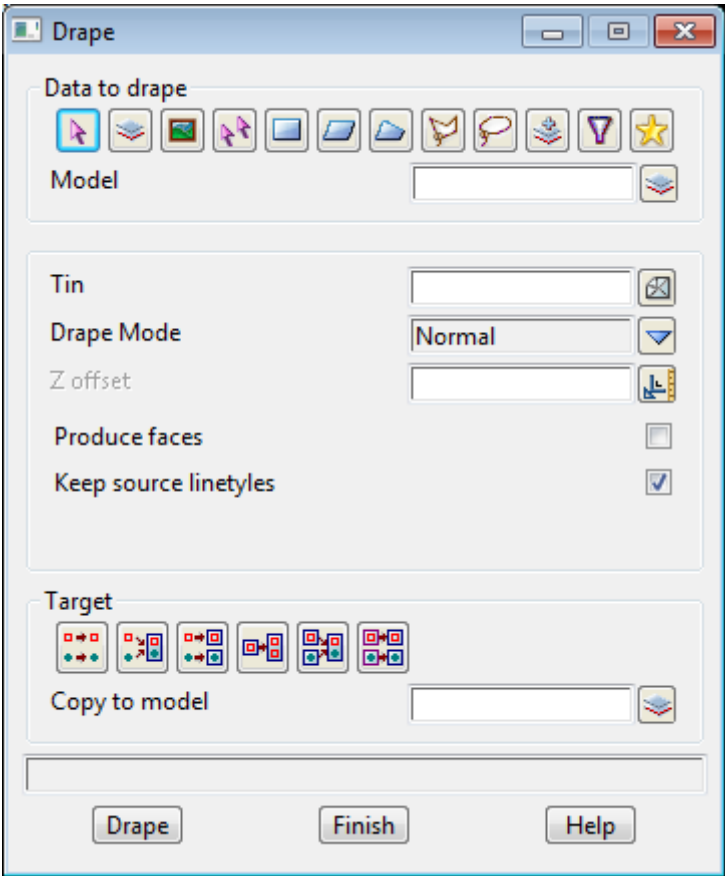
The **drape** operation is simply sectioning along a string.

Draping is a very useful method for attaching a z-value for strings defined in plan only. For example, cadastral information often has only (x,y) co-ordinates. The drape operation could be used to apply z-values to the cadastral information, for example, z-values from the natural surface tin. The draped cadastral information would then sit on the natural surface and could be used effectively in perspective views as well as plan views to delineate properties etc.

The draped strings can also have a z-offset applied so that the draped strings are a constant distance above or below the tin.

Instead of simply producing a section along a string, **drape** can also be used to produce a face for every segment of the string by draping the segment onto the tin and forming a face by perpendicularly connecting the end points of the segment and the draped segment. For example, if the strings represented the tops of buildings, the created faces would be the sides of the buildings down to the terrain.

On selecting **Drape**, the **Drape** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source	input		
<i>data to drape.</i>			
Tin	tin box		available tins
<i>name of the tin to drape the strings over.</i>			
Drape mode	choice box	Normal	Normal, Vertices only
<i>if Normal, the section through the tin is created.</i>			
<i>If Vertices only, only the z-value from the tin is calculated at the vertices of the strings.</i>			
Z offset	real value box		
<i>if non-blank, the z-value of all the draped strings is increased by this value.</i>			
Produce faces	tick-box		
<i>if ticked, drape each segment of the string to form faces.</i>			
<i>If not ticked, simply drape the string onto the tin.</i>			
Keep source linestyles	tick box		
<i>if ticked, the linestyles of the draped strings are the same as the original string that was draped.</i>			
Target type			

Data target type - where to put the processed strings. For a full description go to [Data Target](#) in the chapter [Tools and Concepts](#)

Target info input

models where the draped strings are placed.

Drape button

drape the strings selected by the "data to drape" data source over the tin given in the tin field.

Note: if faces rather than sections are to be produced, tick on the produce faces.

<esc> can be used to abort the drape option.

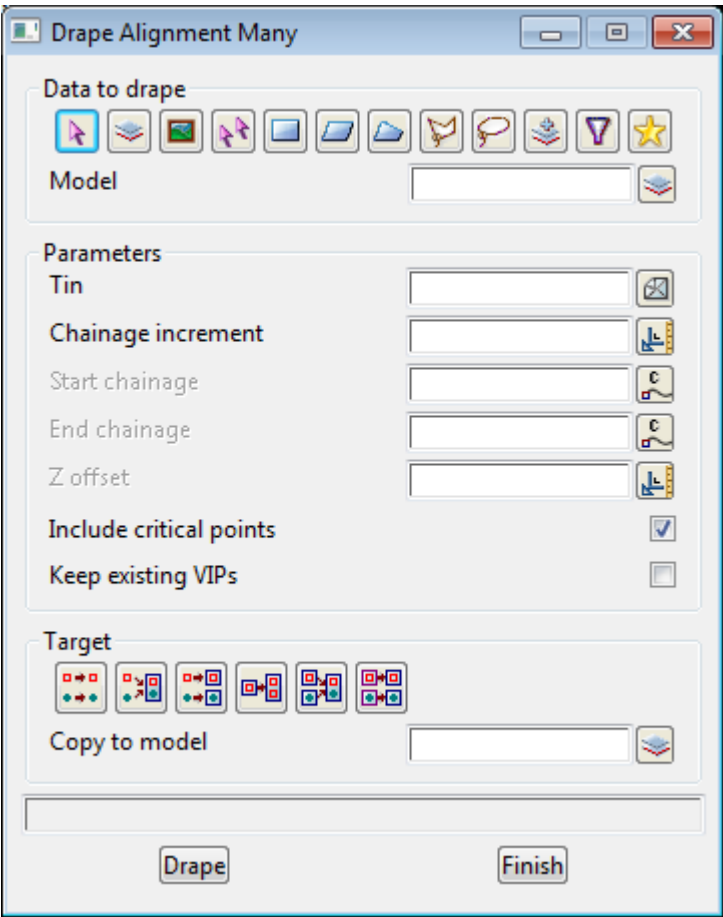
Drape Alignment

Position of option on menu: Tins =>Drape =>Alignment

The **Drape alignment** operation takes an alignment/super alignment string and creates a new alignment/super alignment string with identical horizontal geometry and the z-value for vertical intersection points taken from a tin. The z-values are taken over a user specified chainage interval and chainage increment. Vertical intersection points outside the chainage range can be kept.

The draped alignments can also have a z-offset applied so that the draped alignments are a constant distance above or below the tin.

On selecting **Alignment**, the **Drape Alignment Many** panel is displayed.



The fields and buttons used in this panel have the following functions:

Field	Description	Type	Defaults	Pop-Up
Data source type			Model	
	<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts.</i>			
Data source		input		
	<i>source of data of alignment/super alignment strings to drape.</i>			
Tin		tin box		
	<i>triangulation to take z-values from.</i>			
Chainage increment		input		

the chainage interval to create VIP points for. Each created VIP point is given the z-value from the tin and the (x,y) position of the VIP.

Start/End chainage input

*if **non blank**, the chainage range to create VIP's over.
If **blank**, use the start/end chainage of the selected string.*

Z offset input

*if **non blank**, the value is added to the z-values from the tin.*

Include critical points tick box tick

if ticked, VIP's are created at the horizontal tangent points.

Keep existing VIPs tick box

*if ticked, any existing VIP's outside the given chainage range are kept.
If not ticked, don't create any VIP points outside the chainage range.*

Target type

Data target type - where to put the processed strings. For a full description go to [Data Target](#) in the chapter [Tools and Concepts](#)

Target info input

extra information required for the target.

Drape button

create new alignment/super alignment strings with the same horizontal geometry as the selected strings and the z-value for VIP points taken from the given tin.

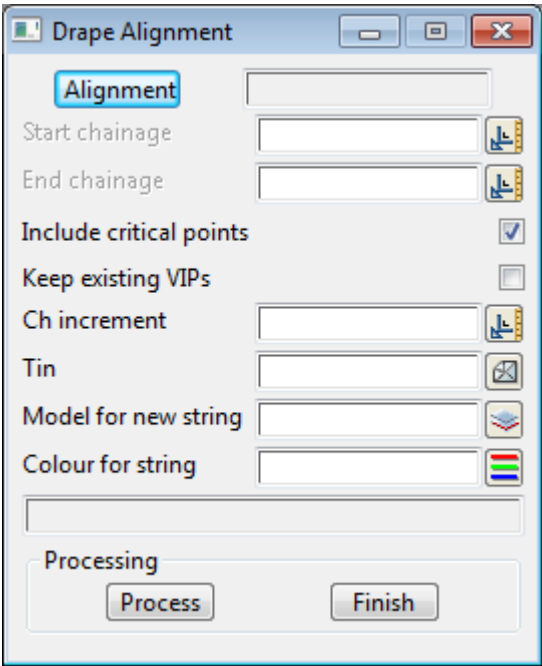
Drape Alignment (Macro)

Position of option on menu: Tins =>Drape =>Alignment (macro)

This is the **Drape =>Alignment** option from V7C1f. It has now been superseded.

The **Drape alignment (macro)** operation takes an alignment string and creates a new alignment string with identical horizontal geometry and the z-value for vertical intersection points taken from a tin. The z-values are taken over a user specified chainage interval and chainage increment. Vertical intersection points outside the chainage range can be kept.

On selecting **Alignment (macro)**, the **drape alignment** panel is displayed.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Alignment <i>alignment string to drape.</i>	string select		
Start/End chainage <i>the chainage range to create VIP's over: if blank, use the start/end chainage of the selected string.</i>	input		
Include critical points <i>if ticked, VIP's are created at the horizontal tangent points.</i>	tick box	tick	
Keep existing VIPs <i>if ticked, any existing VIP's outside the given chainage range are kept. If not ticked, don't create any VIP points outside the chainage range.</i>	tick box		
Ch increment <i>the chainage interval to create VIP points for. Each created VIP point is given the z-value from the tin and the (x,y) position of the VIP.</i>	input		
Tin <i>triangulation to take z-values from.</i>	tin box		

Model for new string model box
model for the draped string.

Colour for string colour box
Colour for the draped string.

Process button
create a new alignment string with the same horizontal geometry as the selected string and the z-value for VIP points taken from the given tin.



Heights for Tin Boundary or Drape Using Closest Tin Node

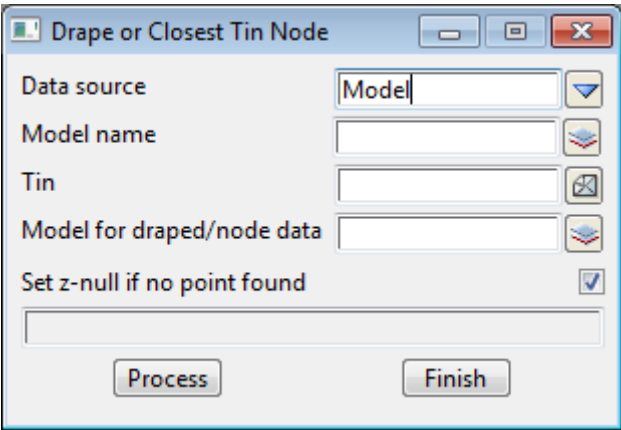
Position of option on menu: Tins =>Drape =>Heights for boundary

This option takes strings and for each vertex of each string, replaces the z-value by the z-value at the same (x,y) position from a given tin, or if there is no tin at the (x,y) position, takes the z-value from the closest non-null tin node to the (x,y) position.

The option is useful for taking a tin boundary with no z-values and creating z-values for each vertex from the tin.

Since V8 the option **Tins =>Boundary** option has a *Boundaries draped* flag which performs the same calculations as this option.

On selecting **Heights from boundary**, the **Update Z-values from Tin** panel is displayed.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Data source <i>type of the data source</i>	choice box	model	model, view, string
Model/View/String name <i>source of the data to drape vertices for.</i>			
Tin <i>tin to drape the vertices onto.</i>	tin box		
Model for draped/node data <i>model for the draped strings.</i>	model box		
Set z-null if no point found <i>if ticked, the vertex z-value is set to null if no tin exists at the vertex. If not ticked and the tin does not exist at the vertex, the z-value for the vertex is taken from the closest non-null tin node.</i>	tick box	tick	
Process <i>run the option.</i>		button	

Tin Analysis

Position of menu: Tins =>Tin analysis

The tin analysis options are used to calculate the direction and slope of triangles, the intersection between tins, surface areas, flow arrows, ridge and valley lines and viewsheds.

The tin analysis walk-right menu is

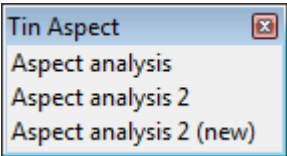
Tin Analysis	
Aspect	colour and report for ranges of aspects
Slope	colour and report for ranges of slopes
Intersection	lines of intersection between two tins
Surface area	report surface area within a polygon
Surface area 2	report surface area for a model of polygons
Viewshed	calculate viewshed
Viewshed dynamic	dynamically create viewshed lines
Viewshed old	viewshed option from V8
Flow arrows	create flow arrows for a tin.
Ridges/Valleys	create ridge and valley lines for a tin
Depth range polygons	create polygons for depth ranges
Polygons from colours	creates polygons around coloured regions of tin
Rain drop	creates flow lines from a selected point

For the options <i>Aspect</i> , go to	Aspect
<i>Slope</i>	Slope
<i>Intersection</i>	Intersection
<i>Surface area</i>	Surface Area
<i>Surface area 2</i>	Surface Area 2
<i>Viewshed</i>	Viewshed
<i>Viewshed dynamic</i>	Dynamic Viewshed
<i>Viewshed old</i>	Viewshed Old
<i>Flow arrows</i>	Flow Arrows
<i>Ridge/Valleys</i>	Ridge/Valleys
<i>Depth range polygons</i>	Depth Range Polygons
<i>Polygons from colours</i>	Polygons from Tin Colours
<i>Rain drop</i>	Raindrop/Teardrop

Aspect

Position of menu: Tins =>Tin analysis =>Aspect

The Tin aspect options calculate and report on the directions of the triangles. The Tin aspect walk-right menu is



The options in this menu will now be discussed.

For the option Aspect analysis, go to
Aspect analysis 2
Aspect analysis 2 (new)

[Aspect Analysis](#)
[Aspect Analysis 2 and 2 \(new\)](#)
[Aspect Analysis 2 and 2 \(new\)](#)

Aspect Analysis

Position of option on menu: Tins =>Tin analysis =>Aspect => Aspect Analysis

This panel is used to calculate the aspect or direction that the triangles of a tin face. The calculations can be restricted to within a user selected polygon, or if no polygon is selected, the entire tin is used.

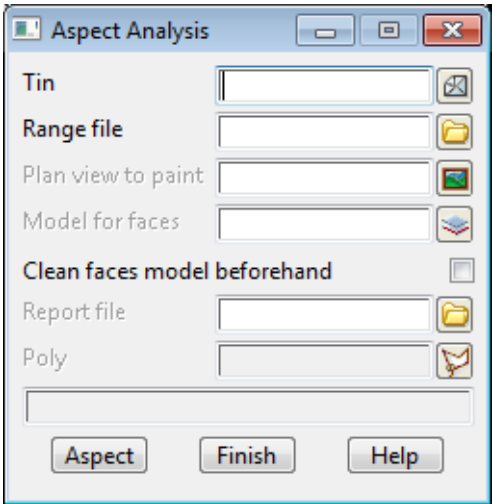
The calculated aspects can be produced and reported over user supplied bearing ranges. Similarly, a plan view can be temporarily coloured on an aspect basis using the same range file. The temporary colours will disappear next time the view is refreshed.

For permanency, the option can also create coloured faces with the appropriate range colour. The faces can be displayed on any plan view using a solid fill colour or a hatch pattern.

For more information on the aspect range file, see [Aspect Range File](#).

For each range in the file, the plan and slope areas of the triangles in the bearing range will be reported on, and the range_colour can be used to colour all areas on a plan view satisfying the range.

On selecting the aspect analysis option, the **Aspect Analysis** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Tin	tin box	available tins
<i>name of the tin for which the aspects of the triangles will be calculated.</i>		
Range file	aspect range file box	*.arf
<i>the user supplied range file is used to split up the aspect report and define the range colours used for painting a plan view. See Aspect Range File.</i>		
Plan view to paint	view box	available views
<i>if non-blank, the given plan view will be painted according to the range colours given in the range file.</i>		
Model for faces	model box	available models
<i>if non-blank, faces will be created with colours according to the range colours given in the range file. The z-value for a face is the line number in the range file of the range that the face satisfies.</i>		
Clean faces model beforehand	tick box	
<i>if ticked, the model of faces is cleaned out before the option runs.</i>		
Report file	file box	*.rpt
<i>name of the file to contain the aspect report. If the file already exists, the report will be appended to the file. If no name is given, no report is produced.</i>		
Poly	string-select	
<i>if selected, this string is used as the bounding polygon for the aspect calculations.</i>		
Aspect	button	
<i>the aspects of the triangles of the tin within the selected bounding polygon are calculated.</i>		
<esc> can be used to terminate the option during aspect calculations.		

Example of an Aspect Range File

```
// aspect range file
// format:  lower_bearing    upper_bearing    colour_for_range
0  45   red    // colour red the triangles with bearing greater than 0 and less than or equal to 45
45  90   green  // colour green the triangles with bearing > 45, and <= 90
90 123.30 "dark green" // colour dark green triangles with bearing > 90 and <= 123 deg 30'
```

Aspect Analysis 2 and 2 (new)

Position of option on menu: Tins =>Tin analysis =>Aspect => Aspect Analysis 2

Position of option on menu: Tins =>Tin analysis =>Aspect => Aspect Analysis 2 (new)

As with the aspect analysis option, the aspect analysis 2 option is used to calculate the aspect or direction that the triangles in the tin face.

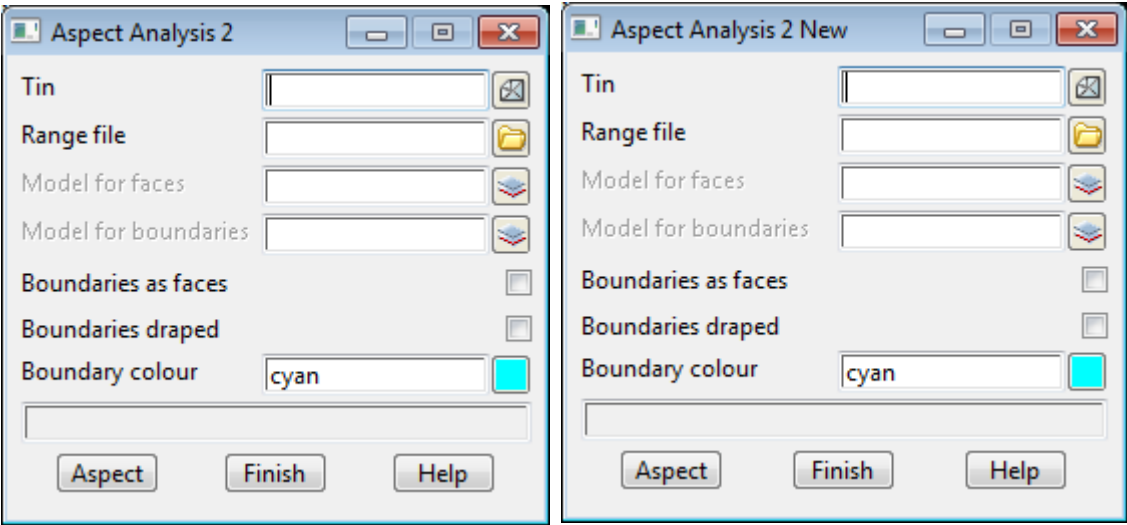
However, this option can also create the strings that bound the triangles in the same aspect range. The aspect analysis 2 (new) option is the same as aspect analysis 2 except the boundary polygons have slightly different names.

One restriction for this option is that the calculations can not be restricted to be within a polygon and the entire tin is used.

For more information on the aspect range file, see [Aspect Range File](#).

For each range in the file, the boundary strings for areas of common range can be created and also coloured faces that can be displayed on any plan view.

On selecting the Aspect analysis 2 option, the **Aspect Analysis 2** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin for which the aspects of the triangles will be calculated.</i>	tin box		available tins
Range file <i>the user supplied range file is used to split the triangles into groups of common aspects so that boundary strings can be created and the range colours used for faces and the boundary strings. See Aspect Range File.</i>	aspect range file box		*.arf
Model for faces <i>if non-blank, a faces will be created (with the colour given in the range file) for each triangle. The z-value for a face is the line number in the range file of the range that the face satisfies.</i>	model box		available models
Model for boundaries <i>if non-blank, for each range of aspects in the range file, boundary strings will be created for regions of common aspect. The boundary strings are given the name "aspect boundaries" plus the number of the entry in the range file. Many of the boundaries will exist twice since they are the upper boundary for one range and the lower boundary for the next range but will have a different colour and name. For aspect analysis 2 (new), the boundary name also has the addition of "face" and a number to more clearly differentiate the boundaries of the same range.</i>	model box		available models
Boundaries as faces <i>if ticked, output the regions of common aspect as faces.</i>	tick box		
Boundaries draped <i>if ticked, the z-values for the boundary are taken from the tin. If not ticked, the z-value for a boundary is the line number in the range file of the range that the boundary satisfies.</i>	tick box		
Boundary colour <i>not used - was the colour for the aspect boundaries.</i>	colour box	cyan	available colours
Aspect <i>On selecting this button, the aspects of the triangles of the tin are calculated and the appropriate</i>	button		

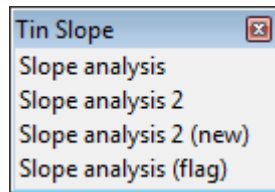
boundaries and faces created.

<esc> can be used to terminate the option during aspect calculations.

Slope

Position of menu: Tins =>Tin analysis =>Slope

The tin slope options calculate and report on the slopes of the triangles. The tin slope walk-right menu is



colour and report for ranges of slopes

The options in this menu will now be discussed.

For the option Slope analysis, go to

Slope analysis 2

Slope analysis 2 (new)

Slope analysis (flag)

[Slope Analysis](#)

[Slope Analysis 2 and 2 \(new\)](#)

[Slope Analysis 2 and 2 \(new\)](#)

[Slope Analysis - Flag Slopes](#)

Slope Analysis

Position of option on menu: Tins =>Tin analysis =>Slope =>Slope analysis

This panel is used to calculate the slopes of triangles in the tin. The calculations can be restricted to within a user selected polygon, or if no polygon is selected, the entire tin is used.

The calculated slopes can be produced and reported over user supplied slope ranges. Similarly, a plan view can be temporarily coloured on a slope basis using the same **range** file. The temporary colours will disappear next time the view is refreshed.

For permanency, the option can also create coloured faces with the appropriate range colour. The faces can be displayed on any plan view using a solid fill colour or a hatch pattern.

For more information on the slope range file, see [Range Files](#).

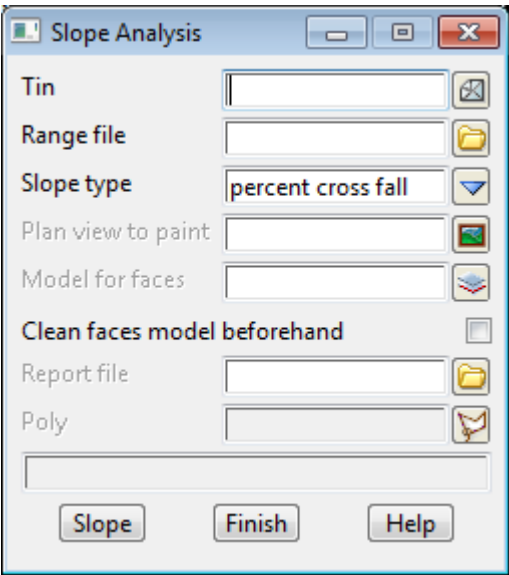
The slopes in the file can be percent cross fall, “1v in” slope or degrees (in 12d Model dms format) but they must all be of the same type in the file.

Note - if **1v in** is used, the range is converted to:

$$\text{smaller_slope_as_percent_cross_fall} < \text{slope} \leq \text{larger_slope_as_percent_crossfall}$$

For each range in the file, the plan and slope areas of the triangles in the range will be reported on, and the range_colour used to colour all areas on a plan view satisfying the range.

On selecting the **Slope analysis** option, the **Slope Analysis** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin for which the slopes of the triangles will be calculated.</i>	tin box		available tins
Range file <i>the user supplied range file is used to split up the slope report and define the range colours used for painting a view. See Range Files.</i>	slope range file		*.srf
Slope type <i>the units used for slope in the range file.</i>	choice box		percent cross fall, degrees, 1v in

Plan view to paint

view box

available views

if non-blank, the given plan view will be painted according to the range colours given in the range file.

Clean faces model beforehand tick box

if ticked, the model of faces is cleaned out before the option runs.

Model for faces

model box

available models

*if non-blank, faces will be created with colours according to the range colours given in the range file.
The z-value for a face is the line number in the range file of the range that the face satisfies.*

Report file

file box

*.rpt

name of the file to contain the slope report. If the file already exists, the report will be appended to the file. If no name is given, no report is produced.

Poly

string-select

if selected, this string is used as the bounding polygon for the slope calculations.

Slope

button

On selecting this button, the slopes of the triangles of the tin within the selected bounding polygon are calculated.

<esc> can be used to terminate the option during slope calculations.

Example of a Slope Range File

```
// slope range file in percent cross fall
// format:  lower_slope    upper_slope    colour_for_range
0  5    red    // colour red the triangles with slope greater than 0% and less than
               // or equal to 5% x-fall
5  10   green  // colour green the triangles with slope > 5%, and <= 10% x-fall
10 300 "dark green" // colour dark green triangles with slope greater than 10%
                  // and less than or equal to 300% x-fall

// slope range file in 1v in slopes
// format:  lower_slope    upper_slope    colour_for_range
0  20    red    // colour red the triangles with slope greater than flat and
               // less than or equal to 1:20
20 10   green  // colour green the triangles with slope between 1:20 and equal to 1:10
10  1    blue  // colour blue triangles with slope between 1:10 and equal to 1:1
```

Slope Analysis 2 and 2 (new)

Position of option on menu: Tins =>Tin analysis =>Slope =>Slope analysis 2

Position of option on menu: Tins =>Tin analysis =>Slope =>Slope analysis 2 (new)

As with the Slope analysis option, the slope analysis 2 option is used to calculate the slope of triangles in the tin. However, this option can also create the strings that bound the triangles in the same slope range.

The Slope analysis 2 (new) option is the same as Slope analysis 2 except the boundary polygons have slightly different names.

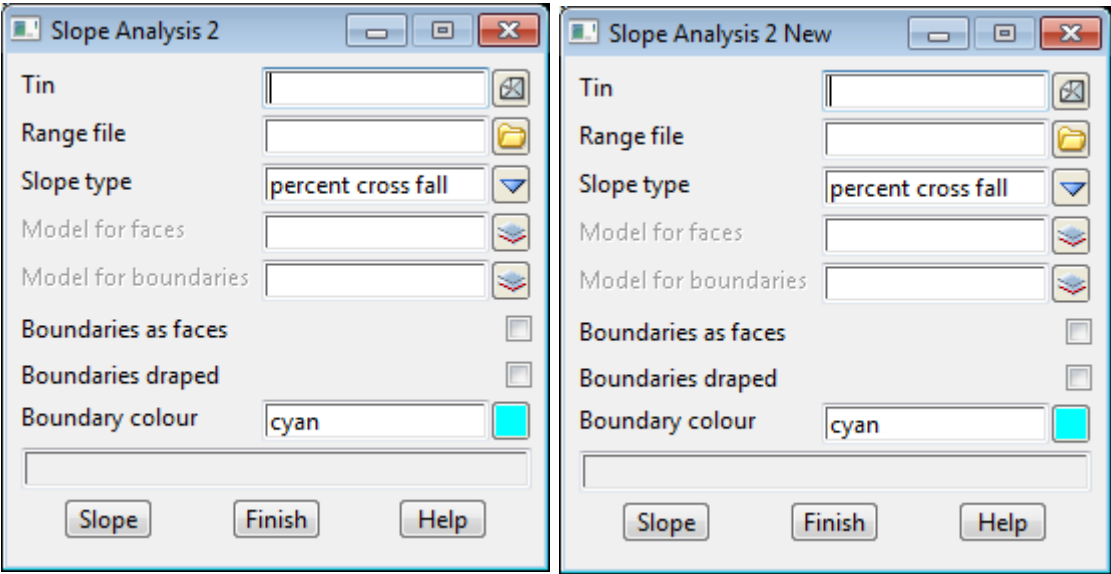
One restriction for this option is that the calculations can not be restricted to be within a polygon and the entire tin is used.

The range file for Slope analysis 2 has the same format as for Slope analysis.

For more information on the slope range file, see [Range Files](#).

For each range in the file, the boundary strings for areas of common range can be created and also coloured faces that can be displayed on any plan view.

On selecting the Slope analysis 2 option, the Slope Analysis 2 new panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin for which the slopes of the triangles will be calculated.</i>	input		available tins
Range file <i>the user supplied range file is used to split the triangles into groups of common slopes so that boundary strings can be created and the range colours used for faces. See Range Files.</i>	input		*.srf
Slope type <i>the units used for slope in the range file.</i>	input		percent cross fall, degrees, 1v in
Model for faces <i>if non-blank, a faces will be created (with the colour given in the range file) for each triangle. The z-value for a face is the line number in the range file of the range that the face satisfies.</i>	input		available models

Model for boundaries input available models

if non-blank, for each range of slopes in the range file, boundary strings will be created for regions of common slope. The boundary strings are given the name "slope boundaries" plus the number of the entry in the range file. Many of the boundaries will exist twice since they are the upper boundary for one range and the lower boundary for the next range but they will have a different colour and name. For slope analysis 2 (new), the boundary name also has the addition of "face" and a number to more clearly differentiate the boundaries of the same range.

Boundaries as faces tick box

if ticked, output the regions of common slope as faces.

Boundaries draped tick box

*if ticked, the z-values for the boundary are taken from the tin.
If not ticked, the z-value for a boundary is the line number in the range file of the range that the boundary satisfies.*

Boundary colour input cyan available colours

not used - was the colour for the slope boundaries.

Slope button

On selecting this button, the slopes of the triangles of the tin are calculated and the appropriate boundaries and faces created.

<esc> can be used to terminate the option during slope calculations.

Slope Analysis - Flag Slopes

Position of option on menu: Tins =>Tin analysis =>Slope =>Slope analysis (flag)

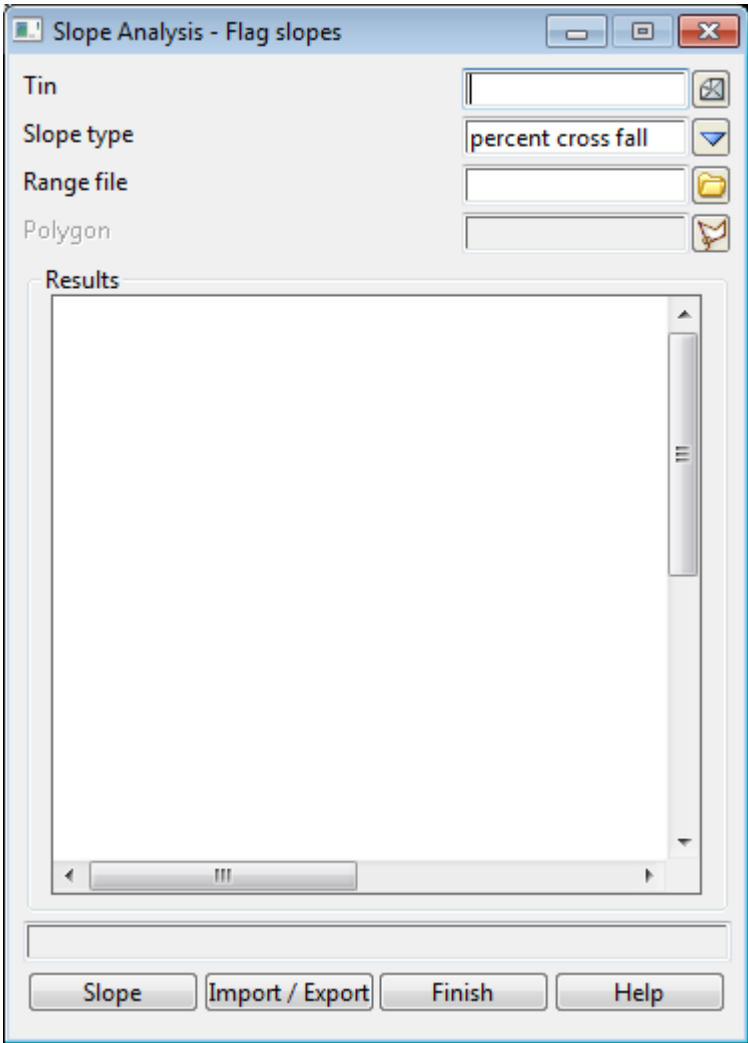
This panel analyses the slope of triangles in a tin and reports on triangles that fall within the supplied range file.

For more information on the slope range file, see [Range Files](#).

The results are listed in the results box.

Selecting a result line will pan the last selected view to display that triangle, as well as highlighting it on screen.

Selecting **Slope analysis (flag)** displays the **Slope Analysis - Flag Slopes** panel on the screen.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin the tin to analyse			
Slope type the type of range file	choice box		percent cross file, 1v in, degrees minute seconds

Polygon

an optional polygon to constraint the analysis within

Results

the list of results

Slope

button

performs the analysis

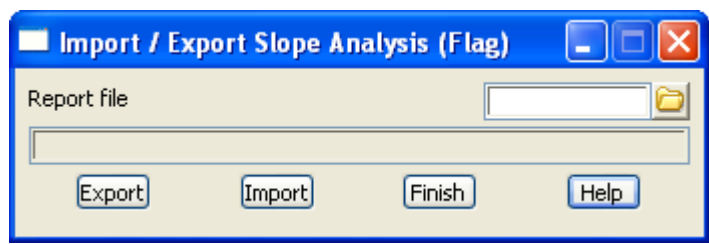
Import/Export

button

opens the [Import/Export Slope Analysis \(Flag\)](#) panel

Import/Export Slope Analysis (Flag)

This panel imports and exports the results of a slope analysis.



The fields and buttons used in this panel have the following functions.

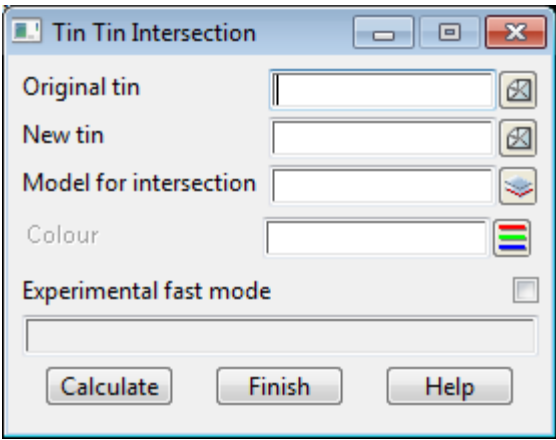
Field Description	Type	Defaults	Pop-Up
Report file <i>the file to read / write from</i>	file		
Export <i>exports the results to the supplied file</i>	button		
Import <i>imports the results from the supplied file</i>	button		

Intersection

Position of option on menu: Tins =>Tin analysis =>Intersection

The intersection option finds the lines of intersection between two tins.

Selecting intersection displays the Tin Tin Intersection panel.



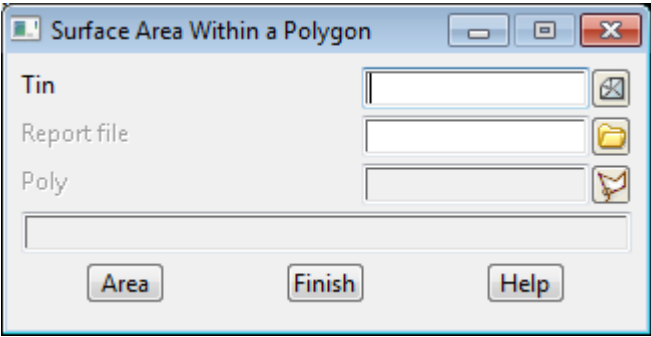
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Original tin <i>name of one of the tins to be intersected.</i>	tin box		available tins
New tin <i>name of the other tin to be intersected.</i>	tin box		available tins
Model for intersection <i>name of the model to contain the intersection strings.</i>	model box		available models
Colour for intersection <i>colour to make the intersection strings</i>	colour box	default colour	available colours
Experimental fast mode <i>if ticked, a faster method is used to calculate the intersection strings</i>	tick box		
Calculate <i>calculate the intersection between two tins given in the panel fields. The resulting intersection strings are added to the model given in the model for intersection field.</i>	button		

Surface Area

Position of option on menu: Tins =>Tin analysis =>Surface area

The **surface area** option is used to calculate the surface area of a tin within a user selected string.
Selecting **surface area** displays the **surface area within a polygon** panel.



The fields and buttons have the following functions.

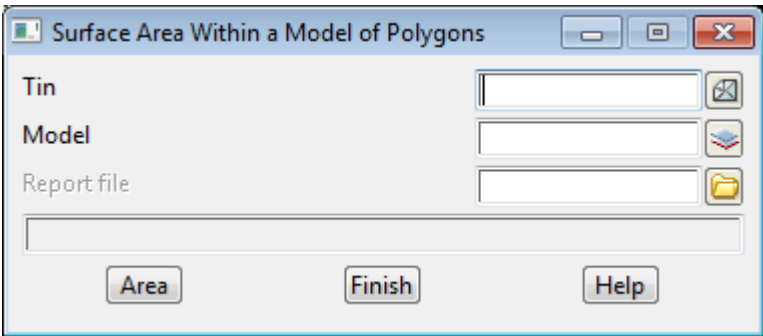
Field Description	Type	Defaults	Pop-Up
Tin <i>the tin to calculate the surface area on.</i>	tin box		available tins
Report file <i>if non-blank, the name of the file to write the surface area within the selected polygon to.</i>	file box		*.rpt files
Poly <i>select the string to find the slope area within.</i>	poly-select		
Area <i>calculate the surface area of the tin within the selected polygon.</i>	button		

Surface Area 2

Position of option on menu: Tins =>Tin analysis =>Surface area 2

The **surface area 2** option is used to calculate the surface area of a tin within each polygon in a model.

Selecting **surface area 2** displays the **Surface Area Within a Model of Polygons** panel.



The fields and buttons have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>the tin to calculate the surface area on.</i>	tin box		available tins
Model <i>the model of polygons for calculating surface area within.</i>	model box		available models
Report file <i>if non-blank, the name of the file to write the surface area within each polygons in the model, plus the total of the surface area.</i>	file box		*.rpt files
Area <i>calculate the surface area of the tin within each polygons in the model, and sum the areas.</i>	button		

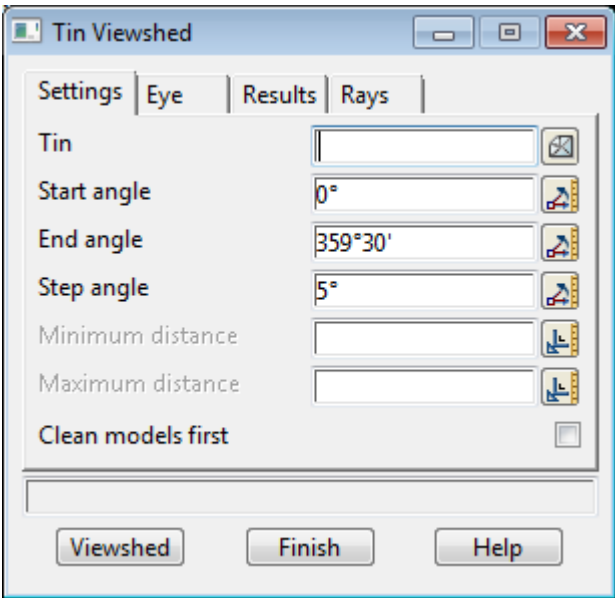
Viewshed

Position of option on menu: Tins =>Tin analysis =>Viewshed

This panel is used to calculate the points that are visible and invisible from a user selected eye position. This is equivalent to calculating the points that can or can not see a selected point.

The calculations are made along rays emanating from the eye point from a minimum to a maximum distance from the eye point. The rays are created at regular angular steps from a start angle to an end angle.

Selecting **Viewshed** displays the **Tin Viewshed** panel.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Setting tab				
Tin		tin box		available tins
	<i>name of the tin to be used for the viewshed analysis.</i>			
Start angle		angle box	0	
	<i>the angle to begin taking sight rays emanating from the eye point.</i>			
End angle		angle box	359.30	
	<i>the angle to stop taking sight rays emanating from the eye point.</i>			
Step angle		angle box	5	
	<i>the angle between successive sight rays emanating from the eye point.</i>			
Minimum distance		input		
	<i>if not blank, the minimum distance from the eye point along the sight ray to begin recording visible/invisible points.</i>			
	<i>If blank, the minimum distance is zero.</i>			
Maximum distance		input		
	<i>the maximum distance from the eye point along the sight ray to record visible/invisible points.</i>			
	<i>If blank, the entire tin is considered.</i>			

Clean model first tick box

if ticked, the models of results are cleaned out before the option runs.

Eye tab

Eye XYZ input/output xyz ops menu

X/Y/Z coordinate

*the XYZ co-ordinates of the eye point.
Each co-ordinate can be individual entered or the point pick icon used to select an existing point.*

Note - the z-value is normally above the surface of the tin and should not be on the tin.

Results tab

More tick box

*if ticked, ask for name, model, linestyle, weight.
if not ticked, only ask for model.*

Name input

name for the created strings

Model model box available models

the model for the visible/invisible sight strings.

Linestyle linestyle box

linestyle for the created strings

Weight weight box

weight for the created strings

Colour of visible bits colour box default line colour

*if not blank, the colour for the visible parts of the rays.
If blank, the visible parts are not created.*

Colour of invisible bits colour box default point colour

*if not blank, the colour for the invisible parts of the rays.
If blank, the invisible parts are not created.*

Separate strings tick box

*if ticked, the visible and invisible sections are separate strings.
If not ticked, the visible and invisible sections are combined into one super string.*

Rays tab

Visible Rays

the visible rays are the lines from the eye point to the point on the tin where the terrain goes from being visible to invisible.

*If **Colour of visible bits** is not blank then this is the colour used for these rays.*

*If **Colour of visible bits** is blank then the colour is the default line colour.*

The ray will be coloured where it is over invisible terrain with the colour for the invisible bits (this happens in undulating country. That is where there are valleys).

More tick box

*if ticked, ask for name, model, linestyle, weight.
if not ticked, only ask for model.*

Name	input	
	<i>name for the created strings</i>	
Model	model box	available models
	<i>if not blank, the model for the visible ray strings. If blank, don't create the visible ray strings</i>	
Linestyle	linestyle box	
	<i>linestyle for the created strings</i>	
Weight	weight box	
	<i>weight for the created strings</i>	

Invisible Rays

*the invisible rays are the lines from the eye point to the point on the tin where the terrain goes from being invisible to visible.
If **Colour of invisible bits** is not blank then this is the colour used for these rays.
If **Colour of invisible bits** is blank then the colour is the default point colour.*

*The ray comes from the eye and is coloured with the **Colour of visible bits** to the change over from visible to invisible and then coloured with the **Colour of invisible bits** to where the ray ends (the change over visible to invisible).*

More	tick box
	<i>if ticked, ask for name, model, linestyle, weight. if not ticked, only ask for model.</i>

Name	input	
	<i>name for the created strings</i>	
Model	model box	available models
	<i>if not blank, the model for the invisible ray strings. If blank, don't create the invisible ray strings</i>	
Linestyle	linestyle box	
	<i>linestyle for the created strings</i>	
Weight	weight box	
	<i>weight for the created strings</i>	

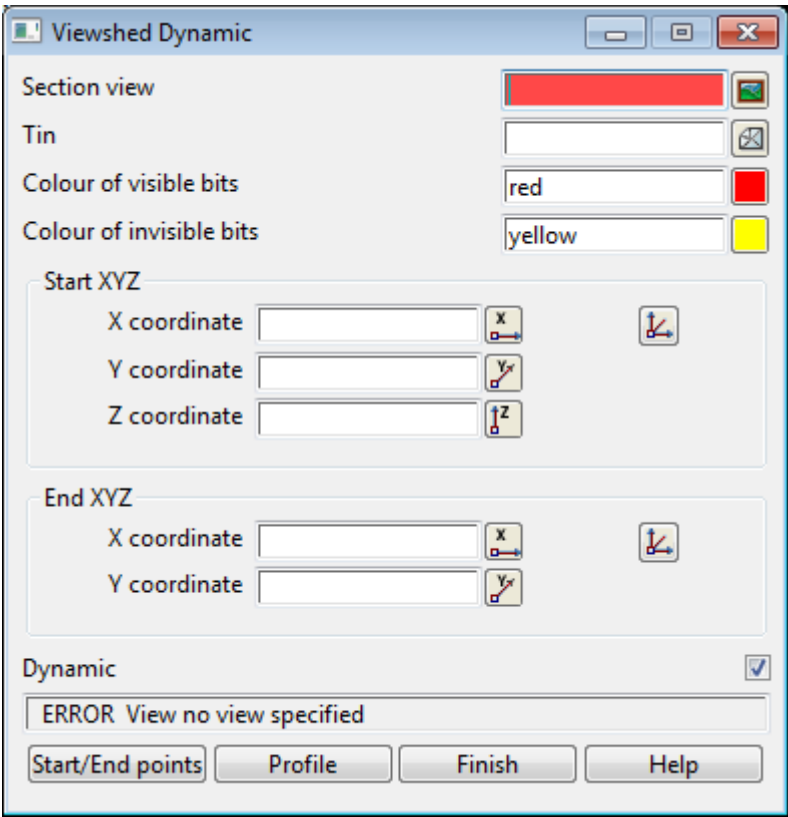
Viewshed	button
<i>On selecting this button, the lines of sight emanating from the eye XYZ point are calculated.</i>	
<esc> can be used to terminate the option during viewshed calculations.	

Dynamic Viewshed

Position of option on menu: Tins =>Tin analysis =>Viewshed dynamic

Dynamic viewshed is used to calculate and display on a section view, the points that are visible and invisible from a user selected eye position to a user selected end position.

Selecting Viewshed dynamic displays the **Viewshed Dynamic** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Section view <i>section view to display the sight lines on</i>	view box		available section view
Tin <i>name of the tin to be used for the viewshed analysis.</i>	tin box		available tins
Colour of visible bits <i>the colour for the visible parts of the viewshed string</i>	colour box		default line colour
Colour of invisible bits <i>the colour for the invisible parts of the viewshed string</i>	colour box		default point colour
Start XYZ X/Y/Z coordinate <i>the XYZ co-ordinates of the start of the line to determine viewshed for.</i> <i>Each co-ordinate can be individual entered or the point pick icon used to select an existing point.</i>	input/output		xyz ops menu

End XY

input/output

xyz ops menu

X/Y coordinate

the XY co-ordinates of the end of the line to determine viewshed for.

Each co-ordinate can be individual entered or the point pick icon used to select an existing point.

No Z is required.

Dynamic

tick box

*if ticked and the **Start/End points** button is used, once the Start point is selected, the viewshed analysis is carried out from the start point to the cursor position which represents the end point. The results are displayed in the section view.*

Start/End points

button

*if picked, an start point is selected and then the height displayed in an **enter height** input box. If*

required, a new height can be typed into the **enter height** box. After typing an <enter> into the input box, the box is removed from the screen and the x, y and height is piped into the **Start XYZ** panel field.

The cursor is then used to select the End point.

If Dynamic is ticked, as the Cursor position is moved, the viewshed is carried out to the new cursor position and the results displayed in the section view.

Profile

button

Selecting this button calculates the line of sight from the start to the end position.

Viewshed Old

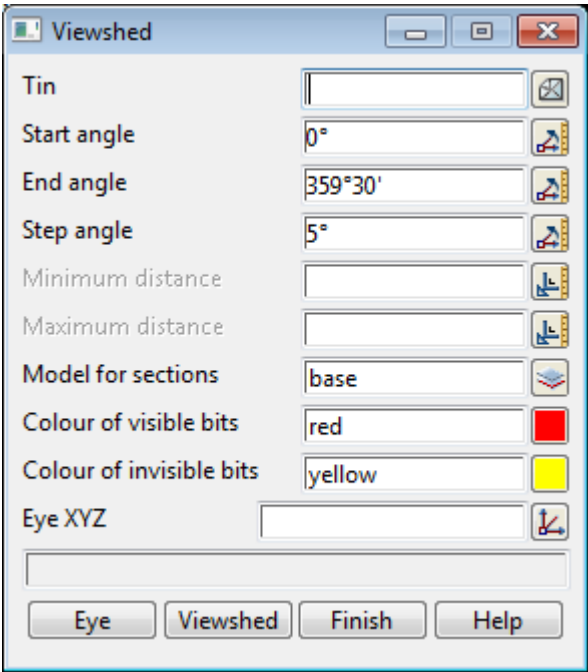
Position of option on menu: Tins =>Tin analysis =>Viewshed old

This option has been superseded in 12d Model 9.

This panel is used to calculate the points that are visible and invisible from a user selected eye position. This is equivalent to calculating the points that can or can not see a selected point.

The calculations are made along rays emanating from the eye point from a minimum to a maximum distance from the eye point. The rays are created at regular angular steps from a start angle to an end angle.

On selecting Viewshed, the Viewshed panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin to be used for the viewshed analysis.</i>	input		available tins
Start angle <i>the angle to begin taking sight rays emanating from the eye point.</i>	input	0	
End angle <i>the angle to stop taking sight rays emanating from the eye point.</i>	input	359.30	
Step angle <i>the angle between successive sight rays emanating from the eye point.</i>	input	5	
Minimum distance <i>if non-blank, the minimum distance from the eye point along the sight ray to begin recording visible/ invisible points. If blank, the minimum distance is zero.</i>	input		
Maximum distance	input		

*the maximum distance from the eye point along the sight ray to record visible/invisible points.
If blank, the entire tin is considered.*

Model for sections input available models
the model for the visible/invisible sight strings.

Colour of visible bits input default line colour
*if non-blank, the colour for the visible parts of the rays.
If blank, the visible parts are not created.*

Colour of invisible bits input default point colour
*if non-blank, the colour for the invisible parts of the rays.
If blank, the invisible parts are not created.*

Eye XYZ input/output xyz ops menu
the XYZ co-ordinates of the eye point.

Eye button
*if picked, an eye point is selected and then the height displayed in an **enter height** input box. If required, a new height can be typed into the **enter height** box. After typing an <enter> into the input box, the box is removed from the screen and the x, y and height is piped into the eye XYZ panel field.*

Viewshed button
On selecting this button, the lines of sight emanating from the eye XYZ point are calculated.

<esc> can be used to terminate the option during viewshed calculations.

Flow Arrows

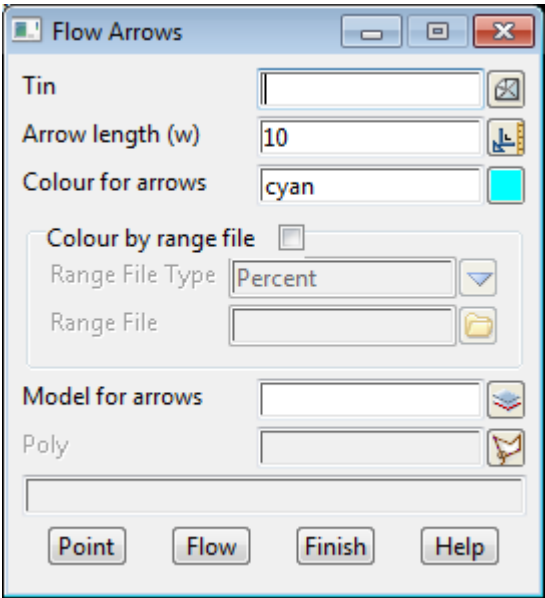
Position of option on menu: Tins =>Tin analysis =>Flow arrows

The flow arrows option draws arrows indicating the flow direction across triangles in a tin.

The flow arrows can be drawn for selected points, for all the triangles within a polygon, or if no polygon is selected, for all triangles in the tin.

The arrows are drawn at the centroid of the triangle and have a fixed user given length.

On selecting the **flow arrows** option, the **flow arrows** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin to calculate flow arrows for.</i>	tin box		available tins
Arrow length (w) <i>length in world units to draw the flow arrows.</i>	real value box		
Colour for arrows <i>colour for the arrows.</i>	colour box	cyan	available colours
Colour by range file <i>if ticked, the flow arrows are coloured by the their slope using a slope range file. See Range Files.</i>	tick box		
Range file type <i>the units used for slopes in the range file</i> <i>Percent - percent cross fall</i> <i>1v in - one vertical in ? horizontal</i>	choice box	Percent	Percent, 1v in
Range file	slope range file box		.srf files
Model for arrows <i>model to put flow arrows in. Must be non-blank.</i>	model box		available models
Poly	polygon select		

*if a polygon is selected, then the spot heights will be restricted to within the polygon.
If no polygon is selected, the spot heights will be calculated over the entire tin.*

Point button

*after selecting **Point**, a flow arrow is drawn at each selected point. This continues until cancel is selected from the **pick ups** menu.*

Flow button

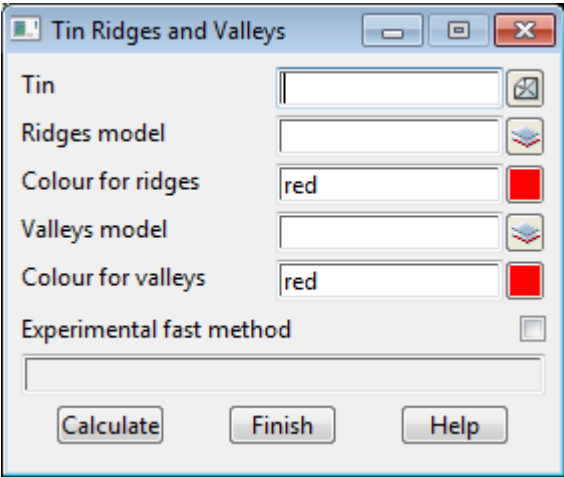
calculate the flow arrows for all the triangles in the tin, or if a polygon has been selected, for the triangles whose centroid is inside the polygon.

Ridge/Valleys

Position of option on menu: Tins =>Tin analysis =>Ridges/Valleys

In the ridge/valleys option, ridge and valley lines are calculated for the given tin.

On selecting the ridge/valley option, the tin ridges and valleys panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin to calculate ridge and valley lines for:</i>	tin box		available tins
Ridges model <i>if non-blank, the name of the model to contain the ridge lines. If blank, the ridge lines are not created.</i>	model box		available models
Colour for ridges <i>colour for the ridge lines</i>	colour box	default colour	available colours
Valleys model <i>if non-blank, the name of the model to contain the valley lines. If blank, the valley lines are not created.</i>	model box		available models
Colour for valleys <i>colour for the valley lines</i>	colour box	default colour	available colours
Calculate <i>ridge and valley lines will be calculated for the given tin and placed in the ridge and valley models.</i>	button		

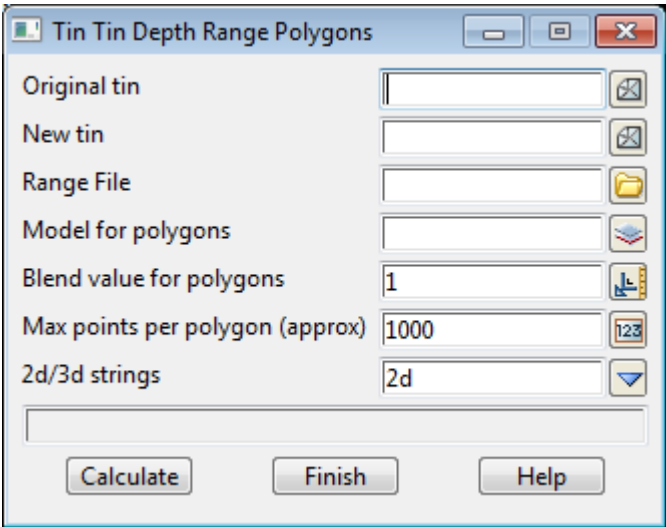
Depth Range Polygons

Position of option on menu: Tins =>Tin analysis =>Depth range polygons

In the **Depth range polygons** option, polygons are created around the regions given by a depth range file.

For more information on the depth range file, see [Depth Range File](#).

On selecting the **Depth range polygons** option, the **Tin Tin Depth Range Polygons** panel is displayed.



The fields and buttons used in this panel have the following functions.

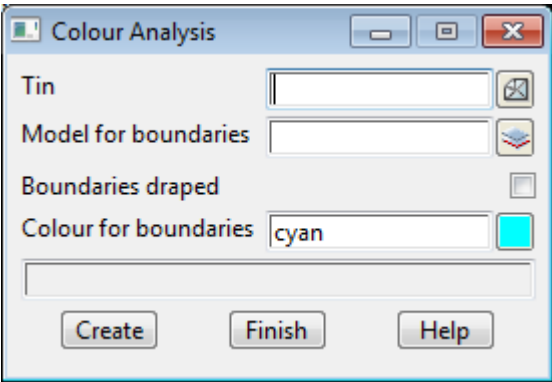
Field Description	Type	Defaults	Pop-Up
Original/New Tin <i>name of the original/new tin for determining depths between.</i>	tin box		available tins
Range file <i>the user supplied range file for splitting up the depths and colouring the polygons. See Depth Range File.</i>	input		*.drf
Model for polygons <i>model to contain the polygons.</i>	model box		available models
Blend value for polygons <i>The value of blending is between 0 and 1. 0 means the polygon is totally transparent (and hence invisible) and 1 means that the polygon is opaque (non-translucent) and can't be seen through at all. If blank, then the value is taken as 1 and the polygon is opaque (non-translucent).</i>	real value	1	
Max points per polygon (approx) <i>when a polygon is created and the number of vertices in it is greater than this value, the polygon will be split into a number of polygons.</i>	real value	1000	
2d/3d strings <i>If 2d, the created strings are 2d strings with a z-value equal to the depth. If 3d original/new, the depth strings are draped over the original/new tin to form 3d strings.</i>	choice box	2d	2d, 3d original, 3d new
Calculate <i>create the polygons surrounding regions of different heights between the tins.</i>	button		

Polygons from Tin Colours

Position of option on menu: Tins =>Tin analysis =>Polygons from colours

In the **Polygons from colours** option, polygons are created around the different coloured regions of the tin.

On selecting the **Polygons from colours** option, the **Colour Analysis** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin to calculate polygons around the coloured regions.</i>	tin box		available tins
Model for boundaries <i>model to contain the polygons.</i>	model box		available models
Boundaries draped <i>if ticked. the z-values for the vertices for the boundary strings come from the vertices of the coloured triangles. If not ticked, the boundaries have constant z-values.</i>	tick box		
Colour for boundaries <i>colour for the polygons</i>	colour box	default colour	available colours
Create <i>create the polygons surrounding regions of different colours on the tin.</i>	button		

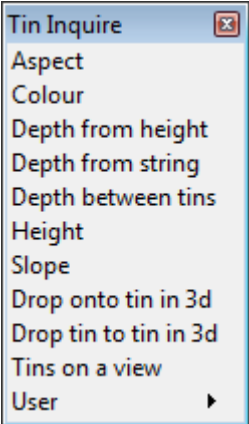
Inquire

Position of menu: Tins =>Inquire

The **inquire** options are used to display at the current cursor position the height (z-value) on a tin, the colour of the triangle, the depth from a fixed height to a tin, and the depth between two tins,.

Once the user specifies which tin or tins are to be analysed, then as the cursor moves around in any plan view, the triangles below the cursor are examined and the appropriate information displayed.

The **tin inquire** walk-right menu is

	
Aspect	display aspect of triangles
Colour	display colour of tin
Depth from height	calculate depth from height to tin
Depth from string	calculate depth from string to a tin
Depth between tins	calculate depth between tins
Height	display height on tin
Slope	display slope of triangles
Drop onto tin in 3d	drop onto a tin in 3d
Drop tin to tin in 3d	display perpendicular height between two tins
Tins on a view	dynamically list all tins under the cursor
User	

The options in the **Tin inquire** menu will now be discussed.

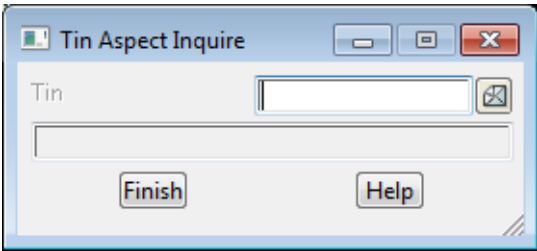
For the options <i>Aspect</i> , go to	Aspect Inquire.
<i>Colour</i>	Colour Inquire
<i>Depth from height</i>	Depth from Height
<i>Depth from string</i>	Depth from String
<i>Depth between tins</i>	Depth Between Tins
<i>Height</i>	Height Inquire
<i>Slope</i>	Slope Inquire
<i>Drop onto tin 3d</i>	Tin Drop Point 3d
<i>Drop tin to tin in 3d</i>	Tin Tin Drop Point 3d
<i>Tins on a view</i>	Tins on View Inquire

Aspect Inquire

Position of option on menu: Tins =>Inquire =>Aspect

The **aspect inquire** option calculates and displays the aspect (direction) of the triangles under the current plan view cursor position. The aspect is displayed in bearings in degrees, minutes and seconds.

Selecting **tin aspect inquire** displays the **tin aspect inquire** panel.



The fields and buttons used in this panel have the following functions.

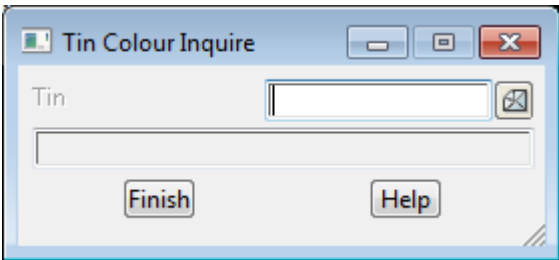
Field Description	Type	Defaults	Pop-Up
Tin	tin box		available tins
<i>name of the tin for which the aspect of the triangle that the cursor is above will be displayed in the panel's message area.</i>			

Colour Inquire

Position of option on menu: Tins =>Inquire =>Colour

colour inquire displays the colour of the triangles under the current plan view cursor position.

Selecting **tin colour inquire** displays the **tin colour inquire** panel.



The fields and buttons used in this panel have the following functions.

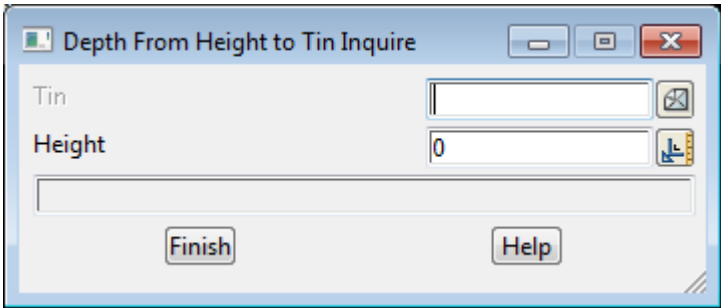
Field Description	Type	Defaults	Pop-Up
Tin	tin box		available tins
<i>name of the tin for which the colour of the triangle at the current cursor position is displayed in the panel's message area.</i>			

Depth from Height

Position of option on menu: Tins =>Inquire =>Depth from height

The **depth from height** option calculates and displays the difference between the z-value of a tin and a given height for the current plan view cursor position.

Selecting **depth from height** displays **depth from height to tin inquire** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin used for calculating the distance from the tin to the given height at the cursor position.</i>	tin box		available tins
Height <i>the difference between the tin value and the value given in this field is displayed in the panel's message area.</i>	input	0	

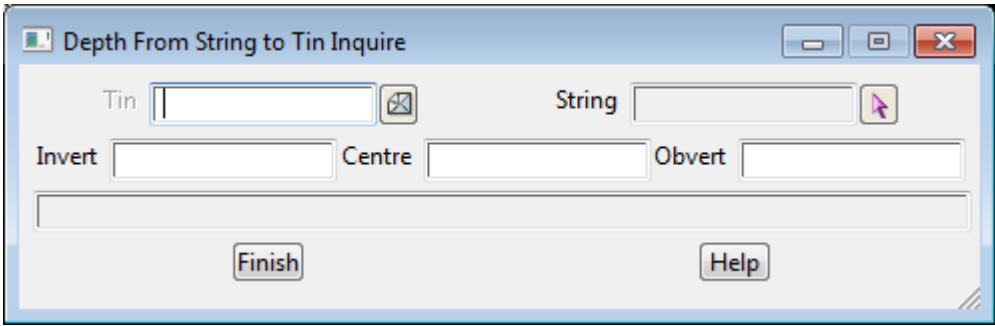
Depth from String

Position of option on menu: Tins =>Inquire =>Depth from string

The **depth from string** option calculates and displays the difference between the z-value of a tin and the height of a selected string at the current plan or section view cursor position projected back onto the selected string.

The obvert (top of the string) value is also known as the cover above a string to a tin.

Selecting **Depth from string** displays the **Depth From String to Tin Inquire** panel.



The fields and buttons used in this panel have the following functions.

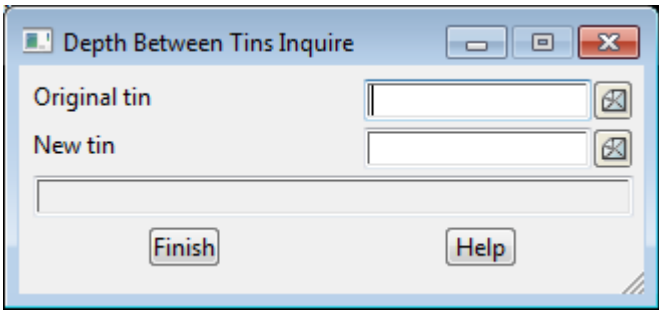
Field Description	Type	Defaults	Pop-Up
Tin	tin box		available tins
<i>name of the tin used for calculating the z-value at the cursor position.</i>			
String	string-select		
<i>if a string is selected, the difference between the tin value and the height of the selected string (to the invert, centre and obvert of the string) at the current plan or section view cursor position, projected back onto the selected string, is displayed in the panel's message areas.</i>			
Invert/Centre/Obvert	output		
<i>displays the distance between the tin and the invert (bottom), centre (axial) and obvert (top) of the selected string</i>			

Depth Between Tins

Position of option on menu: Tins =>Inquire =>Depth between tins

The **depth between tins** option calculates and displays the difference between the z-values of two given tins at the current plan view cursor position.

Selecting **depth between tins** displays the **depth between tins inquire** panel.



The fields and buttons used in this panel have the following functions.

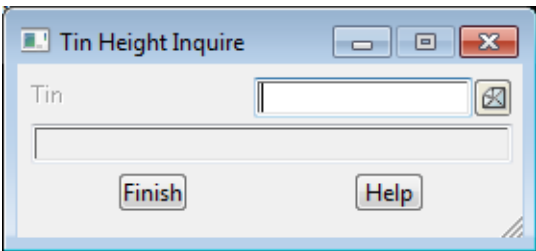
Field Description	Type	Defaults	Pop-Up
Original/new tin	tin box		available tins
<i>name of the two tins or which the z-value is to be calculated at the current plan view cursor position and the difference between the z-values (z_new - z_original) is displayed in the panel's message area.</i>			

Height Inquire

Position of option on menu: Tins =>Inquire =>Height

The **height inquire** option calculates and displays the height (z-value) of triangles from a tin at the current plan view cursor position.

Selecting **tin height inquire** displays the **tin height inquire** panel.



The fields and buttons used in this panel have the following functions.

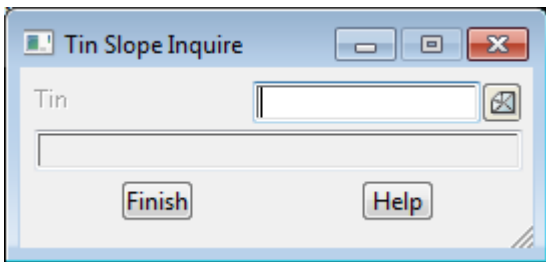
Field Description	Type	Defaults	Pop-Up
Tin	tin box		available tins
<i>name of the tin for which the z-value at the current plan view cursor position is displayed in the panel's message area.</i>			

Slope Inquire

Position of option on menu: Tins =>Inquire =>Slope

The **slope inquire** option calculates and displays the slope of triangles from a tin at the current plan view cursor position. The slope is displayed as a percent cross fall, a “1v in “slope and as an angle in degrees, minutes and seconds.

Selecting **tin slope inquire** displays the **tin slope inquire** panel.



The fields and buttons used in this panel have the following functions.

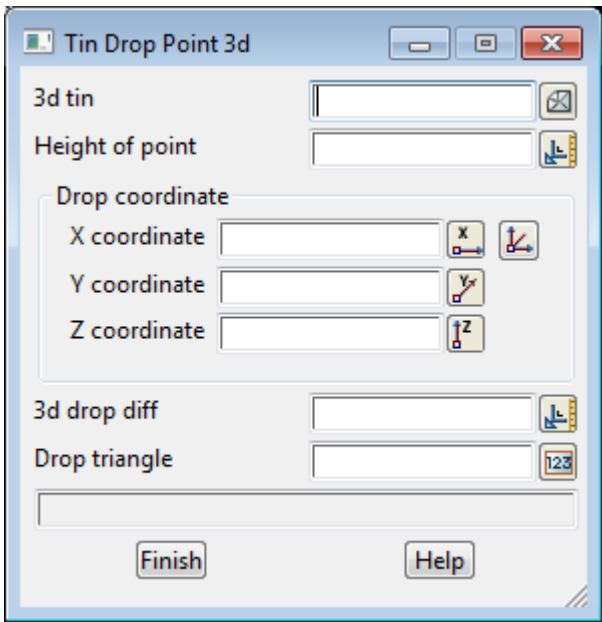
Field Description	Type	Defaults	Pop-Up
Tin	tin box		available tins
<i>name of the tin for which the slope of the triangle that the cursor is above is displayed in the panel's message area.</i>			

Tin Drop Point 3d

Position of option on menu: Tins =>Inquire =>Drop onto tin in 3d

The **Drop onto tin in 3d** option takes a cursor position and a user defined height of the point and drops perpendicularly onto the closest triangle.

Selecting **Drop onto tin in 3d** displays the **Tin Drop Point 3d** panel.



The fields and buttons used in this panel have the following functions.

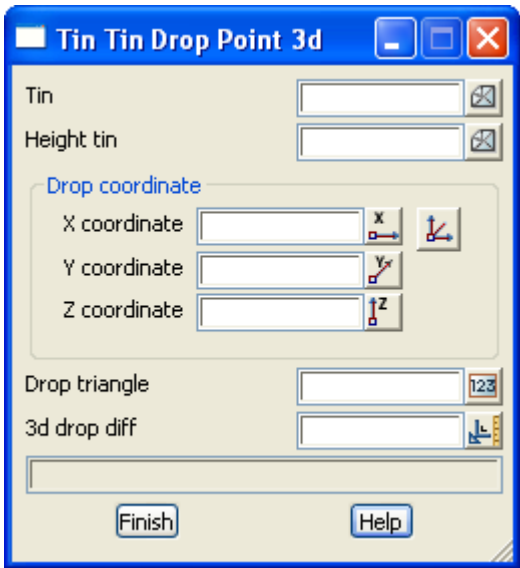
Field Description	Type	Defaults	Pop-Up
3d tin <i>name of the tin to drop the point perpendicularly onto. This cannot be a supertin.</i>	tin box		available tins
Height of point <i>the height to use at the (x,y) cursor position.</i>	real value		
Drop coordinates <i>X, Y, Z coordinate of the point dropped perpendicularly to the tin from the (x,y) cursor position and height from Height of point field</i>			
3d drop diff <i>the perpendicular distance to the tin. positive if the point being dropped is above the tin negative if the point being dropped is below the tin</i>	real		
Drop triangle <i>the number of the triangle the point was dropped to.</i>	number box		

Tin Tin Drop Point 3d

Position of option on menu: Tins =>Inquire =>Drop tin to tin in 3d

The **Tin Tin Drop Point 3d** panel allows the 3d, (perpendicular) height difference between 2 tins to be displayed at any position. Once both tins are selected and a valid 3d drop can occur the difference is displayed and the triangle dropped to highlighted.

Selecting **Drop tin to tin in 3d** brings up the **Tin Tin Drop Point 3d** panel.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

3d Tin

the tin to drop the point to perpendicularly in 3d, this tin cannot be a supertin.

Height tin

the tin to get a z value for the current position to use in the 3d drop, this tin can be a supertin.

Drop coordinate

*the x, y, z positions of the drop on the **3d Tin**.*

3d drop diff

*the 3d, (perpendicular) difference between the 2 tins, a +ve value means the **3d Tin** is below the **Height tin** at the current position, a -ve value the **3d Tin** is above the **Height tin**.*

Drop triangle

*the index of the triangle dropped to in the **3d Tin**.*

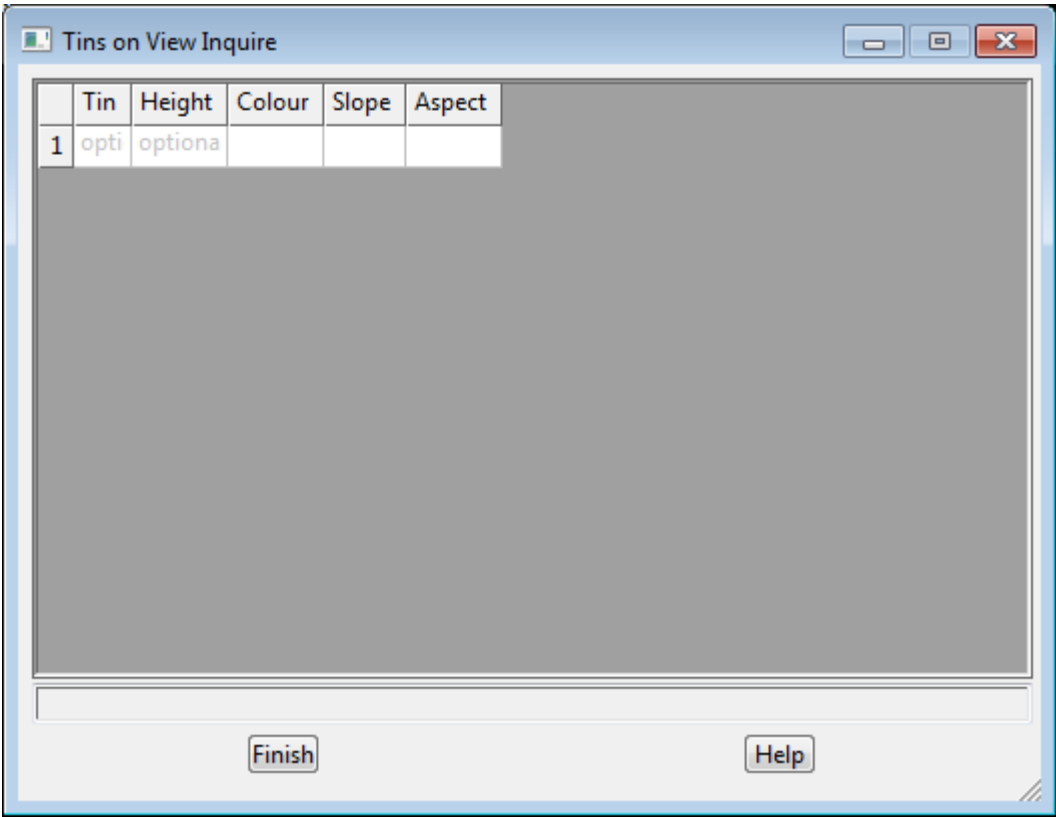
Tins on View Inquire

Position of option on menu: Tins =>Inquire =>Tins on a view

As the cursor is moved over any plan view, the **Tins on a view** option lists all the tins and super tins on that view, and at the (x,y) location of the cursor, dynamically displays the z-value of each tin or super tin at that (x,y) location, and the colour, slope and aspect of the triangle from the tins or super tins currently under the cursor.

For a super tin, it also displays the name of the tin being used from the super tin at that cursor location.

Selecting **Tins on a view** brings up the **Tins on View Inquire** panel.



The fields and buttons used in the this panel have the following functions.

Field Description Type Defaults Pop-Up

Tin output

when the cursor is over a plan view, the Tin column list all the tins and super tins in the view.

When the cursor is actually over a tin or super tin, on the row in the grid for that tin or super tin, the height of the tin or super tin at the cursor (x,y) location, and the colour, slope and aspect of the triangle under the cursor is displayed in the rest of the columns of the grid.

If it is a super tin and the cursor is over the super tine, then the name of the super tin is given and then a "/" and then the name of the tin from the super tin that is being used to give the height, colour, slope and aspect. For example, in the Tin column the name "combined/final" means that the tin the cursor is over is a super tin called "combined" and it is using the tin called "final" from the super tin "combined" at that location.

Height output

when in a plan view and the cursor is actually over the tin given in the Tin column, this is the height

from the tin/super tin at the cursor location.

Colour/Slope/Aspect output

when in a plan view and the cursor is actually over the tin or super tin given in the Tin column, this is the colour/slope/aspect of the triangle from the tin or super tin at that cursor location.

Null

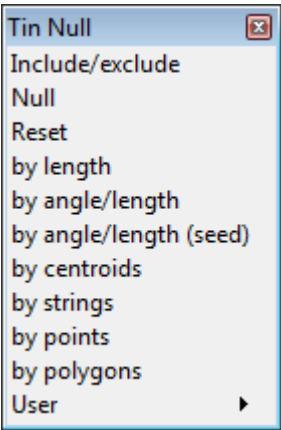
Position of menu: Tins =>Null

The triangulation process forms triangles throughout the convex polygon enclosing the data set. This means that triangles may cross regions where there is very little data and may produce strange results in the ill-defined regions.

In 12d Model, it is possible to make triangles invisible (called nulling triangles) so that they are not used in any options.

Note - nulled triangles are not deleted and can be made visible again at any time.

The null walk-right menu is

	set a polygon to include/exclude all triangles inside the polygon
Null	null triangles outside a polygon
Reset	reset all null triangles
by length	null triangles by length of sides
by angle/length	null triangles by length of sides and angle
by angle/length (seed)	null by angle and length starting at a seed point
by centroids	null/reset triangle under the centroid of strings
by strings	null triangles that are crossed by strings
by points	
by polygons	
User	pick triangles to null/reset

The three options in the tin colouring menu will now be discussed.

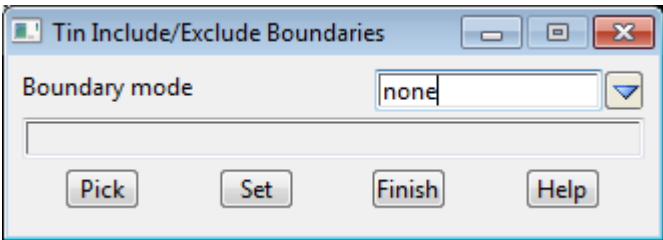
For the options <i>Include/exclude</i> , go to	Include/Exclude Boundaries.
<i>Null</i>	Null
<i>Reset</i>	Reset
<i>by length</i>	Null by Length
<i>by angle/length</i>	Null by Angle and Length
<i>by angle/length (seed)</i>	Null by Angle and Length (Seed)
<i>by centroids</i>	Null by Centroids
<i>by string</i>	Null by Strings
<i>by points</i>	Null by Points
<i>by polygons</i>	Null by polygons

Include/Exclude Boundaries

Position of option on menu: Tins =>Null =>Include/excludes

The **Include/exclude** option is used to tag a polygon that is part of the data set for a Tin so that all the triangles inside the polygon are either set to null or non-null.

On selecting the **Include/exclude** option, the **Tin Include/Exclude Boundaries** panel is displayed.



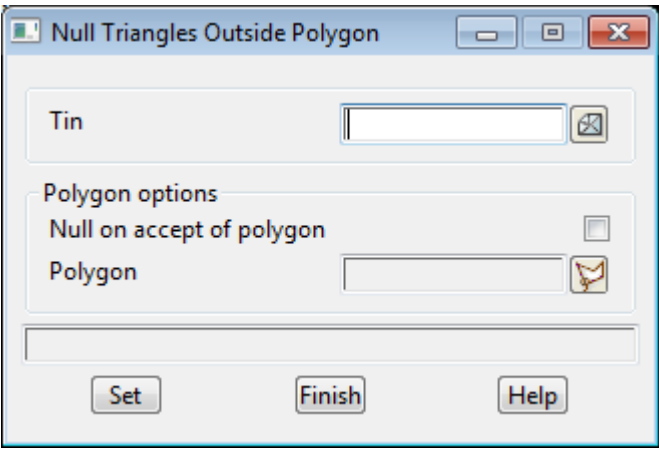
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Boundary mode <i>mode to set the polygon to.</i> <i>If exclude, then any triangles inside the polygon are set to null.</i> <i>If include, then any triangles inside the polygon are reset so that they aren't null.</i> <i>If none, then the polygon is not used for automatically nulling/resetting triangles.</i>	choice box	none	none, include, exclude
Pick <i>select the polygon to define a boundary mode for.</i>	button		
Set <i>set the boundary mode for the selected polygon.</i>	button		

Null

Position of option on menu: Tins =>Null =>Null

The **null** option is used to null any triangle whose *centroid* is outside a user selected polygon.
Selecting **Null** displays the **Null Triangles Outside Polygon** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin to null triangles in.</i>	tin box		available tins

Null on accept of polygon tick box
*if ticked, the triangles will be nulled as soon as the string is accepted.
If not ticked, the triangles will not be nulled until the **Set** button is selected.*

Polygon polygon select
the string to be used as the polygon is selected after choosing this button. If Null on accept of polygon is set, then the polygon is processed immediately.

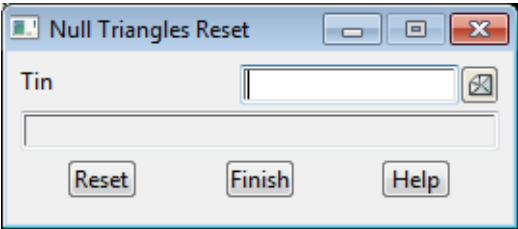
Set button
process the selected string/. Any triangle whose centroid is outside the selected boundary polygon is set to null.

Reset

Position of option on menu: Tins =>Null =>Reset

The reset option is used to change all the nulled triangles in a tin back to the visible triangles.

Selecting reset displays the **Null Triangles Reset** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin	tin box		available tins
<i>name of the tin to have any nulled triangles reset to being visible triangles.</i>			
Reset	button		
<i>the reset button resets all null triangles in the tin to the base colour.</i>			

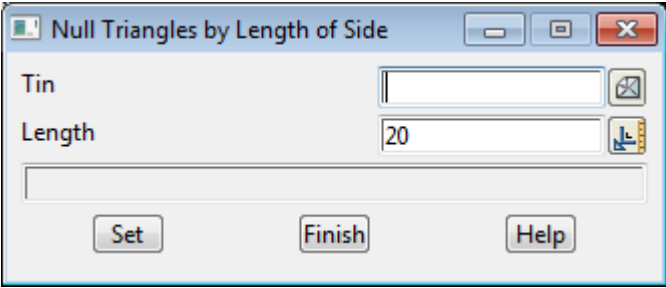
Null by Length

Position of option on menu: Tins =>Null =>by length

The **null by length** option is used to null any triangle with a side of length greater than a user specified length.

Warning - this option will null out *internal* triangles. The next option, Null by angle/length will only null triangles on the outer shell.

On selecting the **by length** option, the **null triangles by length of side** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin to null triangles in.</i>	tin box		available tins
Length <i>length to check triangle sides against.</i>	input		
Set <i>after selecting the set button, the tin will be processed and any triangle with a side of length greater than the value given in the length panel field, will be nulled.</i>	button		

Null by Angle and Length

Position of option on menu: Tins =>Null =>by angle/length

The **null by angle/length** option is a more powerful nulling option which tries to remove most of the external triangles that one expects should be removed. For example, for a T-intersection, all the long, thin outer triangles should be removed. The option has two sets of tests - one to remove long thin triangles and the other which uses a combined test to remove squat triangles.

Unlike the **null by length** option, **null by angle/length** only works on triangles which have an outer null triangle on one or two sides (it does not work on internal holes). These triangles are called **external triangles** and sides with an outer null triangle on them are called **external sides**.

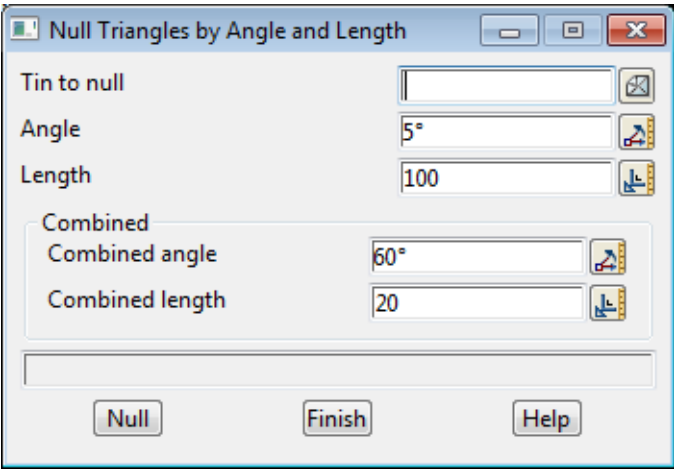
The **null by angle and length** option *does not* remove triangles whose external side is a breakline. Hence, as expected, breaklines will stop the nulling process.

Note that **null by angle and length** keeps processing the remaining non-nulled triangles until no more can be nulled or are stopped by breaklines. Hence the nulling works inwards as outer triangles are nulled revealing new external triangles to be tested. The nulling process is like peeling off layers of an onion.

Important note - the setting for this option are **stored** by the triangulation and the option is automatically re-run if the triangulation is re-run. To turn off the tests, just set the panel fields to blank.

Warning - this option should be the first nulling option used because all null triangles are first reset to valid triangles before this option is applied.

On selecting the **null by angle/length** option, the **Null Triangles by Angle and Length** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin to null	tin box		available tins
<i>name of the tin to have triangles nulled. If this option has been previously run on the tin, the previous panel values are written into the panel fields.</i>			
Angle	angle box	5	
<i>if a triangle has an external side (that is not a breakline) with an angle on it less than Angle, then the triangle is nulled. The default value works most of the time.</i>			
<i>If blank then no triangles are nulled by this test.</i>			

after selecting the **Null** button, all nulled triangles are reset to be valid triangles and the tin then processed and triangles nulled.

Null by Angle and Length (Seed)

Position of option on menu: Tins =>Null =>by angle/length (seed)

The **null by angle/length (seed)** option is similar to the powerful null by angle/length option (see [Null by Angle and Length](#)) except it has the additional **start point**.

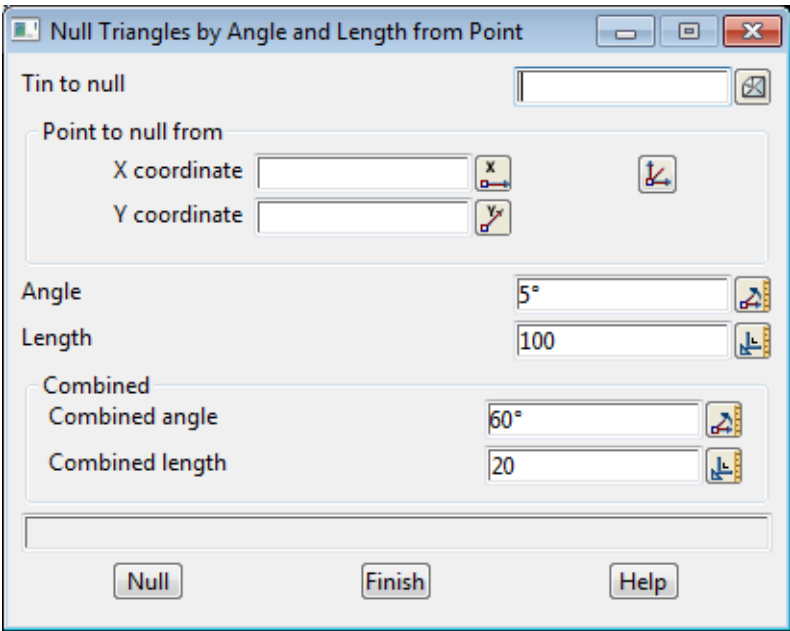
That is, a start triangle is selected by the cursor and the nulling starts from the triangle under the cursor.

The *null by angle/ length (seed)* option then starts nulling triangles from the start triangle using the angle/length parameters until stopped by breaklines.

Hence the nulling works **outwards** from the start triangle revealing new triangles to be tested until stopped by breaklines.

This option is particularly useful for nulling internal areas of a tin.

Selecting null by angle/length (seed) displays the **Null Triangles by Angle and Length from Point** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin to null <i>name of the tin to have triangles nulled. If this option has been previously run on the tin, the previous panel values are written into the panel fields.</i>	tin box		available tins
Point to null from <i>the X/Y co-ordinates of a position to start nulling from.</i>			
Angle <i>if a triangle has an external side (that is not a breakline) with an angle on it less than Angle, then the triangle is nulled. The default value works most of the time. If blank then no triangles are nulled by this test.</i>	angle box	5	
Length	input	100	

*if a triangle has an external side (that is not a breakline) greater than Length, the triangle is nulled.
If blank then no triangles are nulled by this test.*

Combined angle	input	60
Combined length	input	20

*For the Combined case, a triangle is nulled if it:
has an external side (that is not a breakline) and the **sum** of the two angles on it is **less** than Combined
angle (the default value works most of the time)
and
has an external side (that is not a breakline) whose length is **greater** than Combined length. A
suggested value is one third to one half of Length.
If either Combined angle or Combined length is blank, then no triangles are nulled by this test.*

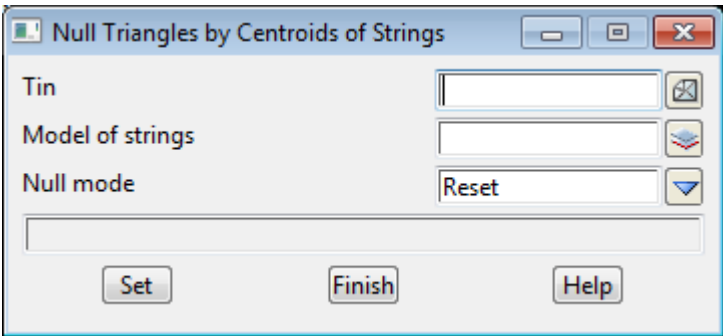
Null button

*after selecting the **Null** button, the triangle under the (X,Y) position is determined and null processing
starts from that triangle.*

Null by Centroids

Position of option on menu: Tins =>Null =>by centroids

null by centroids is used to null/reset any triangle that lies under the centroid of a string.
On selecting the by centroids option, the null triangles by centroids of strings panel is displayed.



The fields and buttons used in this panel have the following functions.

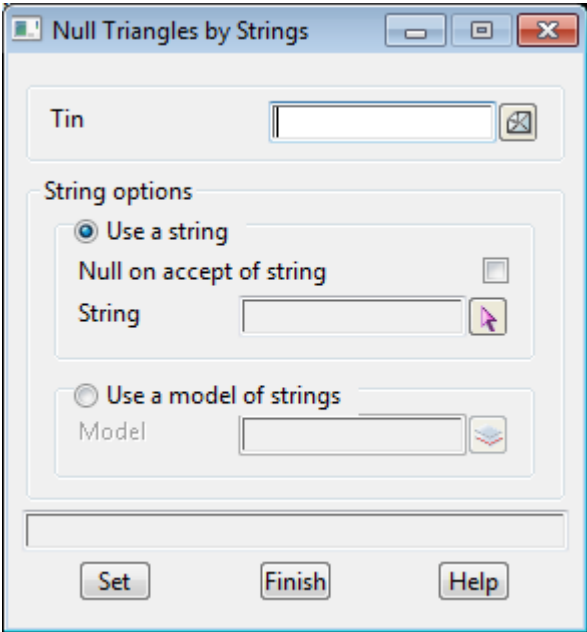
Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin to null/reset triangles in.</i>	tin box		available tins
Model of strings <i>model of strings to be used to select triangles that are under a centroid of one of the model's strings.</i>	model box		available models
Null mode <i>if null, any triangle under the centroid of a string from the model of strings, will be nulled. reset, any triangle under the centroid of a string from the model of strings, will be made visible again.</i>	choice box	Reset	Reset, Null
Set <i>after selecting the set button, the tin will be processed and any triangle under the centroid of a string will be set according to the null mode panel field.</i>	button		

Null by Strings

Position of option on menu: Tins =>Null =>by strings

The **null by strings** option is used to null any triangle that is cut by a string.

On selecting the **by strings** option, the **null triangles by strings** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin to null triangles in.</i>	tin box		available tins
Use a string <i>if set, strings will be selected and used to null any triangle that the string passes through.</i>	radio button		
Null on accept of string <i>if ticked, the triangles will be nulled as soon as the string is accepted. If not ticked, the triangles will not be nulled until the Set button is selected.</i>	tick box		
String	string select	existing string	string pop-up



*if string, a strings will be selected and used to null any triangle that the string passes through.
If line, a temporary two point line is drawn and used to null any triangle that the line passes through
If polyline, a temporary polyline is drawn and used to null any triangle that the string passes through
If closed polyline, a temporary closed polyline is drawn and used to null any triangle that the string passes through*

Use a model of strings radio button

if set, a model of strings is used and a triangle is nulled if it is cut by any one of the strings.

Model model box available models

model of strings to cut the triangles.

Set button

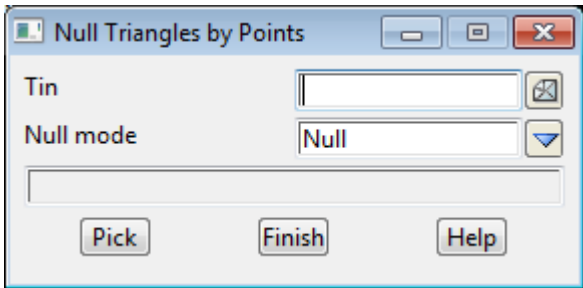
*after selecting the **set** button, the tin will be processed and any triangle that is cut by a string from the Model, or a selected string for the User a string case, will be nulled.*

Null by Points

Position of option on menu: Tins =>Null =>by points

The **null by points** null or reset any triangle that the user clicks LB whilst over the triangle in a plan view.

On selecting the **by points** option, the **null triangles by points** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin to null/reset triangles in.</i>	tin box		available tins
Null mode <i>if null, any triangles under a cursor pick will be nulled.</i> <i>reset, any nulled triangles under a cursor pick will be turned back on.</i>	choice box	Null	Reset, Null
Pick <i>any triangle under the cursor select will be processing according to the null mode panel field.</i>	button		

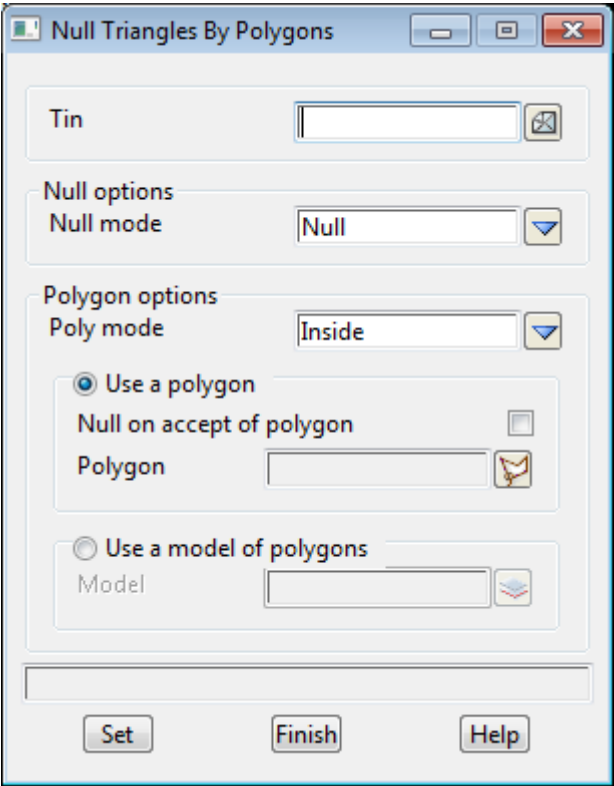
Null by polygons

Position of option on menu: Tins =>Null =>by polygons

The **null by polygons** option is used to null/reset any triangles that are inside or outside a user selected polygon, or model of polygons.

If a string is selected to use and it is not closed, then a polygon is formed by joining the first and the last points of the string.

On selecting the **by polygons** option, the **null triangles by polygons** panel is displayed



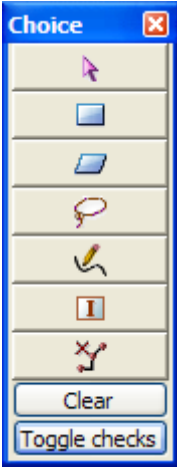
The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Tin	<i>name of the tin to null/reset triangles in.</i>	tin box		available tins
Null mode	<i>if null, any triangles selected will be nulled. reset, any nulled triangles selected will be turned back on.</i>	choice box	Null	Reset, Null
Poly mode	<i>mode to select whether the triangles with centroids inside or outside the selected polygons are to be nulled.</i>	choice box	inside	inside, outside
Use a polygon	<i>if set, strings will be selected and used as the polygon to null/reset all triangles with centroids inside/ outside the polygon.</i>	radio button		
Null on accept of polygon	<i>if ticked, the triangles will be nulled/reset as soon as the polygon (string) is accepted. If not ticked, the triangles will not be nulled/reset until the Set button is selected.</i>	tick box		

Null on accept of string tick box

*if ticked, the triangles will be nulled as soon as the string is accepted.
If not ticked, the triangles will not be nulled until the **Set** button is selected.*

Polygon polygon select polygon pop-up



polygon to null or rest triangles when the centroid is inside/outside the polygon

Use a model of polygons radio button

*if set, a model of strings will be used as the polygons to null/reset triangles whose centroids are inside/
outside one of the polygons.*

Model model box available models

model of strings to provide the polygons for nulling/resetting triangles.

Set button

*each string in the model of polygons is used to null/reset the triangles in the tin given in the tin field
according to the null mode and poly mode panel field.*

Utilities

Position of option on menu: Tins =>Utilities =>Tin Utilities

The triangles=>utilities menu contains miscellaneous options involving tins.

The Utilities walk-right menu is

Tin Utilities	
Add	add tins to project and models
Copy	create a copy of a tin
Copy project tin	copy a tin from another project
Create TIN faces	create faces from a tin
Grid DTM	create regular grid of points on a tin
Rotated grid DTM	create a rotated grid of points on a tin
DEMs	create Digital Elevation Models
Remove	remove tins from project and models
Rename	rename a tin
Report	create report of a tin
Save	save tins to disk
Tin to strings	create points and breaklines from a tin
Translate/copy	translate/copy a tin
Weed	weed duplicate points from the tin database
Z diffs from tins	create vertices with z-difference between two tins
Z diffs from string to tin	create vertices with z-difference between string and a tin
Min/Max of tins	calculate a grid of mi and max values for the tin
User	

Each option will now be described.

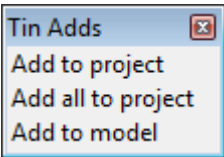
For the options <i>Add</i> , go to	Add
<i>Copy</i>	Copy
<i>Copy project tin</i>	Copy Project Tin
<i>Create Tin faces</i>	Create Tin Faces
<i>Grid DTM</i>	Grid DTM
<i>Rotated grid DTM</i>	Rotated Grid
<i>DEMs</i>	DEMs
<i>Remove</i>	Remove
<i>Rename</i>	Rename
<i>Report</i>	Report
<i>Save</i>	Save
<i>Tin to strings</i>	Tin to Strings
<i>Translate/copy</i>	Translate/Copy
<i>Weed</i>	Weed
<i>Z diffs from tins</i>	Z Differences from Tins
<i>Z diffs from string to tin</i>	Z Differences from String to Tin
<i>Min/ Max of tins</i>	Grid of Min / Max of Tins

Add

Position of menu: Tins =>Utilities =>Add

Tins can be added to the project and to models.

The tin adds walk-right menu is



The options in this menu will now be described.

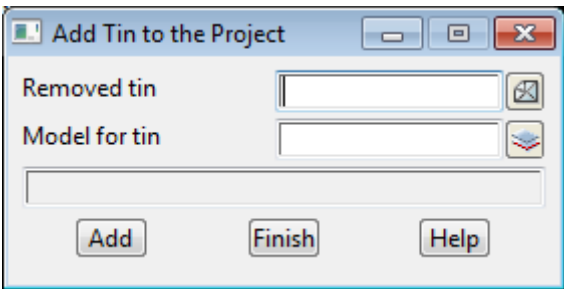
For the option Add to project, go to [Add to Project](#)
Add all to project [Add All To Project](#)
Add to model [Add to Model](#)

Add to Project

Position of option on menu: Tins =>Utilities =>Add =>Add to project

The add to project option is used to add a removed tin back into the project.

On selecting the add tin to project option, the add tin to the project panel is displayed.



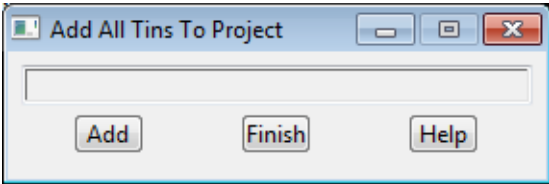
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Removed tin <i>name of the tin to be added to the working project. The tin must exist on the disk in the project area and not already be in the project.</i>	tin box		available tins
Model for tin <i>if non-blank, the loaded tin will be added to the model given in this field.</i>	model box		available models
Add <i>Add the tin given in the Tin field to the working project. If the model for tin field is non-blank, the tin will be added to the model given in that field - if the model does not exist, it will be created.</i>	button		

Add All To Project

Position of option on menu: Tins =>Utilities =>Add =>Add all to project

The **add all tins** option is used to add all the removed tins back into the project.
On selecting the **add all to project** option, the **add all tins to project** panel is displayed.



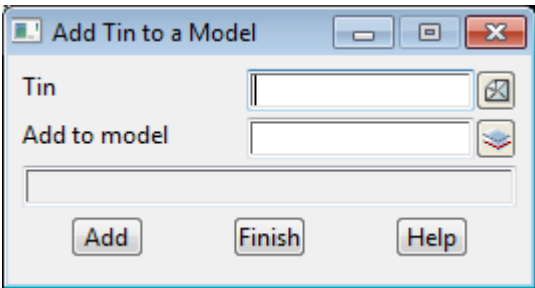
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Add	button		
<i>after selecting this button, all removed tins in the working project will be added to the project.</i>			

Add to Model

Position of option on menu: Tins =>Utilities =>Add =>Add to model

On selecting the **add to model** output option, the **add tin to a model** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin	tin box		available tins
<i>name of the tin to be added to a model.</i>			
Add to model	model box		available models
<i>name of the model to which the tin given in the tin field will be added.</i>			
Add	button		
<i>add the tin given in the tin field to the model given by the add to model field.</i>			

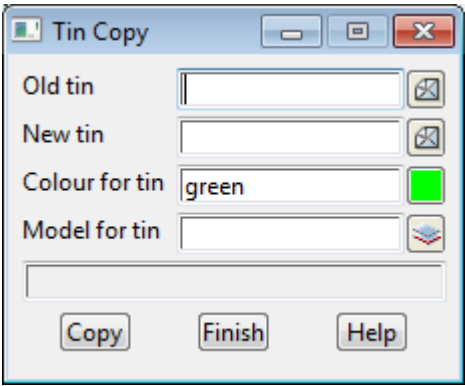
Copy

Position of option on menu: Tins =>Utilities =>Copy

A copy of an existing tin can be made using the `copy` option.

A SuperTin can also be copied and what is created is a new super tin with a new name but with exactly the same tins making it up as the original tin.

On selecting `copy`, the **tin copy** panel is displayed.



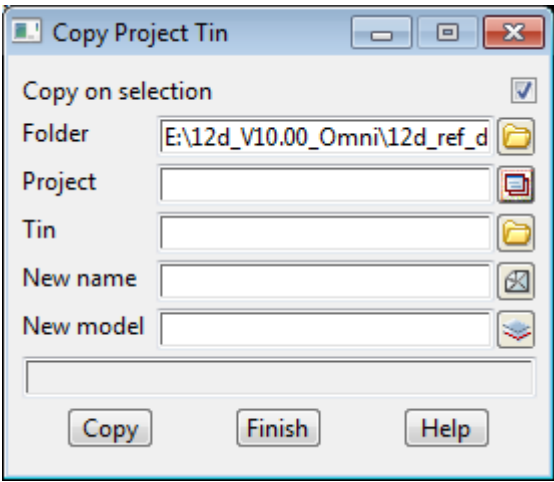
The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Old tin	<i>name of the tin to be copied.</i>	tin box		available tins
New tin	<i>name of the copy of the tin - this can't be the same as any existing tin in the project.</i>	tin box		available tins
Colour of tin	<i>if non-blank, the colour of the new tin. If blank, use the old tin colour</i>	colour box		available colours
Model for tin	<i>if non-blank, the name of the model for the new tin. If blank, the tin is not put in any model.</i>	model box		available models
Copy	<i>after selecting this button, the tin given in the old tin field will be copied and the copy given the name in the new tin field and placed in the model given in the model for tin field.</i>	button		

Copy Project Tin

Position of option on menu: Tins =>Utilities =>Copy project tin

On selecting the copy project tin option, the copy project tin panel is displayed.



The fields and buttons used in this panel have the following functions.

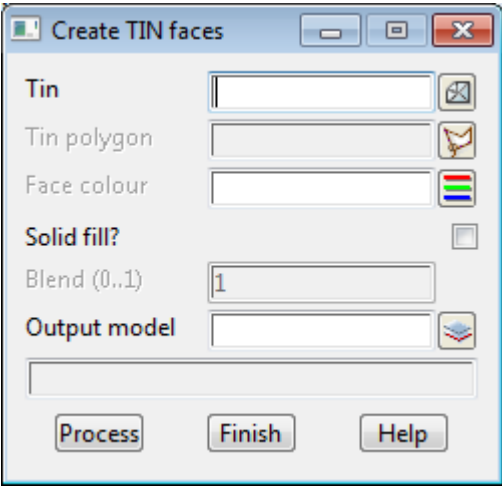
Field Description	Type	Defaults	Pop-Up
Copy on selection	tick box		
<i>if ticked, the project is copied as soon as it is selected. The same tin name and default model containing the tin is used.</i>			
Folder	folder box		working folder
<i>name of the working folder containing the project from which the tin should be copied</i>			
Project	project box		current projects
<i>name of the project in the folder given in the Folder field, from which the tin should be copied.</i>			
Tin	tin box		available tins
<i>name of the tin to be copied.</i>			
New name	tin box		
<i>if non-blank, the new name to be given to the copied tin which must be different to all the exiting tins names in the working project.</i>			
<i>If blank, keep the name of the original tin (as long as it is different to the existing tins).</i>			
New model	model box		available models
<i>if non-blank, the tin will be placed in this model.</i>			
Copy	button		
<i>copy to this project, the tin given in the Tin field from the project given in the Project field.</i>			

Create Tin Faces

Position of option on menu: Tins =>Utilities =>Create tin faces

This options creates a separate face for each triangle in a tin.

Selecting Create tin faces displays the **Create Tin Faces** panel.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Tin	<i>name of the tin to have faces created for each triangle.</i>	tin box		available tins
Tin polygon	<i>if selected, faces are created fro triangles whose centroid is inside the selected polygon.</i>	polygon select		
Face colour	<i>if blank, the tin triangle colour is used for the face colour. If not blank, this colour is used for all faces.</i>	colour box		
Solid fill ?	<i>if ticked, the faces are solid filled with a blend value</i>	tick box		
Blend (0 ... 1)	<i>The value of blending is between 0 and 1. 0 means the face is totally transparent (and hence invisible) and 1 means that the face is opaque (non-translucent) and can't be seen through at all. If blank, then the value is taken as 1 and the polygon is opaque (non-translucent).</i>	real value		
Output model	<i>model for the faces</i>	model box		available models
Process	<i>create faces for selected triangles.</i>	button		

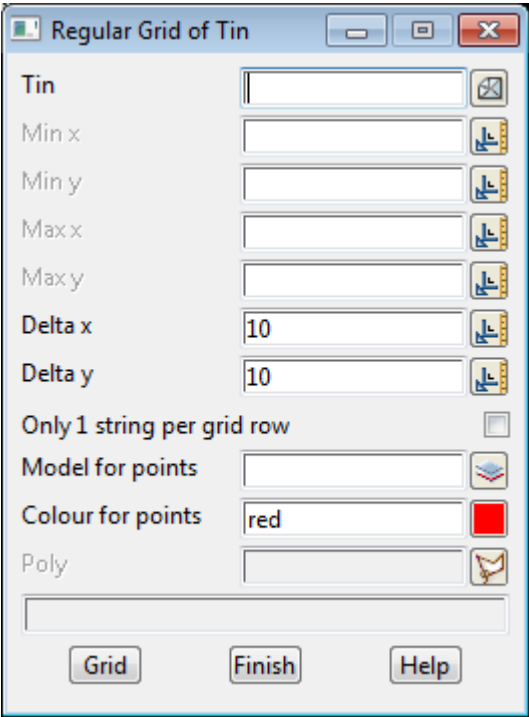
Grid DTM

Position of option on menu: Tins =>Utilities =>Grid

The grid option calculates heights at points at regular x and y increments between given minimum and maximum x and y values. If a polygon is given, a z-value is only calculated for points inside the polygon.

Also see the [DEMs](#) options for creating a file of a regular grid to different formats (Arc View, Quantm, Sokkia).

On selecting the Grid option, the **Regular Grid of Tin** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin on which the spot heights will be calculated.</i>	tin box		available tins
Min x/y <i>minimum x/y values to calculate spot heights for.</i>	input		
Max x/y <i>maximum x/y values to calculate spot heights for.</i>	input		
Delta x/y <i>difference between the x/y-values for the grid.</i>	input		
Only 1 string per grid row <i>if ticked, all the grid points for a row are joined in a point string. If not ticked, individual one vertex strings are created for each grid point.</i>	tick box		
Model for points <i>if blank, no point strings will be created. If non-blank, points strings of the spots heights will be created and stored in this model.</i>	model box		available models

Colour for points colour box default colour available colours

colour to make the point strings.

Poly poly-select

if a polygon is selected, then the spot heights will be restricted to within the polygon.
If no polygon is selected, the spot heights will be calculated over the entire tin.

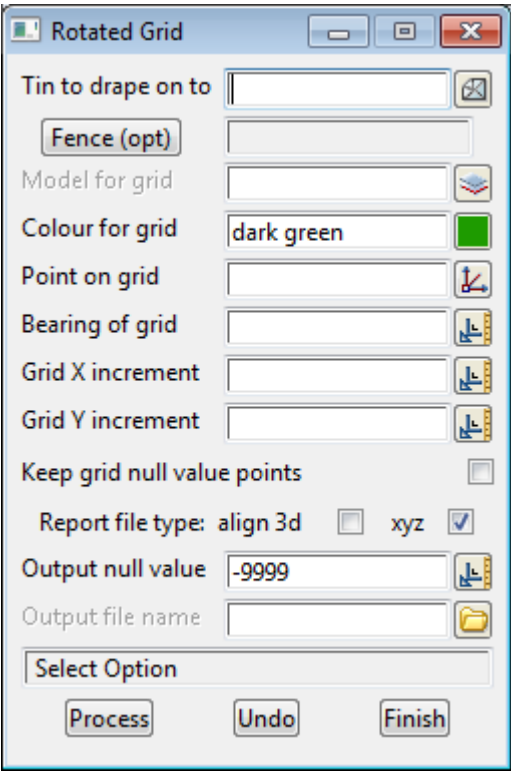
Grid button

calculate the spot heights at regular points over the area given by the min and maximum x and y values and restricted to be inside the polygon.

Rotated Grid

Position of option on menu: Tins =>Utilities =>Rotated Grid

This panel is used to create a grid of points with z-values from a given tin. The grid can be rotated and a polygon can be used to restrict the created points. A report of grid points can also be calculated in either simple x y z (one point per line) form or if no polygon is used, in a format accepted by Quantm (formerly Align 3d).



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Tin to drape on to <i>Tin to get the z-values from.</i>	tin box		available tins
Fence (opt) <i>Optional – if selected, the grid is restricted to being inside the polygon.</i>	string select		
Model for grid <i>Model for the created grid.</i>	model box		available models
Colour for grid <i>Colour for the created grid</i>	colour box	dark green	available colours
Point on grid <i>The selected point is on the grid. The other grid points are integer multiples of the “Grid X increment” and “Grid Y increment” (with the bearing “Bearing of grid”) from this point.</i>	point select box		
Bearing of grid <i>Bearing of the side of the grid.</i>	bearing box		

Undo the last grid created whilst the panel is up.

DEMs

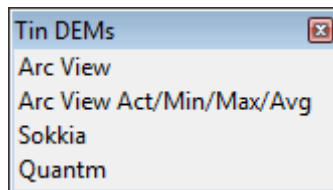
Position of menu: Tins =>Utilities =>DEMs

Position of menu: File I/O =>Data output =>DEMs

DEMS (Digital Elevation Models) can be created from a tin. DEMS are only regular arrays of z-values, rather than the random values and break lines supported by Tins.

Unfortunately there is not just one formats for DEMs.

The DEMS walk-right menu is



For the option *Arc View*, go to

Arc View Act/Min/Max/Avg

Sokkia

Quantm

[Write Arc View DEM](#)

[Write Arc View DEM \(Actual, Min, Max, Av\)](#)

[Sokkia](#)

[Quantm](#)

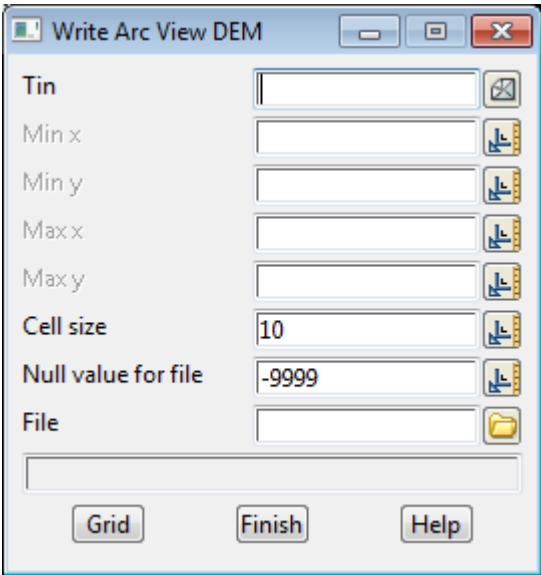
Write Arc View DEM

Position of option on menu: Tins =>Utilities =>DEMs =>Arc View

Position of menu: File I/O =>Data output =>DEMs =>Arc View

The Arc View option calculates heights at points at regular x and y increments (cell size) between given minimum and maximum x and y values and writes out the data in the Arc View DEM format.

On selecting the Arc View option, the Write Arc View DEM panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin on which the DEM heights will be calculated.</i>	tin box		available tins
Min x/y <i>minimum x/y values to calculate spot heights for.</i>	input		
Max x/y <i>maximum x/y values to calculate spot heights for.</i>	input		
Cell size <i>size of the delta x and delta y - cell is a square.</i>	input		
Null value for file <i>value to use when writing null z-values out to the file.</i>	input	-9999	
File <i>the file name for the spot height values in Arc View DEM format.</i>	file box		*.grd
Grid <i>calculate the spot heights at regular points over the area given by the min and maximum x and y values and write out the file.</i>	button		

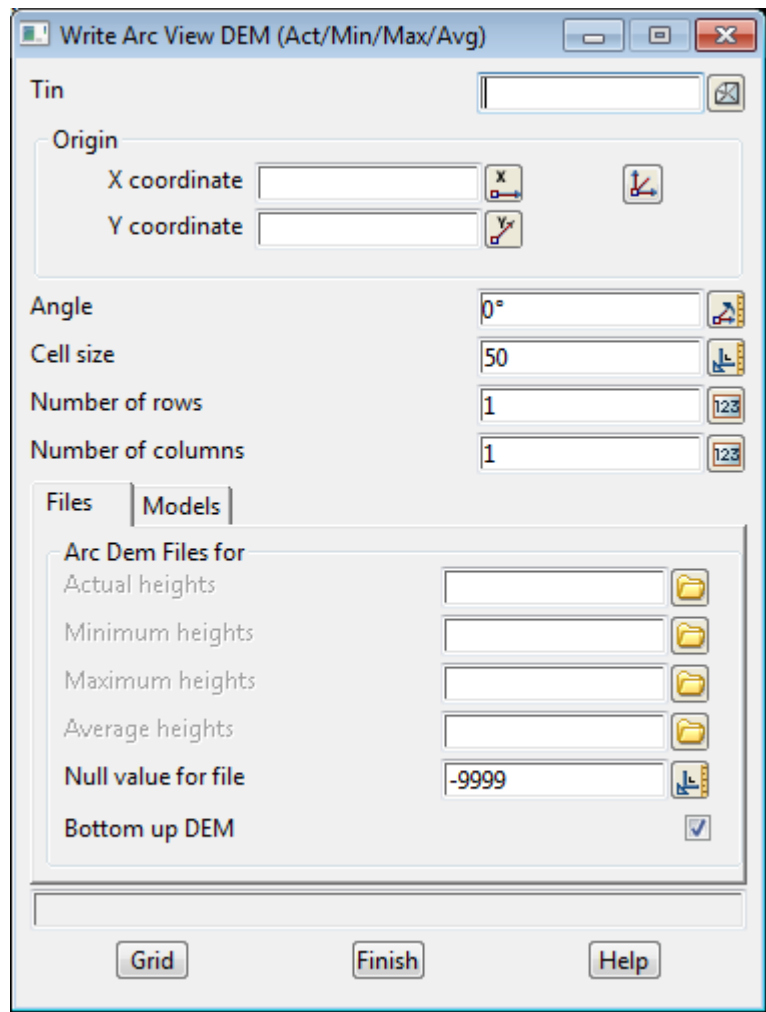
Write Arc View DEM (Actual, Min, Max, Av)

Position of option on menu: Tins =>Utilities =>DEMs =>Arc View Act/Min/Max/Avg

Position of menu: File I/O =>Data output =>DEMs =>Arc View Act/Min/Max/Avg

The Arc View Act/Min/Max/Agg option calculates heights at points at regular x and y increments (cell size) between given minimum and maximum x and y values, and also the minimum, maximum and average values for the cell. The data is written out in the Arc View DEM format.

On selecting the Arc View Act/Min/Max/Avg option, the Write Arc View DEM (Act/Min/Max/Avg) panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin on which the DEM heights will be calculated.</i>	tin box		available tins
X/Y coordinate <i>X/Y coordinates for the origin of the DEM</i>	input		
Angle <i>angle of rotation of the DEM</i>	angle box		
Cell size <i>size of the delta x and delta y - cell is a square.</i>	input		

Number of rows/columns input 1
number of rows/columns in the DEM

Files tab - Arc DEM files for

Actual heights file box
if non blank, write the z-values for the tin at the middle of each cell, out to a dem file

Minimum heights file box
if non blank, write the minimum z-values for the tin for the each cell, out to a dem file

Maximum heights file box
if non blank, write the maximum z-values for the tin for the each cell, out to a dem file

Average heights file box
if non blank, write the average z-values for the tin for the each cell, out to a dem file

Null value for file input -9999
value to use when writing null z-values out to the DEM files.

Bottom up DEM tick box
*if ticked, the DEM files are written from the bottom row of the grid and work up.
If not ticked, the DEM files are written from top row of the grid and work down*

Models tab - Models for

Actual heights model box
if non blank, create points of z-values for the tin at the middle of each cell

Minimum heights model box
if non blank, create points of minimum z-values for the tin for the each cell

Maximum heights model box
if non blank, create points of maximum z-values for the tin for the each cell

Average heights model box
if non blank, create points of average z-values for the tin for the each cell

Colour for points colour box
colour for the point strings

Grid button
calculate the spot heights at regular points over the area given by the min and maximum x and y values and write out the file.

Quantm

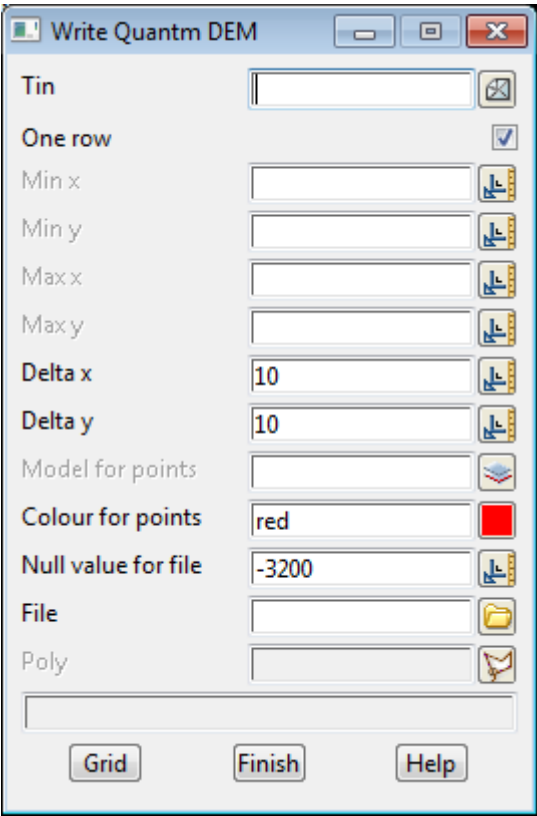
Position of option on menu: Tins =>Utilities =>DEMs =>Quantm

Position of menu: File I/O =>Data output =>DEMs =>Quantm

The **Quantm** option calculates heights at points at regular x and y increments between given minimum and maximum x and y values. If a polygon is given, a z-value is only calculated for points inside the polygon.

Actual point strings and/or a file of heights at the points in Quantm (formerly Align 3D) format can be generated. For Quantm no polygon should be used and if there is no z-value (no tin) at a point, then a null z-value is written to the output file.

On selecting the **Quantm** option, the **Write Quantm DEM** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin on which the spot heights will be calculated.</i>	tin box		available tins
One row <i>If ticked, null points are added in for any missing (x,y) so that there is only one row of data (one string) for each x-value.</i>	tick box		
Min x/y <i>minimum x/y values to calculate spot heights for.</i>	input		
Max x/y <i>maximum x/y values to calculate spot heights for.</i>	input		
Delta x/y	input		

difference between the x/y-values.

Model for points model box available models
if blank, no point strings will be created.
If non-blank, points strings of the spots heights will be created and stored in this model.

Colour for points colour box default colour available colours
colour to make the point strings.

Null value for file input -3200
value to use when writing null z-values out to the file.

File file box *.grd
If non-blank, a file of the spot height values in Quantm format is created.

Poly poly-select
if a polygon is selected, then the spot heights will be restricted to within the polygon.
If no polygon is selected, the spot heights will be calculated over the entire tin.

Grid button
calculate the spot heights at regular points over the area given by the min and maximum x and y values and restricted to be inside the polygon.

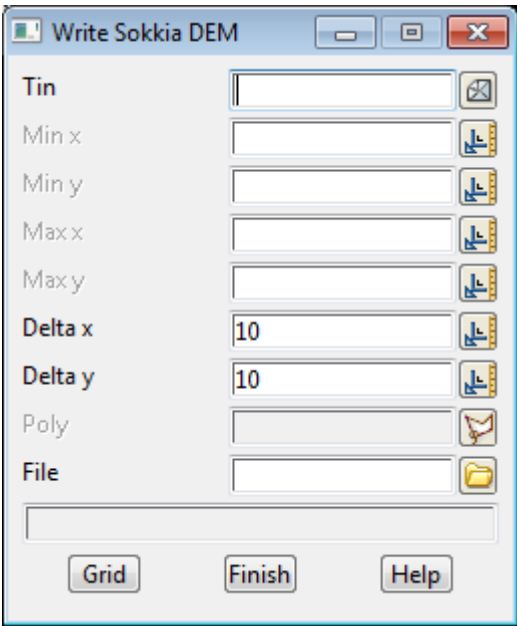
Sokkia

Position of option on menu: Tins =>Utilities =>DEMs =>Sokkia

Position of menu: File I/O =>Data output =>DEMs =>Sokkia

The Sokkia option calculates heights at points at regular x and y increments between given minimum and maximum x and y values. If a polygon is given, a z-value is only calculated for points inside the polygon. A file of heights at the points in Sokkia format is generated.

On selecting the Sokkia option, the Write Sokkia DEM panel is displayed.



The fields and buttons used in this panel have the following functions.

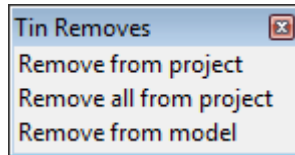
Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin on which the spot heights will be calculated.</i>	tin box		available tins
Min x/y <i>minimum x/y values to calculate spot heights for.</i>	input		
Max x/y <i>maximum x/y values to calculate spot heights for.</i>	input		
Delta x/y <i>difference between the x/y-values.</i>	input		
Poly <i>if a polygon is selected, then the spot heights will be restricted to within the polygon. If no polygon is selected, the spot heights will be calculated over the entire tin.</i>	poly-select		
File <i>If non-blank, a file of the spot height values in Sokkia format is created.</i>	file box		*.grd
Grid <i>calculate and write a file of the spot heights at regular points over the area given by the min and maximum x and y values and restricted to be inside the polygon.</i>	button		

Remove

Position of menu: Tins =>Utilities =>Remove

Tins can be removed from models and from the project. Remove tins are not deleted but simply taken off the tin list in the project. Removed tins are left in the project area and can be added in again using the **add** option.

The **tin removes** walk-right menu is



The options in the menu will now be described.

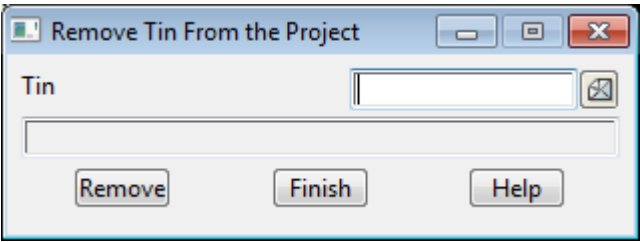
For the option Remove from project, go to
Remove all from project
Remove from model

[Remove From Project](#)
[Remove All From Project](#)
[Remove From Model](#)

Remove From Project

Position of option on menu: Tins =>Utilities =>Remove =>Remove from project

On selecting the remove from project option, the remove tin from the project panel is displayed.



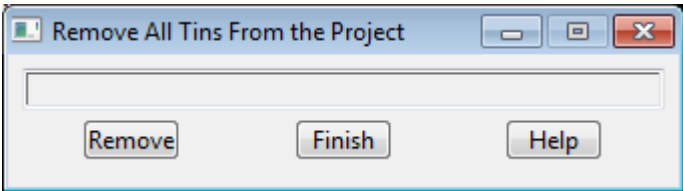
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin	tin box		available tins
<i>name of the tin to be removed from the working project.</i>			
Remove	button		
<i>remove the tin given in the tin field from the project.</i>			

Remove All From Project

Position of option on menu: Tins =>Utilities =>Remove =>Remove all from project

On selecting the remove all from project option, the remove all tins from project panel is displayed.



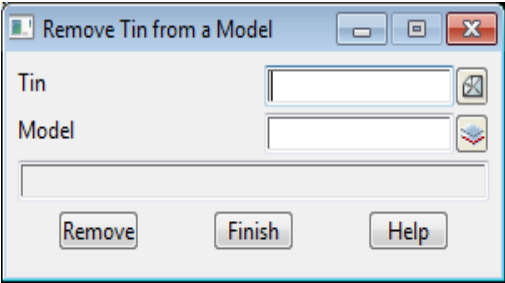
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Remove	button		
<i>remove all the tins from the working project. If no errors occur, the panel will be removed after the tins have been removed.</i>			

Remove From Model

Position of option on menu: Tins =>Utilities =>Remove =>Remove from model

On selecting the remove from model option, the **remove tin from a model** panel is displayed.



The fields and buttons used in this panel have the following functions.

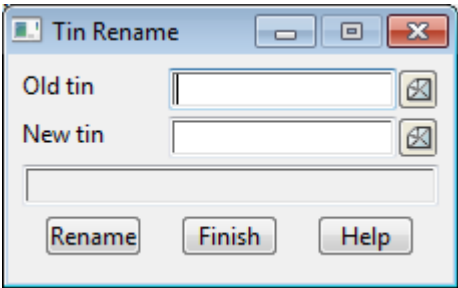
Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin to be removed from a model.</i>	tin box		available tins
Model <i>name of the model from which the tin given in the tin field will be removed.</i>	model box		available models
Remove <i>remove the tin given in the tin field from the model given in the model field.</i>	button		

Rename

Position of option on menu: Tins =>Utilities =>Rename

On selecting the `rename` option, the **tin rename** panel is displayed.

This panel can be used to change the names of existing tins



The fields and buttons used in this panel have the following functions.

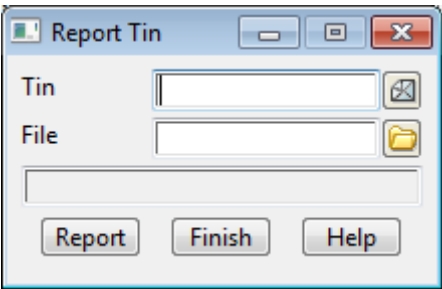
Field Description	Type	Defaults	Pop-Up
Old tin <i>name of the tin to be renamed.</i>	tin box		available tins
New tin <i>new name for the tin</i>	tin box		
Rename <i>change the name of the tin in the old tin field to the name given in the new tin field.</i>	button		

Report

Position of option on menu: Tins =>Utilities =>Report

This panel produces a report on the tin including the models making up the tin and all the settings used when creating the tin.

On selecting the **Tin** report option, the **Report Tin** panel is displayed.



The fields and buttons used in this panel have the following functions.

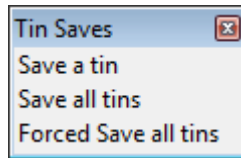
Field	Description	Type	Defaults	Pop-Up
Tin	<i>name of the tin to create report for.</i>	tin box		available tins or super tins
File	<i>name of the report file</i>	file box		*.rpt files
Report	<i>create the tin report.</i>	button		

Save

Position of menu: Tins =>Utilities =>Save

Tins are automatically saved on disk when they are first created but various operations can then be applied to tins which may not be immediately updated on disk.

The tin saves walk-right menu is



The options in the menu will now be described.

For the option Save a tin, go to

Save all tins

Forced Save all tins

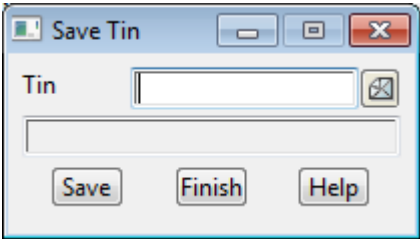
[Save a Tin](#)

[Save/Forced Save All Tins](#)

[Save/Forced Save All Tins](#)

Save a Tin

On selecting the save a tin option, the **save tin** panel is displayed.



The fields and buttons used in this panel have the following functions.

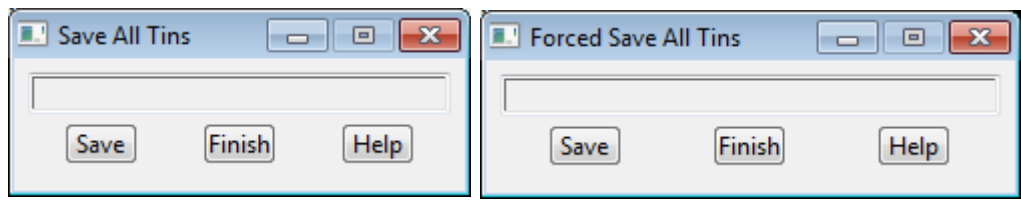
Field	Description	Type	Defaults	Pop-Up
Tin		tin box		available tins
<i>name of the tin to be saved to disk.</i>				
Save		button		
<i>after selecting this button, the tin given in the tin field will be saved to disk.</i>				

Save/Forced Save All Tins

Position of option on menu: Tins =>Utilities =>Save =>Save all tins

Position of option on menu: Tins =>Utilities =>Save =>Forced Save all tins

On selecting the save/force save all tins option, the save/forced save all tins panel is displayed.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Save		button		

for save all tins: after selecting this button, all tins in the working project that have been modified since their last save, will be saved to disk. Unless an error occurs, the panel will be removed after the saving is completed.

for force save all tins: after selecting this button, all tins in the working project will be saved to disk. Unless an error occurs, the panel will be removed after the saving is completed.

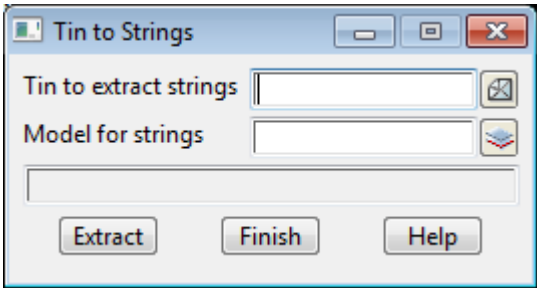
Tin to Strings

Position of option on menu: Tins =>Utilities =>Tin to strings

The points and breaklines of an existing tin can be extracted using the **Tin to strings** option.

Note that only the final points and breaklines used in creating the tin are extracted. Original string name, colours etc. are not obtainable.

Selecting **Tin to strings** displays the **Tin to Strings** panel:



The fields and buttons used in this panel have the following functions.

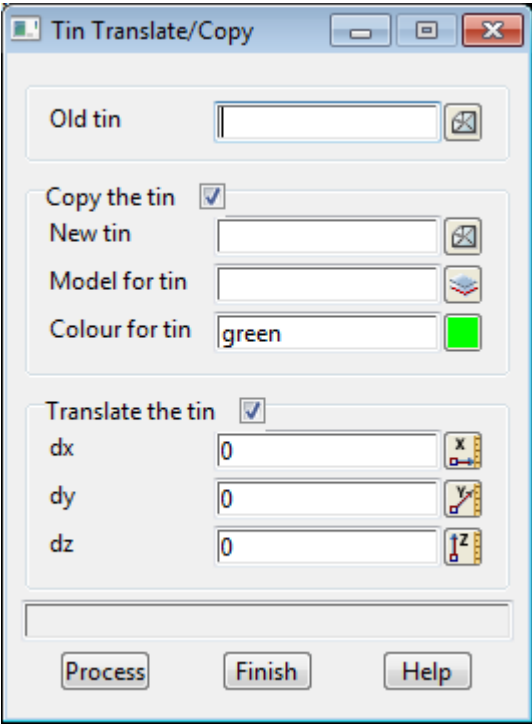
Field Description	Type	Defaults	Pop-Up
Tin to extract strings <i>name of the tin to extract points and breaklines from.</i>	tin box		available tins
Model for strings <i>model to hold the extracted point and breakline strings.</i>	input		available models
Extract <i>extract the points and breaklines that make up a tin.</i>	button		

Translate/Copy

Position of option on menu: Tins =>Utilities =>Translate/copy

An existing tin can be translated and/or copied using the Translate/copy option.

Selecting Translate/copy, displays the **Tin Translate/Copy** panel:



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Old tin	<i>name of the tin to be copied/translated.</i>	tin box		available tins
Copy the tin	<i>if ticked, the New tin, Model for Tin and Colour for tin fields are activated and supply the information for the new tin.</i>	tick box	tick	
New tin	<i>name of the copy of the tin - this can't be the same as any existing tin in the project.</i>	tin box		available tins
Model for tin	<i>if non-blank, the name of the model for the new tin. If blank, the tin is not put in any model.</i>	model box		available models
Colour for tin	<i>if non-blank, the colour of the new tin. If blank, use the old tin colour</i>	colour box		available colours
Translate the tin	<i>if ticked, the dx, dy and dz fields are activated and supply the information for translating the tin</i>	tick box	tick	
dx/dy/dz	<i>the delta amounts to translate the tine by.</i>	real box	0	
Process		button		

translate/copy the tin.

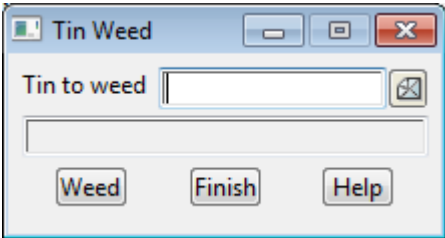
Weed

Position of option on menu: Tins =>Utilities =>Weed

When a tin is created, a copy of all the points and lines used in creating the tin is saved with the tin, including any duplicate points and lines.

The **weed** option will remove all the duplicate points and lines from the tin database.

On selecting the **Weed** option, the **tin weed** panel is displayed.



The fields and buttons used in this panel have the following functions.

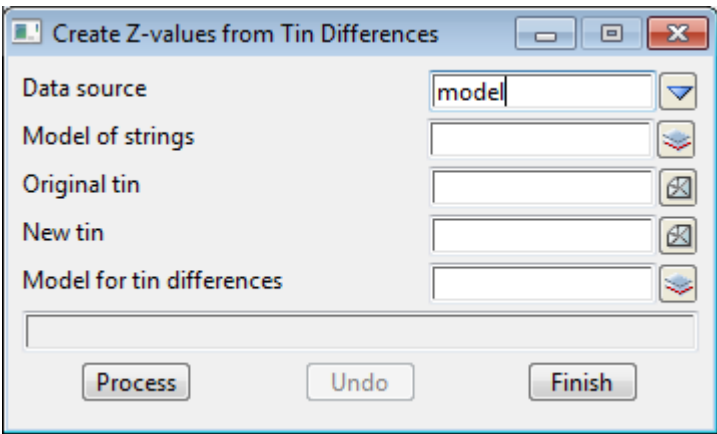
Field Description	Type	Defaults	Pop-Up
Tin to weed <i>name of the tin to weed.</i>	tin box		available tins
Weed <i>remove all duplicate points and lines from the tin database.</i>	button		

Z Differences from Tins

Position of option on menu: Tins =>Utilities =>Z diffs from tins

This option takes a data source and for each point in the data source, creates a new point whose z-value is the difference in z-values from two given tins at the plan position of the data source point.

On selecting the **Z diffs from Tins** option, the **Create Z-Values from Tin Differences** panel is displayed.



The fields and buttons used in this panel have the following functions:

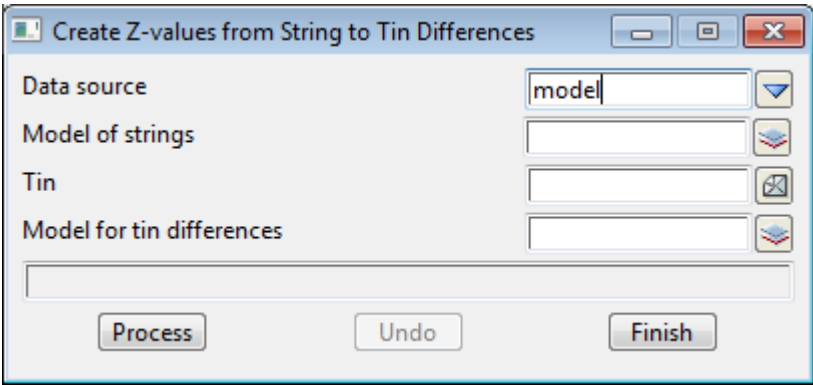
Field Description	Type	Defaults	Pop-Up
Data to settle			
Data source type <i>data selection type</i>	choice box	Model	model. string, view
Data source <i>data to be processed.</i>	input		
Original tin <i>name of the tin to get the z-value from.</i>	tin box		available tins
New tin <i>name of the tin to get the z-value from.</i>	tin box		available tins
Model for tin differences <i>model to place the strings containing the z values with the difference between the tins.</i>	model box		available models
Process <i>for all strings in the data source, calculate the difference in the z-values from the two tins at the string vertices.</i>	button		

Z Differences from String to Tin

Position of option on menu: Tins =>Utilities =>Z diffs from string to tin

This option takes a data source and for each string in the data source, creates a plan copy of the string and for each vertex in the new string, the z-value at a vertex is the difference in z-values from the original string vertex and the z-value of the tin at the (x,y) position of the vertex.

On selecting the **Z diffs from string to tin** option, the **Create Z-Values from String to Tin Differences** panel is displayed.



The fields and buttons used in this panel have the following functions:

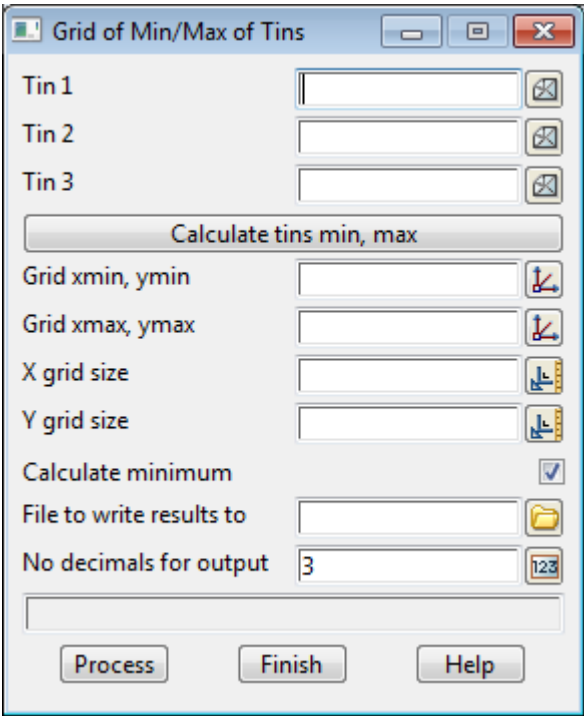
Field Description	Type	Defaults	Pop-Up
Data source type <i>data selection type</i>	choice box	Model	model, string, view
Data source <i>data to be processed.</i>	input		
Tin <i>name of the tin to get the z-value from.</i>	tin box		available tins
Model for tin differences <i>model to place the strings containing the z values with the difference between the original string and the tin.</i>	model box		available models
Process <i>for all strings in the data source, calculate the difference in the z-values from the string to the tin.</i>	button		

Grid of Min / Max of Tins

Position of option on menu: Tins =>Utilities => Min/ Max of Tins

This option takes one to three tins and creates a regular grid of points where the z-value at each point is the minimum of the tins at that point.

Selecting Min/ Max of Tins brings up the **Grid of Min / Max of Tins** panel.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Tin 1, Tin 2, Tin 3	tin box		available tins
<i>if non blank, this tin is used to use in the calculation to find the minimum of the tins at each grid point.</i>			
Calculate tins min, max	button		
<i>when pressed, the minimum and maximum x and y values for the union of the three tins is calculated and the values written to the Grid xmin, ymin, Grid xmax, ymax fields.</i>			
Grid xmin, ymin	input		
<i>the minimum x value, then one or more spaces, and then the minimum y values, to be used for creating the grid.</i>			
Grid xmax, ymax	input		
<i>the maximum x value, then one or more spaces, and then the maximum y values, to be used for creating the grid.</i>			
x grid size	input		
<i>the x coordinates for the grid points are created starting at the Grid xmin and then incremented by "x grid size" for as long as the x value is less than or equal to Grid xmax</i>			
y grid size	input		

the y coordinates for the grid points are created starting at the Grid ymin and then incremented by "y grid size" for as long as the y value is less than or equal to Grid ymax

Calculate minimum tick box ☒

*if ticked, then grid points are created with the z-value being the minimum of tins Tin1, Tin 2, Tin3.
If not ticked, then grid points are created with the z-value being the maximum of tins Tin1, Tin 2, Tin3.*

File to write results to File

name of the file to write the grid points out to. The format of the file is x, y and z, separated by spaces and with one point per line. The "File to write results to" must be non-blank.

No decimals for output input 3

number of decimal places to use for the x, y and z values

Process button

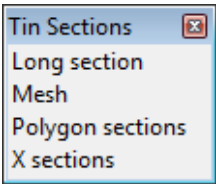
when this button is pressed, the grid of either the tin minimums or maximums is created and written to the file

Sections

Position of menu: Tins =>Sections

The triangles=>sections menu contains options involving sections through the tin.

The sections walk-right menu is



- section along a string
- create sets of sections through tin at right angles
- limit sections to a polygon
- x-sections along a string

For the option *Long section*, go to
Mesh,
Polygon sections
X-sections

- [Long Sections.](#)
- [Mesh](#)
- [Polygon Sections](#)
- [X-Sections](#)

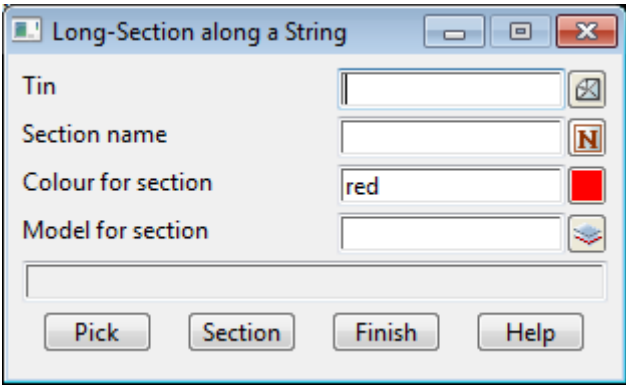


Long Sections

Position of option on menu: Tins =>Sections =>Long Section

The long section option calculates the section through a tin along a particular string. This option is rarely used because tins are automatically profiled through on the section view and in long section and x-section plots.

On selecting the **long section** option, the **long section along a string** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Tin	<i>name of the tin that the string will be sectioned against.</i>	tin box		available tins
Section name	<i>name to give the long section string</i>	input		
Colour for section	<i>colour to make the long section string</i>	colour box	default colour	available colours
Model for section	<i>name of the model to contain the long section string.</i>	model box		available models
Pick	<i>select the string to be sectioned along.</i>	string-select		
Section	<i>calculate the long section along the string selected by the pick button, against the tin given in the tin field. The resulting section string is added to the model given in the Model for Section field.</i>	button		

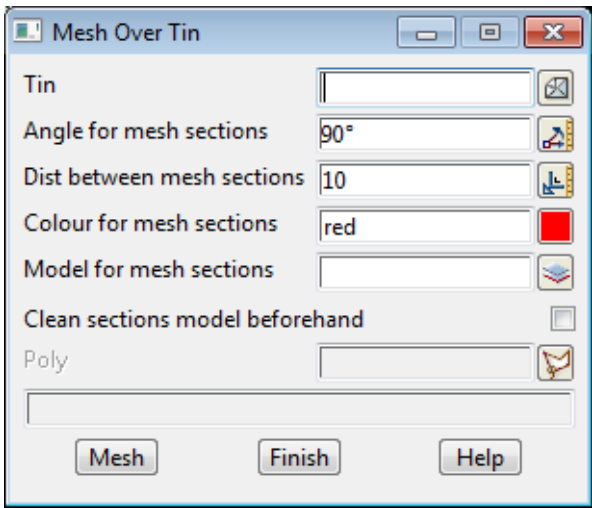
Mesh

Position of option on menu: Tins =>Sections =>Mesh

A 12d Model mesh is simply a series of lines cutting through the tin (sections) at a given angle and spacing, and at right angles to the given angle with the same spacing.

A mesh is an effective method of visualizing a triangulation when displayed in a perspective view and for hidden views.

On selecting the mesh option, the mesh over tin panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin that the mesh sections will be calculated through.</i>	tin box		available tins
Angle for mesh sections <i>angle (in degrees) of the lines to section along. The sections are also created at rights angles to this angle as well.</i>	angle box	90.0	0,45,90
Dist between mesh sections <i>distance between the lines to section along</i>	input	10.0	1,10,100
Colour for mesh sections <i>colour to make the calculated sections</i>	colour box	default colour	available colours
Model for mesh sections <i>name of the model to contain the calculated sections.</i>	model box		available models
Clean sections model beforehand <i>if ticked, the model of sections is cleaned out before the option runs.</i>	tick box		
Poly <i>if a polygon is selected, then the sections are restricted to remaining within the polygon.</i>	polygon select		
Mesh <i>two sets of sections through the tin given in the tin field are created within the selected polygon, or if no polygon is selected, the bounding polygon for the tin. One set of sections are calculated along straight lines at the angle given by the angle field and at a separation given by the dist field and the second set at right angles to the first set.</i>	button		

<esc> can be used to abort the mesh option.

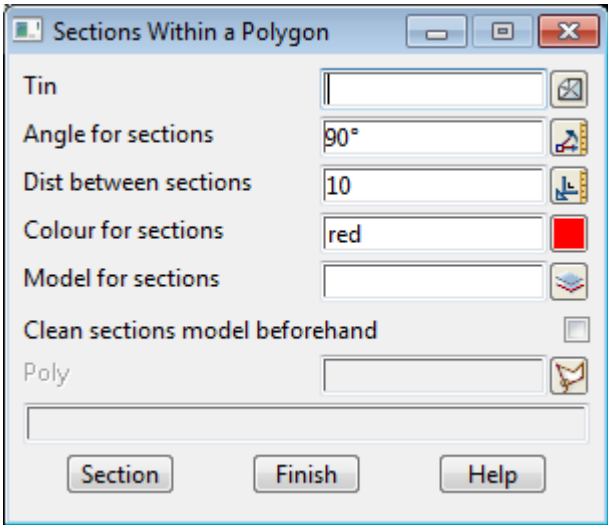
Polygon Sections

Position of option on menu: Tins =>Sections =>Polygon sections

In the **polygon sections** option, sections are calculated for a series of parallel lines covering the polygon, or if no polygon is given, the tin. The angle of the parallel lines and the distance between them are set by the user.

This option provides a quick method for producing a one directional set of sections covering a polygonal region on a tin.

On selecting the **polygon sections** option, the **sections within a polygon** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin that the sections will be calculated through</i>	tin box		available tins
Angle for sections <i>angle (in degrees) of the lines to section along</i>	angle box	90.0	0,45,90
Dist between sections <i>distance between the lines to section along</i>	input	10.0	1,10,100
Colour for sections <i>colour to make the calculated sections</i>	colour box	default colour	available colours
Model for section <i>name of the model to contain the calculated sections.</i>	model box		available models
Clean sections model beforehand <i>if ticked, the model of sections is cleaned out before the option runs.</i>	tick box		
Poly <i>A polygon is selected from a view. If no polygon is selected, sections are created over the entire tin.</i>	polygon-select		
Section <i>Sections within the polygon selected by poly will be calculated along parallel straight lines at the angle given by the angle field and at a separation given by the dist field. The sections are made against the tin given by the Tin field. The sections colour is that given in the colour field and the section strings are</i>	button		

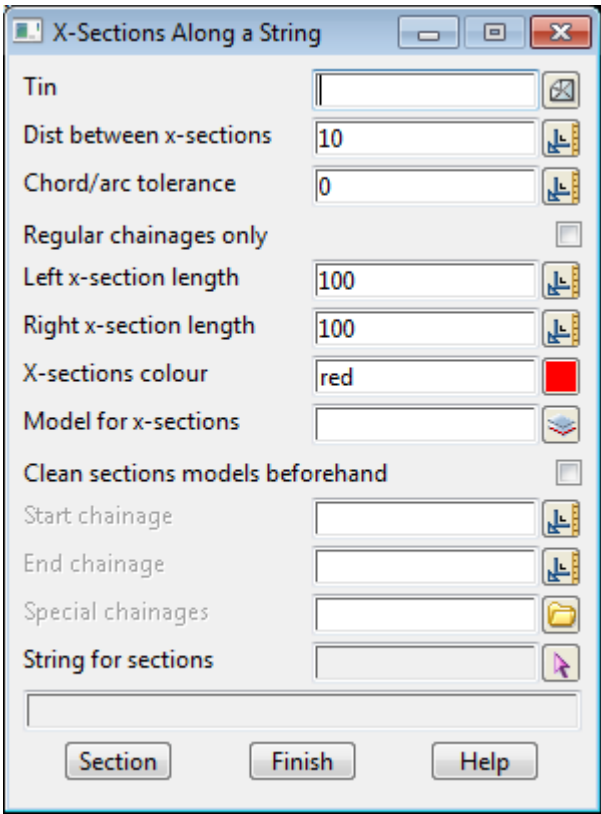
placed in the model given in the model field.

X-Sections

Position of option on menu: Tins =>Sections =>X Sections

The X-sections (cross sections) option calculates cross sections at a given interval along a string.

On selecting the x-section option, the **x-sections along a string** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin that the x-sections will be calculated through.</i>	tin box		available tins
Dist between x-sections the distance between points on the selected string where the x-sections are calculated.	input	10	
Regular chainages only <i>if ticked, sections are only calculated at points at the given chainage distance apart. If not ticked, extra sections are created at horizontal tangent points and horizontal IPs.</i>	tick box		
Left x-section length <i>the plan distance for the left side of the x-section - that is, the distance that the x-section extends to the left of the selected string.</i>	input	100	
Right x-section length <i>the plan distance for the right side of the x-section - that is, the distance that the x-section extends to the right of the selected string.</i>	input	100	
X-sections colour <i>colour to make the x- sections</i>	colour box	default colour	available colours

Model for x-sections model box available models
name of the model to contain the x-sections.

Start/End chainage input
the string chainage to start/end the x-sections. If blank, the start/end chainage is taken to be the chainage at the beginning/finish of the string.

Special chainages file box *.spc files
if non blank, a file of special chainages to also create x-sections at

String for sections string-select
select the string to calculate the x-sections along.

Section button
*calculate the x-sections along the string selected by the **pick** button, against the tin given in the tin field. The resulting x-section strings are added to the model given in the model for x-sections field.*

Sharing

Position of menu: Tins =>Sharing

Sharing allows tins from a project (the server project) to be added to other projects (client projects).

Before any tins can be added to a client project, they must first be tagged in the server project as allowed to be shared.

The **Sharing** walk-right menu is

Shared Tins

Share

Add

Remove

Synchronize

allow tins in this project to used by other projects

add a shared tin from another project

remove a tin shared from another project

updated tins shared from other projects

For the option *Share*, go to

Add

Remove

Synchronize

[Share Tins](#)

[Add Shared Tins](#)

[Remove Shared Tins](#)

[Synchronize Shared Tins](#)

Share Tins

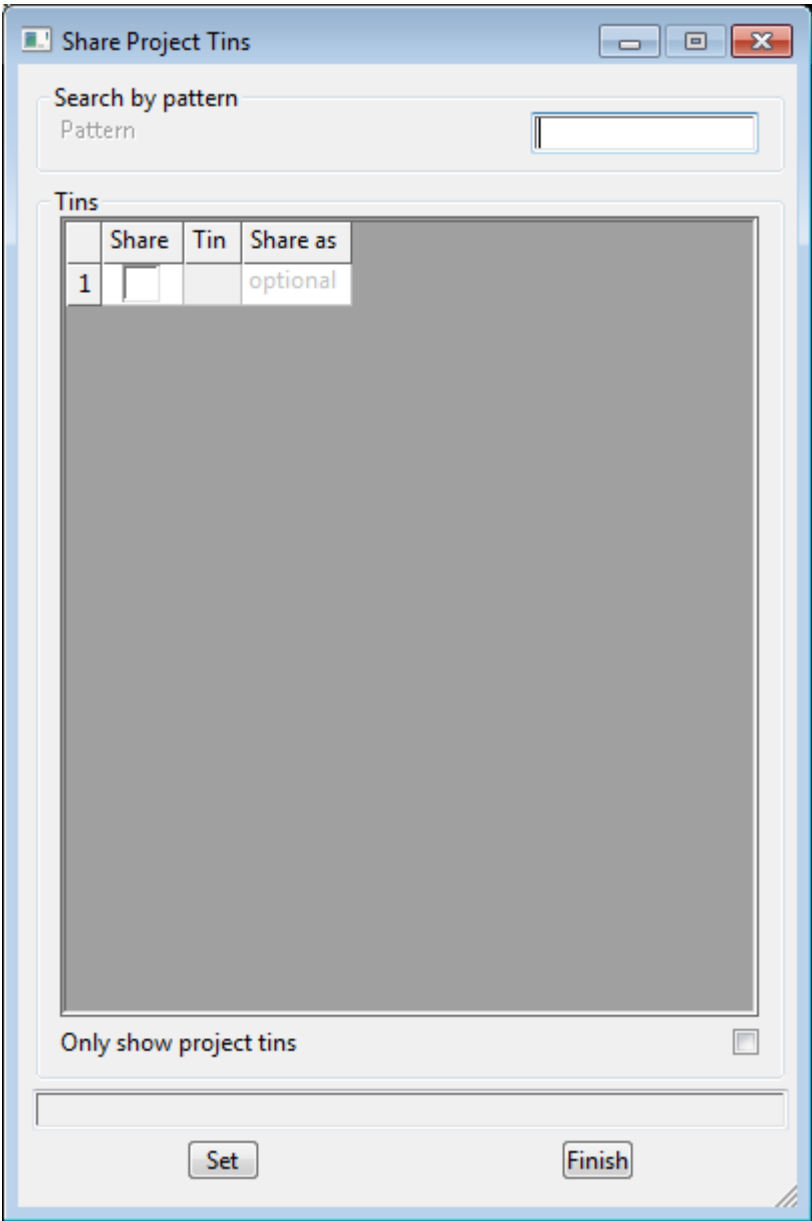
Position of option on menu: Tins =>Sharing =>Share

Before tins in a server project can be added to client projects, the tins must be made available for sharing in the server project by using the **Share** option.

All tins that have been made available for sharing are displayed in tin lists in a colour defined by an environment variable. The default colour is a yellow (RGB of (255,166,0)).

This option also can reverse the process. That is, remove the availability of a tin for sharing. If this is done then clients who have shared this tin will be warned.when starting up their project and/or synchronizing occurs.

Selecting **Share** displays the **Share Project Tins** panel.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Default	Pop-Up
<i>All the models in the project are listed in the Share Project Tins panel and if a tin has been tagged for</i>				

*Sharing, a ticked will be displayed in the **Share** column of the grid.*

Pattern

*if a pattern is typed then all the tins matching the pattern will have a tick placed in the **Share** column. If * is typed then all tin are ticked for sharing.*

Share grid column

*tick if the tin is to be made available for sharing when the **Set** button is pressed.
All tins that have been made available for sharing are displayed in tin lists in a colour defined by an environment variable. The default colour is a yellow (RGB of (255,166,0)).
Clicking RB on **Share** at the top of the column brings up a menu to **Toggle** the ticks, **Set** all the ticks on, **Clear** to turn all the ticks off.*

Tin grid column

this column lists all the tins in the project

Share as grid column

an optional name with which the tin will be shared out to clients. Leave it blank to share under the original name.

Set button

*clicking **Set** marks all the tins with a tick in the **Tick** column as being available for sharing. Those tins without a tick will not be available for sharing.*

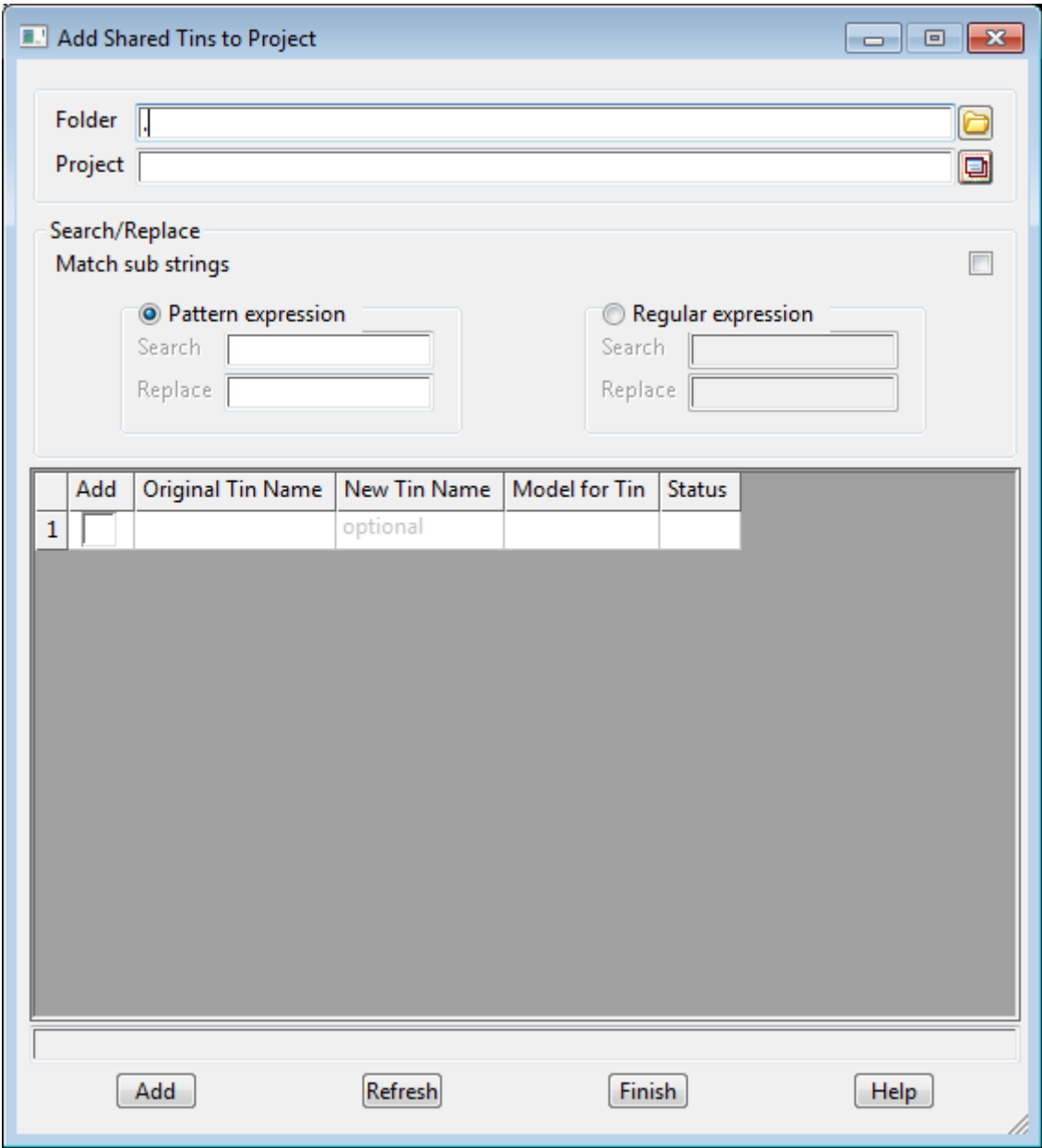
Add Shared Tins

Position of option on menu: Tins =>Sharing =>Add

The **Add** option is used to add shared tins from a server project, to this project (a client project).

All tins that have been added as shared tins are displayed in tin lists in a colour defined by an environment variable. The default colour is blue.

Selecting **Add** displays the **Add Shared Tins to Project** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Folder	folder box		select folder
<i>folder to look for 12d Model projects. When a folder is selected, all the 12d Model projects in the folder will be displayed in a Projects pop-up list.</i>			

Project	folder box	select folder
<i>name of the 12d Model project in the folder given in the Folder field, to search for tins marked for sharing. Once a project is selected, all the tins marked for sharing from that project will be listed in the Original Tin Name column.</i>		
Search/Replace	<i>section for renaming tins from the selected server project</i>	
Match sub strings	tick box	
<i>if ticked, the Search expression is used to match against part of each tin name. If not ticked, the Search expression is used to match against the entire tin name.</i>		
Pattern expression	radio button	
<i>if set on, then Pattern expressions given in the Search and Replace fields are used to modify tin names. Pattern expressions include the standard wild card * and wild character !.</i>		
Search	input	
<i>pattern to search for in the tin names. For example "*" exist" will select all tins with a name ending with " exist"</i>		
Replace	input	
<i>replacement for the search pattern found in the tin name. For example, "exist " in the Replace field, takes the matched part of the tin name and adds "exist " to the front of it. Hence the Search pattern "*" exist" and Replace pattern "exist *" finds all tin with names ending in " exist" and renames them with the name starting with "exist " (and the " exist" at the end of the name is dropped off).</i>		
Regular expression	radio button	
<i>if set on, then Regular expressions given in the Search and Replace fields are used to modify tin names.</i>		
Search	input	
<i>regular expression to search for in the tin names.</i>		
Replace	input	
<i>replacement for the search expression found in the tin name.</i>		
Tin Names Grid	<i>The tins available for sharing in the selected project are shown in the Original Tin Name column. Any renaming by the Search and Replace expressions are shown in the New Tin Name column. Note that if the tin already exists in the current project, then the cell for that model in Original Tin Name column will be displayed in yellow.</i>	
Add	tick boxes in grid column	
<i>if ticked, the tin will be added to the project when the Add button is pressed. If not ticked, the tin will not be added to this project as a shared tin. Clicking RB on Add at the top of the column brings up a menu to Clear which turns all the ticks off. Note - a shared tin that has been previously added can only be removed by using the Tins =>Sharing =>Remove option.</i>		
Original Tin Name	column	
<i>this column lists all the tins in the server project that are available for adding to this client project.</i>		
New Tin Name	column	
<i>if non blank, the name to use instead of the Original Tin Name when the tin is added t the project. If blank, the Original Tin Name is used for the tin when it is added to the project. The New Tin Names can be from applying the Search and Replace, or by just typing them in.</i>		
Model for Tin	grid column	
<i>if non blank, the model name to use in the client project for this tin added to the project If blank, the model name is the same as that in the server project.</i>		

displays if there has been a match or no match for the search/replace for renaming tins

add to this project (a client project) as a shared tin, the ticked tins given in the Original Tin Name field from the project given in the Project field, and add them to the model in the Model for Tin field.

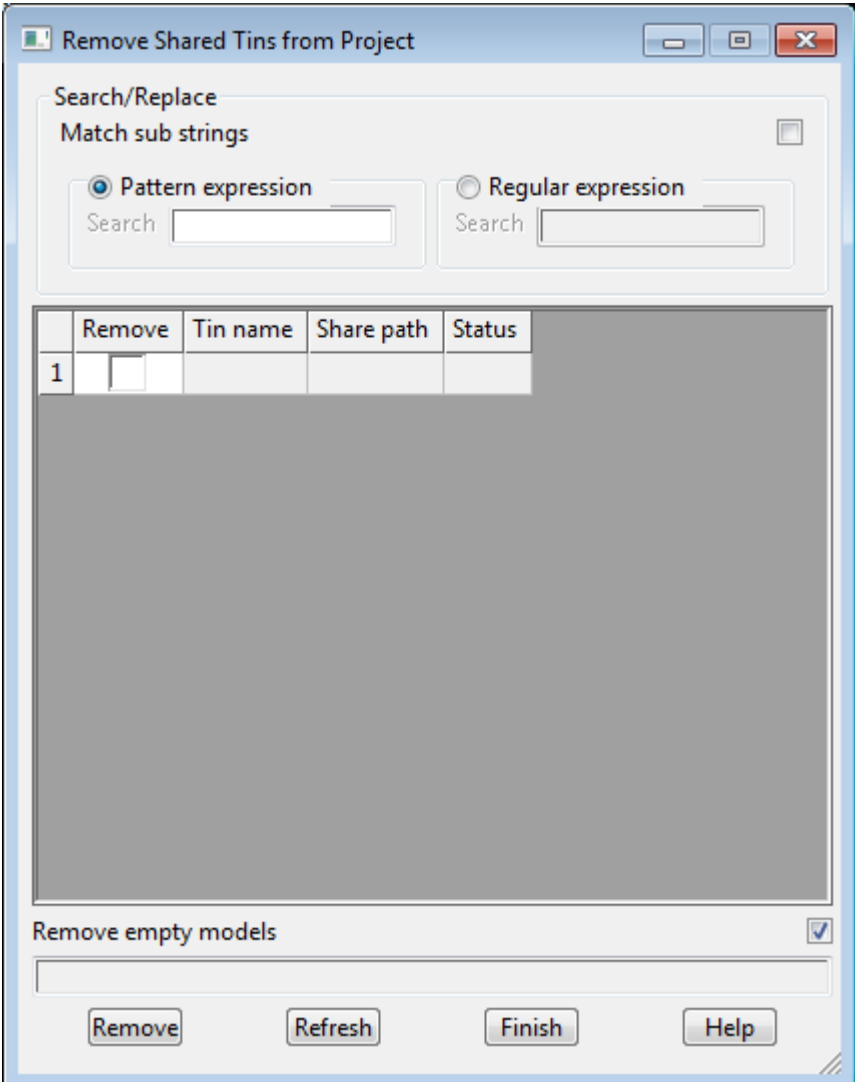
clicking Refresh refreshes the list of all tins available for sharing in the selected **12d Model** project (server project).

Remove Shared Tins

Position of option on menu: Tins =>Sharing =>Remove

The **Remove** option is used to remove shared tins from the project. The shared tins would have been previously added to the project with the **Tins =>Sharing =>Add** option.

Selecting **Remove** displays the **Remove Shared Tins from Project** panel.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Search/Replace				
<i>section for selecting by expressions, tins shared from other projects</i>				
Match sub strings		tick box		
<i>if ticked, the Search expression is used to match against part of each tin name.</i>				
<i>If not ticked, the Search expression is used to match against the entire tin name.</i>				
Pattern expression		radio button		
<i>if set on, then Pattern expressions given in the Search field are used to select tin names. Pattern expressions include the standard wild card * and wild character !.</i>				

Search input

pattern to search for in the tin names. For example "** exist*" will select all tins with a name ending with " *exist*"

Regular expression radio button

if set on, then **Regular** expressions given in the Search field are used to select shared tin names.

Search input

regular expression to search for in the shared tin names.

Tin Names Grid

list of all shared tins added to the project.

Remove tick boxes in grid column

if ticked, the tin will be removed from this project as a shared tin when the **Remove** button is pressed. Clicking RB on **Remove** at the top of the column brings up a menu to **Toggle** the ticks, **Set** all the ticks on, **Clear** to turn all the ticks off.

Tin Name grid column

this column lists all the tins in this project added as shared tins from other server projects

Share path

this column lists the path name to the server project and the original tin name in the server project

Status grid column

displays if there has been a match or no match for the Search for selecting shared tins

Remove button

clicking **Remove** removes as shared tins from this project, all the tins with a tick.

Refresh button

clicking **Refresh** refreshes the list of all shared tins previously added to the project

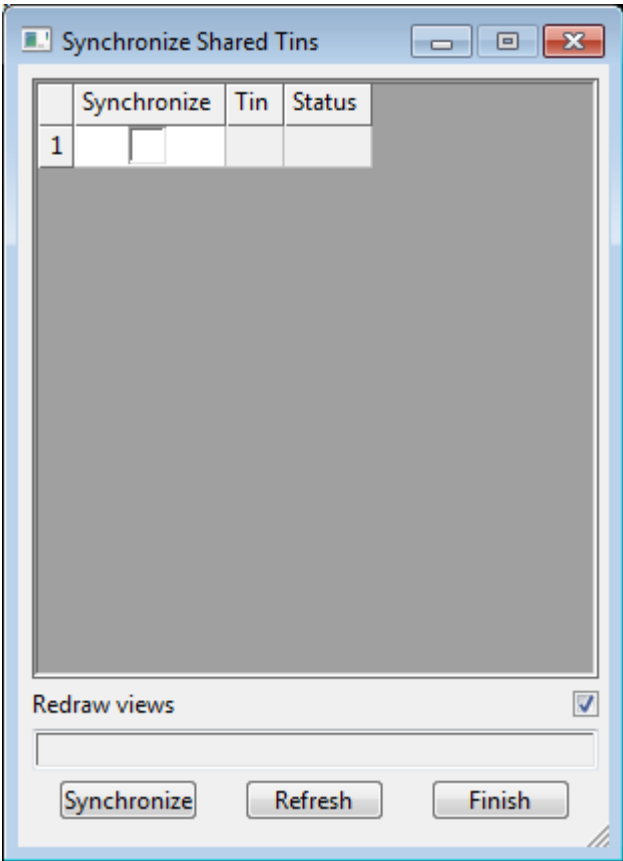
Synchronize Shared Tins

Position of option on menu: Tins =>Sharing =>Synchronize

The **Synchronize** option is used to updated any added shared tins. The shared tins would have been previously added to the project with the **Tins =>Sharing =>Add** option.

Three environment variables control the synchronization of updates of added shared models and tins. For more information on synchronizing, go to the section [Project Share Settings](#).

Selecting **Synchronize** displays the **Synchronize Shared Tins** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Synchronize	tick boxes in grid column		
<i>if ticked and the tin has changed in the server project, then it will be re-copied from the server project when the Synchronize button is pressed.</i>			
<i>Clicking RB on Copy at the top of the column brings up a menu to Toggle the ticks, Set all the ticks on, Clear to turn all the ticks off.</i>			
Tin	grid column		
<i>this column lists all the tins in this project that have been added from other (server) projects</i>			
Synchronize	button		
<i>clicking Synchronize re-copies any tins with a tick from the server projects</i>			
Status			
<i>Status will either be Ok or No Longer Shared to reflect the status of the tin on that row.</i>			

Redraw views tick box

Whether or not to redraw all the views any of the synchronized tins are on.

Refresh button

*clicking **Refresh** refreshes the list of all shared tins previously added to the project*

Delete

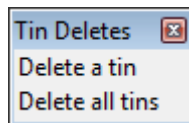
Position of menu: Tins =>Delete

The **delete** option is used to delete tins from the project and from the computer disk so that they no longer can be accessed or take up disk space.

To help protect against disasters, a **yes-no** pop-up menu is used to confirm that the user did intend deleting the tin. If deletion is confirmed, the selected tin is removed from the project (if its in the project) and deleted from the disk.

If a **12d Model trash bin** is being used, the deleted tins may be moved to the trash bin rather than deleted from disk (see [Trash Bin](#)).

The tin Deletes walk-right menu is



For the option *Delete a tin*, go to
Delete all tins

[Delete a Tin](#)
[Delete All Tins](#)

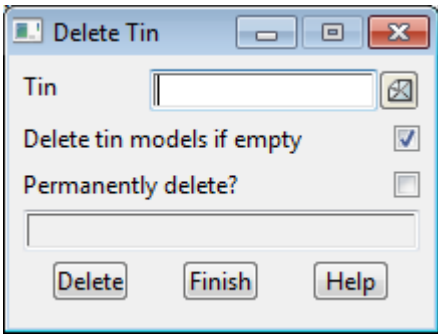
Delete a Tin

Position of option on menu: Tins =>Delete =>Delete a tin

The delete a tin option can be used to delete a tin in the project.

If a **12d Model trash bin** is being used, the deleted tins may be moved to the trash bin rather than deleted from disk (see [Trash Bin](#)).

On selecting the delete a tin option, the delete tin panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin to be deleted from the computer disk.</i>	input		project tins
Delete tin models if empty <i>if ticked then the models containing the tin are also deleted if they are empty after the tin is deleted.</i>	tick box		
Permanently delete <i>if tick, the deleted tins will not go to the trash bin but will be permanently deleted from disk.</i>	tick box		
Delete <i>after selecting this button, the tin given in the tin field will be deleted from the computer disk. A yes-no pop-up is used to confirm that deletion is required.</i>	button		

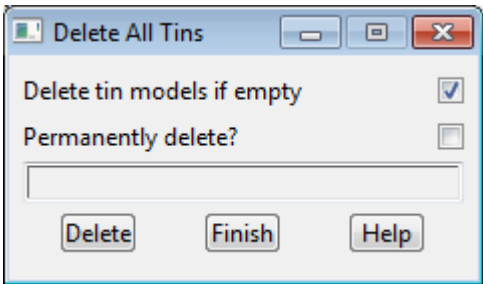
Delete All Tins

Position of option on menu: Tins =>Delete =>Delete all tins

The **delete all** option will delete all tins in the working project. It does not delete tins that are in the working project area but not yet added to the project.

If a **12d Model trash bin** is being used, the deleted tins may be moved to the trash bin rather than deleted from disk (see [Trash Bin](#)).

On selecting the **delete all** option, the **delete all tins** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Delete tin models if empty	tick box		
-----------------------------------	----------	--	--

if ticked then the models containing the tins are also deleted if they are empty after the tins are deleted.

Permanently delete	tick box		
---------------------------	----------	--	--

if ticked, the deleted tins will not go to the trash bin but will be permanently deleted from disk.

Delete	button		
---------------	--------	--	--

*after selecting this button, a **yes-no** pop-up is used to confirm that deletion is required. If it is, all tins in the working project will be deleted from disk. Unless an error occurs, the panel will be removed.*

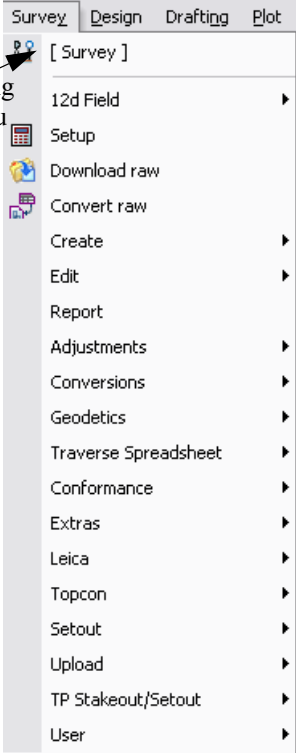
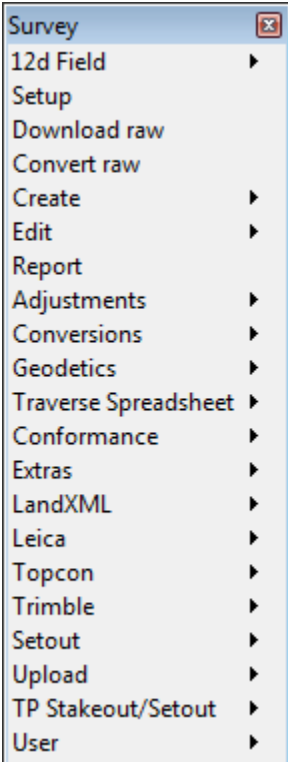
18 Survey

Position of menu: Survey

The Survey walk-right menu is laid out to reflect the normal sequence of operations when handling field survey data.

The description of the options on the Survey menu assumes that the reader is familiar with surveying, the **12d** Model method of field coding for their particular data collector, data collector definitions and the **12d** Model field file.

A description of the **12d** Model field coding and data collector definitions is given in the Appendix [12d Survey Guide](#).

on Main menu	on 12d Model menu and floating Survey menu
 <p>create floating Survey menu</p>	
	<p>12d Field options</p> <p>select data collector (DC)</p> <p>transfer data from DC to 12d field file</p> <p>convert raw DC data to 12d field file</p> <p>create 12d Survey function</p> <p>edit 12d Survey function - text & graphically</p> <p>report on 12d Survey function</p> <p>bowditch, least squares etc.</p> <p>conversion functions</p> <p>Geodetic measure functions</p> <p>traverse spreadsheet functions</p> <p>conformance reporting options</p> <p>extra survey functions - bd entry etc.</p> <p>outputs for Leica instruments</p> <p>outputs for Topcon instruments</p> <p>outputs for Trimble instruments</p> <p>setout macros</p> <p>create upload file & upload to data collectors</p> <p>TP Stakeout/Setout macros</p> <p>Survey User menu</p>

For the option *12d Field*, go to

Setup

Download raw

Convert raw

Create

Edit

Report

Adjustments

Conversions

Geodetics

[12d Field](#)

[Setup](#)

[Download Raw](#)

[Convert Raw](#)

[Create Survey Function](#)

[Edit Survey Function](#)

[Report](#)

[Adjustments](#)

[Conversions](#)

[Geodetic Measures and Entry](#)

<i>Traverse Spreadsheet</i>	<u>Traverse Spreadsheet</u>
<i>Conformance</i>	<u>Conformance</u>
<i>Extras</i>	<u>Extras</u>
<i>Leica</i>	<u>Leica</u>
<i>Topcon</i>	<u>Topcon</u>
<i>Trimble</i>	<u>Trimble</u>
<i>Setout</i>	<u>Setout</u>
<i>Upload</i>	<u>Upload</u>
<i>TP Stakeout/Setout</i>	<u>TP Stakeout/Setout</u>

12d Field

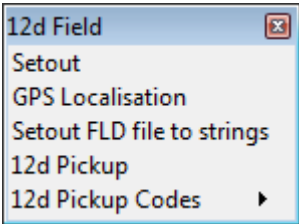
Position of menu: Survey =>12d Field

The **12d Field** module is for communicating directory with survey grade GPS units and Total Station theodolites through radio, blue tooth, Wi-Fi and cable. Survey data is displayed live on screen in conjunction with full road project design and existing surface data.

Because of its specialist nature, the documentation of **12d Field** module is in the **12d Field Training** manual.

The **12d Field** walk-right menu is:

.



For the option <i>Setout</i> , go to	Setout
<i>GPS Localisation</i>	GPS Localisation
<i>Setout FLD file to strings</i>	12dField Setout FLD File To Strings
<i>12d Pickup</i>	
<i>12d Pickup Codes</i>	12d Field Codes

Setout

Position of menu: Survey =>12d Field=>Setout

This section of documentation is a work in progress and will be updated in subsequent releases.

This manual will only refer to the **TPS** and **GPS simulators**, for connection details to actual instruments refer to the supplied 12dField documentation.

TPS

This section of documentation is a work in progress and will be updated in subsequent releases.

For the **TPS Simulator** this is the only panel to enter 12dField. Press **Set** and you will enter 12dField proper.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Instrument

choice box

Select the instrument you wish to use with 12dField, dependent on the instrument selected the panel flow will vary.

Surveyor

Enter the name for the surveyor using 12dField.

*After selecting **Set the 12d Field - Setout TPS Simulator** is displayed on the screen. For more information please go to [12d Field - Setout \(TPS Simulator\)](#)*

Set

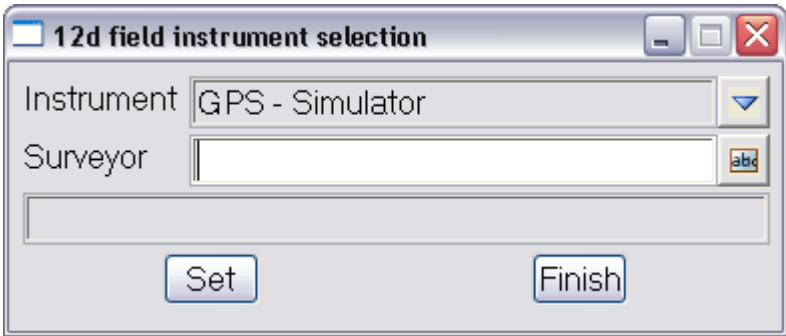
Enter 12dField

GPS

This section of documentation is a work in progress and will be updated in subsequent releases.

For the **GPS-Simulator** 2 more panels are required

Select **GPS-Simulator** from the choice box.



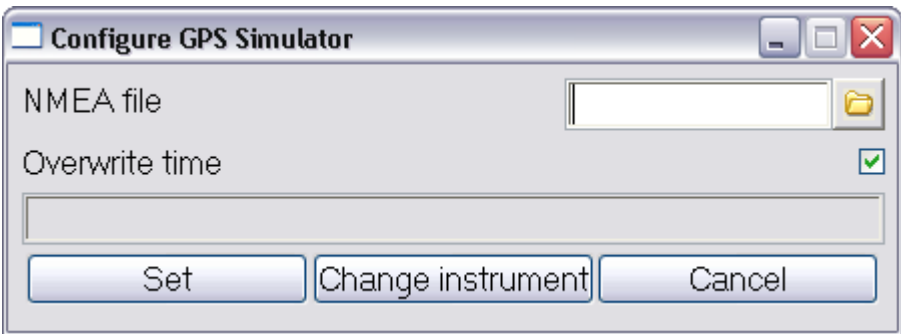
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Instrument	choice box		
<i>Select the instrument you wish to use with 12dField, dependent on the instrument selected the panel flow will vary.</i>			
Surveyor			
<i>Enter the name for the surveyor using 12dField.</i>			
Set			
<i>Brings up the Configure GPS Simulator panel.</i>			

For more information on the **Configure GPS Simulator** panel please go to [Configure GPS Simulator](#)

Configure GPS Simulator

This section of documentation is a work in progress and will be updated in subsequent releases.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

NMEA file folder *.nmea

The GPS simulator needs a NMEA file to run, this can be a file recorded from an actual instrument or constructed from within 12dField itself by 'driving' along an existing string. A default file "Default_LLQ.NMEA" is created automatically for 1st up usage.

Overwrite time tick box

if ticked the time in the NMEA string is ignored and the current computer time used instead.

Set button

proceed to the next panel

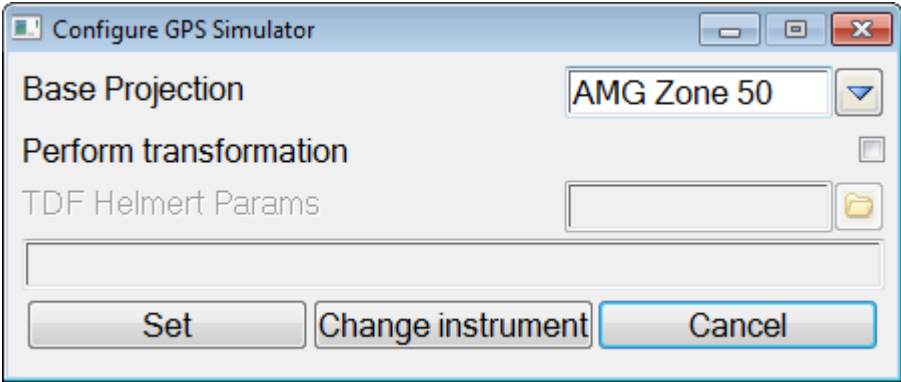
Change instrument button

go back to the instrument selection panel.

Cancel button

exit 12dField

Selecting **Set** displays the next **Configure GPS Simulator** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Base Projection	choice box		
------------------------	------------	--	--

Select the projection to use, these are located in the carto.4d file. This projection is used to convert the WGS84 lat/long/elevation into cartesian coordinates which can be used directly or have a localisation applied to them.

Perform transformation	tick box		
-------------------------------	----------	--	--

if ticked a user defined localisation will be applied to the GPS reading.

12dF Helmert Params

*Select the *.TDF_HEL file containing the transformation details to apply, this file is created with the "GPS Localisation" panel in the main 12dField menu.*

Set	button		
------------	--------	--	--

Enter 12dField

Change instrument	button		
--------------------------	--------	--	--

Go back to the instrument selection panel.

Cancel	button		
---------------	--------	--	--

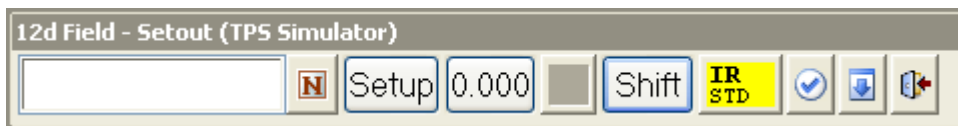
Exit 12dField

*After selecting **Set the 12d Field - Setout GPS Simulator** is displayed on the screen. For more information please go to [12d Field - Setout \(GPS Simulator\)](#)*

12d Field - Setout (TPS Simulator)

This section of documentation is a work in progress and will be updated in subsequent releases.

The control bar has one user definable setting, In the settings panel under the general tab you can toggle on or off whether you want the current string name on the control bar, this is "Str Name on Control Bar", 12dField will need to be restarted for this setting to change.



Names.4d

controls the string details used by 12dField when storing a point, e.g. model/linestyle/weight etc.

Setup

*brings up the **Store Point Setup** panel.*

*For more information on **Store Point Setup** panel, please go to [Store Point Setup](#)*

*brings up the **Target Heights Panel***

*Show the current number of satellites and status, pressing the button brings up the **GPS Status** panel.
In the settings panel the user defines the thresholds for **GPS** errors.*

Shift

is used by 12dField panels to change buttons to add extra functionality.

*Show the current measuring style, pressing brings up the **GPS/TPS settings** panel.*

Select button, for tablet PC, allow selection with a press.

Menu

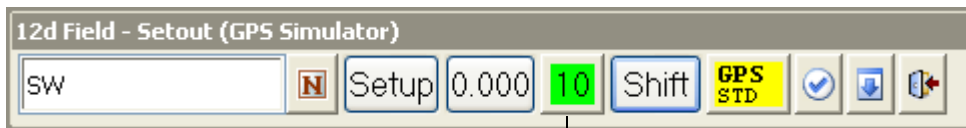
brings up the 12d Field panels menu. For more information please go to [Options](#)

Exit

Exits 12d Field.

12d Field - Setout (GPS Simulator)

This section of documentation is a work in progress and will be updated in subsequent releases.



Selecting this option brings up
the **12d Field - GPS Status** panel.

For information on the **12d Field - GPS Status** panel please go to [12d Field - GPS Status](#)

12d Field - GPS Status

The **12d Field - GPS Status** panel provides information about the current state of the **GPS** instrument such as fix quality and satellites used.

12d Field - GPS Status

Status

Position

GPS Fix Type

RTK

GLN Fix Type

Fix Quality

Good

Tot Sat Count

GPS Sat Count

11

GLN Sat Count

Dilution of precision

Coordinate Quality

0.01

HRMS

VRMS

GPS Latency

GLN Latency

Finish

Help

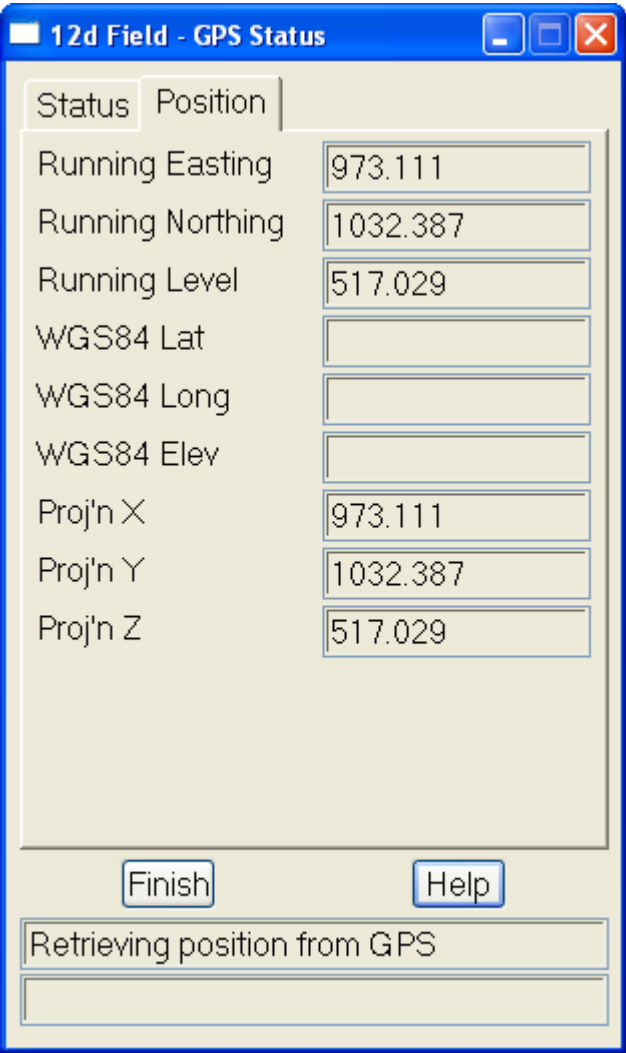
Retrieving position from GPS

Status Tab

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
GPS Fix Type	12dF input box		
<i>The current fix type of the GPS satellites, e.g RTK</i>			
GLN Fix Type	12dF input box		
<i>The current fix type of the Glonass satellites, e.g RTK</i>			
Fix Quality	12dF input box		
<i>The quality of the GPS, Good, Average, Poor no RTK</i>			
Tot Sat Count	12dF long box		
<i>The number of GPS & Glonass satellites</i>			

GPS Sat Count	12dF long box
<i>The number of GPS satellites</i>	
GLN Sat Count	12dF long box
<i>The number of Glonass satellites</i>	
Dilution of precision	12dF double box
<i>The current dilution of precision</i>	
Coordinate Quality	12dF double box
<i>Leica specific coordinate quality</i>	
HRMS	12dF double box
<i>Horizontal Root Mean Square value</i>	
VRMS	12dF double box
<i>Vertical Root Mean Square value</i>	
GPS Latency	12dF double box
<i>The latency of the measurements from the GPS satellites.</i>	
GLN Latency	12dF double box
<i>The latency of the measurements from the Glonass satellites.</i>	



Position Tab

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Running Easting	12dF double box		
<i>The current easting of the GPS.</i>			
Running Northing	12dF double box		
<i>The current northing of the GPS.</i>			
Running Level	12dF double box		
<i>The current level of the GPS.</i>			
WGS84 Lat	12dF angle box		
<i>The WGS84 latitude of the running measurement.</i>			
WGS84 Long	12dF angle box		
<i>The WGS84 longitude of the running measurement.</i>			

WGS84 Elev 1 12dF double box

The WGS84 elevation of the running measurement.

Proj'n X 12dF double box

The WGS84 cartesian X of the running measurement.

Proj'n Y 12dF double box

The WGS84 cartesian Y of the running measurement.

Proj'n Z 12dF double box

The WGS84 cartesian Z of the running measurement.

Store Point Setup

The **12d Field - Store Point Setup** panel is called up the 1st time a user attempts to store a point to a model in a 12dField setout panel or if the user presses the **Setup** button on the 12dField control bar.

This panel must be validly completed before a point can be stored.

The panel is grouped into 4 separate areas each described below.

12d Field - Store Point Setup

Model/string settings

Name

Model

Point/Line type

Colour

Linestyle

Weight

Pre*postfix for models

FLD backup files

File names from

File name

FLD settings

Surveyor

Description

Lot Number

Category

Vertex Id settings

Pickup Id Type

Pickup Id

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Model/string settings

These settings work the same as your typical 12d settings work, they control the look of the stored string in the model.

Name

enter the name of the string to be stored manually or from the pop up select a predefined name (from

names.4d) which will also populate the other settings.

Model	model box	
	the model to store the string in. (This model will automatically be added to your defined 12dField plan view)	
Point/Line type	choice box	Point, Line
	whether the string is a point or line string.	
Colour	colour box	
	the colour of the string.	
Linestyle		
	linestyle of the string	
Weight		
	the thickness of the string.	
Same as	button	
	select an existing point/line and the fields will set to it's properties.	
Pre*postfix for models		
	if non blank the pre-postfix will be applied to the nominal model when storing the point.	

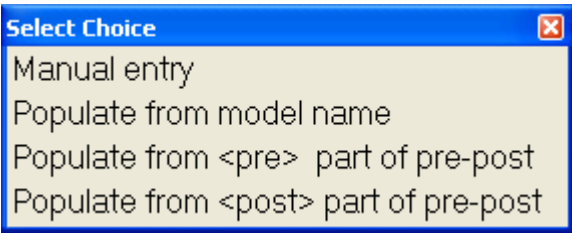
FLD backup files

All 12dField points are stored to a FLD file as well as a model. This is done for backup reasons as every shot is stored to the FLD file on disk when a shot is taken ensuring no data should be lost in the event of an unexpected shutdown of 12d.

The 12dField files have sufficient attributes in them that they can be read directly back into 12d without going through the survey data reduction functions.

File names from

Manual Entry, Populate from model name, Populate from <pre> part of pre post, Populate from <post> part of pre-post



Manual Entry - enter the name of the file in the **File name** box.
Populate from model name - the name of the model in the **model box** is used as the file name.
Populate from <pre> part of pre-post - the name of the file is the pre part.
Populate from <post> part of pre-post - the name of the file is the post part.

For example a surveyor might enter a model name of "Asphalt Conformance" in the **model box**. They then for a pre fix enter the year month and day and their initials "20113006MG " and they select "**Populate from model name**" for the FLD file name.
The model and field file written will be "20113006MG Asphalt Conformance"

FLD Settings

Surveyor

the name of the surveyor

Description

a description of the survey (Populated from 12dF_JOB_DESCRIPTIONS.4D)

Lot number

a lot number of the survey (Populated from 12dF_JOB_LOT_NUMBERS.4D)

Category

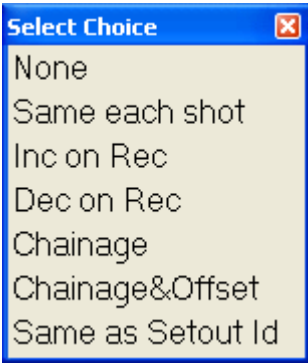
the category of the survey (Populated from 12dF_JOB_CATEGORIES.4D)

Vertex Id settings

This choice box controls the way the id of each vertex in the string is written.

Pickup Id Type

None, Same each shot,
Inc on Rec, Dec on Rec,
Chainage, Chainage&Offset.
Same as Setout Id



None - no vertex id is written.
*Same each shot - the value in the **Pickup Id** box will be used for all points stored.*
*Inc on Rec - the value in the **Pickup Id** box will be used for the next point stored then incremented.*
*Dec on Rec - the value in the **Pickup Id** box will be used for the next point stored then decremented.*
Chainage - the chainage of the point being stored will be used as it's vertex id.
Chainage&Offset - the chainage and offset of the point being stored will be used as it's vertex id.
Same as Setout Id - the vertex id of the point being setout will be used.

Notes on the incrementing of the Id.
The id is alphanumeric and the number of characters does not change. The increment/decrement applies to the either the numeric or alpha ending of the id, not to a combination of both.

Increment examples 1->2, 9->0, A1>A2, A9->A0, AA->AB, AZ->BA,
S099->S100, S999->S000
Decrement examples 6->5, 0->9, A2>A1, A0->A9, AB->AA, AA->ZZ,
S100->S099, S000->S999

Pickup Id

This is the id of the next vertex to be stored

Cancel

button

if cancel is pressed the panel will close but the next time a point is stored it will open again.

Finish

button

if the panel validates correctly it will close and the point will be stored. The panel will only open again if called manually from the control bar or a new setout is started.

Options

This section of documentation is a work in progress and will be updated in subsequent releases.



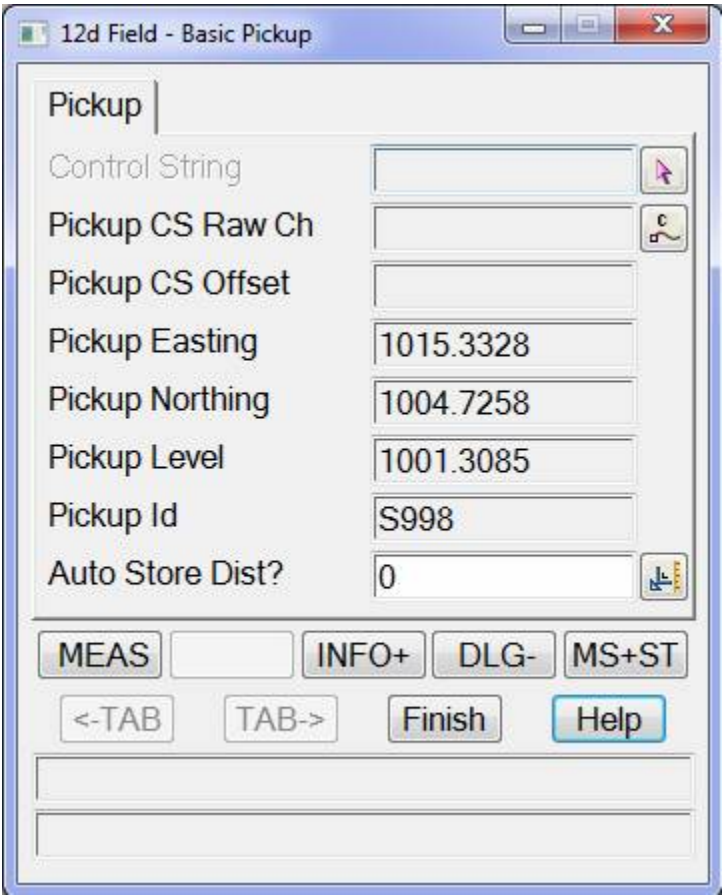
For the option <i>Single String Setout</i> , go to	Single String Setout
<i>Batter Setout</i>	Batter Setout
<i>Basic Pickup</i>	12d Field -Basic Pickup
<i>Tin Setout</i>	Tin Setout
<i>Crossfall Setout</i>	Crossfall Setout
<i>Point Setout</i>	Point Setout
<i>Grid Setout</i>	Grid Setout
<i>Crown Setout</i>	Crown Setout
<i>Tunnel Definition</i>	Tunnel Definition
<i>Tunnel Setout</i>	Tunnel Setout
<i>Station Helmert</i>	Station Helmert
<i>Station Standard</i>	Station Standard
<i>Check Shot</i>	Check Shot
<i>Position TPS</i>	Position TPS
<i>Joystick TPS</i>	Joystick TPS

Status TPS	Status TPS
Locate Prism TPS	Locate Prism TPS
Simulator settings	Simulator Settings
Settings	Settings
Reconnect	Reconnect

Common Measurement Buttons

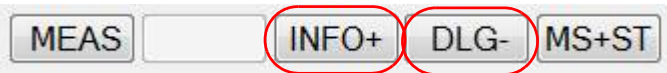
A description of the common measurement buttons on 12dField Setout panels is described below.

The measurement buttons are on a dialog as such:



The INFO and DLG buttons

These buttons do not change in behaviour between all of the different measure modes.

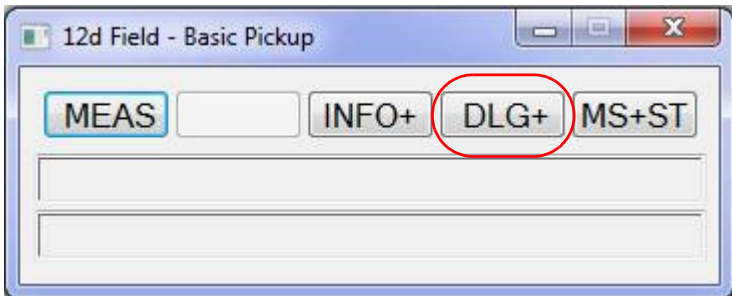


INFO+

Displays the information panel, this panel contains extra information about the current setout that is not displayed in the standard panel, the contents of the information panel is user configurable via the text file 12dF_INFO_PAGE_CONFIG4D. When the information panel is active the button changes to INFO-.

DLG-

When pressed the dialog minimises to maximise the screen area, the button changes to **DLG+** which when pressed will bring the panel back to full size.



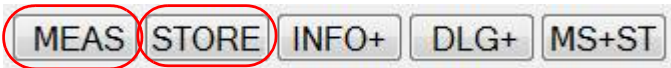
Single (GPS/TPS) and Multiface (TPS only) measurement modes.

The **MEAS** button.



MEAS

Starts the measurement, on completion the button state changes to this



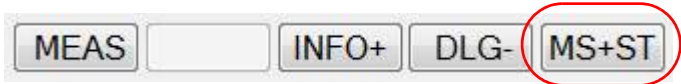
MEAS

Start another measurement.

STORE

Store the point as per the settings in the [Store Point Setup](#) panel, the first store of a point brings this panel up automatically. Once stored the **STORE** button will be blanked out until a new measurement is taken.

The **MS+ST** button



MS+ST

Starts a measurement and stores the point as per the settings in the [Store Point Setup](#) panel. The **STORE** button remains disabled.

Continuous (GPS/TPS) measurement mode



In continuous mode the **MS+ST** button is disabled.

MEAS

Start continuous measurement



STOP

*Stop the continuous measurement, the **STORE** button will remain active until pressed. When the point is stored the button is disabled until a new measurement is started.*

STORE

Store the point as per the settings in the [Store Point Setup](#) panel, the button state does not change meaning the user can continue to move storing points at a single press of the button.

Averaging measurement mode (GPS only)

In averaging mode the **MS+ST** button is disabled.



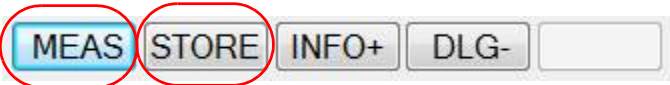
MEAS

Start the averaging measurement, the details of the averaging, std deviations xy&z are displayed in the 3rd message line of the dialog.



STOP

Stop the averaging measurement.



MEAS

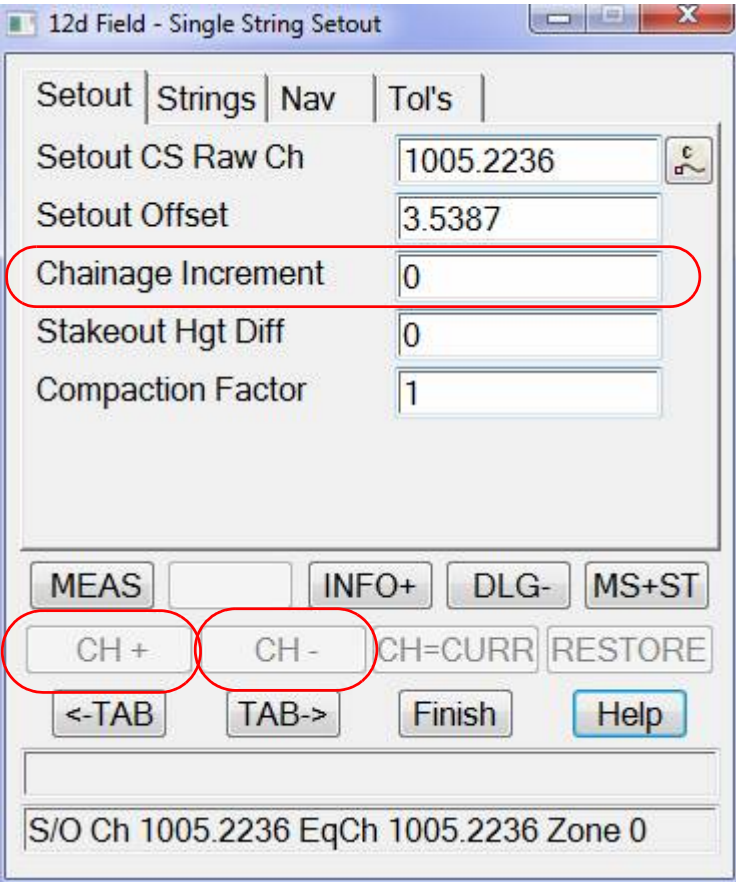
Start a new averaging measurement.

STORE

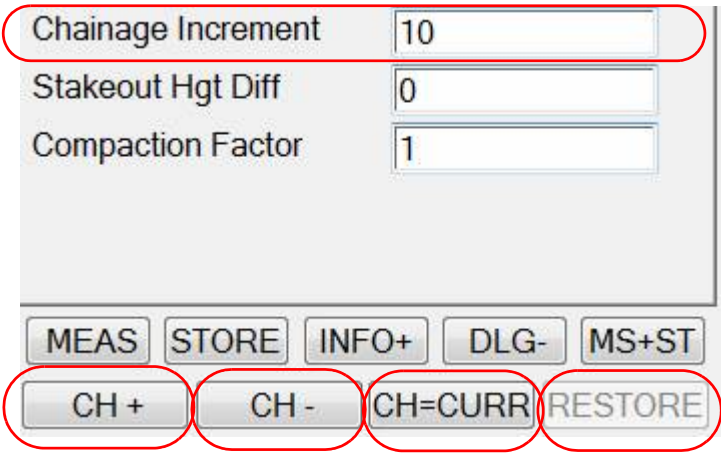
Store the point as per the settings in the [Store Point Setup](#) panel.

The Chainage Buttons

The chainage buttons commonly appear as the middle row of buttons in a 12dField setout panel.



The **CH+** and **CH-** buttons are used to quickly increment to the next chainage to be setout, the buttons are activated when the **Chainage Increment** field in the panel has a value other than 0.



CH+

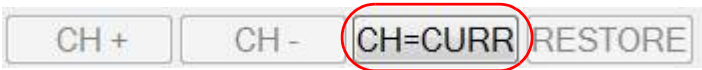
When pressed the value in the **Chainage Increment** field is added to the current setout chainage. The value in **Chainage Increment** field can be +ve or -ve.

CH-

When pressed the value in the **Chainage Increment** field is subtracted from the current setout chainage. The value in **Chainage Increment** field can be +ve or -ve.

The **CH=CURR** and **RESTORE** buttons are used for where the user has a need to temporarily

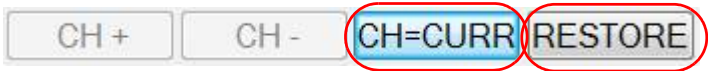
use the current chainage for setout purposes.



CH=CURR

The button is activated when a measurement has been taken.

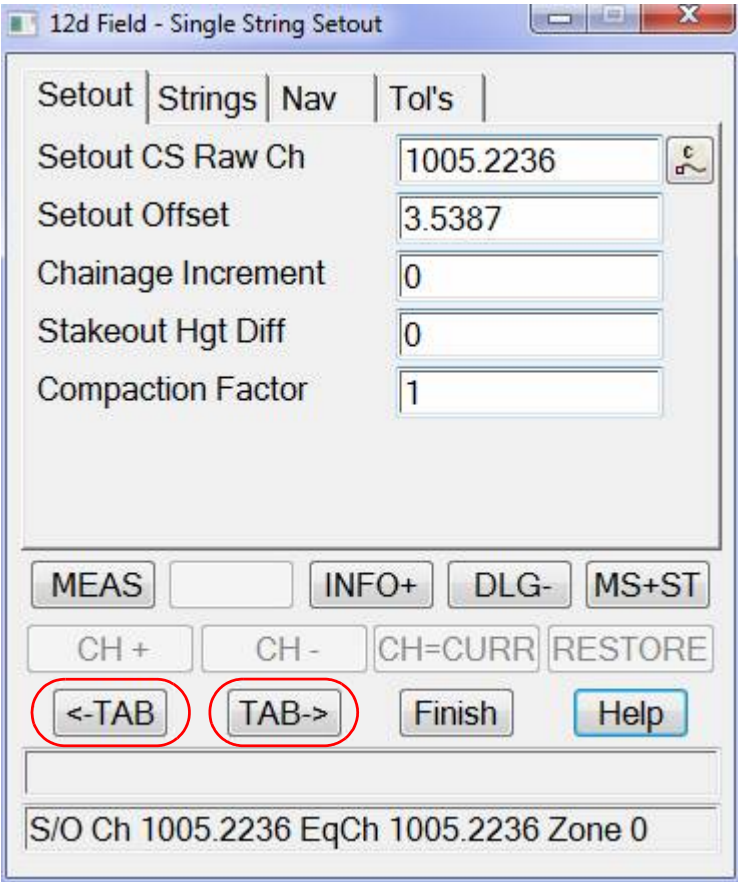
*When pressed the setout chainage is set to the current chainage, the **RESTORE** button is then activated and the **CH+** and **CH-** buttons disabled.*



RESTORE

*When pressed the setout chainage is set back to the chainage when **CH=CURR** was pressed and the **CH+** **CH-** buttons enabled if possible.*

The Bottom Button Row.



<-TAB

changes the active tab in the setout panel to the next left.

TAB->

changes the active tab in the setout panel to the next right.

The **<-TAB** and **TAB->** keys can be overwritten for special user behaviour.

Overwriting the **<-TAB** and **TAB->** keys.

The functionality of the TAB keys can be defined in "**12dF_DLG_USER_KEYS.4D**".

The file allows the user to enter the text for the key and the functionality for the key to take on.

"bt_tab_left" "P2d" "tps_position_hz"

"bt_tab_right" "P XY" "tps_position_xy"

The 1st field is the keyword for the button to override.

The 2nd field is the text for the button to override.

The 3rd field is the action for the button to perform, any of the 12dField hot keys defined in "**12dF_USER_KEYS.4D**" can be assigned.

Single String Setout

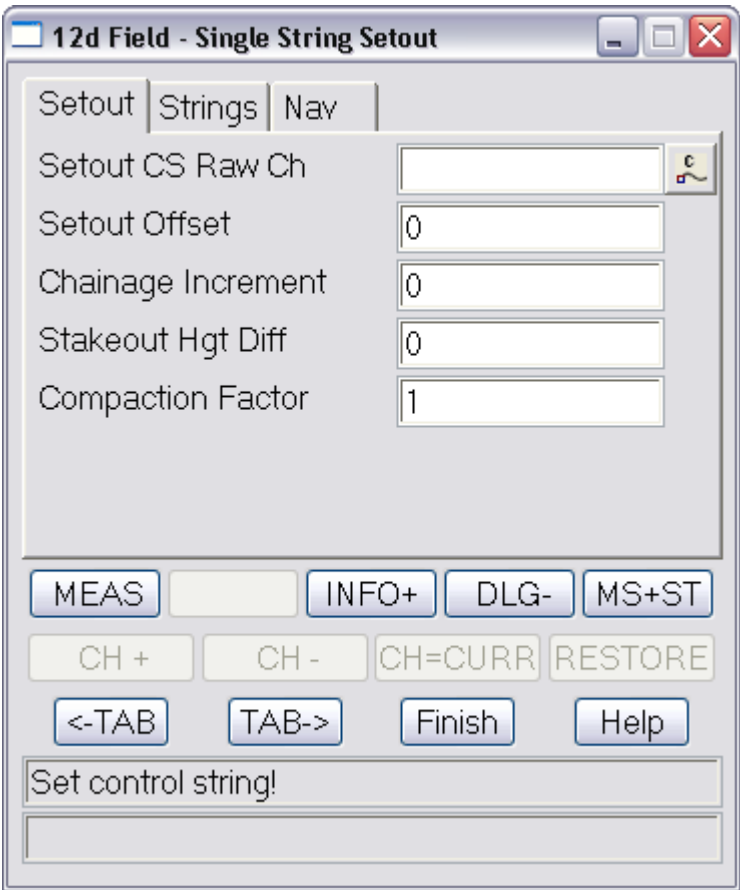
The **12d Field Single String Setout** panel is used when the setout point is relative both horizontally and vertically to one string, for example a traffic island or kerb and gutter.

Single string setout works by dropping a point to a nominated control string, then the setout string is cut normal to the dropped point on the control string.

When setting out the setout string is cut normal from a point at the setout chainage on the control string, then the setout offset is then applied from here to create the setout point.

Note the control string and the setout string could be the same string or all different, this dependant on the task being performed.

Selecting the **Single String Setout** option brings up the **12d Field - Single String Setout** panel.



Setout Tab

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Setout CS Raw Ch	12dF chainage box		
<i>The raw, no equalities setout chainage on the control string, start chainage plus distance along string</i>			

Setout Offset	12dF double box		
<i>The offset from the setout string to setout, +ve is to the right of the string, -ve left</i>			

Chainage Increment	12dF double box		
<i>The value the setout chainage will be changed by when chainage increment/decrement is called.</i>			

Stakeout Hgt Diff	12dF double box		
<i>The height diff from the setout surface/string. +ve is above.</i>			

Compaction Factor	12dF double box		
<i>A compaction factor applied to the delta heights, e.g. if you know say asphalt will compact by 23% and you need to cover this enter the value as 1.23. (Note this widget is optional and only appears if activated in the Settings panel).</i>			

Buttons

MEAS	button
<i>Start a measurement, the behaviour is determined by the TPS/GPS measurement setting set from the</i>	

control bar.

INFO+ button

Display the user configurable information panel to view extra information not available on the standard dialog.

DLG- button

Minimises the dialog so only the first 2 rows of buttons are shown.

MS+ST button

Start a measurement and store it on completion.

CH + button

Increment the setout chainage by the value in the chainage increment field.

CH - button

Decrement the setout chainage by the value in the chainage increment field.

CH=CURR button

Set the setout chainage to the chainage of the last measured point.

RESTORE button

*Restore the setout chainage to the chainage prior to the "**CH=CURR**" button being pressed.*

<-TAB button

Go to the previous tab in the dialog.

TAB-> button

Go to the next tab in the dialog.

DLG+ button

Restore a minimised panel to it's full size.

INFO- button

Close the user configurable information panel.

Nav P button

Load a saved navigation page configuration.

Sh M button

Start a measurement with a touch on the screen.

Sh M+S button

Start a measurement with a touch on the screen, store it on completion.

READ button

Load previously saved setout settings for reuse.

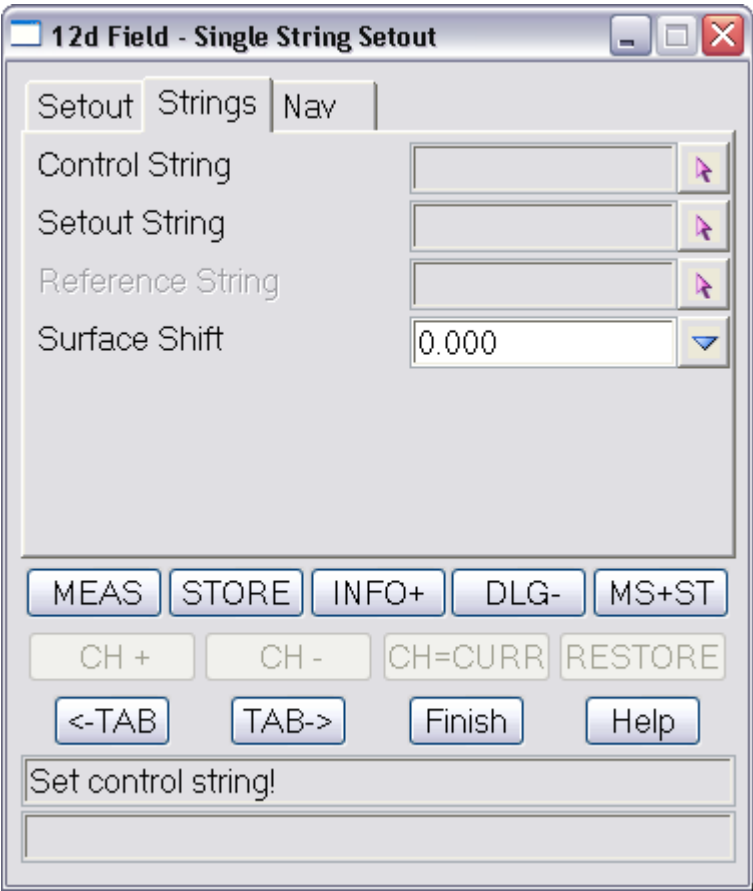
SAVE button

Save the current setout settings for reuse at a later date.

STOP button

Stop the measurement in process.

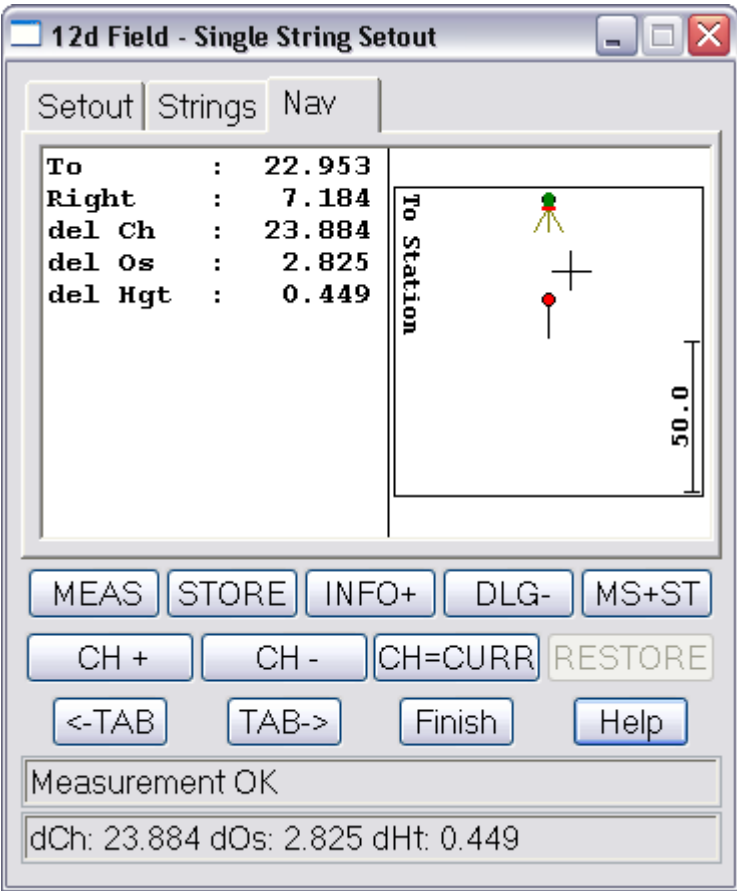
STORE button
Store the last measured point.



Strings Tab

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Control String	12dF string select box		
<i>Control string, the string to which the other strings are cut normal to for calculations.</i>			
Setout String	12dF string select box		
<i>Setout String, setout offset & heights are relative to this string at a point cut normal from the setout chainage on the control string/centreline</i>			
Reference String	12dF string select box		
<i>Reference string, a string to which the current point is dropped normally to for information only.</i>			
Surface Shift	choice box		-0.0000
<i>A vertical shift to be applied to the design level, +ve raises the level, can be manually entered or selected from the choice list, (defined in “TDF_SURFACE_SHIFTS.4D”)</i>			



Nav Tab

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Navigation Box		draw box	

The 12d Field navigation box augments setout by displaying user definable information rows plus a bulls-eye as a visual aid.

Batter Setout

The **12d - Field Batter Setout** panel is used to dynamically locate the intersection point of a slope defined by the cut of 2 strings and the natural surface at the users current position. It is designed around the user wishing to place batter rails in place for guiding the cut/fill.

Note, unlike other string setout routines the batter setout does not have a setout string, just the control string and the 2 design strings.

The user is able to set a shift to move the design surface up or down once the strings are cut. There are manual modes available for setting the design slope when 2 strings are not able to be cut.

Batter setout works by dropping a point to a nominated control string, the 2 strings used to determine the slope are cut normal to the dropped point on the control string, the delta offset for the pole is dependant on the users height rather than a setout string.

Selecting the **Batter Setout** option brings up the **12d - Field Batter Setout** panel.



Setout Tab

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Setout CS Raw Ch	12dF chainage box		
<i>The raw, no equalities setout chainage on the control string, start chainage plus distance along string</i>			

Chainage Increment	12dF double box		
<i>The value the setout chainage will be changed by when chainage increment/decrement is called.</i>			

Hgt Rail over Batter	12dF double box		
<i>The height of the batter rail above the design batter, say 0.1 for cut and 1.0 for fill.</i>			

Hgt Rail over Ground	12dF double box		
<i>The height of the batter rail above the natural ground, typically as large as number as possible to get the rail away from the top/toe of the batter.</i>			

Compaction Factor	12dF double box		
<i>A compaction factor applied to the delta heights, e.g. if you know say asphalt will compact by 23% and you need to cover this enter the value as 1.23. (Note this widget is optional and only appears if activated the Settings panel.)</i>			

Buttons

MEAS	button
-------------	--------

*Start a measurement, the behaviour is determined by the **TPS/GPS** measurement setting set from the control bar.*

INFO+ button

Display the user configurable information panel to view extra information not available on the standard dialog

DLG- button

Minimises the dialog so only the first 2 rows of buttons are shown.

MS+ST button

Start a measurement and store it on completion.

CH + button

Increment the setout chainage by the value in the chainage increment field.

CH - button

Decrement the setout chainage by the value in the chainage increment field.

CH=CURR button

Set the setout chainage to the chainage of the last measured point.

RESTORE button

*Restore the setout chainage to the chainage prior to the "**CH=CURR**" button being pressed.*

<-TAB button

Go to the previous tab in the dialog.

TAB-> button

Go to the next tab in the dialog.

STOP button

Stop the measurement in process.

STORE button

Store the last measured point.

Nav P button

Load a saved navigation page configuration.

Sh M button

Start a measurement with a touch on the screen.

Sh M+S button

Start a measurement with a touch on the screen, store it on completion.

READ button

Load previously saved setout settings for reuse.

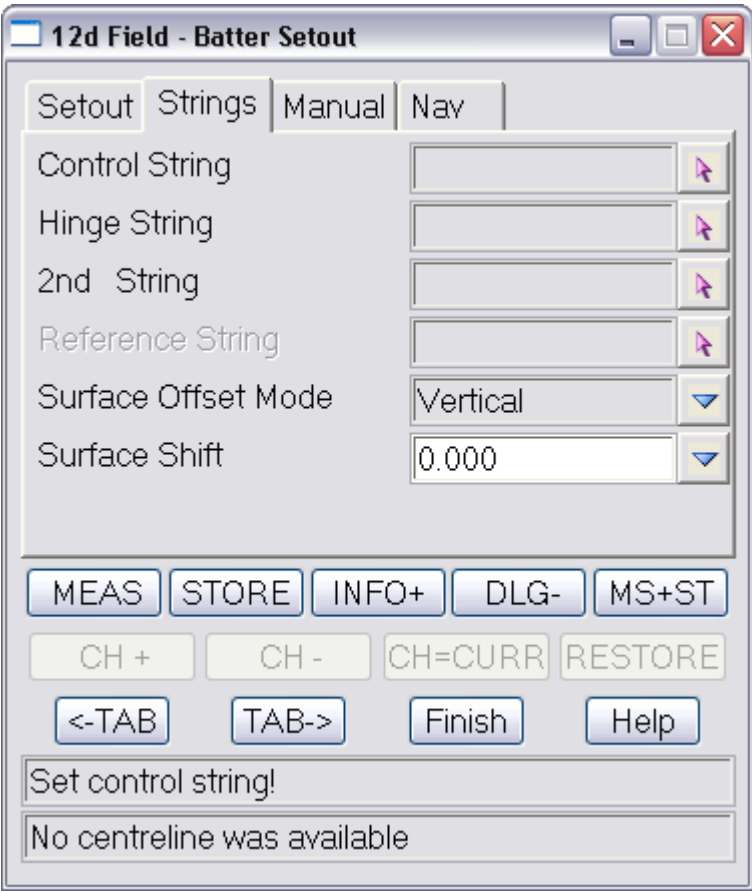
SAVE button

Save the current setout settings for reuse at a later date.

DLG+ button

Restore a minimised panel to it's full size.

INFO- button
Close the user configurable information panel.



Strings Tab

The fields and buttons used in this panel have the following functions.

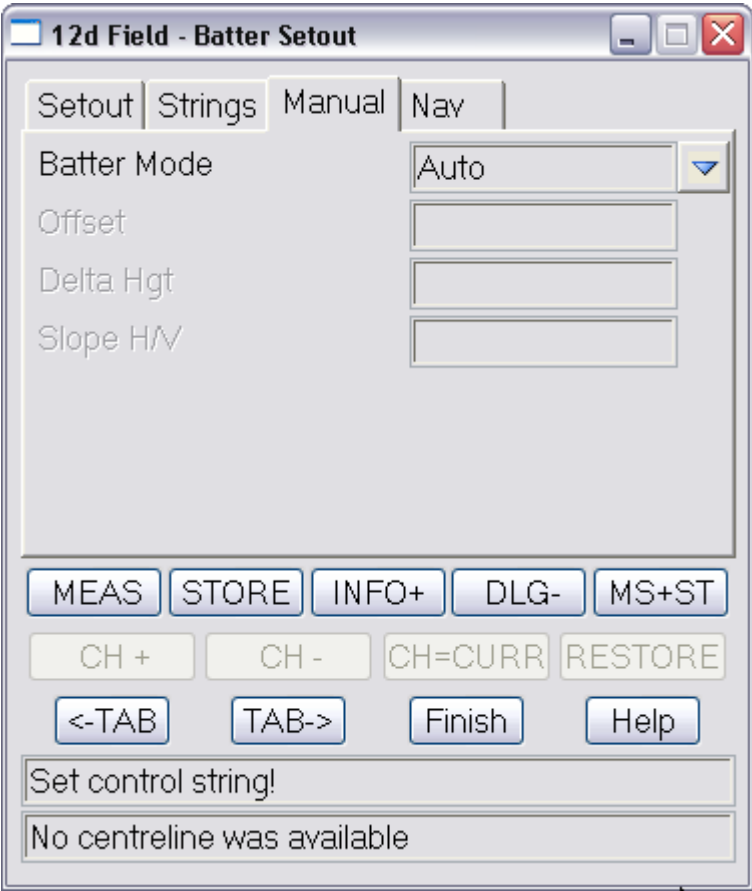
Field Description	Type	Defaults	Pop-Up
Control String	12dF string select box		
<i>Control string, the string to which the other strings are cut normal to for calculations.</i>			
Hinge String	12dF string select box		
<i>The hinge string is the string the batter is being cut or filled to. Slope distances etc. are given to this string.</i>			
2nd String	12dF string select box		
<i>The other string along with the hinge string defining the batter slope.</i>			
Reference String	12dF string select box		
<i>Reference string, a string to which the current point is dropped normally to for information only.</i>			
Surface Offset Mode	choice box		vertical, normal
<i>Whether the offset to the surface is normal or vertical</i>			
Vertical: The height offset is applied vertically to the design slope.			
Normal: The height offset is applied normal/perpendicular to the design slope.			

Surface Shift

choice box

0.000

A vertical shift to be applied to the design level, +ve raises the level, can be manually entered or selected from the choice list, (defined in “*TDF_SURFACE_SHIFTS.4D*”)



Manual Tab

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Batter Mode	choice box		Auto Centreline, hinge & slope Manual relative (dOS&dHgt), Manual absolute (dOS&RL) Manual, use current slope

Choose the method to generate the batter slope.

Auto: The batter slope is determined by cutting the hinge and secondary string.

Centreline, hinge & slope: The batter setout is done by cutting the hinge and applying a manually entered slope from this.

Manual relative (dOS&dHgt): The user manually enters the hinge offset from the control line, the hinge height relative to the control line and the batter slope.

Manual absolute (dOS&RL): The user manually enters the hinge offset from the control line, the absolute hinge height and the batter slope.

Manual, use current slope: The batter setout is done by cutting the hinge and applying the last

measured slope.

Offset 12dF double box

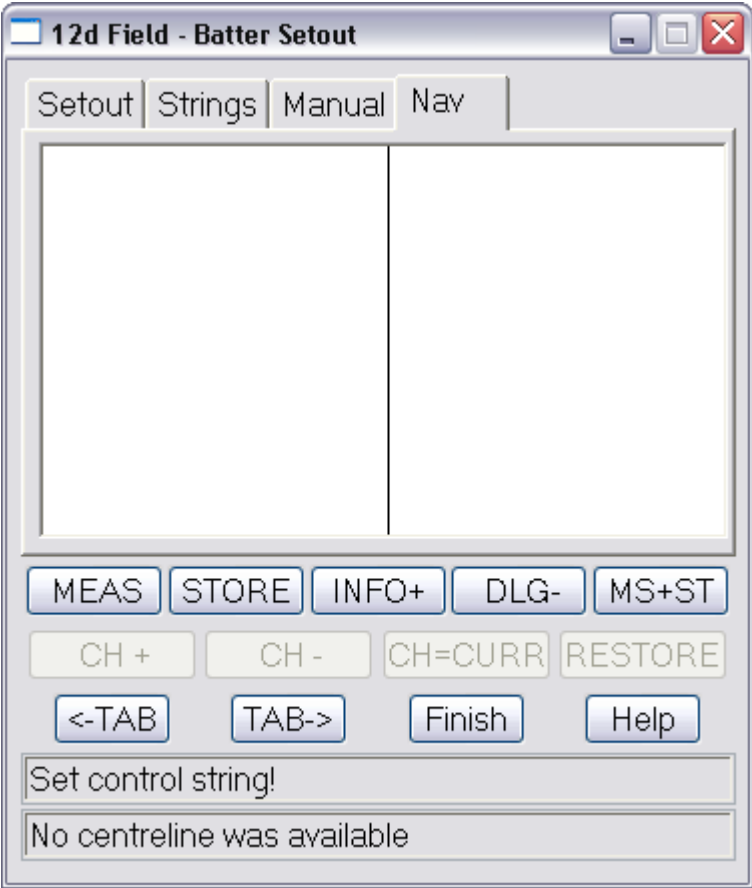
Dependant on the '**Batter Mode**' setting in use, see description of the options in '**Batter Mode**'.

Delta Hgt/Absolute Height 12dF double box

Dependant on the '**Batter Mode**' setting in use, see description of the options in '**Batter Mode**'.

Slope H/V 12dF double box

The slope of the batter in horizontal/vertical from, e.g. 2:1



Nav Tab

The fields and buttons used in this panel have the following functions.

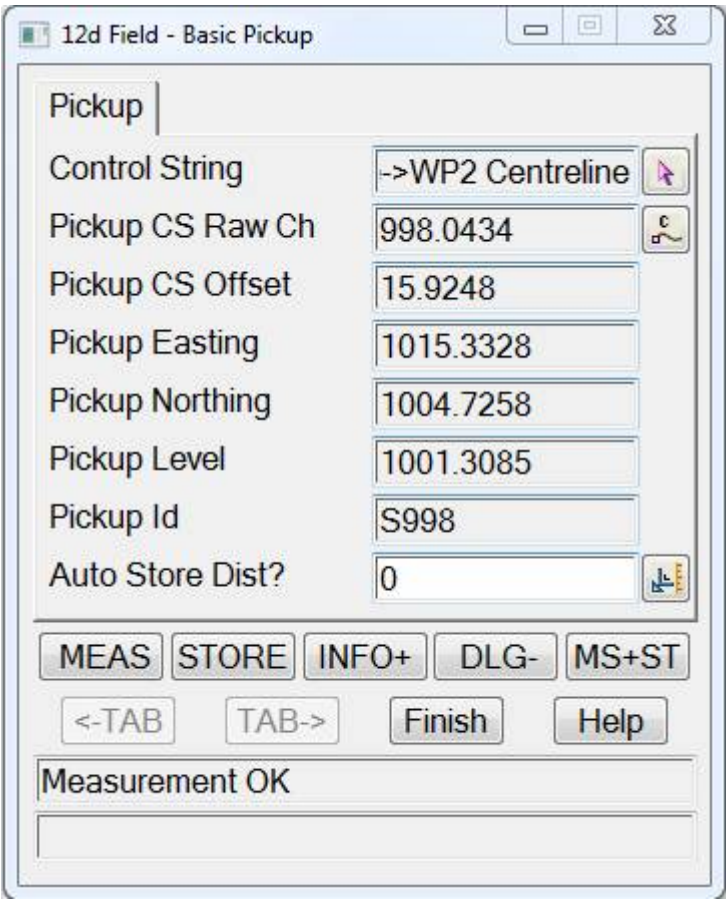
Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Navigation Box	draw box		
-----------------------	----------	--	--

The 12d Field navigation box augments setout by displaying user definable information rows plus a bulls-eye as a visual aid.

12d Field -Basic Pickup

The **12d Field - Basic Pickup** panel enables the user to pickup and store points. Basic Pickup is only for points and simple lines, it has no edit facilities, recalculations for target height corrections etc.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Control String	12dF string select box		
<i>If selected the chainage and offset of the current point on this string will be displayed.</i>			

Pickup CS Raw Ch	12dF chainage box		
<i>The raw/non equality chainage of the current point on the control string.</i>			

Pickup CS Offset	12dF double box		
<i>The offset of the current point from the control string, +ve is right</i>			

Pickup Easting	12dF double box		
<i>The measured easting.</i>			

Pickup Northing	12dF double box		
<i>The measured northing.</i>			

Pickup Level	12dF double box		
<i>The measured level.</i>			

Pickup Id 12dF input box

The Id of the measured point, the behaviour of the Id is controlled from the [Store Point Setup](#) panel.

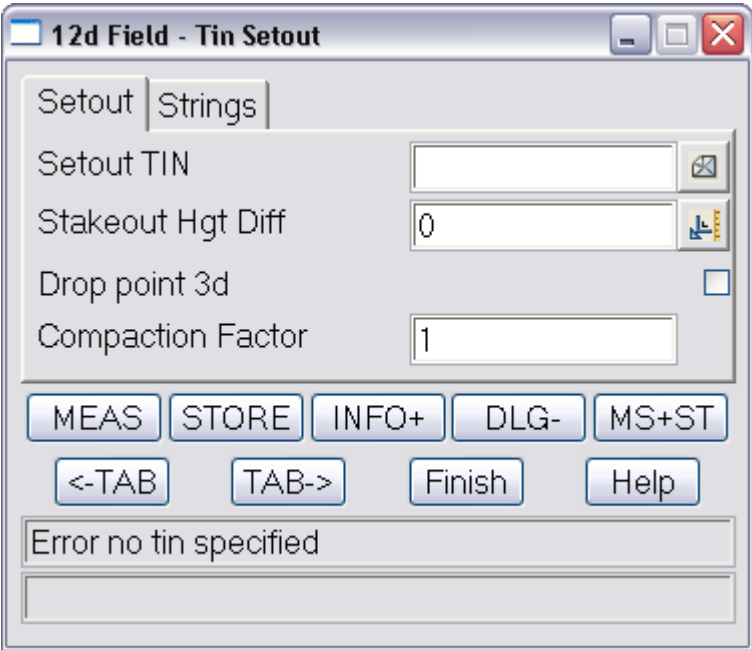
Auto Store Dist? 12dF double box

If non zero the distance between shots to automatically store points, the measurement mode must be continuous.

Please see [Common Measurement Buttons](#) for information on the buttons.

Tin Setout

The **12d Field - Tin Setout** panel is used when the user needs to get design levels from a tin. The point can be dropped either vertically to the tin or 3d/normal to the tin. Selecting the **Tin Setout** option brings up the **12d Field - Tin Setout** panel.



Setout Tab

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Setout TIN	12dF tin box		
-------------------	--------------	--	--

The TIN to use for setting out

Stakeout Hgt Diff	12dF double box		
--------------------------	-----------------	--	--

The height diff from the setout surface/string. +ve is above.

Drop point 3d	named tick box		
----------------------	----------------	--	--

When this is toggled on the point is dropped normal to the tin.

In the event the point cannot be dropped to triangle face it will try drop to the edge of a triangle that lies inside the 2d boundary of the tin.

Compaction Factor	12dF double box		
--------------------------	-----------------	--	--

A compaction factor applied to the delta heights, e.g. if you know say asphalt will compact by 23% and you need to cover this enter the value as 1.23. (Note this widget is optional and only appears if activated in the Settings panel).

Buttons

MEAS button

Start a measurement, the behaviour is determined by the TPS/GPS measurement setting set from the control bar.

INFO+ button

Display the user configurable information panel to view extra information not available on the standard dialog

DLG- button

Minimises the dialog so only the first 2 rows of buttons are shown.

MS+ST button

Start a measurement and store it on completion.

<-TAB button

Go to the previous tab in the dialog.

TAB-> button

Go to the next tab in the dialog.

STOP button

Stop the measurement in process.

STORE button

Store the last measured point.

Nav P button

Load a saved navigation page configuration.

Sh M button

Start a measurement with a touch on the screen.

Sh M+S button

Start a measurement with a touch on the screen, store it on completion.

READ button

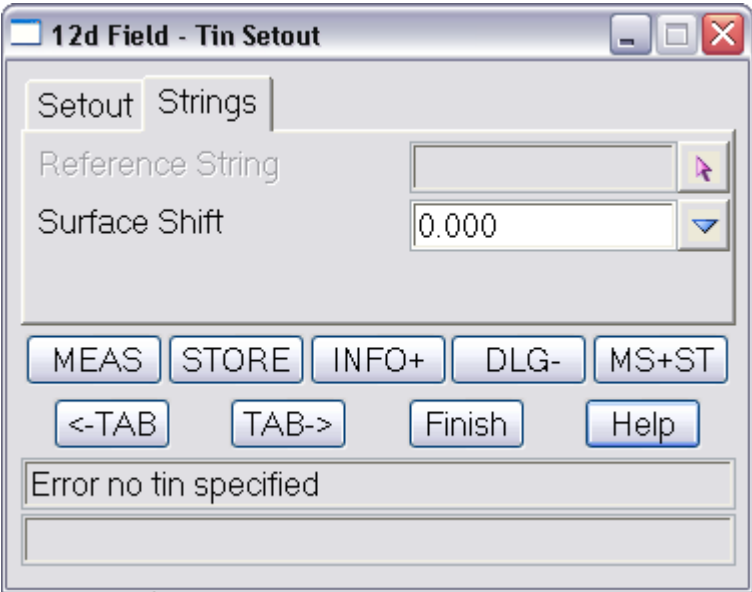
Load previously saved setout settings for reuse.

SAVE button

Save the current setout settings for reuse at a later date.

INFO- button

Close the user configurable information panel.



Strings Tab

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Reference String	12dF string select box		
<i>Reference string, a string to which the current point is dropped normally to for information only.</i>			
Surface Shift	choice box	0.000	
<i>A vertical shift to be applied to the design level, +ve raises the level, can be manually entered or selected from the choice list, (defined in “TDF_SURFACE_SHIFTS.4D”)</i>			

Crossfall Setout

The **12d Field - Crossfall Setout** panel is used when the user wants to generate their design height by cutting 2 strings and projecting the plane of the cuts to their position.

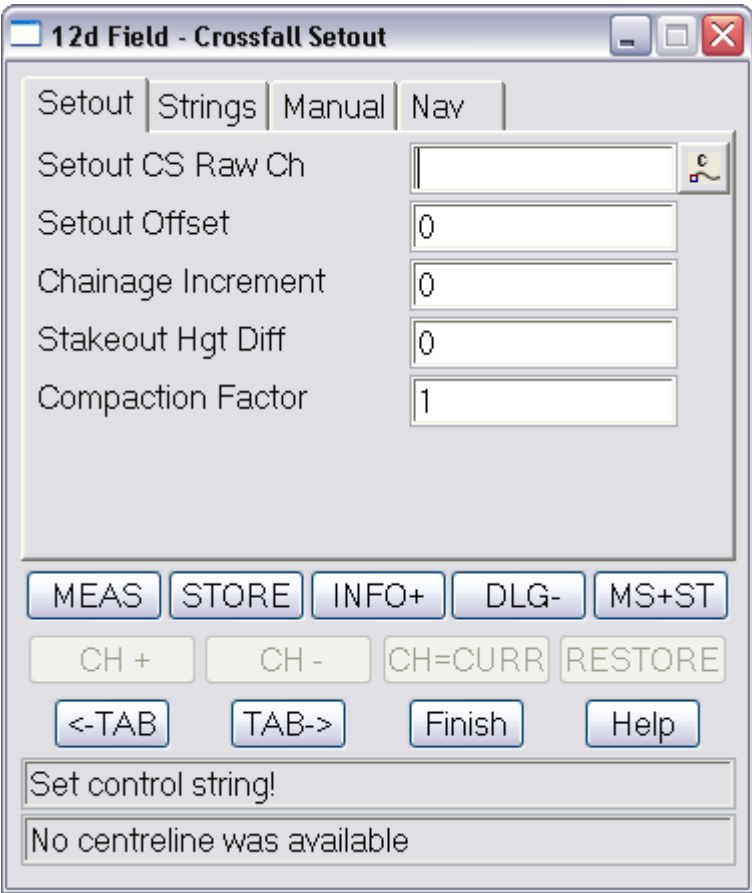
The user is able to set a shift to move the design surface up or down once the strings are cut.

There are manual modes available of setting the design crossfall when 2 strings are not able to be cut.

Crossfall Setout works by dropping a point to a nominated control string, then a setout string and the 2 strings used to determine the crossfall are cut normal to the dropped point on the control string.

Note the control string, the setout string and 1 of the level strings could be the same string or all different, this dependant on the task being performed.

Selecting the **Crossfall Setout** option brings up the **12d Field - Crossfall Setout** panel.



Setout Tab

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Setout CS Raw Ch	12dF chainage box		
<i>The raw, no equalities setout chainage on the control string, start chainage plus distance along string</i>			

Setout Offset	12dF double box		
<i>The offset from the setout string to setout, +ve is to the right of the string, -ve left</i>			

Chainage Increment	12dF double box		
<i>Chainage Increment</i>			

Stakeout Hgt Diff	12dF double box		
<i>The height diff from the setout surface/string. +ve is above.</i>			

Compaction Factor	12dF double box		
<i>A Compaction Factor applied to the delta heights, e.g. if you know say asphalt will compact by 23% and you need to cover this enter the value as 1.23. (Note this widget is optional and only appears if activated in the Settings panel).</i>			

Buttons

MEAS	button
-------------	--------

Start a measurement, the behaviour is determined by the TPS/GPS measurement setting set from the

control bar.

INFO+ button

Display the user configurable information panel to view extra information not available on the standard dialog

DLG- button

Minimises the dialog so only the first 2 rows of buttons are shown.

MS+ST button

Start a measurement and store it on completion.

CH + button

Increment the setout chainage by the value in the chainage increment field.

CH - button

Decrement the setout chainage by the value in the chainage increment field.

CH=CURR button

Set the setout chainage to the chainage of the last measured point.

RESTORE button

*Restore the setout chainage to the chainage prior to the "**CH=CURR**" button being pressed.*

<-TAB button

Go to the previous tab in the dialog.

TAB-> button

Go to the next tab in the dialog.

STORE button

Store the last measured point.

Nav P button

Load a saved navigation page configuration.

Sh M button

Start a measurement with a touch on the screen.

Sh M+S button

Start a measurement with a touch on the screen, store it on completion.

READ button

Load previously saved setout settings for reuse.

SAVE button

Save the current setout settings for reuse at a later date.

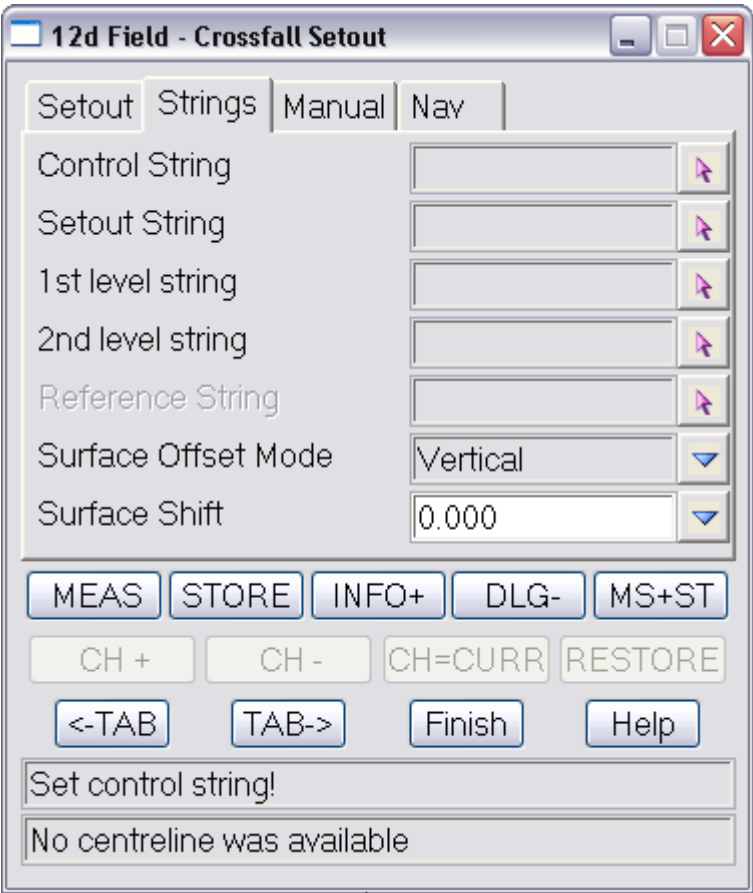
DLG+ button

Restore a minimised panel to it's full size.

INFO- button

Close the user configurable information panel.

STOP button
Stop the measurement in process.



Strings Tab

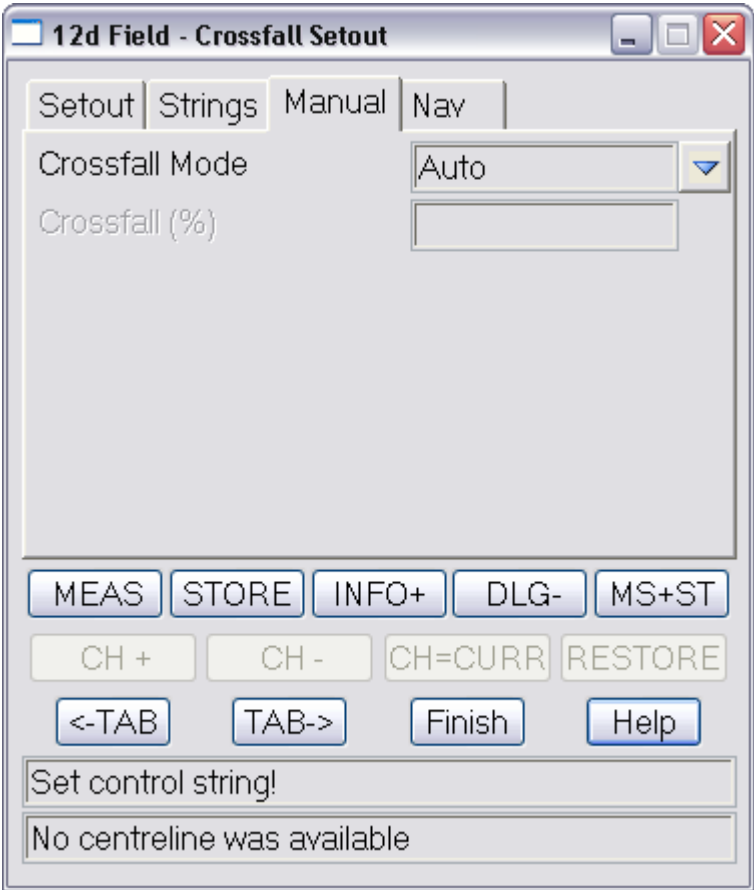
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Control String	12dF string select box		
<i>Control string, the string to which the other strings are cut normal to for calculations.</i>			
Setout String	12dF string select box		
<i>Setout String, setout offset & heights are relative to this string at a point cut normal from the setout chainage on the control string/centreline</i>			
1st level string	12dF string select box		
<i>Level string 1, the string cut for one of the design heights.</i>			
2nd level string	12dF string select box		
<i>Level string 2, the string cut for a 2nd design height.</i>			
Reference String	12dF string select box		
<i>Reference string, a string to which the current point is dropped normally to for information only.</i>			
Surface Offset Mode	choice box		Vertical, Normal
<i>Whether the offset to the surface is normal or vertical</i>			

Vertical: The height offset is applied vertically to the design surface.
Normal: The height offset is applied normal/perpendicular to the design surface.

Surface Shift choice box

A vertical shift to be applied to the design level, +ve raises the level, can be manually entered or selected from the choice list, (defined in “**TDF_SURFACE_SHIFTS.4D**”).



Manual Tab

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Crossfall Mode	choice box		Auto, Centreline, string & x-fall, Manual, use current x-fall

The method used to generate the design crossfall

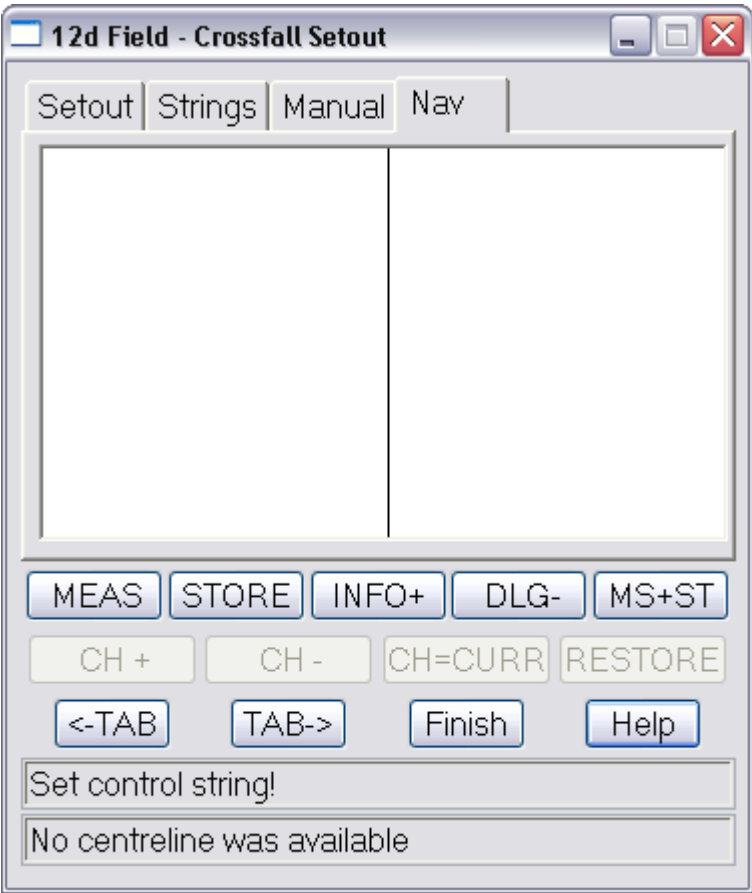
***Auto:** The crossfall is calculated by cutting the 1st and 2nd strings.*

***Centreline, string & x-fall:** The crossfall is entered manually, only the 1st string is cut and the crossfall projected from this.*

***Manual, use current x-fall:** The crossfall is entered manually defaulting to last calculated crossfall, only the 1st string is cut and the crossfall projected from this.*

Crossfall (%) 12dF double box

The manual crossfall entered by the user in the crossfall setout routine



Nav Tab

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Navigation Box	draw box		

The 12d Field navigation box augments setout by displaying user definable information rows plus a bulls-eye as a visual aid.

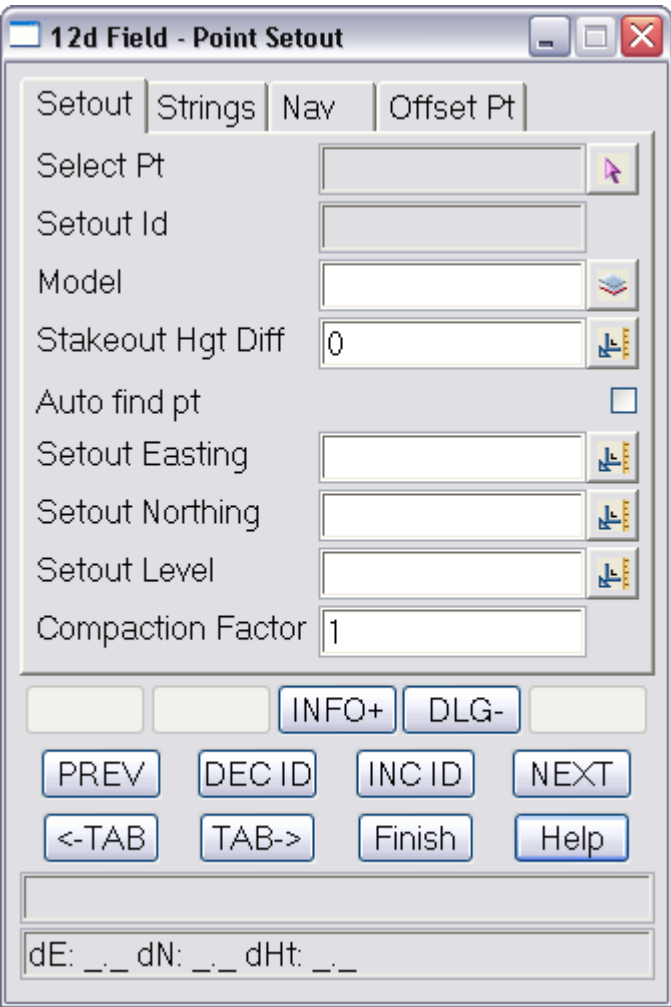
Point Setout

The **12d Field - Point Setout** panel enables the user to setout individual points, optionally referenced to a control string.

The point can be either selected from a view, be found automatically or be manually entered.

The panel also allows the offsetting of the point by a defined bearing and distance.

Selecting the **Point Setout** option brings up the **12d Field - Point Setout** panel.



Setout Tab

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Point Selection

The point can be picked from a view, in this case the Id and Model boxes will be automatically filled out.

The point id can be manually changed but in this case must be unique in the model.

If auto find is on the point will be set to the closest point in the setout model to the current position in the field

Select Pt	12dF new select box
<i>Select the point to setout, will update the Point Id and Model boxes</i>	

Setout Id	12dF input box
<i>The id/name of the setout point.</i>	

Model	model box
<i>The model containing the setout point.</i>	

Stakeout Hgt Diff	12dF double box
--------------------------	-----------------

The height diff from the setout surface/string. +ve is above.

Auto find pt named tick box

Auto find pt

Setout Easting, Setout Northing, Setout Level

The coordinate boxes are only added to the panel if ticked on under survey in the settings panel.

Setout Easting 12dF double box

The easting to setout.

Setout Northing 12dF double box

The northing to setout.

Setout Level 12dF double box

The height to setout.

Compaction Factor 12dF double box

A compaction factor applied to the delta heights, e.g. if you know say asphalt will compact by 23% and you need to cover this enter the value as 1.23. (Note this widget is optional and only appears if activated in the Settings panel.)

Buttons

MEAS button

Start a measurement, the behaviour is determined by the TPS/GPS measurement setting set from the control bar.

INFO+ button

Display the user configurable information panel to view extra information not available on the standard dialog

DLG- button

Minimises the dialog so only the first 2 rows of buttons are shown.

MS+ST button

Start a measurement and store it on completion.

NEXT button

Make the setout point the next point in the current string.

PREV button

Make the setout point the previous point in the current string.

INC ID button

Increment the point ID and make this the setout point. E.g. BOLT30 -> BOLT31

DEC ID button

Decrement the point ID and make this the setout point. E.g. BOLT31 -> BOLT30

<-TAB button

Go to the previous tab in the dialog.

TAB-> button

Go to the next tab in the dialog.

STOP button

Stop the measurement in process.

STORE button

Store the last measured point.

Nav P button

Load a saved navigation page configuration.

Sh M button

Start a measurement with a touch on the screen.

Sh M+S button

Start a measurement with a touch on the screen, store it on completion.

READ button

Load previously saved setout settings for reuse.

SAVE button

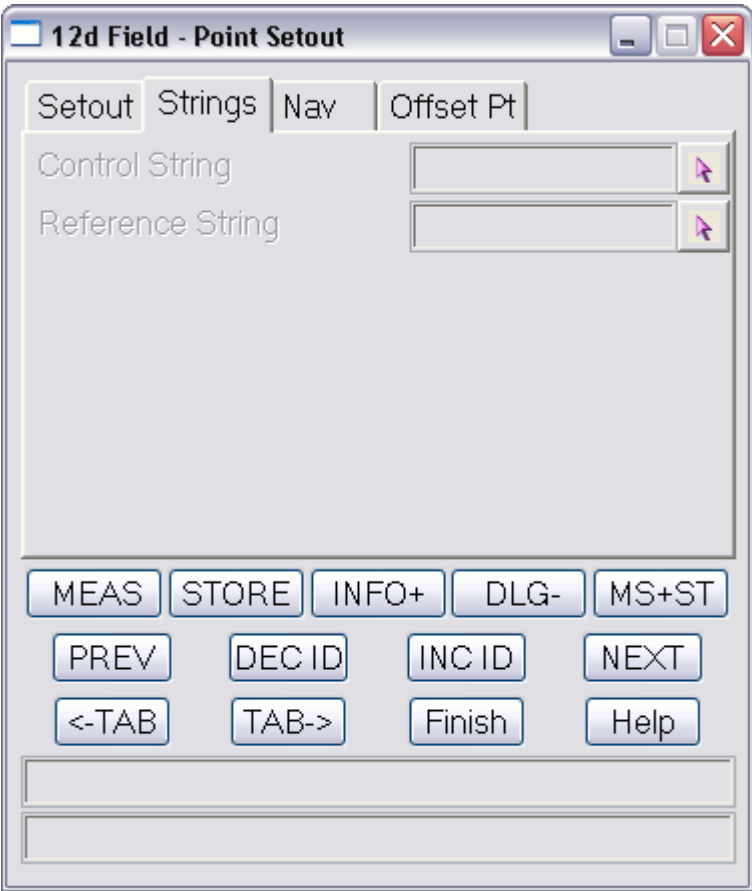
Save the current setout settings for reuse at a later date.

DLG+ button

Restore a minimised panel to it's full size.

INFO- button

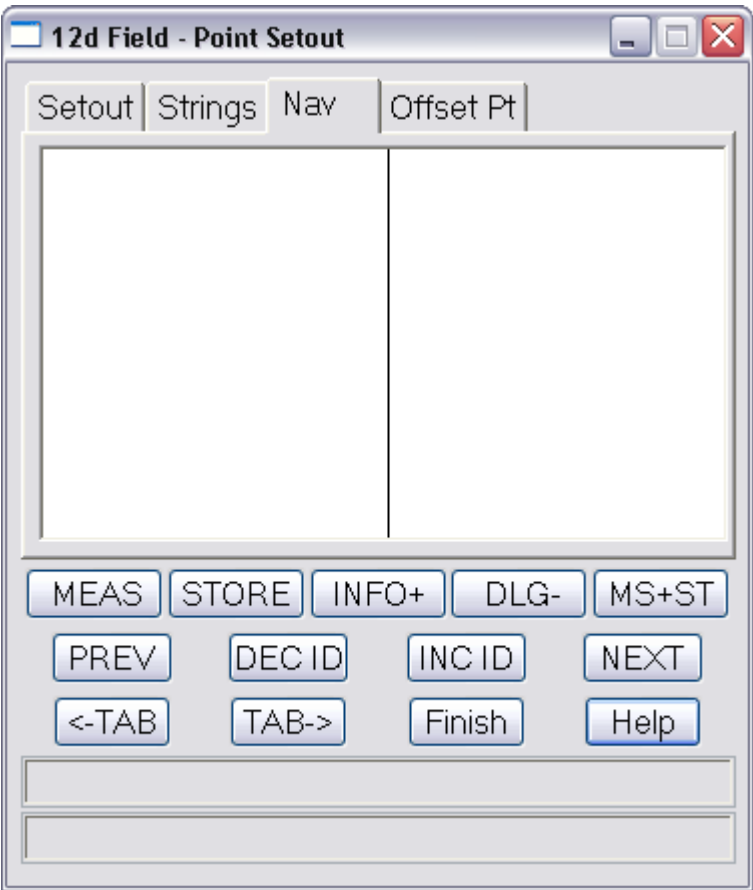
Close the user configurable information panel.



Strings Tab

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Control String	12dF new select box		
<i>Control string, the string to which the other strings are cut normal to for calculations.</i>			
Reference String	12dF new select box		
<i>Reference string, a string to which the current point is dropped normally to for information only.</i>			



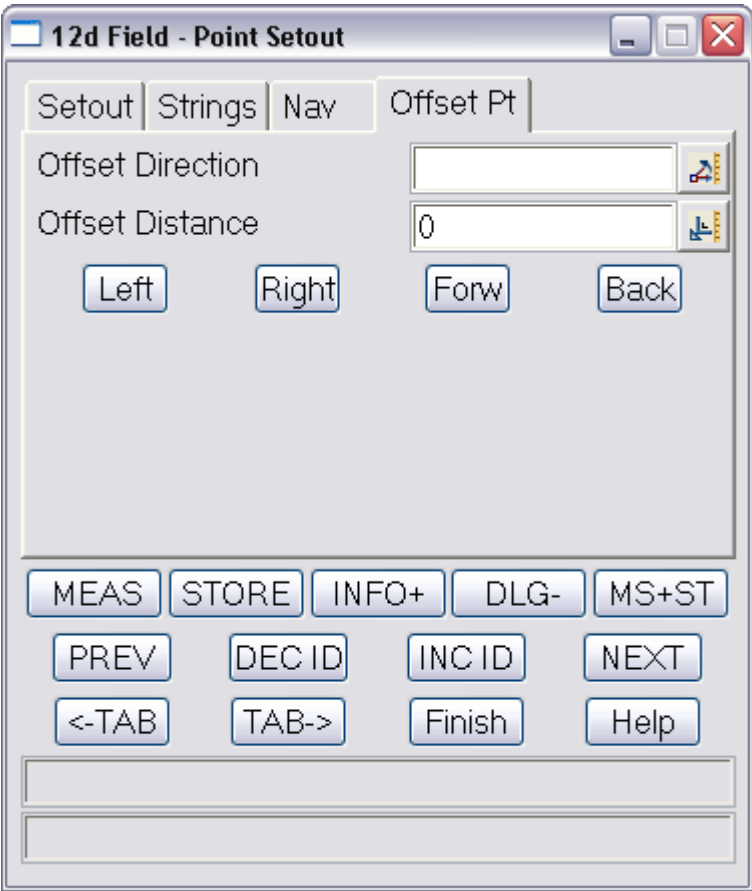
Nav Tab

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Navigation Box	draw box		
----------------	----------	--	--

The 12d Field navigation box augments setout by displaying user definable information rows plus a bulls-eye as a visual aid.



Offset Pt Tab

The **Offset Point** tab allows the current setout point to be offset in a defined direction and distance.

For example if the offset direction was 45° and the offset distance 5m pressing Left would move the point 5m at 315°.

If a control string is nominated then when the point is originally selected it is dropped to the control string and the bearing at this point is the default for the offset direction.

For example, to place offset pegs to a drainage pit select the road centreline and then select the pit. The bearing is that of the road, enter the offset distance and press Right or Left and the point is updated.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Offset Direction	12dF angle box		
<i>Direction to offset base point in.</i>			
Offset Distance	12dF double box		
<i>Distance to offset base point by.</i>			
Left	button		
<i>Offset the point by the offset distance to the left of the offset direction.</i>			
Right	button		

Offset the point by the offset distance to the right of the offset direction.

Forw button

Offset the point by the offset distance in the offset direction.

Back button

Offset the point by the offset distance against the offset direction.

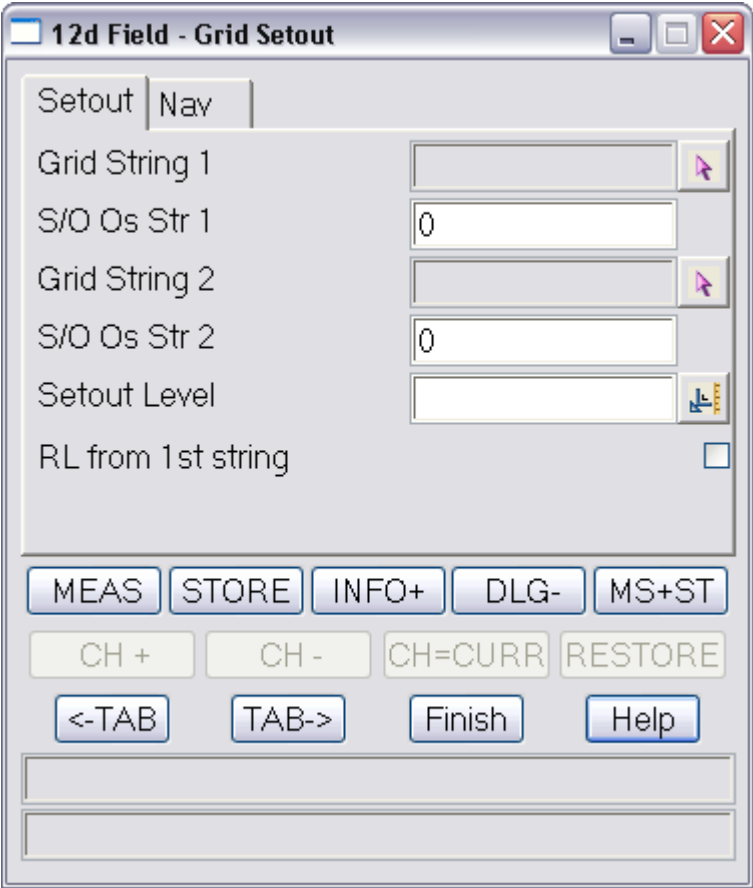
Grid Setout

This section of documentation is a work in progress and will be updated in subsequent releases.

The **12d Field - Grid Setout** panel creates a setout point at offsets from 2 strings.

Most typically used in buildings where points are dimensioned off setout grids

Selecting the **Grid Setout** option brings up the **12d Field - Grid Setout** panel.



Setout Tab

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Grid String 1	12dF new select box		
----------------------	---------------------	--	--

The first string for grid setout

S/O Os Str 1 12dF double box

The setout offset from the first string

Grid String 2 12dF new select box

The second string for grid setout

S/O Os Str 2 12dF double box

The setout offset from the second string

Setout Level 12dF double box

The height to setout.

RL from 1st string tick box

If ticked then the level of the 1st string selected will be the setout level

Buttons

MEAS button

Start a measurement, the behaviour is determined by the TPS/GPS measurement setting set from the control bar.

INFO+ button

Display the user configurable information panel to view extra information not available on the standard dialog

DLG- button

Minimises the dialog so only the first 2 rows of buttons are shown.

MS+ST button

Start a measurement and store it on completion.

CH + button

increment the setout chainage by the value in the chainage increment field.

CH - button

Decrement the setout chainage by the value in the chainage increment field.

CH=CURR button

Set the setout chainage to the chainage of the last measured point.

RESTORE button

Restore the setout chainage to the chainage prior to the "CH=CURR" button being pressed.

<-TAB button

Go to the previous tab in the dialog.

TAB-> button

Go to the next tab in the dialog.

STOP button

Stop the measurement in process.

STORE button

Store the last measured point.

- Nav P

button

Load a saved navigation page configuration.
- Sh M

button

Start a measurement with a touch on the screen.
- Sh M+S

button

Start a measurement with a touch on the screen, store it on completion.
- READ

button

Load previously saved setout settings for reuse.
- SAVE

button

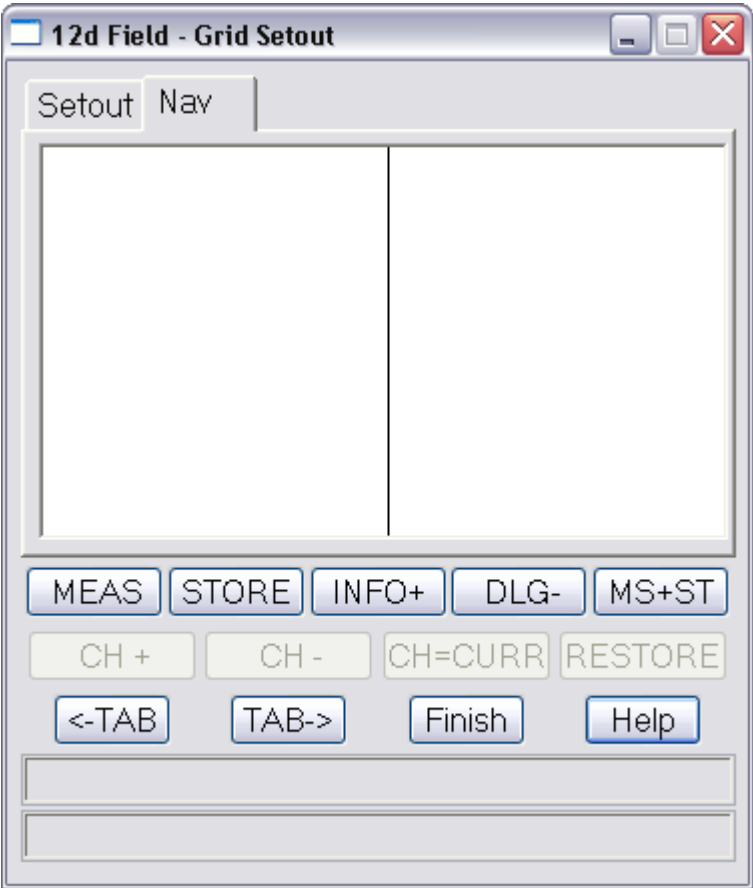
Save the current setout settings for reuse at a later date.
- DLG+

button

Restore a minimised panel to it's full size.
- INFO-

button

Close the user configurable information panel.



Nav Tab

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Navigation Box draw box

The 12d Field navigation box augments setout by displaying user definable information rows plus a bulls-eye as a visual aid.

Crown Setout

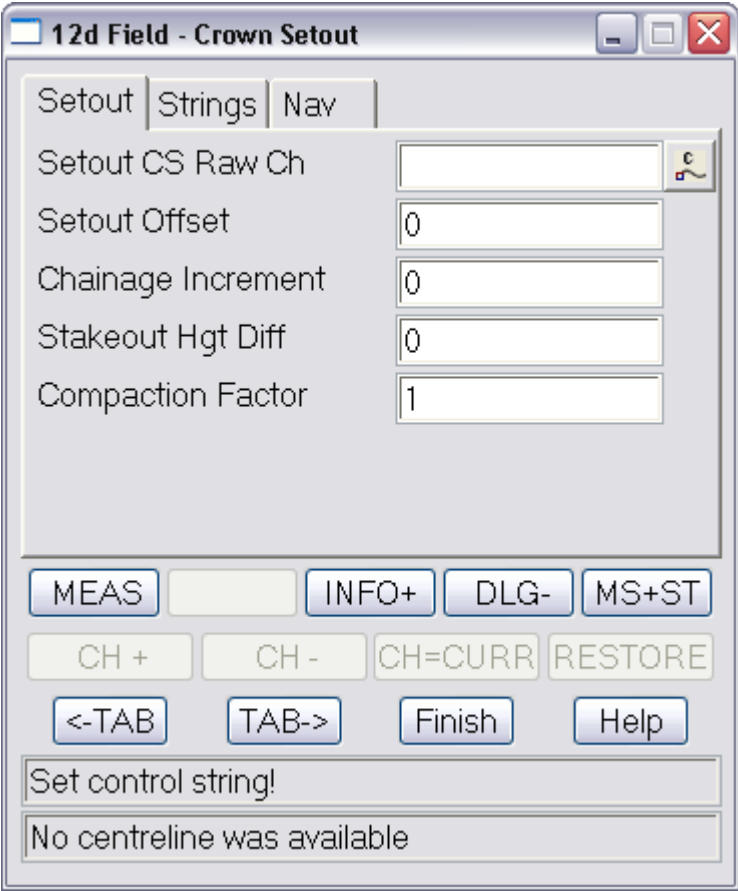
The **12d Field - Crown Setout** panel is effectively 2 **12d Field - Crossfall Setout** panels. It is typically used on rural roads when the user wants to generate design heights to both sides of the crowned road.

Crown setout works by dropping a point to a nominated control string, then the setout string and the 3 strings used to determine the crown are cut normal to the dropped point on the control string.

The user is able to set a shift to move the design surface up or down once the strings are cut.

Note the setout string and 1 of the level strings could be the same string or different, this dependant on the task being performed.

Selecting the **Crown Setout** option brings up the **12d Field - Crown Setout** panel.



Setout Tab

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Setout CS Raw Ch	12dF chainage box		
-------------------------	-------------------	--	--

The raw, no equalities setout chainage on the control string, start chainage plus distance along string

Setout Offset 12dF double box

The offset from the setout string to setout, +ve is to the right of the string, -ve left

Chainage Increment 12dF double box

The value the setout chainage will be changed by when chainage increment/decrement is called.

Stakeout Hgt Diff 12dF double box

The height diff from the setout surface/string. +ve is above.

Compaction Factor 12dF double box

A compaction factor applied to the delta heights, e.g. if you know say asphalt will compact by 23% and you need to cover this enter the value as 1.23. (Note this widget is optional and only appears if activated in the Settings panel.)

Buttons

MEAS button

*Start a measurement, the behaviour is determined by the **TPS/GPS** measurement setting set from the control bar.*

INFO+ button

Display the user configurable information panel to view extra information not available on the standard dialog

DLG- button

Minimises the dialog so only the first 2 rows of buttons are shown.

MS+ST button

Start a measurement and store it on completion.

CH + button

Increment the setout chainage by the value in the chainage increment field.

CH - button

Decrement the setout chainage by the value in the chainage increment field.

CH=CURR button

Set the setout chainage to the chainage of the last measured point.

RESTORE button

*Restore the setout chainage to the chainage prior to the "**CH=CURR**" button being pressed.*

<-TAB button

Go to the previous tab in the dialog.

TAB-> button

Go to the next tab in the dialog.

STOP button

Stop the measurement in process.

STORE button

Store the last measured point.

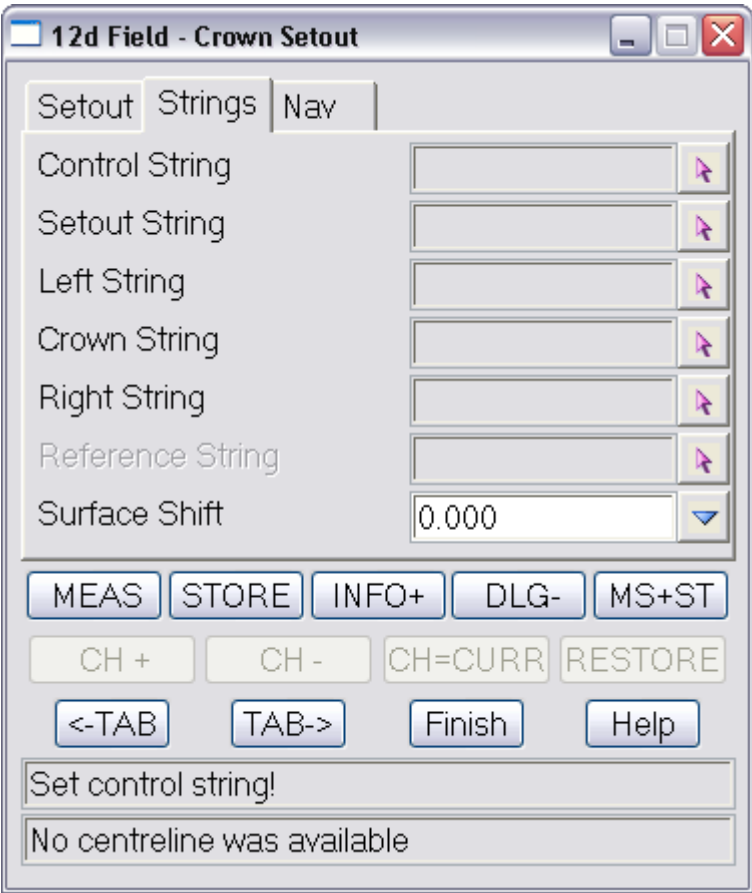
Nav P button
Load a saved navigation page configuration.

Sh M button
Start a measurement with a touch on the screen.

Sh M+S button
Start a measurement with a touch on the screen, store it on completion.

READ button
Load previously saved setout settings for reuse.

SAVE button
Save the current setout settings for reuse at a later date.



Strings Tab

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

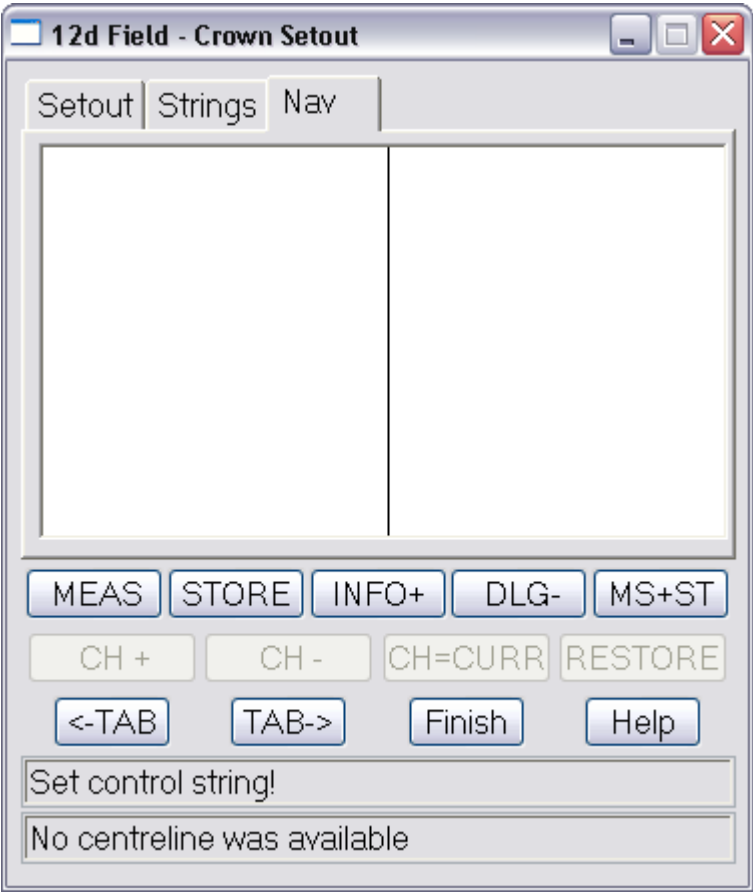
Control String	12dF new select box		
-----------------------	---------------------	--	--

Control string, the string to which the other strings are cut normal to for calculations.

Setout String	12dF new select box		
----------------------	---------------------	--	--

Setout String, setout offset & heights are relative to this string at a point cut normal from the setout chainage on the control string/centreline

1st Level String	12dF new select box	
<i>Level string 1, a string cut for one of the design heights.</i>		
Crown String	12dF new select box	
<i>Crown string, the middle string for design heights in crown setout</i>		
2nd Level String	12dF new select box	
<i>Level string 2, the string cut for a 2nd design height.</i>		
Reference String	12dF new select box	
<i>Reference string, a string to which the current point is dropped normally to for information only.</i>		
Surface Shift	choice box	0.0000
<i>A vertical shift to be applied to the design level, +ve raises the level, can be manually entered or selected from the choice list, (defined in “TDF_SURFACE_SHIFTS.4D”)</i>		



Nav Tab

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

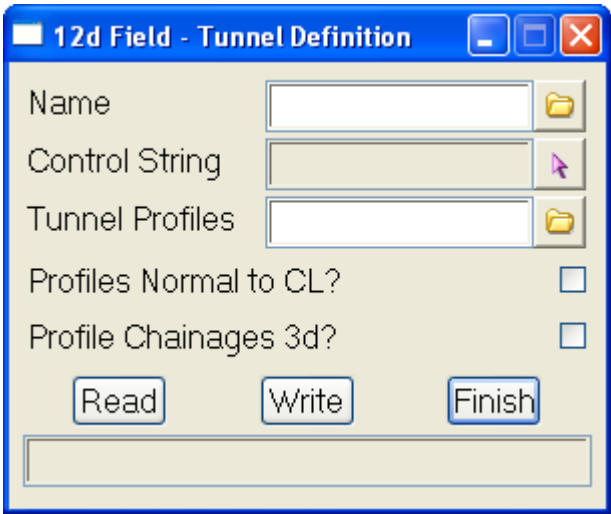
Navigation Box	draw box
-----------------------	----------

The 12d Field navigation box augments setout by displaying user definable information rows plus a bulls-eye as a visual aid.

Tunnel Definition

The **Tunnel Definition** panel combines a centreline, the **PRO/PRA** tunnel definition files and information on how the profiles are applied to the centreline into a single file for use by the **Tunnel Setout** panel.

For more information on **PRO/PRA** tunnel definition files please see [Definition of the PRO and PRA definition files](#)



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Name

*The name of the tunnel, this a file with the extension **12dF_TUN_DEF**.*

Control string

*The centreline the tunnel definitions are applied to, the centreline must have valid vertical geometry for the chainage ranges in the **PRA** file.*

Tunnel Profiles

*The **PRO/PRA** files containing the tunnel definition. For more information on **PRO/PRA** tunnel definition files please see [Definition of the PRO and PRA definition files](#)*

Profiles Normal to CL? tick box

if ticked the tunnel is calculated perpendicular/normal to the vertical alignment of the centreline resulting in a true 3d model.

if not ticked the tunnel is calculated vertical to the vertical alignment of the centreline, this means an effective loss of clearance on steeper grades.

Profile Chainages 3d? tick box

*if not ticked the chainages in the **PRA** file are taken as plan chainages.*

if ticked the chainages are interpreted as 3d, this is the plan/2d chainage of the 1st point where the horizontal and vertical geometry coincide plus the 3d length along the centreline from there.

Read button

Read in a 12dField tunnel definition file.

Write button

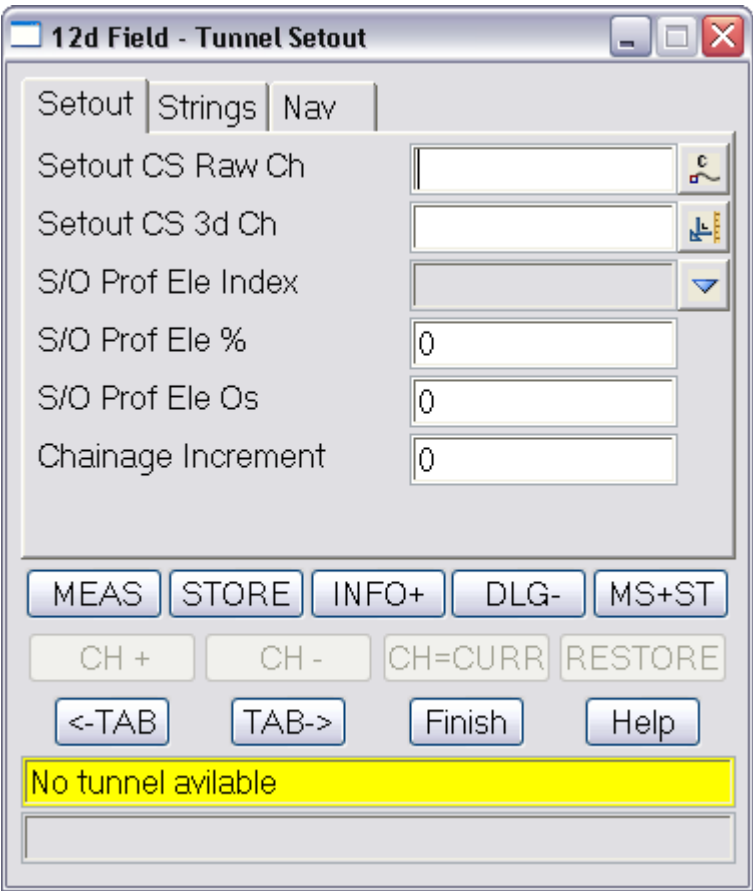
Write to a 12dField tunnel definition file.

Finish

Exit the panel.

Tunnel Setout

The **Tunnel Setout** option, (available in TPS only) allows the user to locate and setout points on a tunnel previously defined in the [Tunnel Definition](#) panel.



Setout Tab

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Setout CS Raw Ch

The plan chainage of the point you wish to setout. If the tunnel chainages are defined as 3d this will be read only and be updated when a 3d chainage is entered.

Setout CS 3d Ch

The 3d chainage of the point you wish to setout. If the tunnel chainages are defined as 2d this will be read only and be updated when a 2d chainage is entered.

S/O Prof Ele Name

The name of the element in the profile to setout.

S/O Prof Ele %

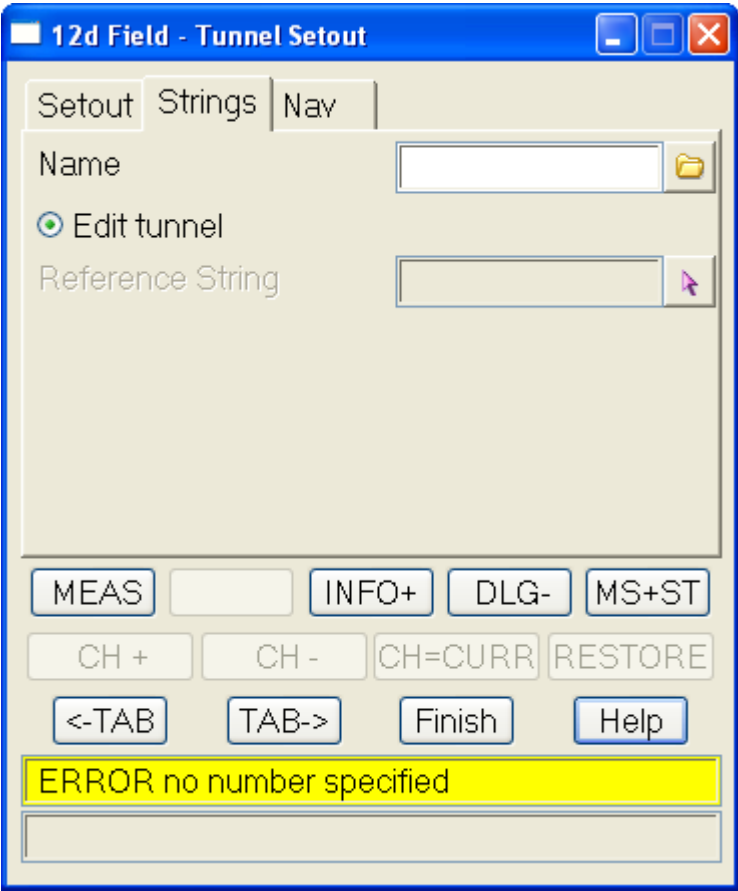
The percentage around the element to setout, 0% means the start of the element, 100% the end of the element.

S/O Prof Ele Os

The offset from the element to setout, +ve is to the right of the element.

Chainage Increment 12dF double box

The value the setout chainage will be changed by when chainage increment/decrement is called.



Strings Tab

The fields and buttons used in this panel have the following functions.

Field Description Type Defaults Pop-Up

Name

Select the tunnel to setout.

Edit tunnel

If pressed will open up the [Tunnel Definition](#) panel with the currently defined tunnel, on closure of the **Tunnel Definition** panel the definition will be read in again.

Reference String 12dF new select box

Reference string, a string to which the current point is dropped normally to for information only.

Attributes specific to tunnel setout for display on the information and navigation pages.

pu_tun_ele_name

Name of the tunnel element at the shot taken

pu_tun_ele_idx

Index, (zero based) of the tunnel element in the profile at the shot taken, 0 is the first element

pu_tun_ele_per

Percentage around the tunnel element at the shot taken.

pu_tun_ele_os

Offset from the tunnel element at the shot taken, +ve is to the right hand side.

so_tun_ele_name

Name of the tunnel element at the point setout

so_tun_ele_idx

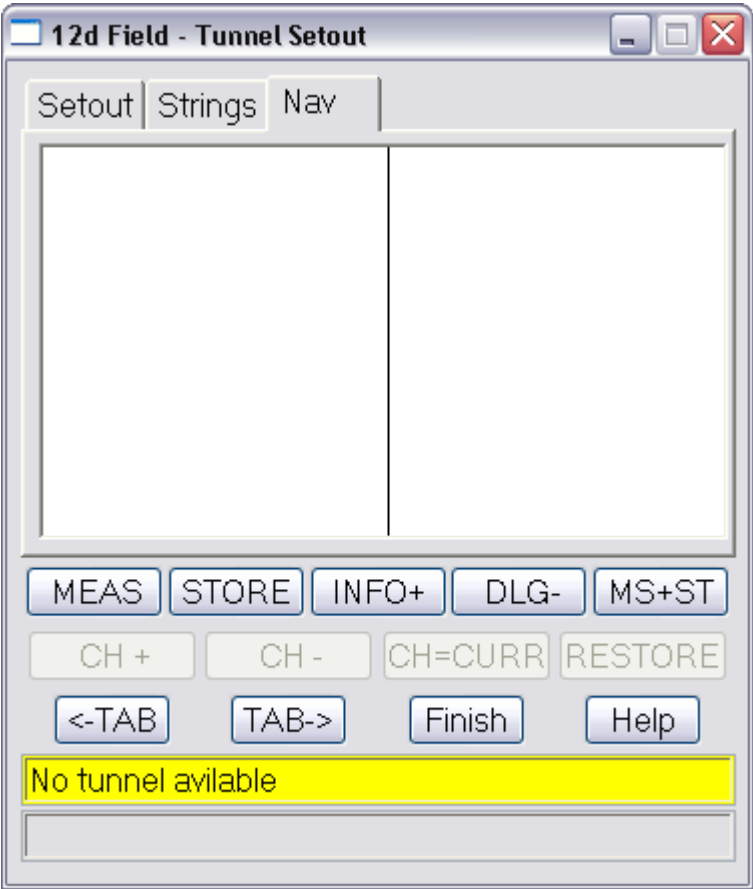
Index, (zero based) of the tunnel element in the profile at the point setout, 0 is the first element

so_tun_ele_per

Percentage around the tunnel element at the point setout.

so_tun_ele_os

Offset from the tunnel element at the point setout, +ve is to the right hand side.



Nav Tab

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Navigation Box draw box

The 12d Field navigation box augments setout by displaying user definable information rows plus a bulls-eye as a visual aid.

Station Helmert

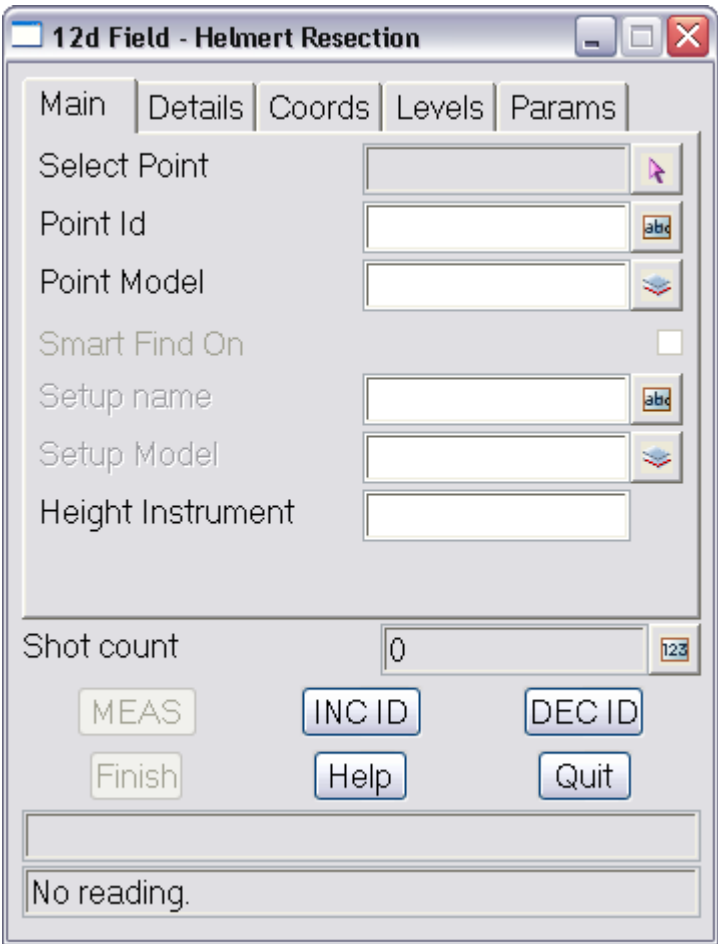
The **12d Field - Helmert Resection** panel can be used to establish a station setup by taking readings to up to 6 known points.

The horizontal position is obtained by a Helmert transformation; translation, rotation and uniform scaling of the readings.

The vertical position is obtained by meaning the z values of the readings, the z value is not weighted on distance measured.

Readings can be used for either horizontal position, vertical position or both.

Selecting **Station Helmert** displays the **12d Field - Helmert Resection** panel on the screen.



Main Tab

A point for use in the resection can either be picked from the screen or manually entered.

If picked from the screen the Id and Model boxes will be filled automatically.

If entered manually the Id must be unique in the point model.

Note in 12dField the Id always refers to the Vertex Id.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Select Point	string select box		
<i>Select the point for the next shot to be used in the resection</i>			
Point Id	12dF input box		
<i>The Id/name of the target point.</i>			
Point Model	model box		
<i>The model containing the point for use in the resection.</i>			
Smart Find On	tick box		
<i>Smart find can be used when you can clearly identify one point in a resection, e.g. in a tunnel you can see multiple targets but only identify the one closest to you.</i>			
<i>Smart find can be used after you have measured to the identified point.</i>			
<i>If ticked on then after a reading to a station smart find will look through the points model to find one that the reading matches, both horizontally and vertically.</i>			
<i>The horizontal and vertical tolerances can be set on the parameters tab.</i>			
<i>Use smart find to identify all stations measured to automatically.</i>			
<i>The surveyor can optionally store the resection point to a model if need be.</i>			
Setup name	input box		
<i>The Id of the setup to be stored.</i>			
Setup Model	model box		
<i>The model to store the setup to.</i>			
Height Instrument	12dF double box		
<i>The height of the instrument above the setup point.</i>			
Buttons			
MEAS	button		
<i>Take a measurement to a station.</i>			
INC ID	button		
<i>Increment the point ID and make this the setout point. E.g. BOLT30 -> BOLT31</i>			
DEC ID	button		
<i>Decrement the point ID and make this the setout point. E.g. BOLT31 -> BOLT30</i>			
Shot Count			
<i>Number of shot used so far in the resection.</i>			
Finish	button		
<i>Leave the panel and make this the new station setup, if any of the position tolerances nominated on the parameters tab are exceeded you will get a warning box allowing you to re-enter or continue.</i>			
Quit	button		
<i>Quit the resection and restore the previous station setup.</i>			

12d Field - Helmert Resection

Main

Details

Coords

Levels

Params

Hz-Dist PPM

0

Easting

Northing

Level

Pos error

Calc'd scale factor

Calc'd PPM

RL Diff

Shot count

0

123

MEAS

INC ID

DEC ID

Finish

Help

Quit

No reading.

Details Tab

The details tab displays the overall details of the current setup.

The level of detail is different for 2 and 3+ shots where redundancies in the helmert calcs are available. For 3+ shot the estimation error can be displayed.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Hz-Dist PPM	12dF long box		
<i>The scale factor to be applied to measured horizontal distances.</i>			
Easting	double box		
<i>The calculated easting of the station setup.</i>			
Northing	double box		
<i>The calculated northing of the station setup.</i>			
Level	double box		
<i>The calculated level of the station setup.</i>			
Pos error	double box		
<i>The estimated horizontal error in the station setup.</i>			
Calc'd scale factor	double box		

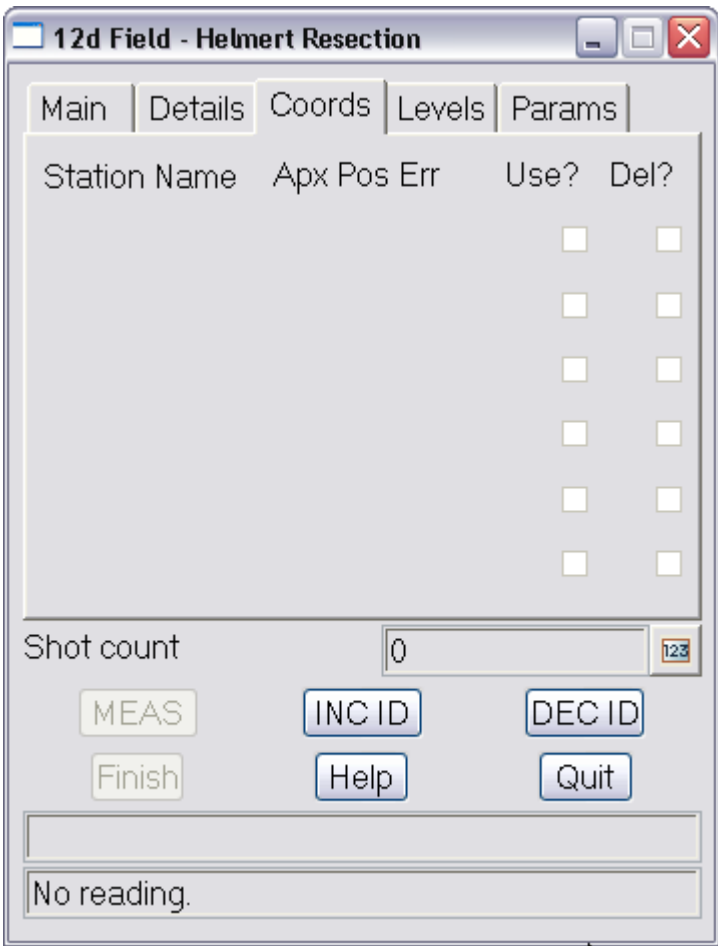
The scale factor applied to the measurements to get the best fit.

Calc'd PPM double box

The scale factor in ppm applied to the measurements to get the best fit.

RL Diff double box

The height difference range between the readings.



Coords Tab

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Station Name

The name of the station this reading refers to.

Apx Pos Err

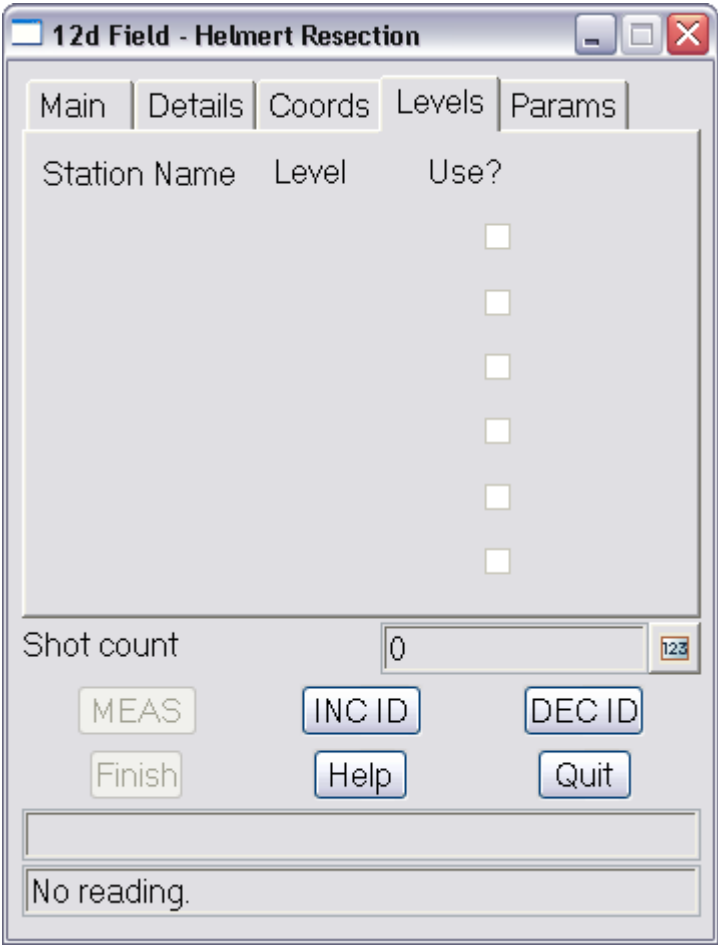
The approximate horizontal position error of this reading calculated in conjunction with all other readings in use. A high error for this reading in comparison to others might indicate a problem with this reading.

Use? tick box

if ticked this reading will be used in the horizontal calculation. Ticking or unticking the box will trigger the recalculation of the horizontal position.

Del? tick box

If ticked a confirmation box will be displayed and the reading removed from the resection. Removal will trigger the recalculation of the horizontal position.



Levels Tab

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Station Name

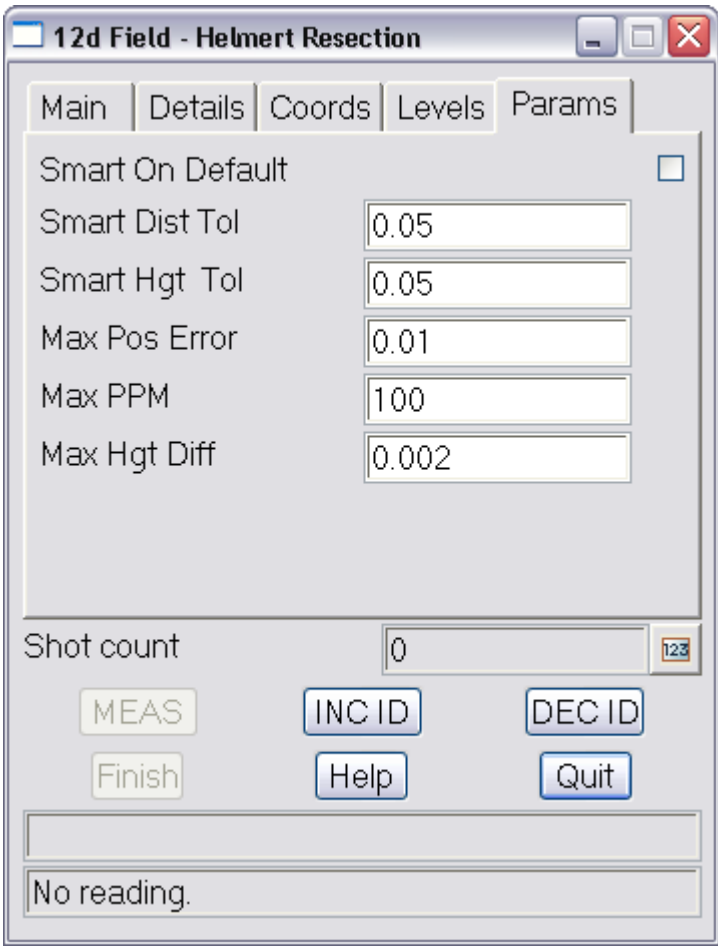
The name of the station this reading refers to.

Level

The level of the station calculated by this reading. A large difference for this reading in comparison to others might indicate a problem with this reading.

Use? tick box

If ticked this reading will be used in the vertical calculation. Ticking or unticking the box will trigger the recalculation of the vertical position.



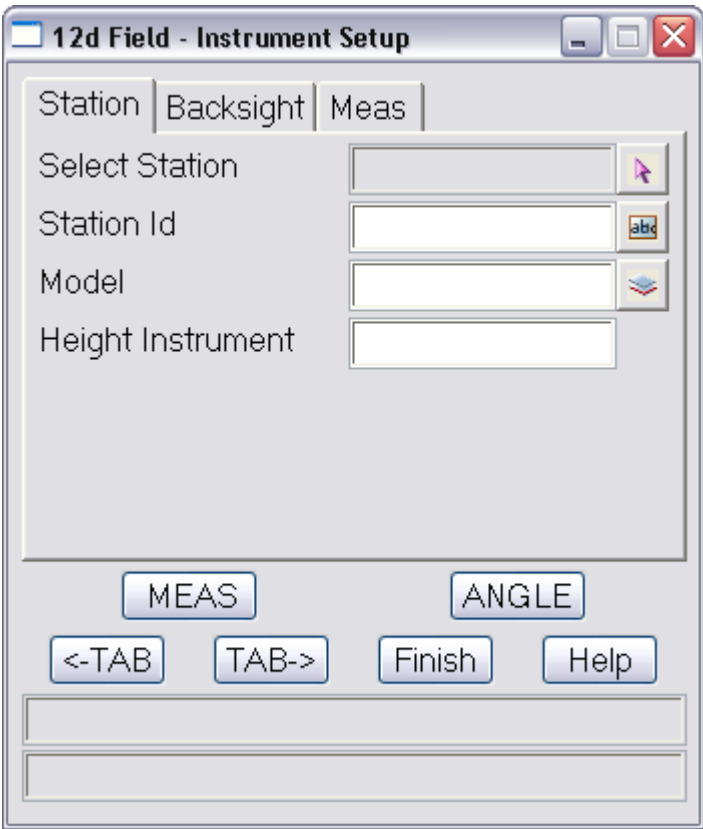
Params Tab

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Smart On Default	tick box		
<i>The smart find feature is ticked on by default</i>			
Smart Dist Tol	12dF double box		
<i>The distance tolerance for a point to be used in the smart find</i>			
Smart Hgt Tol	12dF double box		
<i>The level tolerance for a point to be used in the smart find</i>			
Max Pos Error	12dF double box		
<i>The maximum position error allowed, a warning will be shown if exceeded.</i>			
Max PPM	12dF double box		
<i>The maximum ppm's allowed, a warning will be shown if exceeded.</i>			
Max Hgt Diff	12dF double box		
<i>The maximum height variation allowed, a warning will be shown if exceeded.</i>			

Station Standard

The **12d Field - Instrument Setup** panel is used to establish a station setup over a known point. Orientation is established by measuring/sighting a backsight station. It is not necessary to set an orientation on the instrument, 12dField handles the angle difference internally. Selecting the **Station Standard** option brings up the **12d Field - Instrument Setup** panel.



Station Tab

The point for use in the setup can either be picked from the screen or manually entered. If picked from the screen the Id and Model boxes will be filled automatically. If entered manually the Id must be unique in the point model. **Note** in 12dField the Id always refers to the Vertex Id.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Select Station	string select box		
<i>Select the control station you are setting up over.</i>			
Station Id	12dF input box		
<i>The Id/name of the instrument setup.</i>			
Model	model box		
<i>The model containing the instrument station.</i>			
Height Instrument	12dF double box		
<i>The height of the instrument above the setup point.</i>			

Buttons

- MEAS

button

Start a full measurement, distance and angles.
- ANGLE

button

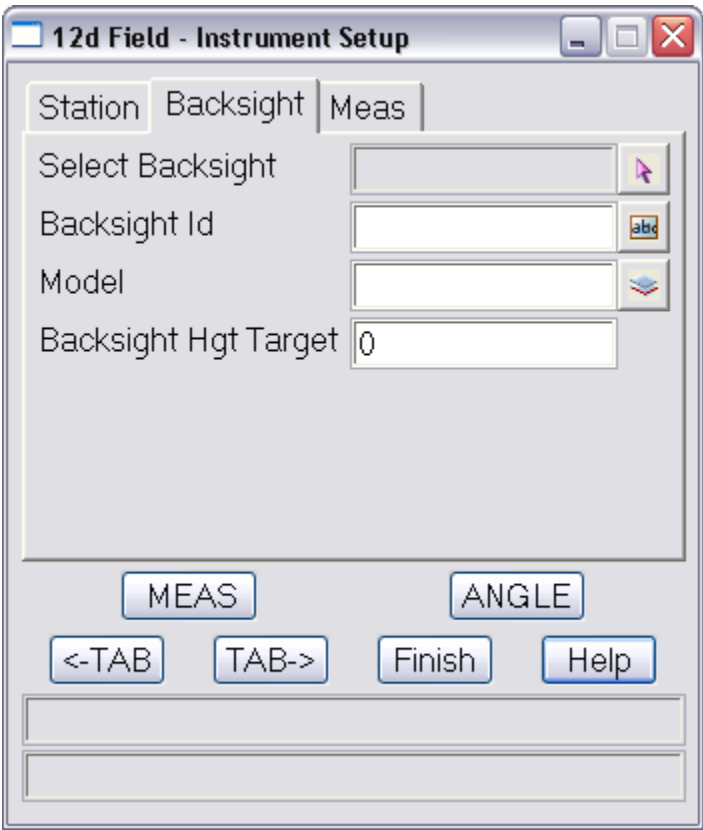
Start a horizontal/vertical angular measurement, no distance.
- <-TAB

button

Go to the previous tab in the dialog.
- TAB->

button

Go to the next tab in the dialog.



Backsight Tab

The backsight for use in the setup can either be picked from the screen or manually entered. If picked from the screen the Id and Model boxes will be filled automatically. If entered manually the Id must be unique in the point model.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Select Backsight	string select box		
<i>Select the point to be used for the backsight.</i>			
Backsight Id	12dF input box		

The Id/name of the backsight point.

Backsight Hgt Target 12dF double box

The height of the backsight target above the backsight point.

The screenshot shows a software window titled "12d Field - Instrument Setup". It has three tabs: "Station", "Backsight", and "Meas". The "Backsight" tab is currently active. Inside the tab, there are seven input fields with labels to their left: "BkSt Diff Horz Dist", "BkSt Diff Meas East", "BkSt Diff Meas North", "BkSt Diff Meas Hgt", "Bearing Swing", "Max Diff Horz Dist", and "Max Diff Meas Hgt". The "Bearing Swing" field contains "0°". The "Max Diff Horz Dist" field contains "0.005". The "Max Diff Meas Hgt" field contains "0.002". Below the input fields, there are four buttons: "MEAS", "ANGLE", "<-TAB", and "TAB->". At the bottom right, there are two more buttons: "Finish" and "Help".

Meas Tab

The fields and buttons used in this panel have the following functions.

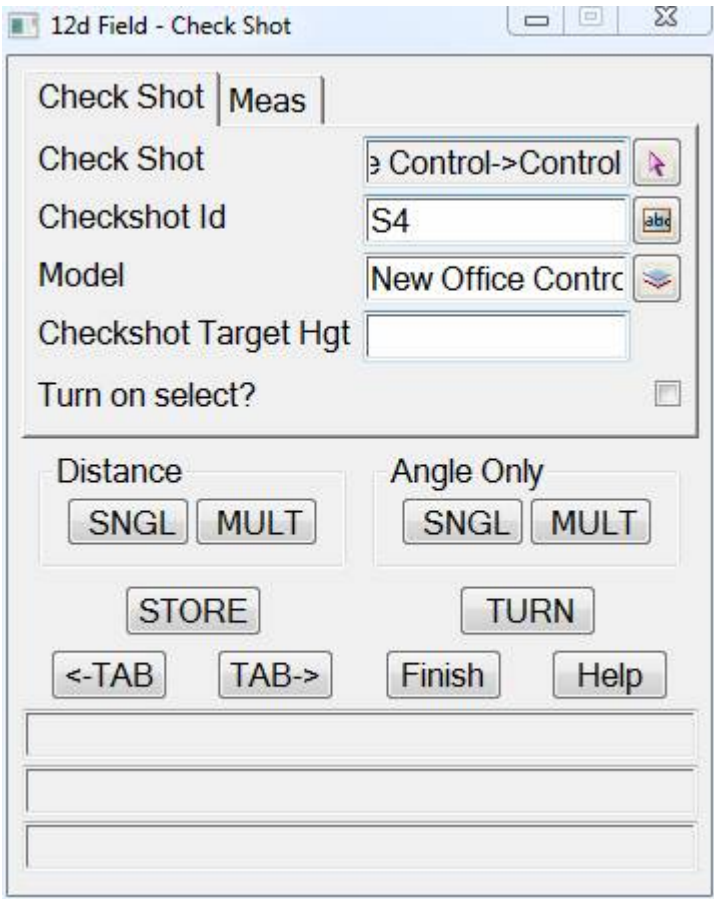
Field Description	Type	Defaults	Pop-Up
BkSt Diff Horz Dist	12dF double box		
<i>Measured difference in horizontal distance to the backsight point.</i>			
BkSt Diff Meas East	12dF double box		
<i>Measured difference in easting to the backsight point.</i>			
BkSt Diff Meas North	12dF double box		
<i>Measured difference in northing to the backsight point.</i>			
BkSt Diff Meas Hgt	12dF double box		
<i>Measured difference in height to the backsight point.</i>			
Bearing Swing	12dF angle box		
<i>A bearing swing applied to the instrument reading to get the correct grid bearing.</i>			
Max Diff Horz Dist	12dF double box		
<i>Difference in horizontal distance that brings up a warning message.</i>			

Max Diff Meas Hgt 12dF double box

Difference in height that brings up a warning message.

Check Shot

The **12d Field - Check Shot** panel allows a measurement to a known point to check the validity of the current setup. The measurement can be a full measurement or angle only.



Check Shot Tab

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Check Shot	string select box		
-------------------	-------------------	--	--

select a point for the check shot measurement

Checkshot Id

the vertex id of the selected point, this can be populated from the select or manually entered.

Model

model box

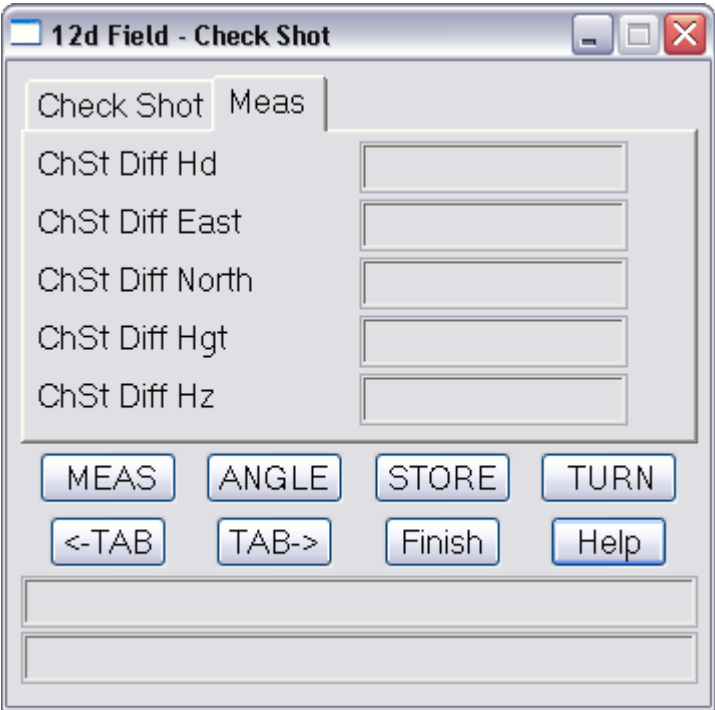
the model containing the checkshot point.

Checkshot Target Hgt

the height of target for the checkshot.

Turn on select? tick box

if ticked on selecting a checkshot point the instrument will rotate automatically to that point.



Meas Tab

Once a measurement is completed the focus will change to the **Meas** tab.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

ChSt Diff Hd

the difference in horizontal distance to the checkshot point, actual - observed

ChSt Diff East

the difference in eastings to the checkshot point, actual - observed

ChSt Diff North

the difference in northings to the checkshot point, actual - observed

ChSt Diff Hgt

the difference in level to the checkshot point, actual - observed

ChSt Diff Hz

the difference in horizontal angle to the checkshot point, actual - observed

Buttons

Distance

SNGL button

Take a single distance measurement to the checkshot dependent on the current TPS measurement settings

MULT button

Take a multiface distance measurement to the checkshot dependent on the current TPS measurement settings

Angle Only

SNGL button

Take a single angular measurement to the checkshot dependent on the current TPS measurement settings

MULT button

Take a multiface angular measurement to the checkshot dependent on the current TPS measurement settings

STORE button

Write the measurement to the checkshot to the current field file (.FLD), this does not store the reading to a model.

TURN button

rotate the instrument to the selected checkshot point.

<-TAB button

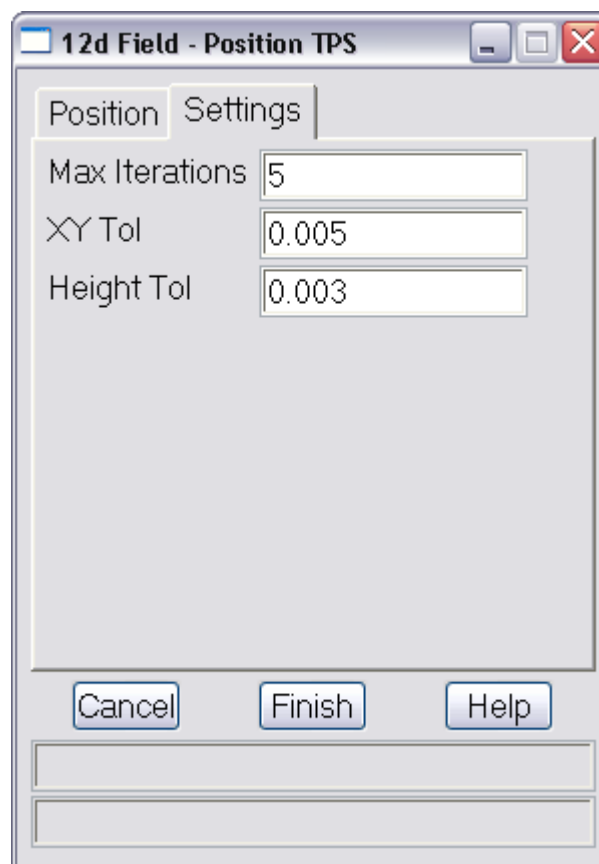
Go to the previous tab in the dialog.

TAB-> button

Go to the next tab in the dialog.

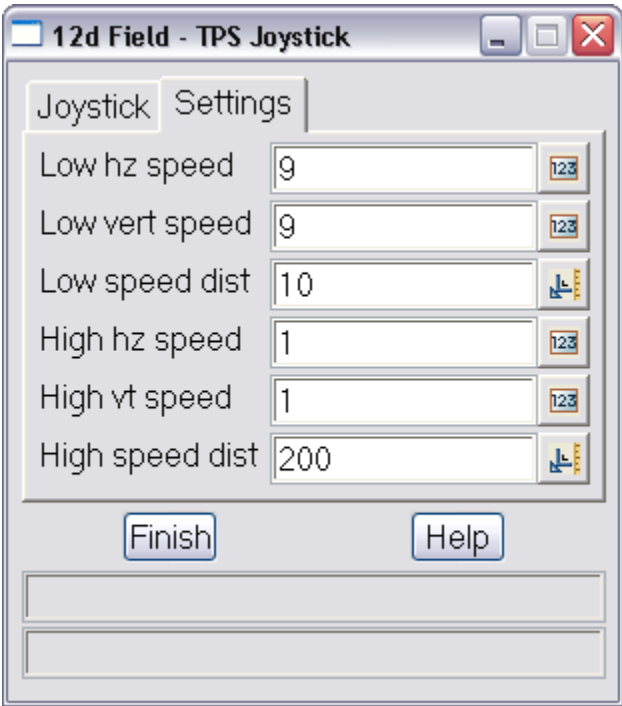
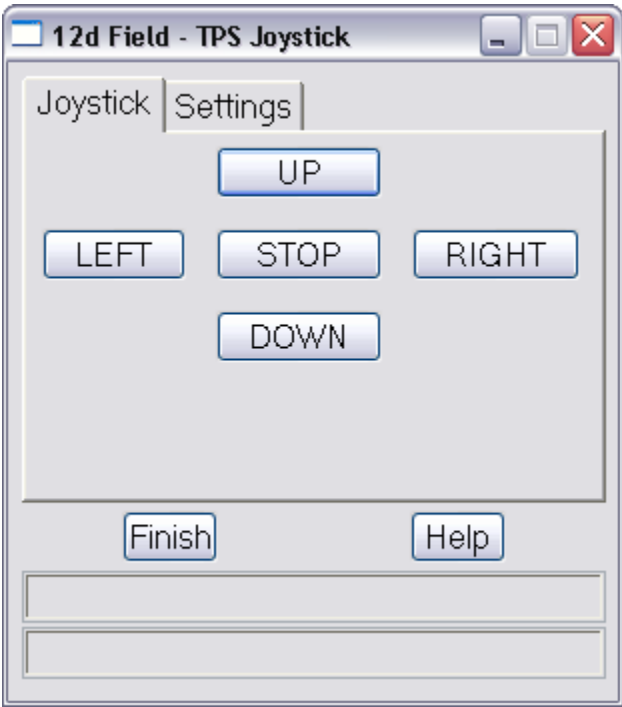
Position TPS

This section of documentation is a work in progress and will be updated in subsequent releases.



Joystick TPS

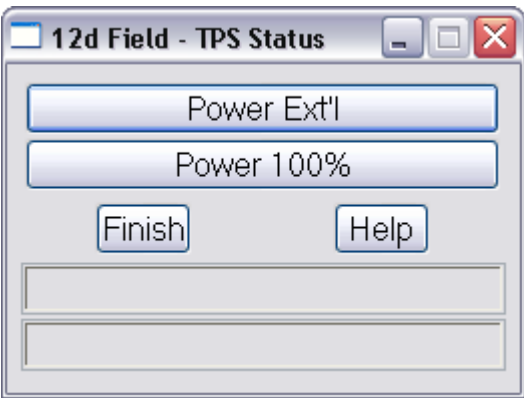
This section of documentation is a work in progress and will be updated in subsequent releases.



Status TPS

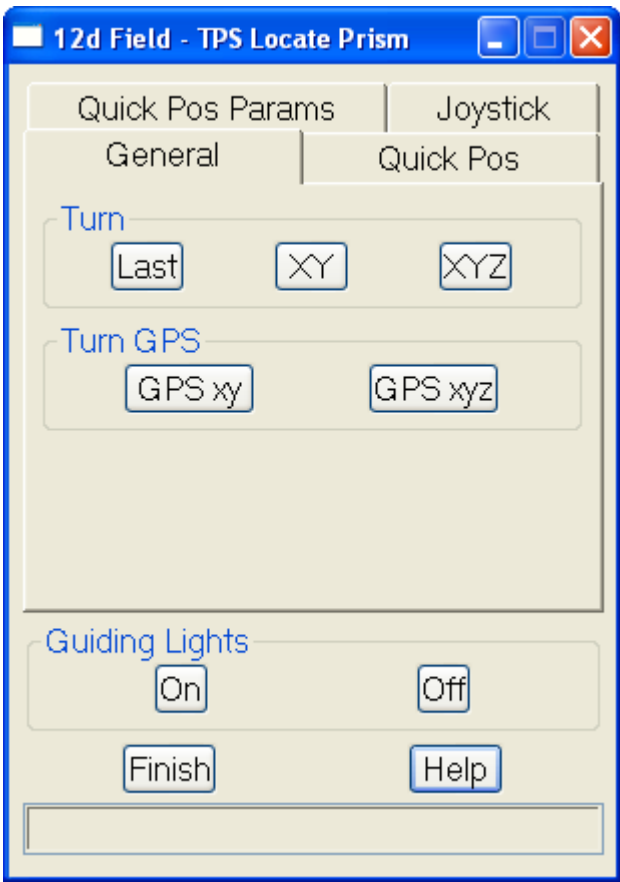
This section of documentation is a work in progress and will be updated in subsequent

releases.



Locate Prism TPS

The **12d Field - TPS Locate Prism** panel is an aid to remotely position the TPS to the current prism location.



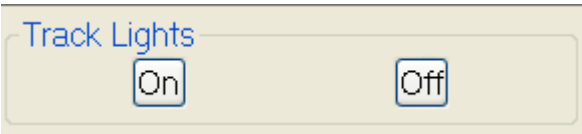
Common fields and buttons

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Guiding lights			

The guiding lights button group is available if the TPS in use has guide lights. The naming of the guiding lights group depends on the primary instrument.

Trimble SPSx30



Topcon 9000



Leica 1200



On

Activate the instruments guiding lights.

On

Deactivate the instruments guiding lights.

General Tab

Turn

Last

The instrument will turn to the last position a measurement was taken at.

XY

A screen select will be activated and the instrument will turn horizontally only to the selected position.

XYZ

A screen select will be activated and the instrument will turn horizontally and vertically to the selected position.

Turn GPS

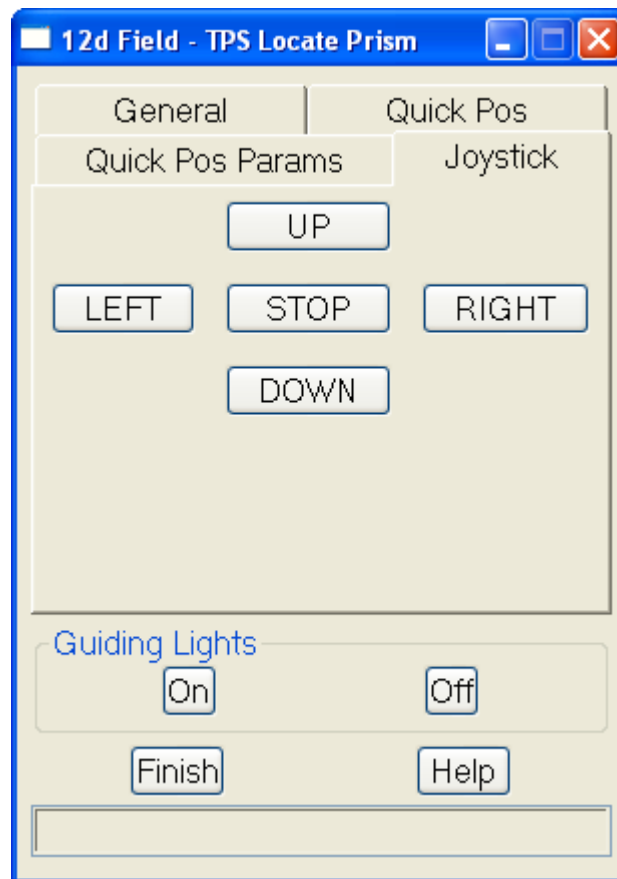
Note these buttons are only available if a GPS instrument is selected as the secondary instrument.

GPS xy

The instrument will turn horizontally only to the current GPS position.

GPS xyz

The instrument will turn horizontally and vertically to the current GPS position.



Joystick Tab

LEFT

Rotate the instrument to the left as viewed from the prism back to the instrument, **LEFT** can be pressed twice more to increase the speed of rotation.

RIGHT

Rotate the instrument to the right as viewed from the prism back to the instrument, **RIGHT** can be pressed twice more to increase the speed of rotation.

UP

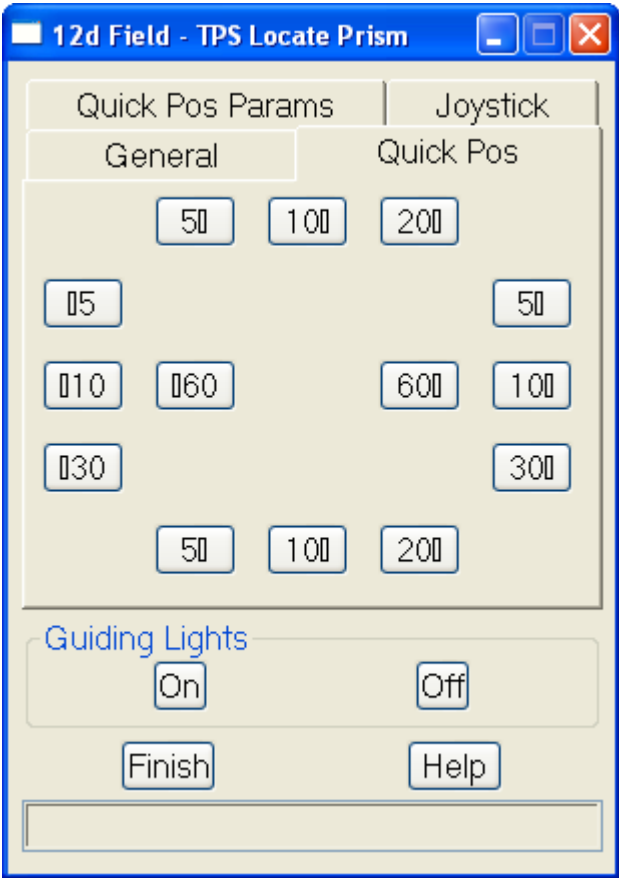
Rotate the Up, **UP** can be pressed twice more to increase the speed of rotation.

DOWN

Rotate the Down, **DOWN** can be pressed twice more to increase the speed of rotation.

STOP

Stop the instrument rotating.

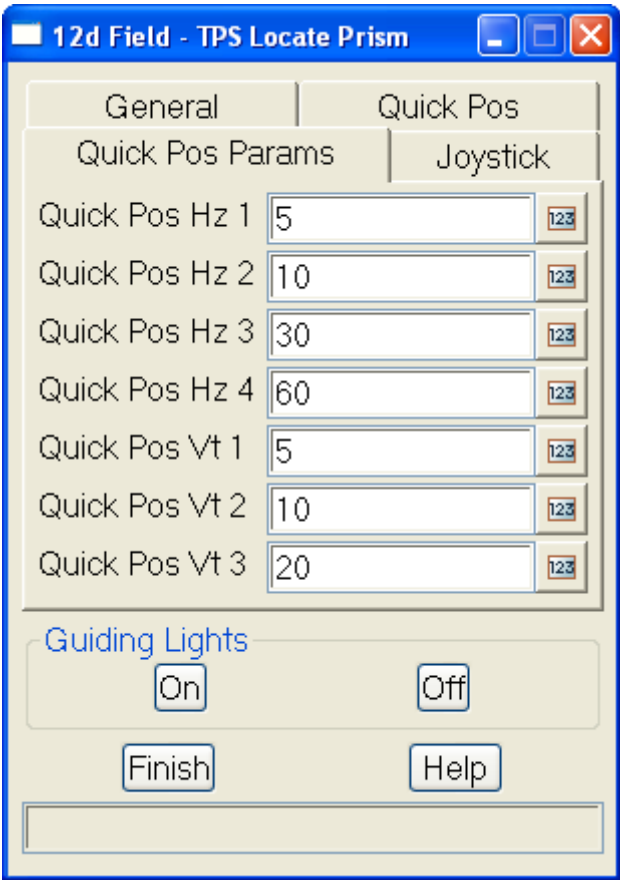


Quick Pos Tab

The **Quick Pos** tab allows the user to manually rotate the instrument in the horizontal and vertical directions by preset amounts. This is sometimes easier to use to orientate the instrument correctly than the joystick controls. There are 4 user definable rotations in the horizontal directions and 3 in the vertical.

The buttons show the direction of rotation and the amount of rotation in degrees, the amount of the rotation is defined on the [Quick Pos Params Tab](#).

When a rotation button is pressed the instrument will rotate by a specified amount and direction, all buttons are disabled until the rotation has completed



Quick Pos Params Tab

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

The **Quick Pos Params** define the rotation available in the [Quick Pos Tab](#).

Quick Pos Hz 1

*the amount of rotation in degrees for the top button in the horizontal groups for **Quick Pos***

Quick Pos Hz 2

*the amount of rotation in degrees for the outer middle button in the horizontal groups for **Quick Pos***

Quick Pos Hz 3

*the amount of rotation in degrees for the lower button in the horizontal groups for **Quick Pos***

Quick Pos Hz 4

*the amount of rotation in degrees for the inner middle button in the horizontal groups for **Quick Pos***

Quick Pos Vt 1

*the amount of rotation in degrees for the left button in the vertical groups for **Quick Pos***

Quick Pos Vt 2

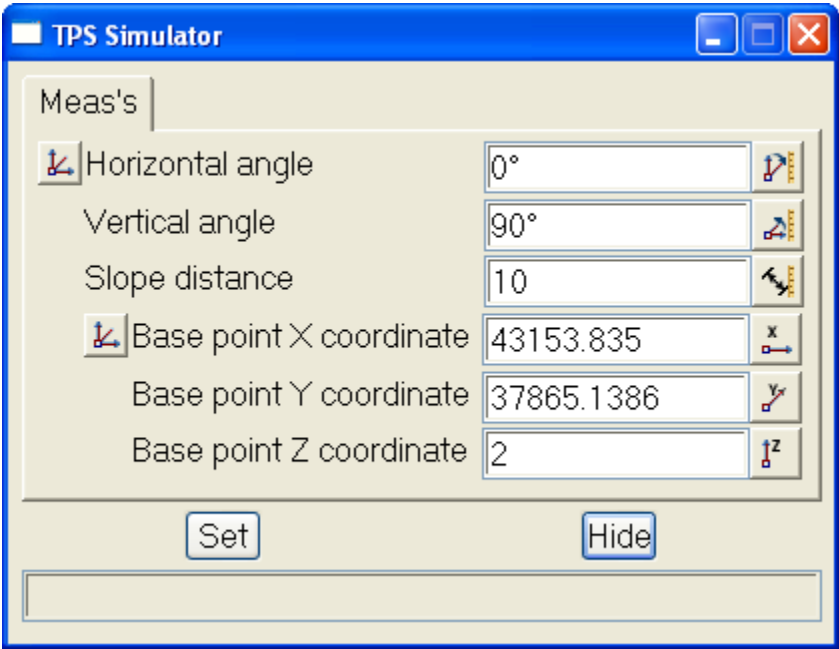
*the amount of rotation in degrees for the middle button in the vertical groups for **Quick Pos***

Quick Pos Vt 3

*the amount of rotation in degrees for the right button in the vertical groups for **Quick Pos***

Simulator Settings

This section of documentation is a work in progress and will be updated in subsequent releases.



Settings

This section of documentation is a work in progress and will be updated in subsequent releases.

12d Field - Settings

General | Storage | Survey | Nav Box | ENV settings
Views 1 | Views 2 | TPS | TPS Hgts | Meas Avg

Plan view: 8

Auto pan Plan view? ☐

Auto pan to selected pt? ☒

Setout section view:

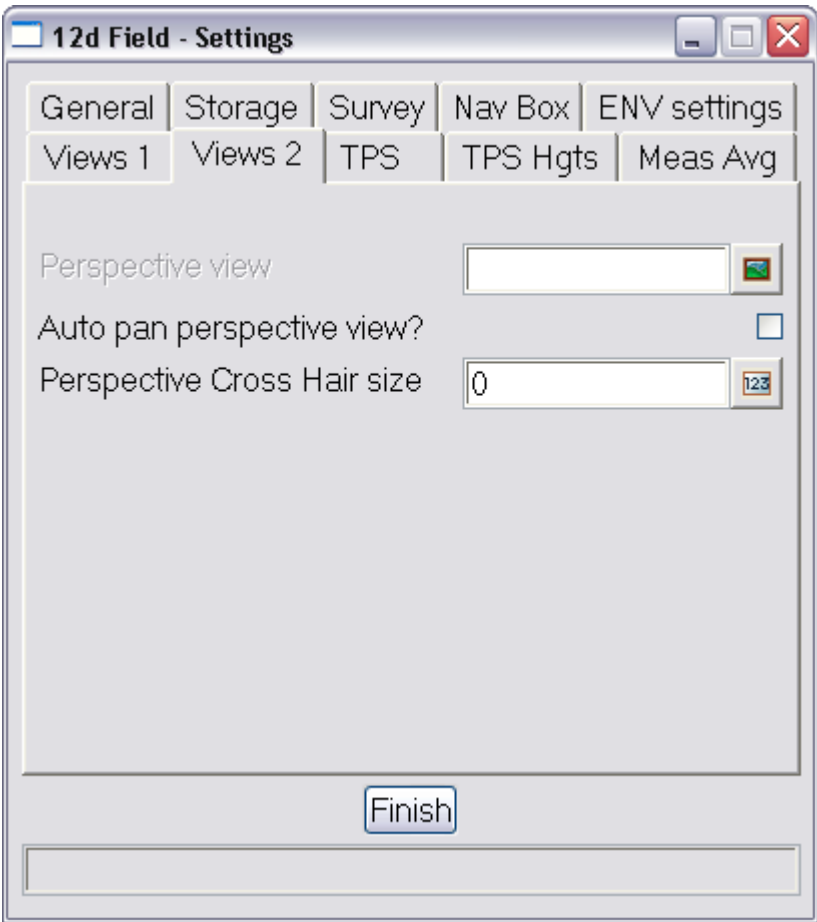
Pickup section view:

PU X-View Extend Left: 20

PU X-View Extend Right: 20

Reverse X-Sect on CH-? ☐

Finish



12d Field - Settings

General Storage Survey Nav Box ENV settings
Views 1 Views 2 TPS TPS Hgts Meas Avg

Hz-Dist PPM

Angle update tme in ms.

Show drifts ☐

Finish

12d Field - Settings

General

Storage

Survey

Nav Box

ENV settings

Views 1

Views 2

TPS

TPS Hgts

Meas Avg

TPS Target Hgt 1

0

TPS Target Hgt 2

0.2

TPS Target Hgt 3

0.3

TPS Target Hgt 4

0.6

TPS Target Hgt 5

1.3

TPS Target Hgt 6

2.15

Finish

12d Field - Settings

General Storage Survey Nav Box ENV settings
Views 1 Views 2 TPS TPS Hgts Meas Avg

Avg Max Shots 10
Avg Min Shots 2
Avg Max XY StdDev 0.003
Avg Max Z StdDev 0.003

Finish

12d Field - Settings

Views 1

Views 2

TPS

TPS Hgts

Meas Avg

General

Storage

Survey

Nav Box

ENV settings

Font Size

20

On MEAS pressed action

Do Nothing

On STOP pressed action

Do Nothing

Prism Size (pixels)

5

Plan Pole Size (pixels)

15

Plan Pole Cross Size (pixels)

5

Surface Linestyle

1

Linestyle Colour

off yellow

Str Name on Control Bar

Finish

12d Field - Settings

Views 1

Views 2

TPS

TPS Hgts

Meas Avg

General

Storage

Survey

Nav Box

ENV settings

12da backup interval (sec)

60

Maximum points per string?

100

Finish

12d Field - Settings

Views 1

Views 2

TPS

TPS Hgts

Meas Avg

General

Storage

Survey

Nav Box

ENV settings

Eastings first?

☒

String Extensions (0 = no ext)

Use Compaction Factors

☐

Store Pt min dist

Pt S/O: Add coord boxes?

☐

Add keyboard control?

☐

Auto zero setout offsets?

☐

Auto zero setout chainage?

☐

TPS auto turn?

Finish

12d Field - Settings

Views 1 | Views 2 | TPS | TPS Hgts | Meas Avg
General | Storage | Survey | Nav Box | ENV settings

Overall width (pixels)

Overall depth (pixels)

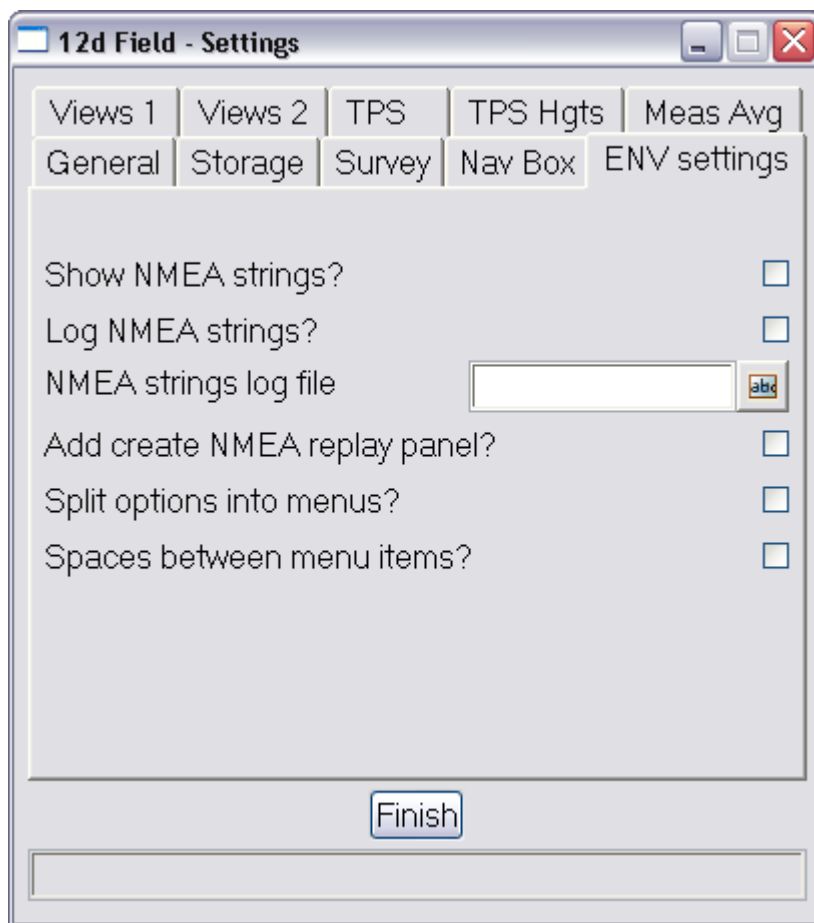
Text region width (pixels)

Text size

Number char's for text

Draw Bulls-eye? ☒

TPS Orientation ▼



Reconnect

Selecting **Reconnect** will attempt to disconnect from the current instrument and then reconnect. This may be required when the instrument has been restarted.

GPS Localisation

Position of option on menu: Survey =>Field 12d=>GPS Localisation

The panel is used to create the localisation parameters used inside 12dField for reducing GPS observations into a local system.

Points collected with 12dField as raw WGS84 cartesian coordinates can be matched with local control points to calculate the parameters to convert GPS readings directly into the local system.

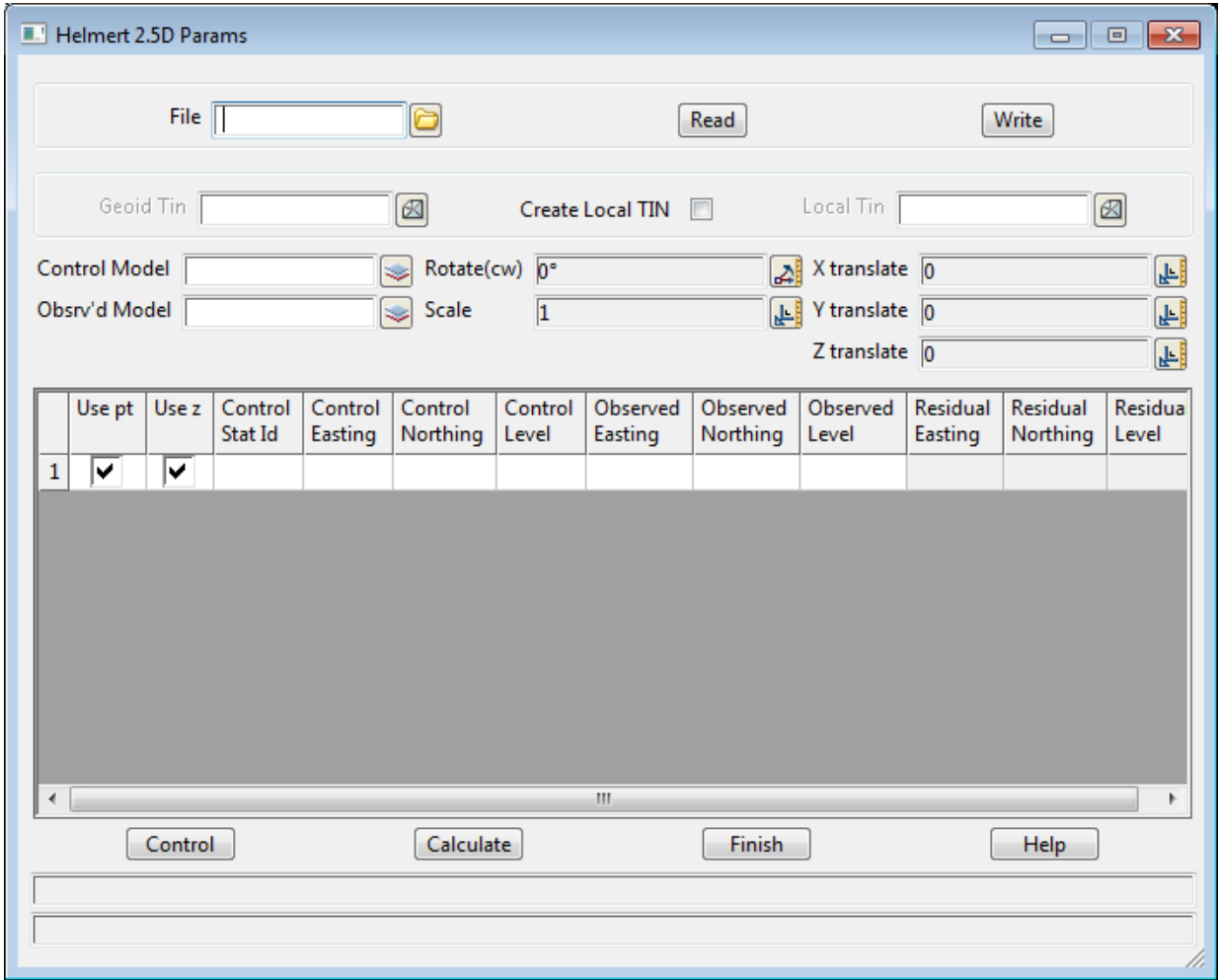
The 12dField localisation treats horizontal and vertical components separately. The horizontal transformation is a Helmert translation, translation, rotation and uniform scaling of the x and y axes.

The vertical translation can either be a simple z translation or be taken from a tin, the tin can be manually created outside of the panel, e.g. from AusGeoid98 or created by the panel via a plane of best fit.

The basic workflow for this panel is to observe known control points in the field with 12dField with just the ellipsoid set, e.g. MGA56.

Then use this panel to match the observed points with the control points to create the

localisation.
Selecting GPS Localisation brings up the **Helmert 2.5D Params** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
File			*.tdf_hel

The TDF_HEL file to be read in or written to. This is the file used by 12dField to localise GPS reading.

Read	button
-------------	--------

Read in the TDF_HEL file

Write	button
--------------	--------

Write out the TDF_HEL file

Geoid Tin

If selected the value of the tin at the local coordinate is added to the height of the raw GPS coordinate.

Create Local TIN	tick box
-------------------------	----------

*If unticked and the **Local Tin** box is blank the points are adjusted by the straight mean z difference of the observations.
If unticked and the **Local Tin** box is not empty the points are adjusted by the value of the TIN at the xy location.*

If ticked and the **Local Tin** box is not empty a plane of best fit is used to create the local TIN and the points are adjusted by the value of the TIN at the current xy location. The extent of the local TIN is 1000m outside the control used.

Local Tin

The **Local Tin** as described above.

Control model model box
the model containing the control points.

Obsrv'd model model box
the model containing the observed points.

Rotate(cw) measure box At Point, Point to Point,
String from Point, String to
Point

The clockwise rotation parameter of the helmert transformation.

Scale measure box At Point, Point to Point,
String from Point, String to
Point

The scaling parameter of the helmert transformation.

X translate measure box At Point, Point to Point,
String from Point, String to
Point

The x translation of the helmert transformation.

Y translate measure box At Point, Point to Point,
String from Point, String to
Point

The y translation of the helmert transformation.

Z translate measure box At Point, Point to Point,
String from Point, String to
Point

The z translation of the helmert transformation, (note this is 0.0 if a local TIN is being used).

The grid

Please note changing the level of a control station to "null" means the station and corresponding observed point will not be used in the height calculations.

Use pt tick box
if ticked this point is used in the transformation calculations

Use z tick box
If unticked this point is not used to calculate the transformation height parameter.

Control Stat Id

The Id of the control station, will normally match the observed Id.

Control Easting/Northing/Level
the coordinate of the control station.

Observed Easting/Northing/Level

the coordinate of the observed point.

Residual Easting/Northing/Level

the delta of the observed point with the control point after the transformation has been applied.

Buttons

Control button

Start the selection of the control/observed point pairs. Note the environment variable PICK_ORDER_OBSERVED_FIRST_4D can be set to make the selection order 'observed' then 'control'. For ease of use 2 plan views should be used, one with the observed points and one with the control points.

Calculate button

Calculate the transformation and update the residuals in the grid control.

Finish button

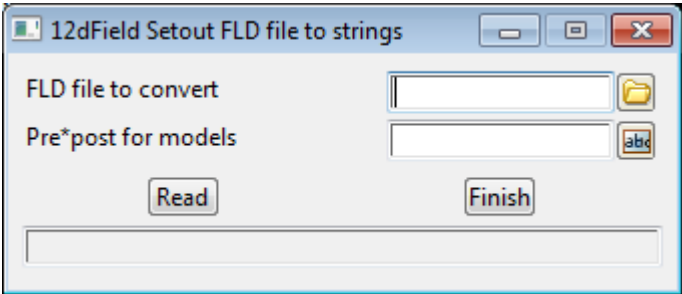
Exit the panel, a warning message will appear if the transformation parameters have not yet been written to file.

12dField Setout FLD File To Strings

Position of option on menu: Survey =>12d Field =>Setout FLD file to strings

A field file, (.FLD) created by **12dField Setout** is attributed in such a way it can be read directly into **12d Model** without going through a Survey Data Reduction function, the string data will be read in with the original name, model, colour, linestyle and weight. Field files created by **12dField Setout** from version **V9C1e** can be read in with this panel.

Selecting **Setout FLD file to strings** displays the**12dField Setout FLD File To Strings** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
FLD file to convert	file		
<i>the field file to be read in.</i>			

Pre*post for models

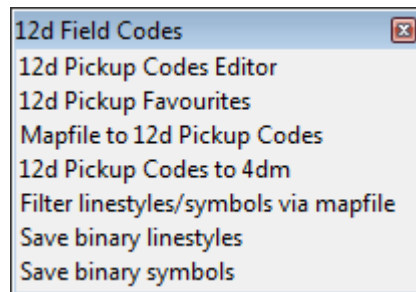
*For more information please go to the section [Pre*Postfix Panel Fields](#) in the chapter [Tools and Concepts](#)*

Read button

the FLD file will be read in, if a point in the field file is not correctly attributed a message will be displayed in the output window and no point will be created.

12d Field Codes

The **12d Field Codes** walk right menu is



For information on *12d Pickup Codes Editor* go to

12d Pickup Favourites

Mapfile to 12d Pickup Codes

12d Pickup Codes to 4dm

Filter linestyles/symbols via mapfile

Save binary linestyles

Save binary symbols

[Pickup Editor](#)

[Pickup Favourites](#)

[Mapfile to 12d Pickup Codes](#)

[12d Pickup Codes to Macro](#)

[Filter Linestyles/Symbols via Mapfile](#)

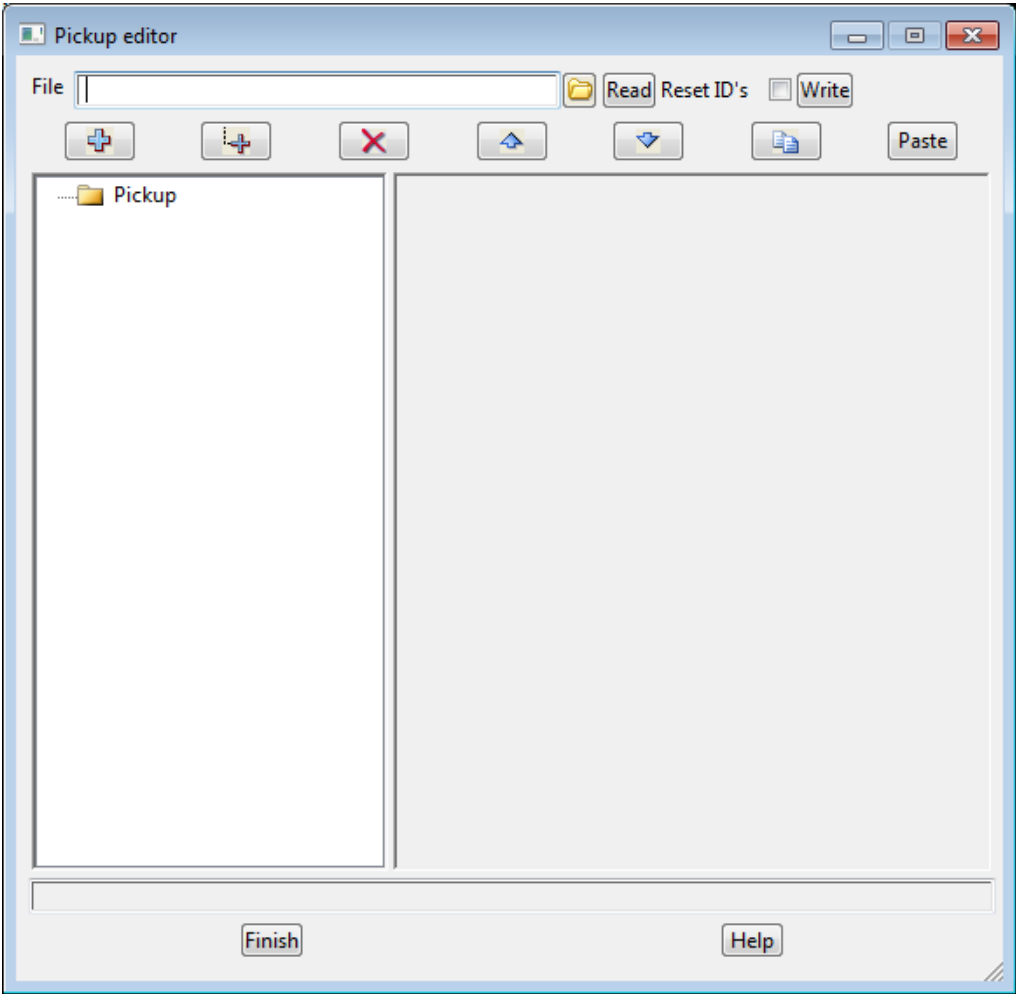
[Save Binary Linestyles](#)

[Save Binary Symbols](#)

Pickup Editor

Position of option on menu: Survey =>12d Field =>12d Field Pickup Codes =>12d Pickup Codes Editor
The **Pickup Editor** panel allows you to define and edit feature codes to be used in **12d Field Pickup**.

Selecting 12d Pickup Codes Editor brings up the **Pickup Editor** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

File <i>the 12d field pickup codes file to edit or create</i>			
-------------------------------------------------------------------------	--	--	--

Read <i>reads the pickup code file</i>			
--------------------------------------------------	--	--	--

Write <i>writes the pickup codes file</i>			
-----------------------------------------------------	--	--	--



add a new node at the current level in the tree



add a child to the current node in the tree



delete the current node in the tree



moves the current node in the tree up



moves the current node in the tree down



copies the current node in the tree

pastes the current node in the tree

Defining Codes

There are a number of different code types that can be added to your pick codes file, depending on the structure of your tree.

Each code has the following field **Type**, which can be used to define the type:

Type

Select Choice ✕

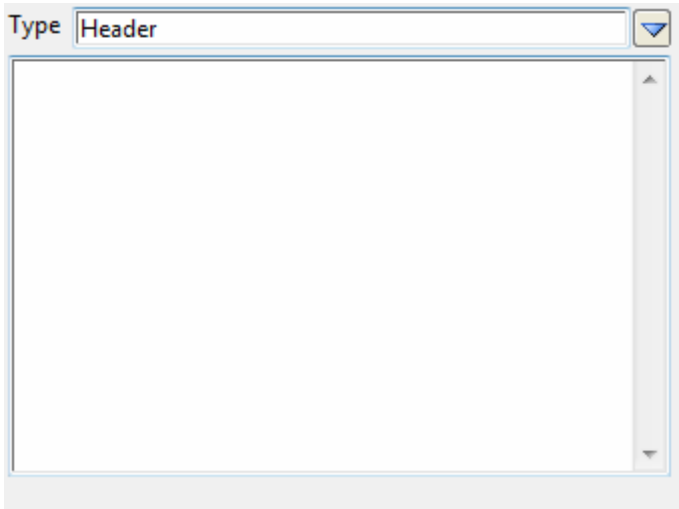
Header
Footer
Features
Opcodes
Attributes
Include

<i>For information on Header go to</i>	Header
<i>Footer</i>	Footer
<i>Features</i>	Features
<i>Opcodes</i>	Opcodes
<i>Attributes</i>	Attributes
<i>Include</i>	Include



Header

A **Header** to be included in any macro code generation.



The fields and buttons used in this panel have the following functions.

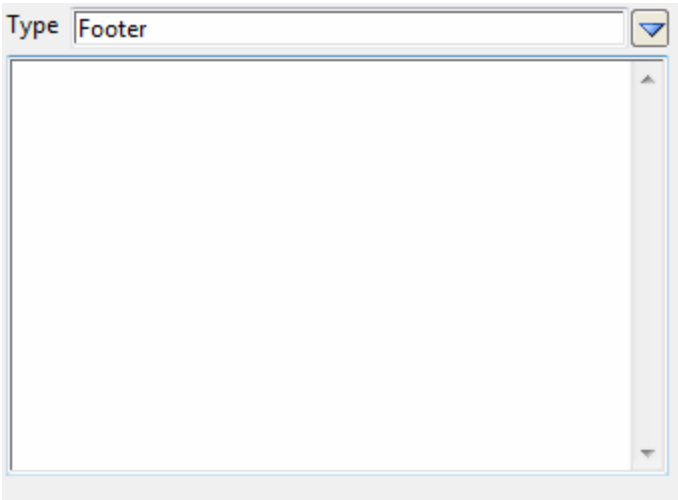
Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Text field

the macro code to include in the header

Footer

A footer to be included in any macro code generation.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Text field				
	<i>the macro code to include in the footer</i>			

Include

Defines another code file to be included.

Type

Include

Include file

Reload

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Include file <i>the include file</i>	file		
Reload <i>reloads the include file</i>	button		

Note that **include files** can be edited inline, within one editor.

Features

This code type defines a group of features

Type

Features

Prompt

Features

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Prompt	input		
<i>the prompt name of the features group to appear in 12d Field pickup</i>			

Available Children Types

Select Choice

Feature

Group

Include

<i>Feature</i>	Feature
<i>Group</i>	Group (Features)
<i>Include</i>	Include

Feature

This code defines a feature to be picked up in the field

Type

Details

Programming

Prompt

Output

Object

Message

Default

Breakline

The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

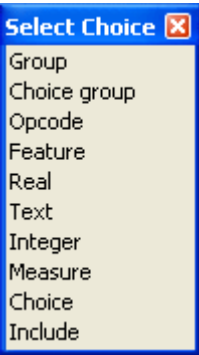
Details Tab

Prompt	input		
<i>the cosmetic name to be displayed during 12d field pickup</i>			
Output	input		
<i>the optional value to output to the pickup file - uses prompt if undefined</i>			
Object	input		
<i>the optional value to be used to define a set of attributes - uses output if undefined</i>			
Message	input		
<i>a message to display when picking up the code</i>			
Default	input		
<i>the default value</i>			
Breakline	choice box		Both, Point, Line
<i>the type of breakline</i>			

Programming Tab

See [Programming](#)

Children types



<i>For information on Group go to</i>	<u>Group (Features)</u>
<i>Choice Group</i>	<u>Choice Group Attribute</u>
<i>Opcode</i>	<u>Opcode Attribute</u>
<i>Feature</i>	<u>Feature Attribute</u>
<i>Real</i>	<u>Real Attribute</u>
<i>Text</i>	<u>Text Attribute</u>
<i>Integer</i>	<u>Integer Attribute</u>
<i>Measure</i>	<u>Measure Attribute</u>
<i>Choice</i>	<u>Choice Attribute</u>
<i>Include</i>	<u>Include</u>



Group (Features)

Defines a group of other features or feature attributes

The fields and buttons used in this panel have the following functions.

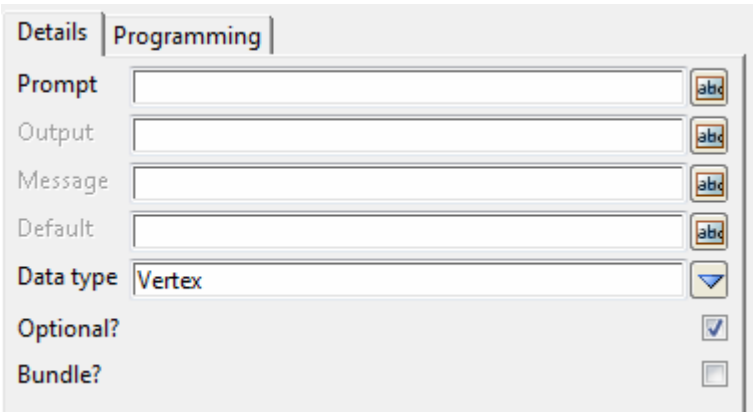
Field Description	Type	Defaults	Pop-Up
Prompt <i>the cosmetic name for the group</i>	input		
Optional? <i>if ticked, filling out the group is optional</i> <i>if not ticked, at least one field in the group must be filled out</i>	tick box		
Bundle? <i>if ticked, this group is treated as a bundle</i> <i>if not ticked, this group is treated as a normal group</i>	tick box		

Available Children Types

For information on Group go to	Group (Features)
Choice Group	Choice Group Attribute
Opcode	Opcode Attribute
Feature	Feature Attribute
Real	Real Attribute
Text	Text Attribute
Integer	Integer Attribute
Measure	Measure Attribute
Choice	Choice Attribute
Include	Include

Choice Group Attribute

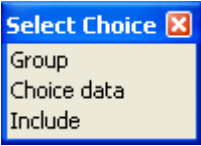
This allows the definition of an attribute defined by a set of choices, defined into groups, to attach to a feature.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Details Tab				
Prompt		input		
	<i>the cosmetic name to be displayed during 12d field pickup</i>			
Output		input		
	<i>the optional value to output to the pickup file - uses prompt if undefined</i>			
Message		input		
	<i>a message to display when displaying the choice group</i>			
Default		input		
	<i>the default value</i>			
Data type		choice box		Vertex, Next Segment, Prev Segment, String, Prompt, Prompt Segment
	<i>how the attribute should be attached</i>			
Optional?		tick box		
	<i>if ticked, this attribute is treated as optional if not ticked, this attribute must be filled out</i>			
Bundle?		tick box		
	<i>if ticked, this attribute is treated as a bundle if not ticked, this attribute is treated as a normal attribute</i>			

Available children types



*For information on Group go to
Choice Data
Include*

[Group \(Choice\)](#)
[Choice Data](#)
[Include](#)

Programming Tab

See [Programming](#)

Group (Choice)

Allows a group of choice group attribute related data to be defined

Type

Prompt

Group

abc

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Prompt	input		
<i>the cosmetic name of the group to display</i>			

Available children types

Select Choice

Group

Choice data

Include

For information on Group go to
Choice Data
Include

[Group \(Choice\)](#)
[Choice Data](#)
[Include](#)

Choice Data

The choices to display for a choice attribute.

Type

Choice data

Data items

	Item
1	

↑

↓

✕

↑

↓

The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Data Items				
	<i>Grid</i>			
Item				
	<i>the value for a choice</i>			

Opcode Attribute

This defines an attribute attached to a feature, which requires the entry of an opcode.

Type

Opcode

Details

Prompt

Output

Message

Pt desc

No Pt desc

Optional?

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Prompt <i>the cosmetic name for the opcode</i>	input		
Output <i>the optional output for the opcode - defaults to prompt if not defined</i>	input		
Message <i>an optional message to display when entering the opcode value</i>	input		
Pt desc <i>the point description</i>	choice box		No pt desc, Pt desc, Null pt desc
Optional <i>if ticked, this opcode attribute is optional</i> <i>if not ticked, this opcode attribute must be entered in the field</i>	tick box		

Feature Attribute

This defines an attribute attached to a feature, which requires the entry of another feature.

Type

Details | Programming

Prompt

Output

Message

Default

Data type

Optional?

Bundle?

abc

abc

abc

abc

Vertex

☒

☐

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Details Tab

Prompt	input		
<i>the cosmetic name to be displayed during 12d field pickup</i>			
Output	input		
<i>the optional value to output to the pickup file - uses prompt if undefined</i>			
Message	input		
<i>a message to display when picking up the code</i>			
Default	input		
<i>the default value</i>			
Data type	choice box		Vertex, Next Segment, Prev Segment, String, Prompt, Prompt Segment
<i>how the attribute should be attached</i>			
Optional?	tick box		
<i>if ticked, this attribute is treated as optional if not ticked, this attribute must be filled out</i>			
Bundle?	tick box		
<i>if ticked, this attribute is treated as a bundle if not ticked, this attribute is treated as a normal attribute</i>			

Programming Tab

See [Programming](#)

Real Attribute

This defines an attribute attached to a feature, which requires the entry of a real value.

Type

Details | Programming

Prompt

Output

Message

Default

Data type

Optional?

Bundle?

abc

abc

abc

abc

Vertex

The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Details Tab				
Prompt		input		
	the cosmetic name to be displayed during 12d field pickup			
Output		input		
	the optional value to output to the pickup file - uses prompt if undefined			
Message		input		
	a message to display when picking up the code			
Default		input		
	the default value			
Data type		choice box		Vertex, Next Segment, Prev Segment, String, Prompt, Prompt Segment
	how the attribute should be attached			
Optional?		tick box		
	if ticked, this attribute is treated as optional if not ticked, this attribute must be filled out			
Bundle?		tick box		
	if ticked, this attribute is treated as a bundle if not ticked, this attribute is treated as a normal attribute			

Programming Tab

See [Programming](#)

Text Attribute

This defines an attribute attached to a feature, which requires the entry of a text value.

Type

Details | Programming

Prompt

Output

Message

Default

Data type

Optional?

Bundle?

abc

abc

abc

abc

Vertex

☒

☐

The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Details Tab				
Prompt		input		
	<i>the cosmetic name to be displayed during 12d field pickup</i>			
Output		input		
	<i>the optional value to output to the pickup file - uses prompt if undefined</i>			
Message		input		
	<i>a message to display when picking up the code</i>			
Default		input		
	<i>the default value</i>			
Data type		choice box		Vertex, Next Segment, Prev Segment, String, Prompt, Prompt Segment
	<i>how the attribute should be attached</i>			
Optional?		tick box		
	<i>if ticked, this attribute is treated as optional if not ticked, this attribute must be filled out</i>			
Bundle?		tick box		
	<i>if ticked, this attribute is treated as a bundle if not ticked, this attribute is treated as a normal attribute</i>			

Programming Tab

See [Programming](#)

Integer Attribute

This defines an attribute attached to a feature, which requires the entry of an integer value.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Details Tab

Prompt	input		
<i>the cosmetic name to be displayed during 12d field pickup</i>			
Output	input		
<i>the optional value to output to the pickup file - uses prompt if undefined</i>			
Message	input		
<i>a message to display when picking up the code</i>			
Default	input		
<i>the default value</i>			
Data type	choice box		Vertex, Next Segment, Prev Segment, String, Prompt, Prompt Segment
<i>how the attribute should be attached</i>			
Optional?	tick box		
<i>if ticked, this attribute is treated as optional if not ticked, this attribute must be filled out</i>			
Bundle?	tick box		
<i>if ticked, this attribute is treated as a bundle if not ticked, this attribute is treated as a normal attribute</i>			

Programming Tab

See [Programming](#)

Measure Attribute

This defines an attribute attached to a feature, which requires a physical measurement.

Type

Measure

Details

Programming

Prompt

abc

Output

abc

Message

abc

Default

abc

Horizontal angle

On - Required

Vertical angle

On - Required

Slope distance

On - Required

Target height

Off

Data type

Vertex

Optional?

☒

Bundle?

☐

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Details Tab

Prompt	input		
<i>the cosmetic name to be displayed during 12d field pickup</i>			
Output	input		
<i>the optional value to output to the pickup file - uses prompt if undefined</i>			
Message	input		
<i>a message to display when picking up the code</i>			
Default	input		
<i>the default value</i>			
Horizontal angle	choice box		Off, On - Required, On - Optional
<i>if the horizontal angle is to be captured</i>			
Vertical angle	choice box		Off, On - Required, On -Optional
<i>if the vertical angle is to be captured</i>			
Slope distance	choice box		Off, On - Required, On -Optional
<i>if the slope distance is to be captured</i>			
Target height	choice box		Off, On - Required, On - Optional

if the target height is required

Data type	choice box	Vertex, Next Segment, Prev Segment, String, Prompt, Prompt Segment
------------------	------------	--------------------------------------------------------------------------

how the attribute should be attached

Optional?	tick box
------------------	----------

if ticked, this attribute is treated as optional
if not ticked, this attribute must be filled out

Bundle?	tick box
----------------	----------

if ticked, this attribute is treated as a bundle
if not ticked, this attribute is treated as a normal attribute

Programming Tab

See [Programming](#)

Choice Attribute

This defines an attribute attached to a feature, which requires a value to be selected from a list of choices.

Type

Choice

Details

Programming

Prompt

abc

Output

abc

Message

abc

Default

abc

Data type

Vertex

Optional?

☒

Bundle?

☐

Data items

	Item
1	

The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Details Tab

Prompt	input		
<i>the cosmetic name to be displayed during 12d field pickup</i>			
Output	input		
<i>the optional value to output to the pickup file - uses prompt if undefined</i>			
Message	input		
<i>a message to display when picking up the code</i>			
Default	input		
<i>the default value</i>			
Data type	choice box		Vertex, Next Segment, Prev Segment, String, Prompt, Prompt Segment
<i>how the attribute should be attached</i>			
Optional?	tick box		

if ticked, this attribute is treated as optional
if not ticked, this attribute must be filled out



Bundle? tick box
if ticked, this attribute is treated as a bundle
if not ticked, this attribute is treated as a normal attribute

Data Items grid
Grid

Item grid
a choice item to display

Opcodes

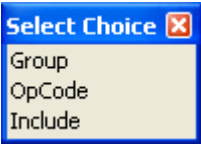
This code type defines a group of opcodes.

Type	Opcodes	
Prompt	Opcodes	

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Prompt	input		
<i>the cosmetic name of the opcodes group</i>			

Available children types



For information on Group go to	Group (Opcodes)
OpCode	OpCode
Include	Include

Group (Opcodes)

This code defines a group of opcodes

Type

Prompt

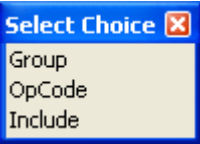
Group

abc

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Prompt	input		
<i>the cosmetic name of the group of opcodes</i>			

Available children types



For information on Group go to

OpCode

Include

[Group \(Opcodes\)](#)

[OpCode](#)

[Include](#)

OpCode

This defines a custom opcode that can be attached to the running pickup function or a picked up feature.

Type

Details

Prompt

Output

Message

Pt desc

Optional?

No Pt desc

☒

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Prompt <i>the cosmetic name to be displayed during 12d field pickup</i>	input		
Output <i>the optional value to output to the pickup file - uses prompt if undefined</i>	input		
Message <i>a message to display when entering the opcode</i>	input		
Pt desc <i>the point description</i>	choice box	No pt desc, Pt desc, Null pt desc	
Optional? <i>if ticked, this opcode is treated as optional if not ticked, it is required</i>	tick box		

Available children types

Select Choice

Feature

Real

Integer

Text

Choice

Include

For information on Feature go to	Feature Attribute (OpCode)
Real	Real Attribute (OpCode)
Integer	Integer Attribute (OpCode)
Text	Text Attribute (OpCode)
Choice	Choice Attribute (OpCode)
Include	Include

Feature Attribute (OpCode)

This defines an attribute attached to an opcode, which requires the entry of a feature.

Type

Feature

Details

Prompt

abc

Message

abc

Default

abc

Optional?

☒

The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Prompt		input		
	the cosmetic name to be displayed during 12d field pickup			
Message		input		
	a message to display when entering the opcode attribute			
Default		input		
	the default value for the attribute			
Optional?		tick box		
	if ticked, this attribute is treated as optional			
	if not ticked, it is required			

Real Attribute (OpCode)

This defines an attribute attached to an opcode, which requires the entry of a real value.

Type

Real

Details

Prompt

Message

Default

Optional?

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Prompt	input		
the cosmetic name to be displayed during 12d field pickup			
Message	input		
a message to display when entering the opcode attribute			
Default	input		
the default value for the attribute			
Optional?	tick box		
if ticked, this attribute is treated as optional			
if not ticked, it is required			

Integer Attribute (OpCode)

This defines an attribute attached to an opcode, which requires the entry of an integer value.

Type

Integer

Details

Prompt

Message

Default

Optional?

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Prompt <i>the cosmetic name to be displayed during 12d field pickup</i>	input		
Message <i>a message to display when entering the opcode attribute</i>	input		
Default <i>the default value for the attribute</i>	input		
Optional? <i>if ticked, this attribute is treated as optional</i> <i>if not ticked, it is required</i>	tick box		

Text Attribute (OpCode)

This defines an attribute attached to an opcode, which requires the entry of a text value.

Type

Text

Details

Prompt

abc

Message

abc

Default

abc

Optional?

☒

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Prompt <i>the cosmetic name to be displayed during 12d field pickup</i>	input		
Message <i>a message to display when entering the opcode attribute</i>	input		
Default <i>the default value for the attribute</i>	input		
Optional? <i>if ticked, this attribute is treated as optional</i> <i>if not ticked, it is required</i>	tick box		

Choice Attribute (OpCode)

This defines an attribute attached to an opcode, which requires the entry of a value selected from a choice.

Type

Choice

Details

Prompt

abc

Message

abc

Default

abc

Optional?

☒

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Prompt <i>the cosmetic name to be displayed during 12d field pickup</i>	input		
Message <i>a message to display when entering the opcode attribute</i>	input		
Default <i>the default value for the attribute</i>	input		
Optional? <i>if ticked, this attribute is treated as optional</i> <i>if not ticked, it is required</i>	tick box		

Attributes

This defines a top level group of attributes.

Type

Prompt

Attributes

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Prompt	input		
<i>the cosmetic name for the group of attributes.</i>			

Available children types

Select Choice

Group

Attribute

Include

For information on Group go to	Group (Attributes)
Attribute	Attribute
Include	Include

Group (Attributes)

This defines a group of attributes or other groups.

Type

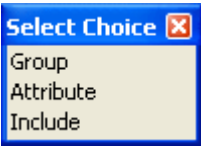
Prompt

Group

The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Prompt		input		
	the cosmetic name for the group that will be displayed			

Available children types



For information on Group go to

Attribute

Include

[Group \(Attributes\)](#)

[Attribute](#)

[Include](#)

Attribute

This defines an attribute that may be attached to a picked up point or string during pickup.

Type Attribute

Details

Programming

Prompt

Output

Object

Message

Default

abc

abc

abc

abc

abc

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Details Tab

Prompt	input
<i>the cosmetic name to be displayed during 12d field pickup</i>	
Output	input
<i>the optional value to output to the pickup file - uses prompt if undefined</i>	
Object	input
<i>the optional value to be used to define a set of attributes - uses output if undefined</i>	
Message	input
<i>a message to display when picking up the code</i>	
Default	input
<i>the default value</i>	

Programming Tab

See [Programming](#)

Available children types

Select Choice

Feature

Real

Text

Integer

Measure

Choice

Include

For information on Feature go to	Feature Attribute
Real	Real Attribute
Text	Text Attribute

<i>Integer</i>	<u>Integer Attribute</u>
<i>Measure</i>	<u>Measure Attribute</u>
<i>Choice</i>	<u>Choice Attribute</u>
<i>Include</i>	<u>Include</u>

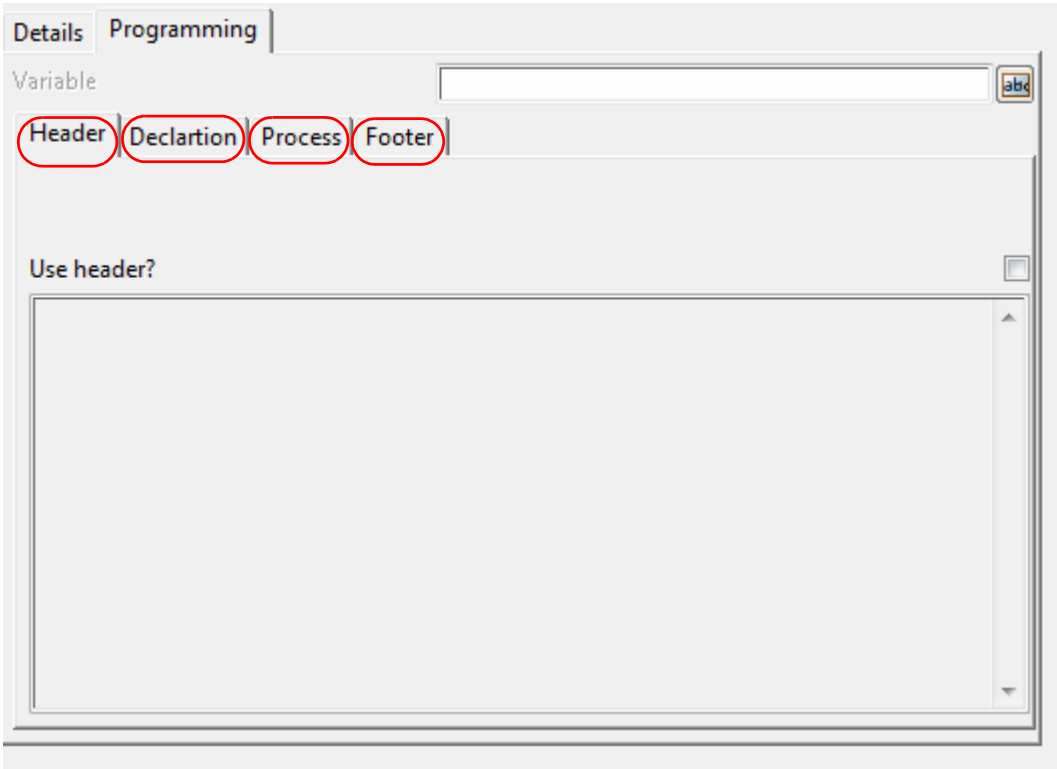


Programming

It is possible to generate macro code for GIS post processing, for any feature or attribute. The **programming tab** is used to assist you in doing so.

See [12d Pickup Codes to Macro](#) for more information on how to generate a GIS post processing 4dm file.

To assist you, this is broken into sections: [Header Tab](#), [Declaration Tab](#), [Process Tab](#), [Footer Tab](#).



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Variable	input		
<i>For use with attributes or opcodes, defines the variable that the data should be stored in for use later.</i>			

Header Tab

The **Header tab** defines any header that should be output into the macro file for the current item.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use header?	tick box		
<i>if ticked, the header will output to the generated file</i>			
<i>if not ticked, no header will be used</i>			

Text field
the macro code to output into the GIS post processing file

Declaration Tab

The **Declaration tab** defines the 'declaration' to be output into the macro, which can be used for defining variables.

Header

Declartion

Process

Footer

Use declaration?

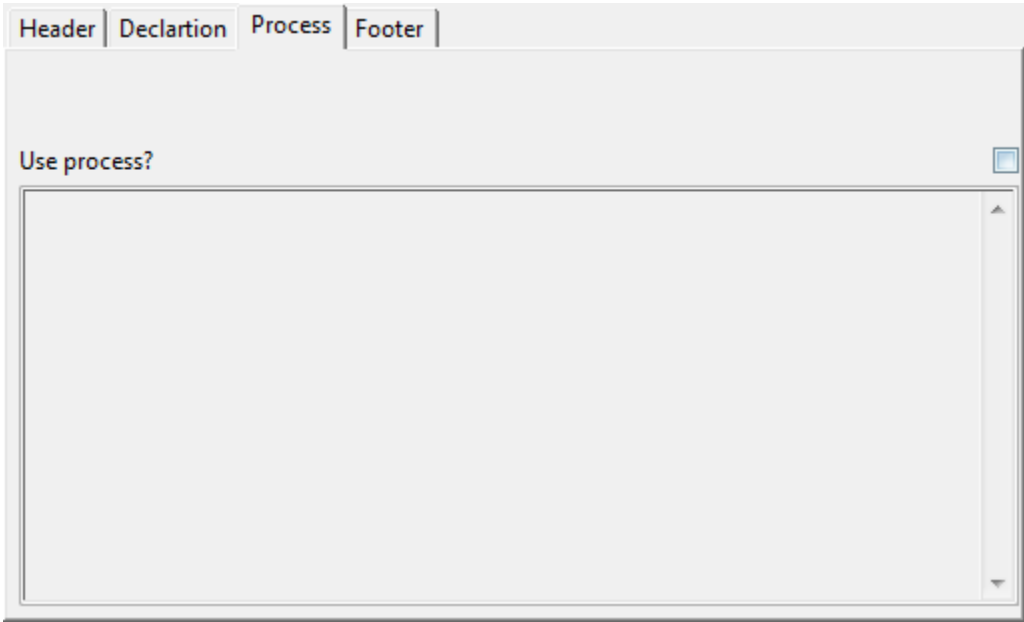
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use declaration?	tick box		
<i>if ticked, a declaration will be output to the generated file</i>			
<i>if not ticked, no declaration will be output</i>			

Text field
the macro code to output into the GIS post processing file.

Process Tab

The **Process tab** defines the main processing part of the macro code, which could be used to process a selected feature code and associated attributes, or other items such as opcodes.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use process?	tick box		
<i>if ticked, the process data will be output into the generated file</i>			
<i>if not ticked, no process data will be output.</i>			

Text field
the macro code to output into the GIS post processing file

Footer Tab

The **Footer tab** is used to define any macro code that should be added to the footer.

Header

Declartion

Process

Footer

Use footer?

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use footer?	tick box		
<i>if ticked, the footer will output to the generated file</i>			
<i>if not ticked, no footer will be output</i>			

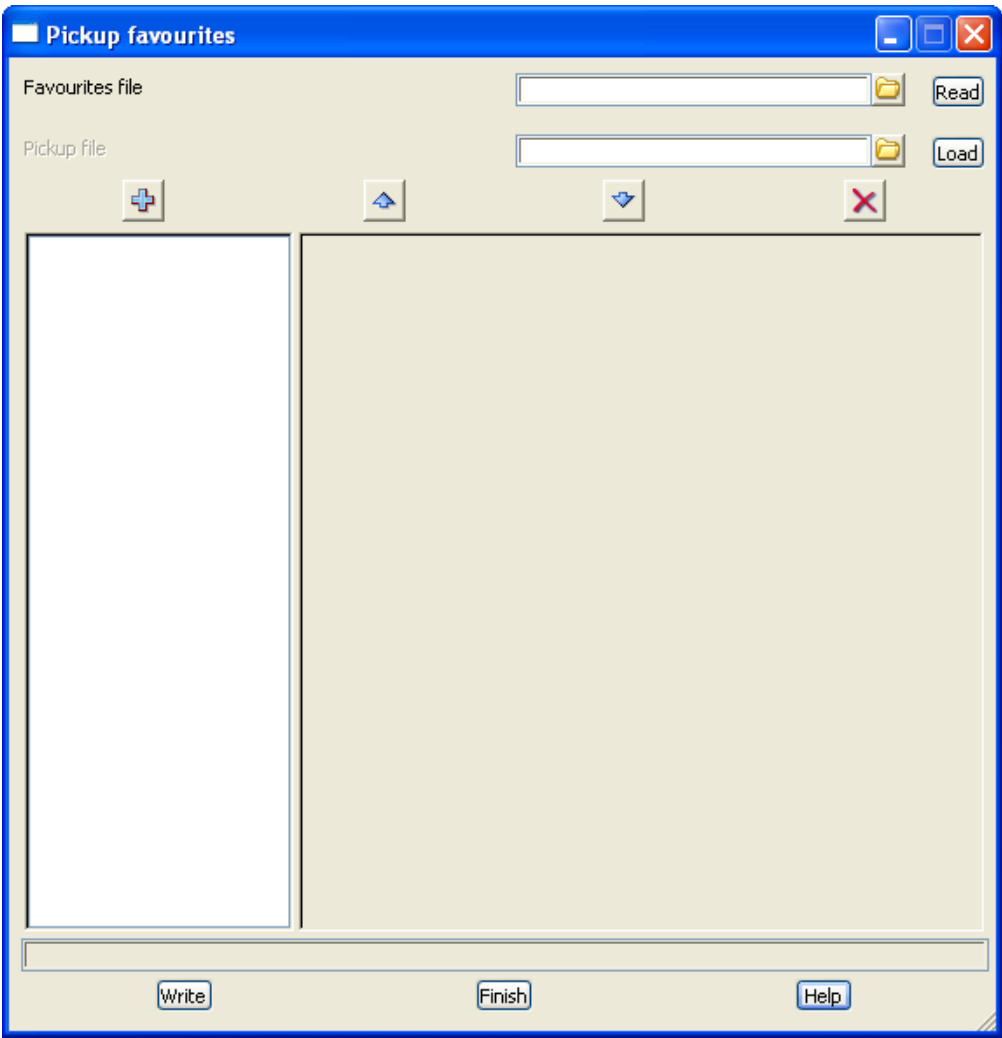
Text field
the macro code to output into the GIS post processing file

Pickup Favourites

Position of option on menu: Survey =>12d Field =>12d Field Pickup Codes => 12d Pickup Favourites


This panel is used to create and edit 12d field pickup favourites files. They contain a list of feature codes and associated information for use within **12d Field Pickup**.


Selecting 12d Pickup Favourites brings up the **Pickup Favourites** panel.





The fields and buttons used in this panel have the following functions.

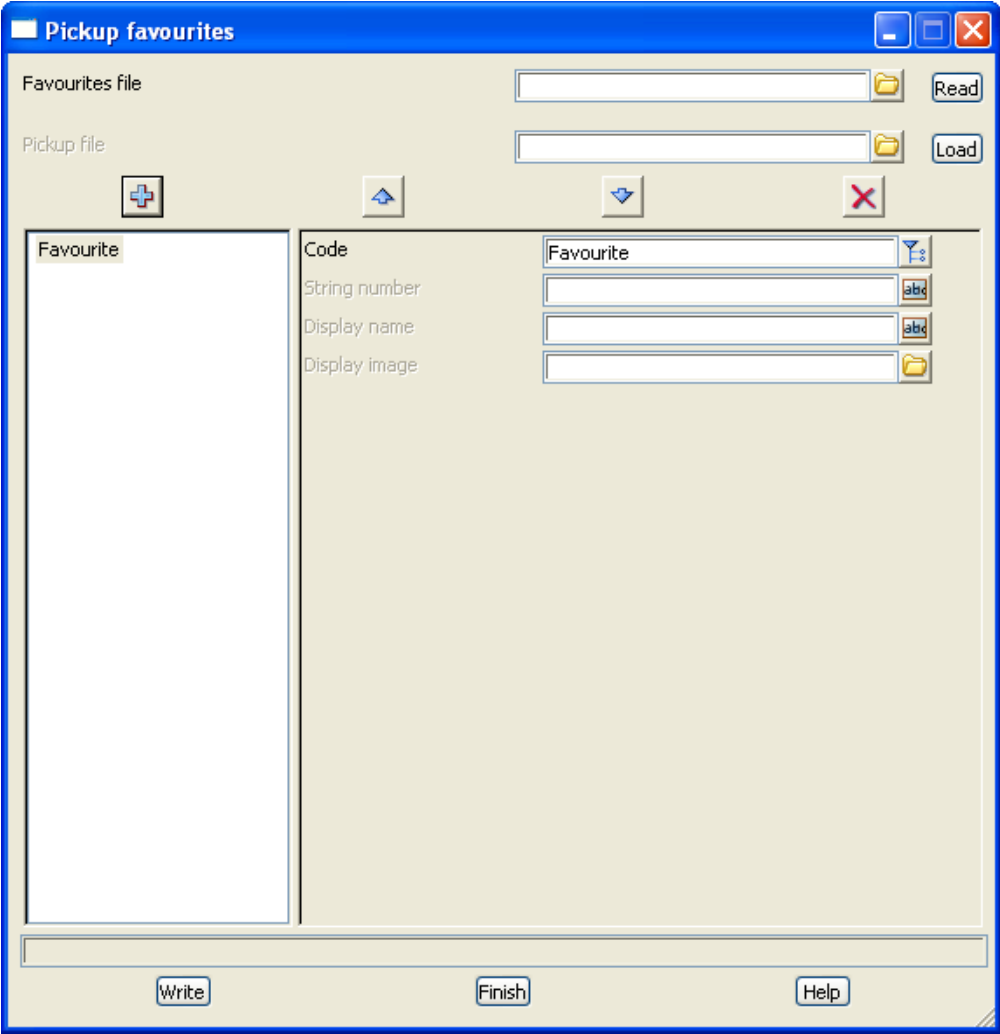
Field Description	Type	Defaults	Pop-Up
Favourites file <i>the favourites file to create or edit</i>	file		*.12dfieldfavourites
Read <i>reads the favourites file, if it exists</i>	button		
Pickup file <i>the optional 12d field pickup codes file to use as the source of feature codes available as favourites.</i>	file		*.12dfieldcodes
Load <i>loads the optional 12d field pickup codes file for use</i>	button		

 adds a new favourite

 moves a favourite up

 moves a favourite down

 delete a favourite



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Code

the name of the favourite.
if a pickup codes file has been loaded, the list of codes in the pickup codes file will be available as a choice in the browse box.
if no pickup codes file has been loaded, nothing will appear in the browse box.

String number	input
----------------------	-------

the optional string number for the favourite

Display name input

the optional cosmetic name of the favourite to display
If not specified, the favourite will display using the code name

Display image file

the optional cosmetic image of the favourite to display
If not specified, no image will be displayed.

Write button

writes the Pickup favourites to the specified file.

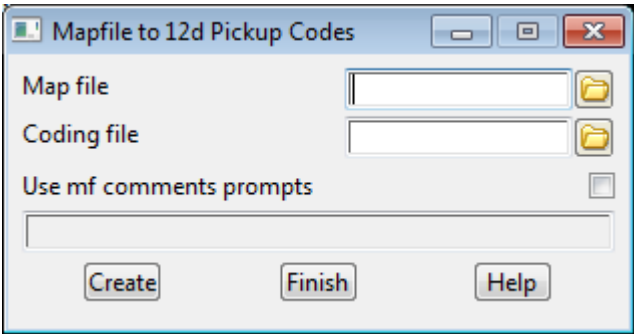
Mapfile to 12d Pickup Codes

Position of option on menu: Survey =>12d Field =>12d Field Pickup Codes => Mapfile to 12d Pickup Codes

This option is used to create a 12d Field Pickup Coding file from an existing map file. Only the following information from the Basic section of the mapfile is used

- Key
- Model
- Comment

Selecting Mapfile to 12d Pickup Codes brings up the Mapfile to 12d Pickup Codes panel



The fields and buttons used in this panel have the following functions.

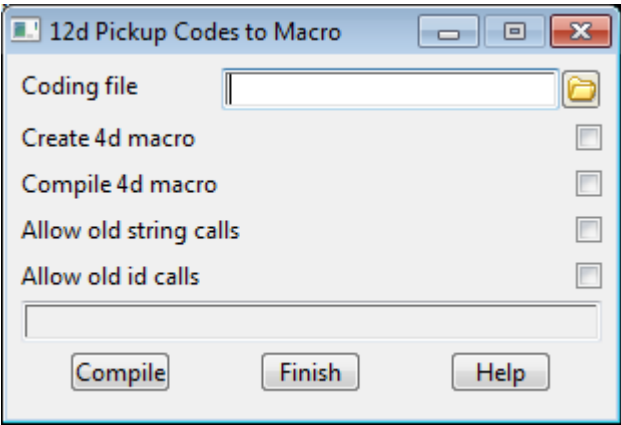
Field Description	Type	Defaults	Pop-Up
Mapfile <i>name of the 12d mapfile to convert from.</i>	file		*.mapfile *.mf
Coding file <i>name of the coding file to convert to.</i>	file		*.12dfieldcodes
Use mf comments prompts tick box <i>if ticked, the Comment field is used as the display prompt that the user sees when selecting the current feature code.</i> <i>If not ticked, the Key field is used as the display prompt.</i>			
Create <i>convert the file.</i>	button		

12d Pickup Codes to Macro

Position of option on menu: Survey =>12d Field =>12d Field Pickup Codes => 12d Pickup Codes to 4dm

This panel generates a macro based on any programming defined in a 12d field pickup codes file. It will create a new file of the same name as the 12d field pickup codes file, with the extension 4dm

Selecting 12d Pickup Codes to 4dm brings up the **12d Pickup Codes to Macro** panel



The fields and buttons used in this panel have the following functions.

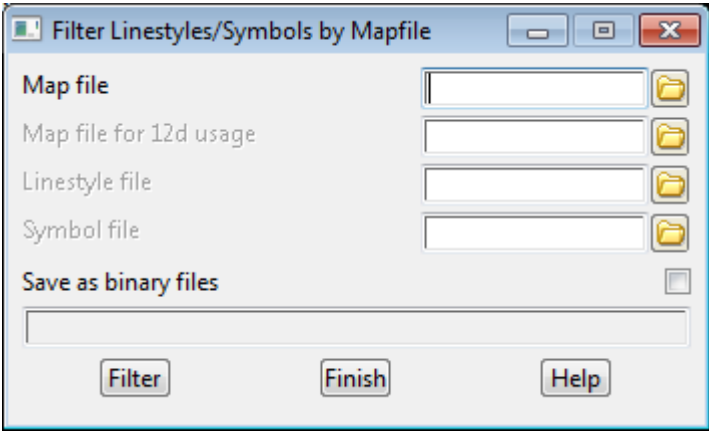
Field Description	Type	Defaults	Pop-Up
Coding file <i>the 12d field pickup codes file to read</i>	file		*.12dfieldcodes
Create 4d macro <i>if ticked, it creates the 4dm file from the 12d field pickup codes file programming.</i>	tick box		
Compile 4d macro <i>if ticked, the created 4dm file will be compiled into a 4do file if not ticked, no compilation will take place</i>	tick box		
Allow old string calls <i>if ticked, old string calls will be allowed by the compiler. if not ticked, old string calls will not be allowed by the compiler.</i>	tick box		
Allow old id calls <i>if ticked, old id calls will be allowed by the compiler. if not ticked, old id calls will not be allowed by the compiler.</i>	tick box		
Compile <i>creates and/or compiles the 12d field pickup codes file into a macro</i>	button		

Filter Linestyles/Symbols via Mapfile

Position of option on menu: Survey =>12d Field =>12d Field Pickup Codes => Filter linestyles/symbols via mapfile

This section of documentation is a work in progress and will be updated in subsequent releases.

Selecting **Filter linestyles/symbols via mapfile** brings up the **Filter Linestyles/Symbols by Mapfile** panel



The fields and buttons used in this panel have the following functions.

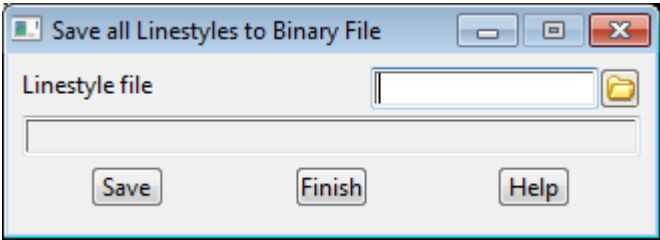
Field Description	Type	Defaults	Pop-Up
Map file	file box		available mapfiles
Map file for 12d usage	file box		available mapfiles
Linestyle file	file box		
Symbol file	file box		
Save as binary files	tick box	not ticked	
Filter	button		

Save Binary Linestyles

Position of option on menu: Survey =>12d Field =>12d Field Pickup Codes => Save binary linestyles

This section of documentation is a work in progress and will be updated in subsequent releases.

Selecting Save binary linestyles brings up the **Save all Linestyles to Binary File** panel



The fields and buttons used in this panel have the following functions.

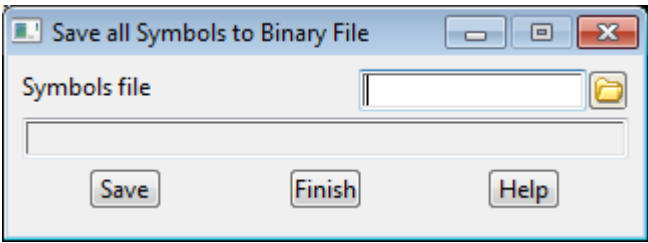
Field Description	Type	Defaults	Pop-Up
Linestyle file	file box		available *.4d files
Save	button		

Save Binary Symbols

Position of option on menu: Survey =>12d Field =>12d Field Pickup Codes => Save binary symbols

This section of documentation is a work in progress and will be updated in subsequent releases.

Selecting Save binary symbols brings up the **Save all Symbols to Binary File** panel

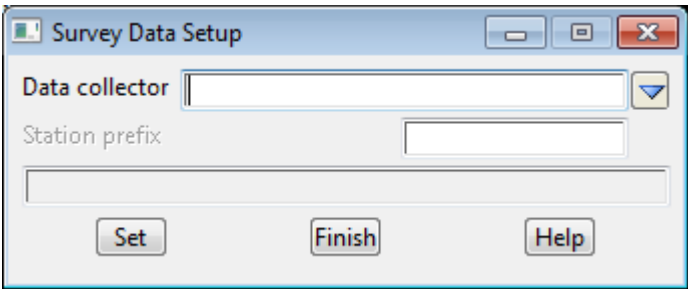


The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Symbols file	file box		available *.4d files
Save	button		

Setup

Position of option on menu: Survey =>Setup
Selecting **setup** brings up the **survey data setup** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data collector <i>name of the data collector definition used to define how to read and interpret the raw survey data file. The list of available data collectors definitions is given in the file pointed to by the environment variable DATA_COLLECTORS_4D.</i> <i>A data collector definition can be created/edited by</i> <i>(a) clicking on the choice button at the end of the Data collector panel field and selecting [Edit] at the bottom of the pop-up list of defined data collectors to bring up the Survey.4d Edit/Create panel.</i> <i>(b) using Project=>Browse=>Survey data collectors the create/edit the Survey.4d file.</i> <i>Please see the Data Collector Definitions of Appendix 12d Survey Guide for more information on setting up a data collector definition.</i>	input		available data collectors
Station prefix <i>if non-blank, the prefix to be used for any text given for new instrument stations.</i>	input		
Set <i>store the selected data collector as being the currently selected one.</i>	button		
Note: Selecting [Edit] at the bottom of the pop-up list of data collectors will bring up the Survey.4d Create/Edit panel.			

Download Raw

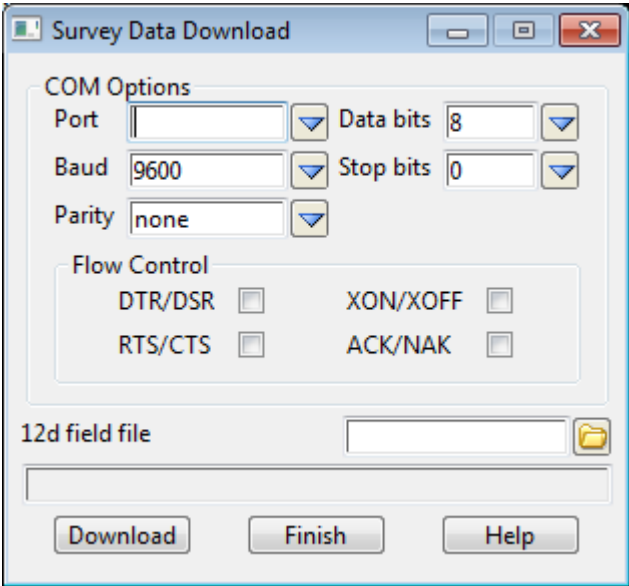
Position of option on menu: Survey =>Download raw

The **download raw** option will read data from the data collector connected to the computer's serial port, save it in a file (the raw data file) and once the download is completed, automatically convert the raw data file into a 12d field file using the currently defined data collector.

Hence the **download** option downloads data from the data recorder and creates a data collector raw file and an equivalent 12d field file.

For more detailed information on the survey reduction process in **12d Model**, go to the Appendix [12d Survey Guide](#).

Selecting **Download raw** brings up the **Survey Data Download** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Port <i>name of the computer serial port that the data collector is connected to. The default port is specified in the data collector configuration file.</i>	input	from configuration file	
Data bits <i>number of bits</i>	input	from configuration file	5,6,7,8
Baud rate <i>speed of the serial port</i>	input	from configuration file	
Stop bits <i>number of stop bits</i>	input	from configuration file	
Parity <i>parity</i>	input	from configuration file	
DTR/DSR <i>if ticked, use DTR/DSR flow control</i>	tick	from configuration file	

RTS/CTS	tick	from configuration file
<i>if ticked, use RTS/CTS flow control</i>		
XON/XOFF	tick	from configuration file
<i>if ticked, use Xon/Xoff</i>		
ACK/NAK	tick	from configuration file
<i>if ticked, use ACK/NAK</i>		

12d Field file input *.fld files

name of the 12d field file that the raw file is to be converted to. The raw file is given the same name but with the extension specified in the configuration file, e.g., “.gre”.

Download button

On clicking the download button, the software will read a data stream from the serial port and store the raw data into a file. The extension of this file, will be specified in the configuration file. The name will be the same as the field file, with any “.fld” removed.

On completion of the download, the raw data file is automatically converted to a 12d field file of name given in the field file field.

Convert Raw

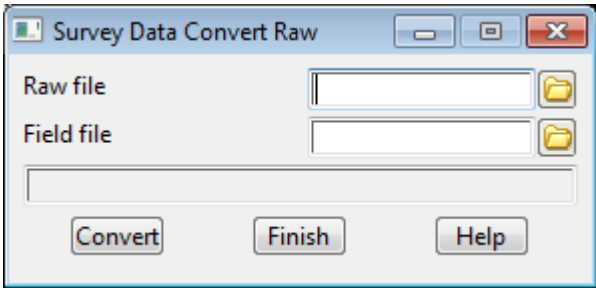
Position of option on menu: Survey =>Convert raw

The **convert raw** option is used to convert an existing raw data file of the type given by the data collector setup, into a 12d field file.

The raw data file may have been previously down loaded by **12d Model** or obtained via another mechanism.

For more detailed information on the survey reduction process in **12d Model**, go to the Appendix [12d Survey Guide](#).

Selecting **Convert raw** brings up the **Survey Data Convert Raw** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Raw file	input		available raw files
<i>name of the raw data file to be converted to a 12d field file. The popup will contain all files with the extension specified in the configuration file for raw data files, e.g. “.gre”.</i>			
Field file	input		*.fld files
<i>name of the 12d field file that the raw file is to be converted to. When the raw file name is given, the file of the same name but with the extension .fld is automatically piped into the field file field.</i>			
Convert	button		
<i>convert the raw data given in the raw file field into the 12d field file format and save it in the file given in the field file field.</i>			

Create Survey Function

Position of menu: Survey =>Create

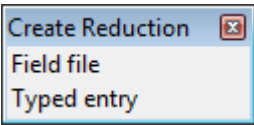
The create walk-right menu contains options to create a **12d Model** Survey function from either a 12d field file or from scratch using *Survey Reduction edit commands*.

Basically, a **Survey** function keeps track of the field data, the information involved in the survey reduction and all the strings and models created by the *Survey* function. The field data for the *Survey* function can be edited and the reduction re-run and all the old reduced strings automatically deleted and replaced by the updated reduced strings.

For more detailed information on the survey reduction process in **12d Model**, go to the Appendix [12d Survey Guide](#).

The field data can be read in from a *12d field file* using the **Field file** option, or the **Typed entry** option can be used to enter all the data by hand.

The create walk-right menu is:



create survey reduction function from a 12d field file - reduces data
create survey reduction function by typed entry into 12d field file.

For the option *Field file*, go to
Typed entry

[Field File](#)
[Typed Entry](#)

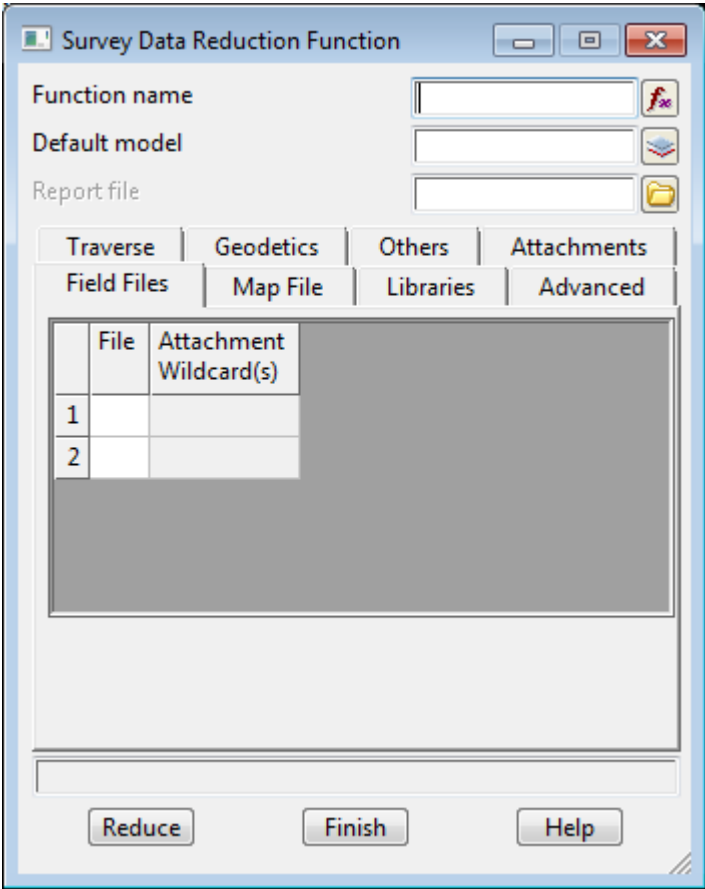
Field File

Position of option on menu: Survey =>Create =>Field file

The **field file** option creates a *Survey function* from a 12d field file.

For more detailed information on the survey reduction process in **12d Model**, go to the Appendix [12d Survey Guide](#).

Selecting **field file** brings up the **survey data reduction function** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Function name	input		available Survey functions
<i>name of the 12d Survey function. If the Survey function exists, then it is loaded into the panel. If the Survey function does not exist, then a new Survey function is created.</i>			
Default model	input		available models
<i>if a feature code is not found in the map file, or no map file is selected, the strings and points of that feature code will be placed in the default model. The colour used will be the default line or point colour for 12d Model. The default model field is compulsory. Check measurements will be always placed in the default model if a check model is not given (on the Advanced tab).</i>			
Report file	input		*.rpt
<i>if non-blank, a log of the reduction steps, including new instrument stations, new target heights, scale factors, backsights and check measurements is created. Any errors are also logged.</i>			

Button at Bottom

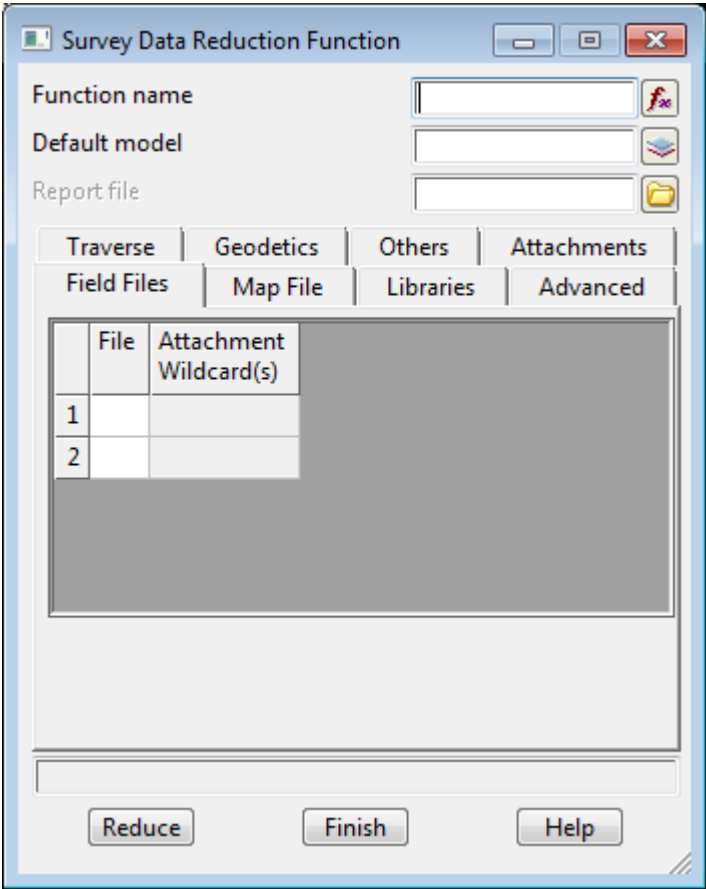
Reduce	button
<i>On clicking the reduce button, the software converts the field measurements in the selected 12d field file, using coordinates from the control model if necessary, and produces super strings. The super strings will be assigned names and models using the name library and map file.</i>	

For descriptions of each of the tabs on the panel, go to:
[Field Files tab](#)

- [Map File tab](#)
- [Libraries tab](#)
- [Advanced tab](#)
- [Traverse tab](#)
- [Geodetics tab](#)
- [Others tab](#)
- [Attachments tab](#)

Field Files tab

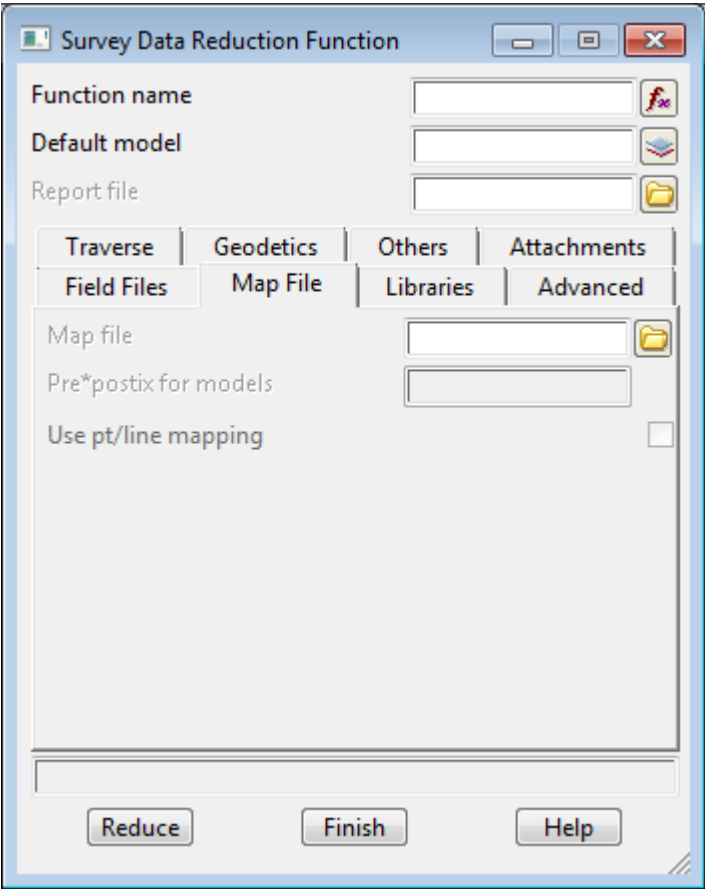
list of field files to read in



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Field file	input		*.fld files
<i>name of the 12d field file to be read into the function as its initial field data, and then reduced. The field data in the Survey function can be edited either by command or graphically.</i>			
Attachment wildcards	input		
<i>not yet used</i>			

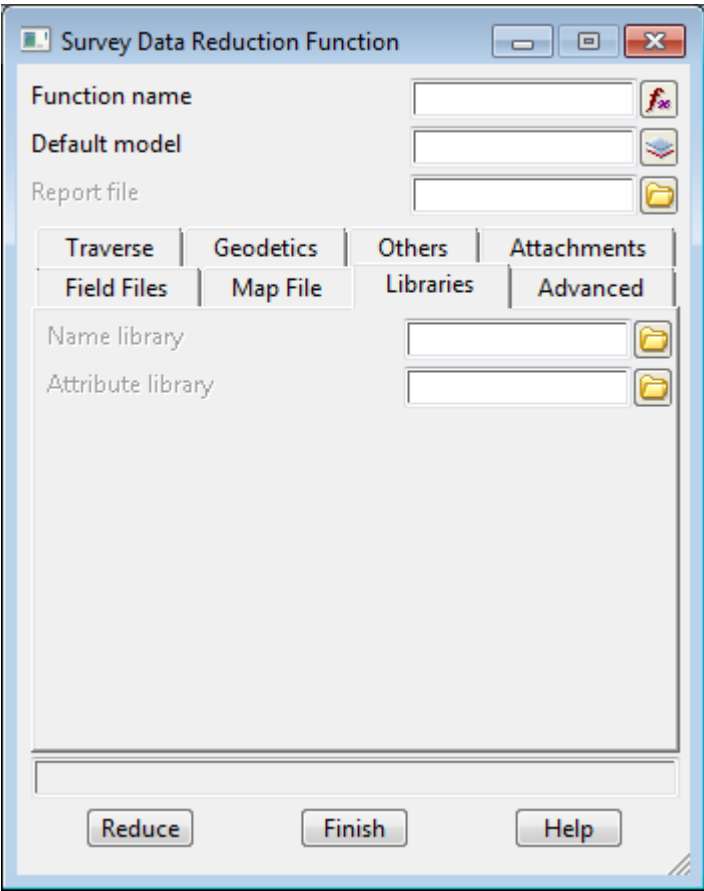
Map File tab



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Map file	input		*.mf files
<i>if non-blank, the map file is used to map feature codes to string names, models, colours, line styles, etc. In general, strings will be created as line strings by assigning a non-zero string number in the field, and strings will be created as point strings by assigning a zero string number in the field. This behaviour may be overridden with field codes 92, 93 and 94.</i>			
Pre*postfix for models	input		available models
<i>the pre*postfix for models text is applied to all model names in the map file.</i>			
Use pt/line mapping	tick		
<i>if ticked and a map file is used, the column in the map file that specifies the point/line type of the string is be used to set the point/line type of the string.</i>			
<i>If not ticked and a map file is used, the column is ignored (not used for setting point/line type of the string).</i>			

Libraries tab



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name library	input		*.nl files

*if **non-blank**, the name library can be used to automatically create vertex text for the string if no vertex text is given in the field. A name library file contains two columns separated by one or more spaces. The text in the first column is matched against the feature code (wild cards * and ? can be used). The second column contains the vertex text to use if a match occurs.*

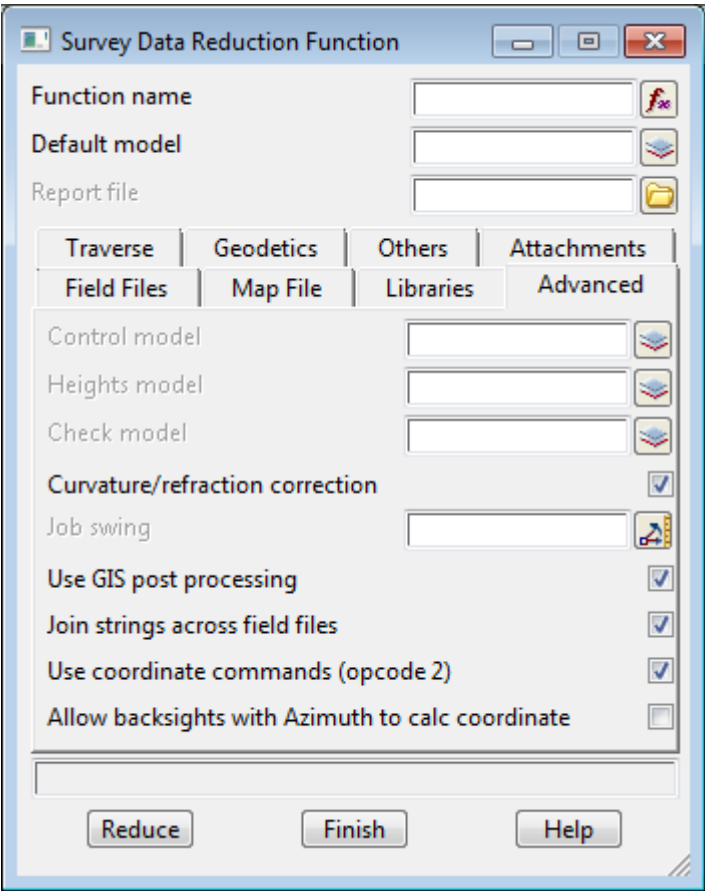
Note that if vertex text is given in the field then it is used instead of the text in the name library.

*Pre-super strings: if **non-blank**, the name library will be used to automatically create 4d strings and to assign text to 4d strings. Name library files will contain two columns. The first column in the name library will be matched against the feature code. Note that if a match is found, a 4d string is always created, as opposed to another string type. The second column will contain the text for the 4d string.*

Attribute library	input	*.al files
--------------------------	-------	------------

*if **non-blank**, the attribute library is used to give names to any unnamed attributes. The first word of each line in the file is the code to define the attribute for (can include wild cards) and the next n words are the names for each unnamed attributes in order. If the attribute library is mission, then the unnamed attributes will be given the names **unnamed attribute i** for $i=1, \dots$.*

Advanced tab



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Control model	input		available models
<i>if not blank, name of the model containing instrument and backsight stations that can be referenced during the reduction. The name of the string is taken as the station name and if the string contains more than one point, the first point in the string is used for the co-ordinates of the station.</i>			
Heights model	input		available models
<i>in not blank, name of the model containing points that are used for the heights of points during reduction. The points in the heights model have the point id of required point and a height which is used whenever that point id is found in the reduction. The (x,y) co-ordinates of the point are ignored.</i>			
Check model	input		available models
<i>if non-blank, then all check shots will go to this model. If blank then check shots go to the default model.</i>			
Curvature/refraction correction	tick box	tick	
<i>if ticked, during the reduction, each EDM tacheometry measurement (field code 7) has a correction for earth curvature and refraction applied to the measurement.</i>			
Job swing			
<i>if non-blank, then the job is swung through this value. The rotation is in a clockwise direction and the value is in hp dms format.</i>			
Use GIS post processing	tick box	tick	

if ticked, run the given 12d macro to process attribute blocks

Join strings across field files tick box tick

if **ticked**, points with the same code and string number will be included in the same string in any of the field files. The order that the points are placed in the string is the order of the field files in the **Field File** tab.

if **not ticked**, any strings will terminate at the end of a field file. Even if the string has the same name and string number is any following field file, a new string is started in the following field files.

Use coordinate commands (opcode 2) tick box tick

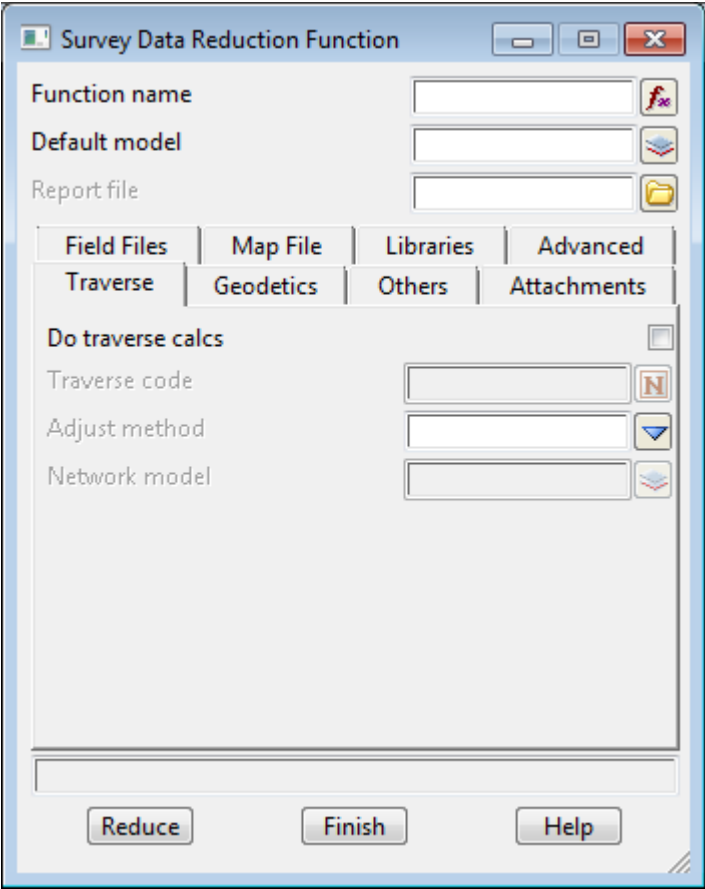
if ticked,

Allow backsights with Azimuth to calc coordinate tick box

If ticked, for backsight commands that reference unknown backsight points, and the backsight has the horizontal angle, vertical angle, slope distance, and Azimuth defined, the backsight point will be created from that information.

This option was only included to allow reduction from legacy external formats, and should not be used as it is not good survey practise.

Traverse tab



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Do traverse calcs	tick box	not tick	

if **ticked**, the traverse coded points are placed into a network model, and an adjustment done at the time of reduction.

Traverse code input

if valid, this code will be used to identify traverse data. This will effectively be the same as stringing features in the field except the user has the option of isolating the model, adjusting the strings etc.

E.g. TL. The reduction function will look at the field file and extract any observations involving field codes with the TL code. Only backsights and measurements with the point name field populated will be processed.

Each traverse will have a separate string number. i.e. The main traverse with a feature code/string number of e.g. TL7 and a side traverse having a feature code/string number of e.g. TL3. Note the string numbers do not have to be in any particular order. The reduction will determine the order on which the separate traverses will be processed (by dependencies).

See [Traverse coding](#) in Appendix [12d Survey Guide](#).

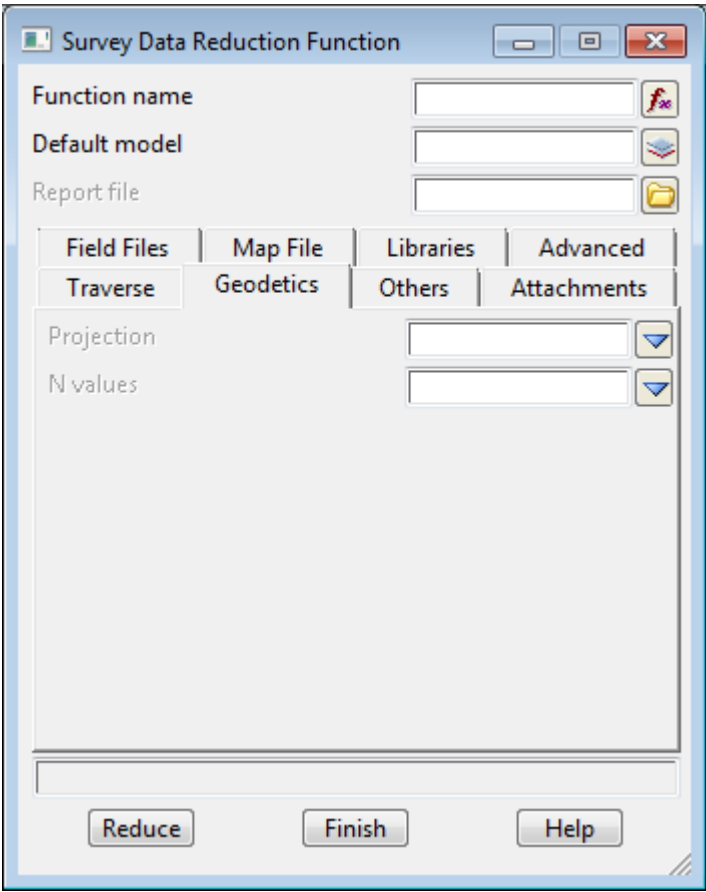
Adjustment method choice bowditch, compass, transit, least square, none

*method of adjustment. The adjustment will be made to the extracted traverse strings from known point to known point. **If a traverse string goes through a number of known points (known coordinates), the adjustment will made from known point to known point rather than the first known to the last known point.***

Network model model box

if non blank, any valid traverse strings are placed in this model

Geodetics tab

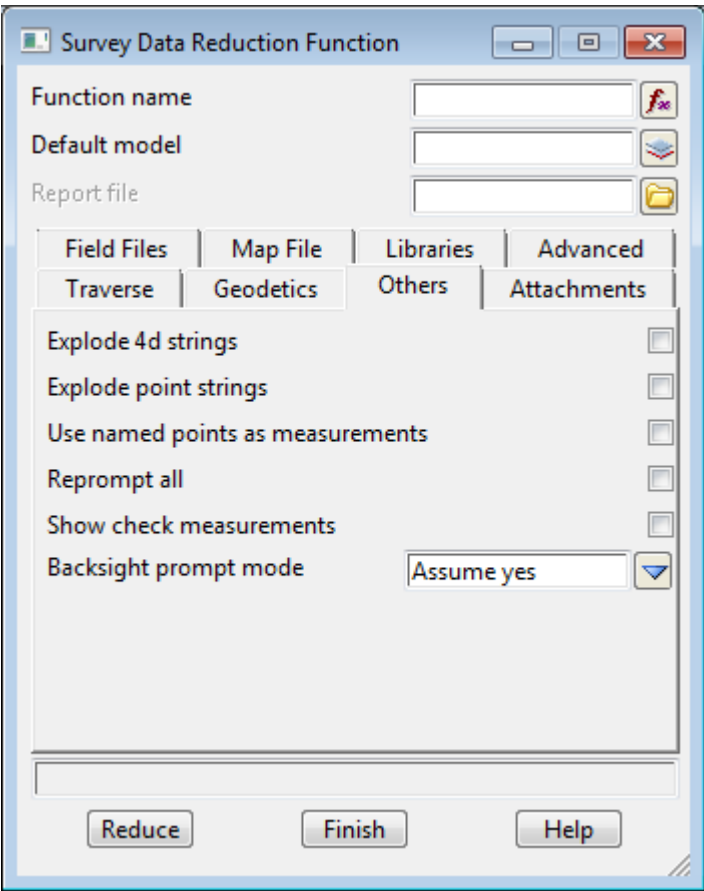


The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Projection <i>the projection of the data to be reduced. If a valid projection is specified, the reduction will be done taking into account the projection scale factors. If this method is used it is paramount that the known coordinates(e.g station setups) are in terms of the projection coordinates and are not truncated (i.e. full coordinate values). These coordinates will allow the calculation of the relative longitude and latitude values which are used to compute coordinates from observations from the setup points. For more information about how to setup different projections see the section Projections.</i>	projection box	current projection	available projections
N values <i>the N value method allows the conversion of non-ellipsoid heights to ellipsoid. The methods are defined in the project n value settings. For more information on the n value settings see the section N values</i> <i>The N value will be used to convert a geoid height (e.g. AHD) into an ellipsoid height. Ellipsoid height = geoid height + N value. The conversion is used for the calculations only. The original z value for the point will remain unchanged</i>	choice box	currently set method	Available n value methods

For more information about geodetic terminology including projections and N values, see the Appendix [Geodetics Summary](#).

Others tab



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Explode 4d strings <i>if ticked, any 4d strings created during the reduction process will have only one vertex (point), i.e., no</i>	tick box		

stringing of 4d strings will occur.

Explode point strings tick box

if **ticked**, point strings are created as one vertex (point) strings i.e., no stringing of any point strings will occur.

Use named points as measurements tick box

if **ticked**, named points are also created as measurements.

Reprompt all

if **ticked**, all check measurements are redisplayed on recalcs. Also if Backsight prompt mode is set to prompt, then backsights are redisplayed on recalcs.

if **not ticked**, check measurements are not redisplayed on a recalc and backsights depend on the backsight prompt mode.

Show check measurements tick box

if **ticked**, when a check measurement is processed a panel is displayed showing the calculated (x,y,z) for the check measurement.

Backsight prompt mode choice box

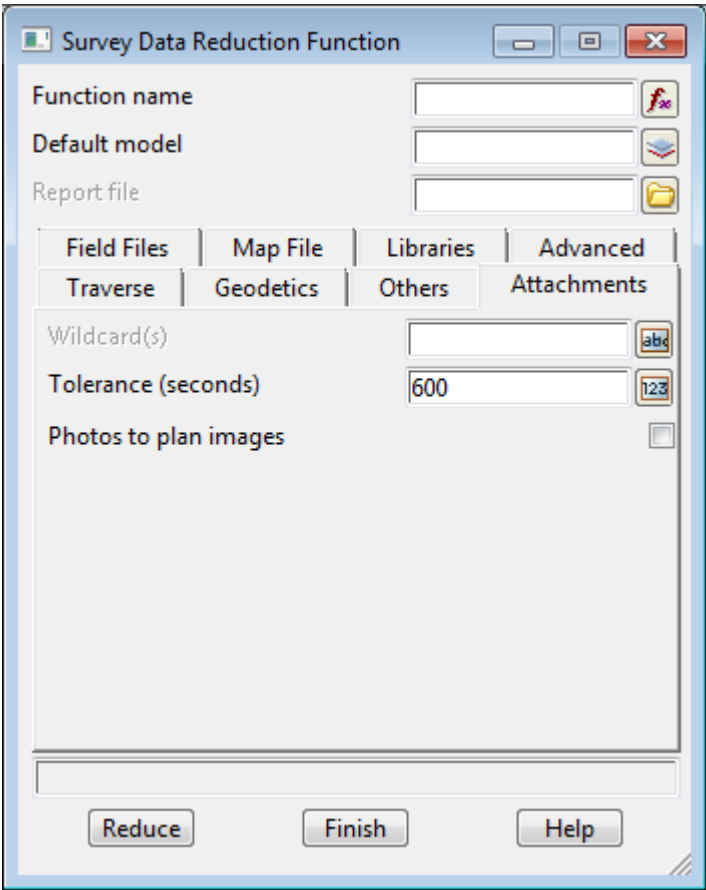
prompt, assume yes
assume no

if **prompt**, then the backsight panel is brought up in a command has not been answered adequately previously or if something has changed that warrants a redisplay of the panel.

If **assume yes**, then **yes** is assumes for all the backsights and the panel is not brought up.

If **assume no**, then **no** is assumes for all the backsights and the panel is not brought up.

Attachments tab



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Wildcard(s)

space delimited list of wildcards for attaching files to shots. For example, photo images taken in the field.

Tolerance (seconds)	input	600
----------------------------	-------	-----

the shot must be taken first and then any files with time less than this number of seconds after the shot, but before any subsequent shots, are attached to the shot

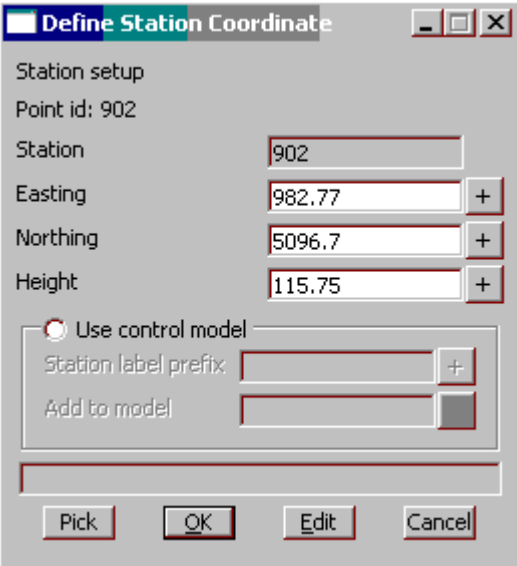
Photos to plan images	tick box
------------------------------	----------

*if **ticked**, 12d plan images are created for ay attached image in jpeg, tiff, bmp or png format*

During the reduction, the coordinates of a point may need to be supplied. This occurs when:

- s an undefined point is named as the new instrument point (field code 3)
- s backsight measurements are made to an undefined point (field code 4)
- s check measurements are made to an undefined point (field code 6)

In this situation, a **define station coordinate** panel will pop up:



The coordinates may be typed in, or selected from existing strings. The station may also be added to a model to allow it to be used as a station later.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Station name	output
---------------------	--------

the station name

Use control model	radio button
--------------------------	--------------

*if **ticked**, the point is added to the control model.
if not **ticked**, the point is created but is not placed in the control model.*

Easting/Northing/Height	input	xyz ops menu
--------------------------------	-------	--------------

the easting (x)/northing (y)/height (z) co-ordinates for the station.

Station prefix input

if non-blank, the created station name will be prefixed by this value.

Add to model input control model available models

if not blank, a 4d string is created using the Easting/Northing/Height values as co-ordinates, and the station name (with a possible prefix) as the text and name of the 4d string. The station can then be referred to later in the reduction.

Pick button

pick a point whose co-ordinates are piped into the Easting/Northing/Height fields.

OK button

*on selecting **ok**, the coordinates entered in the station xyz field are used as the station co-ordinates and if the add to model field is not blank, a 4d string created.*

Edit button

*on selecting **Edit**, the next new instrument station entry is shown which allows the station number and associated fields to be edited.*

Cancel button

the cancel button will remove the panel and terminate the reduction.

If the Backsight prompt mode is set on, then at each backsight measurement, the **bearing datum difference** panel is displayed

:

Bearing Datum Difference

Station name: 901
Backsight name: 902

	Observed	Calculated	Observed - Calculated	Corrected	Corrected - Calculated
Easting	982.767	982.770	-0.003	982.770	0.000
Northing	5096.699	5096.700	-0.001	5096.700	-0.000
Height	115.976	115.750	0.226	115.976	0.226
Bearing	349° 53' 42"	349° 53' 49"	- 0° 0' 7"	349° 53' 49"	0° 0' 0"
Distance		98.223			

No distance was measured on this check measurement.
We assume the correct distance so that we get a measure of the accuracy of the check.

Horizontal collimation: +
Vertical collimation: +

Apply Swing:

If **yes** button is selected, the bearing datum difference is applied to this horizontal circle reading.

If **yes to all** button is selected, the bearing datum difference is applied to all subsequent horizontal circle readings.

The **cancel** button terminates the reduction.

If **no** is selected, this horizontal circle reading is treated as actual bearing.

If **no to all** is selected, all the horizontal circle reading are treated as actual bearings.

This facility allows the horizontal circle to have any orientation during data capture.

At each check measurement, the **check measurement** panel is displayed giving information about the measurement, the point it was a check measurement for and the differences between the two.

:

Check Measurement

Station name901

Check name902

	Observed	Calculated	Difference
Easting	982.770	982.770	-0.000
Northing	5096.687	5096.700	-0.013
Height	115.749	115.750	-0.001
Bearing	349° 53' 44"	349° 53' 49"	- 0° 0' 5"
Distance	98.211	98.223	-0.013

Continue

Cancel

If the **Continue** button is selected, the reduction continues.

The **Cancel** button terminates the reduction

Typed Entry

Position of option on menu: Survey =>Create =>Typed entry

The **Typed entry** option creates a *Survey function* from scratch using the edit commands.

For more detailed information on the survey reduction process in **12d Model**, go to the Appendix [12d Survey Guide](#).

Selecting **Typed entry** brings up the **survey Data Typed Entry Function** panel

Survey Data Typed Entry Function

Function name

Default model

Report file

Traverse

Geodetics

Others

Attachments

Field Files

Map File

Libraries

Advanced

	File	Attachment Wildcard(s)
1		
2		

Entry

Finish

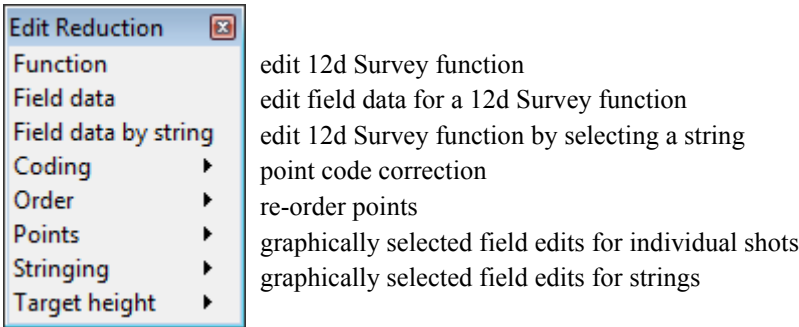
Help

The fields and buttons are identical to those in the **Survey Data Reduction Function** panel in the previous section [Field File](#).

Edit Survey Function

Position of menu: Survey =>Edit =>Edit Reduction

The Edit walk-right menu is



The **Edit reduction** walk-right menu contains options to create a **12d Model Survey function** from either a *12d field file* or from scratch using *Survey Reduction edit commands*.

Basically, a *Survey* function keeps track of all the information involved in the survey data reduction and all the strings and models created by the *Survey* function. The *Survey* function can be re-run and all the old information automatically deleted and replaced by the updated information.

Once the *Survey* function is created, it then reduces the data according to the information supplied and stored with the *Survey* function. As with other **12d Model** functions, the *Survey* function information can be modified and the function recalculated.

Many errors in a raw data file are only detected after the reduction has taken place. These are then corrected and the function recalculated to re-reduce the data.

Some of the types of problems that regularly occur during electronic field surveys are:

- s Instrument height incorrectly entered
- s Target height incorrectly entered
- s Change of target height not entered
- s Backsight station incorrectly named
- s Instrument station incorrectly named
- s Feature code and string number errors

The *12d Survey* edits allow for all commands in the field data to be modified and new commands added. Selection for some edits can be done graphically (for example incorrect target height) and others through interactive editing of the *Survey* field data. In all cases, once the edit is completed, the effect is immediately calculated and displayed.

For more detailed information on the survey reduction process in **12d Model**, go to the Appendix [12d Survey Guide](#).

Each option will now be described in detail.

For the option <i>Function</i> , please go to	Function
<i>Field data</i>	Field Data
<i>Field data by string</i>	Field Data by String
<i>Coding</i>	Coding
<i>Order</i>	Order
<i>Points</i>	SDR Point Edits
<i>Stringing</i>	SDR Strings Edit
<i>Target height</i>	Target Height

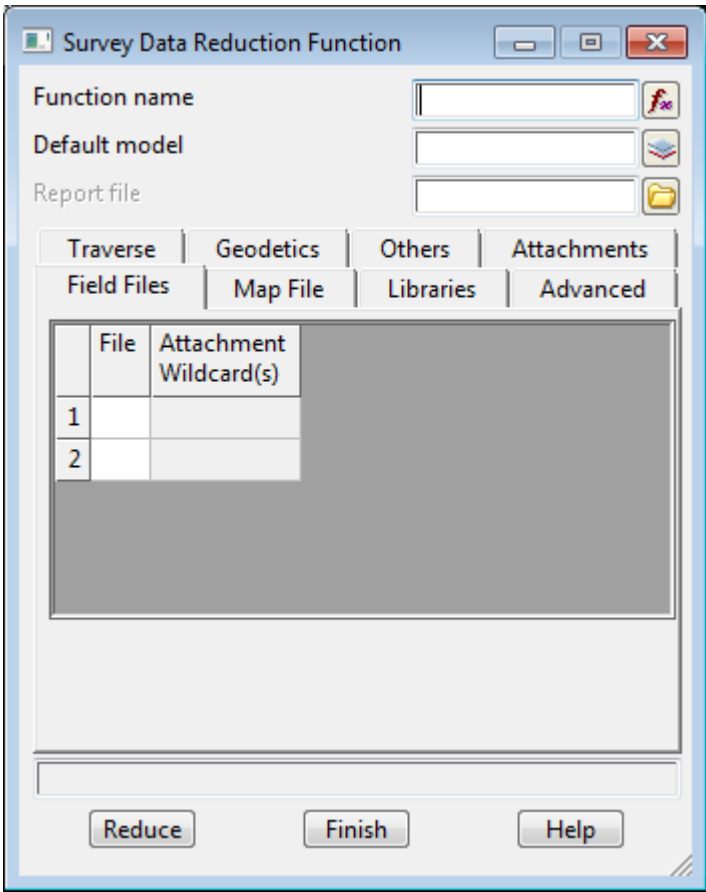
Function

Position of option on menu: Survey =>Edit =>Function

The **function** option is used to edit the set-up panel values for a *Survey* function.

Note - to edit the *field data* rather than the set-up panel, the **Field data** option is used.

Selecting **Function** brings up the **Survey Data Reduction Function** panel (which is the same panel used to create the function in the Survey =>Create =>Field file option).



A *Survey* function is selected for editing by choosing the survey function from the Function name pop-up list which loads up the panel information for that function.

The panel information is then modified and the new values stored and used by selecting the **Reduce** button. This recalcs the function which re-reduces the data using the new panel fields.

For more information on the fields in the panel, go to the section [Edit Survey Function](#).

For information on the *Survey Field Data Editor*, go to the section [Survey Field Data Editor](#).

For more detailed information on the survey reduction process in **12d Model**, go to the Appendix [12d Survey Guide](#).

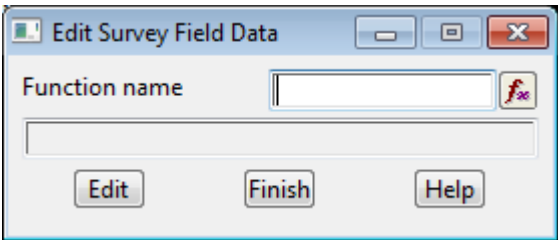
Please continue to the next section [Field Data](#).

Field Data

Position of option on menu: Survey =>Edit =>Field data

The **field data** option is used to edit the *field data* from a Survey function. As the changes are made, the field data is automatically reduced to reflect the changes.

Selecting **Field data** brings up the **Edit Survey Field Data** panel:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Function name	function box		all survey functions
<i>name of the Survey function to have the field data modified.</i>			

Edit	button
<i>clicking edit will start the Survey Field Data Editor for the given Survey function. This will be documented in the section Survey Field Data Editor.</i>	

For information on the *Survey Field Data Editor*, go to the section [Survey Field Data Editor](#).

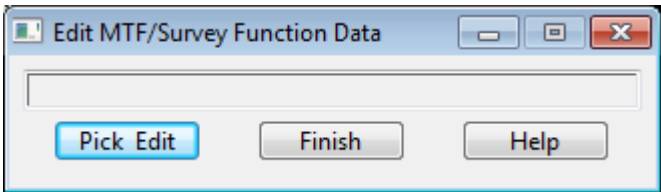
Please continue to the next section [Field Data by String](#).

Field Data by String

Position of option on menu: Survey =>Edit =>Field data by string

The **Field data by string** option is used to edit the *field data* by selecting a string created from a Survey function.

Selecting **Field data by string** brings up the **Edit MTF/Survey Function Data** panel:



After selecting the **Pick Edit** button, a string created by Survey function is selected and the Survey Field Data Editor is started for the given Survey function.

For information on the *Survey Field Data Editor*, go to the section [Survey Field Data Editor](#).

Please continue to the next section [Coding](#).

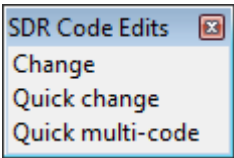
Coding

Position of menu: Survey =>Edit =>Coding

The coding options are used to modify the feature code and/or string number of selected points. The 12d field file is automatically updated.

The coding walk-right menu is

.



change for feature code, string number
change feature code, string number for many point

Each option will now be described in detail.

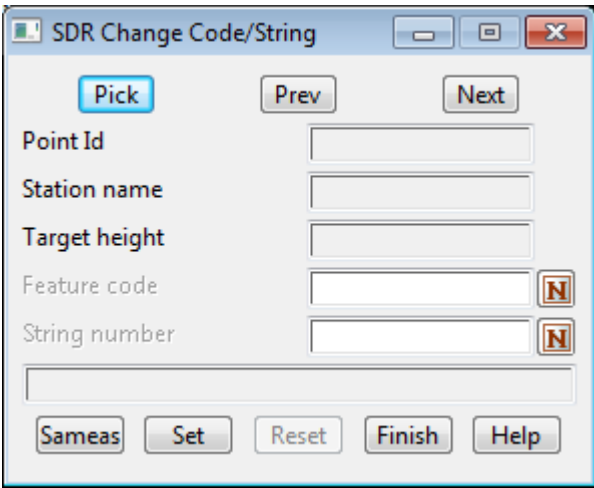
For the option <i>Change</i> , go to	Change
<i>Quick change</i>	Quick Change
<i>Quick multi-code</i>	Quick Multi Coding

Change

Position of option on menu: Survey =>Edit =>Coding =>Change

Change is used to modify a points feature code and/or string number. When a point is selected, its point id, station name and target height are displayed as well as feature code and string number. If either the feature code or string number is then modified in the panel, selecting the set button will give the selected point the new values for feature code and/or string number.

Selecting **Change** brings up the **SDR Change Code/String** panel:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick	button		
<i>select a point whose information will be displayed in the panel fields. A highlighted line joining the point to the station that it was surveyed from is also displayed.</i>			
Prev	button		
<i>move to the previous point in the string.</i>			
Next	button		

move to the next point in the string.

Point id display only
point id of the selected point.

Station name display only
name of the station that the point was surveyed from.

Target height display only
height of the target when the point was surveyed.

Feature code input/output
*when a point is selected, its feature code is displayed in this field. The value can then be changed by the user and if **set** is selected, the point is given the new feature code.*

String number input/output
*when a point is selected, its string number is displayed in this field. The value can then be changed by the user and if **set** is selected, the point is given the new string.*

Same as button
*after selecting **same as**, a point is selected and its feature code and string number are piped into the panel fields.*

Set button
*selecting **set** gives the selected point the values in the panel fields.*

Reset button
***reset** undoes the changes.*

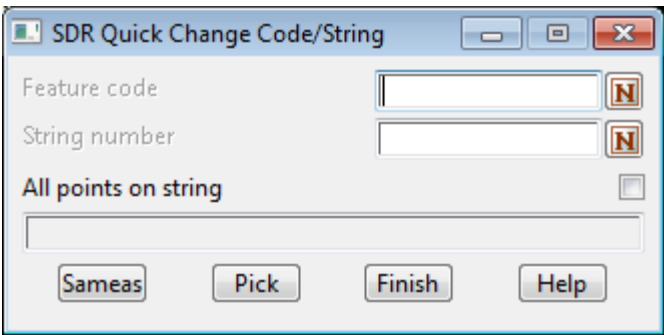
Please continue to the next section [Quick Change](#).

Quick Change

Position of option on menu: Survey =>Edit =>Coding =>Quick change

The **quick change** option is for more advanced users wishing to modify the same feature code and/or string number for many points.

The new feature code and/or string number is entered into the panel and whenever a point is selected and accepted, it is given the new feature code and/or string number. The picking of points continues until the picking is cancelled from the **pick ops** menu.



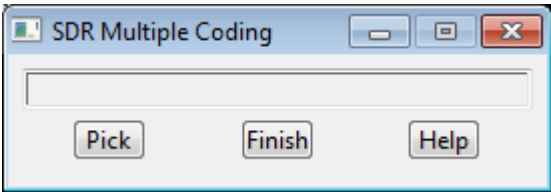
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Feature code	input/output		
<i>if not blank, when a point is accepted its feature code is changed to the value in this field.</i>			
String number	input		
<i>if not blank, when a point is accepted its string number is changed to the value in this field.</i>			
Same as	button		
<i>after selecting same as, a point is selected and its feature code and string number are piped into the panel fields.</i>			
Pick	button		
<i>selecting pick starts the picking sequence and any accepted point will have its feature code and/or string number modified if the corresponding panel field is not blank. The pick is terminated by selecting cancel from the pick ops menu.</i>			

Please continue to the next section [Quick Multi Coding](#).

Quick Multi Coding

Position of option on menu: Survey =>Edit =>Coding =>Quick multi-code



The fields and buttons used in this panel have the following functions.

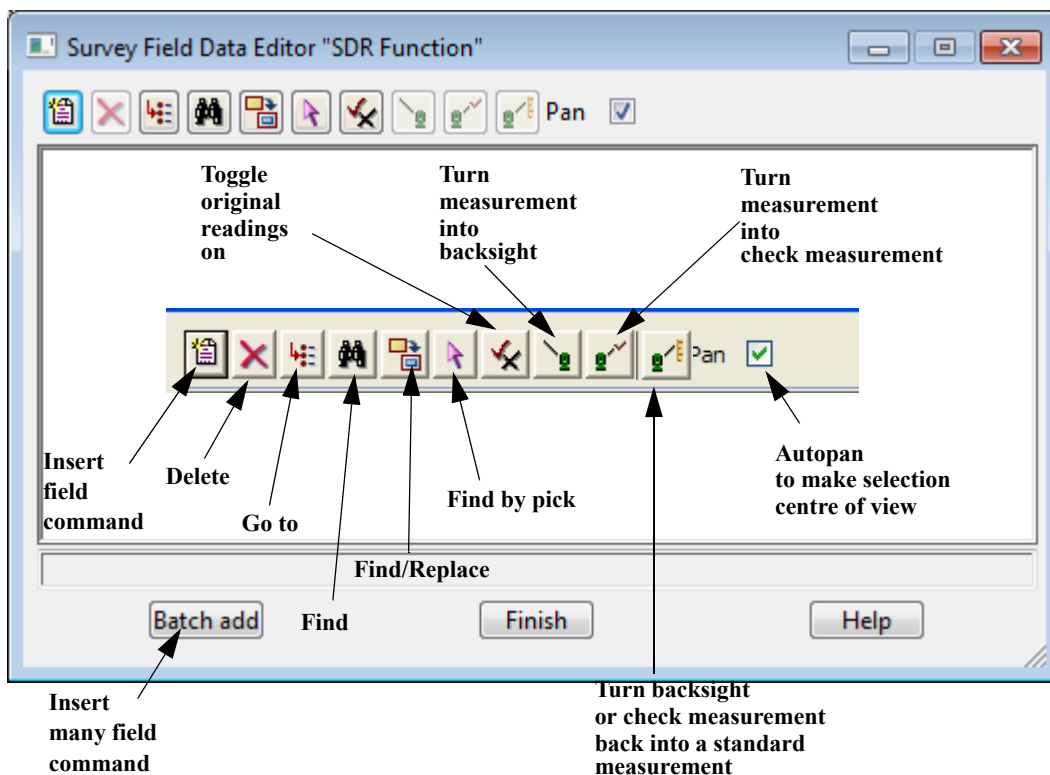
Field Description	Type	Defaults	Pop-Up
Pick	button		
<i>after selecting Pick, pick the vertex that you want to multi-code, and then pick a string and the code and string number from the string will be added to the selected vertex as a multi-code.</i>			
<i>The sequence start again and continues until the pick is terminated by selecting Cancel from the Pick ops menu.</i>			

Please continue to the next section [Survey Field Data Editor](#).

Survey Field Data Editor

The **Survey Field Data Editor** is used to interactively edit the field data of a **Survey** function. All the commands in the field data can be modified or deleted, or new commands added. When changes are made, the field data is automatically re-reduced so the effects can be immediately checked.

If the Editor is opened using the Survey=>Create=>Typed Entry option the editor will appear blank.



For information on using things inside the panel, go to [Using the Survey Field Data Panel](#)

For information on the field commands, go to [List of Field Data Commands and Panels](#)

For information on the icons and buttons on the panel:

	- Insert go to	Insert and Batch Add button
	- Delete	Delete
	- Go to	Goto
	- Find	Find
	- Find/Replace	Find/Replace
	- Find by Pick	Find by Pick
	- Toggle	Toggle
	- Make backsight	Make Measurement into a Backsight
	- Make check measurement	Make Measurement into a Check Measurement
	- Change to measurement	Make into a Measurement
	- Autopan	Autopan
	- Batch add	Insert and Batch Add button

Using the Survey Field Data Panel

Colour Coding of the Field Data

Normally data has been loaded into the Survey function by a raw data file being downloaded from a data collector, converted to a 12d field file and then loaded into a Survey function.

When **12d Model** converts the raw file to a 12d field file, all the raw data can be included in the

12d field file as comments.

All **comments** lines are displayed in **green**.

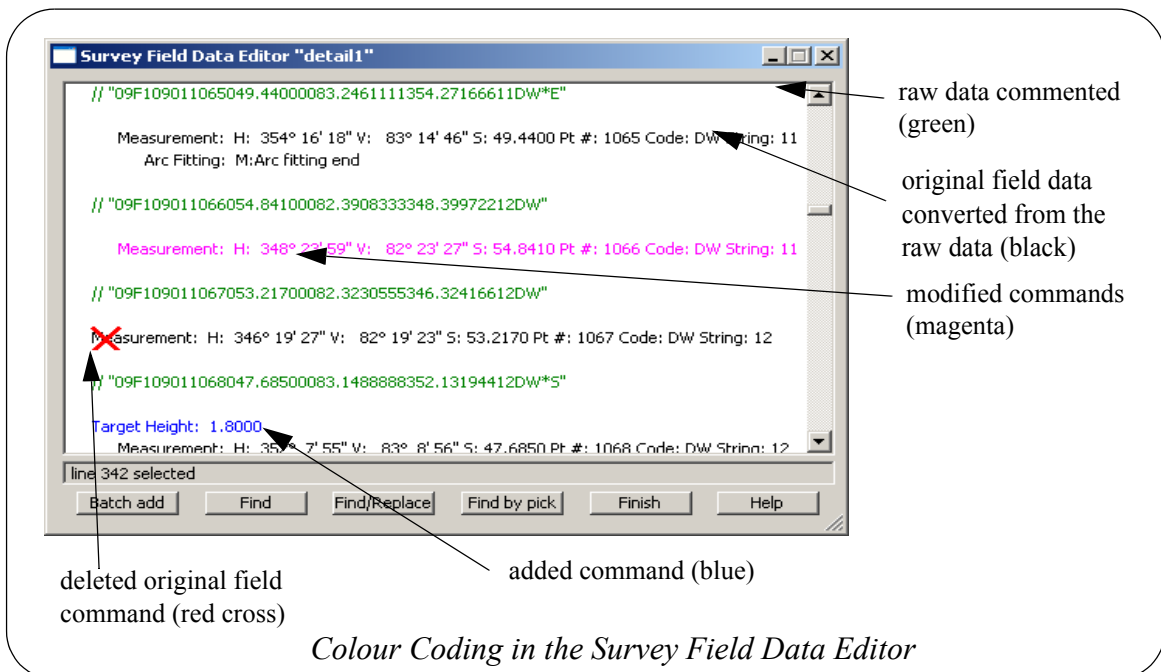
Each line (or lines if necessary) of raw data is converted into one or more equivalent 12d field file commands. These field file commands are placed straight after the commented line containing the raw data lines so it is easy to see what the raw data was converted to.

The **original 12d field commands** converted from the raw data are displayed in **black**.

If a field command has been **inserted**, it is coloured in **blue**. If a comment has been inserted, it will still be displayed in green but the word **: added** will be appended to the end of the comment.

If a field command has been **modified**, it is displayed in **magenta**.

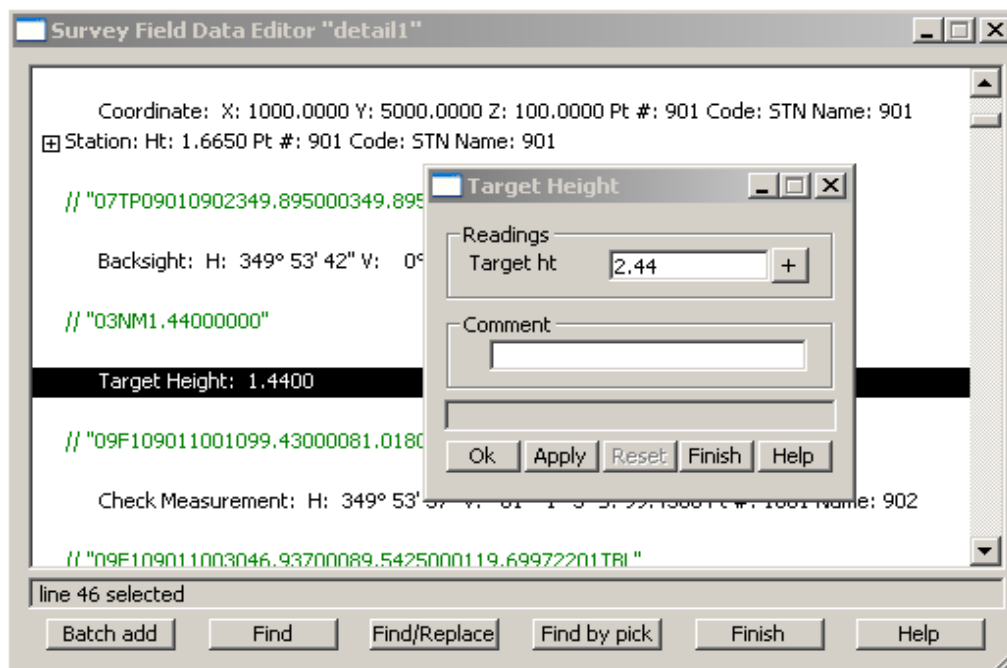
If an **original** command has been **deleted**, the original command is left in the file but it has a **large red cross** placed on the left hand side of the line to indicate that it has been deleted. Any original command that has been deleted can be undeleted by simply deleting the command again.



Modifying the Field Data

To modify an existing command in the field data, double click on the line to be modified and the appropriate panel for the line of field data is displayed. The data in the panel can then be modified and stored by selecting either the **OK** or **Apply** buttons. The colour of the line of modified field data is then magenta.

For example, double clicking on **target height** command in the field file brings up the **Target Height** panel with the values loaded into the appropriate panel field. The data in the panel can be modified and saved by clicking **OK**.



Deleting Field Data

To delete a line from the field data, simply highlight the data by clicking in the line and then delete key on the keyboard or select the delete icon from the top of the panel. If the line was an original command, a red cross is placed

If an **original** command has been **deleted**, the original command is left in the file but it has a **large red cross** placed on the left hand side of the line to indicate that it has been deleted. Any original command that has been deleted can be undeleted by simply highlighting the deleting command and pressing the delete icon or delete key again.

If an **inserted** command has been **deleted**, the command is removed from the field data.

More than one line can be selected for deletion by using the standing Windows selection commands to highlight the commands and then press the delete key on the keyboard or select the delete icon from the top of the panel. Similarly to undelete multiple commands.

For information on the field commands, go to [List of Field Data Commands and Panels](#)

For information on the icons and buttons on the Survey Field Data panel, go to [Icons and Buttons on the Survey Field Data Editing Panel](#)

Icons and Buttons on the Survey Field Data Editing Panel

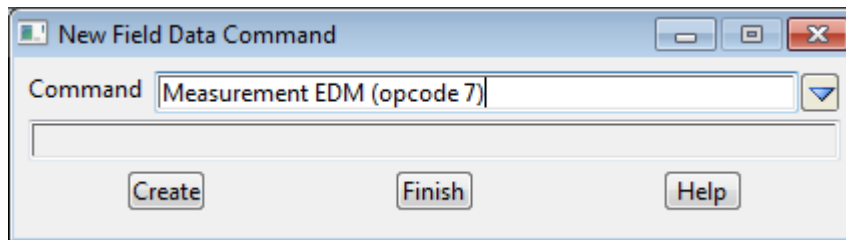
The use of the buttons at the bottom of the survey field data editing panel will now be described.

Insert and *Batch Add* button

To insert a new command into the field data, simply click on the line where the data is to be inserted and press the **Batch Add** button or select the **Insert** icon from the top of the panel.

The difference between the button and the icon, is that the button allows multiple entries whilst the icon allows one entry at a time.

Selecting either the icon or the **Batch Add** button, displays the **New Field Data Command** panel.



By clicking on the Command choice box selector, a full list of field commands is displayed and the required command is selected from the list.

Clicking **Create** then brings up the panel for the selected command type. The description of the field data commands panels is given in the section [List of Field Data Commands and Panels](#)

Alternatively, if the **12d Field Data Op Code** is known, this can be entered into the choice box instead of selecting from the list. For example, to enter a **Measurement EDM** field data command, the number **7** can be inserted in the choice box field.

When using **Batch Add**, once a command is selected, it will remain as a default for subsequent entries until another type is chosen. This allows a number of the same command to be quickly entered such as in the case of **Measurement EDM** by entering data into the appropriate fields and continuing to press <enter> through the default choices

For a more detailed explanation on each of the fields within the panels and the appropriate field **12d Field File Op Codes** see the section [Full Description of 12d Field File Op Codes](#).

For a summary of just the field file op codes, see the section [Summary of 12d Field File Op Codes](#)

Delete

To delete a line from the field data, highlight the data by clicking in the line and then either use the **Delete** key on the keyboard or select the **Delete** icon from the top of the panel.

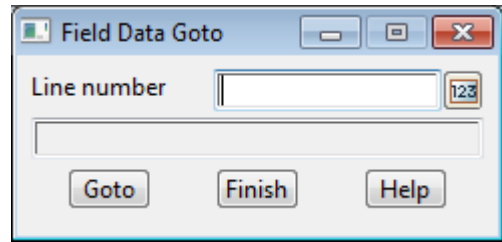
If an **original** command has been **deleted**, the original command is left in the file but has a **large red cross** placed on the left hand side of the line to indicate that it has been deleted. Any original command that has been deleted can be undeleted by simply highlighting the deleted command and pressing the **Delete** icon or **Delete** key again.

If an **inserted** command has been **deleted**, the command is removed from the field data.

More than one line can be selected for deletion by using the standing Windows selection commands to highlight the commands and then press the **Delete** key on the keyboard or the **Delete** icon from the top of the panel. Similarly to undelete multiple commands.

Goto

Selecting the **Goto** icon brings up the **Field Data Goto** panel.

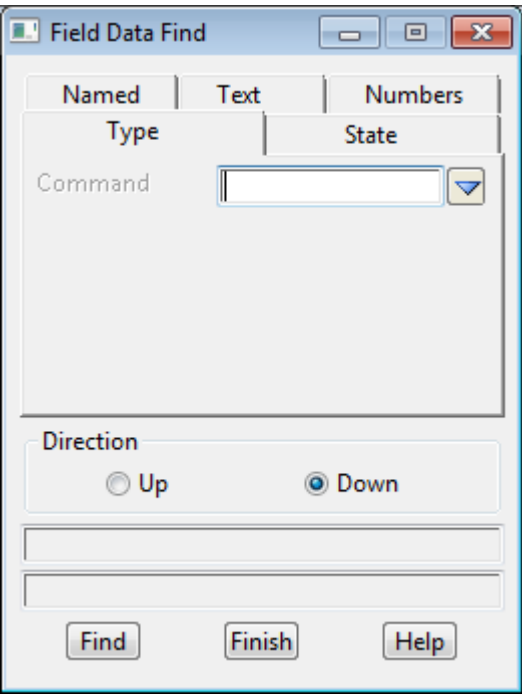


The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Line number <i>line number to go to</i>			
Goto <i>go to the given line number</i>	button		

Find

Selecting **Find** brings up the **Field Data Find** panel.



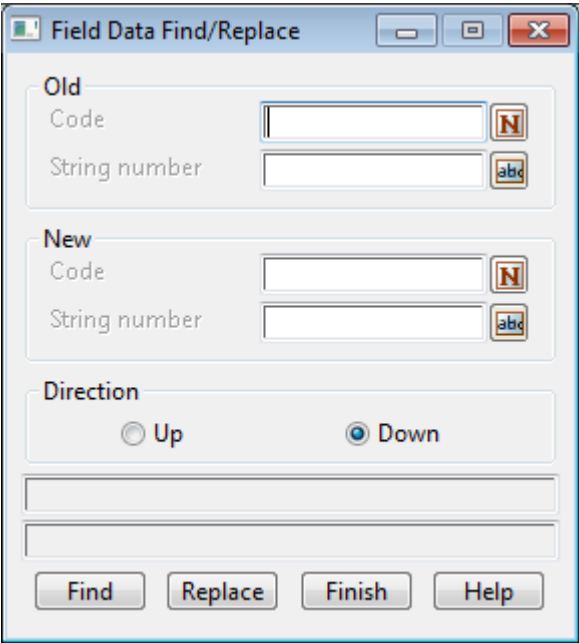
Each of the tabs sets the panel for the required data.

Named	find given code, string number, point id etc.
Numbers	find numbers between given minimum and maximum.
State field)	find a field command in a given modification state (added, changed, deleted,
Text	find text containing given text.
Type	find a field command of a given type. For example "New String".

The up/down radio button define which direction to search in the field data.

Find/Replace

Selecting the **Find/replace** icon brings up the **Field Data Find/Replace** panel.



The dialog box titled "Field Data Find/Replace" contains two sections: "Old" and "New". Each section has two input fields: "Code" and "String number", each with a small icon to its right. Below these sections is a "Direction" section with two radio buttons: "Up" and "Down". At the bottom are four buttons: "Find", "Replace", "Finish", and "Help".

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

The user specifies the old and new **Code** and old and new **String number** fields, and the search and replace is done using those parameters.

The **Up/Down** radio button define which direction to search in the field data.

Find by Pick

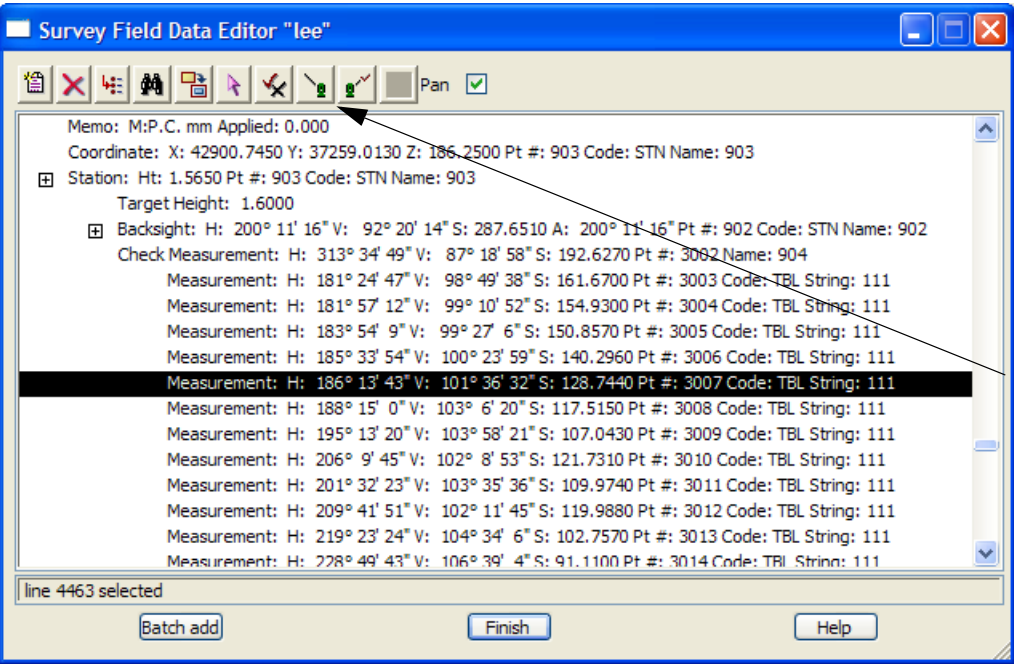
After selecting **Find by pick**, the user selects a point created by the Survey function and the field data editor will scroll to the line of the field data that created the point.

Toggle

The toggle button allows commented information to be shown/ not shown. Simply press the **Toggle** icon to move from one state to another.

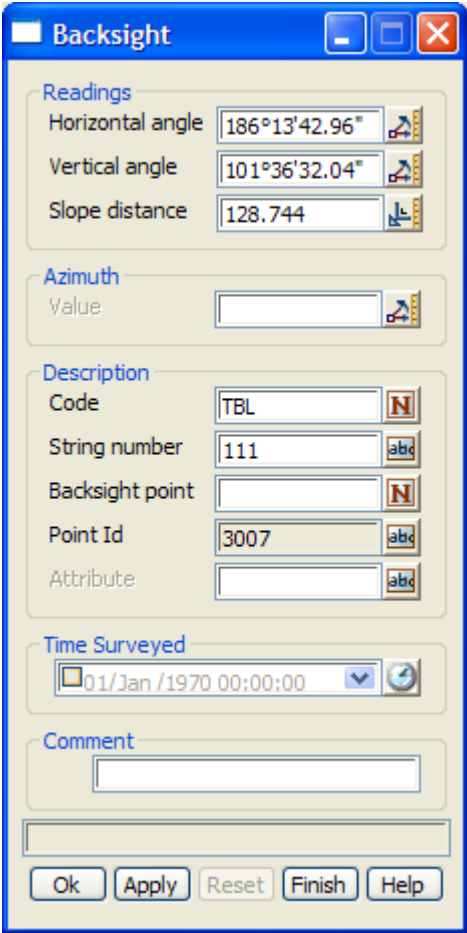
Make Measurement into a Backsight

The **Make Backsight** icon is visible when a **measurement** line has been selected (highlighted) in the field data.

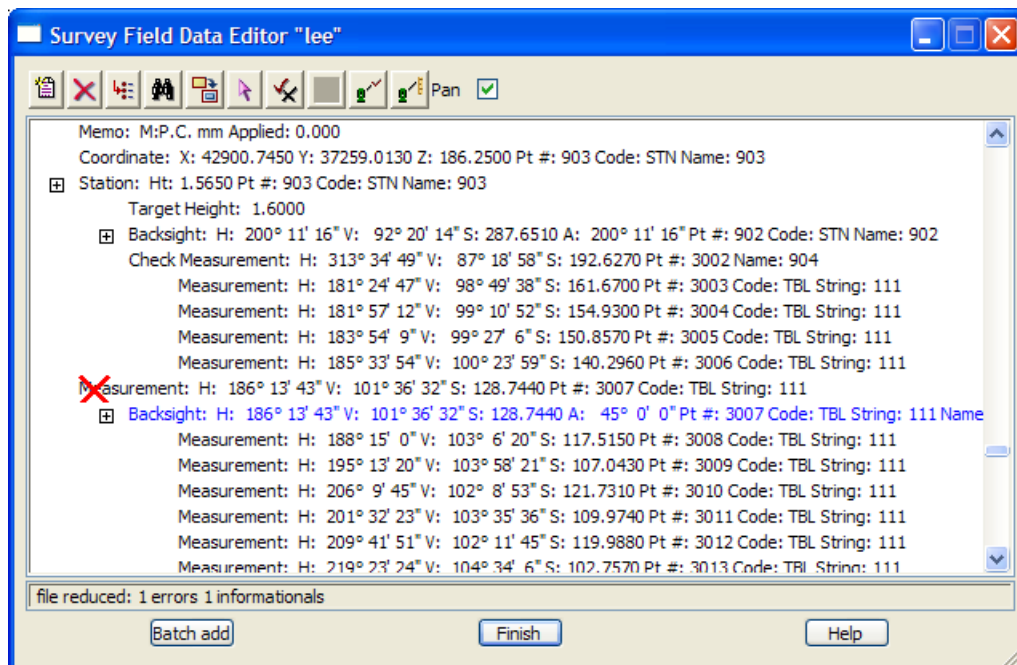


Highlighting a **Measurement** then displays the **Make Backsight** and **Make Check Measurement** icons

When the measurement line is highlighted, clicking on the **Make Backsight** icon brings up the **Backsight** panel with the highlighted measurement details filled in.



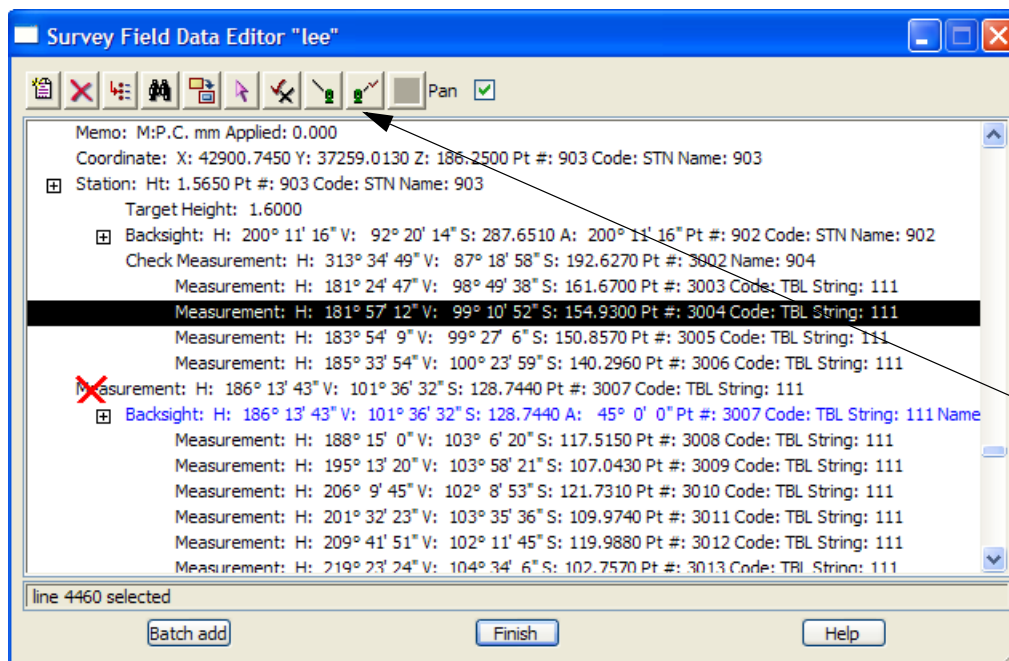
The **Azimuth** and **Backsight point** fields are filled in and the **OK** or **Apply** button selected. The original measurement will then be shown as deleted and a new Backsight record created.



Make Measurement into a Check Measurement



The **Make Check Measurement** icon is only visible when a **measurement** or **backsight** line has been selected (highlighted) in the field data.



Highlighting a **Measurement** or **Backsight** then displays the **Make Check Sight** and **Make Check Measurement** icons

When the measurement line is highlighted, clicking on the **Make Check Measurement** icon brings up the **Check Measurement** panel with the details from the highlighted measurement filled in.

Check Measurement

Readings

Horizontal angle

181°57'11.88"

Vertical angle

99°10'51.96"

Slope distance

154.93

Description

Code

TBL

String number

111

Check point

Point Id

3004

Attribute

Time Surveyed

01/Jan /1970 00:00:00

Comment

Ok

Apply

Reset

Finish

Help

The **Check point** is then filled in and the **OK** or **Apply** button selected.

The original measurement will then be shown as deleted and a new **Check measurement** record created.

Survey Field Data Editor "lee"

Memo: M:P.C. mm Applied: 0.000

Coordinate: X: 42900.7450 Y: 37259.0130 Z: 186.2500 Pt #: 903 Code: STN Name: 903

Station: Ht: 1.5650 Pt #: 903 Code: STN Name: 903

Target Height: 1.6000

Backsight: H: 200° 11' 16" V: 92° 20' 14" S: 287.6510 A: 200° 11' 16" Pt #: 902 Code: STN Name: 902

Check Measurement: H: 313° 34' 49" V: 87° 18' 58" S: 192.6270 Pt #: 3002 Name: 904

Measurement: H: 181° 24' 47" V: 98° 49' 38" S: 161.6700 Pt #: 3003 Code: TBL String: 111

~~Measurement: H: 181° 57' 12" V: 99° 10' 52" S: 154.9300 Pt #: 3004 Code: TBL String: 111~~

Check Measurement: H: 181° 57' 12" V: 99° 10' 52" S: 154.9300 Pt #: 3004 Code: TBL String: 111 Name: lee

Measurement: H: 183° 54' 9" V: 99° 27' 6" S: 150.8570 Pt #: 3005 Code: TBL String: 111

Measurement: H: 185° 33' 54" V: 100° 23' 59" S: 140.2960 Pt #: 3006 Code: TBL String: 111

~~Measurement: H: 186° 13' 43" V: 101° 36' 32" S: 128.7440 Pt #: 3007 Code: TBL String: 111~~

Backsight: H: 186° 13' 43" V: 101° 36' 32" S: 128.7440 A: 45° 0' 0" Pt #: 3007 Code: TBL String: 111 Name: lee

Measurement: H: 188° 15' 0" V: 103° 6' 20" S: 117.5150 Pt #: 3008 Code: TBL String: 111

Measurement: H: 195° 13' 20" V: 103° 58' 21" S: 107.0430 Pt #: 3009 Code: TBL String: 111

Measurement: H: 206° 9' 45" V: 102° 8' 53" S: 121.7310 Pt #: 3010 Code: TBL String: 111

Measurement: H: 201° 32' 23" V: 103° 35' 36" S: 109.9740 Pt #: 3011 Code: TBL String: 111

Measurement: H: 209° 41' 51" V: 102° 11' 45" S: 119.9880 Pt #: 3012 Code: TBL String: 111

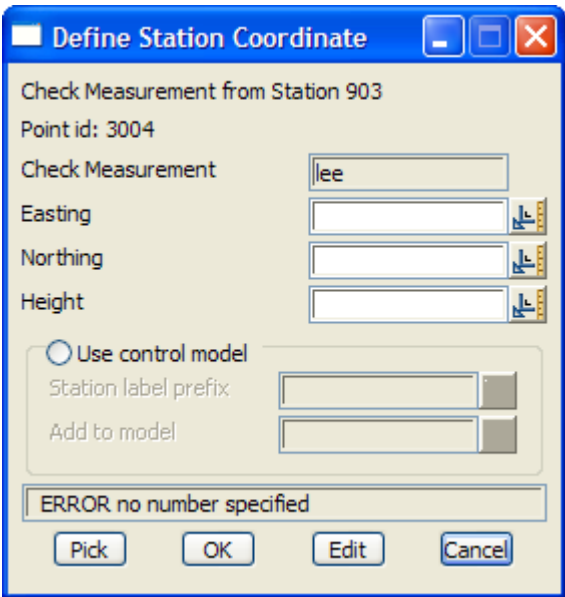
Station coordinate required

Batch add

Finish

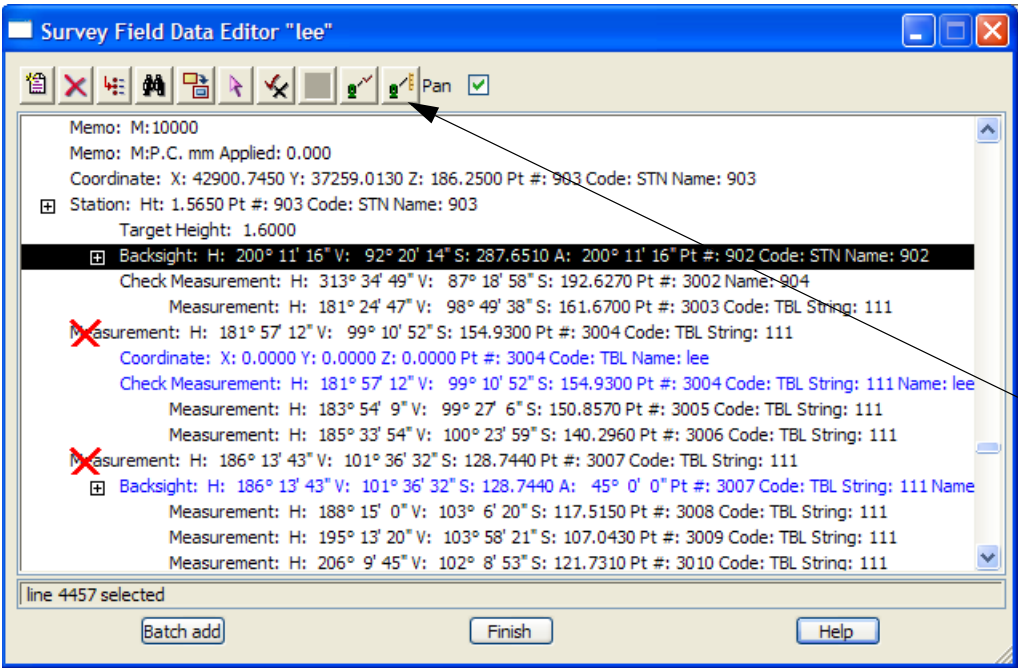
Help

Note - if the **Check point** does not exist, a **Define Station Coordinate** panel is displayed for the user to enter the coordinates for the **Check point**.



Make into a Measurement

The **Make into a Measurement** icon is visible when a *backsight* or *check measurement* line has been selected (highlighted) in the field data.



Highlighting a *Backsight* or *Check Measurement* then displays the **Make Measurement** icon

When the measurement line is highlighted, clicking on the **Make Measurement** icon brings up the **EDM Measurement** panel with the highlighted *backsight* or *check measurement* details filled in.

EDM Measurement

Readings

Horizontal angle

200°11'16.08"

Vertical angle

92°20'13.56"

Slope distance

287.651

Description

Code

STN

String number

Named point

902

Point Id

902

Attribute

Time Surveyed

☐

01/Jan /1970 00:00:00

Comment

Ok

Apply

Reset

Finish

Help

The ***String number*** field may need to be filled in and the **OK** or **Apply** button selected.

The original **backsight** or **check measurement** will then be shown as deleted and a new **Measurement** record created.

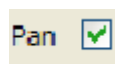
Survey Field Data Editor "lee"

Memo: M:10000
 Memo: M:P.C. mm Applied: 0.000
 Coordinate: X: 42900.7450 Y: 37259.0130 Z: 186.2500 Pt #: 903 Code: STN Name: 903
 Station: Ht: 1.5650 Pt #: 903 Code: STN Name: 903
 Target Height: 1.6000
 Backsight: H: 200° 11' 16" V: 92° 20' 14" S: 287.6510 A: 200° 11' 16" Pt #: 902 Code: STN Name: 902
Measurement: H: 200° 11' 16" V: 92° 20' 14" S: 287.6510 Pt #: 902 Code: STN Name: 902
 Check Measurement: H: 313° 34' 49" V: 87° 18' 58" S: 192.6270 Pt #: 3002 Name: 904
 Measurement: H: 181° 24' 47" V: 98° 49' 38" S: 161.6700 Pt #: 3003 Code: TBL String: 111
 Measurement: H: 181° 57' 12" V: 99° 10' 52" S: 154.9300 Pt #: 3004 Code: TBL String: 111
 Coordinate: X: 0.0000 Y: 0.0000 Z: 0.0000 Pt #: 3004 Code: TBL Name: lee
 Check Measurement: H: 181° 57' 12" V: 99° 10' 52" S: 154.9300 Pt #: 3004 Code: TBL String: 111 Name: lee
 Measurement: H: 183° 54' 9" V: 99° 27' 6" S: 150.8570 Pt #: 3005 Code: TBL String: 111
 Measurement: H: 185° 33' 54" V: 100° 23' 59" S: 140.2960 Pt #: 3006 Code: TBL String: 111
 Measurement: H: 186° 13' 43" V: 101° 36' 32" S: 128.7440 Pt #: 3007 Code: TBL String: 111
 Backsight: H: 186° 13' 43" V: 101° 36' 32" S: 128.7440 A: 45° 0' 0" Pt #: 3007 Code: TBL String: 111 Name: lee
 Measurement: H: 188° 15' 0" V: 103° 6' 20" S: 117.5150 Pt #: 3008 Code: TBL String: 111
 Measurement: H: 195° 13' 20" V: 103° 58' 21" S: 107.0430 Pt #: 3009 Code: TBL String: 111

line 4458 selected

Batch add Finish Help

Autopan



Ticked on - when a line is selected (highlighted) in the survey data editor panel, if the point is not visible in a plan view that the model for the data is on, the view is modified so that the selected point is at the centre of the view (keeping the same scale for the view).

Please continue to the next section [List of Field Data Commands and Panels](#).

List of Field Data Commands and Panels

Panel buttons

The buttons that appear on the bottom of the panels used in this section have the following functions.

OK

Changes field data and closes the panel

Apply

Changes the field data but keeps the panel in view

Reset

If the record was an original field record (i.e. the command was not inserted manually) pressing the reset button will revert the record back to the original values.

Help and Finish

standard 12d buttons.

Existing point search

Some commands such as **Backsight**, **New instrument** and **Check** allow the user to enter existing *point names* (i.e. backsight point, Setup point and Check point) or in the case of measurements from a data collector, both *point name* and *point ids*.

The difference between *point names* and *point ids* is that *point names* are usually specified by the user and should be a unique identifier for a point, whilst for that same physical point a number of measurements (and hence point ids) may be assigned (usually by the data collector). This may be particularly true of control station measurements where measurements are made to a given point name but each measurement is given a different point id by the data collector.

In most instances, a measurement to a point has a point id (from the data collector) and 12d automatically gives it the same point name as it is rare to measure a non-control point more than once (the point name can be over ridden by the user).

The names allow the reduction routine to search for the details of that point (eg coordinates) to allow for the reduction of further measurements. The order in which this searching takes place is as follows:

First search the Control model (if it exists):

1. A search is made of the control model for a string whose name is the same as the specified *point name*. If a string is found, the first point of the string is used for the (x,y,z) co-ordinates.
2. A search is made of the control model for a vertex of a string whose point id is the same as the specified *point name*. If a vertex is found its (x,y,z) co-ordinates are used.
3. If only a *point id* was specified, a search is made of the control model for a vertex of a string whose point id is the same as the specified *point id*. If a vertex is found its (x,y,z) co-ordinates are used.

Next search the already entered directly entered co-ordinates (DEC) in the field file:

4. A search is made of previously entered directly entered co-ordinates in the field file for a directly entered co-ordinate whose *point name* is the same as the specified *point name*. If a DEC is found, its

(x,y,z) co-ordinates are used.

- 5. A search is made of previously entered directly entered co-ordinates in the field file for a directly entered co-ordinate whose *point id* is the same as the specified *point name*. If a DEC is found, its (x,y,z) co-ordinates are used.
- 6. A search is made of previously entered directly entered co-ordinates in the field file for a directly entered co-ordinate whose *point id* is the same as the specified *point id*. If a DEC is found, its (x,y,z) co-ordinates are used.

Next search the previous measurements in the field file:

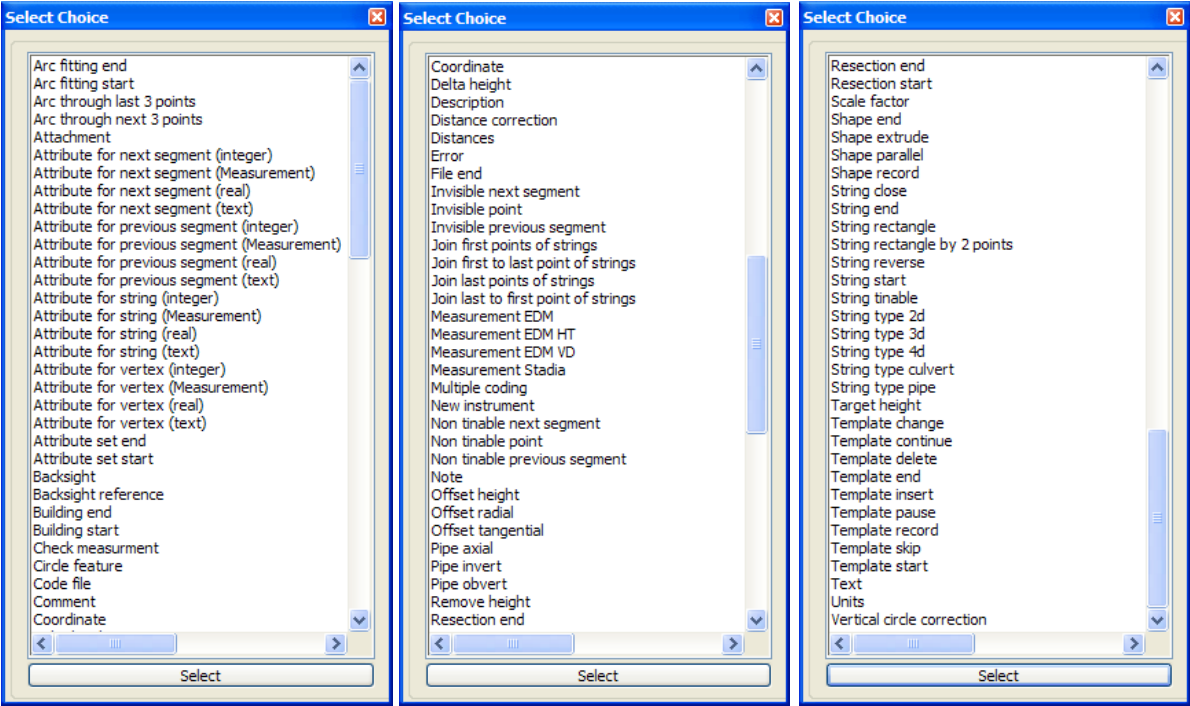
- 7. A search is made of previous measurements in the field file for a measurement whose *point name* is the same as the specified *point name*. If a measurement is found, its (x,y,z) co-ordinates are used.
- 8. A search is made of previous measurements in the field file for a measurement whose *point id* is the same as the specified *point name*. If a measurement is found, its (x,y,z) co-ordinates are used.
- 9. A search is made of previous measurements in the field file for a measurement whose *point id* is the same as the specified *point id*. If a measurement is found, its (x,y,z) co-ordinates are used.

Finally

- 10. If no match is found, the user will be prompted for the details of the previously undefined point. The user is asked to type in the (x,y,z) co-ordinates in the **Define Station coordinate** panel. If a model is specified in the Add to model field of the panel, then a new one point super string is created with the name *point name*, and as the vertex text for the point, the Station label prefix field value followed by *point name*

Field Data commands

The list of field commands in the pop-up from **Insert** or **Batch Add** are:



For a summary of the field file op codes see the section [Summary of 12d Field File Op Codes](#)

For details on each option in the pop-up:

- Arc fitting end* (opcode 62), go to [Arc Fitting \(opcodes 17, 60, 61, 62\)](#)
- Arc fitting start* (opcode 61) [Arc Fitting \(opcodes 17, 60, 61, 62\)](#)

<i>Arc through last 3 points</i> (opcode 17)	<u>Arc Fitting (opcodes 17, 60, 61, 62)</u>
<i>Arc through next 3 points</i> (opcode 60)	<u>Arc Fitting (opcodes 17, 60, 61, 62)</u>
<i>Attachment</i> (opcode 126)	<u>Attachment (opcode 126)</u>
<i>Attribute for next segment (Measurement)</i> (opcode 122)	<u>Measurement Attributes (Opcode 120 to 123)</u>
<i>Attribute for next segment (integer)</i> (opcode 74)	<u>Attributes (opcode 68 to79)</u>
<i>Attribute for next segment (real)</i> (opcode 75)	<u>Attributes (opcode 68 to79)</u>
<i>Attribute for next segment (text)</i> (opcode 76)	<u>Attributes (opcode 68 to79)</u>
<i>Attribute for previous segment (measurement)</i> (opcode 123)	<u>Measurement Attributes (Opcode 120 to 123)</u>
<i>Attribute for previous segment (integer)</i> opcode 77)	<u>Attributes (opcode 68 to79)</u>
<i>Attribute for previous segment (real)</i> opcode 78)	<u>Attributes (opcode 68 to79)</u>
<i>Attribute for previous segment (text)</i> opcode 79)	<u>Attributes (opcode 68 to79)</u>
<i>Attribute for string (measurement)</i> (opcode 120)	<u>Measurement Attributes (Opcode 120 to 123)</u>
<i>Attribute for string (integer)</i> (opcode 68)	<u>Attributes (opcode 68 to79)</u>
<i>Attribute for string (real)</i> (opcode 69)	<u>Attributes (opcode 68 to79)</u>
<i>Attribute for string (text)</i> (opcode 70)	<u>Attributes (opcode 68 to79)</u>
<i>Attribute for vertex (measurement)</i> (opcode 121)	<u>Measurement Attributes (Opcode 120 to 123)</u>
<i>Attribute for vertex (integer)</i> (opcode 71)	<u>Attributes (opcode 68 to79)</u>
<i>Attribute for vertex (real)</i> (opcode 72)	<u>Attributes (opcode 68 to79)</u>
<i>Attribute for vertex (text)</i> (opcode 73)	<u>Attributes (opcode 68 to79)</u>
<i>Attribute set start</i> (opcode 125)	<u>Attribute Set (opcode 124 and 125)</u>
<i>Attribute set end</i> (opcode 124)	<u>Attribute Set (opcode 124 and 125)</u>
<i>Backsight</i> (opcode 4)	<u>Backsight (opcode 4)</u>
<i>Backsight reference</i> (opcode 50)	<u>Backsight Reference (opcode 50)</u>
<i>Building start</i> (opcode 111)	<u>Buildings (opcodes 110, 111)</u>
<i>Building end</i> (opcode 110)	<u>Buildings (opcodes 110, 111)</u>
<i>Check coordinate</i> (opcode 14)	<u>Check Coordinate (opcode 14)</u>
<i>Check measurement</i> (opcode 6)	<u>Check Measurement (opcode 6)</u>
<i>Circle feature</i> (opcode 18)	<u>Feature (opcode 18)</u>
<i>Code file</i> (opcode 119)	<u>Code file (opcode 119)</u>

<i>Comment</i> (opcode -2)	<u>Comment</u> (opcode -2)
<i>Coordinate</i> (opcode 2)	<u>Coordinate</u> (opcode 2)
<i>Delta height</i> (opcode 28)	<u>Height Or Depth</u> (opcode 28)
<i>Description</i> (opcode 1)	<u>Job Data</u> (opcode 1)
<i>Distance correction</i> (opcode 127)	<u>Distance correction</u> (opcode 127)
<i>Distances</i> (opcode 49)	<u>Distances</u> (opcode 49)
<i>Error</i> (opcode -1)	<u>Error</u> (opcode -1)
<i>File end</i> (opcode 99)	<u>End File</u> (opcode 99)
<i>Invisible next segment</i> (opcode 108)	<u>Invisible</u> (opcodes 107, 108, 109)
<i>Invisible point</i> (opcode 109)	<u>Invisible</u> (opcodes 107, 108, 109)
<i>Invisible previous segment</i> (opcode 107)	<u>Invisible</u> (opcodes 107, 108, 109)
<i>Join first points of strings</i> (opcode 23)	<u>Strings Join</u> (opcodes 21 to 24)
<i>Join first to last point of strings</i> (opcode 22)	<u>Strings Join</u> (opcodes 21 to 24)
<i>Join last points of strings</i> (opcode 21)	<u>Strings Join</u> (opcodes 21 to 24)
<i>Join last to first point of strings</i> (opcode 24)	<u>Strings Join</u> (opcodes 21 to 24)
<i>Measure EDM</i> (opcode 7)	<u>EDM Measurement</u> (opcode 7)
<i>Measure EDM HT</i> (opcode 11)	<u>EDM Measurement (HA,HD,HT)</u> (opcode 11)
<i>Measure EDM VD</i> (opcode 12)	<u>Edm measurement (HA,HD,Diff HT)</u> (opcode 12)
<i>Measure Stadia</i> (opcode 10)	<u>Stadia Measurement</u> (opcode 10)
<i>Multiple coding</i> (opcode 16)	<u>Multiple Coding</u> (opcode 16)
<i>New instrument</i> (opcode 3)	<u>New Instrument</u> (opcode 3)
<i>Non tinable next segment</i> (opcode 38)	<u>Tinable</u> (opcodes 38, 39, 40)
<i>Non tinable point</i> (opcode 40)	<u>Tinable</u> (opcodes 38, 39, 40)
<i>Non tinable previous segment</i> (opcode 39)	<u>Tinable</u> (opcodes 38, 39, 40)
<i>Note</i> (opcode 29)	<u>Note</u> (opcode 29)
<i>Offset height</i> (opcode 44)	<u>Offset Measurement</u> (opcodes 42, 43, 44)
<i>Offset radial</i> (opcode 42)	<u>Offset Measurement</u> (opcodes 42, 43, 44)
<i>Offset tangential</i> (opcode 43)	<u>Offset Measurement</u> (opcodes 42, 43, 44)
<i>PPM Correction</i> (opcode 131)	<u>PPM Correction</u> (opcode 131)

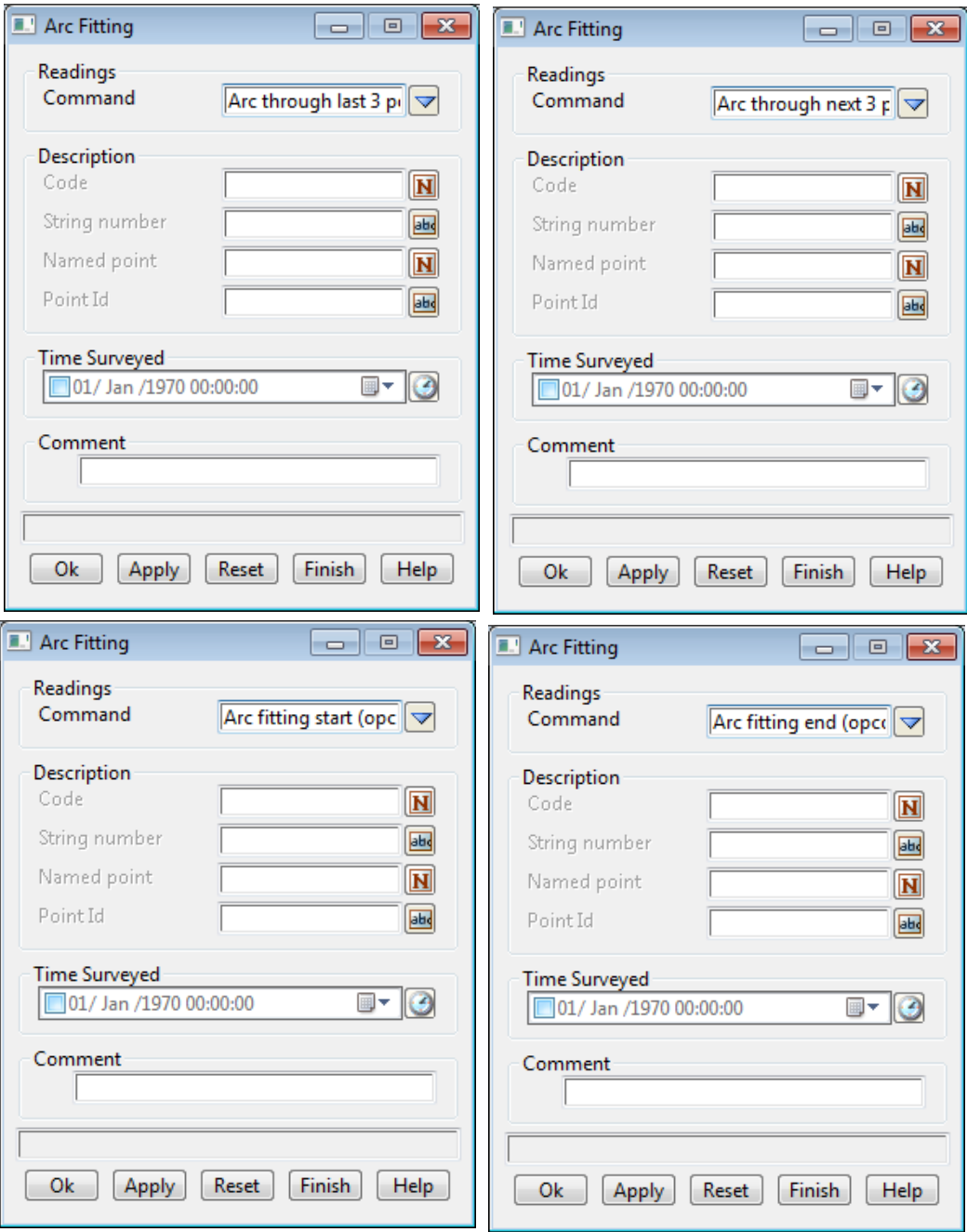
<i>Pipe axial</i> (opcode 81)	<u>Pipe Justification (opcodes 80, 81, 82)</u>
<i>Pipe invert</i> (opcode 80)	<u>Pipe Justification (opcodes 80, 81, 82)</u>
<i>Pipe obvert</i> (opcode 82)	<u>Pipe Justification (opcodes 80, 81, 82)</u>
<i>Remove height</i> (opcode 30)	<u>Remove Height (opcode 30)</u>
<i>Resection end</i> (opcode 129)	<u>Resection end (opcode 129)</u>
<i>Resection start</i> (opcode 128)	<u>Resection Start (opcode 128)</u>
<i>Scale factor</i> (opcode 9)	<u>Scale Factor (opcode 9)</u>
<i>Shape end</i> (opcode 84)	<u>Shaping (opcodes 83 to 86)</u>
<i>Shape extrude</i> (opcode 86)	<u>Shaping (opcodes 83 to 86)</u>
<i>Shape parallel</i> (opcode 85)	<u>Shaping (opcodes 83 to 86)</u>
<i>Shape record</i> (opcode 83)	<u>Shaping (opcodes 83 to 86)</u>
<i>String close</i> (opcode 20)	<u>String Close (opcode 20)</u>
<i>String end</i> (opcode 48)	<u>String End (opcode 48)</u>
<i>String rectangle</i> (opcode 45)	<u>Rectangle (opcode 45)</u>
<i>String rectangle by 2 points</i> (opcode 37)	<u>Rectangle By 2 Points (opcode 37)</u>
<i>String reverse</i> (opcode 19)	<u>String Reverse (opcode 19)</u>
<i>String start</i> (opcode 47)	<u>String Start (opcode 47)</u>
<i>String tinable</i> (opcode 46)	<u>Breakline String (String tinable (opcode 46))</u>
<i>String type 2d</i> (opcode 92)	<u>String Type (opcodes 92, 93, 94)</u>
<i>String type 3d</i> (opcode 93)	<u>String Type (opcodes 92, 93, 94)</u>
<i>String type 4d</i> (opcode 94)	<u>String Type (opcodes 92, 93, 94)</u>
<i>String type culvert</i> (opcode 96)	<u>Culvert (opcode 96)</u>
<i>String type pipe</i> (opcode 95)	<u>Pipe Diameter (opcode 95)</u>
<i>Target height</i> (opcode 5)	<u>Target Height (opcode 5)</u>
<i>Template change</i> (opcode 59)	<u>Templating (opcodes 51 to 59)</u>
<i>Template continue</i> (opcode 54)	<u>Templating (opcodes 51 to 59)</u>
<i>Template delete</i> (opcode 57)	<u>Templating (opcodes 51 to 59)</u>
<i>Template end</i> (opcode 52)	<u>Templating (opcodes 51 to 59)</u>
<i>Template insert</i> (opcode 58)	<u>Templating (opcodes 51 to 59)</u>

<i>Template pause</i> (opcode 53)	Templating (opcodes 51 to 59)
<i>Template record</i> (opcode 55)	Templating (opcodes 51 to 59)
<i>Template skip</i> (opcode 56)	Templating (opcodes 51 to 59)
<i>Template start</i> (opcode 51)	Templating (opcodes 51 to 59)
<i>Text</i> (opcode 41)	Additional Text For Point (opcode 41)
<i>Vertical circle correction</i> (opcode 15)	Vertical Circle Correction (opcode 15)

Arc Fitting (opcodes 17, 60, 61, 62)

Fitting arcs through measurements.

See [Arcs Through Points](#) in Appendix [12d Survey Guide](#).



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Command	choice box		Arc through last 3 points (opcode 17) Arc through next 3 points (opcode 60) Arc fitting start (opcode 61) Arc fitting end (opcode 62)

for Arc through last 3 pts

Named point is not used.

If no *feature code*, *string number*, *named point* or *point id* is given, then the current measurement point and the two previous points with the same feature code and string number as the current measurement point, are joined by an arc. If there is less than three such points, no arc is fitted.

If the *feature code* and *string number* exist, the last three previous measurement points of the same *feature code* and *string number* are joined by an arc. If the current measurement point has that *feature code* and *string number*, then it is the third of the three points used. If there is less than three points, no arc is fitted.

If a *point id* exists, then the *feature code* and *string number* are taken from the previous measurement point **with** that point id. That point and two measurement points previous to the predefined point of the same *feature code* and *string number*, are joined by an arc. If there is less than three points, no arc is fitted

for Arc through next 3 pts

Named point is not used.

If no *feature code*, *string number*, *named point* or *point id* is given, an arc is inserted through the current measurement point and the next two measured points with the same *feature code* and *string number* as the current measurement point. If there is less than three points, no arc is fitted.

If a *feature code*, *string number* or *point id* exists, then either the *feature code* and/or *string number* and/or the *point id* section of the *point description* can be used.

If the *feature code* or *string number* exist, a search is made for a previously defined measurement with the same *feature code* or *string number*. An arc is inserted through this previous measurement and the next two measured points following this previous measurement with the same *feature code* and *string number*. If the current point has that *feature code* and *string number*, then it is the first of the three points. If there is less than three points, no arc fitted.

If the *point id* exists, then the *feature code* and *string number* are taken from the previous measurement point **with** that point id, and an arc is inserted through that point and the next two measurement points with the same *feature code* and *string number*. If there is less than three points, no arc is fitted

for Start arc fitting

Named point is not used.

If no *feature code*, *string number*, *named point* or *point id* is given, arcs are inserted through the following sets of measurement points with the same *feature code* and *string number* as the current measurement point. The current measurement point is the first of the points.

The arcs are fitted as follows - the first arc is fitted through points one, two and three, the next arc through points three, four and five etc. If the current point has that *feature code* and *string number*, then it is the first of the points. If there is less than three points, then no arc is fitted.

If the *feature code* and *string number* exist, a search is made for a previously defined measurement with the same *feature code* or *string number*. An arc is inserted through the following measured points with the same *feature code* and *string number* as given. If the current point has that *feature code* and *string number*, then it is the first of the points.

If the *point id* exists, then the *feature code* and *string number* are taken from the previous measurement point **with** that point id, and arcs are inserted through that point and the following measured points with the same *feature code* and *string number*.

for End arc fitting

Named point is not used.

If no *feature code*, *string number*, *named point* or *point id* is given, the fitting of arcs through the current string is stopped. The current measurement point is the last of the points used in the arc fitting.

If the *feature code* and *string number* exist, then the fitting of arcs through the points of the previous string with the same *feature code* and *string number* is stopped. If the current measurement point has that *feature code* and *string number*, then it is the last point used in the arc fitting.

If the *point id* from the *point description* exists, then the point with that point id is the last point used in the arc fitting.

If **12d Model** encounters an *End Arcs* (62) but no *Start Arcs through sets of three points* (61) command for the string, then a *Start Arcs through sets of three points* (61) is assumed to apply at the beginning of the string and hence arc fitting will be applied to the entire string.

Code

feature code. See the description of the panel field Arc mode for usage

String number

string number. See the description of the panel field Arc mode for usage

Named point

not used

Point id

point id. See the description of the panel field Arc mode for usage

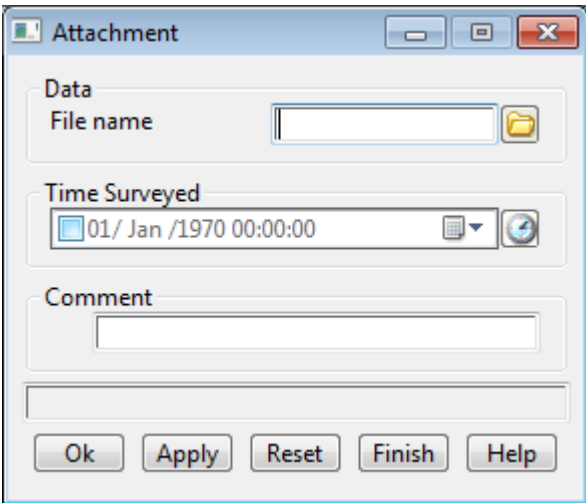
Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

Attachment (opcode 126)

Attach a file to the measurement.

The image shows a software dialog box titled "Attachment". It contains several input fields: a "Data" section with a "File name" text box and a folder icon; a "Time Surveyed" section with a date/time picker showing "01/ Jan /1970 00:00:00" and a refresh icon; and a "Comment" section with a text area. At the bottom, there are five buttons: "Ok", "Apply", "Reset", "Finish", and "Help".

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

File name

file to attach to the measurement

Time surveyed

time when the command (op code) was created

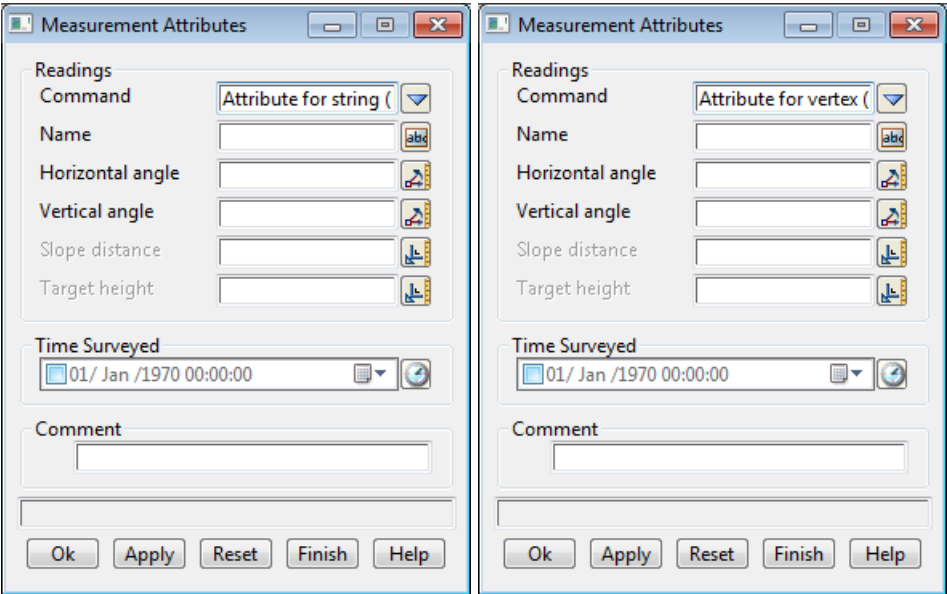
Comment

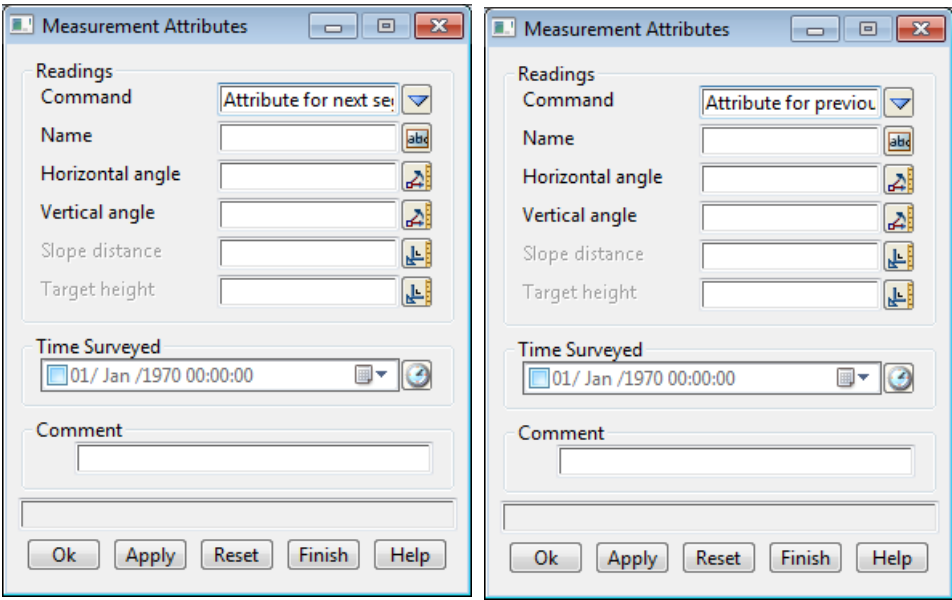
comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

Measurement Attributes (Opcode 120 to 123)

This section of documentation is a work in progress and will be updated in subsequent releases.



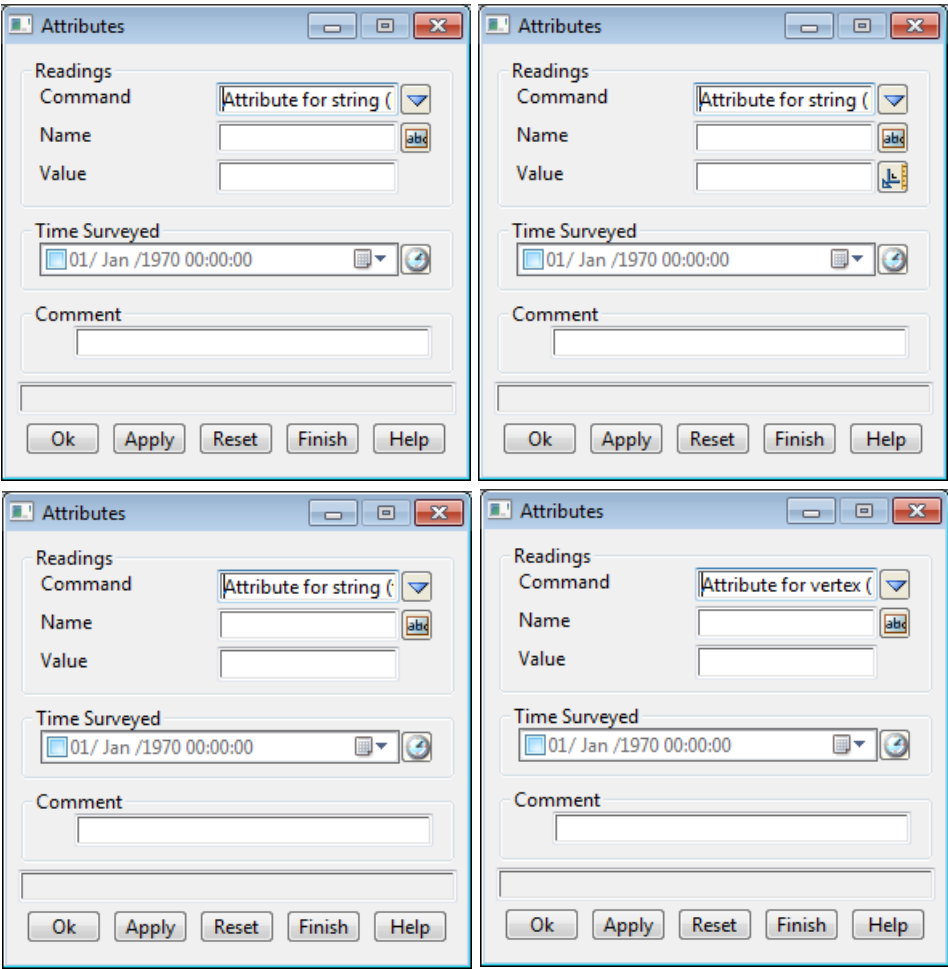


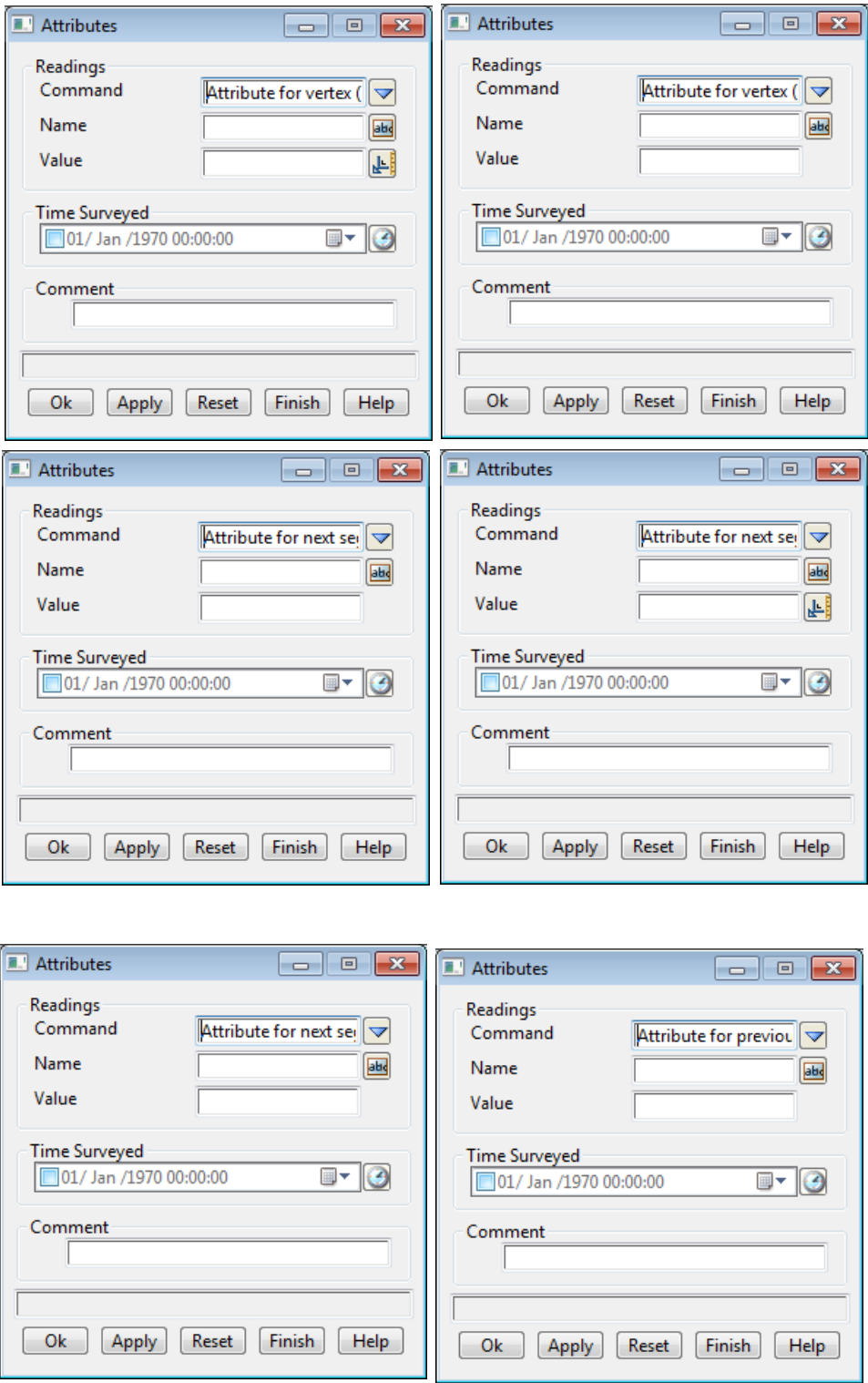
The fields and buttons used in this panel have the following functions.

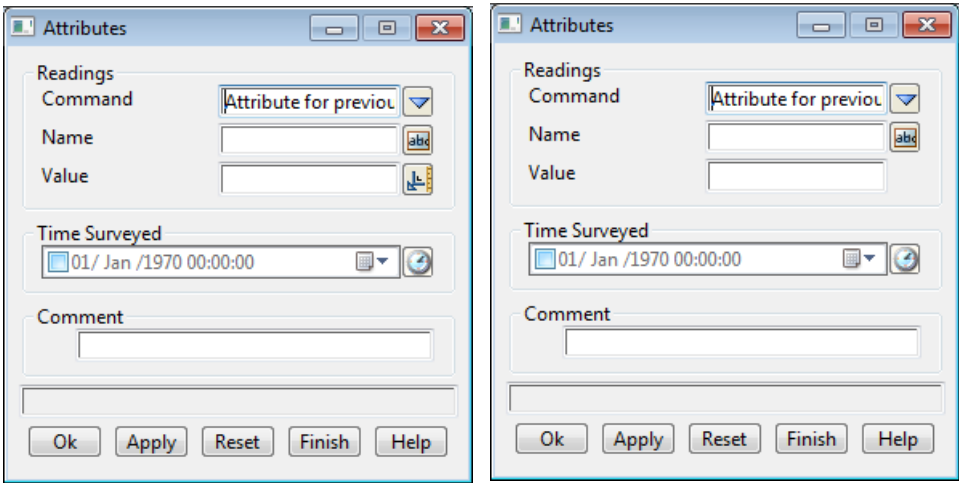
Field Description	Type	Defaults	Pop-Up
			Attribute for string (Measurement) (opcode 120)
			Attribute for vertex (Measurement) (opcode 121)
			Attribute for next segment (Measurement) (opcode 122)
			Attribute for previous segment (Measurement) (opcode 123)

Attributes (opcode 68 to79)

Create attributes of type measurement, integer, real or text, to string, vertices or segments.







The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Command	choice box		Attribute for string (integer) (opcode 68) Attribute for string (real) (opcode 69) Attribute for string (text) (opcode 70) Attribute for vertex (integer) (opcode 71)) Attribute for vertex (real) (opcode 72)) Attribute for vertex (text) (opcode 73) Attribute for next segment (integer) (opcode 74) Attribute for next segment (real) (opcode 75)) Attribute for next segment (text) (opcode 76)) Attribute for previous segment (integer) (opcode 77)) Attribute for previous segment (real) (opcode 78) Attribute for previous segment (text) (opcode 79)

for String (integer)

Add an user defined integer attribute to the current string.

for String (real)

Add a real (floating point) user defined attribute to the current string.

for String (text)

Add a text user defined attribute to the current string.

for Vertex (integer)

Add an integer user defined attribute to the current measurement point.

for Vertex (real)

Add a real (floating point) user defined attribute to the current measurement point.

for Vertex (text)

Add a text user defined attribute to the current measurement point.

for Next segment (integer)

Add an integer user defined attribute to the next segment from the current measurement point.

for Next segment (real)

Add a real (floating point) user defined attribute to the next segment from the current measurement point.

for Next segment (text)

Add a text user defined attribute to the next segment from the current measurement point.

for Previous segment (integer)

Add an integer user defined attribute to the previous segment for the current measurement point.

for Previous segment (real)

Add a real (floating point) user defined attribute to the previous segment for the current measurement point.

for Previous segment (text)

Add a text user defined attribute to the previous segment for the current measurement point.

Name

The name of the attribute.

Value

The attribute data in the form specified by the mode.

Time surveyed

time when the command (op code) was created

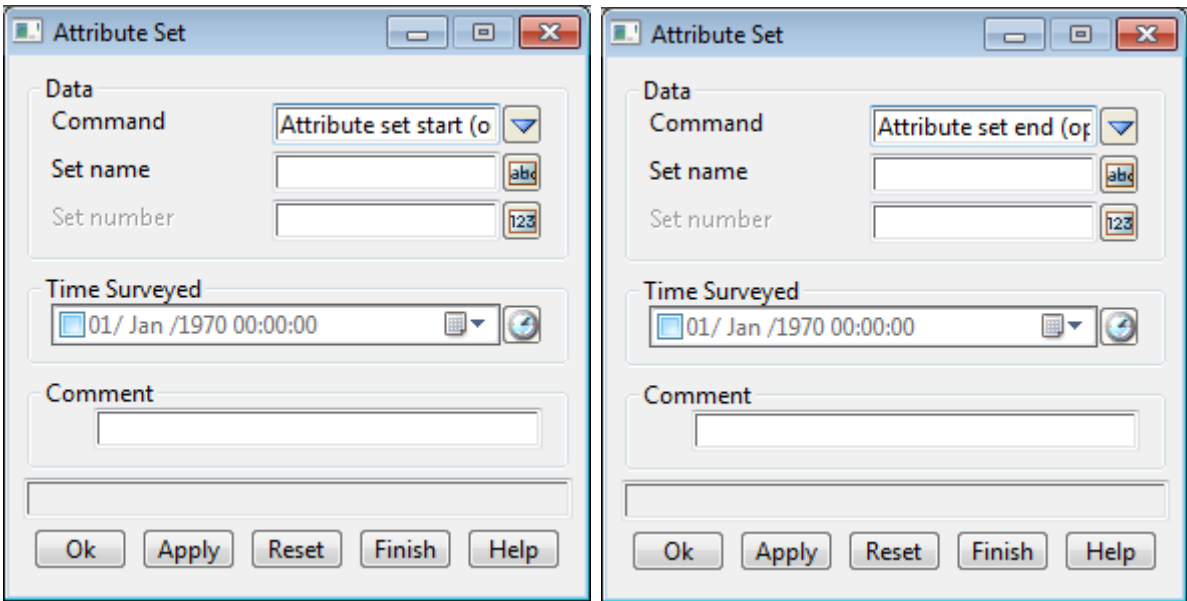
Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

Attribute Set (opcode 124 and 125)

This section of documentation is a work in progress and will be updated in subsequent releases.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
			Attribute set start (opcode 124)
			Attribute set end (opcode 125)

Backsight (opcode 4)

Denote the measurement as a backsight measurement.

Individual backsight measurements can be entered, or they can consist of pairs of Face1/Face2 measurements.

To enter a Face1/Face2 measurement, the backsight command should be entered twice, with the appropriate values entered into the panel each time.

Backsight

Readings

Horizontal angle

Vertical angle

Slope distance

Azimuth

Value

Description

Code

String number

Backsight point

PointId

Attribute

Time Surveyed

01/ Jan /1970 00:00:00

Comment

Ok

Apply

Reset

Finish

Help

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Horizontal angle

the horizontal angle to the backsight in dd.mmss format.

Vertical angle

the vertical angle to the backsight in dd.mmss format. If the value is in the range 0 -180 degrees the measurement is considered a Face 1 measurement, and for measurements in the range 180-360 degrees they are considered Face2.

Slope distance

the slope distance to the measurement to the backsight. If a pair of face1/face2 measurements exist, the mean value of the slope distance is used for reduction purposes.

Value

the azimuth to the backsight in dd.mmss format. This allows backsights to be specified by azimuth only. In the case of a differing azimuth and horizontal angle, a swing will be computed by the subtraction of the azimuth value and the horizontal angle.

Code

the feature code of the measurement.

String number

the string number of the measurement.

Backsight point

point name.of the backsight point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section [Existing point search](#)

Point id

point id.of the backsight point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section [Existing point search](#). If a new backsight entry is inserted into the file, this field will be non-editable since only the backsight point is required.

Attribute

Time surveyed

time when the command (op code) was created

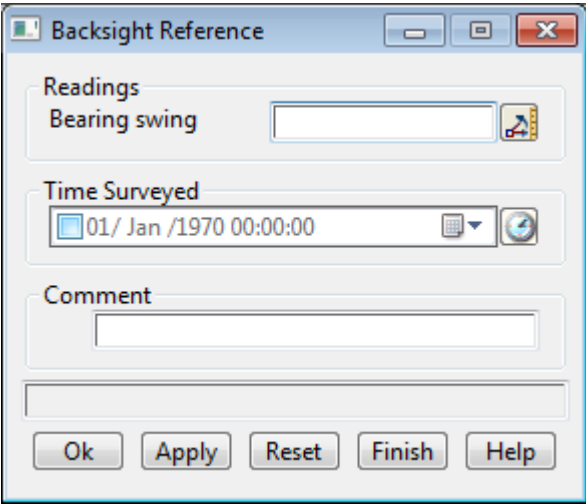
Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

Backsight Reference (opcode 50)

Specify an angle (measured positive, clockwise from north) to swing the following measurements by.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Bearing swing			

the angle (measured positive, clockwise from north) to swing following measurements. It is equivalent to the bearing datum difference. Note, this swing is only current for measurements following the command and for that particular station setup. It also negates any previous swings calculated from

backsight measurements (bearing datum difference) for that station setup. Therefore, measurements after the command will use the new swing value. The direction of the swing is positive in the clockwise direction

Time surveyed

time when the command (op code) was created

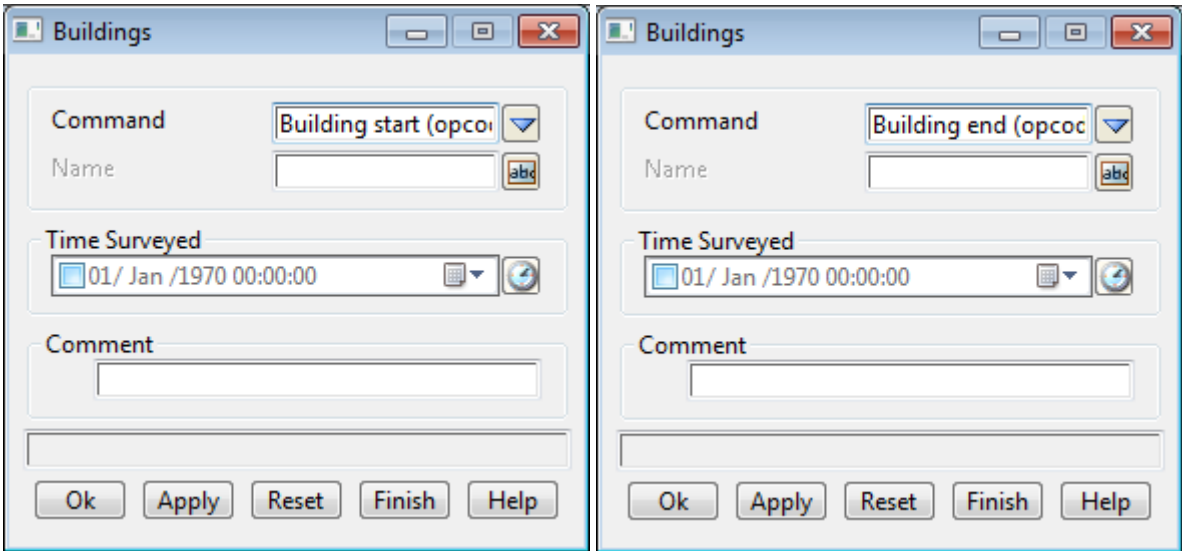
Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

Buildings (opcodes 110, 111)

Create a building face.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Command			Building end (opcode 111)
			Building start (opcode 110)

for Building end

If no *name* exists, the current building face observation set is finished (including the current measurement point).

for Buildings start

Start recording a building face with the given name. If *name* is non-blank, then the default building face is defined by the *feature code* and *string number*.

The following measurements until a *Finish* code (111), are stored as the building face. There is no limit to the number of points in a building face.

Name

Name has the meaning as outlined above in Building end/start definition.

Time surveyed

time when the command (op code) was created

Comment

insert a comment within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

Check Coordinate (opcode 14)

This section of documentation is a work in progress and will be updated in subsequent releases

Check Coordinate

Readings

X coordinate

Y coordinate

Z coordinate

Description

Code

String number

Check point

PointId

Attribute

Time Surveyed

01/ Jan /1970 00:00:00

Comment

Ok

Apply

Reset

Finish

Help

Check Measurement (opcode 6)

Denote the measurement as a check measurement.

Individual check measurements can be entered, or they can consist of pairs of Face1/Face2 measurements.

To enter a Face1/Face2 measurement the check command should be entered twice, with the appropriate values entered into the panel each time.

Check Measurement

Readings

Horizontal angle

Vertical angle

Slope distance

Description

Code

String number

Check point

Point Id

Attribute

Time Surveyed

01/ Jan /1970 00:00:00

Comment

Ok

Apply

Reset

Finish

Help

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Horizontal angle

the horizontal angle to the check point in dd.mmss format.

Vertical angle

the vertical angle to the check point in dd.mmss format. If the value is in the range 0 -180 degrees the measurement is considered a Face 1 measurement, and for measurements in the range 180-360 degrees they are considered Face2.

Slope distance

the slope distance to the measurement to the check point. If a pair of face1/face2 measurements exist, the mean value of the slope distance is used for reduction purposes.

Code

the feature code of the measurement.

String number

the string number of the measurement.

Check point

point name.of the check point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section [Existing point search](#)

Point id

point id.of the check point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section [Existing point search](#). If a new check point entry is inserted into the file, this field will be non-editable since only the check point is required.

Attribute

Time surveyed

time when the command (op code) was created

Comment

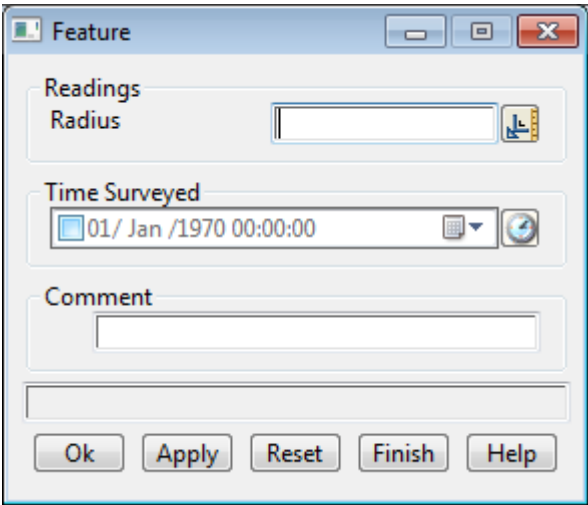
comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

Feature (opcode 18)

Create a circle of a given radius around the current measurement point.

See [Feature](#) in [Appendix 12d Survey Guide](#).



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Radius

the radius of the circle to be drawn around the current measurement point.

Time surveyed

time when the command (op code) was created

Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

Code file (opcode 119)

This section of documentation is a work in progress and will be updated in subsequent releases.

The screenshot shows a Windows-style dialog box titled "Field12d Coding File". It has three main input sections: "Data" with a "Code file name" text box and a folder icon; "Time Surveyed" with a date/time picker showing "01/ Jan /1970 00:00:00"; and a "Comment" section with a large text area. At the bottom, there are five buttons: "Ok", "Apply", "Reset", "Finish", and "Help".

Comment (opcode -2)

Insert a comment in the field file.

The screenshot shows a "Comment" dialog box. It contains a "Comment" text area at the top, followed by a "Time Surveyed" date/time picker showing "01/ Jan /1970 00:00:00". At the bottom, there are five buttons: "Ok", "Apply", "Reset", "Finish", and "Help".

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Comment

the comment to insert into the field file.

Time surveyed

time when the command (op code) was created

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

Coordinate (opcode 2)

Create a point with specified coordinates.

Direct Coordinate

Readings

X coordinate

Y coordinate

Z coordinate

Description

Code

String number

Named point

Point Id

Attribute

Time Surveyed

01/ Jan /1970 00:00:00

Comment

Ok

Apply

Reset

Finish

Help

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

X coordinate	double box		
<i>the x coordinate value of the nominated point.</i>			

Y coordinate	double box		
<i>the y coordinate value of the nominated point.</i>			

Z coordinate	double box		
<i>the z coordinate value of the nominated point.</i>			

Code			
<i>the feature code of the nominated point.</i>			

String number			
<i>the string number of the nominated point.</i>			

Named point			
<i>point name of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section Existing point</i>			

[search](#)

Point id

point id.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section [Existing point search](#). If a new check point entry is inserted into the file, this field will be non-editable since only the check point is required.

Attribute

Time surveyed

time when the command (op code) was created

Comment

insert a comment within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

Height Or Depth (opcode 28)

Note - this option **does not alter heights**. It just adds a text comment of the given value.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Value

value is converted to text and added to the string name as specified in the description fields.

Code, String number, Named point

Named point is not used.

If no feature *code*, *string number*, *named point* or *point id* is given, the value is added to all string names with the same code and string number as the current measurement. This applies to the entire field file.

If the *feature code* and *string number* exist, then the value is added to all string names with the same code and string number. This applies to the entire field file.

If the *point id* exists, then the value is added to all string names with the same code and string number as the point defined by the point id. This applies to the entire field file.

Time surveyed

time when the command (op code) was created

Comment

insert a comment within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

Job Data (opcode 1)

Enter text to be added as header information

The image shows a Windows-style dialog box titled "Job Data". It has a standard title bar with minimize, maximize, and close buttons. The dialog contains three main input areas: a single-line text field labeled "Data", a date-time field labeled "Time Surveyed" which currently shows "01/ Jan /1970 00:00:00" and includes a calendar icon and a refresh icon, and a multi-line text field labeled "Comment". At the bottom of the dialog, there are five buttons: "Ok", "Apply", "Reset", "Finish", and "Help".

The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Data

extra text to be added as header information

Time surveyed

time when the command (op code) was created

Comment

insert a comment within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

Distance correction (opcode 127)

This section of documentation is a work in progress and will be updated in subsequent releases.

The 'Measure Offset' dialog box contains the following fields and controls:

- Readings**: A section containing an 'Offset' text input field with a small icon to its right.
- Time Surveyed**: A date and time selection field showing '01/ Jan /1970 00:00:00' with a calendar icon and a refresh icon.
- Comment**: A multi-line text area for entering notes.
- Buttons**: A row of five buttons at the bottom: 'Ok', 'Apply', 'Reset', 'Finish', and 'Help'.

Distances (opcode 49)

This section of documentation is a work in progress and will be updated in subsequent releases.

The 'Distances' dialog box contains the following fields and controls:

- Description**: A section with four input fields, each with a small icon to its right:
 - Code**: Input field with an 'N' icon.
 - String number**: Input field with an 'abc' icon.
 - Named point**: Input field with an 'N' icon.
 - Point Id**: Input field with an 'abc' icon.
- Time Surveyed**: A date and time selection field showing '01/ Jan /1970 00:00:00' with a calendar icon and a refresh icon.
- Comment**: A multi-line text area for entering notes.
- Buttons**: A row of five buttons at the bottom: 'Ok', 'Apply', 'Reset', 'Finish', and 'Help'.

Error (opcode -1)

Enter text to be added as error information.

If the field file was reduced from a raw data collector file, any records that can't be parsed correctly will be made into an error comment.

Error

Data

Time Surveyed

01/ Jan /1970 00:00:00

Comment

Ok

Apply

Reset

Finish

Help

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data			
<i>extra text to be added as error information. If the field file was reduced from a raw data collector file, any records that can't be parsed correctly will have an error comment.</i>			

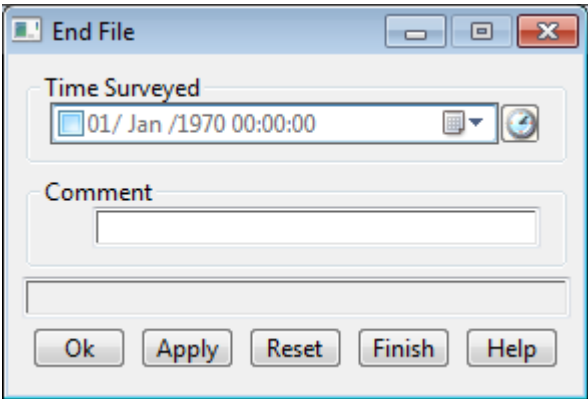
Time surveyed			
<i>time when the command (op code) was created</i>			

Comment			
<i>insert a comment within the field file.</i>			

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

End File (opcode 99)

Command to stop the processing of the 12d field file at this line.
This is useful for debugging errors.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Time surveyed

time when the command (op code) was created

Comment

Stop processing the 12d field file at this line. Useful for debugging errors.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#).

Invisible (opcodes 107, 108, 109)

Make segments or vertices invisible.

Invisible

Readings
CommandInvisible previous se

Description
CodeString numberNamed pointPointId

Time Surveyed
01/ Jan /1970 00:00:00

Comment

OkApplyResetFinishHelp

Invisible

Readings
CommandInvisible next segme

Description
CodeString numberNamed pointPointId

Time Surveyed
01/ Jan /1970 00:00:00

Comment

OkApplyResetFinishHelp

Invisible

Readings
CommandInvisible point (opcc

Description
CodeString numberNamed pointPointId

Time Surveyed
01/ Jan /1970 00:00:00

Comment

OkApplyResetFinishHelp

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Command	choice box		Invisible previous segment (opcode 107) Invisible next segment (opcode 108) Invisible point (opcode 109)

for Make the previous segment invisible

If no *description* is given, the previous segment containing the current measurement point is set to

invisible.

If a *description* exists, then either the *feature code* and *string number* or the *point id* section of the *description* can be used.

If the *feature code* and *string number* exist, then the last segment of the previous string with that *feature code* and *string number* is set to invisible.

If the *point id* exists, then the segment containing the point with that point id as an end point, is set to invisible.

for Make the next segment invisible

If no *description* is given, the next segment containing the current measurement point as a starting point is set to invisible. That is, it will not be treated as a breakline in triangulations.

If a *description* exists, then either the *feature code* and *string number* or the *point id* section of the *description* can be used.

If the *feature code* and *string number* exist, then the segment that is created in the future from the last point of the previous string with that *feature code* and *string number* is set to invisible.

If the *point id* exists, then the segment containing the point with that point id as a start point, is set to invisible.

for Make a point invisible

If no *description* is given, the current measurement point is set to invisible. That is, it will not be included in triangulations.

If a *description* exists, then either the *feature code* and *string number* or the *point id* section of the *description* can be used.

If the *feature code* and *string number* exist, then the last point of the previous string with that *feature code* and *string number* is set to invisible.

If the *point id* exists, then the point with that point id is set to invisible.

Code

the feature code of the nominated point.

String number

the string number of the nominated point.

Named point

point name of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section [Existing point search](#)

Point id

point id of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section [Existing point search](#). If a new check point entry is inserted into the file, this field will be non-editable since only the check point is required.

Time surveyed

time when the command (op code) was created

Comment

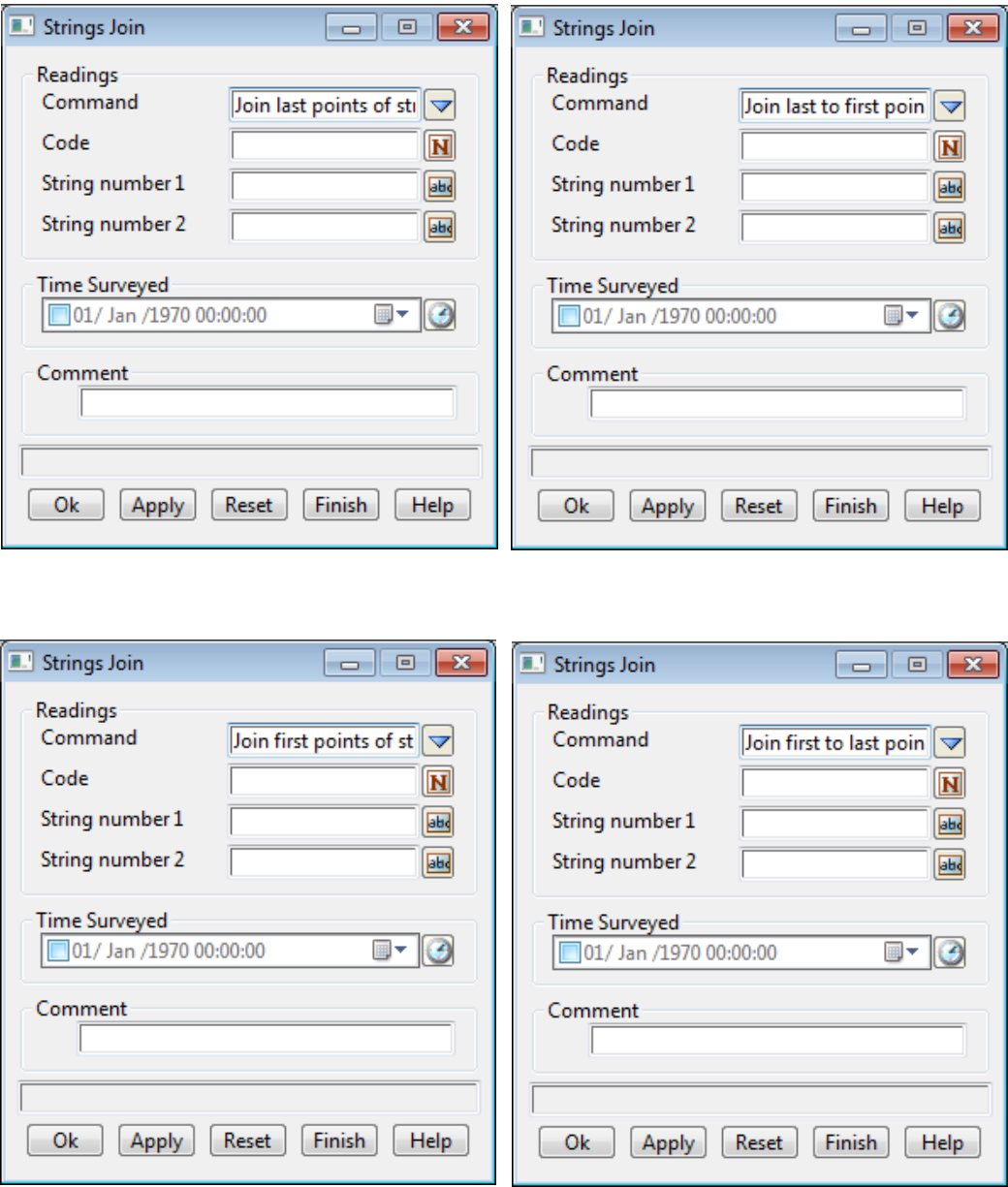
comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

Strings Join (opcodes 21 to 24)

Join two strings together.

See [Joining Strings](#) in Appendix [12d Survey Guide](#).



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Command	choice box		Join last points of strings (opcode 21) Join first to last point of strings (opcode 22) Join first points of strings (opcode 23) Join last to first point of strings (opcode 24)

for Join last points of strings

In the final reduction, the last point of the string with the given *feature code* and *string_number_1* is joined to the last point of the string with given *feature code* and *string_number_2*. The created string has the given *feature code* (no string number is needed since it is the final phase of reduction when the string numbers are dropped).

for Join first to last point of strings

In the final reduction, the first point of the string with the given *feature code* and *string_number_1* is joined to the last point of the string with given *feature code* and *string_number_2*. The created string has the given *feature code* (no string number is needed since it is the final phase of reduction when the string numbers are dropped).

for Join first points of strings

In the final reduction, the first point of the string with the given *feature code* and *string number 1* is joined to the first point of the string with given *feature code* and *string number 2*. The created string has the given *feature code* (no string number is needed since it is the final reduction when the string numbers are then dropped).

for Join last to first point of strings

In the final reduction, the last point of the string with the given *feature code* and *string_number_1* is joined to the first point of the string with given *feature code* and *string_number_2*. The created string has the given *feature code* (no string number is needed since it is the final phase of reduction when the string numbers are dropped).

Code

the feature code of the strings to be joined

String number 1

the string number of the first string

String number 2

the string number of the second string

Time surveyed

time when the command (op code) was created

Comment

insert a comment within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

EDM Measurement (opcode 7)

Store a measurement given by Horizontal angle, Vertical angle and Slope distance.
Individual measurements can be entered or they can consist of pairs of Face1/Face2 measurements.
To enter a Face1/Face2 measurement the command should be entered twice, with the appropriate values entered into the panel each time.

EDM Measurement

Readings

Horizontal angle

Vertical angle

Slope distance

Description

Code

String number

Named point

Point Id

Attribute

Time Surveyed

01/ Jan /1970 00:00:00

Comment

Ok

Apply

Reset

Finish

Help

The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Horizontal angle

the horizontal angle to the point in dd.mmss format.

Vertical angle

the vertical angle to the point in dd.mmss format. If the value is in the range 0 -180 degrees the measurement is considered a Face 1 measurement, and for measurements in the range 180-360 degrees they are considered Face2.

Slope distance

the slope distance to the measurement to the point. If a pair of face1/face2 measurements exist, the mean value of the slope distance is used for reduction purposes.

Code

the feature code of the measurement.

String number

the string number of the measurement.

Named point

point name.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section [Existing point search](#)

Point id

point id.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section [Existing point search](#). If a new check point entry is inserted into the file, this field will be non-editable since only the check point is required.

Attribute**Time surveyed**

time when the command (op code) was created

Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

EDM Measurement (HA,HD,HT) (opcode 11)

Store a measurement given by Horizontal angle, Horizontal distance and Height.
Individual measurements can be entered or they can consist of pairs of Face1/Face2 measurements.
To enter a Face1/Face2 measurement the command should be entered twice, with the appropriate values entered into the panel each time.

EDM Measurement HT

Readings

Horizontal angle

Horizontal distance

Height

Description

Code

String number

Named point

Point Id

Attribute

Time Surveyed

01/ Jan /1970 00:00:00

Comment

Ok

Apply

Reset

Finish

Help

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Horizontal angle
the horizontal angle to the point in dd.mmss format.

Horizontal distance
the reduced horizontal distance.

Height
the height of the observation point.

Code
the feature code of the measurement.

String number
the string number of the measurement.

Named point

point name.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section [Existing point search](#)

Point id

point id.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section [Existing point search](#). If a new check point entry is inserted into the file, this field will be non-editable since only the check point is required.

Attribute**Time surveyed**

time when the command (op code) was created

Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

Edm measurement (HA,HD,Diff HT) (opcode 12)

Store a measurement given by Horizontal angle, Horizontal distance and Vertical distance. Individual measurements can be entered or they can consist of pairs of Face1/Face2 measurements.

To enter a Face1/Face2 measurement the command should be entered twice, with the appropriate values entered into the panel each time.

EDM Measurement VD

Readings

Horizontal angle

Horizontal distance

Vertical distance

Description

Code

String number

Named point

Point Id

Attribute

Time Surveyed

01/ Jan /1970 00:00:00

Comment

Ok

Apply

Reset

Finish

Help

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Horizontal angle

the horizontal angle to the point in dd.mmss format.

Horizontal distance

the reduced horizontal distance.

Vertical distance

the change in height as measured from the collimation height of the instrument to the target point (usually centre of target).

Code

the feature code of the measurement.

String number

the string number of the measurement.

Named point

point name.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section [Existing point search](#)

Point id

point id.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section [Existing point search](#). If a new check point entry is inserted into the file, this field will be non-editable since only the check point is required.

Attribute**Time surveyed**

time when the command (op code) was created

Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

Stadia Measurement (opcode 10)

Store a measurement given by Horizontal angle, Horizontal distance and the Top, Middle and Bottom hair readings.

Stadia Measurement

Readings

Horizontal angle

Vertical angle

Top

Middle

Bottom

Description

Code

String number

Named point

Point Id

Attribute

Time Surveyed

01/ Jan /1970 00:00:00

Comment

Ok

Apply

Reset

Finish

Help

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Horizontal angle

the horizontal angle to the point in dd.mmss format.

Vertical angle

the vertical angle to the point in dd.mmss format.

Top

the top hair reading.

Middle

the middle hair reading.

Bottom

the bottom hair reading.

Code

the feature code of the measurement.

String number

the string number of the measurement.

Named point

point name.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section [Existing point search](#)

Point id

point id.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section [Existing point search](#). If a new check point entry is inserted into the file, this field will be non-editable since only the check point is required.

Attribute

Time surveyed

time when the command (op code) was created

Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

Multiple Coding (opcode 16)

Record a new point at the same position as the current measurement point but with possibly a different feature code and string number.

The image shows a software dialog box titled "Multiple Coding". It has a standard Windows-style title bar with minimize, maximize, and close buttons. The dialog contains several input fields: "Description Code", "String number", "Named point", "Point Id", and "Attribute", each followed by a small icon (a box with 'N' or 'abc'). Below these is a "Time Surveyed" field with a date/time picker showing "01/ Jan /1970 00:00:00". At the bottom is a "Comment" text area and a row of five buttons: "Ok", "Apply", "Reset", "Finish", and "Help".

A new point is created at the same position as the current measurement point but with the specified *feature code* and *string number*.

The *point id* and *text* are recorded as the point id and text for that vertex of the super string.

If a *point name* exists, then it is a **named measurement** and a 4d point string of name *point name* is created and mapped using the mapping file. The 4d text is the station prefix followed by *point name*. The *point name* is added to the internal list of named points for searching for co-ordinates.

The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Code

the feature code of the new point.

String number

the string number of the new point.

Named point

point name of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section [Existing point search](#)

Point id

point id of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section [Existing point search](#). If a new check point entry is inserted into the file, this field will be non-editable since only the check point is required.

Attribute

Time surveyed

time when the command (op code) was created

Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

New Instrument (opcode 3)

Define a new instrument setup.

New Instrument

Readings

Instrument ht

Description

Code

N

String number

abc

Setup point

N

Point Id

abc

Attribute

abc

Position

Easting

Northing

Height

Accuracy

Unknown

Time Surveyed

01/ Jan /1970 00:00:00

Comment

Ok

Apply

Reset

Finish

Help

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Instrument ht

the height of the instrument setup.

Code

the feature code of the measurement.

String number

the string number of the measurement.

Named point

point name.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section [Existing point search](#)

Point id

point id.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section [Existing point search](#). If a new check point entry is inserted into the file, this field will be non-editable since only the check point is required.

Easting

this field is non-editable and is populated if a valid coordinate exists for the nominated setup point.

Northing

this field is non-editable and is populated if a valid coordinate exists for the nominated setup point.

Height

this field is non-editable and is populated if a valid coordinate exists for the nominated setup point.

Attribute

Time surveyed

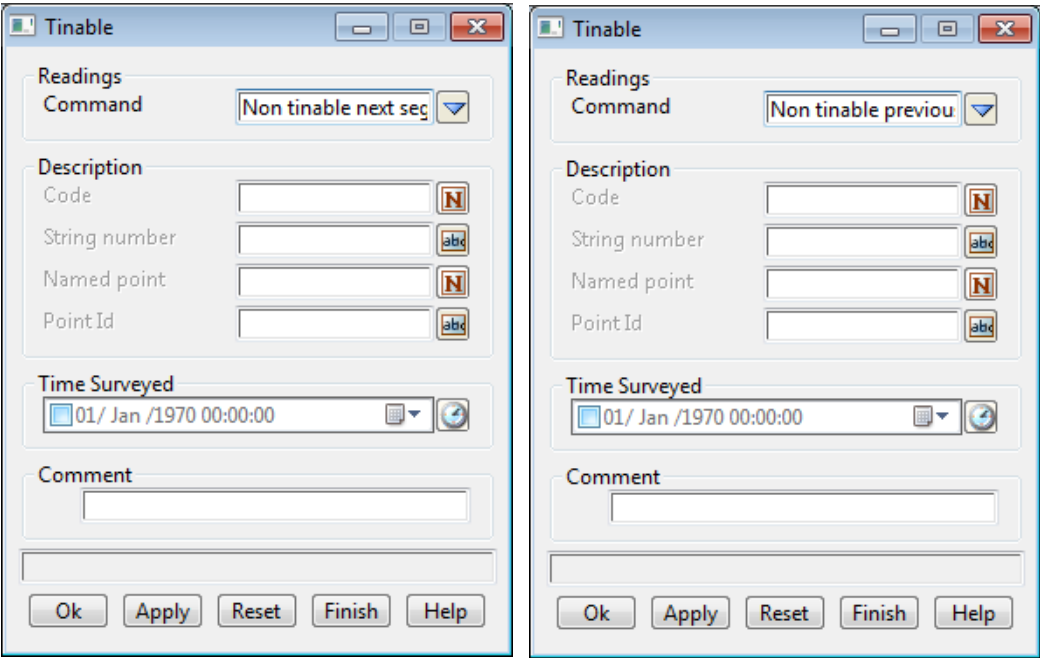
time when the command (op code) was created

Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

Tinable (opcodes 38, 39, 40)



Tinable

Readings

Command

Non tinable point (o

Description

Code

String number

Named point

PointId

Time Surveyed

01/ Jan /1970 00:00:00

Comment

Ok

Apply

Reset

Finish

Help

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Command	choice box		Non tinable previous segment (opcode 39) Non tinable next segment (opcode 38) Non tinable point (opcode 40)

for Make the previous segment non-tinable

If no *description* is given, the previous segment containing the current measurement point is set to non-tinable. That is, it will not be treated as a breakline in triangulations.

If a *description* exists, then either the *feature code* and *string number* or the *point id* section of the *description* can be used.

If the *feature code* and *string number* exist, then the last segment of the previous string with that *feature code* and *string number* is set to non-tinable.

If the *point id* exists, then the segment containing the point with that point id as an end point, is set to non-tinable.

for Make the next segment non-tinable

If no *description* is given, the next segment containing the current measurement point as a starting point is set to non-tinable. That is, it will not be treated as a breakline in triangulations.

If a *description* exists, then either the *feature code* and *string number* or the *point id* section of the *description* can be used.

If the *feature code* and *string number* exist, then the segment that is created in the future from the last point of the previous string with that *feature code* and *string number* is set to non-tinable.

If the *point id* exists, then the segment containing the point with that point id as a start point, is set to non-tinable.

for Make a point not tinable

If no *description* is given, the current measurement point is set to not tinable. That is, it will not be included in triangulations.

If a *description* exists, then either the *feature code* and *string number* or the *point id* section of the

description can be used.

If the *feature code* and *string number* exist, then the last point of the previous string with that *feature code* and *string number* is set to not tinalbe.

If the *point id* exists, then the point with that point id is set to not tinalbe.

Attribute

Time surveyed

time when the command (op code) was created

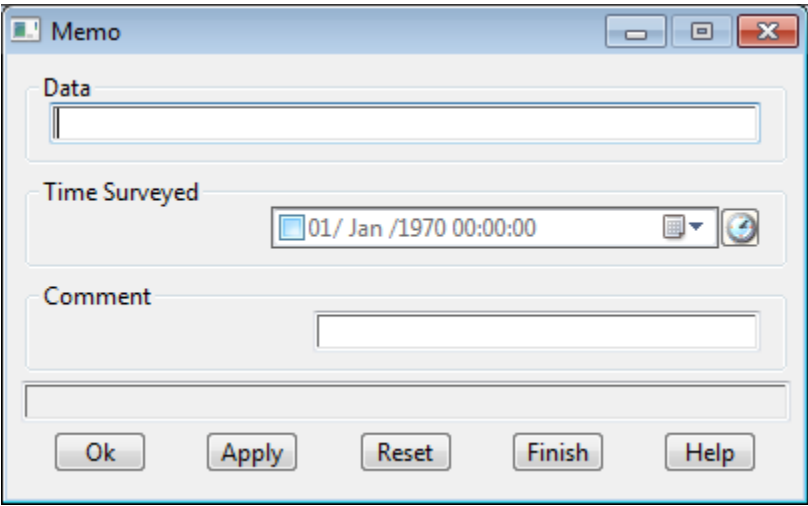
Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

Note (opcode 29)

Give extra text to be added as information in the field file.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data

extra text to be added as information in the field file.

Time surveyed

time when the command (op code) was created

Comment

insert a comment within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

Offset Measurement (opcodes 42, 43, 44)

It is not always possible to measure a point directly but it may be possible to measure a point nearby and then measure an offset to adjust the measured point by and so produce the coordinates of the required point.

See [Offsets](#) in Appendix [12d Survey Guide](#).

Offset Measurement

Readings

Command

Offset radial (opcode)

Offset

Description

Code

String number

Named point

Point Id

Time Surveyed

01/ Jan /1970 00:00:00

Comment

Ok

Apply

Reset

Finish

Help

Offset Measurement

Readings

Command

Offset tangential (opcode)

Offset

Description

Code

String number

Named point

Point Id

Time Surveyed

01/ Jan /1970 00:00:00

Comment

Ok

Apply

Reset

Finish

Help

Offset Measurement

Readings

Command

Offset height (opcode)

Offset

Description

Code

String number

Named point

Point Id

Time Surveyed

01/ Jan /1970 00:00:00

Comment

Ok

Apply

Reset

Finish

Help

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Command			Offset radial (opcode 42) Offset tangential (opcode 43) Offset height (opcode 44)

for Radial

The *radial offset* is used to adjust the position of the specified point by a plan distance from the specified points original position, along the plan line joining the current station to the specified point. A positive offset is away from the station, negative is toward the station.

If no *point description* is given, the offset is used to adjust the position of the current measured point.

If a *point description* exists, then either the *feature code* and *string number* or the *point id* section of the *point description* can be used.

If the *feature code* and *string number* exist, then the last point of the previous string with that *feature code* and *string number* is adjusted.

If the *point id* exists, then the point with that point id is adjusted.

for Tangential

The *tangential offset* is used to adjust the position of the specified point by a plan distance from the specified points original position, at rights angles to the plan line joining the current station to the specified point. A negative offset is to the left (looking from the station), and positive is to the right (looking from the station).

If no *point description* is given, the offset is used to adjust the position of the current measured point.

If a *point description* exists, then either the *feature code* and *string number* or the *point id* section of the *point description* can be used.

If the *feature code* and *string number* exist, then the last point of the previous string with that *feature code* and *string number* is adjusted.

If the *point id* exists, then the point with that point id is adjusted.

for Height

If the height of the specified point is not null, then the *height offset* adjusts the height of the point. A positive offset adds to the height, a negative offset reduces the height.

If no *point description* is given, the offset is used to adjust the position of the current measured point.

If a *point description* exists, then either the *feature code* and *string number* or the *point id* section of the *point description* can be used.

If the *feature code* and *string number* exist, then the last point of the previous string with that *feature code* and *string number* is adjusted.

If the *point id* exists, then the point with that point id is adjusted.

Time surveyed

time when the command (op code) was created

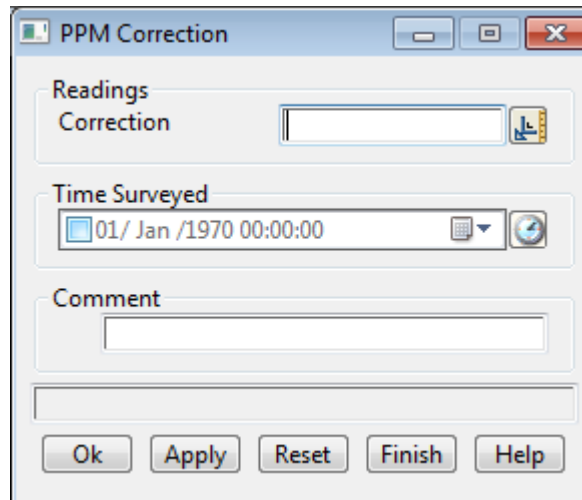
Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

PPM Correction (opcode 131)

This section of documentation is a work in progress and will be updated in subsequent releases.



The screenshot shows a Windows-style dialog box titled "PPM Correction". It contains three main sections: "Readings Correction" with a text input field and a download icon; "Time Surveyed" with a date/time picker showing "01/ Jan /1970 00:00:00" and a refresh icon; and "Comment" with a text input field. At the bottom, there are five buttons: "Ok", "Apply", "Reset", "Finish", and "Help".

Pipe Justification (opcodes 80, 81, 82)

Specify what type of pipe justification point that the current measurement is.

Pipe Justification

Readings
CommandPipe invert (opcode

Description
CodeString numberNamed pointPointId

Time Surveyed
01/ Jan /1970 00:00:00

Comment

OkApplyResetFinishHelp

Pipe Justification

Readings
CommandPipe axial (opcode 8

Description
CodeString numberNamed pointPointId

Time Surveyed
01/ Jan /1970 00:00:00

Comment

OkApplyResetFinishHelp

Pipe Justification

Readings
CommandPipe obvert (opcode

Description
CodeString numberNamed pointPointId

Time Surveyed
01/ Jan /1970 00:00:00

Comment

OkApplyResetFinishHelp

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Command			Pipe invert (opcode 80) Pipe axial (opcode 81) Pipe obvert (opcode 82)

for Pipe invert (opcode 80)

If no *point description* is given, the current measurement point is on the invert (bottom) of a pipe. This is the default for measurements to points on pipe strings. If the point is not part of a pipe string, it is ignored.

If the *feature code* and *string number* exist, the last point of the previous string with the same *feature code* and *string number* as given in *point description* is on the invert (bottom) of a pipe. If the point is not part of a pipe string, it is ignored.

If the *point id* exists, then the point with that point id is on the invert (bottom) of a pipe. If the point is not part of a pipe string, it is ignored.

for Pipe axial (opcode 81)

If no *point description* is given, the current measurement point is on the axis (centre) of a pipe. If the point is not part of a pipe string, it is ignored.

If the *feature code* and *string number* exist, the last point of the previous string with the same *feature code* and *string number* as given in *point description* is on the axis (centre) of a pipe. If the point is not part of a pipe string, it is ignored.

If the *point id* exists, then the point with that point id is on the axis (centre) of a pipe. If the point is not part of a pipe string, it is ignored.

for Pipe obvert (opcode 82)

If no *point description* is given, the current measurement point is on the obvert (top) of a pipe. If the point is not part of a pipe string, it is ignored.

If the *feature code* and *string number* exist, the last point of the previous string with the same *feature code* and *string number* as given in *point description* is on the obvert (top) of a pipe. If the point is not part of a pipe string, it is ignored.

If the *point id* exists, then the point with that point id is on the obvert (top) of a pipe. If the point is not part of a pipe string, it is ignored.

Code

the feature code of the measurement.

String number

the string number of the measurement.

Named point

point name of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section [Existing point search](#)

Point id

point id of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section [Existing point search](#). If a new check point entry is inserted into the file, this field will be non-editable since only the check point is required.

Time surveyed

time when the command (op code) was created

Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

Remove Height (opcode 30)

Set the height of a measurement to null.

The 'Remove Height' dialog box is a standard Windows-style window. It features a title bar with minimize, maximize, and close buttons. The main area is divided into sections. The 'Description' section contains four input fields: 'Code', 'String number', 'Named point', and 'Point Id'. Each field has a small icon to its right: a numeric keypad for 'Code' and 'Named point', and an alphanumeric keypad for 'String number' and 'Point Id'. Below the 'Description' section is the 'Time Surveyed' section, which includes a date and time field showing '01/ Jan /1970 00:00:00', a calendar icon, and a refresh icon. A 'Comment' section with a text area follows. At the bottom of the dialog are five buttons: 'Ok', 'Apply', 'Reset', 'Finish', and 'Help'.

If no *point description* is given, the height of the current measurement point is set to null.

If the *feature code* and *string number* exist, then the height of the last point of the previous string with that *feature code* and *string number* is set to null.

If the *point id* exists, then the height of the point with that point id is set to null.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Code

the feature code of the measurement.

String number

the string number of the measurement.

Named point

point name.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section [Existing point search](#)

Point id

point id.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section [Existing point search](#). If a new check point entry is inserted into the file, this field will be non-editable since only the check point is required.

Time surveyed

time when the command (op code) was created

Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

Resection Start (opcode 128)

This option is under development.

Resection

Readings

Instrument ht

Description

Code

String number

Setup point

Point Id

Attribute

Position

Easting

Northing

Height

Accuracy

Unknown

Time Surveyed

01/ Jan /1970 00:00:00

Comment

Ok

Apply

Reset

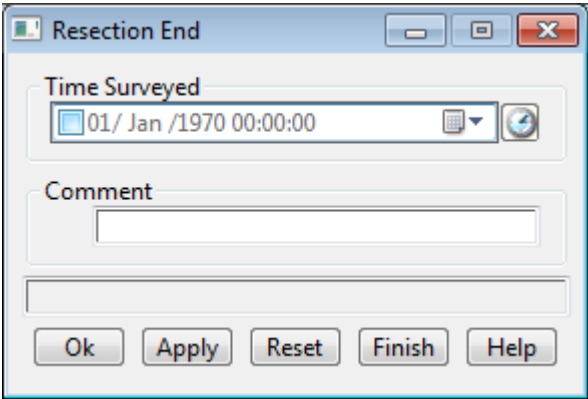
Finish

Help

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

Resection end (opcode 129)

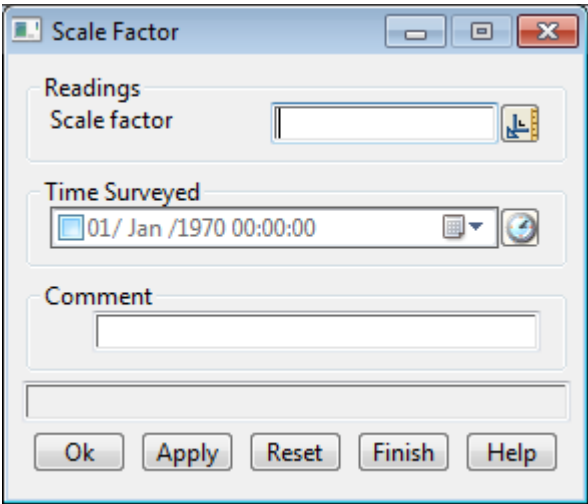
This option is under development.



OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

Scale Factor (opcode 9)

Specify the scale factor for subsequent measurements.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Scale factor

the scale factor to be applied to subsequent distance measurements. It is applied by multiplying raw distances by the scale factor to give the corrected distance.

Time surveyed

time when the command (op code) was created

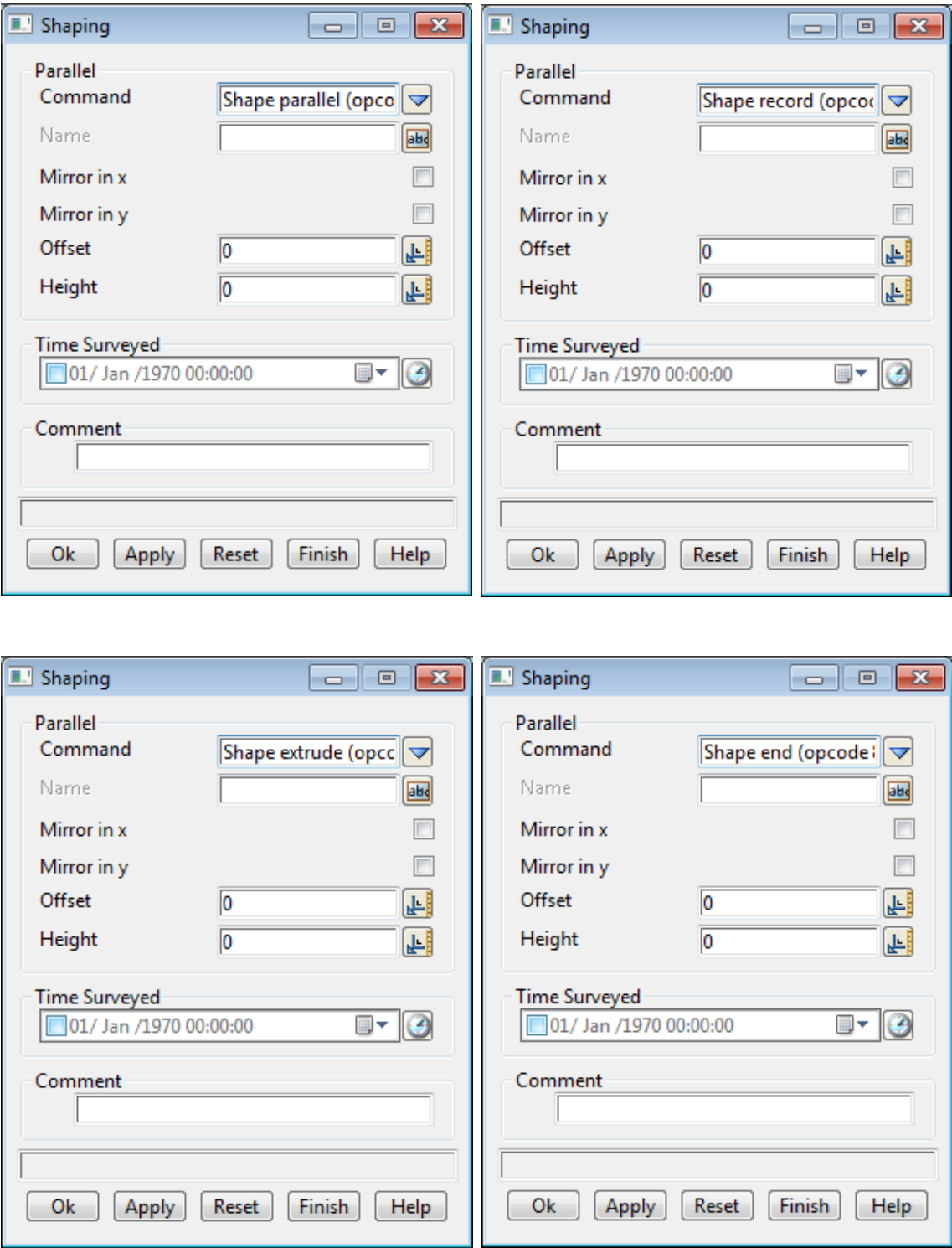
Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

Shaping (opcodes 83 to 86)

See [Shape field coding](#) in Appendix [12d Survey Guide](#).



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Command	choice box		Shape end (opcode 84) Shape record (opcode 83) Shape extrude (opcode 86) Shape parallel (opcode 85)

for Shape end

Stops using the current shape or stops recording a shape.

for Shape record

Start recording a shape with the shape name. If *Shape_name* is not blank, then the default field Shape is defined by the *feature_code* and *string_number* of the following measurements until a *shape end* co. There is no limit to the number of points in a shape.

for Shape extrude

extrude the current shape along the specified super string.

for Shape parallel

parallel the current shape along the specified super string. This creates a number of strings to represent each feature code of the shape record. In the case of shapes which contain curves, a number of strings will be created according to an arc/chord tolerance.

Name

the name of the shape.

Time surveyed

time when the command (op code) was created

Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

String Close (opcode 20)

Close a string.
See [Close String](#) in Appendix [12d Survey Guide](#).

The 'String Close' dialog box is shown with the following fields and controls:

- Description:**
 - Code:** Text input field with a numeric keypad icon.
 - String number:** Text input field with an alphanumeric keypad icon.
 - Named point:** Text input field with a numeric keypad icon.
 - Point Id:** Text input field with an alphanumeric keypad icon.
- Time Surveyed:** Date and time picker showing '01/ Jan /1970 00:00:00'.
- Comment:** Large text area for notes.
- Buttons:** Ok, Apply, Reset, Finish, Help.

If no *point description* is given, the current string is closed.

If the *feature code* and *string number* from the *point description* exist, the last previous string with that *feature code* and *string number* is closed.

If the *point id* from the *point description* exists, then the string containing that point id will be closed.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Code

the feature code of the measurement.

String number

the string number of the measurement.

Named point

point name.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section [Existing point search](#)

Point id

point id.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section [Existing point search](#). If a new check point entry is inserted into the file, this field will be non-editable since only the check point is required.

Time surveyed

time when the command (op code) was created

Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

String End (opcode 48)

Stop a string.

The 'String End' dialog box is shown with the following fields and controls:

- Description:**
 - Code:** Text input field with a numeric keypad icon.
 - String number:** Text input field with an alphanumeric keypad icon.
 - Named point:** Text input field with a numeric keypad icon.
 - Point Id:** Text input field with an alphanumeric keypad icon.
- Time Surveyed:** Date and time selection field showing '01/ Jan /1970 00:00:00' with a calendar icon and a refresh icon.
- Comment:** Large text area for entering a comment.
- Buttons:** 'Ok', 'Apply', 'Reset', 'Finish', and 'Help' at the bottom.

If no *Description* exists, the current string is terminated (including the current measurement point).

If *Code* (feature code) and *String number* exist, then the last point of the previous string with that feature code and string number becomes the last point of that string.

If *Point id* exists, then the previous string containing the point with that point id is terminated *after* the point id point

The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Code

the feature code of the measurement.

String number

the string number of the measurement.

Named point

point name.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section [Existing point](#)

[search](#)

Point id

point id of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section [Existing point search](#). If a new check point entry is inserted into the file, this field will be non-editable since only the check point is required.

Time surveyed

time when the command (op code) was created

Comment

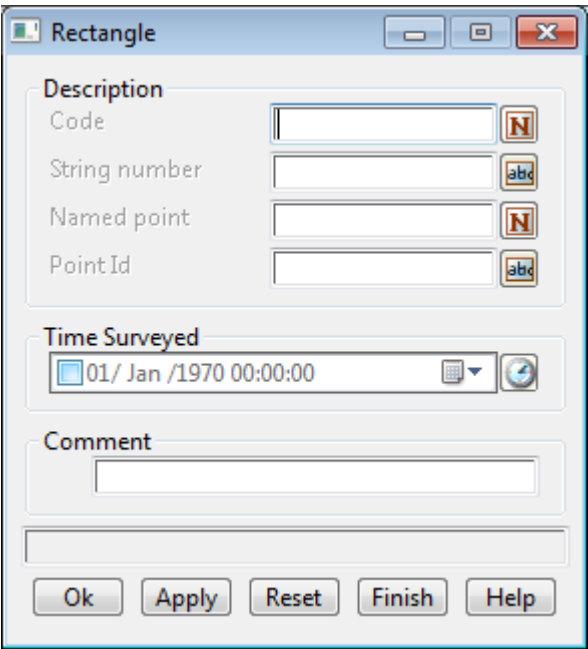
comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

Rectangle (opcode 45)

Create a parallelogram (squashed rectangle) from three points.

See [Rectangle](#) in Appendix [12d Survey Guide](#).



If no *Description* is given, the current measurement point and the two previous points from the current string are used and a fourth point is created to form a parallelogram (squashed rectangle) and the height of the fourth point is set to null. The string is then closed.

If the *feature code* and *string number* exist, the last three points with that *feature code* and *string number* are used and a fourth point is created to form a parallelogram (squashed rectangle) and the height of the fourth point is set to null. The string is then closed.

If the *point id* exists, then the *feature code* and *string number* of the point with that point id are used and processed as above. Note that the point with the point id is not necessarily used.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Code			
<i>the feature code of the measurement.</i>			
String number			
<i>the string number of the measurement.</i>			
Named point			
<i>point name of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section Existing point search</i>			
Point id			
<i>point id of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section Existing point search. If a new check point entry is inserted into the file, this field will be non-editable since only the check point is required.</i>			
Time surveyed			
<i>time when the command (op code) was created</i>			
Comment			
<i>comment for the command within the field file.</i>			
OK, Apply, Reset, Finish, Help	See the description for the panel buttons in the section Panel buttons		

Rectangle By 2 Points (opcode 37)

Create a rectangle from two points and a given offset.
See [Rectangle by 2 Points](#) in Appendix [12d Survey Guide](#).

Rectangle by 2 Points

Readings

Offset

Description

Code

String number

Named point

PointId

Time Surveyed

01/ Jan /1970 00:00:00

Comment

Ok

Apply

Reset

Finish

Help

The rectangle is defined by two points (reference side) and a offset.

If a positive offset value is given, two points will be created to the right of the reference side.

If a negative offset value is given, two points will be created to the left of the reference side.

If no *Description* is given, the two new points will be joined to the given points in a closed rectangular string, and will have the same feature code as the points given.

If the *feature code* and *string number* exist, then a search is made for the last occurrence of two points with the same *feature code* and *string number*. If found, then these points are used to define the reference side of the rectangle.

If the *point id* exists, then a search is made for the last occurrence of two points with the same *feature code* and *string number* as the point given by the point id. If found, then these points are used to define the reference side of the rectangle.

Two consecutive rectangles are unable to be defined side by side. In other words if the two points given are part of string of greater than two vertices, the command will only work for sets of two points that are exclusively defined. i.e. For a 5 point string, a rectangle can be defined by points 1 and 2, and 4 and 5.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Code

the feature code of the measurement.

String number

the string number of the measurement.

Named point

point name.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section [Existing point search](#)

Point id

point id.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section [Existing point search](#). If a new check point entry is inserted into the file, this field will be non-editable since only the check point is required.

Time surveyed

time when the command (op code) was created

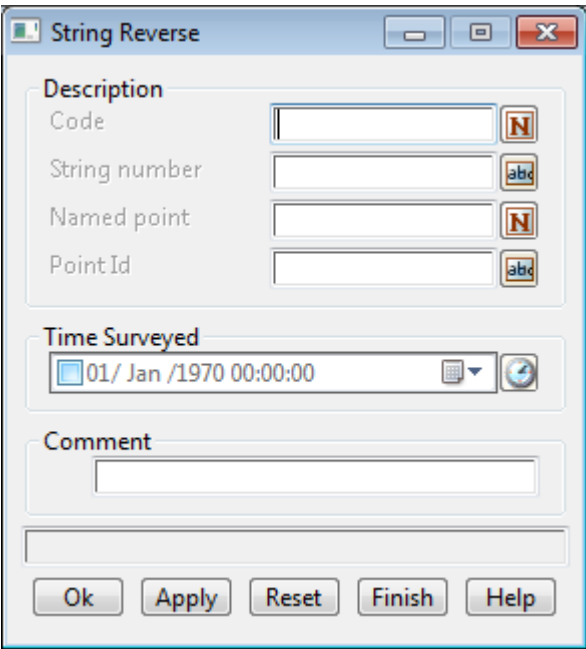
Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

String Reverse (opcode 19)

Reverse the direction of a string.



If no *point description* is given, the current string is reversed.

If the *feature code* and *string number* from the *point description* exist, the last previous string with that *feature code* and *string number* is reversed.

If the *point id* from the *point description* exists, then the string containing that point id will be reversed.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Code

the feature code of the measurement.

String number

the string number of the measurement.

Named point

point name.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section [Existing point search](#)

Point id

point id.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section [Existing point search](#). If a new check point entry is inserted into the file, this field will be non-editable since only the check point is required.

Time surveyed

time when the command (op code) was created

Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

String Start (opcode 47)

Start a new string.

See [Start New String](#) in Appendix [12d Survey Guide](#).

The image shows a 'String Start' dialog box with a title bar containing a minimize, maximize, and close button. The dialog is divided into several sections. The 'Description' section has four rows: 'Code' with a text input and a button with 'N', 'String number' with a text input and a button with 'abc', 'Named point' with a text input and a button with 'N', and 'Point Id' with a text input and a button with 'abc'. The 'Time Surveyed' section has a date-time input showing '01/ Jan /1970 00:00:00' with a calendar icon and a refresh icon. The 'Comment' section has a large text area. At the bottom, there are five buttons: 'Ok', 'Apply', 'Reset', 'Finish', and 'Help'.

If no *Description* is given, the current string is terminated (without including the current

measurement point) and the current measurement point becomes the first point of a new string with the same feature code and string number.

If the *feature code* and *string number* exist, then the last point of the previous string with that feature code and string number becomes the first point of a new string with the same *feature code* and *string number*.

If the *point id* exists, then the previous string containing the point with that point id is terminated *before* the point id point, and the point becomes the first point of a new string with the *same feature code* and *string number*.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Code

the feature code of the measurement.

String number

the string number of the measurement.

Named point

point name.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section [Existing point search](#)

Point id

point id.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section [Existing point search](#). If a new check point entry is inserted into the file, this field will be non-editable since only the check point is required.

Time surveyed

time when the command (op code) was created

Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

Breakline String (String tinable (opcode 46))

Make a string a breakline (*i.e.* all vertices and segments are tinable) or not a breakline.

Breakline String

Readings

Breakline mode

not a breakline

Description

Code

N

String number

abc

Named point

N

PointId

abc

Time Surveyed

☐ 01/ Jan /1970 00:00:00

Comment

Ok

Apply

Reset

Finish

Help

The *point description* is used to select a string and the *mode* is used specify if the string is a breakline or not.

If no *point description* is given, the current string is selected.

If the *feature code* and *string number* exist, the last string with that *feature code* and *string number* is selected.

If the *point id* exists, then the string containing the point with that point id is selected.

If no *mode* is given, the selected string is set as a point string (that is, not a breakline).

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Breakline mode			not a breakline breakline

for Not a breakline

the selected string is set to a point string and hence is not a breakline (however the points are tinable).

for Breakline

the selected string is set to a line string (all vertices and segments are tinable) and is therefore a breakline.

Code

the feature code of the measurement.

String number

the string number of the measurement.

Named point

point name of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section [Existing point search](#)

Point id

point id of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section [Existing point search](#). If a new check point entry is inserted into the file, this field will be non-editable since only the check point is required.

Time surveyed

time when the command (op code) was created

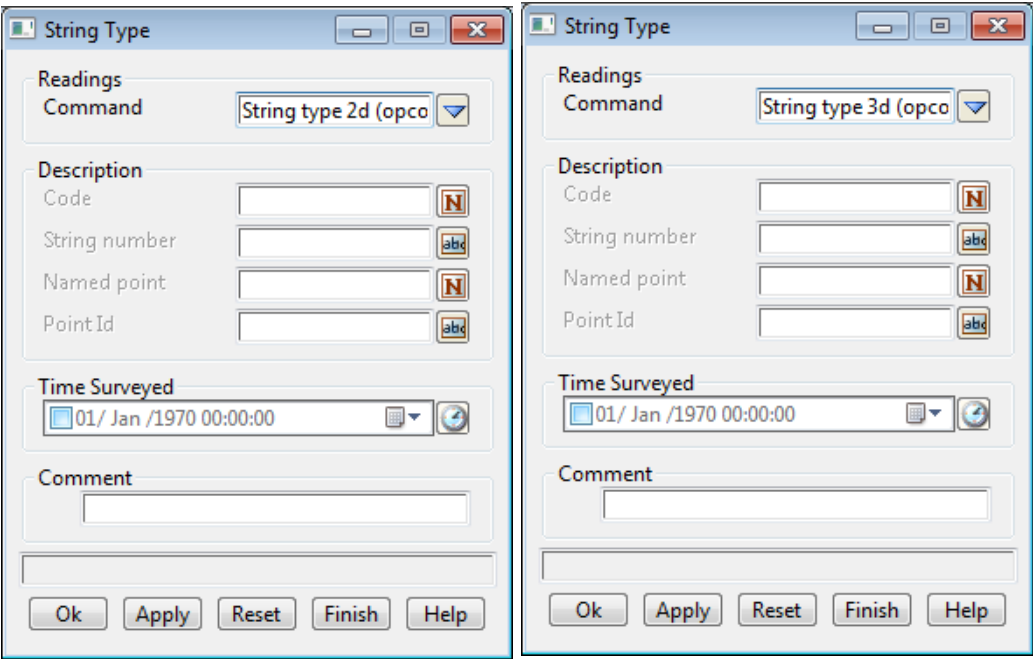
Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

String Type (opcodes 92, 93, 94)

Specify the string to be a 2d, 3d or 4d string.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Command	choice box	String type 2d	String type 2d (opcode 92) String type 3d (opcode 93) String type 4d (opcode 94)

- if 2d - the string has one height for the entire string*
- if 3d - the string can have different heights at each vertex*
- if 4d - the string can have different heights and text at each vertex*

Code

the feature code of the measurement.

String number

the string number of the measurement.

Named point

point name.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section [Existing point search](#)

Point id

point id.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section [Existing point search](#). If a new check point entry is inserted into the file, this field will be non-editable since only the check point is required.

Time surveyed

time when the command (op code) was created

Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#).

Culvert (opcode 96)

Specify the string to be a culvert and give the culvert width and height.

Culvert

Readings

Width

Height

Description

Code

String number

Named point

PointId

Time Surveyed

01/ Jan /1970 00:00:00

Comment

Ok

Apply

Reset

Finish

Help

Culvert strings are always line strings and are stored with the justification of the majority of the string points. Individual culvert points are picked up either top (obvert), centre (axial) or bottom (invert) of the culvert using op codes 80, 81 and 82.

If no *point_description* is given, the current string is created as a culvert string with the given width and height.

If a *point_description* exists, then either the *feature code* and *string number* or the *point id* section of the *point_description* can be used.

If the *feature code* and *string number* exist, the last string with the same *feature code* and *string number* is created as a culvert with the given width and height.

If the *point id* exists, then the string containing that point id is created as a culvert string with the given width and height.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Width			
<i>the width of the culvert</i>			
Height			
<i>the height of the culvert</i>			
Code			
<i>the feature code of the measurement</i>			

String number

the string number of the measurement

Named point

point name.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section [Existing point search](#)

Point id

point id.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section [Existing point search](#). If a new check point entry is inserted into the file, this field will be non-editable since only the check point is required.

Time surveyed

time when the command (op code) was created

Comment

comment for the command within the field file

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#).

Pipe Diameter (opcode 95)

Specify the string to be a pipe and give the pipe diameter.

Pipe Diameter

Readings

Diameter

Description

Code

N

String number

abc

Named point

N

PointId

abc

Time Surveyed

01/ Jan /1970 00:00:00

Comment

Ok

Apply

Reset

Finish

Help

Pipe strings are always line strings and are stored with the justification of the majority of the string points. Individual pipe points are picked up either top (obvert), centre (axial) or bottom (invert) of the pipe using op codes 80, 81 and 82.

If no *point_description* is given, the current string is created as a pipe string with the given diameter.

If a *point_description* exists, then either the *feature code* and *string number* or the *point id* section of the *point_description* can be used.

If the *feature code* and *string number* exist, the last string with the same *feature code* and *string number* is created as a pipe with the given diameter.

If the *point id* exists, then the string containing that point id is created as a pipe string with the given diameter.

The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Diameter

the diameter of the pipe.

Code

the feature code of the measurement.

String number

the string number of the measurement.

Named point

point name.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section [Existing point search](#)

Point id

point id.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section [Existing point search](#). If a new check point entry is inserted into the file, this field will be non-editable since only the check point is required.

Time surveyed

time when the command (op code) was created

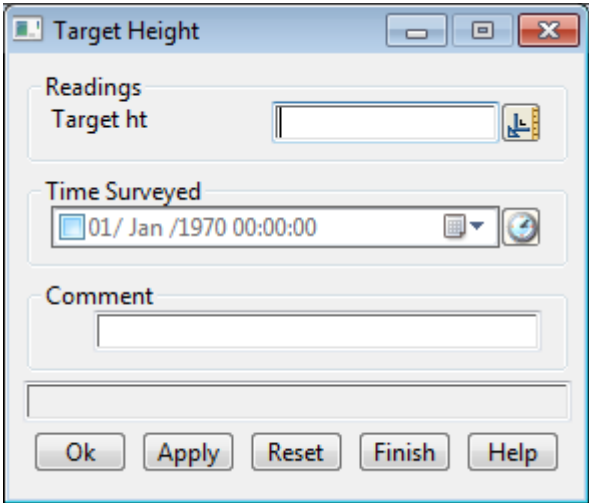
Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

Target Height (opcode 5)

Define the target height to be used for following measurements.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Target height

target height of following measurements.

Time surveyed

time when the command (op code) was created

Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel](#)

[buttons](#)

Templating (opcodes 51 to 59)

Record and use field templates when picking up string.

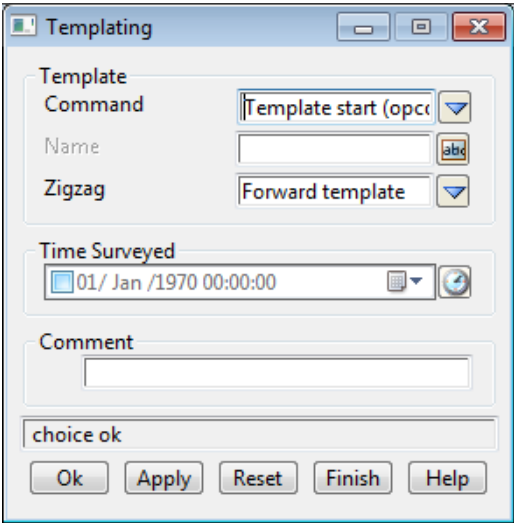
See [Field Templates](#) in Appendix [12d Survey Guide](#).

For <i>Template start</i> (opcode 51),go to	Template start
<i>Template end</i> (opcode 52)	Template end
<i>Template pause</i> (opcode 53)	Template pause
<i>Template continue</i> (opcode 54)	Template continue
<i>Template record</i> (opcode 55)	Template record
<i>Template skip</i> (opcode 56)	Template skip
Template insert (opcode 58)	Template insert
Template delete (opcode 57)	Template delete
<i>Template change</i> (opcode 59)	Template change

Template start

Selecting *Template start* (opcode 51) brings up the **Templating** panel with the *Command* field set to **Template start**

Template start starts using the field template given in the field **Name**.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Command		Template start	Template start (opcode 51) Template end (opcode 52) Template pause (opcode 53) Template continue (opcode 54) Template record (opcode 55)
Name	Text box		
Name of the field template to use. If <i>Name</i> is blank, the default field template is used.			
Zigzag	choice box	Forward template	Forward template

Reverse template
Start on zig of zigzag
Start of zag of zigzag

If zigzag is **forward template**, then the field template is used as a *forward* template. See [Forward Direction](#) in Appendix [12d Survey Guide](#)

reverse template, then the field template is used as a *reverse* template. See [Reverse Direction](#) in Appendix [12d Survey Guide](#)

start on zig, then the field template is used as a zig_zag template and is used in the *forward* definition direction first (that is starts on a zig). See [Zig-Zag](#) in Appendix [12d Survey Guide](#).

start on zag, then the template is used as a zig_zag template and is used in the *reverse* direction first (that is, starts on a zag). See [Zig-Zag](#) in Appendix [12d Survey Guide](#).

If zigzag is **blank**, or anything other than **forward**, **reverse**, or **start on zag** then the field template is used as a zig-zag template starting on a **zig**.

Time surveyed

time when the command (op code) was created

Comment

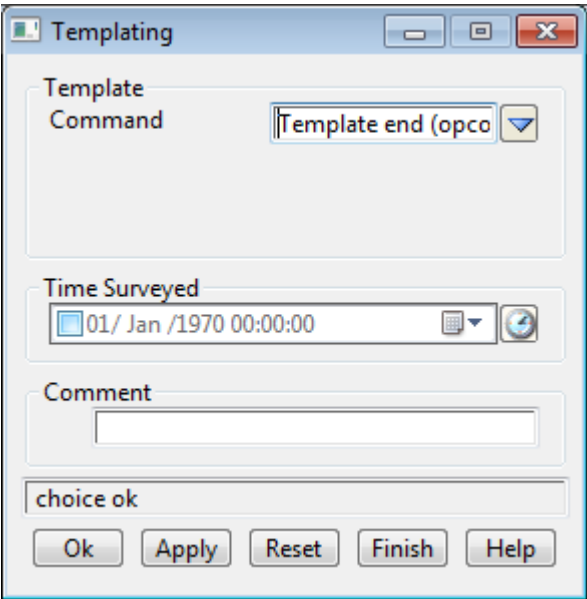
comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

Template end

Selecting *Template end* (opcode 52) brings up the **Templating** panel with the *Command* field set to **Template end**

Template end stops using the current field template, or stops recording a field template.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Command		Template end	Template start (opcode 51) Template end (opcode 52) Template pause (opcode 53)

Template continue (opcode 54)
Template record (opcode 55)

Time surveyed

time when the command (op code) was created

Comment

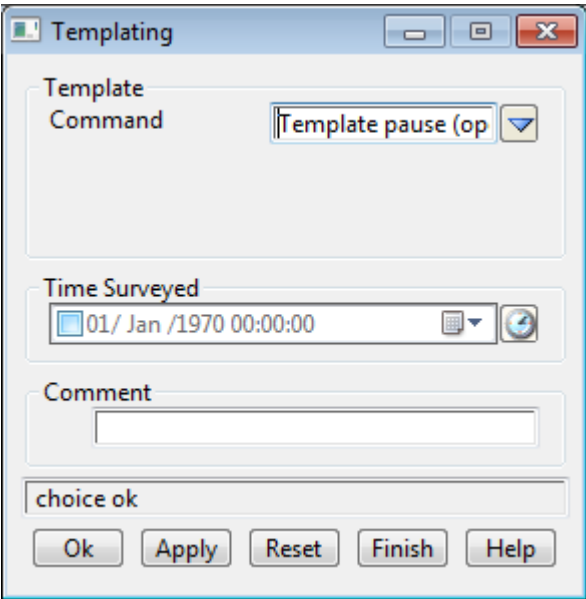
comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

Template pause

Selecting *Template pause* (opcode 53) brings up the **Templating** panel with the *Command* field set to **Template pause**

Pause using the current field template or defining a field template, until a *continue field template* (54) or a *finish field template* (52) code is given.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Command		Template pause	Template start (opcode 51) Template end (opcode 52) Template pause (opcode 53) Template continue (opcode 54) Template record (opcode 55)

Time surveyed

time when the command (op code) was created

Comment

comment for the command within the field file.

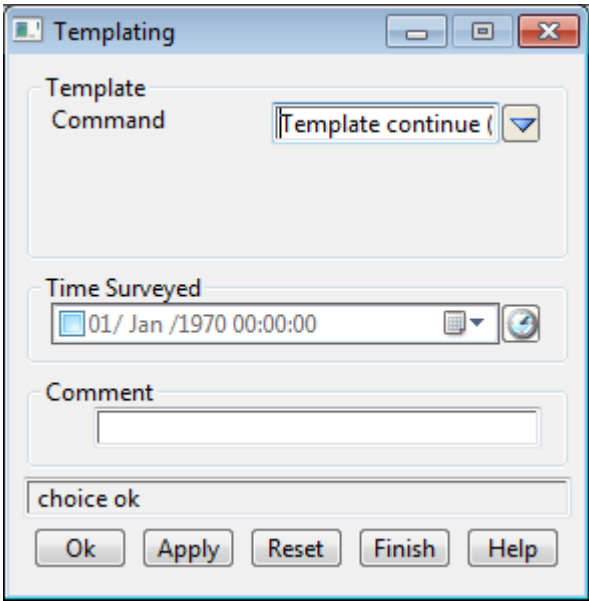
OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel](#)

buttons

Template continue

Selecting *Template continue* (opcode 54) brings up the **Templating** panel with the *Command* field set to **Template continue**

Continue using or defining the current field template, which has been stopped by a *Template pause* (opcode 53). The *Continue* command only needs to be given once and applies to all following measurements until another *Pause* or *Finish* command is given.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Command		Template continue	Template start (opcode 51) Template end (opcode 52) Template pause (opcode 53) Template continue (opcode 54) Template record (opcode 55)

Time surveyed

time when the command (op code) was created

Comment

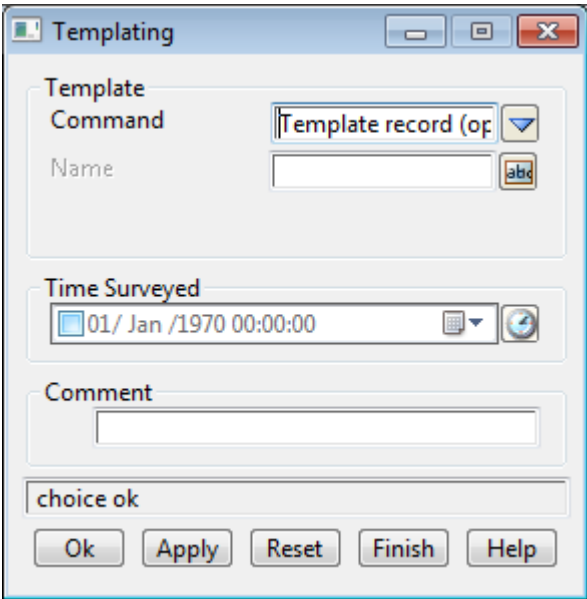
comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

Template record

Selecting *Template record* (opcode 55) brings up the **Templating** panel with the *Command* field set to **Template record**

Template record stores the *feature code* and *string number* of the following measurements as a field template until a *Finish* code (52) is given.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Command		Template record	Template start (opcode 51) Template end (opcode 52) Template pause (opcode 53) Template continue (opcode 54) Template record (opcode 55)

Name

name of the template being created

Start recording a field template with the name Name. If Name is blank, then it is the default field template that is defined.

The feature code and string number of the following measurements are stored as the field template until a Finish code (52) is given. There is no limit to the number of feature code and string number pairs that can be stored in a field template.

Time surveyed

time when the command (op code) was created

Comment

comment for the command within the field file.

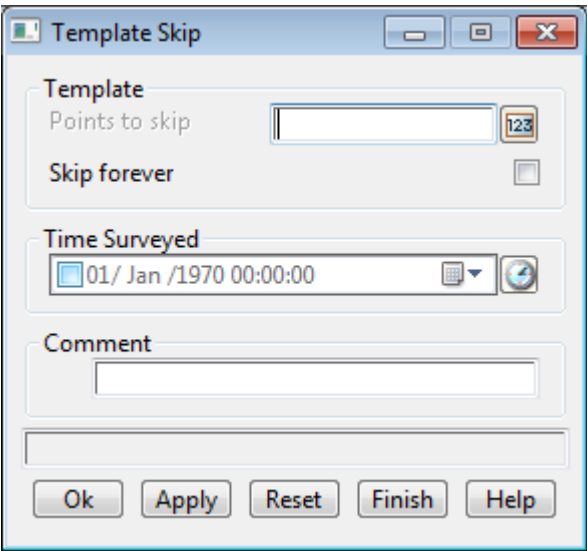
OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

Template skip

Selecting *Template skip* (opcode 56) brings up the **Template Skip** panel.

This panel allows the user to skip picking up one or more points (feature code and string number pairs) from the field template currently being used. The next measurement takes the *feature code* and *string number* from the next point after the skipped points, from the field template definition.

See [Skipping Field Template Points](#) in Appendix [12d Survey Guide](#)



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Points to skip

*the number of points (feature code and string number pairs) of the template to skip.
If Points to skip is blank or zero, then only one point is skipped otherwise Points to skip points are skipped.*

Skip forever	tick box
---------------------	----------

*if ticked, the given number of feature code and string number pairs are not used from then on.
If not ticked, only skip for this one used of the template.*

Time surveyed

time when the command (op code) was created

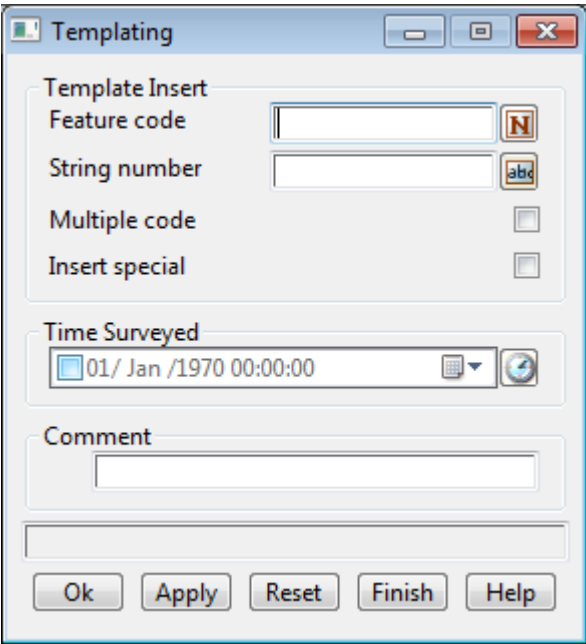
Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

Template insert

Selecting *Template insert (opcode 58)* brings up the **Templating** panel.
This option allows the user to insert new point definitions into the template.
These may be **new points** or to **add a multiple code** to an **existing point** in the template.
See [Insert Template Points or Insert Multiple Codes](#) in Appendix [12d Survey Guide](#)



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Feature code

feature code to be inserted (as a new point or a multiple code) with the string number, into the template

String number

string number to be inserted (as a new point or a multiple code) with the feature code, into the template

Multiple code	tick box
----------------------	----------

If ticked off (the default), a new point is inserted into the template with the Feature code and String number given in the panel.

If ticked on, no new point is inserted but the current template point will be made a multiple coded point with the Feature code and String number given in the panel. The multiple coding will be used each time the template point is used.

Insert special	tick box
-----------------------	----------

If ticked on, the point will be added to the current template being picked up (that is, to the end of the template).

If not ticked, the point will be added to the next template being picked up (that is, to the beginning of the template).

Time surveyed

time when the command (op code) was created

Comment

comment for the command within the field file.

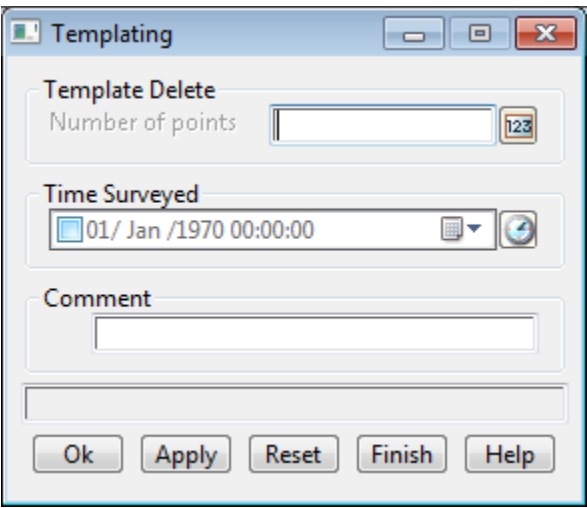
OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

Template delete

Selecting *Template delete* (opcode 57) brings up the **Templating** panel.

Allows the user to delete one or more points on the template. Picking up will use the updated template definition.

See [Delete Template Points](#) in Appendix [12d Survey Guide](#)



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Number of points

number of points to delete from the template. Any further use of the template will used the updated template definition.

Time surveyed

time when the command (op code) was created

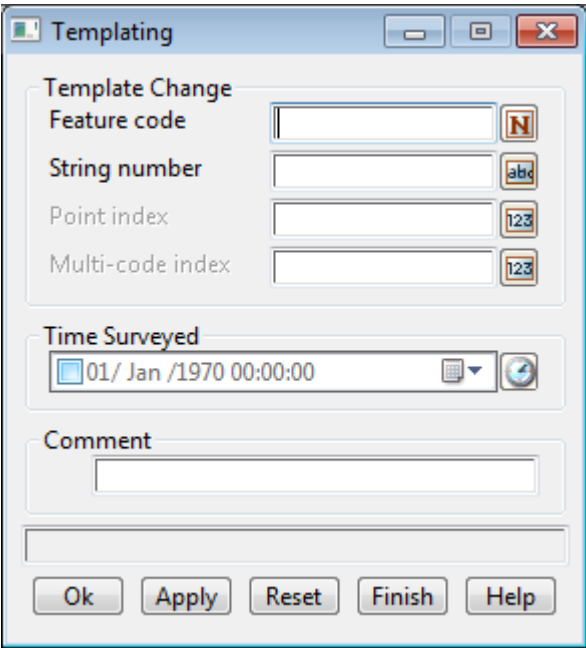
Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

Template change

Selecting *Template change* (opcode 59) brings up the **Templating** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Time surveyed

time when the command (op code) was created

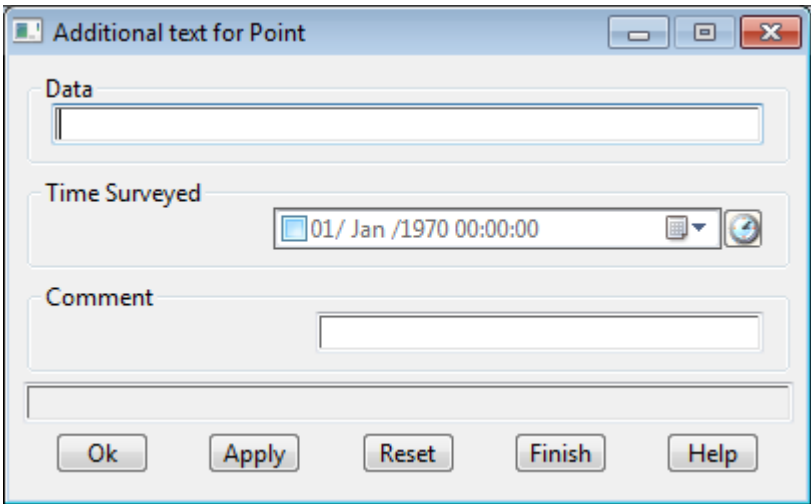
Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

Additional Text For Point (opcode 41)

Add extra text to any existing text for the current measurement.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data

The given text in Data is added to the end of any existing text for the current measurement point.

Time surveyed

time when the command (op code) was created

Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

Vertical Circle Correction (opcode 15)

The given value (in decimal degrees) is **subtracted** from the vertical circle value in subsequent measurements.

Vertical Circle

Readings

Vertical circle

Time Surveyed

01/ Jan /1970 00:00:00

Comment

Ok

Apply

Reset

Finish

Help

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Vertical circle

*the vertical circle (in decimal degrees) is **subtracted** from the vertical circle value in any measurements*

Time surveyed

time when the command (op code) was created

Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section [Panel buttons](#)

Order

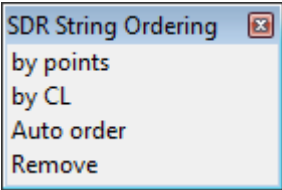
Position of menu: Survey =>Edit =>Order

This option is still under development.

The `order` option re-orders points in a string.

The Order walk-right menu is

.



For information on *by points* please go to
by CL
Auto order
Remove

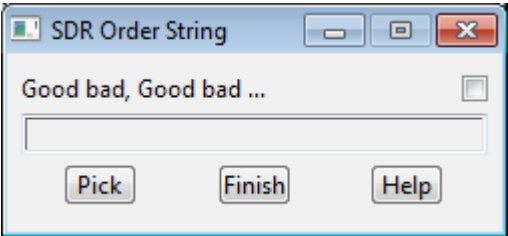
[By Points](#)
[By CL](#)
[Auto Order](#)
[Remove Order](#)

By Points

Position of option on menu: Survey =>Edit =>Order =>by points

This option is still under development.

.

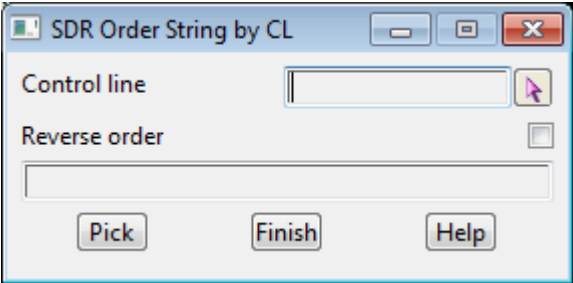


By CL

Position of option on menu: Survey =>Edit =>Order =>by CL

This option is still under development.

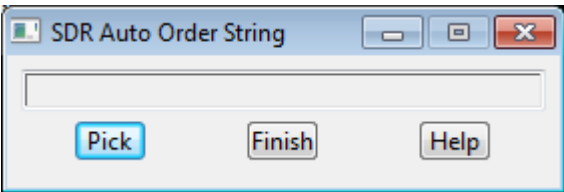
.



Auto Order

Position of option on menu: Survey =>Edit =>Order =>Auto order

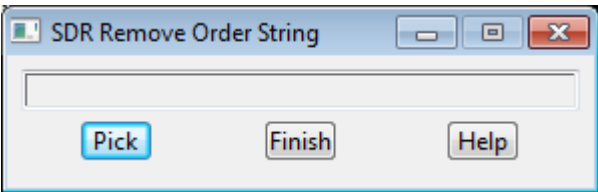
This option is still under development.



Remove Order

Position of option on menu: Survey =>Edit =>Order =>Remove

This option is still under development.



SDR Point Edits

Position of menu: Survey =>Edit =>Points

The Points walk-right menu contains options that work on individual points (vertices).

Note - a point may be individual point (one vertex strings) or a vertex of a string.

The Points walk-right menu is:

SDR Point Edits	
Additional text	add text to the vertex
Attachment	attach an image to the vertex
Arc next 3 points	put an arc through the next 3 points
Arc previous 3 points	put an arc through the preceding 3 points
Arc fitting start	start arc fitting
Arc fitting end	end arc fitting
Circle feature	make the vertex a feature
Invisible	make the vertex invisible
Invisible previous seg	make the last segment invisible
Invisible next seg	make the next segment invisible
Non tinable	make the vertex non tinable
Non tinable previous seg	make the last segment non tinable
Non tinable next seg	make the next segment non tinable
Pipe invert	the z-value is the invert of a pipe
Pipe axial	the z-value is the centre of a pipe
Pipe obvert	the z-value is the overt of a pipe
Rectangle last 3 points	make a rectangle of the last 3 points
Rectangle last 2 points	make a rectangle of the last two points
Remove point	delete a point
Remove height	

For the option *Additional text*, go to

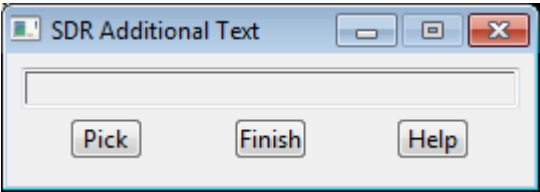
<i>Attachment</i>	Additional Text
<i>Arc next 3 points</i>	Attach a File
<i>Arc last 3 points</i>	Arc Through Next Three Points
<i>Arc fitting start</i>	Arc Through Last Three Points
<i>Arc fitting end</i>	Start Arc Fitting
<i>Circle feature</i>	End Arc Fitting
<i>Invisible</i>	Create a Feature String
<i>Invisible last seg</i>	Make a Vertex Invisible
<i>Invisible next seg</i>	Make the Previous Segment Invisible
<i>Non tinable</i>	Make the Next Segment Invisible
<i>Non tinable last seg</i>	Make a Vertex Non Tinable
<i>Non tinable next seg</i>	Make the Previous Segment Non Tinable
<i>Pipe invert</i>	Make the Next Segment Non Tinable
<i>Pipe axial</i>	Make a Vertex an Invert Level of a Pipe
<i>Pipe obvert</i>	Make a Vertex an Axial Level of a Pipe
<i>Rectangle last 3 points</i>	Make a Vertex an Obvert Level of a Pipe
<i>Rectangle last 2 points</i>	Make a Parallelogram from the Last Three Points
<i>Remove point</i>	Make a Rectangle from the Last Two Points
<i>Remove height</i>	Delete a Vertex
	Set a Vertex Height to Null

Additional Text

Position of option on menu: Survey =>Edit =>Points =>Additional text

Additional text adds text to selected vertices. The user selects the vertex to add text to, and then types in the text.

Selecting *Additional text* brings up the **SDR Additional Text** panel:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick	button		

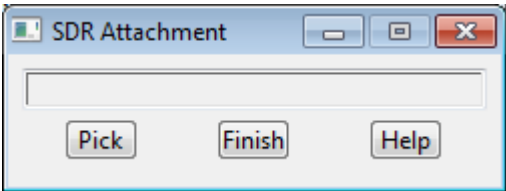
- As soon as the option is selected, the **Pick** is active and vertices can be selected.*
- Each time a vertex is picked and accepted, an **Additional text** typed input panel is displayed to type the text into. A **Text** code is then inserted into the 12d field file.*
- The option continues until the **Finish** button is selected.*
- If the **pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the **Pick Ops** menu, the **Pick** button can be used to restart the option.*

Attach a File

Position of option on menu: Survey =>Edit =>Points =>Attachment

Attachment adds files to selected vertices. The user selects the vertex to add an attachment to, and then enters the name of the file to attach.

Selecting **Attachment** brings up the **SDR Attachment** panel:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick	button		

*As soon as the option is selected, the **Pick** is active and vertices can be selected.*

*Each time a vertex is picked and accepted, an **Attachment file name** typed input panel is displayed to enter the file name into. An **Attachment** field code is then inserted into the 12d field file.*

*The option continues until the **Finish** button is selected.*

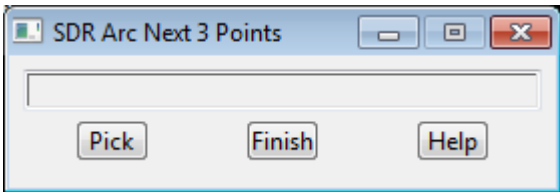
*If the **pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the **Pick Ops** menu, the **Pick** button can be used to restart the option.*

Arc Through Next Three Points

Position of option on menu: Survey =>Edit =>Points =>Arc next 3 points

Arc next 3 points adds an arc through the selected vertex and the next two vertices of the same string.

Selecting **Arc next 3 points** brings up the **SDR Arc Next 3 Points** panel:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick	button		

*As soon as the option is selected, the **Pick** is active and vertices can be selected.*

*Each time a vertex is picked and accepted, an arc is placed through the selected vertex and the next two vertices of the same string by inserting an **Arc through next 3 points** field code.*

*The option then repeats and continues until the **Finish** button is selected.*

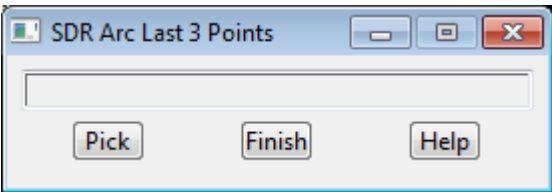
*If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the **Pick Ops** menu, the **Pick** button can be used to restart the option.*

Arc Through Last Three Points

Position of option on menu: Survey =>Edit =>Points =>Arc last 3 points

Arc last 3 points adds an arc through the selected vertex and the previous two vertices of the same string.

Selecting Arc last 3 points brings up the SDR Arc Last 3 Points panel:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Pick	button		
-------------	--------	--	--

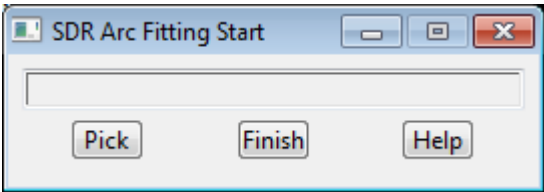
- As soon as the option is selected, the **Pick** is active and vertices can be selected.
- Each time a vertex is picked and accepted, an arc is placed through the selected vertex and the previous two vertices of the same string by inserting an **Arc through last 3 points** field code.
- The option then repeats and continues until the **Finish** button is selected.
- If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the **Pick Ops** menu, the **Pick** button can be used to restart the option.

Start Arc Fitting

Position of option on menu: Survey =>Edit =>Points =>Arc fitting start

Arc fitting start starts arc fitting through from the selected vertex until the end of the string or an stop arc fitting field code is encountered for that string.

Selecting Arc fitting start brings up the SDR Arc Fitting Start panel:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Pick	button		
-------------	--------	--	--

- As soon as the option is selected, the **Pick** is active and vertices can be selected.
- Each time a vertex is picked and accepted, arc fitting is started at the selected vertex by inserting an **Arc fitting start** field code.

The option then repeats and continues until the **Finish** button is selected.

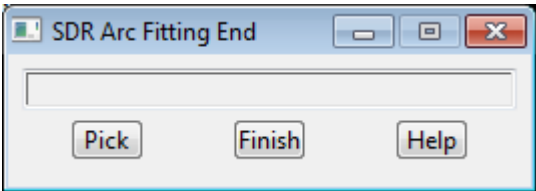
If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the **Pick Ops** menu, the **Pick** button can be used to restart the option.

End Arc Fitting

Position of option on menu: Survey =>Edit =>Points =>Arc fitting end

Arc fitting end ends any arc fitting for that string at the selected vertex.

Selecting Arc fitting end brings up the **SDR Arc Fitting End** panel:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick	button		

As soon as the option is selected, the **Pick** is active and vertices can be selected.

Each time a vertex is picked and accepted, any arc fitting for the string is stopped at the selected vertex by inserting an **Arc fitting end** field code.

The option then repeats and continues until the **Finish** button is selected.

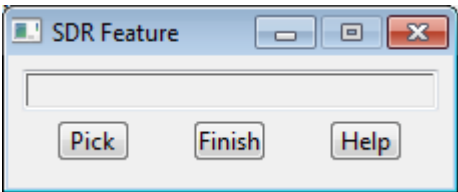
If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the **Pick Ops** menu, the **Pick** button can be used to restart the option.

Create a Feature String

Position of option on menu: Survey =>Edit =>Points =>Circle feature

Circle feature creates a feature string of a given radius at the selected vertex.

Selecting Circle feature brings up the **SDR Feature** panel:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick	button		

As soon as the option is selected, the **Pick** is active and vertices can be selected.

Each time a vertex is picked and accepted, an **Feature radius** typed input panel is displayed to type the

radius into. A **Feature** code is then inserted into the 12d field file.

The option then repeats and continues until the **Finish** button is selected.

If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the **Pick Ops** menu, the **Pick** button can be used to restart the option.

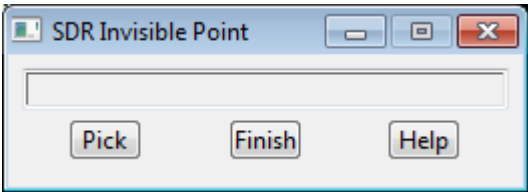
Make a Vertex Invisible

Position of option on menu: Survey =>Edit =>Points =>Invisible

Invisible turns the selected vertex invisible.

Even if the segments on either side of the invisible vertex **are** tagged as visible, the segments can not be drawn because the start/end point of the segment is invisible.

Selecting **Invisible** brings up the **SDR Invisible Point** panel:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick	button		

As soon as the option is selected, the **Pick** is active and vertices can be selected.

Each time a vertex is picked and accepted, the vertex is turned invisible by inserting an **Invisible Point** code into the 12d field file.

The option then repeats and continues until the **Finish** button is selected.

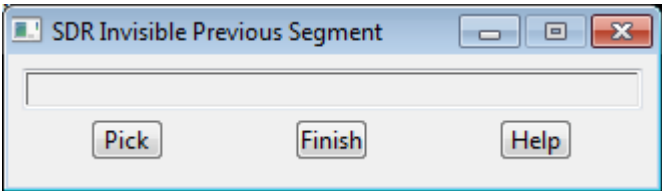
If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the **Pick Ops** menu, the **Pick** button can be used to restart the option.

Make the Previous Segment Invisible

Position of option on menu: Survey =>Edit =>Points =>Invisible previous segment

Invisible previous segment turns the segment ending on the selected vertex invisible. The vertex itself is not invisible.

Selecting **Invisible previous segment** brings up the **SDR Invisible Previous Segment** panel:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Pick button

*As soon as the option is selected, the **Pick** is active and vertices can be selected.*

*Each time a vertex is picked and accepted, the segment ending on the vertex is turned invisible by inserting an **Invisible Previous Segment** code into the 12d field file.*

*The option then repeats and continues until the **Finish** button is selected.*

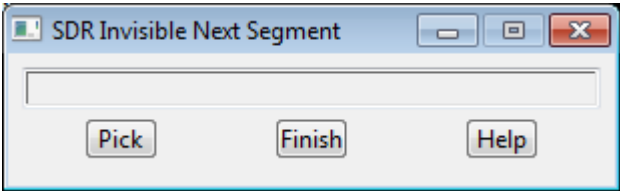
*If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the **Pick Ops** menu, the **Pick** button can be used to restart the option.*

Make the Next Segment Invisible

Position of option on menu: Survey =>Edit =>Points =>Invisible next segment

Invisible next segment turns the segment starting on the selected vertex invisible. The vertex itself is not invisible.

Selecting **Invisible next segment** brings up the **SDR Invisible Next Segment** panel:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick	button		

*As soon as the option is selected, the **Pick** is active and vertices can be selected.*

*Each time a vertex is picked and accepted, the segment starting on the vertex is turned invisible by inserting an **Invisible Next Segment** code into the 12d field file.*

*The option then repeats and continues until the **Finish** button is selected.*

*If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the **Pick Ops** menu, the **Pick** button can be used to restart the option.*

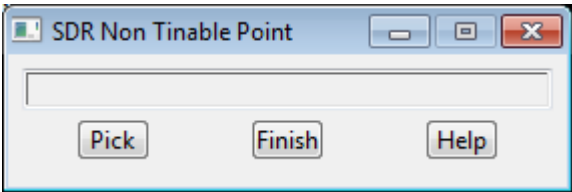
Make a Vertex Non Tenable

Position of option on menu: Survey =>Edit =>Points =>Non tenable

Non tenable sets the selected vertex to be non tenable (that is, the vertex is not included in any triangulation).

Even if the segments on either side of the non tenable vertex **are** tenable, the segments can not be included in any triangulation because the start/end point of the segment is non tenable.

Selecting **Non tenable** brings up the **SDR Non Tenable Point** panel:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick	button		

*As soon as the option is selected, the **Pick** is active and vertices can be selected.*

*Each time a vertex is picked and accepted, the vertex is set to non tinable (that is, the vertex is not included in any triangulations) by inserting a **Non tinable point** code into the 12d field file.*

*The option then repeats and continues until the **Finish** button is selected.*

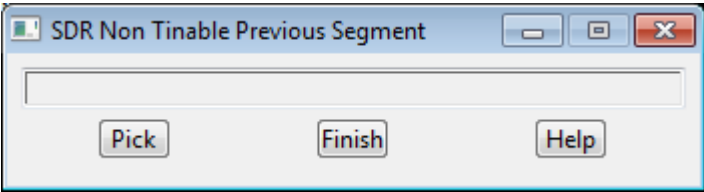
*If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the **Pick Ops** menu, the **Pick** button can be used to restart the option.*

Make the Previous Segment Non Tinable

Position of option on menu: Survey =>Edit =>Points =>Non tinable previous segment

Non tinable previous segment sets the segment ending on the selected vertex non tinable. That is, the segment is not included as a breakline in any tins (triangulations) The vertex itself can be tinable.

Selecting **Non tinable previous segment** brings up the **SDR Non Tinable Previous Segment** panel:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick	button		

*As soon as the option is selected, the **Pick** is active and vertices can be selected.*

*Each time a vertex is picked and accepted, the segment ending on the vertex is set to non tinable by inserting a **Non tinable previous segment** code into the 12d field file.*

*The option then repeats and continues until the **Finish** button is selected.*

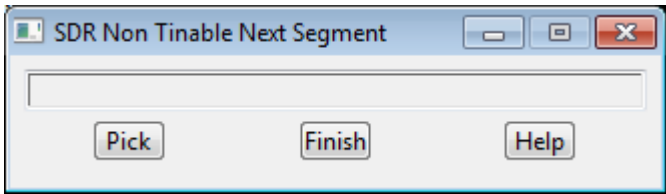
*If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the **Pick Ops** menu, the **Pick** button can be used to restart the option.*

Make the Next Segment Non Tinable

Position of option on menu: Survey =>Edit =>Points =>Non tinable next segment

Non tinable next segment sets the segment starting on the selected vertex non tinable. That is, the segment is not included as a breakline in any tins (triangulations) The vertex itself can be tinable.

Selecting **Non tinable next segment** brings up the **SDR Non Tinable Next Segment** panel:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick	button		

*As soon as the option is selected, the **Pick** is active and vertices can be selected.*

*Each time a vertex is picked and accepted, the segment starting on the vertex is set to non tinable by inserting an **Non tinable next segment** code into the 12d field file.*

*The option then repeats and continues until the **Finish** button is selected.*

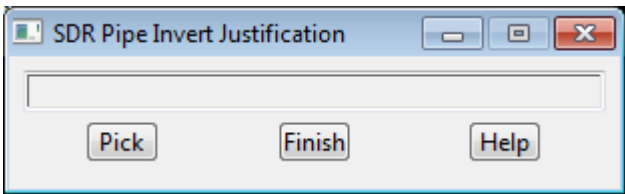
*If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the **Pick Ops** menu, the **Pick** button can be used to restart the option.*

Make a Vertex an Invert Level of a Pipe

Position of option on menu: Survey =>Edit =>Points =>Pipe invert

Pipe invert sets the z-value of the selected vertex to be used as an invert level (pipe top) when the vertex is in a pipe string.

Selecting **Pipe invert** brings up the **SDR Pipe Invert Justification** panel:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick	button		

*As soon as the option is selected, the **Pick** is active and vertices can be selected.*

*Each time a vertex is picked and accepted, the vertex is set to be an invert level (top of the pipe) for any pipe string it is in by inserting a **Pipe invert** code into the 12d field file.*

*The option then repeats and continues until the **Finish** button is selected.*

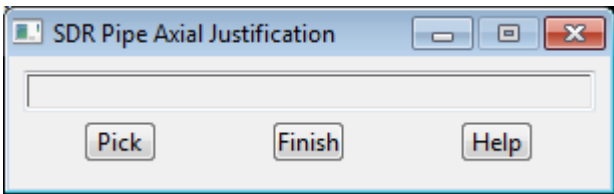
*If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the **Pick Ops** menu, the **Pick** button can be used to restart the option.*

Make a Vertex an Axial Level of a Pipe

Position of option on menu: Survey =>Edit =>Points =>Pipe axial

Pipe axial sets the z-value of the selected vertex to be used as an axial level (pipe centre) when the vertex is in a pipe string.

Selecting Pipe axial brings up the **SDR Pipe Axial Justification** panel:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick	button		

*As soon as the option is selected, the **Pick** is active and vertices can be selected.*

*Each time a vertex is picked and accepted, the vertex is set to be an axial level (centre of the pipe) for any pipe string it is in by inserting a **Pipe axial** code into the 12d field file.*

*The option then repeats and continues until the **Finish** button is selected.*

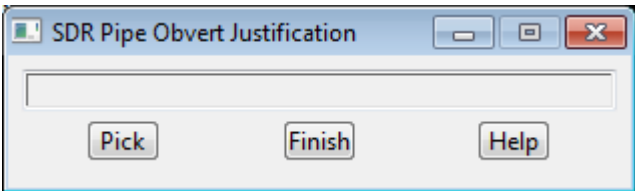
*If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the **Pick Ops** menu, the **Pick** button can be used to restart the option.*

Make a Vertex an Obvert Level of a Pipe

Position of option on menu: Survey =>Edit =>Points =>Pipe obvert

Pipe obvert sets the z-value of the selected vertex to be used as an obvert level (bottom of pipe) when the vertex is in a pipe string.

Selecting Pipe obvert brings up the **SDR Pipe Obvert Justification** panel:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick	button		

*As soon as the option is selected, the **Pick** is active and vertices can be selected.*

*Each time a vertex is picked and accepted, the vertex is set to be an obvert level (bottom of the pipe) for any pipe string it is in by inserting a **Pipe obvert** code into the 12d field file.*

*The option then repeats and continues until the **Finish** button is selected.*

*If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the **Pick Ops** menu, the **Pick***

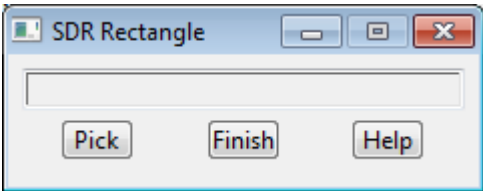
button can be used to restart the option.

Make a Parallelogram from the Last Three Points

Position of option on menu: Survey =>Edit =>Points =>Rectangle last 3 points

Rectangle last 3 points creates a parallelogram (squashed rectangle) from the selected vertex and the previous two vertices in the same string.

Selecting Rectangle last 3 points brings up the SDR Rectangle panel:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick	button		

As soon as the option is selected, the **Pick** is active and vertices can be selected.

Each time a vertex is picked and accepted, a parallelogram (squashed rectangle) is created using the selected vertex and the previous two vertices of the same string (three vertices in total) and creating a four vertex to form the parallelogram of four vertices. The three vertices are removed from the original string and any following vertices are used in a new string.

A **String rectangle** code is inserted into the 12d field file.

The option then repeats and continues until the **Finish** button is selected.

If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the **Pick Ops** menu, the **Pick** button can be used to restart the option.

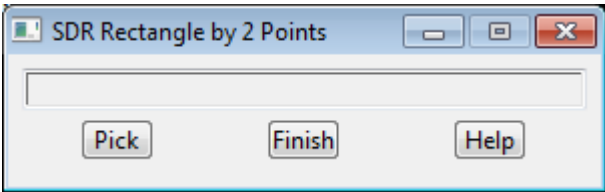
Make a Rectangle from the Last Two Points

Position of option on menu: Survey =>Edit =>Points =>Rectangle last 2 points

Rectangle last 2 points creates a rectangle from the selected vertex and the previous vertex in the same string, and a width supplied by the user.

The rectangle is formed by using the two vertices as the base of the rectangle and using the given width as the length of the other side of the rectangle. Two new vertices are created to form the rectangle.

Selecting Rectangle last 2 points brings up the SDR Rectangle by 2 Points panel:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick	button		

*As soon as the option is selected, the **Pick** is active and vertices can be selected.*

*Each time a vertex is picked and accepted, a **Rectangle width** type input box is displayed and filled in.*

The rectangle is formed by using the two vertices as the base of the rectangle and using the given width as the length of the other side of the rectangle. Two new vertices are created to form the rectangle.

The two vertices are removed from the original string and any following vertices are used in a new string.

*A **String rectangle by 2 points** code is inserted into the 12d field file.*

*The option then repeats and continues until the **Finish** button is selected.*

*If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the **Pick Ops** menu, the **Pick** button can be used to restart the option.*

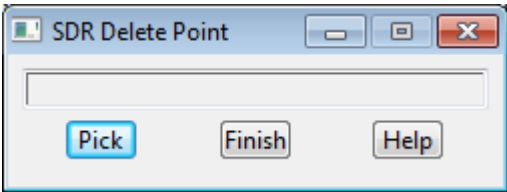
Delete a Vertex

Position of option on menu: Survey =>Edit =>Points =>Remove point

Remove point deleted the selected vertex.

The adjacent vertices in the string containing the deleted vertex will then be joined together.

Selecting **Remove point** brings up the **SDR Delete Point** panel:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick	button		

*As soon as the option is selected, the **Pick** is active and vertices can be selected.*

Each time a vertex is picked and accepted, the vertex deleted from the field file.

*The option then repeats and continues until the **Finish** button is selected.*

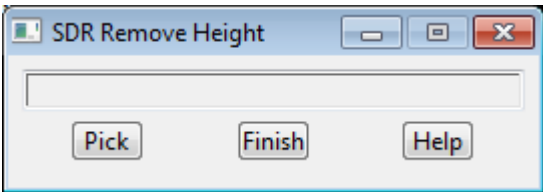
*If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the **Pick Ops** menu, the **Pick** button can be used to restart the option.*

Set a Vertex Height to Null

Position of option on menu: Survey =>Edit =>Points =>Remove height

Remove height sets the height of the selected vertex to null.

Selecting **Remove height** brings up the **SDR Remove Height** panel:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick	button		

*As soon as the option is selected, the **Pick** is active and vertices can be selected.*

*Each time a vertex is picked and accepted, the height of the selected vertex is set to null by inserting a **Remove height** code into the 12d field file.*

*The option then repeats and continues until the **Finish** button is selected.*

*If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the **Pick Ops** menu, the **Pick** button can be used to restart the option.*

SDR Strings Edit

Position of menu: Survey =>Edit =>Stringing

The **Stringing** walk-right menu contains options that work on strings rather than individual points.
The **Stringing** walk-right menu is:

SDR String Edits	
New string	start a new string
End string	end a string
Close	close a string
Join	join two strings
Reverse	reverse a string
2d string	make a string 2d
3d string	make a string 3d
4d string	make a string 4d
Pipe string	make a string a pipe
Culvert string	make a string a culvert
Assign string numbers	

For the option *New string*, go to

End string
Close
Join
Reverse
2d string
3d string
4d string
Pipe string

[New String](#)
[End String](#)
[Close String](#)
[Join Two Strings of Same Feature Code](#)
[Reverse String Direction](#)
[Make a 2d String](#)
[Make a 3d String](#)
[Make a 4d String](#)
[Make a Pipe String](#)

Culvert string
Assign string numbers

[Make a Culvert String](#)
[Assign String Numbers](#)

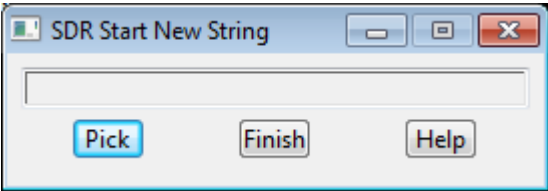
New String

Position of option on menu: Survey =>Edit =>Stringing =>New string

New string corrects the problem of not changing string numbers which creates the error of the last point of one string being joined to the first point of what should have been the next string. Hence there is a link between the two points that should not exist.

With new string, the user selects the incorrect link and a **new string** command is inserted into the 12d field file which removes the link by starting a new string at the end point of the link.

Selecting New string brings up the **SDR Start New String** panel:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick	button		

*As soon as the option is selected, the **Pick** is active and string links can be selected. If the pick is cancelled for some reason, the **Pick** button can be used to restart the option.*

*Each time a string segment is picked and accepted, a **string start** command is inserted into the 12d field file which removes the link by starting a new string at the end point of the link.*

*The option then repeats and continues until the **Finish** button is selected.*

*If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the **Pick Ops** menu, the **Pick** button can be used to restart the option.*

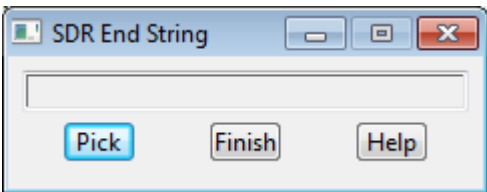
End String

Position of option on menu: Survey =>Edit =>Stringing =>End string

End string corrects the problem of not changing string numbers which creates the error of the last point of one string being joined to the first point of what should have been the next string. Hence there is a link between the two points that should not exist.

With end string, the user selects the incorrect link and a **end string** command is inserted into the 12d field file which removes the link by starting a new string at the end point of the link.

Selecting End string brings up the **SDR End String** panel:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick	button		

*As soon as the option is selected, the **Pick** is active and string links can be selected. If the pick is cancelled for some reason, the **Pick** button can be used to restart the option.*

*Each time a string segment is picked and accepted, an **string end** command is inserted into the 12d field file which removes the link by starting a new string at the end point of the link.*

*The option then repeats and continues until the **Finish** button is selected.*

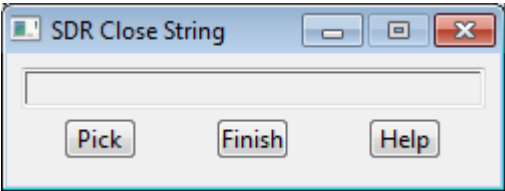
*If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the **Pick Ops** menu, the **Pick** button can be used to restart the option.*

Close String

Position of option on menu: Survey =>Edit =>Stringing =>Close

With **Close**, the user selects any part of the string to be closed and a **close string** command is inserted into the 12d field file.

Selecting **Close** brings up the **SDR Close String** panel:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick	button		

*As soon as the option is selected, the **Pick** is active and string can be selected. If the pick is cancelled for some reason, the **Pick** button can be used to restart the option.*

*Each time a string is picked and accepted, a **string close** command is inserted in the 12d field file which closes the selected string.*

*The option then repeats and continues until the **Finish** button is selected.*

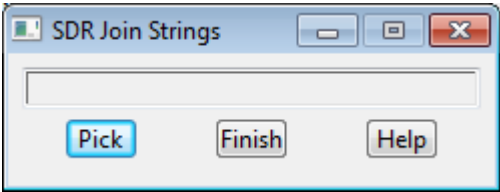
*If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the **Pick Ops** menu, the **Pick** button can be used to restart the option.*

Join Two Strings of Same Feature Code

Position of option on menu: Survey =>Edit =>Stringing =>Join

With **Join**, the two strings of the same name (code) are selected with direction and the strings are joined by inserting the appropriate **join string** command in the 12d field file.

Selecting **Join** brings up the **SDR Join Strings** panel:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
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Pick	button		
-------------	--------	--	--

*As soon as the option is selected, the **Pick** is active and string can be selected. If the pick is cancelled for some reason, the **Pick** button can be used to restart the option.*

*Each time two strings of the same name (code) are picked with direction, the appropriate join string field code (**Join first points of strings**, **Join first to last point of strings**, **Join last points of strings**, **Join last to first point of strings**) is inserted into the 12d field file.*

*The option then repeats and continues until the **Finish** button is selected.*

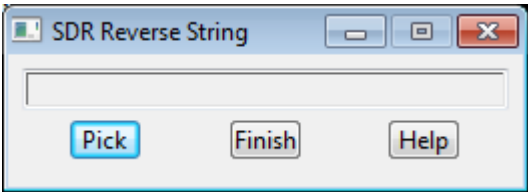
*If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the **Pick Ops** menu, the **Pick** button can be used to restart the option.*

Reverse String Direction

Position of option on menu: Survey =>Edit =>Stringing =>Reverse

With **Reverse**, the selected strings is reversed by inserting the **String reverse** command into the 12d field file.

Selecting **Reverse** brings up the **SDR Reverse String** panel:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Pick	button		
-------------	--------	--	--

*As soon as the option is selected, the **Pick** is active and string can be selected. If the pick is cancelled for some reason, the **Pick** button can be used to restart the option.*

*Each time a string is selected, a **String reverse** field code is inserted into the 12d field file.*

*The option then repeats and continues until the **Finish** button is selected.*

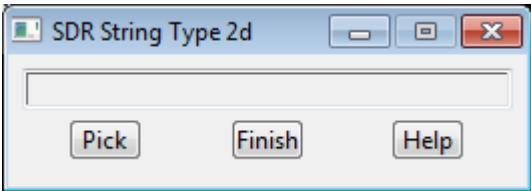
*If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the **Pick Ops** menu, the **Pick** button can be used to restart the option.*

Make a 2d String

Position of option on menu: Survey =>Edit =>Stringing =>2d string

With 2d string the user selects any vertex of a string and a **string type 2d** command is then inserted into the 12d field file.

Selecting 2d string brings up the **SDR String Type 2d** panel:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick	button		

*As soon as the option is selected, the **Pick** is active and string can be selected. If the pick is cancelled for some reason, the **Pick** button can be used to restart the option.*

*Each time a string is picked and accepted, a **String type 2d** command is inserted in the 12d field file.*

*The option then repeats and continues until the **Finish** button is selected.*

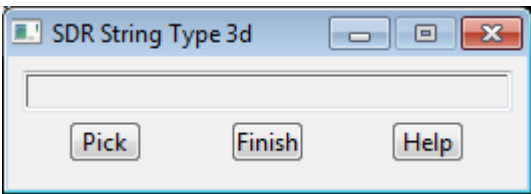
*If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the **Pick Ops** menu, the **Pick** button can be used to restart the option.*

Make a 3d String

Position of option on menu: Survey =>Edit =>Stringing =>3d string

With 3d string the user selects any vertex of a string and a **string type 3d** command is then inserted into the 12d field file.

Selecting 3d string brings up the **SDR String Type 3d** panel:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick	button		

*As soon as the option is selected, the **Pick** is active and string can be selected. If the pick is cancelled for some reason, the **Pick** button can be used to restart the option.*

*Each time a string is picked and accepted, a **String type 3d** command is inserted in the 12d field file.*

*The option then repeats and continues until the **Finish** button is selected.*

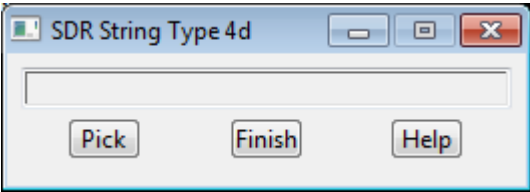
*If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the **Pick Ops** menu, the **Pick** button can be used to restart the option.*

Make a 4d String

Position of option on menu: Survey =>Edit =>Stringing =>4d string

With 4d string the user selects any vertex of a string and a **string type 4d** command is then inserted into the 12d field file.

Selecting 4d string brings up the **SDR String Type 4d** panel:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick	button		

*As soon as the option is selected, the **Pick** is active and string can be selected. If the pick is cancelled for some reason, the **Pick** button can be used to restart the option.*

*Each time a string is picked and accepted, a **String type 4d** command is inserted in the 12d field file.*

*The option then repeats and continues until the **Finish** button is selected.*

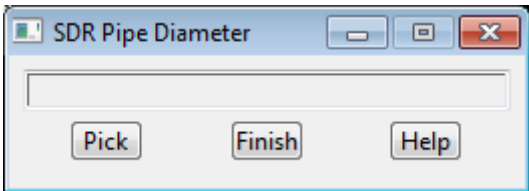
*If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the **Pick Ops** menu, the **Pick** button can be used to restart the option.*

Make a Pipe String

Position of option on menu: Survey =>Edit =>Stringing =>Pipe string

With Pipe string, the user selects any vertex of a string, gives a pipe diameter and then a **string type pipe** command is inserted into the 12d field file.

Selecting Pipe string brings up the **SDR Pipe Diameter** panel:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick	button		

*As soon as the option is selected, the **Pick** is active and string can be selected. If the pick is cancelled for some reason, the **Pick** button can be used to restart the option.*

*Each time a string is picked and accepted, a **Pipe diameter** text input is displayed and after a value is typed in, a **String type pipe** command is inserted in the 12d field file.*

*The option then repeats and continues until the **Finish** button is selected.*

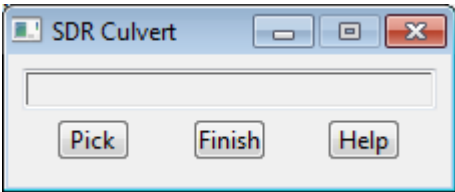
*If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the **Pick Ops** menu, the **Pick** button can be used to restart the option.*

Make a Culvert String

Position of option on menu: Survey =>Edit =>Stringing =>Culvert string

With Culvert string, the user selects any vertex of a string, gives a culvert width and height and then a **string type culvert** command is inserted into the 12d field file.

Selecting Culvert string brings up the **SDR Culvert** panel:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick	button		

*As soon as the option is selected, the **Pick** is active and string can be selected. If the pick is cancelled for some reason, the **Pick** button can be used to restart the option.*

*Each time a string is picked and accepted, **Culvert width** and **Culvert height** text inputs are displayed and after values are typed in, a **String type culvert** command is inserted in the 12d field file.*

*The option then repeats and continues until the **Finish** button is selected.*

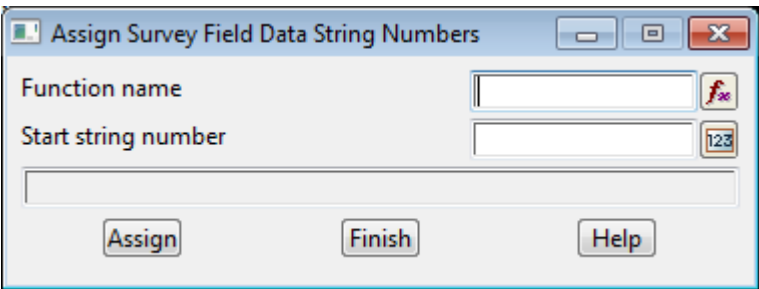
*If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the **Pick Ops** menu, the **Pick** button can be used to restart the option.*

Assign String Numbers

Position of option on menu: Survey =>Edit =>Stringing =>Assign string numbers

Assign string numbers XXX

Selecting Assign string numbers brings up the **Assign Survey Field Data String Numbers** panel:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Function name	function box		SDR functions

name of the SRD function to give string numbers to.

Start string number

string number to start numbering at.

Assign button

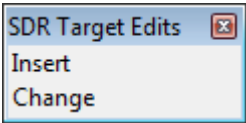
Target Height

Position of menu: Survey =>Edit =>Target height

The **Target height** option is used to correct target height errors. This includes giving an incorrect value for a target height or forgetting to change the target height.

The **Target height** walk-right menu is

.



insert an new target height
change existing target height

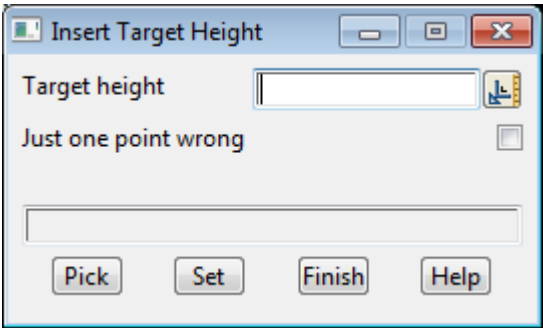
Each option will now be described in detail.

Insert Target Height

Position of option on menu: Survey =>Edit =>Target height =>Insert

The **insert** option inserts a new target height command into the 12d field file at a user selected point. The user can choose whether the new target height only applied for that one point or for all following points until a new target height is set.

Selecting **insert** brings up the **insert target height** panel:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Target height	input/output		

*when a point is selected, the target height for that point is displayed. The value can then be changed by the user and if **set** is selected, the target height is modified and all affected points updated.*

Just one point tick

*if ticked, the new target height only applied for that one point and then reverts pack to the previous target height.
if not tick, the new target height applies for all following points until a new target height is set.*

Pick button

pick the point to insert a new target height.

Set button

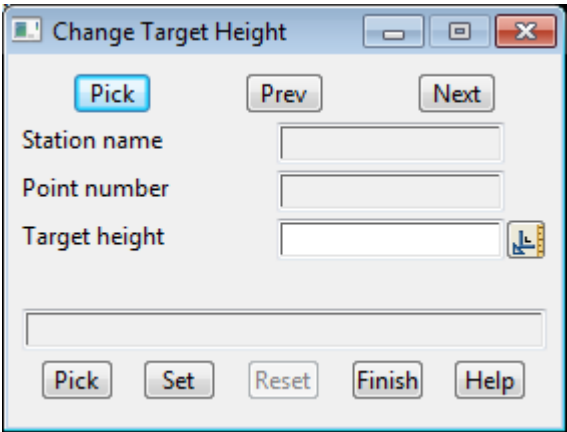
*selecting **set** inserts the new target height command into the 12d field file.*

Change Target Height

Position of option on menu: Survey =>Edit =>Target height =>Change

The Change option changes an existing target height to a new value.

Selecting Change brings up the **change target height** panel:

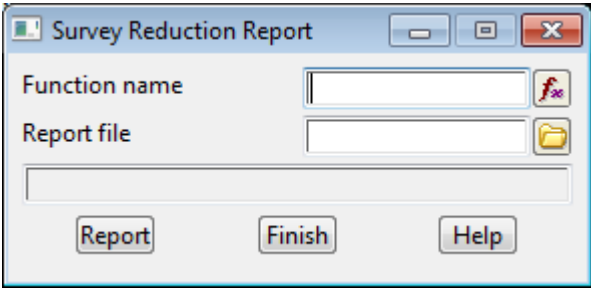


The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick	button		
<i>select a point whose information will be displayed in the panel fields. A highlighted line joining the point to the station that it was surveyed from is also displayed.</i>			
Prev	button		
<i>move to the previous point in the string.</i>			
Next	button		
<i>move to the next point in the string.</i>			
Station name	display only		
<i>name of the station that the point was surveyed from.</i>			
Point id	display only		
<i>point id of the selected point.</i>			
Target height	input/output		
<i>when a point is selected, the target height for that point is displayed. The value can then be changed by the user and if set is selected, the target height is modified and all affected points updated.</i>			
Pick	button		
<i>pick the point to change the target height.</i>			
Set	button		
<i>selecting set changes the target height command in the 12d field file and updates affected points.</i>			
Reset	button		
<i>reset undoes the changes.</i>			

Report

Position of option on menu: Survey =>Report
Report produces a report on the field data from a *Survey* function.
Selecting **report** brings up the **survey reduction report** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Function name <i>name of the 12d Survey function to report on.</i>	input		available Survey functions
Report file <i>name of the file for the Survey function report.</i>	input		*.rpt
Report <i>create the Survey report.</i>	button		

Adjustments

Position of menu: Survey =>Adjustments

The Adjustments walk-right menu is

Survey Adjustments	
2D Helmert (Advanced)	2D Helmert with fixed scale
3D Helmert	3D Helmert
Least squares network	least squares network adjustment
Level network	least squares level adjustment
Network	adjustment of level nets
Height adjustment	adjust heights of data
Traverse adjustment	traverse adjustment
Traverse Adjustment (new)	traverse adjustment (new)
Utilities	various utilities for massaging Leica files

For 2D Helmert (Advanced), go to	2D Helmert (Advanced) in the chapter Utilities
3D Helmert	3D Helmert in the chapter Utilities
Least squares network	Least Squares Network
Level network	Level Network
Height adjustment	Height Adjustment
Traverse Adjustment	Traverse Adjustment
Traverse Adjustment (new)	Traverse Adjustment
Utilities	Survey Adjustments Utilities

2D Helmert (Advanced)

Position of option on menu: Survey =>Adjustments =>2D Helmert (Advanced)

A **2D Helmert** transformation is a two dimensional linear transformation consisting of a scaling, rotation and a 2D- translation (shift) of data. Hence there are four parameters to be specified.

The 2D Helmert (Advanced) option calculated and applied a Helmert transformation, and also allows the user to **fix the scale** for the transformation.

For information on the 2D Helmert transformation, please go to the section [Coordinate Transformations - Helmert and Affine](#)

The *2D Helmert (Advanced)* panel is documented in the section [2D Helmert \(Advanced\)](#) in the chapter [Utilities](#)

3D Helmert

Position of option on menu: Survey =>Adjustments =>3D Helmert

A **3D Helmert** transformation is a three dimensional linear transformation consisting of a scaling, three rotations, and a 3D-translation (shift) of data. Hence there are 7 parameters to be specified.

For information on the 3D Helmert transformation, please go to the section [Coordinate Transformations - Helmert and Affine](#)

The *3D Helmert* panel is documented in the section [3D Helmert](#) in the chapter [Utilities](#)

Least Squares Network

Position of option on menu: Survey =>Adjustments =>Least squares network

The **Least square network** option performs a least square adjustment on a set of observations that can be manually entered into predefined grid box columns or by reading an existing input file. These observations can be of the form of distances, angles, azimuths or a combination of these.

Selecting **Least squares network** brings up the **Least Squares Horizontal Network Adjustment** panel

	Use	From	To	Distance	S(in mm)	ppm
1	<input checked="" type="checkbox"/>					

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Input file	input box		*.in

a pre existing .in input file can be specified. For the format of the .in file, go to [Format of the LSA .in](#)

File

Read button

on selection of the read button, if a valid .in input file has been specified, the relevant parameters will be read into the grid controls.

Distance tab

Distance

Angle

Azimuth

Fixed

Initial

Draw

Output

Control Model

S (in mm)

ppm

	Use	From	To	Distance	S(in mm)	ppm
1	<input checked="" type="checkbox"/>					

The fields and buttons used in this tab have the following functions.

Field Description Type Defaults Pop-Up

S(in mm) input box

standard deviation of a single distance measurement in mm. If entered the value will be used for all lines in the grid. This eliminates the need to put the standard deviation on each line.

ppm button

parts per million error. If entered the value will be used for all lines in the grid. This eliminates the need to put the ppm on each line.

the grid control values can be entered using valid inputs into the various fields:

- Use** - if *ticked*, the row is used in the adjustment. If *not ticked* then the row is ignored
- From** point id which represents the point from which the distance was read
- To** point id which represents the point to which the distance was read
- Distance** (horizontal) with all corrections having been made except for that of scale.
- S(in mm)** - if not blank, the standard deviation to use for this single distance measurement in millimetres. If blank, the default value in the panel field **S(in mm)** is used.
- ppm** - if not blank, the parts per million (ppm) error to use for this single distance measurement. If blank, the default value in the panel field **Pmm** is used.

Angle tab

Distance

Angle

Azimuth

Fixed

Initial

Draw

Output

Control Model

S (in sec)

	Use	Backsight	Instrument	Foresight	Cw angle(dms)	S(in second)
1	<input checked="" type="checkbox"/>					

The fields and buttons used in this tab have the following functions.

Field Description Type Defaults Pop-Up

S(in sec) input box

standard deviation for a single angle measurement in seconds of arc. If entered the value will be used for all lines in the grid. This eliminates the need to put the standard deviation on each line.

the grid control values can be entered using valid inputs into the various fields. Angle input must be in the form of degrees minutes and seconds in [HP Notation](#) (e.g. 12.1055)

Use - if **ticked**, the row is used in the adjustment. If **not ticked** then the row is ignored

Backsight - the backsight point id is entered.

Instrument - the point id of the instrument or observation station is entered.

Foresight - the point id of the foresight station is entered into the **Foresight** column.

Angle (dms) -. the angle defined by the clockwise measurement from the backsight to foresight station as observed from the instrument station. Valid ranges of 0 -360 degrees.

S (in second) - if non blank, the standard deviation of the angular measurement in seconds of arc to use for this single angle measurement. If blank, the default value in the panel field **S (in sec)** is used.

Azimuth tab

Distance

Angle

Azimuth

Fixed

Initial

Draw

Output

Control Model

S (in sec)

	Use	From	To	Azimuth	S(in second)
1	<input checked="" type="checkbox"/>				

The fields and buttons used in this tab have the following functions.

Field Description Type Defaults Pop-Up

S(in sec) input box

standard deviation for a single azimuth measurement in seconds of arc. If entered the value will be used for all lines in the grid. This eliminates the need to put the standard deviation on each line.

the grid control values can be entered using valid inputs into the various fields.

Use - if **ticked**, the row is used in the adjustment. If **not ticked** then the row is ignored

From - the instrument station point id should be entered.

To - the point id of the observed station is entered.

Azimuth - the true azimuth to the observed point is entered. Azimuth input should be in the form of degrees minutes and seconds (e.g. 12.1055) Valid ranges of 0 -360 degrees.

S(in second) - if non blank, the standard deviation of the azimuth in seconds of arc to use for this single angle measurement. If blank, the default value in the panel field **S (in sec)** is used.

Fixed tab

Distance

Angle

Azimuth

Fixed

Initial

Draw

Output

Control Model

	Use	Point name	X coord	Y coord	Z coord
1	<input checked="" type="checkbox"/>				

the grid control values can be entered using valid inputs into the various fields.

Use - if **ticked**, the row is used in the adjustment. If **not ticked** then the row is ignored

Point name - the point id of the fixed stations

X coord - the fixed x coordinate value is entered

Y coord - the fixed y coordinate value is entered

Z coord - the fixed z coordinate value is entered

Initial tab

12d Model will try and calculate initial position for each point from the entered measurement but for some points this is not possible and then the user must enter an initial position.

Distance	Angle	Azimuth	Fixed	Initial	Draw	Output	Control Model
	Use	Point name	X coord	Y coord	Z coord		
1	<input checked="" type="checkbox"/>						

the grid control values can be entered using valid inputs into the various fields.

Use - if **tick**, the row is used in the adjustment. If **not ticked** then the row is ignored

Point name - the point id of a free or floating station should be entered.

X coord - the initial x coordinate estimate is entered.

Y coord - the initial y coordinate estimate is entered.

Z coord - the initial z coordinate estimate is entered.

NB. It is very important that the initial values are approximately equal to the true values. A solution will still be generated for rubbish values.

Draw tab

Distance	Angle	Azimuth	Fixed	Initial	Draw	Output	Control Model
Name	<input type="text"/>					<input type="button" value="+"/>	
Model	<input type="text"/>						
Colour	<input type="text" value="red"/>						
Fixed station style	<input type="text" value="STATION"/>						
Fixed station size	<input type="text" value="1"/>					<input type="button" value="+"/>	
Fixed station colour	<input type="text" value="green"/>						
Scale for error ellipses	<input type="text" value="1000"/>					<input type="button" value="+"/>	
Symbol for given init pts	<input type="text" value="1"/>						
Symbol for calc init pts	<input type="text" value="1"/>						
Clear draw model						<input type="checkbox"/>	

the following values can be entered to enable the production of a user defined plot of the adjustment.

Field Description	Type	Defaults	Pop-Up
Name	name box		defined names from names.4d file
if non-blank, the name of the new string			
Model	model box		available models
if non-blank, the model of the new string (including error ellipse and station symbol if specified).			

Colour	colour box	red	available colours
<i>if non-blank, the colour of the new string. If blank, the original string colour is used.</i>			
Fixed station style	input	Station	available line styles
<i>line style of the station symbol. These will be placed at all of the fixed stations if specified.</i>			
Fixed station size	input	1	
<i>size of symbol in world units.</i>			
Fixed station colour	colour box	green	available colours
<i>if non-blank, the colour of the station symbols</i>			
Scale for error ellipses	input	1000	
<i>this value will be applied to any error ellipses to enable an exaggerated view of the ellipse geometry</i>			
Symbol for given init points	input	1	available line styles
<i>line style of the given initial point symbols</i>			
Symbol for calc init points	input	1	available line styles
<i>line style of the calculated initial point symbols</i>			
Clear draw model beforehand	tick box		
<i>if ticked, the draw model will be cleaned before the new strings are created</i>			

Output tab

Distance

Angle

Azimuth

Fixed

Initial

Draw

Output

Control Model

Output file

Report file

No. decimal places for output

Report standard error ellipses

5

+

−

The fields in this panel define the output parameters.

Field Description	Type	Defaults	Pop-Up
Output file	input box		*.in
<i>if non blank, an output file is produced that can be read in the future.</i>			
Report file	input box		*.rpt
<i>if non blank, a report file of this name is creating giving the calculation specific parameters and result.</i>			
No. decimal places for output	input box	5	
<i>the number of decimal place to use in the report</i>			
Report standard error ellipse	tick box	ticked	
<i>if ticked, error ellipses for each new point are created</i>			

Control Model tab

Distance

Angle

Azimuth

Fixed

Initial

Draw

Output

Control Model

Model

Colour

Style

Update existing control point(s)

1

☒

Update

- Model

model box

a new model or an existing model containing some control points an be entered.

If a new model, the calculated points will placed into that control model.

If an existing model, if there is a point in the model with the same point id as a point being calculated, then that rather than a new point being created, the coordinates of the existing point can be updated after the reduction is complete (depends on the **Update existing controls points** tick box).
- Colour

model box

colour used for control station symbol
- Style

linestyle box

style for control stations.
- Update existing control points

tick box

ticked

if ticked, any existing coordinate positions from the adjustment will be updated in the given control model.
- Update

button

if pressed, the updating of changed level values in the given control model will be carried out.

The remaining fields refer to those located below the grid control

Scale factor

Add calculated initial values

Maximum number of iterations

Stop when coords differ by less than

Stop when the variance increases

0.9996

☒

10

0.0001

☒

Calc Init

Process

Finish

Help

- Scale factor

input box

project central meridian scale factor

a scale factor can be defined which will be applied to any entered distances. Final distances used in calculations are derived by multiplying the entered distance by the scale factor.
- Add calculated initial values

tick box

tick

if this box is checked, then the initial values will be included in the report
- Maximum number of iterations

input box

10

the calculation of the adjustment can be aborted if a solution is not found after the specified number of iterations

Stop when coords differ...	input box	0.0001
----------------------------	-----------	--------

the calculation of the adjustment is stopped when the difference between successive calculations meet the defined tolerance

Stop when the variance increases tick box tick

*if **ticked**, the calculation of the adjustment is stopped when the variance between successive calculations increases*

Process button

run the adjustment

Format of the LSA .in File

The data in each line of the .in file is space delimited. That is, each piece of data on the line is separated by one or more spaces.

Line 1:

The layout of the data on the first line is as follows:

Position	Description	Variable	Type
1	Number of distance observations	N-Dist	Integer
2	Number of angle observations	N-Ang	Integer
3	Number of true azimuth observations	N-Azi	Integer
4	Number of control (fixed) stations	N-Fix	Integer
5	Number of stations (including control stations)	N-Stn	Integer
6	Distance standard deviation (positive if used)	D-Std	Double
7	Distance part per million (non-negative if used)	D-Ppm	Double
8	Angle standard deviation (positive if used)	A-Std	Double
9	Azimuth standard deviation (positive if used)	Z-Std	Double
10	Scale factor		Double

Note: *D-Std*, is in millimetres, *A-Std* and *Z-Std* are in seconds.

Example:

63 71 0 16 35 5.00000 5.00000 15.00000 5.00000 1.00000

Next N-Stn lines:

The next *N-Fix* lines are *control station* records, followed by (*N-Stn - N-Fix*) *station* records.

The layout of the line of a *station record* is as follows:

Position	Description	Type
1	Flag (1 if the station is used, otherwise 0)	Integer
2	Point number	Text
3	X-coord	Double
4	Y-coord	Double

Example:

1 9338 3889.23700 5341.54800

....

....

0 9712a 4007.45700 5168.68700

....

Next N-Dist lines

The next *N-Dist* lines are *distance observation* records.

The layout of the line of a *distance observation record* is as follows:

Position	Description	Type
1	Flag (1 if the observation is used, otherwise 0)	Integer
2	Start point number	Text
3	End point number	Text
4	Distance	Double
5	Standard deviation (in meter, negative if not used)	Double
6	Part per million*	Double

Note: * Part per million is different to D-Ppm by a factor of 1000. That is, if you want a ppm value of 5, the number in the file should be 0.005

Example:

```
1 9542 9702 100.20200 0.00300 0.00200
1 9542 9703 142.98200 -1.00000 -1.00000
0 9700 9506 72.10700 -1.00000 -1.00000
```

....

Next *N-Ang* lines

The next ***N-Ang*** lines are *angle observation* records.

The layout of the line of a *angle observation record* is as follows:

Position	Description	Type
1	Flag (1 if the observation is used, otherwise 0)	Integer
2	Backsight point number	Text
3	Instrument point number	Text
4	Foresight point number	Text
5	Degree	Integer
6	Minute	Integer
7	Second	Double
8	Standard deviation (in mm, negative if not used)	Double

Example:

```
1 19206 9506 9701 174 29 20.00000 -1000.00000
```

....

Next *N-Azi* lines

The next ***N-Azi*** lines are *true azimuth observation* records.

The layout of the line of a *true azimuth observation record* is as follows:

Position	Description	Type
1	Flag (1 if the observation is used, otherwise 0)	Integer
2	Backsight point number	Text
3	Instrument point number	Text
4	Foresight point number	Text
5	Degree	Integer
6	Minute	Integer
7	Second	Double
8	Standard deviation (in mm, negative if not used)	Double

Example:

1 19206 9506 174 29 20.00000 3.00000

....

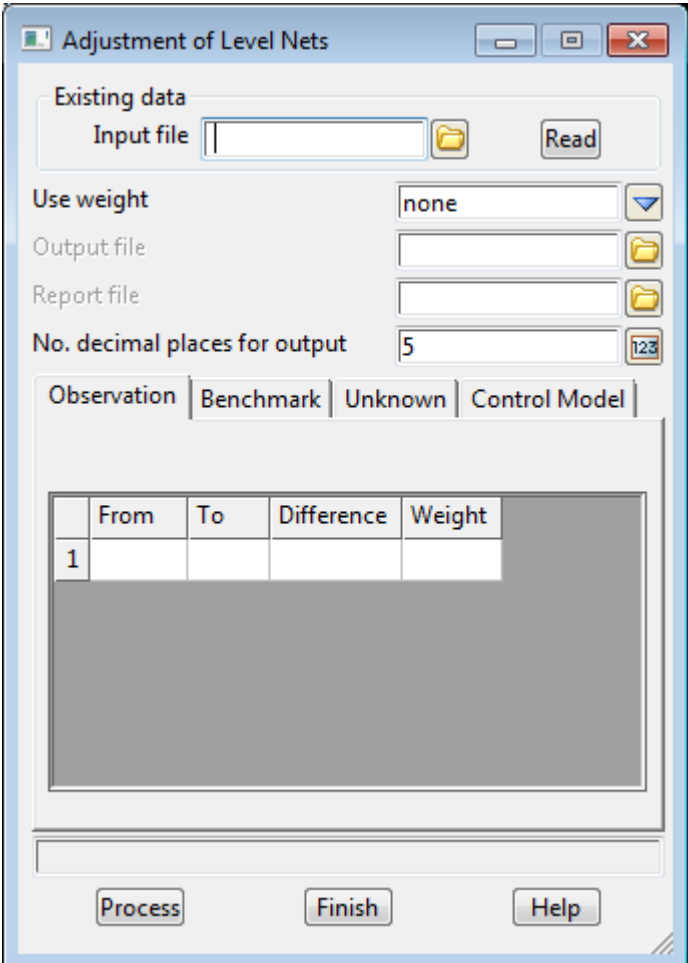
That is the end of data in the file.

Level Network

Position of option on menu: Survey =>Adjustments =>Level network

The **level network** option performs a least square adjustment on a set of level observations that can be manually entered into predefined grid box columns or by reading an existing input file.

Selecting **Level network** brings up the **Adjustment of Level Nets** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Input file	input box		*.in
<i>a pre existing input file can be specified.</i>			
Read	button		
<i>on selection of the read button, if a valid input file has been specified, the relevant parameters will be read into the grid controls.</i>			
Use weight	choice box	none	none, distance, standard deviation
<i>a weighting per observation can be made according to the none, distance, and standard deviation choices</i>			
<i>None - no weighting will be applied.</i>			
<i>Distance - if the distance of the level network legs are to be used. The horizontal distance is entered into the weight field. eg 101.23</i>			
<i>Standard deviation - to define a standard deviation. e.g. 0.005</i>			
<i>Note: The method of defining the weight should be kept consistent. i.e. one of the 3 options.</i>			
Output file	input box		*.in
<i>an output file can be defined which will allow for the reading of the file in the future.</i>			

Report file

*.rpt files

a report using the nominated file name is created.

No. decimal places for out,,input box

5

the number of decimal places for the new levels can be defined.

Observation tab

Adjustment of Level Nets

Existing data

Input file

Read

Use weight

none

Output file

Report file

No. decimal places for output

5

Observation | Benchmark | Unknown | Control Model

	From	To	Difference	Weight
1				

Process

Finish

Help

the grid control values can be entered using valid inputs into the various fields:

From point id which represents the first point of the level difference

To point id which represents the second point to which the level difference refers

Difference the difference between the levels defined by the **From** point and the **To** point. i.e. the difference = (to point) level - (from point) level

Benchmark tab

Adjustment of Level Nets

Existing data

Input file

Read

Use weight

none

Output file

Report file

No. decimal places for output

5

Observation

Benchmark

Unknown

Control Model

	Station	Level
1		

Add a point

Process

Finish

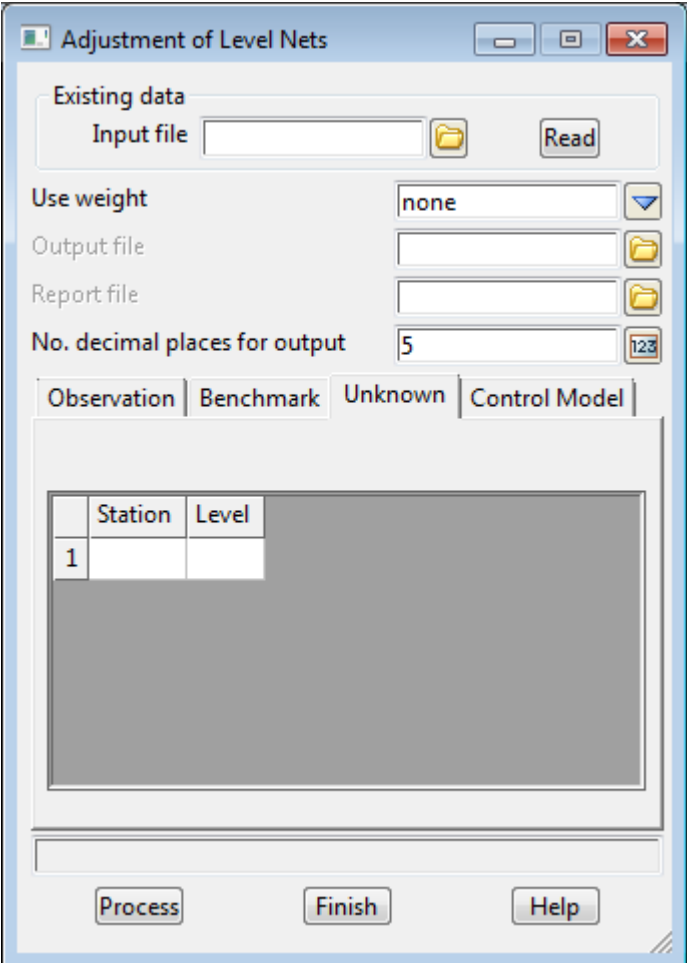
Help

the grid control values can be entered using valid inputs into the various fields.

Station. The point id of a fixed level station should be entered.

Level. The corresponding level value of the fixed station.

Unknown tab



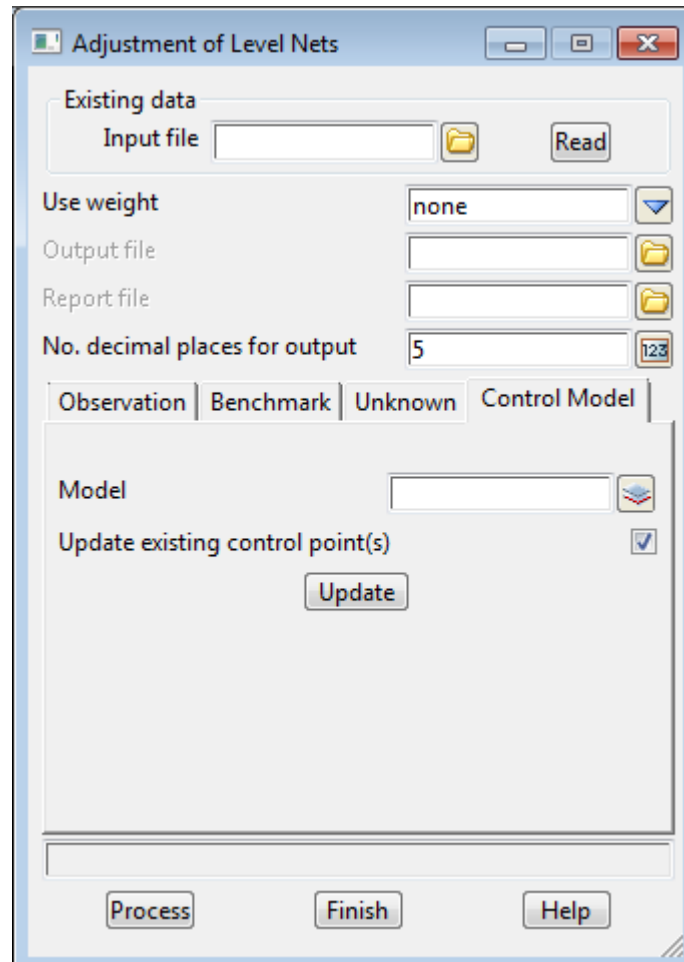
the grid control values can be entered using valid inputs into the various fields.

Station. The point id of any free or floating level stations should be entered.

Level. The corresponding approximate level value of free or floating level station.

a report using the nominated file name is created.

Control Model tab



Model model box

an existing control model can be entered so that changes to level values can be updated.

Update existing control points tick box ticked

if ticked, any new level values from the adjustment will be updated in the given control model.

Update button

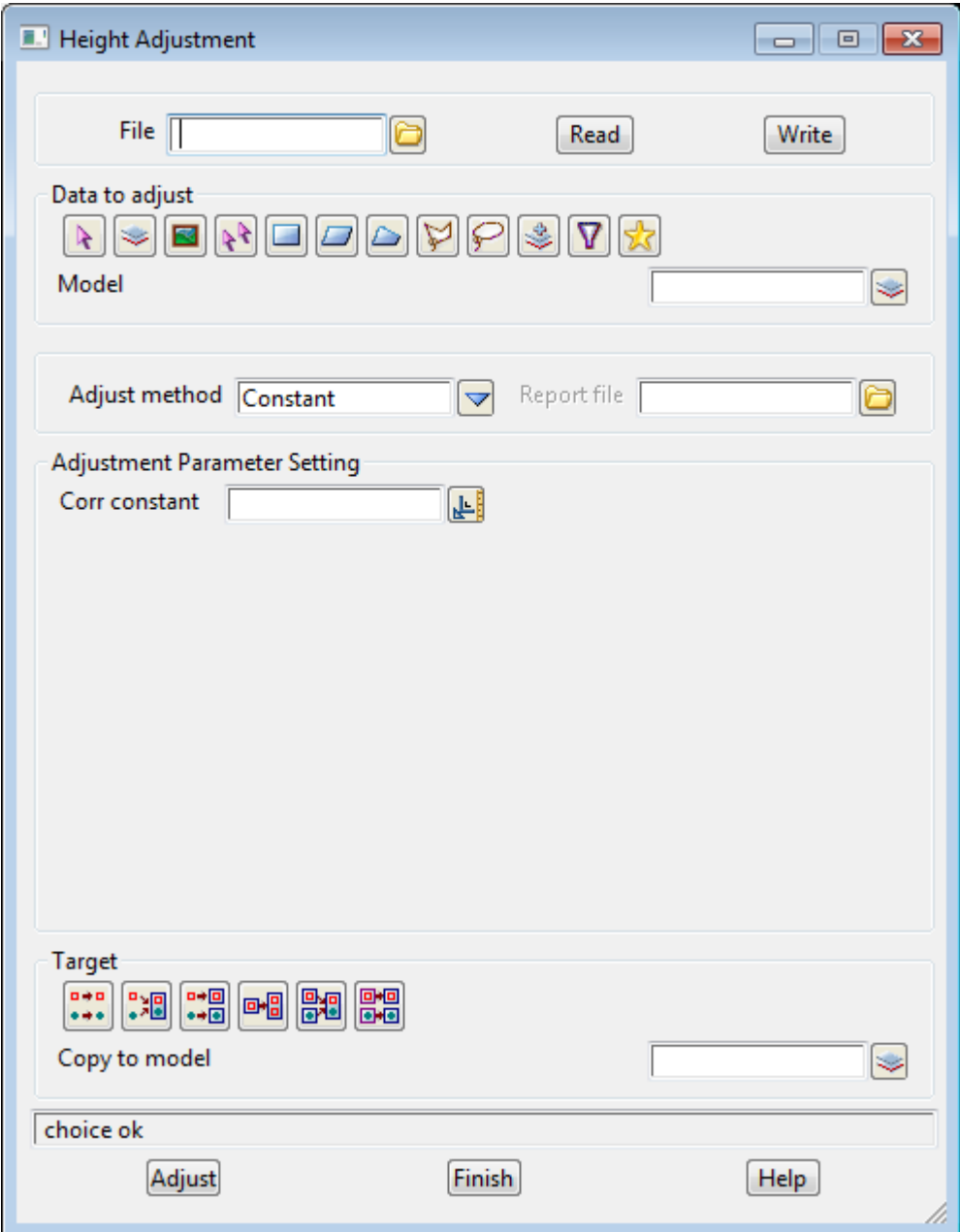
if pressed, the updating of changed level values in the given control model will be carried out.

Height Adjustment

Position of option on menu: Survey =>Adjustments =>Height adjustment

The **Height adjustment** option adjusts the selected data using either a constant z value, a plane defined by parameters, a plane defined by points (least square fit) or a tin of height differences.

Selecting **Height adjustment** brings up the **Height Adjustment** panel



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
File		file box		*.haf files

a filename can be specified for reading or writing a file.

Read		button		
-------------	--	--------	--	--

if a valid file exists, the file contents can be loaded into the panel.

Write		button		
--------------	--	--------	--	--

if a valid name is specified, the user can write the input data to a file.

Data to adjust		input		
-----------------------	--	-------	--	--

the source of the data to be adjusted is selected using the data source box. For more information on the data source box see [Data Source](#)

Adjustment method	choice box	Constant	Constant Plane parameters Plane by points Difference tin
-------------------	------------	----------	-------------------------------------------------------------------

the adjustment method should be selected from the list. A description of each method is given below.

Report file *.rpt files

a report using the nominated file name is created.

Target target

the target for the adjusted data should be specified. For more information on how to use a data target box see the section [Data Target](#)

Transform button

perform the transformation.

Constant adjustment method

The screenshot shows a software dialog box for the 'Constant' adjustment method. At the top, there is a section with 'Adjust method' set to 'Constant' and a 'Report file' field with a folder icon. Below this is a section titled 'Adjustment Parameter Setting' which contains a 'Corr constant' input field with a numeric keypad icon.

Corr constant input box

the value to be added to the selected data.This method is the same as a translation in the z values only.

Plane parameters adjustment method

The screenshot shows a software dialog box for the 'Plane parameter' adjustment method. At the top, 'Adjust method' is set to 'Plane parameter' and 'Report file' has a folder icon. The 'Adjustment Parameter Setting' section contains several fields: 'Corr constant', 'Corr per unit N', and 'Corr per unit E' (all with numeric keypad icons), and 'Origin point' (set to 'SL'), 'North coord' (36971.386), and 'East coord' (42663.658), each with a numeric keypad icon.

Corr constant input box

the value to be added to the selected data.

Corr per unit N input box

the z value correction per unit nothing.

Corr per unit E input box

the z value correction per unit easting.

- Origin point

string select

[same as]
- the name of the string of the origin pt.
- North coord

input box
- the northing value of the origin point.
- East coord

input box
- the easting value of the origin point.

Plane by points adjustment method

Adjust method

Plane by points

Report file

Adjustment Parameter Setting

Corr constant

Origin point

Corr per unit N

North coord

Corr per unit E

East coord

	Use pt	Point	Northing	Easting	Current_Ht	Correct_Ht	Adju
1	<input checked="" type="checkbox"/>						

Add pt

Calculate

the grid control values can be entered to build up the bench mark points from which the plane will be fitted to.

Use pt. the point (bench mark point) can be included in the derivation of the parameters by selecting the **Use pt** option. If the point is not to be included, then uncheck the box.

Point. The point id of the bench mark

Northing. The northing value of the bench mark

Easting. The Easting value of the bench mark

Current_Ht. The current level value of the bench mark

Correct_Ht. The correct height in the adjusted level plane.

Adjusted_Ht. This field shows the adjusted height after the adjustment is performed.

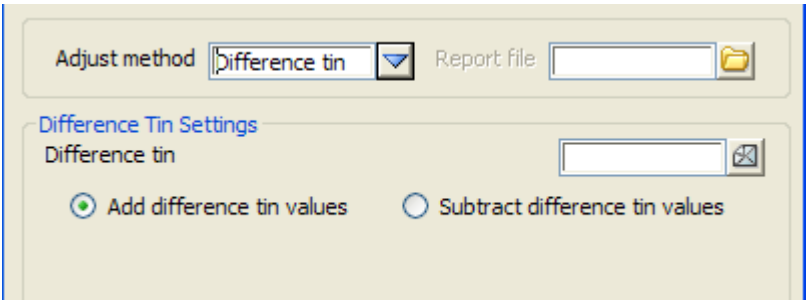
Residual. This field shows the difference between the correct height and the adjusted height. This value is shown after the adjustment is performed.

The **Add pt** button used in this panel can be used to add points into the grid control from

selecting points from a current view. After the button is selected, consequent selection and acceptance of points from the view will add the value into the grid. The **Correct_Ht** parameter will then have to be filled out by the user.

The **Calculate** button can be used to calculate the adjustment parameters and residuals so that they can be inspected before the adjustment is made.

Difference tin adjustment method



This option allows a difference tin to be specified as the adjustment reference. The selected points to be adjusted will be projected onto the difference tin to establish an interpolated adjustment value. This value is then applied to the data according to the add or subtract options. The fields used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Difference tin	tin box		available tins

the difference tin to be used to interpolate adjustment values.

Add difference tin values radio button

*if the button **Add difference tin values** is checked the interpolated value from the difference tin will be added to the existing levels of the adjusted points.*

Subtract difference tin values radio button

*if the button **Subtract difference tin values** is checked the interpolated value from the difference tin will be subtracted from the existing levels of the adjusted points.*

if Constant, a given value is subtracted from each z-value

Corr constant

the value to be subtracted from all z-values

Origin points

the value to be added to all z-values

if Plan parameters, a 3d-plane is defined and the z-value of the plane subtracted from any points

Corr constant

z-correction at the original point

Corr per unit N

z-correction per unit is the North (y) direction about the origin point

Corr per unit E

z-correction per unit is the East (x) direction

Origin point 2d select box

pick box for selected a pint to use for North and East coordinates about the origin point

North coordinate

East coordinate

if Constant, a given value is subtracted from each z-value

Corr constant

the value to be subtracted from all z-values

Origin points

the value to be added to all z-values

if Plan by points a 3d-plane is fitted using least squares adjustment to selecting points. The z-value of the plane is then subtracted from any points.

Corr constant

z-correction at the original point

Corr per unit N

z-correction per unit is the North (y) direction about the origin point

Corr per unit E

z-correction per unit is the East (x) direction

Origin point 2d select box

pick box for selected a pint to use for North and East coordinates about the origin point

North coordinate

East coordinate

if Difference tin, the z-value from a triangulation is added/subtracted from any points

Difference tin tin box available tins

tin of values to be added/subtracted from the z-values of points

Add difference tin values radio button

*if **on**, the values of the tin are **added** to the selected points*

Subtract difference tin values radio button

*if **on**, the values of the tin are **subtracted** to the selected points*

Traverse Adjustment

Position of option on menu: Survey =>Adjustments =>Traverse adjustment

The **Traverse adjustment** option performs a Bowditch, Transit, Compass or Least Square adjustment on a selected string. The adjustment can be for a closed string (loop) or an open string (non-loop).

Selecting **Traverse adjustment** brings up the **Traverse Adjustment** panel.

Traverse Adjustment

Adjustment | **Output**

Adjustment settings

Traverse type: loop

Closing point coord: []

Angular adjustment: none

Closing azimuth: []

Closing bearing: []

Coordinate adjustment: bowditch

Tolerance (relative acc) 1: []

Elevation adjustment: none

Least square settings

Angular std (sec): []

Distance std (mm): []

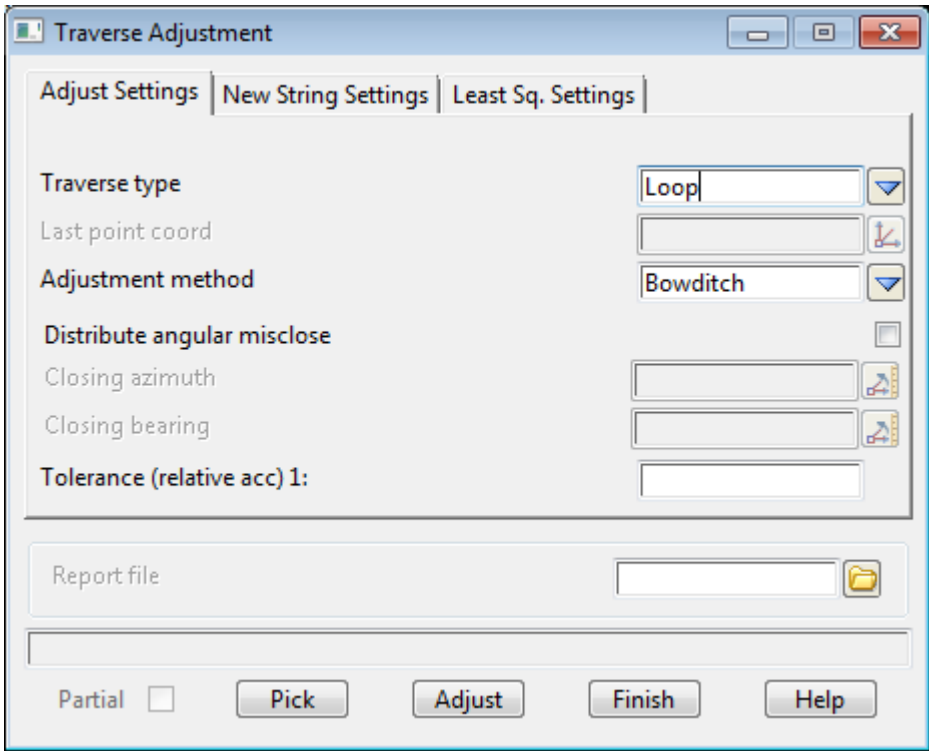
Part per million (mm): []

Max. iterations: 123

Adjustment accuracy: []

Stop when variance increase: ☒

Partial ☐ Pick Adjust Finish Help



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Adjust Settings tab			
Traverse type <i>the traverse can be a closed loop or a non loop.</i>	choice box	loop	loop, non-loop
Last point coord <i>co-ordinates of the last point of the traverse. Only applicable for a non-loop traverse.</i>	xyz		
Adjustment method <i>method of adjustment.</i>	choice box	transit	Transit, Bowditch, Compass, Least Square
Distribute angular misclose <i>if ticked, the closing azimuth and bearing fields are enabled, allowing the entry of the values so that a calculation of an angular misclose can be made. i.e. angular misclose = closing azimuth - closing bearing.</i> <i>This requires a closing observation to be recorded separately to the adjustment string chosen.</i> <i>This angular misclose can be distributed around the traverse before adjustment. The distribution follows standard survey practice, calculating a misclose value per setup station and then adding this constant to every traverse leg in a accumulative manner.</i> <i>i.e. The 1st leg angle adjusted bearing = orig bearing 1st leg + 1*misclose/setup stn.</i> <i>The 2nd leg angle adjusted bearing = orig bearing 1st leg + 2*misclose/setup stn. and so forth.</i> <i>The closing observation is not taken from the traverse string to be adjusted, but by direct entry into the closing azimuth and bearing fields.</i>	tick box	unticked	

Closing azimuth angle box

The closing azimuth is the bearing as calculated from the last point (known coordinate; equal to the start point if a loop traverse) to the closing station (known coordinate or bearing).

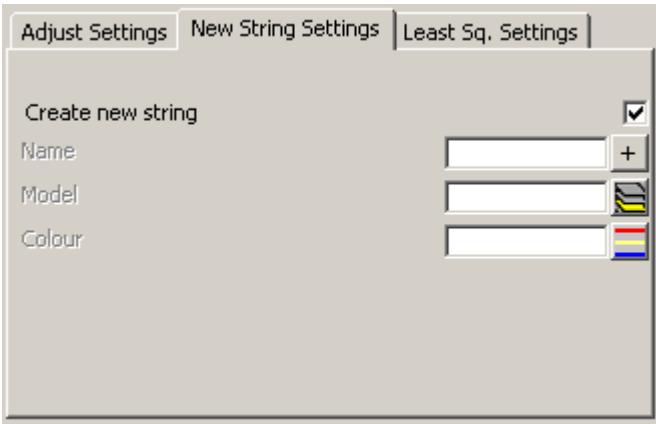
Closing bearing angle box

The closing bearing is the observation from the last traverse point to the closing station (known coordinate or bearing)

Tolerance (relative acc) 1:

The accuracy can be set which will be used to assess the misclose value before the adjustment is made. If the misclose is out of tolerance, a message box will appear notifying the user that the linear tolerance has not been met and prompting for further action. This may force the adjustment to continue or the exit of the process.

New String Settings tab



Create new string tick box tick

if ticked, a new adjusted string is created. If not tick, the selected string is adjusted.

Name name box

if non-blank, the name of the new string. If blank, the original string name is used.

Model model box available models

if non-blank, the model of the new string. If blank, the original string model is used.

Colour colour box available colours

if non-blank, the colour of the new string. If blank, the original string colour is used.

*if the least square method is chosen the following parameters can be set in the **Least Sq. Settings** tab. If a different method is chosen the least square parameters are shown **greyed out** indicating that they are not used in the adjustment.*

Least Sq. Settings tab

Adjust Settings	New String Settings	Least Sq. Settings
Direction obs std (sec)		<input type="text"/>
Distance obs std (mm)		<input type="text"/>
Distance ppm		<input type="text"/>
Maximum number of iterations		<input type="text" value="10"/>
Stop when coords differ <		<input type="text" value="0.0001"/>
Stop when variance increase		<input checked="" type="checkbox"/>

Direction obs std (sec)

standard deviation of a single angular measurement in seconds of arc.

Distance obs std (mm)

standard deviation of a single distance measurement.

Distance ppm

distance error in parts per million.

This value is defined by the edm scale error which is dependant on the length of line measured (e.g. 5ppm = 5mm error over a 1km distance)

Iterations	input box	10
-------------------	-----------	----

the calculation of the adjustment can be aborted if a solution is not found after the specified number of iterations.

Coords differ	input box	0.0001
---------------	-----------	--------

the calculation of the adjustment can be stopped when the difference between successive calculations meets the defined tolerance.

Variance increase	tick box	ticked
--------------------------	----------	--------

the calculation of the adjustment can stopped when the variance between successive calculations increases

The remaining values are as follows:

Report file	*.rpt files
--------------------	-------------

if non-blank, a report for the adjustment is created with this name. If non-blank, no report is created.

Partial ☐ tick box

if ticked, only part of the selected string is adjusted.

Pick button

select the string to adjust.

Adjust button

perform the adjustment.

Survey Adjustments Utilities

Position of option on menu: Survey =>Adjustments =>Utilities

The options on the **Survey Adjustment Utilities** menu are designed to get data from external sources into the Least Squares Network and Level Network formats, (.IN .LIN files respectively) for processing by 12d.

The data conversion is a multistep process as it is designed to bring in several different formats into the 12d .IN/.LIN formats.

.SOA files

The SOA files are an intermediate text file generated onboard a Leica 1200/Viva TPS/GPS instrument.

The format files to generate these files from a Leica DBX are shipped in the library directory.

- **ANG_Code_Office.FRT** is the format file used when the Station number is put in as a code
- **ANG_ID_Office.FRT** is the format file used when the Station number is put in as a Point ID

The use of format files is out of the scope of this manual and described in the Leica documentation.

The SOA file format is intermediary and not documented.

.ANG files

ANG files are a text file containing rounds of angles, they are generated by the **Leica DBX to ANG** panel or can be generated in TP-Setout or TP-Stakeout.

The format of an **.ANG** is such

```
<Backsight ID> <Backsight Height> <Station ID> <Station Height>
<Foresight ID> <Foresight Height> <Backsight bearing> <Backsight
Vertical angle> <Backsight slope distance> <Foresight bearing>
<Foresight Vertical angle> <Foresight slope distance>
```

Bearing and angles are in radians and station IDs must be quoted if they have spaces.

```
"34748A" 1.300 "34872A" 1.660 "34978B" 0.000 5.49580322 1.58360594
159.477 2.83371620 1.53209318 117.170
```

.LSF files

LSF files are a TP-Setout/ TP-Stakeout format for a least squares network adjustment.

The format consists of several sections, each section is terminated by an **END**.

The first a list of station coordinates and weighting definitions.

```
<Station name> <Easting> <Northing> <Weight> <Level> <Weight>
GB117 9808.1480 168635.6450 1000 4.0314 1000
```

A weight of 1000 means fixed, 1 completely free.

The second section is the horizontal observations.

```
<Backsight ID> <Station ID> <Foresight ID> <Backsight bearing>
```

```
<Foresight bearing>  
KHABB KHP14 KHP13 0.0000 3.15157367
```

Bearing and angles are in radians and station ids must be quoted if they have spaces.

The 3rd section is the horizontal distances.

```
<Station name> < Station name > < Horizontal distance>  
KHABB GB117 68.909
```

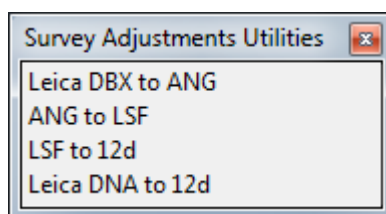
The 4th section is the height difference information.

```
<Station name> < Station name > < Vertical distance>  
KHABB GB117 -11.138
```

A complete sample:

```
GB117 9808.1480 168635.6450 1000 4.0314 1000  
KHP17 9839.3686 168651.5200 1 18.2912 1000  
KHABB 9813.0536 168704.3997 1 15.1675 1  
END  
GB117 KHABB KHP17 0.0000 5.74994583  
KHABB KHP17 KHP16 0.0000 3.13833713  
END  
KHABB KHP17 59.053  
KHABB GB117 68.909  
KHP17 KHP16 71.045  
END  
KHABB KHP17 3.119  
KHABB GB117 -11.138  
KHP17 KHP16 3.757  
END
```

The Utilities walk-right menu is



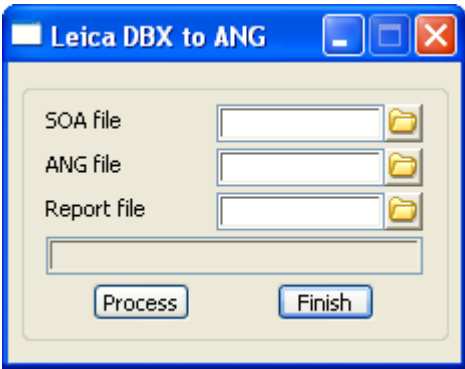
For the option Leica DBX to ANG go to [Leica DBX to ANG](#)
ANG to LSF [ANG to LSF](#)
LSF to 12d [LSF to 12d](#)
Leica DNA to 12d [Leica DNA to 12d](#)

Leica DBX to ANG

Position of option on menu: Survey =>Adjustments =>Utilities => Leica DBX to ANG
This option converts the **.SOA** file produced on the Leica instrument into a rounds of

angles **.ANG** file.

Selecting Leica DBX to ANG brings up the **Leica DBX to ANG** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

SOA file	file box		
-----------------	----------	--	--

select the SOA file produced from a Leica DBX to process.

ANG file	file box		
-----------------	----------	--	--

enter the ANG to be created, if existing you will be warned it will be overwritten.

Report file	file box		
--------------------	----------	--	--

a report file is generated to allow scrutiny of the conversion process to detect gross errors.

if it looks as below containing details of each collated measurement, this report should be checked before further processing of the created ANG file.

Report for conversion of "6404-CONTROL.SOA" to "QQ.ANG"

Overall stations 50

Overall measures 1816

17 meas's from SSM139008 to target PM42949

Hz: mean 49°54'55.7" std dev 0°00'03.0"

Va: mean 87°34'50.4" std dev 0°00'05.0"

Sd: mean 385.938 std dev 0.0003

TH: mean 1.784 std dev 0.0000

Process	button		
----------------	--------	--	--

process the SOA file and produce the ANG file.

ANG to LSF

Position of option on menu: Survey =>Adjustments =>Utilities => ANG to LSF

The panel converts a round of angles **ANG file** into the **LSF** least squares network format.

As a prerequisite to using this panel a **PTA file** of the fixed control points must be created.

The PTA format is a space delimited **<Easting> <Northing> <Level> <"ID">**

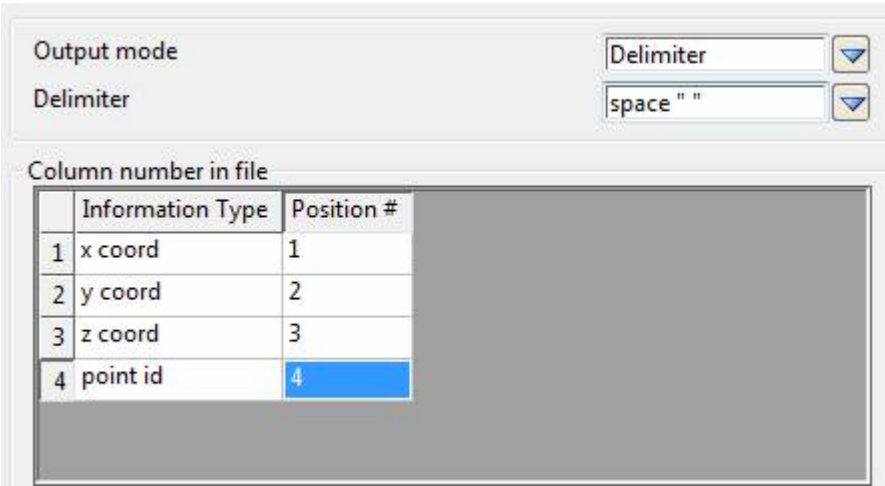
12343.345 234435.236 500.127 "STN1"

12654.877 234435.345 501.457 "STN2"

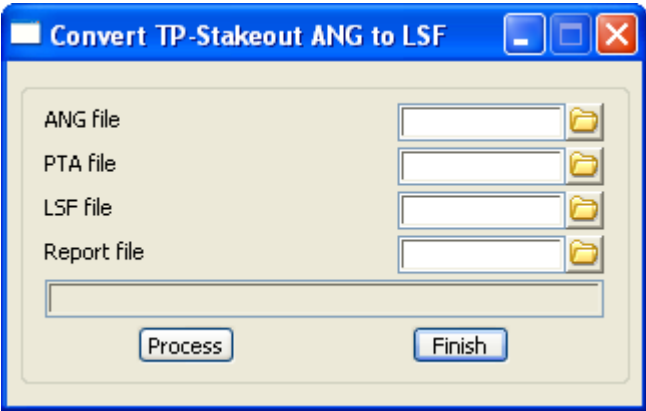
```
12456.345 234543.866 499.345 "STN3"
```

The **PTA file** can come in from **TP-Setout/TP-Stakeout** or it can be written out using the **File I/O->Data output->x y z general** option. See [User X Y Z and Attributes Output](#)

Set the following fields in the xyz output for creating a **PTA** format file.



Selecting **ANG to LSF** brings up the **Convert TP- Stakeout ANG to LSF** panel.



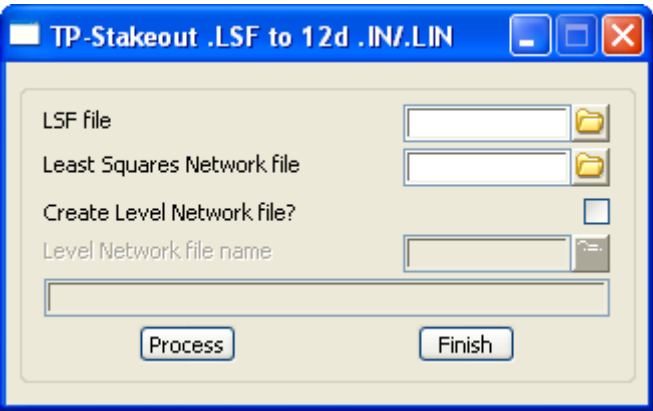
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
ANG file <i>the ANG file to be converted.</i>	file box		
PTA file <i>the PTA file containing the fixed control points.</i>	file box		
LSF file <i>the LSF file to be created.</i>	file box		
Report file <i>a report file is generated to allow scrutiny of the conversion process to detect gross errors. It has simple statistics on the angle, distances and height differences.</i>	file box		

Process button
create a LSF file from the ANG file.

LSF to 12d

Position of option on menu: Survey =>Adjustments =>Utilities => LSF to 12d
This panel converts a **LSF** format file into the **12d** Least squares network and Level network file formats.
Selecting LSF to 12d brings up the **TP- Stakeout .LSF to 12d .IN/.LIN** panel.

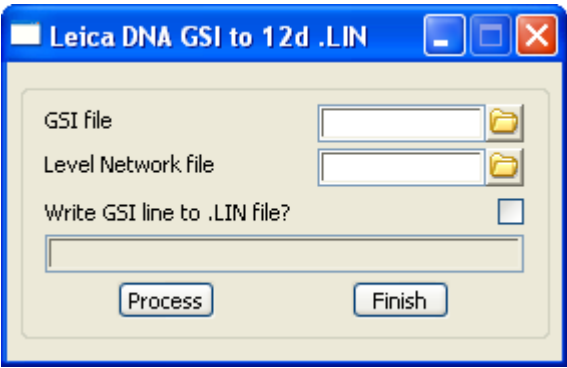


The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
LSF file	file box		
<i>the LSF file to be processed.</i>			
12d Least squares network file	file box		
<i>the 12d .IN file to be created.</i>			
Create Level Network file?	tick box		
<i>if ticked enter the Level Network .LIN file will be created.</i>			
Level Network file name			
<i>the Level Network .LIN file to be created.</i>			
Process	button		
<i>create the .IN and optional .LIN file form the LSF file.</i>			

Leica DNA to 12d

Position of option on menu: Survey =>Adjustments =>Utilities => Leica DNA to 12d
This panel converts a **GSI** format file from a Leica digital level into the 12d Level network file format.
Selecting Leica DNA to 12d brings up the **Leica DNA GSI to 12d .LIN** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
GSI file <i>the GSI file to process</i>	file box		
Level Network file <i>the .LIN file to create</i>	file box		
Write GSI line to .LIN file? <i>if ticked the raw data from the GSI file will be written as a comment line into the .LIN file.</i>	tick box		
Process <i>create the level network LIN file.</i>	button		

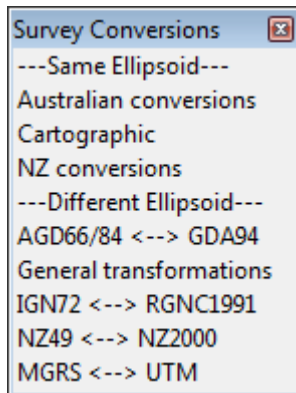
Conversions

Position of menu: Survey =>Conversions

The **Conversions** walk-right menu contains survey transformations for converting between most projections (or longitude, latitude) including Transverse Mercator, UTM etc.conversion options.

Conversions can involve the same ellipsoid or different ellipsoid. When using different ellipsoids, either a 7-parameter transformation or NTVT2 grids can be used to convert between the ellipsoids.

The **Conversion** walk-right menu is



Australian conversions (eg zone to zone) fro the same datum

Cartographic conversion from one projection to another (same datum)

NZ conversions (eg circuit to circuit) for the same datum

AGD 66/84 <--> GDA94 conversions (AMG <--> MGA

General conversions with ellipsoid change

IGN72 <-->RGNC1991 conversions

For converting between projections using the same ellipsoid:

For the option *Australian conversions*, go to

[Australian Conversions](#).

Cartographic,

[Cartographic](#)

NZ conversions,

[NZ Conversions](#)

For converting between projections with different ellipsoids:

For the option *AGD66/84<-->GDA94*, go to

[AGD66/84 <--> GDA94](#).

General transformations

[General Transformations](#)

IGN72<-->RGNC1991,

[IGN72 <--> RGNC1991](#)

NZ49<-->NZ2000,

[NZ49 <--> NZ2000](#)

MGRS<-->UTM,

[MGRS <--> UTM](#)

For more information about terminology used in these sections, see the Appendix [Geodetics Summary](#).

Australian Conversions

Position of option on menu: Survey =>Conversions =>Australian conversions

The **Australian conversions** option converts data from one form (AMG/MGA, Long Lat, Global XYZ) to another for the same common datum (AGD66/84 or GDA94). The option also allows for the conversion from one zone to another for a common datum. (e.g. from zone 54 to 55 in MGA).

For converting ISG co-ordinates in the same datum, use the option

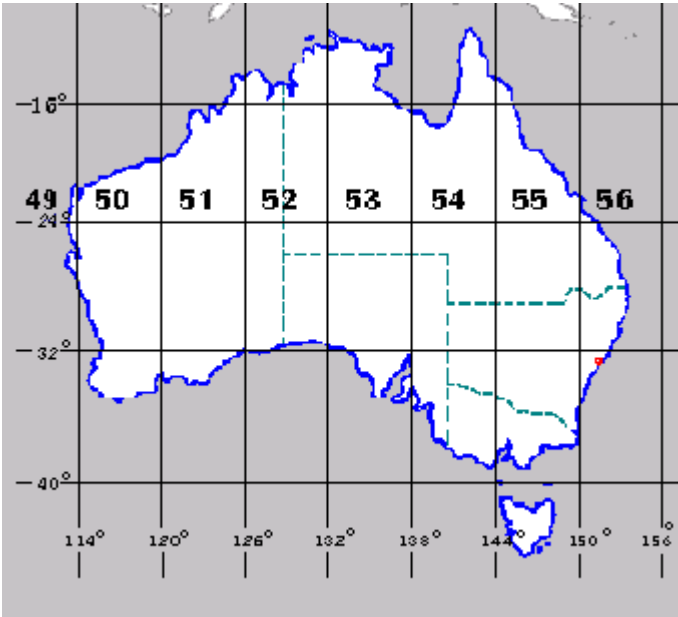
Survey =>Conversions =>Cartographic (see [Cartographic](#)).

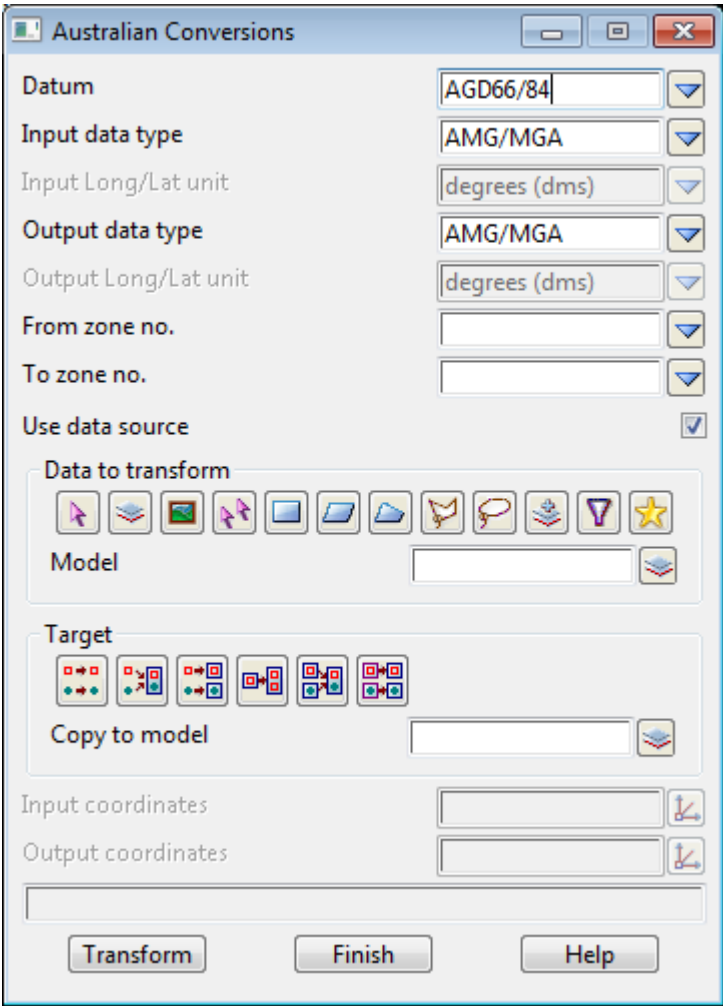
For converting between the **different** datums AGD66/84 and GDA94, use the option

Survey =>Conversions =>AGD66/84 <--> GDA94 (see [AGD66/84 <--> GDA94](#)).

For more information, go to the section [Converting Between AMG, ISG and MGA](#) in the Appendix [Geodetics Summary](#).

Selecting **Australian conversions** brings up the **Australian conversions** panel





The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Datum <i>either AGD66/84 or MGA94 is selected.</i>	choice box	AGD66/84	AGD66/84, GDA94
Input data type <i>type of the input data type.</i>	choice box	AMG/MGA	AMG/MGA, Long Lat Global XYZ
Input Lat/Long unit <i>if Lat/Long was selected, the Lat-Long coords have the selected units.</i>	choice box	degrees	radians, degrees, decimal degrees
Output data type <i>type of the input data type.</i>	choice box	AMG/MGA	AMG/MGA, Long Lat Global XYZ
Output Lat/Long unit <i>if Lat/Long was selected, the Lat-Long coords have the selected units.</i>	choice box	degrees	radians, degrees, decimal degrees

From zone no.	49 -> 59	
<i>if AMG/MGA was selected for the input data type, the AMG/MGA zone is given is this field.</i>		
To zone no.	49 -> 59	
<i>if AMG/MGA was selected for the output data type, the AMG/MGA zone is given is this field.</i>		
Use data source	tick box	tick
<i>if ticked, a data source is used to select the data to be transformed. If not ticked, a given co-ordinate is transformed.</i>		
Data source	input	
<i>if use data source is ticked, the source of data to transform. The source of the data to be adjusted is selected using the data source box. For more information on the data source box see Data Source</i>		
Target	target	
<i>if use data source in the data source is ticked, the target of the transformed data should be specified. The target for the data is selected using the data target box. For more information on the data target box see Data Target</i>		
Input coordinates	XYZ box	
<i>if use data source is not ticked, the co-ordinates in this field is transformed.</i>		
Output coordinates	XYZ box	
<i>if use data source is not ticked, the transformed co-ordinates are displayed in this field.</i>		
Transform	button	
<i>perform the transformation.</i>		

Cartographic

Position of option on menu: Survey =>Conversions =>Cartographic
Position of option on menu: Utilities =>A-G =>Cartographic

The **Cartographic** option is used to transform data based on the same datum between

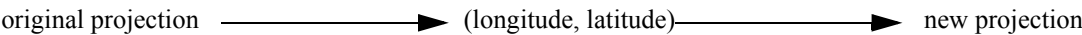
- (a) two different cartographic projections (based on the same datum)
- (b) longitude and latitude and a cartographic projection (based on the same datum)
- (c) a cartographic projection and longitude and latitude (based on the same datum).

The datum, relates to the ellipsoid model used. This should be the same for both the to and from fields. i.e. a transform between data based on the ANS ellipsoid, to data based on the WGS84 ellipsoid would be incorrect.

(a) Transforming Between Two Cartographic Projections

For the first case, the data starts in one cartographic projection and is to be transformed into another cartographic projection.

This is achieved by converting the data in (x,y) co-ordinates in the original projection, to (longitude, latitude) and then converting from (longitude, latitude) to (x,y) in the new projection.



For example, to transform from MGA zone 50 to MGA zone 51, the original data starts in MGA zone 50, is transformed to (longitude, latitude) and then transformed from (longitude, latitude) to

MGA zone 51.

Note that to make the transformation, the two cartographic projection must already be defined. That is in the example above, the two projections MGA zone 50 and MGA zone 51 must already be defined.

In **12d** Model, a *Cartographic projection* is defined by the option

Project => Projections => Create/edit

and is documented in the section [Create/Edit Projection](#) in the chapter [Projects](#).

The two cartographic projection definitions for the conversion are given in the **Cartographic** panel.

(b) Transform Between Longitude-Latitude and a Cartographic Projection

For the second case, the data starts in (longitude, latitude) is to be transformed into (x,y) co-ordinates in a cartographic projection.

(longitude, latitude) \longrightarrow cartographic projection

For example, to transform (longitude, latitude) to MGA zone 51.

To make the transformation, the required cartographic projection must already be defined by the option

Project => Projections => Create/edit

which is documented in the section [Create/Edit Projection](#) in the chapter [Projects](#).

Notes

1. In the southern hemisphere, the latitude values are **negative**. If the latitude is given as positive rather than negative, then the option **Factor** can be used to multiply the latitude by -1.
2. If the information is given in (latitude, longitude) rather than the required (longitude, latitude), then the option **Swap XY** can be used to swap the order of the co-ordinates.

(c) Transform Between a Cartographic Projection and Longitude-Latitude

For the third case, the data starts in (x,y) co-ordinates in a cartographic projection and need to be transformed to (longitude, latitude).

cartographic projection \longrightarrow (longitude, latitude)

For example, to transform from MGA zone 51 to (longitude, latitude).

To make the transformation, the required cartographic projection must already be defined by the option

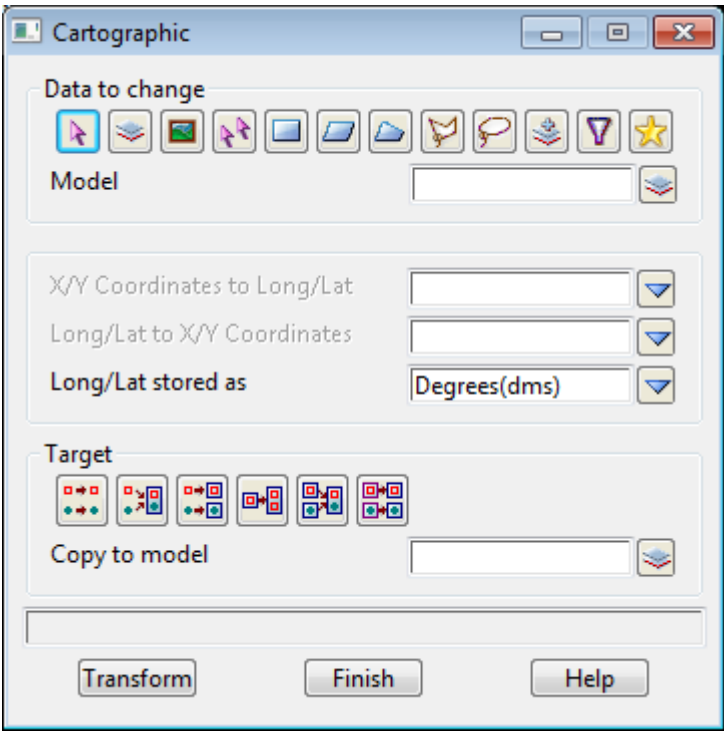
Project => Projections => Create/edit

which is documented in the section [Create/Edit Projection](#) in the chapter [Projects](#).

Notes

1. In the southern hemisphere, the latitude values are **negative**. If a positive value for latitude is required, then the option **Factor** can be used to multiply the latitude by -1.
2. If the information is required to be given in (latitude, longitude) rather than the (longitude, latitude) produced by the transformation, then the option **Swap XY** can be used to swap the order of the co-ordinates.

On selecting the **Cartographic** option, the **Cartographic** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Data source type				
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>				
Data source		input		
<i>source of data to be processed.</i>				
X/Y Coordinates to Long/Lat		input		available projections
<i>if non-blank, the name of the cartographic projection to map the selected string co-ordinates into longitude-latitude values.</i>				
<i>If blank, the initial co-ordinates are not transformed from (x,y) to (longitude, latitude). Hence the initial co-ordinates are then assumed to be in (longitude, latitude) form ready to be transformed to (x,y) by the transformation given in the Long/Lat to x/y coordinates field. Note that in the southern hemisphere, the latitude values must be given as negative.</i>				
Long/Lat to X/Y Coordinates		input		available projections
<i>if non-blank, the cartographic projection to apply to the longitude-latitude values.</i>				
<i>If blank, the co-ordinates are not transformed from (longitude, latitude) to (x,y). Hence the initial (x,y) co-ordinates are transformed to (longitude, latitude) by the transformation given in the x/y co-ordinates to Long/Lat field and then left in (longitude, latitude). Note that in the southern hemisphere, the latitude values are negative.</i>				
Long/Lat stored as		input	degrees	radians degrees decimal
degrees				
<i>format for the longitude and latitudes - either radians, degrees (in HP Notation for degrees, minutes and seconds) or decimal degrees.</i>				
Target type				

Data target type - where to put the processed strings. For a full description go to [Data Target](#) in the chapter [Tools and Concepts](#)

Target info input

extra information required for the target.

Transform button

transform the selected strings to longitude-latitude co-ordinates using the x/y coordinates to long/lat (radians) transformation, and then project those longitude-latitude co-ordinates into the new co-ordinate system using the long/lat (radians) to x/y coordinates transformation.

Note

The **Cartographic** option can be used to transform just *x/y coordinates* to *long/lat* or *long/lat* to *x/y coordinates* by simply leaving the appropriate panel field blank. The units for *longitude* and *latitude* are either degrees (dms), decimal degrees or radians.

NZ Conversions

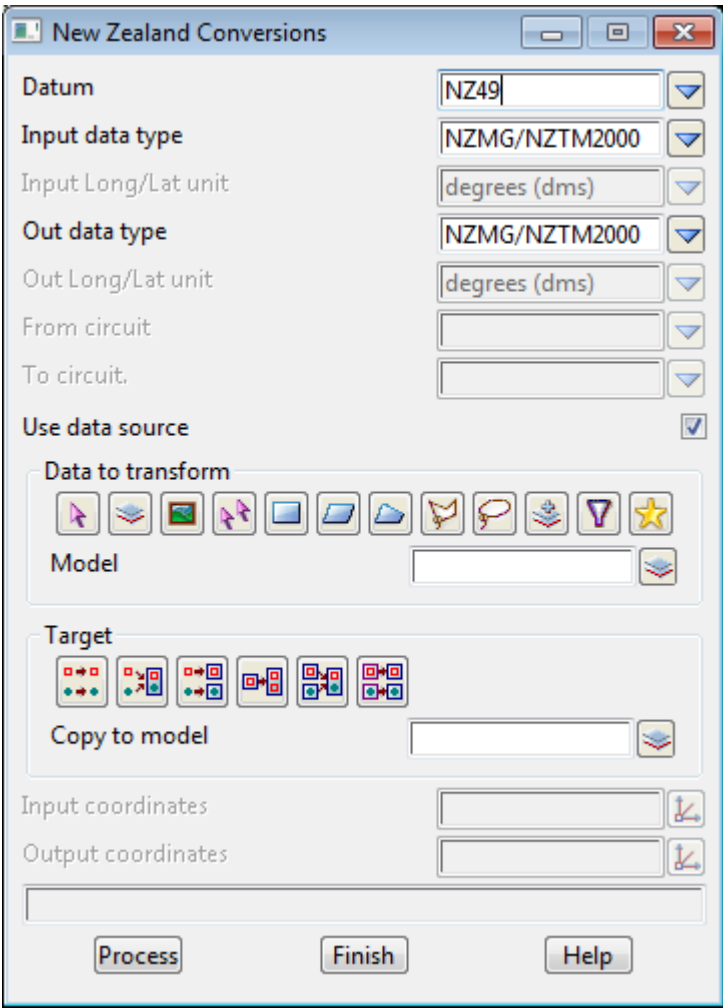
Position of option on menu: Survey =>Conversions =>NZ conversions

The **NZ conversions** option converts data from one form (NZMG/NZTM2000, Long Lat) to another for the same ellipsoid (i.e. datum NZ49 or NZ2000).

For converting between the **different** datums NZ 49 and NZ 2000, use the option

Survey =>Conversions =>NZ49 <-> NZ2000 (see [NZ49 <---> NZ2000](#)).

Selecting **NZ conversions** brings up the **New Zealand Conversions** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Datum <i>either NZ49 or NZ2000 is selected.</i>	choice box	NZ49	NZ49, NZ2000
Input data type <i>type of the input data type.</i>	choice box	NZMG/NZTM2000	NZMG. Circuit, Long Lat
Input Lat/Long unit <i>if Lat/Long was selected, the Lat-Long coords have the selected units.</i>	choice box	degrees	radians, degrees, decimal degrees
Output data type <i>type of the input data type.</i>	choice box	NZMG/NZTM2000	NZMG. Circuit, Long Lat
Output Lat/Long unit <i>if Lat/Long was selected, the Lat-Long coords have the selected units.</i>	choice box	degrees	radians, degrees, decimal degrees
From Circuit <i>if Circuit was selected for the input data type, the NZ Circuit is given is this field.</i>			

To Circuit

*if **Circuit** was selected for the output data type, the NZ Circuit is given is this field.*

Use data source tick box tick

if ticked, a data source is used to select the data to be transformed. If not ticked, a given co-ordinate is transformed.

Data source type Model

*if **use data source** is ticked, the data selection type*

Data source input

*if **use data source** is ticked, the source of data to transform. The source of the data to be adjusted is selected using the data source box. For more information on the data source box see [Data Source](#)*

Target target

*if **use data source** in the data source is ticked, the target of the transformed data should be specified. The target for the data is selected using the data target box. For more information on the data target box see [Data Target](#)*

Input coordinates XYZ box

*if **use data source** is not ticked, the co-ordinates in this field is transformed.*

Output coordinates XYZ box

*if **use data source** is not ticked, the transformed co-ordinates are displayed in this field.*

Transform button

perform the transformation.

AGD66/84 <---> GDA94

Position of option on menu: Survey =>Conversions =>AGD66/84 <-> GDA94

This option converts data between the two Australian Datums, AGD 66/84 and GDA 94. The transformation between the two datums can be by either a seven parameter similarity transformation for a State, or a NTV2 grid for either a State or Australia.

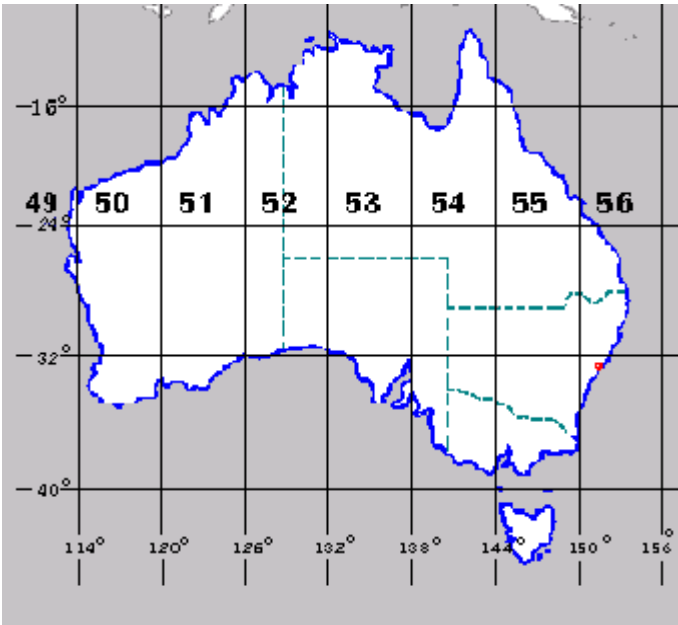
12d Model is GDA compliant for both the similarity transformations and NTV2 grids.



The AGD 66/84 data can be either longitude and latitude, co-ordinates in an AMG Zone or co-ordinates in an ISG Zone.

The GDA 94 data can be either longitude and latitude, Global XYZ or co-ordinates in a MGA Zone.

Hence the option will converts data from AMG 66/84 or ISG 66/84 to MGA 94 and vice-versa.
For more information, go to the section [Converting Between AMG, ISG and MGA](#) in the Appendix [Geodetics Summary](#)



Selecting agd66/84 <----> gda94 brings up the agd66/84 <----> gda94 panel

A screenshot of a software dialog box titled "AGD66/84 <----> GDA94". The dialog has two tabs: "Transformation Settings" and "Data Source". Under "Transformation Settings", there are sub-tabs for "AGD Settings" and "GDA Settings". The "AGD Settings" sub-tab is active. It contains the following fields and controls:

- Datum:** Two radio buttons, "AGD66" (selected) and "AGD84".
- Data Type:** Three radio buttons, "AMG" (selected), "Long/Lat", and "ISG".
- AMG zone no.:** A text input field with a dropdown arrow.
- Long/Lat unit:** A text input field with a dropdown arrow, currently showing "degrees (dms)".
- ISG zone no.:** A text input field with a dropdown arrow.

At the bottom of the dialog are three buttons: "Transform", "Finish", and "Help".

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

AGD Settings

AGD66 AGD84	radio button		
---------------------------	--------------	--	--

either AGD66 or AGD84 is selected. (AGD = Australian Geodetic datum)

AMG Lat/Long ISG radio button

either AMG, Lat/Long or ISG is selected. (AMG = Australian Map Grid, ISG = Integrated Survey Grid). The ISG relates to the state of New South Wales

AMG Zone no. choice box 49 -> 59

if AMG was selected, the AMG zone is given is this field.

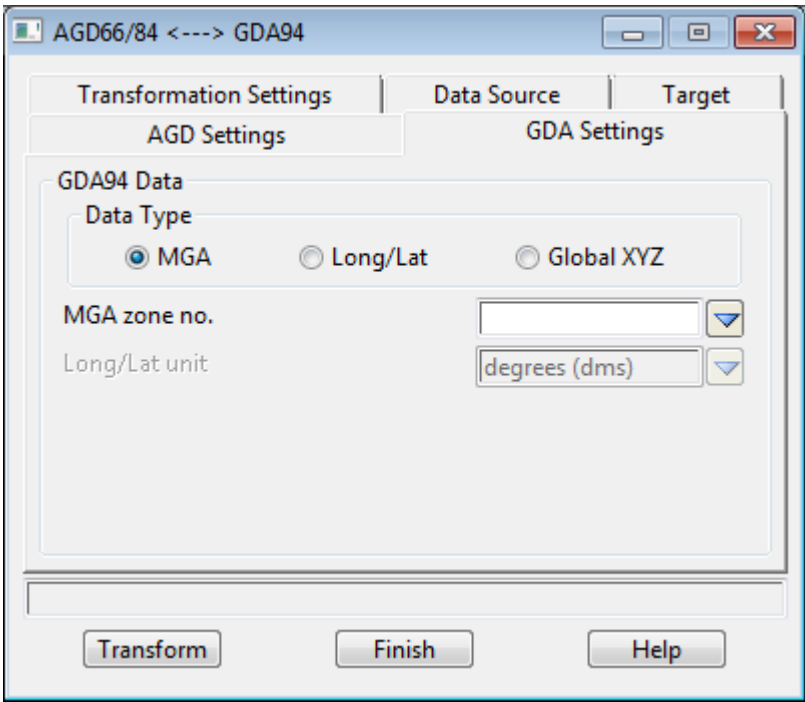
Lat/Long unit choice box degrees radians, degrees, decimal degrees

if Lat/Long was selected, the Lat-Long coords have the selected units.

ISG Zone no. choice box ISG54/2 -> ISG56/3

if ISG was selected, the ISG zone is given is this field.

GDA Settings



The fields and buttons used in this panel have the following functions.

Field Description Type Defaults Pop-Up

MGA Lat/Long Global XYZ radio button

one of the three choices is selected.

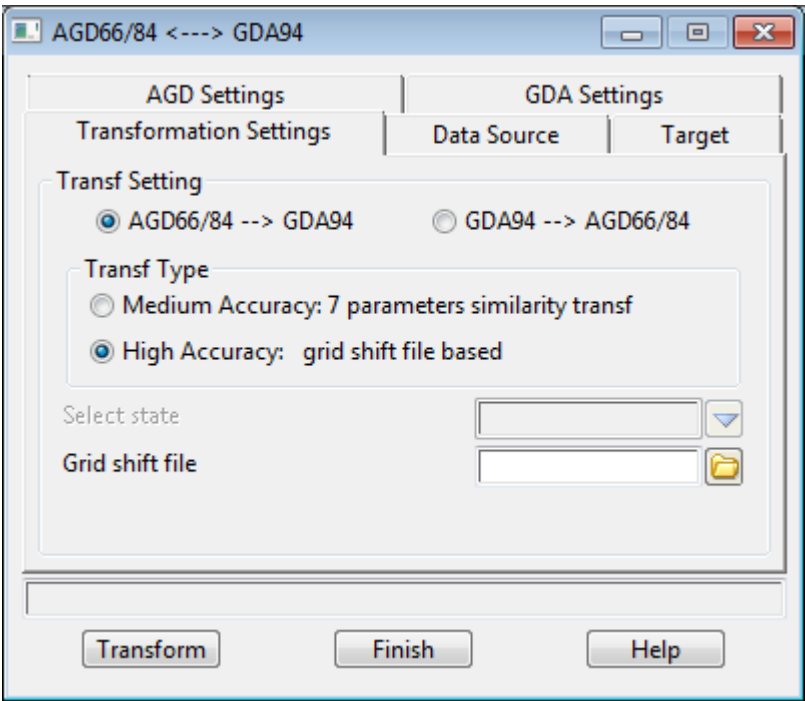
MGA Zone no. choice box 49 -> 59

if MGA was selected, the MGA zone is given is this field.

Lat/Long unit choice box degrees radians, degrees, decimal degrees

if Lat/Long was selected, the Lat-Long coordinates have the selected units.

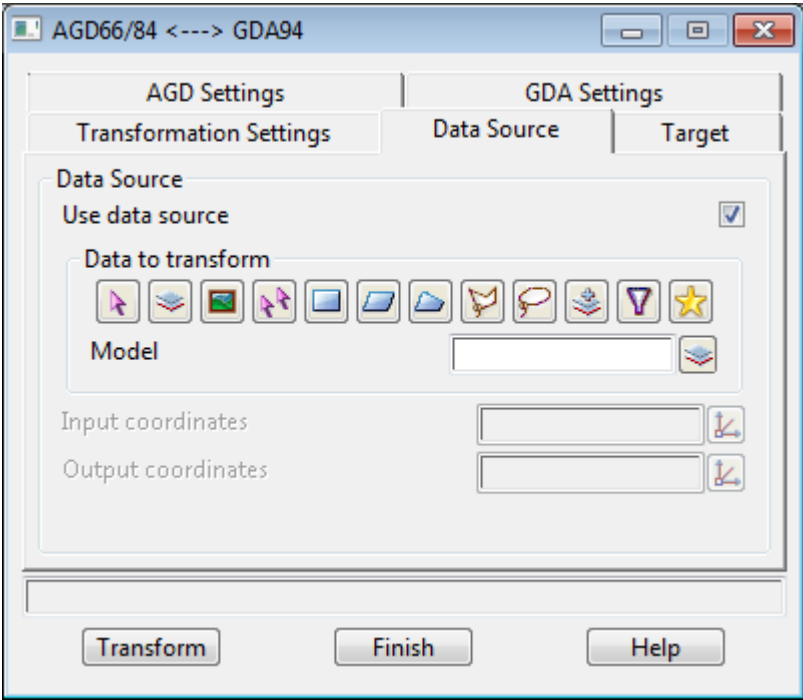
Transformation Settings



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
AGD66/84 --> GDA94	GDA94 --> AGD66/84	radio button <i>one of the two choices is selected.</i>	
Medium accuracy	radio box	tick	<i>if ticked, a seven parameter similarity transformation for the selected Australian State is used.</i>
High accuracy	radio button		<i>if ticked, the NT V2 grid shift file is used.</i>
Select State	choice box	ACT, NSW,TAS, VIC	<i>if the AGD66 datum has been selected, and the 7 parameter transformation is to be used, the seven parameter transformation parameters are different for each state. (i.e the states which adopted the AGD66 datum) By selecting the appropriate state, the corresponding values will be used.</i> <i>If the AGD84 datum has been selected, the parameters used are the australian wide values and therefore the state selection is not appropriate.</i>
Grid shift file	file box	*gsb	<i>for high accuracy, the NTv2 grid shift files can be used.</i>

Data Source



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Use data source	tick box	tick	
<i>if ticked, a data source is used to select the data to be transformed. If not ticked, a given co-ordinate is transformed.</i>			

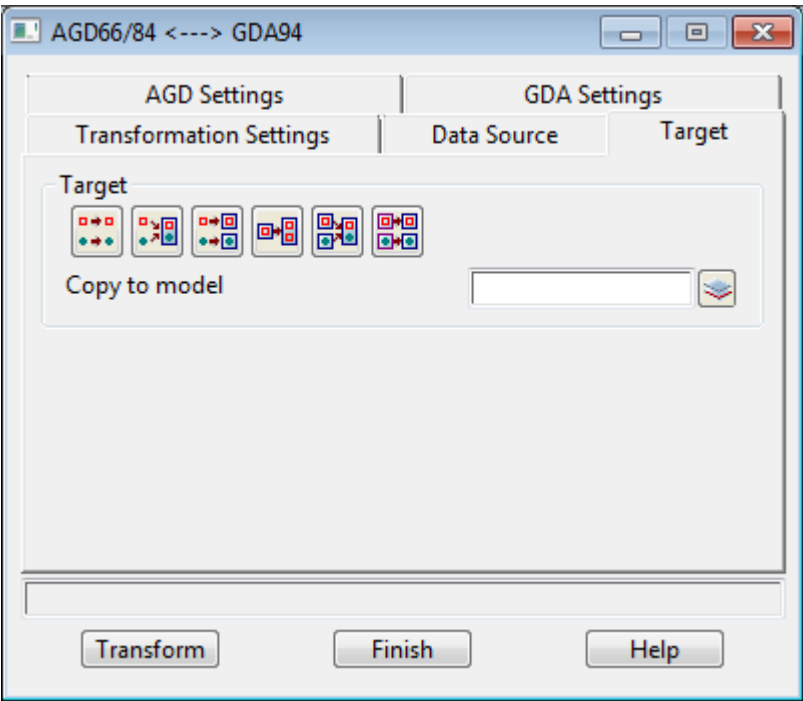
Data source	input		
<i>if use data source is ticked, the source of data to transform. The source of the data to be adjusted is selected using the data source box. For more information on the data source box see Data Source</i>			

Input coordinates	XYZ box		
<i>if use data source is not ticked, the co-ordinates in this field is transformed.</i>			

Output coordinates	XYZ box		
<i>if use data source is not ticked, the transformed co-ordinates are displayed in this field.</i>			

Transform	button		
<i>perform the transformation.</i>			

Target



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Target	target		
---------------	--------	--	--

*if use data source in the data source is ticked, the target of the transformed data should be specified
The target for the data is selected using the data target box. For more information on the data target
box see [Data Target](#)*

NZ49 <---> NZ2000

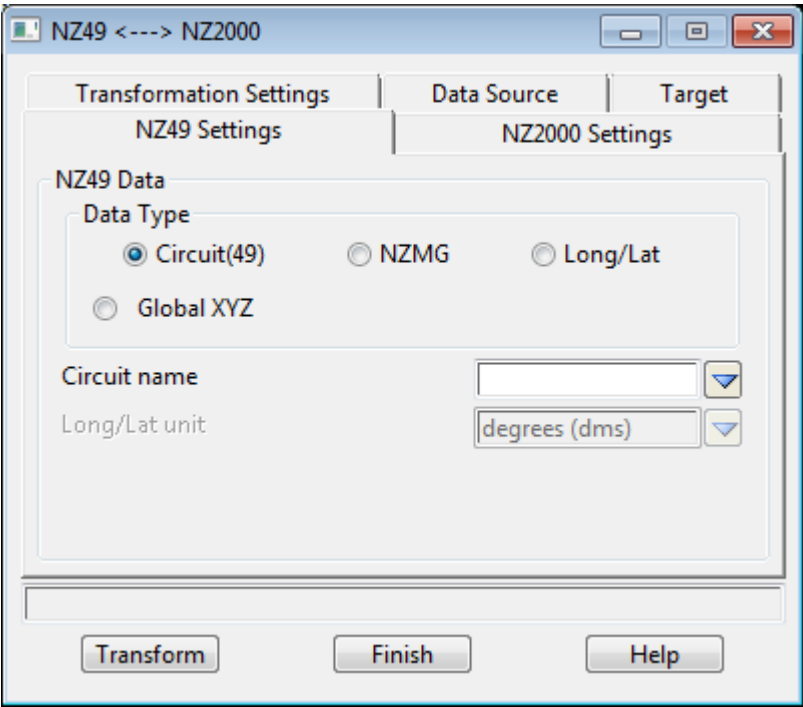
Position of option on menu: Survey =>Conversions =>NZ49 <-> NZ2000

This option converts data from the NZ 49 datum to the NZ 2000 datum and vice-versa.

The transformation between the two datums can be by either the NZ seven parameter similarity transformation or a NTv2 grid.

The data to be converted can be longitude and latitude, NZMG, circuits or Global XYZ.

Selecting NZ49<---> NZ2000 brings up the **NZ49 <---> NZ2000** panel



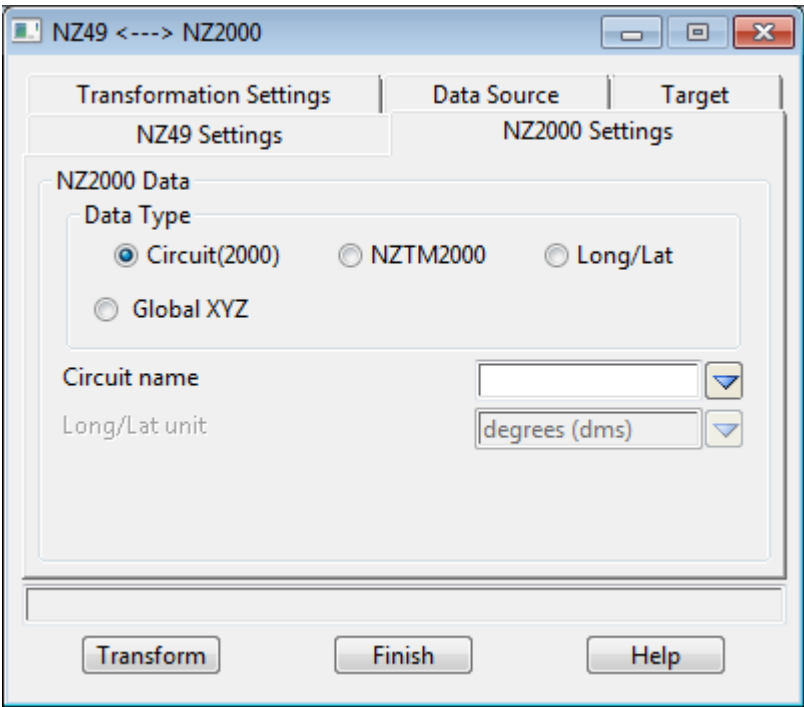
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

NZ 49 Settings

Circuit (49)	radio button		
<i>if the data in the NZ49 datum is of circuit type the circuit radio button is selected.</i>			
NZMG	radio button		
<i>if the data in the NZ49 datum is of NZMG type the radio button is selected.</i>			
Lat/Long	radio button		
<i>if the data in the NZ49 datum is of Lat/Long type the radio button is selected.</i>			
Global XYZ	radio button		
<i>if the data in the NZ49 datum is of Global XYZ type the radio button is selected.</i>			
Circuit name	choice box		All NZ 1949 circuits
<i>if Circuit (49) was selected, the specific NZ Circuit should be selected.</i>			
Lat/Long unit	choice box	degrees	radians, degrees, decimal degrees
<i>if Lat/Long was selected, the Lat-Long coords have the selected units.</i>			

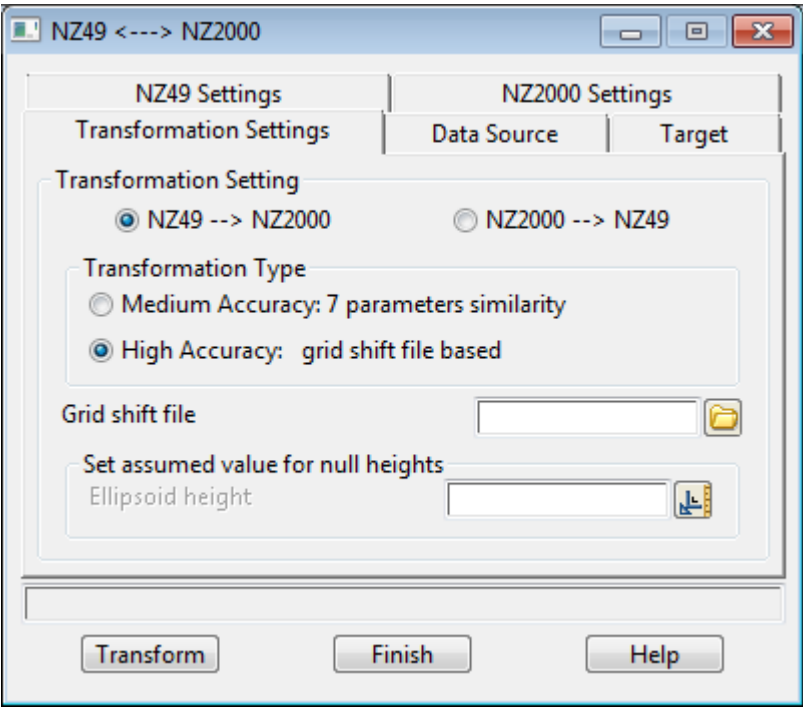
NZ 2000 Settings



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Circuit (2000)	radio button		
<i>if the data in the NZ2000 datum is of circuit type the circuit radio button is selected.</i>			
NZTM2000	radio button		
<i>if the data in the NZ2000 datum is of NZTM2000 type the radio button is selected.</i>			
Lat/Long	radio button		
<i>if the data in the NZ2000 datum is of Lat/Long type the radio button is selected.</i>			
Global XYZ	radio button		
<i>if the data in the NZ2000 datum is of Global XYZ type the radio button is selected.</i>			
Circuit name	choice box		All NZ 1949 circuits
<i>if Circuit (2000) was selected, the specific NZ Circuit should be selected.</i>			
Lat/Long unit	choice box	degrees	radians, degrees, decimal degrees
<i>if Lat/Long was selected, the Lat-Long coords have the selected units.</i>			

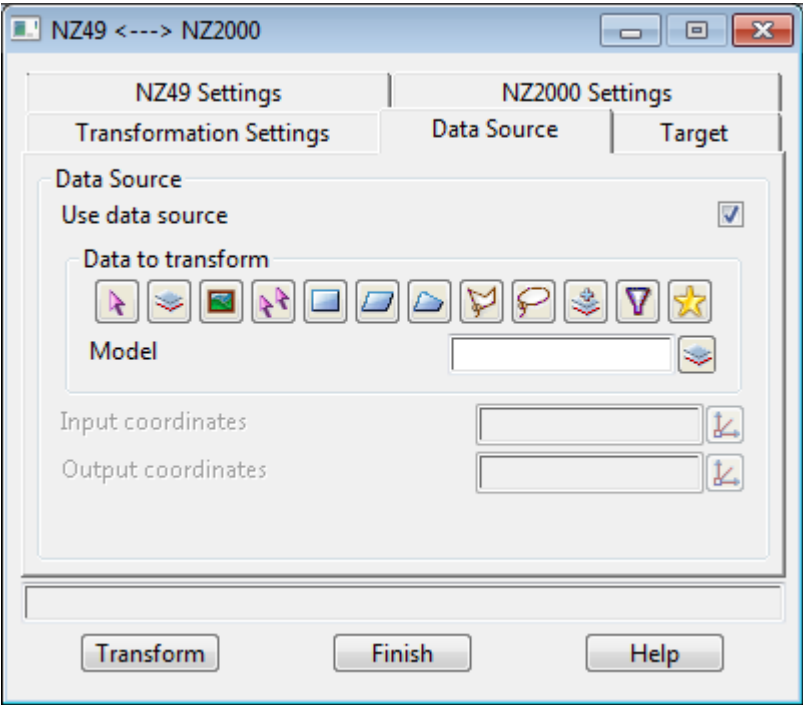
Transformation Settings



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
NZ49 --> NZ2000 NZ2000 --> NZ49	radio button		
<i>the direction of the transformation is specified by the selection of one of the two choices.</i>			
Medium accuracy	tick box	tick	
<i>if ticked, a seven parameter similarity transformation for NZ is used.</i>			
High accuracy	tick box		
<i>if ticked, the NT V2 grid shift file is used.</i>			
Grid shift file	file box		
<i>if High accuracy is ticked, a NTv2 grid shift should be selected. A single file for New Zealand can be used.</i>			
Ellipsoid Height	input box		
<i>this is only required if the data to be transformed contains null values and when</i>			
<i>1) The 7 parameter similarity transformation is used and/or</i>			
<i>2) When either the input or output types are of Global XYZ type</i>			
<i>An approximate ellipsoid level needs only to be +/- 100 m from the true value for most accuracy requirements. (An error in estimation of the ellipsoid height of a few hundred metres will introduce an error in the transformed horizontal position in the order of millimetres only).</i>			

Data Source



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
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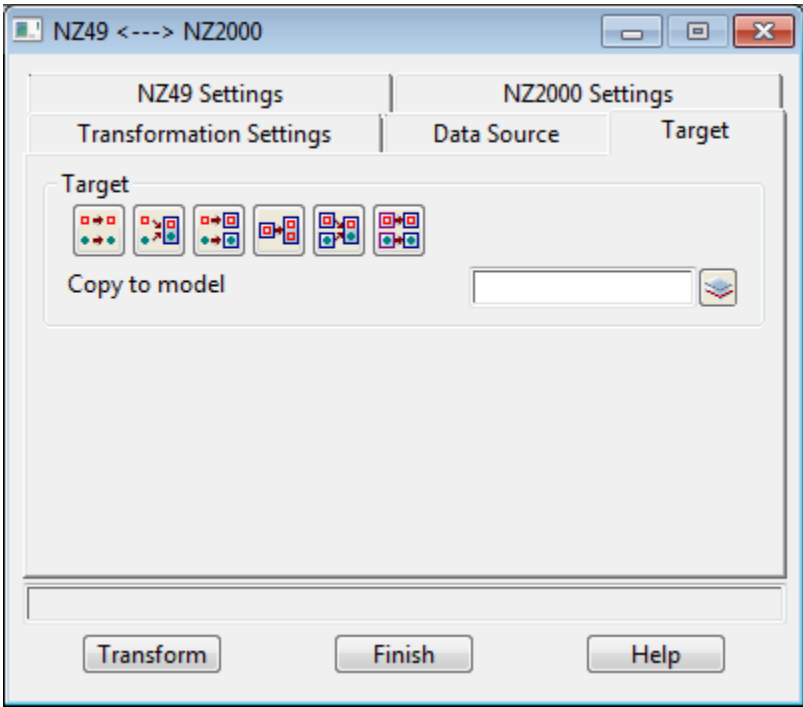
Use data source	tick box	tick	
<i>if ticked, a data source is used to select the data to be transformed. If not ticked, a given co-ordinate is transformed.</i>			

Data source	input		
<i>if use data source is ticked, the source of data to transform. The source of the data to be adjusted is selected using the data source box. For more information on the data source box see Data Source</i>			

Input coordinates	XYZ box		
<i>if use data source is not ticked, the co-ordinates in this field is transformed.</i>			

Output coordinates	XYZ box		
<i>if use data source is not ticked, the transformed co-ordinates are displayed in this field.</i>			

Target



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Target	target		
---------------	--------	--	--

*if **use data source** in the data source is ticked, the target of the transformed data should be specified. The target for the data is selected using the data target box. For more information on the data target box see [Data Target](#)*

Transform	button		
------------------	--------	--	--

perform the transformation.

General Transformations

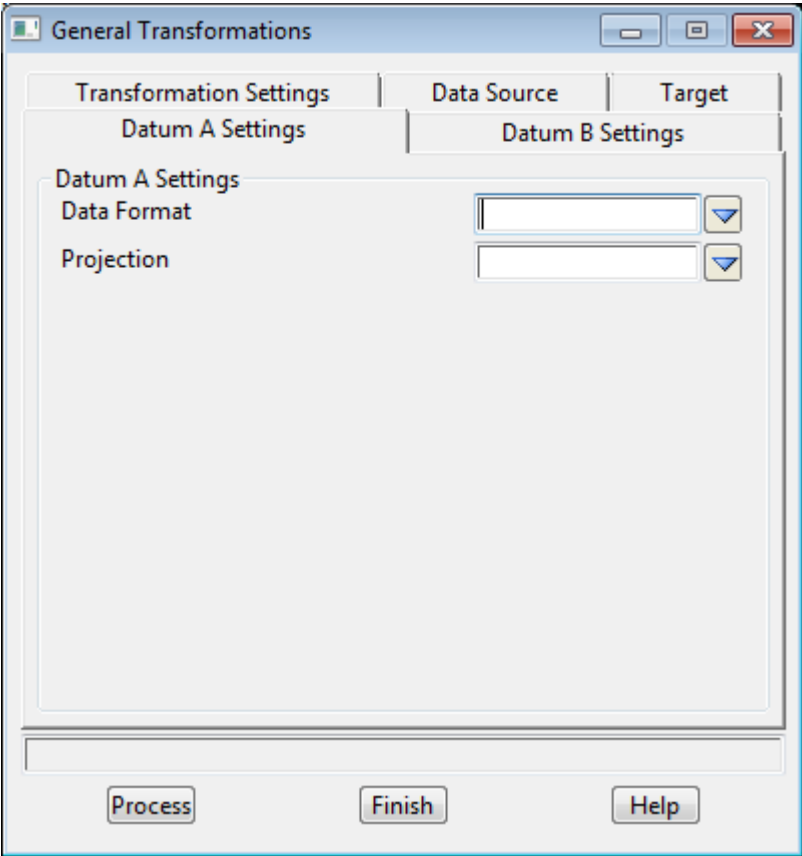
Position of option on menu: Survey =>Conversions =>General transformations

This option converts data between two datums (i.e. different ellipsoids).

The transformation between the two datums can be by either a seven parameter similarity transformation or a NTv2 grid.

The data to be converted can be longitude and latitude, a 12d supported projection (eg TM, UTM) or Global XYZ.

Selecting **General transformations** brings up the **General Transformations** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Datum A Settings, Datum B Settings

Data format	choice box		Global XYZ Easting Northing Long Lat - radians Long Lat - degrees (dms) Long Lat - decimal degrees
--------------------	------------	--	----------------------------------------------------------------------------------------------------------------

the type of data to be transformed/ transformed to.

*if **Easting, Northing**, the data is co-ordinates in the projection defined by the Projection field.*

*if **Long Lat - radians**, the data is (longitude, latitude) with the angles given in radians.*

*if **Long Lat - degrees (dms)**, the data is (long, lat) with the angles given in hp format (i.e. ddd.mmssss).*

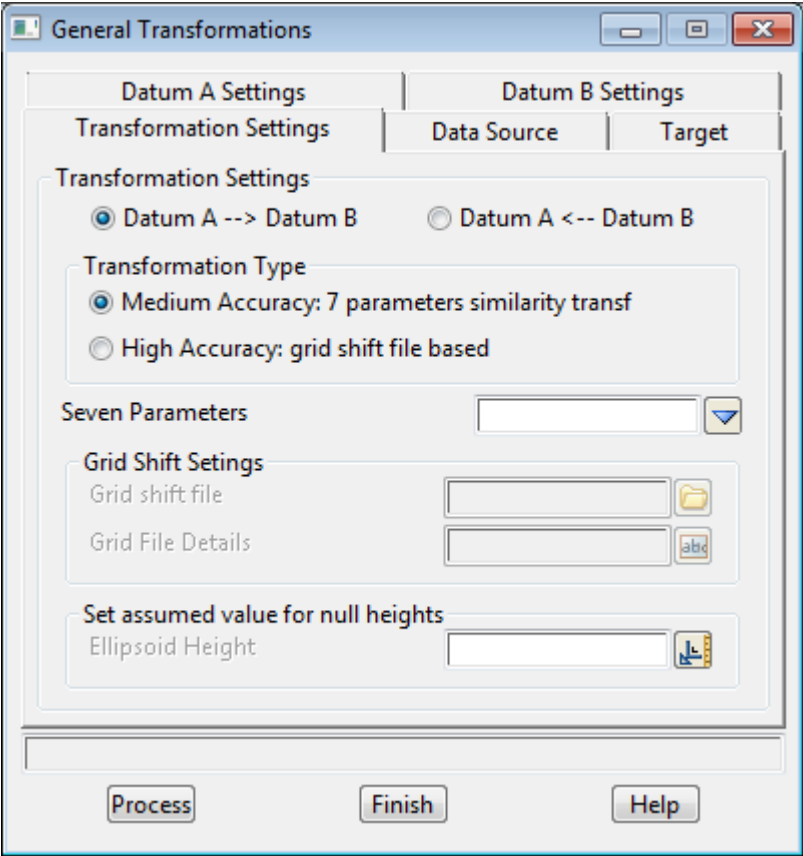
*if **Long Lat - decimal degrees**, the data is (long, lat) with the angles given decimal degrees.*

*if **Global XYZ**, the data is in the Global XYZ system.*

Projection	projection box	defined projections
-------------------	----------------	---------------------

the name of the cartographic projection that the data is in.

Transformation Settings

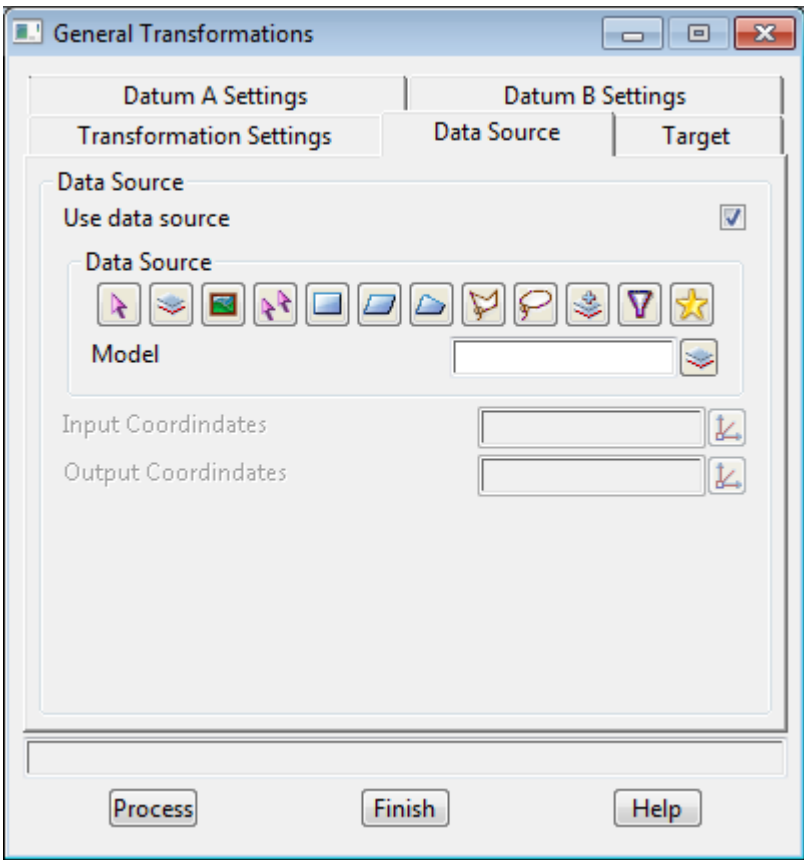


The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Datum A --> Datum B	Datum B --> Datum A	radio button	
<i>the direction of the transformation is specified by the selection of one of the two choices.</i>			
Medium accuracy	tick box	tick	
<i>if ticked, a seven parameter similarity transformation is used.</i>			
High accuracy	tick box		
<i>if ticked, a NT V2 grid shift file is used.</i>			
Seven parameters	file box		available 7 param definitions
<i>if Medium accuracy is ticked, a seven parameter similarity transformation is selected.</i>			
Grid shift file	file box		available gsb files
<i>if High accuracy is ticked, a NTv2 grid shift is selected.</i>			
Ellipsoid Height	input box		
<i>this is only required if the data to be transformed contains null values and when</i>			
<i>1) The 7 parameter similarity transformation is used and/or</i>			
<i>2) When either the input or output types are of Global XYZ type</i>			
<i>An approximate ellipsoid level needs only to be +/- 100 m from the true value for most accuracy requirements. (An error in estimation of the ellipsoid height of a few hundred metres will introduce an</i>			

error in the transformed horizontal position in the order of millimetres only).

Data Source



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use data source	tick box	tick	

if ticked, a data source is used to select the data to be transformed. If not ticked, a given co-ordinate is transformed.

Data source	input
-------------	-------

if use data source is ticked, the source of data to transform. The source of the data to be adjusted is selected using the data source box. For more information on the data source box see [Data Source](#)

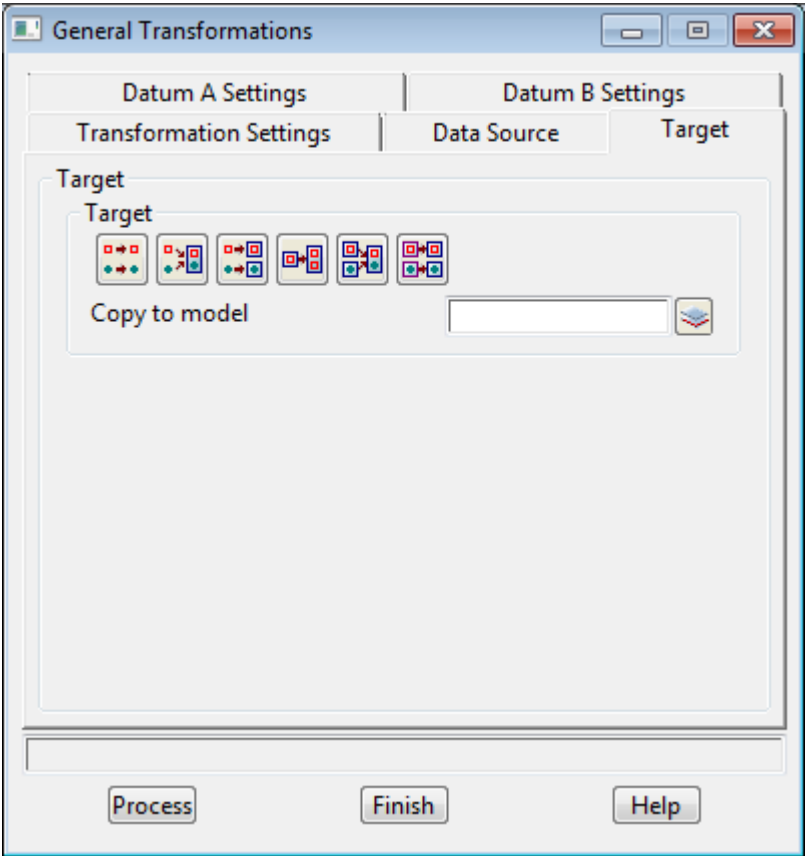
Input coordinates	XYZ box
-------------------	---------

if use data source is not ticked, the co-ordinates in this field is transformed.

Output coordinates	XYZ box
--------------------	---------

if use data source is not ticked, the transformed co-ordinates are displayed in this field.

Target



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Target	target		
<i>if use data source in the data source is ticked, the target of the transformed data should be specified. The target for the data is selected using the data target box. For more information on the data target box see Data Target</i>			
Process	button		
<i>perform the transformation.</i>			

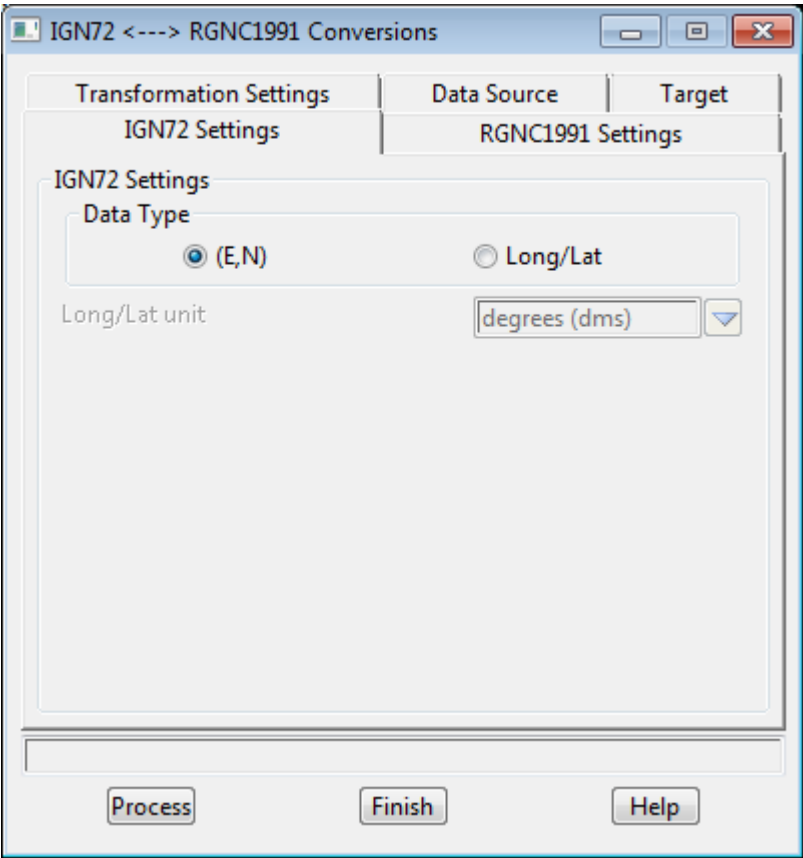
IGN72 <---> RGNC1991

Position of option on menu: Survey =>Conversions =>IGN72 <->RGNC1991

This option converts data between the old and new datums for New Caledonia.

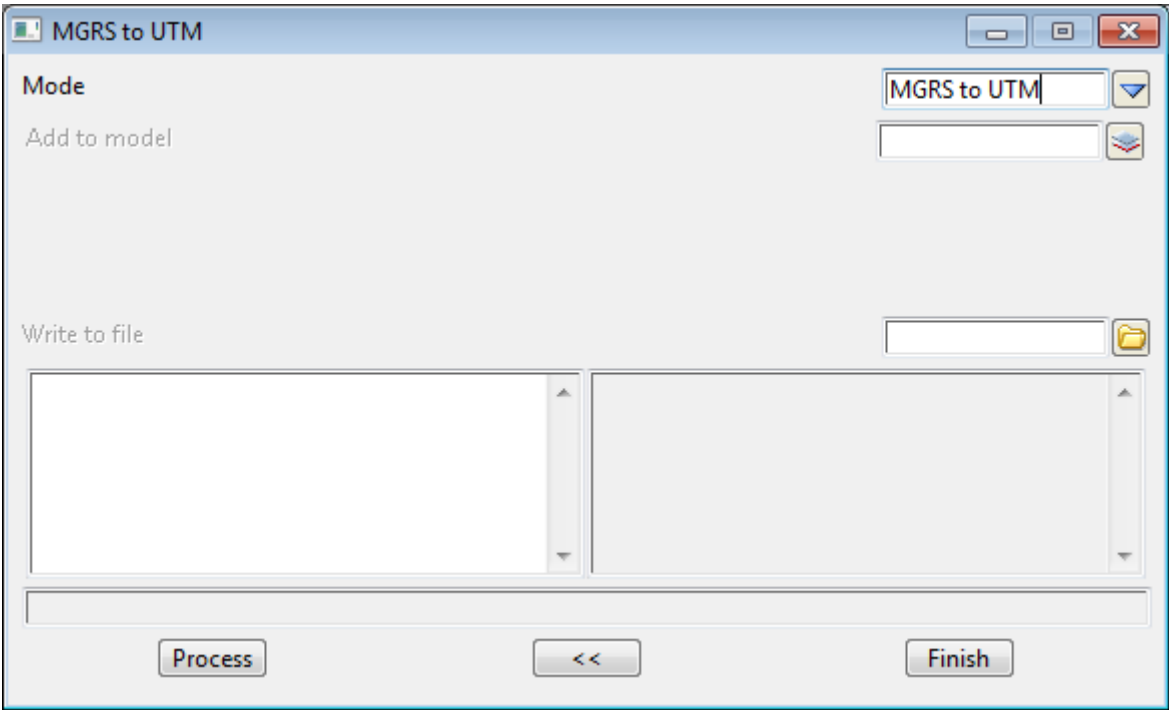
The transformation between the two datums can be by either a seven parameter similarity transformation or a NTV2 grid.

The data to be converted to/from can be (longitude, latitude) or (Easting, Northing).



MGRS <---> UTM

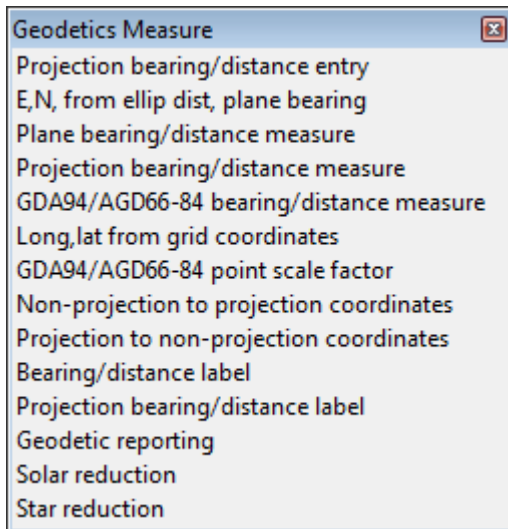
Position of option on menu: Survey =>Conversions => MGRS<->UTM



Geodetic Measures and Entry

Position of menu: Survey =>Geodetics

The Geodetics walk-right menu is



Bearing distance entry for a projection

Use ellipsoid dist, plane brg to create point

Measure bearing, distance, with user input for scale

Measure plane brg, ellip dist, given projection

Bearing dist between 2 pts for GDA/AGD

Long and lat from projection (grid) coords

Point scale factor at a grid point for GDA/AGD

Non-projection to projection coordinate conversion

Projection to non-projection coordinate conversion

Bearing distance label for selected string/segment

Projection brg-dist label for selected string/segment

Create a report based on projection coordinates

For Projection bearing /distance entry, go to
E,N calc from ellip dist, plane brg,
Plane bearing /distance measure,
Projection bearing/distance measure,
GDA94/AGD66-84 bearing/distance measure,
[Measure](#)

Long, lat from grid coordinates,
GDA94/AGD66-84 Point scale factor,
Non-projection to projection coordinates,
Projection to non-projection coordinates,
Bearing/distance label,
Projection bearing/distance label,
Geodetic reporting,
Solar reduction,
Star reduction,

[Projection Bearing/Distance Entry](#)
[E,N from Ellipsoid Distance and Plane Bearing.](#)
[Bearing and Distance](#) in the chapter [Utilities](#)
[Projection Bearing and Distance Measure](#)
[GDA94/AGD66-84 Bearing and Distance](#)

[Longitude, Latitude from Grid Coordinates](#)
[GDA94/AGD66-84 Point Scale Factor](#)
[Non-Projection to Projection Coordinates](#)
[Projection to Non-Projection Coordinates](#)
[Bearing/Distance Label](#)
[Projection Bearing/Distance Label](#)
[Geodetic Reporting](#)
[Solar Reduction](#)
[Star Reduction](#)

For more information about terminology used in these sections, see the Appendix [Geodetics Summary](#).

Projection Bearing/Distance Entry

Position of option on menu: Survey =>Geodetics =>Projection bearing/distance entry

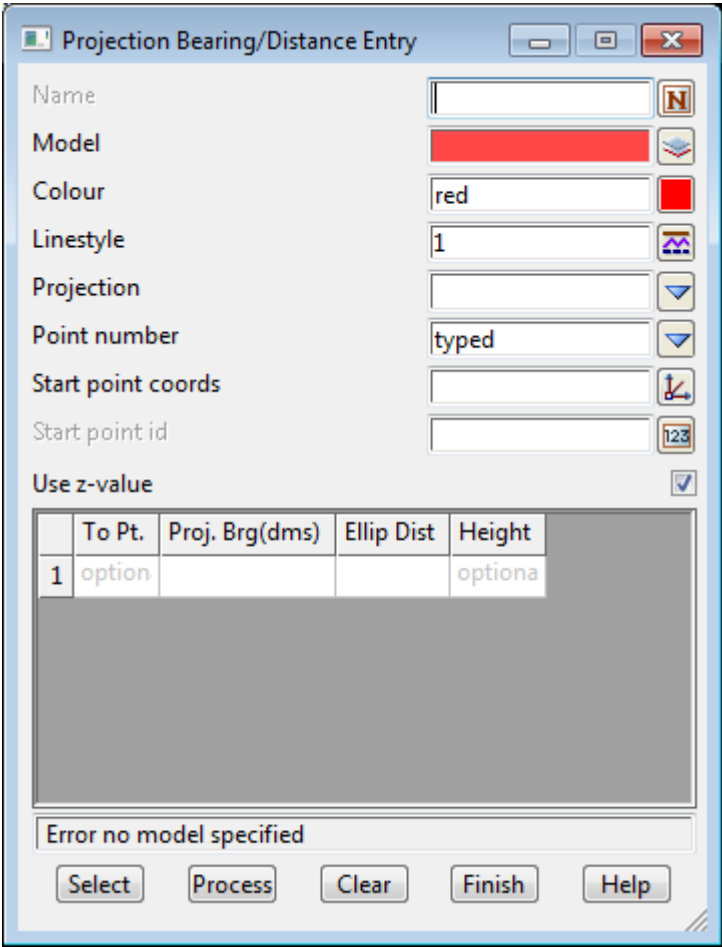
This section of documentation is a work in progress and will be updated in subsequent releases.

The **Projection bearing/distance entry** option allows the input of a traverse by manual input of projection bearings (the plane bearing) and ellipsoid distances or by selecting an existing string.

For each point, the projection co-ordinates are used with the projection bearing and ellipsoid distance from that point to calculate the projection co-ordinates for the new point taking the map

projection into account.

Selecting **Projection bearing/distance** entry brings up the **Projection Bearing/Distance Entry** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name	name box		defined names from names.4d file
<i>this field is optional. If non-blank, the name of the new string.</i>			
Model	model box		available models
<i>if non-blank, the model of the new string. If blank, the original string model is used.</i>			
Colour	colour box	red	available colours
<i>if non-blank, the colour of the new string. If blank, the original string colour is used.</i>			
Linestyle	input	1	available line styles
<i>line style of the string.</i>			
Projection	input	project projection	available projections
<i>This is the projection that is used for calculating the (Easting, Northing) values.</i>			
Point number	choice box		
Start point coords	measure box		

Use z- value tick box transit

*if **ticked**, the z-values for each point are entered.*

*If **no ticked** then z-values are not entered and are not displayed in the grid.*

Point id input typed none, auto increment, typed

*if **none**, no point ids are entered and the grid control will not show a column for point ids.*

*If **auto increment** then the values of point ids will be incremented by a value of 1 starting from the specified **Start point id**. If no **Start point id** is specified then no point ids will be allocated. No column for point ids is shown in the grid control.*

*if **typed** then the values of point ids will be incremented by a value of 1, starting from the specified **Start point id**. If no **Start point id** is specified then no point ids will be allocated unless a value is entered in the grid control on which time the next value in the grid will have a incremented value. The column for point ids is shown in the grid control.*

VALUES IN GRID grid box

*The columns shown in the grid will depend on the selection of the **Use z- value** and **Point id** fields.*

	To Pt.	Proj. Brg(dms)	Ellip Dist	Height
1				

To Pt. input

*if **none** is selected for the **Point id** field, this column will not be displayed.*

*if **auto increment** is selected for the **Point id** field, this column will not be displayed.*

*if **typed** is selected for the **Point id** field, this column will be displayed. In this case, the point id will increment automatically by entering over the field. If a new value is typed into the To Pt. field, the next line will increment from that number.*

Proj.Brg angle box

The user should enter the projection bearing for the segment into this field. The projection bearing can be defined as the bearing resulting from plane geometry calculations between the two projection coordinates. This is sometimes called the grid bearing in some countries (e.g. New Zealand) and the plane bearing in others such as Australia as defined in the GDA technical manual (ICSM)).

Ellip Dist input box

the user should enter the ellipsoid distance. This distance is the measured horizontal distance that has been reduced onto the ellipsoid taking into account the heights above the ellipsoid at each end of the measured line. This reduction may be by the use of a height scale factor for example. Distances that are measured near mean sea level approximate the ellipsoid distance (since the MSL approximates the ellipsoid in many reference ellipsoids (eg AGD)). The amount of correction will be dependant on the length of line, the heights above the ellipsoid and the reference ellipsoid being used.

Height input box

*This column will only be visible in the grid if the **Use z- value** tickbox has been ticked. The user should enter the height of the point. This value will not be used for calculation of the segment. It will simply be assigned to the newly created vertex.*

Select button

on pressing the select button, a user is able to pick an existing string from the current view. If a non-traverse type string is selected an option to convert it to a traverse string will be given. The grid control will be filled with the relevant information for the traverse string.

If a traverse string has been modified by some other process (e.g. move) an option will be given to adopt the new characteristics of the string as displayed or revert back to the information that originally defined the traverse string. Depending on which option is selected, the grid will be filled with the relevant information.

Process button

changes to the traverse can be made in the grid control for lines already defined. For example, a distance entry may be incorrectly typed in and edited some time later. By using the process button the traverse string is re-calculated using the current values in the grid control.

E,N from Ellipsoid Distance and Plane Bearing

Position of option on menu: Survey =>Geodetics =>E,N from ellip dist, plane bearing

The E,N calc from ellip dist, plane brg option allows users to calculate projection coordinates given the projection, start coordinate, plane bearing and ellipsoid distance. The results are given inside the panel.

On selecting the E,N calc from ellip dist, plane brg option, the Projection Coords from plane brg and ellipsoid dist panel is displayed.

Projection Coords From Plane Brg And Ellipsoid Dist

Projection selection
Projection

Start coordinates
Easting
Northing
Select Pt

Bearing/Dist obs
Plane bearing
Ellipsoid dist

Reduced coordinates
Easting
Northing

Process Clear Finish Help

Enter calculation parameters

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Projection selection			
Projection	choice box	current projection	available projections
the projection of the data to be used.			

Start coordinates

Select Pt button

if the point exists in a view, the coordinate can be entered by selecting the button and then on the required point. The selected points coordinates will be returned to the relevant coordinate boxes.

Ellipsoid distance	input
<i>the ellipsoid distance of the line from the nominated start coordinate</i>	

Northing input
the calculated northing value of the 2nd point.

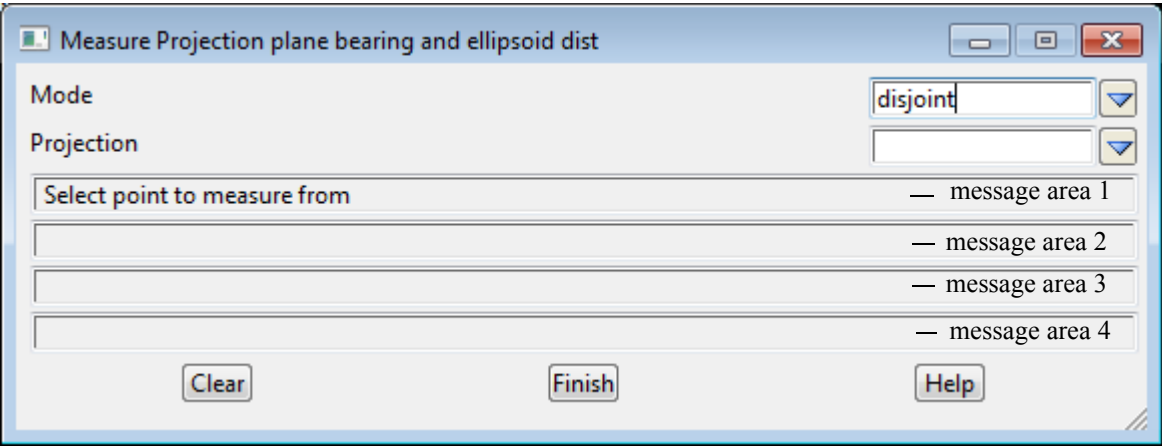
Clear button
clear the input fields

Position of option on menu: Survey =>Geodetics =>Plane bearing/distance measure

Measures the plane angle and plane distance between two selected points.

This option has already been documented in the section [Bearing and Distance](#) in the chapter [Utilities](#).

On selecting the **Projection bearing and dist** option, the **Measure Projection Plane bearing and ellipsoid dist** panel is displayed.



This panel is principally used to display the distances between, and bearing of the line joining, pairs of user selected points.

- message area 1: point selection comment
- message area 2: $dx =$ $dy =$
- message area 3: plane brg = plane dist = ellipsoid dist =
- message area 4: t-T fwd = t-T rev = l.s.f =

where dx is the x coordinate difference between the points, dy is the y coordinate difference between the points

plane brg is the angle measured clockwise from north and is calculated using the coordinate values (Inverse value)

plane dist is the distance calculated using the coordinate values (Inverse value)

ellipsoid dist is the ellipsoid distance calculated using the specified projection and coordinate values.

t-T fwd is the forward arc-to chord correction.

t-T rev is the reverse arc-to chord correction.

l.s.f is the line scale factor. It is calculated by plane distance/ellipsoid distance.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Mode	input	disjoint	disjoint, continuous
<i>In disjoint mode, only the distance between the two points and the bearing (in degrees, minutes and seconds) of the (imaginary) line connecting the two points are displayed.</i>			
<i>In continuous mode, after the initial reporting of the bearing/distance, the user is prompted to select the next point(2nd point). In this case the previously selected second point becomes the first point.</i>			
Projection	choice	current projection	available projections
<i>the projection of the data to be used.</i>			
Clear	button		
<i>when this button is selected, the selection sequence is re-initialised.</i>			

GDA94/AGD66-84 Bearing and Distance Measure

Position of option on menu: Survey =>Geodetics =>GDA94/AGD66-84 bearing/distance measure

The **Bearing and distance (GDA94/AGD66-84)** is specifically for Australian use. It allows users to select two AMG/MGA coordinates and return the calculated geodetic parameters.

On selecting the **Bearing and distance (GDA94/AGD66-84)** option, the **Bearing and distance (GDA94/AGD66-84)** panel is displayed.

Measure bearing and distance (GDA94/AGD66-84)

Mode

disjoint

Datum

GDA94

Zone

N level determination for non-ellipsoid heights (AHD)

Select N value setting

N value interpolation method

Input N values

1st pt N value

2nd pt N value

Select point to measure from

Clear

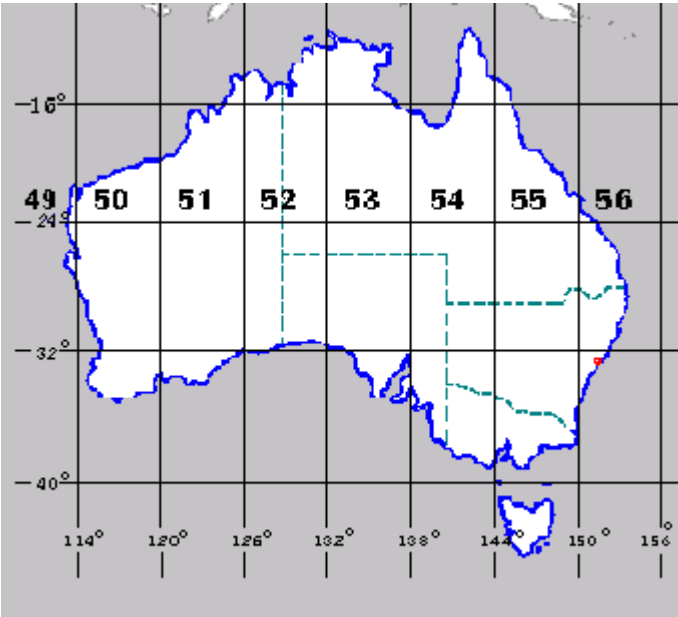
Finish

Help

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Mode	input	disjoint	disjoint, continuous
<i>In disjoint mode, the geodetic parameters between the two points are displayed. After the first calculation, further selections must include both the first and second points.</i>			
<i>In continuous mode, after the initial reporting of the values, the user is prompted to select the next point(2nd point). In this case the previously selected second point becomes the first point.</i>			
Datum	choice	current projection	AGD66/84 GDA94
<i>the datum of the data to be used.</i>			

|



Zone	choice	current zone	49
			50
			51
			52
			53
			54
			55
			56
			57
			58
			59

the zone of the data to be used.

Select N value setting radio button selected
if the data has non-ellipsoid heights then a conversion to ellipsoid heights is available using a method defined in the N value interpolation method choice box.

Note: The ellipsoid height is required to calculate the values. However most level datums, such as AHD approximate geoid heights. Therefore, one of the selected points should at least have a non-null value and a means for computing a ellipsoid height. If one point has a valid height and the other does not, an option will be given to assume the other point has the same value.

Various options of converting non-ellipsoid geoid heights to ellipsoid are given by the N value interpolation method choice box or the user can enter N values for the first and second points.

N value interpolation method choice box currently set method Available n value methods
the N value method allows the conversion of non-ellipsoid heights to ellipsoid. The methods are define d in the project n value settings. For more information on the n value settings see the section [N values](#)

The N value will be used to convert a geoid height (e.g. AHD) into an ellipsoid height. Ellipsoid height = geoid height + N value. The conversion is used for the calculation only. The original z value for the point will remain unchanged

Input N values radio button unselected

if an *N* value is known for the area or for the selected points, it will be used to convert a geoid height (e.g. AHD) into an ellipsoid height. Ellipsoid height = geoid height + *N* value. The conversion is used for the calculation only. The original *z* value for the point will remain unchanged

1st pt N value input box
if the Input *N* value option is chosen, an *N* value is entered for the first point.

2nd pt N value input box
if the Input *N* value option is chosen, an *N* value is entered for the second point.

How to Use the Panel and Panel Messages

The results are returned to the panel in the following format:

message area 1	Messages
message area 2	plane brg =, plane dist, dx =, dy =
message area 3	grid brg =, ellipsoid dist =, line scale factor =
message area 4	Mean height factor =, (Plane dist/level terrain dist) scale factor =
message area 5	Mean level terrain distance =

Note: Mean height factor is the factor to apply to a measured horizontal distance (usually measured at a height above or below the ellipsoid) to reduce it down to an ellipsoid distance. The other geodetic values and terminology are clearly defined in the GDA technical manual. See <http://www.anzlic.org.au/icsm/gdatm/>

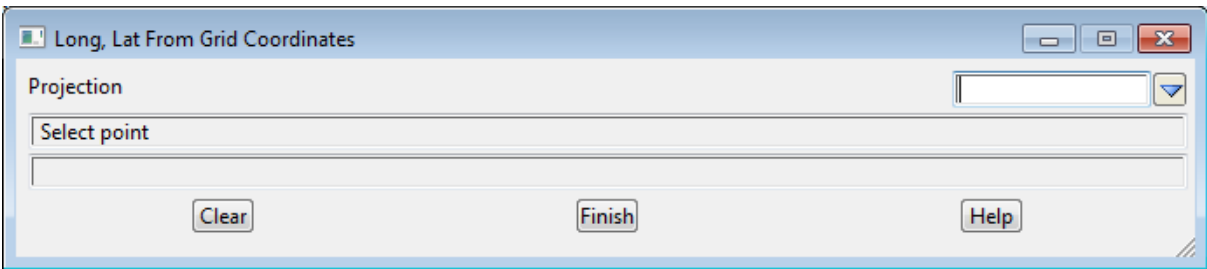
The cycle can then be repeated for another point by simply selecting another point without leaving the option. The **clear** button resets the message areas.

Longitude, Latitude from Grid Coordinates

Position of option on menu: Survey =>Geodetics =>Long, lat from grid coordinates

The **Longitude, latitude from grid coordinates** option allows a user to calculate Longitude, latitude and convergence of a point, given a projection and selection of a grid coordinate.

On selecting the **Longitude, latitude from grid coordinates** option, the **Longitude, latitude from grid coordinates** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Projection	choice	current projection	available projections
the projection of the data to be used.			

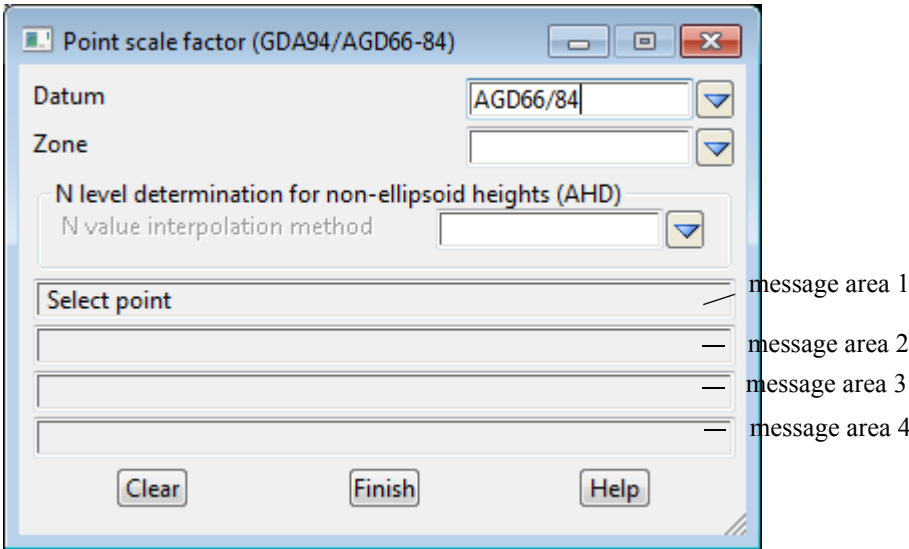
The cycle can then be repeated for another point by simply selecting another point without leaving the option. The **clear** button resets the message areas.

GDA94/AGD66-84 Point Scale Factor

Position of option on menu: Survey =>Geodetics =>GDA94/AGD66-84 point scale factor

The Point scale factor (GDA94/AGD66-84) is specifically for Australian use. It allows users to select AMG/MGA coordinates and return the point scale factor and latitude and longitude of the point.

On selecting the Point scale factor (GDA94/AGD66-84) option, the Point scale factor (GDA94/AGD66-84) panel is displayed.

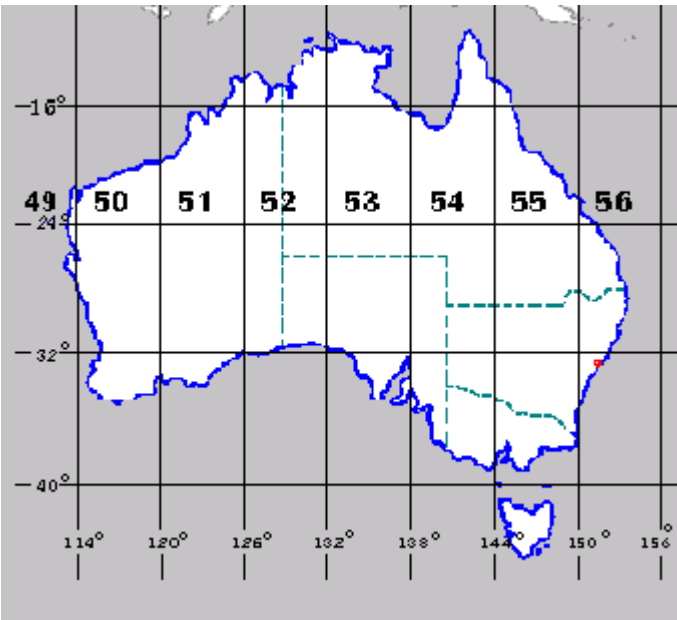


The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Datum	choice	current projection	AGD66/84 GDA94

the datum of the data to be used.

|



Zone	choice	current zone	49
			50
			51
			52
			53
			54
			55
			56
			57
			58
			59

the zone of the data to be used.

Note: The ellipsoid height is required to calculate the point scale factor. However most level datums, such as the AHD approximate geoid heights. Therefore, selected points should at least have a non-null value and a means for computing a ellipsoid height. Various options of converting non-ellipsoid geoid heights to ellipsoid are given.

Select N value setting

radio button selected

if the data has non-ellipsoid heights then a conversion to ellipsoid heights is available using a method defined in the **N value interpolation method choice box**.

N value interpolation method choice box currently set method Available n value methods

the N value method allows the conversion of non-ellipsoid heights to ellipsoid. The methods are define d in the project n value settings. For more information on the n value settings see the section [N values](#)

The N value will be used to convert a geoid height (e.g. AHD) into an ellipsoid height. Ellipsoid height = geoid height + N value. The conversion is used for the calculation only. The original z value for the point will remain unchanged

Input N value radio button unselected

if an N value is known for the area or for the selected point, it will be used to convert a geoid height (e.g. AHD) into an ellipsoid height. Ellipsoid height = geoid height + N value. The conversion is used for the calculation only. The original z value for the point will remain unchanged

Enter N value input box

if the Input N value option is chosen, an N value is entered.

How to Use the Panel and Panel Messages

The results are returned to the panel in the following format:

message area 1	Messages
message area 2	Point scale = , Interpolated or entered N value = (if applicable)
measure area 3	Combined point scale/height factor =
message area 4	Longitude = Latitude =

The cycle can then be repeated for another point by simply selecting another point without leaving the option. The **clear** button resets the message areas.

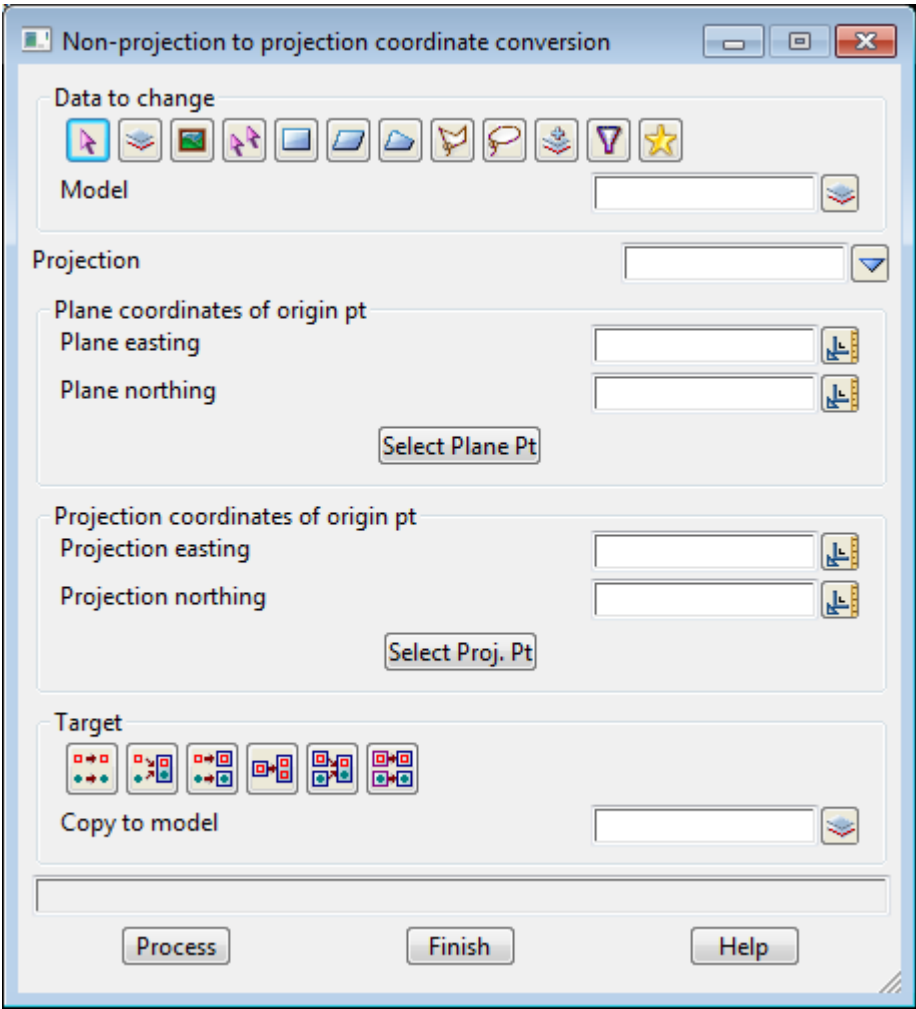
Non-Projection to Projection Coordinates

Position of option on menu: Survey =>Geodetics =>Non-projection to projection coordinate conversion

The **Non-projection to projection coordinate conversion** is for the conversion of non-projection coordinates (plane) to a specified projection system. This is done by calculating a series of vectors from an origin point. The origin coordinates in both the plane and projection are known. The plane vector is calculated between the origin and other selected points. Then using the projection coordinates of the origin and the plane vector a projection vector is calculated which allows the projection coordinates of the selected points to be calculated. **The azimuth orientation should be the same in both systems, i.e. no swing should be required.**

The process will convert the vertex of straight segments very effectively. However, care should be taken when trying to convert non-linear segments such as curves. These may have construction entities such as TP's that no longer have the same relationship with a centre point after conversion for example. This is due to differing scale factors of points due to the projection.

On selecting the Non-projection to projection coordinates option, the Non-projection to projection coordinate conversion panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data to change	source box	model	
<i>the source of objects to be converted are selected using the data source box. For more information on the data source box see Data Source</i>			
Projection	projection box	current projection	available projections

the projection to which the data is to be converted to is specified in the projection box.

Plane easting input box

the plane easting value of the origin point.

Plane northing input box

the plane northing value of the origin point.

Select Plane Pt button

selection of the button allows the point to be picked from a view. The user selects and accepts the point and then the values are placed into the relevant input boxes.

Projection easting input box

the projection easting value of the origin point.

Projection northing input box

the projection northing value of the origin point.

Select Projection Pt button

selection of the button allows the point to be picked from a view. The user selects and accepts the point and then the values are placed into the relevant input boxes.

Target target

the target of the transformed data should be specified. The target for the data is selected using the data target box. For more information on the data target box see [Data Target](#)

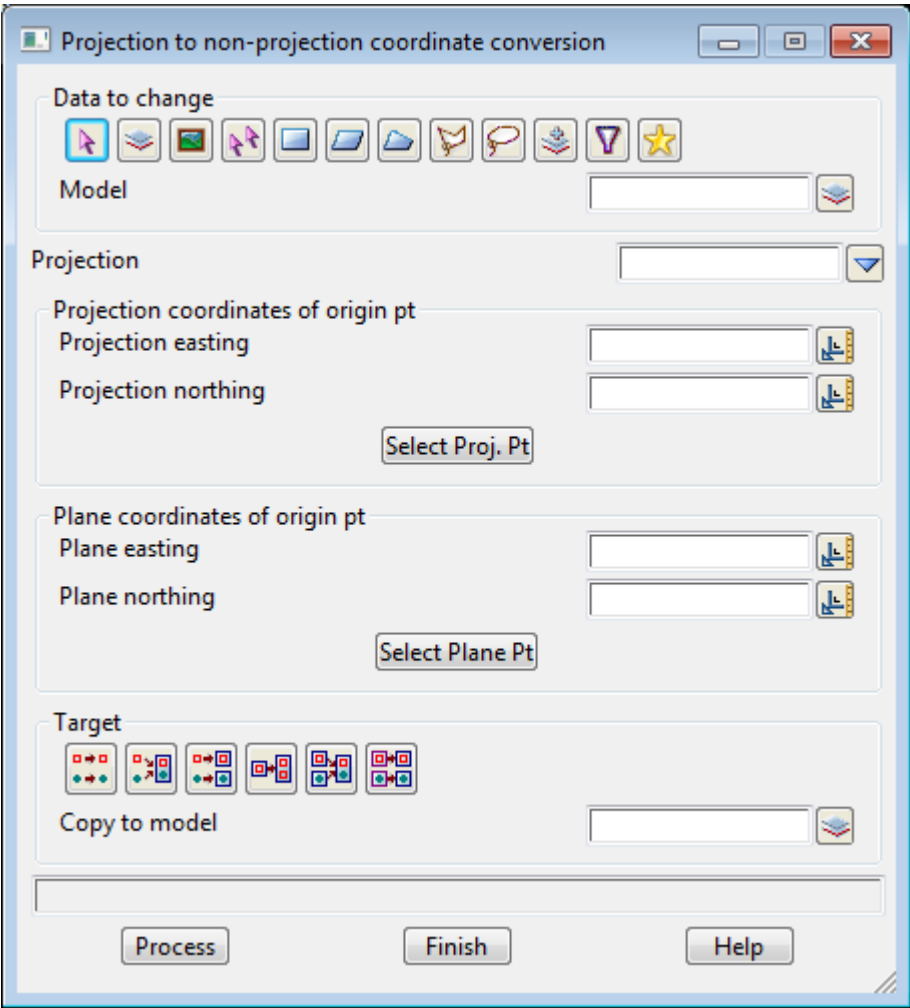
Projection to Non-Projection Coordinates

Position of option on menu: Survey => Geodetics => Projection to non-projection coordinate conversion

The **Projection to non-projection coordinate conversion** is for the conversion of projection coordinates to plane coordinates. This is done by calculating a series of vectors from an origin point. The origin coordinates in both the plane and projection are known. The projection vector is calculated between the origin and other selected points. Then using the plane coordinates of the origin and the projection vector a plane vector is calculated which allows the projection coordinates of the selected points to be calculated. **The azimuth orientation should be the same in both systems, i.e. no swing should be required.**

The process will convert the vertex of straight segments very effectively. However, care should be taken when trying to convert non-linear segments such as curves. These may have construction entities such as TP's that no longer have the same relationship with a centre point after conversion for example. This is due to differing scale factors of points due to the projection.

On selecting the **Projection to non-projection coordinates** option, the **Projection to non-projection coordinate conversion** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data to change	source box	model	
<i>the source of objects to be converted are selected using the data source box. For more information on the data source box see Data Source</i>			
Projection	choice box	current projection	available projections
<i>the projection to which the data is to be converted from is specified in the projection box.</i>			
Projection easting	input box		
<i>the projection easting value of the origin point.</i>			
Projection northing	input box		
<i>the projection northing value of the origin point.</i>			
Select Proj. Pt	button		
<i>selection of the button allows the point to be picked from a view. The user selects and accepts the point and then the values are placed into the relevant input boxes.</i>			
Plane easting	input box		
<i>the plane easting value of the origin point.</i>			

Plane northing input box

the plane northing value of the origin point.

Select Plane Pt button

selection of the button allows the point to be picked from a view. The user selects and accepts the point and then the values are placed into the relevant input boxes.

Target target

the target of the transformed data should be specified. The target for the data is selected using the data target box. For more information on the data target box see [Data Target](#).

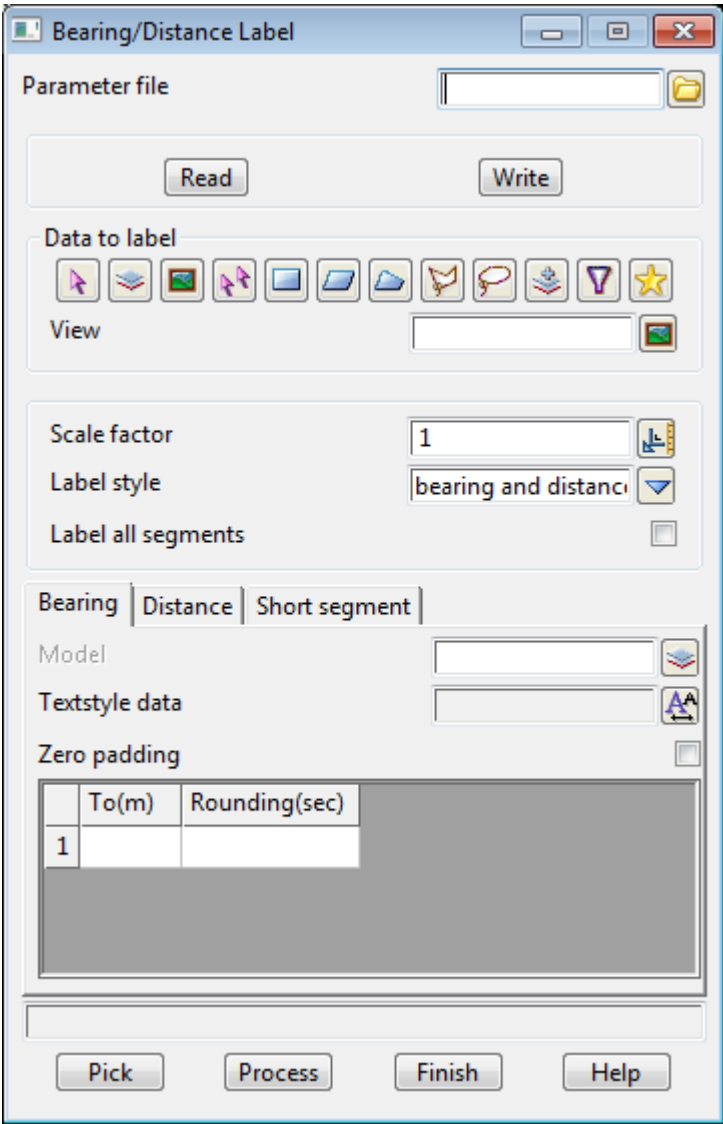
Bearing/Distance Label

Position of option on menu: Survey =>Geodetics => Bearing/distance label

The Bearing/distance label is for the labelling of a selected string with bearing and distance information. It allows a parameter file to be setup (*.lbf) which can be written and read into the option. This file allows the setting of panel parameters such as rounding, textstyle data etc.

The pick should be with direction. This will effect the bearing that is labelled (+/-180 degrees).

On selecting the Bearing/distance label option, the **Bearing/distance label** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Parameter file	file box		*.lbf files

the parameter file can be read in which will fill in the remaining values within the panel. The user can make changes and save the choices as a different file, thus enabling a library of labelling options to be created.

Read	button
-------------	--------

if a valid parameter file is entered into the parameter file field, the user can press the read button to load the information in the file into the panel.

Write button

if a valid parameter file name is entered into the parameter file field, the user can press the write button to save the edited panel information into a file so that it can be read in at a later date.

Scale factor input box Current Scale factor at Central meridian if set

if a scale factor is specified, the distance values labelled will use the scale factor to compute the label distance. This scale factor will be applied to the calculated plane distance from coordinates in the following manner:

label distance = plane distance /scale factor.

Label style choice box bearing and distancebearing and distance
bearing distance
distance bearing

the label style.

Bearing and distance equates to having the bearing and distance justification point at the same point on the midpoint of the segment (the text justification can make the bearing bottom-middle and the distance top-middle for example to show the bearing above the line and the distance below)

Bearing distance equates to having the bearing and distance justification point along side. For example, a label may be a bearing on the left and a distance on the right

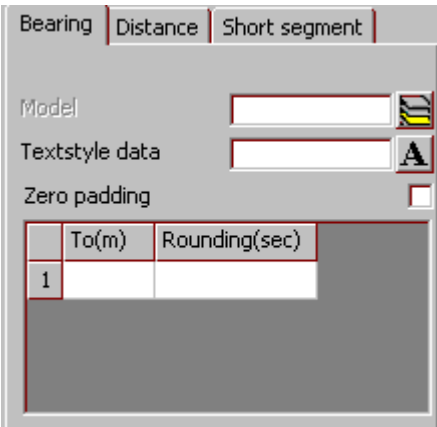
Distance bearing equates to having the distance and bearing justification point along side. For example, a label may be a distance on the left and a bearing on the right

Label all segments tick box unticked

if ticked all the segments of the selected string will be labelled.

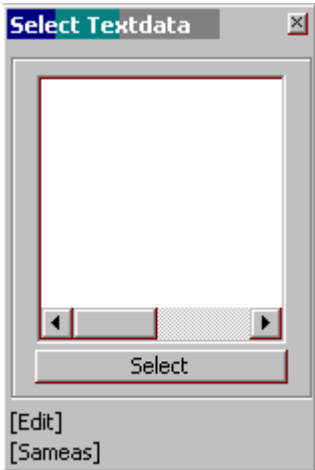
Bearing tab

the following fields are located on the bearing tab.

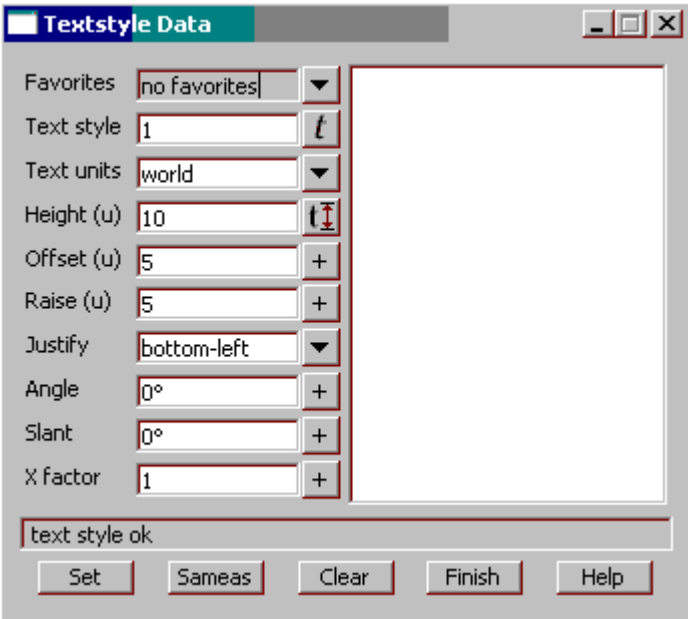


Field Description	Type	Defaults	Pop-Up
Model	model box		current models
if a valid model name is specified, the bearing text will be created in that model.			
Textstyle data	textstyle box		current textstyle names
on pressing the textstyle data button a list of available txtdata predefined names read from the			

texstyles_name.4d file are displayed.



If no names exist, the user can edit the current settings by selecting the edit button and bring up the **textstyle data** panel. This allows for definition of textstyle, units, height offset raise etc.



The textstyle data panel enables the user to define multiple text parameters.

Zero padding tick box unticked

if ticked, the labels will have zero's inserted so that at least 2 characters exist for the minutes and second part of the label. For example, A bearing of 10° 6' 5" would become 10° 06' 05" with padding.

The values in the grid relate to the rounding of bearings for labelling. Many different ranges can be specified in the grid with each line representing a valid rounding range.

To(m) input box

the rounding upper range limit in meters. This value together with the rounding specified, allow the bearings between certain distance ranges to be rounded to a certain value. The first line in the grid is from 0 to the specified distance range. Any following lines in the grid use the **To(m)** value in the previous line for the lower limit to the **To(m)** value in that line.

Rounding (sec) input box

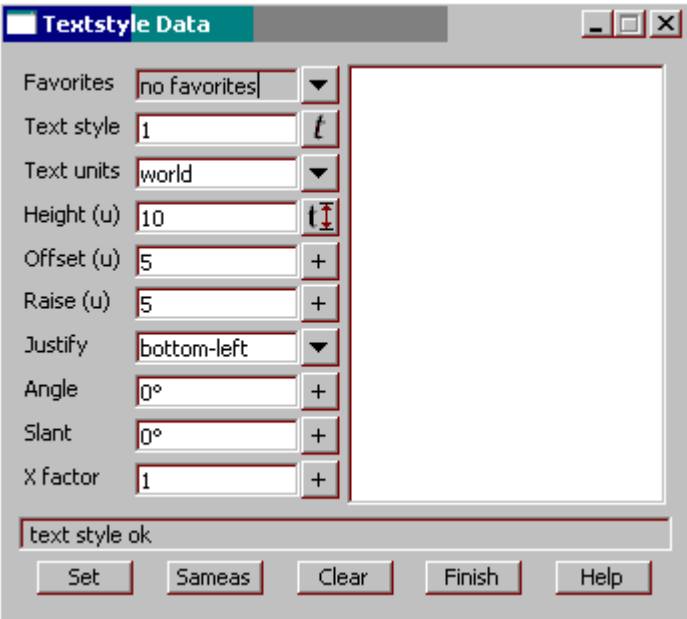
the rounding value given relates to the distance range. Any bearing within the distance range specified will be rounded to the value in seconds. e.g for a rounding value of 60 seconds the bearing will be rounded to the nearest minute.

Distance tab

the following fields are located on the distance tab.

Field Description	Type	Defaults	Pop-Up
Model	model box		current models
<i>if a valid model name is specified, the distance text will be created in that model.</i>			
Textstyle data	textstyle box		current textstyle names
<i>on pressing the textstyle data button a list of available textdata predefined names read from the <code>textstyles_name.4d</code> file are displayed.</i>			

*If no names exist, the user can edit the current settings by selecting the edit button and bring up the **textstyle data** panel. This allows for definition of textstyle, units, height offset raise etc.*



The textstyle data panel enables the user to define multiple text parameters.

Suffix input box

if entered, this suffix will be appended to the end of the distance label.

The values in the grid relate to the rounding of distances for labelling. Many different ranges can be specified in the grid with each line representing a valid rounding range.

To(m) input box

*the rounding upper range limit in meters. This value together with the rounding and number of decimals specified, allow the distance to be rounded to a certain value. The first line in the grid is from 0 to the specified distance range. Any following lines in the grid use the **To(m)** value in the previous line for the lower limit to the **To(m)** value in that line.*

Rounding (m) input box

the rounding value given relates to the distance range. Any distance within the distance range specified will be rounded to the value in metres. e.g for a rounding value of 0.05 a distance of 125.261 will be rounded to a value of 125.25

Decimals input box

the number of decimal places can be specified. For a distance of 125.261, rounding of 0.05 and Decimals equal to 3, the label will be 125.250.

Short segment tab

the following fields are located on the short segment tab.

Bearing

Distance

Short segment

Model

Textstyle data

Max. length

Number

A

+

+

Field Description	Type	Defaults	Pop-Up
Model	model box		current models
<i>if a valid model name is specified, the short segment text will be created in that model.</i>			
Textstyle data	textstyle box		current textstyle names
<i>on pressing the textstyle data button a list of available textdata predefined names read from the textstyles_name.4d file are displayed.</i>			

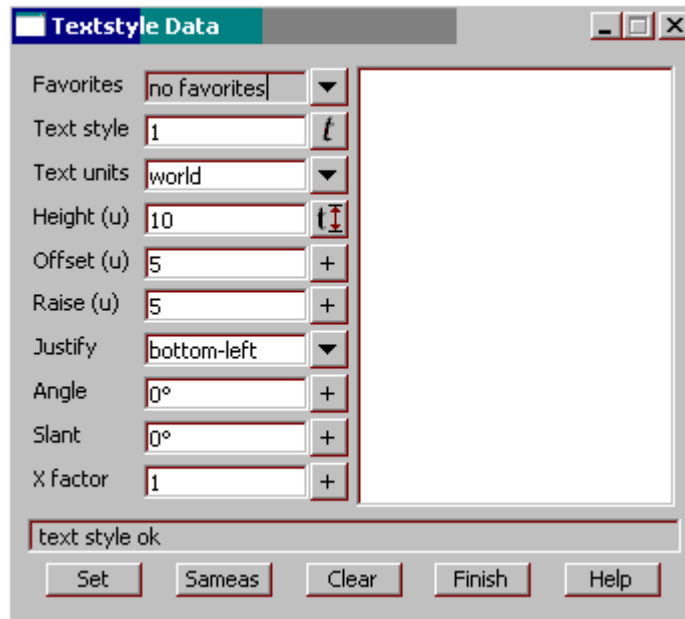
Select Textdata

Select

[Edit]

[Sameas]

*If no names exist, the user can edit the current settings by selecting the edit button and bring up the **Textstyle data** panel. This allows for definition of textstyle, units, height offset raise etc.*



The textstyle data panel enables the user to define multiple text parameters.

Max. length input box

if entered, this value will be compared with the selected segment distance. If the selected distance is less than this distance, the short line labelling will override any bearing and distance labelling.

Number input box

if entered, this value will be used for the short segment text.

Pick button

on selection the user can then select a segment/line from a view with direction. The direction will give the bearing direction which is usually +/- 180 degrees different. eg a segment with a bearing of 24 degrees can be labelled with a bearing of 204 by picking in a south west direction.

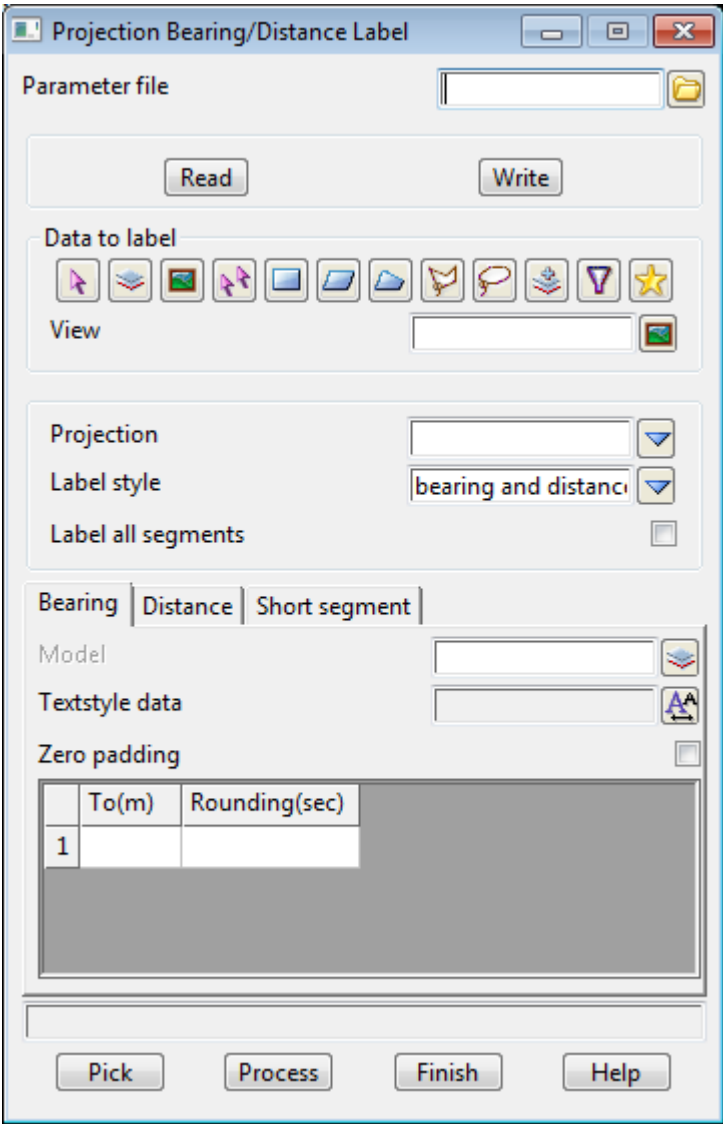
Projection Bearing/Distance Label

Position of option on menu: Survey =>Geodetics => Projection bearing/distance label

The **Projection bearing/distance label** is for the labelling of a selected string with plane bearing and ellipsoid distance information that is in terms of a selected projection. It allows a parameter file to be setup (*.lbf) which can be written and read into the option. This file allows the setting of panel parameters such as rounding, textstyle data etc.

The pick should be with direction. This will effect the bearing that is labelled (+/-180 degrees of actual direction).

On selecting the **Projection bearing/distance label** option, the **Projection bearing/distance label** panel is displayed.



The fields and buttons used in this panel have the following functions.

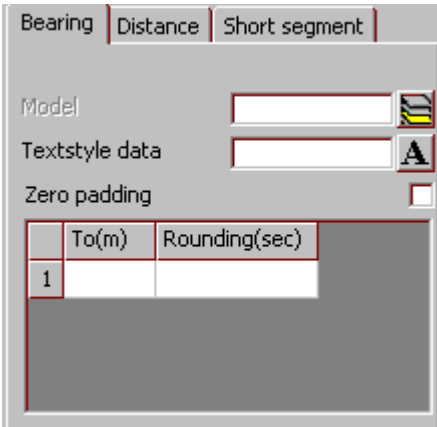
Field Description	Type	Defaults	Pop-Up
Parameter file	file box		*.lbf files

the parameter file can be read in which will fill in the remaining values within the panel. The user can make changes and save the choices as a different file, thus enabling a library of labelling options to be created.

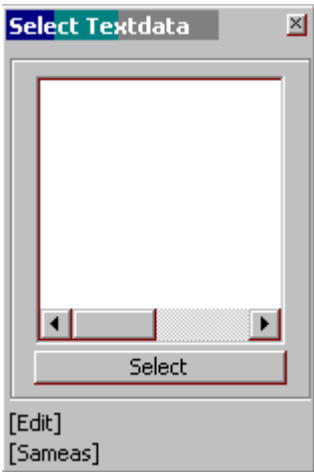
Read	button		
<i>if a valid parameter file is entered into the parameter file field, the user can press the read button to load the information in the file into the panel.</i>			
Write	button		
<i>if a valid parameter file name is entered into the parameter file field, the user can press the write button to save the edited panel information into a file so that it can be read in at a later date.</i>			
Projection	choice	current projection	available projections
<i>the projection of the data to be used for labelling.</i>			
Label style	choice box	bearing and distance	bearing and distance, bearing distance, distance bearing
<i>the label style.</i>			
<i>Bearing and distance equates to having the bearing and distance justification point at the same point on the midpoint of the segment (the text justification can make the bearing bottom-middle and the distance top-middle for example to show the bearing above the line and the distance below)</i>			
<i>Bearing distance equates to having the bearing and distance justification point along side. For example, a label may be a bearing on the left and a distance on the right</i>			
<i>Distance bearing equates to having the distance and bearing justification point along side. For example, a label may be a distance on the left and a bearing on the right</i>			
Label all segments	tick box	unticked	
<i>if ticked all the segments of the selected string will be labelled.</i>			

Bearing tab

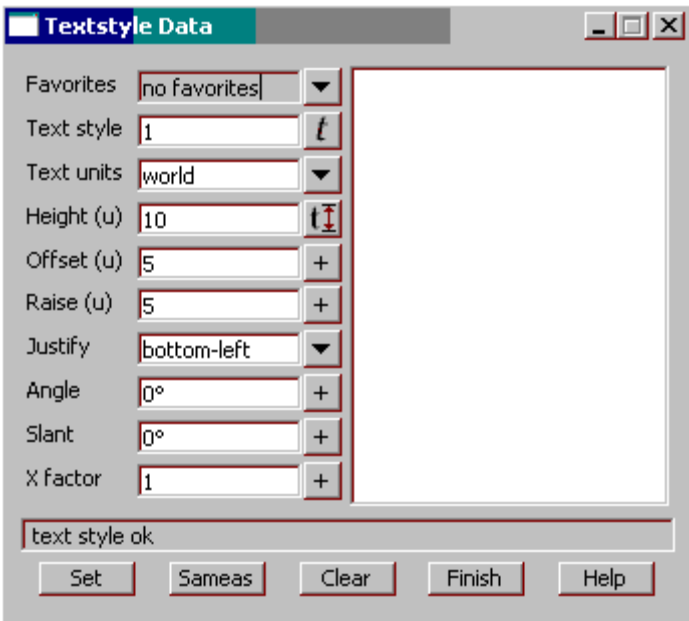
the following fields are located on the bearing tab.



Field Description	Type	Defaults	Pop-Up
Model	model box		current models
<i>if a valid model name is specified, the bearing text will be created in that model.</i>			
Textstyle data	textstyle box		current textstyle names
<i>on pressing the textstyle data button a list of available textdata predefined names read from the <code>texstyles_name.4d</code> file are displayed.</i>			



If no names exist, the user can edit the current settings by selecting the edit button and bring up the **textstyle data** panel. This allows for definition of textstyle, units, height offset raise etc.



The textstyle data panel enables the user to define multiple text parameters.

Zero padding tick box unticked

if ticked, the labels will have zero's inserted so that at least 2 characters exist for the minutes and second part of the label. For example, A bearing of $10^{\circ} 6' 5''$ would become $10^{\circ} 06' 05''$ with padding.

The values in the grid relate to the rounding of bearings for labelling. Many different ranges can be specified in the grid with each line representing a valid rounding range.

To(m) input box

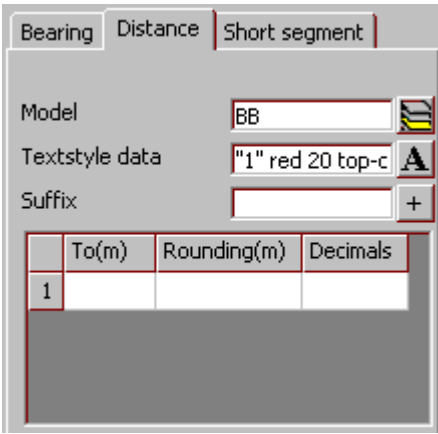
the rounding upper range limit in meters. This value together with the rounding specified, allow the bearings between certain distance ranges to be rounded to a certain value. The first line in the grid is from 0 to the specified distance range. Any following lines in the grid use the **To(m)** value in the previous line for the lower limit to the **To(m)** value in that line.

Rounding (sec) input box

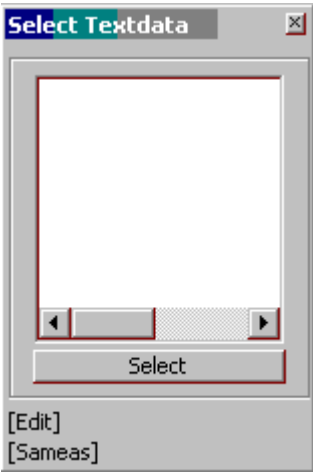
the rounding value given relates to the distance range. Any bearing within the distance range specified will be rounded to the value in seconds. e.g for a rounding value of 60 seconds the bearing will be rounded to the nearest minute.

Distance tab

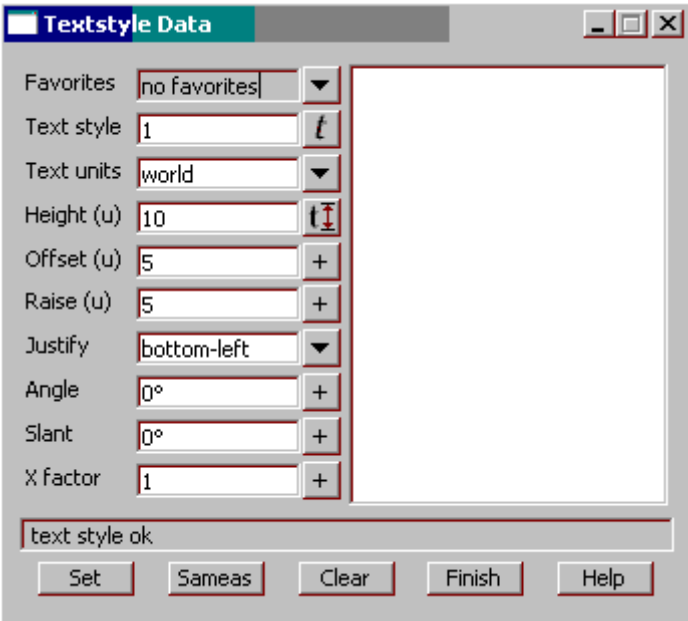
the following fields are located on the distance tab.



Field Description	Type	Defaults	Pop-Up
Model	model box		current models
if a valid model name is specified, the distance text will be created in that model.			
Textstyle data	textstyle box		current textstyle names
on pressing the textstyle data button a list of available textdata predefined names read from the <code>textstyles_name.4d</code> file are displayed.			



If no names exist, the user can edit the current settings by selecting the edit button and bring up the **textstyle data** panel. This allows for definition of textstyle, units, height offset raise etc.



The textstyle data panel enables the user to define multiple text parameters.

Suffix input box

if entered, this suffix will be appended to the end of the distance label.

The values in the grid relate to the rounding of distances for labelling. Many different ranges can be specified in the grid with each line representing a valid rounding range.

To(m) input box

*the rounding upper range limit in meters. This value together with the rounding and number of decimals specified, allow the distance to be rounded to a certain value. The first line in the grid is from 0 to the specified distance range. Any following lines in the grid use the **To(m)** value in the previous line for the lower limit to the **To(m)** value in that line.*

Rounding (m) input box

the rounding value given relates to the distance range. Any distance within the distance range specified will be rounded to the value in metres. e.g for a rounding value of 0.05 a distance of 125.261 will be rounded to a value of 125.25

Decimals input box

the number of decimal places can be specified. For a distance of 125.261, rounding of 0.05 and Decimals equal to 3, the label will be 125.250.

Short segment tab

the following fields are located on the short segment tab.

BearingDistanceShort segment

Model

Textstyle data

Max. length

Number

A

+

+

Field Description	Type	Defaults	Pop-Up
Model	model box		current models
<i>if a valid model name is specified, the short segment text will be created in that model.</i>			
Textstyle data	textstyle box		current textstyle names
<i>on pressing the textstyle data button a list of available textdata predefined names read from the textstyles_name.4d file are displayed.</i>			

Select Textdata

◀

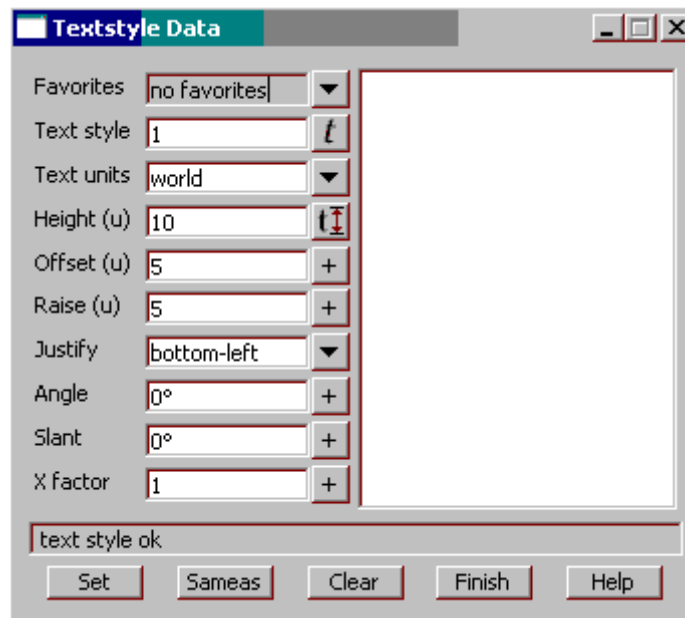
▶

Select

[Edit]

[Sameas]

*If no names exist, the user can edit the current settings by selecting the edit button and bring up the **textstyle data** panel. This allows for definition of textstyle, units, height offset raise etc.*



The textstyle data panel enables the user to define multiple text parameters.

Max. length input box

if entered, this value will be compared with the selected segment distance. If the selected distance is less than this distance, the short line labelling will override any bearing and distance labelling.

Number input box

if entered, this value will be used for the short segment text.

Pick button

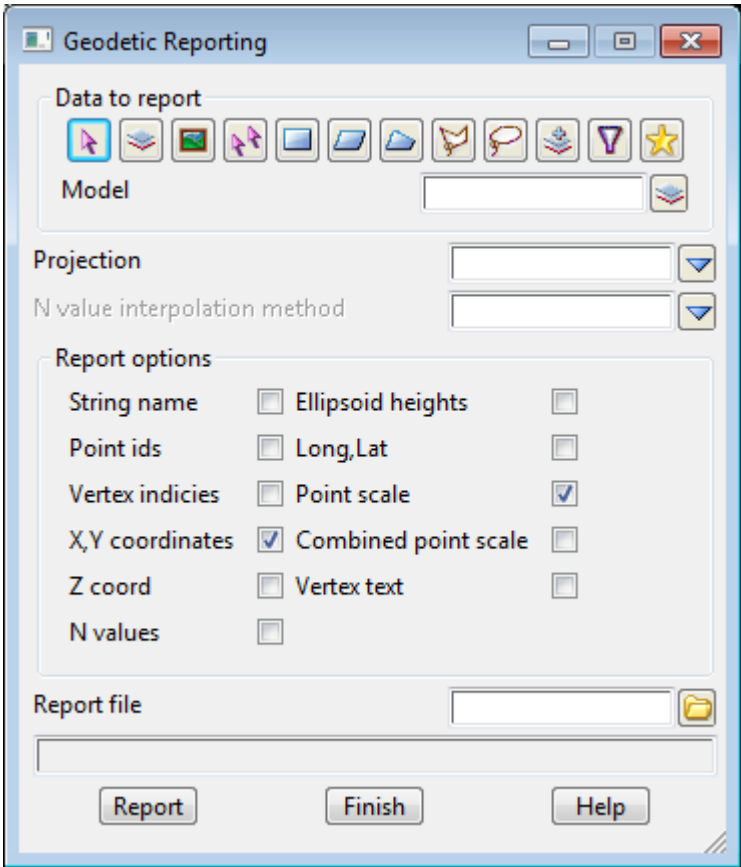
on selection the user can then select a segment/line from a view with direction. The direction will give the bearing direction which is usually +/- 180 degrees different. eg a segment with a bearing of 24 degrees can be labelled with a bearing of 204 by picking in a south west direction.

Geodetic Reporting

Position of option on menu: Survey =>Geodetics => Geodetic reporting

The **Geodetic reporting** option is for the reporting of selected data (projection coordinates) in terms of geodetic positions and variables. The user can choose from a number of different reporting options including, point scale factor, Longitude and latitude, point IDs, etc.

On selecting the **Geodetic reporting** option, the **Geodetic Reporting** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data to report	source box	model	
-----------------------	------------	-------	--

the source of objects to be reported are selected using the data source box. For more information on the data source box see [Data Source](#). The selected data must be in terms of the selected map projection.coordinate system.

Projection	choice	current projection	available projections
-------------------	--------	--------------------	-----------------------

the projection of the data to be reported.

N value interpolation method	choice box	currently set method	Available n value methods
-------------------------------------	------------	----------------------	---------------------------

the N value method allows the conversion of non-ellipsoid heights to ellipsoid. The methods are define d in the project n value settings. For more information on the n value settings see the section [N values](#)

The N value will be used to convert a geoid height (e.g. AHD) into an ellipsoid height. Ellipsoid height = geoid height + N value. The conversion is used for the reporting only. The original z value for the point will remain unchanged

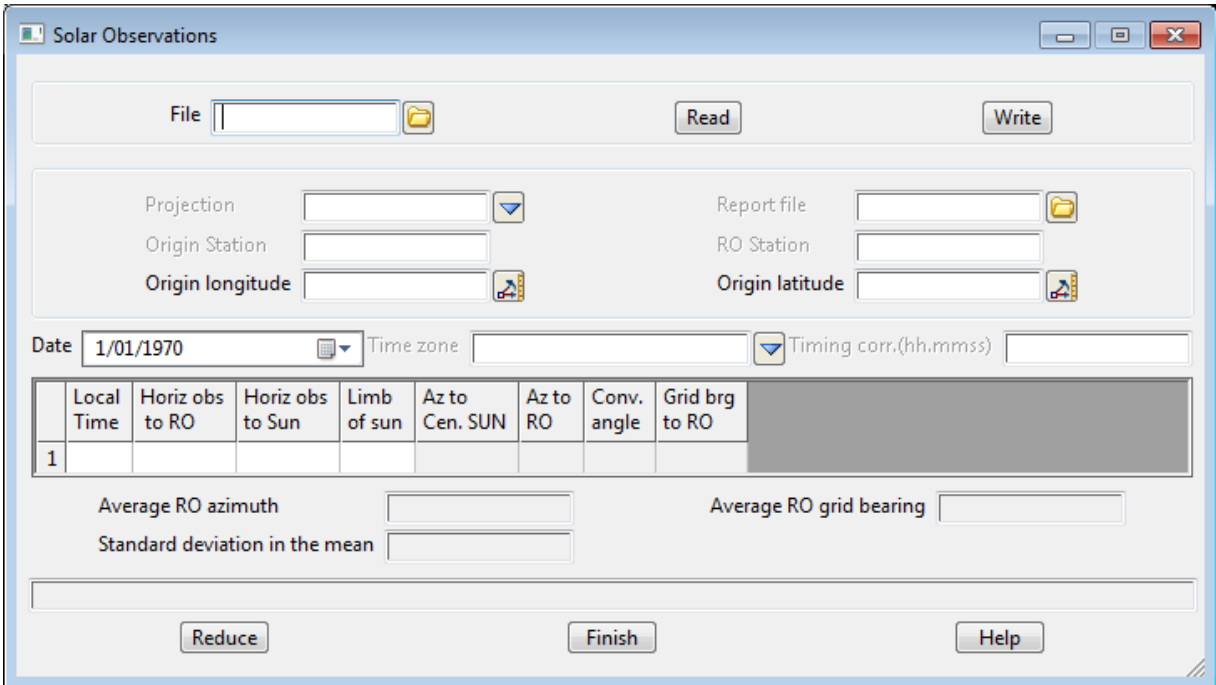
String name	tick box	
<i>if selected, any valid string names will be shown in the report.</i>		
Point IDs	tick box	
<i>if selected, any valid point ids will be shown in the report.</i>		
Vertex indices	tick box	
<i>if selected, vertex numbers will be shown in the report.</i>		
X,Y coordinates	tick box	ticked
<i>if ticked, the coordinates of the selected data will be reported.</i>		
Z coord	tick box	
<i>if selected, any valid z values will be shown in the report.</i>		
N values	tick box	
<i>if ticked, the N value calculated for the given point will be reported (if valid).</i>		
Ellipsoid heights	tick box	
<i>if selected, the calculated ellipsoid height will be reported. If no N values are calculated, this will be the same as the Z value.</i>		
Long, Lat	tick box	
<i>if selected, the calculated longitude and latitude will be reported.</i>		
Point scale	tick box	ticked
<i>if selected, the point scale for each point will be reported.</i>		
Combined point scale	tick box	
<i>if selected, the combined point scale for each point will be reported. This combined scale factor is the product of the point scale factor and a height scale factor. The height scale factor is computed from the ellipsoid height of the point.</i>		
Text	tick box	
<i>if selected, any valid text values will be shown in the report.</i>		
Report file	input	*.rpt
<i>name of the file to report to.</i>		
Report	button	

Solar Reduction

Position of option on menu: Survey =>Geodetics => Solar reduction

The Solar reduction option allows the reduction of observations to the sun by the hour angle method. The user can specify either limb or the centre of the sun, and a number of observations can be processed together. **The option does not require almanac details as these are processed internally using algorithms supplied by the US naval observatory.** These algorithms will produce accuracy in the order of 2 arc seconds in azimuth for the period AD1800 - 2050

On selecting the Solar reduction option, the **Solar Observations** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
File	file box		*.ast files
<i>a filename can be specified for reading or writing a file.</i>			
Read	button		
<i>if a valid file exists, the file contents can be loaded into the panel.</i>			
Write	button		
<i>if a valid name is specified and the valid values are entered into all of the fields, the user can write the input data to a file.</i>			
Projection	choice	current projection	available projections
<i>a projection can be specified so that a grid convergence value can be computed. This value will be used to compute the grid or projection bearing to the RO. If left blank, only the True azimuth will be reported.</i>			
Report file	input		*.rpt
<i>name of the file to report to.</i>			
Origin station	input		

name of the origin station

RO station input

name of the reference object station

Origin longitude input

the observation station's longitude should be specified in DMS format.

Origin latitude input

the observation station's latitude should be specified in DMS format.

Date date box current system date

the date of the observations as at the observers position should be entered. This can be by direct entry into the date field or by selecting the day, month, year from a date pop-up panel. The user can scroll through different months by selecting the arrow buttons on the pop-up date panel.

Time zone time zone box major time zones

a valid time zone for the observers position and local time should be selected from the pop-up list.

Timing corr.(hh.mmss) input

the correction to apply for any timing error including stopwatch corrections should be entered. The value should be in a hours, minutes seconds in hp format.

GRID VALUES: input

	Local Time	Horiz obs to RO	Horiz obs to SUN	Limb of sun	Az to Cen. SUN	Az to RO	Conv. angle	Grid brg to RO
1								

Local time input

the local time of the observation specified in 24 hour time in HMS. eg. 18.121002

Horiz obs to RO input

the horizontal angle (bearing) observed to the RO for the set of measurements. A set in this case includes a pointing to the RO and sun (at a certain time) in the same face.

Horiz obs to SUN input

the horizontal angle (bearing) observed to the Sun for the set of measurements.(The observation should not be corrected for the suns semi diameter as this is done internally by the reduction process)

If observation s are made on both faces, a separate line should be entered for each face. e.g Face 1 to RO may be 0.0000 and the face 1 to the sun may be 50.0000 which would be on the same line, then the observer may change face to face 2 and observe to the sun again followed by the RO. The face 2 observations should appear on the next line eg 180.0004 230.0110.

Limb of sun choice box Centre
Left limb
Right limb

the limb of the sun observed should be specified. This enables the suns semi diameter correction to be applied. This also allows the observations to be read in any order.

Az to cen. SUN output

the true azimuth to the sun will be displayed in this field on successful reduction of the observations.

Az to RO output

the true azimuth to the RO will be displayed in this field on successful reduction of the observations.

[illegible]

the convergence angle at the observation point will be displayed in this field if a valid projection is specified and there is a successful reduction of the observations.

Grid brg to RO output

the grid bearing to the RO will be displayed in this field if a valid convergence angle is calculated and there is a successful reduction of the observations. The grid bearing is calculated by:

$$\text{Grid brg} = \text{True azimuth} + \text{convergence}$$

The fields and buttons used in this panel below the grid have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Average RO azimuth output

if there is as successful reduction, the average RO azimuth value will be reported in this field.

Average RO grid bearing output

if there is as successful reduction, and the projection given, the average RO grid bearing value will be reported in this field.

Standard deviation in the mean output

this is a statistical measure of the reduced observations.

Star Reduction

Position of option on menu: Survey =>Geodetics => Star reduction

The **Star reduction** option allows the reduction of observations to the nominated star by the hour angle method. A number of observations can be processed together. **The option does not require almanac details as these are processed internally using algorithms supplied by the US naval observatory.** These algorithms will produce accuracy in the order of 2 arc seconds in azimuth for the period AD1800 - 2050

On selecting the **Star reduction** option, the **Star Observations** panel is displayed.

Star Observations

File

Read

Write

Star id by

FK5 number

Projection

Origin Station

Origin longitude

Star id

1

Report file

RO Station

Origin latitude

Date

1/01/1970

Time zone

Timing corr.(hh.mm.ss)

	Local Time	Horiz obs to RO	Horiz obs to Star	Az to Star	Az to RO	Conv. angle	Grid brg to RO
1							

Average RO azimuth

Average RO grid bearing

Standard deviation in the mean

choice ok

Reduce

Finish

Help

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
File	file box		*.ast files
<i>a filename can be specified for reading or writing a file.</i>			
Read	button		
<i>if a valid file exists, the file contents can be loaded into the panel.</i>			
Write	button		
<i>if a valid name is specified and the valid values are entered into all of the fields, the user can write the input data to a file.</i>			
Star id by	button	FK5 number	General name Constellation Bayer/ Flamsteed number FK5 number SAO number
<i>the star can be identified by a number of different means. The stars available are based on the Fifth Fundamental Catalogue(FK5) catalogue. Cross matching of id's are not possible in some instances. e.g A star may have no known general name.</i>			
<i>The selection of an id method will force the changing of the id list so the particular star can be selected.</i>			
Star id	choice	1st star id in list	available id's for that type
<i>the star id can be selected from the list.</i>			
Report file	input		*.rpt
<i>name of the file to report to.</i>			

Origin station input
name of the origin station

RO station input
name of the reference object station

Origin longitude input
the observation station's longitude should be specified in DMS format.

Origin latitude input
the observation station's latitude should be specified in DMS format.

Date date box current system date
the date of the observations as at the observers position should be entered. This can be by direct entry into the date field or by selecting the day, month, year from a date pop-up panel. The user can scroll through different months by selecting the arrow buttons on the pop-up date panel.

Time zone time zone box major time zones
a valid time zone for the observers position and local time should be selected from the pop-up list.

Timing corr.(hh.mmss) input
the correction to apply for any timing error including stopwatch corrections should be entered. The value should be in a hours, minutes seconds in hp format.

GRID VALUES: input

	Local Time	Horiz obs to RO	Horiz obs to Star	Az to Star	Az to RO	Conv. angle	Grid brg to RO
1							

Local time input
the local time of the observation specified in 24 hour time in HMS. eg. 18.121002

Horiz obs to RO input
the horizontal angle (bearing) observed to the RO for the set of measurements. A set in this case includes a pointing to the RO and star (at a certain time) in the same face.

If observation s are made on both faces, a separate line should be entered for each face. e.g Face 1 to RO may be 0.0000 and the face 1 to the star may be 50.0000 which would be on the same line, then the observer may change face to face 2 and observe to the star again followed by the RO. The face 2 observations should appear on the next line eg 180.0004 230.0110.

Horiz obs to Star input
the horizontal angle (bearing) observed to the Star for the set of measurements.

Az to Star output
the true azimuth to the sun will be displayed in this field on successful reduction of the observations.

Az to RO output
the true azimuth to the RO will be displayed in this field on successful reduction of the observations.

Conv. angle output
the convergence angle at the observation point will be displayed in this field if a valid projection is

specified and there is a successful reduction of the observations.

Grid brg to RO output

the grid bearing to the RO will be displayed in this field if a valid convergence angle is calculated and there is a successful reduction of the observations. The grid bearing is calculated by:

Grid brg = True azimuth + convergence

The fields and buttons used in this panel below the grid have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Average RO azimuth	output		
---------------------------	--------	--	--

if there is as successful reduction, the average RO azimuth value will be reported in this field.

Average RO grid bearing	output		
--------------------------------	--------	--	--

if there is as successful reduction, and the projection given, the average RO grid bearing value will be reported in this field.

Standard deviation in the mean	output		
---------------------------------------	--------	--	--

this is a statistical measure of the reduced observations.

Traverse Spreadsheet

Position of menu: Survey =>Traverse spreadsheet

The **Traverse Spreadsheet** options allow the entry of traverse and radiation blocks from the keyboard, selection of strings from the current view or by reading from a file. Adjustments can then be made including transit, Bowditch, compass or least square adjustment. The adjustment can be for a closed string (loop) or an open string (non-loop). Traverse Spreadsheet will often be abbreviated as TSS.

There are two types of traverse spreadsheets (TSS) - Plane and Projection.

For the Plane TSS, entered distances are multiplied by the scale factor to give final distances and hence calculate co-ordinates, whereas for the Projection TSS, ellipsoid distances are entered and **12d Model** calculates the correct co-ordinate position using full projection calculations.

The **Traverse spreadsheet** walk-right menu contains the traverse spreadsheet options.

Traverse Spreadsheet	
Parameters	Setting parameters for the traverse spreadsheet option
Create	Create a TSS - Plane or Projection
Edit	Edit an existing TSS
Utilities	Utilities for use with existing TSSs
Lot check	Run lot checks on typed bearing/distance data
NZ report	NZ traverse spreadsheet report
Standard report	Standard traverse spreadsheet report
Drafting	Traverse spreadsheet drafting
Radiation table	Creating radiation tables from a TSS
Landonline XML read	Reading LINZ XML data
Landonline XML write	Writing LINZ XML data
Least square adjustment	Least Square adjustment

For the option *Parameters*, go to

Create

Edit

Utilities

Lot check

NZ report

Standard report

Drafting

Radiation table

Landonline XML read

Landonline XML write

Least square adjustment

[TSS Parameters](#)

[TSS Create](#)

[TSS Edit](#)

[TSS Utilities](#)

[Lot Check](#)

[NZ TSS Report](#)

[Standard TSS Report](#)

[TSS Drafting](#)

[TSS Radiation Table Drafting](#)

[Landonline XML Read](#)

[Landonline XML Write](#)

TSS Parameters

Position of option on menu: Survey =>Parameters

The **Traverse Spreadsheet Parameters** sets the parameters for defining the *look and feel* of the TSS create and edit panels, reports and drafting.

Selecting **Parameters** brings up the **Traverse Spreadsheet Parameters** panel:

Traverse Spreadsheet Parameters

General | Data | Report | Observations | Points | Parcels

General

Show coordinates ☐

Northing and easting order

Bearing and distance order

Copy down bearing and distance ☒

Auto update network when entering data ☒

Auto refresh network models ☒

Use auto point number ☒

Auto start select parcel point ☒

Use auto trace point number ☒

Use auto number when convert trace ☒

Use smart measurement ☒

Create simple boundary parcel ☒

Use trace parcel on view ☒

Disable closing grid warning ☒

Remember last edited file ☒

Highlight

Point style

Point colour

Point size

Segment colour

Segment thickness

Highlight join observations ☒

Highlight split observation ☐

Warning

Maximum fixed misclosure

Part per million misclosure

C:\Program Files (x86)\12d\12dmodel\10.00\set_ups\ts_param.4d

TSS Create

Position of option on menu: Survey => Traverse spreadsheet => Create

A traverse spreadsheet (TSS) can either use a constant scale factor or a cartographic projection to define the relationship between bearings/distances and the (x,y) co-ordinates.

The **Traverse Spreadsheet Create** option allows the entry of traverse and radiation blocks from the keyboard, selection of strings from the current view or by reading from a file. Adjustments can then be made including transit, Bowditch, compass or least square adjustment. The adjustment can be for a closed string (loop) or an open string (non-loop).

Selecting Traverse Spreadsheet **Create** brings up the **Create Traverse Spreadsheet** panel:

The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Projection spreadsheet	radio button			
<i>if selected then the Projection field must be filled in.</i>				

Projection	projection box	first projection	project projections	
<i>the cartographic projection used in the TSS. For more information on projections go to Projections in the chapter Projects. This is a Projection TSS.</i>				

Scaled spreadsheet radio button
if selected then the Scale factor field must be filled in.

Scale factor real box
the constant scale factor used in the TSS. This is a Plane TSS.

Details section

Spreadsheet name text box
the name for the TSS

File name text box
*name of the *.tf file to store all the TSS data in. The TSS can be brought back for editing by giving this filename.*

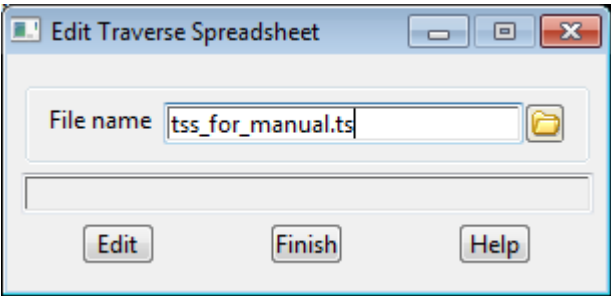
Create button
*create a new traverse spreadsheet using the parameters entered in the above panel field. The appropriate editor (either for a **Projection Traverse Spreadsheet** or a **Plane Traverse Spreadsheet** panel) is then brought up for the TSS data to be entered and/or edited.*

TSS Edit

Position of option on menu: Survey =>Traverse spreadsheet =>Edit

The traverse spreadsheet editor reads in an existing TSS file and loads the information into either the **Projection Traverse Spreadsheet** or the **Plane Traverse Spreadsheet** panel.

Selecting Traverse Spreadsheet Edit brings up the **Edit Traverse Spreadsheet** panel:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
File name	file box		*.ts files
<i>name of the file containing the traverse spreadsheet information to be edited.</i>			

Edit button
*read the information in the traverse spreadsheet file and load it into either a **Projection Traverse Spreadsheet** or a **Plane Traverse Spreadsheet** panel.*

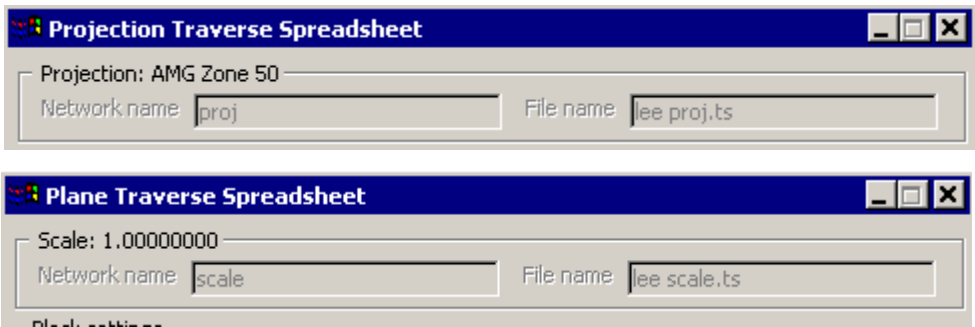
For entering/editing either a Projection TSS or Plane TT, please go to the section [Traverse Spreadsheets](#)

Traverse Spreadsheets

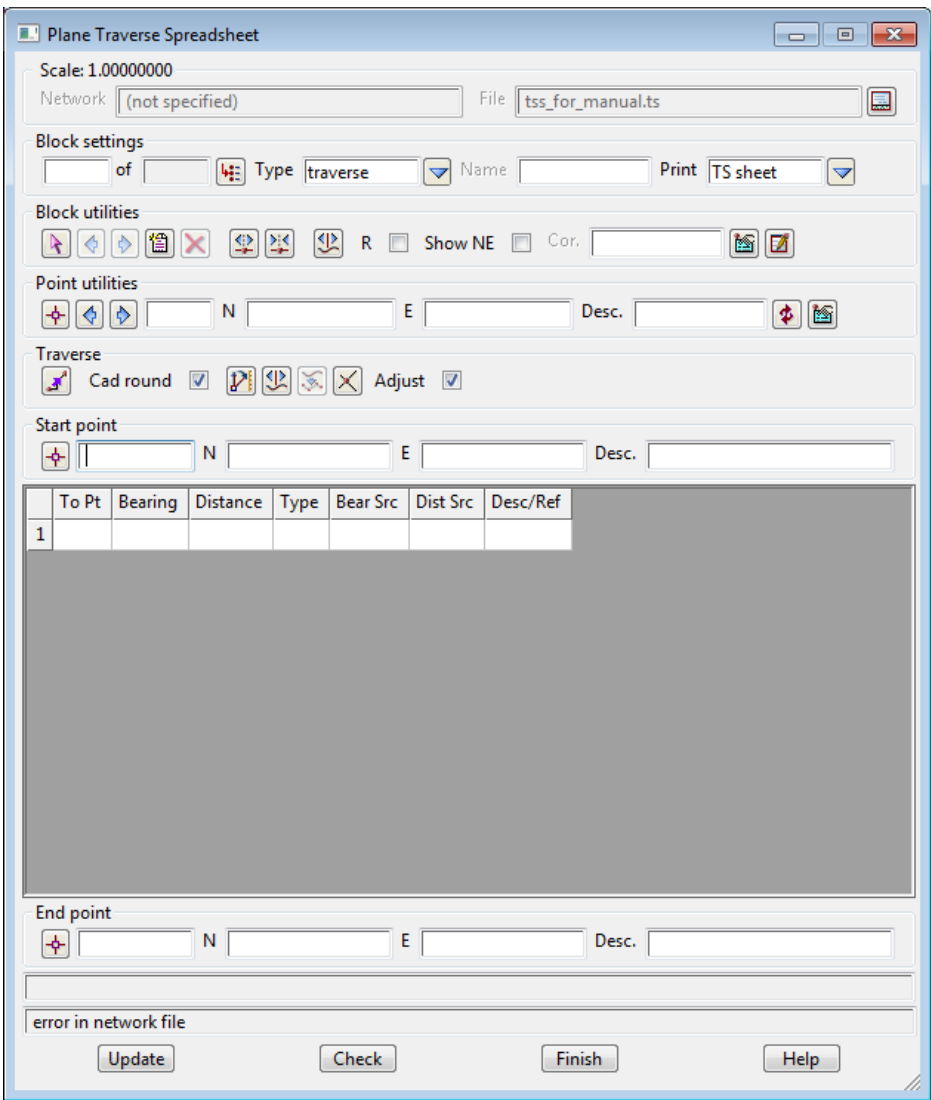
The **Projection** and **Plane** TSS panels allows the entry of traverse and radiation blocks from the

keyboard, selection of strings from the current view or by reading from a file. Adjustments can then be made including transit, Bowditch, compass or least square adjustment. The adjustment can be for a closed string (loop) or an open string (non-loop).

The two panels are very similar and only the top section is different. The Projection Traverse Spreadsheet requires a Projection rather than a Scale factor.



For more information about terminology used in the projection option, see the Appendix [Geodetics Summary](#).



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Network name	display only		
<i>the entire spreadsheet can be given a name for identification purposes. This was defined when the TSS was created and can only be changed using the TSS Utilities option.</i>			
File name	display only		
<i>the file name containing the TSS information. This was defined when the TSS was created and can only be changed using the TSS Utilities option.</i>			

The only visible difference between the Plane and Projections Traverse Spreadsheet panel is that the Scale or Projection is given at the top of the panel. All the panel fields are the same.

Of course the calculations are different for the two types of spreadsheets. For the Plane TSS, entered distances are multiplied by the scale factor to give final distances and hence calculated co-ordinates, whereas for the Projection TSS, ellipsoid distances are entered and **12d Model** calculates the correct co-ordinate position using full projection calculations.

Block Settings

Position	input		
<i>the order of a block within the spreadsheet can be specified by nominating the block position. Numbering within the list starts at 1. This parameter is used for inserting new blocks into the list. If a user nominates to insert in position 5 and there is only 2 blocks already defined, the block will be placed at the end of the list (i.e. position 3)</i>			
Count	input		
<i>the number of blocks within the spreadsheet.</i>			
Type	choice	traverse	traverse, radiation, radiation backsight, parcel, irregular trace, balance

the type of a block within the spreadsheet can be specified by nominating the block type.

The **traverse** block is for the entry of loop and non-loop traverses starting and ending at points with known coordinate values.

For a hanging traverse, i.e. a traverse that does not close onto a known point, the data can be entered by entering a 0 (zero) in the point id field of the grid control, as well as the end point - point id field.

The **radiation** block consists of a number of radiations or **side shots** from a point with known coordinates. This point may be defined in a previous traverse block or it may be from a known point. A valid coordinate must exist for the radiation start point for the radiation block to be used.

A **radiation backsight** block is the same as a radiation block except that the value set to the backsight is included. After adjustment of previous blocks, the coordinates of setup and backsight points often change. This will introduce swing errors into calculations if not accounted for. By entering the backsight value as set in the field, a comparison is made between what was set and the adjusted value. The difference is then applied to the radiations in the block to reflect the corrected angle measurements.

XXXX - need 12d NZ documentation on TSS

Name	input
-------------	-------

a spreadsheet can consist of a number of different blocks. For each block, a name can be given which can help identify a particular traverse/radiation block within the spreadsheet.

Flag	input	
	<i>the adjustment mode of the current block. The mode is either adjusted or unadjust. All blocks are set to unadjusted on reading of a file, and the user specifies which blocks are to be adjusted.</i>	
Prev	button	
	<i>allows the navigation to the previous block in the list.</i>	
Next	button	
	<i>allows the navigation to the next block in the list.</i>	
New	button	
	<i>allows for the definition and entry of a new block in the list.</i>	
Update	button	
	<i>allows for the updating of entries when changes have been made. For example, if a distance measurement were to be changed, pushing the update button will ensure the new value will be used in further calculations and adjustments</i>	
Insert	button	
	<i>allows for the insertion of a block into the list in the position defined by the Block position entry.</i>	
Append	button	
	<i>allows for the insertion of a block at the end of the list.</i>	
Delete	button	
	<i>allows for the deletion of the currently displayed block.</i>	
Show EN	tick box	ticked
	<i>if ticked the easting and northing columns will be shown in the grid. If unticked the columns will not be shown.</i>	
Copy b dsc	tick box	ticked
	<i>if ticked the bearing and description from the previous line in the grid will automatically be copied down to the next entered line.</i>	
Pick string	button	
	<i>allows for the loading of the current block by selecting a string from the current view.</i>	
Adjustment method	choice	bowditch, compass, transit, least square
	<i>method of adjustment.</i>	
Loop	tick box	unticked
	<i>For loop traverses the tick box should be checked. This assumes that the start and end points are the same.</i>	

The fields in this panel define the start and end point details. If the **loop** option is chosen the end point details are assumed to be the same as the start point In this case the end point group is disabled.

Least square tab

Angular std (sec).

The standard deviation of a single angular measurement in seconds of arc.

Linear std (mm)

this value is defined by the standard deviation of a single distance measurement (e.g. 5 mm)

ppm

this value is defined by the edm scale error which is dependant on the length of line measured (e.g. 5ppm = 5mm error over a 1km distance)

Iterations input box 10

the calculation of the adjustment can be aborted if a solution is not found after the specified number of iterations.

Coords differ input box 0.0001

the calculation of the adjustment can stopped when the difference between successive calculations meet the defined tolerance.

variance increase tick box ticked

the calculation of the adjustment can stopped when the variance between successive calculations increases

The fields in start point group specify the start point parameters

Start point button/input

the start point can be selected by selecting the button and then selection and acceptance of a point in an open view. If valid a point id, easting, northing and description of the selected point will be copied into the appropriate fields.

If the start point is to be entered manually, the point id should be entered into the field adjacent to the start point button.

N input

the start point's northing value.

E input

the start point's easting value.

Desc input

the start point's description.

the grid control values can be entered using valid inputs into the various fields.

To Point. *The point id of the next traverse station.*

Bearing (dms). *The bearing of the traverse line.*

Distance. *The distance of the traverse line.*

Point Desc. *The description of the traverse point*

Easting *The easting coordinate of the traverse point. NB. This field is only displayed when the calc or adjust buttons are selected.*

Northing *The northing coordinate of the traverse point. NB. This field is only displayed when the calc or adjust buttons are selected.*

The fields in end point group specify the end point parameters

end point button/input

the end point can be selected by selecting the button and then selection and acceptance of a point in an open view. If valid a point id, easting, northing and description of the selected point will be copied into the appropriate fields.

If the end point is to be entered manually, the point id should be entered into the field adjacent to the end point button.

N input

the end point's northing value.

E input

the end point's easting value.

Desc input

the end point's description.

the misclose line near the bottom of the panel have the following functions.

Bearing input box

the closing bearing for the traverses.

Distance input box

the closing distance of the traverse

Delta east input box

the closing vector's delta east component

Delta east input box

the closing vector's delta east component

Misclosure input box

the ratio of the closing distance to the total traverse distance.

The buttons at the bottom of the panel have the following function.

Calc button

*the calc button is used to calculate coordinate values based on the information input into the grid control and the points tab. The block has to be inserted or appended into the list **before** this can be done.*

Adjust button

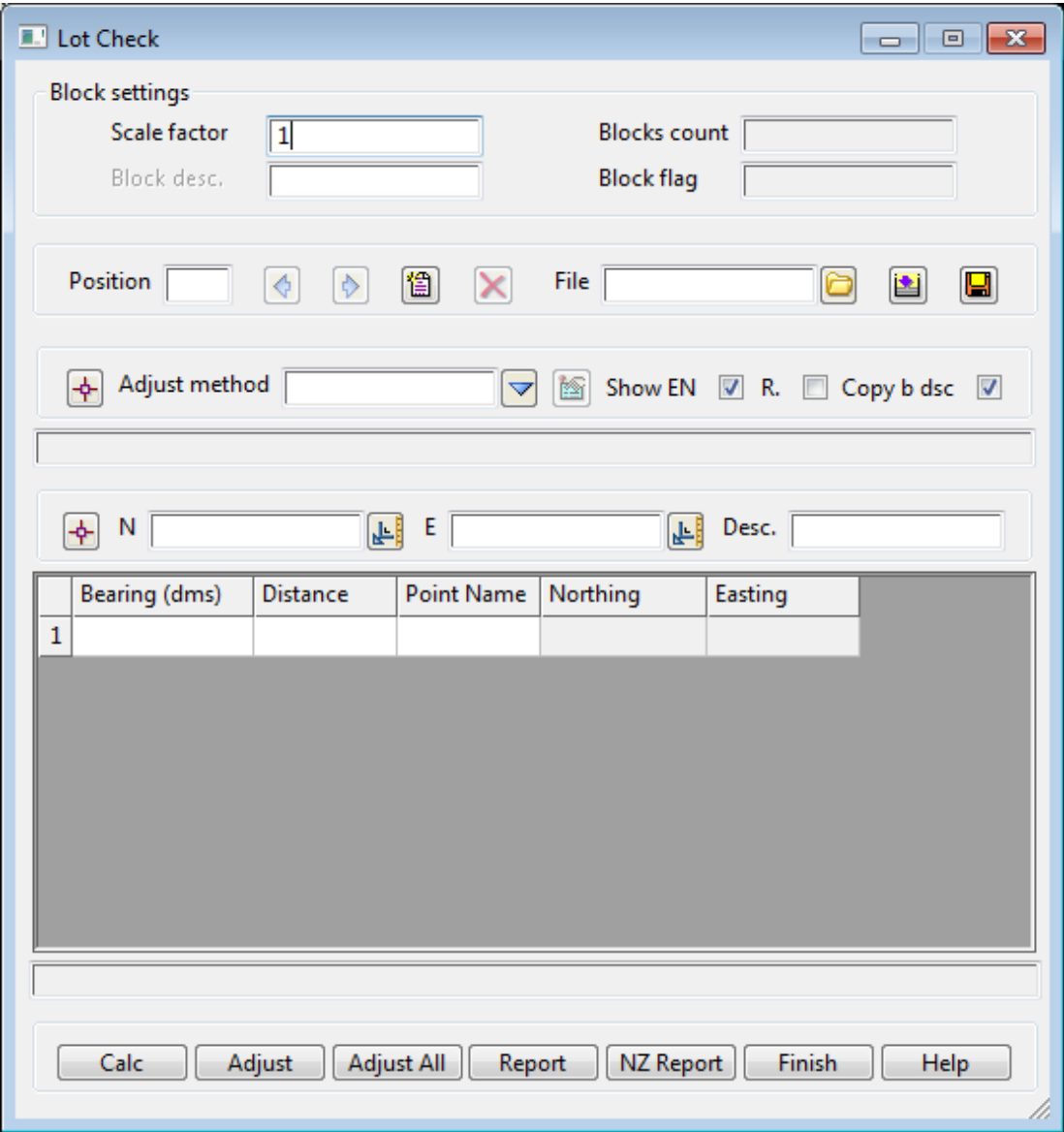
the adjustment of the current block can be done after the calc stage has been reached. This will use the method of adjustment as stipulated by the user.

Adjust All button

the adjustment of all of the blocks in the list can be done after the calc stage has been reached in each of the individual blocks. This will use the method of adjustment as stipulated by the user.

Save button

*saves the current data in the panel to the TSS file (displayed in the **file name** box).*



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

The scale and datum fields are the only difference between the plane and datum lot check panels.

Scale factor	input	project scale factor
---------------------	-------	----------------------

a scale factor can be defined which will be applied to any entered distances. Final distances used in calculations are derived by multiplying the entered distance by the scale factor.

Block count	input
--------------------	-------

the number of blocks within the spreadsheet.

Desc.	input
--------------	-------

a spreadsheet can consist of a number of different blocks. For each block, a block description can be given which can help identify a particular traverse/radiation block within the spreadsheet.

Block flag	input
-------------------	-------

the adjustment mode of the current block. The mode is either adjusted or unadjust. All blocks are set to

unadjusted on reading of a file, and the user specifies which blocks are to be adjusted.

Prev button
allows the navigation to the previous block in the list.

Next button
allows the navigation to the next block in the list.

New button
allows for the definition and entry of a new block in the list.

Update button
*allows for the updating of entries when changes have been made. For example, if a distance measurement were to be changed, pushing the **update** button will ensure the new value will be used in further calculations and adjustments*

Insert button
*allows for the insertion of a block into the list in the position defined by the **Block position** entry.*

Append button
allows for the insertion of a block at the end of the list.

Delete button
allows for the deletion of the currently displayed block.

File name input box *.ts
a file name can be defined which will allow for the reading of an existing file and for defining a new file name for reading in the future.

Read button
*the read button allows for the loading of an existing file as specified by the **file name** box.*

Write button
*the write button allows for the saving of the current file as specified in the **file name** box.*

Pick string button
allows for the loading of the current block by selecting a string from the current view.

Adjust method choice bowditch, compass, transit, least square, none
method of adjustment.

Show EN tick box ticked
if ticked the easting and northing columns will be shown in the grid. If unticked the columns will not be shown.

Copy b dsc tick box ticked
if ticked the bearing and description from the previous line in the grid will automatically be copied down to the next entered line.

The fields in this panel define the start and end point details. If the **loop** option is chosen the end point details are assumed to be the same as the start point In this case the end point group is disabled.

Least square tab

The fields in this panel define the values to be used for least square adjustments.

Angular std (sec).

The standard deviation of a single angular measurement in seconds of arc.

Linear std (mm)

this value is defined by the standard deviation of a single distance measurement (e.g. 5 mm)

ppm

this value is defined by the edm scale error which is dependant on the length of line measured (e.g. 5ppm = 5mm error over a 1km distance)

Iterations	input box	10
-------------------	-----------	----

the calculation of the adjustment can be aborted if a solution is not found after the specified number of iterations.

Coords differ	input box	0.0001
---------------	-----------	--------

the calculation of the adjustment can stopped when the difference between successive calculations meet the defined tolerance.

variance increase	tick box	ticked
--------------------------	----------	--------

the calculation of the adjustment can stopped when the variance between successive calculations increases

The fields in start point group specify the start point parameters

Start point button/input

the start point can be selected by selecting the button and then selection and acceptance of a point in an open view. If valid a point id, easting, northing and description of the selected point will be copied into the appropriate fields.

If the start point is to be entered manually, the point id should be entered into the field adjacent to the start point button.

N input

the start point's northing value.

E input

the start point's easting value.

Desc	input
------	-------

the start point's description.

the grid control values can be entered using valid inputs into the various fields.

To Point. *The point id of the next traverse station.*

Bearing (dms). The bearing of the traverse line.

Distance. The distance of the traverse line.

Point Desc. The description of the traverse point

Easting The easting coordinate of the traverse point. **NB.** This field is only displayed when the calc or adjust buttons are selected.

Northing The northing coordinate of the traverse point. **NB.** This field is only displayed when the calc or adjust buttons are selected.

The fields in end point group specify the end point parameters

end point button/input
the end point can be selected by selecting the button and then selection and acceptance of a point in an open view. If valid a point id, easting, northing and description of the selected point will be copied into the appropriate fields.

If the end point is to be entered manually, the point id should be entered into the field adjacent to the end point button.

N input
the end point's northing value.

E input
the end point's easting value.

Desc input
the end point's description.

the misclose line near the bottom of the panel have the following functions.

Bearing input box
the closing bearing for the traverses.

Distance input box
the closing distance of the traverse

Delta east input box
the closing vector's delta east component

Delta east input box
the closing vector's delta east component

Misclosure input box
the ratio of the closing distance to the total traverse distance.

The buttons at the bottom of the panel have the following function.

Calc button
*the calc button is used to calculate coordinate values based on the information input into the grid control and the points tab. The block has to be inserted or appended into the list **before** this can be done.*

Adjust button
the adjustment of the current block can be done after the calc stage has been reached. This will use the method of adjustment as stipulated by the user.

Adjust All button
the adjustment of all of the blocks in the list can be done after the calc stage has been reached in each of the individual blocks. This will use the method of adjustment as stipulated by the user.

Report button
on selecting this button the NZ traverse spreadsheet report panel appears.

NZ TSS Report

Position of option on menu: Survey => Traverse spreadsheet => NZ report

The NZ report option allows the user to define the report header etc. so as to produce a spreadsheet report which can be printed to a pre-printed NZ sheet.

Selecting NZ report brings up the NZ Traverse Spreadsheet Report panel

NZ Traverse Spreadsheet Report

TSS file

Datum information

Traverse title

Other details

Field book

Plan no.

NZ Land District

Report details

Report file

Report type

Standard

Print

TS sheet

Report parcels

Report point IDs

Report plan references

Report

Finish

Help

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Input format	choice box	*.ts	*.ts, *.lch
<i>either a TSS file (*.ts) or a lot check file (*.lch) can be reported.</i>			

Input file	input box	*.ts
<i>name of the TSS or lot check file.</i>		
Print	choice box	TS sheet
<i>TS sheet, Calc sheet, Other either TS sheet.</i>		
Report parcels	tick box	
<i>If tick, parcel block types are included in the report.</i>		

Traverse Title section

Traverses of, line 2, line 3, line 4

*The title of the traverses can be entered into the **traverses of** box as well as the following **line 2**, **line 3** and **line 4** input boxes. Due to the limitation of space on the pre-printed forms supplied by LINZ the number of characters should be limited to 20 characters (inclusive of space characters) for the **traverse of** line and 33 characters (inclusive of space characters) for **lines 2 to 4**.*

*The input into the **traverses for** line is compulsory but for **lines 2 to 4** it is optional.*

Datum Information section

NZ Circuit	choice box	existing NZ circuits
<i>the circuit in which the current spreadsheet file relates to should be specified.</i>		
Projection	choice box	Geodetic 1949 Geodetic 2000 Old Cadastral

the appropriate NZ geodetic datum should be selected.

Coords in terms of section

these parameters are only required to be entered for the Old cadastral datum case. For other datums, the values are automatically updated.

Point name	input box
<i>the name of the origin point should be entered.</i>	
Northing	input box
<i>the nothing coordinate of the origin point should be entered.</i>	
Easting	input box
<i>the easting coordinate of the origin point should be entered.</i>	

Other Details section

Field book	input box	
<i>the name of the field book used.</i>		
Plan no	input box	
<i>the plan no to be created if known.</i>		
NZ Land District	choice box	Existing NZ land districts
<i>the appropriate NZ land district should be selected.</i>		
Report file	files box	*.rpt files
<i>file name for the report.</i>		

Report file button
a report using the nominated file name is created.

Standard TSS Report

Position of option on menu: Survey => Traverse spreadsheet => Standard report

The **Standard report** allows the user to define the report header etc. so as to produce a standard TSS report which can be printed, saved or edited.

Selecting **Standard report** brings up the **Standard Traverse Spreadsheet Report** panel

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Input format	choice box	*.ts	*.ts, *.lch
<i>either a TSS file (*.ts) or a lot check file (*.lch) can be reported.</i>			
Input file	input box		*.ts
<i>name of the TSS or lot check file.</i>			
Print	choice box	TS sheet	TS sheet, Calc sheet, Other
<i>either TS sheet.</i>			
Report parcels	tick box		

If ticked, parcel block types are included in the report.

Traverse Title section

Job id text input box

text to use as the Job id.

Traverses of, line 2, line 3, line 4

The title of the traverses can be entered into the **traverses of** box as well as the following **line 2**, **line 3** and **line 4** input boxes. Due to the limitation of space on the pre-printed forms supplied by LINZ the number of characters should be limited to 20 characters (inclusive of space characters) for the **traverse of** line and 33 characters (inclusive of space characters) for **lines 2** to **4**.

The input into the **traverses for** line is compulsory but for **lines 2** to **4** it is optional.

Surveyor id text input box

text to use as the Surveyor id.

Computer operator text input box

text to use as the Computer operator.

Report file files box *.rpt files

file name for the report.

Report file button

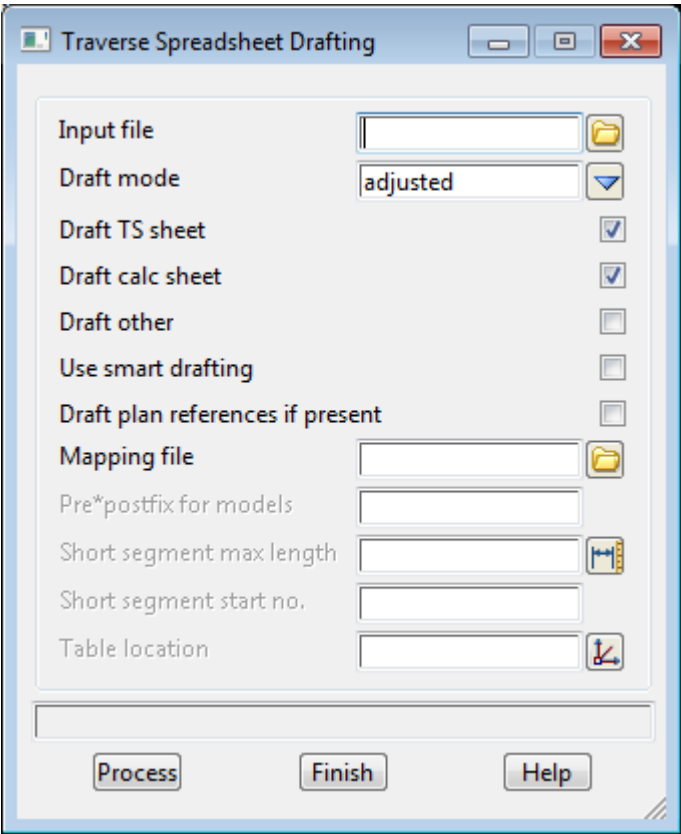
a report using the nominated file name is created.

TSS Drafting

Position of option on menu: Survey => Traverse spreadsheet=> Drafting

The Traverse spreadsheet **drafting** produce models, linestyles and colours for data within the TSS.

Selecting **Drafting** brings up the **Traverse Spreadsheet Drafting** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Input file <i>name of the existing spreadsheet file to create drafting for.</i>	file box		*.ts
Draft mode <i>the draft mode will determine if adjusted strings are used for drafting or if the unadjusted values (initial) values are used</i>	choice box	adjusted	adjusted initial
Draft TS sheet <i>if ticked,</i>	tick box		
Draft calc sheet <i>if ticked,</i>	tick box		
Draft other <i>if ticked,</i>	tick box		
Mapping file <i>mapping file to define the drafting</i>	mapping file box		*.mf
Pre*postfix for models <i>pre and post text to add to the model names given in the mapping file</i>	text input box		
Short segment max length	real input box		

maximum size for a segment to be considered a short segment. Short segments are labelled with a number and the details placed in a table.

Short segment start no. integer input box
start number for any short segments.

Table location xyz box
world position for the short segment table.

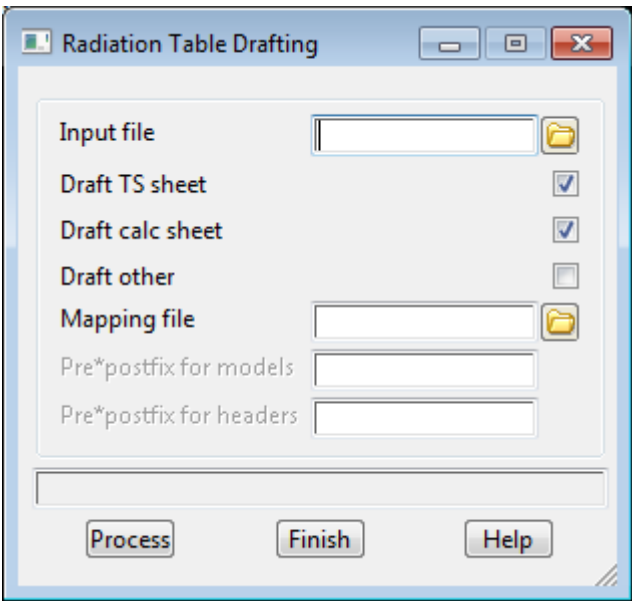
Process button
process the traverse spreadsheet and create the drafting and short segment table.

TSS Radiation Table Drafting

Position of option on menu: Survey => Traverse spreadsheet=> Radiation table

The Traverse spreadsheet **radiation table** option produces radiation tables for the radiation data in a traverse spreadsheet.

Selecting **Radiation table** brings up the **Radiation Table Drafting** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Input file	file box		*.ts
name of the existing spreadsheet file to create radiation tables for.			
Draft TS sheet	tick box		
if ticked,			
Draft calc sheet	tick box		
if ticked,			
Draft other	tick box		

if ticked,

Mapping file mapping file box *.mf
mapping file to define the drafting

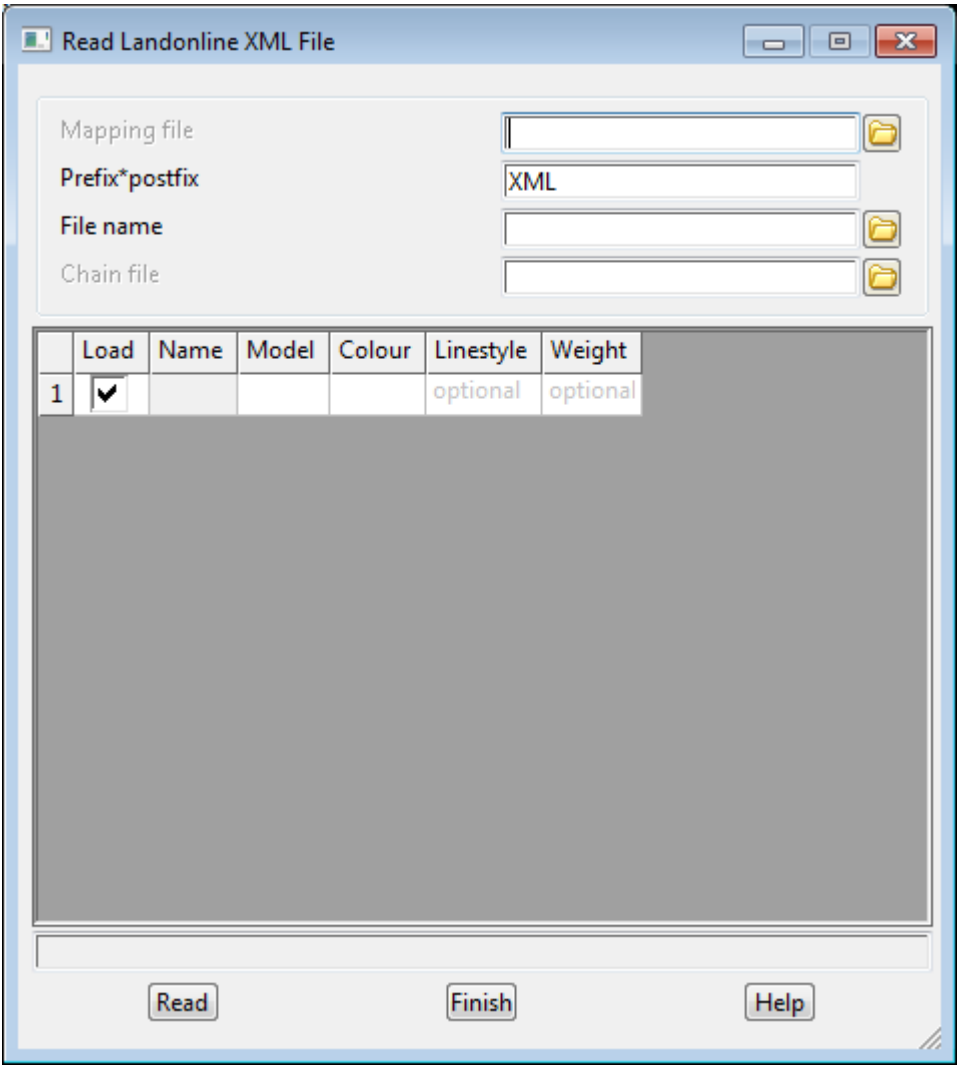
Pre*postfix for models text input box
pre and post text to add to the model names given in the mapping file

Pre*postfix for headers text input box
pre and post text to add to the header names for the radiation tables.

Process button
process the traverse spreadsheet and create the radiation tables.

Landonline XML Read

Position of menu: Survey =>Traverse spreadsheet => Landonline XML read
The Landonline XML Read option reads in data in the XML format for Landonline New Zealand.
Selecting Landonline XML read brings up the Read Landonline XML File panel



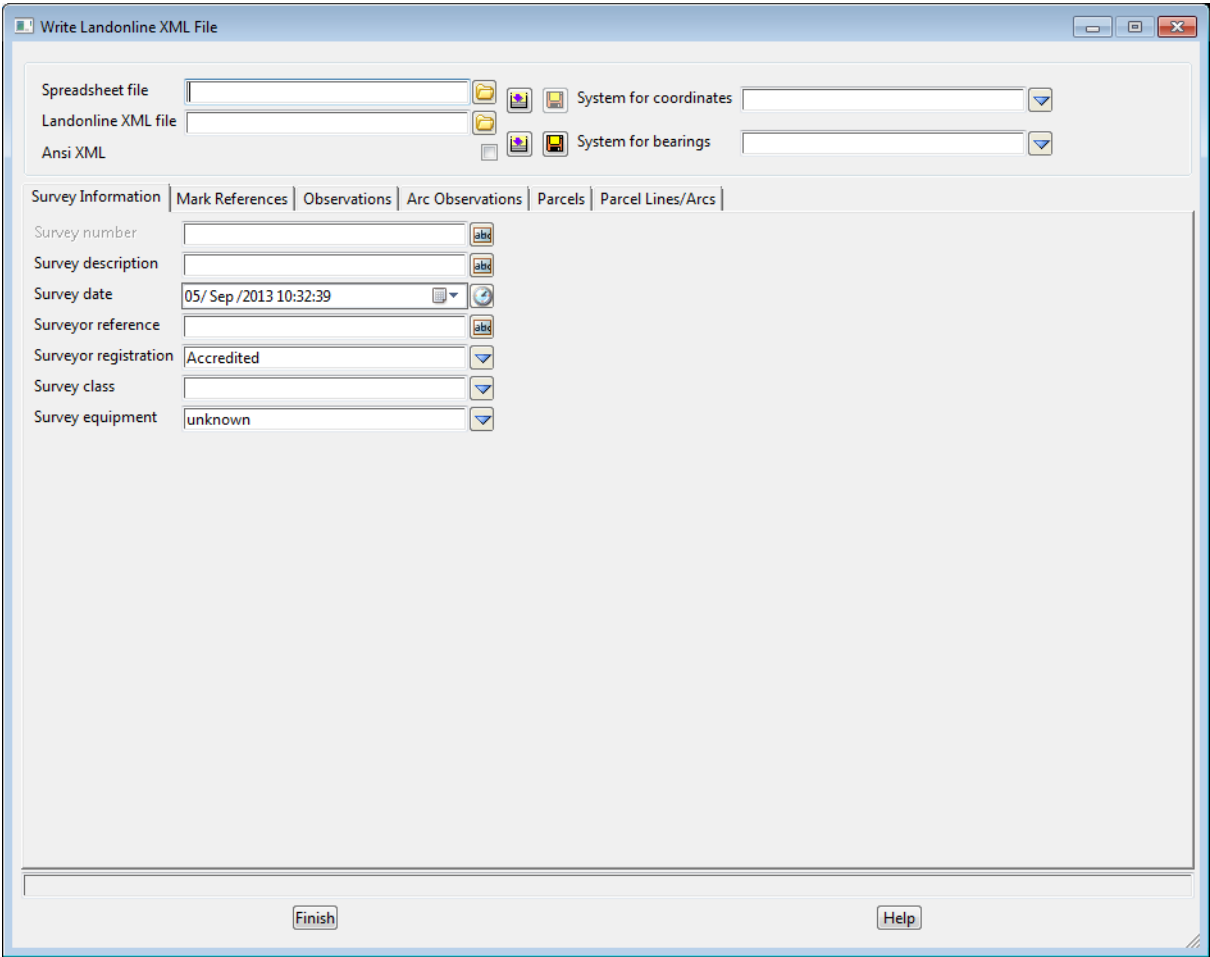
Documentation is available from 12d NZ Ltd.

Landonline XML Write

Position of menu: Survey => Traverse spreadsheet => Landonline XML write

The Landonline XML Write option writes out data in the XML format for Landonline New Zealand.

Selecting Landonline XML write brings up the Write Landonline XML File panel



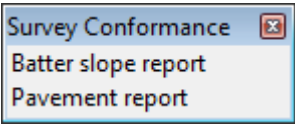
Documentation is available from 12d NZ Ltd.

Conformance

Position of menu: Survey =>Conformance

The **Conformance** walk-right menu contains survey options for generating conformance reports and models on surveyed points representing as-built batter slopes and pavements, compared against string data representing designed batter slopes and pavements.

The **Conformance** walk-right menu is



Generate batter slope conformance report
Generate pavement conformance report

For the option *Batter slope report*, go to
Pavement report

[Batter slope report](#)
[Pavement report](#)

Batter slope report

Position of option on menu: Survey =>Conformance =>Batter slope report

The **Batter slope report** option generates a conformance report on surveyed points representing an as-built batter slope, compared against string data representing a designed batter slope.

In addition to the conformance report, an output results model of the surveyed points can be generated, grouping the points by colour into their conformance zones (i.e. *within tolerance*, *above tolerance*, *below tolerance*, and *not tested*). The points in the results model can have z-values and vertex text set to show various combinations of point level, point conformance, and point error.

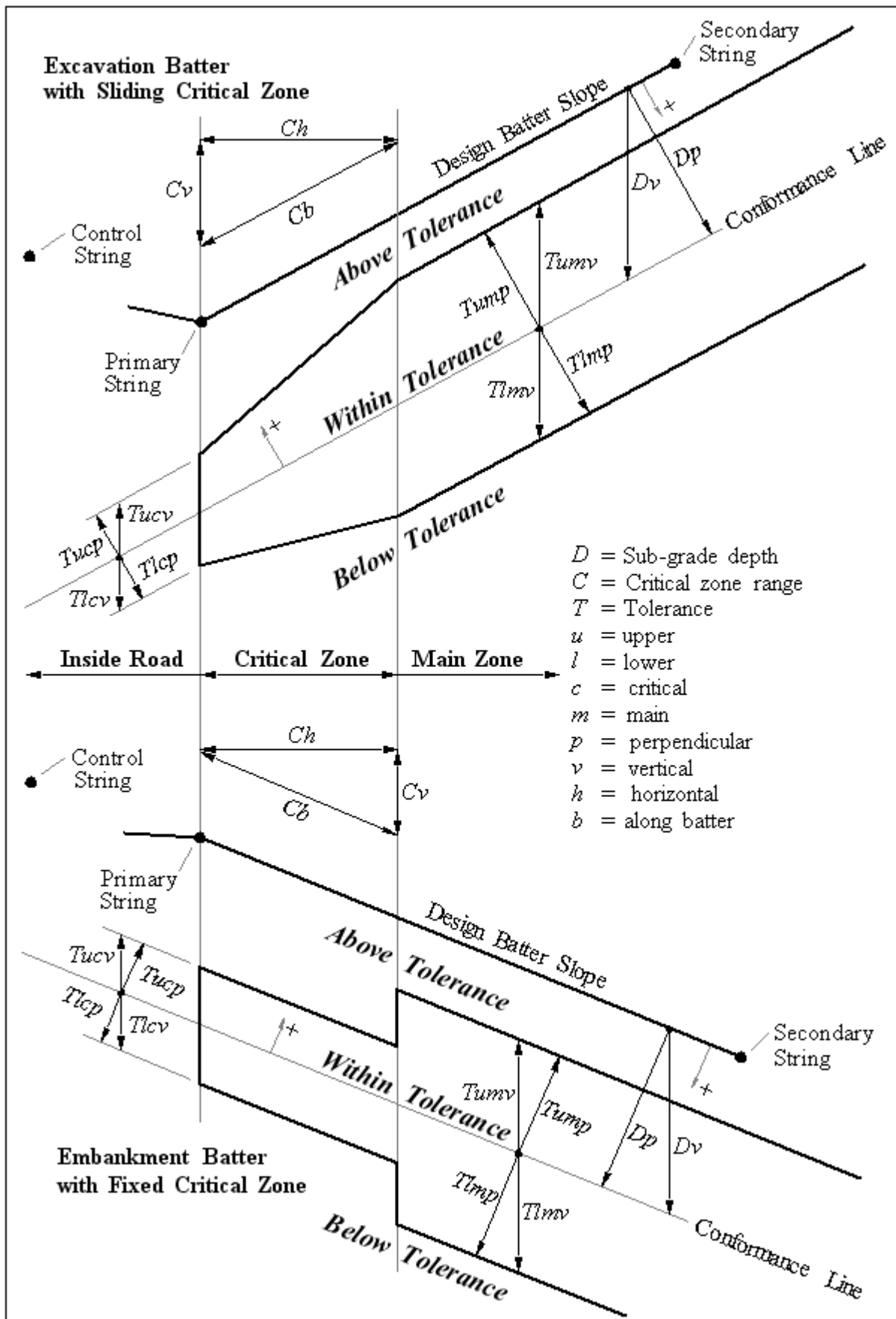
Note1: the term *point conformance* is used here to refer to a point's distance from design (distance from the conformance line on diagram below), while the term *point error* refers to a point's distance out of tolerance. As such, a point that is within tolerance (i.e. a *conformant point*) will, in general, have a non-zero conformance and a zero error, while a point that is out of tolerance (i.e. a *non-conformant point*) will have both a non-zero conformance and a non-zero error.

Note2: the point conformances and errors can be measured either vertically or perpendicular to the conformance line. It is perhaps worthwhile to note, especially in the case of the *sliding critical zone*, that the perpendicular measurements are determined from the vertical measurements, and **not** vice versa. That is, if the slope of the conformance line, measured from horizontal, is denoted by the angle *A*, then a surveyed point *Q*, has a perpendicular conformance *Qcp*, and error *Qep*, determined from the point's vertical conformance *Qcv*, and error *Qev*, via the following relationships:

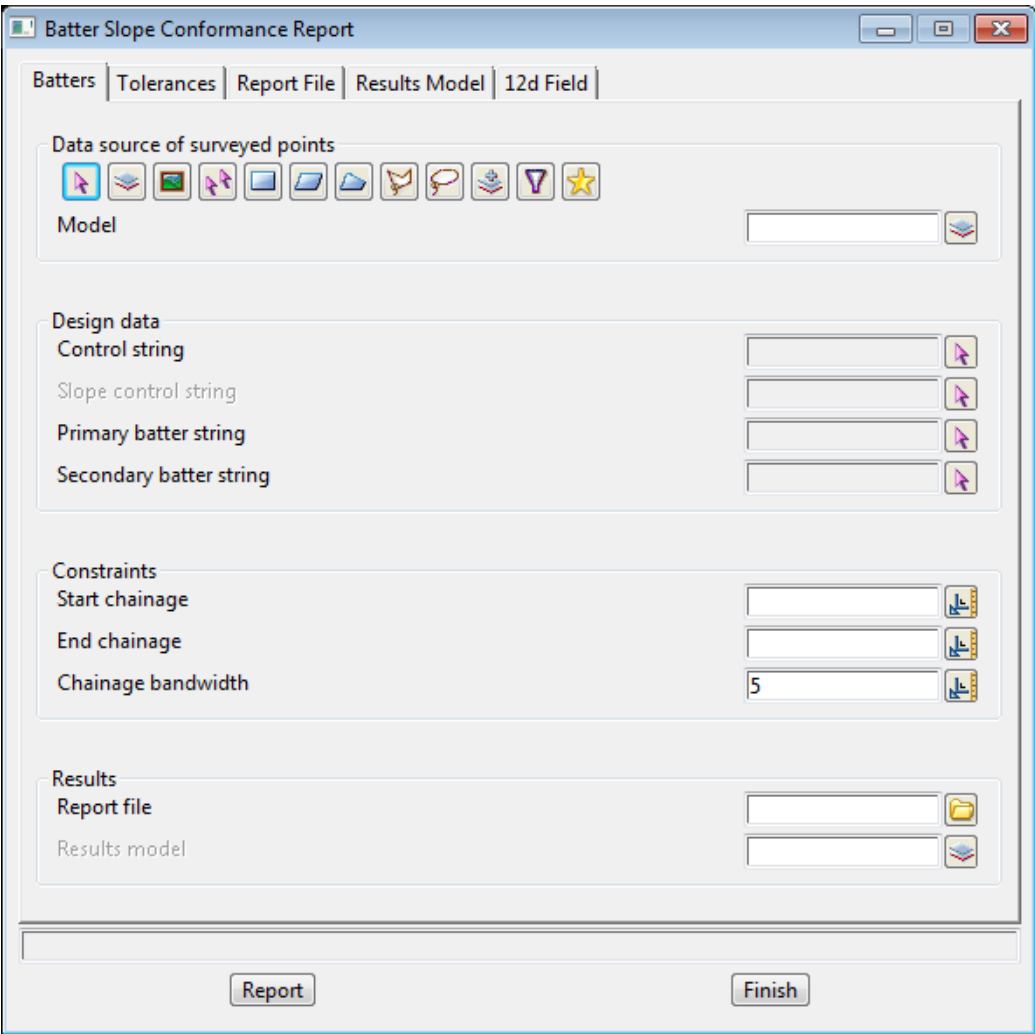
$$Qcp = Qcv.\cos A$$
$$Qep = Qev.\cos A$$

Note3: the conformance line is the line from which all point conformances and tolerances are measured, and is always parallel to the design batter slope line. When testing a sub-grade survey, the conformance line will normally be below the design batter slope line, but when testing a completed-construction survey, the two lines should normally coincide.

Typical sections through excavation and embankment batters are shown in the diagram below, along with schematics showing how the surveyed points are tested for conformance:



Selecting Batter slope report brings up the Batter Slope Conformance Report panel



Batters Tab:

The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Data source of points		source box		
-----------------------	--	------------	--	--

all points selected with this source box (whether they exist in point-string form or line-string form) will be considered as the set of surveyed points to be tested for conformance.

***Note:** the data for the Point Description column in the report will be taken from the string names of the selected points. If **all** the string names are blank, however, the point description data in the report will show point ids representing the sequential order that the points are reported in. The results model (if generated) will always have the string names of each point set to match the reported point description.*

Design data

Control string	string box
----------------	------------

the string selected with this box should normally represent the road centreline, and will be used to determine the chainage and offset of each surveyed point

Slope control string	string box
----------------------	------------

the Slope control string is optional (and is not shown on the diagram above). If no string is selected, the Primary string, below, will be used as the Slope control string. The line that is formed in plan, from a surveyed point to the nearest point on the Slope control string, defines the vertical plane used to conform that surveyed point. The slope formed between the primary and secondary strings on this vertical plane, is the design slope for that surveyed point.

Primary string string box

the string selected with this box should represent one edge of the designed batter (normally the edge closer to the road - i.e. the toe string of an excavation batter, or the crest string of an embankment batter).

The Primary string represents the start of the Critical Zone, which continues horizontally in the direction of the Secondary string, for a distance specified in the Critical zone range field (on the Tolerances Tab).

Secondary string string box

the string selected with this box should represent the other edge of the designed batter (normally the edge further away from the road - i.e. the interface string)

Constraints

Start chainage real box

the start chainage of the surveyed points to be conformed. Any point with a chainage less than the start chainage will not be tested. By default, the start chainage is set when the Control string is selected, but a different value can be typed in.

End chainage real box

the end chainage of the surveyed points to be conformed. Any point with a chainage greater than the end chainage will not be tested. By default, the end chainage is set when the Control string is selected, but a different value can be typed in.

Chainage bandwidth real box 5.0

if zero or blank, the surveyed points are simply sorted in ascending chainage order. However, if a value greater than zero is entered, the surveyed points will also be sub-sorted into chainage bands, in ascending offset order. Within each chainage band, the difference between the maximum and minimum chainage will be less than the Chainage bandwidth. This is a useful feature if the surveyed points are set out in rows of roughly equivalent chainage.

Results

Report file file box *.rpt

the name of the conformance report file to be created. If no extension is given, it will be given an extension of ".rpt".

Results model model box available models

the name of the results model to be created. If blank, the results model is not created.

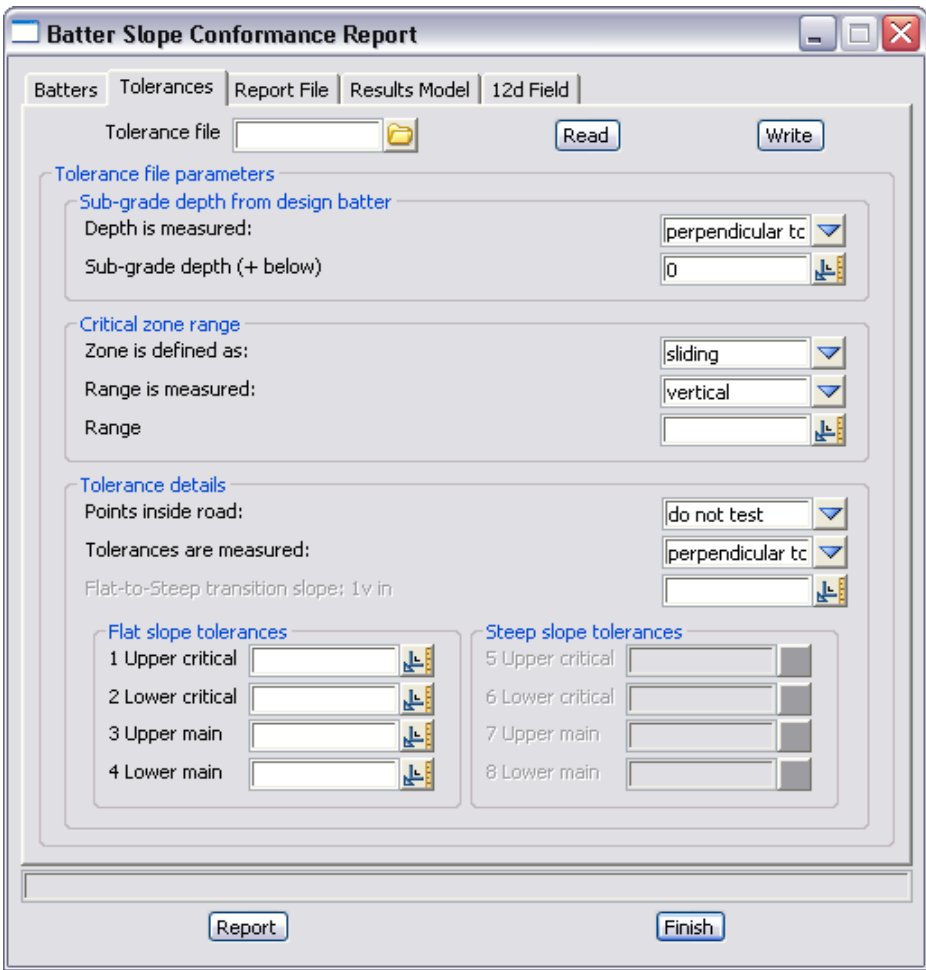
Report button

generates the conformance report file and the results model. This button can be activated regardless of which panel tab is currently active.

Finish button

exits the option and closes the panel. This button can be activated regardless of which panel tab is currently active.

Tolerances Tab:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tolerance file	file box		*.tol

the name of the tolerance file used to load and/or save the details of the conformance. If no extension is given, it will be given an extension of ".tol". The tolerance file stores the details of every field on the Tolerances Tab, the Report File Tab, and the Results Model Tab. The tolerance file itself is not required to run a conformance test - it is merely provided as a convenience.

Read	button
-------------	--------

Pressing this button will populate the panel fields on the last three panel tabs, with the data stored in the tolerance file. If data for a particular field is not found, that field remains unaffected.

Write	button
--------------	--------

Pressing this button will create a new tolerance file or replace an existing one. The contents of all non-blank fields on the last three panel tabs, are written to the file at this time.

Sub-grade depth from design batter

Depth is measured	choice box	perpendicular	perpendicular to batter vertical
--------------------------	------------	---------------	-------------------------------------

whether the sub-grade depth is measured perpendicular to the batter or vertically (refer to parameters

Dp and Dv on the diagram above)

Sub-grade depth real box 0.0

the depth of the conformance line from the design batter (refer to parameters Dp and Dv on the diagram above). If testing a sub-grade survey, this value will normally be greater than zero. If testing a completed-construction survey, however, this value will normally be zero, and the conformance line will coincide with the design batter slope line.

Critical zone range

Zone is defined as choice box sliding sliding fixed

determines whether the Critical Zone is defined as sliding or fixed (refer to diagram above). For excavation batters, the zone is normally sliding, whilst for embankment batters, it is normally fixed.

Range is measured choice box vertical along batter vertical horizontal

determines how the size of the Critical Zone is measured (refer to parameters Cb, Cv, and Ch on the diagram above)

Range real box

the size of the Critical Zone, measured in the specified direction (refer to parameters Cb, Cv, and Ch on the diagram above). This distance must be zero or greater.

Tolerance details

Points inside road choice box do not test do not test test with zero tolerance test with fixed crit. tolerance

*determines what to do with any surveyed points found inside the road. If such points are found, and this field is set to **do not test**, the points will be classified as untested, and in the results model, will have their vertex text set to **INR**.*

***Note:** untested points do not appear in the conformance report.*

Tolerances measured choice box perpendicular perpendicular to batter vertical

*whether the conformance tolerances are measured perpendicular to the batter or vertically (refer to parameters T**p and T**v on the diagram above). This field also determines whether the reported point conformances and point errors are measured perpendicular or vertically.*

Flat-to-Steep transition slope: 1v in real box

It is possible to use two different sets of batter slope tolerances, when producing the conformance report. The Flat slope tolerance set will be used whenever the design slope is equal to the transition slope or flatter; and the Steep slope tolerance set will be used whenever the design slope is steeper than the transition slope. The transition slope must be specified as a positive number; and will be interpreted as a slope in the form

1[v] : transition slope[h]. Leaving this field blank will disable the Steep slope tolerance set, ensuring that only the Flat slope tolerance set will ever be used.

Flat slope tolerances

The following four tolerances are used if the *transition slope* is not specified, or whenever the design slope is equal to the *transition slope* or flatter.

1 Upper critical real box

refer to parameters Tucp and Tucv on the diagram above. This value is normally zero or greater.

2 Lower critical real box
refer to parameters Tlcp and Tlcv on the diagram above. This value is normally zero or less.

3 Upper main real box
the upper allowable distance that a surveyed point, found to be in the Main Zone, may be from the conformance line, in order to be conformant (refer to parameters Tump and Tumv on the diagram above). This value is normally zero or greater.

4 Lower main real box
the lower allowable distance that a surveyed point, found to be in the Main Zone, may be from the conformance line, in order to be conformant (refer to parameters Tlmp and Tlmv on the diagram above). This value is normally zero or less.

Steep slope tolerances

The following four tolerances are used only if the *transition slope* is specified, and the design slope is steeper than the *transition slope*.

5 Upper critical real box
refer to parameters Tucp and Tucv on the diagram above. This value is normally zero or greater.

6 Lower critical real box
refer to parameters Tlcp and Tlcv on the diagram above. This value is normally zero or less.

7 Upper main real box
the upper allowable distance that a surveyed point, found to be in the Main Zone, may be from the conformance line, in order to be conformant (refer to parameters Tump and Tumv on the diagram above). This value is normally zero or greater.

8 Lower main real box
the lower allowable distance that a surveyed point, found to be in the Main Zone, may be from the conformance line, in order to be conformant (refer to parameters Tlmp and Tlmv on the diagram above). This value is normally zero or less.

Report File Tab:

Batter Slope Conformance Report

Batters

Tolerances

Report File

Results Model

12d Field

Report file details

Max lines per page

70

Header information

Original survey file

Re-check file

Lot number

Lot location

Lot description

Table options

Show design levels

Show non-conformance errors

Show non-conformance slopes

Show vertex ids

Footer information

Surveyor name

Surveyor title

Report

Finish

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Max lines per page	integer box	70	

the maximum number of report lines that can fit on a printed page. This number is needed so that page breaks (form feed characters) can be inserted into the report file at the appropriate places. The number of lines per page will vary depending on the editor/word-processor used for printing, the desired page size and margin widths, the desired page layout (portrait or landscape), and the desired font and font size. As such, the number needs to be tuned for the user's particular report specifications/requirements.

***Note1:** you may find that MS Notepad is not a good program for printing out the report file (Notepad doesn't seem to interpret form feed characters).*

***Note2:** if Max lines per page is set to a large enough number, there will be no page breaks in the report file.*

Header information

Original survey file input box
optional line of text in the report header to identify the original survey data file

Re-check file
optional line of text in the report header to identify the survey data file where the pavement was rechecked.

- Lot number

input box

optional line of text in the report header to identify the lot number
- Lot location

input box

optional line of text in the report header to identify the lot location
- Lot description

input box

optional line of text in the report header to identify the lot description

Table options

- Show design levels

tick box

off

whether to show the design levels in the column after the point levels

Note: the design levels are always vertically above or below the point levels, even if the tolerances are measured perpendicular to the design slope.

- Show non-conformance errors

tick box

off

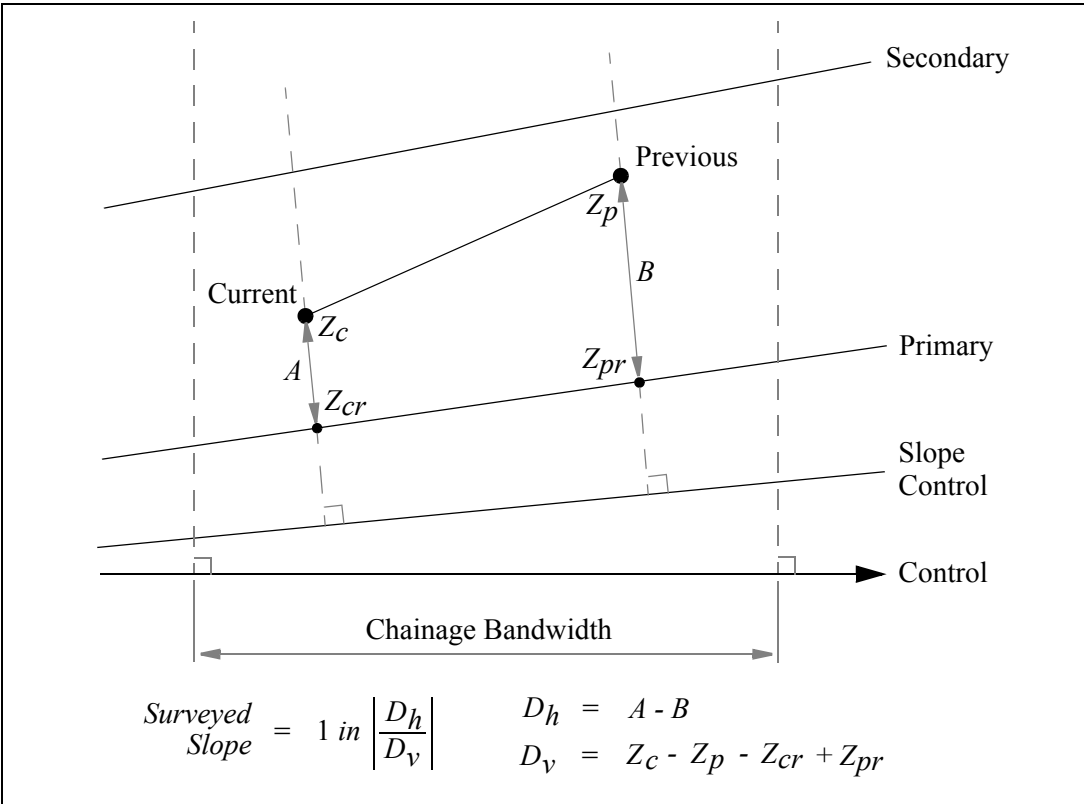
whether to show the point errors for non-conformant points (i.e. the distances the points are out of tolerance). If turned on, the point errors will appear in parentheses, (=, after the conformance and tolerance details.

- Show non-conformance slopes

tick box

off

whether to show the surveyed slopes at non-conformant points. The surveyed slope is the slope between the previous and current point in the report, within a single, offset-sorted chainage band. The slope is calculated as though the previous point lies in the same vertical plane as that of the current point's design slope. As such, the slope is adjusted for any differences in bearing direction between the two design slopes, and for any incline in the road, as shown in the diagram, below:



If turned on, the surveyed slopes will appear in square brackets, [=, after the conformance, tolerance and point error details.

***Note:** if the Chainage bandwidth on the Batters Tab is zero or blank, then the points will only be sorted by chainage, and not sub-sorted by offset within chainage bands. In this case, surveyed slopes will never be reported.*

Show vertex ids

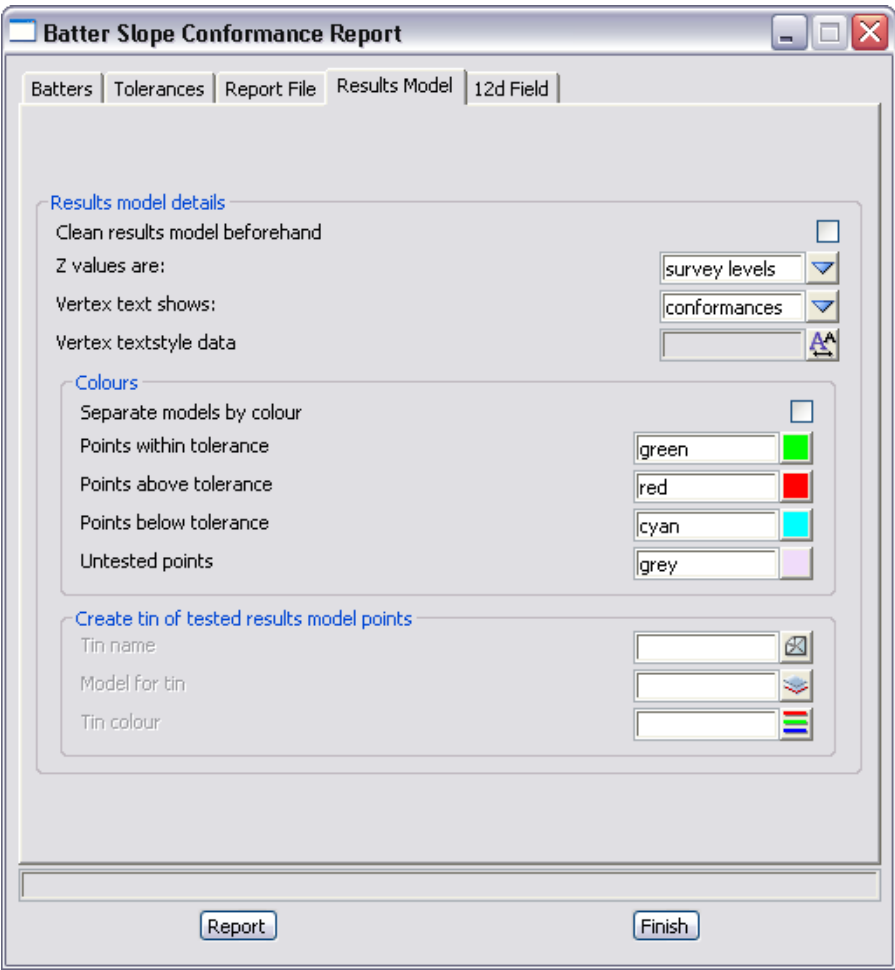
if ticked the vertex id of the point rather than the name of the string containing the point will be shown in the report file.

Footer information

Surveyor name input box
name of the person required to sign the report (optional)

Surveyor title input box
title of the person required to sign the report (optional)

Results Model Tab:



The fields have the following functions:

Field Description	Type	Defaults	Pop-Up
Clean results model beforehand	tick box	off	
<i>whether to clean the contents of an existing results model before re-running the option</i>			
Z values are	choice box	levels	levels conformances

errors

determines what z values to give the points generated in the results model

Note: any untested points in the model will have their z values set to their original point levels, regardless.

Vertex text shows	choice box	conformances	levels conformances errors
--------------------------	------------	--------------	----------------------------------

determines what values to show in the vertex text of the points generated in the results model

Note1: any points within tolerance will have a zero error. For these points, if the vertex text is set to **errors**, no text will be set.

Note2: any untested points in the model will have the vertex text set to show one of four possible error codes, explaining why the point was not tested. The error codes are **NUL** (invalid z-value), **OCR** (outside chainage range), **ERR** (intersection error or similar), and **INR** (inside road).

Vertex textstyle data	textdata box	user textdata favourites
------------------------------	--------------	--------------------------

controls the appearance of the vertex text for the points generated in the results model

Colours

Separate models by colour tick box

if ticked the results model will be several models, each result colour going to a separate model named with a suffix of the colour name.

Points within tolerance	colour box	green	available colours
--------------------------------	------------	-------	-------------------

colour for points within tolerance

Points above tolerance	colour box	red	available colours
-------------------------------	------------	-----	-------------------

colour for points above tolerance

Points below tolerance	colour box	cyan	available colours
-------------------------------	------------	------	-------------------

colour for points below tolerance

Untested points	colour box	grey	available colours
------------------------	------------	------	-------------------

colour for untested points

Note: untested points do not appear in the conformance report.

Create tin of tested results model points

Tin name	tin box	available tins
-----------------	---------	----------------

name of the tin to create. If the tin already exists, a prompt will ask if it should be replaced. If this field is blank, or if the Results model field (on the Batters Tab) is blank, no tin will be created.

Note: the tin will be created only with the set of tested points created in the Results model, and can be used to quickly display contour maps of the results. When creating the tin, an attempt is made to null any triangles outside the **shrink-wrapped** boundary of the tested points. The boundary polygon used for this nulling procedure is determined from the extremity points of each offset-sorted chainage band (see Chainage bandwidth on the Batters Tab).

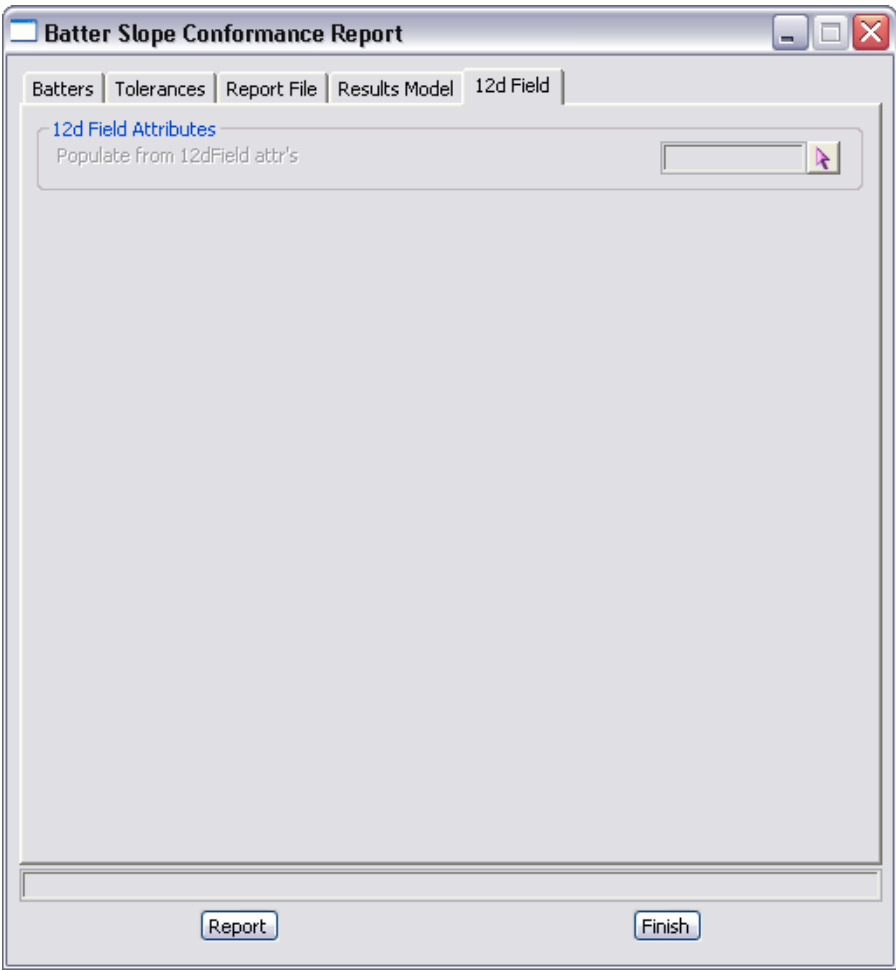
Model for tin	model box	available models
----------------------	-----------	------------------

model for tin to be placed in, for viewing purposes. If blank, the tin is not placed into a model.

Tin colour	colour box	available colours
-------------------	------------	-------------------

colour for tin. If blank, the tin will adopt the colour selected for Points within tolerance.

12d Field Tab:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Populate from 12dField attr's

if 12dField was used to pickup the points then the attributes can be used to populate the conformance panel automatically, for example the control lines and primary and secondary edge strings. On selecting the string the panel will be updated.

Pavement report

Position of option on menu: Survey =>Conformance =>Pavement report

The **Pavement report** option generates a conformance report on surveyed points representing the top of an as-built pavement, compared against string data representing the top of a designed pavement (level conformance), and compared against tin data representing the bottom of an as-built pavement (thickness conformance).

In addition to the conformance report, an output results model of the surveyed points can be generated, grouping the points by colour into their conformance zones (i.e. *within tolerance*, *above tolerance*, *below tolerance*, and *not tested*). The points in the results model can have z-values and vertex text set to show various combinations of point level, point conformance, point error, pavement thickness and pavement thickness error.

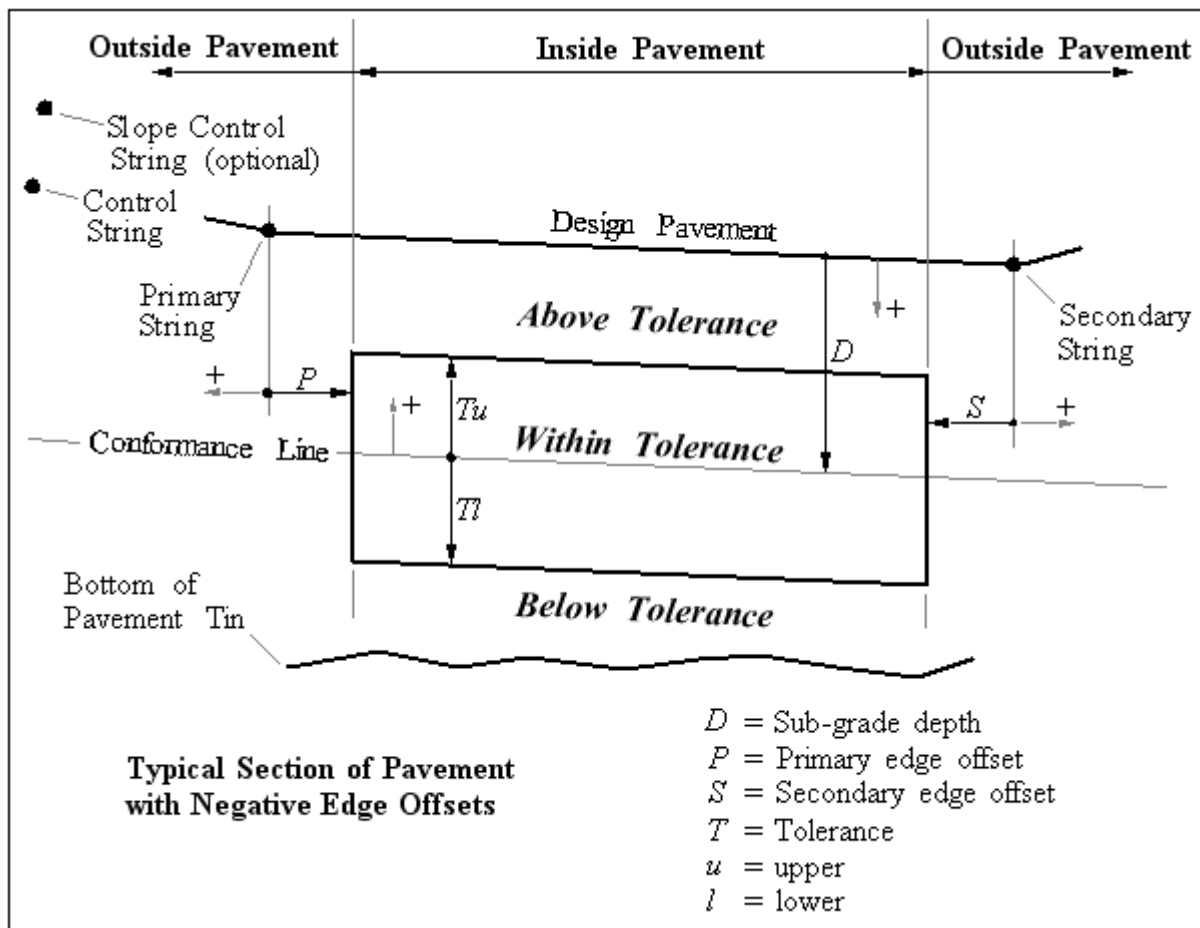
Note1: the term *point conformance* is used here to refer to a point's distance from design

(distance from the conformance line on diagram below), while the term *point error* refers to a point's distance out of tolerance. As such, a point that is within tolerance (i.e. a *conformant point*) will, in general, have a non-zero conformance and a zero error, while a point that is out of tolerance (i.e. a *non-conformant point*) will have both a non-zero conformance and a non-zero error.

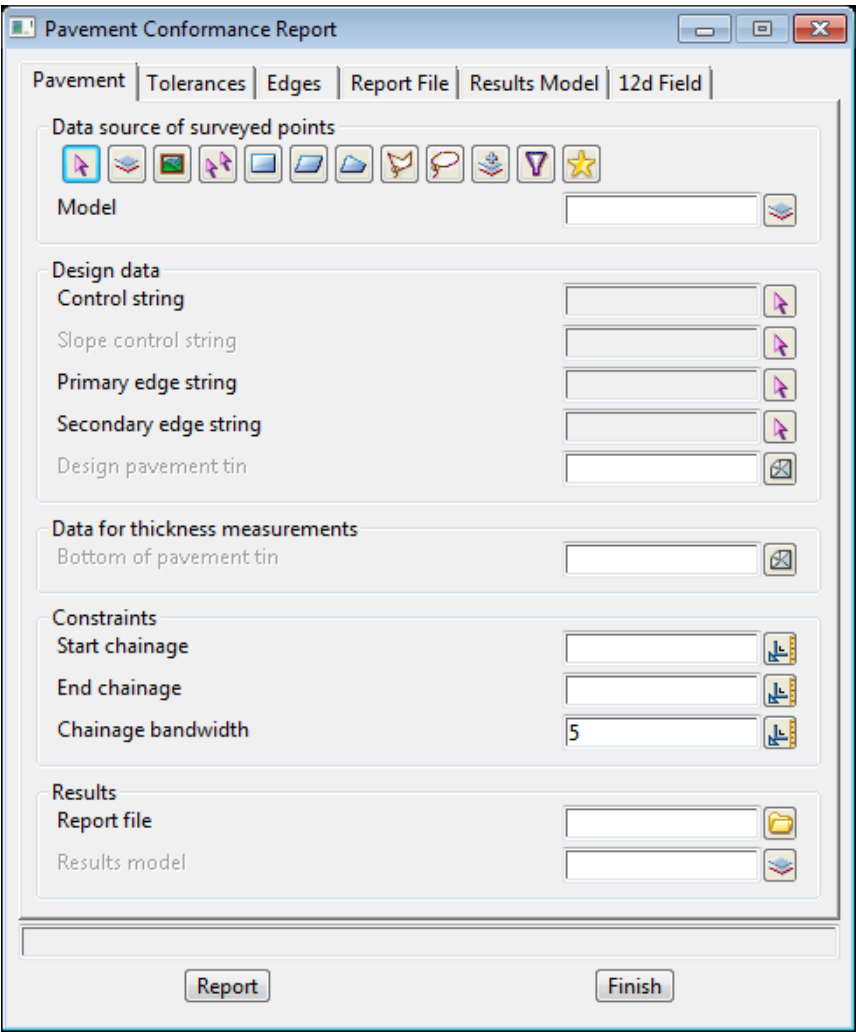
Note2: the point conformances and errors can be measured either vertically or perpendicular to the conformance line. The conformance line is the line from which all point conformances and tolerances are measured, and is always parallel to the design pavement line. When testing a sub-grade survey, the conformance line will normally be below the design pavement line, but when testing a completed-construction survey, the two lines should normally coincide.

Note3: the optional pavement thickness measurements are always made vertically downwards from the surveyed points, to the tin representing the bottom of pavement. Pavement thickness errors will be non-zero wherever the pavement is found to be too thick or too thin. When testing for both level conformance and thickness conformance, both tests must pass for a point to be considered conformant.

A typical section of pavement is shown in the diagram below, along with a schematic showing how the surveyed points are tested for level conformance:



Selecting Pavement report brings up the Pavement Conformance Report panel



Pavement Tab:

The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
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Data source of points		source box		
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all points selected with this source box (whether they exist in point-string form or line-string form) will be considered as the set of surveyed points to be tested for conformance.

***Note:** the data for the Point Description column in the report will be taken from the string names of the selected points. If **all** the string names are blank, however, the point description data in the report will show point ids representing the sequential order that the points are reported in. The results model (if generated) will always have the string names of each point set to match the reported point description.*

Design data

Control string	string box
----------------	------------

the string selected with this box should normally represent the road centreline, and will be used to determine the chainage and offset of each surveyed point

Slope control string string box

the Slope control string is optional. If no string is selected, the Control string, above, will be used as the Slope control string. The line that is formed in plan, from a surveyed point to the nearest point on the Slope control string, defines the vertical plane used to conform that surveyed point. The slope formed between the primary and secondary strings on this vertical plane, is the design slope for that surveyed point.

Primary string string box

the string selected with this box should represent one edge of the designed pavement (normally the edge that is closer to the Control string)

Secondary string string box

the string selected with this box should represent the other edge of the designed pavement (normally the edge that is further away from the Control string).

Note: *If the selected string is the same as the Primary string, or if no string is selected, then the pavement is defined by one string and is considered to be flat (i.e. zero cross-fall), and to have a width defined by the Primary and Secondary edge offsets (on the Tolerances Tab). This feature can be useful for identifying any surveyed points that are close to an edge line.*

Design pavement tin

if selected this tin will be used for design levels rather than the primary and secondary strings.

Data for thickness measurements**Bottom of pavement tin** tin box available tins

the Bottom of pavement tin is optional. If not selected, the pavement is not tested for thickness conformance. The tin selected with this box should represent the as-built bottom surface of the pavement currently being tested.

Constraints**Start chainage** real box

the start chainage of the surveyed points to be conformed. Any point with a chainage less than the start chainage will not be tested. By default, the start chainage is set when the Control string is selected, but a different value can be typed in.

End chainage real box

the end chainage of the surveyed points to be conformed. Any point with a chainage greater than the end chainage will not be tested. By default, the end chainage is set when the Control string is selected, but a different value can be typed in.

Chainage bandwidth real box 5.0

if zero or blank, the surveyed points are simply sorted in ascending chainage order. However, if a value greater than zero is entered, the surveyed points will also be sub-sorted into chainage bands, in ascending offset order. Within each chainage band, the difference between the maximum and minimum chainage will be less than the Chainage bandwidth. This is a useful feature if the surveyed points are set out in rows of roughly equivalent chainage.

Results**Report file** file box *.rpt

the name of the conformance report file to be created. If no extension is given, it will be given an extension of .rpt.

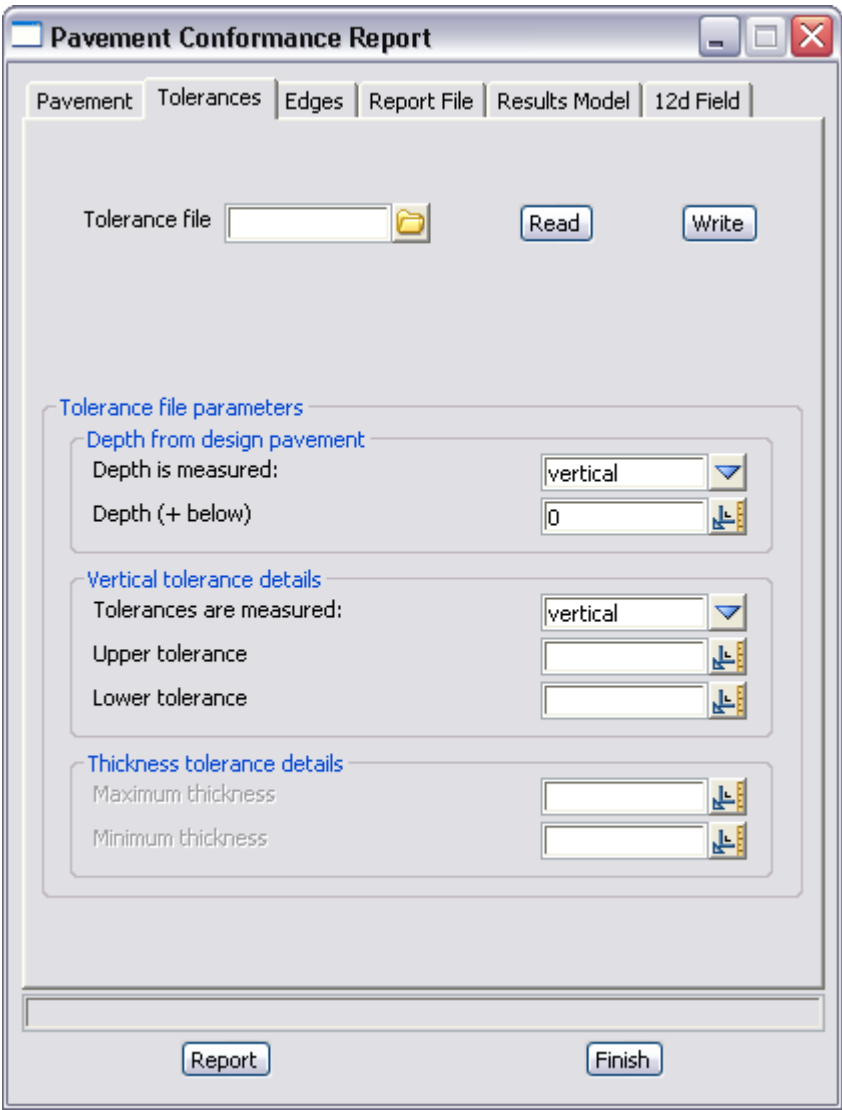
Results model model box available models

the name of the results model to be created. If blank, the results model is not created.

Report button
generates the conformance report file and the results model. This button can be activated regardless of which panel tab is currently active.

Finish button
exits the option and closes the panel. This button can be activated regardless of which panel tab is currently active.

Tolerances Tab:



The fields and buttons have the following functions:

Field Description	Type	Defaults	Pop-Up
Tolerance file	file box		*.tol

the name of the tolerance file used to load and/or save the details of the conformance. If no extension is given, it will be given an extension of .tol. The tolerance file stores the details of every field on the Tolerances Tab, the Report File Tab, and the Results Model Tab. The tolerance file itself is not required to run a conformance test - it is merely provided as a convenience.

Read button

Pressing this button will populate the panel fields on the last three panel tabs, with the data stored in the tolerance file. If data for a particular field is not found, that field remains unaffected.

Write button

Pressing this button will create a new tolerance file or replace an existing one. The contents of all non-blank fields on the last three panel tabs, are written to the file at this time.

Depth from design pavement

Depth is measured choice box vertical perpendicular to pavement vertical

whether the sub-grade depth is measured perpendicular to the pavement or vertically (refer to parameter D on the diagram above)

***Note:** since pavements typically have cross-fall slopes of less than 7%, the value of this setting should make very little difference to the results.*

Depth (+ below) real box 0.0

the depth of the conformance line from the design pavement (refer to parameter D on the diagram above). If testing a sub-grade survey, this value will normally be greater than zero. If testing a completed-construction survey, however, this value will normally be zero, and the conformance line will coincide with the design pavement line.

Vertical tolerance details

Tolerances are measured choice box vertical perpendicular to pavement vertical

whether the conformance tolerances are measured perpendicular to the pavement or vertically (refer to parameters Tu and Tl on the diagram above). This field also determines whether the reported point conformances and point errors are measured perpendicular or vertically.

***Note:** since pavements typically have cross-fall slopes of less than 7%, the value of this setting should make very little difference to the results.*

Upper tolerance real box

the upper allowable distance that a surveyed point may be from the conformance line, in order to be conformant (refer to parameter Tu on the diagram above). This value is normally zero or greater.

Lower tolerance real box

the lower allowable distance that a surveyed point may be from the conformance line, in order to be conformant (refer to parameter Tl on the diagram above). This value is normally zero or less.

Thickness tolerance details

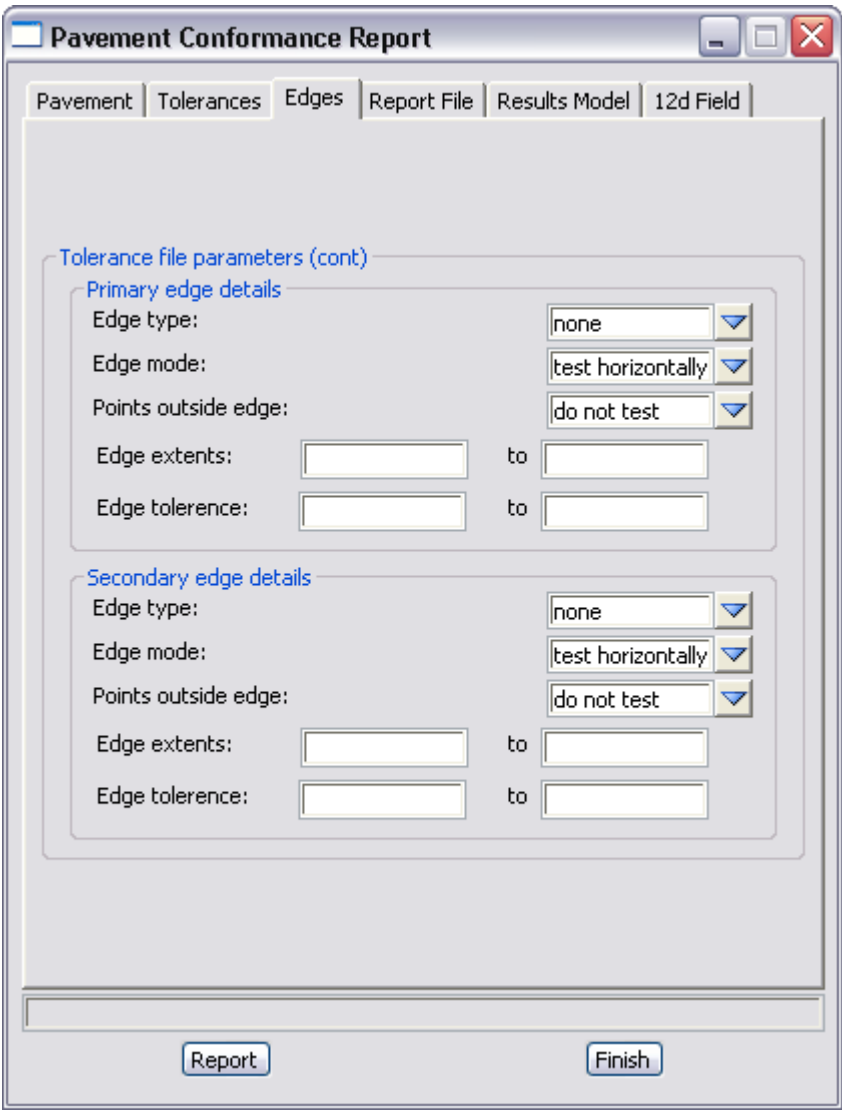
Maximum thickness real box

the maximum allowable vertical distance that a surveyed point may be above the Bottom of pavement tin, in order to be conformant. If blank, there will be no upper limit to the pavement thickness.

Minimum thickness real box

the minimum allowable vertical distance that a surveyed point may be above the Bottom of pavement tin, in order to be conformant. If blank, there will be no lower limit to the pavement thickness.

Edges Tab:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
The settings for Primary edge details and Secondary edge details are the same.			

Tolerance file parameters (cont).

Primary edge details /Secondary edge details

Edge type	choice box	left, right, join, none
<i>left:</i> the string is the left hand edge of the pavement. <i>right:</i> the string is the right hand edge of the pavement. <i>join:</i> the string is joint between pavements. <i>none:</i> the string is not used for edge checks.		
Edge mode	choice box	test horizontally, test vertically & horizontally
<i>test horizontally:</i> the edge is only tested for horizontal conformance <i>test vertically & horizontally:</i> the edge is only tested for both horizontal and vertical conformance		
Points outside edge	choice box	do not test, test vertically
<i>Determines what to do with any surveyed points found outside the pavement.</i>		

***do not test:** points outside the edge are not tested. The points will be classified as untested, and in the results model, will have their vertex text set to EDG **Note:** untested points do not appear in the conformance report.*

***test vertically:** points outside the edge are tested vertically.*

Edge extents

Enter the range around the nominal edge in which a point is considered to be an edge check. This is relative to the 'left/right' setting for the edge, +ve is outside the pavement and -ve into the pavement.

Edge tolerance

Enter the tolerances from the design edge, this is relative to the 'left/right' setting for the edge, +ve is outside the pavement and -ve into the pavement.

Report File Tab:

Pavement Conformance Report

Pavement

Tolerances

Edges

Report File

Results Model

12d Field

Report file details

Max lines per page

70

Header information

Original survey file

Re-check file

Lot number

Lot location

Lot description

Table options

Show design levels

Show non-conformance errors

Show vertex ids

Footer information

Surveyor name

Surveyor title

Report

Finish

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Max lines per page	integer box	70	

the maximum number of report lines that can fit on a printed page. This number is needed so that page

breaks (form feed characters) can be inserted into the report file at the appropriate places. The number of lines per page will vary depending on the editor/word-processor used for printing, the desired page size and margin widths, the desired page layout (portrait or landscape), and the desired font and font size. As such, the number needs to be tuned for the user's particular report specifications/requirements.

Note1: you may find that MS Notepad is not a good program for printing out the report file (Notepad doesn't seem to interpret form feed characters).

Note2: if Max lines per page is set to a large enough number, there will be no page breaks in the report file.

Header information

Original survey file input box
optional line of text in the report header to identify the original survey data file

Re-check file
Optional line of text in the report header to identify the survey data file where the pavement was rechecked.

Lot number input box
optional line of text in the report header to identify the lot number

Lot location input box
optional line of text in the report header to identify the lot location

Lot description input box
optional line of text in the report header to identify the lot description

Table options

Show design levels tick box off
whether to show the design levels in the column after the point levels

***Note:** the design levels are always vertically above or below the point levels, even if the tolerances are measured perpendicular to the design slope.*

Show non-conformance errors tick box off

whether to show the point errors and thickness errors for non-conformant points (i.e. the distances the points are out of level and thickness conformance, respectively). If turned on, the point errors will appear in parentheses, (), after the conformance and tolerance details, and the thickness errors will appear in parentheses, (), after the thickness and max/min thickness details.

Show vertex ids tick box

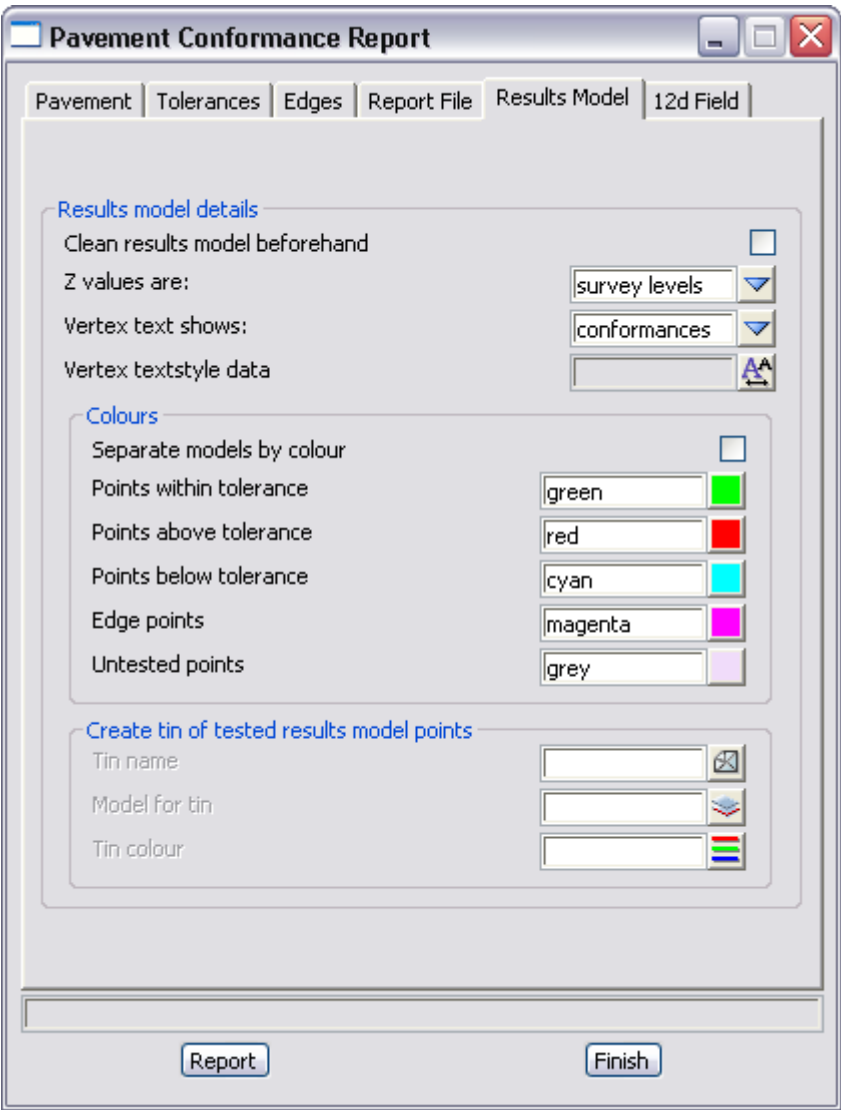
if ticked the vertex id of the point rather than the name of the string containing the point will be shown in the report file.

Footer information

Surveyor name input box
name of the person required to sign the report (optional)

Surveyor title input box
title of the person required to sign the report (optional)

The next tab on the panel is the Results Model Tab:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Clean results model beforehand	tick box	off	
<i>whether to clean the contents of an existing results model before re-running the option</i>			
Z values are	choice box	levels	levels conformances errors thicknesses thickness errors

determines what z values to give the points generated in the results model

***Note:** any untested points in the model will have their z values set to their original point levels, regardless.*

Vertex text shows	choice box	conformances	levels conformances errors thicknesses
--------------------------	------------	--------------	-------------------------------------------------

thickness errors

determines what values to show in the vertex text of the points generated in the results model

Note1: any points that pass the level conformance test will have a zero error. For these points, if the vertex text is set to **errors**, no text will be set. Likewise, any points that pass the thickness conformance test will have a zero thickness error. For these points, if the vertex text is set to **thickness errors**, no text will be set.

Note2: any untested points in the model will have the vertex text set to show one of five possible error codes, explaining why the point was not tested. The error codes are **NUL** (invalid z-value), **OCR** (outside chainage range), **ERR** (intersection error or similar), **EDG** (outside pavement edge), and **NTN** (bottom of pavement tin not defined at point).

Vertex textstyle data	textdata box	user textdata favorites
------------------------------	--------------	-------------------------

controls the appearance of the vertex text for the points generated in the results model

Colours

Separate models by colour tick box

if ticked the results model will be several models, each result colour going to a separate model named with a suffix of the colour name.

Points within tolerance	colour box	green	available colours
--------------------------------	------------	-------	-------------------

colour for points within tolerance (i.e. points that pass both the level and thickness conformance tests)

Points above tolerance	colour box	red	available colours
-------------------------------	------------	-----	-------------------

colour for points above tolerance (i.e. points that are above the Upper tolerance or points where the pavement is thicker than the Maximum thickness)

Points below tolerance	colour box	cyan	available colours
-------------------------------	------------	------	-------------------

colour for points below tolerance (i.e. points that are below the Lower tolerance or points where the pavement is thinner than the Minimum thickness)

Untested points	colour box	grey	available colours
------------------------	------------	------	-------------------

colour for untested points

Note: untested points do not appear in the conformance report.

Create tin of tested results model points

Tin name	tin box	available tins
-----------------	---------	----------------

name of the tin to create. If the tin already exists, a prompt will ask if it should be replaced. If this field is blank, or if the Results model field (on the Pavement Tab) is blank, no tin will be created.

Note: the tin will be created only with the set of tested points created in the Results model, and (depending on what the points' z-values are set to in the Results model) can be used to quickly display contour maps of the results, or to create a Bottom of pavement tin for the next pavement layer to be tested. When creating the tin, an attempt is made to null any triangles outside the shrink-wrapped boundary of the tested points. The boundary polygon used for this nulling procedure is determined from the extremity points of each offset-sorted chainage band (see Chainage bandwidth on the Pavement Tab).

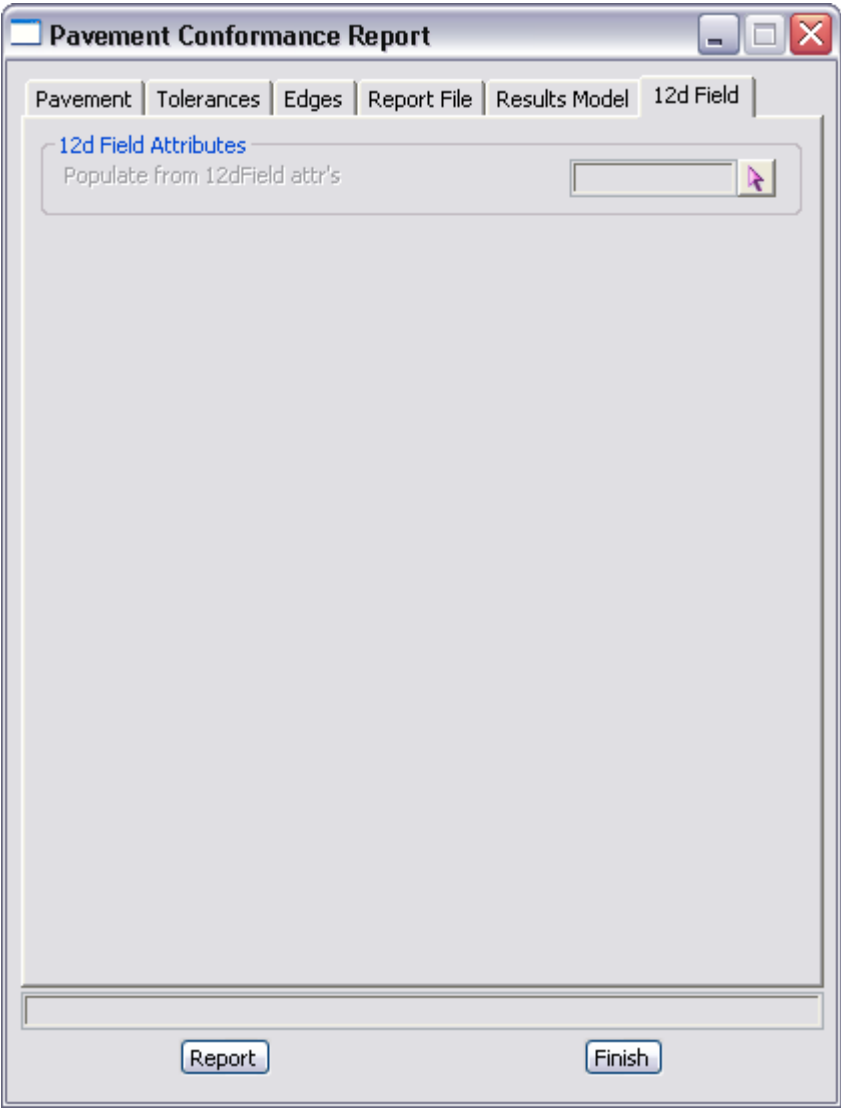
Model for tin	model box	available models
----------------------	-----------	------------------

model for tin to be placed in, for viewing purposes. If blank, the tin is not placed into a model.

Tin colour	colour box	available colours
-------------------	------------	-------------------

colour for tin. If blank, the tin will adopt the colour selected for Points within tolerance.

12d Field Tab:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Populate from 12dField attr's

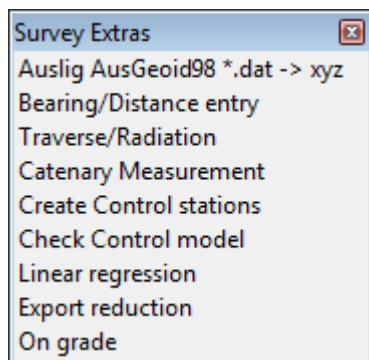
if 12dField was used to pickup the points then the attributes can be used to populate the conformance panel automatically, for example the control lines and primary and secondary edge strings. On selecting the string the panel will be updated.

Extras

Position of menu: Survey =>Extras

The extras walk-right menu contains extra survey options. some of which are still being developed.

The extras walk-right menu is



Convert AusGeoid98 file into XYZ format
entry and edit by plane bearing and plane distance
bearing distance entry to produce traverse or radiations
create points in a vertical plane
create control stations
check unique point id in control model
Linear regression
write out a field file from a survey function

For the option *Auslig AusGeoid98 *.dat ->xyz*, go to

Bearing/Distance entry

Traverse/Radiation

Catenary measurement

Create Control Station

Check control model

Linear regression

Reduction to field file

On grade

[AusGeoid98 *.dat -> xyz](#)

[Plane Bearing/Distance Entry](#)

[Bearing/Distance Entry for Traverse/Radiation](#)

[Catenary Measurement](#)

[Create Control Stations](#)

[Check Control Model](#)

[Linear Regression](#)

[Survey Function to Field File](#)

[On Grade](#)

AusGeoid98 *.dat -> xyz

Position of option on menu: Survey =>Extras =>Auslig AusGeoid98 *.dat->xyz

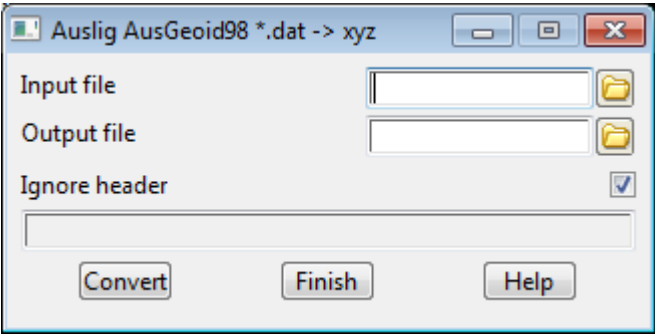
The *Ausgeoid98 *.dat -> xyz* option allows the conversion of a standard AusGeoid98 *.dat file into a XYZ format. This format can then be read into 12d. The values in the XYZ file will have the following meaning

X value will represent the Longitude

Y value will represent the Latitude

Z value will represent the N value

Selecting *Ausgeoid98 *.dat -> xyz* brings up the *Ausgeoid98 *.dat -> xyz* panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Input file	file box		*.dat
<i>this filename of the AusGeoid file. The .dat extension is added by default.</i>			
Output file	file box		
<i>this filename of the XYZ file to be produced.</i>			
Ignore header	tick box	ticked	
<i>if ticked, the first line in the *.dat file is ignored (usually the header)</i>			
Convert	button		
<i>convert the file.</i>			

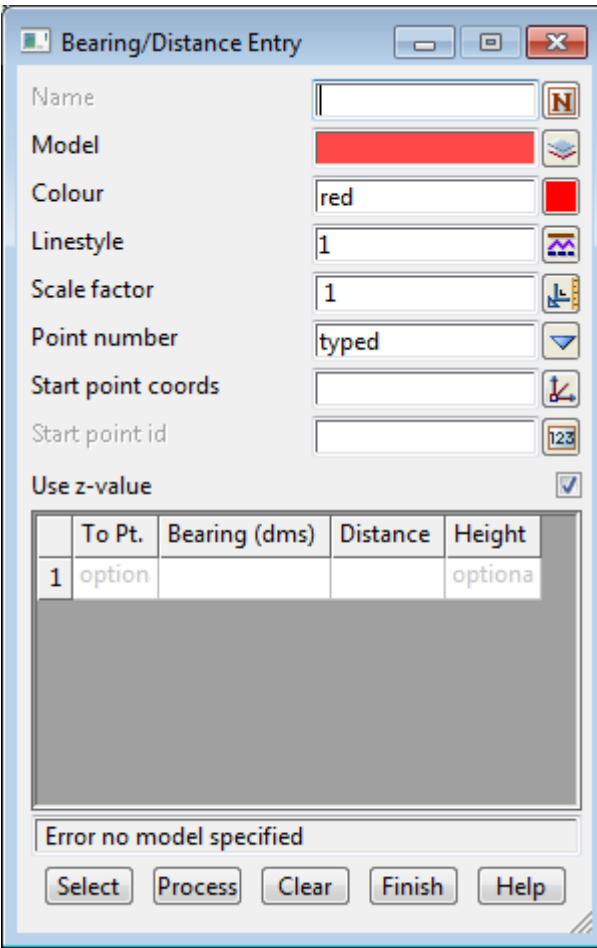
For more information about terminology used in this option, see the Appendix [Geodetics Summary](#).

Plane Bearing/Distance Entry

Position of option on menu: Survey =>Extras =>Bearing/distance entry

The **bearing/distance entry** option allows the input of a traverse by manual input of plane bearings and plane distances or by selecting an existing string.

Selecting **Bearing/distance entry** brings up the **Bearing/Distance Entry** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name	name box		defined names from names.4d file
<i>this field is optional. If non-blank, the name of the new string.</i>			
Model	model box		available models
<i>if non-blank, the model of the new string. If blank, the original string model is used.</i>			
Colour	colour box	red	available colours
<i>if non-blank, the colour of the new string. If blank, the original string colour is used.</i>			
Linestyle	input	1	available line styles
<i>line style of the string.</i>			
Scale factor	input	projection scale	
<i>This value will be applied to any entered distances. i.e. final distance = entered distance * scale factor</i>			
<i>The scale factor could be a point scale factor, a line scale factor or a combined scale factor.</i>			
<i>The final distance will be used for coordinate calculations.</i>			
Use z- value	tick box	transit	
<i>if ticked, the z-values for each point can be entered.</i>			
<i>If no ticked then z-values are not entered.</i>			

Point id	input	typed	none, auto increment, typed
-----------------	-------	-------	-----------------------------

if **none**, no point ids are entered and the grid control will not show a column for point ids.

If **auto increment** then the values of point ids will be incremented by a value of 1 starting from the specified **Start point id**. If no **Start point id** is specified then no point ids will be allocated. No column for point ids is shown in the grid control.

if **typed** then the values of point ids will be incremented by a value of 1, starting from the specified **Start point id**. If no **Start point id** is specified then no point ids will be allocated unless a value is entered in the grid control on which time the next value in the grid will have a incremented value. The column for point ids is shown in the grid control.

VALUES IN GRID grid box

*The columns shown in the grid will depend on the selection of the **Use z- value** and **Point id** fields.*

	To Pt.	Bearing (dms)	Distance	Height
1				

To Pt.

*if **none** is selected for the **Point id** field, this column will not be displayed.*

*if **auto increment** is selected for the **Point id** field, this column will not be displayed.*

*if **typed** is selected for the **Point id** field, this column will be displayed. In this case, the point id will increment automatically by entering over the field. If a new value is typed into the To Pt. field, the next line will increment from that number.*

Bearing (dms) angle box

The user should enter the bearing for the segment into this field.

Distance

the user should enter the distance of the segment.

Height

*This column will only be visible in the grid if the **Use z- value** tickbox has been ticked. The user should enter the height of the point. This value will not be used for calculation of the segment. It will simply be assigned to the newly created vertex.*

Select button

on pressing the select button, a user is able to pick an existing string from the current view. If a non-traverse type string is selected an option to convert it to a traverse string will be given. The grid control will be filled with the relevant information for the traverse string.

If a traverse string has been modified by some other process (e.g. move) an option will be given to adopt the new characteristics of the string as displayed or revert back to the information that originally defined the traverse string. Depending on which option is selected, the grid will be filled with the relevant information.

Process button

changes to the traverse can be made in the grid control for lines already defined. For example, a distance entry may be incorrectly typed in and edited some time later. By using the process button the traverse string is re-calculated using the current values in the grid control.

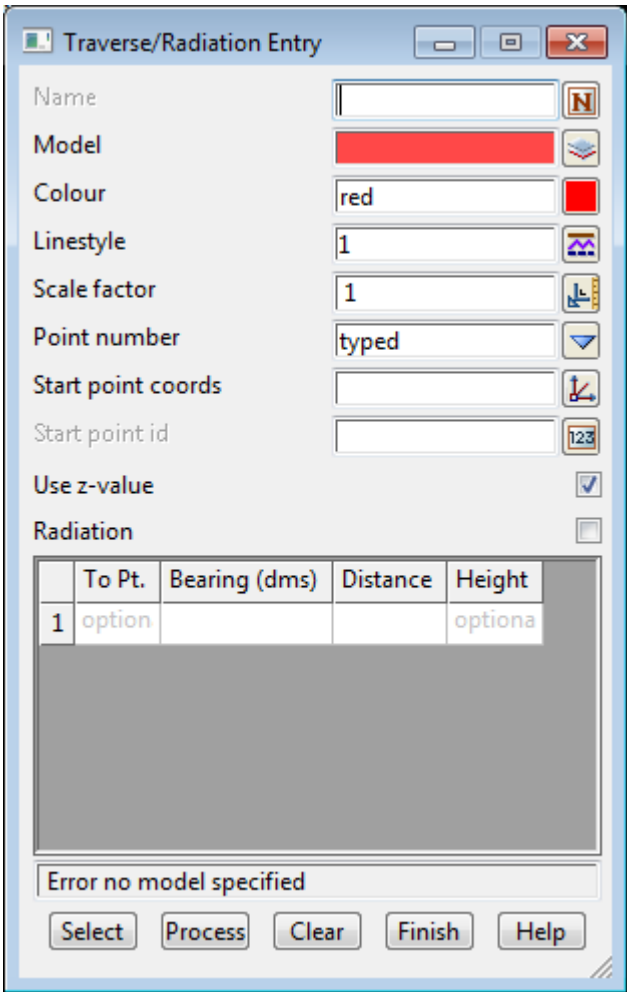
Bearing/Distance Entry for Traverse/Radiation

Position of option on menu: Survey =>Extras =>Traverse/Radiation

The Traverse/radiation option allows the input of a traverse or radiations by manual input of plane bearings and plane distances or by selecting an existing string.

Bearing/Distance Traverse/Radiation Entry

Selecting Traverse/Radiation brings up the **Bearing/Distance Traverse/Radiation Entry** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name	name box		defined names from names.4d file
<i>this field is optional. If non-blank, the name of the new string/strings.</i>			
Model	model box		available models
<i>if non-blank, the model of the new string. If blank, the original string model is used.</i>			
Colour	colour box	red	available colours
<i>if non-blank, the colour of the new string. If blank, the original string colour is used.</i>			
Linestyle	input	1	available line styles
<i>line style of the string.</i>			

Scale factor input projection scale

*This value will be applied to any entered distances. i.e. final distance = entered distance * scale factor*
The scale factor could be a point scale factor, a line scale factor or a combined scale factor.
The final distance will be used for coordinate calculations.

Start point coords xyz pick box

coordinates of the first point. The bearing/distances start from this point.

Start point id input

if Point ids is auto increment, point id of the first point.

Point id input typed none, auto increment, typed

*if **none**, no point ids are entered and the grid control will not show a column for point ids.*

*If **auto increment** then the values of point ids will be incremented by a value of 1 starting from the specified **Start point id**. If no **Start point id** is specified then no point ids will be allocated. No column for point ids is shown in the grid control.*

*if **typed** then the values of point ids will be incremented by a value of 1, starting from the specified **Start point id**. If no **Start point id** is specified then no point ids will be allocated unless a value is entered in the grid control on which time the next value in the grid will have a incremented value. The column for point ids is shown in the grid control.*

Use z- value tick box

*if **ticked**, the z-values for each point can be entered.*
*If **not ticked** then z-values are not entered.*

Radiation tick box

*if **ticked**, the bearing distances are used to create points that are radiations from the start point.*
*If **not ticked** the bearing/distances are used to create a traverse string beginning at the start point.*

Values In Grid grid box

*The columns shown in the grid will depend on the selection of the **Use z- value** and **Point id** fields.*

	To Pt.	Bearing (dms)	Distance	Height
1				

To Pt. input

*if **none** is selected for the **Point id** field, this column will not be displayed.*

*if **auto increment** is selected for the **Point id** field, this column will not be displayed.*

*if **typed** is selected for the **Point id** field, this column will be displayed. In this case, the point id will increment automatically by entering over the field. If a new value is typed into the To Pt. field, the next line will increment from that number.*

Bearing (dms) angle box

The user should enter the bearing for the segment into this field.

Distance input box

the user should enter the distance of the segment.

Height input box

*This column will only be visible in the grid if the **Use z- value** tickbox has been ticked. The user should enter the height of the point. This value will not be used for calculation of the segment. It will simply be*

assigned to the newly created vertex.

Select button

on pressing the select button, a user is able to pick an existing string from the current view. If a non-traverse type string is selected an option to convert it to a traverse string will be given. The grid control will be filled with the relevant information for the traverse string.

If a traverse string has been modified by some other process (e.g. move) an option will be given to adopt the new characteristics of the string as displayed or revert back to the information that originally defined the traverse string. Depending on which option is selected, the grid will be filled with the relevant information.

Process button

changes to the traverse can be made in the grid control for lines already defined. For example, a distance entry may be incorrectly typed in and edited some time later. By using the process button the traverse string is re-calculated using the current values in the grid control.

Catenary Measurement

Position of option on menu: Survey =>Extras =>Catenary measurement

The **Catenary measurements** option allows for the picking up of data in the vertical plane between two known points using only a bearing and a vertical angle. For example, picking up wires between towers where a distance measurement to the cable is not possible.

Selecting **Catenary measurements** brings up the **Catenary Measurements** panel

Catenary Measurement

Instrument setup

Coords

Id

abcd

Height

12

1st attachment

Coords

Id

abcd

2nd attachment

Coords

Id

abcd

Readings

Horz. angle correction

	Reading No.	Horz. Angle	Vert. Angle
1			

Results

Create string

Name

N

Model

Colour

Linestyle

1

Report file

Process

Finish

Help

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Instrument setup

Coords	xyz box
---------------	---------

the xyz coordinates of the instrument.

Id input box
the vertex id (point id) of the instrument.

Height input box
the height of the instrument.

1st Attachment

Coords xyz box
the xyz coordinates of the attachment point of the cable on the first tower.

Id input box
the vertex id (point id) of the first tower.

2nd Attachment

Coords xyz box
the xyz coordinates of the attachment point of the cable on the second tower.

Id input box
the vertex id (point id) of the second tower.

Reading

Horizontal angle correction angle box
angle to be subtracted from the Horizontal Angle reading to give true bearing.

Reading No input box
number for the reading.

Horz. Angle angle box
Horizontal Angle reading. The Horizontal angle correction is subtracted from this to give the true bearing.

Vert. Angle angle box
Vertical Angle reading.

Results

Create string tick box ticked
if ticked, a string of the observed points is created.

Name input box
name of the created string.

Model model box available models
name of the model for the created string.

Colour colour box red available colours
the colour of the created string.

Linestyle input 1 available linestyles
linestyle of the created string.

- Report file

file box

*.rpt files
- if non-blank, the name of the file to write the report to.
- Process

button

reduce the angle readings.

Create Control Stations

- Position of option on menu:

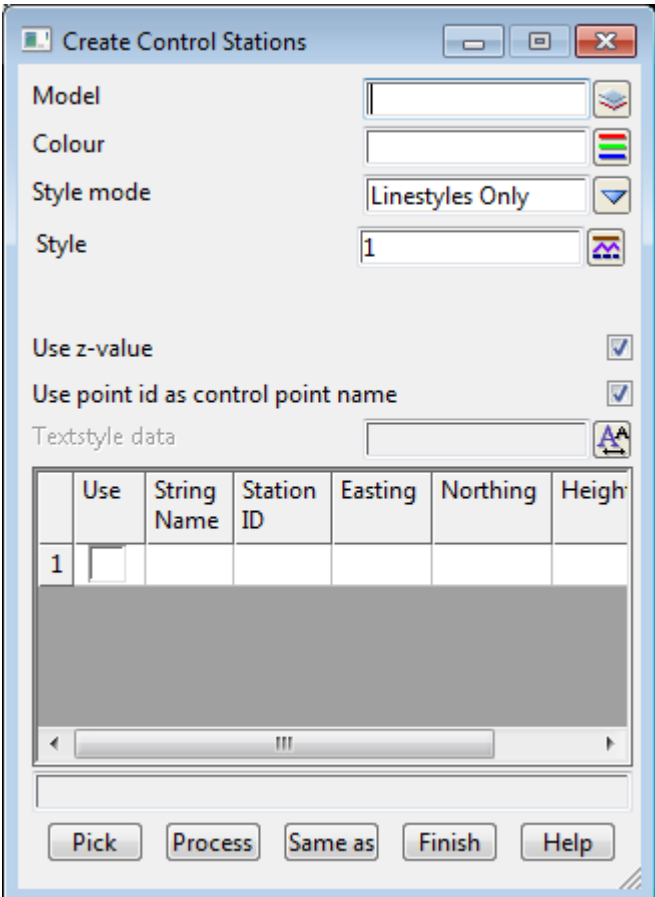
Survey =>Extras =>Create Control stations
- Position of option on menu:

Strings =>Create =>Create Control Stations

A *control station* (for surveying) consists of a one point string. For V6, the *point name* is the name of the control station. For V5 and before, the *string name* is used as name of the control station. Control stations are used when reducing 12d field files in the *Survey Reduction* module.

The **Create Control Stations** options allows the user to define control stations in a given model. The option checks that the point ids are unique in the control model.

Selecting **Create Control Stations** brings up the **Create Control Station** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Model	model box		available models
<i>name of the model for the control stations.</i>			
Colour	colour box	red	available colours

the colour of the new control stations.

Line style input 1 available line styles
line style of the control station.

Use z-value tick box ticked
if ticked, the height value must be specified for all of the stations.

Use point id as control point name tick box ticked
*if ticked, the point names are used as the names of the control points and the **point names** are checked for uniqueness.
If not ticked, the name of the string is used as the names of the control points and the **string names** are checked for uniqueness. This is only for compatibility in pre **12d Model V6.0**.*

Station name Easting Northing Height Remark
*the information for stations to be created is entered into the grid. The stations are created by selecting the **Process** button.*

*If a station name is typed in and the <enter> key pressed then the Model is searched and if a control station already exists of the same name (either point name or string name depending on the **Use point id as control point name** flag), the co-ordinates are displayed in the grid.*

The grid control values can be entered/displayed using valid inputs into the various fields.

Station name. *The associated text that identifies the control point.*
Easting *The easting coordinate of the control point.*
Northing *The northing coordinate of the control point.*
Height *The height of the station. (Only displayed if the use z-value tickbox is selected.)*
Remark *The description of the control station.*

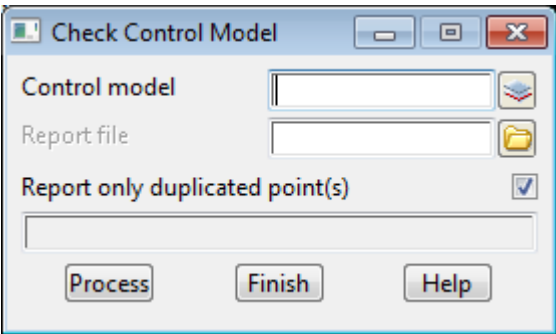
Process button
*After the **Process** button is chosen, the control stations in the grid are created. If a station of the given name already exists in the control Model, the user is asked if the co-ordinates of the station are to be updated by the values given in the grid.*

Same as button
*After the **Same as** button is chosen, another string is selected and information about it is used for the Model, Colour and Point style fields in this panel.*

Check Control Model

Position of option on menu: Survey =>Extras =>Check Control model

The **Check control model** option checks that there are no points in the control model with the same point id. A report of all the points in the control models, or only those with clashing point ids, is created.
Selecting **Check control model** brings up the **Check Control Model** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Control model <i>the model the check for unique point ids.</i>	model box		available models
Report file <i>if non-blank, the name of the file to write the report to.</i>	file box		*.rpt files
Report only duplicated point(s) <i>if ticked, only those points with duplicated point ids are reported. If not ticked, all points in the control model are written out.</i>	tick box	ticked	
Process <i>check the Control model for duplicated point ids.</i>	button		

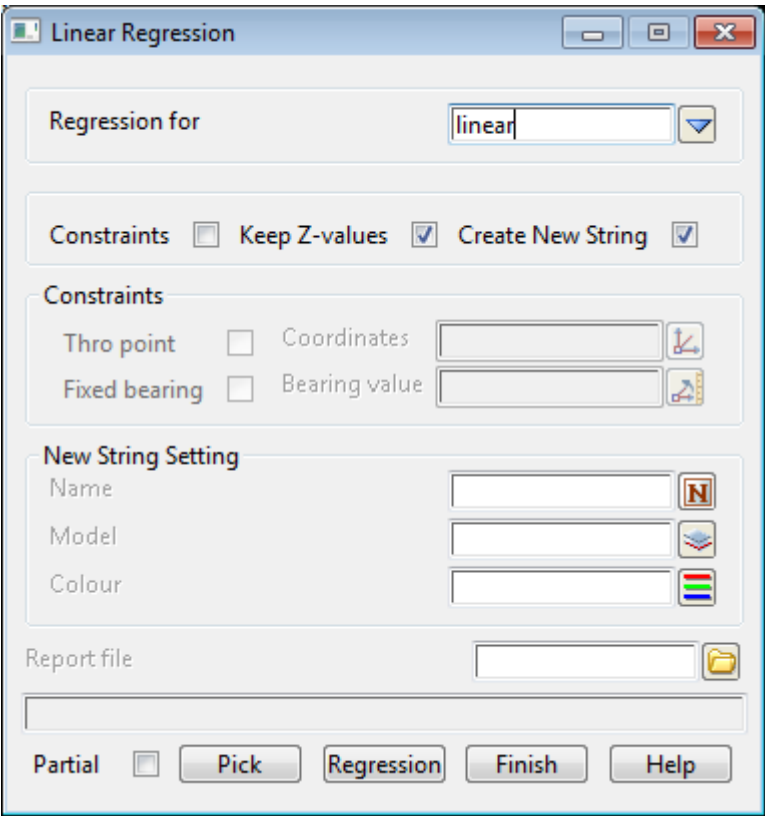
Linear Regression

Position of option on menu: Survey =>Extras =>Linear regression

Position of option on menu: Strings =>Utilities =>Linear regression

The linear regression option will create a line, circle or arc of best fit through points on a string. The line can be constrained to go through a selected point or have a given bearing.

Selecting **linear regression** brings up the **linear regression** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Regression for	choice box	line	line, circle, arc
<i>if line/circle/arc, the line/circle/arc of best fit through the points is created.</i>			
Constraints	tick box		
<i>if ticked, the regression line can be restrained to go through a selected point or be given a selected bearing.</i>			
Keep z-values	tick box	tick	
<i>if ticked, the z-values of the selected string are used on the regression string.</i>			
Create new string	tick box	tick	
<i>if ticked, a new adjusted string is created. If not ticked, the selected string is adjusted.</i>			

Constraints

Thro point	tick box
<i>if ticked, the regression line is constrained to go through the point with co-ordinates given in the Coordinates field.</i>	
Coordinates	
<i>if thro point is ticked, the regression line is constrained to go through the point given in this field.</i>	
Fixed bearing	tick box
<i>if ticked, the regression line is constrained to have the bearing given in the Bearing value field.</i>	

Bearing value

if **thro point** is ticked, the regression line is constrained to have the bearing given in this field.

Name

name box

if non-blank, the name of the new string. If blank, the original string name is used.

Model

model box

available models

if non-blank, the model of the new string. If blank, the original string model is used.

Colour

colour box

available colours

if non-blank, the colour of the new string. If blank, the original string colour is used.

Report file

*.rpt files

if non-blank, a report for the adjustment is created with this name. If non-blank, no report is created.

Partial

tick box

if ticked, only part of the string is used in the regression.

Pick

button

select the string to create a regression line/circle/arc from.

Regression

button

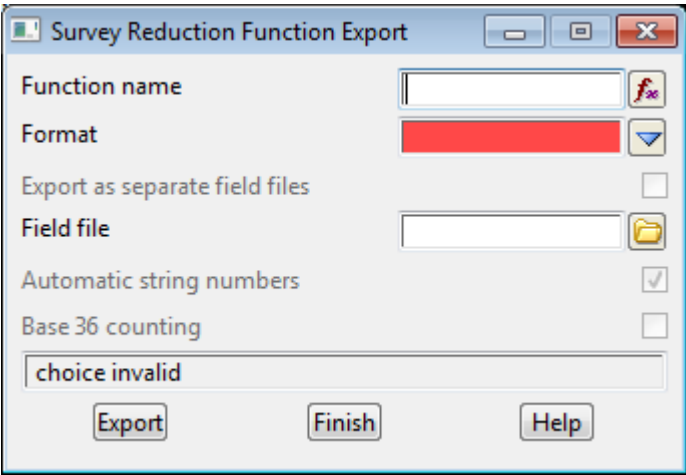
perform the regression.

Survey Function to Field File

Position of option on menu: Survey =>Extras =>Reduction to field file

The **reduction to field file** option writes out the field data from a Survey function to a file in the standard 12d field file format.

Selecting **reduction to field file** brings up the **survey reduction function export** panel



The fields and buttons used in this panel have the following functions.

Field Description

Type

Defaults

Pop-Up

Function name

input

available Survey functions

name of the 12d Survey function to write out a 12d field file for.

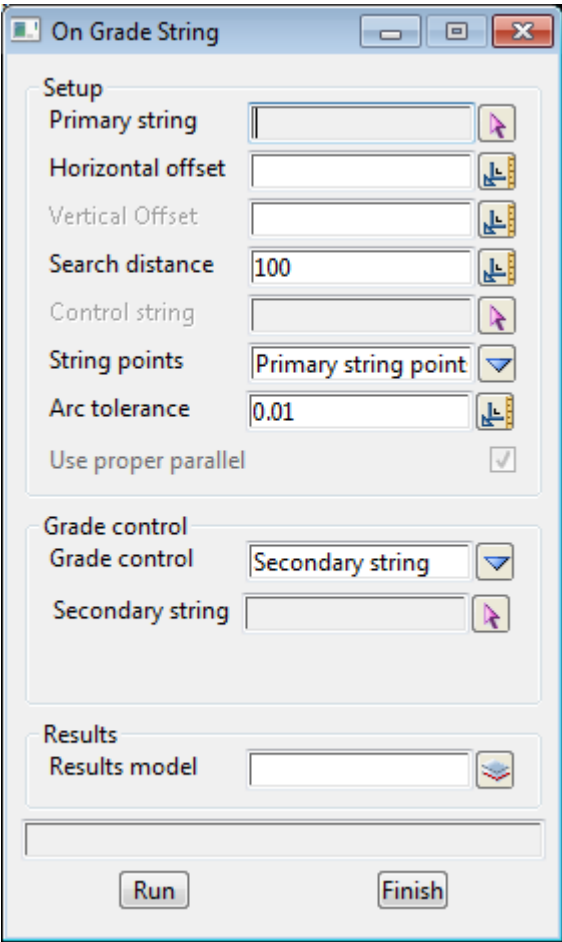
Field file	input	*.fld
<i>name of the 12d field file to write out the Survey field data to.</i>		
Export	button	
<i>create the 12d field file.</i>		

On Grade

- Position of option on menu: Survey =>Extras =>On grade
- Position of option on menu: Strings =>Utilities =>On grade

The **on grade** option produces a string that is a fixed horizontal distance from a selected string with z-values produced by extrapolating the grade from two strings or from a tin.

Selecting **On grade** brings up the **On Grade String** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Primary string	string select		
<i>string to produce the on grade string from</i>			
Horizontal offset	input		
<i>horizontal distance to offset the on grade string from the primary string, relative to the direction of the primary/control string, +ve to the right</i>			

Vertical offset	input	
<i>vertical distance to offset the on grade string from the primary string</i>		
Search distance	input	
<i>only string cuts inside this distance will be considered</i>		
Control string	string select	
<i>if selected, the horizontal distance is measured at right angles to the control string. In this case, the on-grade may not be parallel to the primary string.</i>		
<i>If not selected, the horizontal distance is measured at right angles to the primary string.</i>		
String points	choice box	Primary string points Chainage interval Special chainage file
<i>if Primary string points, the on-grade string has vertices on it where ever there is a vertex on the primary string. Extra points will also be include for the given arc tolerance.</i>		
Arc tolerance	input	
<i>if non zero, chord to arc tolerance to use for adding additional vertices</i>		
Use proper parallel	tick box	
<i>if ticked, the primary string is parallellled to from the on-grade string</i>		
<i>If Chainage interval, vertices are created on the on-grade string corresponding to the given chainage interval along the primary/control string.</i>		
Interval	input	
<i>the chainage interval the use along the primary/control string for creating on-grade vertices.</i>		
<i>If Special chainage file, vertices are created on the on-grade string from chainages on the primary or control string, corresponding to the special chainages file.</i>		
Special chainages	file box	.spc files
<i>the chainage interval the use along the primary/control string for creating on-grade vertices.</i>		
Grade control	choice box	Secondary string Tin
<i>if Secondary string, the grade to use to create z-values on the on-grade string is the grade between the secondary string and the primary string.</i>		
Secondary string	string select	
<i>the grade to use is taken from the secondary to the primary string</i>		
<i>If Tin,</i>		
Tin	tin box	
<i>the tin to use</i>		
Offset	input	
<i>offset from the primary string to the point on the tin to create the grade, relative to the primary string direction, +ve to the right</i>		
Results model	model box	available models
<i>the model for the created on-grade string</i>		
Run	button	
<i>create the on grade string</i>		

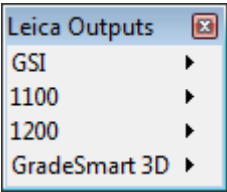
Leica

Position of menu: Survey =>Leica

The Leica walk-right menu collects options for working with Leica instruments.

The Leica walk-right menu is

.



For the option *GSI*, go to

1100

1200

GradeSmart 3D

[Leica GSI](#)

[Leica 1100](#)

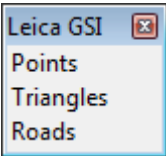
[Leica 1200](#)

[Leica GradeSmart 3D](#)

Leica GSI

The Leica GSI walk-right menu collects under the one menu, options that can work with Leica GSI format.

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For the option *Points*, go to

Triangles

Roads

[Create Points Upload File](#)

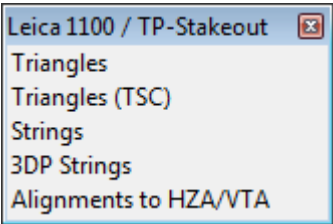
[Create Triangle Upload File](#)

[Create Road Upload File](#)

Leica 1100

The Leica 1100 walk-right menu collects under the one menu, options that can work with Leica 1100 instruments.

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For the option *Triangles*, go to

Triangles (TSC)

[TP Stakeout Triangles Output](#)

[Write TP Stakeout Binary Triangles \(TSC Format\)](#)

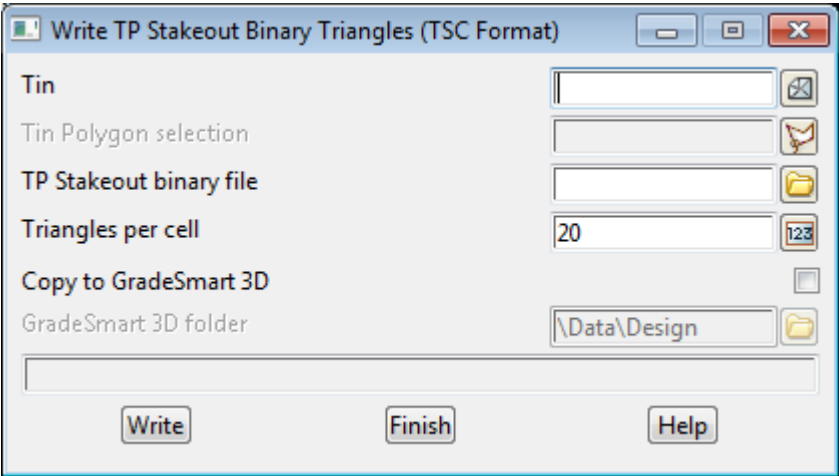
Strings	TP Stakeout Strings Output
3DP Strings	Write TP Stakeout 3DP String
Alignments to HZA/VTA	TP Alignment

Write TP Stakeout Binary Triangles (TSC Format)

Position of option on menu: Survey => Leica => 1100 =>Triangles (TSC)

The Write *TP Stakeout Binary triangles TSC* option writes out a tin as a TP Stakeout binary file.

On selecting the Triangles (TSC) option, the **Write TP Stakeout Binary Triangles (TSC Format)** panel is displayed.



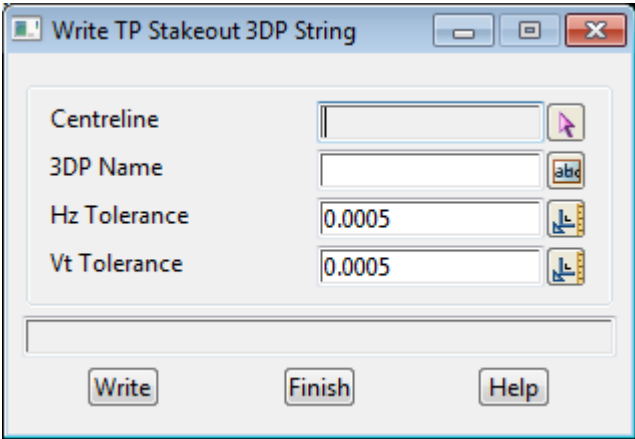
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin to write out in TP Stakeout binary format.</i>	tin box		available tins
Tin polygon selection <i>if selected, only triangles with their centroid inside this string are written out</i>	poly string-select		
TP Stakeout binary file <i>name of the file for the triangles</i>	input		*.tsc
Triangles per cell <i>a TP Stakeout parameter</i>			
Copy to GradeSmart 3D <i>if ticked, copy file to GradeSmart folder</i>	tick box		
GradeSmart 3D folder <i>folder for GradeSmart files</i>	folder box		
Write <i>write out the tin in TP Stakeout binary format.</i>	button		

Write TP Stakeout 3DP String

Position of option on menu: Survey => Leica => 1100 =>3DP Strings

This panel creates a TP-Stakeout 3DP format file
Selecting **3DP Strings** brings up the **Write TP Stakeout 3DP String** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Centreline	string select		
<i>select the super alignment or super string to convert, the string must have valid vertical geometry or an error will occur when processing.</i>			
3DP Name			
<i>the name of the 3DP file to be created, the name of the file must be <= 8 characters.</i>			
Hz Tolerance			
<i>the arc to chord tolerance of the created horizontal points.</i>			
Vt Tolerance			
<i>the arc to chord tolerance of the created vertical points.</i>			
Write	button		
<i>write the 3DP file, any errors in processing the selected string will be displayed.</i>			

TP Alignment

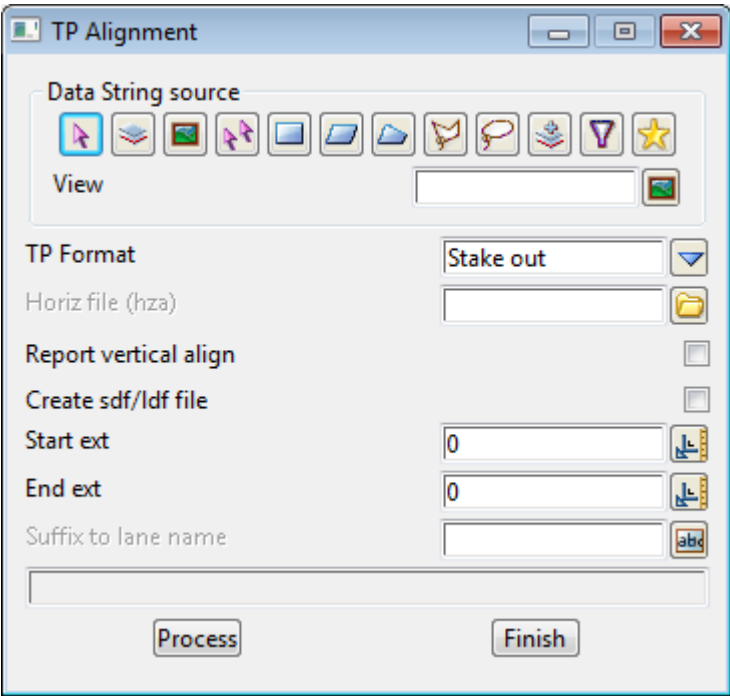
Position of option on menu: Survey => Leica => 1100 =>Alignments to HZA/VTa

This option converts alignments or super alignments into the TP-Setout/TP-Stakeout alignment format. These programs support the clothoid/natural clothoid and cubic parabola transition types. Due to restrictions in the software using these files the file names and alignment names must be <= 8 characters.

On selecting the **Alignments to HZA/VTa** option, the **TP Alignment** panel is displayed.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data String source			



Data source type

for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data source model

Source of the alignment/super alignment strings to convert.

TP Format choice box Stake out Stake out, Set out

Stake out - write the data out in TP-Stakeout format.
Set out - write the data out in TP-Setout format.

Horiz file (hza) file

The HZA file to create, the name must be 8 characters or less.

Report vertical align tick box

if ticked the vertical alignment will be written to a .VTA file of the same name as the HZA file.

Create sdf/ldf file tick box

if ticked a surface/lane entry will be created for the alignments being written in the SDF/LDF file of the same name as the HZA file.

Start ext input

The start extension to all alignments being written, +ve extends before the start chainage, -ve invalidates that distance +into the alignment.

End ext input

The end extension to all alignments being written, +ve extends after the end chainage, -ve invalidates that distance back into the alignment.

Suffix to lane name

A suffix will be added to the alignment name in the SDF/LDF file entry.

Process button

Create the TP-Stakeout/Setout format files, if errors are encountered during the conversion such as

names > 8 characters the appropriate warnings will be displayed.

Leica 1200

The **Leica 1200** walk-right menu collects under the one menu, options that can work with Leica 1200 instruments.



For the option *Strings*, go to
Strings (V4)
Triangles
Roads
Tunnel

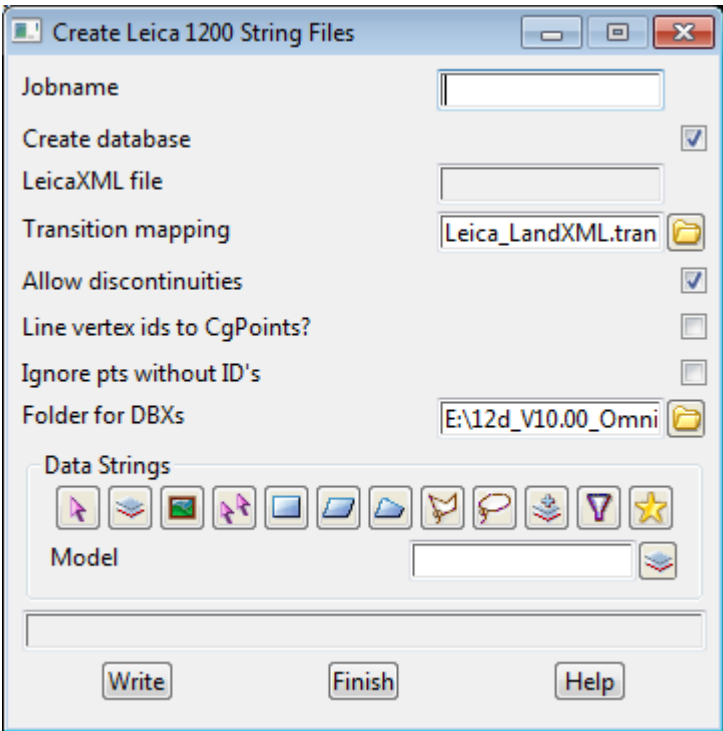
[Create Leica 1200 String Files](#)
[Create Leica 1200 String Files \(Old\)](#)
[Create Leica 1200 Triangle Files](#)
[Create Leica 1200 Road Files](#)
[Create Leica 1200 Tunnel Files](#)

Create Leica 1200 String Files

Position of menu: Survey=>Leica => 1200 => Strings

This panel creates a points and lines database for use on the Leica 1200 series of TPS/GPS instruments. This is done by creating an intermediate LandXML file and then calling a Leica provided converter to create the DBX files.

Selecting **Strings** brings up the **Create Leica 1200 String Files** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Jobname

The internal jobname seen inside the Leica software.

Create database tick box

*If ticked will create the 1200 DBX
if not ticked just the LandXML file is created.*

LeicaXML file

The name of the Leica LandXML file to create.

Transition mapping file

*Due to the inadequate specification of transitions in the LandXML schema users must explicitly map
12d transition types to other vendors types.*

Allow discontinuities tick box

If ticked super string discontinuities will not be written to the DBX.

Line vertex ids to CgPoints? tick box

If ticked will write all of the string vertices to CgPoints as well as writing the strings as plan features.

Ignore pts without ID's tick box

If ticked, points without a Point ID will be ignored.

Folder for DBXs file

The folder to create the databases in.

Data Strings

Data source type model

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data source model

The data source to write to the DBX files

Write button

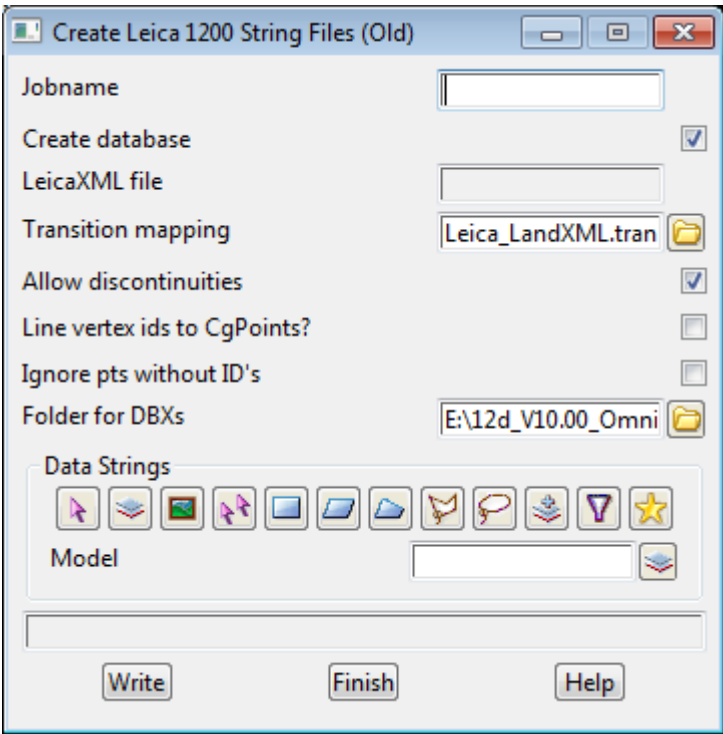
Create the Leica 1200 Strings DBX files.

Create Leica 1200 String Files (Old)

Position of menu: Survey =>Leica => 1200 => Strings (V4)

This panel is identical to [Create Leica 1200 String Files](#) but calls an older version of the Leica LandXML/DBX converter.

Selecting **Strings (V4)** brings up the **Create Leica 1200 String Files (Old)** panel

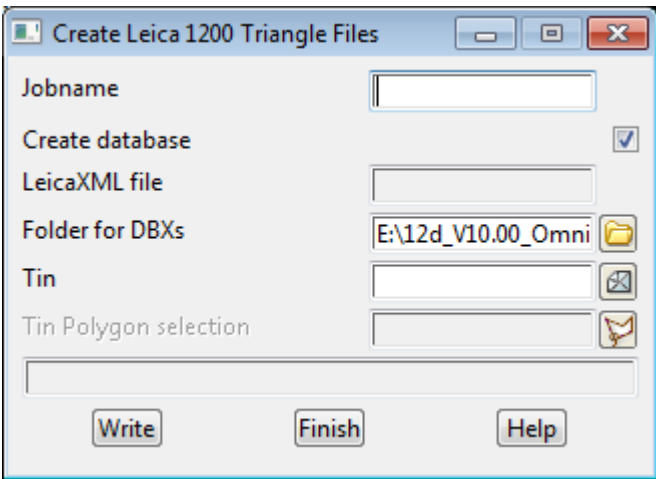


Create Leica 1200 Triangle Files

Position of menu: Survey => Leica => 1200 => Triangles

This panel creates a triangle database for use on the Leica 1200 series of TPS/GPS instruments. This is done by creating an intermediate LandXML file and then calling a Leica provided converter to create the DBX files.

Selecting **Triangles** brings up the **Create Leica 1200 Triangle Files** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Jobname			

The internal jobname seen inside the Leica software.

Create database tick box

*if ticked will create the 1200 DBX,
if not ticked just the LandXML file is created.*

LeicaXML file

The name of the Leica LandXML file to create.

Folder for DBXs file

The folder to create the databases in.

Tin input

The tin to write to the DBX.

Tin Polygon selection

Select a polygon for the region of the tin to write out.

Write button

Create the Leica 1200 Triangle DBX files.

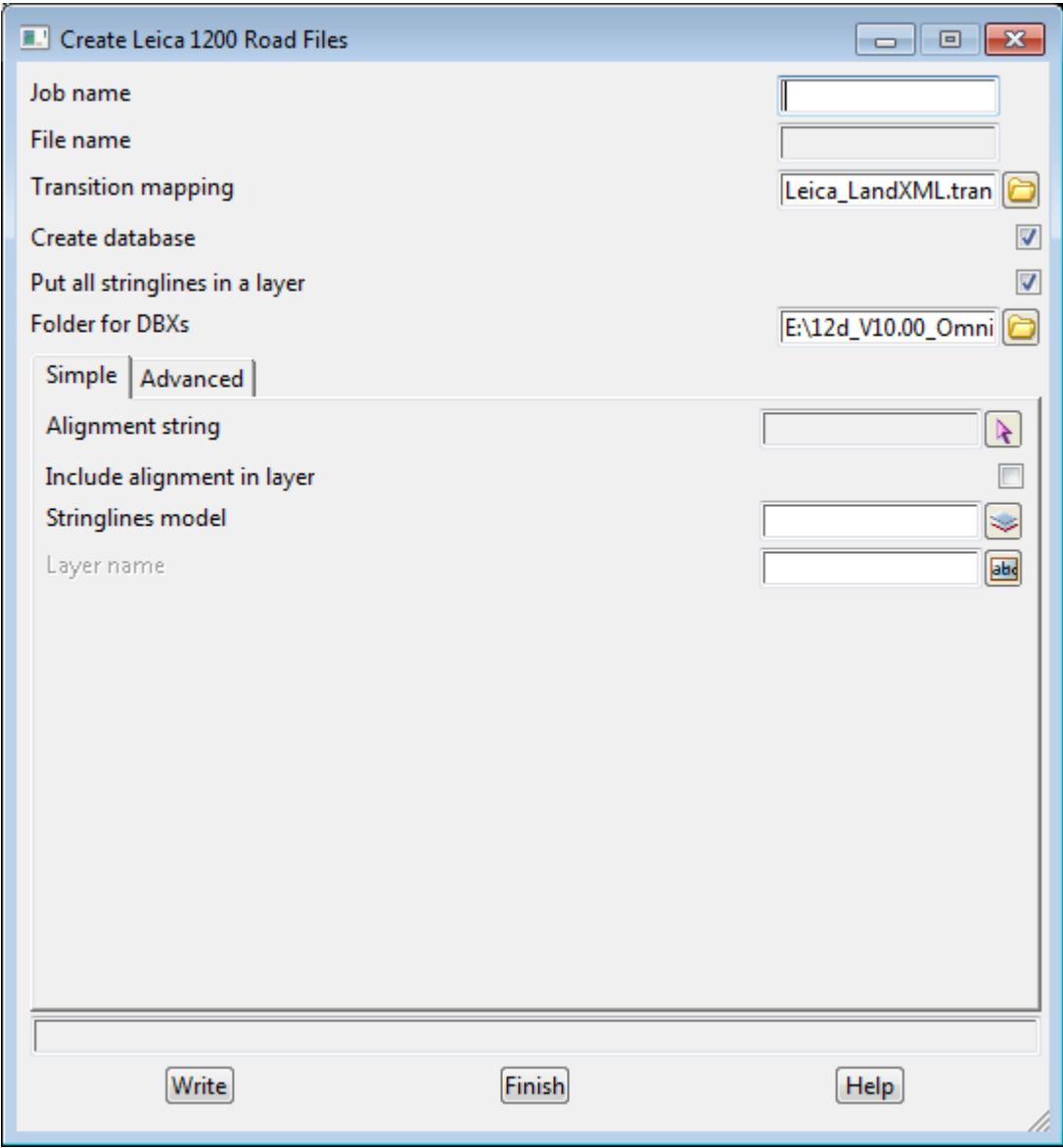
Create Leica 1200 Road Files

Position of menu: Survey =>Leica => 1200 => Roads

This panel creates a roads database for use on the Leica 1200 series of TPS/GPS instruments. This is done by creating an intermediate Leica LandXML file and then calling a Leica provided converter to create the DBX files.

This panel allows either a flat group of strings to be written to the DBX or multiple roads and layers in those roads dependent on the users needs.

Selecting **Roads** brings up the **Create Leica 1200 Road Files** panel



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Jobname

The internal jobname seen inside the Leica software.

File name

The name of the Leica LandXML file to create.

Transition mapping	file
---------------------------	------

Due to the inadequate specification of transitions in the LandXML schema users must explicitly map 12d transition types to other vendors types.

Create database	tick box
------------------------	----------

*if ticked will create the 1200 DBX,
if not ticked just the LandXML file is created.*

Put all stringlines in a layer	tick box
---------------------------------------	----------

if not ticked then the strings in the model selected in the **Stringlines model** box in the "**Simple**" tab are written to the LandXML file with no layer grouping.
if ticked there are 2 options.

Folder for DBXs file

The folder to create the databases in.

Simple Tab

The "**Simple**" tab allows a centreline and model of strings to be written to a single layer in the DBX.

Alignment string string select

The centreline for the layer.

Include alignment in layer tick box

if ticked the centreline is included in the layer, is cut as part of the road surface.

Stringlines model model box

The model of strings forming the road surface/layer.

Layer name

The default layer name is the model name, this can be changed here.

Advanced Tab

The "**Advanced**" tab allows multiple centrelines and strings to be written to layers in the DBX. For each alignment string there can be up to 10 layers, e.g. an entire subdivision can be uploaded by nominating the centreline for each road and adding the models for the final surface layers, boxing layers etc.

Alignment string

The centreline for the 10 optional layers.

Alignment in layer 1

If ticked the centreline is included in the 1st layer, is cut as part of the road surface.

Stringlines models 1

The model of strings forming the road surface/layer.

Layer name 1

The default layer name is the model name, this can be changed here.

For the rest of the option layer enter the model and layer name to suit.

To create extra roads/centrelines right click on the row number in the grid box to insert an extra row and fill out to suit.

Write button

Create the Leica 1200 Road DBX files.

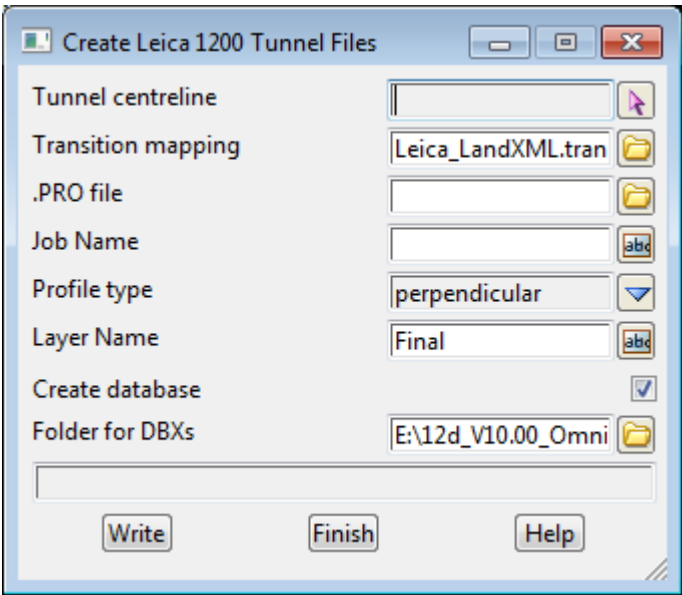
Create Leica 1200 Tunnel Files

Position of menu: Survey =>Leica => 1200 =>Tunnel

This panel creates a tunnel database for use on the Leica 1200 series of TPS instruments. This is done by creating an intermediate Leica LandXML file and then calling a Leica provided converter to create the tunnel DBX files.

This panel allows a single centreline and layer to be written to a tunnel DBX, it uses some industry standard tunnel definition files (.PRO,.PRA) to define the shape of profiles and the chainages they are applied at, these files are created via a text editor or other software packages.

Selecting **Tunnel** brings up the **Create Leica 1200 Tunnel Files** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tunnel centreline	string select		
<i>The centreline for the tunnel.</i>			
Transition mapping	file	Leica_LandXML.trans_map	
<i>Due to the inadequate specification of transitions in the LandXML schema users must explicitly map 12d transition types to other vendors types.</i>			
.PRO file	file		
<i>The profiles file containing the definition of the tunnel elements.</i>			
Create database			
<i>If ticked will create the 1200 tunnel DBX if not ticked, just the Leica LandXML file is created.</i>			
Jobname			
<i>The internal jobname seen inside the Leica software.</i>			
Profile type	choice box	perpendicular	perpendicular, vertical
<i>perpendicular - the profiles are to be interpreted normal to the grade of the tunnel vertical alignment. vertical - the profiles are not adjusted to the grade of the tunnel vertical alignment.</i>			

Layer name Final

The name of the tunnel DBX layer.

Create database tick box

*if ticked will create the 1200 DBX
if not ticked just the LandXML file is created.*

Folder for DBXs file

The folder to create the databases in.

Write button

Create the tunnel DBX files.

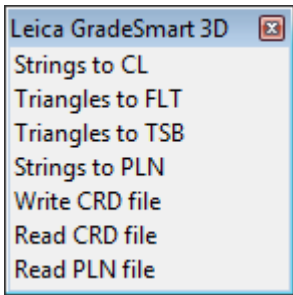
For more information on PRO/PRA tunnel definition files please see [Definition of the PRO and PRA definition files](#)

Leica GradeSmart 3D

The **Leica GradeSmart 3D** walk-right menu collects under the one menu, options that can work with Leica GradeSmart software.

The *GradeSmart* options are all documented in the Leica GradeSmart manual.

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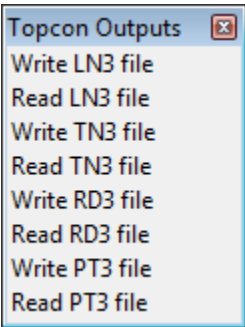


Triangles to TSB [TP Stakeout Triangles Output](#)

The *GradeSmart* options are all documented in the Leica GradeSmart manual.

Topcon

The **Topcon** walk-right menu collects under the one menu, options that can work with Topcon instruments.



- For the option *Write LN3 file* go to

[Create Topcon LN3 String Files](#)
- Read LN3 file*

[Read Topcon LN3 Strings Files](#)
- Write TN3 file*

[Create Topcon TN3 Triangle Files](#)
- Read TN3 file*

[Read Topcon TN3 Triangle Files](#)
- Write RD3 file*

[Create RD3 Road File](#)
- Read RD3 file*

[Read Topcon RD3 Road File](#)
- Write PT3 file*

[Create Topcon PT3 Points Files](#)
- Read PT3 file*

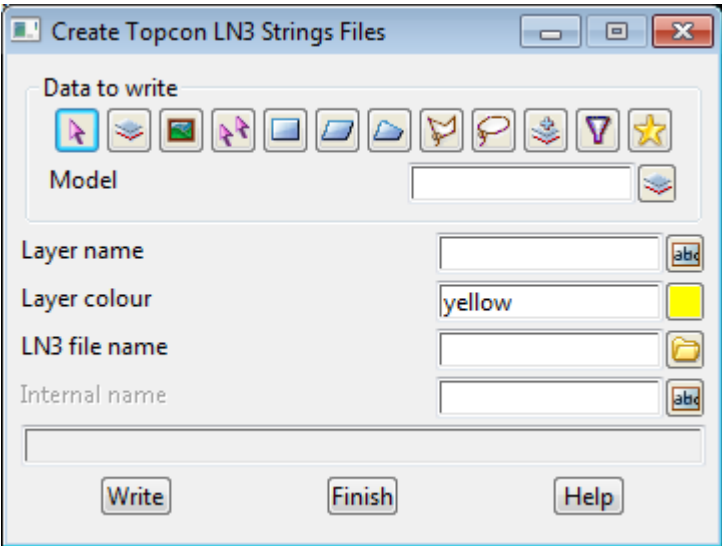
[Read Topcon PT3 Points Files](#)

Create Topcon LN3 String Files

Position of menu: Survey =>Topcon=> write LN3 file

This panel writes strings to Topcon LN3 linework files.

Selecting write LN3 file brings up the **Create Topcon LN3 String Files** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data to write			

Data source type model

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data source model

The data source to write to the LN3 file.

Layer name

The name of the layer in the LN3 file.

Layer colour colour yellow

*The colour of the strings in the Topcon LN3 file.
Please note that the LN3 format colour string by layer and hence individual string colours cannot be mapped to a LN3 file.*

LN3 file name

The name of the LN3 file.

Internal name

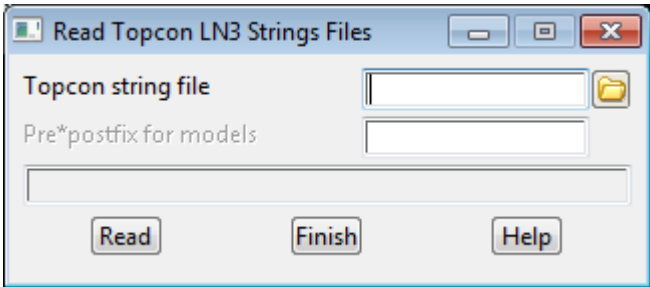
The name of the LN3 file you see inside the Topcon software.

Read Topcon LN3 Strings Files

Position of menu: Survey =>Topcon=> Read LN3 file

This panel reads in strings from the Topcon LN3 linework files.

Selecting **Read LN3 file** brings up the **Read Topcon LN3 String Files** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Topcon string file	file		

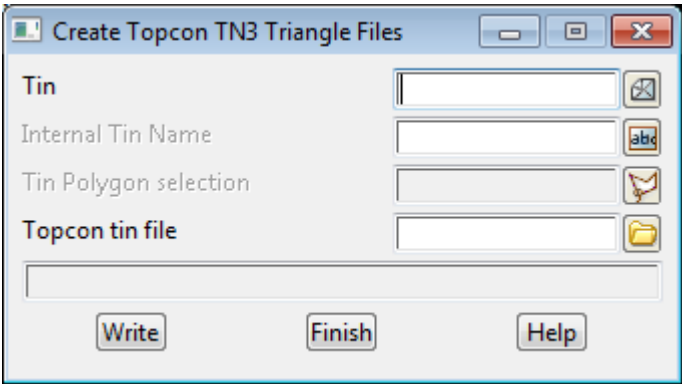
The LN3 file you wish to read.

Pre* postfix for models

*for information please go to [Pre*Postfix Panel Fields](#) in the chapter [Tools and Concepts](#)*

Create Topcon TN3 Triangle Files

Position of menu: Survey =>Topcon=> Write TN3 file
This panel writes triangles to the Topcon TN3 triangulation files.
Selecting Write TN3 file brings up the **Create Topcon TN3 Triangle Files** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin	input		
<i>The tin to write to the TN3 file.</i>			

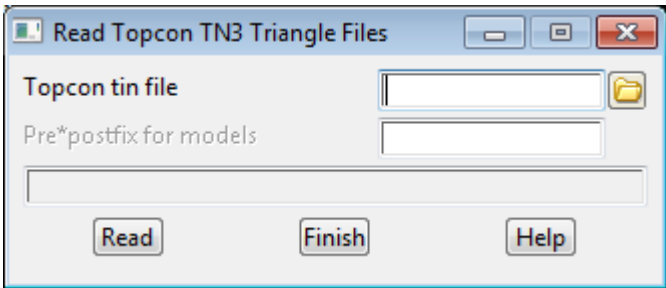
Internal Tin name
The name of the tin you see inside the Topcon software.

Tin Polygon selection
Select a polygon for the region of the tin to write out.

Topcon tin file file
The name of the TN3 file to create.

Read Topcon TN3 Triangle Files

Position of menu: Survey =>Topcon=> Read TN3 file
This panel reads in triangles from the Topcon TN3 triangulation files.
Selecting Read TN3 file brings up the **Read Topcon TN3 Triangle Files** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Topcon tin file	file		
<i>The TN3 file you wish to read.</i>			

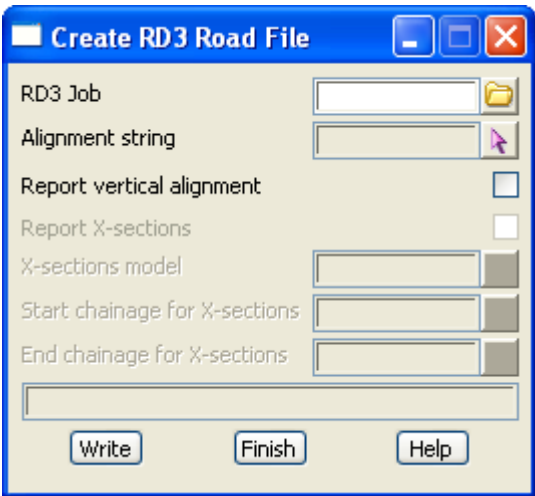
Pre* postfix for models
*for information please go to [Pre*Postfix Panel Fields](#) in the chapter [Tools and Concepts](#)*

Create RD3 Road File

Position of menu: Survey =>Topcon=> Write RD3 file

This panel uploads the centreline and cross sections for a Topcon RD3 road definition file. The RD3 file can contain just a centreline, a centreline with vertical alignment or the full definition including cross sections.

Selecting **Write RD3 file** brings up the **Create RD3 Road File** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
RD3 Job	file		
<i>The RD3 file you wish to create.</i>			
Alignment string	string select		
<i>The centreline of the road.</i>			
Report vertical alignment	tick box		
<i>If ticked the vertical alignment is uploaded to the RD3 file</i>			
Report X-sections	tick box		
<i>If ticked cross sections are uploaded to the RD3 file</i>			
X-sections model			
<i>The model containing the cut cross section strings to upload to the RD3 file. These must have been cut normal to the nominated alignment string or the upload will fail. Start chainage for X-sections</i> <i>If non blank the start chainage to upload cross sections from.</i>			

End chainage for X-sections

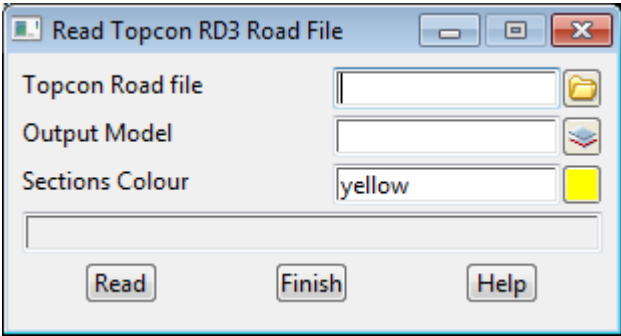
If non blank the end chainage to upload cross sections to.

Read Topcon RD3 Road File

Position of menu: Survey =>Topcon=> Read RD3 file

This panel reads in the centreline and cross sections from a Topcon RD3 road definition file.

Selecting Read RD3 file brings up the **Read Topcon RD3 Road File** panel.



The fields and buttons used in this panel have the following functions.

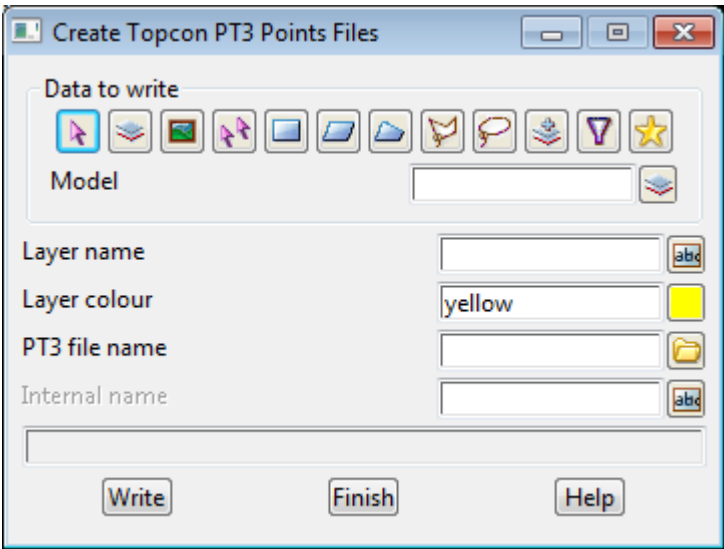
Field Description	Type	Defaults	Pop-Up
Topcon Road file			
<i>The RD3 file you wish to read.</i>			
Output Model	model		
<i>The model for the centreline and cross sections.</i>			
Sections Colour	colour box	yellow	
<i>The colour for the cross section strings.</i>			

Create Topcon PT3 Points Files

Position of menu: Survey =>Topcon=> Write PT3 file

This panel writes strings to Topcon PT3 points files.

Selecting Write PT3 file brings up the **Create Topcon PT3 Points Files** panel.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
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Data to write

The data to write to the PT3 file.

Data source type

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data source	model
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Layer name

The name of the layer in the PT3 file.

Layer colour	select colour	yellow	available colours
---------------------	---------------	--------	-------------------

The colour of the points in the Topcon PT3 file. Please note that the PT3 format colours points by layer and hence individual point colours cannot be mapped to a PT3 file.

PT3 file name	file box
----------------------	----------

The name of the PT3 file.

Internal name

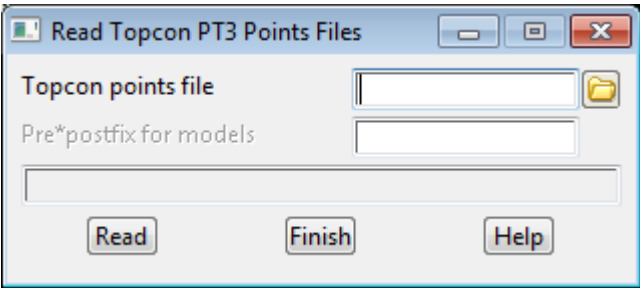
The name of the PT3 file you see inside the Topcon software.

Read Topcon PT3 Points Files

Position of menu: Survey =>Topcon=> Read PT3 file

This panel reads in points from the Topcon PT3 points files.

Selecting Read PT3 file brings up the **Read Topcon PT3 Points Files** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Topcon points file	file box		

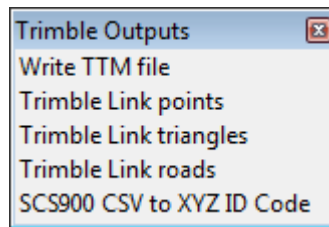
The PT3 file you wish to read.

Pre* postfix for models

*for information please go to [Pre*Postfix Panel Fields](#) in the chapter [Tools and Concepts](#)*

Trimble

The **Trimble** walk-right menu is:



For the option *Write TTM file*, go to

Trimble Link points

Trimble Link triangles

Trimble Link roads

SCS900 CSV to XYZ ID Code

[Write TTM File](#)

[Trimble Link Points](#)

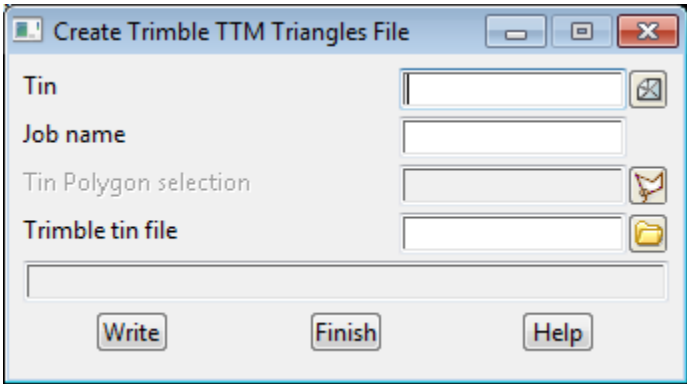
[Trimble Link Triangles](#)

[Trimble Link Roads](#)

[SCS900 CSV to XYZ ID Code](#)

Write TTM File

Triangles from a tin (not a super tin) can be written out as a Trimble TTM file.
Note that the Trimble TTM is binary and so can not be viewed or edited.
Selecting **Write TTM file** brings up the **Create Trimble TTM Triangles File** panel:



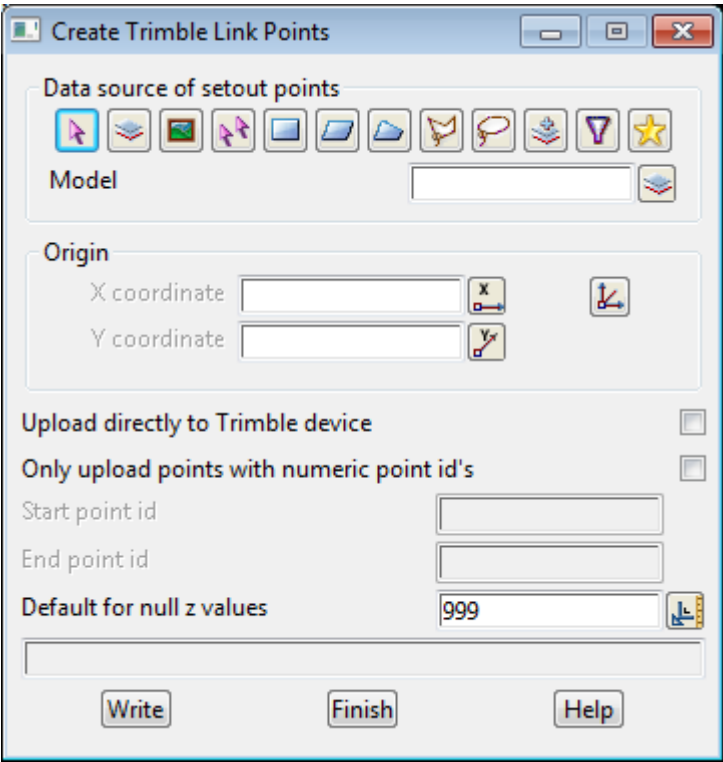
The fields and buttons used in this panel have the following functions:

Field	Description	Type	Defaults	Pop-Up
Tin	<i>the tin (not a super tin) to write out to a Trimble TTM file. A super tin can not be written out to a TTM file.</i>	tin box		available tins
Job name	<i>name of the job to write into the Trimble TTM file</i>	text input		
Tin Polygon selection	<i>if a string is selected, then only those triangles whose centroid is inside the polygon are written to the TTM file. If no string is selected, then all the triangles in the tin are written to the TTM file.</i>	polygon box		
Trimble tin file	<i>name of the Trimble TTM file. If it is not present, ".TTM" will be automatically added to the end of the file name.</i>	file box		
Write	<i>write out the triangles to the given TTM file.</i>	button		

Trimble Link Points

This option uploads selected vertices with point IDs to a Trimble device or writes the (X, Y, Z, point ID) data to a file.

Selecting **Trimble Link points** brings up the **Create Trimble Link Points** panel:



The fields and buttons used in this panel have the following functions:

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Data source of setout points

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data source

data source of setout points to create the upload data from.

Origin X coordinate/Origin Y coordinate

If non-zero, subtract the value from the x/y value before uploading/writing out.

Upload directly to Trimble device tick box not ticked

if ticked, the selected points are uploaded to the Trimble device.

If not ticked, the data is written to a Trimble DC file with the name as the 12d Model project and ending in .DC

Only upload points with numeric point id's tick box not ticked

if ticked, only vertices with numeric point IDs are uploaded to the Trimble device or written out.

If not ticked, all vertices (whether numeric or alpha-numeric point IDs) are uploaded to the Trimble device or written out.

- Start point id**

input box

point ID to start creating upload data from.
- End point id**

input box

last point ID to create upload data to.
Note: Start and End point IDs may be left blank, and all point IDs are uploaded.
- Default for null z values**

measure box

999

value to write for null z-values.
- Write**

button

send the vertices directly to the Trimble device or write them to a DC file.

Trimble Link Triangles

Triangles from a tin (not a super tin) can be uploaded to a Trimble device or written out as a Trimble TTM file.

Note that the Trimble TTM is binary and so cannot be viewed or edited.

Selecting **Trimble Link triangles** brings up the **Create Trimble Link Triangles** panel:



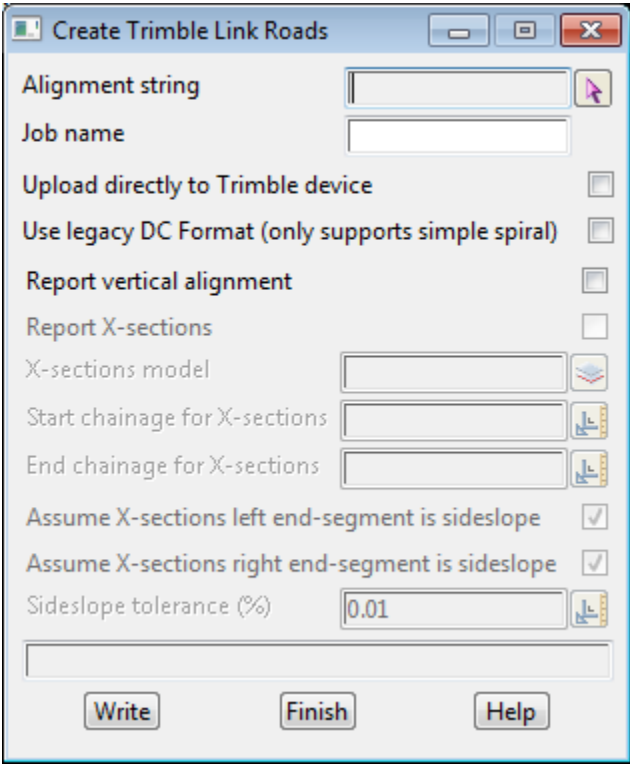
The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Tin <i>the tin (not a super tin) to either upload directly to the Trimble device or write out to a Trimble TTM file. A super tin can not be written out to a TTM file.</i>	tin box		available tins
Job name <i>name of the Trimble job</i>	text input		
Tin Polygon selection <i>if a string is selected, then only those triangles whose centroid is inside the polygon are processed. If no string is selected, then all the triangles in the tin are processed.</i>	polygon box		
Upload directly to Trimble device <i>if ticked, the selected triangles are uploaded to the Trimble device. If not ticked, the data is written to a Trimble TTM file with the given job name and ending in .TTM</i>	tick box	not ticked	
Write <i>send the triangles directly to the Trimble device or write them to the given TTM file.</i>	button		

Trimble Link Roads

This option uploads an alignment string and associated x-sections to a Trimble device, or writes the data to a specific roading file.

Selecting **Trimble Link roads** brings up the **Create Trimble Link Roads** panel:



The Trimble upload/DC file has certain limitations and criteria. These include:

- 1. The alignment string must exist on the X-sections. This allows us to calculate the *zero pt* so we can split the template into left and right.
- 2. The X-sections model should be representative of the alignment string, *i.e.* not generated from a different alignment. Therefore the alignment string should have a 0 offset on the xsections.
- 3. The alignment string cannot exist above or below the X-sections, *i.e.* it should be on the section as per 1.
- 4. The number of points on successive section templates (left and right) should be the same, *i.e.* if 5 points are on the LHS template for ch0 then the same number of points should exist for the LHS template for ch20. The instruments using this file, may not handle transitions between different number of points effectively and can give incorrect results. The user should limit the upload data by using the chainage range between areas where the number of points on each side of the X-sections are the same.

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Alignment string <i>the alignment string to be uploaded/written to the file.</i>	input		
Job name <i>name of the Trimble job</i>	input		
Upload directly to Trimble device	tick box	not ticked	

*if ticked, the selected data is uploaded to the Trimble device.
If not ticked, the data is written to a Trimble DC file with the given job name and ending in .DC*

Use legacy DC Format tick box not ticked

Report vertical alignment tick box not ticked

if ticked, include vertical alignment details in the upload/file.

Report X-sections tick box not ticked

if ticked, the X-sections in X-section model will be uploaded/output to the file.

X-sections model model box

the model of X-sections to be uploaded/written to the file. This can only be filled in if Report vertical alignment and Report X-sections are ticked.

Start chainage for X-sections measure box

if non blank, only X-sections whose chainage is greater than or equal to the Start chainage for X-sections and less than or equal to the End chainage for X-sections are uploaded/written out.

If blank, all X-sections that are less than or equal to the End chainage for x-sections are uploaded/written out.

End chainage for X-sections measure box

if non blank, only X-sections whose chainage is less than or equal to the End chainage for X-sections and greater than or equal to the Start chainage for X-sections are uploaded/written out.

If blank, all X-sections that are greater to or equal to the Start chainage for X-sections are uploaded/written out.

Assume X-sections left end-segment is sideslope tick box ticked

if ticked, the first segment is considered to be a sideslope, and the Sideslope tolerance (%) field is enabled.

Assume X-sections right end-segment is sideslope tick box ticked

if ticked, the last segment is considered to be a sideslope, and the Sideslope tolerance (%) field is enabled.

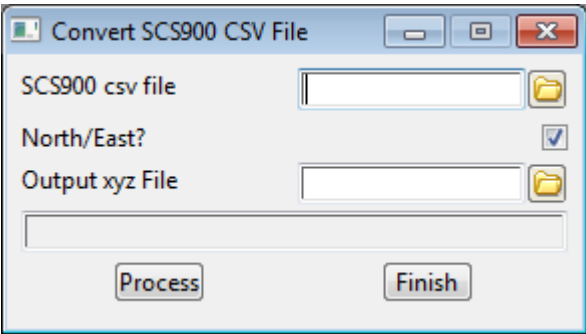
Sideslope tolerance (%) measure box 0.01

Write button

send the data directly to the Trimble device or write it to the given DC file.

SCS900 CSV to XYZ ID Code

This option converts a Trimble SCS900 CSV file to an xyz file.
Selecting **SCS900 CSV to XYZ ID Code** brings up the **Convert SCS900 CSV File** panel:



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
SCS900 csv file <i>name of the SCS900 CSV file</i>	file box		*.csv files
North/East? <i>if ticked,</i>	tick box	ticked	
Output xyz File <i>name of the xyz file to convert the SCS900 CSV file to</i>	file box		*.xyz files
Process <i>convert teh SCS900 file to a xyz file</i>	button		

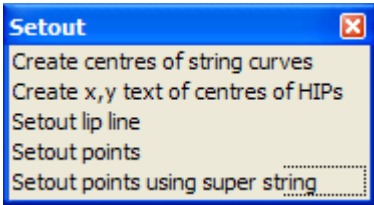
Setout

Position of menu: Survey =>Setout

The **Setout** walk-right menu contains options for creating points numbers and files for uploading to data recorders.

The **Setout** walk-right menu is

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- setout centres of string curves
- create text at centre of HIP's
- setout lip line
- create setout points
- create setout points using super strings

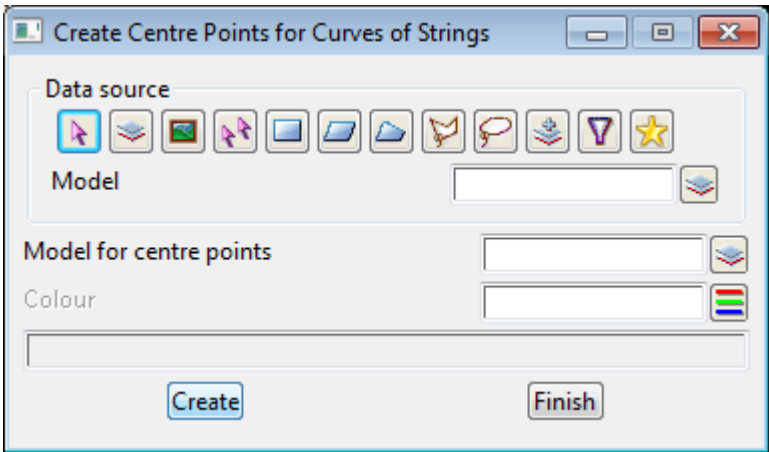
For *Create centres of string curves*, go to
Create x,y,z,text of centres of HIPs
Setout lip line
Setout points
Setout points using super string

[Create Centre Points for Curves of Strings](#)
[Create X Y Text for Centre Points of Alignments](#)
[Setout Lip Line.](#)
[Create Setout Points.](#)
[Create Setout Points Using Super String.](#)

Create Centre Points for Curves of Strings

Position of option on menu: Survey =>Setout =>Create centres of string curves

This option is used to create points at the centres of arcs in alignment strings, polylines, arcs or circles.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Data source type	Model		

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data source

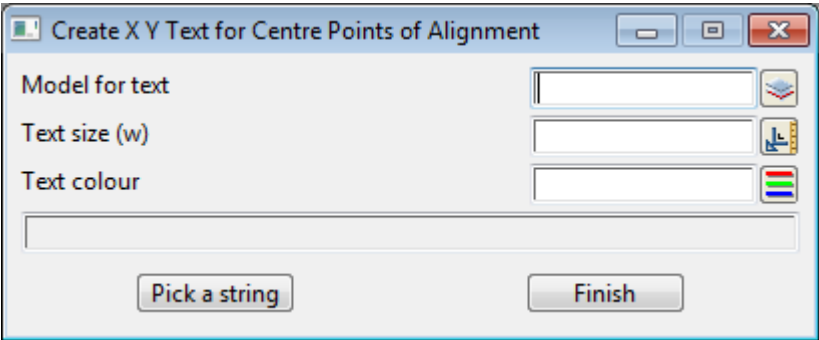
data source for strings to process

Model for centre points	input box	
<i>model for the created points</i>		
Colour	colour box	available colours
<i>colour of centre points</i>		
Create	button	
<i>create the points</i>		

Create X Y Text for Centre Points of Alignments

Position of option on menu: Survey =>Setout =>Create x y text of centres of HIPs

This option creates text for the x and y co-ordinates of the horizontal arcs on an alignment string.



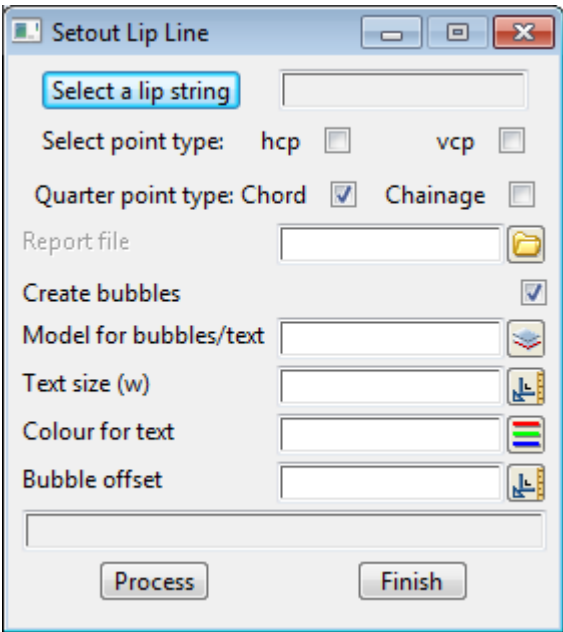
The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Model for text	input box		
<i>model for the text of the x and y co-ordinates</i>			
Text size (w)	input box		
<i>size of text in world units.</i>			
Text colour	input box		
<i>colour of text</i>			
Pick a string	button		
<i>select string to create text for.</i>			

Setout Lip Line

Position of option on menu: Survey =>Setout =>Setout lip line

This panel is used to create bubbles and/or a report for the critical horizontal and vertical points and quarter points (by chord or by chainage) for any arcs in an alignment string.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Select a lip string	string select		
<i>pick the alignment string to have bubbles created for.</i>			

Select point type:

hcp	tick box
<i>if ticked, the horizontal tangent points are included.</i>	
vcp	tick box
<i>if ticked, the vertical tangent points are included.</i>	

Quarter point type:

Chord	tick box	tick
<i>if ticked, the quarter points by chord distance are included.</i>		
Chainage	tick box	
<i>if ticked, the quarter points by chainage distance are included.</i>		

Report file	input box	
<i>name of the report file.</i>		
Create bubbles	tick box	tick
<i>if ticked, bubbles are created with the string name and bubble number inside.</i>		

Model for bubbles/text	input box
<i>model for the bubbles and text.</i>	
Text size (w)	input box
<i>size (in world units) for the text inside the bubble.</i>	
Colour for text	input box
<i>Colour for the bubble and bubble text.</i>	
Bubble offset	input box
<i>offset distance from the alignment string to place the bubble.</i>	
Process	button
<i>run the option.</i>	

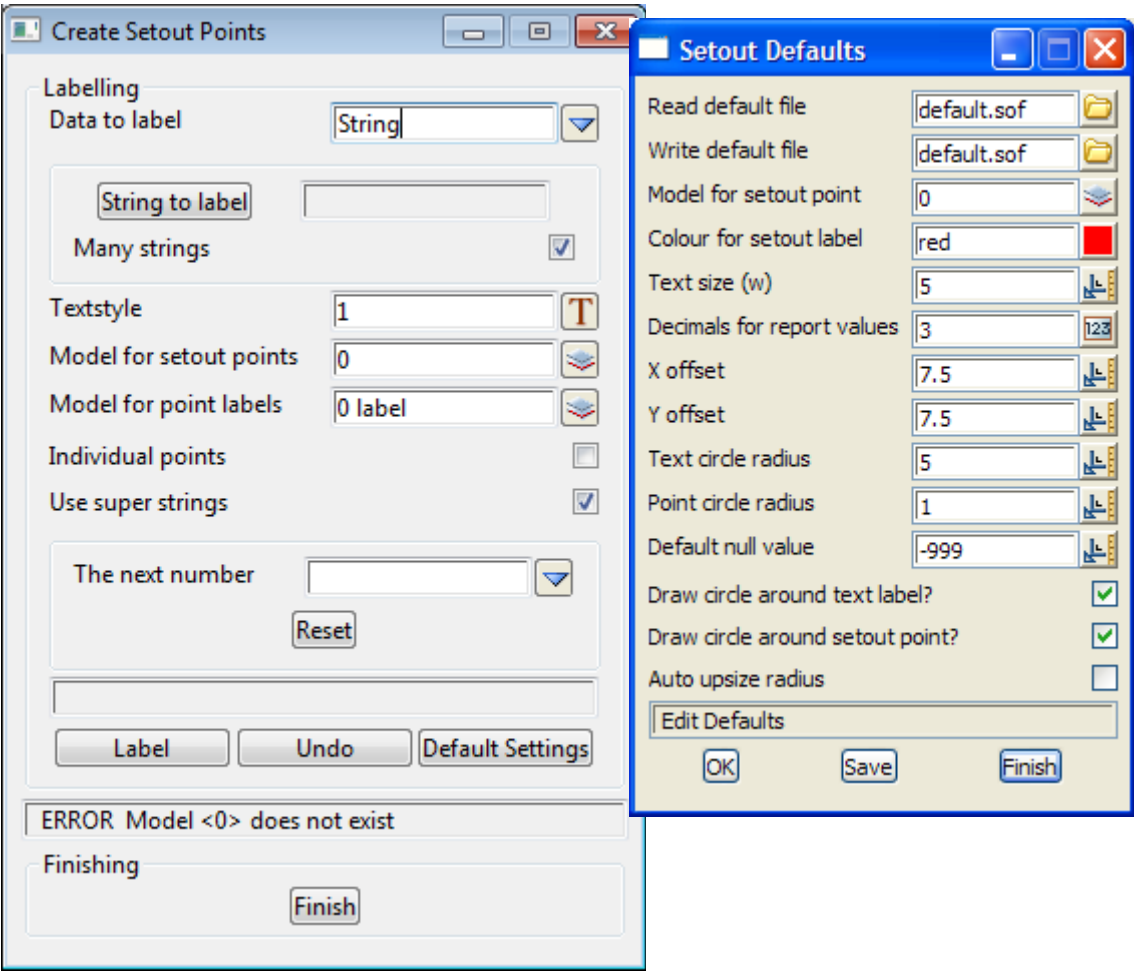
Create Setout Points

Position of option on menu: Survey =>Setout =>Setout points

This panel is used to create points with numbers for use in setting out data. This option is usually run before the option to create an instrument upload file. The setout point is created as a 4d string with the point at the data point and with the point id as the text for the 4d string, with a text size of zero.

Separate text for the numbers and circles surrounding the data points and the text numbers are also created. By default, a file called "defaults.sof" is read in containing settings required for the option.





The fields and buttons used in this panel have the following functions:

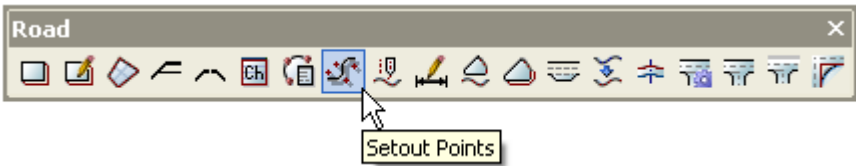
Field Description	Type	Defaults	Pop-Up
Textstyle <i>textstyle for the created point ids</i>	input box	1	
Model for setout points <i>model to place the setout points in</i>	input box	0	
Model for points labels <i>model to place the setout point ids and circles in.</i>	input box	0	
Individual points <i>if ticked, the setout points are created as point strings If not ticked, individual one point strings are created.</i>	tick box		
Use super strings <i>if not ticked, super strings are created for the setout points. The super string point id is set to the setout point id. If not ticked, 4d strings are created for the setout points strings with the 4d text as the setout point id (with text size set to zero).</i>	tick box	tick	
The next number	input box	1 or highest number in model for setout points	

next numeric point id to use for creating point ids. If a **Model for setout points** is given, the model is searched for any super strings or 4d strings with numbers as text and the **The next number** is set to one more than the highest numeric point id in the model.

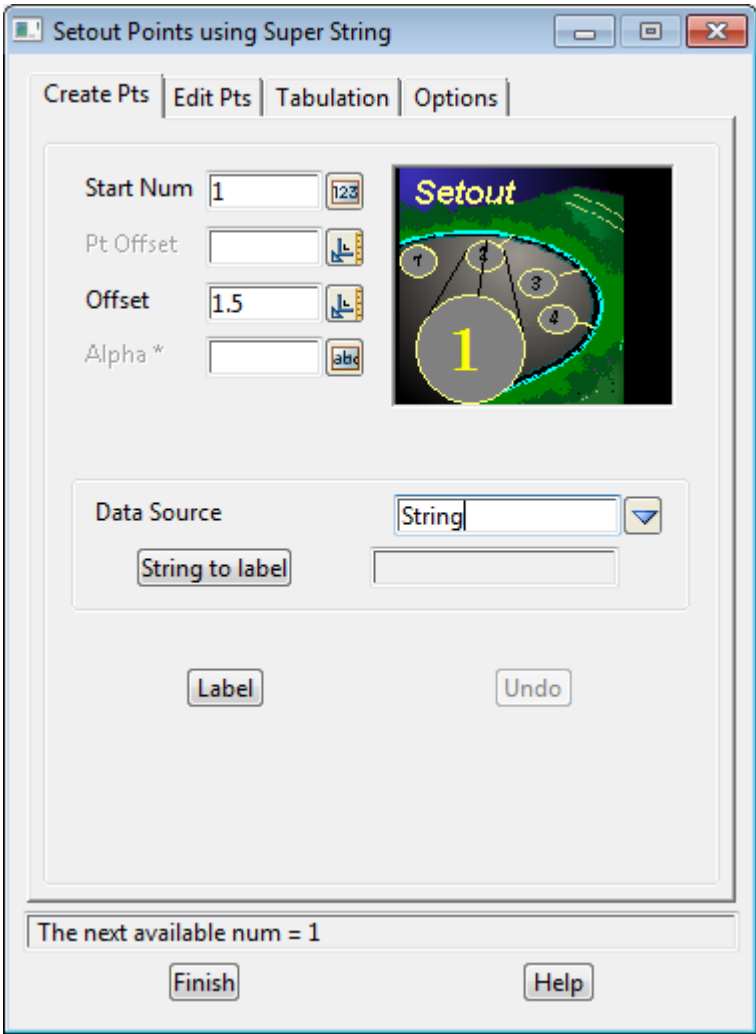
Reset	button		
reset the The next number to the highest point in the model for setout points.			
Data to label	input box	string	string, model, view, point
type of data source.			
Model/View/String/Point to output box			
data to create point ids for.			
Many points/strings	tick box	tick	
if ticked, the each time a string/point is selected, the string/point is processed without having to click on the Label button. After a string/point is processed, another string/point can then be selected. If not ticked, the Label button must be clicked before the selected string/point is processed.			
Label	button		
create setout points and circles for the selected data.			
Undo	button		
undo the last setout points and s created whilst the panel has been up.			
Default settings	button		
default settings for the s. These can be read in from a file.			

Create Setout Points Using Super String

Position of option on menu:	Survey =>Setout =>Setout points using super string
Position of option on menu:	Road Toolbar



This option creates a super string over the top of the data selected. The super string allows point numbers. The incremental point numbers are displayed at each vertex inside a circle symbol. The setout numbers are identified on a setout model and incremented each time the panel is activated.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Create Pts			
Start Num	integer	1 (or next available number on subsequent runs of the option)	
<i>Type in number and <enter> or accept default</i>			
Pt Offset	real		
<i>Offset of the setout point, typically a distance behind the back of kerb. (This will be the setout point x,y location but the z value refers to the original string selected e.g. the kerb return)</i>			
Offset	real		
<i>Offset of the setout point text and circle, from the actual setout point.</i>			
Alpha*	text		
<i>If non-blank, Alpha point number prefix is used</i>			
Data Source	choice box	String	String, Point, Model, View
<i>String: Allows the selection of a string (using 12d pick with direction), where the setout number is</i>			

*always placed on the right hand side in relation to the pick direction, perpendicular to the string.
Alignment choices: A selection panel is displayed with 3 choices:-*

- s by number <divides the string into equal parts>
- s by distance <divides the string and may have a remainder>
- s by special chainage file

String to label button

***Point:** Allows the selection of a point. There is no direction involved.*

Point to label button

***Model and View:** Allows the setout of multiple strings and points but again there is no control over the pick direction or the orientation of the setout number in relation to any string.*

Model to label model

existing model selection required

View to label view

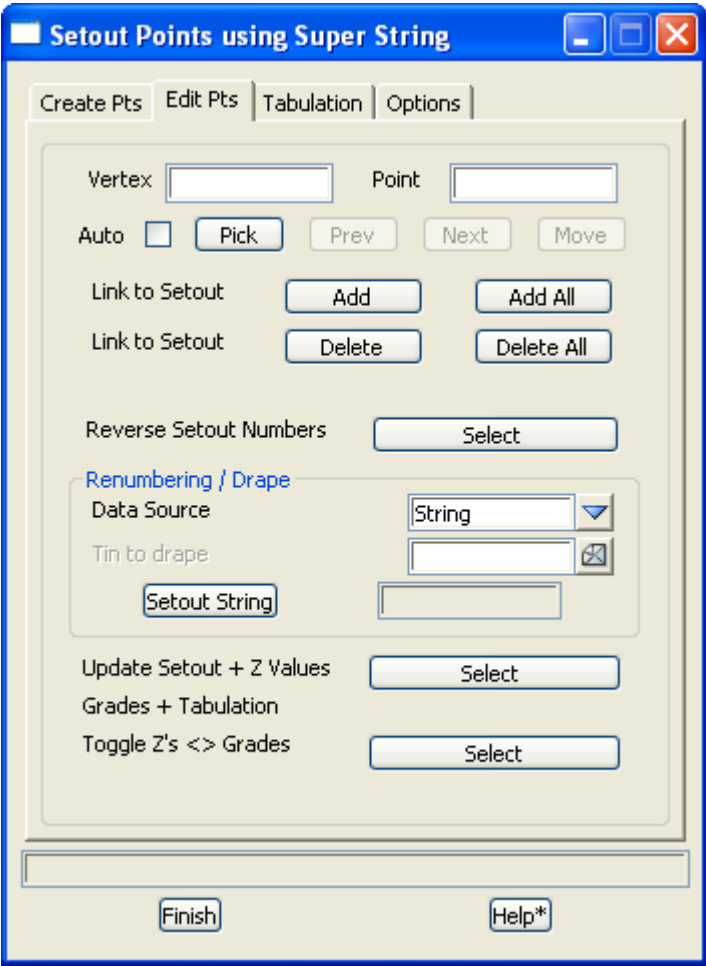
Existing view to be selected

Label button

Runs the option and adds the setout model to the view from which the Data Source was selected

Undo button

Each <Label> creation has an undo



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Edit Pts

Vertex	Integer
---------------	---------

Point	Integer
--------------	---------

The Vertex and Point fields above are automatically filled in after a setout string has been picked

Auto	tick box	false
-------------	----------	-------

When ticked on, and a setout point is selected using <Pick>, then the <Move> option is automatically activated

Pick	button
-------------	--------

Select setout point to move text bubble

Prev	button
-------------	--------

Steps backward and highlights the previous point on setout string

Next	button
-------------	--------

Steps forward and highlights the next point on setout string

Move	button
-------------	--------

Activates the move option allowing the setout text bubble to be dynamically relocated on screen, but still remain attached to the actual setout point

Link to Setout:

Add button

Draws a leader line from the actual setout point to the setout text value bubble

Add All button

Draws a leader line from the actual setout point to the setout text value bubble at all vertices on the selected setout string

Link to Setout:

Delete button

Deletes the leader line from the actual setout point to the setout text value bubble, if it exists

Delete All button

Deletes the leader line from the actual setout point to the setout text value bubble at all vertices on the selected setout string

Reverse Setout Numbers:

Select button

This option reverses the numbering order only on a setout string.

Renumbering / Drape:

This option can renumber the start number used on setout data. When a string or model is selected a prompt for a new start number is displayed.

The tin to drape is used to reset the z value of the setout point. A design tin can be used, but care should be taken to have a design point in the tin, close to the setout point, as a “drop onto the tin” is used to calculate the new z value.

Data Source choice box String String, Model

String or model are the choices

Tin to drape tin

if non-blank, setout vertices will be draped to get new z value

Setout String button

*Select the setout string to perform the above **Renumbering / Drape***

Update Setout + Z Values + Grades + Tabulation:

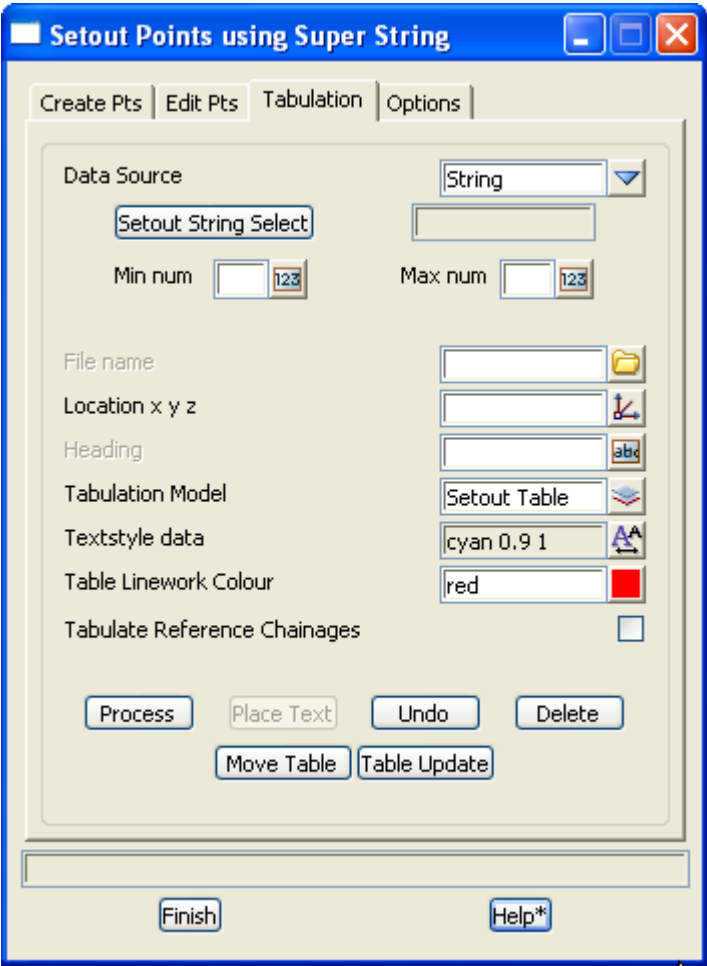
Select button

Setout features can be updated as the original string selected for setout (e.g. Kerb return alignment) has been stored as an attribute on the setout string. Care must be taken to re-select the original string.

Toggle Z's <> Grades:

Select button

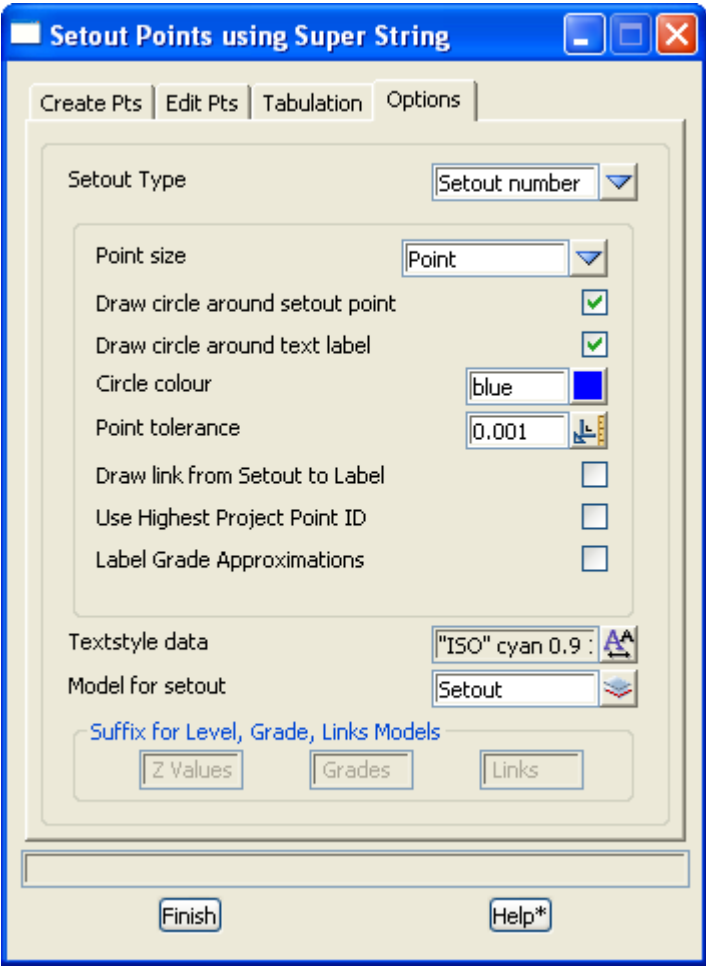
Setout features such as labelling Z values and grades on segments are discussed under [Options](#) tab. This option toggles the display between the two



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Tabulation			
Data Source	choice box	String	String, Model
<i>String or model are the choices</i>			
Setout String Select	button		
<i>Select a setout string to tabulate</i>			
Model to Tabulate	model		
<i>Select existing setout string to tabulate</i>			
Min num	integer		
Max num	integer		
<i>Fields are filled out once setout data is selected, but can be changed manually.</i>			
File name	file		
<i>If non-blank an xyz file will be created</i>			
Location xyz	xyz pick		
<i>Select on screen or enter a coord for the top left hand corner of table</i>			

Heading	Input	
<i>if non-blank entry used as heading for tabulation</i>		
Tabulation Model	model	available models
<i>Enter a model name for the tabulation</i>		
Textstyle Data	textstyle box	select Textdata
<i>Setup text colour, height and width</i>		
Table Linework Colour	colour box	available colours
<i>Colour for any linework in tabulation</i>		
Tabulate Reference Chainages	tick box	false
<i>Chainages can be displayed from the original selected string (e.g. Reference kerb return alignment) in relation to setout vertices</i>		
Process	button	
<i>runs the option</i>		
Place Text	button	
<i>Creates the tabulation on the tabulation model</i>		
Undo	button	
<i>Undo for that operation</i>		
Delete	button	
<i>Deletes all the entities on the table selected</i>		
Move Table	button	
<i>Moves the complete table on screen (select table and destination point)</i>		
Table Update	button	
<i>Table can be updated if text parameters are changed or Reference Chainages is ticked on or off. Select the tabulation.</i>		



Options

Setout Type	choice box	Setout number	Setout number, Z value
-------------	------------	---------------	------------------------

Setout number or Z values are the choices

Setout Number:

Point size	choice box	Point	Point, Point 0.5
------------	------------	-------	------------------

Selections are Point and Point 0.5 (refer to the size of the point shown at the setout z, y)

Draw circle around setout point	tick	true
---------------------------------	------	------

Refers to the linestyle circle at each setout z, y.

Draw circle around text label	tick	true
-------------------------------	------	------

Refers to the circle surrounding each setout point number text value

Circle colour	colour box	blue
---------------	------------	------

The colour of the circle surrounding each setout point number text value

Point tolerance	real	
-----------------	------	--

X,Y Tolerance between setout points to handle duplicate or near duplicate points

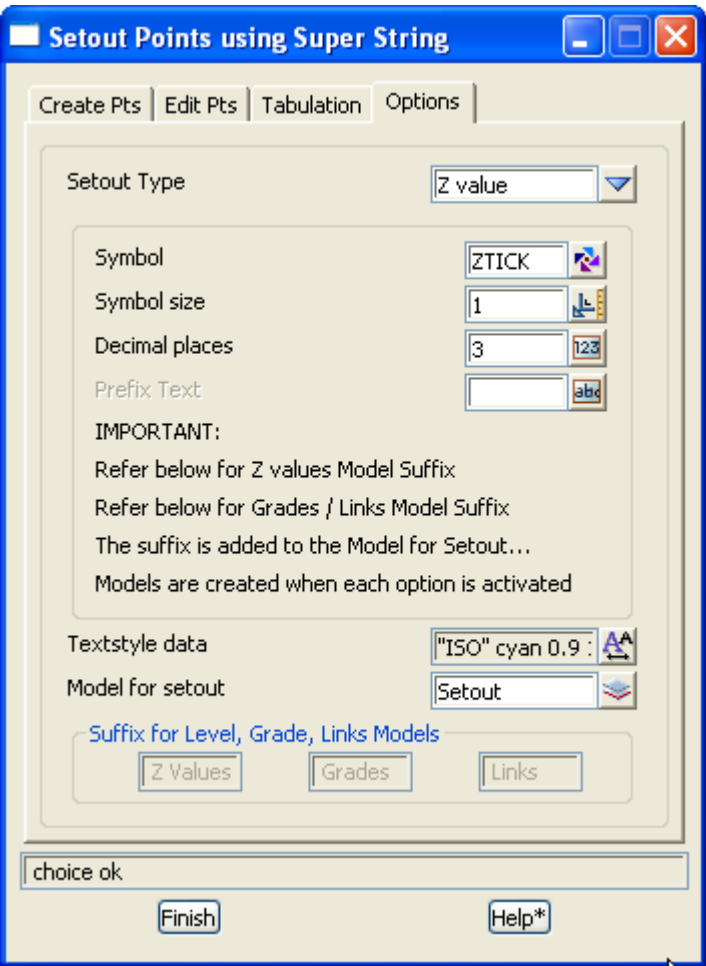
Draw link from Setout to Label	tick box	false
--------------------------------	----------	-------

Use Highest Project Point ID	integer	
------------------------------	---------	--

Search for the highest point number available in the project

Label Grade Approximations tick box false

(Grades can be labelled between setout points, but care must be taken as the z value is used from the setout points, the length from the original reference string selected.
The grade is only correct if the points are on grade and or on a parabola. So the grades are reported as approximate only and for a visual check.)



Z Value:

Symbol	input	ZTICK
Symbol Size	real	1
Decimal Places	Integer	3
Prefix Text	input	

if non-blank text value added to text Z value. <e.g. R.L.>

Textstyle Data textstyle box

Setup text style, colour, height and width

Model for setout model box available models

Enter a model name for the setout data

Suffix for Level, Grade, Links Models

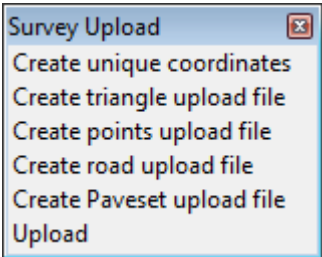
Display default values for models that may be created if you choose to draw link lines, label levels or grades. If setout model is "Setout"....then these models would default to "Setout Level" "Setout Link" "Setout Grade"

Upload

Position of menu: Survey =>Upload

The Survey Upload walk-right menu contains survey options to upload data the most survey instruments. There are options to upload points, triangulations and road geometry.

The Survey Upload walk-right menu is



- Create triangle upload file
- Create points upload file
- Create roads upload file
- Create points upload file (new) - only for *Trimble Link*
- Create roads upload file (new) - only for *Leica XML* and *Trimble Link*

For the option *Create unique coordinates*, go to
Create triangle upload file
Create points upload file
Create road upload file
Create points upload file (new)
Create road upload file (new)
Create Paveset upload file
Upload

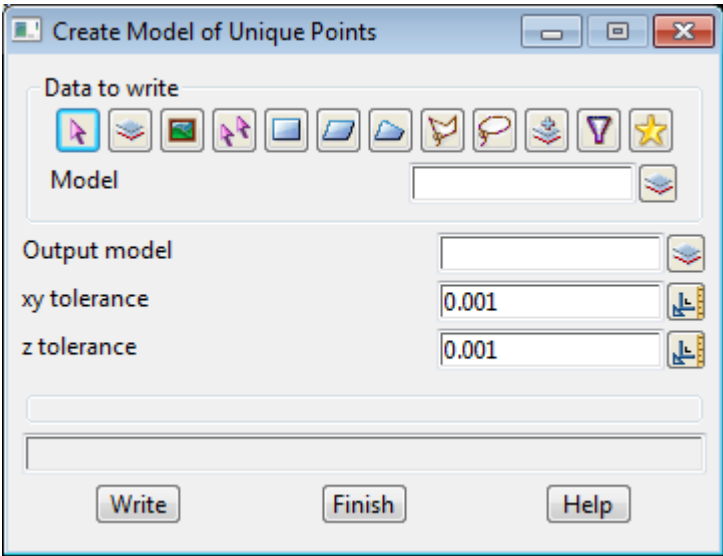
- [Create Unique Coordinates](#)
- [Create Triangle Upload File](#)
- [Create Points Upload File](#)
- [Create Road Upload File](#)
- [Create Points Upload File \(New\)](#)
- [Create Road Upload File \(New\)](#)
- [Create Paveset Upload File](#)
- [Survey Data Upload](#)

Create Unique Coordinates

Position of option on menu: Survey =>Upload => Create unique coordinates

This option creates points from the selected data so that there is only one point for all vertices within user defined xy and z tolerances.

Selecting *Create unique coordinates* brings up the **Create Model of Unique Points** panel.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source of setout points

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data source

data source of strings to create unique points from

Output model	model box
---------------------	-----------

model for the created vertices.

xy tolerance	real value box	-0.001
---------------------	----------------	--------

z tolerance	real value box	-0.001
--------------------	----------------	--------

all vertices closer than these tolerances are considered to be the same vertex and only one point will be created for all of them.

Process	button
----------------	--------

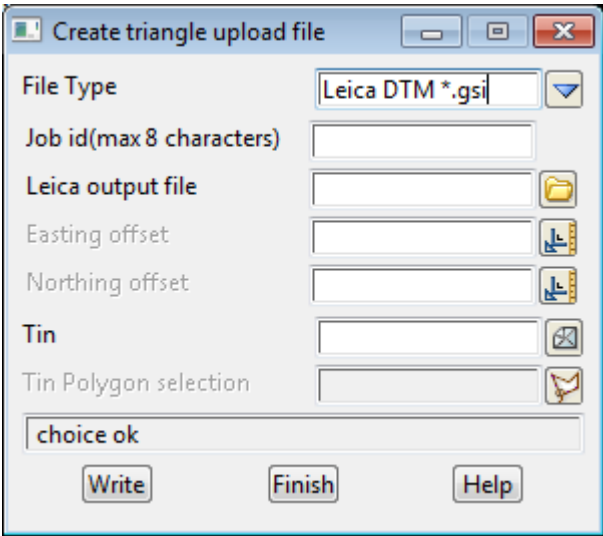
create the distinct points

Create Triangle Upload File

Position of option on menu: Survey =>Upload => Create triangle upload file

The **Create triangle upload file** option allows the creation of a triangle file based on a tin. Various file formats can be selected

Selecting **Create triangle upload file** brings up the **Create triangle upload file** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Common parameters at bottom:

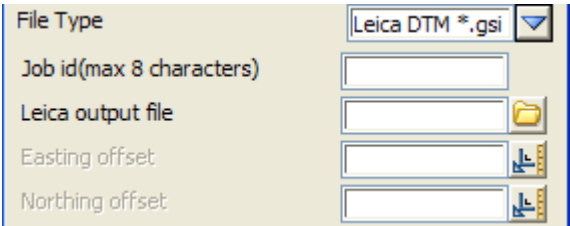
Tin	input
<i>name of tin from which the triangle file will be based.</i>	

Tin polygon selection	selection
<i>allows the user to select a specific area of the tin to be exported as a triangle file.</i>	

Write	button
<i>On clicking the write button, 12d Model will write the specified file.</i>	

File type	choice box	Leica DTM *.gsi 12d xyzs *.dat Ortho 12d *.T12 Sokkia *.tri TP Setout/Stakeout *.tsa LandXML *.xml
<i>file type to be produced.</i>		

For Leica DTM *.gsi format:



Job id	input
<i>job id to be included in file. (max 8 characters)</i>	

Leica output file input
name of file to be produced

Easting offset input
easting offset to be applied to data. This is important where large coordinate values are used, such as in map projections.

Northing offset input
northing offset to be applied to data. This is important where large coordinate values are used, such as in map projections.

For 12D xyzs *.dat format:

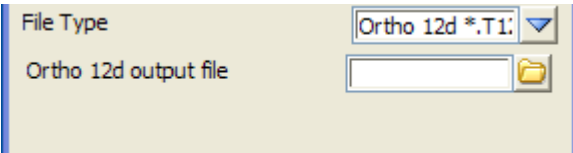
.

A screenshot of a software dialog box for file type selection. It has a light beige background. At the top, 'File Type' is written in a small font. To its right is a dropdown menu showing '12D xyzs *.dat' with a downward arrow. Below this, the text '12d output file' is on the left, and on the right is a text input field followed by a folder icon.

12d output file input
name of file to be produced

For Ortho 12d *.T12 format:

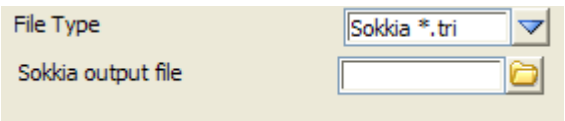
.

A screenshot of a software dialog box for file type selection. It has a light beige background. At the top, 'File Type' is written in a small font. To its right is a dropdown menu showing 'Ortho 12d *.T12' with a downward arrow. Below this, the text 'Ortho 12d output file' is on the left, and on the right is a text input field followed by a folder icon.

Ortho 12d output file input
name of file to be produced

For Sokkia *.tri format:

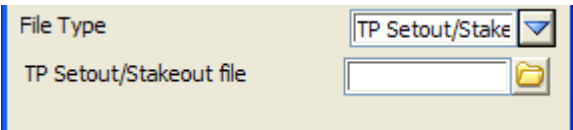
.

A screenshot of a software dialog box for file type selection. It has a light beige background. At the top, 'File Type' is written in a small font. To its right is a dropdown menu showing 'Sokkia *.tri' with a downward arrow. Below this, the text 'Sokkia output file' is on the left, and on the right is a text input field followed by a folder icon.

Sokkia output file input
name of file to be produced

For TPSetout/Stakeout *.tsa format:

.

A screenshot of a software dialog box for file type selection. It has a light beige background. At the top, 'File Type' is written in a small font. To its right is a dropdown menu showing 'TP Setout/Stake' with a downward arrow. Below this, the text 'TP Setout/Stakeout file' is on the left, and on the right is a text input field followed by a folder icon.

Tp Setout/Stakeout file input
name of file to be produced

For TPSetout/Stakeout *.tsa format:

.

File Type

LandXML *.xml

LandXML file

LandXML file input
name of file to be produced

Create Points Upload File

Position of option on menu: Survey =>Upload => Create points upload file

The **Create points upload file** option allows the creation of a file of point ids, x, y and z, for string data (super strings and 4d strings only). Various file formats can be selected

Selecting **Create points upload file** brings up the **Create Instrument Points Upload File** panel.

Upload files for points can be created for various Leica, Geodimeter, Sokkia, Topcon, UPL, QuikDraw, Trimble XYZ formats as well as a text file of point id, x,y,z data.

Create Instrument Points Upload File

Instrument choices

Sokkia SDR 33

Output Z values

☒

Create new job on SDR33

☒

Add + last character of code

☐

Left justify fields

☐

Output feature codes

☒













User definable terminator

&

Default char for blank name

z

Data source of setout points



Model

Number of decimal places

3

123

Default for null value

999

Start point number

123

End point number

123

Origin x

Origin y

Upload file

Selection not supported

Get Point Range

Write File

Finish

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Instrument choices <i>type of output format</i>	choice box	report_xyz	available instruments
Output z values <i>if ticked, z-values are output - only used for Geodimeter formats</i>	tick box		
Create new job on SDR 33 <i>if ticked, create a new job on SDR33 - only used for Sokkia formats</i>	tick box		
Left justify fields <i>if ticked, each field is left justified - only used for Sokkia formats</i>	tick box		
User definable terminator <i>terminator to use - only used for Geodimeter formats.</i>	input box	&	
Default char for blank name <i>character used for blank names - only used for Geodimeter formats.</i>	input box	z	
Data source of setout points <i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source <i>data source of setout points to create the upload file from.</i>			
Number of decimal places <i>number of decimal places for x, y and z values.</i>	input box	3	
Default for null value <i>value to write for null z-values.</i>	input box	-9999	
Start point id <i>point id to start creating upload file from.</i>	input box		
End point id <i>last point id to write to upload file.</i>	input box		
<i>Note: Start and End point ids may be left blank, and all point ids (whether numeric or alpha-numeric) will be written to the upload file.</i>			
Origin x/Origin y <i>If non-zero, subtract the value from the x/y value before writing out.</i>	input box		
Upload file <i>name of the upload file to create.</i>	file box		
Get Point Range <i>pressing this button will populate the Start and End point id fields with the minimum and maximum (numeric) point ids found in the selected source data. If the selected source data contains a mix of numeric and alpha-numeric point ids, the alpha-numeric point ids are considered to have a numeric value of zero (0), but are ignored when determining the range. If the selected source data contains alpha-numeric point ids only, then the Start and End point id fields will both be set to zero (0).</i>	button		

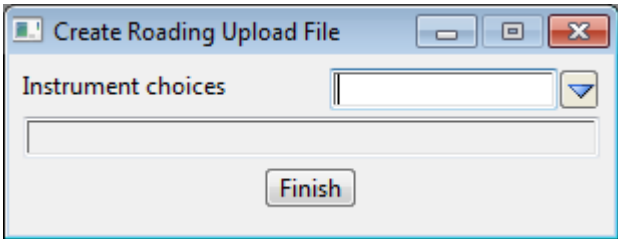
Write File button
create the upload file

Create Road Upload File

Position of option on menu: Survey =>Upload => Create roads upload file

The **Create roads upload file** option allows the creation of a specific roading file. Files can be created for various Leica (8 & 16 formats), Geodimeter, Sokkia, Topcon and Trimble Roading formats.

Selecting **Create road upload file** brings up the **Create Roading Upload File** panel



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Instrument choices	choice box		Geodimeter Roadline 3d Leica Road Plus 8 Leica Road Plus 16 LMGS - D45 Sokkia Roading - Alignment Road Sokkia Roading - String Road Topcon MS2000 Topcon GTS-700 Roads Trimble Roading

For choice of *Geodimeter Roadline 3d*, go to
Leica Road Plus 8
Leica Road Plus 16
LMGS - D45 file
Sokkia Roading - Alignment road
Sokkia Roading - String road
Topcon MS2000
Topcon GTS-700 Roads
Trimble Roading

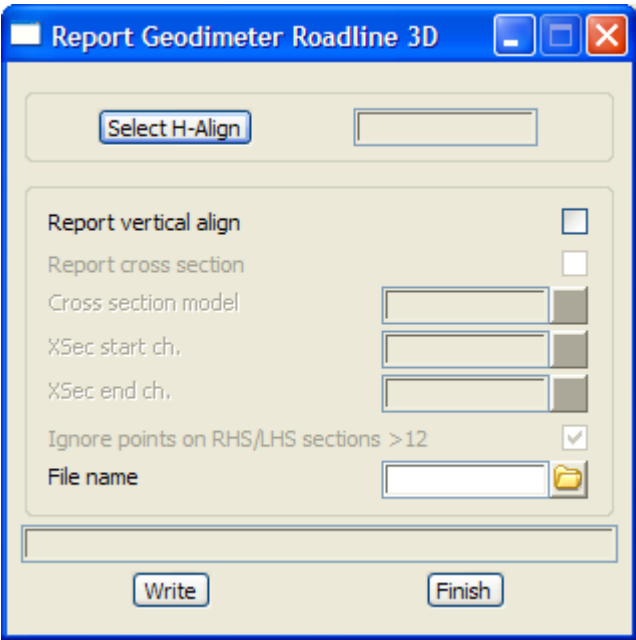
[Geodimeter Roadline 3D file](#)
[Leica road plus 8 / 16 file](#)
[Leica road plus 8 / 16 file](#)
[LMGS - D45 file](#)
[Sokkia Roading - Alignment Road file](#)
[Sokkia Roading - String Road file](#)
[Topcon MS2000 Roading file](#)
[Topcon GT700 Roading File](#)
[Trimble Roading File](#)

Geodimeter Roadline 3D file

Position of option on menu: Survey =>Upload => Create roads upload file, Instrument choice = Geodimeter Roadline 3d

The **Geodimeter Roadline 3d** option allows the creation of a specific roading file.

Selecting Geodimeter Roadline 3d brings up the Report Geodimeter Roadline 3D panel



The Geodimeter (trimble), has certain limitations and criteria associated with the 3d file. These include:

- 1. Each section template (i.e. right or left) has a max number of 12 points.
- 2. The first and last segments of the alignment must be a straight (for both horizontal and vertical).
- 3. The start and end chainages of the horizontal alignment should be the same for the vertical alignment.
- 4. The alignment string must exist on the xsec's. This allows the calculation of the *zero pt* so we can split the section into left and right templates.
- 5. The xsec model should be representative of the alignment string used in the macro. i.e. not generated from a different alignment. Therefore the alignment string should have a 0 offset on the xsections.
- 6. The alignment string cannot exist above or below the xsection. I.e. it should be on the section as per 4)
- 7. The number of points on consecutive section templates (left and right) should be the same. i.e. if 5 points are on the LHS template for ch0 then the same number of points should exist for the LHS template for ch20. The instruments using this file, cannot handle transitions between different number of points effectively and can give incorrect results. The user should limit the file by using the chainage range between areas where the number of points on each side of the cross sections is the same.

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Select H-Align	Select box		
<i>select valid alignment string.</i>			
Report vertical alignment	tick box	no	
<i>write vertical alignment details to file mode. If yes vertical alignment details written to the specified file.</i>			
Report cross sections	tick box	no	
<i>if selected, the cross section model box will be enabled.</i>			
Cross section model	model box		
<i>This will ask for the model of cross sections. These sections will be written out to the file.</i>			

XSec start ch input box min alignment ch
chainage value to start writing cross sections.

XSec end ch input box max alignment ch
chainage value to end writing cross sections.

Ignore points on RHS/LHS sections >12 tick box ☒ **ticked**
if ticked, where there are more than 12 points in either the RHS or LHS template (derived from the xsection) the outlying points are ignored. e.g. if there was 14 points on the RHS template, only 12 will be written to the file with 2 pts being ignored.

File name input box
the name to be used for file creation

Write button
write appropriate files.

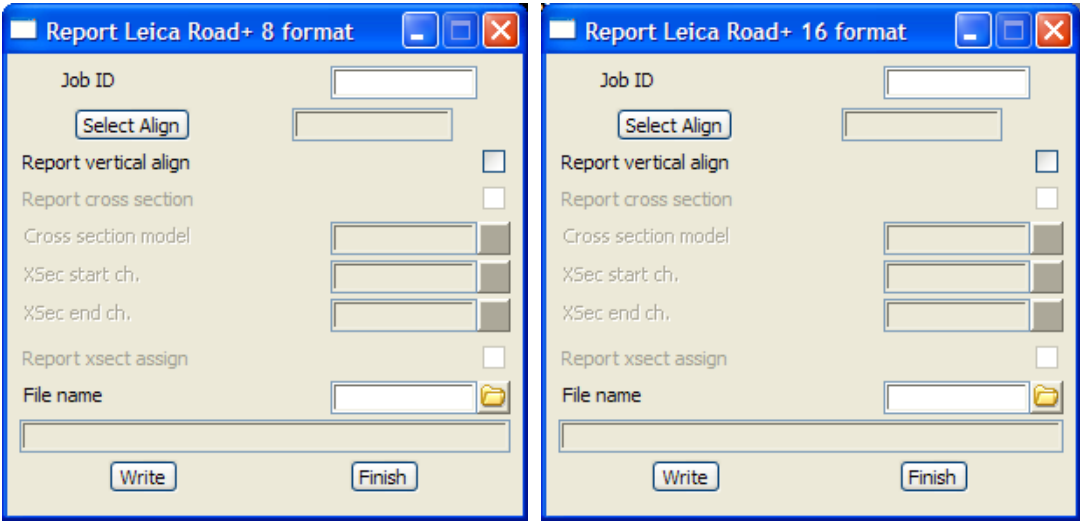
Leica road plus 8 / 16 file

Position of option on menu: Survey =>Upload => Create roads upload file, Instrument choice = Leica roadplus 8 or Leica roadplus 16

The Leica roadplus 8 and Leica roadplus 16 options allow the creation of specific Leica roading files.

Selecting Leica roadplus 8 brings up the **Report Leica roadplus 8** panel.

Selecting Leica roadplus 16 brings up the **Report Leica roadplus 16** panel.



The 8 and 16 formats are different file formats for the leica range of instruments. The user should be aware of the required format for the particular instrument. Please refer to the Leica documentation for specifications

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Job id	input box		
<i>job id (max 8 characters).</i>			
Select alignment	String select box		
<i>select valid alignment string.</i>			

Report vertical alignment tick box no

*write vertical alignment details to file mode. If yes vertical alignment details written to appropriate file.
i.e. (PRF*****.gsi)*

Report cross sections tick box no

if selected, the cross section model box will be enabled.

Cross section model model box

*This will ask for the model of cross sections. These sections will be written out to the appropriate file.
i.e. (CRS*****.gsi)*

XSec start ch input box min alignment ch

chainage value to start writing cross sections.

XSec end ch input box max alignment ch

chainage value to end writing cross sections.

Report cross section assignment tick box no

*If ticked, a cross section assignment file (STA*****.gsi) file will be made.*

File name input box

the name to be used for file creation. NB depending on what files are specified, the name given will be appended with the correct prefix eg ALN for alignment file. As Leica only takes 8 character file names, the name may be truncated.

Write button

write appropriate files.

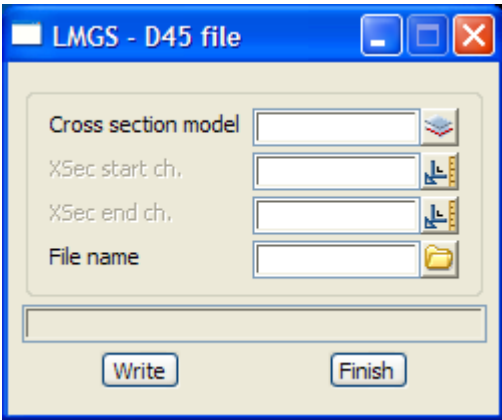
LMGS - D45 file

Position of option on menu: Survey =>Upload => Create roads upload file, Instrument choice = LMGS - D45 file

The **LMGS - D45 file** option allows the creation of a specific file format suitable for upload to Leica's grader and paver control systems. The format has a number of rules that must be satisfied for correct file creation. These include:

1. There must be an equal number of points on each section
2. Points should not be closer than 5cm in both directions
3. Azimuth changes between cross section points should not be greater than 20gon (18 degrees).

Selecting **LMGS - D45 file** brings up the **LMGS - D45 file** panel



The fields and buttons used in this panel have the following functions:

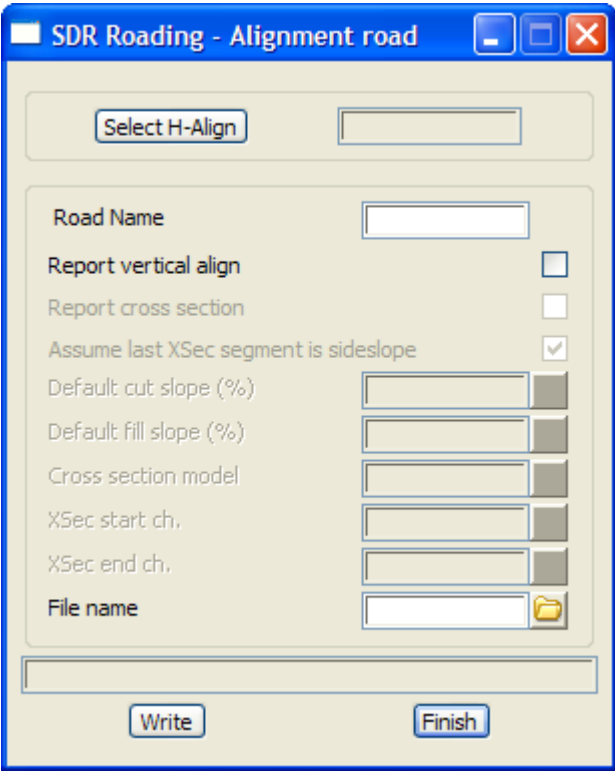
Field Description	Type	Defaults	Pop-Up
Cross section model	model box		
<i>the model of cross sections. These sections will be written out to the file.</i>			
XSec start ch	input box	min alignment ch	
<i>chainage value to start writing cross sections.</i>			
XSec end ch	input box	max alignment ch	
<i>chainage value to end writing cross sections.</i>			
File name	input box		
<i>the name to be used for the file creation. The file will automatically be given a .D45 extension.</i>			
Write	button		
<i>write appropriate file.</i>			

Sokkia Roding - Alignment Road file

Position of option on menu: Survey =>Upload => Create roads upload file, Instrument choice = Sokkia Roding - Alignment road

The Sokkia Roding - Alignment road option allows the creation of a specific roding file.

Selecting Sokkia Roding - Alignment road brings up the SDR Roding - Alignment Road panel



The sdr33 roding file has certain limitations and criteria. These include:

- 1. The alignment string must exist on the xsec's. This allows us to calculate the **zero pt** so we can split the template into left and right.
- 2. The xsec model should be representative of the alignment string used in the macro. i.e. not generated from a different alignment. Therefore the alignment string should have a 0 offset on the xsections.
- 3. The alignment string cannot exist above or below the xsection. I.e. it should be on the section as per 1).
- 4. The number of points on adjacent section templates (left and right) should be the same. i.e. if 5 points are on the LHS template for ch0 then the same number of points should exist for the LHS template for ch20. The instruments using this file, may not handle transitions between different number of points effectively and can give incorrect results. The user should limit the file by using the chainage range between areas where the number of points on each side of the cross sections are the same.

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Select H-Align <i>select valid alignment string.</i>	Select box		
Road Name <i>input road name. If a valid alignment is selected, the name of that alignment will be the default road name.</i>	input box	Name of selected alignment string	
Report vertical alignment <i>write vertical alignment details to file mode. If yes vertical alignment details written to the specified file.</i>	tick box	no	
Assume last XSec segment is sideslope <i>if box is selected, the last segments left and right of 0.0 offset are considered to be side slopes, and the default cut and fill slope fields are enabled.</i>	tick box	ticked	

Default cut slope (%) input box

this field is optional. From the section data it is only possible to calculate either the cut or fill sideslope. A default value can be specified to be used for the non calculated value.

*When the segment is rising (i.e has a positive slope) it is considered a cut slope. Similarly, if the grade is negative the sideslope is considered a fill. If a fill sideslope is calculated, the cut sideslope definition in the file will be given the value as entered into the **default cut slope** field. If no value is set for the default, the cut slope in this instance will be given a null value. The default value if entered, should be in whole percent e.g. 50.0 for a 1v in 2h slope.*

Default fill slope (%) input box

this field is optional. From the section data it is only possible to calculate either the cut or fill sideslope. A default value can be specified to be used for the non calculated value.

*When the segment is rising (i.e has a positive slope) it is considered a cut slope. Similarly, if the grade is negative the sideslope is considered a fill. If a cut sideslope is calculated, the fill sideslope definition in the file will be given the value as entered into the **default fill slope** field. If no value is set for the default, the fill slope in this instance will be given a null value. The default value if entered, should be in whole percent e.g. 50.0 for a 1v in 2h slope.*

Cross section model model box

This will ask for the model of cross sections. These sections will be written out to the file.

XSec start ch input box min alignment ch

chainage value to start writing cross sections

XSec end ch input box max alignment ch

chainage value to end writing cross sections

File name input box

the name to be used for file creation

Write button

write appropriate file

Sokkia Roding - String Road file

Position of option on menu: Survey =>Upload => Create roads upload file, Instrument choice = Sokkia Roding - String road

The Sokkia Roding - String road option allows the creation of a specific string roading file.

Selecting Sokkia Roding - String road brings up the **SDR Roding - String Road** panel



The fields and buttons used in this panel have the following functions:

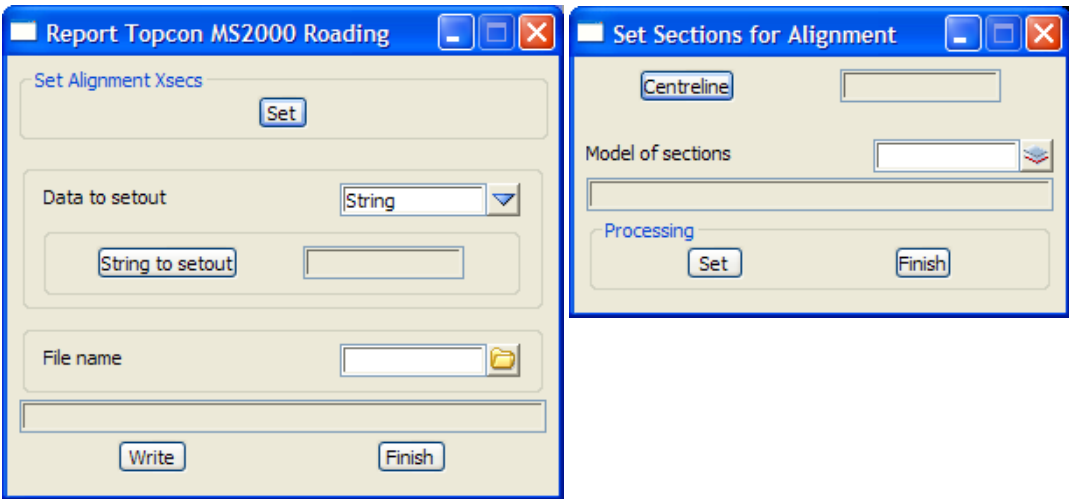
Field Description	Type	Defaults	Pop-Up
Road Name <i>input road name. If a valid alignment is selected, the name of that alignment will be the default road name.</i>	input box	Name of selected alignment string	
Cross section model <i>model of cross sections to write out in SDR33 string format</i>	Model box		available models
XSec start ch. <i>chainage of the first cross sections to write out</i>	input box	min alignment ch	
XSec end ch. <i>chainage of the last cross sections to write out</i>	input box	max alignment ch	
File name <i>the name to be used for file creation</i>	file box		
Write <i>write appropriate file.</i>	button		

Topcon MS2000 Roding file

Position of option on menu: Survey =>Upload => Create roads upload file, Instrument choice = Topcon MS2000

The **Topcon MS2000** option allows the creation of a specific roading file.

Selecting **Topcon MS2000** brings up the **Report topcon MS2000 Roding** panel



The fields and buttons used in this panel have the following functions:

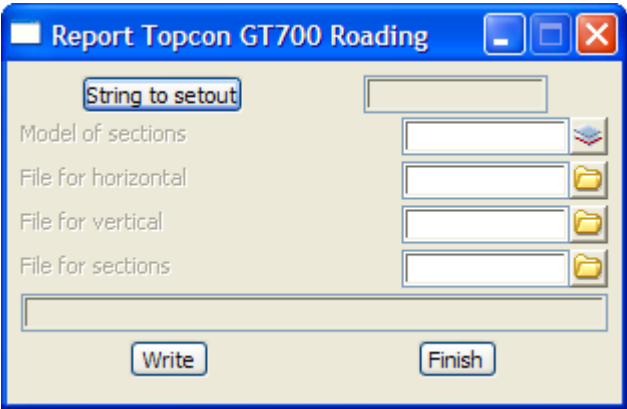
Field Description	Type	Defaults	Pop-Up
Set	button		Set section for alignment panel
<i>the set button will bring up the set sections for alignment panel. This panel allows the user to select multiple alignment/xsection combinations for the one file. The alignment is selected (using the Centreline selection button) followed by the Model of sections for that alignment. The Set button is pressed to accept the selection. This can be repeated for a number of alignments. Finish will close the set sections for alignment panel and return to the original panel</i>			
Data to setout	choice box	string	model view string
<i>the data to be included in the file can be selected by choosing a valid model, view or string. Depending on which data source is selected, the appropriate selection button will appear. The user then selects the button and then the items of interest.</i>			
File name	input box		
<i>the name to be used for file creation</i>			
Write	button		
<i>write appropriate files.</i>			

Topcon GT700 Roading File

Position of option on menu: Survey =>Upload => Create roads upload file, Instrument choice = Topcon GTS-700 Roads

The **Topcon GTS-700 Roads** option allows the creation of a specific roading file.

Selecting **Topcon GTS-700 Roads** brings up the **Report Topcon GT700 Roading** panel



The fields and buttons used in this panel have the following functions:

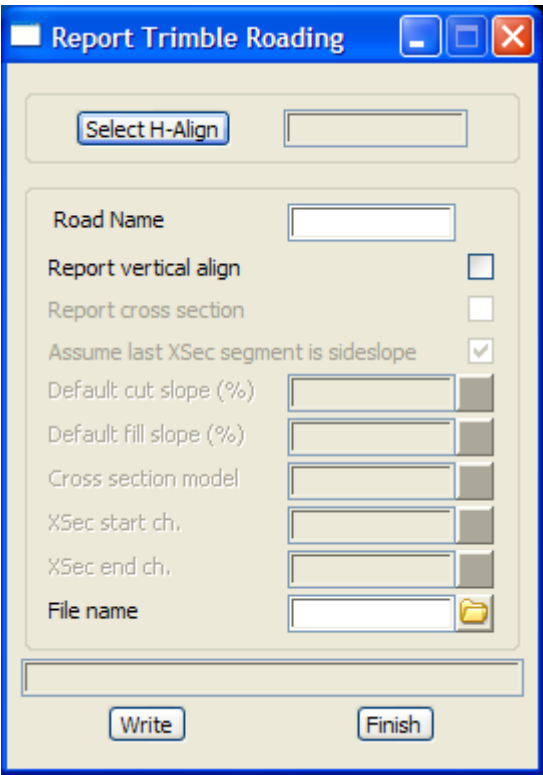
Field Description	Type	Defaults	Pop-Up
String to setout	select button		
<i>after pressing the string to setout button, the user can select a valid string. This string will be used for setting out.</i>			
Model of sections	model box		
<i>the model of cross sections. These sections will be written out to the file.</i>			
File for horizontal	input box		
<i>the name to be used for horizontal file creation. The file will automatically be given a .hg extension.</i>			
File for vertical	input box		
<i>the name to be used for the vertical file creation. The file will automatically be given a .vg extension.</i>			
File for sections	input box		
<i>the name to be used for the section file creation. The file will automatically be given a .xs extension.</i>			
Write	button		
<i>write appropriate files.</i>			

Trimble Roding File

Position of option on menu: Survey =>Upload => Create roads upload file, Instrument choice = Trimble Roding

The **Trimble Roding** option allows the creation of a specific roading file.

Selecting **Trimble Roding** brings up the **Report Trimble Roding** panel



The Trimble DC file has certain limitations and criteria. These include:

- 1. The alignment string must exist on the xsec's. This allows us to calculate the **zero pt** so we can split the template into left and right.
- 2. The xsec model should be representative of the alignment string used in the macro. i.e. not generated from a different alignment. Therefore the alignment string should have a 0 offset on the xsections.
- 3. The alignment string cannot exist above or below the xsection. I.e. it should be on the section as per 1).
- 4. The number of points on successive section templates (left and right) should be the same. i.e. if 5 points are on the LHS template for ch0 then the same number of points should exist for the LHS template for ch20. The instruments using this file, may not handle transitions between different number of points effectively and can give incorrect results. The user should limit the file by using the chainage range between areas where the number of points on each side of the cross sections are the same.

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Select H-Align	Select box		
<i>select valid alignment string.</i>			
Road Name	input box	Name of selected alignment string	
<i>input road name. If a valid alignment is selected, the name of that alignment will be the default road name.</i>			
Report vertical alignment	tick box	no	
<i>write vertical alignment details to file mode. If yes vertical alignment details written to the specified file.</i>			
Assume last XSec segment is sideslope	tick box	ticked	
<i>if box is selected, the last segments left and right of 0.0 offset are considered to be side slopes, and the</i>			

default cut and fill slope fields are enabled.

Default cut slope (%) input box

this field is optional. From the section data it is only possible to calculate either the cut or fill sideslope. A default value can be specified to be used for the non calculated value.

*When the segment is rising (i.e has a positive slope) it is considered a cut slope. Similarly, if the grade is negative the sideslope is considered a fill. If a fill sideslope is calculated, the cut sideslope definition in the file will be given the value as entered into the **default cut slope** field. If no value is set for the default, the cut slope in this instance will be given a null value. The default value if entered, should be in whole percent e.g. 50.0 for a 1v in 2h slope.*

Default fill slope (%) input box

this field is optional. From the section data it is only possible to calculate either the cut or fill sideslope. A default value can be specified to be used for the non calculated value.

*When the segment is rising (i.e has a positive slope) it is considered a cut slope. Similarly, if the grade is negative the sideslope is considered a fill. If a cut sideslope is calculated, the fill sideslope definition in the file will be given the value as entered into the **default fill slope** field. If no value is set for the default, the fill slope in this instance will be given a null value. The default value if entered, should be in whole percent e.g. 50.0 for a 1v in 2h slope.*

Cross section model model box

This will ask for the model of cross sections. These sections will be written out to the file.

XSec start ch input box min alignment ch

chainage value to start writing cross sections.

XSec end ch input box max alignment ch

chainage value to end writing cross sections.

File name input box

the name to be used for file creation

Write button

write appropriate files.

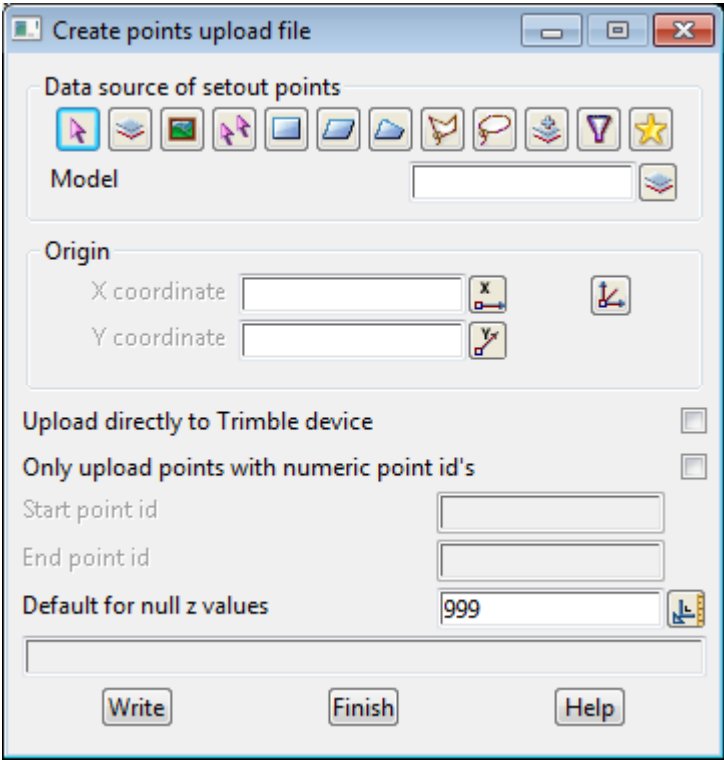
Create Points Upload File (New)

Position of option on menu: Survey =>Upload => Create points upload file (new)

The **Create points upload file (new)** option creates or uploads directly to a Trimble instrument a file of point ids, x, y and z, for string data (super strings and 4d strings only).

Only Trimble file formats is supported as this stage - the option **Create points upload file** ([Create Points Upload File](#)) is used to create files for most other instruments.

Selecting **Create points upload file (new)** brings up the **Create Points Upload File** panel.



The fields and buttons used in this panel have the following functions:

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Upload directly to Trimble device	tick box			
<i>if ticked, the points are uploaded to the attached Trimble instrument</i>				
<i>if not ticked, a dc file will be created.</i>				

Data source type
data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data source
source of data to be processed.

Default for null value	input box	999
<i>value to write for null z-values.</i>		

Only upload points with numeric point names tick box
if ticked, only points with numeric (integer) point names are used.
if not ticked, alphanumeric point names are used.

Start point id	input box
<i>point id to start creating upload file from.</i>	

End point id	input box
<i>last point id to write to upload file.</i>	

Note: Start and End point ids may be left blank, and all point ids (whether numeric or alphanumeric) will be written to the upload file.

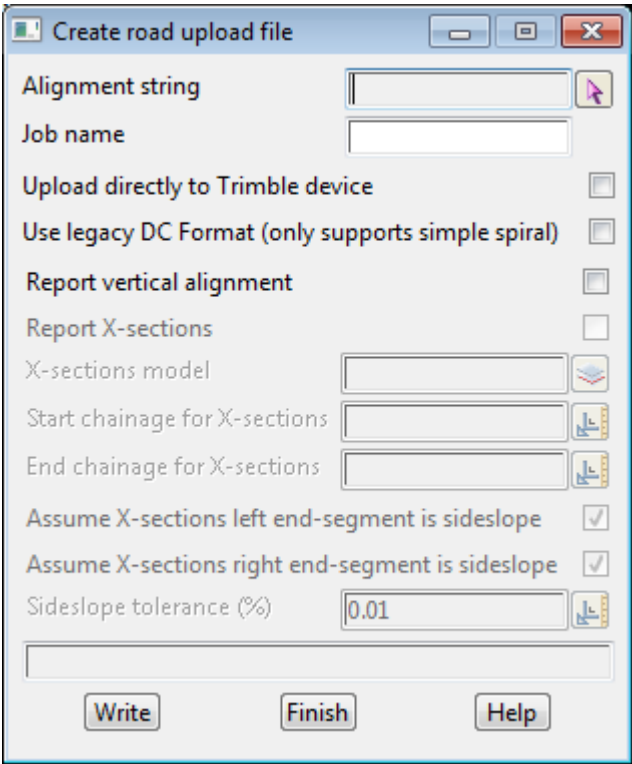
Origin x/Origin y	input box
<i>If non-zero, subtract the value from the x/y value before writing out.</i>	

Upload File button
create the upload file

Create Road Upload File (New)

Position of option on menu: Survey =>Upload => Create road upload file (new)
The **Create road upload file (new)** option allows the creation of road files or uploads directly to a Trimble instrument and Leica using *Leica XML* format.
Only *Trimble* and *Leica LandXML* file formats are supported as this stage- the option **Create road upload file** ([Create Road Upload File](#)) is used to create files for most other instruments.

Selecting **Create road upload file (new)** brings up the **Create Road Upload File** panel



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
File type	choice box		Trimble Link Leica X-sections LandXML

For the choice Trimble Link, go to
Leica X-Sections LandXML

[Trimble Link](#)
[Leica X-Sections LandXML](#)

Trimble Link

Position of option on menu: Survey =>Upload => Create roads upload file (new), File type = Trimble Link
The **Trimble Link** options creates a file in Trimble dc format or uploads the date directly to the

instrument using *Trimble Link*.

The fields and buttons used in this panel have the following functions:

Field	Description	Type	Defaults	Pop-Up
Upload directly to Trimble device	tick box			
	<i>if ticked, the points are uploaded to the attached Trimble instrument if not ticked, a dc file will be created.</i>			
Alignment string	String select box			
	<i>select valid alignment string.</i>			
Road Name	input box		Name of selected alignment string	
	<i>input road name. If a valid alignment is selected, the name of that alignment will be the default road name.</i>			
Report vertical alignment	tick box			
	<i>If ticked, vertical alignment details written to file.</i>			
Report cross sections	tick box			
	<i>if ticked, the cross section model box will be enabled.</i>			
X- sections model	model box			
	<i>model of cross sections to be written out.</i>			
Start chainage for X-sections				
	<i>chainage value to start writing cross sections. If blank, start with first x-section.</i>			
End chainage for X-sections				
	<i>chainage value to stop writing cross sections. If blank, end with last x-section.</i>			

Assume X-sections left end-segment is sideslope tick box

If ticked, left end segments are tagged as sideslopes.

Assume X-sections right end-segment is sideslope tick box

If ticked, right end segments are tagged as sideslopes.

Sideslope tolerance (%) input 0.01

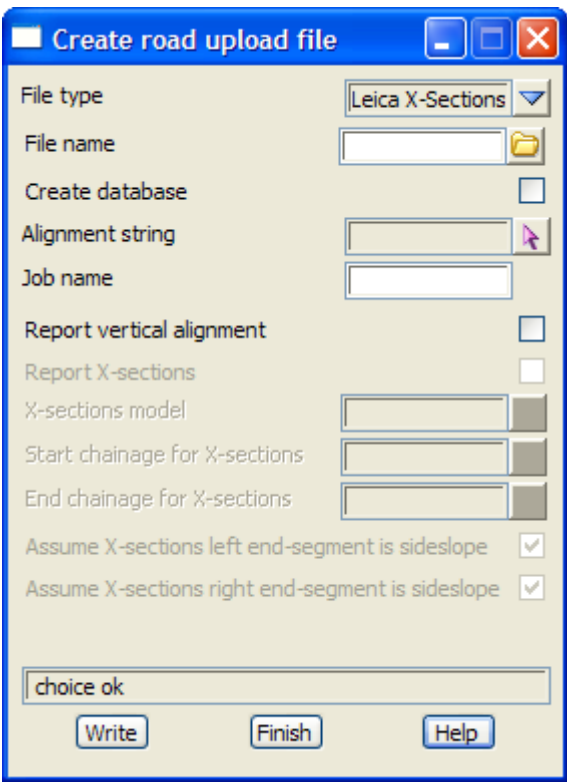
Write button

write out or upload the data.

Leica X-Sections LandXML

Position of option on menu: Survey =>Upload => Create roads upload file (new), File type = Leica X-Sections LandXML

The Leica X-Sections LandXML options creates a file in LandXML format suitable for *Leica* instruments



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
File name <i>the name of the Leica LandXML file.</i>	input box		*.xml
Create database <i>if ticked, a DBX file is created</i>	tick box		
Alignment string <i>select valid alignment string.</i>	string select		

Job Name	input box	name of selected alignment string
<i>input job name. If a valid alignment is selected, the name of that alignment will be the default job name.</i>		
Report vertical alignment	tick box	
<i>if ticked, vertical alignment details written to file.</i>		
Report cross sections	tick box	
<i>if ticked, the cross section model box will be enabled.</i>		
X- sections model	model box	available models
<i>model of cross sections to be written out.</i>		
Start chainage for X-sections		
<i>chainage value to start writing cross sections. If blank, start with first x-section.</i>		
End chainage for X-sections		
<i>chainage value to stop writing cross sections. If blank, end with last x-section.</i>		
Assume X-sections left end-segment is sideslope	tick box	
<i>If ticked, left end segments are tagged as sideslopes.</i>		
Assume X-sections right end-segment is sideslope	tick box	
<i>If ticked, right end segments are tagged as sideslopes.</i>		
Write	button	
<i>write out file.</i>		

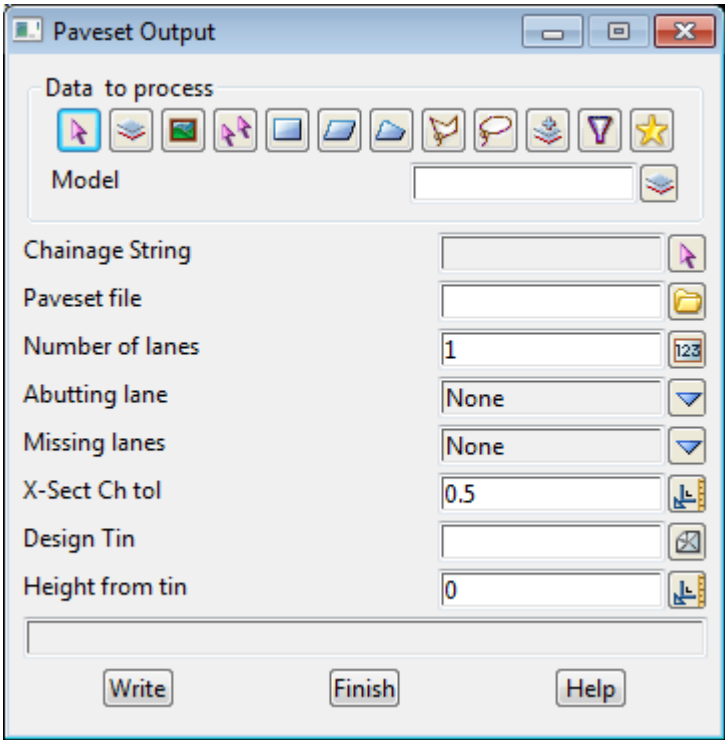


Create Paveseet Upload File

Position of option on menu: Survey =>Create Paveseet upload file

The **Paveseet Output** panel produces data in a format used by Paveseet machine guidance software used in laying asphalt and other materials.

Selecting **Create Paveseet upload file** brings up the **Paveseet Output** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data to process	Model		
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source	input		
<i>source of data to be processed.</i>			
Chainage String	string select		
<i>The string for chainages</i>			
Paveseet file	file select		
<i>File to write the output data to</i>			
Number of lanes	number box		
<i>The number of lanes for this paving run</i>			
Abutting lane	choice box	None	None, Left, Right
<i>If the paving run is abutting an existing lane choose that here</i>			
Missing lanes	choice box	None	None, Left, Right
<i>If the paving runs have missing points in some areas choose the side they are missing from here.</i>			

None - the same number of points exist at each cross section, an error will occur in processing if a difference is detected.

Left/Right - the output to paveset is padded on the nominated side to match the nominal number of lanes, when processing is finished you will display a list of chainages where this occurred

X- Sect Ch tol input box 0.5

The chainage variation allowed for each cross section

Design Tin input

The design TIN to drop the selected points against for level differences

Height from tin input box

The height from the design TIN
+ve = above
-ve = below

Write button

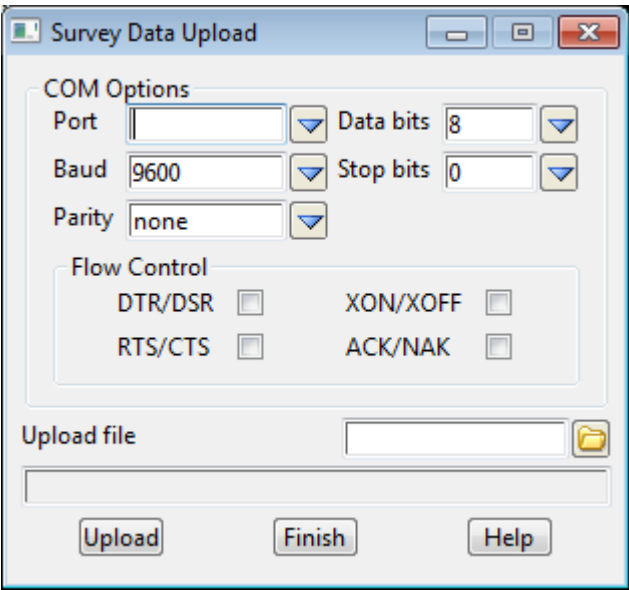
Process the points and write the Paveset file

Survey Data Upload

Position of option on menu: Survey =>Upload

The **upload** option take data from the computer and sends it to the data collector connected to the computer's serial port.

Selecting **Upload** brings up the **Survey Data Upload** panel



The fields and buttons used in this panel have the following functions.

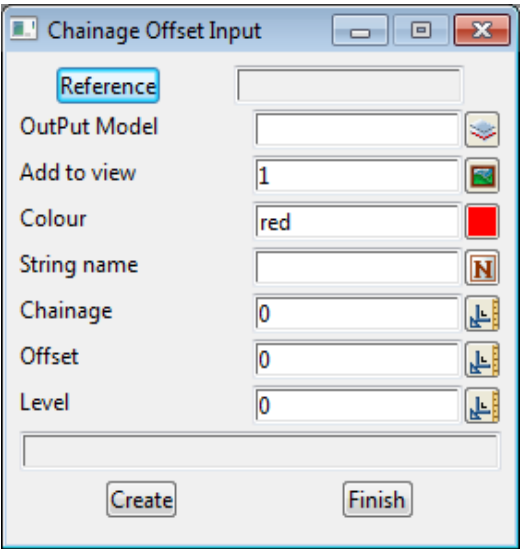
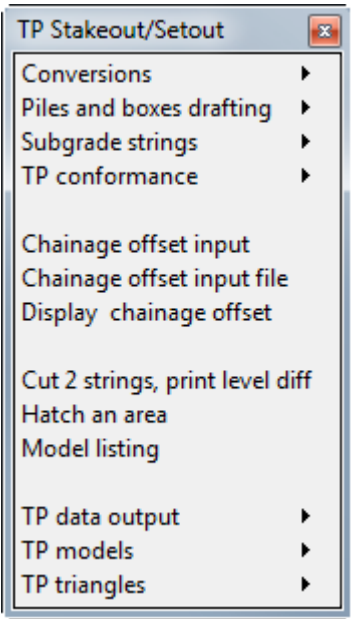
Field Description	Type	Defaults	Pop-Up
Port	input	from configuration file	
<i>name of the computer serial port that the data collector is connected to. The default port is specified in the data collector configuration file.</i>			
Baud rate	input	from configuration file	
<i>speed of the serial port</i>			

Data bits <i>number of data bits</i>	input	from configuration file
Stop bits <i>number of stop bits</i>	input	from configuration file
Parity <i>parity</i>	input	from configuration file
DTR/DSR <i>if ticked, use DTR/DSR flow control</i>		from configuration file
RTS/CTS <i>if ticked, use RTS/CTS flow control</i>		from configuration file
XON/XOFF <i>if ticked, use Xon/Xoff</i>		from configuration file
ACK/NAK <i>if ticked, use ACK/NAK</i>		from configuration file
Field file <i>name of the 12d field file that the raw file is to be converted to. The raw file is given the same name but with the extension specified in the configuration file, e.g., “.gre”.</i>	input	*.fld files
Upload <i>On clicking the upload button, 12d Model will send the specified file through the serial port and up to the data collector.</i>	button	

TP Stakeout/Setout

The TP Stakeout /Setout menu contains a variety of options for TP Stakeout and TP Setout users.

These options are not supplied or supported by 12d Solutions Pty Ltd.



Chainage Offset File Input

Reference

OutPut Model

Add to view

Type

Line

Colour

1

String name

Ch file

Create

Finish

Cut 2 strings, list heights

Output File Name

Centreline

Start chainage

-9999

End chainage

-9999

Ch Inc

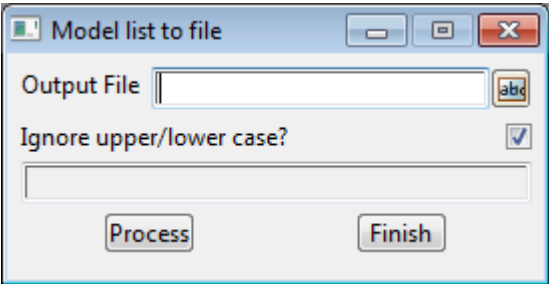
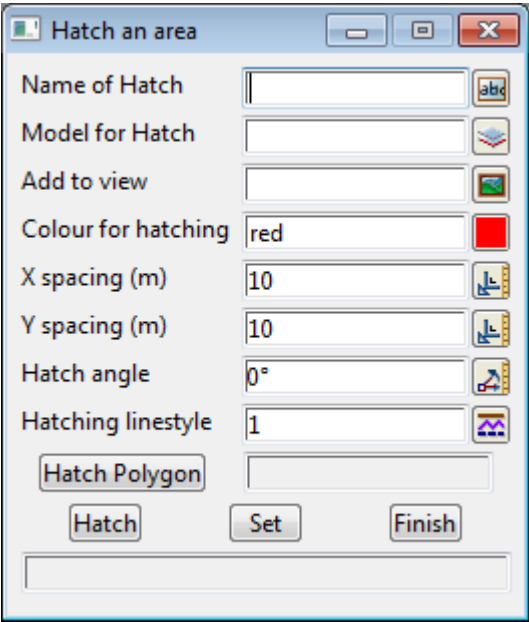
10

1st String

2nd String

Process

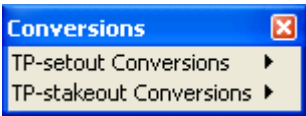
Finish



Conversions

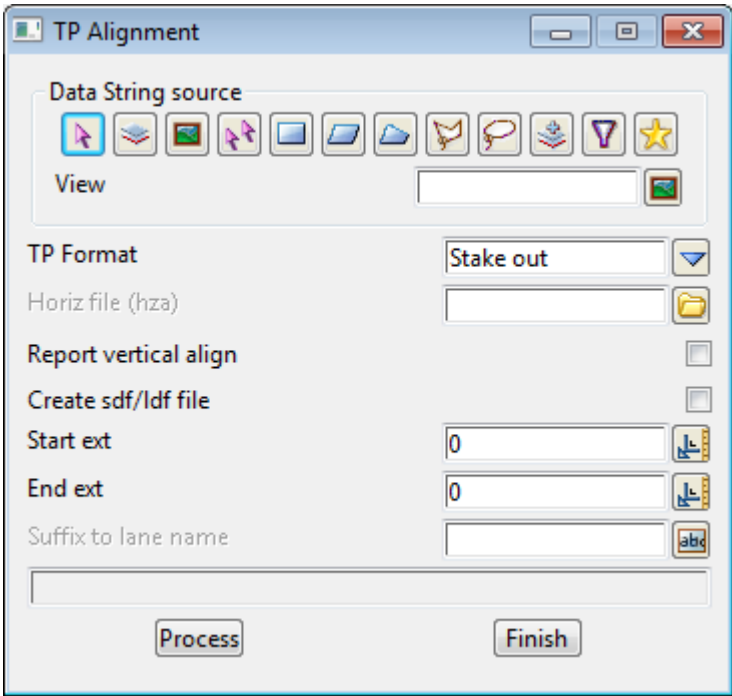
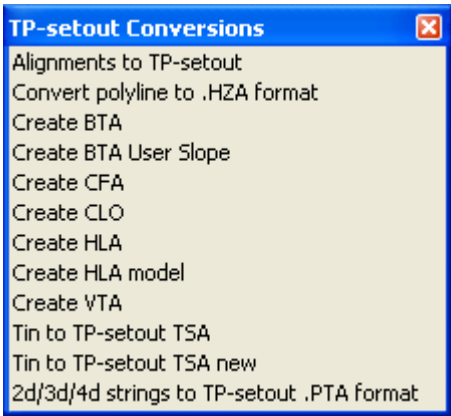
The TP Stakeout /Setout menu contains a variety of options provided for TP Stakeout and TP Setout users.

These options are not supplied or supported by 12d Solutions Pty Ltd.



TP Setout Conversions

These options are not supplied or supported by 12d Solutions Pty Ltd.



Create TP-Setout .BTA files

Main Job Name

abc

BTA/HLA File Name

abc

Centreline

Conversion Tolerance

0.005

abc

Max Ch/Os pairs

10

123

Start chainage

-9999

abc

End chainage

-9999

abc

Ch Inc

10

abc

Name of Batter/Lane

abc

Top/Toe String

Name of Top/Toe string Name

abc

Interface String

Process

Finish

Create .BTA files (user sets slope)

Main Job Name

abc

BTA/HLA File Name

abc

Centreline

Conversion Tolerance

0.005

abc

Max Ch/Os pairs

10

123

Start chainage

-9999

abc

End chainage

-9999

abc

Ch Inc

10

abc

Name of Batter/Lane

abc

Top/Toe String

Name of Top/Toe string Name

abc

Batter Slope

0

abc

Process

Finish

Create TP-Setout .CFA files

Main Job Name

abc

Centreline

Conversion Tolerance

0.01

Max Ch/Os pairs

10

123

Start chainage

-9999

End chainage

-9999

Ch Inc

10

Name of X-Fall Alignment

abc

1st String

2nd String

Process

Finish

Create TP-Setout .CLO files

CLO File Name

abc

Centreline

Conversion Tolerance

0.01

Max Ch/Os pairs

10

123

Start chainage

-9999

End chainage

-9999

Ch Inc

10

CLO String

Name of string

abc

Process

Finish

Create TP-Setout .HLA files

Hla File Name

abc

Centreline

Conversion Tolerance

0.005

Max Ch/Os pairs

10

123

Start chainage

-9999

End chainage

-9999

Ch Inc

10

HLA String

Name of string

abc

Process

Finish

Create TP-Setout .HLA files from model

Model for Strings

Hla File Name

abc

Centreline

Start chainage

-9999

End chainage

-9999

Ch Inc

10

Conversion Tolerance

0.005

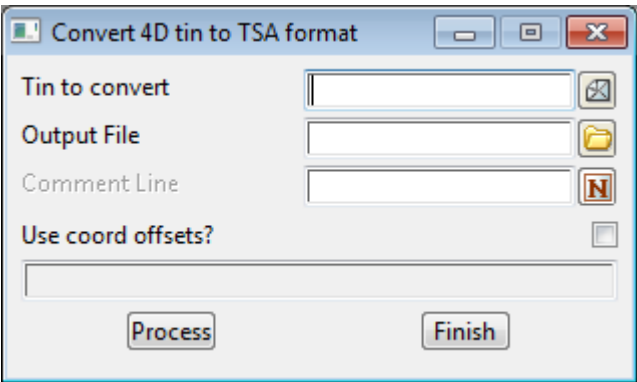
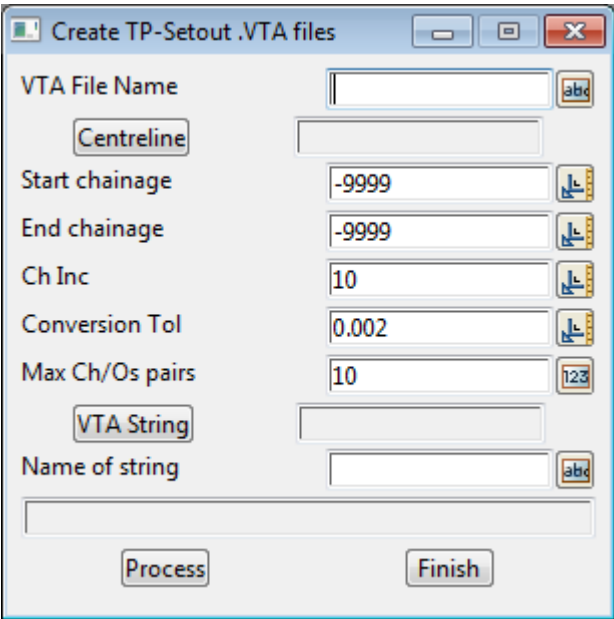
Max Ch/Os pairs

10

123

Process

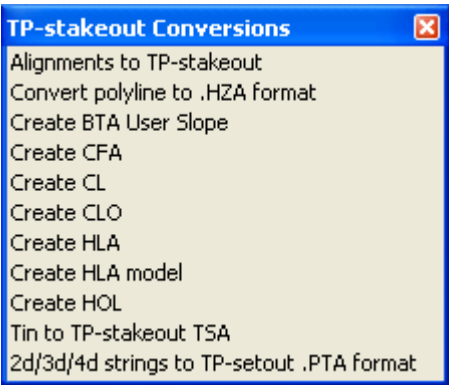
Finish



TP Stakeout Conversions

The TP Stakeout /Setout menu contains a variety of options for TP Stakeout and TP Setout users.

These options are not supplied or supported by 12d Solutions Pty Ltd.



Create TP-Stakeout .VTA files

VTA File Name

abc

Centreline

Start chainage

-9999

End chainage

-9999

Ch Inc

10

Conversion Tol

0.002

Max Ch/Os pairs

10

123

VTA String

Name of string

abc

Process

Finish

Create TP-Stakeout .CFA files

Main Job Name

abc

Centreline

Conversion Tolerance

0.01

Max Ch/Os pairs

10

123

Start chainage

-9999

End chainage

-9999

Ch Inc

10

Name of X-Fall Alignment

abc

1st String

2nd String

Process

Finish

Create TP-Stakeout .CLO files

CLO File Name

abc

Centreline

Conversion Tolerance

0.01

Max Ch/Os pairs

10

123

Start chainage

-9999

End chainage

-9999

Ch Inc

10

CLO String

Name of string

abc

Process

Finish

Create TP-Stakeout .HLA files

Hla File Name

abc

Centreline

Hza File Name

abc

Conversion Tolerance

0.005

Max Ch/Os pairs

10

123

Start chainage

-9999

End chainage

-9999

Ch Inc

10

HLA String

Name of string

abc

Process

Finish

Create TP-Stakeout .HLA files from model

Model for Strings

Hla File Name

abc

Centreline

Hza File Name

abc

Start chainage

-9999

End chainage

-9999

Ch Inc

10

Conversion Tolerance

0.005

Max Ch/Os pairs

10

123

Process

Finish

Create TP-Stakeout .HOL files

Centreline

Max Ch/Os/RL triples

10

123

Start chainage

-9999

End chainage

-9999

Select String

HOL File Name

abc

TPS HZA file

abc

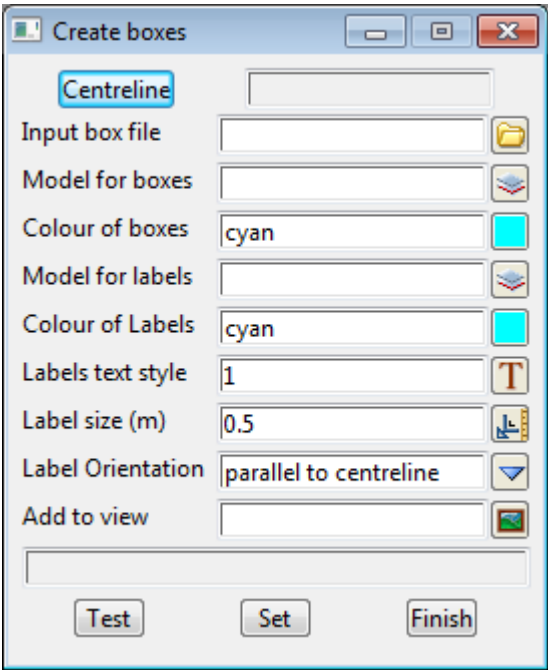
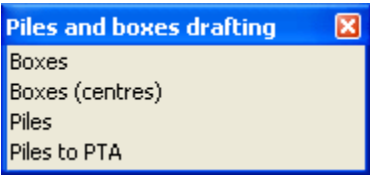
Process

Finish

Piles and Boxes Drafting

The TP Stakeout /Setout menu contains a variety of options provided for TP Stakeout and TP Setout users.

These options are not supplied or supported by 12d Solutions Pty Ltd.



Create boxes (centres)

Input box file

Model for boxes

Colour of boxes

cyan

Model for labels

Colour of Labels

cyan

Labels text style

1

Label size (m)

0.5

Label ch offset (m)

0

Label os offset (m)

0

Label Orientation

parallel to centreline

Add to view

Test

Set

Finish

Create piles (centres)

Input pile file

Model for piles

Colour of piles

cyan

Model for labels

Colour of Labels

cyan

Labels text style

1

Label size (m)

0.5

Label ch offset (m)

0

Label os offset (m)

0

Label Orientation

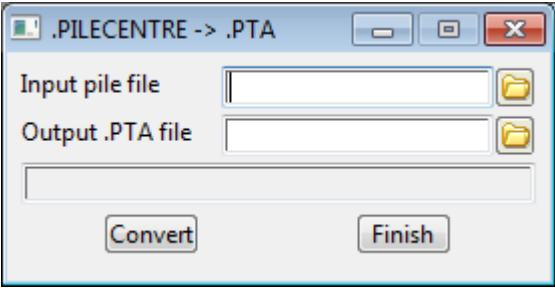
parallel to centreline

Add to view

Test

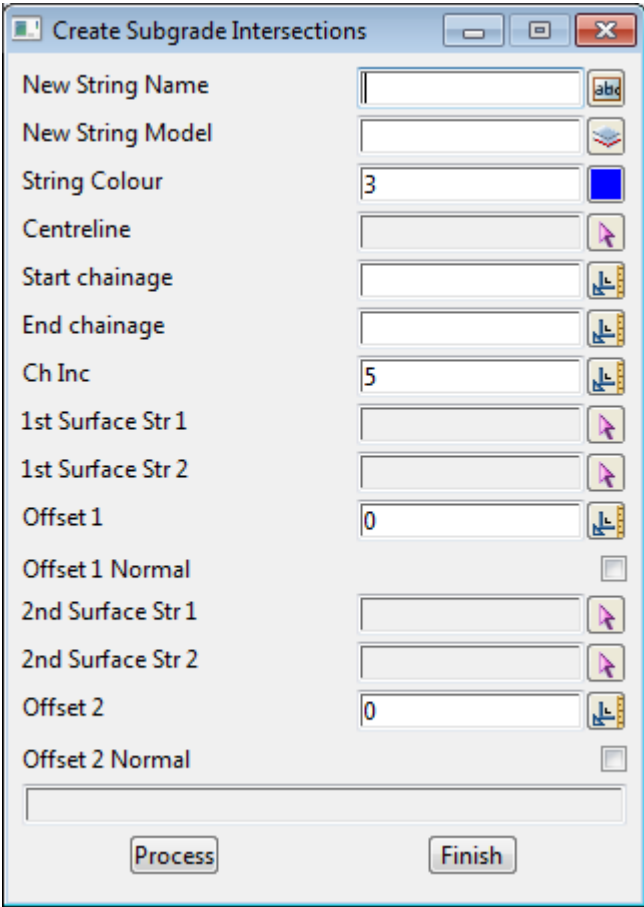
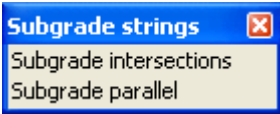
Set

Finish



Subgrade Strings

These options are not supplied or supported by 12d Solutions Pty Ltd.



Subgrade Parallel

New String Name

abc

New String Model

String Colour

3

Add to view

1

Centreline

Start chainage

End chainage

Ch Inc

5

String to parallel

Second String

Parallel Offset

0

Height Diff

0

Process

Finish

TP Conformance

These options are not supplied or supported by 12d Solutions Pty Ltd.



Check Tolerance to tin

Model of shots

Tin to check against

Layer depth (m)

0

Upper tolerance (m)

0

Lower tolerance (m)

0

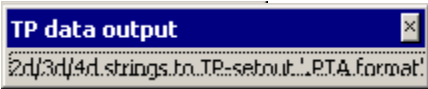
Select report file

Report

Finish

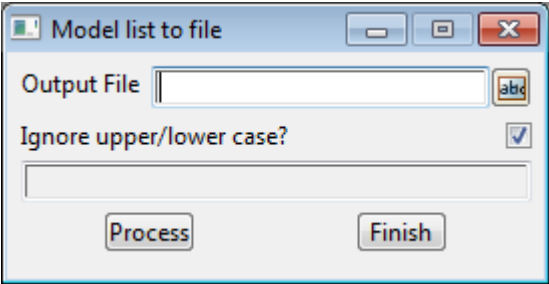
TP Conformance

These options are not supplied or supported by 12d Solutions Pty Ltd.



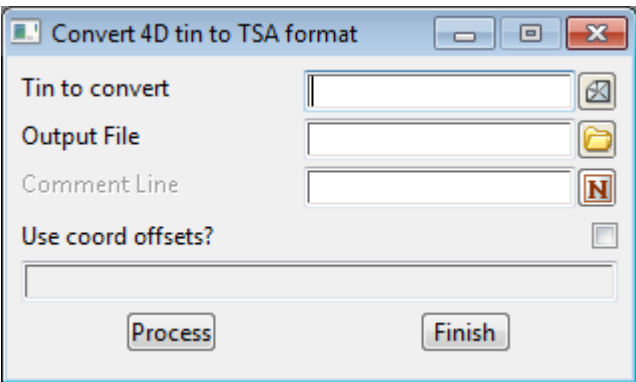
TP Models

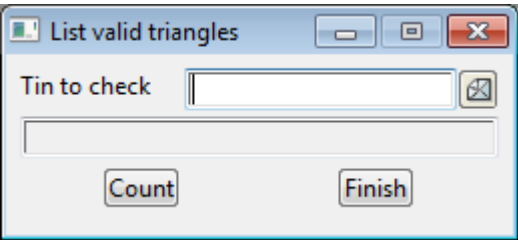
These options are not supplied or supported by 12d Solutions Pty Ltd.



TP Triangles

These options are not supplied or supported by 12d Solutions Pty Ltd.



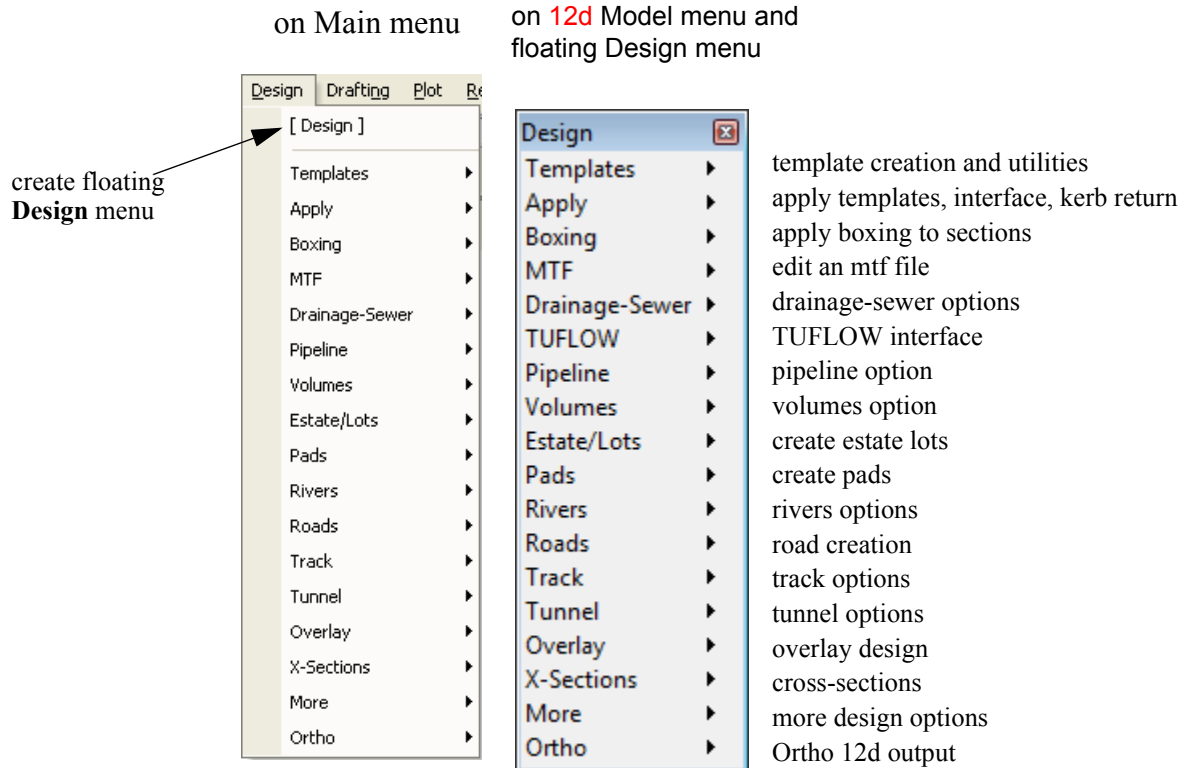




19 Design

Position of menu: Design

The Design walk-right menu is



For a description of the definition of a template in **12d Model**, please go to the section [Templates in 12d Model](#).

For the option *Templates*, go to

Apply

Boxing

MTF

Drainage-Sewer

Pipeline

Volumes

Estate lots

Pads

Rivers

Roads

Track

Tunnel

Overlay

X-Sections

More

Ortho

[Templates](#)

[Apply](#)

[Boxing](#)

[MTF](#)

in the chapter [Drainage and Sewer](#)

in the chapter [Pipeline](#)

in the chapter [Volumes](#)

[Estate Lots](#)

[Pads](#)

[Rivers](#)

[Roads](#)

[Track](#)

[Tunnel](#)

[Overlay](#)

[X-Sections](#)

[More Design](#)

[Ortho 12d](#)

Note: The options *Drainage-Sewer*, *Pipeline*, *Volumes* and *Super alignment* (parametric design) are described in separate chapters of this Reference manual, not in this chapter, *Design*.

Templates in 12d Model

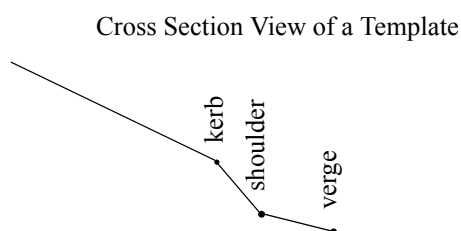
In **12d Model**, Templates provide a quick and easy method for defining design details along a string for use in conceptual designs and detailed designs, and visualisations.

An easy way of visualising a template is to look at its affect in a cross section.

A template can be thought of as simply a number of links, which are ultimately defined by width and slope, and are connected sequentially (according to rules for each link type) to form a cross section.

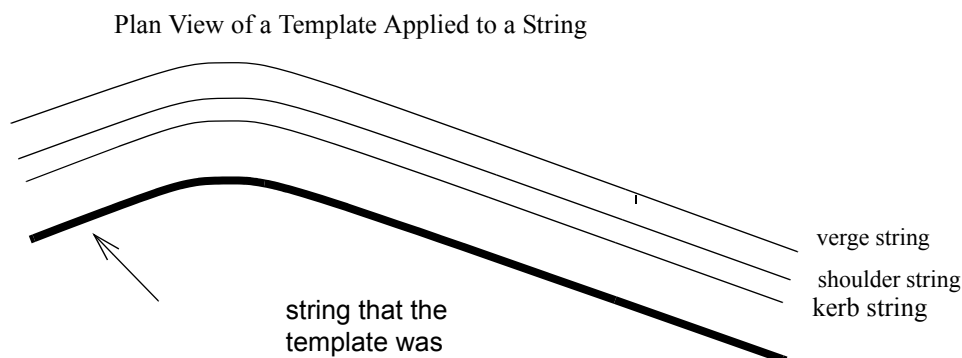
The point defined at the end of each link creates a **string** of the given link name when the template is used to create a design. The default colour of the string is the link colour and polygons created for each link are given the link colour.

For example, a template consisting of just the three links kerb, shoulder, verge could look like:



Templates are “applied” to a hinge string at right angles to a user selected reference string to produce a design model. That is, for a given string, specified templates are used as the cross-sectional definition of the geometry at a regular chainage interval down the string.

Both design cross sections and longitudinal strings (created by joining together the same points from each cross section) are created. The longitudinal strings are given the name of the template points used to define them



12d Model supports templates with an unlimited number of fixed links, followed by

(a) a decisions table

and

(b) an unlimited number of variable cut and fill links and a cut/fill slope to be applied at the end

of the last cut or fill template link.

The definition of a template with a fixed link table, a cut and fill tables and the final cut/fill links is discussed under the option **Create/edit Template**. The definition of the **Decision Table** is given in the section [Full Definition of Template Decisions](#) in the chapter [Advanced Design](#).

Fixed Template Links

The **fixed template links** are applied to the selected hinge string and are always used when applying the template regardless of whether the template points are in cut or fill. Each link is defined by two of the three variables, width, height and crossfall, and has a name and colour.

At the end of the fixed links, **12d Model** checks to see if a **Decisions** table exists.

If a **Decisions** table exists, then it is used and the Decision commands processed.

If a **Continue Cut/Fill** command is reached in the decision command processing, then this stops the Decision command processing, and the processing moves onto the **Cut**, **Fill** and **Final Cut/Fill** tables.

If no **Continue Cut/Fill** command is reached in the decisions, then the processing stops after the decision commands are exhausted and the **Cut**, **Fill** and **Final Cut/Fill** tables **ARE NOT USED**.

If no **Decisions** table exists, then the **Cut**, **Fill** and **Final Cut/Fill** tables are used after the **Fixed** table.

Template Decisions

The decisions table is used for

- s complicated cut and fill requirements including multiple strata, decisions based on depth below one or more strata or strings, multi-level decisions (i.e. depth decisions followed by fixed links, more depth decision etc.); and
- s extended battering including repetitive battering, fixed width batters, and battering relative to a string or strata.

The **decisions** table is documented in the section [Full Definition of Template Decisions](#) in the chapter [Advanced Design](#).

Cut and Fill Template Links and Final Cut/Fill

At the end of the fixed links, if there is **no** Decisions table, or if a *Continue Cut Fill* command is reached in the Decisions, the **Cut**, **Fill**, **Final Cut/Fill** tables are used.

If the end of the last link of the fixed template/last decision is in cut, then the Cut links are used. If the end of the fixed template/last decision is in fill, the fill links are used. There can be an unlimited number of cut and fill links and they are used sequentially starting with the first link.

If the surface tin is intersected when using a link, the section is terminated at that intersection point. Otherwise, the entire link is included in the section, and next link is then used. This is repeated until the surface is intersected or all the links have been used.

If there is still no intersection with the surface after using all of the cut or fill links, then the final cut/fill slope is used to try and intersect with the tin.

The unlimited cut/fill links are called **variable** template links because at each section, a different number of them may be needed - the number of links used varies from section to section depending on the tin above it.

Applying Templates

Once templates are defined, they can be “applied” to strings to produce the required design model. That is, for a given string, specified templates are used as the cross-sectional definition of the geometry at a regular chainage interval down the string.

Note

Around any curves, the string is approximated by chords spaced at the string's chainage interval or, if it is different, the section separation interval, or extra points as determined by the horizontal and vertical chord-arc tolerances.

If the chord-to-arc distance is greater than the chord/arc tolerance given in the **apply** options panels, then extra points are inserted around the curve so that the chord/arc tolerance is met.

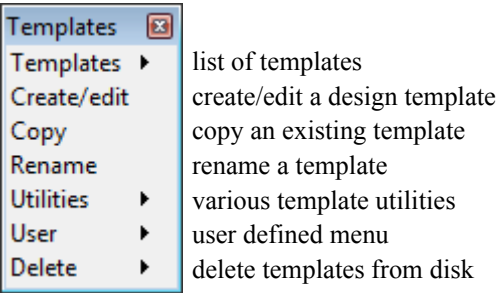
Templates

Position of menu: Design =>Templates

The **templates** walk-right menu has options to create and edit templates, copy, rename and other template utilities.

For a description of templates in **12d Model**, go to the section [Templates in 12d Model](#).

The **templates** walk- right menu is



For the option *Templates*, go to
Create/edit
Copy
Rename
Utilities
Delete

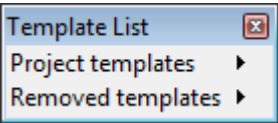
[Templates](#)
[Create/Edit](#)
[Copy](#)
[Rename](#)
[Utilities](#)
[Delete](#)

Templates

Position of option on menu: Design =>Templates =>Templates

The **templates** walk-right menu provides options to list all the templates added to the project (templates) and all the templates in the project area but not in the project (removed templates).

The **Templates** walk- right menu is



For the option *Project templates*, go to
Removed templates

[Project Templates](#)
[Removed Templates](#)

Project Templates

The **Project templates** walk-right menu provides a list of all the templates in the project.

Removed Templates

The **Removed templates** walk-right menu provides a list of all the templates in the project area that

have been removed from the project (using the **removed from project** option).

Create/Edit

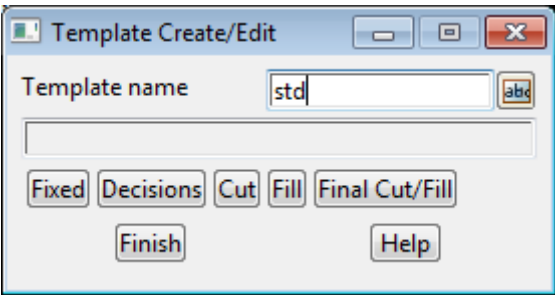
Position of option on menu: **Design =>Templates =>Create/edit**

12d Model supports templates with an unlimited number of fixed links, followed by either

- (a) a decisions table
- and/or
- (b) an unlimited number of cut and fill links and a final cut/fill slope the be applied at the end of the last template link.

To collect the different types of link information needed in the template, the **Template Create/Edit** panel was designed with five buttons **fixed**, **decisions**, **cut**, **fill** and **final cut/fill** used to bring up and display the panels for creating and editing the fixed, decisions, cut, fill and final cut/fill tables.

Selecting **Create/edit** displays the **Template Create/Edit** panel.



The description of the fields and buttons used in the **Template Create/Edit** panel now follows.

The associated panels created by the buttons fixed, cut, fill, final cut/fill will be described in the next four sections and the **Decisions** panel will be described in the section [Full Definition of Template Decisions](#) in the chapter [Advanced Design](#).

Field Description	Type	Defaults	Pop-Up
Template name <i>name of the template being created/edited. If the template already exists, then the associated panels will already contain the information for that template. The buttons fixed, decisions, cut, fill and final cut/fill can only be selected after the template name is given.</i>	input		available templates
Fixed <i>On selecting this button, the fixed template panel is displayed. See Fixed Template.</i>	button		
Decisions <i>On selecting this button, the Decisions Template panel is displayed.</i> <i>For the complete definition of decisions, please go to the section Full Definition of Template Decisions in the Chapter Advanced Design.</i>	button		
Cut or Fill <i>The variable cut or fill template panel is displayed on selecting this button. See Variable Cut or Fill Template.</i>	button		
Final Cut/Fill	button		

The **final cut/fill template** panel is displayed on selecting this button. See [Final Cut/Fill Template](#).

Note - the buttons can only be selected after the template name has been given in the **template name** panel field.

How to Use the Panel

- (a) A new template is created, or an existing template modified, by first entering the template name into the template field (typed or picked from the pop-up).
- (b) To define or edit the fixed sections of the template, select the **Fixed** button and the **Fixed Template** panel will appear.
- (c) use the **Decisions** button to define or edit the decisions table
- (d) use the **Cut**, **Fill** and **Final Cut/Fill** button to define or edit the variable cut, fill or final cut/fill sections of the template respectively.

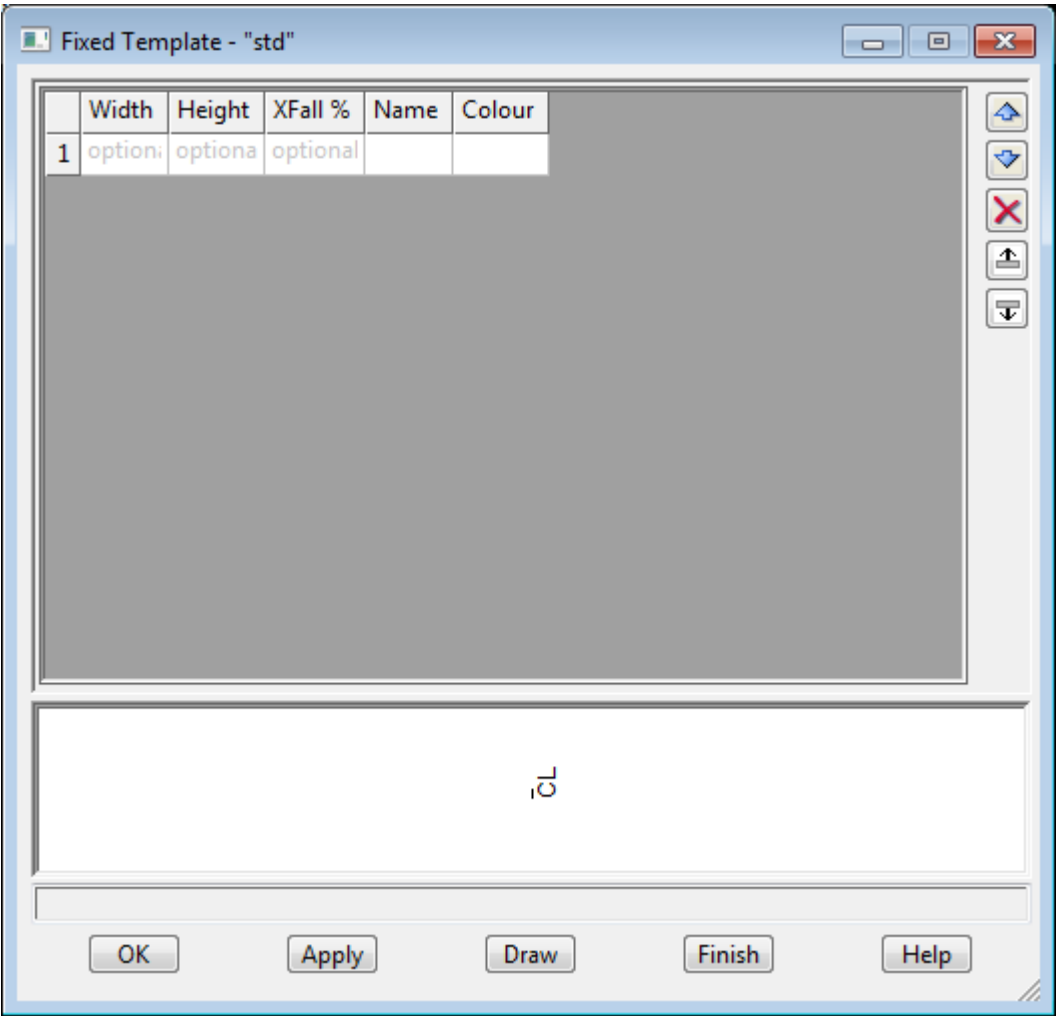
The four panels controlled by the buttons **Fixed**, **Cut**, **Fill** and **Final Cut/Fill** from the **Template Create/Edit** panel will now be described in detail. The **Decisions** button is described in the section [Full Definition of Template Decisions](#) in the chapter [Advanced Design](#).

Go to the next section [Fixed Template](#).

Fixed Template

If the template already exists, the current fixed template links will be displayed in the panel. If the template is new, the panel will be empty.

The **Fixed Template** panel is



An unlimited number of fixed links can be defined in the template. For each link, any two of the three values of width, height and percent crossfall can be used to defined the link. The colour and name are also defined for the link.

The name is given to the sting created by the end of the link and the colour is used as either the string colour, or when a **map file** is used in the **Apply Many** option, is the colour of the created polygon joining the two ends of the link.

The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Width		input		
<i>width of the link being defined</i>				

Height		input		
<i>height of the link being defined. For a fixed link, height is positive in the up direction. Hence for a fixed link, height is positive up and negative down.</i>				

NOTE - if height and cross-fall are being used to go down, then define height to be negative and cross-fall to be negative.

X-fall %		input		
-----------------	--	-------	--	--

percent cross-fall of the link being defined - units are percent grade. For cross fall, positive is up and negative down.

NOTE - if height and cross-fall are being used to go down, then define height to be negative and cross-fall to be negative.

Colour colour box available colours

colour of the link being defined. If no colour is supplied, the default colour is used.

Name input

name of the link being defined - this is used as the name of the string created by the end point of the link.

OK/Apply button

OK stores the values in the fields and exits the panel. **Apply** stores the values but doesn't exit the panel.

*Warning - If the **OK** or **Apply** button is **not** selected, then **no** new information will be recorded.*

Draw button

draws the fixed template at the bottom of the panel. Automatically does a fit.

NOTE - if height and cross-fall are being used to go down, then define height to be negative and cross-fall to be negative.

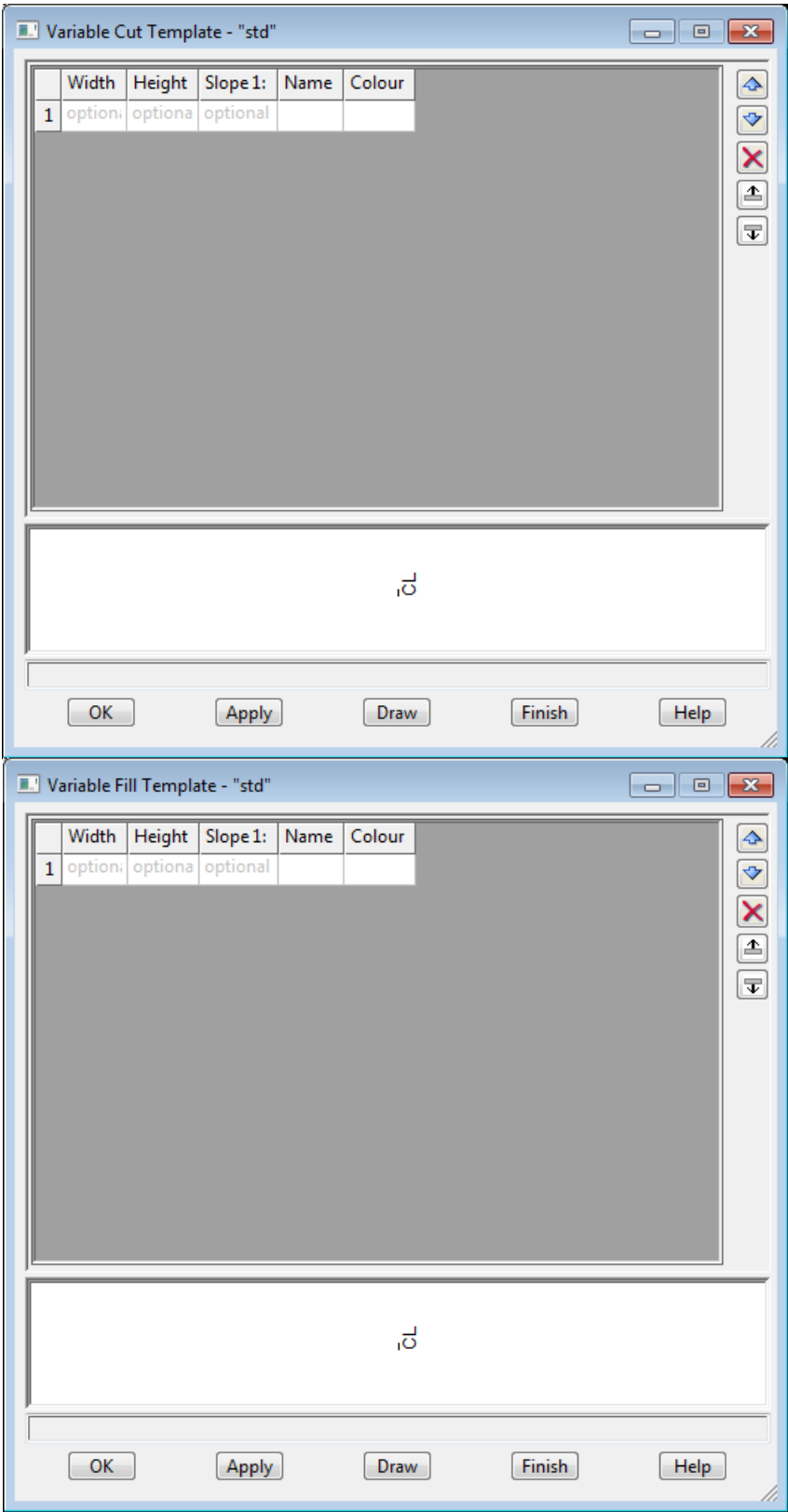
Go to the next section [Variable Cut or Fill Template](#).

Variable Cut or Fill Template

The definition of the cut or fill template links are similar to the fixed template links except the slope is given as a “one vertical in a user given horizontal value” rather than a percent crossfall.

If the template already exists, the current cut (fill) template links will be displayed in the panel. If the template is new, the panel will be empty.

The **Variable Cut Template** panel and the **Variable Fill Template** panel are similar and look like



An unlimited number of links can be defined in the variable template. For each link, any two of the three values of width, height and slope can be used to define the link. The colour and name are also defined for the link.

The fields and buttons used in this panel have the following functions.

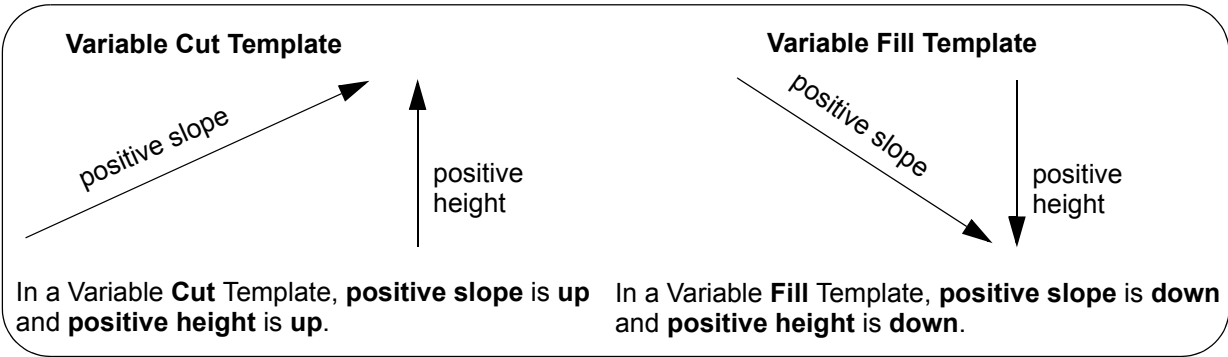
Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Width	input		
<i>width of the link being defined</i>			

Height	input		
<i>height of the link being defined</i>			

Important note:
For cut link, height is positive in the up direction. That is, for a cut link, height is positive up and negative down.
*For fill link, height is positive in the **down** direction. That is, for a fill link, height is positive down and negative up.*
This definition for fill links of down being positive for heights may seem strange but it is to fit in with the definition of slope for fill links where a positive slope is down. This was done so that most of the entries in the Slope table did not need a negative sign in front of them.

Slope 1:	input		
<i>slope of the cut link being defined. The units are “one vertical in the given horizontal value”. The value 0 is used to designate a horizontal slope - a vertical slope is not allowed.</i>			
<i>In the Variable Cut Template, for cut slopes, positive is up and negative down</i>			
<i>In the Variable Fill Template, for fill slopes, positive is down and negative is up.</i>			



Important note:
This definition of slope for fill links of down being positive may seem strange but it was done so that most of the entries in the Slope table did not need a negative sign in front of them.

NOTE -in cut: *if height and slope are being used to go down, then define height to be negative **and** slope to be negative.*

In fill: *if height and slope are being used to go up, then define height to be negative **and** slope to be negative.*

Colour	colour box	available colours
<i>colour of the link being defined. If no colour is supplied, the default colour is used.</i>		

Name	input		
<i>name of the link being defined - this is used as the name of the string created by the end point of the link.</i>			

OK/Apply button

OK stores the values in the fields and exits the panel. **Apply** stores the values but doesn't exit the panel.

Warning - If the **OK** or **Apply** button is **not** selected, then **no** new information will be recorded.

NOTE -in cut: if height and slope are being used to go down, then define height to be negative and slope to be negative.

In fill: if height and slope are being used to go up, then define height to be negative and slope to be negative.

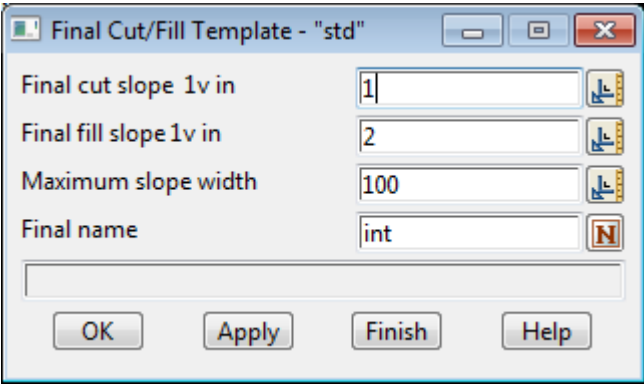
Go to the next section [Final Cut/Fill Template](#).

Final Cut/Fill Template

The final cut/fill template is used if the links in either the cut or fill templates are exhausted without an intersection with the tin being found.

If the template already exists, the current final cut/fill values will be displayed in the panel. If the template is new, the default values are displayed.

The **Final Cut/Fill Template** panel is



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Final cut slope 1 v in	input	0	no slope, 0,1,2,3,4,5,10
<i>cut slope for the interface calculation to be done at the end of the last link of the template. A cut slope of one vertical to the given value of horizontal units is used. The value 0 is used to designate a horizontal slope - vertical slopes are not allowed.</i>			
<i>For final cut slope, positive is up and negative down</i>			
Final fill slope 1 v in	input	0	no slope, 0,1,2,3,4,5,10
<i>fill slope for the interface calculation to be done at the end of the last link of the template. A fill slope of one vertical to the given value of horizontal units is used. The value 0 is used to designate a horizontal slope - vertical slopes are not allowed.</i>			
<i>For final fill slope, positive is down and negative is up.</i>			
<i>This definition of fill slope being positive when going down is used so that the value in the Final fill slope 1 v in field is normally positive.</i>			

Maximum slope width input 100

the maximum width for the final slope.

Final name input int

name for the string created by this link (normally this string lies on the tin - the interface string).

OK/Apply button

OK stores the values in the fields and exits the panel. **Apply** stores the values but doesn't exit the panel.

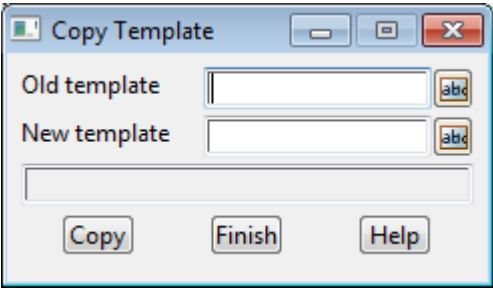
Warning - If the **OK** or **Apply** button is **not** selected, then **no** new information will be recorded.

Copy

Position of option on menu: **Design =>Templates =>Copy**

A copy of an existing template can be made using the **Copy** option. This is often useful when a new template that is similar to an existing template is needed. The existing template can be copied and the copy then edited and modified.

On selecting the **Copy** option, the **Copy Template** panel is displayed.



The fields and buttons used in this panel have the following functions.

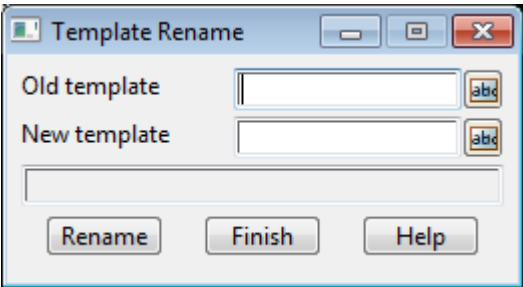
Field Description	Type	Defaults	Pop-Up
Old template <i>name of the template to be copied.</i>	template box		available templates
New template <i>name of the template copy.</i>	template box		available templates
Copy <i>after selecting this button, the template given in the Old template field will be copied and the copy given the name in the New template field.</i>	button		

Rename

Position of option on menu: **Design =>Templates =>Templates =>Rename**

On selecting the **Rename** option, the **Template Rename** panel is displayed.

This panel can be used to change the names of existing templates



The fields and buttons used in this panel have the following functions.

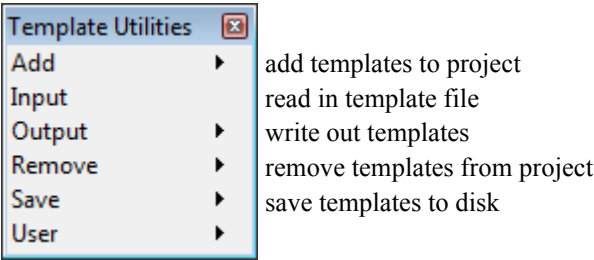
Field Description	Type	Defaults	Pop-Up
Old template <i>name of the template to be renamed.</i>	template box		available templates
New template <i>new name for the template</i>	template box		
Rename	button		
<i>Change the name of the template in the old template field to the name given in the new template field.</i>			

Utilities

Position of menu: Design =>Templates =>Utilities

The Utilities menu contains miscellaneous options involving templates.

The Utilities walk-right menu is



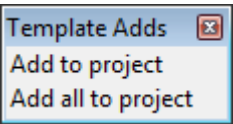
Each option will now be described.

For the option *Add*, go to [Add](#)
Input [Input](#)
Output [Output](#)
Remove [Remove](#)
Save [Save](#)

Add

Position of menu: Design =>Templates =>Utilities =>Add

Removed templates can be added back into the project using the options in the Add walk-right menu. The Template Adds walk-right menu is



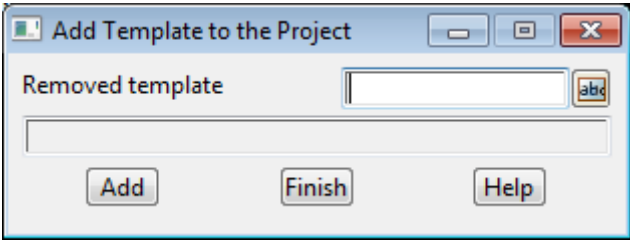
For the option *Add to project*, go to [Add to project](#)
Add all to project [Add All To Project](#)

Add to project

Position of option on menu: Design =>Templates =>Utilities =>Add =>Add to project

Templates in the working project area but not yet in the project can be added to the project using this option.

On selecting the Add to project option, the Add Template to the Project panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Removed template <i>name of the template to be added to the project.</i>	removed templates box		removed templates
Add <i>add the template given in the template field to the working project.</i>	button		

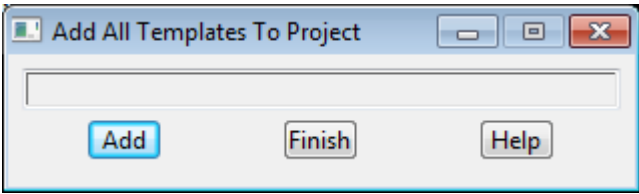
Go to the next section [Add All To Project](#).

Add All To Project

Position of option on menu: Design =>Templates =>Utilities =>Add =>Add all to project

The **Add all to project** option is used to add all the removed templates back into the project.

On selecting the **Add all to project** option, the **Add All Templates To Project** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Add	button		
------------	--------	--	--

after selecting this button, all removed templates in the working project will be added to the project.

Input

This **input** option is used to read in templates from files in this special **12d Model** format.

The option has already been described under **File I/O=>Templates input** (see [Templates Input](#))

Output

The **output** option writes out one or all templates in the **12d Model** template format.

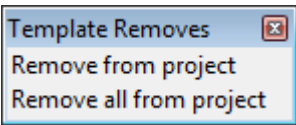
The option has already been described under **File I/O=>Templates output** (see [Templates Output](#))

Remove

Position of menu: Design =>Templates =>Utilities =>Remove

Templates can be removed from the project using the options in the remove walk-right menu. Removed templates are not deleted but remain in the project area and are no longer accessible in the project.

The **Template Removes** walk-right menu is



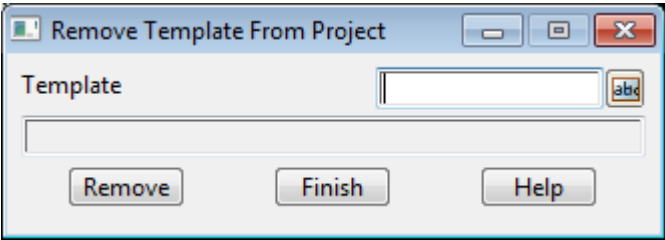
For the option *Remove from project*, go to
Remove all from project

[Remove Template from Project](#)
[Remove All Templates From Project](#)

Remove Template from Project

Position of option on menu: **Design =>Templates =>Utilities =>Remove => Remove from project**

Individual templates can be removed from the project using the **Remove from project** option and on selecting the option, the **Remove Template From Project** panel is displayed.



The fields and buttons used in this panel have the following functions.

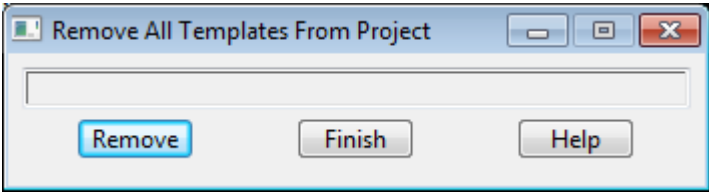
Field Description	Type	Defaults	Pop-Up
Template <i>name of the template to be removed from the working project.</i>	template box		available templates
Remove <i>after selecting this button, the template given in the template field will be removed from the working project.</i>	button		

Go to the next section [Remove All Templates From Project](#).

Remove All Templates From Project

Position of option on menu: Design =>Templates =>Utilities =>Remove => Remove all from project

All templates can be removed from the project using the **Remove all** option and on selecting the option, the **Remove All Templates From Project** panel is displayed.



The fields and buttons used in this panel have the following functions.

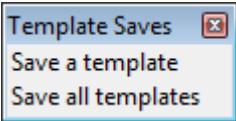
Field Description	Type	Defaults	Pop-Up
Remove	button		
<i>after selecting this button, all templates in the working project will be removed.</i>			

Save

Position of menu: Design =>Templates =>Utilities =>Save

Templates can be saved on disk. This is done automatically by the **Save** option on the **12d Model** but this option allows just the templates to be saved.

The **Template saves** walk-right menu is



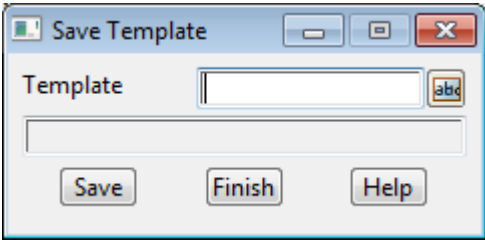
For the option *Save a template*, go to
Save all templates

[Save Template](#)
[Save All Templates](#)

Save Template

Position of option on menu: Design =>Templates =>Utilities =>Save =>Save a template

On selecting the Save a template option, the Save Template panel is displayed.



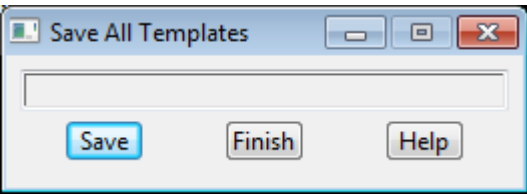
The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Template	template box <i>name of the template to be saved.</i>			available templates
Save	button <i>after selecting this button, the template given in the template field will be saved to disk.</i>			

Go to the next section [Save All Templates](#).

Save All Templates

Position of option on menu: Design =>Templates =>Utilities =>Save =>Save all templates
On selecting the Save all templates option, the **Save All Templates** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Save	button		
<i>after selecting this button, all templates in the working project will be saved to disk. Unless an error occurs, the panel will be removed after the saving is completed.</i>			

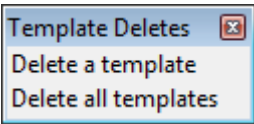
Delete

Position of menu: Design =>Templates =>Delete

Using the **Delete** option, templates can be deleted from the project and moved to the Trash Bin, or permanently deleted from the computer disk so that they can no longer be accessed or take up disk space.

To help protect the user against disasters, when a template is selected for deletion, a **Yes-No** pop-up menu is used to confirm that the user did intend deleting the template.

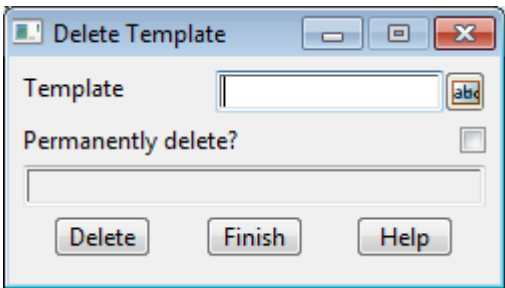
The **Template Deletes** walk-right menu is



For the option <i>Delete a template</i> , go to	Delete Template
<i>Delete all templates</i>	Delete All Templates

Delete Template

Position of option on menu: Design =>Templates =>Delete =>Delete a template
The **delete a template** option is used to delete individual template from the project.
On selecting the **Delete a template** option, the **Delete Template** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Template <i>name of the template to be deleted.</i>	template box		project templates
Permanently delete? <i>if ticked, the deleted template will not go to the trash bin but will be permanently deleted from disk</i>	tick box		
Delete <i>after selecting this button, the template given in the template field will be deleted. A Yes-No pop-up is used to confirm that deletion is required.</i>	button		

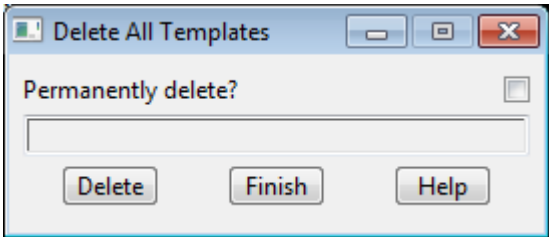
Go to the next section [Delete All Templates](#).

Delete All Templates

Position of option on menu: Design =>Templates =>Delete =>Delete all templates

The **Delete all** option will delete all templates in the working project. It does not delete templates that are in the working project area but not yet added to the project.

On selecting the **Delete all** option, the **Delete All Templates** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Delete <i>after selecting this button, a Yes-No pop-up is used to confirm that deletion is required. If it is, all templates in the project will be deleted from disk. Unless an error occurs, the panel will be removed.</i>	button		
Permanently delete	tick box		

if ticked, the deleted templates will not go to the trash bin but will be permanently deleted from disk.

Apply

Position of menu: Design =>Apply

The **Apply** options are for producing design strings using templates and modifiers to create strings along a reference or reference and hinge string - “applying the template to a string”. This method can be used to quickly produce roads, canals, trenches, site batters etc.

When applying the templates, design x-sections and strings are automatically produced, plus the cut and fill volumes for the design.

Creating a design in this way is the first job of the **Apply** options.

However, after applying a template and examining the results, it is normally necessary to make changes to either the template, the string that the template was applied to or even the tin used for interfacing.

In all cases, the strings, sections and volumes created during the **Apply** will no longer be valid and need to be replaced by new information.

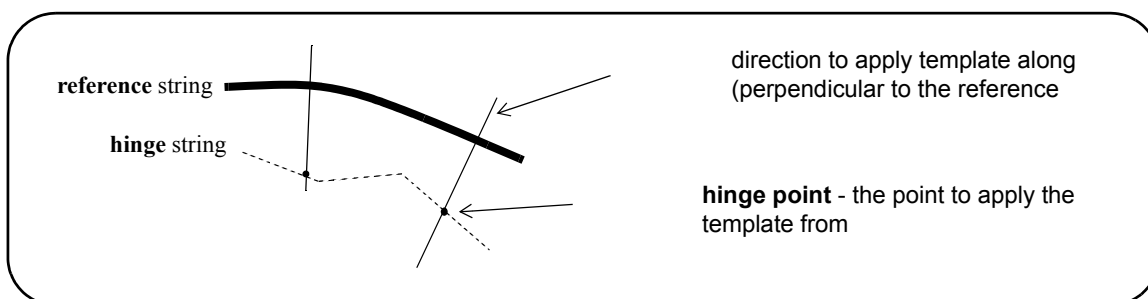
Although this can be accomplished by deleting the incorrect models and replacing them with new ones by re-applying the template, this would be a time consuming if repeated over and over again. Hence in **12d Model**, a concept called **Apply functions** was introduced.

Basically, an **apply function** keeps track of all the information involved in applying a template and all the strings and models created during the **Apply/Apply many**. If either the template, the tin or the string that the template was applied to is subsequently modified, the apply functions can be re-run and all the old information automatically deleted and replaced by the updated information.

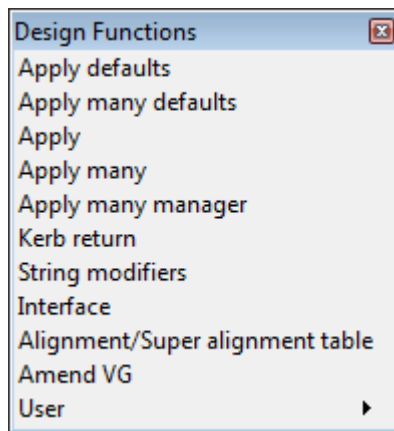
NOTES ABOUT THE STRING CHOSEN TO APPLY TEMPLATES TO

1. If vertical geometry does not exist for the entire length of the string, then the template(s) is/are only applied to the section of the string where vertical geometry exists.
2. If the horizontal or vertical geometry has overlapping tangent points at any section of the string, then the option terminates without any calculations being made.
3. Any curves will be approximated by chords spaced at chainage interval given by the section separation value. If the chord-to-arc distance for the chords is greater than the chord/arc tolerance given in the **Apply/Apply many** panel, then extra points are inserted around the curve so that the chord/arc tolerance is met.
4. The **Apply** options create sections and strings using a **reference** string to define the chainage and what is perpendicular at each chainage, and a **hinge** string from where the template links are defined. The template defines a point name and colour for each template link.

Cross sections can be created with point names corresponding to the template links, and strings formed by joining the same named points from consecutive cross sections.



The **Apply** walk-right menu is



Each option in this menu will now be described.

For the option *Apply/ Apply many defaults*, go to

Apply

Apply many

Apply many manager

Kerb return

String modifiers

Interface

Alignment/Super alignment table

Amend VG

[Apply and Apply Many Defaults](#)

[Apply](#)

[Apply Many](#)

[Apply Many Manager - Create/Update](#)

[Kerb Return](#)

[String Modifiers](#)

[Interface](#)

[Alignment & Super Alignment Table](#) in the chapter [Drafting](#)

[Amend VG](#)

Apply and Apply Many Defaults

Position of option on menu: Design =>Apply =>Apply defaults

Design =>Apply =>Apply many defaults

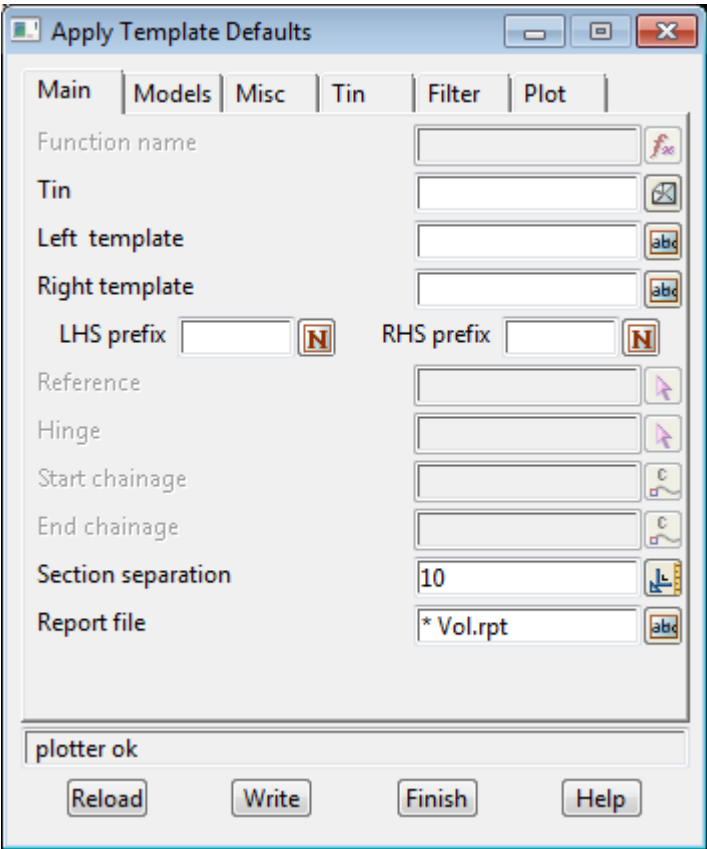
There are two files *apply_defaults.4d* and *apply_many_defaults.4d* which contain the **pre** or **post text** to be added to the name of the function to automatically create many entries in the panel fields for *Apply* and *Apply Many* plus default values for all the other panel fields.

After the name of a new function is typed in and an <enter> typed, all the fields mentioned in the default files are automatically filled in using the function name and the defined **pre-post text** as supplied in the file, plus setting any other panel fields from default values supplied in the file. If the files are missing, no panel fields are automatically filled in.

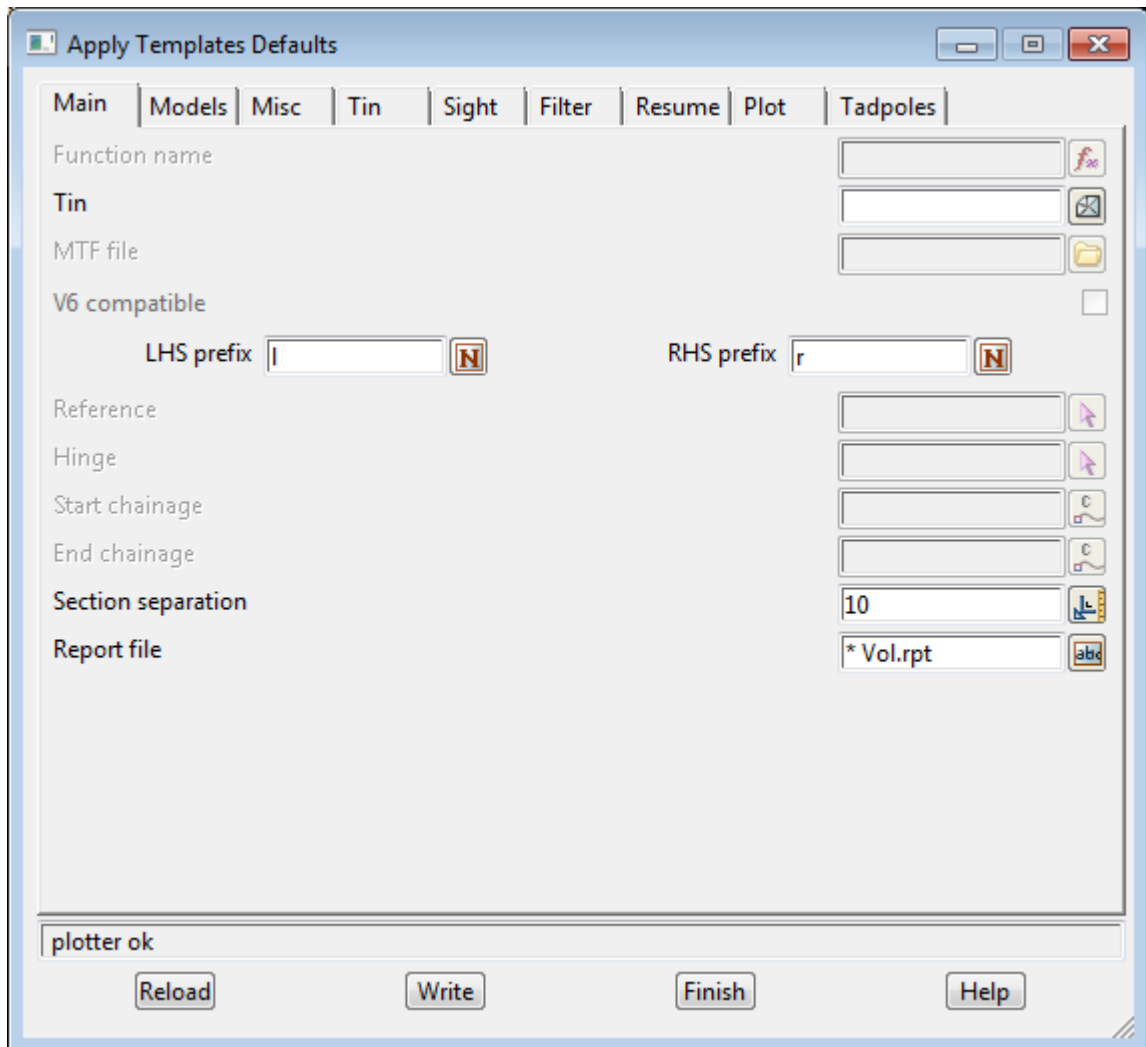
The files can be created and edited using the **Apply defaults** or **Apply many defaults** option which brings up the **Apply Template Defaults** or **Apply Templates Defaults** panels respectively.

Each of the fields in the **Apply Template Defaults** panel matches a field in the **Apply** panel and so for the documentation see [Apply](#).

Each of the fields in the **Apply Templates Defaults** panel matches a field in the **Apply Templates Function** panel and so for the documentation see [Apply Many](#).



Each of the fields in the **Apply Template Defaults** panel matches a field in the **Apply** panel and so for the documentation see [Apply](#).



Each of the fields in the **Apply Templates Defaults** panel matches a field in the **Apply Templates Function** panel and so for the documentation see [Apply Many](#).

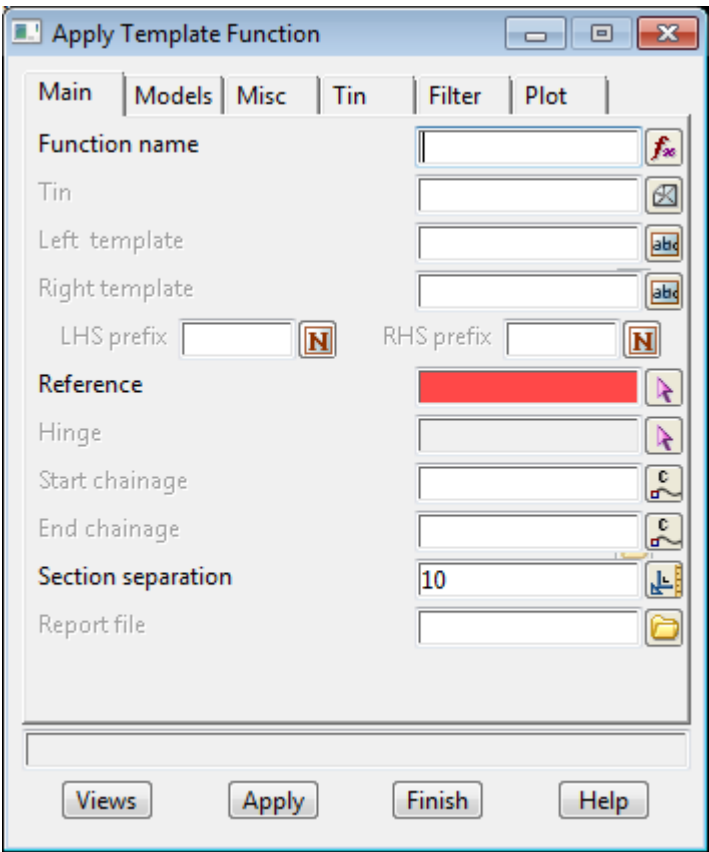
Apply

Position of option on menu: **Design =>Apply =>Apply**

On selecting the **Apply** option, the **Apply Template Function** panel is displayed.

This panel is used to create the information for applying a new template function or to modify the information for an existing template function.

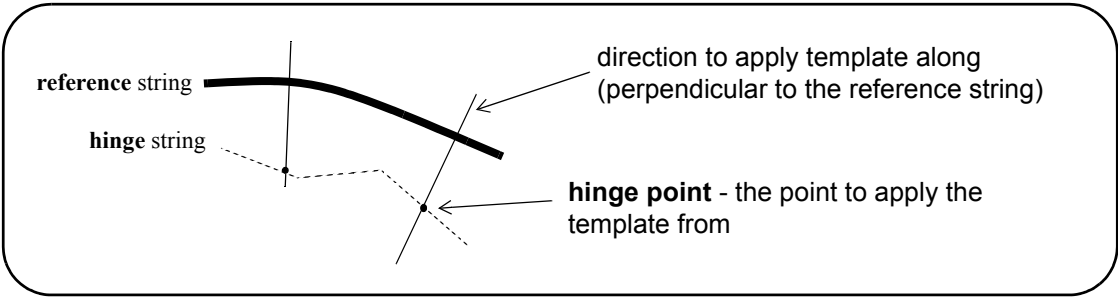
The **Apply Template Function** panel is



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Buttons at bottom			
Views	button		
<i>perspective views can be defined with respect to chainages on the string. This option is described in more detail in the section Views</i>			
Apply	button		

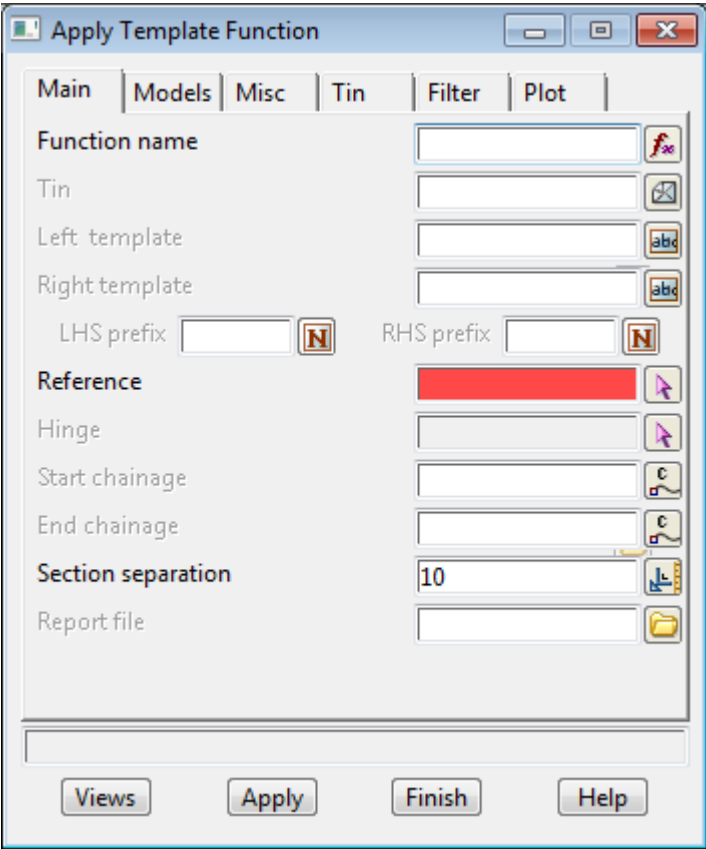
apply the template information to the selected reference and hinge strings, between the start and end chainages. The cut, fill and balance volumes are also calculated and written to the message area.



For the information on each **Apply Template Function** tab, go to

- [Apply Main tab](#)
- [Apply Models tab](#)
- [Apply Misc tab](#)
- [Apply Tin tab](#)
- [Apply Filter tab](#)
- [Apply Plot tab](#)

Apply Main tab

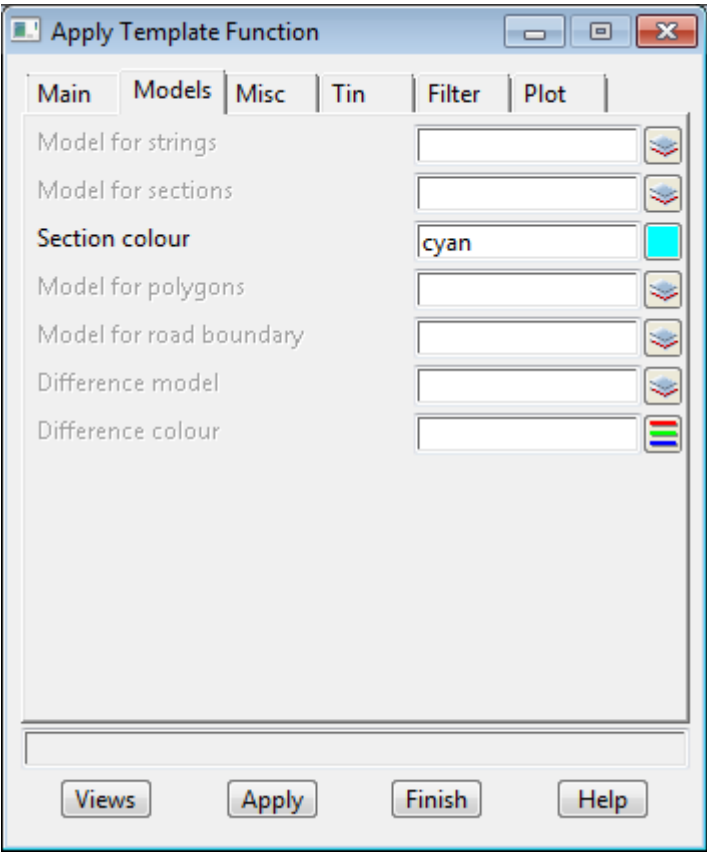


Function name function box available template functions

*name of the function to define the **apply** for. If the function already exists and is picked from a pop-up or an <enter> is given at the end of the name, the information from the existing function will be placed in the appropriate panel fields.*

Tin	tin box	available tins
<i>if non-blank, the name of the tin to calculate the cut/fill interfaces against at the end of the fixed part of the templates given in the left and right template fields.</i> <i>If blank, then only the fixed part of the templates are used unless a tin is specified in the decisions section of the templates.</i>		
Left/right template	template box	available templates
<i>name of the template to be applied to the left/right of the string. If a template is used on the left/right, the template definitions go from the hinge string out to the left/right.</i>		
LHS/RHS prefix	input	
<i>prefix/postfix (pre*post) to be applied to the left/right template string names. If pretext only, just give the text. If post text is required, precede it by a *.</i>		
Reference	string-select	
<i>the selected string is used to defined the meaning of chainage and bearing for each point in the apply. Sections are defined at right angles to the reference string at the appropriate chainage points on the reference string.</i>		
Hinge	string-select	
<i>the reference string defines chainage and bearing but the templates are actually applied to the hinge string. For a given chainage, a line is taken at right angles to the point of that chainage on the reference string and extended until it cuts the hinge string. The templates are applied at that point on the hinge string along the direction of the line.</i> <i>If no hinge string is selected, the reference string is also the hinge string.</i>		
Start/End chainage	input	
<i>the reference string start/end chainage for applying the template. If blank, the start/end chainage of the reference string is used.</i>		
Section separation	input	10.0
<i>sections are created at right angles to points on the reference string that are the section separation chainage distance apart.</i>		
Report file	file box	*.rpt
<i>if non-blank, the name of the file to contain the volume report for the template calculations. If the file already exists, the report will be appended to the file.</i> <i>If blank, no report is produced.</i>		

Apply Models tab

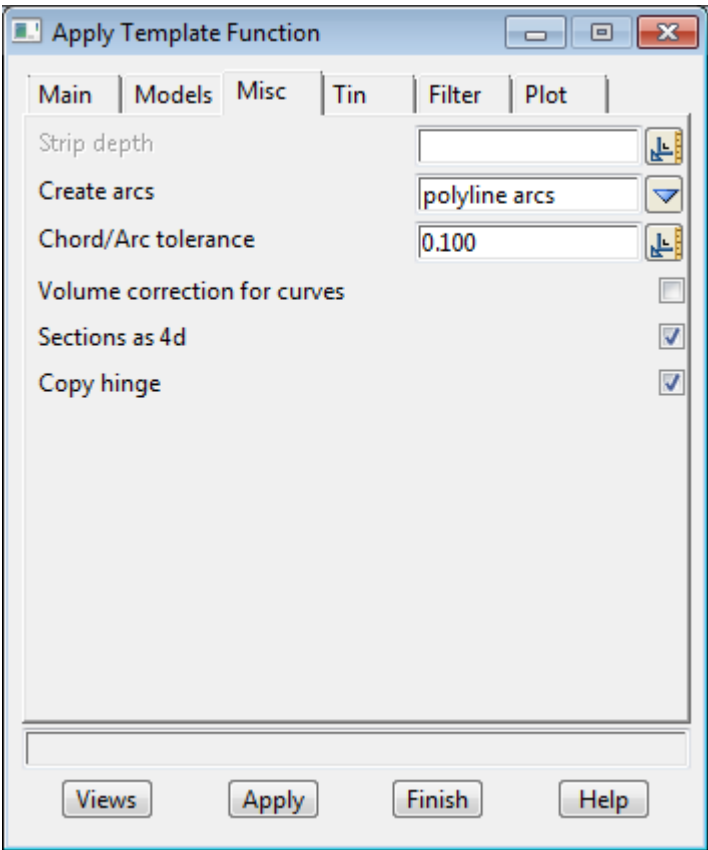


Model for strings	model box	available models
<i>if non-blank, the name of the model to contain the template and interface strings. The string colour is the template link colour.</i>		
<i>If blank, the strings will not be stored.</i>		
Model for sections	model box	available models
<i>if non-blank, the name of the model to contain the design sections generated by the templates.</i>		
<i>If blank, the sections will not be stored.</i>		
Section colour	colour box	default colour available colours
<i>the colour for the sections strings</i>		
Model for polygons	model box	available models
<i>if non-blank, the name of the model to contain the polygons created for each link of the template. The polygon is given the colour of the template link.</i>		
<i>If blank, the polygons will not be stored.</i>		
Model for road boundary	model box	available models
<i>if non-blank, the name of the model to contain the polygon created by joining the outside links of the road.</i>		
<i>If blank, the polygon will not be stored.</i>		
Difference model	model box	available models

if non-blank, the sections which are the difference between the tin sections and the template x-sections are retained and placed in the model given in this field. If blank, the sections are not kept.

Difference colour colour box available colours
colour for the difference sections strings

Apply Misc tab



Strip depth input 0
the stripping depth to be used on the tin before the apply is done.

Create arcs choice box super arcs no arcs, alignment arcs, polyline arcs, super arcs
*if **no arcs**, the strings are created as 3d strings with no arcs.*
***alignment arcs**, the strings are created as alignment strings with arcs*
***polyline arcs**, the strings are created as polyline strings with arcs.*
***super arcs**, the strings are created as super strings with arcs.*

Chord/arc tolerance input default chord/arc tolerance
the chord to arc tolerance to use on the reference string for determining how many sections are created around horizontal curves.

Volume correction for curves tick box
if ticked, volume corrections are made when going around curves.

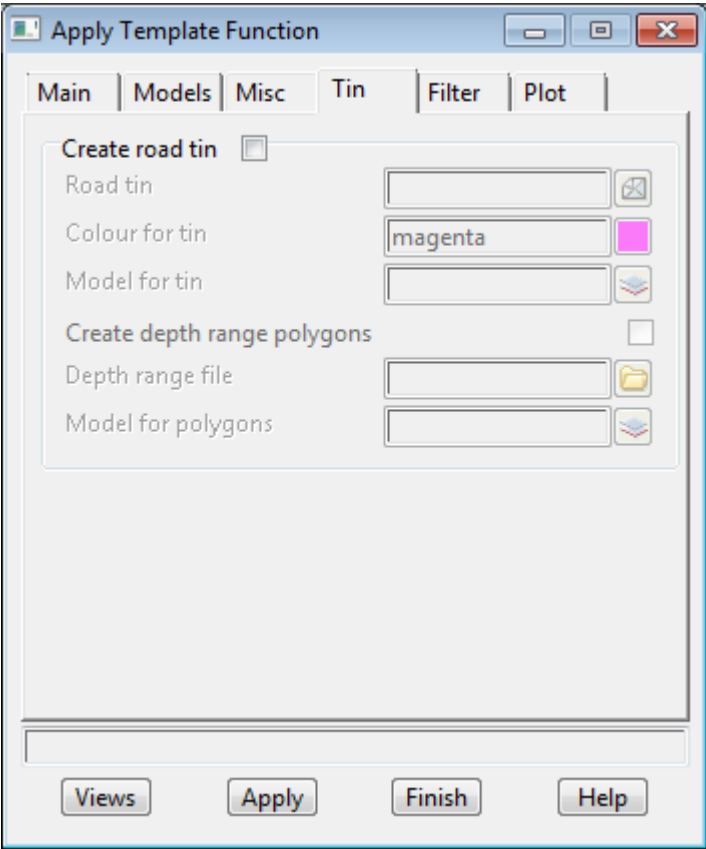
Sections as 4d tick box tick

if ticked, the section strings will be created as 4d super strings with the appropriate template string names as the vertex text at each vertex of the section. These are needed for boxing and some options on x-section plots.

Copy hinge tick box tick

if ticked, a string with points at the apply chainages is created on top of the hinge string.

Apply Tin tab



Create road tin tick box

if ticked, the fields in this tab are used to create a road tin

Road tin tin box available tins

name for the tin created from the design strings and sections

Colour for tin colour box available colours

colour of the road tin

Model for tin model box available models

model for the road tin

Create depth range polygons tick box

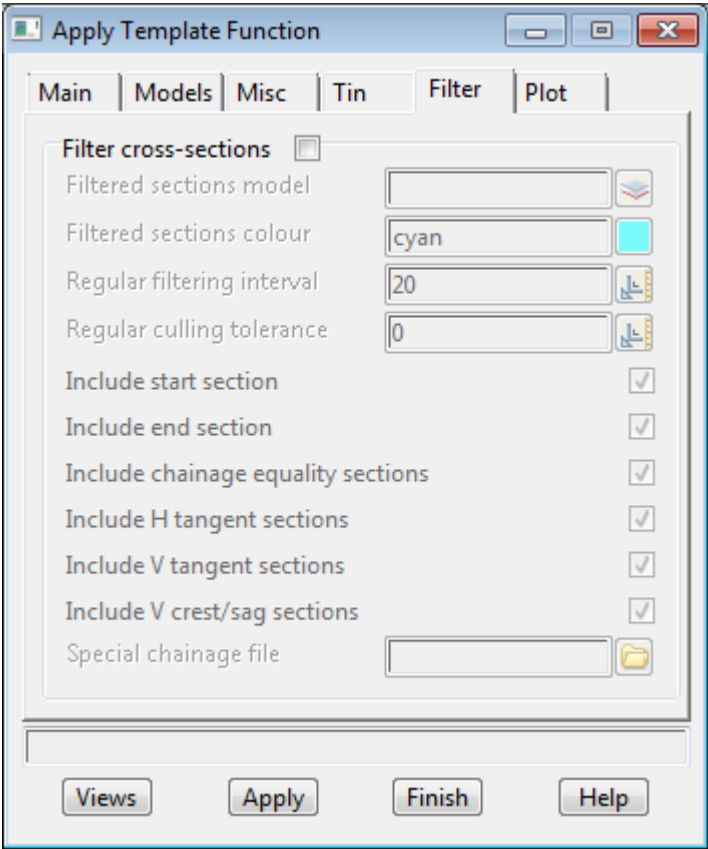
if ticked, depth polygons are created

Depth range file file box *.drf files

depth range file used when creating polygons

Model for polygons	model box	available models
<i>model for the depth polygons</i>		

Apply Filter tab



Filter cross-sections tick box
if ticked, the fields in this tab are used to filter cross sections

Filter sections model	model box	available models
<i>model for the filtered cross sections</i>		

Filtered sections colour	colour box	available colours
<i>colour of the filtered cross sections</i>		

Regular filtering interval input
regular interval to use for filtering the cross sections

Regular culling tolerance input 0
tolerance to use when selecting a cross section

Include start sections tick box
if ticked, a section at the start chainage is included even if the start chainage is not at a regular interval

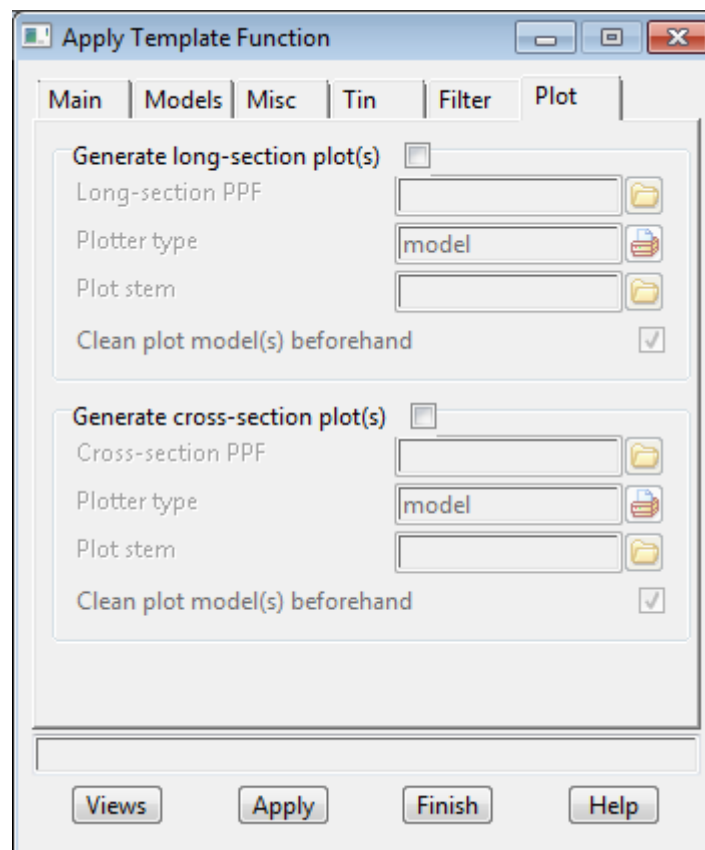
Include end sections tick box

if ticked, include sections where there is a chainage equality

if ticked, a sections at the horizontal/vertical tangent points are included even if they are not at a regular interval

if ticked, a sections at the crest and sag points are included even if they are not at a regular interval

if non blank, a file of chainages to include sections at even if they are not a regular interval



if ticked, long section plots are created

binary ppf file to use for the long section plots

type of plotter to use for the long section plots

Plot stem

the name to use for the plots - a number will be added when more than one page is produced

Clean plot model(s) beforehand tick box

if ticked and the **plotter type is model**, the plot models are cleaned before the plots are created

Generate cross section plot(s) tick box

if ticked, cross section plots are created

Cross section PPF file box *.lplotppf files

binary ppf file to use for the cross section plots

Plotter type plotter box model available plotters

type of plotter to use for the cross section plots

Plot stem

the name to use for the plots - a number will be added when more than one page is produced

Clean plot model(s) beforehand tick box

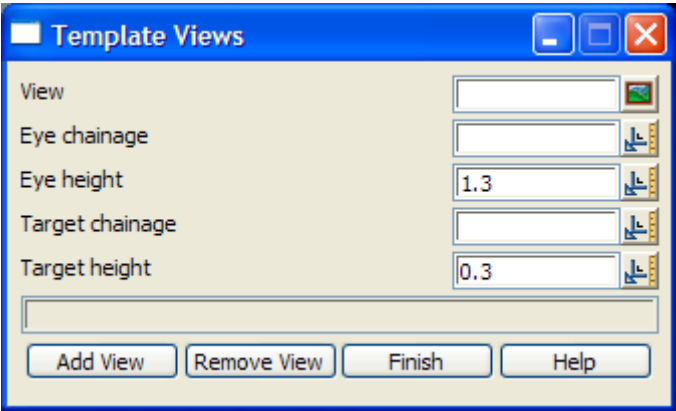
if ticked and the **plotter type is model**, the plot models are cleaned before the plots are created

Views

This option locks perspective views to the reference string of the **Apply/Apply Many** function, It defines the eye and target co-ordinates for the perspective views in terms of the chainage and height above an existing reference string (as in the perspective view-ops option, string-walk) rather than entering the (x,y,z) eye and target co-ordinates.

If the string is modified, then the perspective eye and target points will also change.

Selecting **Views** fires up the **Template Views** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View	view box		available views
the perspective view to define the eye and target points for.			
Eye chainage	input		

the string chainage of the eye viewing point.

Eye height input 1.3

height of the eye viewing point above the string.

Target chainage input

the string chainage the target viewing point.

Target height input 0.3

height of the target viewing point above the string.

Add View button

add the view to the template function and then redraw the view using the above eye and target parameters.

Remove View button

remove the view from the Apply/Apply Many function.

Apply Many

Position of option on menu: **Design =>Apply =>Apply many**

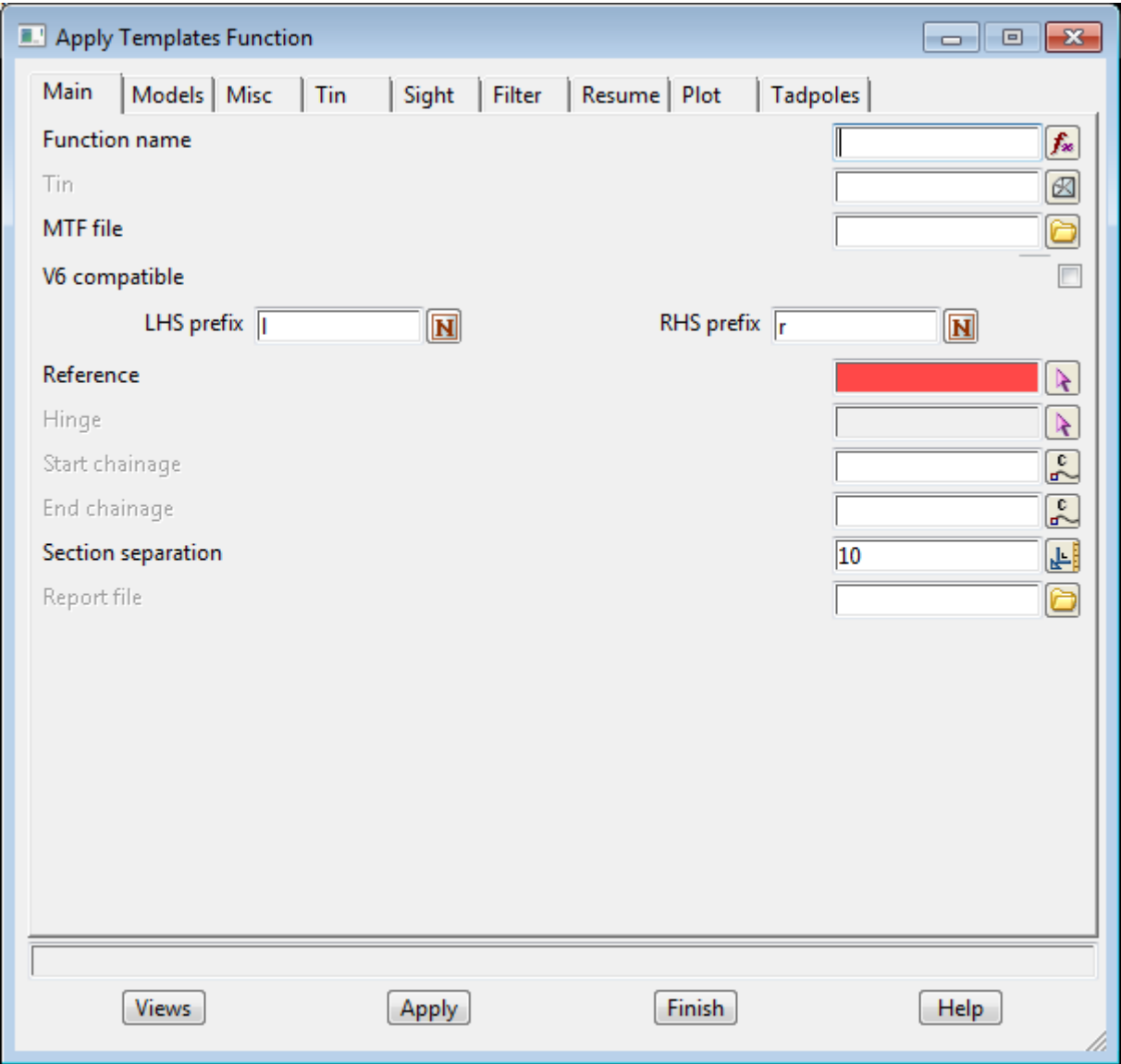
The **Apply Many** option is used for more complex design work.

It includes defining different templates over different chainage ranges, modifiers for advanced control of the strings created by the **Apply Many**, stripping depths and boxing, a road tin and depth polygons, sights lines, tadpoles, plus long section and cross section plots.

The **Apply Many** can also create up to eight layers of boxing.

For **Apply Many**, the templates and all the modifiers are supplied in a file called the **Many Templates File** or **MTF** file. The definition of the **MTF** will follow after the description of the **Apply Many** option.

Selecting **Apply many** displays the **Apply Templates Function** panel.



This panel can be used to create the information for applying a new template function or to modify the information for an existing template function.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

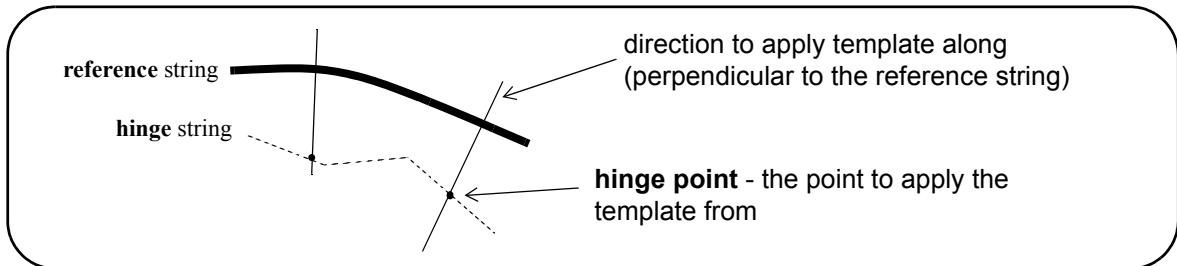
Buttons from bottom

Views button

perspective views can be defined with respect to chainages on the string. This option is described in more detail in the section [Views](#).

Apply button

apply the template information to the selected reference and hinge strings, between the start and end chainages. The cut, fill and balance volumes are also calculated and written to the message area.



For the information on each **Apply Templates Function** tab, go to

[Apply Many Main tab](#)

[Apply Many Models tab](#)

[Apply Many Misc tab](#)

[Apply Many Tin tab](#)

[Apply Many Sight tab](#)

[Apply Many Filter tab](#)

[Apply Many Resume tab](#)

[Apply Many Plot tab](#)

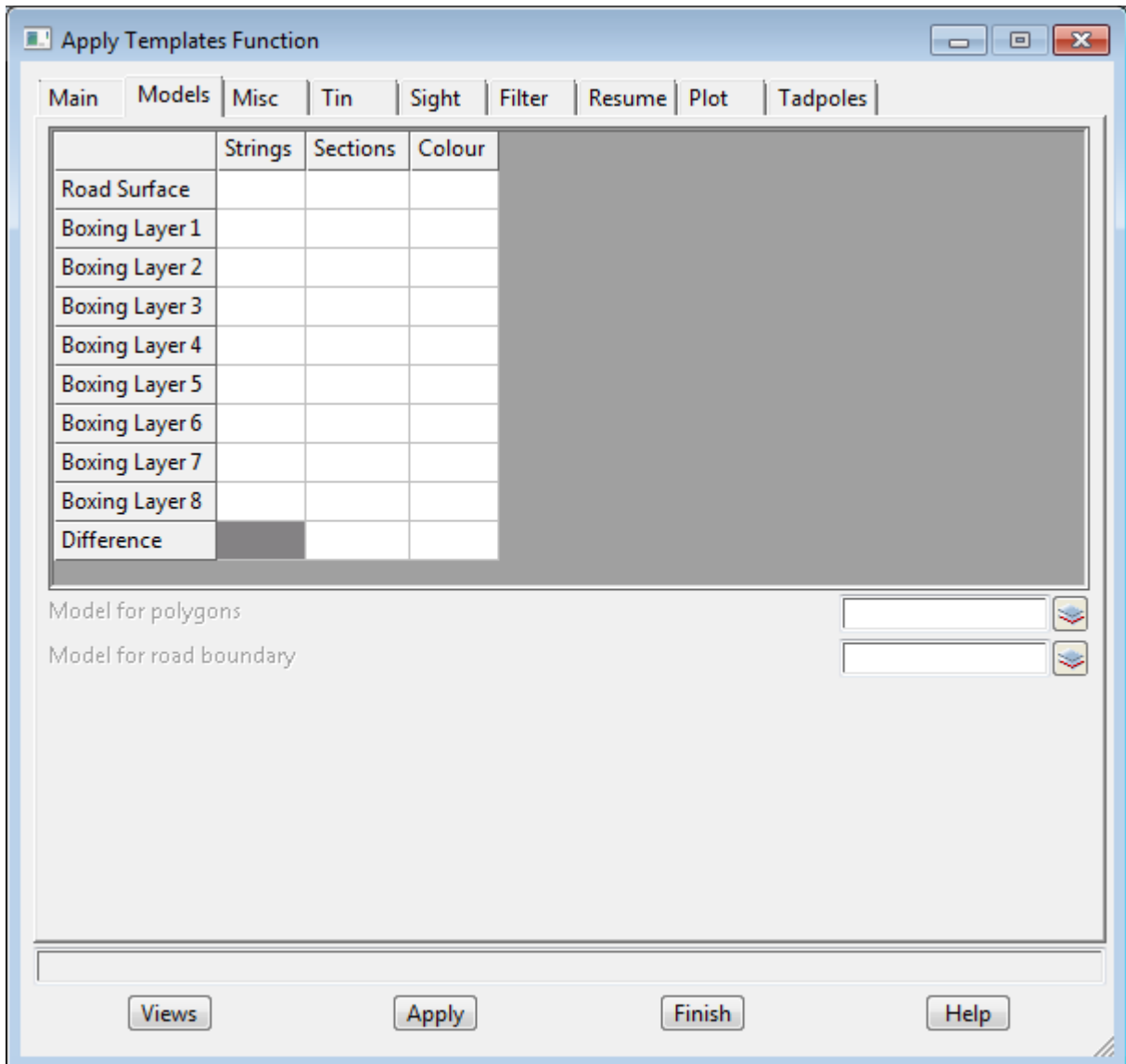
[Apply Many Tadpoles tab](#)

V6 compatible	tick box	
<i>if ticked, the template is used as it was in 12d Model version 6</i>		
LHS/RHS prefix	input	
<i>prefix/postfix (pre*post) to be applied to the left/right template string names. If pretext only, just give the text. If post text is required, precede it by a *.</i>		
Reference	string-select	
<i>the selected string is used to defined the meaning of chainage and bearing for each point in the apply. Sections are defined at right angles to the reference string at the appropriate chainage points on the reference string.</i>		
Hinge	string-select	
<i>the reference string defines chainage and bearing but the templates are actually applied to the hinge string. For a given chainage, a line is taken at right angles to the point of that chainage on the reference string and extended until it cuts the hinge string. The templates are applied at that point on the hinge string along the direction of the line. If no hinge string is selected, the reference string is also the hinge string.</i>		
Start/End chainage	input	
<i>the reference string start/end chainage for applying the template. If blank, the start/end chainage of the reference string is used.</i>		
Section separation	input	10.0
<i>sections are created at right angles to points on the reference string that are the section separation chainage distance apart.</i>		
Report file	input	*.rpt
<i>if non-blank, the name of the file to contain the volume report for the template calculations. If the file already exists, the report will be automatically over written. If blank, no report is produced.</i>		
<i>Also if boxing is included in the MTF file definition, the volumes in the report can include not only the volumes from the stripped natural surface tin to the design, but also the interboxing layer volumes and the volumes from the last boxing layer to the design and to the stripped natural surface.</i>		

Apply Many Models tab

the model tab consists of a grid for defining the design strings forming the road surface and design cross section, up to eight layers of boxing and models for the difference sections between the design and the natural surface.

The last boxing layer is also referred to as the **subgrade** layer.



Road Surface:

Strings

model box

available models

if non-blank, the name of the model to contain the design and interface strings. The default string colours are the template link colours but that can be overridden by a map file.

If blank, the strings are stored.

Sections

model box

available models

*if non-blank, the name of the model to contain the design sections generated by the apply.
If blank, no sections are stored.*

Colour	colour box	available colours
---------------	------------	-------------------

the colour for the design sections strings

Boxing Layer 1-8:

if non blank, boxing strings and sections will be created for that layer.
*The last boxing layer is also referred to as the **subgrade** layer.*
For more information on boxing, see [What is Boxing ?](#).

Strings	model box	available models
----------------	-----------	------------------

if non-blank, the name of the model to contain the boxing strings for this layer.
If blank, the strings will not be stored.

Sections	model box	available models
-----------------	-----------	------------------

if non-blank, the name of the model to contain the boxing sections generated by the templates and boxing rules. If blank, the sections will not be stored.

Colour	colour box	available colours
---------------	------------	-------------------

colour for the boxing sections for this layer

Difference

Sections	model box	available models
-----------------	-----------	------------------

if non-blank, the sections which are the difference between the tin sections and the template x-sections are retained and placed in the model given in this field.
If blank, the sections are not kept.

Colour	colour box	available colours
---------------	------------	-------------------

colour for the difference sections strings

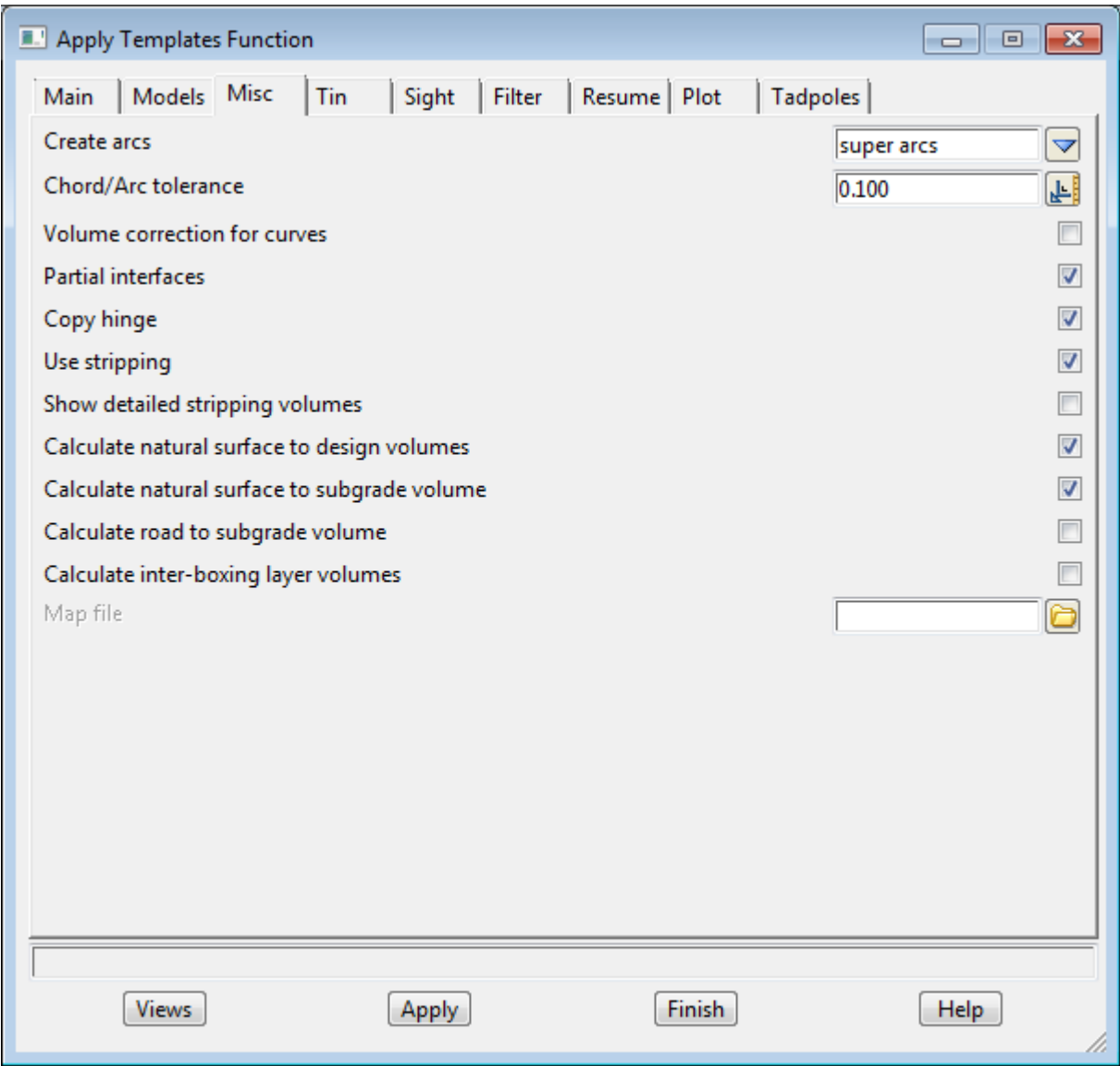
Model for polygons	model box	available models
---------------------------	-----------	------------------

if non-blank, the name of the model to contain the polygons created for each link of the template. The polygon is given the colour of the template link.
If blank, the polygons will not be stored.

Model for road boundary	model box	available models
--------------------------------	-----------	------------------

if non-blank, the name of the model to contain the polygon created by joining the outside links of the road.
If blank, the polygon will not be stored.

Apply Many Misc tab



Create arcs choice box super arcs no arcs, alignment arcs, polyline arcs, super arcs

*if **no arcs**, the strings are created as 3d strings with no arcs.
alignment arcs, the strings are created as alignment strings with arcs
polyline arcs, the strings are created as polyline strings with arcs.
super arcs, the strings are created as super strings with arcs.*

Chord/arc tolerance input default chord/arc tolerance

the chord to arc tolerance to use on the reference string for determining how many sections are created around horizontal curves.

Volume correction for curves tick box

if ticked, volume corrections are made when going around curves.

Partial interfaces tick box tick

if ticked, an interface string is not produced when no intersection is made with the tin. The interface may then be broken into a number of interface strings.

If not ticked, a yellow segment is created in the interface string when no intersection is made with the tin. Only one interface string will then be produced.

Copy hinge tick box tick

if ticked, a string with points at the apply chainages is created on top of the hinge string.

Use stripping tick box tick

if ticked, the stripping depths in the mtf file are used.

Show detailed stripping volumes tick box

if ticked, end area stripping volumes are written to the report file

Calculate natural surface to design volumes tick box tick

if ticked, end area volumes between the natural surface and the design strings are written to the report file. If stripping is used, then the cut and fill areas and volumes are calculated from the design to the stripped natural surface.

Calculate natural surface to subgrade volume tick box tick

if ticked, end area volumes between the natural surface to the subgrade (the last boxing layer) are written to the report file. If stripping is used, then the cut and fill areas and volumes are calculated from the last layer of boxing, to the stripped natural surface.

Calculate road to subgrade volumes tick box tick

if ticked, end area volumes between the design strings and the subgrade (the last boxing layer) are written to the report file.

Calculate inter-boxing layer volumes tick box tick

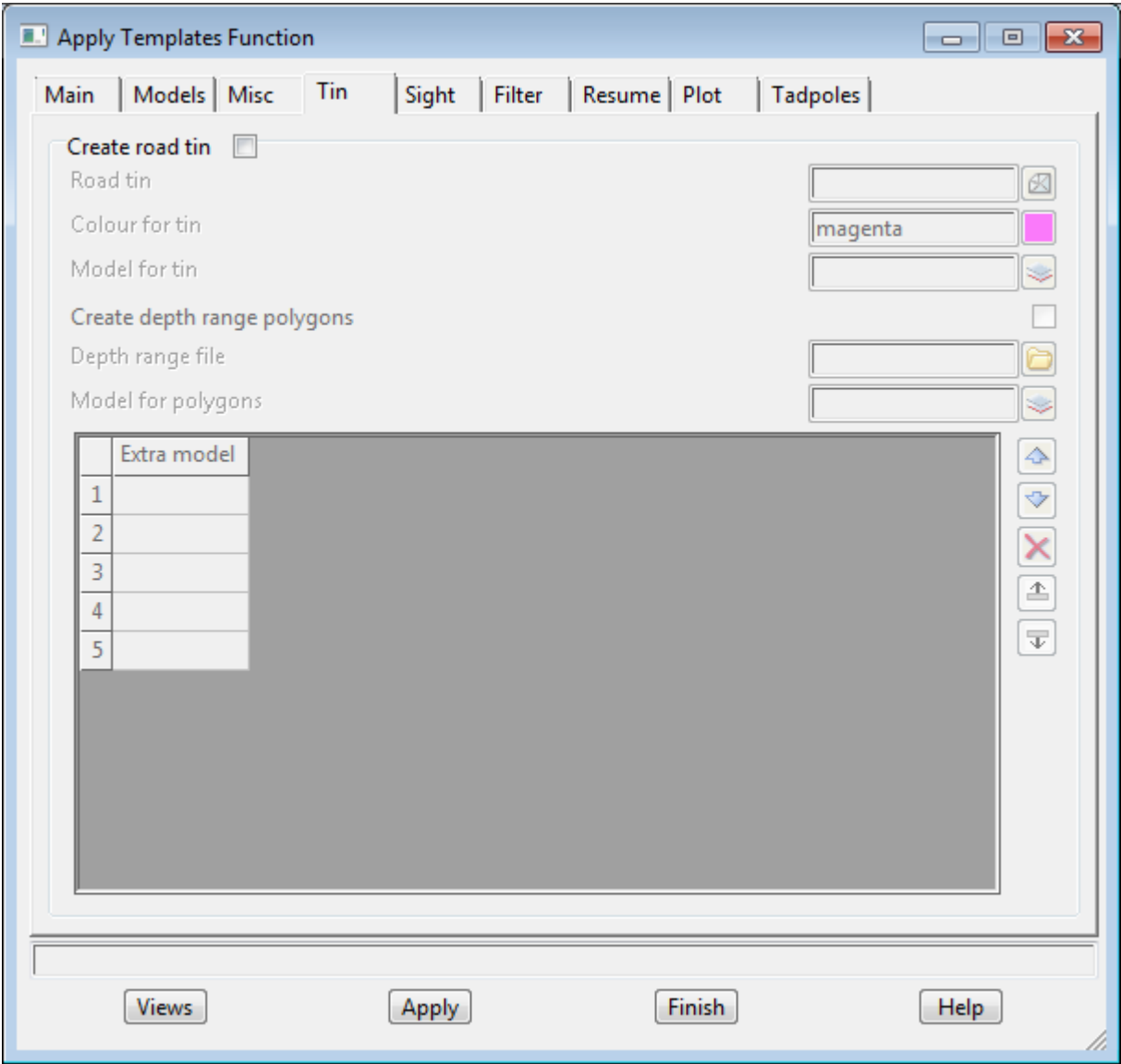
if ticked, end area volumes between each of the boxing layers are written to the report file.

Map file file box *.mapfile files

*if **non blank**, the given map file is applied to all the design strings created by the **Apply Many**. The map file overrides any default colours from the templates. The map file can colour strings, apply linestyles, apply hatch patterns to polygons, apply extrudes to super strings etc. For more details on the map file, see [Create/Edit a Map File](#) in the chapter [File I/O](#).*

Apply Many Tin tab

the Tin tab controls the creation of a design tin and depth polygons



Create road tin	tick box	
if ticked, the fields in this tab are used to create a road tin		
Road tin	tin box	available tins
name for the tin created from the design strings and sections		
Colour for tin	colour box	available colours
colour of the road tin		
Model for tin	model box	available models
model for the road tin		
Create depth range polygons	tick box	
if ticked, depth polygons are created		
Depth range file	file box	*.drf files

depth range file used when creating polygons

Model for polygons	model box	available models
<i>model for the depth polygons</i>		

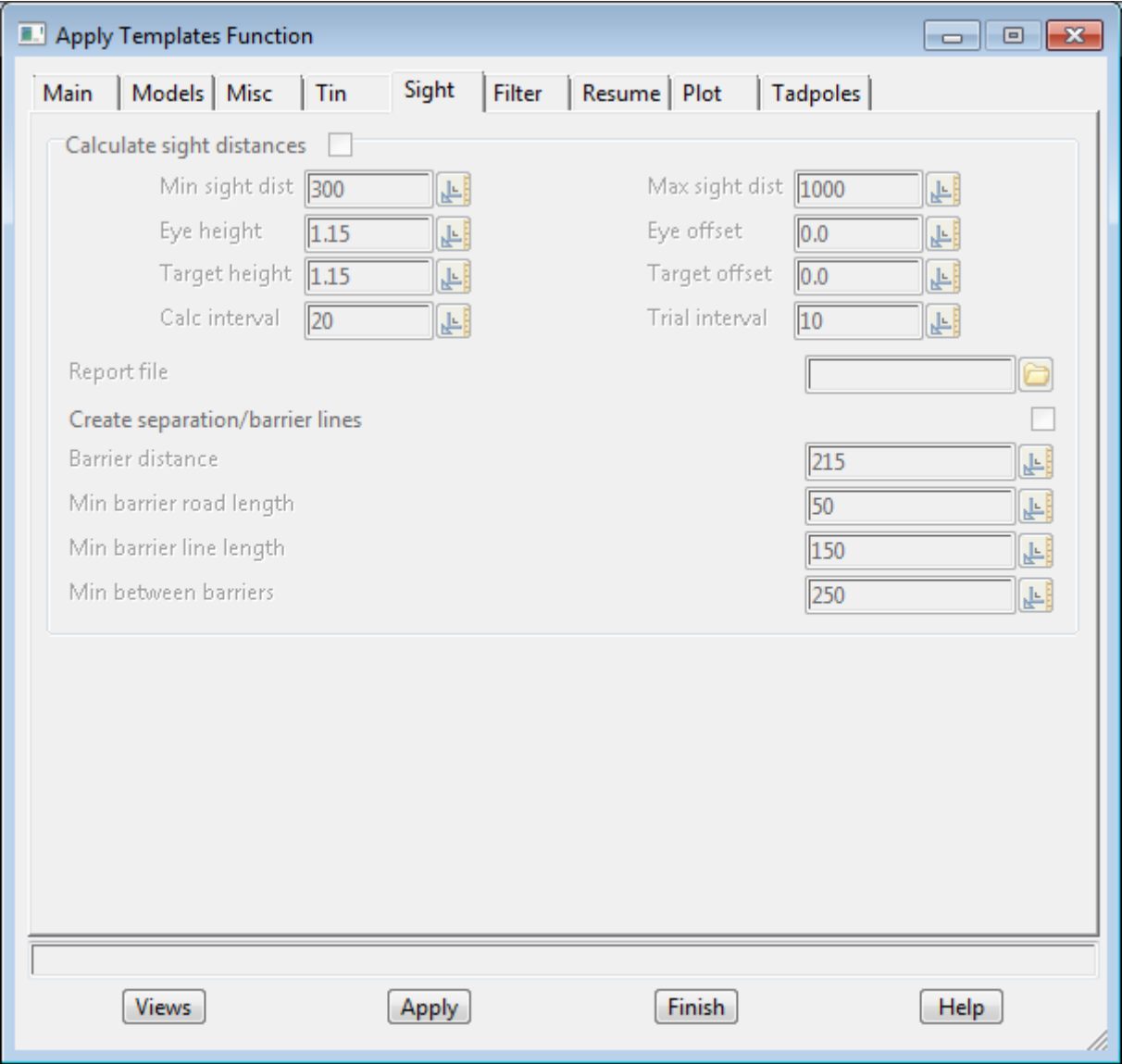
Extra Models grid

extra models to be included in creating the road tin

Extra Model	model box in column	available models
<i>name of a model to include in the road tin</i>		

Apply Many Sight tab

the **Sight** tab controls the reporting of sight distance lines between the reference line and a super tin formed from the natural surface tin and the design tin, and barrier lines on the reference line if it is a super alignment. For more information on sight distance calculations and for the option that will also create sight lines/no-lines and take bridge tins into consideration, go to the section [Sight Distance](#).



- Calculate sight distance

tick box

if ticked, sight distance lines are created and barrier lines calculated and applied to the reference string if it is a super alignment.
- Min sight distance

input

100

minimum chainage distance to use for placing the test target point.
- Max sight distance

input

3000

maximum chainage distance to use for placing the test target point.
- Eye height

input

1.3

height of the eye point above the picked string

Eye offset input 1.3

offset of the eye point from the picked string.

Target height input 0.3

height of the test target point above the picked string

Target offset input 1.3

offset of the target point from the picked string.

Calc interval input 20

chainage increment to move the eye point for the next sight distance calculation.

Trial interval input 10

chainage increment to move to test target point.

Report file file box *.rpt files

if non blank, a sight distance report is produced and written out to this file name.

Create separation/barrier lines tick box

if ticked, and the reference string is a super alignment, barrier and separation lines are created and defined in the super alignment.

Barrier distance input

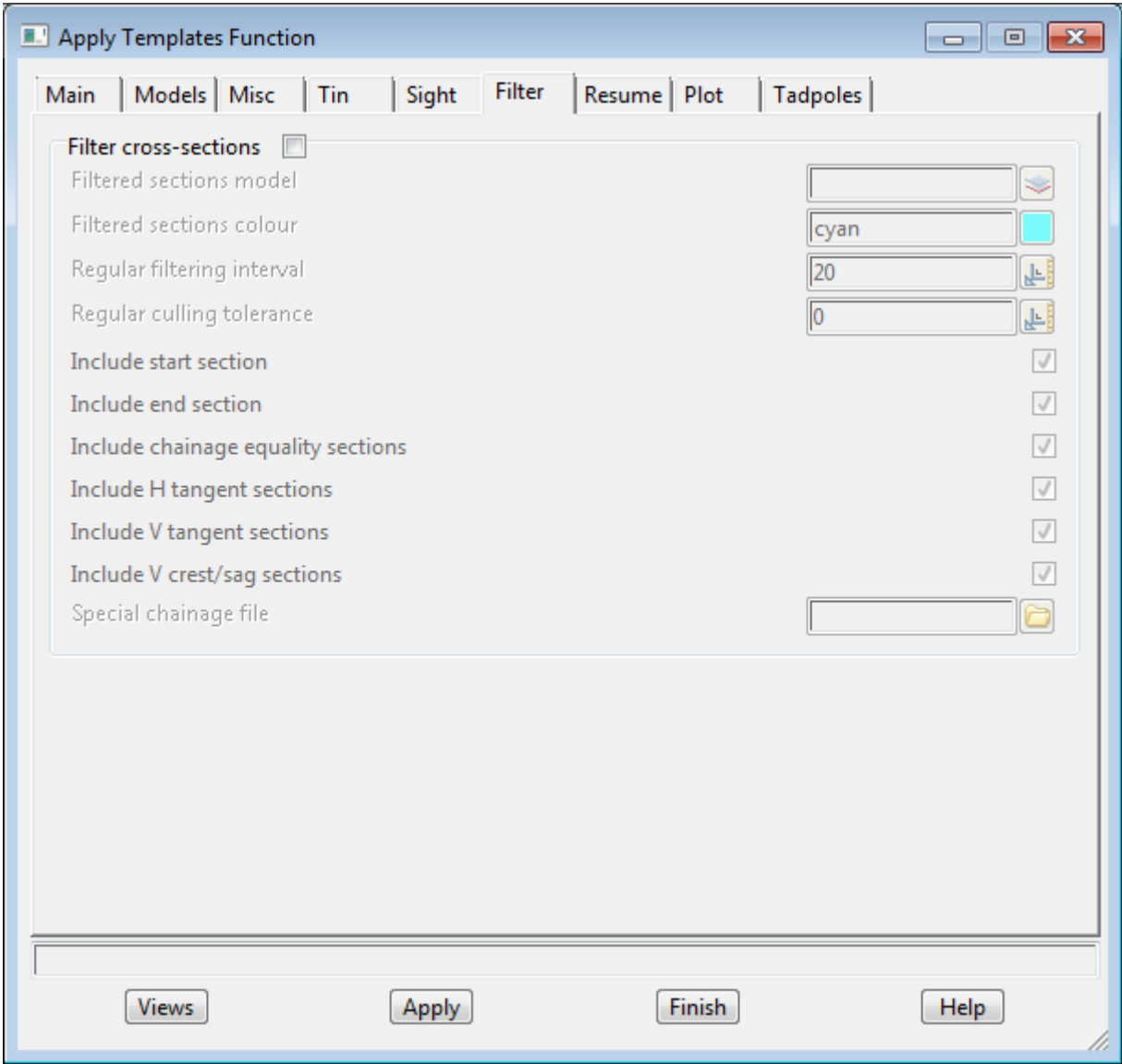
Min barrier road length input

Max barrier road length input

Min between barriers input

Apply Many Filter tab

the *Filter* tab controls the filtering of cross sections



Filter cross-sections	tick box	
<i>if ticked, the fields in this tab are used to filter cross sections</i>		
Filter sections model	model box	available models
<i>model for the filtered cross sections</i>		
Filtered sections colour	colour box	available colours
<i>colour of the filtered cross sections</i>		
Regular filtering interval	input	
<i>regular interval to use for filtering the cross sections</i>		
Regular culling tolerance	input	0
<i>tolerance to use when selecting a cross section</i>		
Include start sections	tick box	

if ticked, a section at the start chainage is included even if the start chainage is not at a regular interval

Include end sections tick box

if ticked, a section at the end chainage is included even if the end chainage is not at a regular interval

Include H tangent sections tick box

if ticked, a sections at the horizontal tangent points are included even if they are not at a regular interval

Include V create/sag sections tick box

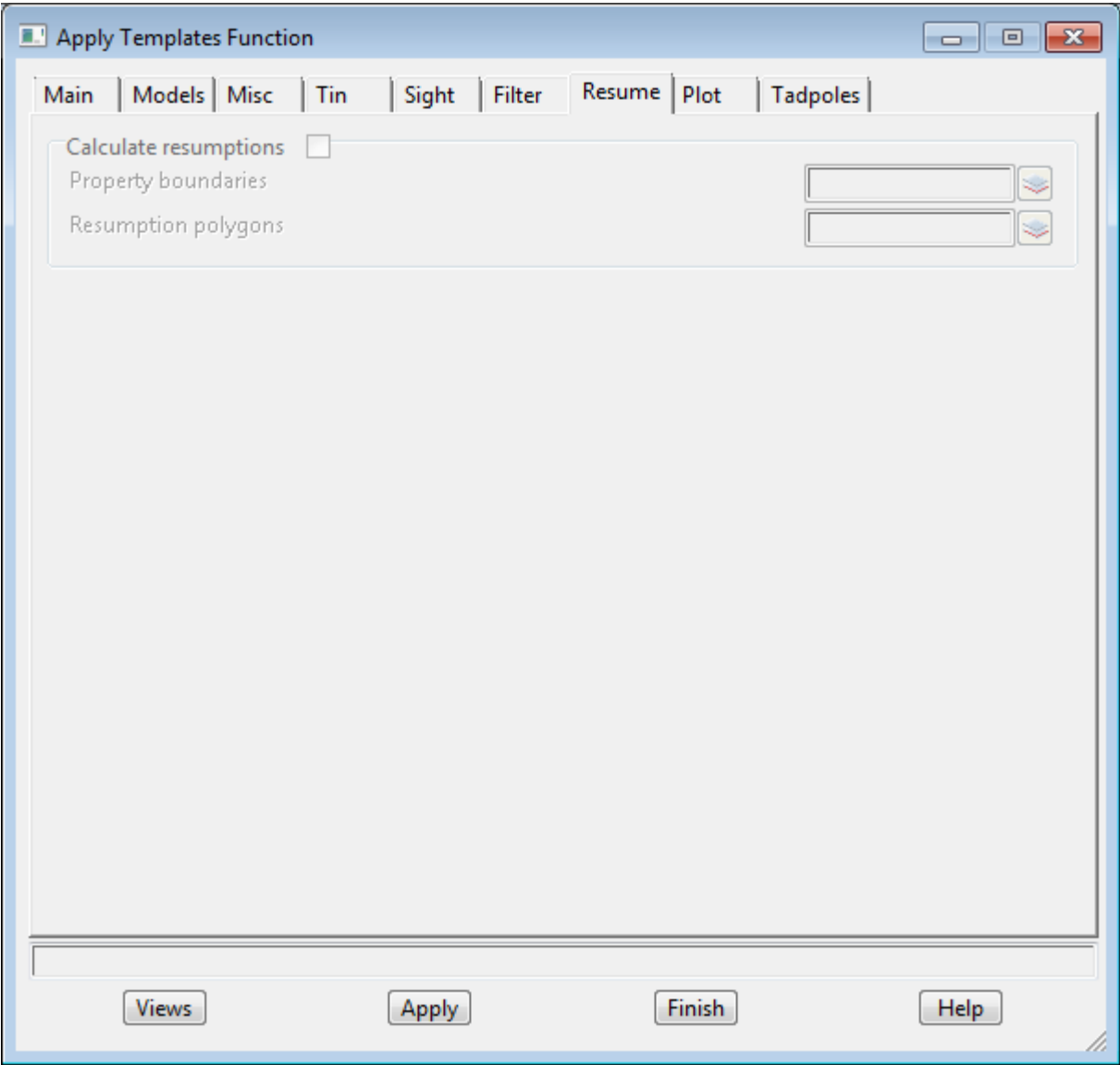
if ticked, a sections at the crest and sag points are included even if they are not at a regular interval

Special chainage file file box *.spc files

if non blank, a file of chainages to include sections at even if they are not at regular intervals

Apply Many Resume tab

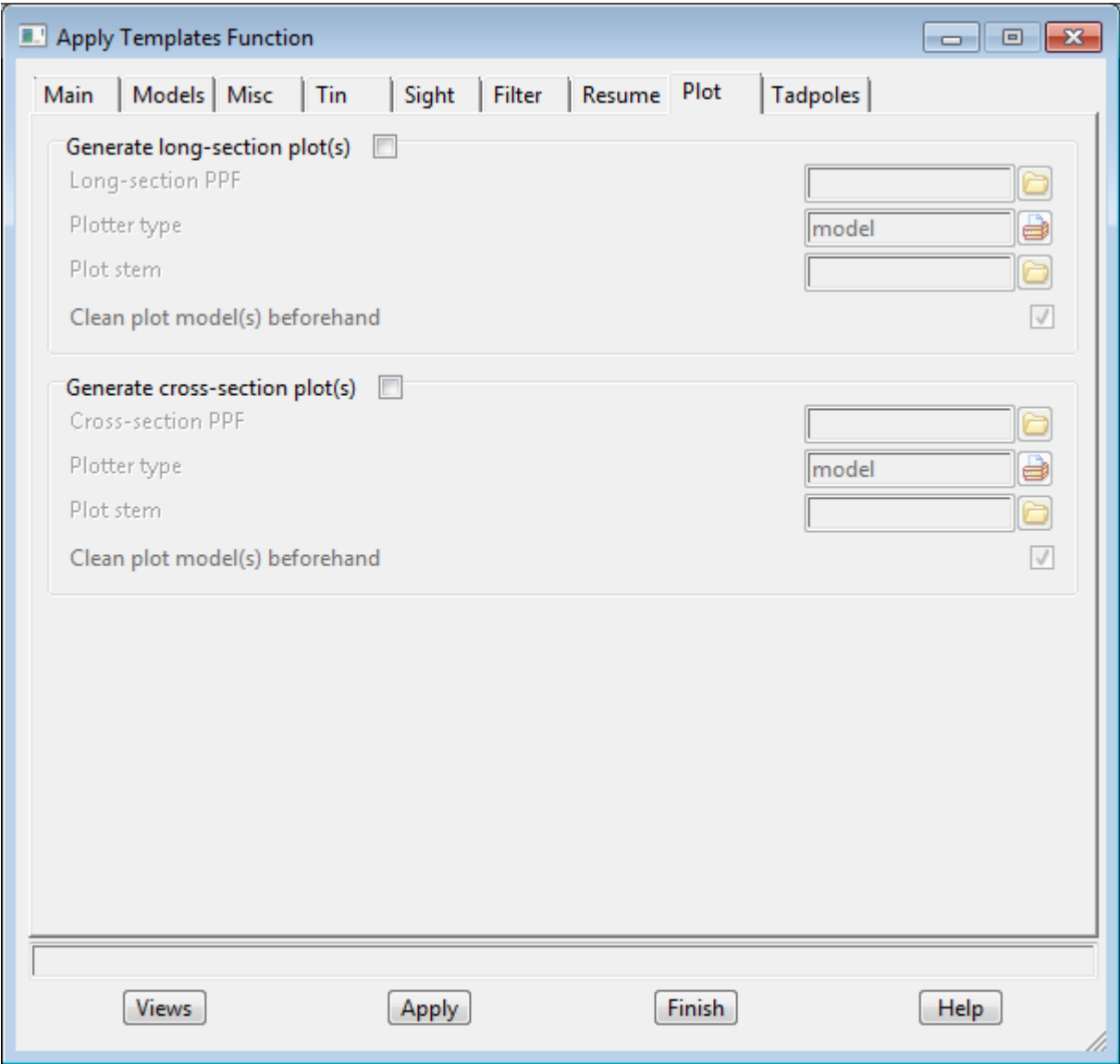
This section of documentation is a work in progress and will be updated in subsequent releases.



Calculate resumptions	tick box	
Property boundaries	model box	available models
Resumption polygons	model box	available models

Apply Many Plot tab

the *Plot* tab controls the generation of long section and cross section plots



Generate long section plot(s) tick box

if ticked, long section plots are created

Long section PPF

file box

*.lplotppf files

binary ppf file to use for the long section plots

Plotter type

plotter box

model

available plotters

type of plotter to use for the long section plots

Plot stem

the name to use for the plots - a number will be added when more than one page is produced

Clean plot model(s) beforehand tick box

*if ticked and the **plotter type** is **model**, the plot models are cleaned before the plots are created*

Generate cross section plot(s) tick box

if ticked, cross section plots are created

Cross section PPF file box

*.lplotppf files

binary ppf file to use for the cross section plots

Plotter type	plotter box	model
--------------	-------------	-------

available plotters

type of plotter to use for the cross section plots

Plot stem

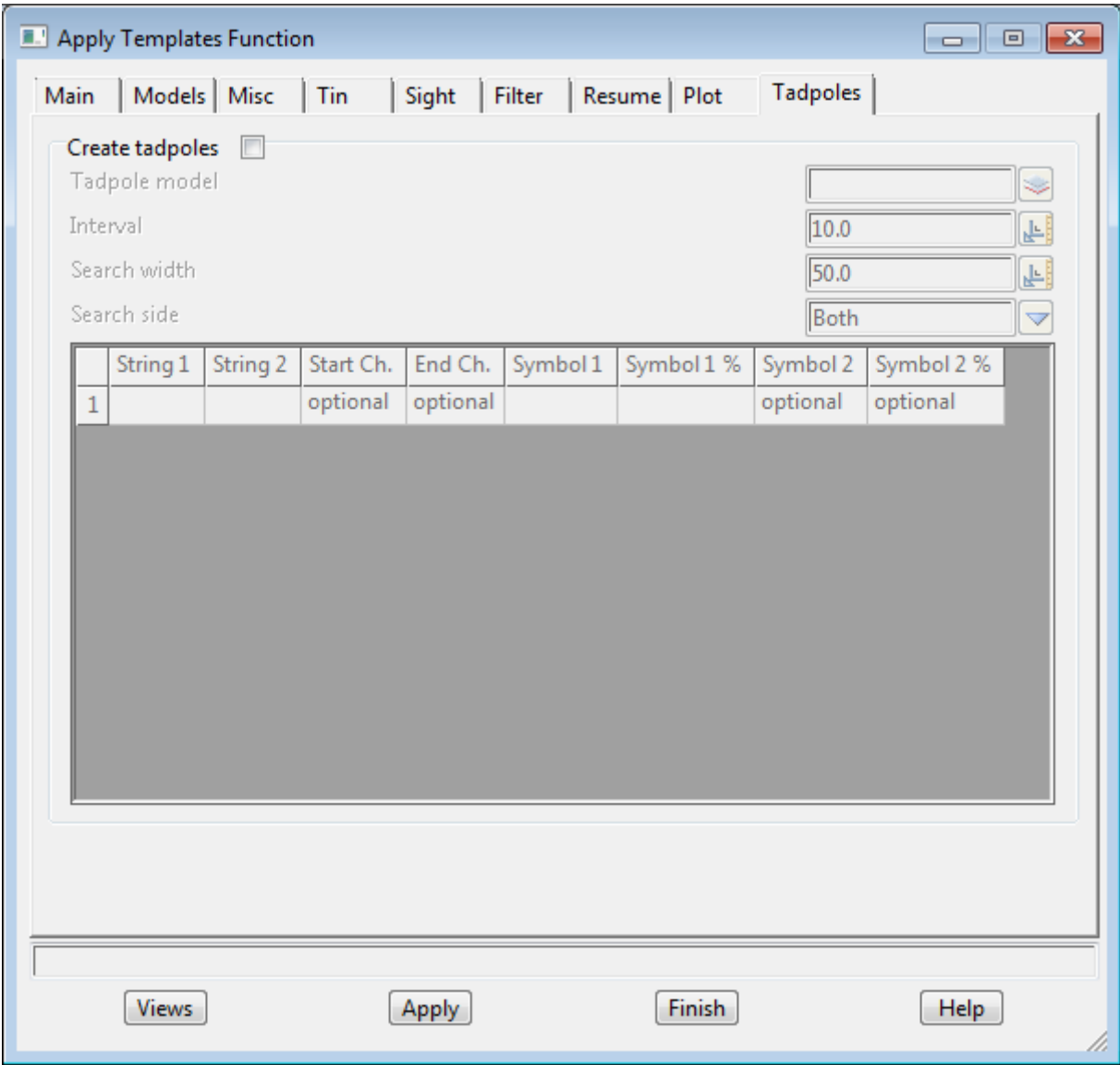
the name to use for the plots - a number will be added when more than one page is produced

Clean plot model(s) beforehand tick box

*if ticked and the **plotter type** is **model**, the plot models are cleaned before the plots are created*

Apply Many Tadpoles tab

the *Tadpole* tab controls the generation of batters ticks and tadpoles (hachure notation). For more information see the section [Create Cut/Fill Symbols](#) in the chapter [Drafting](#).



Create tadpoles tick box
if ticked, cut/fill symbols are created between given strings

Tadpole model model box available models
model for the created cut-fill symbols

Interval input 10
chainage distance between the symbols

Search width input 50
maximum distance to search to cut the strings for creating symbols. This is important for cases such as a bend in a road where multiple sets of string may then exist even when only searching out on one side of the road

Search side choice box both both, left side only

right side only

side of the reference string to search for strings to apply symbols to.

String 1 input

name of the point on the template to start symbol.

String 2

name of the point on the template to stop symbol.

Start Ch.

if blank, use the start chainage of the apply many.

If non blank, the chainage to start applying this symbol to.

End Ch. input

if blank, use the end chainage of the apply many.

If non blank, the chainage to stop applying this symbol to.

Symbol 1 symbol data

definition of the symbol to create at the given interval, or at twice the given interval if Symbol 2 is defined

Symbol 1 % input

if non-blank, percentage of the distance between String 1 and String 2 to apply the symbol.

If blank, the symbol is applied to the full distance between String 1 and String 2 (i.e. 100%)

Symbol 2 symbol data

definition of a second symbol to create at twice the given interval

Symbol 2 %

if non-blank, percentage of the distance between String 1 and String 2 to apply the symbol.

If blank, the symbol is applied to the full distance between String 1 and String 2 (i.e. 100%)

Apply Many Manager - Create/Update

Position of option on menu: **Design =>Apply =>Apply many manager**

This option is part of a process to manage your Apply Many Functions in conjunction with the Apply Many Defaults.

The Manager is in part an extension of the model naming convention within the defaults.

All models, except ROAD SURFACE STRINGS and ROAD SURFACE SECTIONS, can be toggled on and off when creating an Apply Many Function,

e.g.

BOXING STRINGS

BOXING SECTIONS

POLYGONS AND BOUNDARY POLYGONS

DESIGN TIN

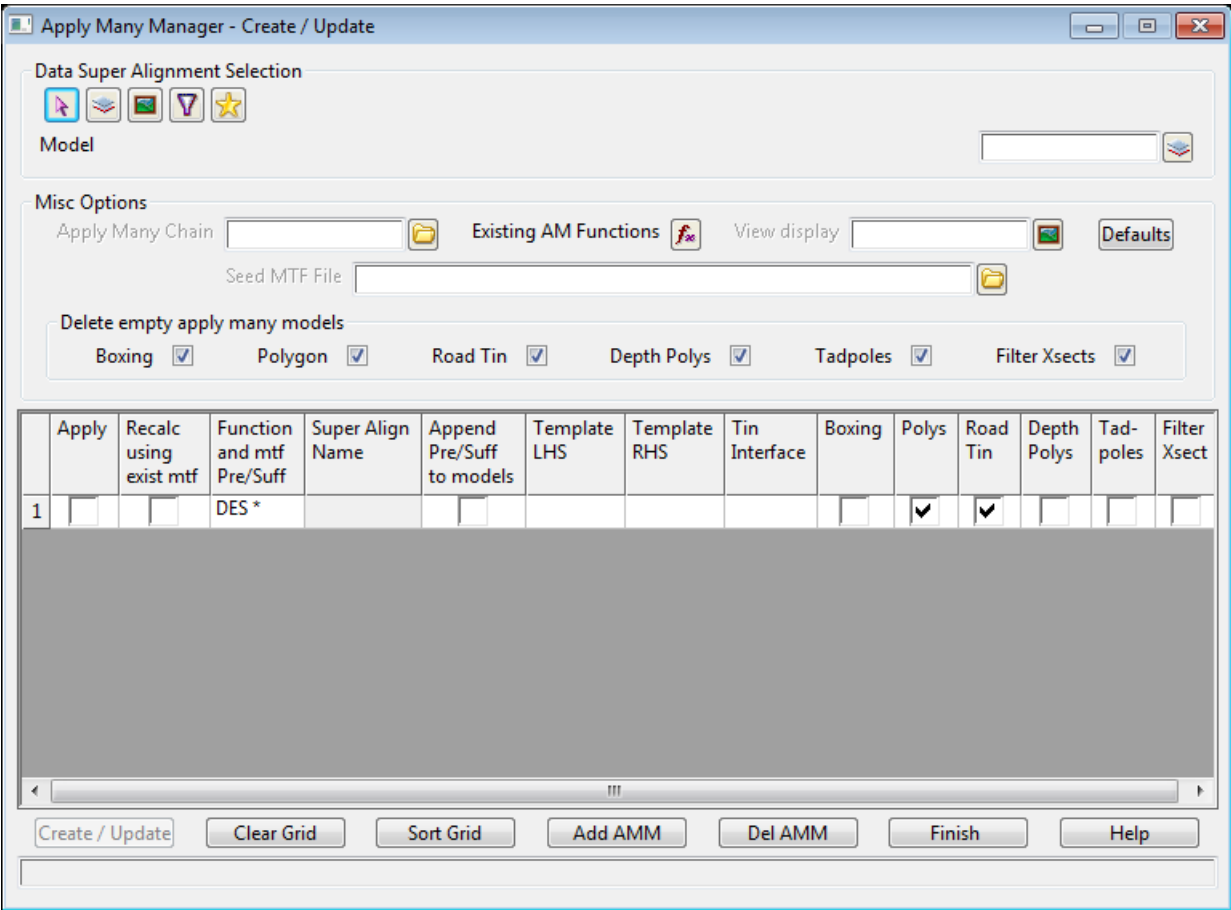
DEPTH POLYGONS

FILTER SECTIONS

TADPOLES

The Manager also allows one project model for ROAD SURFACE STRINGS, ROAD SURFACE SECTIONS, POLYGONS AND BOUNDARY POLYGONS and TADPOLES by using a new syntax in the Apply Many Defaults.

Selecting the **Apply many manager** option displays the **Apply Many Manager - Create / Update** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Misc Options

Apply Many Chain	file box	available *.rcn files
-------------------------	----------	-----------------------

If non-blank entry used as chain file of all the Apply Many Functions that are created at the time of process...optional

Existing AM Functions	function box	available functions
------------------------------	--------------	---------------------

This option will give you a list of all the existing AM Functions in the project, as a quick reference when creating new ones

View Display	view box	available views
---------------------	----------	-----------------

If non-blank entry used as view onto which design strings and sections models will be automatically added, for ease of viewing...optional

Defaults	button
-----------------	--------

*If selected a separate panel will appear that allows you to set up defaults that relate to how the main panel appears. Selecting **Defaults** brings up the **Defaults for startup** panel. For more information on the **Defaults for startup** panel, go to [Defaults For Startup](#)*

Seed MTF File	file box
----------------------	----------

If non-blank, entry used as a seed from which any default names for the application of future Superelevation/Widening will be set

Delete empty apply many models

Boxing	tick box	ticked
---------------	----------	--------

If ticked then any empty boxing models will be deleted when an existing AM is updated

Polygon	tick box	ticked
----------------	----------	--------

If ticked then any empty polygon models will be deleted when an existing AM is updated

Road Tin	tick box	ticked
-----------------	----------	--------

If ticked then any empty road tin models will be deleted when an existing AM is updated

Depth Polys	tick box	ticked
--------------------	----------	--------

If ticked then any empty depth polys models will be deleted when an existing AM is updated

Tadpoles	tick box	ticked
-----------------	----------	--------

If ticked then any empty tadpoles models will be deleted when an existing AM is updated

Filter Xsects	tick box	ticked
----------------------	----------	--------

If ticked then any empty filter xsects models will be deleted when an existing AM is updated

Grid

Apply tick box not ticked

Set to ticked once a SA selection string is accepted

If ticked and the <Create/Update> is selected, then the Apply Many will be created or an existing one recalced

If ticked and the <Del AMM> button is also selected, then the Apply Many Manager reference to that alignment will be deleted

If not ticked and the <Create/Update> is selected, then the Apply Many will NOT be created or an existing one recalced

Note: It is up to the user to delete the actual Apply Many Function and all associated data including the mtf

Recalc using exist mtf tick box

This tick box is an automatic indication of whether or not a Reference Super Alignment has an Apply Many Function already linked to it

There is no need for the user to use this box when creating or updating an Apply Many Function

It will be unticked if the reference has no Apply Many Function attached

In this case templates are required for Left, Right or both

It will be ticked if the reference does have one or more Apply Many Functions attached

In this case the existing AM will be updated using the existing MTF and reflect any changes in regards to models required

Function & mtf Pre/Suff input DES*

If non-blank, entry used as a prefix or suffix in conjunction with the Apply Many Reference Super Alignment Name

Example:

Reference SA name:	MC00
Pre/Suff:	DES*
Apply Many Function Name:	DES MC00
Reference SA name:	MC00
Pre/Suff:	* DES
Apply Many Function Name:	MC00 DES

If blank, the Apply Many Reference Super Alignment Name is used only

Apply Many Function Name:	MC00
---------------------------	------

Super Align Name input

Automatically populated, after the SA reference is selected

The Super Alignment Name entry cannot be changed as it comprises part of the Apply Many Function

name....refer above

Append Pre/Suff to models tick box not ticked

If ticked then the prefix or suffix will be combined with the SA name (refer above) and passed down to any default extensions from the Apply Many Defaults

*refer **Design=>Apply=>Apply Many Defaults***

Model Format for Apply Many Defaults:

Road Surface Strings e.g.

"DESIGN *" used in conjunction with a Pre/Suff of DES * and a SA name MC00, would result in a strings model called "DES DESIGN MC00"

"* DESIGN" used in conjunction with a Pre/Suff of DES * and a SA name MC00, would result in a strings model called "DES MC00 DESIGN"

There is a new addition to the format used by the Apply Many Manager, that allows one design strings model. That model can be used in all Apply Many Functions

"DESIGN &" would result in a strings model called just "DESIGN"

Note: The above format can also be used for the following Apply Many Models:

Model for Cross Sections"CROSS SECTIONS &"
Model for Polygons "VIS POLYGONS &"
Model for Road Boundary"ROAD BOUNDARIES &"
Model for Tadpoles "TADPOLES &"

Template LHS input

name of the template to be applied to the left side of the reference SA

Template RHS input

name of the template to be applied to the right side of the reference SA

Tin interface input

If non-blank, the name of the tin to calculate the cut/fill interfaces against at the end of the fixed part of the templates given in the left and right template fields

If blank, then only the fixed part of the templates is used unless a tin is specified in the decisions section of the templates

Boxing tick box not ticked

If ticked then all boxing models will be created

Polys tick box ticked

If ticked then both polygon models will be created

Road Tin tick box ticked

If ticked then road tin and model will be created

Depth Polys tick box not ticked

If ticked then depth polygon models will be created

Tadpoles tick box not ticked
If ticked then tadpole model will be created

Filter Xsect tick box not ticked
If ticked then filter xsection model will be created

Buttons

Create/Update button
A validation on the panel is carried out along with a check if an Apply Many Function being created, exists or not

Appropriate warning messages in the output window will be displayed

The Apply Many Function is created or an existing one is updated

If a new Apply Many is being created, then the grid on the AMM panel is refreshed and the tick box <Recalc using exist mtf> is set to ticked

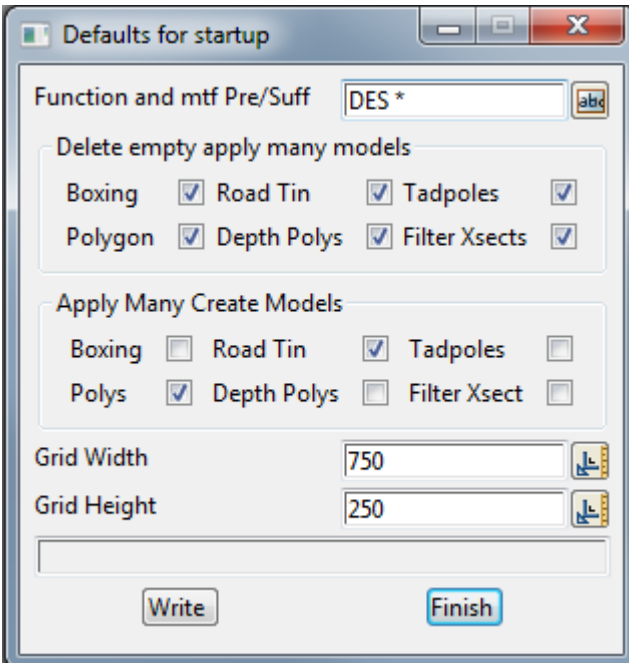
Clear Grid button
Clears the selection lines in the grid

Sort Grid button
Sorts the grid lines by placing lines where the <Recalc using exist mtf> box is ticked on, at the top of the grid

Add AMM button
For clarity...clear the grid first and then select the Super Alignment you wish to add another Apply Many Function to

Del AMM button
In order to delete (or remove) from the Apply Many Manager any connection to a Super Alignment, then first clear the grid, select the Super alignment and UNTICK the <Apply> box

Defaults For Startup



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Function & mtf Pre/Suff	input	DES*	
<i>If non-blank, entry used as a prefix or suffix in conjunction with the Apply Many Reference Super Alignment Name</i>			
Example:			
Reference SA name:		MC00	
Pre/Suff:		DES*	
Apply Many Function Name:		DES MC00	
Reference SA name:		MC00	
Pre/Suff:		* DES	
Apply Many Function Name:		MC00 DES	
<i>If blank, the Apply Many Reference Super Alignment Name is used only</i>			
Apply Many Function Name:		MC00	

Delete empty apply many models

Boxing	tick box	ticked
<i>If ticked then any empty boxing models will be deleted when an existing AM is updated</i>		
Polygon	tick box	ticked
<i>If ticked then any empty polygon models will be deleted when an existing AM is updated</i>		

Road Tin	tick box	ticked
<i>If ticked then any empty road tin models will be deleted when an existing AM is updated</i>		
Depth Polys	tick box	ticked
<i>If ticked then any empty depth polys models will be deleted when an existing AM is updated</i>		
Tadpoles	tick box	ticked
<i>If ticked then any empty tadpoles models will be deleted when an existing AM is updated</i>		
Filter Xsects	tick box	ticked
<i>If ticked then any empty filter xsects models will be deleted when an existing AM is updated</i>		

Apply Many Create Models

Boxing	tick box	not ticked
<i>If ticked then all boxing models will be created</i>		
Polys	tick box	ticked
<i>If ticked then both polygon models will be created</i>		
Road Tin	tick box	ticked
<i>If ticked then road tin and model will be created</i>		
Depth Polys	tick box	not ticked
<i>If ticked then depth polygon models will be created</i>		
Tadpoles	tick box	not ticked
<i>If ticked then tadpole model will be created</i>		
Filter Xsect	tick box	not ticked
<i>If ticked then filter xsection model will be created</i>		
Grid Width	real	750
<i>If non-blank entry used as width of grid on main panel</i>		
Grid Height	real	250
<i>If non-blank entry used as height of grid on main panel</i>		
Write	button	
<i>If selected, the defaults file (Create_Apply_Many_Manager_Panel.def) will be written out to the <.project> directory</i>		

Kerb Return

Position of option on menu: Design =>Apply =>Kerb return

The **kerb return** option is used to help create the vertical geometry for an alignment string being used as a kerb return.

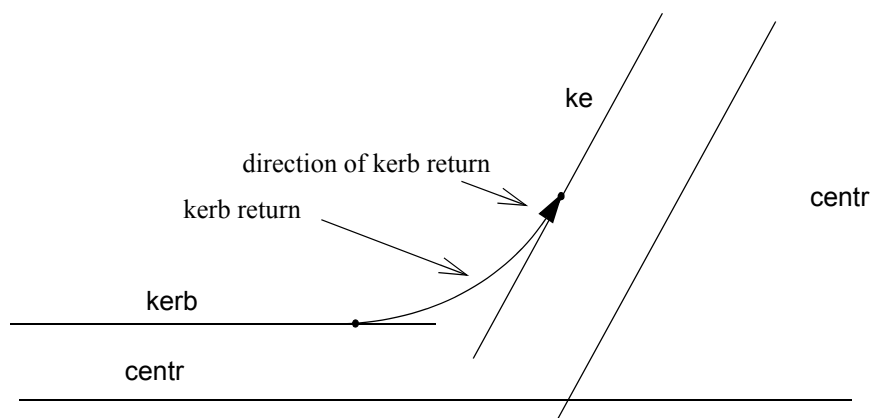
The standard situation is that in the plan view, the kerb return joins two kerb lines which already have z-values.

It is then necessary to define vertical geometry for the kerb return, usually taking into consideration the z-values and incoming grades from selected strings (often the centre lines and kerb strings).

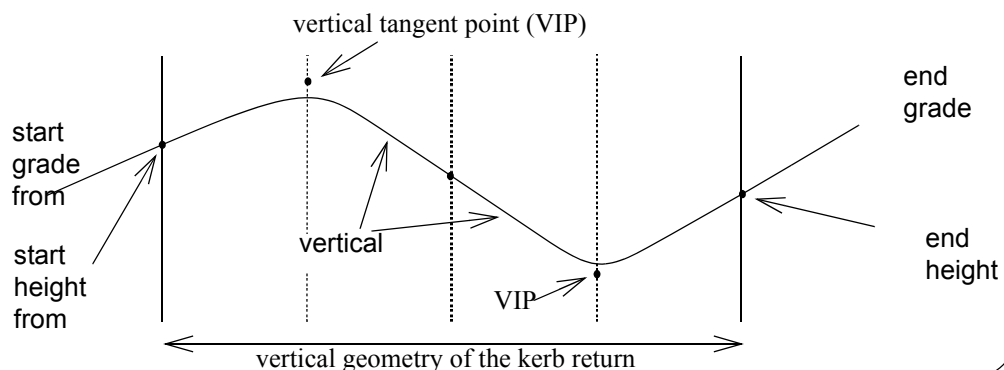
A standard first guess at the kerb return vertical geometry is known as the quarter point vertical geometry and it is defined by

- break the section along the kerb return into four equal pieces
- project the incoming grade from a selected start grade string to intersect the first quarter point line
- project back the outgoing grade from a selected end grade string to intersect the last quarter point line
- join the two projected intersection points
- define vertical intersection points (VIP's) at the intersection points
- create back to back vertical curves for the VIP's

Plan View of the Horizontal Geometry of the Kerb Return



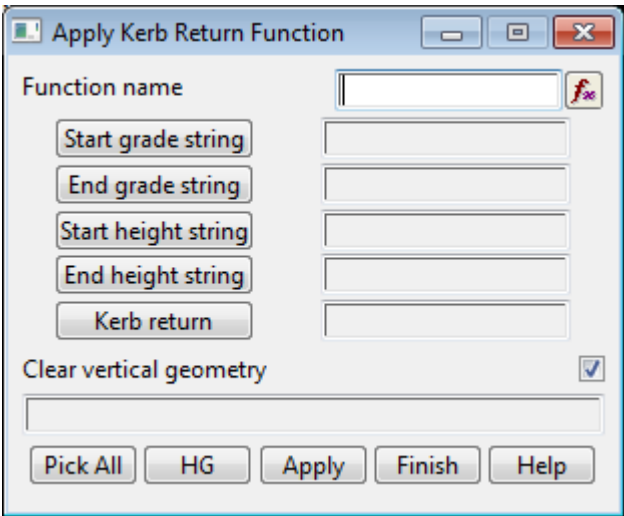
Section View of the Quarter-Point Vertical Geometry for the Kerb Return



The **kerb return** option creates a function which will automatically create the quarter-point vertical geometry for the kerb return and will recalculate it as required.

Note: the actual **direction** of the kerb is important - start grade and start height apply to the **start** of the kerb and end grade and end height apply to the **end of the kerb** where start and end are determined by the **actual direction** of the kerb (**not the picking direction**).

On selecting the **kerb return** option, the **apply kerb return function** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Function name <i>name of the function to define the apply for. If the function already exists and is picked from a pop-up or an <enter> is given at the end of the name, the information from the existing function will be placed in the appropriate panel fields.</i>	function box		available kerb functions
Start grade string <i>select the string to be used for the in grade at the start of the kerb return.</i>	string-select		
End grade string <i>select the string to be used for the out grade at the end of the kerb return.</i>	string-select		
Start height string <i>select the string to be used for the height at the start of the kerb return - this is used for the z-value at the start of the kerb return.</i>	string-select		
End height string <i>select the string to be used for the height at the end of the kerb return - this is used for the z-value at the end of the kerb return.</i>	string-select		
Kerb return <i>select the alignment string that is the kerb return.</i>	string-select		
Clear vertical geometry	tick box		

if ticked, the vertical geometry of the kerb return string is cleared as soon as the **apply** button is selected, or a recalc done.

Pick all button

if **pick all** is selected, the user is asked to sequentially select the four strings: the Start grade string, End grade string, Start height string and End height string. The strings are automatically assigned to the appropriate string-select panel fields.

HG button

brings up the **kerb return function create HG** panel. This option is currently under development.

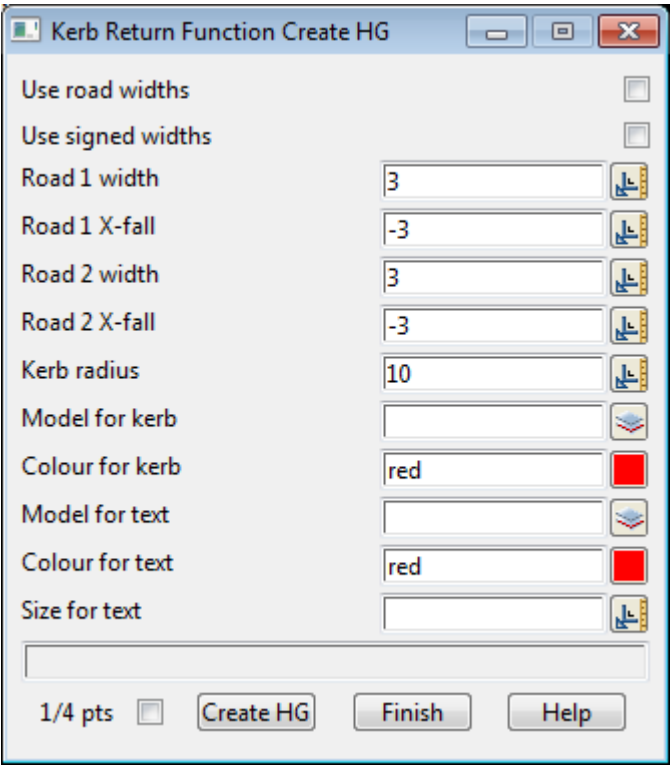
Apply button

if the kerb return has no vertical geometry (it will be automatically be deleted if the clear vertical geometry is set to **tick**) or the vertical geometry is the quarter-point geometry for the previous apply, then new quarter-point vertical geometry is created for the kerb return string.

Otherwise, nothing happens when the **apply** button is selected. That is, if the kerb return already has vertical geometry which is not the quarter-point geometry for the previous apply, and the clear vertical geometry is set to **no tick**, then **nothing happens** when the **apply** button is selected.

Note

The experimental **Kerb Return Function Create HG** panel is



String Modifiers

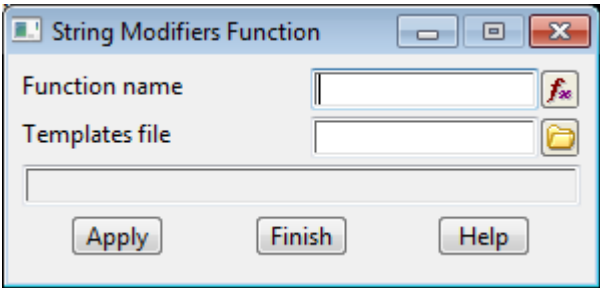
Position of option on menu: **Design =>Apply =>String modifiers**

The **String Modifiers** option is used to create vertical intersection points for an alignment string, or heights for a 2d, 3d, 4d, polyline or super string, using projection of heights from a selected string and user given cross-falls or cross-fall between two selected strings.

The **String Modifier** commands are actually part of an mtf file and are documented in the [Advanced Design](#) chapter of this manual.

This option allows the user to run just the **string_modifiers** section of the **mtf**.

Selecting **String Modifiers** displays the **String Modifiers Function** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Function name <i>name of the function to define the apply for. If the function already exists and is picked from a pop-up or an <enter> is given at the end of the name, the information from the existing function will be placed in the appropriate panel fields.</i>	function box		available template functions
Template file <i>the name of the many template file to use the string_modifiers section from.</i>	file box		available mtf files
Apply <i>apply the string_modifiers section of the many template file.</i>	button		

Interface

Position of option on menu: **Design =>Apply =>Interface**

An **interface** string is where the design meets the natural terrain - it shows the **extent** of the design. The method used for calculating the **interface string** for a given string, tin and cut and fill slopes, is as follows:

For a point on a string, an interface point is calculated by going off at right angles to the string along a line of fixed slope until either the tin is cut or a fixed (plan) distance is travelled. The slope of the line is either the cut or fill slope depending on whether the string point is below the tin (cut point) or above the tin (fill point).

The interface string for a string is constructed by calculating the interface points at regular intervals along the string and then joining the interface points together to form the interface string.

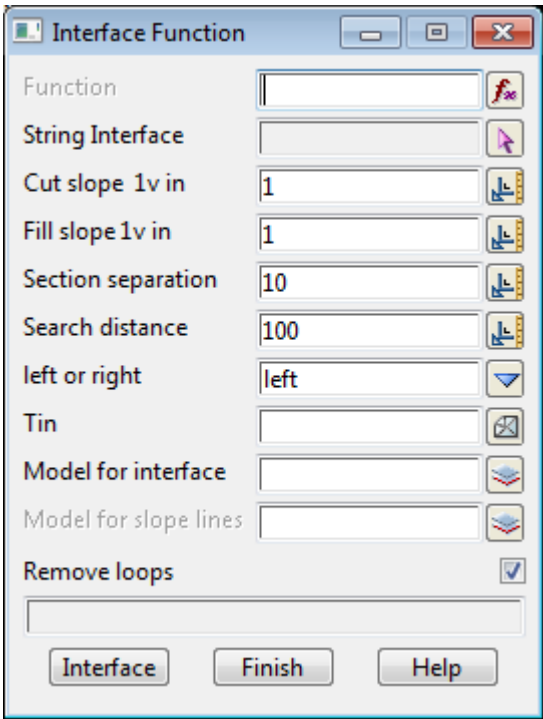
After calculating an interface string and examining the results, it is often necessary to make

changes to either the original string, the cut and fill slopes used, or even the tin used for interfacing against. The interface string and slope strings created during the **interface** would no longer be valid and need to be replaced by new information.

Although this can be accomplished by deleting the incorrect models and replacing them by new ones by re-applying the interface, this is would be time consuming if repeated over and over again. The **interface function** has been introduced to help reduce the work involved when re-calculating an interface string.

Basically, an **interface function** keeps track of all the information involved in creating an interface string and all the strings and models created during the **interface**. If either the original string, the cut and fill slope or the tin is subsequently modified, the interface functions can be re-run and all the old information automatically deleted and replaced by the updated information.

On selecting **interface**, the **interface function** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Function	<i>name of the function to define the interface for. If the function already exists and is picked from a popup or and an <enter> is given at the end of the name, the information from the existing function will be placed in the appropriate panel fields.</i>	function box		available interface functions
String interface	<i>select the string to calculate the interface from.</i>	string select box		
Cut slope 1 v in	<i>the slope of the interface line if a point is in cut. A cut slope of one vertical to the given value of horizontal units is used. Positive is up for a cut slope. A value 0 is used to designate a horizontal line.</i>	input	1.0	
Fill slope 1 v in	<i>the slope of the interface line if the point is in fill. A fill slope of one vertical to the given value of horizontal units is used. Positive is down for a fill slope. A value 0 is used for a horizontal line.</i>	input	1.0	

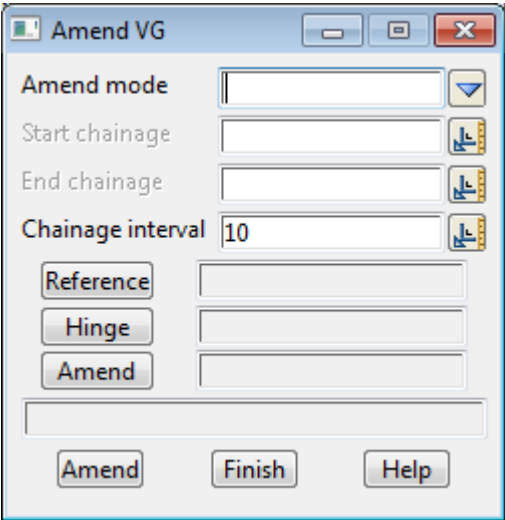
Section separation	input	10	
<i>the distance between the points on the selected string that interface points will be calculated from.</i>			
Search distance	input	100	
<i>the (plan) distance to search along the interface line to see if the tin has been intersected. If the tin has not been intersected then the z-value at the end of the interface line is taken as the interface point z-value.</i>			
Left or right	choice box	left	left, right
<i>the interface point is calculated by going out at right angles to the selected string. It is possible to go to either the left or the right depending on the value of this field.</i>			
Use super strings	tick box		
<i>if ticked, the interface and cut and fill slope lines are created as super strings.</i>			
Tin	tin box		available tins
<i>name of the tin that the interface points will be calculated against.</i>			
Model for interface	model box		available models
<i>name of the model to contain the calculated interface string.</i>			
Model for slope lines	model box		available models
<i>if not blank, name of the model to contain the lines connecting the string points with the interface points (the slope lines). If the field is blank, no slope lines are recorded. If blank, the slope lines are not created.</i>			
Remove loops	tick box		tick
<i>if tick, the strings and sections created by the Interface function are process to try an remove any loops from the strings, and create sections that don't cross each other. That is, remove any places where a string crosses over itself, or sections cross each other. Loops in the strings and crossing sections often occur on the inside of curves or the inside of adjacent lines.</i>			
Interface	button		
<i>An interface string is calculated using the selected string and the parameters defined in the panel. The interface string points are coloured red if the original string point was in cut and green if the original string point was in fill.</i>			
<esc> can be used to abort the interface option.			

Amend VG

Position of option on menu: **Design =>Apply =>Amend VG**

Amend VG is used to modify the vertical geometry of an alignment string using a variety of methods including linear interpolation cubic reverse and circular reverse interpolating or by extending crossfall between two given strings.

Selecting **Amend VG**, the **Amend VG** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Amend mode	choice box		linear, cubic reverse, circular reverse, VG linear, Extend Xfall

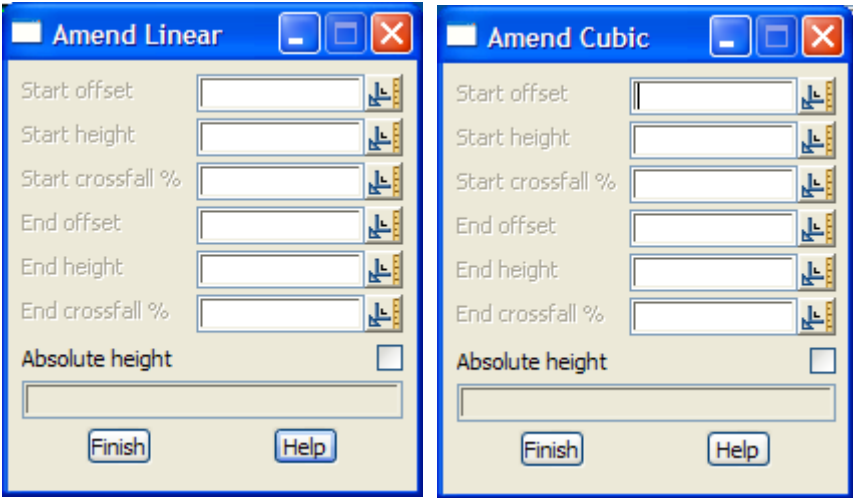
*if **linear**, a panel to input the values for **Start offset/height/crossfall %**, **End offset/height/crossfall %** and **Absolute height** is displayed and filled in to define how to modifying the vertical geometry of the **Amend** string*

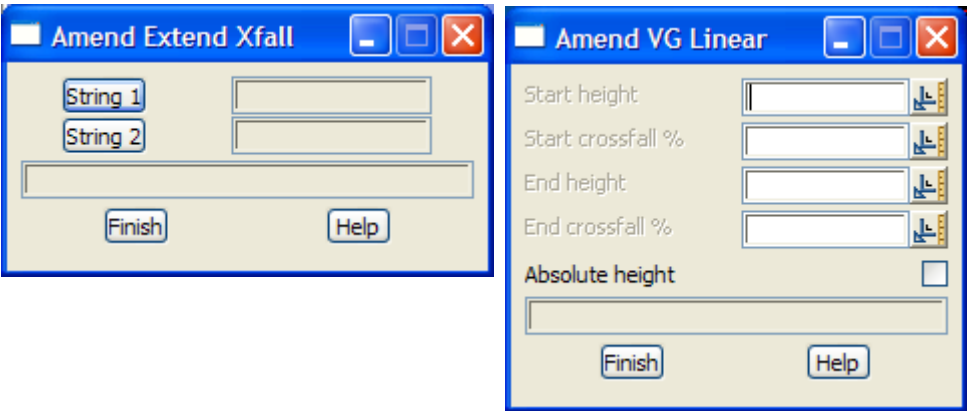
*If **cubic reverse**, a panel to input the values for **Start offset/height/crossfall %**, **End offset/height/crossfall %** and **Absolute height** is displayed and filled in to define how to modifying the vertical geometry of the **Amend** string*

*If **circular reverse**, no extra information is needed to define how to modifying the vertical geometry of the **Amend** string*

*If **VG linear**, a panel to input the values for **Start height/crossfall %**, **End height/crossfall %** and **Absolute height** is displayed and filled in to define how to modifying the vertical geometry of the **Amend** string*

*If **Extend Xfall**, a panel to select the two strings to extend the crossfall from is displayed and filled in to define how to modifying the vertical geometry of the **Amend** string*



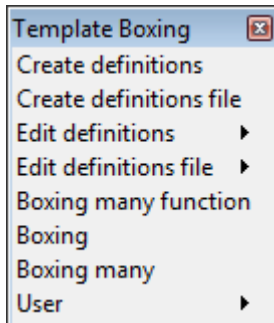


- Start chainage** input
chainage to start modifying the vertical geometry of a string
- End chainage** input
chainage to stop modifying the vertical geometry of a string
- Chainage interval** input 10
chainage interval to apply the vertical geometry modification
- Reference** string select box
*select the reference string to define chainage and perpendicular. If there is no **Hinge** string, then z-values are only taken from the Reference string.*
chainage interval to apply the vertical geometry modification
- Amend** string select box
*select the reference string to define chainage and perpendicular. If there is no **Hinge** string, then z-values are only taken from the Reference string.*
- Hinge** string select box
if selected, the string to take z-values from
- Amend** string select box
the string to have its vertical geometry amended
- Amend** button
amend the vertical geometry of the Amend string between the start and end chainages

Boxing

Position of menu: Design =>Boxing

The Boxing walk-right menu is



In the **Apply Many** option, **boxing** can be applied to the generated design sections by special commands in the **MTF**.

However, it is also possible to apply boxing as a post process to a model of x-sections as long as the x-sections were generated in the 4d super string format (this is done by both Apply options and the Cuts options - see [Cuts](#)).

For more information on boxing, see [What is Boxing ?](#) and for more information on the various scenarios for generating boxing, see [Applying Boxing](#).

The rules for calculating different types of boxing are known as **Boxing Definitions** and *Boxing Definition* are created and stored in a **Boxing** file.

The **Boxing**, and the different **Boxing Definitions** contained within the file, are created/edited using the options **Create** and **Edit** from the **Template Boxing** menu.

The options **Boxing many function**, **Boxing many** and **Boxing** use the *Boxing Definitions* to generate boxing.

For the option <i>Create definitions</i> , go to	Create Boxing Definitions
<i>Create definitions file</i>	Create Definitions Text File
<i>Edit definitions</i>	Edit Boxing Definitions
<i>Edit definitions file</i>	Edit Definitions Text File
<i>Boxing many function</i>	Boxing Many Function
<i>Boxing</i>	Boxing
<i>Boxing many</i>	Boxing Many

Create Boxing Definitions

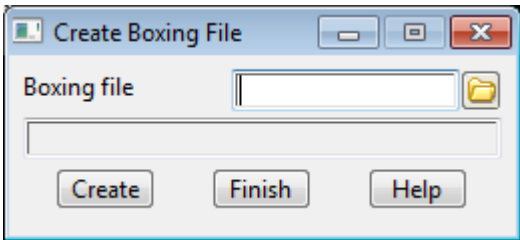
Position of option on menu: Design =>Boxing =>Create definitions

The rules for calculating different types of boxing are known as **Boxing Definitions** and *Boxing Definition* are created and stored in a **Boxing** file.

The **Boxing=>Create definitions** option is used to create a new **Boxing** file (*.bf), and then the **Edit Boxing Definitions** panel is opened for the **Boxing** file to create and add new *Boxing Definitions*. The **Edit Boxing Definitions** panel is then used to write the **Boxing** file to disk.

and can be edited using the **Boxing =>Edit definitions** option, or by standard text editor.

Selecting **Create definitions** displays the **Create Boxing File** panel.

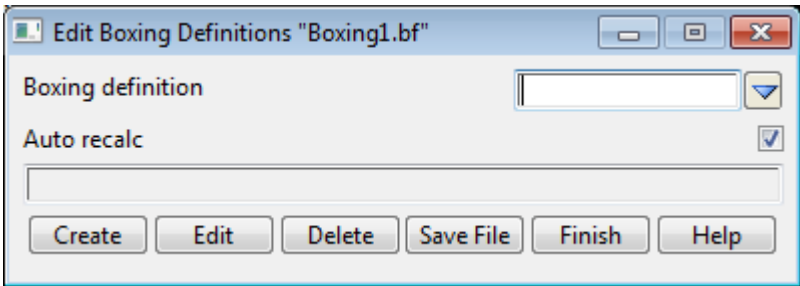


The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Boxing file <i>name of the boxing file to create.</i>	file box		*.bf files

Create button
*create a boxing file with name given by the boxing file panel fields.
If the file given in the boxing file field does not exist, then the **Edit Boxing Definitions** panel is placed on the screen and is used to created and edit the boxing definitions for the boxing file.
If the file already exists, then nothing will happen on selecting **Create**.*

When **Create** is selected from the **Create Boxing File** panel, it brings up the **Edit Boxing Definitions** panel which is used to create and edit the boxing definitions, and to saved the boxing definitions to disk in the boxing file.



For information on the **Edit Boxing Definitions** panel, go to [Edit Boxing File](#) in the chapter [Advanced Design](#).

The **Edit Boxing Definitions** panel is described in the section [Edit Boxing File](#) in the chapter [Advanced Design](#).

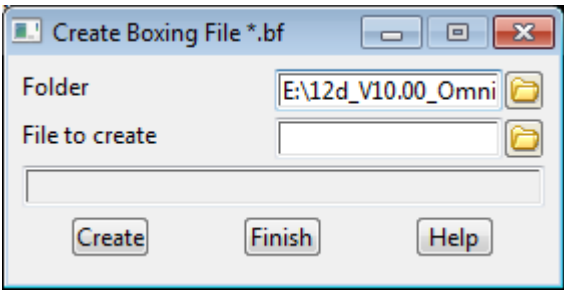
Create Definitions Text File

Position of option on menu: **Design =>Boxing =>Create definitions file**

The **Boxing=>Create definition file** option is used to create a new **Boxing** file (*.bf) with the text editor pointed to by the EDIT_4D environment variable.

The created text file will already have a section header set up for a boxing called "1"(key word and opening and closing brackets).

Selecting **Create definitions file** brings up the **create boxing file *.bf** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Folder <i>name of the folder for the .bf file.</i>	folder box	current folder	
File to create <i>name of the file to create.</i>	file box		*.bf files
Create <i>create a Boxing file given by the folder and file to create panel fields. If the file given in the file to edit field does not exist, then a new file is created which already has a section header set up.</i>	button		

For more information on boxing, see [What is Boxing ?](#) and for more information on the various scenarios for generating boxing, see [Applying Boxing](#).

The text format for the *Boxing* file is described in the section [Text Format of the Boxing File](#) the chapter [Advanced Design](#).

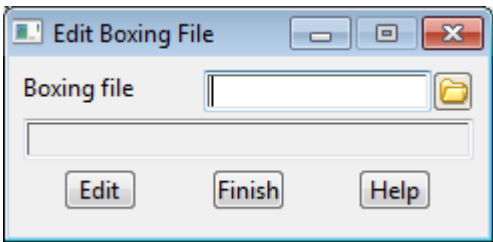
Edit Boxing Definitions

Position of option on menu: **Design =>Boxing =>Edit definitions**

The **Boxing =>Edit definitions** option is used to edit *Boxing* files (*.bf).

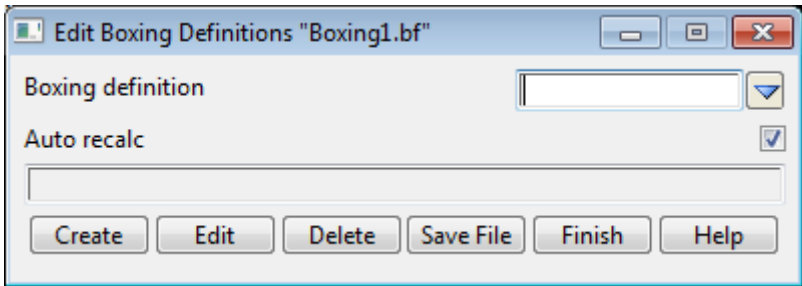
The **Boxing =>Edit definitions** option has two modes of operation - selecting the **Boxing =>Edit definitions** itself, or by activating the **Boxing =>Edit definitions** option's walk-right menu, **folder *.bf**.

Clicking on **Boxing=>Edit definitions** itself brings up the **edit boxing file** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Boxing file <i>name of the boxing file to edit.</i>	input		*.bf files
Edit <i>edit the file given by boxing file panel field.</i> <i>If the file given in the boxing file field exists, then the Edit Boxing Definitions panel is brought up to create/edit the boxing definitions in the boxing file.</i>	button		



Similarly, walking right on **Boxing=>Edit** provides a list all the boxing files (files ending in .bf) in the current folder and when a file is selected from the list, the **Edit Boxing Definitions** panel is brought up for the selected boxing file.

The **Edit Boxing Definitions** panel is described in the section [Edit Boxing File](#) in the chapter [Advanced Design](#).

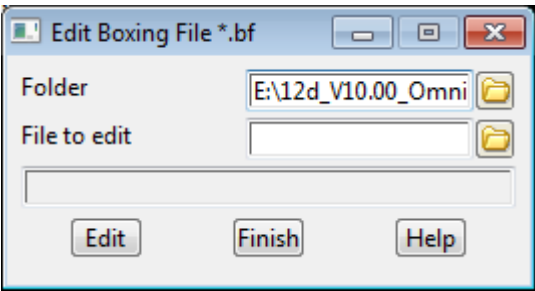
Edit Definitions Text File

Position of option on menu: **Design =>Boxing =>Edit definitions file**

The **Boxing=>Edit definitions file** option is used to edit boxing files (*.bf) with the text editor pointed to by the EDIT_4D environment variable.

The **Boxing=>Edit definitions file** option has two modes of operation - selecting the **Boxing=>Edit definitions file** itself, or by activating the **Boxing=>Edit definitions file** option's walk-right menu, **folder *.bf**.

Selecting **Boxing=>Edit definitions file** itself brings up the **edit boxing file *.bf** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Folder <i>name of the folder for the .bf file.</i>	input	current folder	
File to edit <i>name of the file, in folder, to edit.</i>	input		*.bf files
Edit <i>edit the file given by the folder and file to edit panel fields. If the file given in the file to edit field does not exist, then a new file is created which already has a section header set up.</i>	button		

The **Boxing=>Edit definitions file** walk-right menu provides a list all the boxing files (files ending in .bf) in the current folder. When a file is selected from the list, it is automatically loaded into the text editor.

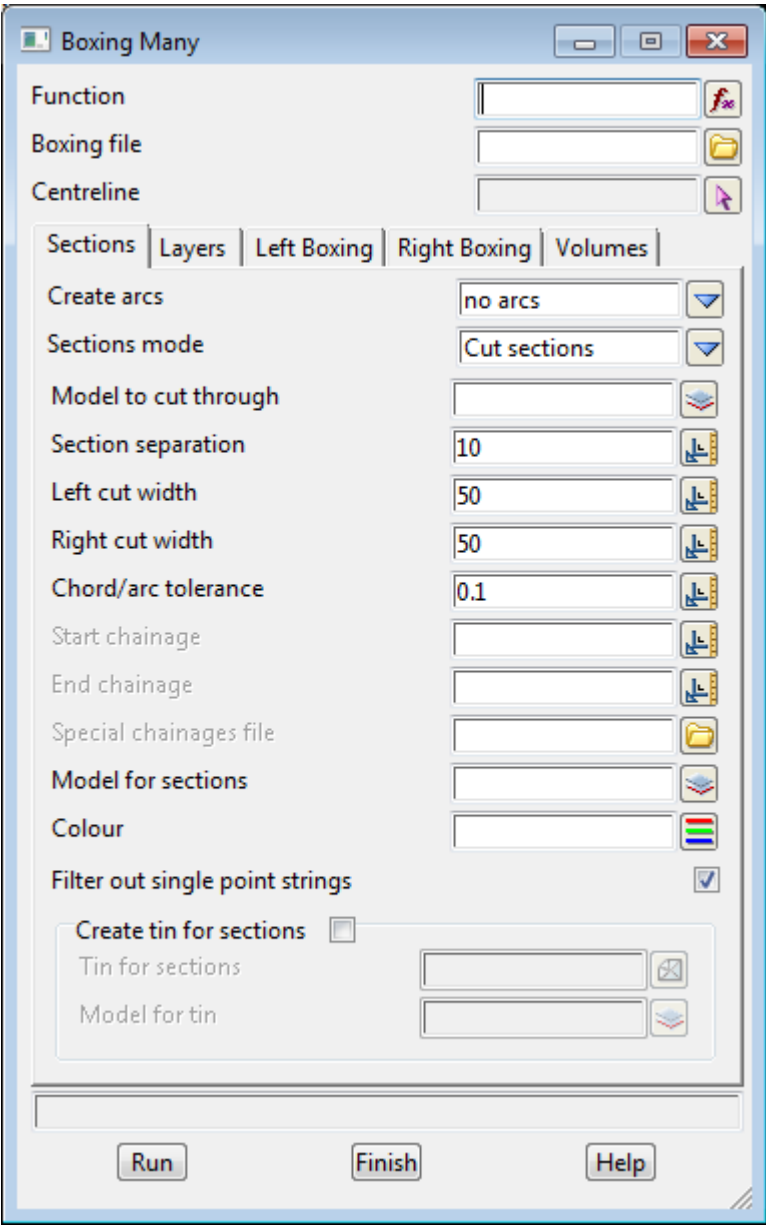
The format for the boxing file is described in the [Text Format of the Boxing File](#) section in the chapter [Advanced Design](#).

Boxing Many Function

Position of option on menu: **Design =>Boxing =>Boxing many function**

This option is used to cut strings to create sections and then apply up to eight layers of boxing to the cut sections.

Selecting **Boxing many function** displays the **Boxing Many** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Function <i>name of the Boxing function</i>	function box		available boxing functions
Boxing file	file box		*.bf files

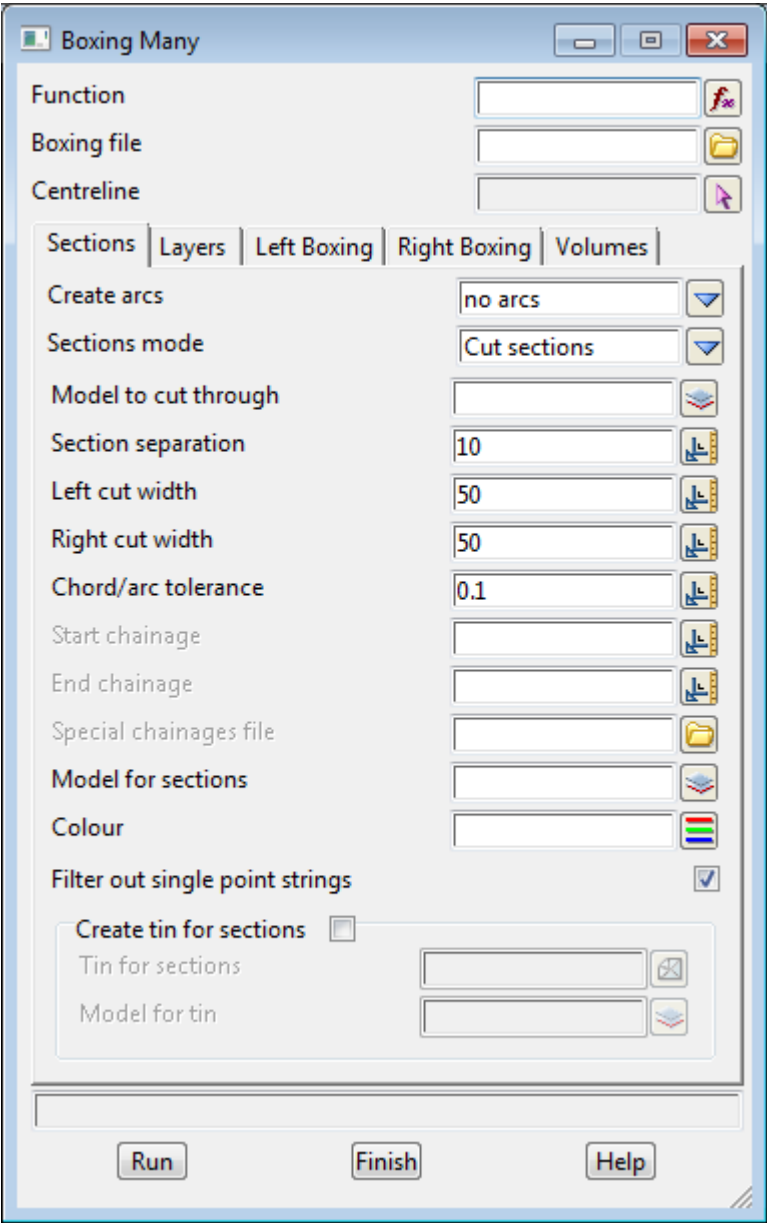
the Boxing file that contains the Boxing Definition that are be applied to the cut sections

Centreline string select
string to use for chainage, and perpendicular, for cutting cross sections to apply the boxing to

For the information on each **Boxing Many** tab, go to

- [Sections tab](#)
- [Layers tab](#)
- [Left Boxing tab](#)
- [Right Boxing tab](#)
- [Volumes tab](#)

Sections tab



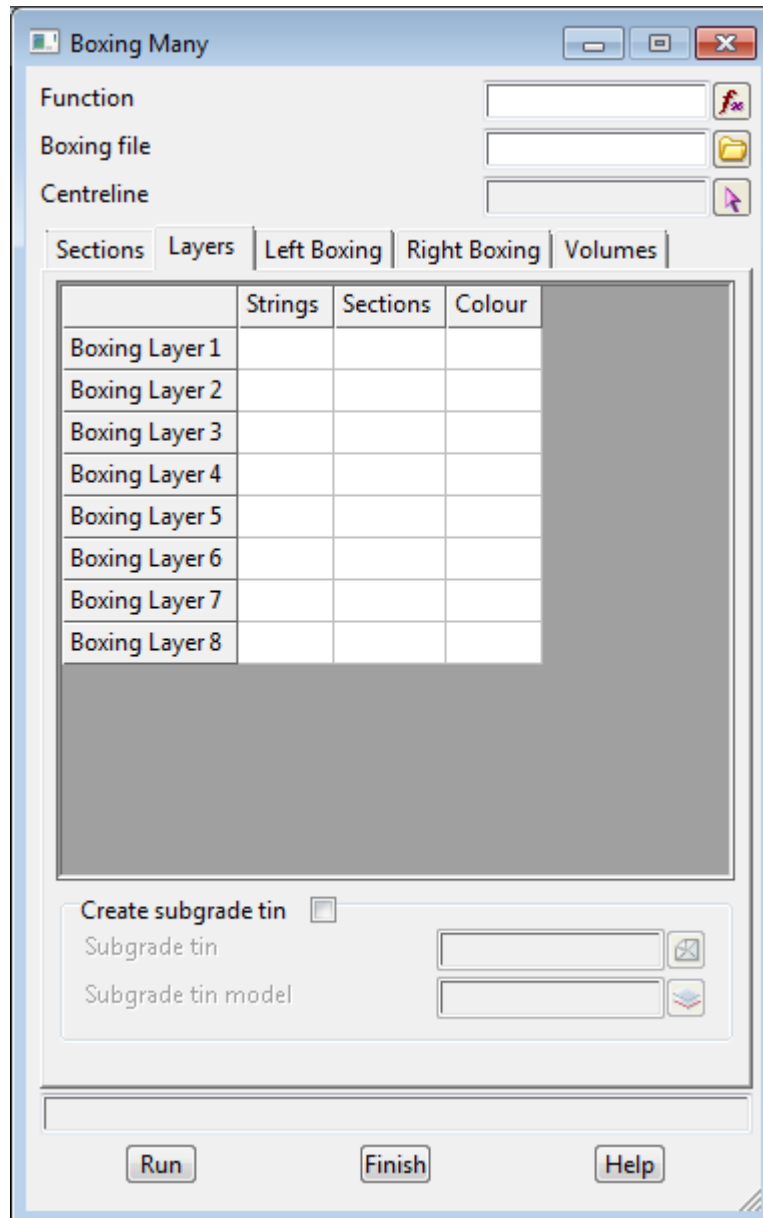
Sections mode choice box Cut sections, Use existing sections

if Cut section, sections are cut through the strings in the Model to cut through and placed in Model for sections.
If User existing sections, no sections are cut and the existing sections in Model for sections are used to apply the boxing to.

Model to cut through	model box	available models
<i>model of strings to cut sections through</i>		
Section separation	input	10
<i>the distance along the selected centre line to generate plan section lines to be used to cut through the model or view.</i>		
Left/Right cut width	input	50
<i>the left/right distance to go out from the centre line for creating a section to cut through the strings.</i>		
Chord/arc tolerance	input	default chord/arc tolerance
<i>the chord to arc tolerance to use on the selected string for determining how many plan sections are created around horizontal curves.</i>		
Start/End chainage	input	
<i>if non-blank then sections for the cuts are restricted to between the given start and end chainage of the selected centreline string</i>		
Special chainages file	file box	*.spf files
<i>a file containing chainages, one per line, that are also used as extra chainages to create cross sections at</i>		
Model for sections	model box	available models
<i>model for the cut cross sections</i>		
Colour	colour box	available colours
<i>colour for the cut cross sections</i>		
Filter out single point strings	tick box	
<i>if ticked, don't save any sections that only have a single point in them</i>		
Create tin for sections	tick box	
<i>if ticked, a tin of the cross sections in Model for sections is created</i>		
Tin for sections	tin box	available tins
<i>name of the tin of cross sections</i>		
Model for tin	model box	available models
<i>model for the cross sections tin</i>		

Layers tab

the layers tab consists of a grid for defining up to eight layers of boxing strings and sections.
*The last boxing layer is also referred to as the **subgrade** layer.*



Boxing Layer 1-8:

if the model names are non blank, boxing strings and sections will be created for that layer.

For more information on boxing, see [What is Boxing ?](#).

Strings

*if non-blank, pre*post text to use with the function name to create the name of the model for the boxing strings for this layer.*

If blank, the boxing strings will not be stored for this layer.

Sections input available models

*if non-blank, pre*post text to use with the function name to create the name of the model for the boxing sections for this layer.*

If blank, the boxing sections will not be stored for this layer.

Colour	colour box	available colours
<i>colour for the boxing sections for this layer</i>		

Create subgrade tin	tick box	
<i>if ticked, then a tin of the subgrade strings and sections is created. Note - the subgrade is the last boxing layer.</i>		

Subgrade tin	tin box	available tins
<i>name for the subgrade tin</i>		

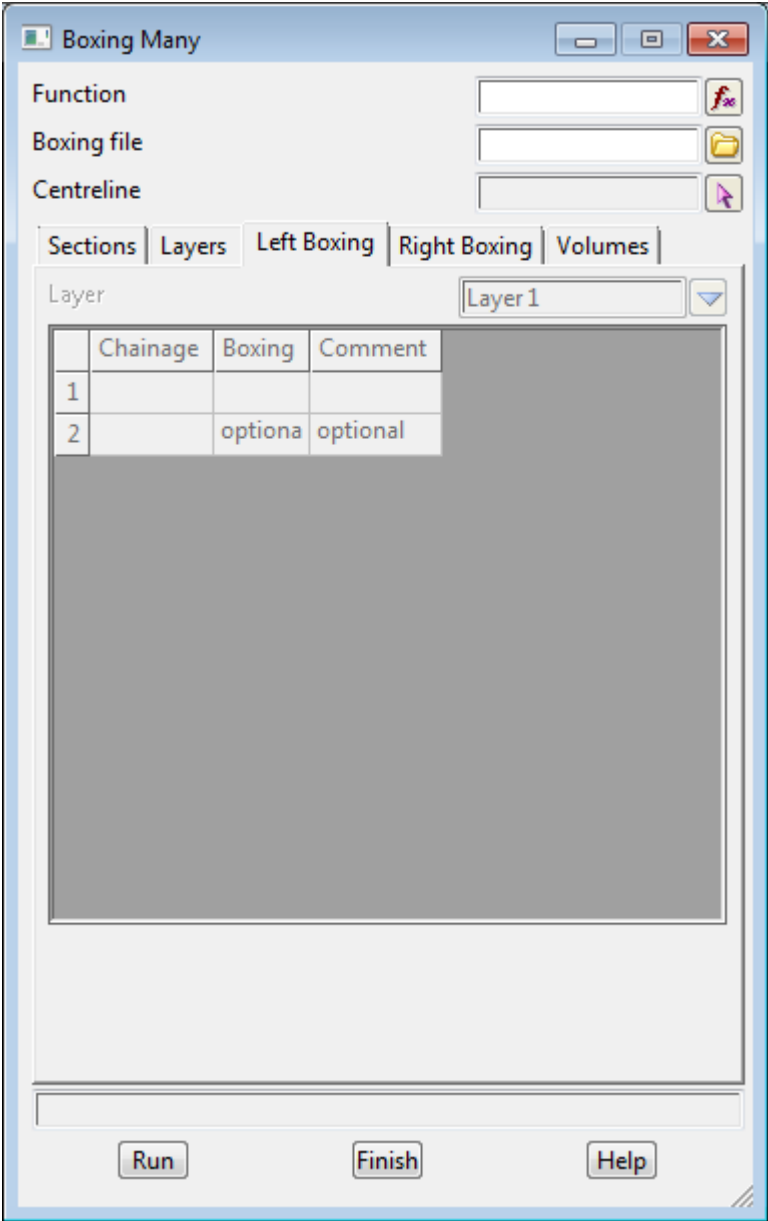
Subgrade tin model	model box	available models
<i>model for the subgrade tin</i>		



Left Boxing tab

tab for applying left boxing - gives the chainage range and boxing definitions to use for each of the eight layers of boxing

For more information on boxing, see [What is Boxing ?](#).



Layer choice box Layer 1, Layer 2 ... Layer 8
as each layer is selected, a grid for defining the chainages and boxing definition that applies to that chainage are given in the grid

For each selected layer:

Chainage input available models
for the selected boxing layer, the chainage range to apply the boxing definition to

Boxing boxing definition box boxing definitions

*the boxing definition to use with the given chainage range. The pop-up lists all the boxing definitions in the **Boxing file***

Comment

record a comment

Right Boxing tab

tab for applying right boxing - gives the chainage range and boxing definitions to use for each of the eight layers of boxing

For more information on boxing, see [What is Boxing ?](#).

Boxing Many

Function

Boxing file

Centreline

Sections | Layers | Left Boxing | Right Boxing | Volumes

Layer

	Chainage	Boxing	Comment
1			
2		optiona	optional

Layer

choice box

Layer 1, Layer 2 ... Layer 8

as each layer is selected, a grid for defining the chainages and boxing definition that applies to that chainage are given in the grid

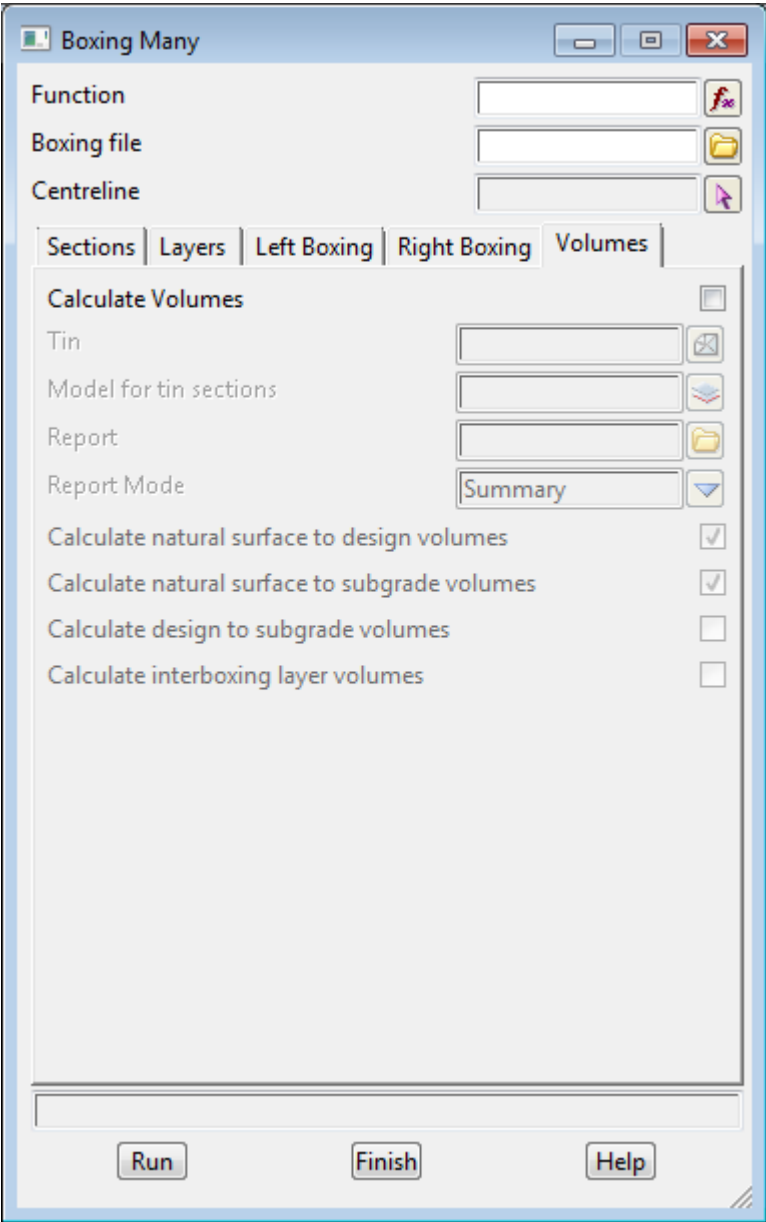
For each selected layer:

Chainage input available models
for the selected boxing layer, the chainage range to apply the boxing definition to

Boxing boxing definition box boxing definitions
*the boxing definition to use with the given chainage range. The pop-up lists all the boxing definitions in the **Boxing file***

Comment
record a comment

Volumes tab



Calculate volumes tick box

if ticked, then end area volumes are created

Tin tin box available tins
name of the natural surface tin - required if volumes to the natural surface are calculated

Model for tin sections model box available models
if non blank, model to put the natural surface sections into

Report file file box *.rpt
if non-blank, the name of the file to contain the volume report. If the file already exists, the report will be appended to the file.

If blank, no report is produced.

Report mode choice box Summary, Full
*if **Summary**, the report only contains the final volumes.*

*If **Full**, the report contains sections by section areas and volumes as well as the summary of volumes.*

Calculate natural surface to design volumes tick box tick
if ticked, end area volumes between the natural surface and the design strings are written to the report file

Calculate natural surface to subgrade volume tick box tick
if ticked, end area volumes between the natural surface to the subgrade (the last boxing layer) are written to the report file

Calculate design to subgrade volumes tick box tick
if ticked, end area volumes between the design strings and the subgrade (the last boxing layer) are written to the report file.

Calculate inter-boxing layer volumes tick box tick
if ticked, end area volumes between each of the boxing layers are written to the report file.

Run button
run the option

For more information on boxing, see [What is Boxing ?](#) and for more information on the various scenarios for generating boxing, see [Applying Boxing](#).

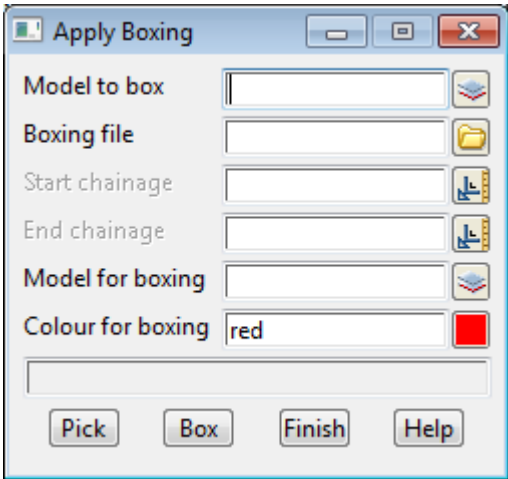
Boxing

Position of option on menu: **Design =>Boxing =>Boxing**

Selecting **boxing** displays the **apply boxing** pane.

This panel is used to create boxing sections by applying the first **Boxing Definition** in a *Boxing* file, to a selected 4d super string or model of sections created as 4d super strings. Only the one *Boxing Definition* is used for all of the sections.

The **Apply Boxing** panel is



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Model to box <i>model of sections (in 4d string format) to apply the boxing definition to.</i>	model box		available models
Boxing file <i>name of the file containing the boxing definition to be applied to the sections in the model to box.</i>	file box		*.bf files
Start/End chainage <i>the start/end string chainage for applying boxing. If blank, then the start/end chainage is taken to be the chainage at the beginning/end of the picked string.</i>	input		
Model for boxing <i>model for the created boxing x-sections</i>	model box		available models
Colour for boxing <i>colour for the boxing x-sections</i>	colour box		available colours
Pick <i>after picking the Pick button, any selected strings will have the boxing applied to them.</i>	button		
Box <i>apply the first Boxing Definition given in the Boxing file to the sections in the model to box that are between the given Start chainage and End chainage.</i>	button		

For more information on boxing, see [What is Boxing ?](#) and for more information on the various scenarios for generating boxing, see [Applying Boxing](#).

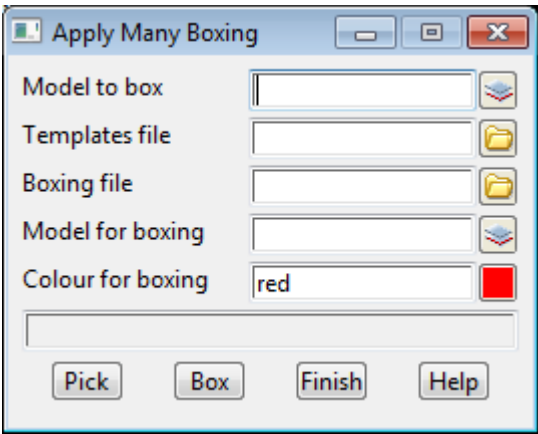
Boxing Many

Position of option on menu: **Design =>Boxing =>Boxing many**

This panel can be used to create boxing sections by applying the **Boxing Definitions** as specified in an MTF file. to a selected 4d super string or to a model of sections.

If an individual 4d super string is picked, the option uses the Boxing defined for the chainage where the section 4d string was created.

Selecting **Boxing Many** displays the **Apply Many Boxing** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Model to box <i>model of sections (in 4d string format) to apply the boxing definition to.</i>	model box		available models
MTF file <i>name of the MTF file which contains the application of the Boxing Definitions to the sections given in the Model to box panel field.</i> <i>If Boxing file is blank, use the Boxing file given in the MTF file.</i> <i>If Boxing file is non-blank, then all the Boxing Definitions referred to in the MTF file are taken from the Boxing file.</i>	file box		*.mtf files
Boxing file <i>If non-blank, then all the Boxing Definitions referred to in the MTF file are taken from the Boxing file. That is, the Boxing file given in the MTF file is NOT used for the Boxing Definitions.</i> <i>If blank, use the Boxing file given in the MTF file.</i>	file box		*.bf files
Model for boxing <i>model for the created boxing x-sections</i>	model box		available models
Colour for boxing <i>colour for the generated boxing x-sections</i>	colour box		available colours
Pick	button		

*after picking the **Pick** button, any selected strings will have the boxing applied to them.*

Box button

apply the boxing as given by the MTF file, using the boxing definitions in the Boxing file, to the 4d sections in the Model for boxing field. The new boxing sections are added to the Model for boxing.

For more information on boxing, see [What is Boxing ?](#) and for more information on the various scenarios for generating boxing, see [Applying Boxing](#).

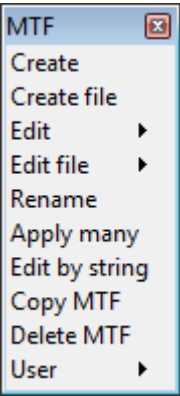
MTF

Position of menu: **Design =>MTF**

In the **Apply Many** option, a **MTF file** is used to control the application of templates, modifiers, boxing etc to the Hinge string.

The full definition for the MTF file is given in the section [MTF - Many Templates File](#) in the chapter [Advanced Design](#).

The **MTF** walk-right menu is



Each option in this menu will now be described.

For the option <i>Create</i> , go to	Create MTF
<i>Create file</i>	Create File
<i>Edit</i>	Edit
<i>Edit file</i>	Edit File
<i>Rename</i>	Rename MTF
<i>Apply many</i>	Apply Many
<i>Edit by string</i>	Edit by String
<i>Copy MTF</i>	Copy MTF
<i>Delete MTF</i>	Delete MTF

Create MTF

Position of option on menu: **Design =>MTF =>Create**

The **MTF=>Create** option is used to create a new MTF file (*.mtf).

The created MTF file is written to disk and can be edited using the **MTF=>Edit** option, or a standard file editor.

Selecting **Create** displays the **Create MTF File** panel.

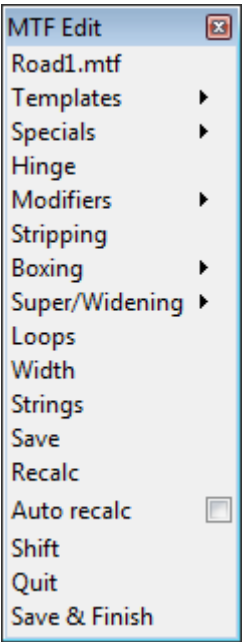


The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
MTF file <i>name of the MTF file to create.</i>	file box		*.mtf files
Seed MTF file <i>name of an MTF file to load into the new MTF file. This allows standard information to be automatically included in the new MTF file. The Seed MTF file is just a standard MTF file with the extension after the . changed to mtf_seed</i>	file box		*.mtf_seed files
Centreline <i>if a centreline string is selected, it is used for selecting chainages in the MTF</i>	string select		
Create <i>create an MTF file with name given by the MTF file panel fields. If the file given in the MTF file field does not exist, then the MTF Edit menu is placed on the screen and is used to created and edit the MTF sections in the MTF file. If the file already exists, then nothing will happen on selecting Create.</i>	button		

MTF Edit

When **Create** is selected from the **Create MTF File** panel, it brings up the **MTF Edit** menu which is used to create and edit the MTF sections to be saved in the MTF file.

	
Road1.mtf	name of mtf file being edited
Templates	create/edit template table
Specials	special chainages to use
Hinge	create/edit hinge modifiers
Modifiers	" " " modifiers table
Stripping	" " " stripping depths
Boxing	" " " boxing table
Super/Widening	strings to apply super/widening to
Loops	removed loops in strings from mtf
Width	set maximum section width
Strings	create/edit string modifiers
Save	save the mtf information to a file
Recalc	recalc the Apply many with this mtf
Auto recalc	if ticked a recalc is done when "Apply" is clicked on Modifiers panels
Shift	apply a delta chainage to the mtf
Quit	quit without saving the information
Save & Finish	finish, remove the menu

The **MTF Edit** menu is described in the section [MTF - Many Templates File](#) in the chapter [Advanced Design](#).

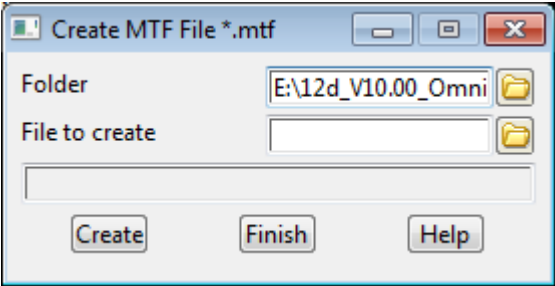
Create File

Position of option on menu: **Design =>MTF =>Create file**

The **MTF=>Create file** option is used to create a new many templates files (*.mtf) with the text editor pointed to by the EDIT_4D environment variable.

The created file will already have all the section headers (key words and opening and closing brackets) in it.

Selecting **Create file** brings up the **Create MTF File *.mtf** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Folder <i>name of the folder for the .mtf file.</i>	folder box	current folder	
File to create	file box		*.mtf files

name of the file to create. The new MTF file already has each of the section headers set up.

Create button

create an MTF file given by the Folder and File to create panel fields. If the file given in the File to edit field already exists, then an error occurs.

The text format for the MTF file is described in the section [Text Format of the MTF File](#) in the chapter [Advanced Design](#).

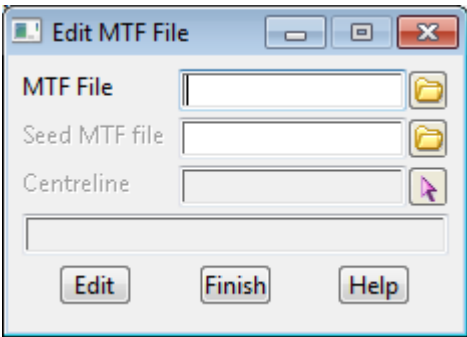
Edit

Position of option on menu: Design =>MTF =>Edit

The MTF=>Edit option is used to edit mtf files (*.mtf).

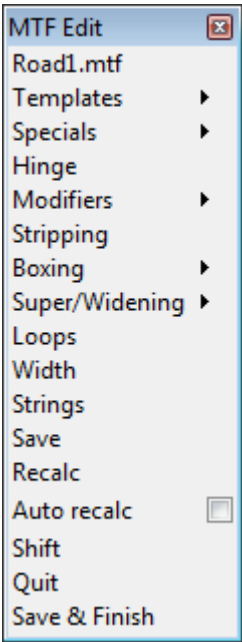
The MTF=>Edit option has two modes of operation - selecting the MTF=>Edit itself, or by activating the MTF=>Edit option's walk-right menu, **folder *.mtf**.

Selecting MTF=>Edit itself brings up the **Edit MTF File** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
MTF file <i>name of the MTF file to edit</i>	file box		*.mtf files
Seed MTF file <i>for a new MTF file, the name of an MTF file to load into the new MTF file. This allows standard information to be automatically included in the new MTF file. The Seed MTF file is just a standard MTF file with the extension after the . changed to mtf_seed</i>	file box		*.mtf_seed files
Centreline <i>if a centreline string is selected, it is used for selecting chainages in the MTF</i>	string select		
Edit <i>edit the file given by MTF file panel field. If the file given in the MTF file field exists, then the MTF Edit menu is brought up to create/edit the MTF sections.</i>	button		



- name of mtf file being edited
- create/edit template table
- special chainages to use
- create/edit hinge modifiers
- " " " modifiers table
- " " " stripping depths
- " " " boxing table
- strings to apply super/widening to
- removed loops in strings from mtf
- set maximum section width
- create/edit string modifiers
- save the mtf information to a file
- recalc the Apply many with this mtf
- if tick a recalc is done when "Apply" is clicked on Modifiers panels
- apply a delta chainage to the mtf
- quit without saving the information
- finish, remove the menu

Similarly the **MTF=>Edit** walk-right menu provides a list all the MTF files (files ending in .mtf) in the current folder. When a MTF file is selected from the list, the **Edit MTF File** panel is brought up to create/edit the MTF sections.

The **MTF Edit** menu is described in the section [MTF - Many Templates File](#) in the chapter [Advanced Design](#).

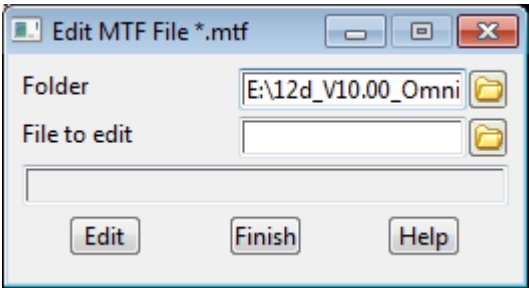
Edit File

Position of option on menu: **Design =>MTF =>Edit file**

The **MTF=>Edit file** option is used to edit MTF files (*.mtf) with the text editor pointed to by the EDIT_4D environment variable.

The **MTF=>Edit file** option has two modes of operation - selecting the **MTF=>Edit file** itself, or by activating the **MTF=>Edit file** option's walk-right menu, **folder *.mtf**.

Selecting **MTF=>Edit file** itself brings up the **Edit a MTF File *.mtf** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Folder	folder box	current folder	
<i>name of the folder for the .mtf file.</i>			

File to edit file box *.mtf files
name of the MTF file, in Folder, to edit.

Edit button
edit the MTF file given by the Folder and File to edit panel fields by the text editor pointed to by the EDIT_4D environment variable. If the file given in the File to edit field does not exist, then a new file is created which already has each of the section headers set up.

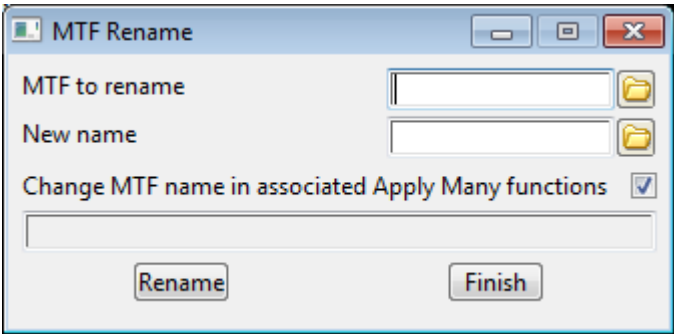
Similarly the **MTF=>Edit file** walk-right menu provides a list all the MTF files (files ending in .mtf) in the current folder. When a file is selected from the list, it is automatically loaded into the text editor.

The text format for the MTF file is described in the section [Text Format of the MTF File](#) in the chapter [Advanced Design](#).

Rename MTF

Position of option on menu: **Design =>MTF =>Rename**

Selecting **Rename** brings up the **MTF Rename** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
MTF to rename <i>name of the MTF file to rename</i>	file box		*.mtf files
New name <i>new name for the MTF file</i>	file box		*.mtf files
Change MTF name is associated Apply Many functions <i>if ticked, rename the MTF in all functions that include it</i>	tick box		
Rename <i>rename the MTF file to the new name</i>	button		

Apply Many

Position of option on menu: Design =>MTF =>Apply many

The **Apply Many** option is used to apply a MTF file to a selected hinge string.

The option has already been described under **Design=>Apply=>Apply many**.

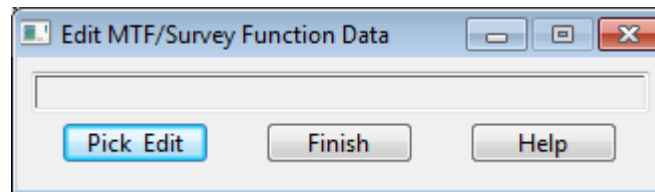
For the description of *Apply many*, please go to the section [Apply Many](#).

Edit by String

Position of option on menu: Design =>MTF =>Edit by string

The **Edit by string** option is used to edit the **MTF** by selecting a string created by the **MTF** in an **Apply Many**.

Selecting **Edit by string** brings up the **Edit MTF/Survey Function Data** panel:

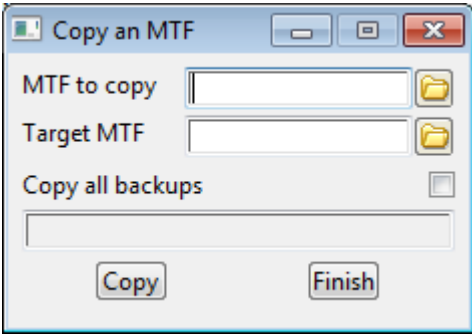


After selecting the **Pick Edit** button, a string created by MTF function is selected and the MTF editor is started for the MTF.

For information on the *MTF Editor*, go to the section [MTF Edit](#).

Copy MTF

Position of option on menu: **Design =>MTF =>Copy**
Selecting **Copy** brings up the **Copy an MTF** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
MTF to copy <i>name of the MTF file to copy</i>	file box		*.mtf files
Target MTF <i>new name for the MTF file</i>	file box		*.mtf files
Copy all backups <i>if ticked, copy all the backup files of the MTF as well</i>	tick box		
Copy <i>copy the MTF file to the new name</i>	button		

Delete MTF

Position of option on menu: **Design =>MTF =>Delete**
Selecting **Delete** brings up the **Delete an MTF** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
MTF to delete <i>name of the MTF file to delete</i>	file box		*.mtf files
Delete all backups <i>if ticked, delete all the backup files of the MTF as well</i>	tick box		
Delete <i>delete the MTF file</i>	button		

Estate Lots

Position of menu: Design => Estate/Lots

This module is currently under development.

The Estate Lots module is for creating house lots for an Estate (Subdivision).

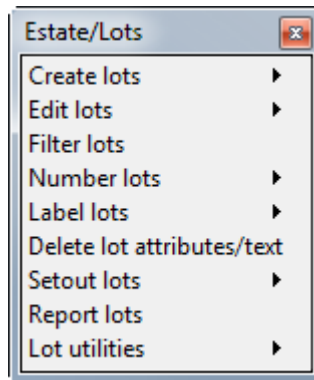
There are options to create and edit lots by a variety of methods. Once the lots are created they can be numbered, given a lot type (see [Lot types](#)) and labelled.

The labelling includes labelling the side of lots with bearing and distances, lots with areas and lot numbers.

Reports of lot areas and types can be created and lots coloured according to areas.

Finally options exist to create point numbers and reports for setting out the lots.

The **Estate/Lots** walk-right menu is:



For the option *Create lots*, go to

Edit lots

Filter lots

Number lots

Label lots

Delete lot attributes/text

Setout lots

Report lots

Lot utilities

[Create Lots](#)

[Edit Lots](#)

[Filter Lots](#)

[Number Lots](#)

[Label Lots](#)

[Delete Lot Attributes and Text](#)

[Setout Lots](#)

[Report Lots](#)

[Lot Utilities](#)

Lot types

Lots can have a **type** which is used in reports. The lot types are defined in a text file called *lottypes.4d* which is searched for in the standard library areas (see [Library](#), [User Library](#), [Customer Library](#)).

For example of *lottypes.4d* is

park

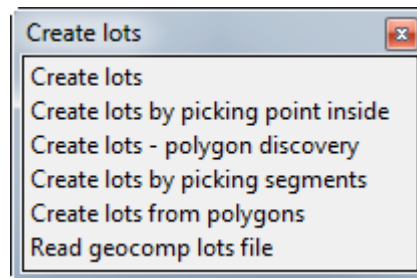
road

other

surround
McDonalds

Create Lots

Position of menu: Design => Estate/Lots => Create lots



For the option *Create lots*, go to

Create lots by picking point inside

Create lots- polygon discovery

Create lots by picking segments

Create lots from polygons

Read geocomp lots file

[Create Lot](#)

[Create Lot from Picking](#)

[Polygon Discovery](#)

[Create Lot from Picking Segments](#)

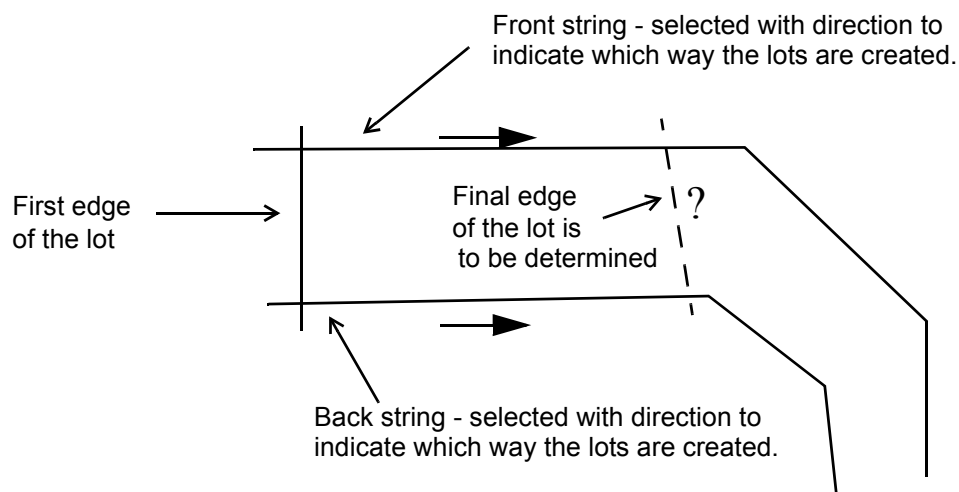
[Create Lot from Polygon](#)

[Read Geocomp Lots File](#)

Create Lot

Position of option on menu: Design => Estate/Lots => Create lots => Create lot

This option creates lots of a user given area using the front and back strings for a number of lots and an initial **straight line edge** of a lot. The final edge of the lot then needs to be determined.

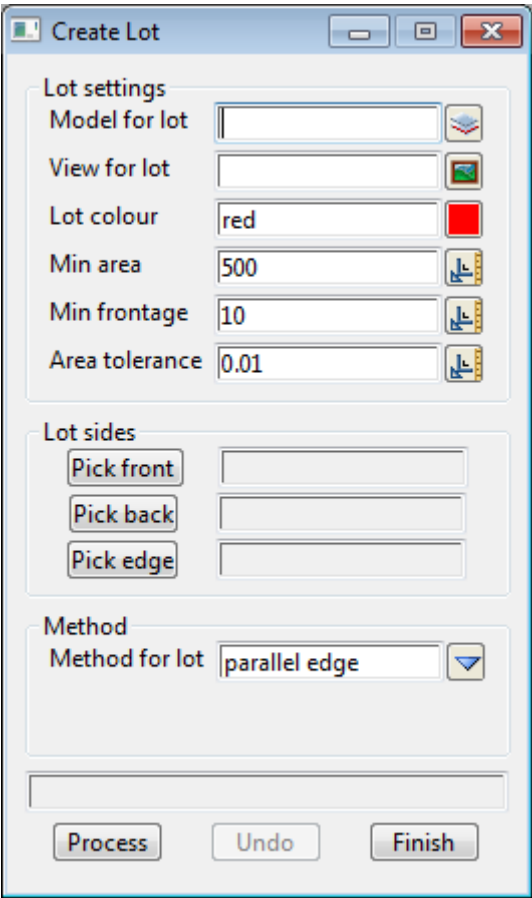


The methods of creating the final edge of lot are:

- parallel the existing side - *parallel edge*. See [Parallel Edge](#)
- having the same bearing as a selected line - *parallel pick*. See [Parallel Pick](#)
- having a given bearing - *parallel bear*. See [Parallel Bearing](#)
- perpendicular to either the front string or the back string - *perpendicular*. See [Perpendicular](#)

[and Perpendicular Pick](#)

- (e) perpendicular to either the front string or the back string but starting from a user selected point - *perpen start pt.* See [Perpendicular and Perpendicular Pick](#)See [Perpendicular and Perpendicular Pick](#)
- (f) pivoting about a selected point - *pivot pick.* See [Pivot Pick and Pivot Frontage](#)
- (g) pivoting about the point at minimum frontage - *pivot frontage.* See [Pivot Pick and Pivot Frontage](#)
- (h) closing a selected string - *close string.* See [Close String](#)



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Model for lot <i>model for the created lot.</i>	model box		available models
View for lot <i>view to add model of created lot to.</i>	view box		available views
Lot colour <i>colour for the created lot.</i>	colour box		available colours
Min area	double box		

required area of the created lot.

Min frontage input box
required minimum frontage of the created lot.

Area tolerance double box
lot to be created can be within this tolerance of the minimum area.required area of the created lot.

Pick front string select
pick the string to form the front of the created lot.

Pick back string select
pick the string to form the back of the created lot.

Pick edge string select
*pick the **straight** line to form the edge of the created lot.*

The front, back and edge form three sides of the lot to be created.

Method choice box parallel edge parallel edge, parallel pick
parallel bear, perpendicular,
perpen start pt, pivot pick,
pivot frontage, close string

pick the string to form the back of the created lot.

Process button
use the selected front, back and edged and then create the final side of the lot by the selected method.

Continue to the next section [Creating Lots from a Front and Back String and an Edge](#) for a full description of each method of creating the lots.

Creating Lots from a Front and Back String and an Edge

Parallel Edge

This method creates a lot of a user specified area using user selected front and back strings and a user selected initial edge. The final edge then needs to be determined to define the lot.

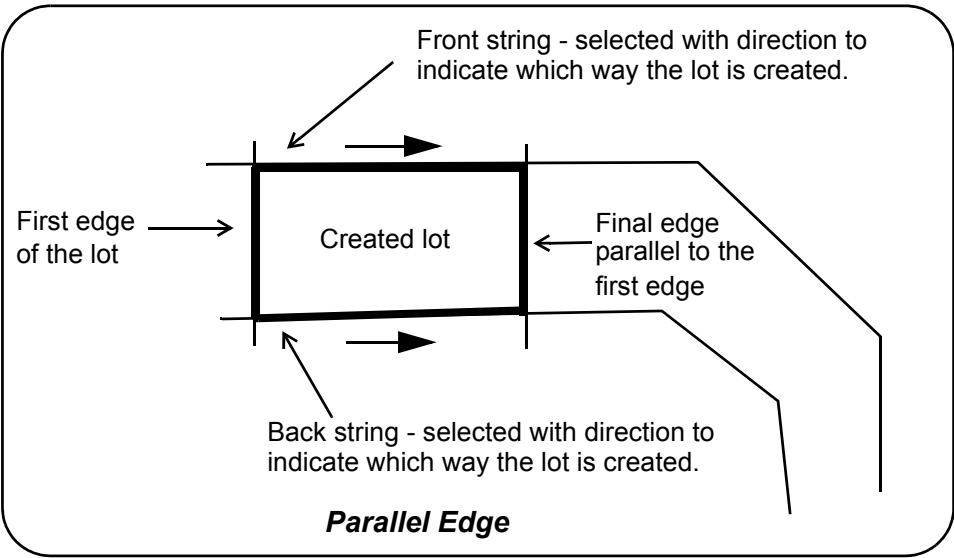
The front and back strings **must** be selected **with direction** to indicate which direction to move along them to form the lot. The front and back strings can not be closed strings and must be different strings. The front and back strings can have more than one segment and can have straight or arc segments.

The initial edge must cut or be very close to cutting the front and back strings. The **initial edge** must be **one straight line segment**. It can not be an arc.

For *Parallel Edge*, the **final edge** is created parallel to the initial edge and is positioned along the front and back strings in their selected direction so that the lot has the user given area (to within the area tolerance).

The lot is only created if the new edge is at least the minimum frontage distance along the front string.

When the lot is created, the final edge is automatically set as the initial edge for the calculation of the next lot.



Parallel Bearing

This method creates a lot of a user specified area using user selected front and back strings and a user selected initial edge. The final edge then needs to be determined to define the lot.

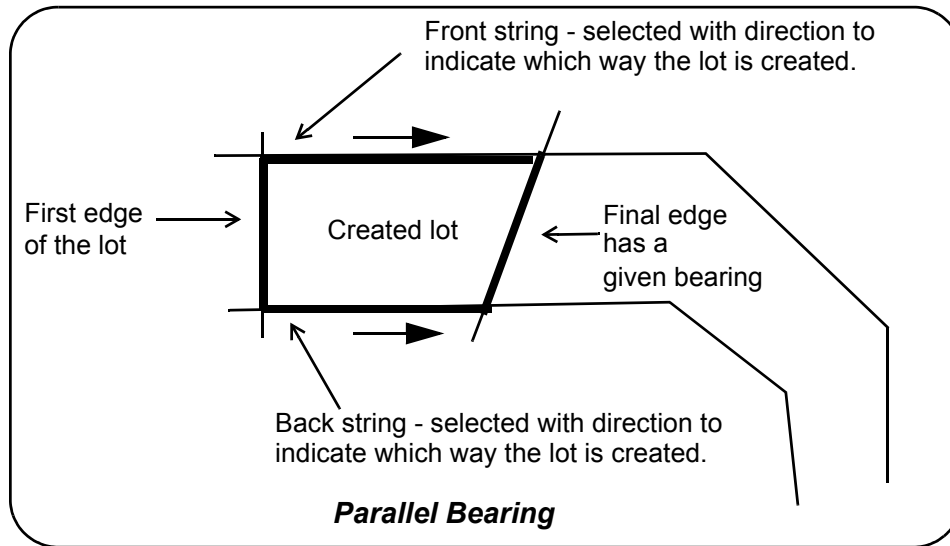
The front and back strings **must** be selected **with direction** to indicate which direction to move along them to form the lot. The front and back strings can not be closed strings and must be different strings. The front and back strings can have more than one segment and can have straight or arc segments.

The initial edge must cut or be very close to cutting the front and back strings. The **initial edge** must be **one straight line segment**. It can not be an arc.

For *Parallel Bear*, the **final edge** is created with a user specified bearing and is positioned along the front and back strings in their selected direction so that the lot has the user given area (to within the area tolerance).

The lot is only created if the new edge is at least the minimum frontage distance along the front string.

When the lot is created, the final edge is automatically set as the initial edge for the calculation of the next lot.



Parallel Pick

This method creates a lot of a user specified area using user selected front and back strings and a user selected initial edge. The final edge then needs to be determined to define the lot.

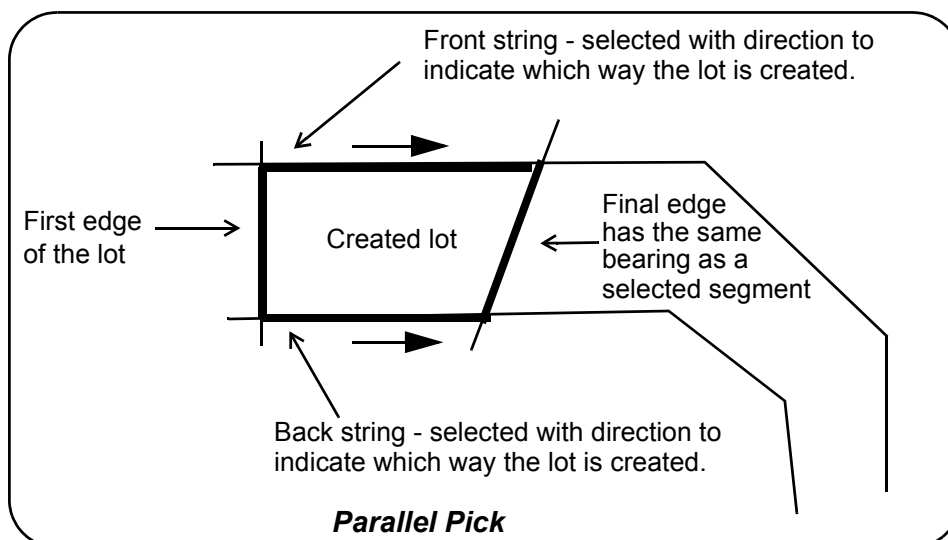
The front and back strings **must** be selected **with direction** to indicate which direction to move along them to form the lot. The front and back strings can not be closed strings and must be different strings. The front and back strings can have more than one segment and can have straight or arc segments.

The initial edge must cut or be very close to cutting the front and back strings. The **initial edge** must be **one straight line segment**. It can not be an arc.

For *Parallel Pick*, the **final edge** is created with the bearing of a user selected segment and is positioned along the front and back strings in their selected direction so that the lot has the user given area (to within the area tolerance).

The lot is only created if the new edge is at least the minimum frontage distance along the front string.

When the lot is created, the final edge is automatically set as the initial edge for the calculation of the next lot.



Perpendicular and Perpendicular Pick

This method creates a lot of a user specified area using user selected front and back strings and a user selected initial edge. The final edge then needs to be determined to define the lot.

The front and back strings **must** be selected **with direction** to indicate which direction to move along them to form the lot. The front and back strings can not be closed strings and must be different strings. The front and back strings can have more than one segment and can have straight or arc segments.

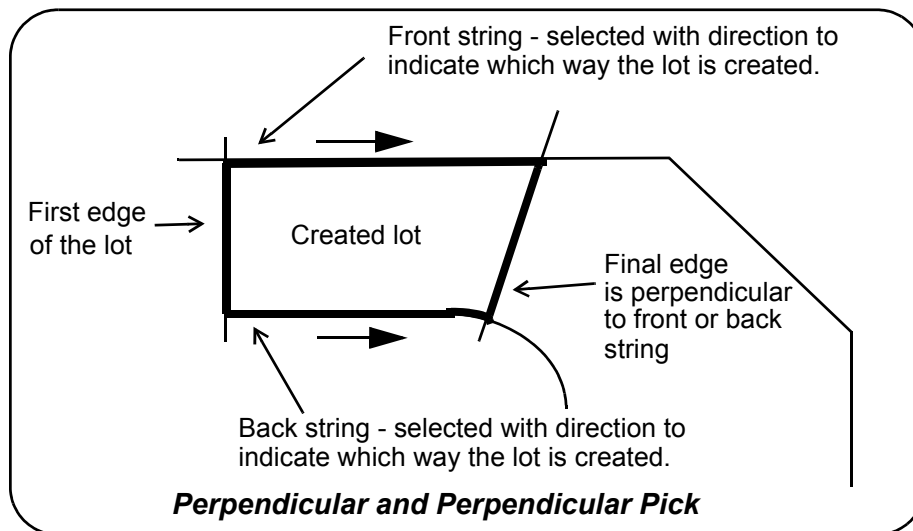
The initial edge must cut or be very close to cutting the front and back strings. The **initial edge** must be **one straight line segment**. It can not be an arc.

For *Perpendicular*, the **final edge** is constrained to be perpendicular to either the front or the back string and is positioned along the front and back strings in their selected direction so that the lot has the user given area (to within the area tolerance).

For *Perpendicular Pick*, a start point is selected on the front/back string and the **final edge** is created past the start point. This option only needs to be used when *Perpendicular* has problems finding a solution due to sharp changes of bearing along the front/back string.

The lot is only created if the new edge is at least the minimum frontage distance along the front string.

When the lot is created, the final edge is automatically set as the initial edge for the calculation of the next lot.



Pivot Pick and Pivot Frontage

This method creates a lot of a user specified area using user selected front and back strings and a user selected initial edge. The final edge then needs to be determined to define the lot.

The front and back strings **must** be selected **with direction** to indicate which direction to move along them to form the lot. The front and back strings can not be closed strings and must be different strings. The front and back strings can have more than one segment and can have straight or arc segments.

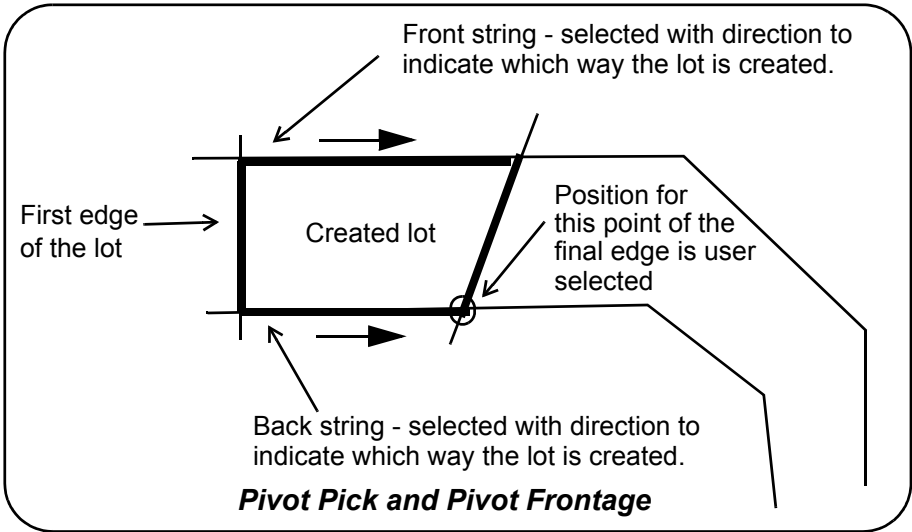
The initial edge must cut or be very close to cutting the front and back strings. The **initial edge** must be **one straight line segment**. It can not be an arc.

For **Pivot Pick**, a position is selected on either the front or back string to be one point of the **final edge**. The other point of the final edge is determined so that the lot has the required given area (to within the area tolerance).

For **Pivot Frontage**, the pivot point is taken to be the position on the front string that is the minimum frontage distance along the front string from the initial edge.

The lot is only created if the new edge is at least the minimum frontage distance along the front string.

When the lot is created, the final edge is automatically set as the initial edge for the calculation of the next lot.



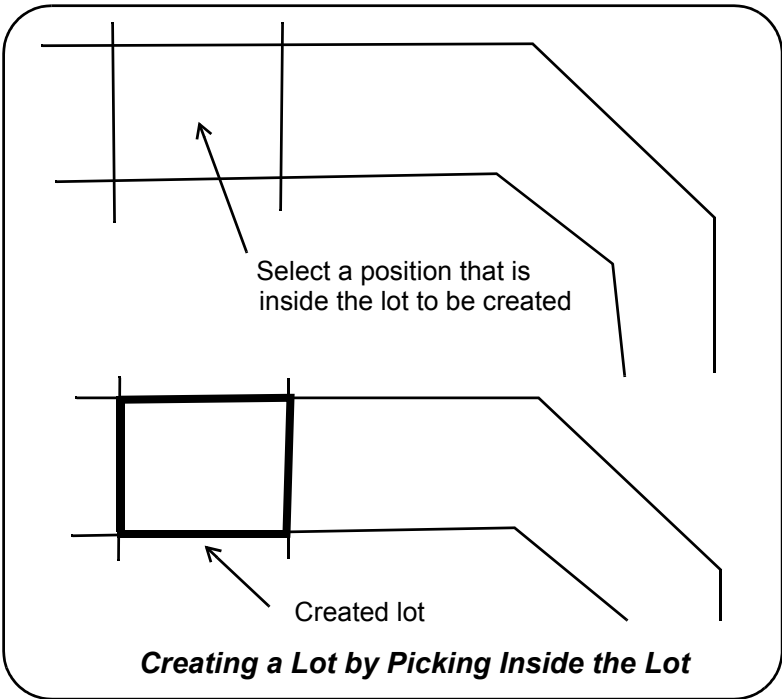
Close String

This method simply closes the string that is selected by the user.

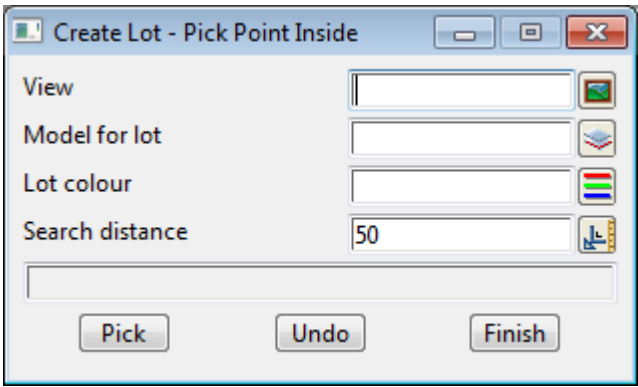
Create Lot from Picking

Position of option on menu: **Design =>Estate/Lots => Create lots =>Create lots by picking point inside**

This option creates a lot by a picking inside a collection of strings and the lot is created from the closest strings to the picked position. The picked position must be selected so that all sides of the lot can be "seen" from the picked position. That is, a straight line can be drawn from the picked position to the lot side without cutting any other segment.



On selecting the **Create lot by picking point inside** option, the **Create Lot - Pick Point Inside** panel is displayed.



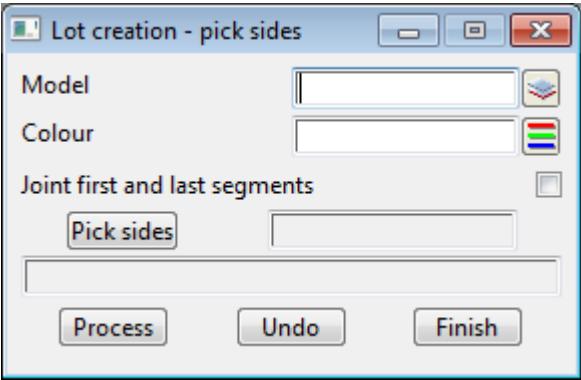
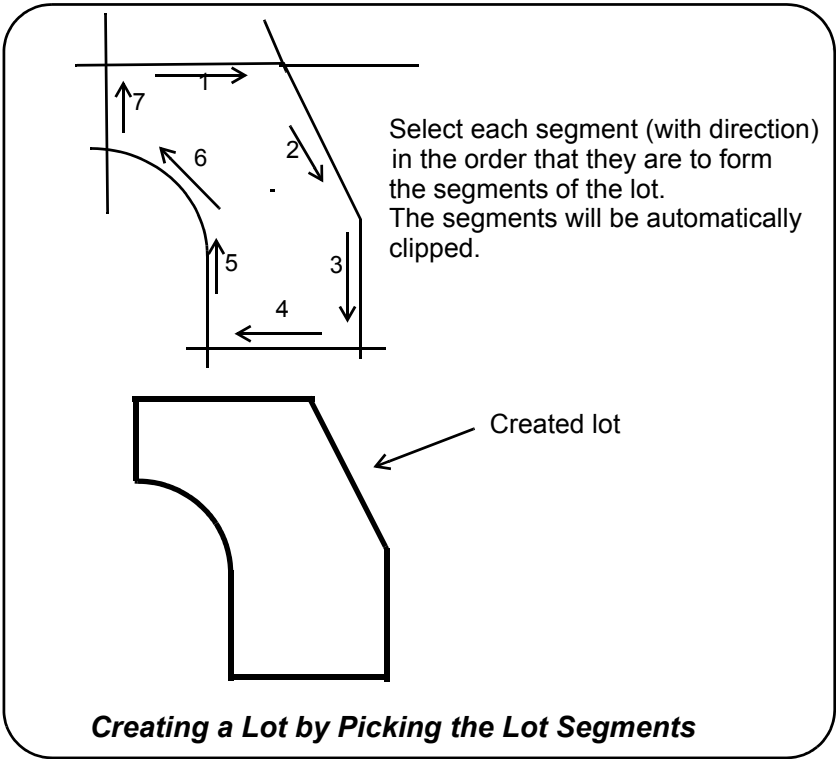
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>view to add model of created lot to.</i>	view box		available views
Model for lot <i>model for the created lot.</i>	model box		available models
Lot colour <i>colour for the created lot.</i>	colour box		available colours
Search distance <i>maximum distance to search from the selected point for sides of the lot</i>	double box	20	
Pick <i>pick the position to try and form a lot around.</i>	string select		

Create Lot from Picking Segments

Position of option on menu: Design =>Estate/Lots => Create lots =>by picking segments

This option creates a lot by a picking each segment in its order (and with direction) around the lot. Segments will be automatically extended or clipped to form the lot.



The fields and buttons used in this panel have the following functions.

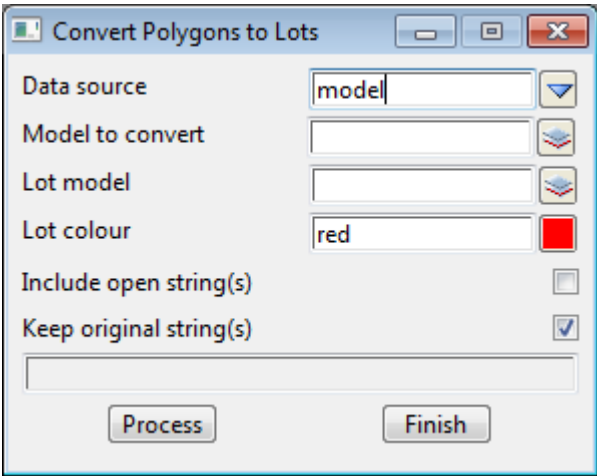
Field Description	Type	Defaults	Pop-Up
Model for lot <i>model for the created lot.</i>	model box		available models
Lot colour <i>colour for the created lot.</i>	colour box		available colours
Join first and last segment <i>if ticked, join the end of the last selected segment to the start of the first selected segment to form the final side of the lot.</i>	tick box		
Pick sides	string select		

pick, with direction, the segments to be joined together to form the sides of the lot.

Process button
create the lot from the selected segments.

Create Lot from Polygon

Position of option on menu: Design =>Estate/Lots =>Create lots =>Lots from polygons
This option converts strings to a lot. The strings can be open.

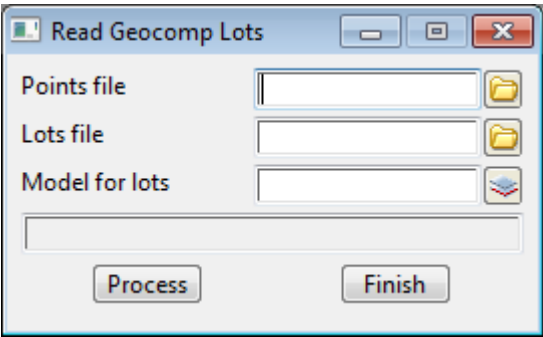


The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type <i>data source type.</i>			
Data source <i>data source for strings to convert to lots.</i>			
Model for lot <i>model for the created lot.</i>	model box		available models
Lot model <i>model for the created lots.</i>	model box		available models
Lot colour <i>colour for the created lots.</i>	colour box		available colours
Include open strings <i>if ticked, open strings are used to from lots by making then closed strings. If not ticked, open strings are ignored.</i>	tick box		
Process <i>create lots from the selected strings.</i>	button		

Read Geocomp Lots File

Position of option on menu: Design =>Estate/Lots => Create lots =>Read geocomp lots file
This option reads a Geocomp lots file and creates **12d Model** lots.

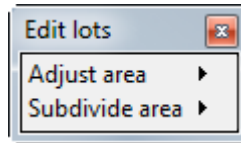


The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Points file <i>name of the Geocomp points file.</i>			*.pts files
Lots file <i>name of the Geocomp lots file - is uses points from the given Geocomp points file.</i>			*.pts files
Model for lot <i>model for the created lot.</i>	model box		available models
Process <i>read in the given Geocomp points and lots file and created 12d Model lots.</i>	button		

Edit Lots

Position of menu: Design =>Estate/Lots =>Edit lots

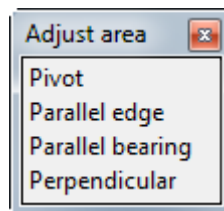


For the option *Adjust area*, go to
Subdivide area

[Adjust Area](#)
[Subdivide Area](#)

Adjust Area

Position of menu: Design =>Estate/Lots =>Edit lots =>Adjust area



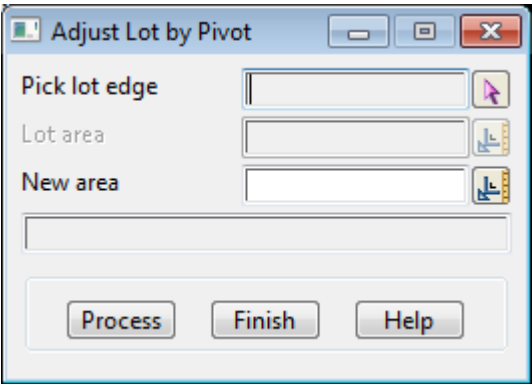
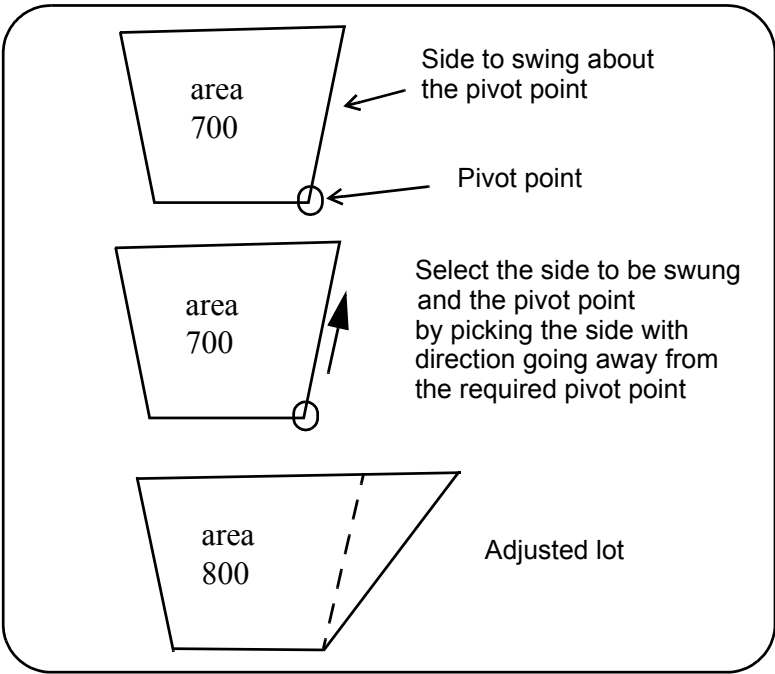
For the option *Pivot*, go to
Parallel edge
Parallel bearing
Perpendicular

[Adjust Lot by Pivot](#)
[Adjust Lot by Parallel Edge](#)
[Adjust Lot by Parallel Bearing](#)
[Adjust Lot by Perpendicular](#)

Adjust Lot by Pivot

Position of option on menu: Design =>Estate/Lots =>Edit lots =>Adjust area =>Pivot

This option adjusts the size of a lot by pivoting one side about one of its end points until the lot area has a new given area.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick lot edge	string select		
<i>pick the lot to adjust by picking a side of the lot with direction. The start of the selected side will be the pivot point.</i>			
Lot area	output box		
<i>area of the selected lot.</i>			
New area	input box		
<i>required area of the adjusted lot. The area can be larger or smaller than the existing lot area.</i>			

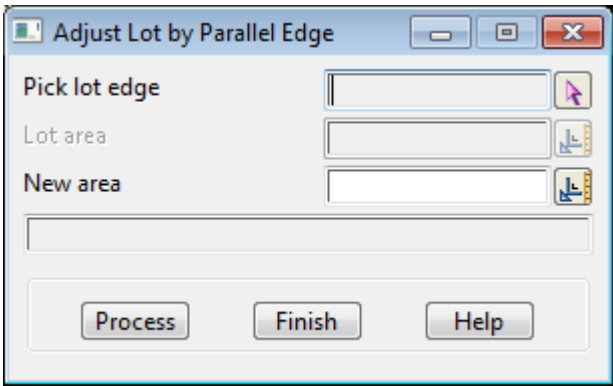
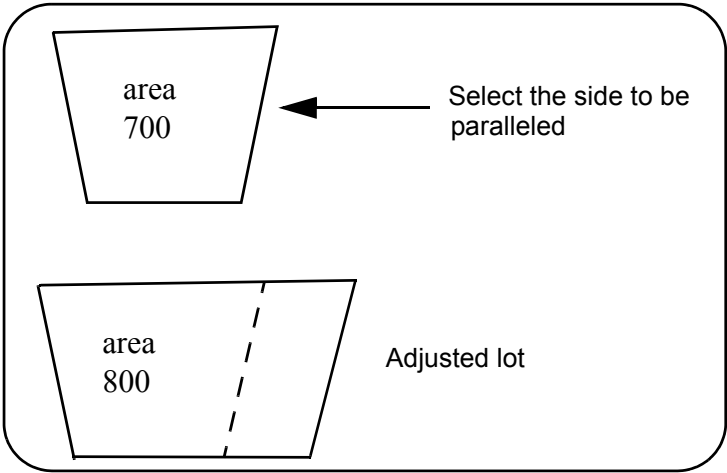
Process button
adjust the lot by pivoting the side.



Adjust Lot by Parallel Edge

Position of option on menu: Design =>Estate/Lots =>Edit lots =>Adjust area =>Parallel edge

This option adjusts the size of a lot by moving a side parallel to itself until the lot area has a new given area.



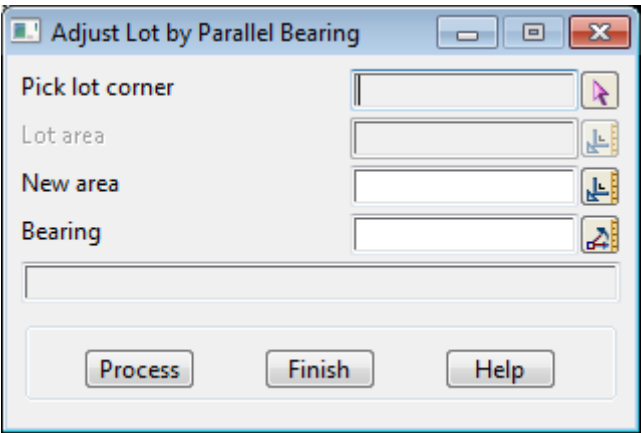
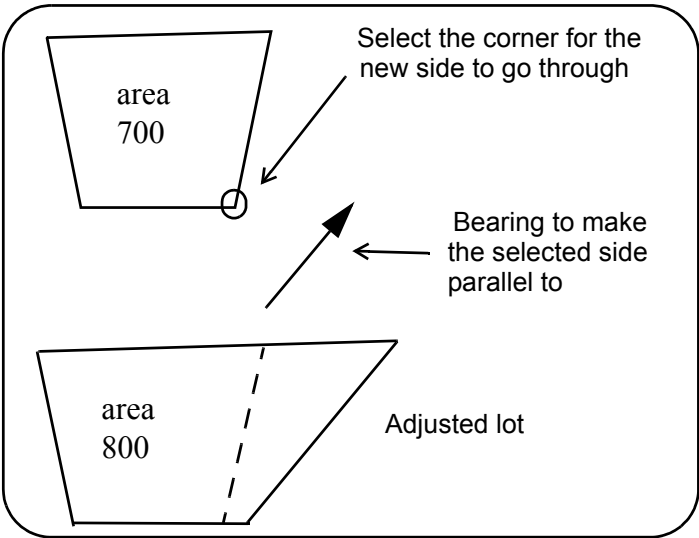
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick lot edge <i>pick the lot to adjust by picking the edge of the lot that is to be paralleled.</i>	string select		
Lot area <i>area of the selected lot.</i>	output box		
New area <i>required area of the adjusted lot. The area can be larger or smaller than the existing lot area.</i>	input box		
Process <i>adjust the lot by paralleling the selected edge.</i>	button		

Adjust Lot by Parallel Bearing

Position of option on menu: Design =>Estate/Lots =>Edit lots =>Adjust area =>Parallel bearing

This option adjusts the size of a lot by moving a side parallel to a given bearing until the lot area has a new given area.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick lot corner	string select		
<i>pick the lot to adjust by picking the corner of the lot that the side goes through and has the given bearing.</i>			
Lot area	output box		
<i>area of the selected lot.</i>			
New area	input box		
<i>required area of the adjusted lot. The area can be larger or smaller than the existing lot area.</i>			
Bearing	bearing box		

the bearing used for the selected edge.

Process button

adjust the lot by paralleling the selected edge with the given bearing.

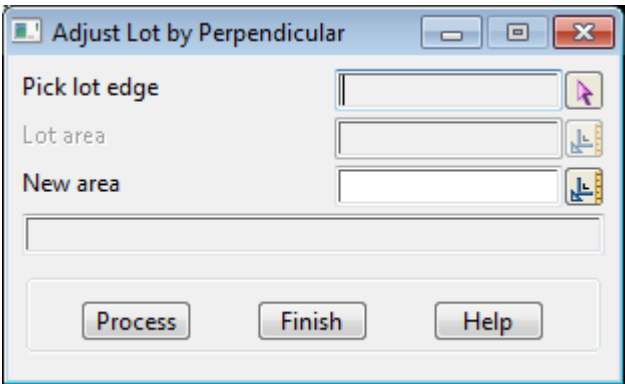
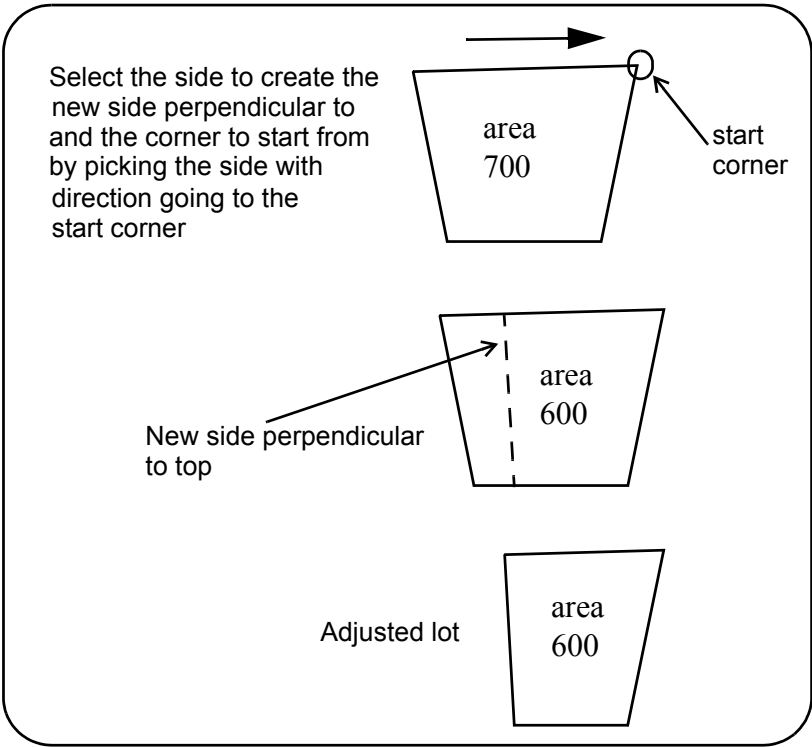


Adjust Lot by Perpendicular

Position of option on menu: Design =>Estate/Lots =>Edit lots =>Adjust area =>Perpendicular

This option adjusts the size of a lot by creating a new side perpendicular to a selected side and then moving the new side until the created lot area has a given area.

Note -the new area must be less than the original area.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick lot edge	string select		
<i>pick the side of the lot that a new side will created perpendicular to</i>			
Lot area	output box		
<i>area of the selected lot.</i>			

New area input box

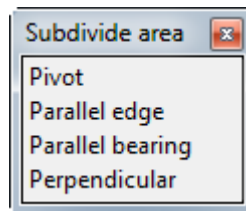
required area of the adjusted lot. The area must be smaller than the existing lot area.

Process button

adjust the lot by moving the side whilst keeping it perpendicular to another side.

Subdivide Area

Position of menu: **Design =>Estate/Lots =>Edit lots =>Subdivide area**



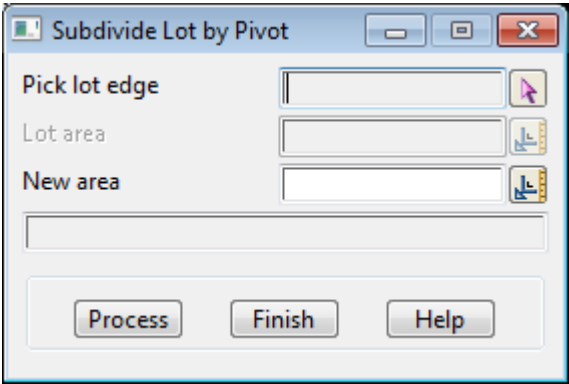
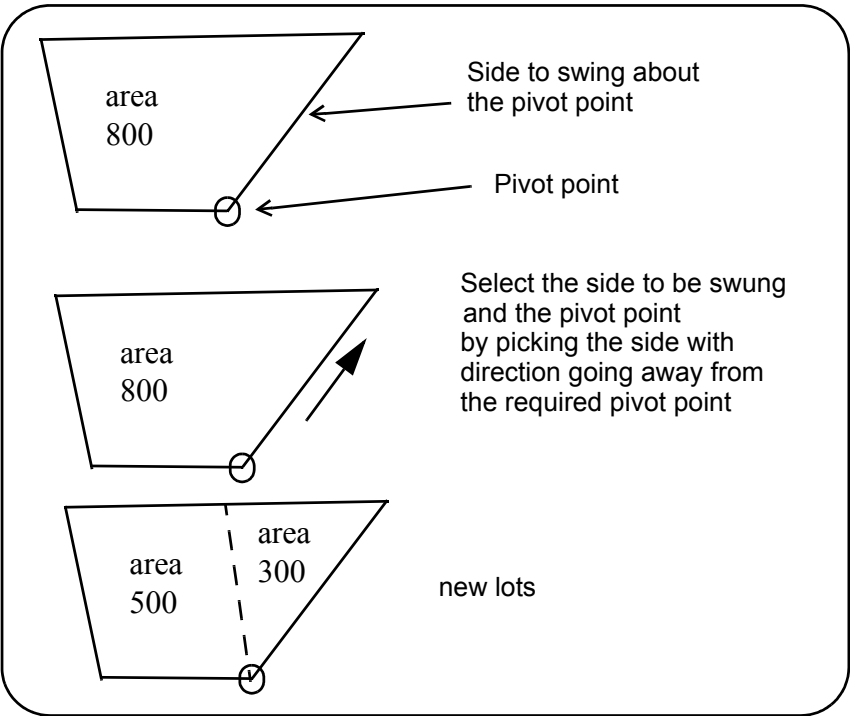
For the option *Pivot*, go to
Parallel edge
Parallel bearing
Perpendicular

[Subdivide Lot by Pivot](#)
[Subdivide Lot by Parallel Edge](#)
[Subdivide Lot by Parallel Bearing](#)
[Subdivide Lot by Perpendicular](#)

Subdivide Lot by Pivot

Position of option on menu: Design =>Estate/Lots =>Edit lots =>Subdivide area =>Pivot

This option reduces the size of a lot by pivoting one side about one of its end points until the lot area has a new smaller area. A second lot is created from the remainder of the original lot.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick lot	string select		
<i>pick the lot to adjust by picking a side of the lot with direction. The start of the selected side will be the pivot point.</i>			
Lot area	output box		
<i>area of the selected lot.</i>			

New area input box

required area of the adjusted lot. The area must be smaller than the existing lot area.

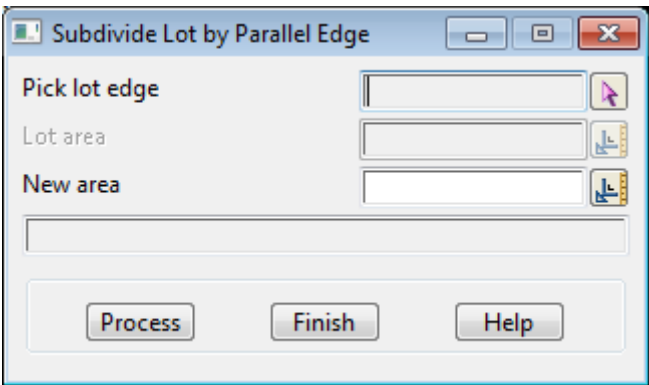
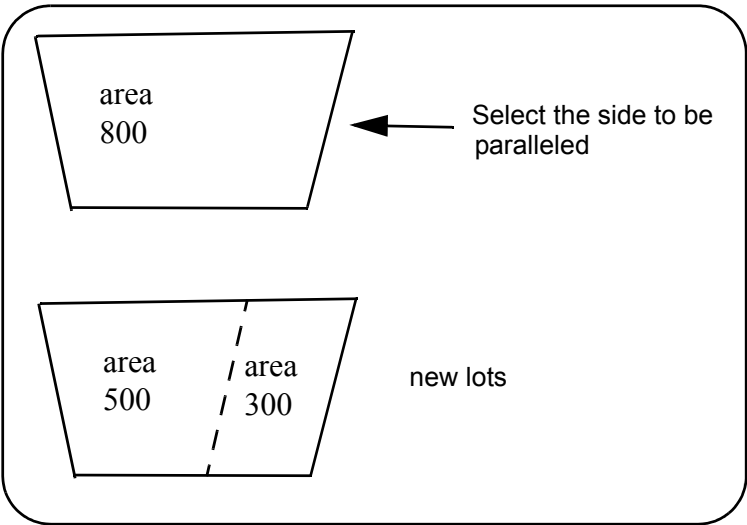
Process button

adjust the lot by pivoting the side. A second lot is created from the remainder of the original lot.

Subdivide Lot by Parallel Edge

Position of option on menu: Design =>Estate/Lots =>Edit lots =>Subdivide area =>Parallel edge

This option adjusts the size of a lot by moving a side parallel to itself until the lot area has a new smaller area. A second lot is created from the remainder of the original lot.



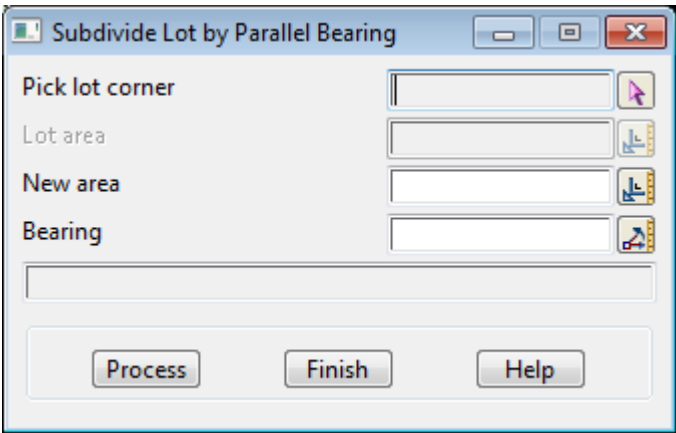
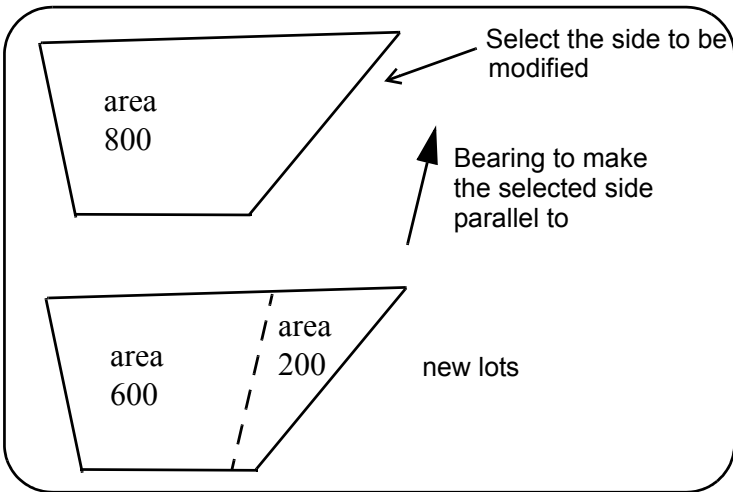
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick lot edge	string select		
<i>pick the lot to adjust by picking the edge of the lot that is to be paralleled.</i>			
Lot area	output box		
<i>area of the selected lot.</i>			
New area	input box		
<i>required area of the adjusted lot. The area must be than the existing lot area.</i>			
Process	button		
<i>adjust the lot by paralleling the selected edge. A second lot is created from the remainder of the original lot.</i>			

Subdivide Lot by Parallel Bearing

Position of option on menu: Design =>Estate/Lots =>Edit lots =>Subdivide area =>Parallel bearing

This option adjusts the size of a lot by moving a side parallel to a given bearing until the lot area has a new smaller area. A second lot is created from the remainder of the original lot.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick lot corner	string select		
<i>pick the lot to adjust by picking the edge of the lot that is to be paralleled.</i>			
Lot area	output box		
<i>area of the selected lot.</i>			
New area	input box		
<i>required area of the adjusted lot. The area must be smaller than the existing lot area.</i>			
Bearing	bearing box		
<i>the bearing used for the selected edge.</i>			

Process button

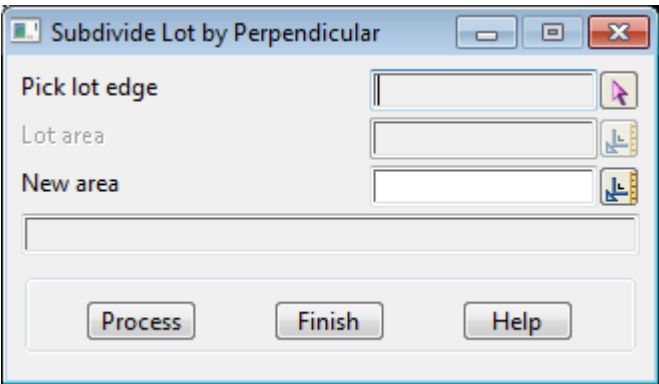
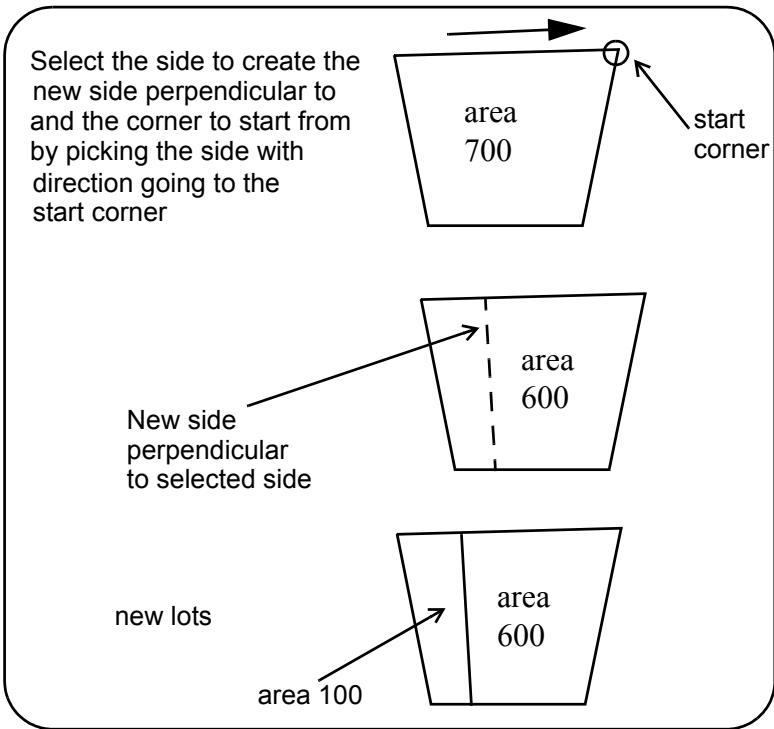
adjust the lot by paralleling the selected edge with the given bearing. A second lot is created from the remainder of the original lot.

Subdivide Lot by Perpendicular

Position of option on menu: Design =>Estate/Lots =>Edit lots =>Subdivide area =>Perpendicular

This option adjusts the size of a lot by creating a new side perpendicular to a selected side and then moving the new side until the created lot area has a given smaller area. A second lot is created from the remainder of the original lot.

Note -the new area must be less than the original area.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick lot edge <i>pick the side of the lot that a new side will created perpendicular to</i>	string select		
Lot area <i>area of the selected lot.</i>	output box		

New area input box

required area of the adjusted lot. The area must be smaller than the existing lot area.

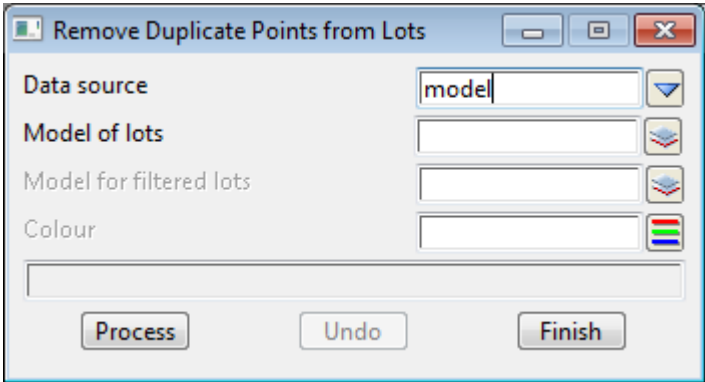
Process button

adjust the lot by moving a side whilst keeping it perpendicular to another side. A second lot is created from the remainder of the original lot.

Filter Lots

Position of option on menu: **Design =>Estate/Lots => Filter lots**

This option is used to remove adjacent duplicate points from lots.



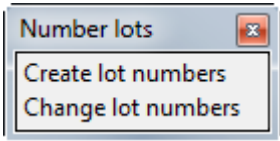
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type <i>data source type.</i>			
Data source <i>data source for strings to convert to lots.</i>			
Model for filtered lots <i>model for the filtered lots.</i>	model box		available models
Colour <i>if non-blank, the filtered lots are given this colour.</i> <i>Otherwise a filtered lot has the same colour as the non-filtered lot.</i>	colour box		available colours
Process <i>filter the selected lots.</i>	button		

Number Lots

Position of menu: **Design =>Estate/Lots => Number lots**

After lots are created, they are then numbered. The lot numbers are stored with the lot

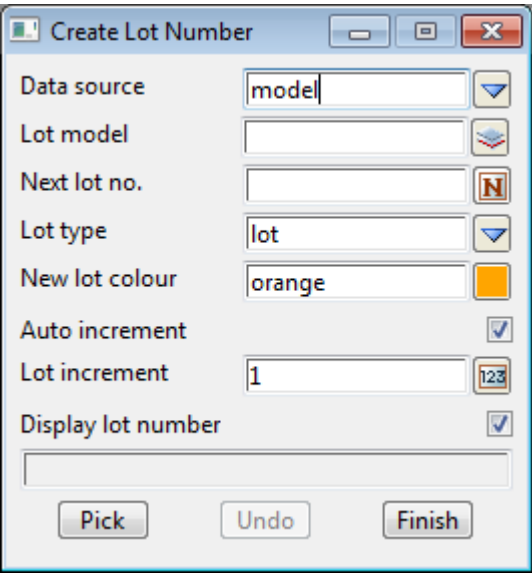


For the option *Create lot numbers*, go to [Create Lot Numbers](#).
 Change lot numbers [Change Lot Numbers](#)

Create Lot Numbers

Position of option on menu: Design =>Estate/Lots => Number lots =>Create lot numbers

This option creates lot numbers.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
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Data source

data source for lots that have been numbered. A new lot number cannot be the same as an existing one in the data source.

Next lot no.

the number to give the next lot that is numbered.

Lot type	choice box	user defined	user defined
----------	------------	--------------	--------------

type of the lot. The choices are defined by the user in the file. See [Lot types](#)

New lot colour	colour box	available colours
----------------	------------	-------------------

colour to created the numbered lot. This is done so that numbered and non-numbered lots can be easily distinguished.

Auto increment	tick box	tick
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if ticked, the Next lot no. is incremented after the lot is numbered.

Lot increment	integer box	1
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amount to increment the Next lot no if the Auto increment flag is tick.

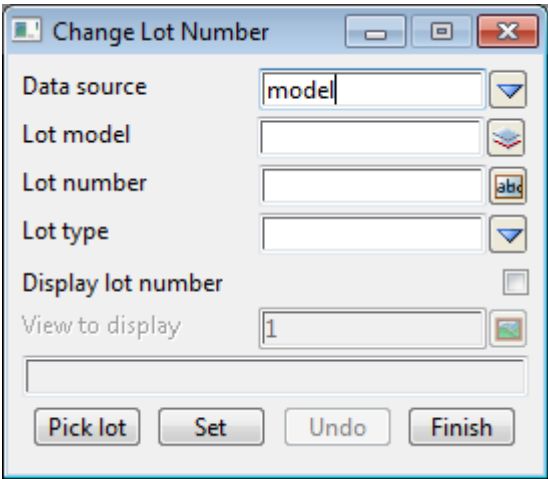
Display lot numbers	tick box	tick
---------------------	----------	------

if ticked, the lot number is temporarily displayed. Permanent lot numbers are created using the Label Lots options.

Pick string select
pick the lot the be numbered. After accepting the lot, it is given the Next lot no.

Change Lot Numbers

Position of option on menu: Design =>Estate/Lots => Number lots =>Change lot numbers
This option changes the lot numbers stored with the lot.



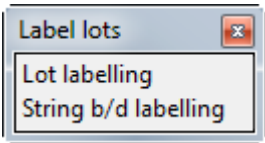
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Lot number <i>when a lot is selected, its lot number is displayed in this field. This can be changed and the selected lot will get the new Lot number when the Set button is selected.</i>	text box	number of selected lot	
Lot type <i>when a lot is selected, its lot type is displayed in this field. This can be changed and the selected lot will get the new Lot type when the Set button is selected. See Lot types.</i>	choice box	type of selected lot	
Display lot numbers <i>if ticked, the lot numbers are displayed for the selected lots.</i>	tick box		
View to display <i>view to temporarily display the lot numbers.</i>	view box		available views
Pick lot <i>select the lot to change either the lot number or the lot type.</i>	button		
Set <i>set the lot number and the lot type of the selected lot to the values given in the Lot number and Lot type fields.</i>	button		

Label Lots

Position of menu: Design =>Estate/Lots => Label lots

After lots are numbered, text for the lot numbers and areas can be displayed.

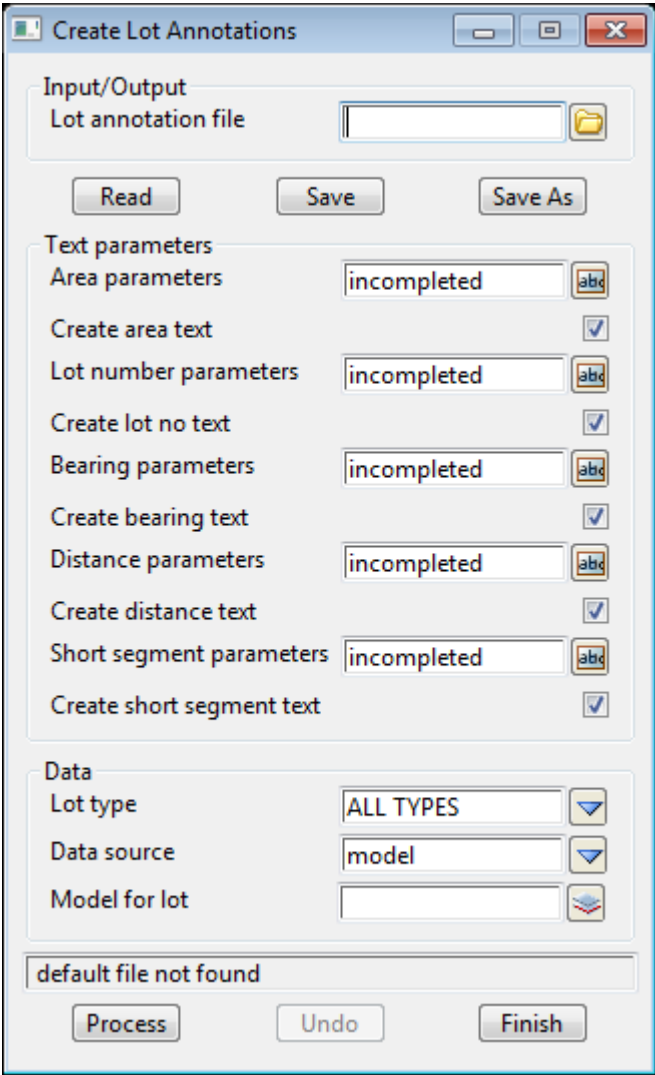


For the option *Lot labelling*, go to [Create Lot Annotation](#).
For the option *String b/d labelling*, go to [String Bearing Distance Labelling](#).

Create Lot Annotation

Position of option on menu: Design =>Estate/Lots => Number lots =>Lot labelling

This option creates annotation of the lot numbers, lot areas, bearings of the sides and lengths of the sides.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Input/Output parameters			
Lot annotation file <i>file of defaults for labelling the lots.</i>			*.laf files
Read <i>read in a given lot annotation file.</i>	button		
Save <i>write out the current parameters to the given lot annotation file.</i>	button		
Save as <i>write out the current parameters to a different lot annotation file.</i>	button		
Text parameters			
Area parameters <i>parameters for labelling the area of a lot.</i>			
Create area text <i>if ticked, annotation for the areas is created using the Area parameters.</i>	tick box	tick	
Lot number parameters <i>parameters for labelling the lot numbers.</i>			
Create lot no. text <i>if ticked, annotation for the lot numbers is created using the Lot number parameters.</i>	tick box	tick	
Bearing parameters <i>parameters for labelling the bearings of the sides of the lots.</i>			
Create bearing text <i>if ticked, annotation for the lot bearings is created using the Bearing parameters.</i>	tick box	tick	
Distance parameters <i>parameters for labelling the lengths of the sides of the lots.</i>			
Create distance text <i>if ticked, annotation for the lengths of the sides is created using the Distance parameters.</i>	tick box	tick	
Short segment parameters <i>parameters for specifying what is a "short Segment" and the parameters for labelling sides of the lots that are short segments.</i>			
Create short segment text <i>if ticked, annotation for short segments is created using the Short segment parameters.</i>	tick box	tick	

Data

Data source type

data source type.

Data source

data source for lots to be annotated.

Lot type

choice box user defined user defined

of the lots selected by the data source, only lots of this type are labelled. See [Lot types](#).

Process

button

select all the lots given by the Data source and Lot type and create annotations according the Text parameters.

String Bearing Distance Labelling

Position of option on menu: Design =>Estate/Lots => Label lots =>String b/d labelling

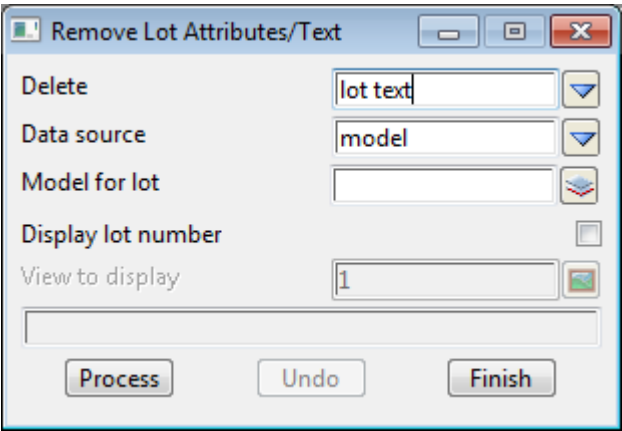
Option to label the bearing and lengths of segments of strings.

This option is described in the section [Bearing/Distance Labelling](#) in the chapter [Drafting](#)

Delete Lot Attributes and Text

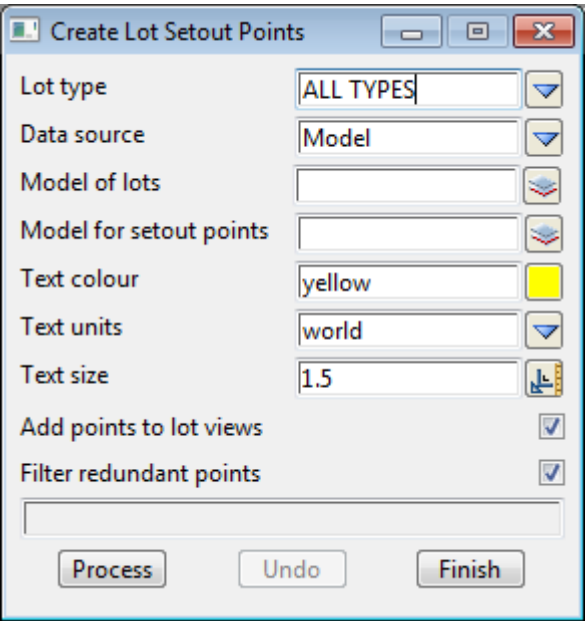
Position of option on menu: Design =>Estate/Lots => Delete lot attributes/text

This option is used to remove the attributes for a lot which store the lot number, area etc. It can also delete the annotation text that has been created for the lot.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Delete	choice box	lot text	lot text, lot attributes
<i>when a lot is selected, its lot type is displayed in this field. This can be changed and the selected lot will get the new Lot type when the Set button is selected.</i>			



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Lot type <i>of the lots selected by the data source, only lots of this type have point numbers created. See Lot types</i>	choice box	user defined	user defined
Data source <i>data source for lots to have point numbers created.</i>			
Model for setout points <i>model for the set out points.</i>	model box		available models
Text colour <i>colour of the point numbers.</i>	colour box		available colours
Text units <i>units for text size.</i>	choice box	world	screen, paper, world
Text size <i>Size of the text for the point numbers.</i>	double box		
Add points to lot views <i>if ticked, add the model of point numbers to the views that the lots are displayed on.</i>	tick box	tick	
Create short segment text <i>if ticked, annotation for short segments is created using the Short segment parameters.</i>	tick box	tick	
Filter redundant points <i>if ticked, then if two adjacent line have the same bearing then the two segments are replaced by one</i>	tick box	tick	

segment. And if two adjacent arc segments could be the one arc, then they are replaced by one arc.

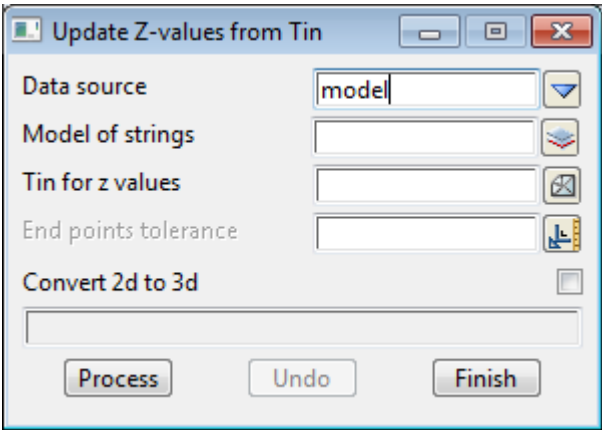
Process button

select all the lots given by the Data source and Lot type and create annotations according the Text parameters.

Drape Points

Position of option on menu: Design =>Estate/Lots => Setout lots =>Drape points

Option for setting the z-value of points to the z-value from a specified tin.

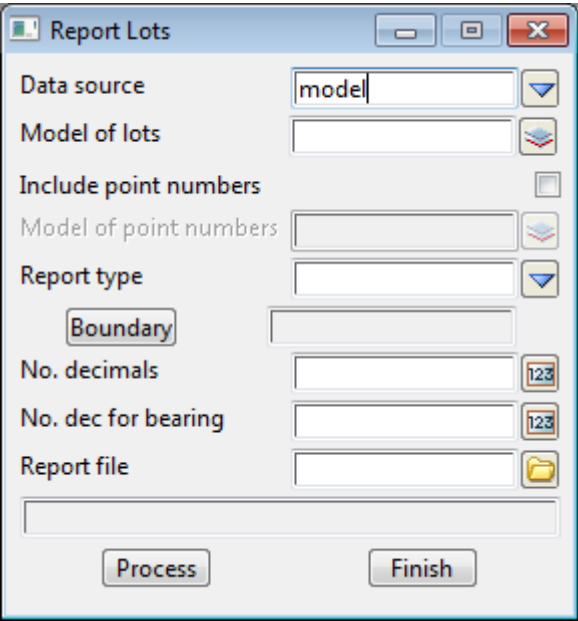


The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source <i>type of the data source</i>	choice box		model, view, string
Model of strings / View of strings / Pick a String <i>source of the data</i>			
Tin for z values <i>The tin to take the z values for the vertices from</i>	tin box		
End points tolerance	input		
Convert 2d to 3d <i>if ticked, 2d strings will be converted to 3d strings which have a different z value from the tin for each vertex. if not ticked the 2d string takes its z value from the tin at the first vertex</i>	tick box		

Report Lots

Position of option on menu: Design =>Estate/Lots => Report lots



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source <i>data source for lots to be reported.</i>			
Include point numbers <i>if ticked, include the point number for each vertex around the lot.</i>	tick box		
Model of point numbers <i>model of the point numbers for the vertices of the lots.</i>	model box		available models
Report type <i>type of report for the selected lots.</i>	choice box		sort by type, sort by number sort by area, setout
Boundary <i>if selected, the boundary string for the lots. If selected then the area of the boundary string is calculated and the total area of the lots compared to the area of the boundary string.</i>	string select	optional	
No. decimals <i>Number of decimal places for co-ordinates and lengths in the report.</i>	integer box		
No. dec for bearings <i>Number of decimal places for bearings in the report.</i>	integer box		
Report file <i>Name of the file for the report.</i>	file box		

Process

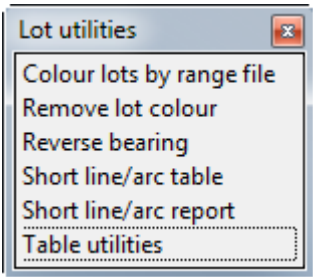
button

Create the report.

Lot Utilities

Various lot options.

Position of menu: Design =>Estate/Lots => Lot utilities



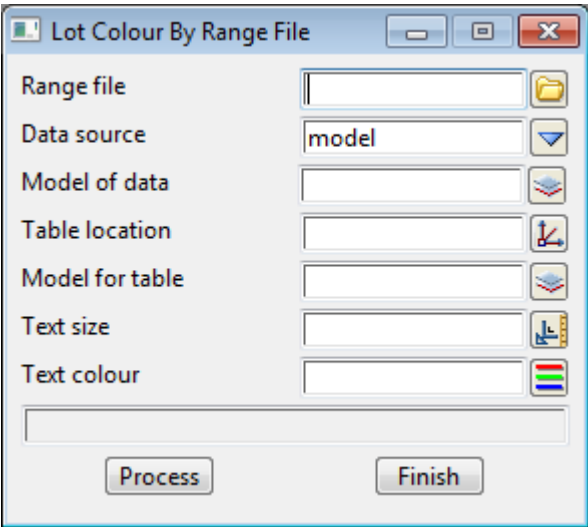
For the option *Colour lots by range file*, go to
Remove lot colour
Reverse bearing
Short line/arc table
Short line/arc report
Table utilities

[Colour Lots by Range File](#)
[Remove Lot Colour](#)
[Reverse Bearing](#)
[Short Line/Arc Table](#)
[Short Line/Arc Report](#)
[Short Segment Utilities](#)

Colour Lots by Range File

Position of option on menu: Design =>Estate/Lots => Lot utilities =>Colour lots by range file

The option colours lots by area using a lot range file (.lrf) to define the colour for each minimum and maximum area. It also creates a table of the statistics for the area ranges.



The fields and buttons used in this panel have the following functions.

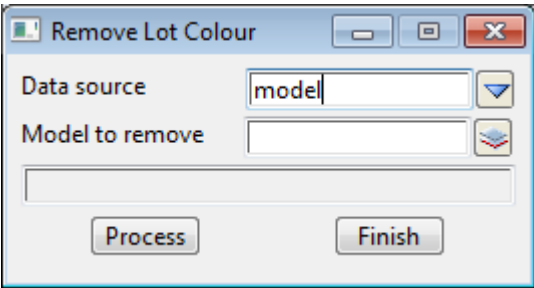
Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Range file	file box	*.lrf
<i>range file for colouring lots.</i>		
Data source		
<i>data source for lots to be coloured.</i>		
Table location	position select box	
<i>position of the table.</i>		
Model for table	model box	available models
<i>model for the table of statistics on the lot areas.</i>		
Text colour	colour box	available colours
<i>colour of the text.</i>		
Text size (w)	double box	
<i>size of the text for the table.</i>		
Process	button	
<i>select all the lots given by the Data source and Lot type and colour them according to the lot range file.</i>		

Remove Lot Colour

Position of option on menu: Design ==>Estate/Lots ==> Lot utilities ==>Remove lot colour

The option removes the colour of all the selected lots.



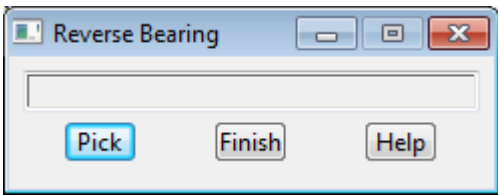
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source			
<i>data source for lots to have their colour removed.</i>			
Process	button		
<i>select all the lots given by the Data source and remove the lot colour.</i>			

Reverse Bearing

Position of option on menu: Design =>Estate/Lots => Lot utilities =>Reverse bearing

Option to change the value of the bearing text created by the lot labelling option by adding 180 degrees to the bearing. This is then the bearing of a line in the reversed direction to that represented by the original bearing text. The rounding for the reversed bearing is done according to the lot parameters.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Zero padding	tick box	tick	
<i>if ticked, if the minutes and/or seconds are zero then two zeros are written out. If not ticked, if the minutes and/or seconds are zero then they are left out.</i>			
Pick	button		
<i>pick the bearing text that is to be modified.</i>			

Short Line/Arc Table

Position of option on menu: Design =>Estate/Lots => Lot utilities =>Short line/arc table

Position of option on menu: Drafting =>Text and Tables =>Short segment table

Option to create a table of all the short segments and/or short arcs.

This option is described in the section [Short Segments Table](#) in the chapter [Drafting](#)

Short Line/Arc Report

Position of option on menu: Design =>Estate/Lots => Lot utilities =>Short line/arc report

Position of option on menu: Drafting =>Text and Tables =>Short segment report

Option to create a report of all the short segments and/or short arcs.

This option is described in the section [Short Segment Report](#) in the chapter [Drafting](#)

Short Segment Utilities

Position of option on menu: Design =>Estate/Lots => Lot utilities =>Table utilities

Position of option on menu: Drafting =>Text and Tables =>Short segment table utilities

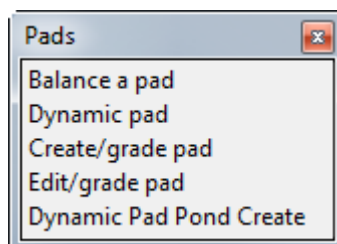
This panel is used modify an existing short segments table.

This option is described in the section [Short Segments Table Utilities](#) in the chapter [Drafting](#)

Pads

Position of menu: **Design =>Pads**

The **Pads** walk-right menu is



For the option *Balance a pad*, go to

Dynamic pad

Create/grade pad

Edit/grade pad

Dynamic Pad Pond Create

[Balance a Pad](#)

[Dynamic Pad Interface](#)

[Allotment Pad Create](#)

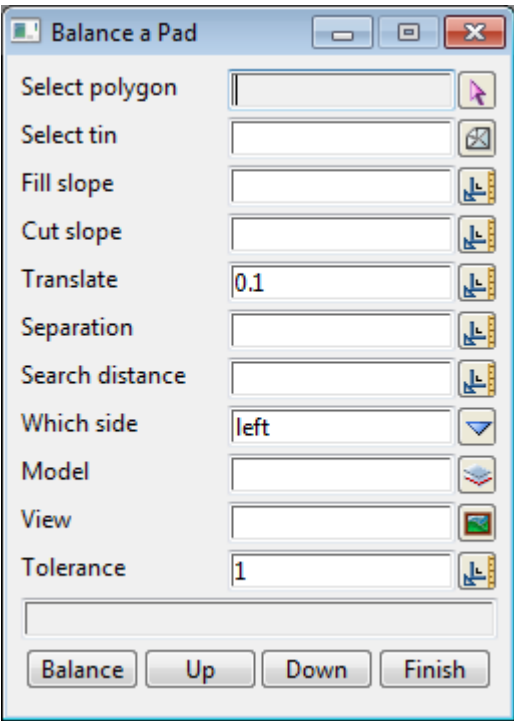
[Allotment Pad Edit](#)

[Dynamic Pad/Pond Interface](#)

Balance a Pad

Position of option on menu: Design =>Pads =>Balance a pad

This option takes a pad formed by a string and user given slopes and batters from the pad to a given tin. The pad is moved up or down until a balance is found.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Select polygon <i>The string defining the pad</i>	string select		
Select tin <i>The tin to interface the pad to</i>	tin select		
Fill slope <i>The fill slope for the pad</i>	measures box		At Point, Point to Point, String from Point, String to Point)
Cut slope <i>The cut slope for the pad</i>	measures box		At Point, Point to Point, String from Point, String to Point)
Translate	measures box	0.1	At Point, Point to Point, String from Point, String to Point)

The value for translating the pad up and down with the 'Up' and 'Down' keys.

Seperation	measures box	At Point, Point to Point, String from Point, String to Point)
-------------------	--------------	---------------------------------------------------------------

The interval along the pad string for the volume calculations.

Search distance	measures box	At Point, Point to Point, String from Point, String to Point)
------------------------	--------------	---------------------------------------------------------------

The maximum search distance for intersecting the cut/fill slopes with the pad.

Which side	choice box	left	left, right
-------------------	------------	------	-------------

Which side of the string is the outside of the pad.

Model	model box	available models
--------------	-----------	------------------

The model for the final strings and tadpoles.

View	view box	select view
-------------	----------	-------------

View to add temporary strings to.

Tolerance	
------------------	--

The tolerance for balancing the cut/fill for the pad.

Balance	button
----------------	--------

Balance the pad to within tolerance value.

Up	button
-----------	--------

Move pad up by translation value.

Down	button
-------------	--------

Move pad down by translation value.

Finish	button
---------------	--------

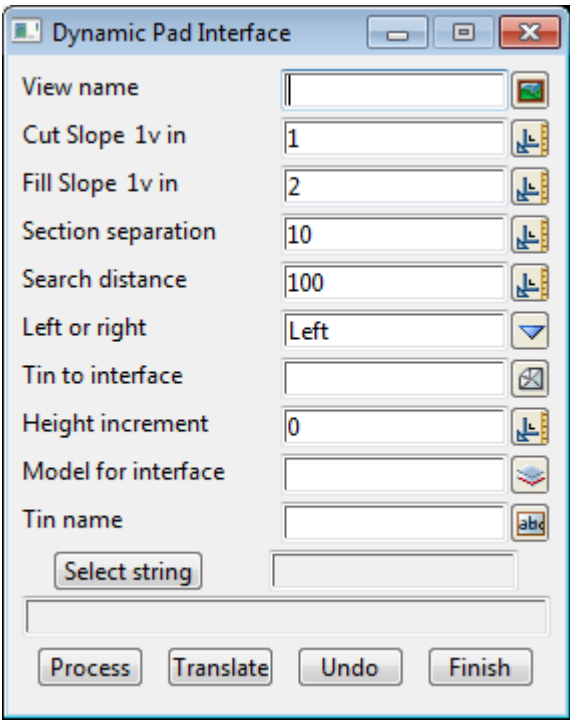
Add strings to permanent model and finish.

Dynamic Pad Interface

Position of option on menu: **Design =>Pads =>Dynamic pad**

This option is to create a pad by interfacing from a selected string and calculated the volume for the pad. The pad can be moved up or down and the new volumes are calculated.

The pad can also be moved in plan and the new interface and volumes are dynamically calculated.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View name <i>name of the view to display the pad interface strings.</i>	view box		
Cut slope 1v in <i>cut slope for interfacing.</i>		1	
Fill slope 1v in <i>fill slope for interfacing.</i>		2	
Section separation <i>interval to calculate cut and fill batters.</i>		10	
Search distance <i>distance for the batter to search to find intersection with the triangles.</i>		100	
Left or right <i>batter to the left or right of the selected string.</i>	choice box	left	left, right
Tin to interface <i>tin to batter to.</i>	tin box		
Height increment		0	

when process is selected, the pad height is adjusted by the value in this panel field and the new interface and volumes are calculated.

Select string select
select string to batter from

Process button
adjust the height of the pad by the Height increment and recalculate the new interface and volumes.

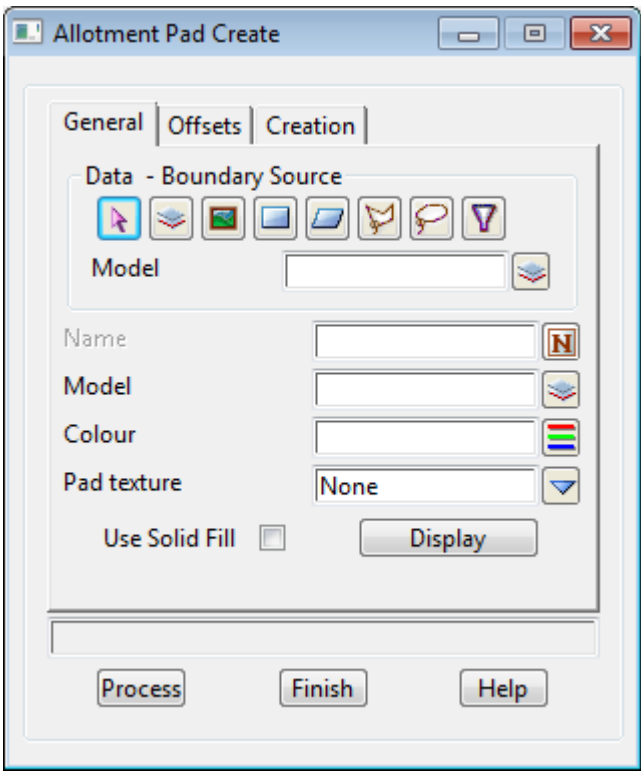
Translate
when selected the pad will move to the cursor position and dynamically calculate the interface and volumes.

Reset button
reset the pad height to its original value.

Allotment Pad Create

Position of option on menu: **Design =>Pads =>Create/grade pad**

This option and the next **Design =>Pads =>Edit/grade pad** are used to create a pad from surrounding lines, grade the created pad and edit pads already created with this option.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

General tab

Data source type	Model		
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source	input		
<i>source of data is used to create a pad.</i>			
Name	input		
<i>the name of the new pad.</i>			
Model	model box		available models
<i>name of the model that the new pad is in.</i>			
Colour	colour box	default colour	available colours
<i>the colour of the new pad.</i>			
Pad texture	choice box	None	None, some textures
<i>the colour of the new pad.</i>			

Use solid fill tick box
if ticked, solid fill the pad

Display button
*brings up the **Display Text Defaults** panel*

Offsets tab

Global offset input
if other offsets are not given, the distance to offset the sides of the pad from the strings used to create the pad

Offsets model model box
model for the offset lines

Offsets type choice box Segment Segment, Point to Point
*if **Segment**, define the offset line by picking a segment.
If **Point to Point**, define the offset line by picking two points.*

Select button
select an offset line

Creation tab

Pad level type choice box Typed input, Use tin level
Use bdy/ht, Use bdy/slope
*if **typed input**, all vertices of the pad are given the height in the Lot level field.
If use **tin level**, the height of each vertex of the pad is taken from the tin given in the Tin field.*

If **typed input**:

Pad level input
the height to use for all the vertices of the pad.

If **Use tin level**:

Tin tin box available tins
the tin used to give heights to the vertices of the pad.

If **Bdy/ht**:

Height
the height to be above the selected boundary string

Reference boundary
the selected boundary string for the pad to be a given height above/below

If **Use/slope**:

Slope 1 in
the slope to be above the selected boundary string

Reference boundary

the selected boundary string for the pad to be a given slope above/below

Single/ Along a string radio buttons single

*if **single**, a single pad is created from the strings surrounded the selected point.
If **along a string**, pads are created surrounding each vertex of selected string.*

Centroid/search distance string select

*if **single**, a point is selected and then a circle is rubber banded until a second point is selected. The pad is created from segments within the circle.*

Search dist input

*if **along a string**, then for each vertex, all segments within the distance are processed to create the pad.*

Select string select

*if **along a string**, select the string to use. Pads are created surrounding each vertex of this string.*

Process button

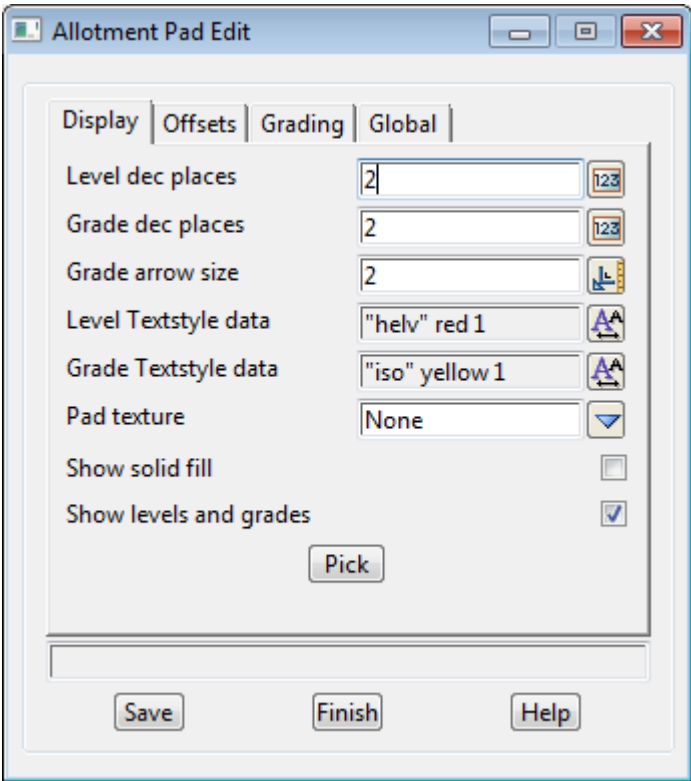
run the option

Allotment Pad Edit

Position of option on menu: **Design =>Pads =>Edit/grade pad**

This option is used to grade a pad created with the previous option, **Design =>Pads =>Create/grade pad**.

Selecting **Edit/grade pad** brings up the **Allotment Pad Edit** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Display tab

- | | | | |
|---------------------------------------------------------------------------------------------|--------------------|--|--|
| Level dec places | input | | |
| <i>the number of decimal places used to display the height (level) of the pad vertices.</i> | | | |
| Grade dec places | input | | |
| <i>the number of decimal places used to display the grade of the pad sides.</i> | | | |
| Grade arrow size | input | | |
| <i>size of the grade arrows</i> | | | |
| Level textstyle data | textstyle data box | | |
| <i>the textstyle data used for the displaying the level (height).</i> | | | |
| Grade textstyle data | textstyle data box | | |
| <i>the textstyle data used for the displaying the grade.</i> | | | |

Pad texture <i>the colour of the new pad.</i>	choice box	None	None, some textures
Show solid fill <i>if ticked, solid fill the pad</i>	tick box		
Show levels and grades <i>if ticked, turn on the level and grades</i>	tick box		
Pick <i>select the pad to edit</i>	button		

Offset tab

Maintain level/Maintain level on Grade <i>if Maintain level, keep the level when a new offset/boundary is selected</i> <i>If Maintain level on grade, keep the level on grade when a new offset/boundary is selected</i>	radio buttons	
Select new offset <i>select a new offset string</i>	string select	
Select new boundary <i>select a new boundary string</i>	string select	

Grading tab

Level and/or grade	button	
Level entire pad	button	
Level by str/ht	button	
Level by str/slope	button	
Level by seg/ht	button	
Level by seg/slope	button	
Batter slope	button	
Surface grading	button	
Ht <i>heights to increment the selected pad by</i>		
Up <i>move the pad up by the give height</i>	button	
Down <i>move the pad down by the give height</i>	button	
Pick (ht) <i>select a pad</i>	string select	
Batter slope model <i>model for the batter slopes</i>	model box	available models

Global tab

Data source type

Model

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data source

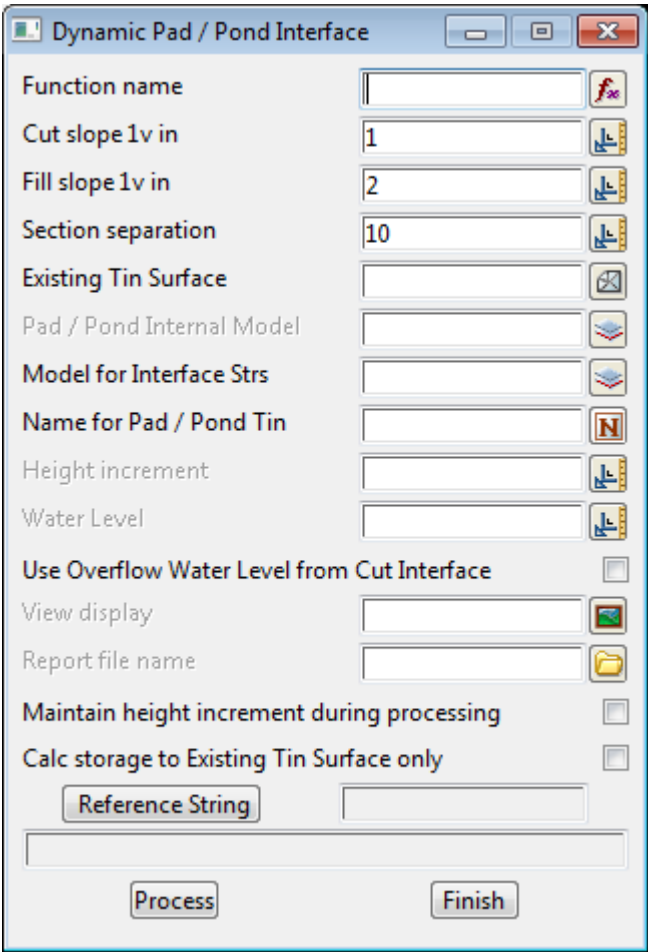
input

source of data is used to create a pad.

Dynamic Pad/Pond Interface

Position of option on menu: Design =>Pads =>Dynamic Pad Pond Create

This option is used to interface from a string to a tin plus it can have an included pond model.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Function name	function box		available functions
<i>name of the pad/pond function. If the function already exists and is picked from a popup or and an <enter> is given at the end of the name, the information from the existing function will be placed in the appropriate panel fields</i>			
Cut slope 1 v in	input	1.0	
<i>the slope of the interface line if a point is in cut. A cut slope of one vertical to the given value of horizontal units is used. Positive is up for a cut slope. A value 0 is used to designate a horizontal line.</i>			
Fill slope 1 v in	input	1.0	
<i>the slope of the interface line if the point is in fill. A fill slope of one vertical to the given value of horizontal units is used. Positive is down for a fill slope. A value 0 is used for a horizontal line.</i>			
Section separation	input	10	

the distance between the points on the selected string that interface points will be calculated from.

Existing tin surface	tin box	available tins
<i>name of the tin to interface to.</i>		
Pad /Pond internal model	model box	available model
<i>if non blank, name of the model to include as part of the interface model</i>		
Model for interface strs	model box	available models
<i>name of the model to contain the calculated interface string.</i>		
Name for pad/pond tin	tin box	available tins
<i>name of the tin to create from the reference string, the interface string and the pad/pond internal model</i>		
Height increment	input	
<i>value to vertically translate the reference string by (cleared after each process unless Maintain height increment during processing is ticked)</i>		
Water level	input	
<i>if non blank, the height of the water level</i>		
Use overflow water level from cut interface	tick box	
<i>if ticked, the water level to the lowest point on the cut interface is determined and used as the water level height</i>		
View display	view box	available views
<i>if non blank, the view to display the results on</i>		
Report file name	file box	*.rpt files
<i>if non blank, the view to display the results on</i>		
Maintain height increment during processing	tick box	
<i>if ticked, the reference string will be raised by the Height increment each time the function is processed, but only while the panel is open</i>		
Calculate storage to existing tin surface only	tick box	
<i>if ticked, this will calculate the storage to the Existing tin surface from the Water level only</i>		
Reference string	string select	
<i>select the string to interface from.</i>		
Process	button	
<i>run the function</i>		

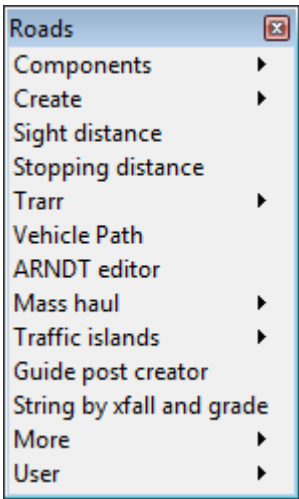
Roads

Position of menu: Design =>Roads

The road options include road network creation options and a number of other options for creating road details.

Some of the options are currently under development.

The roads walk-right menu is

	
Components	generate components
Create	setup and create road network
Sight distance	sight distance calculations
Stopping distance	stopping distance calculations
Trarr	input/output to TRARR
Vehicle Path	run TMR VPATH
ARNDT editor	editor for creating/running TMR ARNDT
Mass haul	generate data for mass haul on long section
Traffic islands	create traffic islands
Guide post creator	create guide posts to AUSTROAD standard
String by xfall and grade	lots of generating strings by Xfalls
More	more roads macros
User	

Each option in this menu will now be described.

For the option *Components*, go to

<i>Components</i>	Components
<i>Create</i>	Create Roads
<i>Design checker</i>	Design Checker
<i>Sight distance</i>	Sight Distance
<i>Stopping distance</i>	Stopping Distance
<i>Trarr</i>	Trarr
<i>Vehicle path</i>	Vehicle Path
<i>ARNDT editor</i>	ARNDT Editor
<i>Mass haul</i>	Mass Haul
<i>Traffic islands</i>	Traffic Islands
<i>Guide post creator</i>	Guide Post Placement
<i>String by xfall and grade</i>	String by Xfall and Grade
<i>More</i>	More Roads

Create Roads

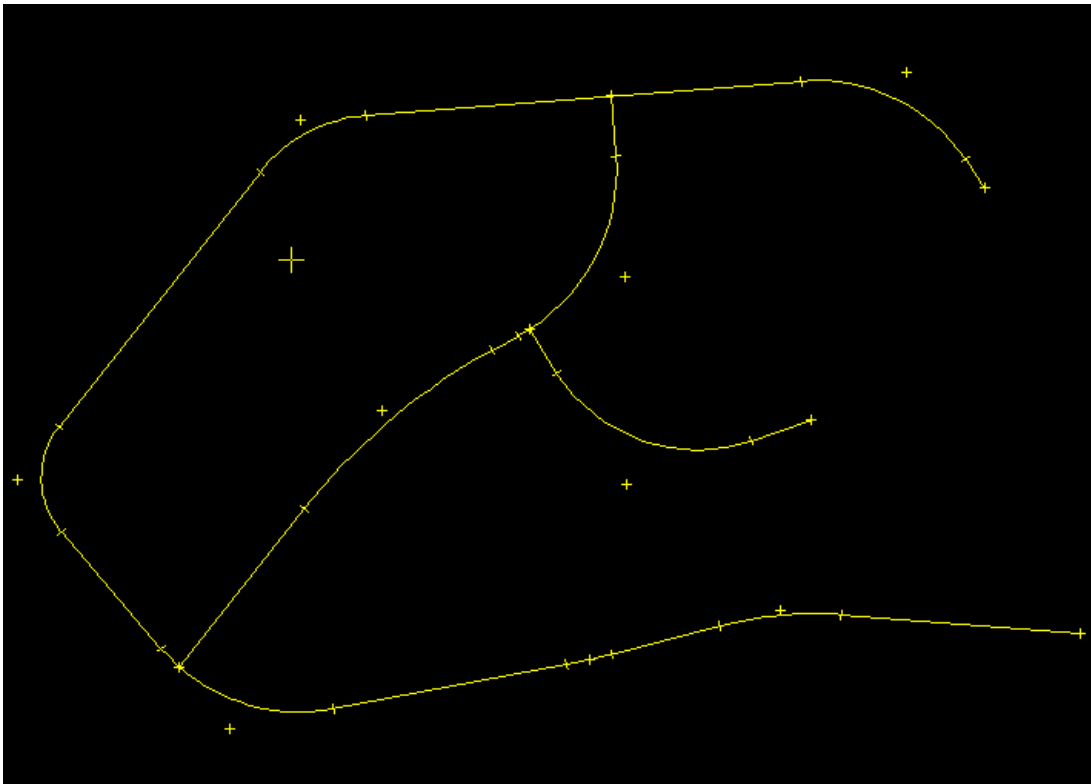
Position of menu: **Design =>Roads =>Create**

The **Create roads** function allow the user to start with a model of road centrelines with vertical geometry, and unique string name.

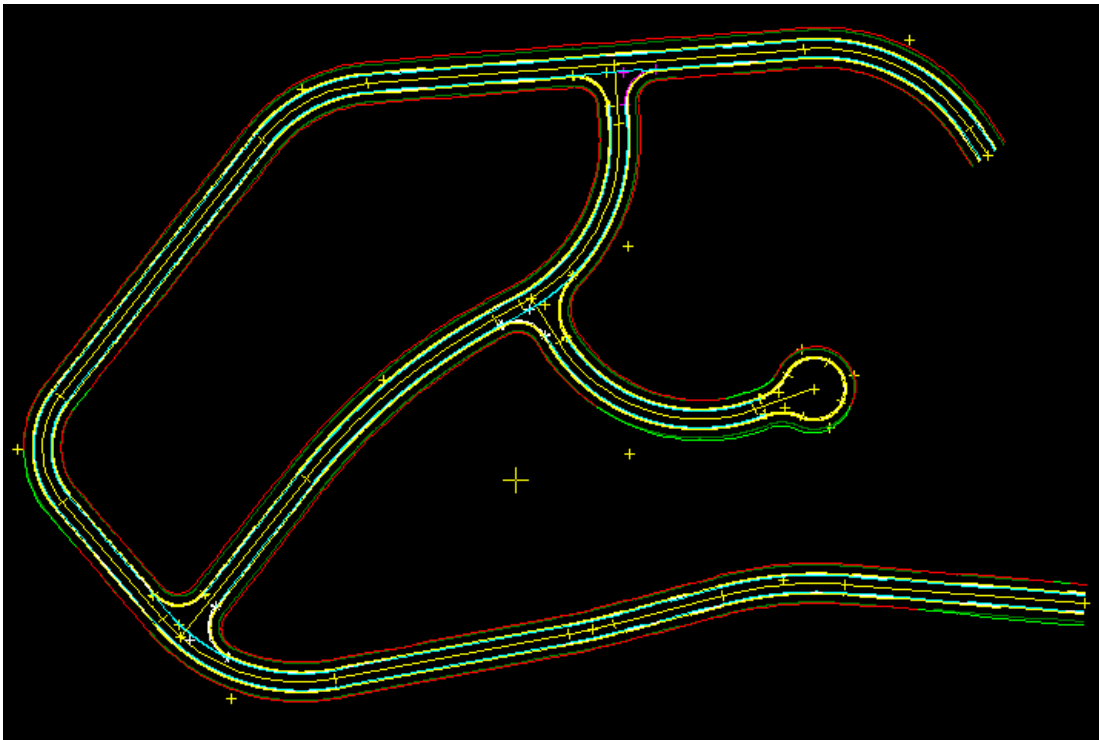
The centrelines can then be tagged with the width of the roads, left and right turn radii for any intersections and the definitions of any culdesacs at the end of a centreline.

The **Create** option will then create the left and right edges of the roads, create kerb returns and any intersections and the appropriate culdesacs.

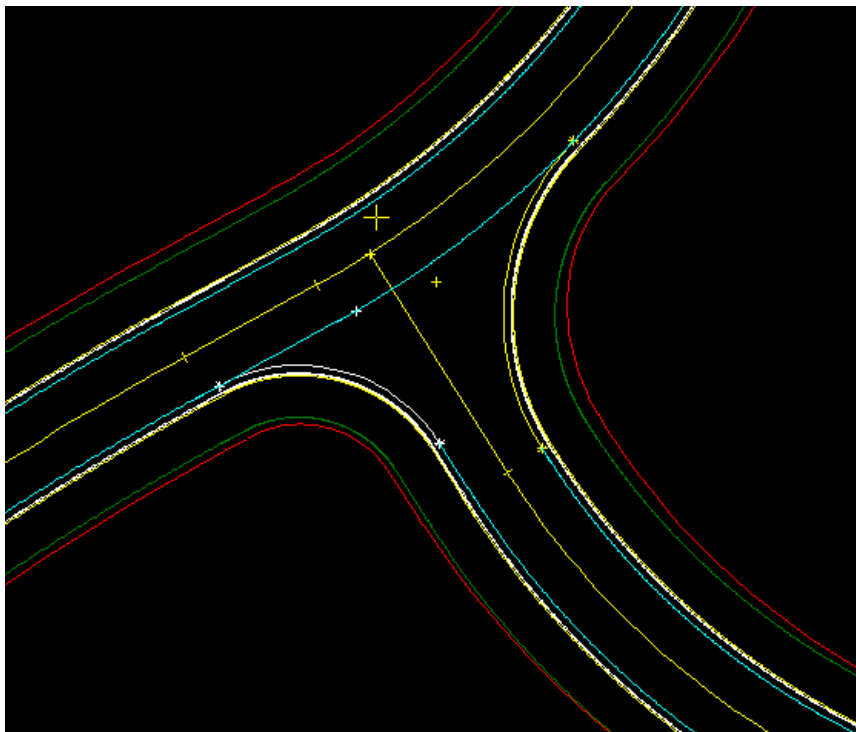
For example



Initial Network of Centrelines



Road Network After Running the Roads Option



Blow Up of an Intersection

The Create Roads walk-right menu is

Create Roads

Create Roads - Manager

Create Roads - Setup

Create Roads - Kret convet

construct the roads network

setups for road network

convert kerb returns

Each option in this menu will now be described.

- For the option *Create Roads - Manager*, go to

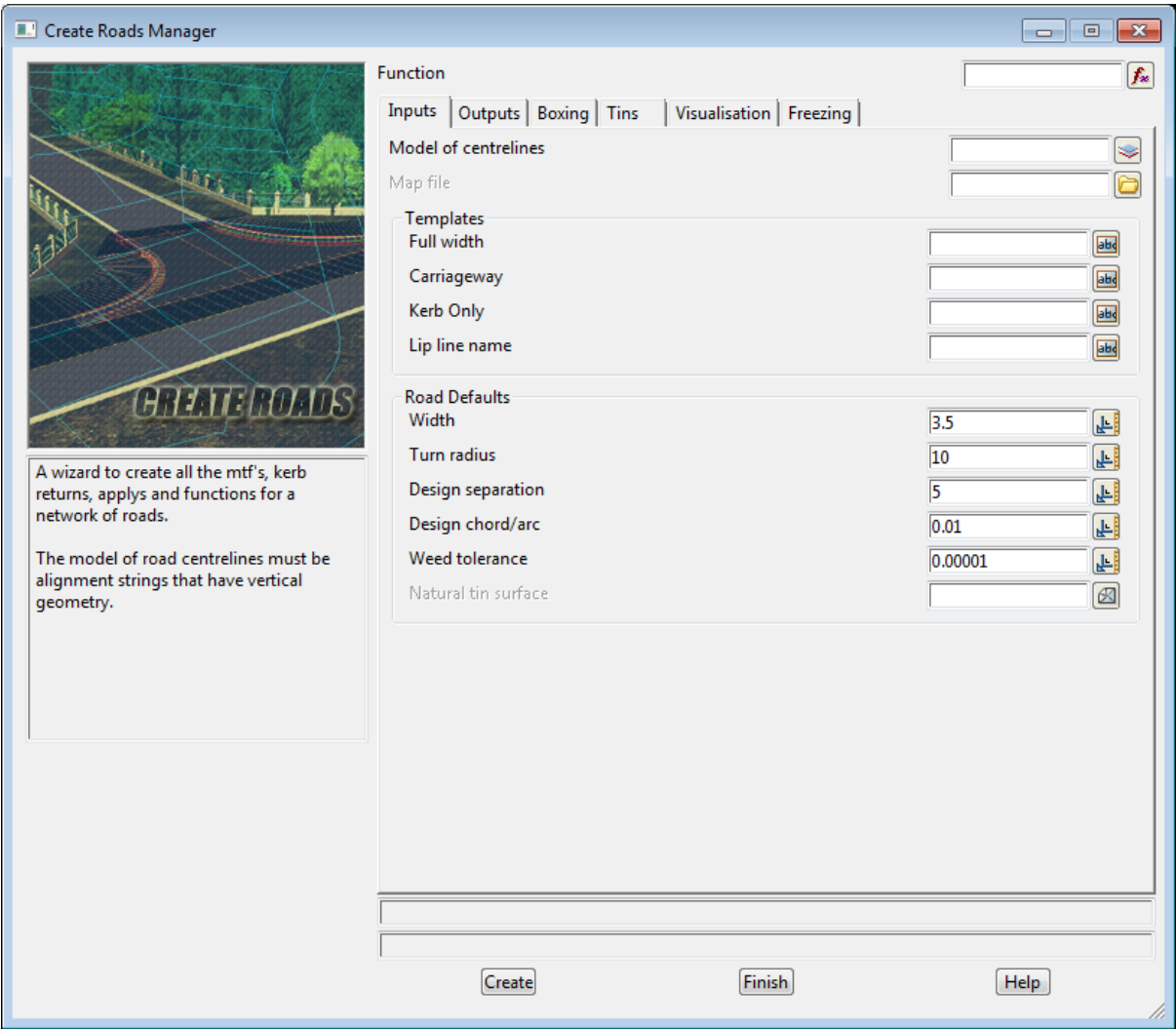
[Create Roads - Manager](#)
- Create Roads - Setup*

[Create Roads - Setup](#)
- Create Roads - Kret convert*

[Create Roads - Kreturns Convert](#)

Create Roads - Manager

This option takes all the centrelines in a model and uses road widths and left and right turn radii to form roads on each centreline.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Function	function box		available roads functions
<i>name of the create roads function</i>			

Input tab

Model of centrelines	model box		available models
<i>model of the centreline lines that are to processed to create roads, intersections and culdesac. Each centreline must have a unique name and vertical geometry</i>			

Templates

Full width	template box		available templates
<i>template with one fixed link and then cut and fill definitions to use for creating the roads. If a centreline has a road width defined, then the template is modified to use those values. The cut/fill section of the template are used to batter as normal.</i>			

Carriageway	template box		available templates
<i>a template with only a fixed part to the end of the carriageway which is applied across any intersections - going from the chainage of the start of the kerb return on one side of the intersection to the chainage at the end of kerb return on the other side of the intersection.</i>			

Kerb only	template box		available templates
<i>a template with no carriageway part. It is applied to any kerb returns</i>			

Lip line name			
<i>name of the lip line that must exist in each of the full width template and the road template. The kerb returns are created from the lip line on each road and the start height and grades are taken from the lip lines.</i>			

Road Defaults

Width			
<i>width of the road to be used if one hasn't been defined for any centrelines</i>			

Turn radius			
<i>radius to use for filleting between any centrelines that don't have a left or right radius defined</i>			

Design separation			
<i>chainage distance to use in the Applies for creating the roads along the centrelines</i>			

Default chord/arc			
<i>chord to arc tolerance to use on curves</i>			

Natural surface tin	tin box		available tins
<i>if non blank, the tin to use as the natural surface for battering in the Applies. If blank, no battering is done.</i>			

Output tab

Model stems

Road strings input

*pre*post text to use with the function name in the created Applies for the design string models for each centreline*

Road sections input

*pre*post text to use with the function name and the created Applies for the design cross section models for each centreline*

Polygons choice box One model One model, No Polygons
Model for Centreline

*if **One model**, all the polygons created by the applies are place in one model.*
*If **Model for Centreline**, different models are created for the polygons in each apply.*
*If **No Polygons**, no polygons are created by the applies.*

Model model box available models

*when **One model**, model for all the polygons created by the Applies.*

Road polygons input

*pre*post text to use with the function name in the created Applies for polygon models for each centreline*

Kerb Returns

Turn separation

chord/arc tolerance for use in the kerb return Applies

Turn chord/arc

chord to arc tolerance to use on kerb return

Model for kerb returns model box available models

model for all the kerb returns

Naming choice box Follow Road Names - LHS driving
Follow Road Names - RHS driving
Use Numbers
Use Letters

method of naming the kerb returns

Just create kerb returns tick box

if ticked, only create the kerb returns. Usually only run at the beginning to see if the kerbs look correct.

Just create kerb returns tick box

if ticked, only create the kerb returns. Usually only run at the beginning to see if the kerbs look correct.

Kerb return strings and sections in one model tick box

if ticked, then all the kerb return strings and sections are place in the one model. The model names are given in the next two fields.

Model for kerb return strings model box available models

model for all the kerb return strings

Model for kerb return sections model box available models
model for all the kerb return sections

Delete frozen apply many functions tick box
if ticked, the apply many functions are deleted for all the frozen roads. Normally not used

View for models view box available views
if non blank, view to add all the created models onto.

Error report file box *.rpt files
file for error messages

Boxing tab

boxing can be created for all the road and kerb return strings. The boxing definitions must have a common centreline name in them which will be replaced by the name of each of the road/kerb return centrelines.

Create boxing tick box
if ticked, boxing is applied for all the road and kerb returns. The boxing definitions must have a common centreline name in them which will be replaced by the name of each of the road centrelines or kerb returns.

Default boxing file file box *.blf files
file of boxing file definitions

Default boxing CL delimiter input
common name in each boxing definition which will be replaced by the name of each road/kerb return centreline

Model stem for boxing strings input
*pre*post text to use with the road/kerb return function name for boxing string models*

Boxing sections input
*pre*post text to use with the road/kerb return function name for boxing section models*

Boxing kerb return sections and strings in one model tick box
if ticked, the strings for all the kerb return Applies are place in one model rather than one model for each kerb return. Similarly, the sections for all the kerb return Applies are placed in the one model. If not ticked, the model names are created in the same way as for the road centrelines. That is, the Model stem for boxing strings and sections are used with the kerb return function name and the layer stems to produce the kerb return boxing strings and sections models.

Model name for boxing kerb strings input
*when only one model (per layer) for the box kerb strings is used - the base name for the model of kerb strings created for each boxing layer. The pre*post text in the Layer Stem is applied to this name.*

Model name for boxing kerb sections input
*when only one model (per layer) for the box kerb sections is used - the base name for the model of kerb sections created for each boxing layer. The pre*post text in the Layer Stem is applied to this name.*

Boxing Layer 1-8 in the grid:

if non blank, boxing strings and sections will be created for that layer.

The last boxing layer is also referred to as the **subgrade** layer.

Layer stem input

*for this boxing layer, the pre*post text used when naming models for boxing sections and strings.*

Road - LHS input

for this boxing layer, the boxing definition to use on the left hand side of road centrelines

Road - RHS input

for this boxing layer, the boxing definition to use on the right hand side of road centrelines

Kerb return input

for this boxing layer, the boxing definition to use on the kerb returns

Intersection - LHS input

for this boxing layer, the boxing definition to use on the left hand side of the road though an intersection. The strings and sections are place in the models for the road centreline going through the intersection.

Intersection - RHS input

for this boxing layer, the boxing definition to use on the right hand side of the road though an intersection. The strings and sections are place in the models for the road centreline going through the intersection.

Tins tab

Create tin ☐ tick box

if ticked, create a tin for all the roads, kerb returns and culdesacs

Road tin tin box

available tins

name for the tin created from the all the strings and sections

Road tin colour colour box

available colours

colour of the road tin

Subgrade tin tin box

available tins

if non blank, a subgrade tin of this name is created

Subgrade tin colour colour box

available colours

colour of the subgrade tin

Nulling angle

angle for nulling the triangles

Nulling length input

length for nulling the triangles

Null Seed points:

Seed X/Y input
X/Y coordinate of a nulling seed point

Seed Point button
select a seed point for nulling the tins. The X and Y coordinates are written to the Seed X/Y grid

Visualisation tab

Create visualisation tick box
if ticked, the road tin is processed for visualisation

Apply texture map to tin tick box
if ticked, the texture map is applied to the road tin

Draw road tin as solid on view tick box

Tin colour to use for cut polygons colour box available colours
colour to use for all the cut polygons

Tin colour to use for fill polygons colour box available colours
colour to use for all the fill polygons

Tin colour to use for transition polygons colour box available colours
colour to use for all the polygons in neither cut nor fill

Freezing tab

Colour for the frozen sections colour box available colours
colour to use for the sections of frozen strings. In any view, this gives a quick way of identifying frozen roads.

Road grid - list of all the centrelines

Element available colours
centreline name

Frozen tick box
if ticked, the centreline is frozen out of the automatic Create Roads process.

*For a frozen centreline, when the **Create Roads** function is run, the Apply Many for that centreline is deleted and re-created. However any existing Apply Many for that centreline will be run. Kerb returns are still calculated using the lip line create by running the existing Apply Many for the frozen centreline. Hence the mtf for a frozen centreline can be modified and the changes will **not** be deleted when the Create Roads function is recalcd.*

Note - if the two roads used to define a kerb return are both frozen, then the kerb return is automatically frozen and the kerb return is not deleted and recreated when the Create Roads function is recalcd. However the existing Apply Many for the frozen kerb return is run on each recalcd.

Buttons at bottom

Create button

run the option and create the road network.

Create Roads - Setup

In the **Create Roads - Manager** panel there are default values for the road width and road crossfall and turn radius.

If a different road width or crossfall, or a different left turn radius or right hand radius is required, the **Create Roads - Setup** option is used to define the different information for any centreline. **Create Roads - Setup** is also used to define culdesacs.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Road Setup tab			
Centreline	string select		
<i>used to set the left and right turn radii, and the width of the road. This option is used twice to set the</i>			

different radii for each end of a road by picking the centreline close to the end that is to have the left and right turn radii defined. The left and right turn radii can be different for each end of an alignment.

Road width

width of one side of the road for the selected centreline.

LHS turn radius

radius to use for filleting between any centrelines on the left.

RHS turn radius

radius to use for filleting between any centrelines on the right.

Set button

store the given values in the panel with the selected centreline.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Culdesac Setup tab

- Left fillet

input

radius of the fillet between the road and the bulb on the left hand side
- Bulb radius

input

radius of the culdesac bulb
- Bulb offset

input

offset of the culdesac bulb
- Right fillet

input

radius of the fillet between the bulb and the right had side of the road
- Left straight

input

distance between the left fillet and the bulb
- Right straight

input

distance between the right fillet and the bulb
- Set

button

store the panel values the selected centreline.



Create Roads - Kreturns Convert

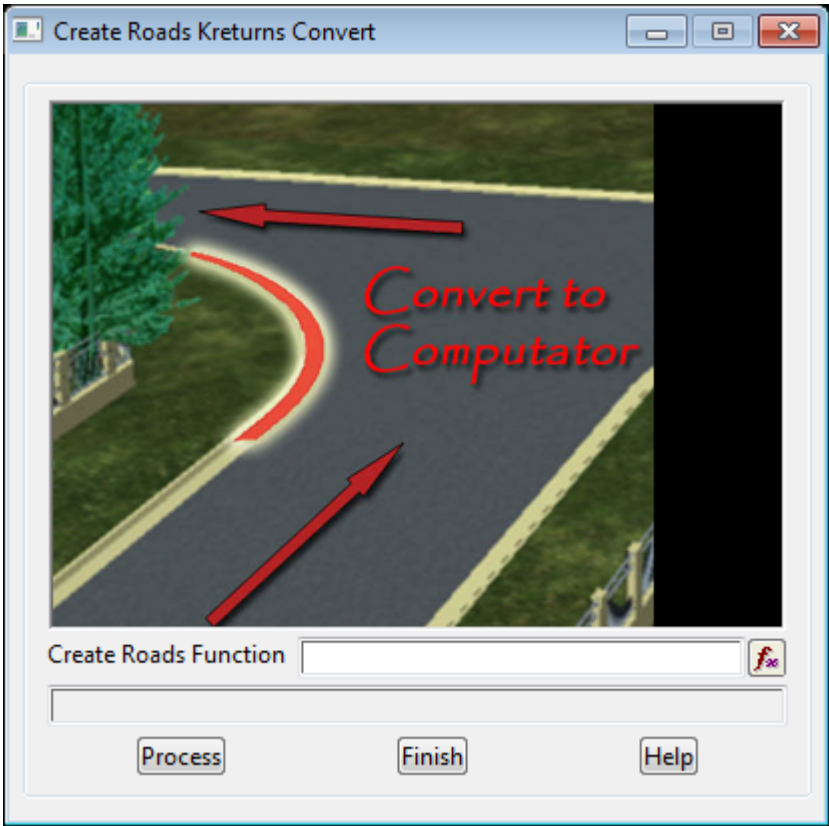
Position of menu: **Design =>Roads =>Create Roads - Kret Convert**

This macro is to be used in conjunction with the **Create Roads**.

Once **Create Roads** has been run, this macro will convert all the SA kerb returns to Element method (in both horizontal and vertical).

The horizontal parts are referenced to the appropriate road centreline, using segment computators and a free arc radius.

The vertical is a combination of a fixed grade at the start and end, with a compound parabola.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Create Roads Function <i>select function from list</i>	function		select function
Process <i>runs the option</i>	Button		

Design Checker

Position of option on menu: **Design =>Roads =>Design checker**

This option is still under development.

Selecting **Design checker** displays the **Design Checker** panel.

Sight Distance

Position of option on menu: Design =>Roads =>Sight distance

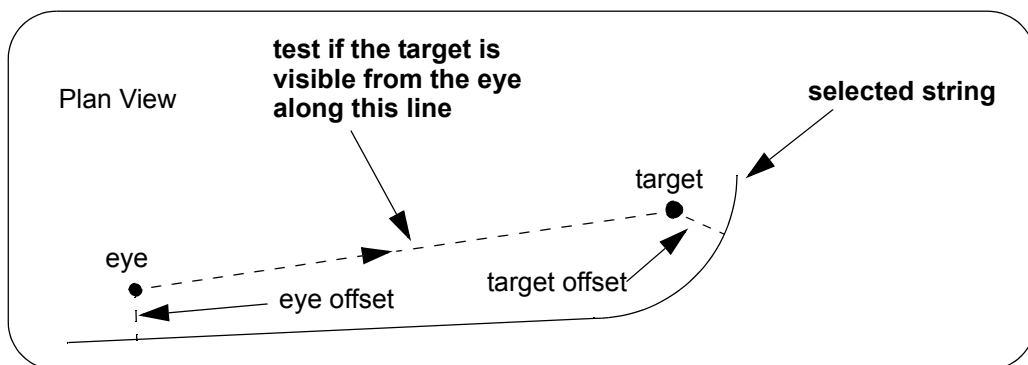
For an alignment and a given tin (or SuperTin), the **sight distance** option calculates the maximum distance that can be seen from an eye point on the tin to a target point further along the string.

In the option, a string and a tin are selected and (optionally) an eye point offset and height, and a target offset and height.

12d Model then positions the eye point at the given start chainage on the selected string, and then going out perpendicular for the given eye offset, drops that position onto the tin, and finally raises it by the given eye height.

From the eye point, a target point is placed at a chainage distance equal to the given minimum sight distance along the string. The target point is offset by the given target offset, and dropped onto the tin and finally raised by the given target height.

The **target point** is then tested for visibility from the eye point, against the given tin. That is, a test is made to see if the *target point can be seen from the eye point*, against the surface given by the tin.



If the target point is visible, it is moved the given chainage distance, trial interval, further along the string and the visibility test redone.

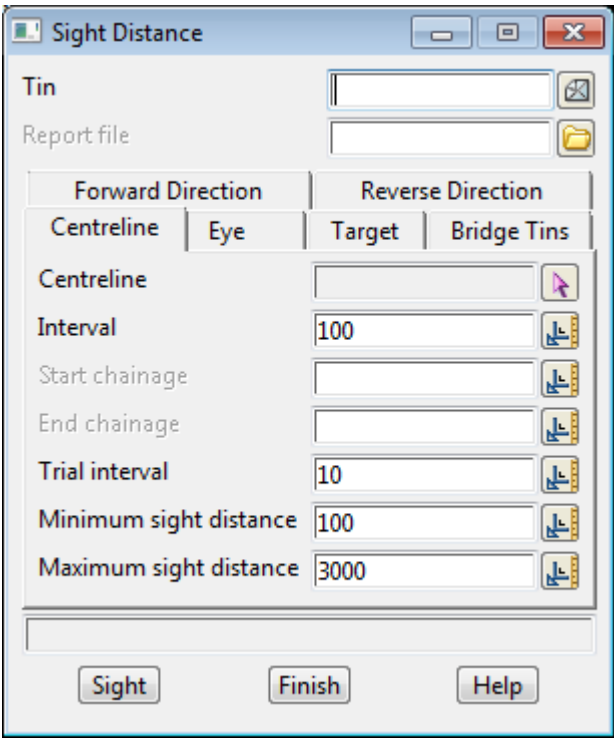
The process is repeated until either the target point is invisible, or the target point is the given maximum sight distance (in chainage) away from the eye point.

A line joining the eye and **final target point position** is created and placed in the model for sight lines. The **chainage** distance between the eye and the final target point is placed as a text string in the model for sight text, positioned at the eye point.

The eye point is then moved the given chainage distance interval along the string, and the process repeated until the eye point is past the given end chainage.

The eye point is then placed at the end chainage and the negative of the trial interval and interval values used to calculate sight distance for the reverse direction along the string.

On selecting the **sight distance** option, the **sight distance** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin to use as the surface for testing visibility.</i>	input		available tins
Report file <i>if non blank, a report is produced and written out to this file name.</i>	file box		*.rpt files

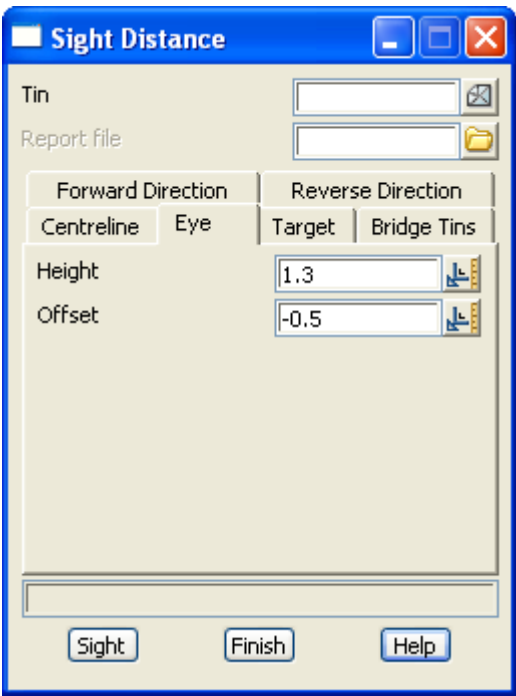
Centreline tab

Centreline <i>the string to be used for calculating the chainage position for the eye and target points, is selected from a view.</i>	string-select		
Interval <i>once the sight distance is calculated for the eye at a chainage, the eye chainage is incremented by this amount the sight distance calculation repeated.</i>	input	100	
Start/end chainage <i>the sight distance is calculated for points on the selected string covering the chainage range given by the start and end chainage fields. If the start/end chainage is blank, the star/end chainage of the selected string is used.</i>	input		
Trial interval <i>if the target point is visible, it is then moved along by this chainage increment and the sight test repeated.</i>	input	10	
Minimum sight distance	input	100	

minimum chainage distance from the eye point to place the test target point. The first test of a target is made at this minimum chainage distance from the eye chainage.

Maximum sight distance input 3000

maximum chainage distance to use for placing the test target point. The testing stops if the test target position goes over this chainage distance. In this case, the sight distance will be the maximum sight distance.



Eye tab

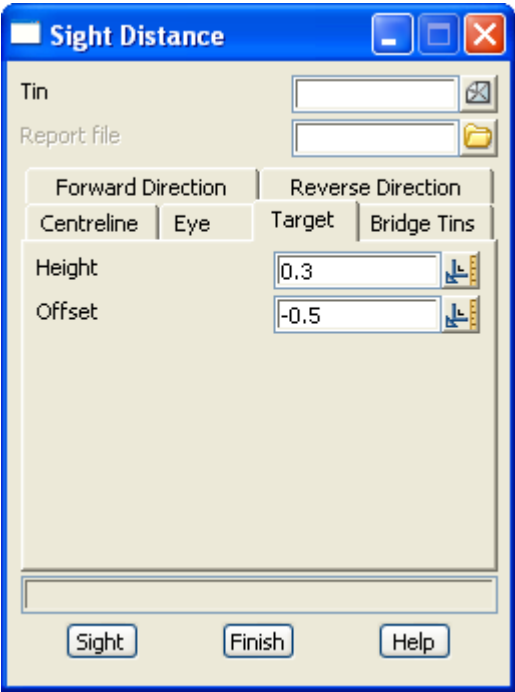
the eye position is determined by finding the chainage along the selected string, going out perpendicularly for the given eye offset (negative to the left, positive to the right), dropping that position onto the given tin, and then adding the eye height to the height on the tin. Hence the eye point is always the eye height above the tin.

Height input 1.3

height of the eye point above the given tin.

Offset input -0.5

offset of the eye point from the picked string.

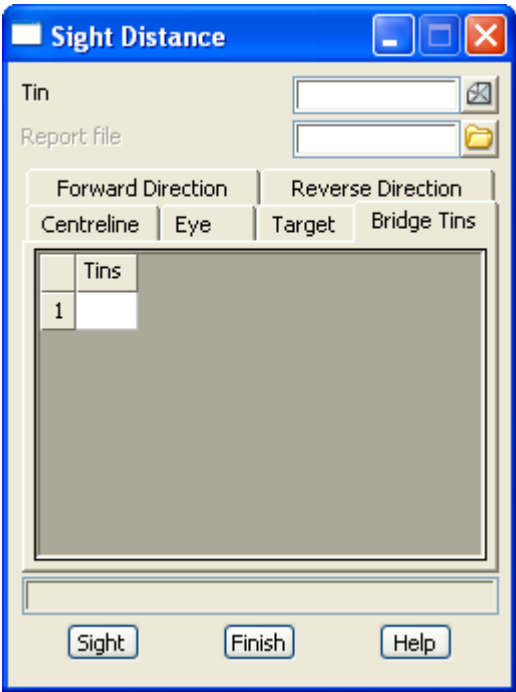


Target tab

the target position is determined by finding the chainage along the selected string, going out perpendicularly for the given target offset (negative to the left, positive to the right), dropping that position onto the given tin, and then adding the target height to the height on the tin. Hence the target point is always the target height above the tin.

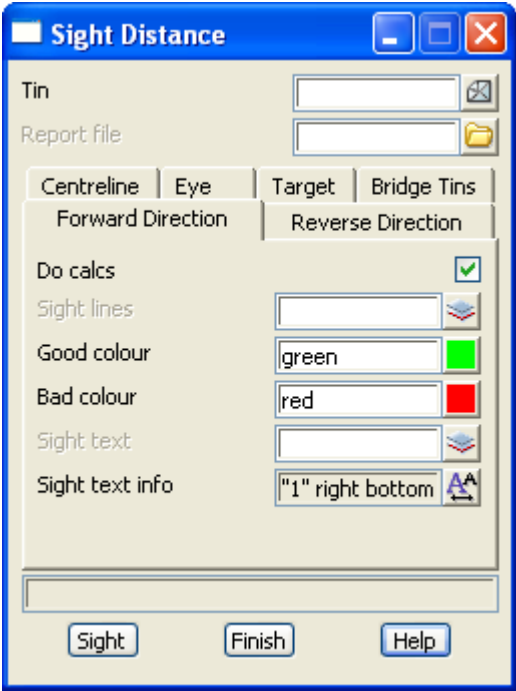
Height input 0.3
height of the target point above the given tin

Offset input -0.5
offset of the target point from the picked string.



Bridge Tins tab

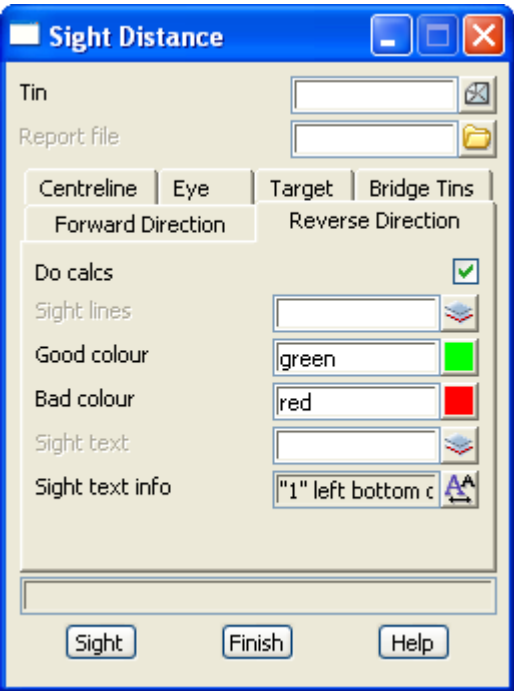
Tin grid available tins
name of the tins to use as vertical obstructions when testing visibility.



Forward Direction tab

Do calcs tick box
if ticked, do the calcs for the forward direction

Sight lines	model box	available models	
<i>if non-blank, the name of the model to contain the sight lines.</i> <i>If blank, the sight lines are not created.</i>			
Good colour	colour box	default colour	available colours
<i>when the minimum sight distance is achieved, sight lines are created in the good colour</i>			
Bad colour	colour box	default colour	available colours
<i>when the minimum sight distance is not achieved, sight lines are created in the Bad colour</i>			
Sight text	model box	available models	
<i>if non-blank, the name of the model to contain the sight distance text.</i> <i>If blank, the sight distance text is not created.</i>			
Sight text info	text info		
<i>definition of the sight text.</i>			



Reverse Direction tab

Do calcs	tick box		
<i>if ticked, do the calcs for the reverse direction</i>			
Sight lines	model box	available models	
<i>if non-blank, the name of the model to contain the sight lines when going down the string in the reverse direction Note that the eye and target offsets are then applied in the reverse direction of the string. If blank, the sight lines are not created.</i>			
Good colour	colour box	default colour	available colours
<i>when the minimum sight distance is achieved, sight lines are created in the good colour</i>			

Bad colour colour box default colour available colours

when the minimum sight distance is not achieved, sight lines are created in the Bad colour

Sight text model box available models

if non-blank, the name of the model to contain the sight distance text.
If blank, the sight distance text is not created.

Sight text info text info

definition of the sight text.

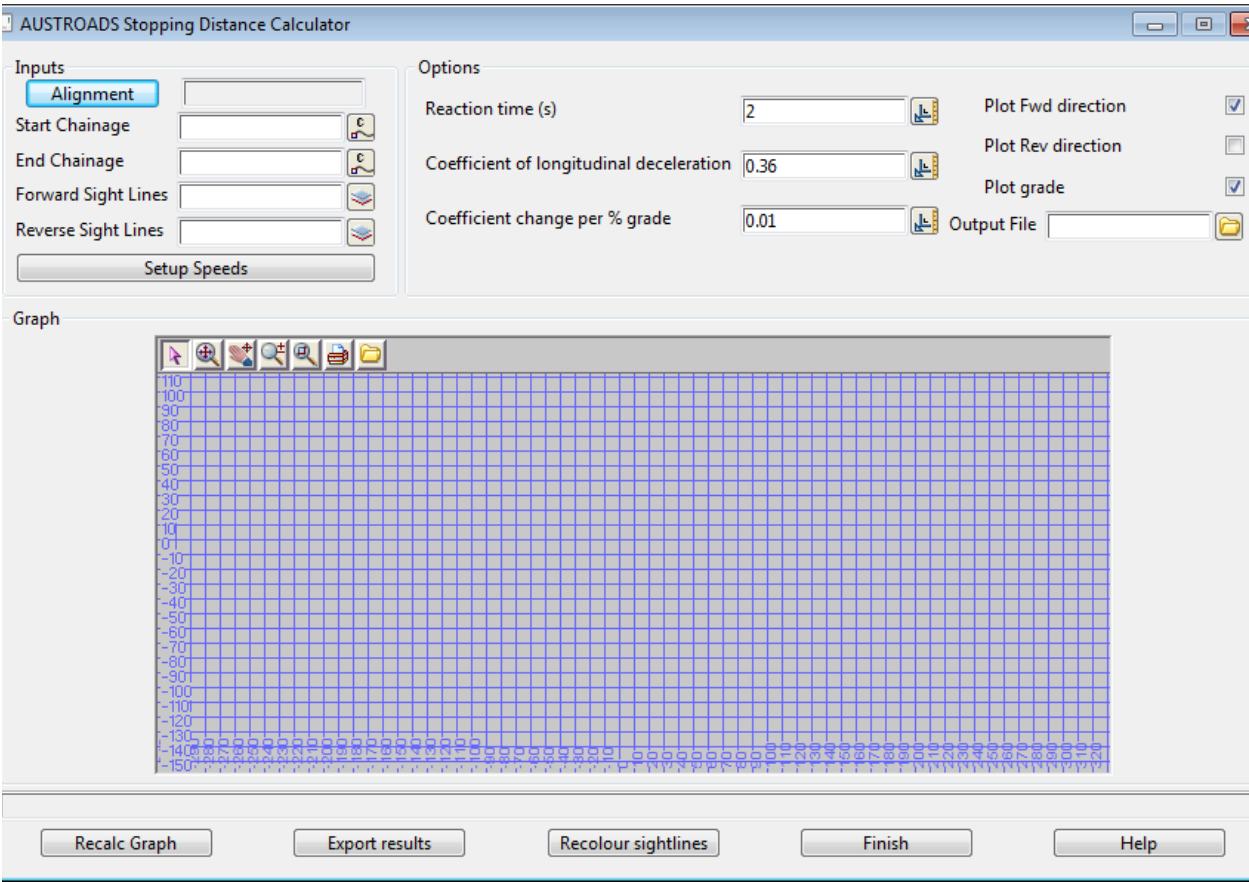
Sight button

sight lines and text will be calculated for the given string and tin, and placed in the sight line and text models.

Stopping Distance

Position of option on menu: Design =>Roads =>Stopping distance

This section of documentation is a work in progress and will be updated in subsequent releases.

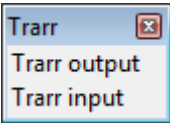


Trarr

Position of menu: Design => Roads =>Trarr

The option under **Trarr** read and write Design TRARR files.

The **Trarr** walk-right menu is



write out a Trarr file
read in a Trarr file

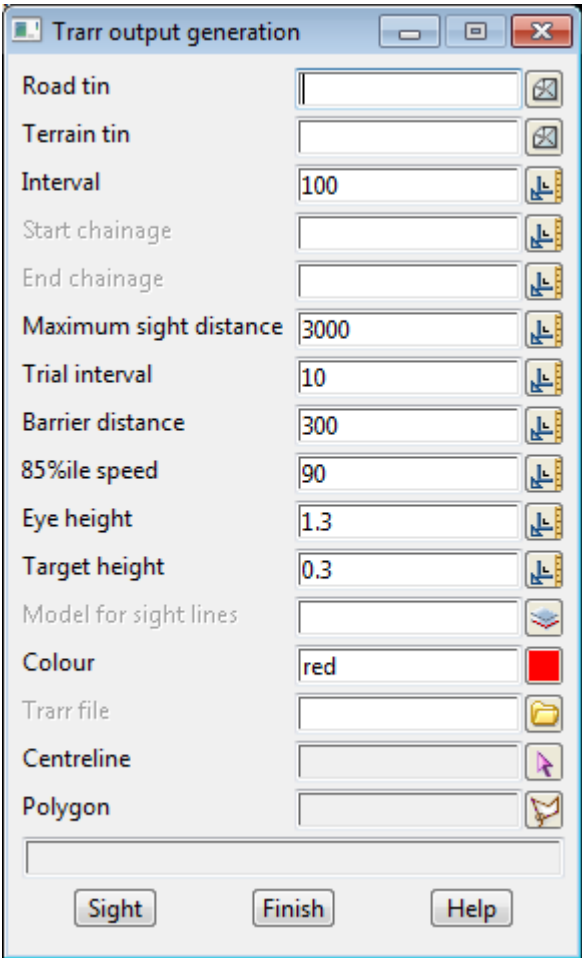
For *Trarr output*, go to [Trarr Output](#)
Trarr input [Trarr input](#)

Trarr Output

Position of option on menu: Design =>Roads =>Trarr =>Trarr output

Options to create a file for use with TRARR.

Please contact **12d** Solutions Pty Ltd if you wish to use this option.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Road tin	tin box	available tins
<i>tin of the road design</i>		
Terrain tin	tin box	available tins
<i>tin of the terrain</i>		
Interval	input	
<i>interval to calculate sight lines</i>		
Start chainage		
<i>if non blank, start chainage for producing the Trarr file.</i>		
<i>if blank, start at the beginning of the centreline string.</i>		
End chainage		
<i>if non blank, end chainage for producing the Trarr file.</i>		
<i>if blank, go to the end of the centreline string.</i>		
Maximum sight distance	input	
<i>maximum distance to try and calculate sight lines</i>		
Trial interval	input	
<i>interval to move ahead to test sight distance to</i>		
Barrier distance	input	
<i>if sight distance is less than this value then a barrier line is required</i>		
85%ile speed	input	
<i>85 percentile speed (to write to the Trarr file)</i>		
Eye height	input	1.3
<i>height of the eye point above the picked string</i>		
Target height	input	0.3
<i>height of the target point above the picked string</i>		
Model for sight lines	model box	available models
<i>if non blank, the sight lines are kept and placed in this model</i>		
Colour	colour box	available colours
<i>colour of the sight lines</i>		
Trarr file	file box	*.rpt files
<i>if non blank, a Trarr file of this name is produced</i>		
Centreline	string-select	
<i>string to be used for placing the eye and target points and calculating sight distance, is selected from a view.</i>		
Polygon	string-select	

boundary polygon for the road tin

Sight button

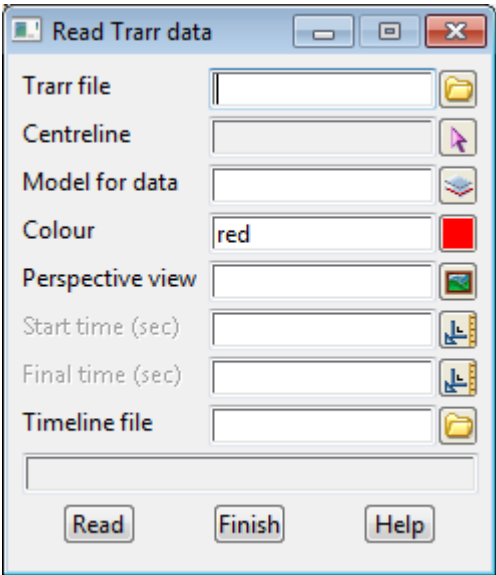
calculate sight lines and write out a Trarr file

Trarr input

Position of option on menu: **Design =>Roads =>Trarr =>Trarr input**

Option to read a TRARR file.

Please contact **12d** Solutions Pty Ltd if you wish to use this option.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Vehicle Path

Position of menu: **Design =>Roads =>Vehicle Path**

The **vehicle path** option is used to interface with the vehicle path program **Vpath**, written by the Queensland Department of Transport and Main Roads.**Vpath** can be obtained from the Queensland Department of Transport and Main Roads.

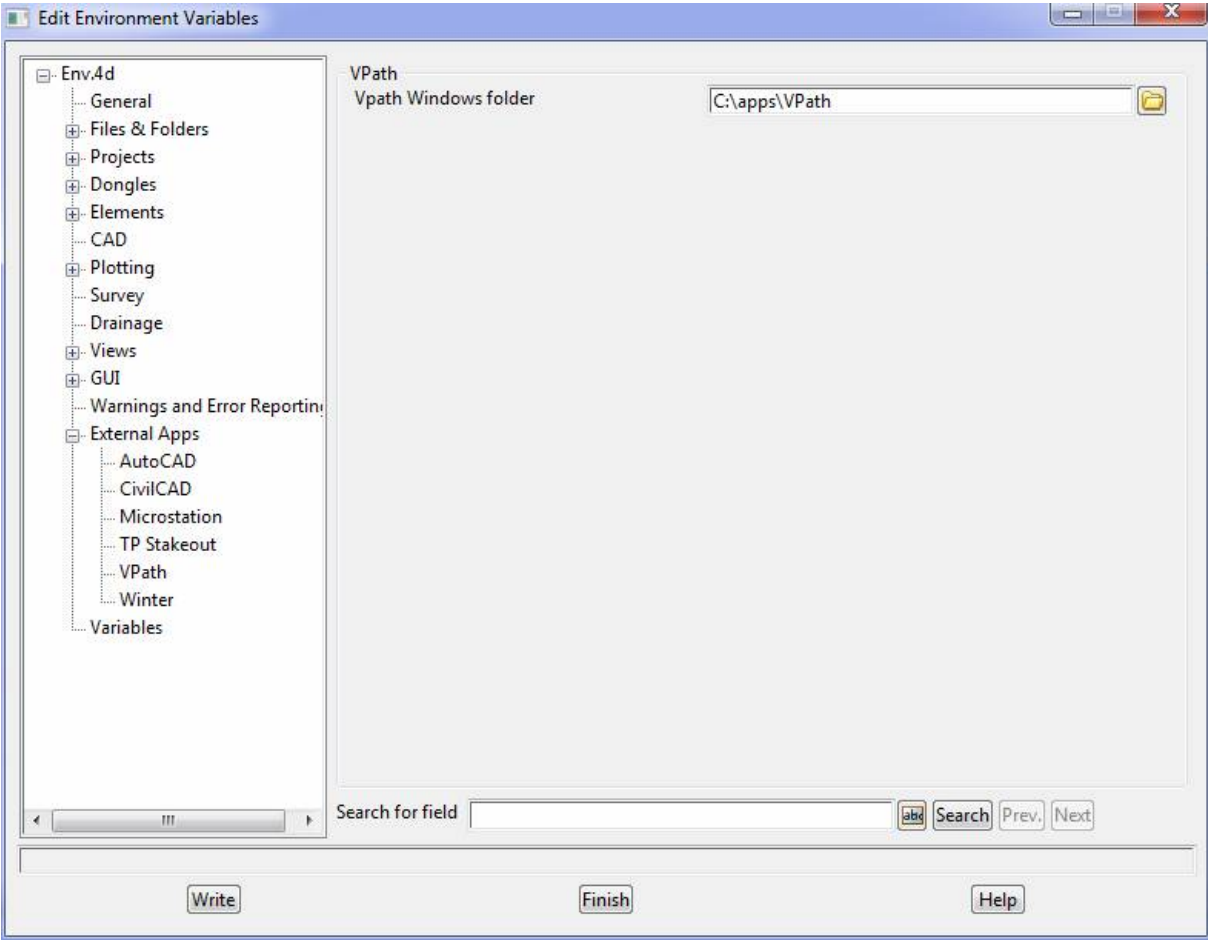
The **Vpath** program is fully described in its own Manual available from Queensland Department of Transport and Main Roads.

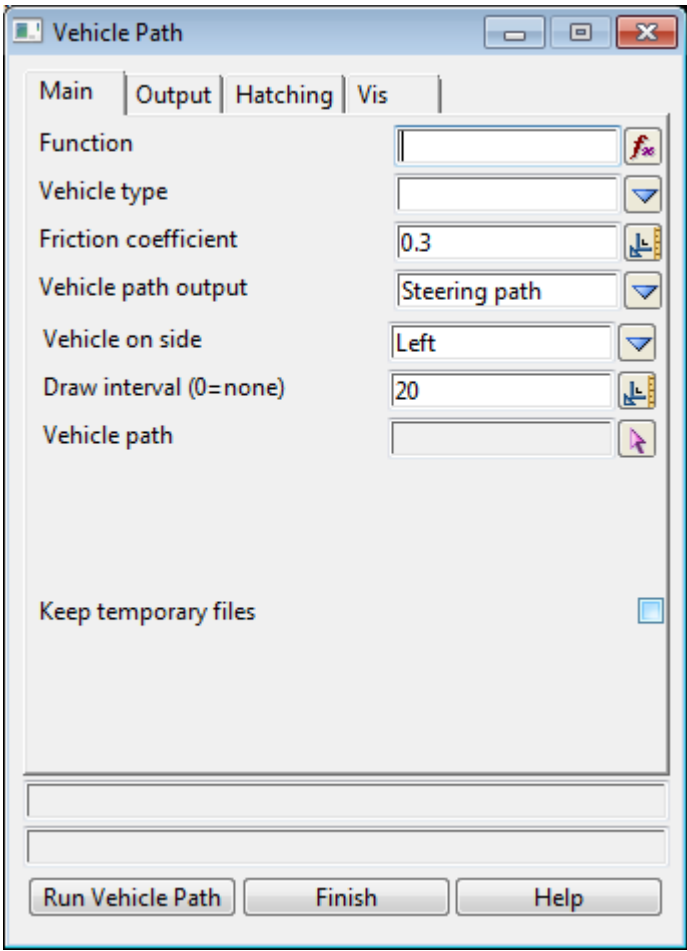
To run **Vpath** from within 12d Model the environment variable **WINDOWS_VEHICLE_PATH_4D** is set to point to the folder where the Windows **Vpath** executable is located.

This can be set manually or done through the Edit Environment Variables panel.

WINDOWS_VEHICLE_PATH_4D *folder-path*

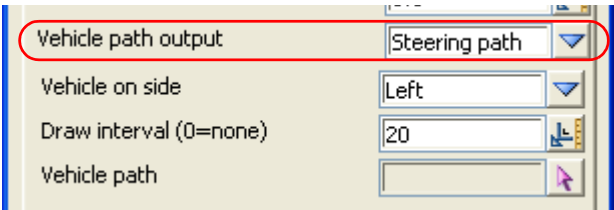
On selecting the **Vehicle Path** option, the **Vehicle Path** panel is displayed. If the environment variable is not set the **Edit Environment Variables** panel will be displayed on the screen.





The fields and buttons used in this panel have the following functions.

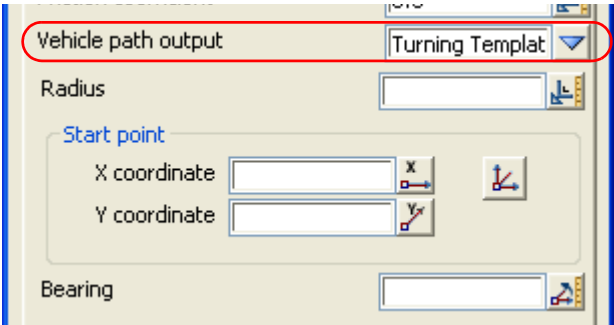
Field Description	Type	Defaults	Pop-Up
Main Tab			
Function	function box		
<i>name of the Steering Path function. If the function already exists and is picked from a pop-up or an <enter> is given at the end of the name, the information from the existing function will be placed in the appropriate panel fields</i>			
Vehicle type	choice box		
<i>the vehicle type used for generating the swept path. This is populated from first the vehicles.std and then the vehicles.cus files located in the defined vehicle path directory.</i>			
Friction coefficient	input		
<i>the coefficient of friction to be used for the vehicle.</i>			
Vehicle Path Output	choice box		Steering path, Turning Template
<i>Steering path: the swept path of the vehicle is generated along the selected super alignment/alignment string.</i>			
<i>Turning Template: the swept path of the vehicle is generated through 180° at a nominated radius</i>			



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Steering path options			
Vehicle on side <i>the side of the vehicle that the selecting steering path represents</i>	choice box		Left, Right
Draw interval (0=none) <i>if non-zero, the position of the vehicle on the steering path is, draw the position at this interval</i>	input		
Vehicle Path <i>select the string for generating the swept path. The string must be a super alignment or alignment string, consecutive straights and transitions curves are not allowed and there can be no more than 20 arcs in the string.</i>	string select		

Turning Template Options



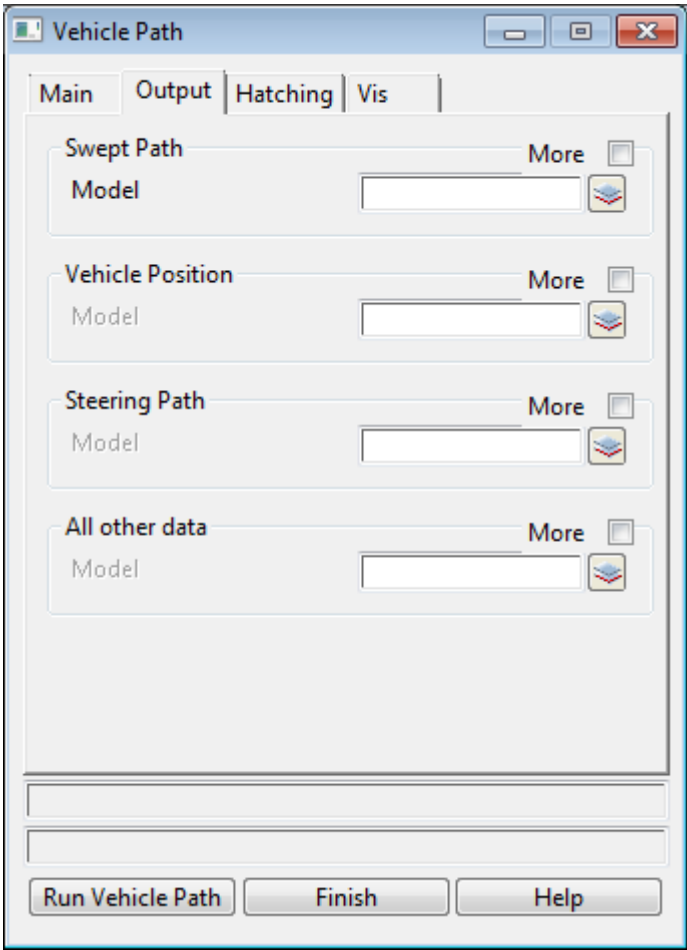
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Radius <i>enter the radius of the turning template, +ve defines a clockwise turn, -ve anti-clockwise</i>	input		
Start point <i>select the coordinates of the start point of the turning template.</i>	input		
Bearing <i>enter the bearing of the start point of the turning template.</i>	input		

Common options

Keep temporary files tick box

*if ticked the input file for **Vpath** and the **dxg** file produced by **Vpath** are kept in the **Vpath** directory.*



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Output Tab

Swept Path

the model for the swept path generated by the extremities of the vehicle

Vehicle Position

if non-blank, the strings tracing out the vehicle position at the nominated interval are placed in this model

Steering Path

if non-blank, the steering path including the marking of the tangent points and centres of each circular curve are created and placed in this model

All other data

*if non blank all other data produced by **Vpath** including a table of parameters used is placed in this model.*

If the **More** tick box is ticked the following fields are displayed.

Vehicle Path

Main

Output

Hatching

Vis

Swept Path

More

☒

Name

Model

Colour

Linestyle

Weight

Vehicle Position

More

☒

Name

Model

Colour

Linestyle

Weight

Steering Path

More

☒

Name

Model

Colour

Linestyle

Weight

All other data

More

☒

Name

Model

Colour

Linestyle

Weight

choice ok

Run Vehicle Path

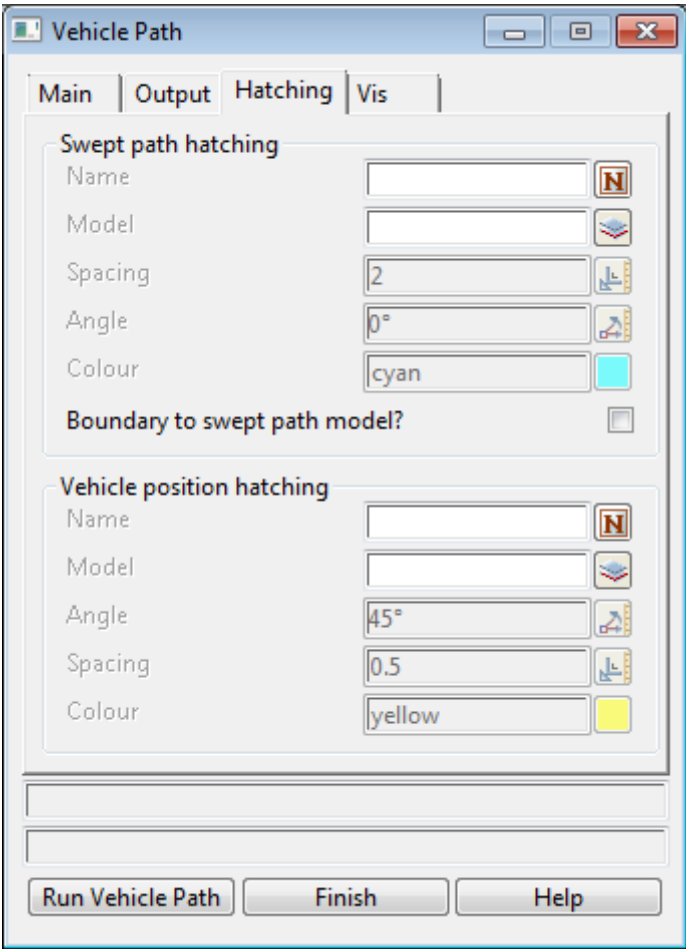
Finish

Help

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

With the **More** enabled the **Name**, **Model**, **Colour**, **Linestyle** and **Weight** can be entered for each option.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Hatching Tab

Swept path hatching

The swept path of the vehicle can be hatched, the swept path strings generated by **Vpath** are collated into a single boundary string to produce the hatching.

Warning, this operation can take some time on longer alignments.

Name

name of the swept path hatching.

Model

model for the swept path hatching.

Spacing

spacing of the swept path hatching.

Colour

colour of the swept path hatching.

Boundary to swept path model? tick box

if ticked the collated boundary string is copied to the swept path model.

Vehicle position hatching

the strings tracing out the vehicle position can be hatched.

Name

name of the vehicle position hatching.

Model

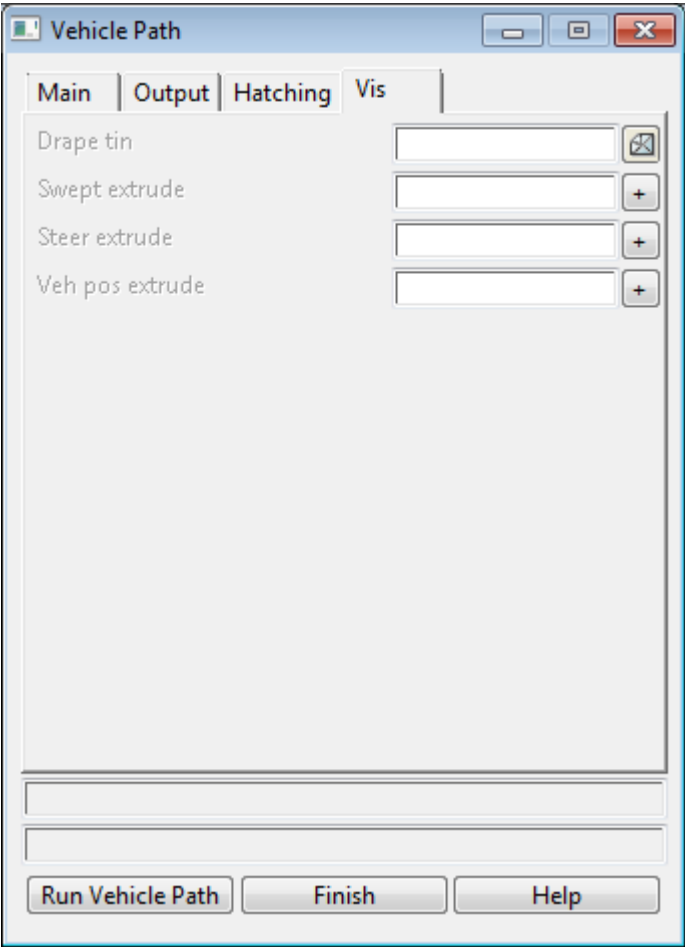
model for the vehicle position hatching.

Spacing

spacing of the vehicle position hatching.

Colour

colour of the vehicle position hatching.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Vis Tab			

The **Vis** tab is used to create a visualisation from the generated strings.

Drape tin

the tin to drape the generated string onto to create the visualisation

Swept extrude

the extrusion to use for the swept path strings

Steer extrude

the extrusion to use for the steering path strings

Veh pos extrude

the extrusion to use for the vehicle position strings

Run Vehicle Path button

*run the **Vpath** program and load the results back into the models given in the panel fields.*

***Vehicle Path** supports up to 20 IPs. A warning message will be displayed if this is exceeded and no data will be produced.*

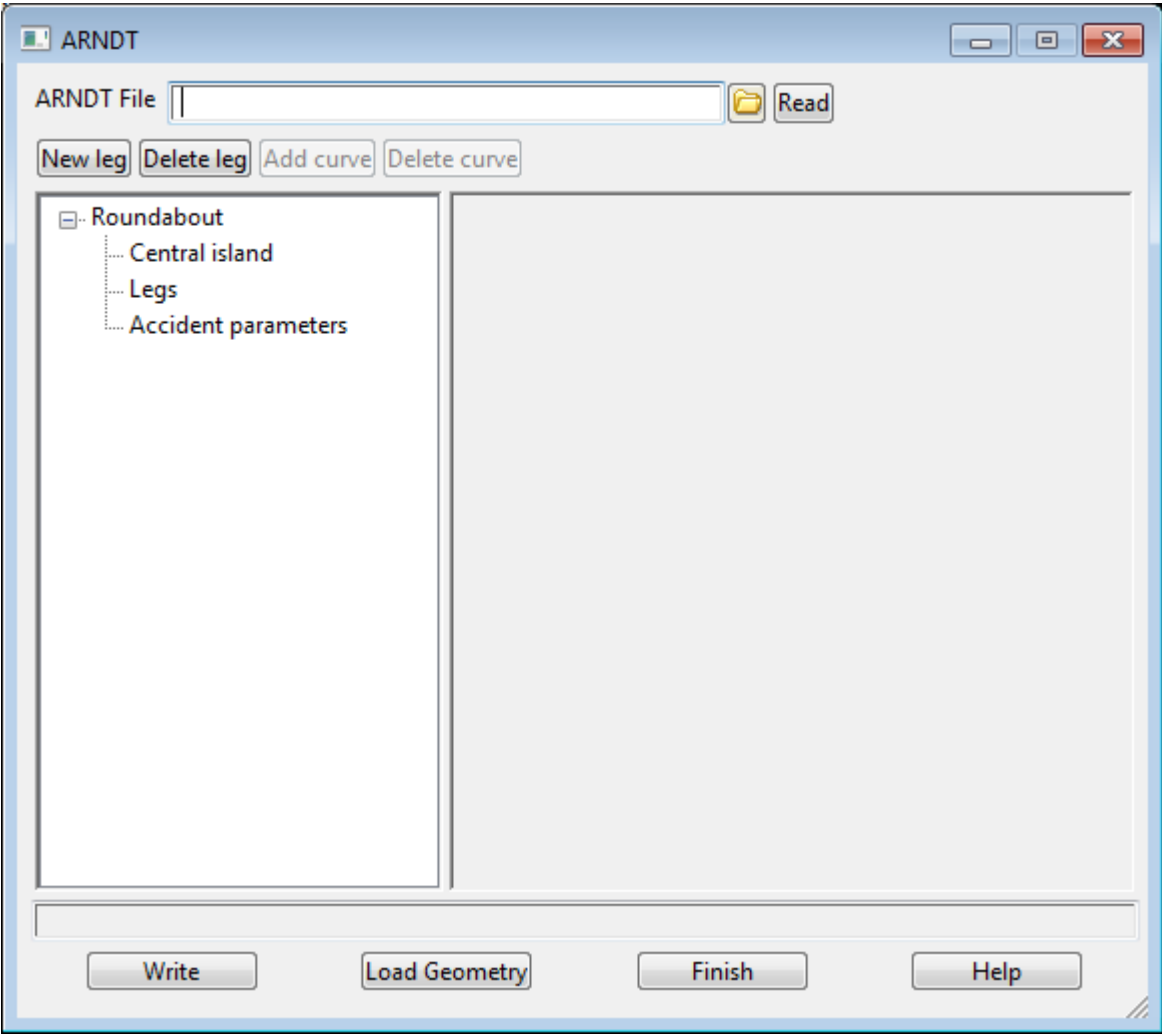
***Vehicle Path** only supports tangential straight/curve and curve/curve geometry. A warning message will be displayed if this criteria is not met and no data will be produced.*

ARNDT Editor

Position of menu: **Design =>Roads =>ARNDT Editor**

This editor allows you to create or edit files for **ARNDT (A Roundabout Numerical Design Tool)** files. It can also interface directly with **ARNDT** to create geometry and generate reports.

Selecting **ARNDT Editor** brings up the **ARNDT** panel.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
ARNDT file	file		
<i>the ARNDT file to read or write</i>			
Read	button		
<i>reads the ARNDT file</i>			
New leg	button		
<i>creates a new leg for the roundabout</i>			

Delete leg button

deletes the currently selected leg

Add curve button

adds a new entry curve to the selected leg

Delete curve button

deletes the selected entry curve

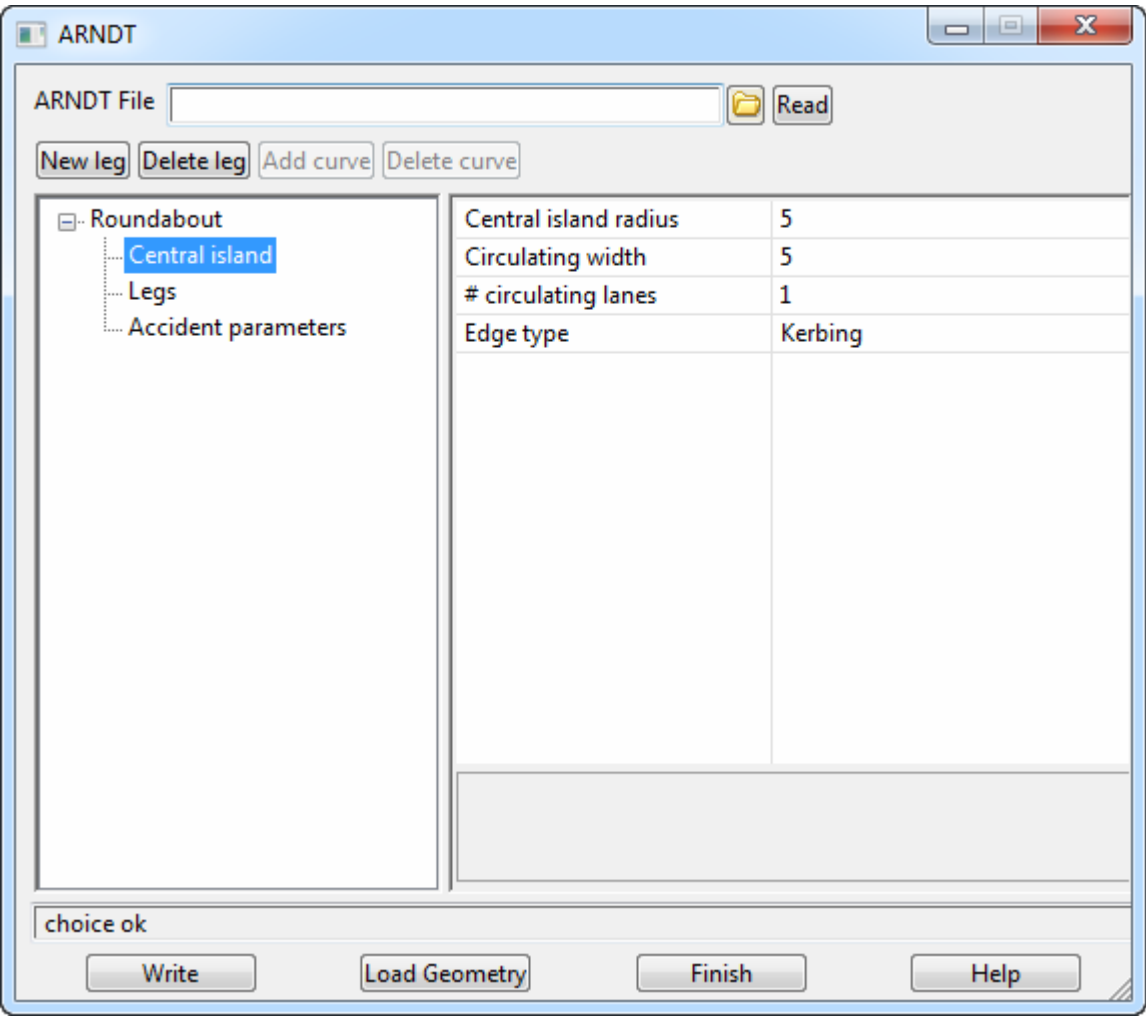
Write button

*writes the **ARNDT** file*

Load geometry button

*options for loading geometry via **ARNDT** and generating report files*

Central Island



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Central island radius

the radius of the central island

Circulating width

the offset from the radius of the circulating string

of circulating lanes

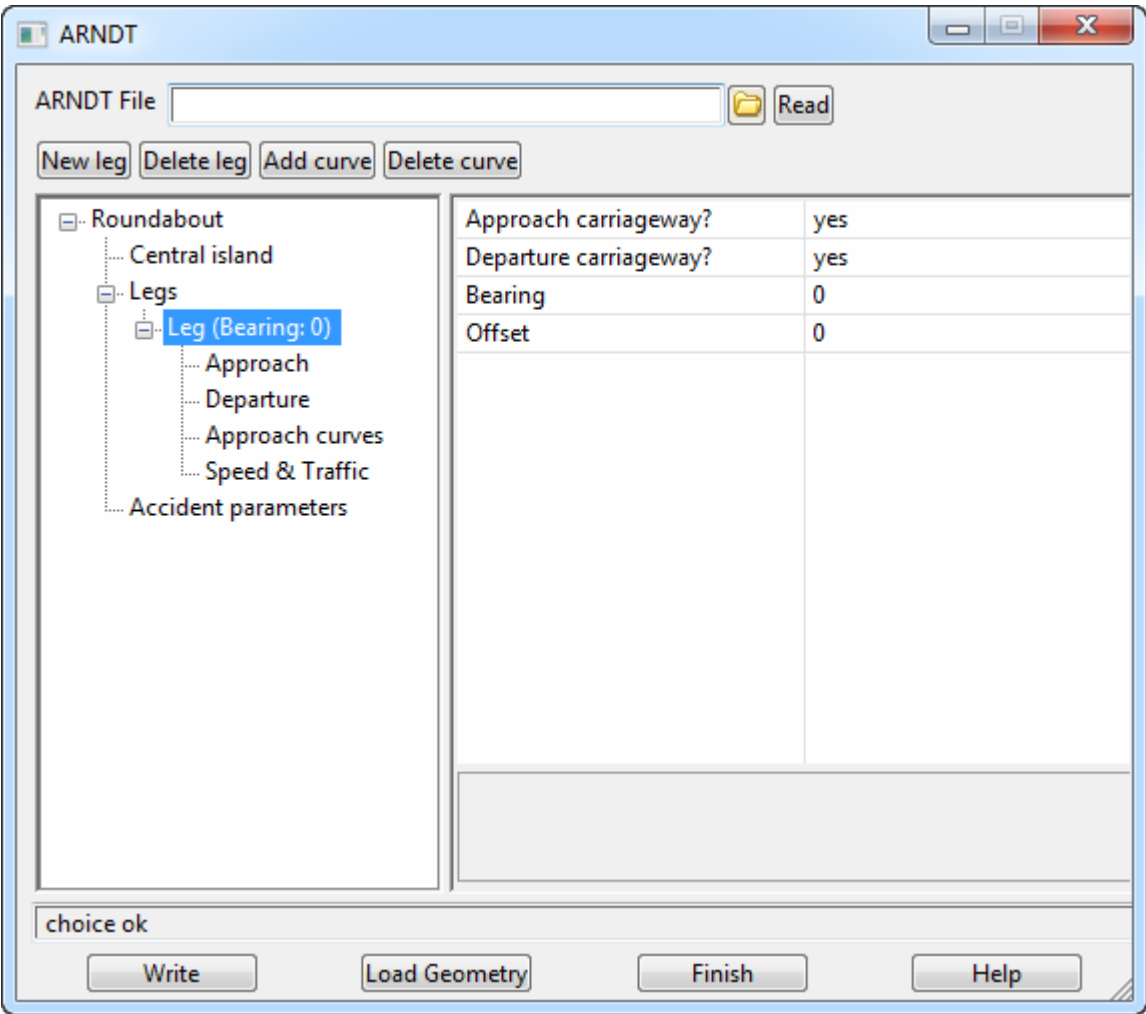
the number of lanes circulating the roundabout

Edge type

the edge type for the central island (Kerbing or Edge Line)

Legs Node

The **Leg node**, for each leg of the roundabout, allows you to modify parameters for that leg.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Approach carriageway?	choice box		yes, no

Width

the width of the approach carriageway

of lanes

the number of lanes in the approach carriageway

Offset to median edge

the offset of the approach from the median

Curve details - right edge

Radius

the radius of the right edge of the approach

Edge type

the type of edging for the right edge of the approach

Curve details - left edge

Radius

the radius of the left edge of the approach

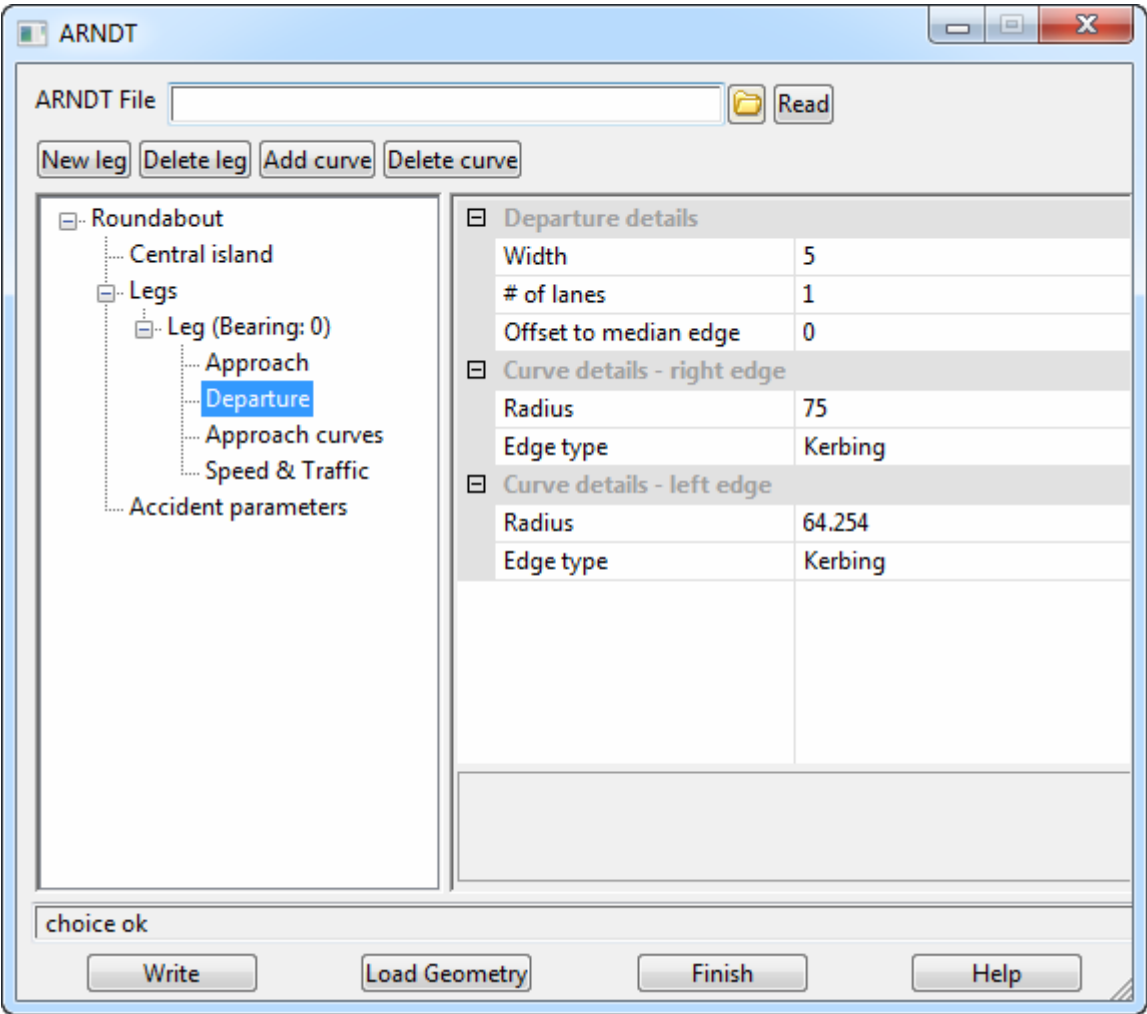
Edge type

the type of edging for the left edge of the approach

Leg Departure Node

This defines the properties for the departure carriage of the leg, if there is a departure.





The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Departure details

Width

the width of the departure carriageway

of lanes

the number of lanes in the departure carriageway

Offset to median edge

the offset of the departure from the median

Curve details - right edge

Radius

the radius of the right edge of the departure

Edge type

the type of edging for the right edge of the departure

Curve details - left edge

Radius

the radius of the left edge of the departure

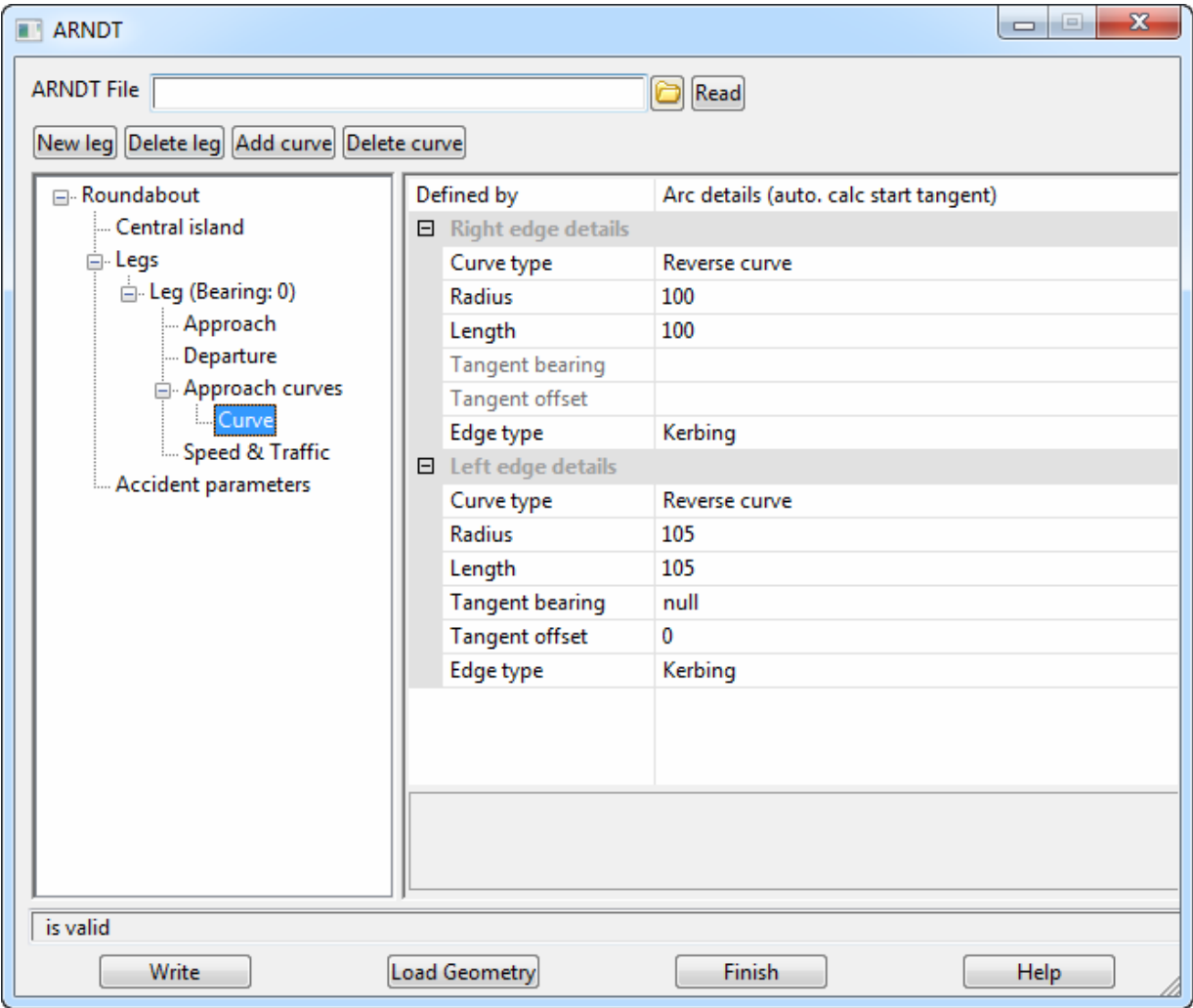
Edge type

the type of edging for the left edge of the departure

Approach Curves Node

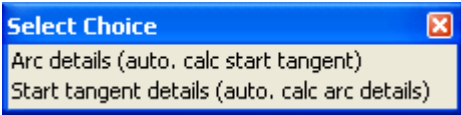
This node defines the setting for each approach curve. New approach curves can be added to a leg by clicking the **Add curve** button. There are two methods for defining a curve - either by arc details or start tangent.

Approach curves are only defined by their right hand edge.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Right Edge Details			
Defined by	choice box		



how the curve is defined

Curve type

the type of curve (Reverse or Compound)

Radius

*the radius of the right edge - only available when defined by **Arc details***

Length

*the length of the right edge - only available when defined by **Arc details***

Tangent bearing

*the bearing of the tangent to the curve - only available when defined by **Start tangent details***

Tangent offset

*the offset of the tangent to the roundabout - only available when defined by **Start tangent details***

Edge type

the type of edging for the right edge (Kerbing or Edge Line)

Left Edge Details

Curve type

the type of curve. This field is read only.

Radius

*the radius of the curve, if using **Arc details**. This field is read only.*

Length

*the length of the curve, if using **Arc details**. This field is read only.*

Tangent bearing

*the bearing of the tangent to the curve, if using **Start tangent details**. This field is read only.*

Tangent offset

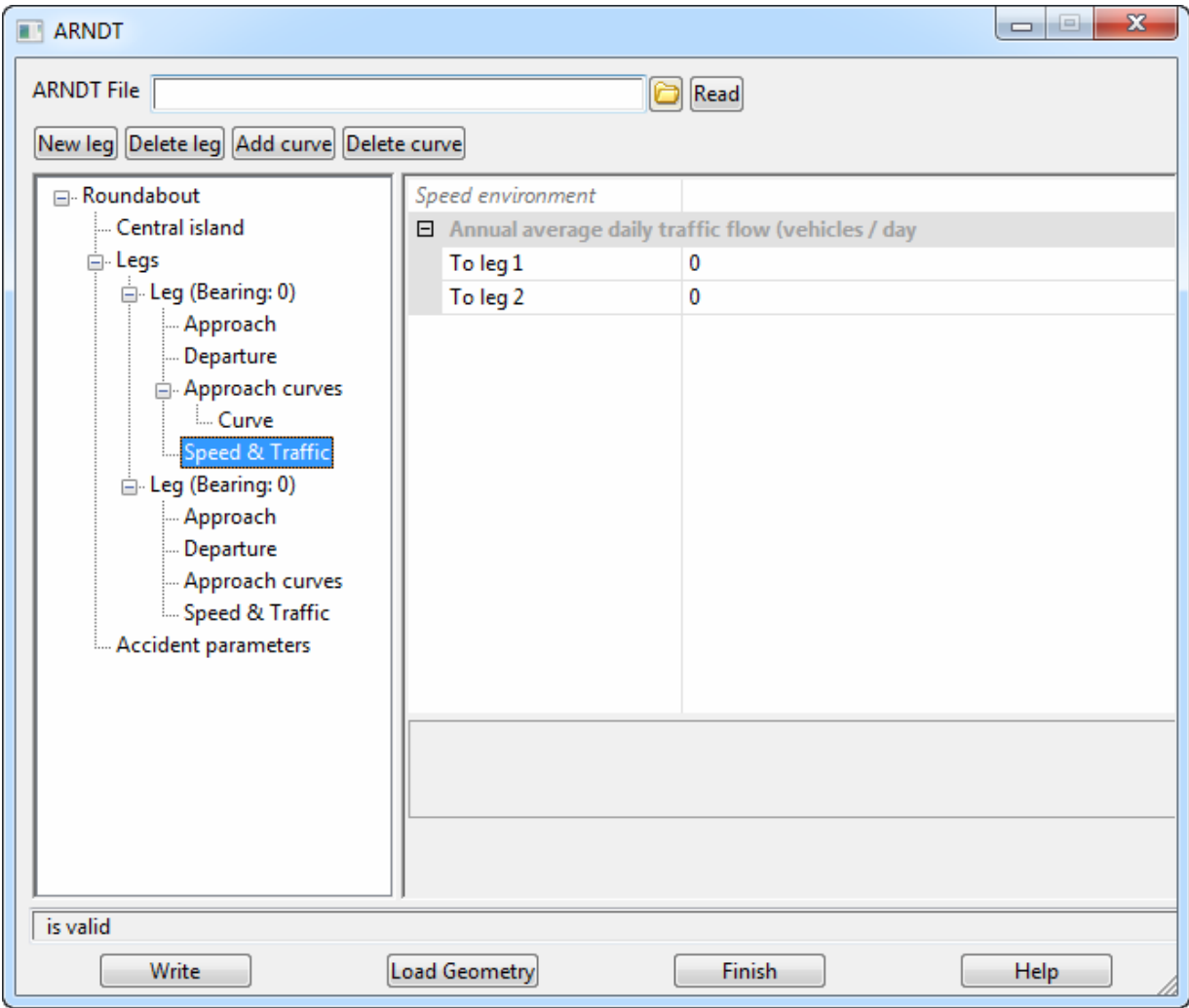
the offset of the tangent, if using *Start tangent details*. This field is read only.

Edge type

the type of edging for the right edge (Kerbing or Edge Line)

Leg Speed & Traffic Node

This node defines the speed and traffic details for each leg of the roundabout.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Speed environment

the speed environment of the carriageway

Annual average daily traffic flow

To leg 1

the average daily traffic flow (vehicles per day) leaving leg 1 and returning to leg 1

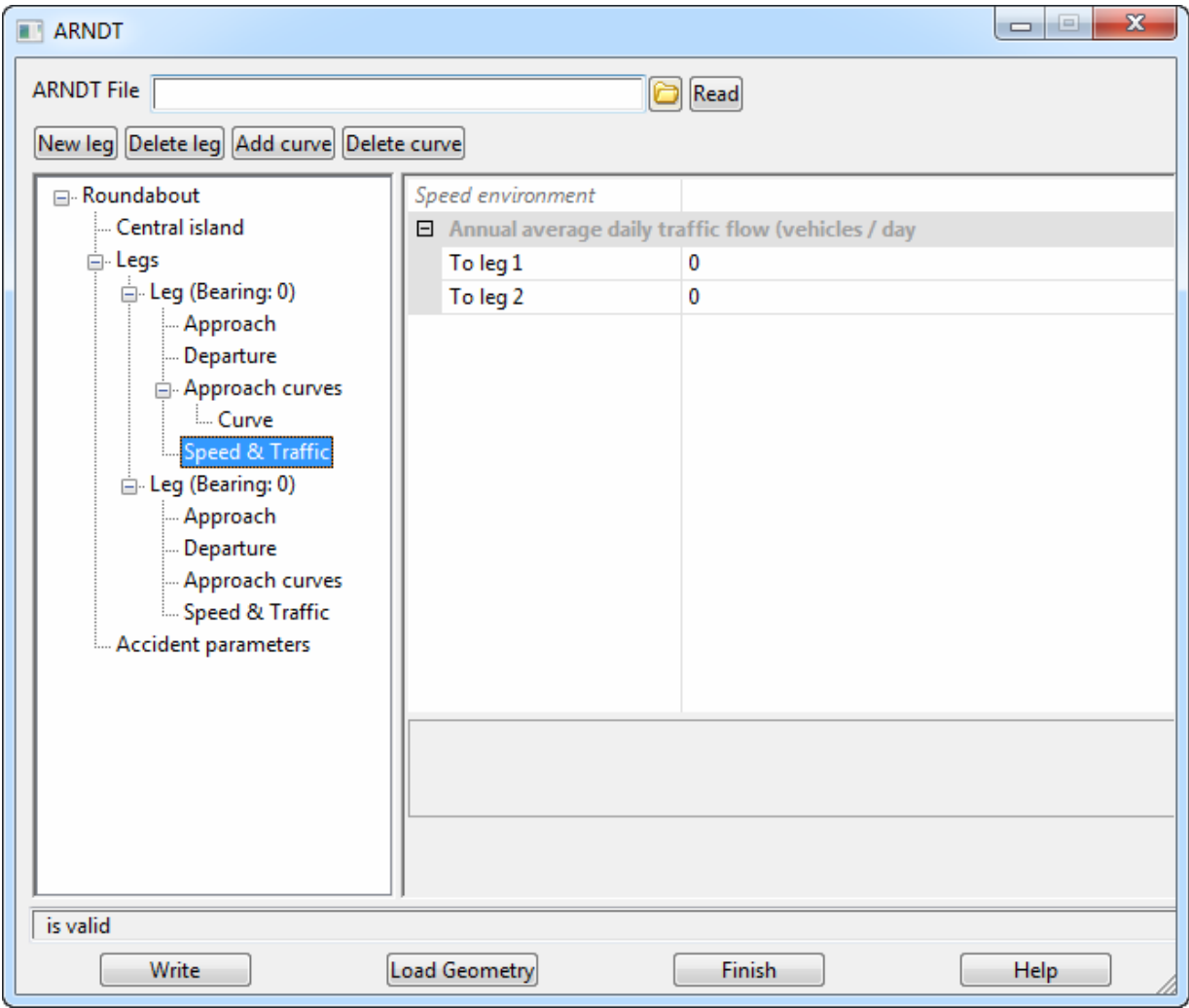
To leg 2

the average daily traffic flow (vehicles per day) leaving leg 1 and exiting via leg 2

This is repeated for each leg of the roundabout

Accident Parameters

This defines various parameters used by **ARNDT** for calculating risks and costs for the roundabout. These parameters are requested by the **ARNDT** program. Please see the **ARNDT** documentation for more details on these parameters.



Load Geometry / Export to ARNDT

Selecting **Load Geometry** Load Geometry brings up the **Export to ARNDT** panel.

This panel allows you to load geometry from **ARNDT**, based on the file you are editing, as well as optionally generating reports.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Position

the x and y co-ordinate for the roundabout

Pre*Post

*an optional pre*post applied to any strings read back from **ARNDT***

ARNDT report

*an optional report file of details generated by **ARNDT***

Export

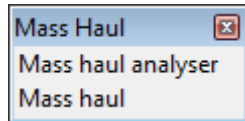
*Exports the current roundabout details to **ARNDT**, imports the results generated by **ARNDT**. Results will include geometry at the nominated position, and a report if specified.*

Mass Haul

Position of menu: Design =>Roads =>Mass haul

The option under **Mass haul** reads a volumes report and creates Mass Haul information.

The **Mass haul** walk-right menu is



mass haul analysis from volumes report

create mass haul string and report from volumes report

For *Mass haul analyser*, go to
Mass haul

[Mass Haul Analyser](#)
[Mass Haul String and Report](#)

Mass Haul Analyser

Position of option on menu: Design =>Roads =>Mass haul =>Mass haul analyser

The **Mass Haul Analyser** option calculates the mass haul along an alignment using the volume report files from various **12d** functions.

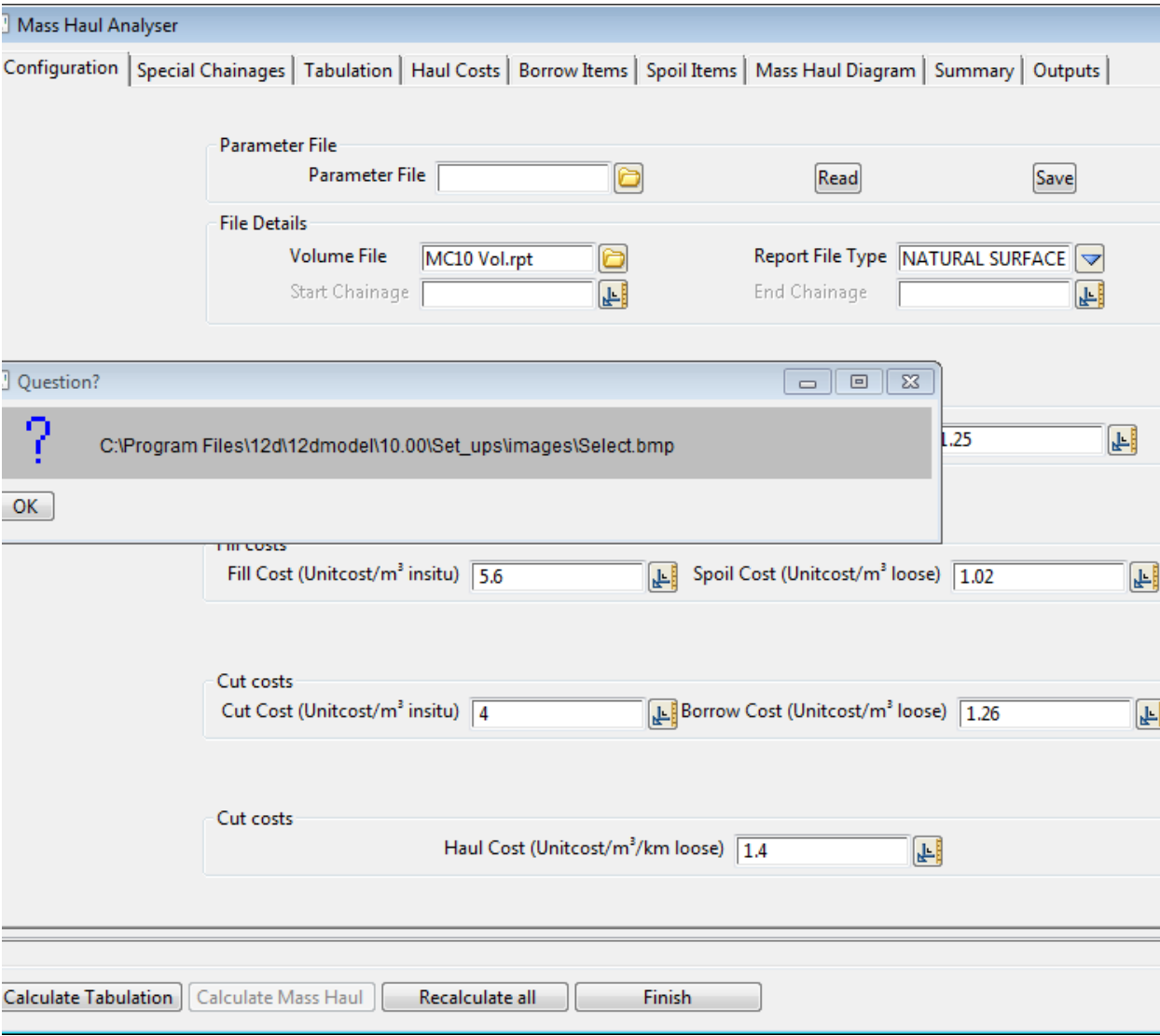
To operate the option a volume report file is selected and the report file type set to match the report type. The **Calculate tabulation** button will then calculate the bulking factors and add the special chainage items to the tabulation. After this the **Calculate Mass Haul** option will push excess fill material forwards along the alignment to a matching cut item with the same accumulated balance and push excess cut material backwards along the alignment to a matching fill item.

Where the cost of Haul cost is greater than the Borrow Plus Spoil cost the option will skip that material.

The option performs this operation several times passing back over the alignment until no more haul material can be found. It then borrows and spoils the remaining material.

The macro is intended to provide an analysis methodology to the designer to enable them to quickly review where material is available in an alignment in order to optimise the alignment with respect to potential cost savings. It is also a useful tool for training in the techniques of mass haul. The final mass haul graph should be exported for detailed analysis using the **Design=>Roads=>Mass haul =>Mass Haul** option.

Selecting the **Mass haul analyser** option brings up the **Mass Haul Analyser** panel.



Configuration Tab

This tab is used to set up the parameters to be used by the macro.

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Parameter File	file		*.mhp files
name of the file containing the previously used settings for the fields in the panel.			
Read Button	button		
read the parameter file in			
Write button	button		
write the setting in the panel out to a parameter file.			
Volume File	file		*.rpt files
input file generated from another 12d option			

Report File Type choice box NATURAL SURFACE TO DESIGN VOLUMES
see [Selecting The Right Report File Type](#)
the report file type to be used as an input to the macro

Excavation bulking factor real box 1.5
*bulking factor ratio between loose excavated material and insitu compacted material.
number greater than one indicates loose material is bulkier than insitu material.
defaults are arbitrary and must be selected by the user*

Fill compaction factor real box 1.25
*compaction factor ratio between loose excavated material and insitu compacted material.
number greater than one indicates loose material is bulkier than insitu material.
defaults are arbitrary and must be selected by the user*

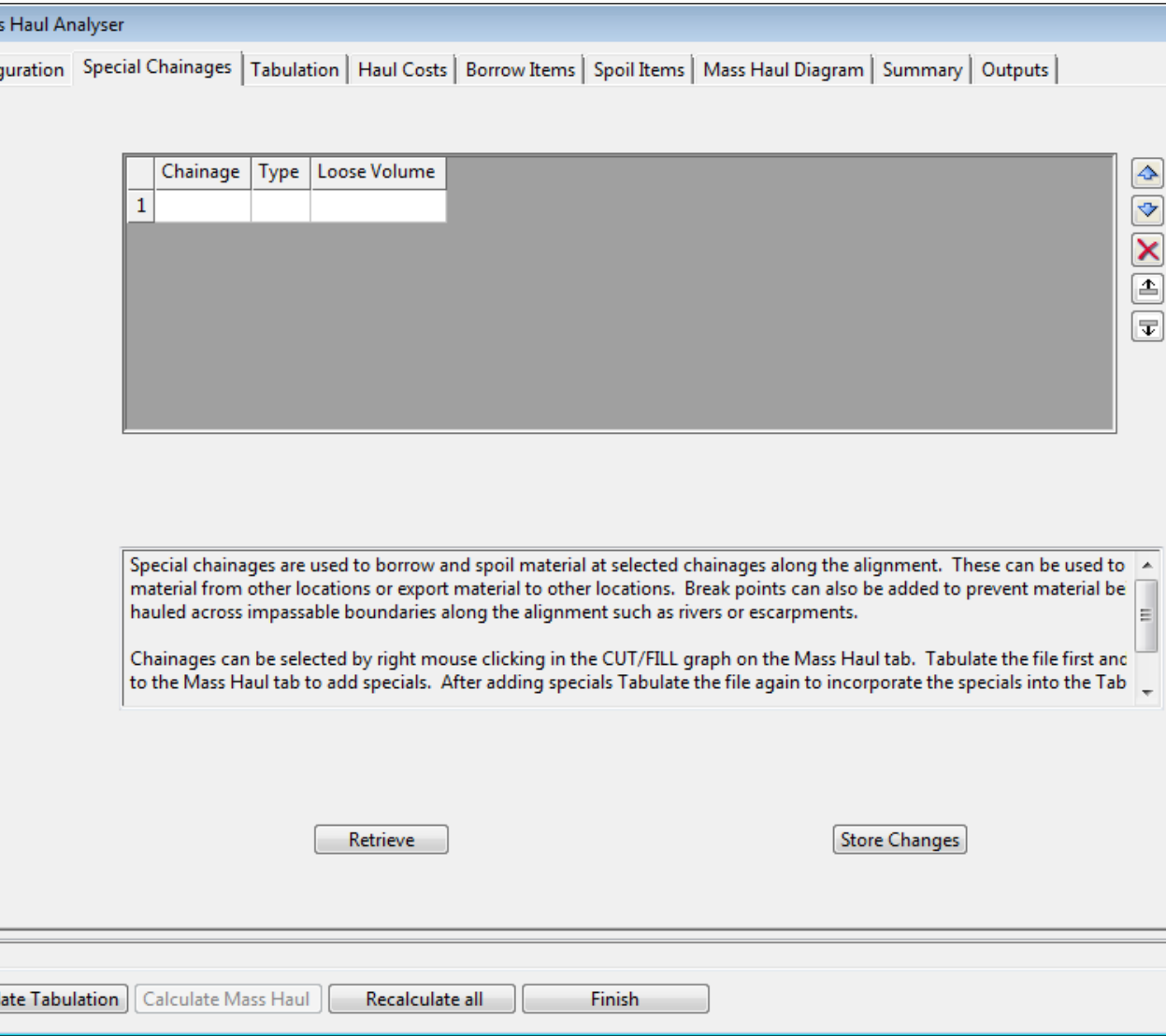
Fill Cost real box 5.6
*cost per cubic metre to place and compact material.
defaults are arbitrary and must be selected by the user*

Spoil cost real box 1.02
*cost per cubic metre to dispose of excess material (including haul costs) defaults are arbitrary and
must be selected by the user*

Cut cost real box 4
*cost per cubic metre to excavate material.
defaults are arbitrary and must be selected by the user*

Borrow cost real box 1.26
*cost per cubic metre to import additional material (including delivery costs) defaults are arbitrary and
must be selected by the user*

Haul cost real box 1.4
*cost per cubic metre to haul material one kilometre.
defaults are arbitrary and must be selected by the user*



Special Chainages Tab

This tab is used to add additional items to the tabulation.

The fields and buttons used in this panel have the following functions:

Field	Description	Type	Defaults	Pop-Up
Chainage	chainage box			
	the chainage that the special item is to be applied			
Type	choice box			borrow, spoil, break
	the type of special item to be applied			
Loose Volume				
	the volume of loose material in the special item			
Retrieve	button			
	retrieve special chainages into the grid control			

Store Chainages button
save special chainages from the grid control

Mass Haul Analyser

ConfigurationSpecial ChainagesTabulationHaul CostsBorrow ItemsSpoil ItemsMass Haul DiagramSummaryOutputs

	Chainage	Type	Insitu Cut Vol.	Insitu Fill Vol.	Loose cut 2 fill	Req'd loose fill	Excess loose Cu
1	0.0000	Fill	15.5260	18.8820	23.2890	0.3135	
2	5.0000	Fill	9.1950	13.4230	13.7925	2.9862	
3	10.0000	Fill	3.8770	6.7700	5.8155	2.6470	
4	15.0000	Fill	0.7810	3.6450	1.1715	3.3848	
5	20.0000	Fill	0.1290	36.4830	0.1935	45.4102	
6	25.0000	Fill		76.6300		95.7875	
7	30.0000	Fill	0.2840	84.9670	0.4260	105.7827	
8	35.0000	Fill	3.4670	80.3370	5.2005	95.2207	
9	40.0000	Fill	12.1090	65.3850	18.1635	63.5678	
10	45.0000	Fill	25.7750	53.5170	38.6625	28.2338	
11	50.0000	Fill	35.8770	49.0090	53.8155	7.4458	
12	55.0000	Cut	42.6470	41.1950	51.4937		12.4768
13	60.0000	Cut	51.7030	30.6390	38.2987		39.2558
14	65.0000	Cut	60.2380	20.9980	26.2475		64.1095
15	70.0000	Cut	67.5370	14.7150	18.3938		82.9118
16	75.0000	Cut	74.8010	11.9890	14.9863		97.2153
17	80.0000	Cut	83.8110	9.4920	11.8650		113.8515
18	85.0000	Cut	92.4710	6.5370	8.1713		130.5353
19	90.0000	Cut	99.6280	4.0910	5.1138		144.3283
20	95.0000	Cut	107.3100	2.0760	2.5950		158.3700
21	100.0000	Cut	113.2510	1.3920	1.7400		168.1365
22	105.0000	Cut	113.7690	2.5330	3.1662		167.4873
23	110.0000	Cut	113.3090	2.9640	3.7050		166.2585
24	115.0000	Cut	38.7660	0.8180	1.0225		57.1265
25	116.6920	Cut	77.2860	1.2970	1.6212		114.3078

mouse usage: [pick] [menu] x: 613.88 y:1864.20

Calculate TabulationCalculate Mass HaulRecalculate allFinishHelp

Tabulation Tab

This tab displays the processed cut and fill volumes after bulking factors have been applied.

Mass Haul Analyser

ConfigurationSpecial ChainagesTabulationHaul CostsBorrow ItemsSpoil ItemsMass Haul DiagramSummaryOutputs

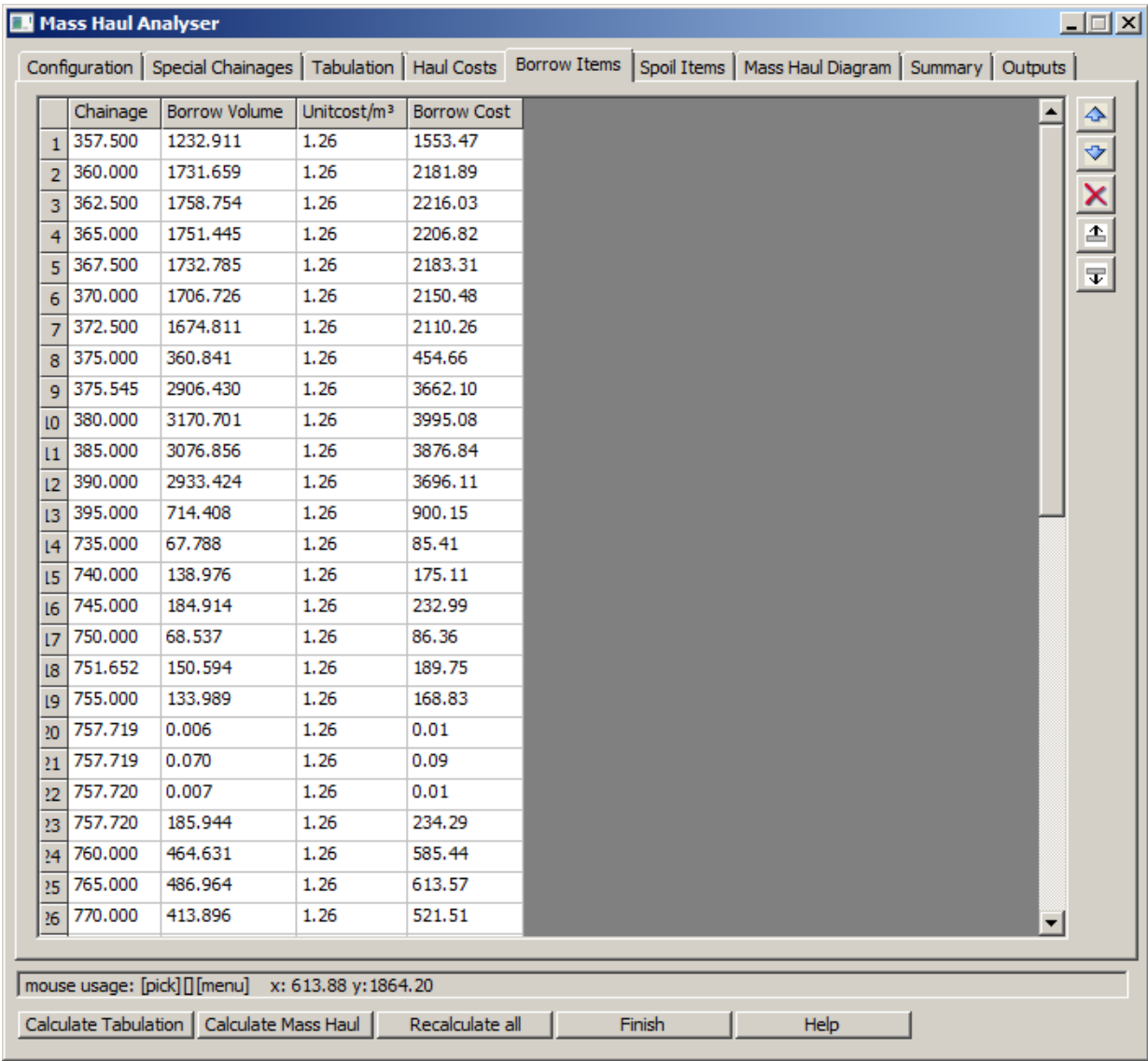
	From Chainage	To Chainage	Haul Vol.	Haul Dist.	Unitcost/m³/km	Haul Cost
1	55.000	50.000	7.446	0.005	1.40	0.05
2	55.000	45.000	5.031	0.010	1.40	0.07
3	60.000	45.000	23.203	0.015	1.40	0.49
4	60.000	40.000	16.053	0.020	1.40	0.45
5	65.000	40.000	47.515	0.025	1.40	1.66
6	65.000	35.000	16.595	0.030	1.40	0.70
7	70.000	35.000	78.626	0.035	1.40	3.85
8	70.000	30.000	4.286	0.040	1.40	0.24
9	75.000	30.000	97.215	0.045	1.40	6.12
10	80.000	30.000	4.282	0.050	1.40	0.30
11	80.000	25.000	95.787	0.055	1.40	7.38
12	80.000	20.000	13.782	0.060	1.40	1.16
13	85.000	20.000	31.628	0.065	1.40	2.88
14	85.000	15.000	3.385	0.070	1.40	0.33
15	85.000	10.000	2.647	0.075	1.40	0.28
16	85.000	5.000	2.986	0.080	1.40	0.33
17	85.000	0.000	0.314	0.085	1.40	0.04
18	300.000	302.500	3.829	0.003	1.40	0.01
19	297.500	302.500	4.928	0.005	1.40	0.03
20	297.500	305.000	10.079	0.007	1.40	0.11
21	297.500	306.364	1.496	0.009	1.40	0.02
22	295.000	306.364	9.770	0.011	1.40	0.16
23	295.000	307.500	19.366	0.013	1.40	0.34
24	292.500	307.500	15.024	0.015	1.40	0.32
25	292.500	310.000	25.086	0.018	1.40	0.61
26	290.000	310.000	23.390	0.020	1.40	0.65

mouse usage: [pick][menu] x: 613.88 y: 1864.20

Calculate TabulationCalculate Mass HaulRecalculate allFinishHelp

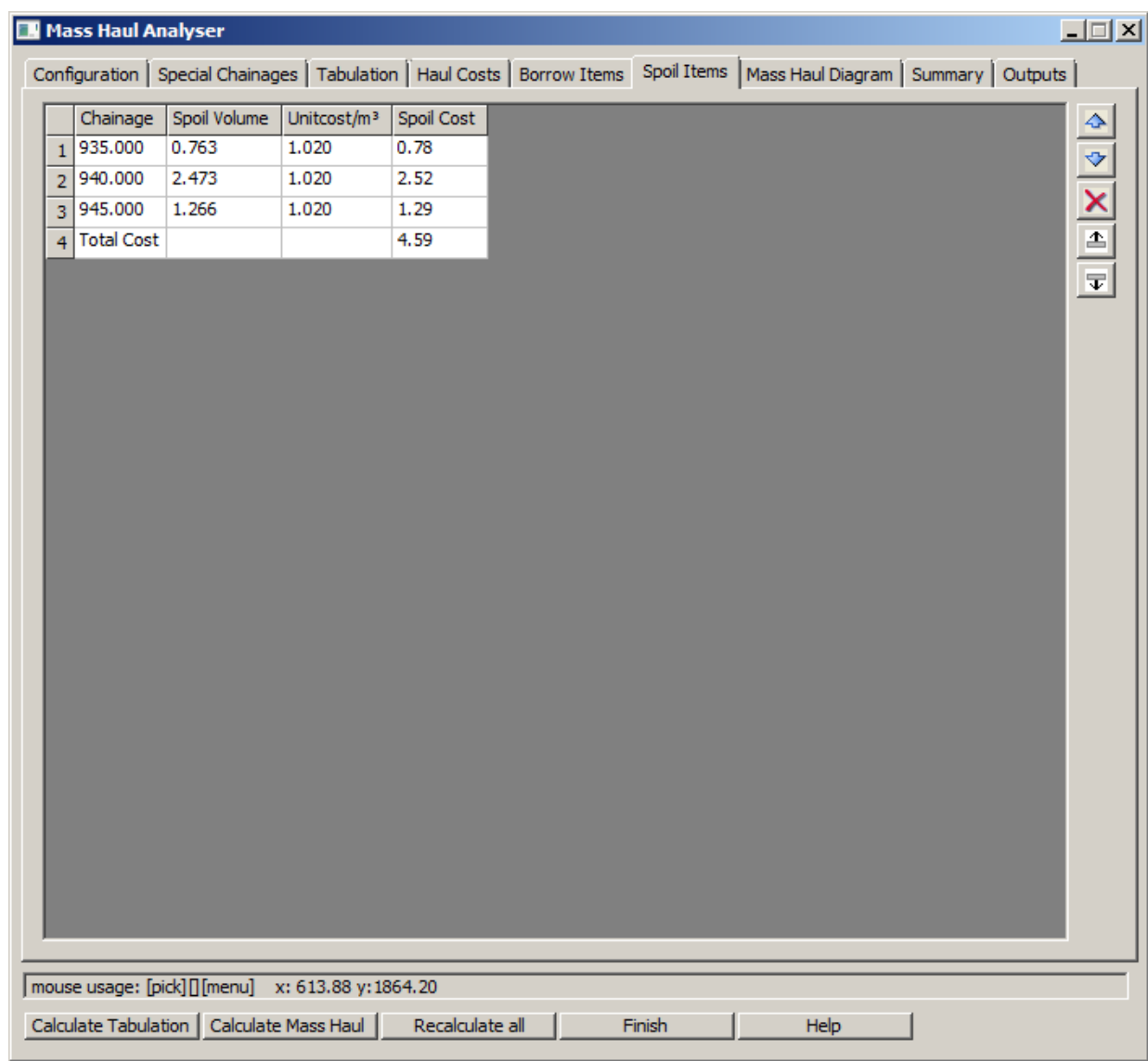
Haul Costs Tab

This tab displays the processed haul volumes after mass haul has been applied.



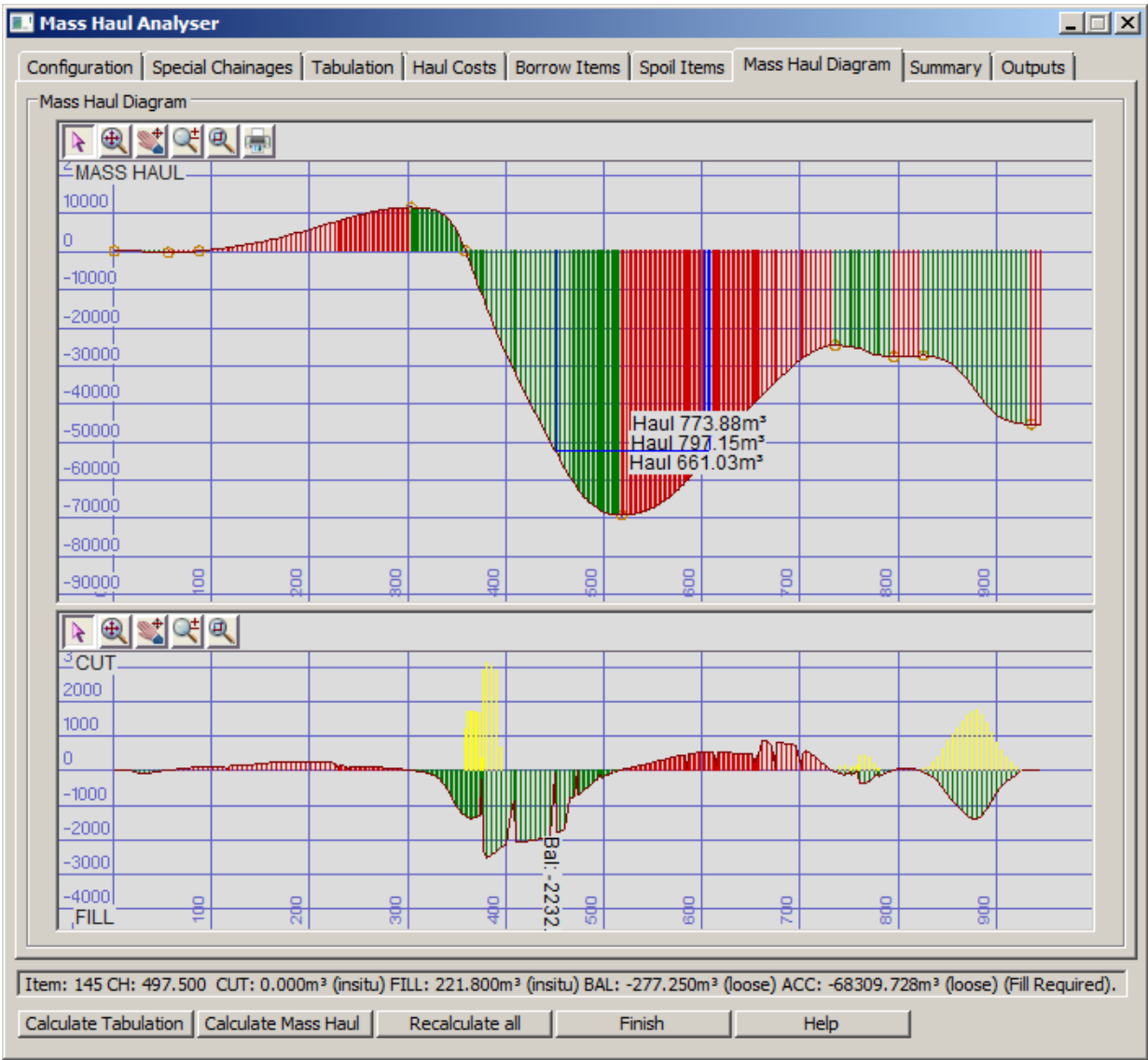
Borrow Items Tab

This tab displays the remaining borrow volumes after mass haul has been applied.



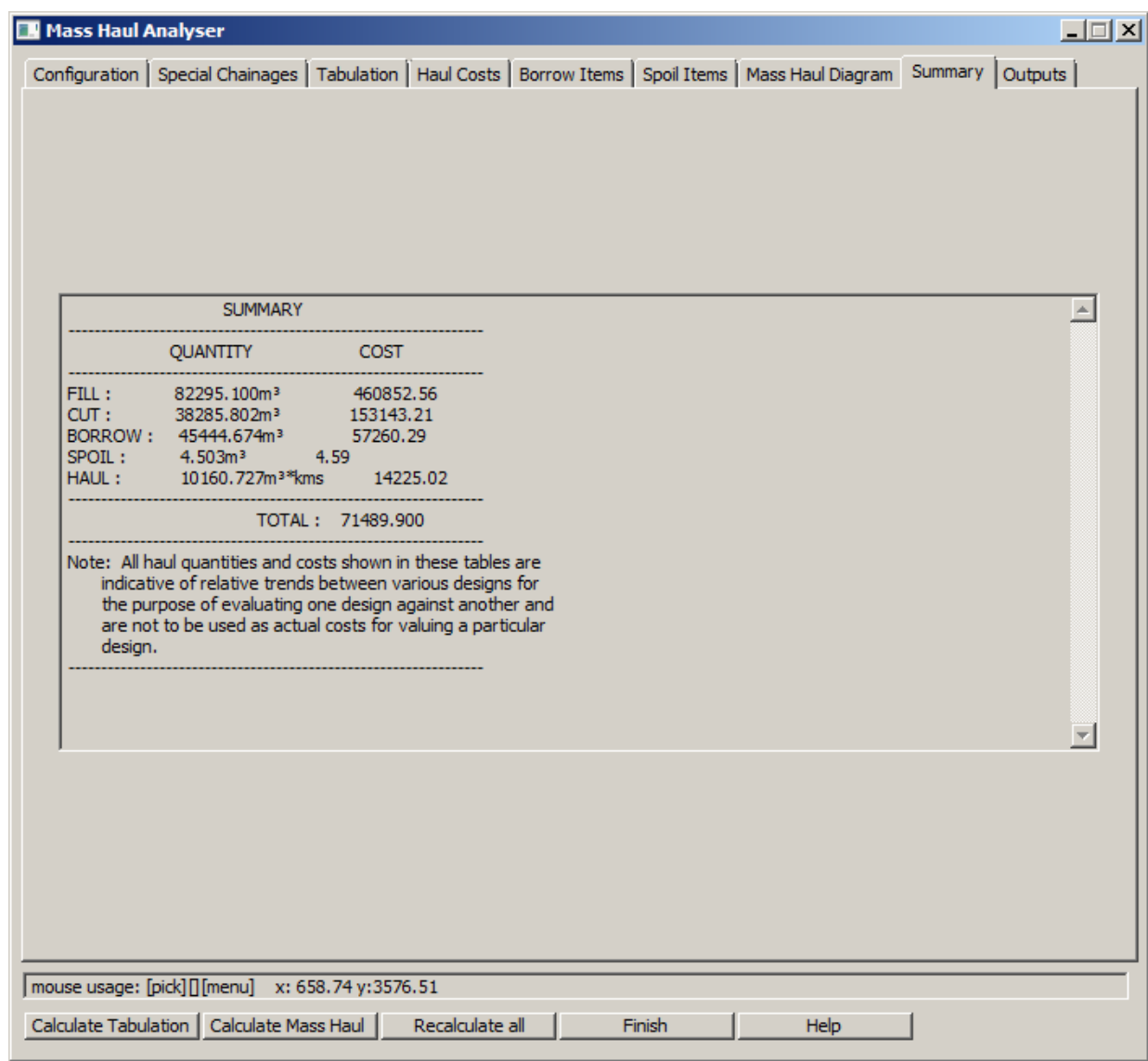
Spoil Items Tab

This tab displays the remaining spoil volumes after mass haul has been applied



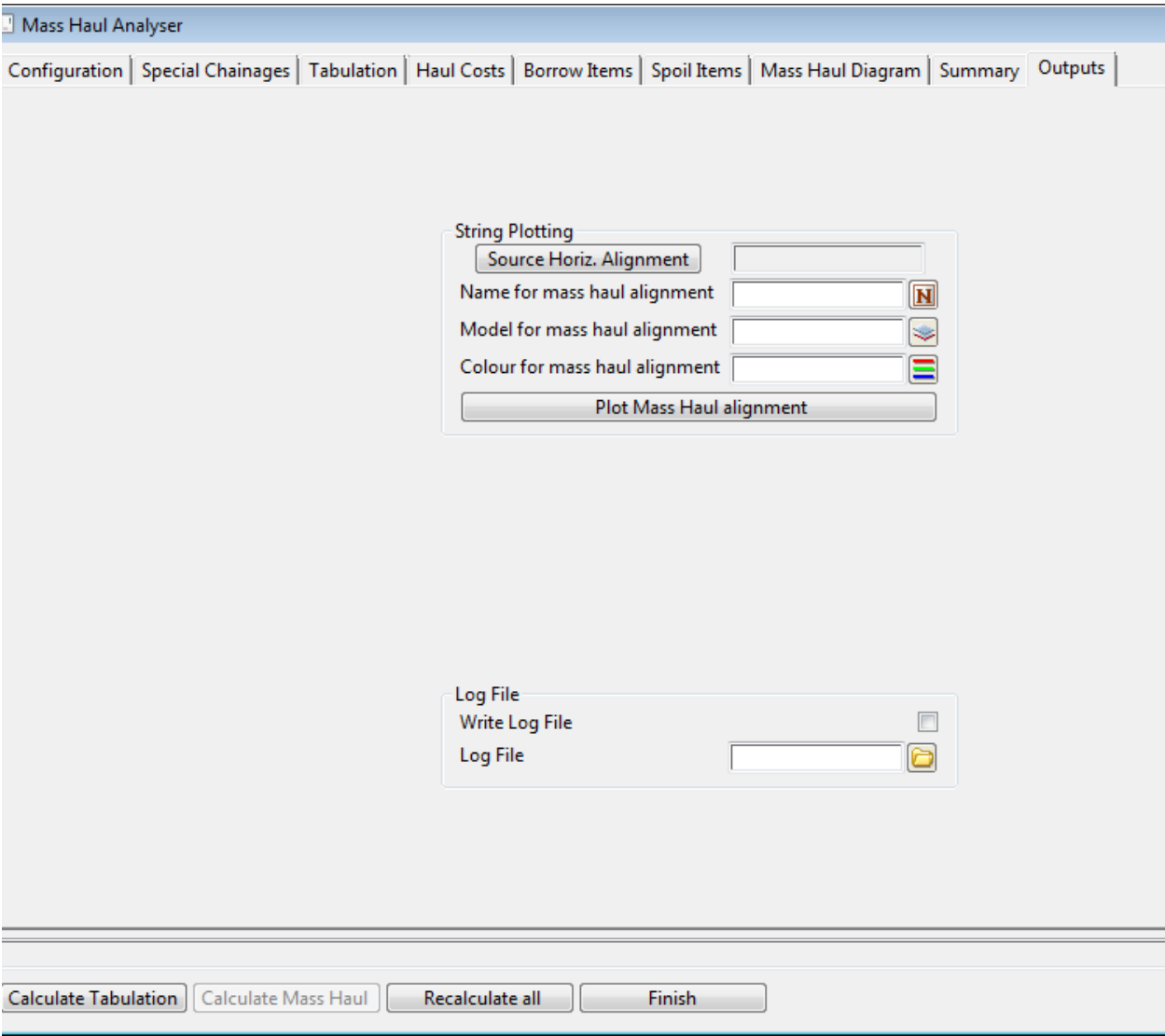
Mass Haul Diagram Tab

This tab displays a graph of the resulting mass haul diagram. For information on several features of the graph please go to [Graph Box Operation](#).



Summary Tab

This tab displays a summary of the costs calculated. These costs can be used to compare trends in the efficiency of the mass haul between different designs. The costs given are not intended to be the final cost of the mass haul as further analysis will be required however they do give an indication as to the efficiency of a design with regard to mass haul.



Outputs Tab

This tab can be used to export data from the option

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Source Horiz. Alignment	select string
<i>selects the seed alignment that will be used for the horizontal alignment of the mass haul string</i>	

Name for mass haul alignment	name box
<i>sets the name of the plotted mass haul string</i>	

Model for mass haul alignment	model box
<i>sets the model of the plotted mass haul string</i>	

Colour for mass haul alignment	colour box	red
<i>sets the colour of the plotted mass haul string</i>		

Plot Mass Haul Alignment button

duplicates the seed alignment and stores the mass haul accumulated volume balances as chainage height points in that alignment

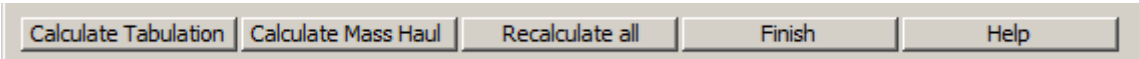
Write log file tick box

choose this option to export a log file

Log file file box

the calculations generated by the mass haul option are stored in this log file

Common Buttons

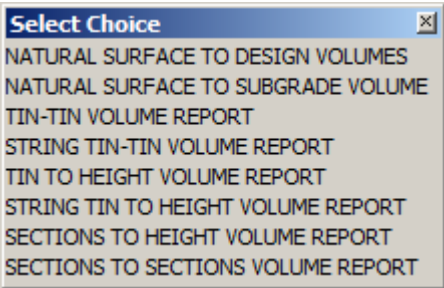


The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Calculate Tabulation <i>recalculate tabulation</i>	button		
Calculate Mass Haul <i>recalculate mass haul</i>	button		
Recalculate all <i>recalculate both tabulation and mass haul</i>	button		
Finish <i>closes the panel</i>	button		
Help <i>displays this help</i>	button		

Selecting The Right Report File Type

The report file type option allows the user to use various report file types generated by 12d.



Each type is selected to cause the option to look for certain key phrases in the report file at the top of each cut/fill/balance tabulation.

Go to [NATURAL SURFACE TO DESIGN VOLUMES](#)
[NATURAL SURFACE TO SUBGRADE VOLUME](#)
[TIN-TIN VOLUME REPORT](#)
[STRING TIN-TIN VOLUME REPORT](#)
[TIN TO HEIGHT VOLUME REPORT](#)
[STRING TIN TO HEIGHT VOLUME REPORT](#)
[SECTIONS TO HEIGHT VOLUME REPORT](#)
[SECTIONS TO SECTIONS VOLUME REPORT](#)

NATURAL SURFACE TO DESIGN VOLUMES

This choice is selected to use the natural surface to design volumes table generated by the "apply many" function. This function must be run first from the **Design=>Apply=>Apply many** menu item.

NATURAL SURFACE TO SUBGRADE VOLUME

This choice is selected to use the natural surface to subgrade volumes table generated by the "apply many" function. This function must be run first from the **Design=>Apply=>Apply many** menu item. In order to use this option boxing must be calculated in the apply many function.

TIN-TIN VOLUME REPORT

This choice is selected to use the tin to tin volumes table generated by the "apply many" function. This function must be run first from the **Design=>Volumes=>End Area=>Tin to tin** menu item.

STRING TIN-TIN VOLUME REPORT

This choice is selected to use the string tin to tin volumes table generated by the "apply many" function. This function must be run first from the **Design=>Volumes=>End Area=>String tin to tin** menu item.

TIN TO HEIGHT VOLUME REPORT

This choice is selected to use the tin to height volumes table generated by the "apply many" function. This function must be run first from the **Design=>Volumes=>End Area=>Tin to height** menu item.

STRING TIN TO HEIGHT VOLUME REPORT

This choice is selected to use the string tin to height volumes table generated by the "apply many" function. This function must be run first from the **Design=>Volumes=>End Area=>String tin to height** menu item.

SECTIONS TO HEIGHT VOLUME REPORT

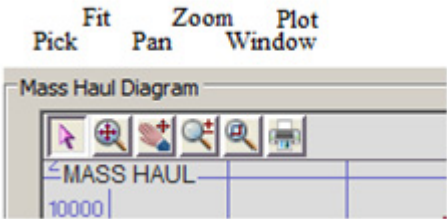
This choice is selected to use the sections to height volumes table generated by the "apply many" function. This function must be run first from the **Design=>Volumes=>End Area=>Sections to height** menu item.

SECTIONS TO SECTIONS VOLUME REPORT

This choice is selected to use the sections to sections volumes table generated by the "apply many" function. This function must be run first from the **Design=>Volumes=>End Area=>Sections to sections** menu item.

Graph Box Operation

Each graph box has a number of graph options available as buttons (graph buttons) at the top of the graph. To select one of the graph buttons, click LB whilst the cursor is over the button.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Pick	button		
-------------	--------	--	--

This option sets the graph box to pick mode. When in this mode the graph box will show various information as the mouse hovers over a chainage in the graph.

The loose material tabulation item number, the available cut and fill within that chainage interval are shown in the message area at the bottom of the panel and the borrow, spoil and haul amounts are graphically shown in the graph highlighting the source chainage and destination chainage.

Fit	button		
------------	--------	--	--

This option sets the graph box to fit mode. This option will calculate the extents of the items plotted in the graph box and zoom out to show them. After the fit is complete the graph will return to pick mode.

Pan	button		
------------	--------	--	--

This option sets the graph box to panning mode. Click once to commence panning, then move the mouse and click a second time to stop panning.

Zoom	button		
-------------	--------	--	--

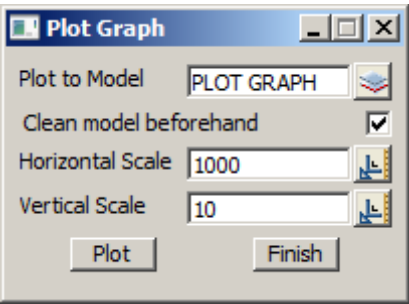
This option sets the graph box to zoom mode. Click once to commence zooming, then move the mouse and click a second time to stop zooming. Moving the mouse left and right will reduce and increase the X scale factor and moving the mouse down and up will reduce or increase the Y scale factor.

Window	button		
---------------	--------	--	--

This option sets the graph box to window mode. Click once to select the first corner of a window and click a second time to select the second corner. After the window is complete the graph will return to pick mode.

Plot	button		
-------------	--------	--	--

*This option enables the contents of the graph box to be plotted to a **12d Model**. Click on the button and the **Plot Graph** panel is displayed.*



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Plot to Model <i>the name of the model to be created/used</i>	model box	PLOT GRAPH	all available models
Clean model beforehand <i>deletes any existing data from the plot model</i>	check box	off	
Horizontal Scale <i>set the horizontal scale to be used to plot the data</i>	real box	1000	
Vertical Scale <i>set the vertical scale to be used to plot the data</i>	real box	10	
Plot <i>plot the data</i>	button		
Finish <i>closes the panel</i>	button		

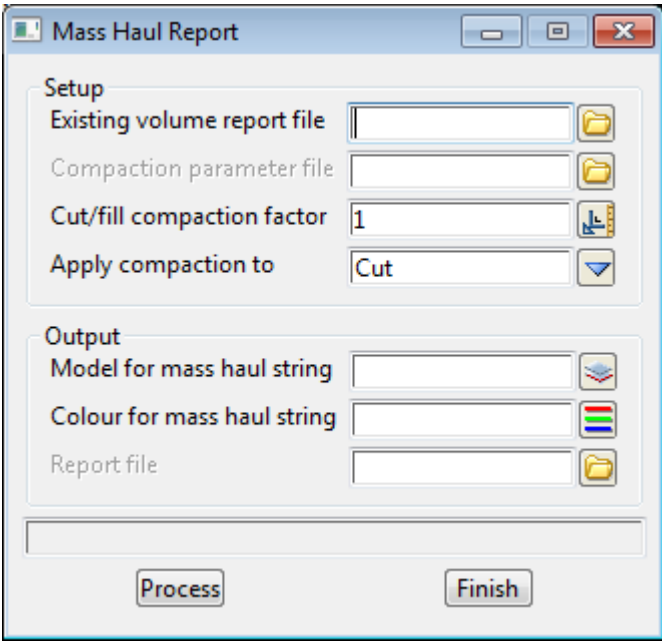
Mass Haul String and Report

Position of option on menu: Design =>Roads =>Mass haul =>Mass haul

This panel is used to read in a volumes report and optionally a cut/fill compaction parameter file and creates a mass haul string and a new volumes report with the compaction volumes.

The compaction parameter file simply contains the compaction factor for given chainage ranges. Either the cut volumes are multiplied by the compaction factor or the fill volumes are divided by the compaction factor, to give the compacted volumes in the new volumes report.

If the existing volume report contains an alignment string and that string can be found in the project then a new alignment string is created with the same horizontal geometry but with the accumulated volumes as the z-values.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Existing volume report file <i>name of the existing volumes report.</i>	file box		*.rpt files
Compaction parameter file <i>file containing compaction factors to be used. See Format of the Compaction Parameter File.</i>	input		*.mhf files
Cut/fill compaction factor <i>cut/fill compaction factor for any chainages not in the compaction parameter file or if there is no file.</i>	input	1	
Apply compaction factor to <i>if cut, the cut volumes are multiplied by the compaction factors. If fill, the fill volumes are divided by the compaction factors.</i>	choice box	cut	cut, fill
Model for mass haul string <i>model for the created mass haul string.</i>	model box		available models

- Colour for mass haul string

colour box

available colours

colour of the created mass haul string.
- Report file

input box

if non-blank, a mass haul volumes file is created.
- Process

button

run the option.

Format of the Compaction Parameter File

```
Format of the
// Sample cut/fill compaction parameter file - the file ending
is .mhf
// All lines starting with // are comments and blank lines are
ignored
//
// A range is specified by a start and end chainage and a compaction
factor.
// A compaction factor of 1.0 means there is no compaction.
// A compaction factor of 0.9 means that 1.0 cubic metres of cut is
equivalent
// to 0.9 cubic metres of fill due to compaction.

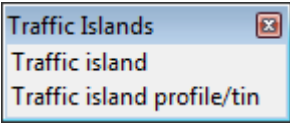
// format is
// Start_ch      End_ch      Compaction_factor
           0           100           0.9
        100           500           1.0
        500          2000           1.1
```

Traffic Islands

Position of menu: **File I/O =>Roads =>Traffic islands**

The options under **Traffic islands** create a traffic island from three travel lines, offsets and nose radii, and also can apply a kerb profile around the island.

The **Traffic islands** walk-right menu is



create a traffic island
run a kerb profile around a traffic island

For *Traffic island*, go to
 Traffic island profile/tin

[Create Traffic Island](#)
[Traffic Island Profile/Tin](#)

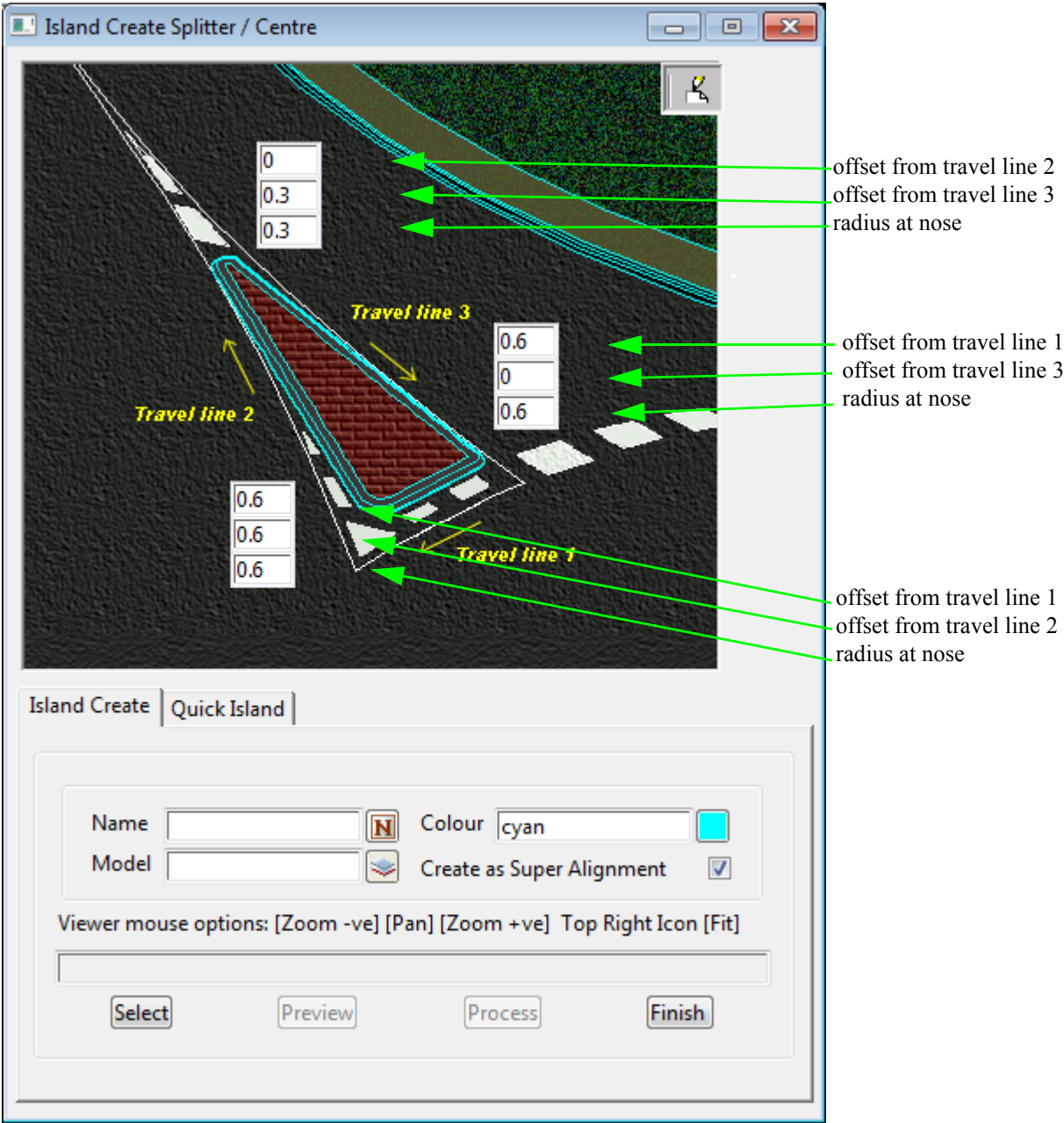
Create Traffic Island

Position of option on menu: **Design =>Roads =>Traffic islands =>Traffic Island**

Create an alignment string for a traffic island between user selected strings and with user defined offsets from the strings and nose radii. Drape the island onto a tin to give is z-values and then apply a kerb profile to complete the island.

On selecting the **traffic island** option, the **Island Create Splitter/Centre** panel is displayed.





The position of the panel fields indicate what the values are for. Tool tips appear when the cursor is passed over the panel fields.

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Buttons at bottom

- | Field Description | Type | Defaults | Pop-Up |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------|--------|
| Select | strings select | | |
| <i>select in order and with direction, the three strings to use in creating the traffic island. Terminate by clicking RB and selecting cancel from the pick ops menu.</i> | | | |
| Preview | string select | | |
| <i>draw the traffic island with the given parameters in the panel draw box.</i> | | | |

Process button
create the alignment string

Island Create tab

Offset from travel lines input box
offset distance from the selected travel lines.

Radius at nose input box
radius of the corner of the traffic island between the selected travel lines

Name name box available names
name of the created alignment string.

Model model box available models
model for the created alignment string.

Colour colour box available colours
colour of the created alignment string.

Create as super alignment tick box
*if ticked, create the string as a super alignment.
If not ticked, create the string as an alignment.*

Quick Island tab

the quick island tab produces a traffic island of fixed sides but with the given nose radii. The traffic island can be created as a super alignment that can then be easily moved around and modified.

Radius at nose input box
radius of the corner of the traffic island

Name name box available names
name of the created alignment string

Model model box available models
model for the created alignment string

Colour colour box available colours
colour of the created alignment string

Create as super alignment tick box
*if ticked, create the string as a super alignment.
If not ticked, create the string as an alignment.*

Position xyz select box
pick two points to indicate the direction that the island will be created.

*Then click on **Process** to create the Traffic Island.*

Kerb Profile tab

Use island alignment levels instead of Tin tick box
*if ticked, use the alignments own z-value instead of draping the alignment onto the tin.
If not ticked, drape the alignment onto the tin to get z-values.*

offset for kerb face/top/back for the selected kerb type.

height for kerb face/top/back.

triangulation to drape the traffic island strings onto.

type of kerb to apply to the reference string of the traffic island. If type User is selected from the pop-up list, a file which defines the kerb profile can be selected and used.

file to read/write the user defined kerb type to.

read the given File to define a kerb type.

save the kerb parameters to the given File.

Position of option on menu: Design =>Roads =>Traffic islands =>Traffic island profile/tin

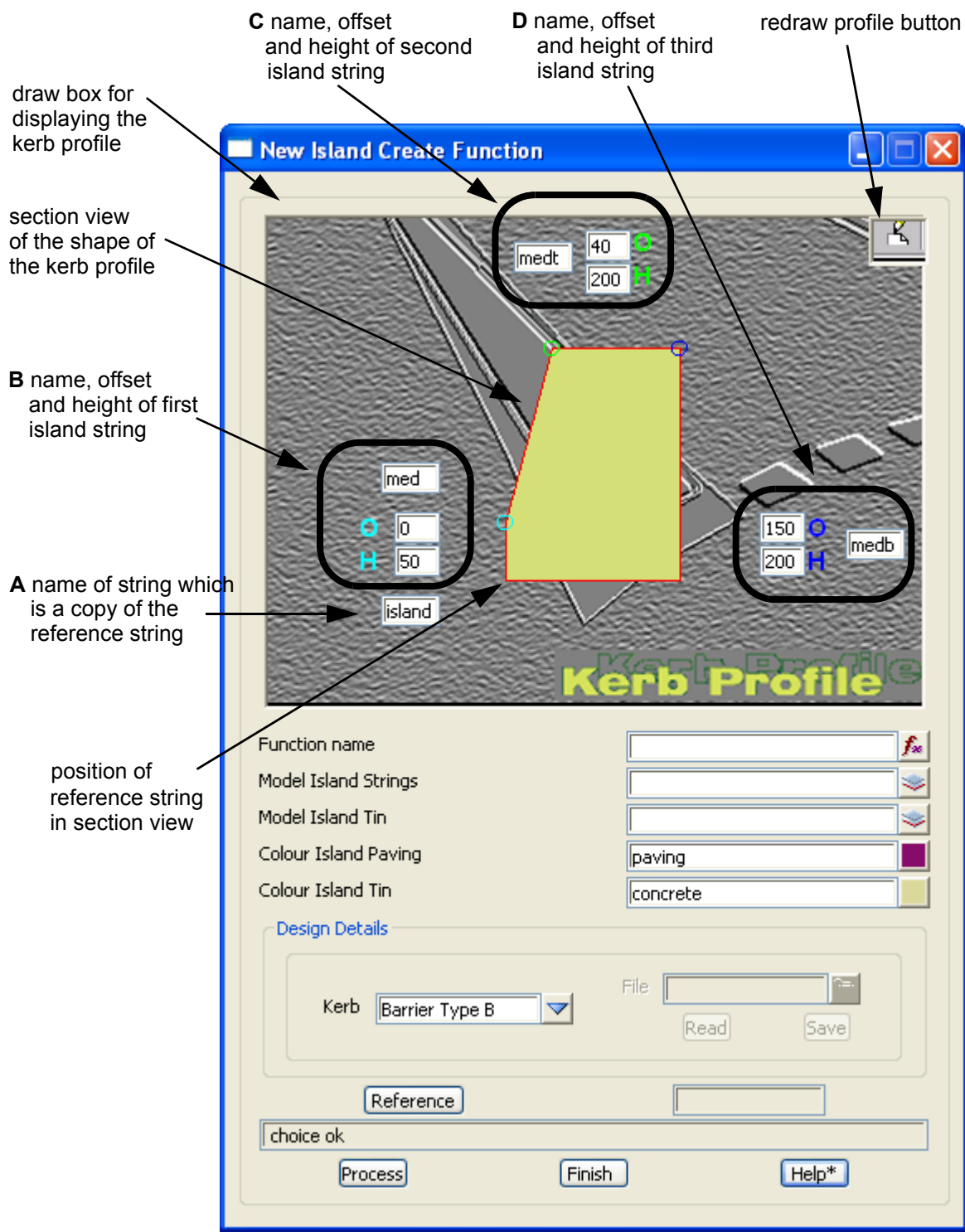
This option applies a kerb profile, either from the **12d** library or from a user defined file.

The option is saved as a function within **12d** and as a function can be re-run at any time if changes occur with the Super Alignment.

User defined kerbs are created by entering offset, height and string names in the fields in the draw box at the top of the panel, and then saved as a User Kerb Type file (*.ukt)

User Kerb Type files can then be written out, or read in as required.

On selecting the **Traffic Island** profile/tin, the **New Island Create Function** panel is displayed.



The fields and buttons used in this panel have the following functions.

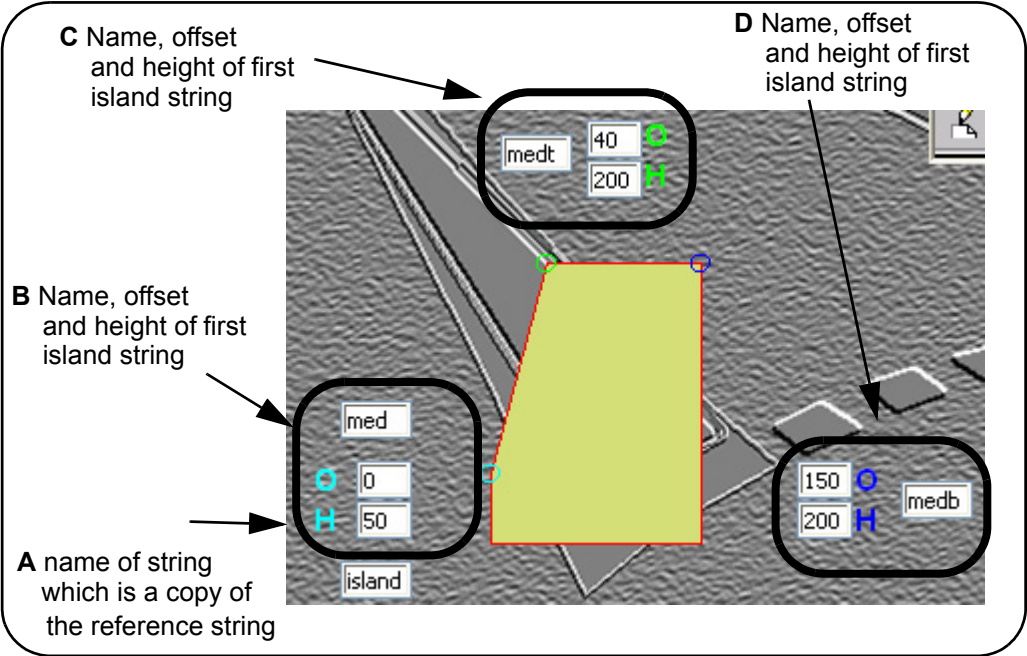
Field Description	Type	Default	Pop-Up
Function name <i>name of the Island Create function</i>	function		available functions
Model Island Strings	model box		available models

model for the created island strings

Model Island Tin model box
model for the tin of the created island

Colour Island Paving input paving available colours
if non-blank, then the colour is used to colour the island triangulation within innermost kerb string (D)

Colour Island Tin input concrete available colours
if non-blank, then the colour is the colour is used to colour the island triangulation between the strings defined by A and D.



In the drawing area:

A
a string is created which is a copy of the reference string and given this name. It is added to the Model Island Strings model.

B
name, offset and height from the reference string, of the first string of the island. It is added to the Model Island Strings model. If offset and height are both zero, then the string is not created.

C
name, offset and height from the reference string, of the second string of the island. It is added to the Model Island Strings model. If offset and height are both zero, then the string is not created.

D
name, offset and height from the reference string, of the third string of the island. It is added to the Model Island Strings model. If offset and height are both zero, then the string is not created.

Design Details

Kerb choice box Barrier Type A Barrier Type A, Barrier Type B, Mountable, Semi - Mountable, User

selected kerb type is displayed in draw box above

If Kerb is User then the File field and the Read and Save buttons are made active, and are used to read in an existing user defined Kerb type, or to create a new one.

File file box files ending in.ukt

name of the user kerb type file (ukt) to read in or create

Read button

Reads in the user defined kerb definition from the ukt file given in the File field and displays the profile and Offsets and Height in the draw box at the top of the Panel

Save button

Writes out the kerb profile information (O and H values, and string names) as a user defined kerb, into the file given in the File field.

Reference select pick

Select the reference alignment which will have the kerb profile applied to it to create the island. "pick with direction" in a clockwise manner as the kerb profile is always on the RHS.

Process button

runs the option which created the island string and the coloured island tin

Note:

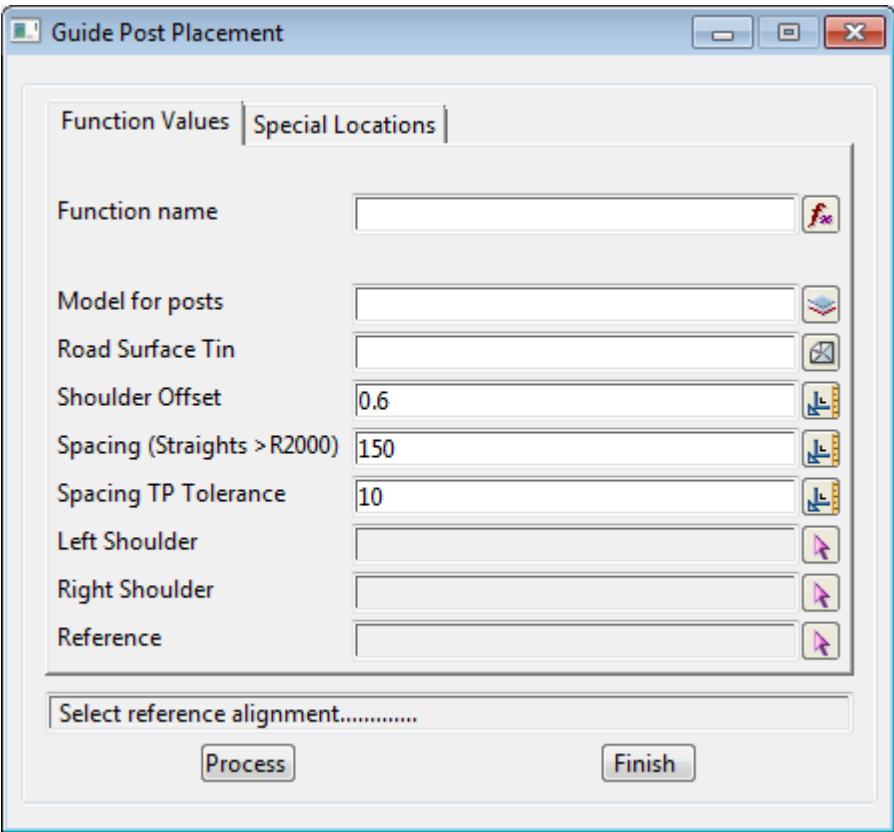
The New Island Create Function reads in the standard kerb profiles as templates and if required, creates a template from the ukt files. The function needs these templates because an apply is used (internally) to create the Island.

Guide Post Placement

Position of option on menu: Design =>Roads =>Guide post creator

This section of documentation is a work in progress and will be updated in subsequent releases.

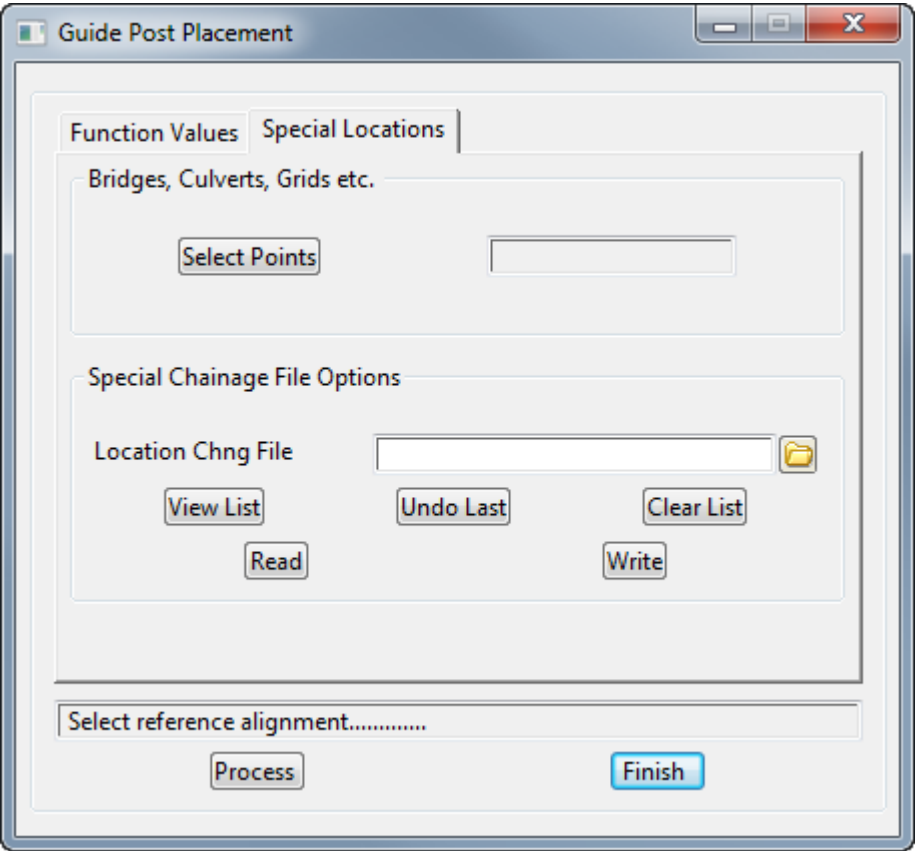
Selecting Guide post creator brings up the **Guide Post Placement** panel.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Function Values tab			
Function name	function box		available functions
Model for posts	model box		available models
Road Surface Tin	tin box		available tins
Shoulder Offset		0.6	
Spacing (Straights >R2000)		150	
Spacing TP Tolerance		10	
Left Shoulder	choice box		

Right Shoulder	choice box
Reference	choice box
Process	button



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Special Locations tab

Bridges, Culverts, Grids etc.

Select Points	button
---------------	--------

Special Chainage File Options

Location Chng File	file
View List	button
Undo Last	button
Clear List	button
Read	button
Write	button

Process

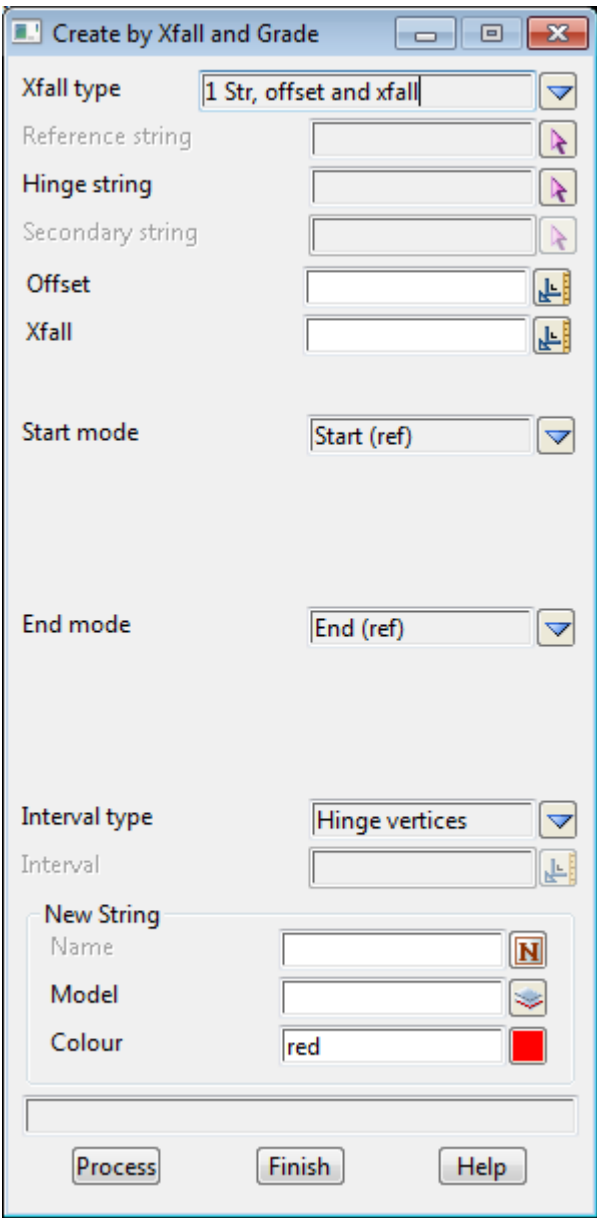
button

String by Xfall and Grade

Position of option on menu: **Design =>Roads =>String by xfall and grade**

This panel is used to create strings by a variety of methods using xfall from one string, or xfalls from two strings, either using a reference string to define where the xfall is measured, or perpendicular to selected strings. Some of the methods grade the created string.

Selecting **String by xfall and grade** brings up the **Create by Xfall and Grade** panel.

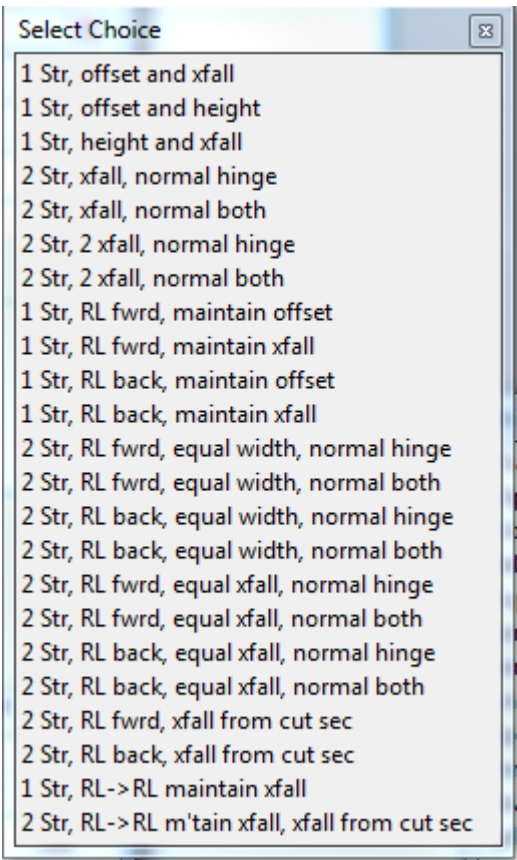


The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Xfall type

choice box



methods for creating the new string. For the definition of each choice, go to [Xfall Types](#)

Reference string

Hinge string

Secondary string

Offset, Xfall, Grade etc

which of these fields are present, and what they are for depends on the Xfall type.

Start/End mode

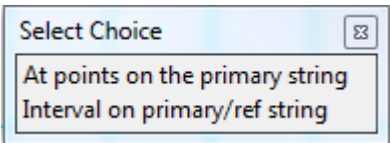
choice box

Start (ref)/End (ref)

*defines the start/end chainages for creating the string.
The Start/End modes are the same as for the MTF modifiers. For more information on Start/End mode, see [Start and End Chainages](#) in the chapter [Advanced Design](#).*

Interval type

choice box



At vertices on the Hinge string -

Interval on Hinge/ref string -

String name

name box

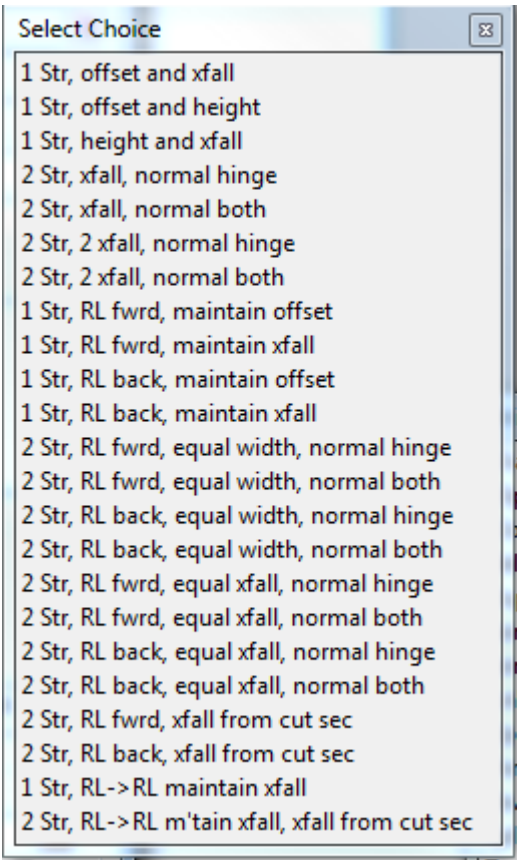
names.4d list

the name to use for the created string.

Model for string	model box		available models
<i>the created string is placed in this mode</i>			
String colour	colour box	green	available colours
<i>the colour of the created string</i>			
Process	button		
<i>run the option.</i>			

Continue to the next section [Xfall Types](#).

Xfall Types



for the definitions of the calculations for each choice

- 1 Str, offset and xfall go to [1 String, Offset and Xfall](#)
- 1 Str, offset and height [1 String, Offset and Height](#)
- 1 Str, height and xfall [1 String, Height and Xfall](#)
- 2 Str, xfall, normal hinge [2 Strings, Xfall and Normal to Reference String or Hinge String](#)
- 2 Str, xfall, normal both [2 Strings, Xfall and Normal to Both](#)
- 2 Str, 2 xfall, normal hinge [2 Strings, 2 Xfalls and Normal to Reference String or Hinge String](#)
- 2 Str, 2 xfall, normal both [2 Strings, 2 Xfalls and Normal to Both](#)
- 1 Str, RL fwd, maintain offset [1 String, Start RL and Grade, Fixed Offset](#)
- 1 Str, RL fwd, maintain xfall [1 String, Start RL and Grade, Fixed Xfall](#)
- 1 Str, RL back maintain offset [1 String, End RL and Grade, Fixed Offset](#)
- 1 Str, RL back, maintain xfall [1 String, End RL and Grade, Fixed Xfall](#)

- 2 Str, RL fwd, equal width, normal hinge [2 Strings, Start RL & Grade, Equal Width, Normal to Reference or Hinge String](#)
- 2 Str, RL fwd, equal width, normal both [2 Strings, Start RL & Grade, Equal Width and Normal to Both](#)
- 2 Str, RL back, equal width, normal hinge [2 Strings, End RL & Grade, Equal Width, Normal to Reference or Hinge String](#)
- 2 Str, RL back, equal width, normal both [2 Strings, End RL & Grade, Equal Width and Normal to Both](#)
- 2 Str, RL fwd, equal xfall, normal hinge [2 Strings, Start RL & Grade, Equal Xfall, Normal to Reference or Hinge String](#)
- 2 Str, RL fwd, equal xfall, normal both [2 Strings, Start RL & Grade, Equal Xfall and Normal to Both](#)
- 2 Str, RL back, equal, normal hinge [2 Strings, End RL & Grade, Equal Xfall, Normal to Reference or Hinge String](#)
- 2 Str, RL back, equal, normal both [2 Strings, End RL & Grade, Equal Xfall and Normal to Both](#)
- 2 Str, RL fwd, xfall from cut sec [2 Strings, Start Delta Height & Grade, Xfall from Secondary String, Normal to Reference or Hinge String](#)
- 2 Str, RL back, xfall from cut sec [2 Strings, End Delta Height & Grade, Xfall from Secondary String, Normal to Reference or Hinge String](#)
- 2 Str, RL->RL, xfall from cut sec [2 Strings, Start RL and End RL, Xfall from Secondary String, Normal to Reference or Hinge String](#)

For information about the sign convention for offset and xfalls, go to [Sign Convention for Heights, Offsets and Xfalls in Create by Xfall and Grade](#).

1 String, Offset and Xfall

Xfall type	1 Str, offset and xfall	
Reference string		
Primary string		
Secondary string		
Offset		
Xfall		

This option requires a **Hinge** string, an **Offset** and **Xfall**, and an **optional Reference** string.

Reference String Selected

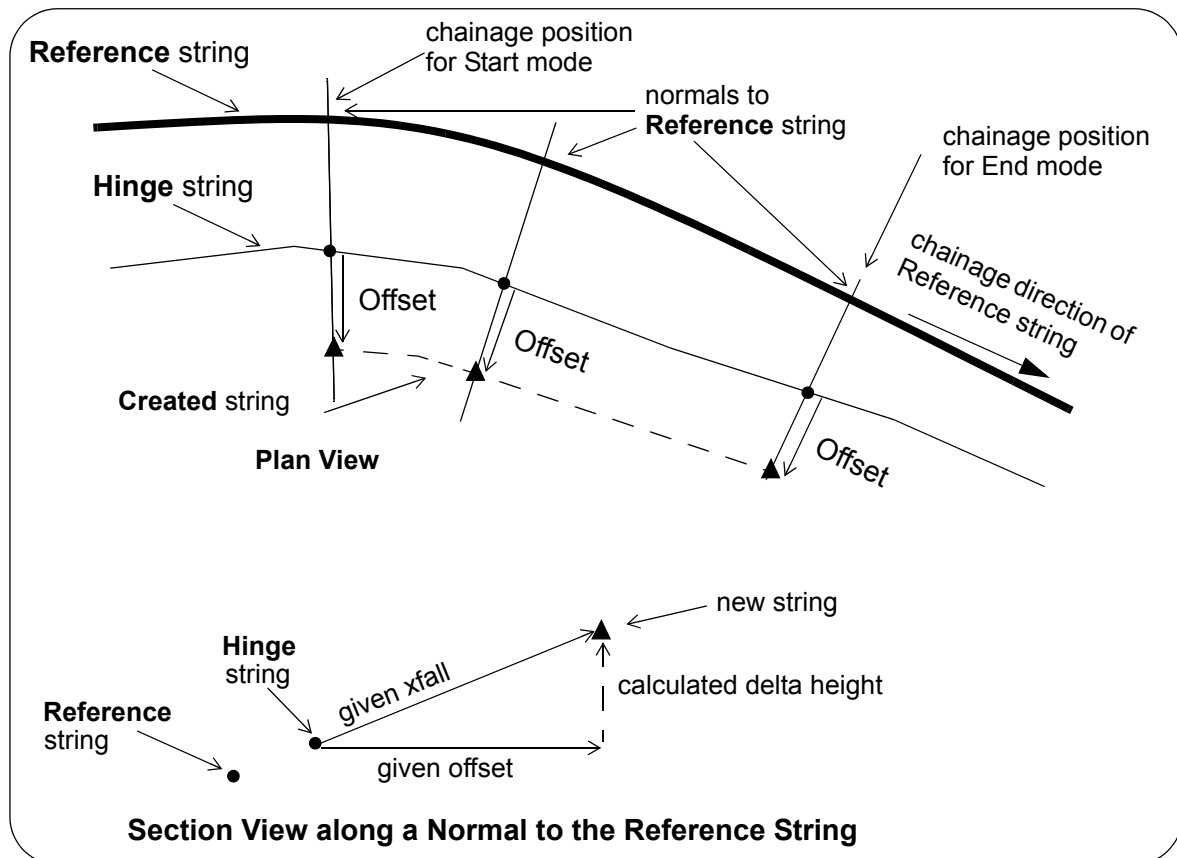
If a **Reference** string is selected then the **Start mode** and **End Mode** refer to **Reference** string and at each chainage ch between the Start mode and the End mode, a section is taken **normal** (perpendicular) to the **Reference string** and cutting the **Hinge** string.

A vertex of a new string is created by going out from the Hinge string along the section at the given **Offset** and **Xfall**.

Positive Offset is defined as going to the right of the **Hinge** string when travelling in the direction of **increasing chainage on the Reference** string. Offset can be positive or negative.

Positive Xfall is in the upward direction. Xfall can be positive or negative.

For information about the sign convention for offset and xfalls, go to [Sign Convention for Heights, Offsets and Xfalls in Create by Xfall and Grade](#).



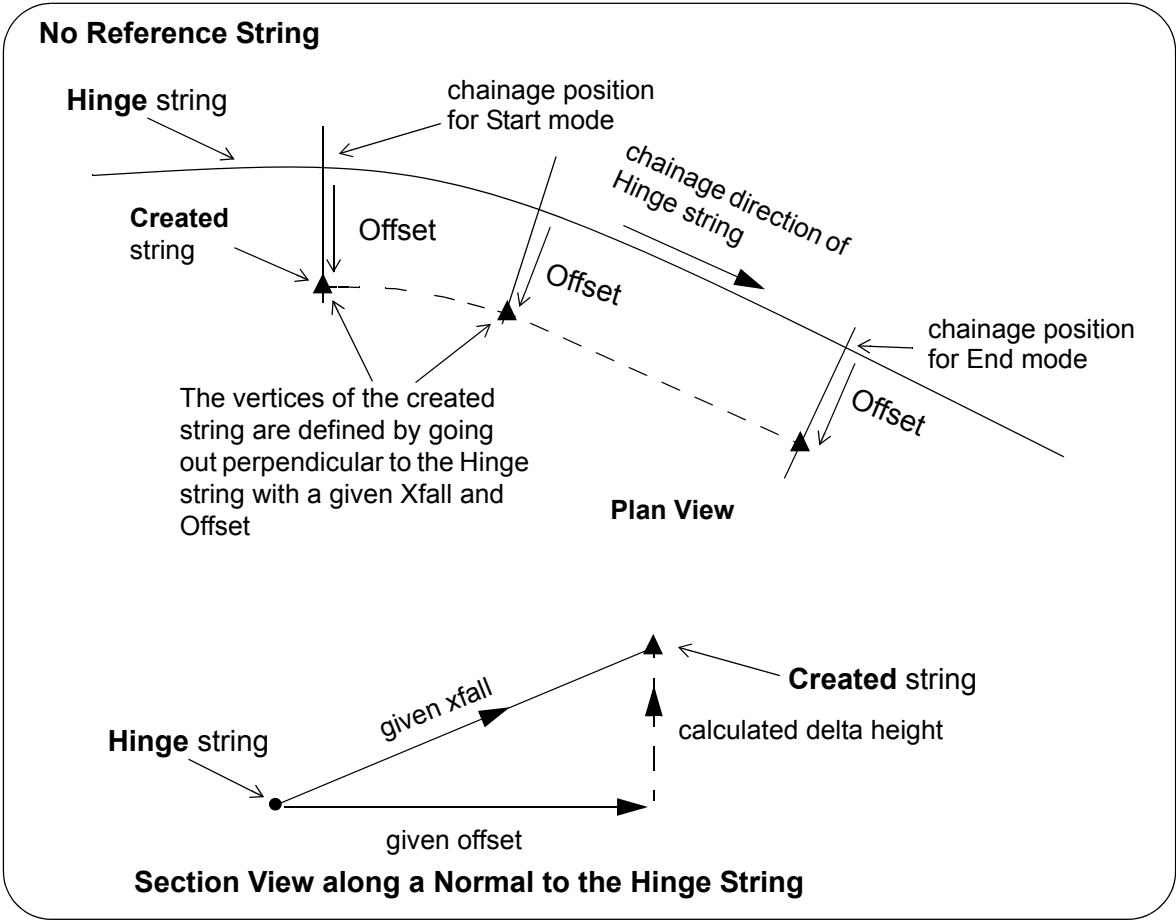
Reference String NOT Selected

If a **Reference string** is **NOT** selected then the **Start mode** and **End Mode** refer to the **Hinge string** and at each chainage ch , a vertex of the new string is created by going out **normal** (perpendicular) to the **Hinge string** for the given **Offset** and **Xfall**.

Positive **Offset** is defined as going to the right of the **Hinge string** when travelling in the direction of increasing chainage on the **Hinge string**. **Offset** can be positive or negative.

Positive **Xfall** is in the upward direction. **Xfall** can be positive or negative.

For information about the sign convention for offset and xfalls, go to [Sign Convention for Heights, Offsets and Xfalls in Create by Xfall and Grade](#).



Continue to the next choice [1 String, Offset and Height](#) or return to [Xfall Types](#) or [String by Xfall and Grade](#).

1 String, Offset and Height

Xfall type	1 Str, offset and heig	▼
Reference string		↗
Primary string		↗
Secondary string		↗
Offset		↕
Height		↕

This option requires a **Hinge** string, an **Offset** and **Height**, and an **optional Reference** string.

Reference String Selected

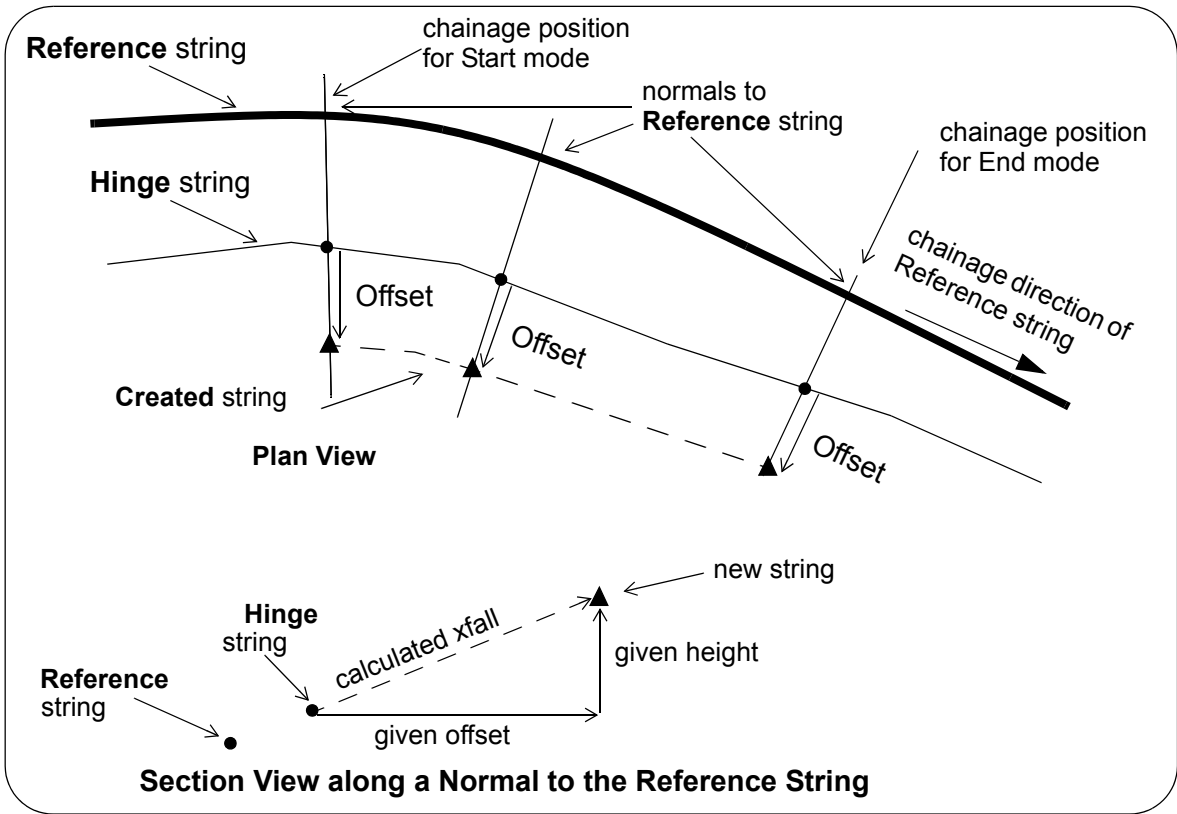
If a **Reference** string is selected then the **Start mode** and **End Mode** refer to **Reference** string and at each chainage ch between the Start mode and the End mode, a section is taken **normal** (perpendicular) to the **Reference string** and cutting the **Hinge** string.

A vertex of a new string is created by going out from the Hinge string along the section at the given **Offset** and **Height**.

Positive Offset is defined as going to the right of the **Hinge** string when travelling in the direction of **increasing chainage on the Reference** string. Offset can be positive or negative.

Height is **added** to the height on the Hinge string. Height can be positive or negative.

For information about the sign convention for offset and xfalls, go to [Sign Convention for Heights, Offsets and Xfalls in Create by Xfall and Grade](#).



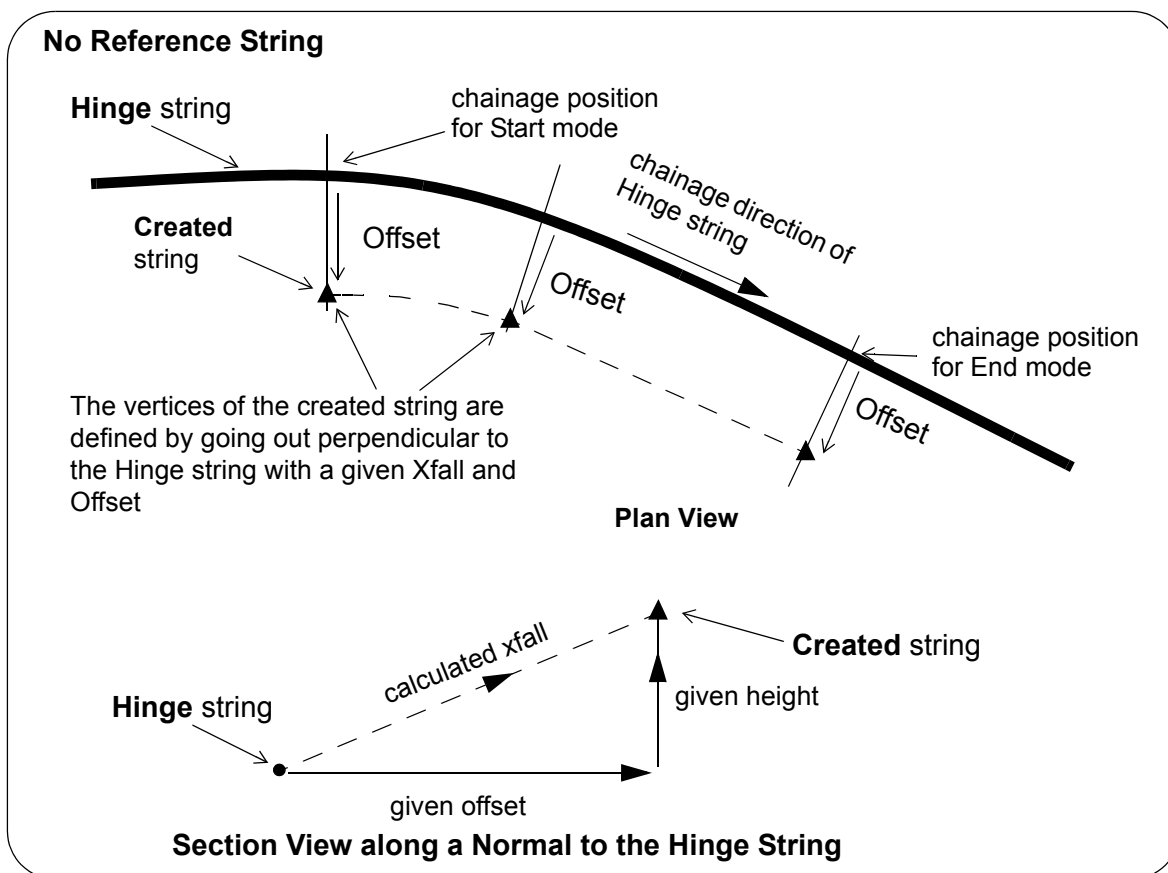
Reference String NOT Selected

If a **Reference** string is **NOT** selected then the **Start mode** and **End Mode** refer to the **Hinge** string and at each chainage ch , a vertex of a new string is created by going out **normal** (perpendicular) to the **Hinge string** for the given **Offset** and **Height**.

Positive **Offset** is defined as going to the right of the Hinge string when travelling in the direction of increasing chainage on the Hinge string. Offset can be positive or negative.

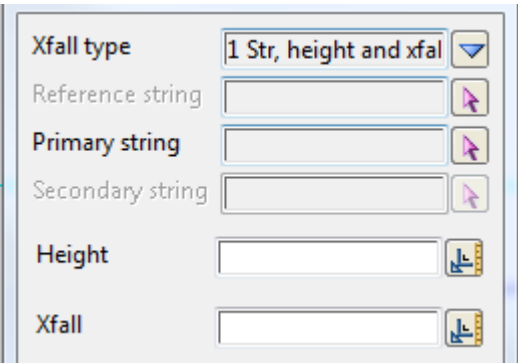
Height is **added** to the height on the Hinge string. Height can be positive or negative.

For information about the sign convention for offset and xfalls, go to [Sign Convention for Heights, Offsets and Xfalls in Create by Xfall and Grade](#).



Continue to the next choice [1 String, Height and Xfall](#) or return to [Xfall Types](#) or [String by Xfall and Grade](#).

1 String, Height and Xfall



This option requires a **Hinge** string, a **Height** and **Xfall**, and an **optional Reference** string.

Reference String Selected

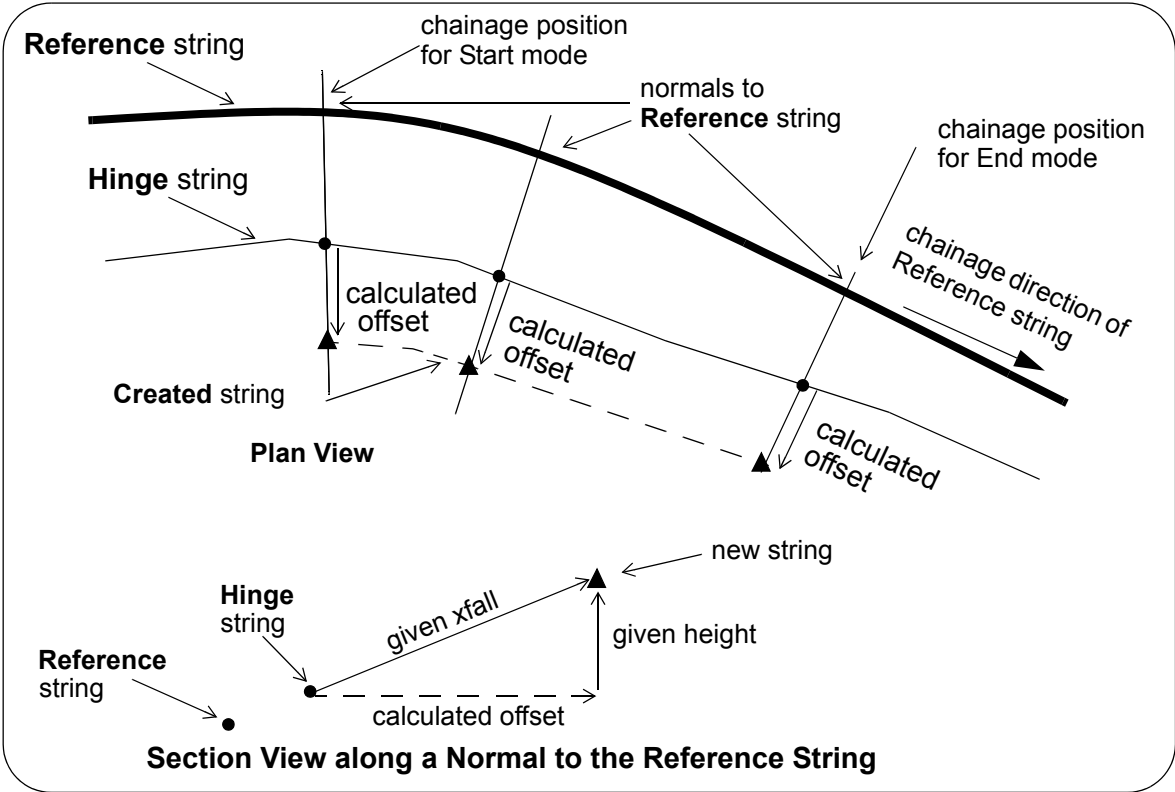
If a **Reference** string is selected then the **Start mode** and **End Mode** refer to **Reference** string and at each chainage *ch* between the Start mode and the End mode, a section is taken **normal** (perpendicular) to the **Reference string** and cutting the **Hinge** string.

A vertex of a new string is created by going out from the Hinge string along the section at the given **Height** and **Xfall**.

Height is **added** to the height on the Hinge string. Height can be positive or negative.

Positive **Xfall** is in the upward direction. **Xfall** can be positive or negative.

For information about the sign convention for offset and xfalls, go to [Sign Convention for Heights, Offsets and Xfalls in Create by Xfall and Grade](#).



Reference String NOT Selected

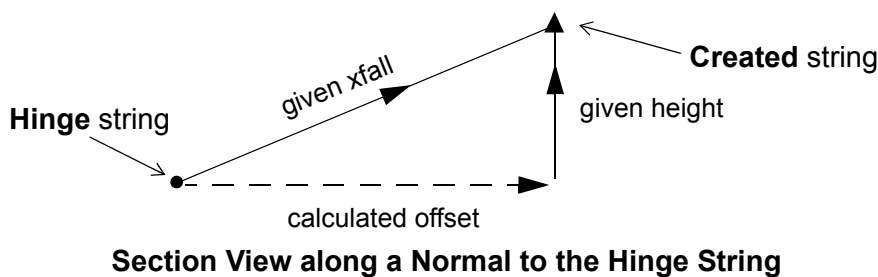
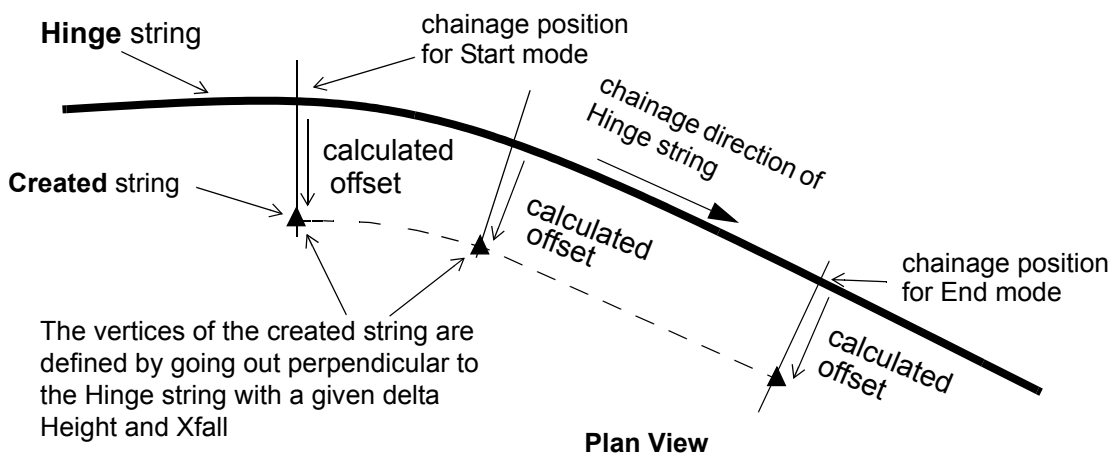
If a **Reference** string is **NOT** selected then the **Start mode** and **End Mode** refer to the **Hinge** string and at each chainage ch , a vertex of a new string is created by going out **normal** (perpendicular) to the **Hinge string** for the given **Height** and **Xfall**.

Height is **added** to the height at that chainage on the Hinge string. Height can be positive or negative.

Positive Xfall is in the upward direction. Xfall can be positive or negative.

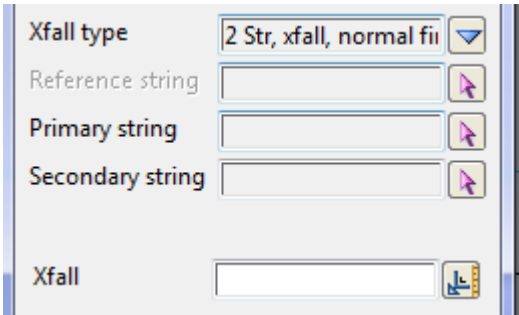
For information about the sign convention for offset and xfalls, go to [Sign Convention for Heights, Offsets and Xfalls in Create by Xfall and Grade](#).

No Reference String



Continue to the next choice [2 Strings, Xfall and Normal to Reference String or Hinge String](#) or return to [Xfall Types](#) or [String by Xfall and Grade](#).

2 Strings, Xfall and Normal to Reference String or Hinge String



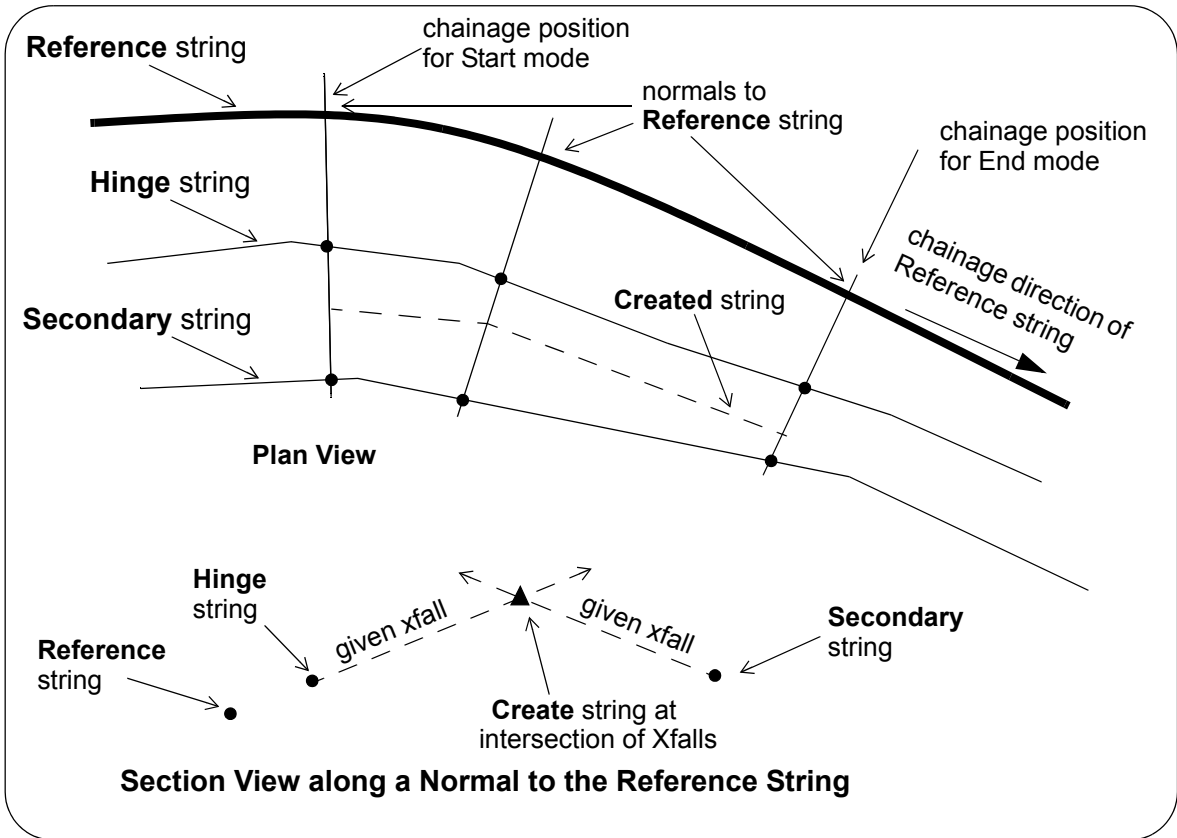
This option requires a **Hinge** and a **Secondary** string, a **Xfall**, and an **option Reference** string.

Reference String Selected

If a **Reference** string is selected then the **Start mode** and **End Mode** refer to **Reference** string and at each chainage (ch) between the Start mode and the End mode, a section is taken **normal** (perpendicular) to the **Reference string** and cutting the **Hinge** string and the **Secondary** strings.

On this section, the **Xfall** is taken from the Hinge and Secondary strings and a vertex of a new string created where the Xfalls intersect.

For information about the sign convention for offset and xfalls, go to [Sign Convention for Heights, Offsets and Xfalls in Create by Xfall and Grade](#).



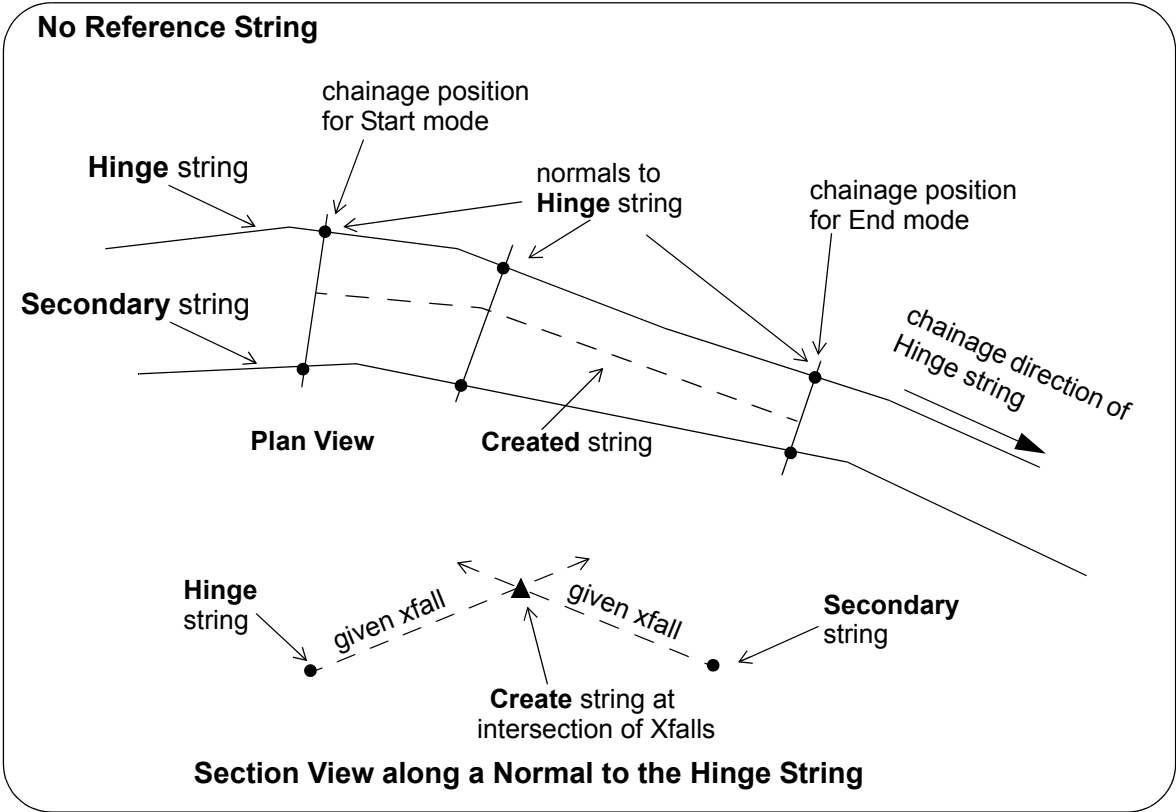
Reference String NOT Selected

If a **Reference** string is **NOT** selected then the **Start mode** and **End Mode** refer to **Hinge** string and at each chainage (ch), a section is taken **normal** (perpendicular) to the **Hinge string** and

cutting the **Secondary** strings.

On this section, the **Xfall** is taken from the Hinge and Secondary strings and a vertex of a new string created where the Xfalls intersect.

For information about the sign convention for offset and xfalls, go to [Sign Convention for Heights, Offsets and Xfalls in Create by Xfall and Grade](#).



Continue to the next choice [2 Strings, Xfall and Normal to Both](#) or return to [Xfall Types](#) or [String by Xfall and Grade](#).

2 Strings, Xfall and Normal to Both

This option requires a **Hinge** and a **Secondary** string, a **Xfall**, and an **option Reference** string.

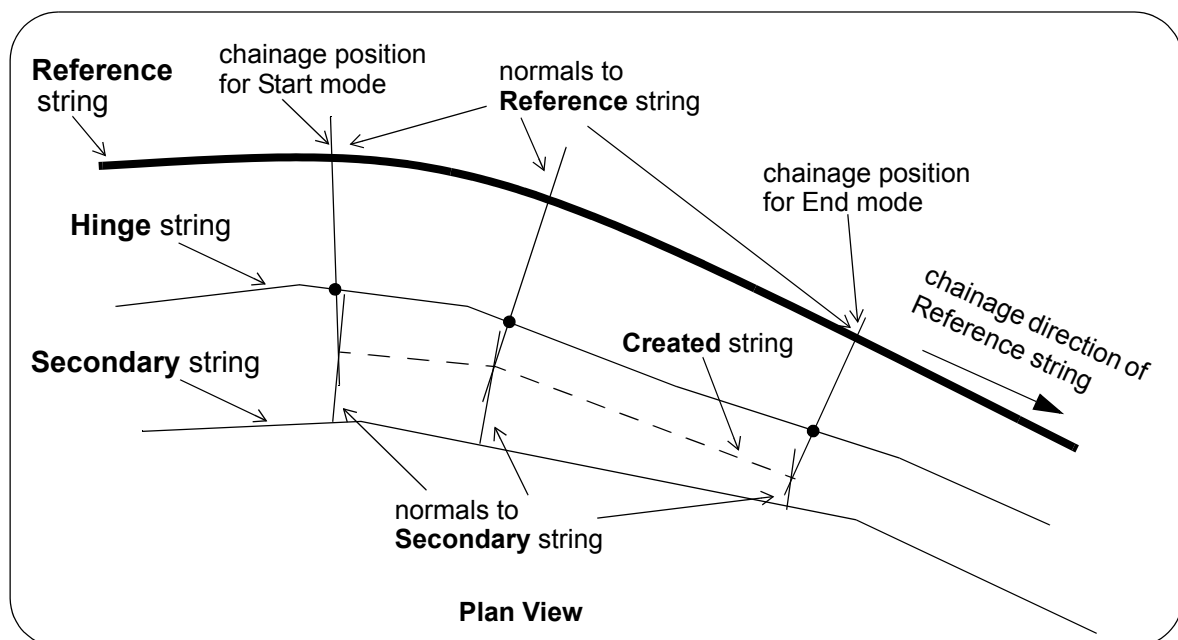
Reference String Selected

If a **Reference** string is selected then the **Start mode** and **End Mode** refer to **Reference** string and at each chainage ch between the Start mode and the End mode, a section is taken **normal** (perpendicular) to the **Reference string** and cutting the **Hinge** string, and the **Xfall** is taken from the cut with the Hinge string and along the section.

This is then intersected with a section **normal** to the **Secondary** string and with the given **Xfall**.

The new string is formed from the intersection points.

Note - it may not be possible to find such an intersection point.



Reference String NOT Selected

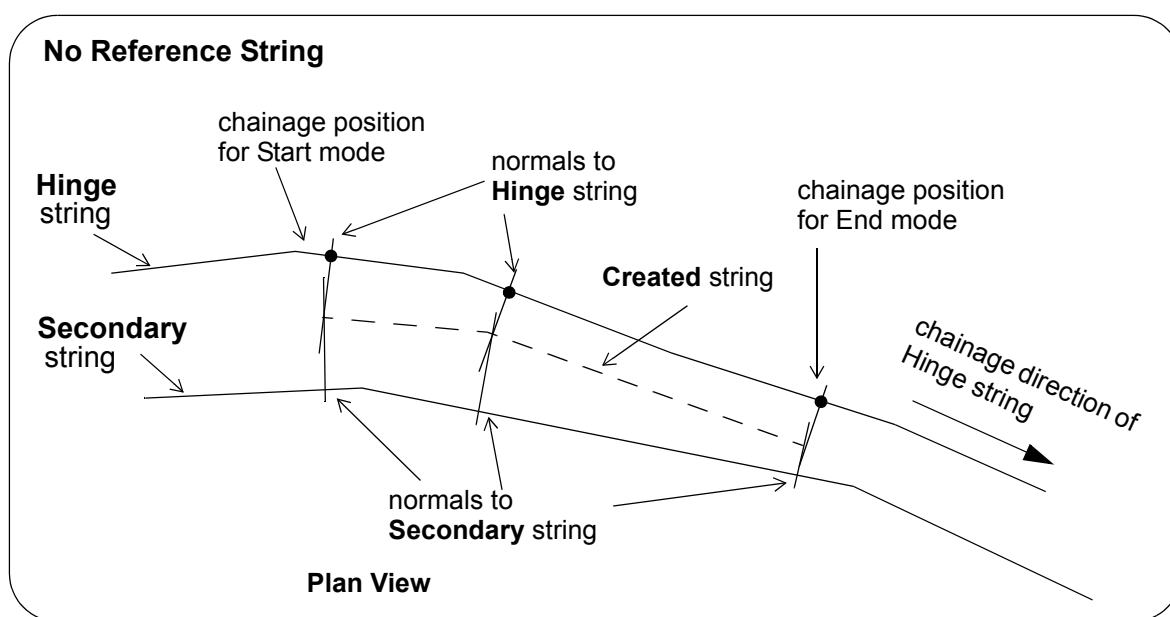
If a **Reference** string is **NOT** selected then the **Start mode** and **End Mode** refer to the **Hinge** string.

At each chainage ch between the Start mode and the End mode, a section is taken **normal** (perpendicular) to the **Hinge string** and the **Xfall** is taken along this section.

This is then intersected with a section **normal** to the **Secondary** string and with the given **Xfall**.

The new string is formed from the intersection points.

Note - it may not be possible to find such an intersection point.



Positive Xfall is in the upward direction. Xfall can be positive or negative.

Continue to the next choice [2 Strings, 2 Xfalls and Normal to Reference String or Hinge String](#) or return to [Xfall Types](#) or [String by Xfall and Grade](#).

2 Strings, 2 Xfalls and Normal to Reference String or Hinge String

Xfall type	2 Str, 2 xfall, normal	
Reference string		
Primary string		
Secondary string		
Pri xfall		
Sec xfall		

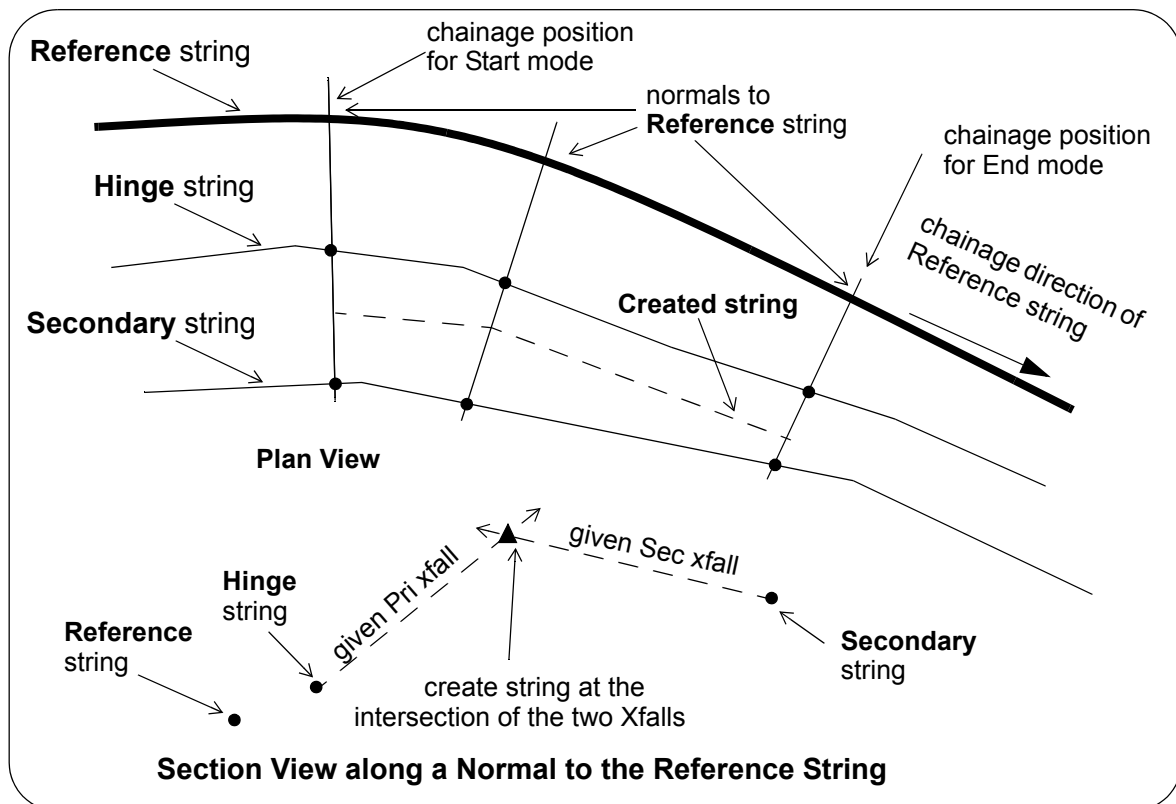
This option requires a **Hinge** and a **Secondary** string, two **Xfalls**, and an **option Reference** string.

Reference String Selected

If a **Reference** string is selected then the **Start mode** and **End Mode** refer to the **Reference** string and at each chainage (ch) between the Start mode and the End mode, a section is taken **normal** (perpendicular) to the **Reference string** and cutting the **Hinge** string and the **Secondary** strings.

On this section, the xfall **Pri xfall** is taken from the Hinge string, and xfall **Sec xfall** from the Secondary string, and a vertex of a new string created where the two xfalls intersect.

For information about the sign convention for offset and xfalls, go to [Sign Convention for Heights, Offsets and Xfalls in Create by Xfall and Grade](#).



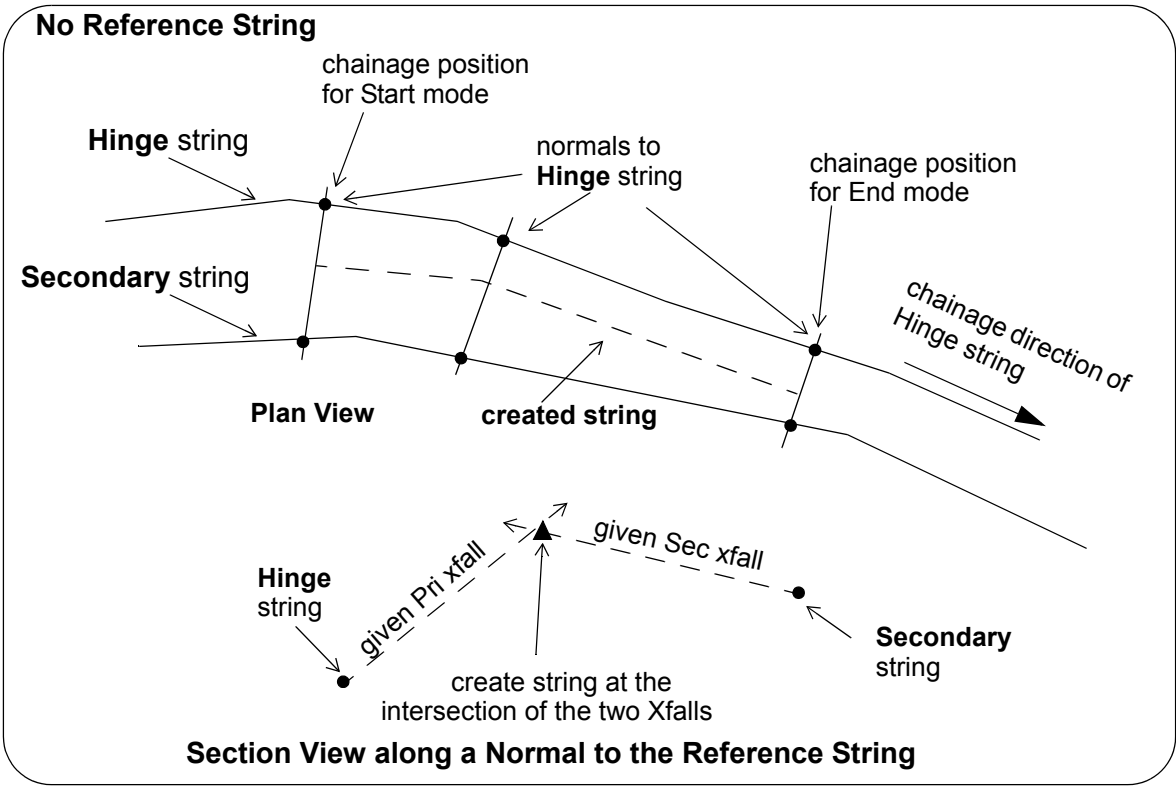
Reference String NOT Selected

If a **Reference** string is **NOT** selected then the **Start mode** and **End Mode** refer to **Hinge** string

and at each chainage (ch), a section is taken **normal** (perpendicular) to the **Hinge string** and cutting the **Secondary** strings.

On this section, the xfall **Pri xfall** is taken from the Hinge string, and xfall **Sec xfall** from the Secondary string, and a vertex of a new string created where the two xfalls intersect.

For information about the sign convention for offset and xfalls, go to [Sign Convention for Heights, Offsets and Xfalls in Create by Xfall and Grade](#).



Positive Xfall is in the upward direction. Xfall can be positive or negative.

Continue to the next choice [2 Strings, 2 Xfalls and Normal to Both](#) or return to [Xfall Types](#) or [String by Xfall and Grade](#).

2 Strings, 2 Xfalls and Normal to Both

Xfall type	2 Str, 2 xfall, normal	
Reference string		
Primary string		
Secondary string		
Pri xfall		
Sec xfall		

This option requires a **Hinge** and a **Secondary** string, two **Xfalls**, and an **option Reference** string.

Reference String Selected

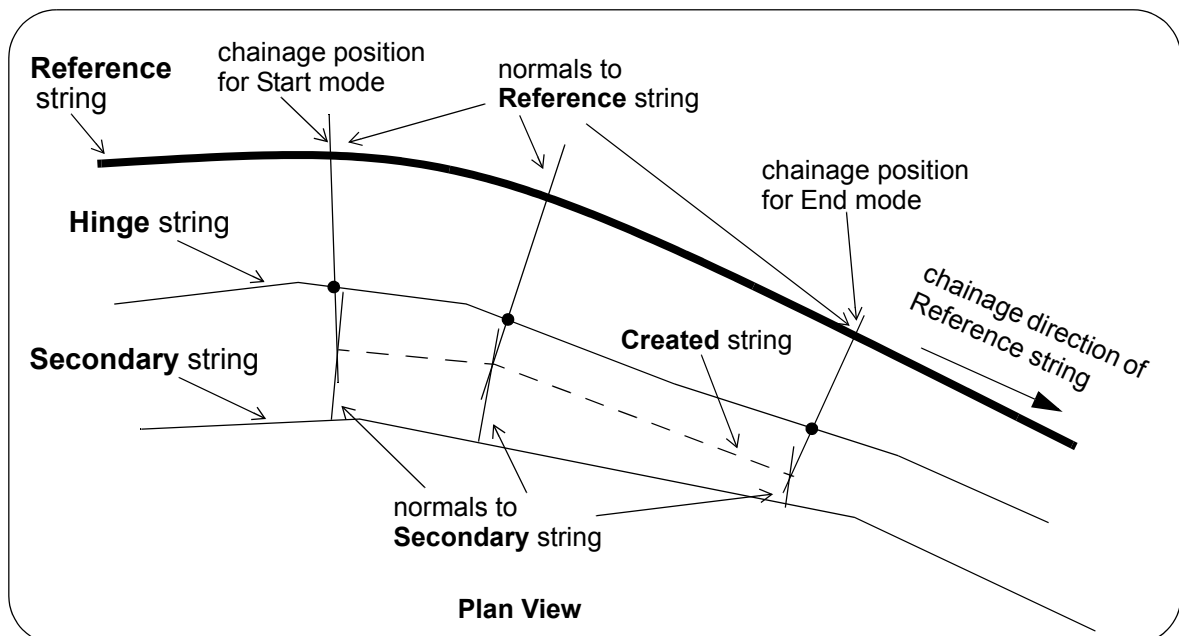
If a **Reference** string is selected then the **Start mode** and **End Mode** refer to **Reference** string and at each chainage ch between the Start mode and the End mode, a section is taken **normal** (perpendicular) to the **Reference string** and cutting the **Hinge** string, and the xfall **Pri xfall** is taken from the cut with the Hinge string and along the section.

This is then intersected with a section **normal** to the **Secondary** string and with the xfall **Sec xfall**.

The new string is formed from the intersection points.

Note - it may not be possible to find such an intersection point.

For information about the sign convention for offset and xfalls, go to [Sign Convention for Heights, Offsets and Xfalls in Create by Xfall and Grade](#).



Reference String NOT Selected

If a **Reference** string is **NOT** selected then the **Start mode** and **End Mode** refer to the **Hinge** string.

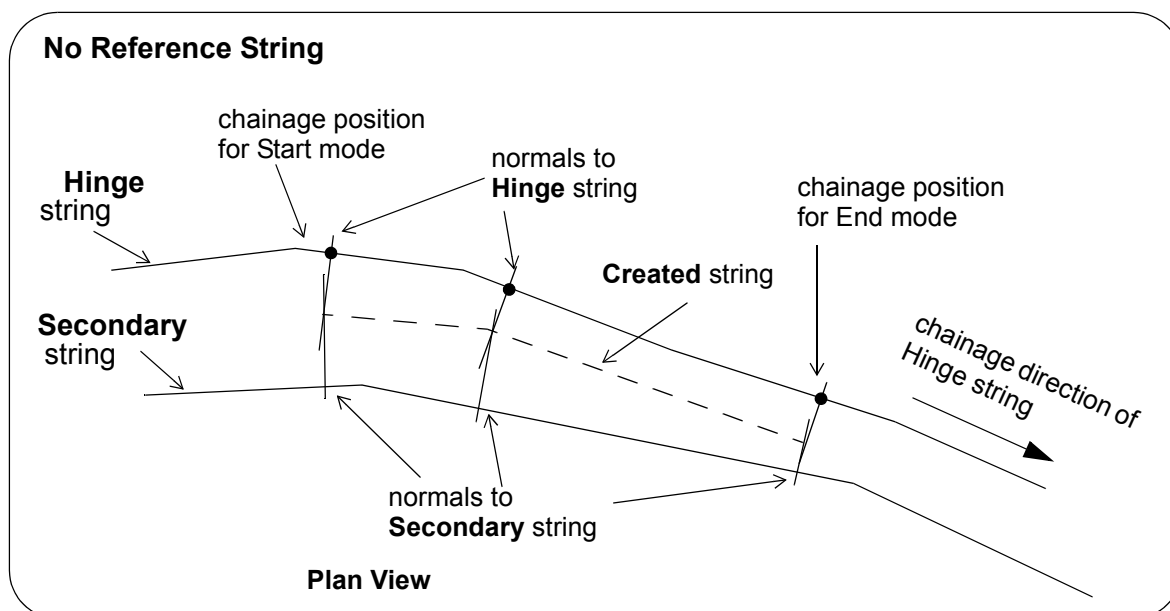
At each chainage *ch* between the Start mode and the End mode, a section is taken **normal** (perpendicular) to the **Hinge string** and the xfall **Pri xfall** is taken along this section.

This is then intersected with a section **normal** to the **Secondary** string and with the xfall **Sec xfall**.

The new string is formed from the intersection points.

Note - it may not be possible to find such an intersection point.

For information about the sign convention for offset and xfalls, go to [Sign Convention for Heights, Offsets and Xfalls in Create by Xfall and Grade](#).



Positive Xfall is in the upward direction. Xfall can be positive or negative.

Continue to the next choice [1 String, Start RL and Grade, Fixed Offset](#) or return to [Xfall Types](#) or [String by Xfall and Grade](#).

1 String, Start RL and Grade, Fixed Offset

Xfall type	RL fwd, maintain of	
Reference string		
Primary string		
Secondary string		
Start RL		
Grade->		
Offset		

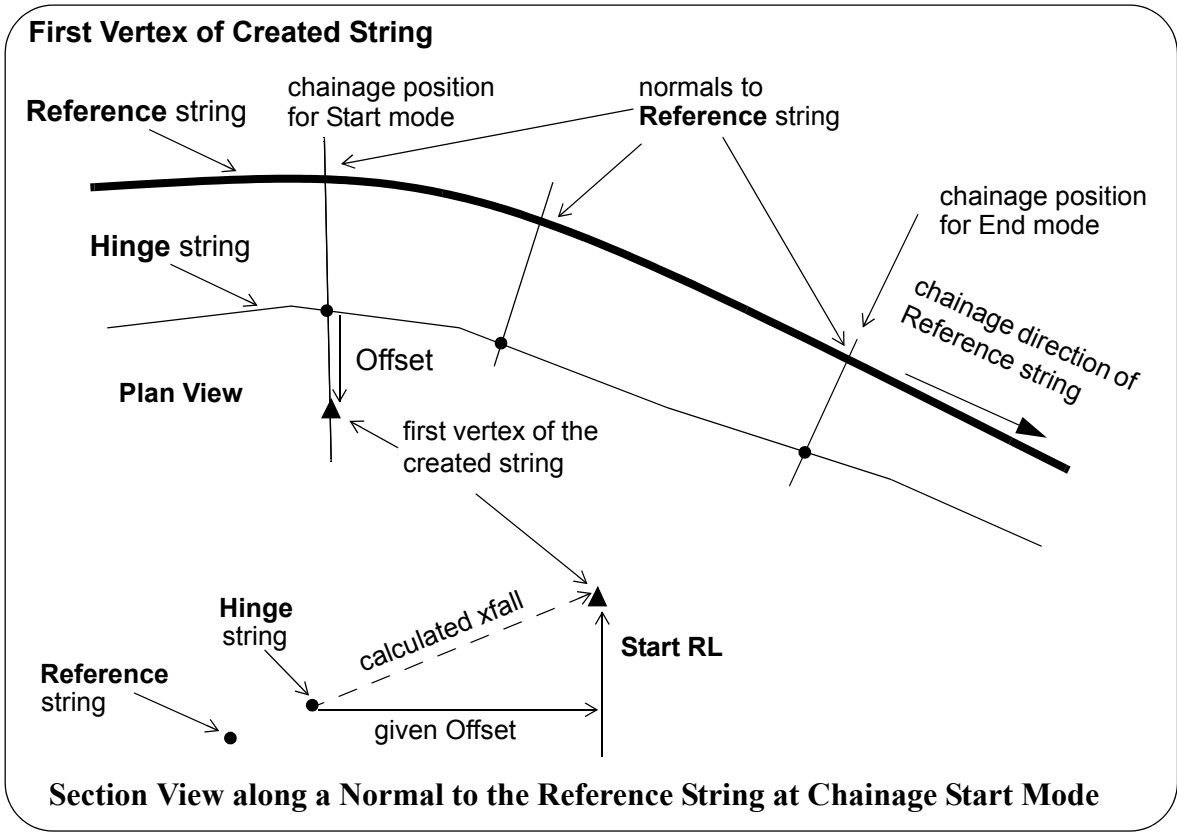
This option requires a **Hinge** string, a **Start RL** and forward **Grade**, an **Offset**, and an **optional Reference** string.

Reference String Selected

If a **Reference** string is selected then the **Start mode** and **End Mode** refer to the **Reference** string, and at the given chainage interval between the Start mode and the End mode, sections are taken **normal** (perpendicular) to the **Reference string** and cutting the **Hinge** string. The vertices of the created string lie on these normals.

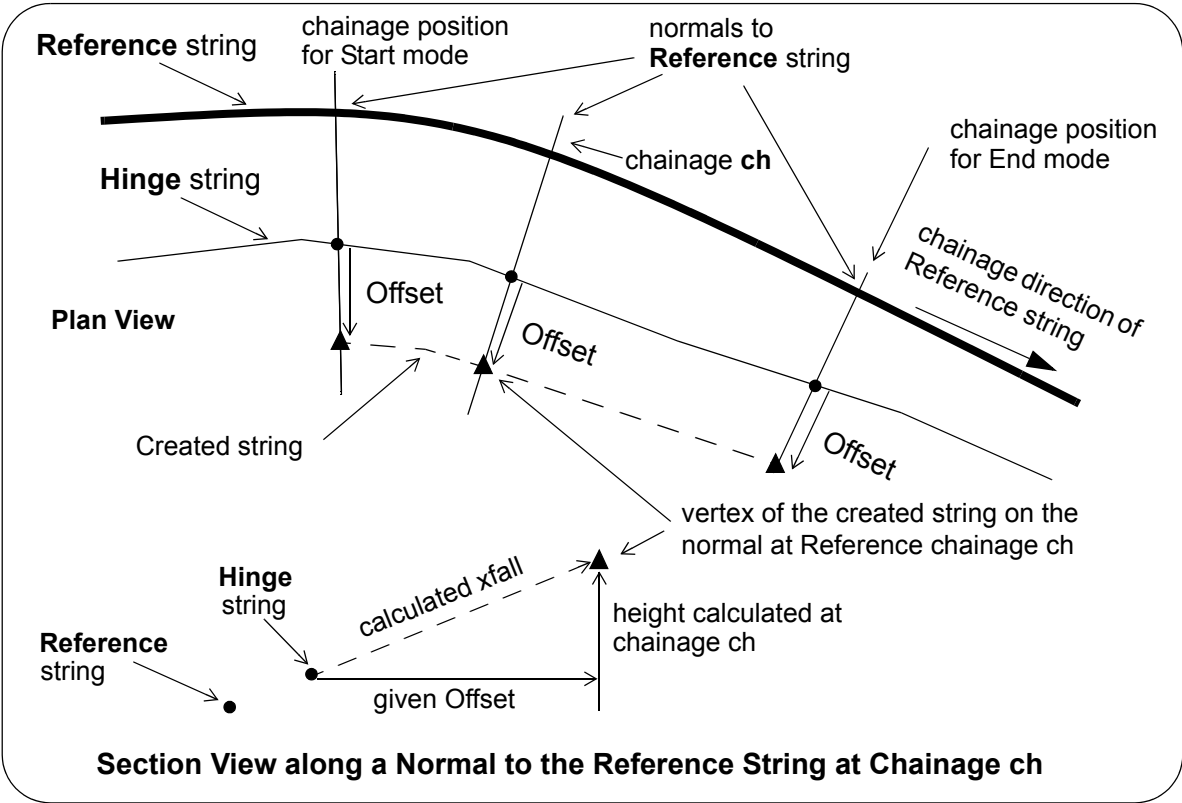
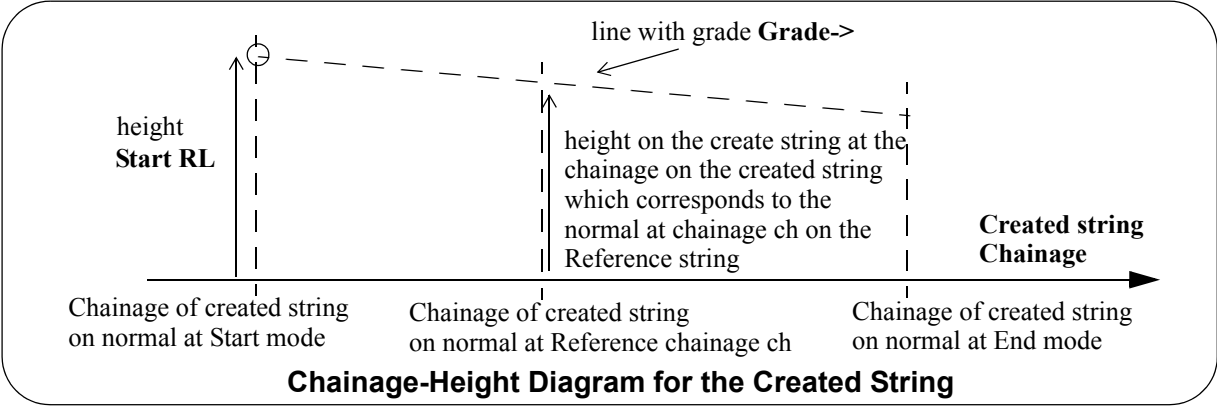
The **plan position** of the created vertices are given by going out from the Hinge string along the normal section for the given **Offset**.

The **first vertex** of the created string is on the normal to the Reference string at chainage **Start mode**, with an offset from the **Hinge** string of **Offset** and with a **height** of **Start RL**.



The **heights** of the subsequent vertices of the created string are defined in (created string

chainage, height) space, and lie on the line with grade **Grade->** and going through the first vertex.



For information about the sign convention for offset and xfalls, go to [Sign Convention for Heights, Offsets and Xfalls in Create by Xfall and Grade](#).

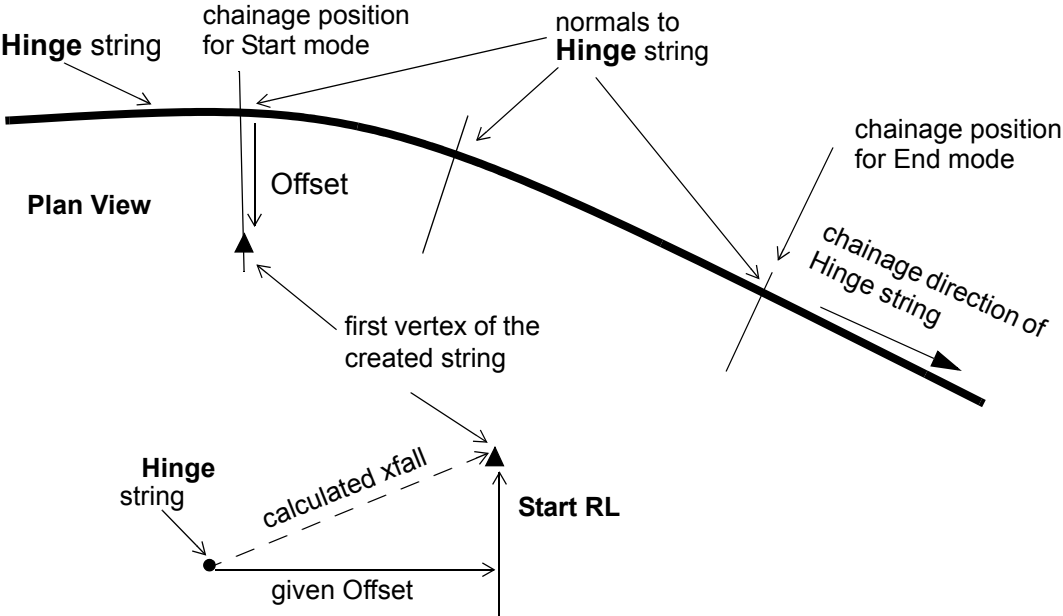
Reference String NOT Selected

If a **Reference** string is **NOT** selected then the **Start mode** and **End Mode** refer to the **Hinge** string, and at the given chainage interval between the Start mode and the End mode, sections are taken **normal** (perpendicular) to the **Hinge string**. The vertices of the created string lie on these normals.

The **plan position** of the created vertices are given by going out from the Hinge string along the normal section for the given **Offset**.

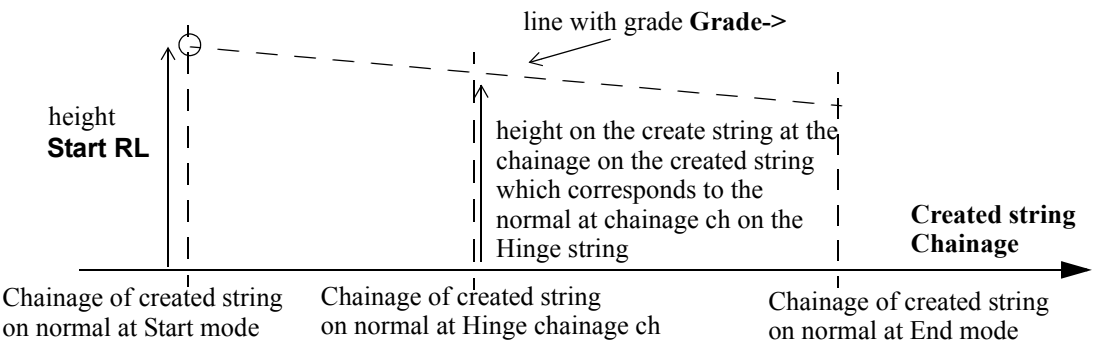
The **first vertex** of the created string is on the normal to the Hinge string at chainage **Start mode**, with an offset from the **Hinge** string of **Offset**, and with a **height** of **Start RL**.

First Vertex of Created String - No Reference String

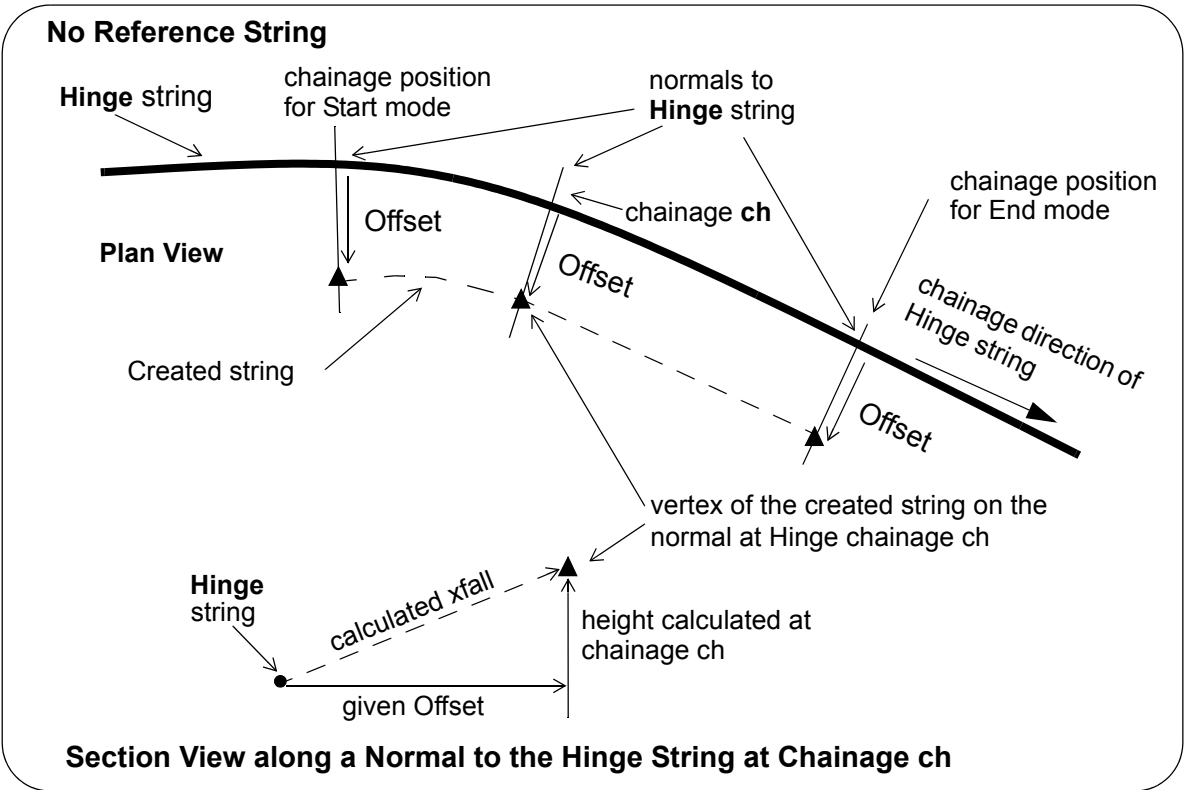


Section View along a Normal to the Hinge String at Chainage Start Mode

The **heights** of the subsequent vertices of the created string are defined in (created string chainage, height) space, and lie on the line with grade **Grade->** and going through the first vertex.



Chainage-Height Diagram for the Created String



For information about the sign convention for offset and xfalls, go to [Sign Convention for Heights, Offsets and Xfalls in Create by Xfall and Grade](#).

Continue to the next choice [1 String, Start RL and Grade, Fixed Xfall](#) or return to [Xfall Types](#) or [String by Xfall and Grade](#).

1 String, Start RL and Grade, Fixed Xfall

Xfall type	RL fwd, maintain xf	
Reference string		
Primary string		
Secondary string		
Start RL		
Grade->		
Xfall		

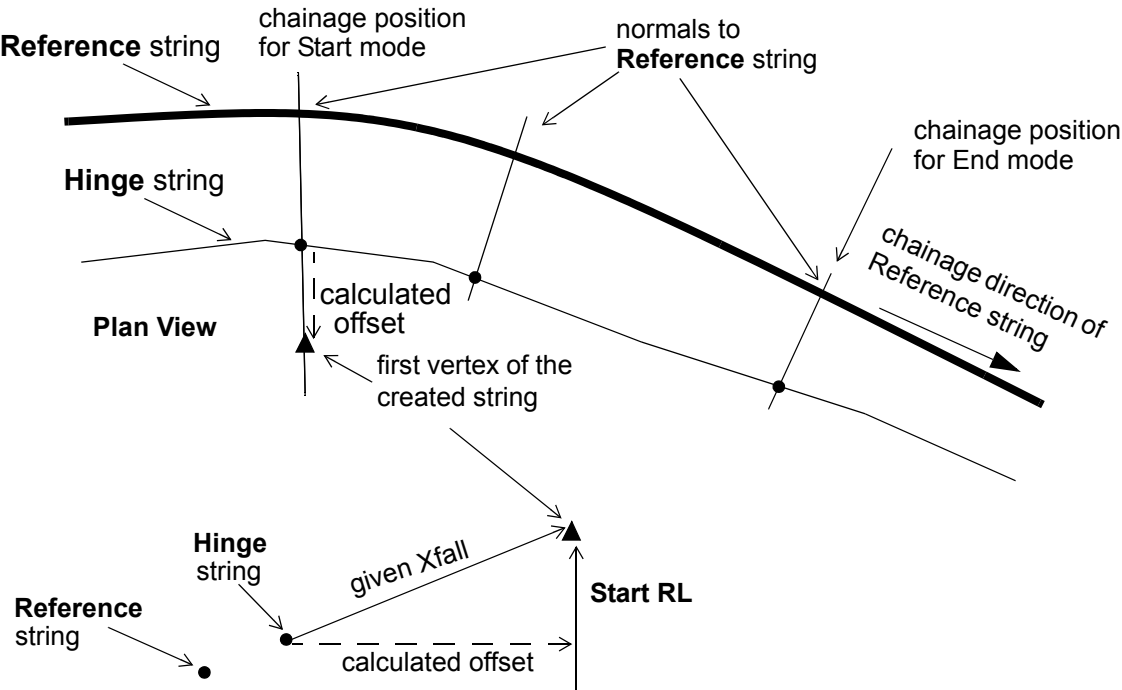
This option requires a **Hinge** string, a **Start RL** and forward **Grade**, a **Xfall**, and an **optional Reference** string.

Reference String Selected

If a **Reference** string is selected then the **Start mode** and **End Mode** refer to the **Reference** string, and at the given chainage interval between the Start mode and the End mode, sections are taken **normal** (perpendicular) to the **Reference string** and cutting the **Hinge** string. The vertices of the created string lie on these normals.

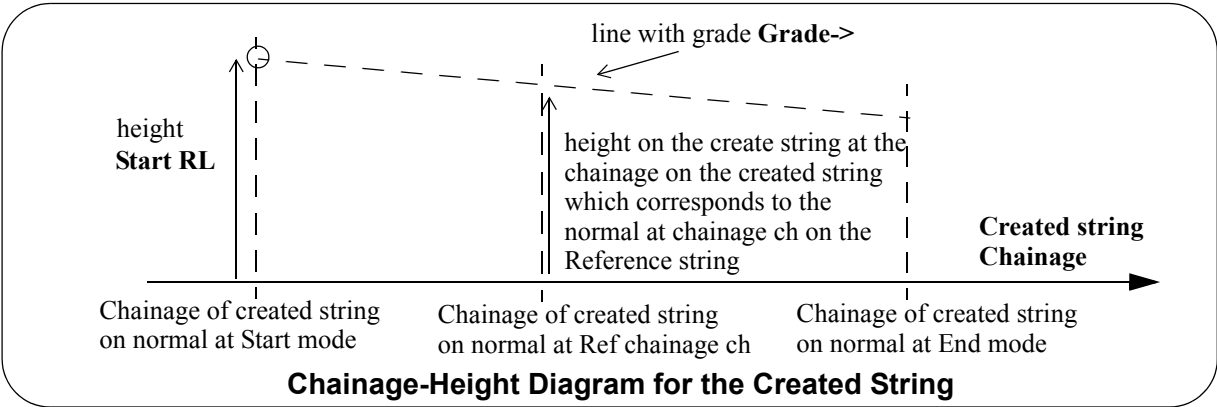
The **first vertex** of the created string is on the normal to the Reference string and has a **height Start RL**. The offset for the first vertex is calculated and is such that the given **Xfall** from Hinge string will give the vertex the height **Start RL**.

First Vertex of Created String

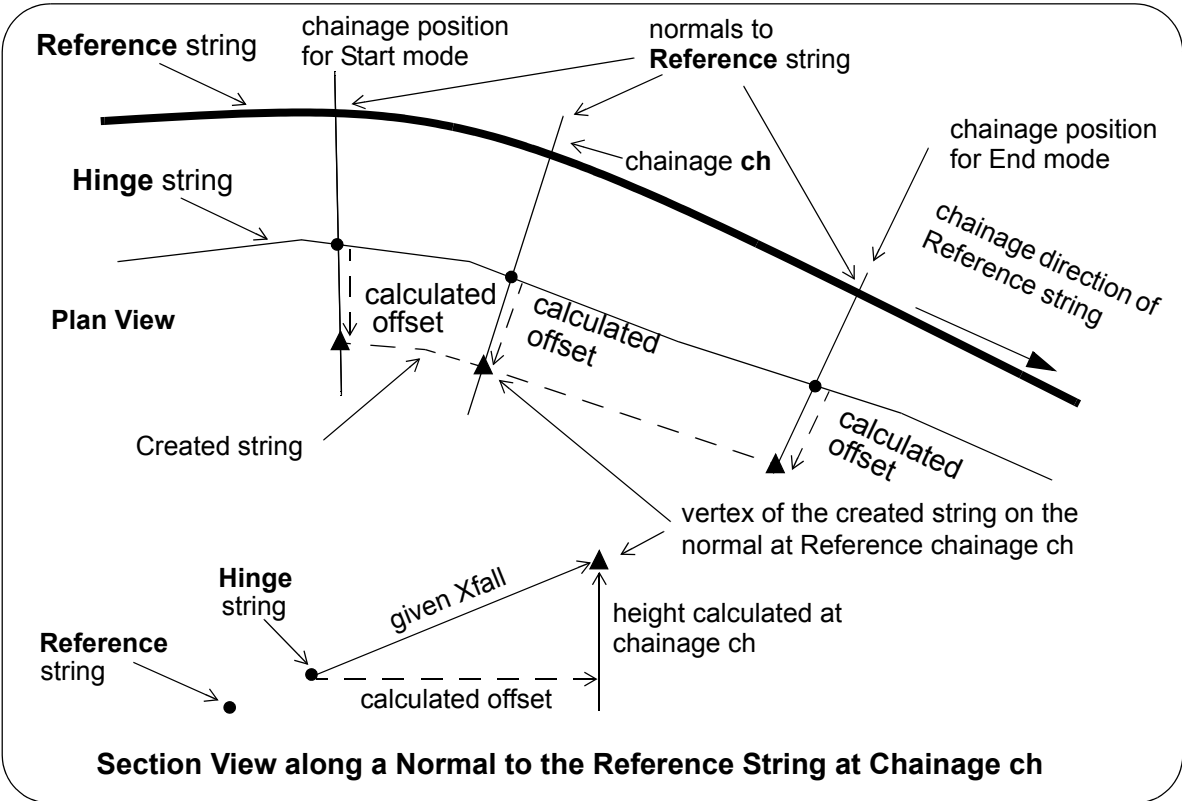


Section View along a Normal to the Reference String at Chainage Start Mode

The **heights** of the subsequent vertices of the created string are defined in (created string chainage, height) space, and lie on the line with grade **Grade->** and going through the first vertex.



The offsets for the vertices are calculated and are such that the given **Xfall** from Hinge string will give the vertex the correct **height** for that chainage.



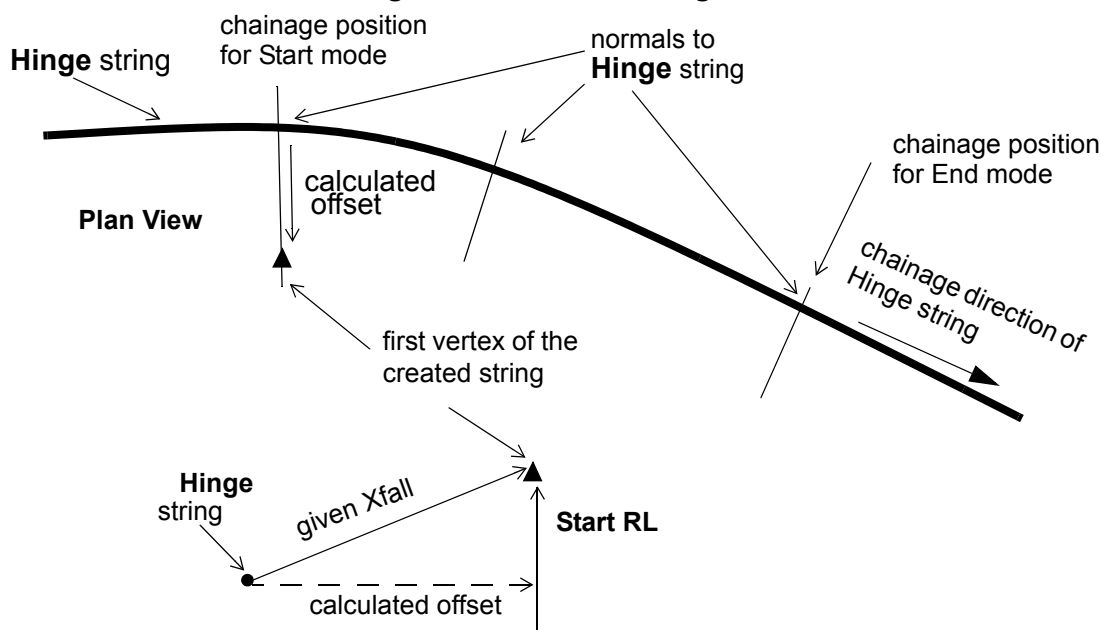
For information about the sign convention for offset and xfalls, go to [Sign Convention for Heights, Offsets and Xfalls in Create by Xfall and Grade](#).

Reference String NOT Selected

If a **Reference** string is **NOT** selected then the **Start mode** and **End Mode** refer to the **Hinge** string, and at the given chainage interval between the Start mode and the End mode, sections are taken **normal** (perpendicular) to the **Hinge string**. The vertices of the created string lie on these normals.

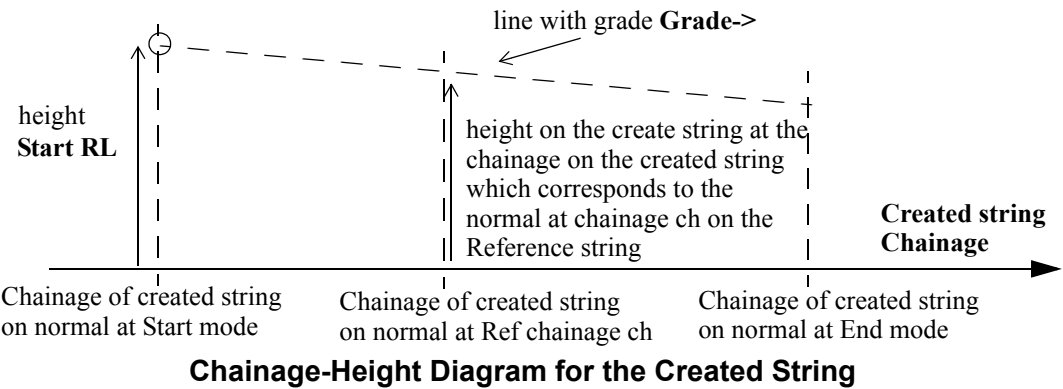
The **first vertex** of the created string is on the normal to the Hinge string and has a **height Start RL**. The offset for the first vertex is calculated and is such that the given **Xfall** from Hinge string will give the vertex the height **Start RL**.

First Vertex of Created String - No Reference String

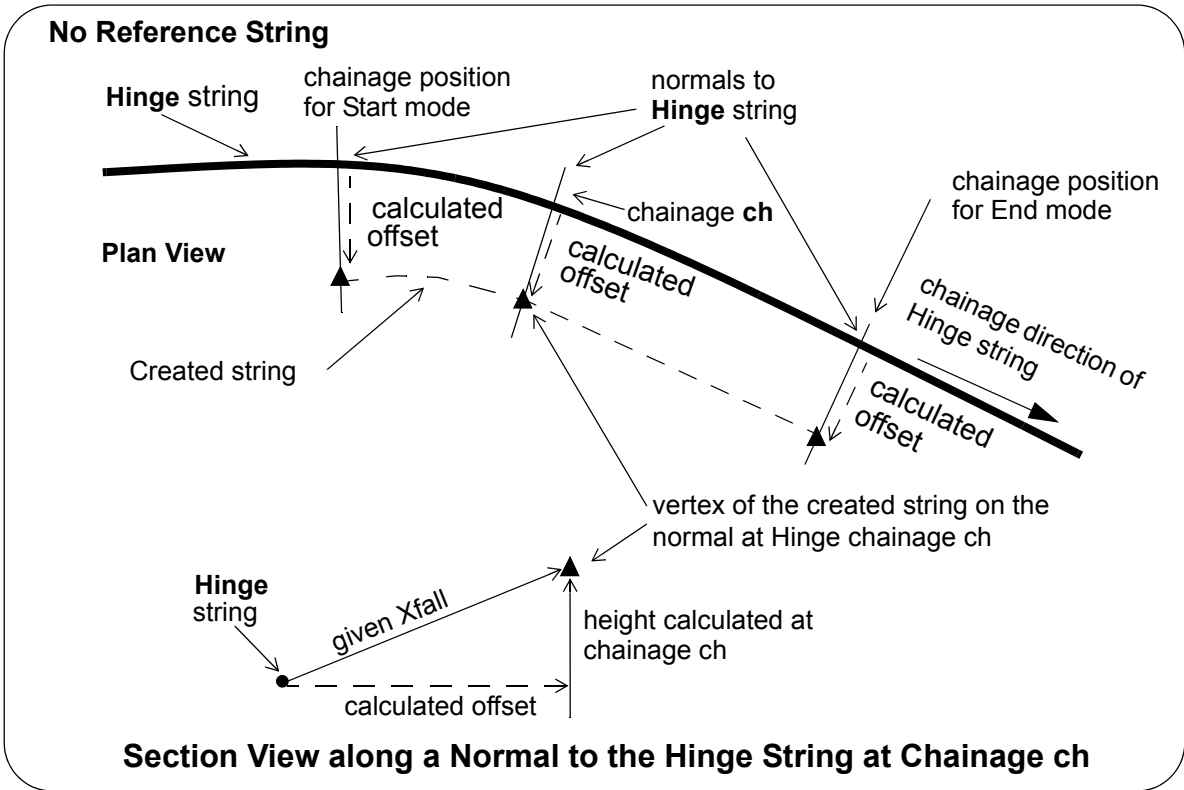


Section View along a Normal to the Hinge String at Chainage Start Mode

The **heights** of the subsequent vertices of the created string are defined in (created string chainage, height) space, and lie on the line with grade **Grade->** and going through the first vertex.



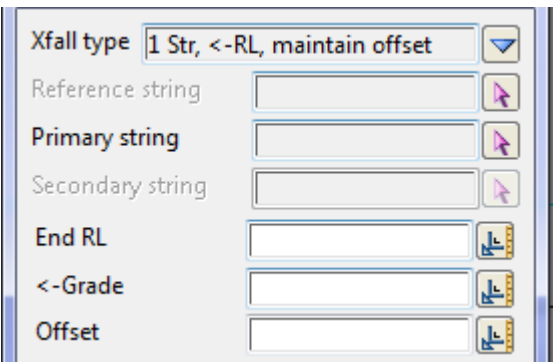
The offsets for the vertices are calculated and are such that the given **Xfall** from Hinge string will give the vertex the correct **height** for that chainage.



For information about the sign convention for offset and xfalls, go to [Sign Convention for Heights, Offsets and Xfalls in Create by Xfall and Grade](#).

Continue to the next choice [1 String, End RL and Grade, Fixed Offset](#) or return to [Xfall Types](#) or [String by Xfall and Grade](#).

1 String, End RL and Grade, Fixed Offset



This option requires a **Hinge** string, an **End RL** and backward **Grade**, an **Offset**, and an optional **Reference** string.

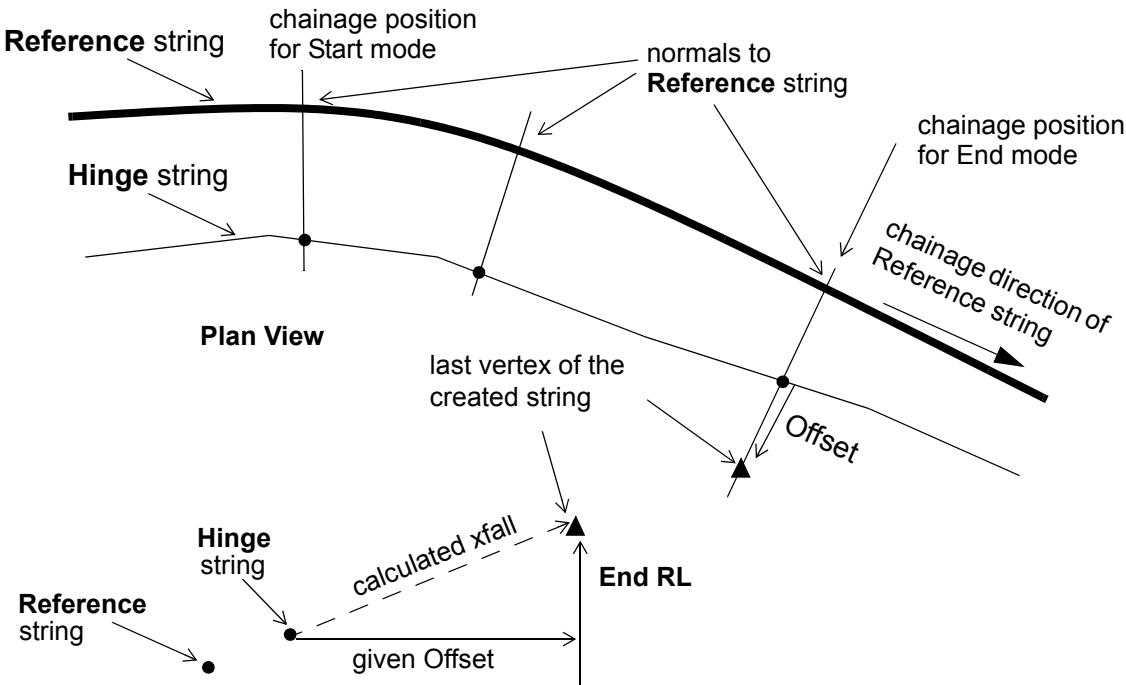
Reference String Selected

If a **Reference** string is selected then the **Start mode** and **End Mode** refer to the **Reference** string, and at the given chainage interval between the Start mode and the End mode, sections are taken **normal** (perpendicular) to the **Reference string** and cutting the **Hinge** string. The vertices of the created string lie on these normals.

The **plan position** of the created vertices are given by going out from the Hinge string along the normal section for the given **Offset**.

The **last vertex** of the created string is on the normal to the Reference string at chainage **End mode**, with an offset from the **Hinge** string of **Offset** and with a **height** of **End RL**.

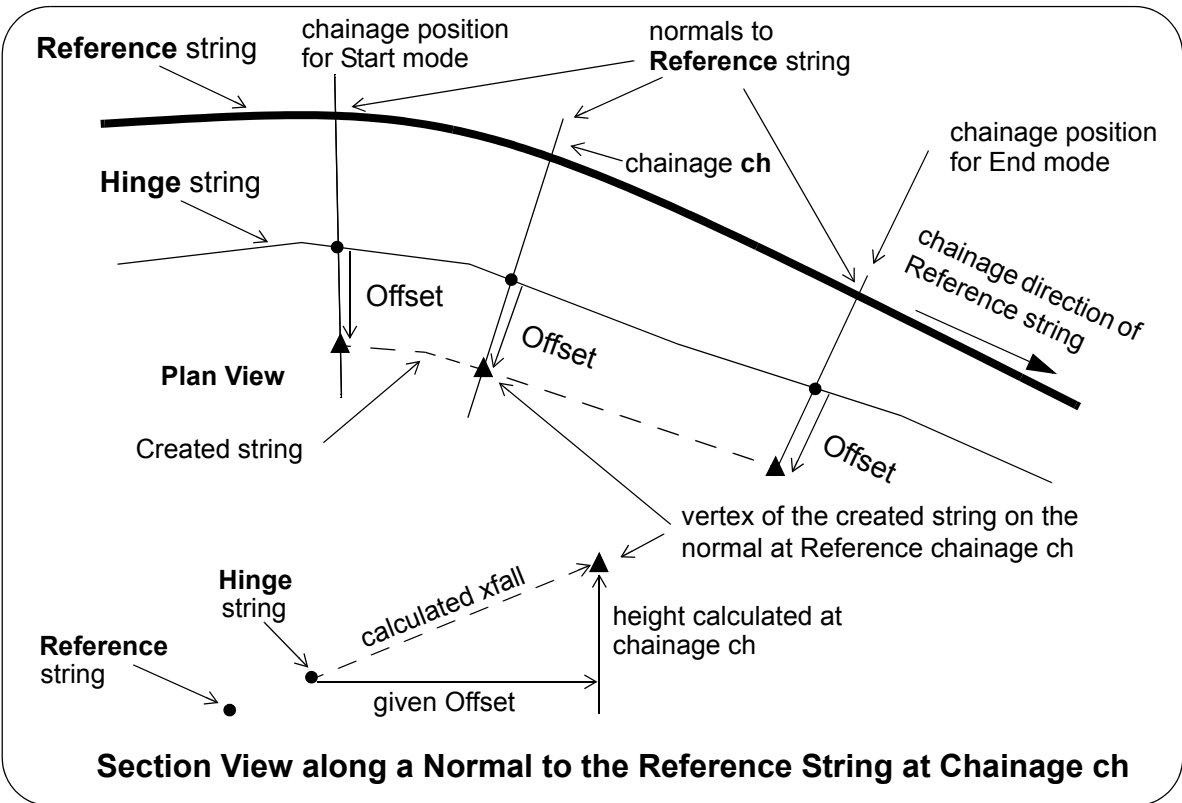
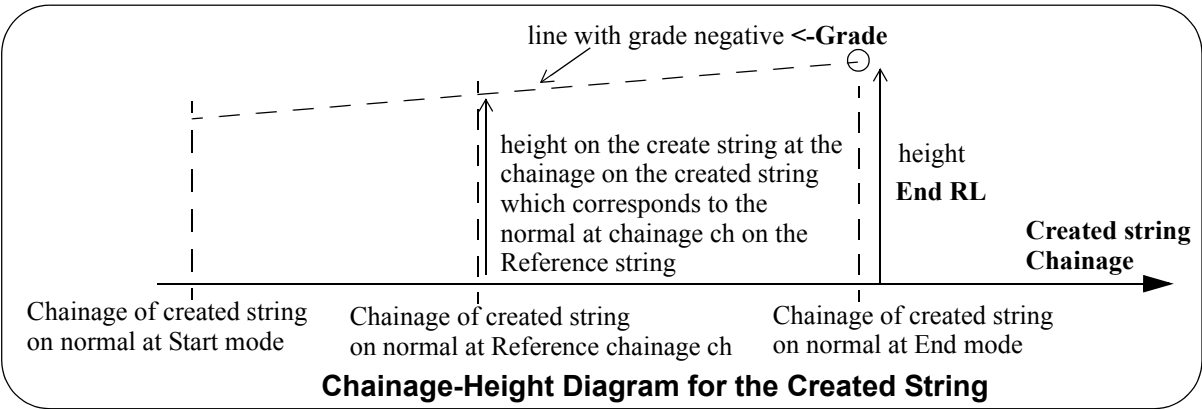
Last Vertex of Created String



Section View along a Normal to the Reference String at Chainage End Mode

The **heights** of the previous vertices of the created string are defined in (created string chainage,

height) space, and lie on the line with grade negative **<-Grade** and going through the last vertex.



For information about the sign convention for offset and xfalls, go to [Sign Convention for Heights, Offsets and Xfalls in Create by Xfall and Grade](#).

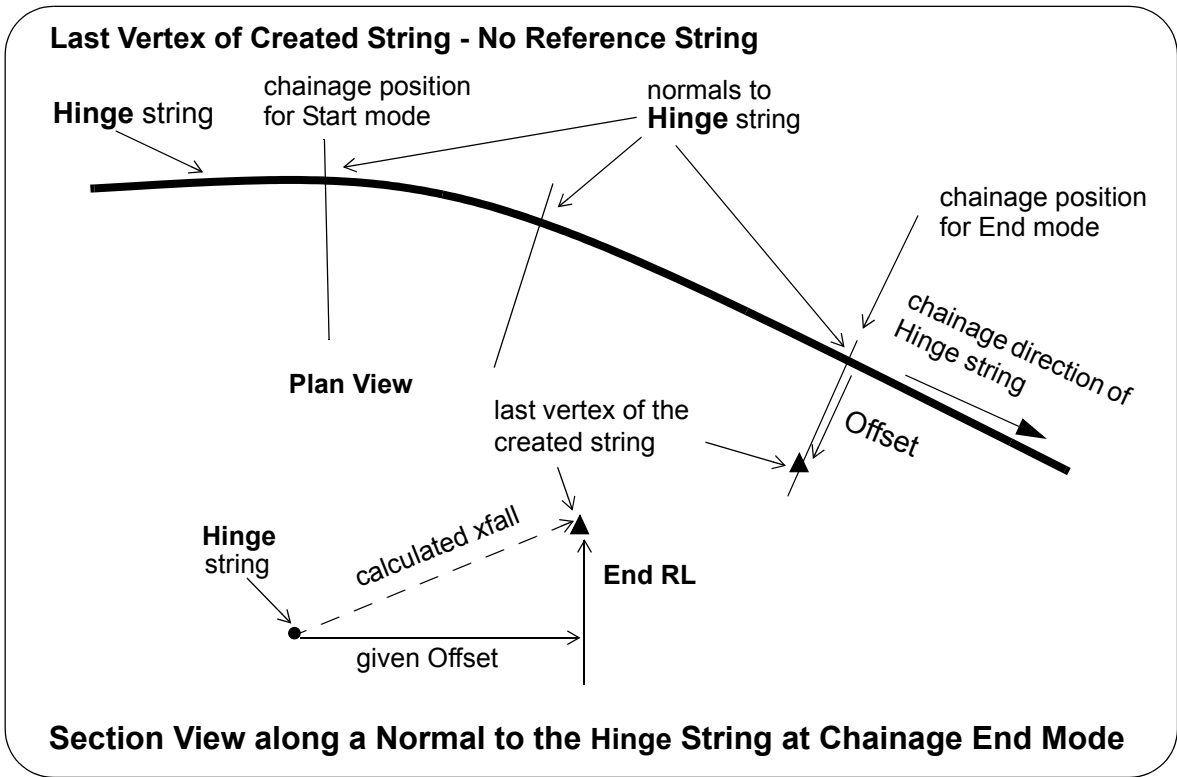
Reference String NOT Selected

If a **Reference** string is **NOT** selected then the **Start mode** and **End Mode** refer to the **Hinge** string, and at the given chainage interval between the Start mode and the End mode, sections are taken **normal** (perpendicular) to the **Hinge string**. The vertices of the created string lie on these normals.

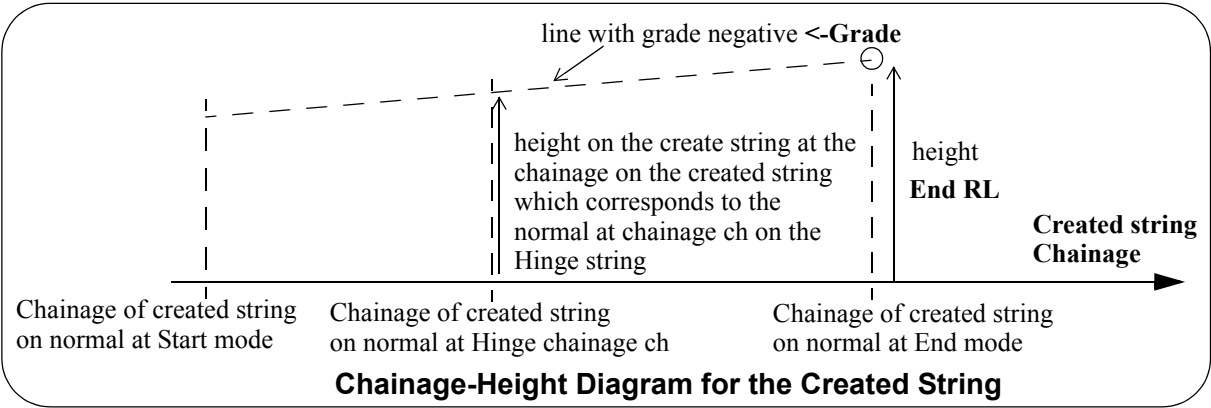
The **plan position** of the created vertices are given by going out from the Hinge string along the normal section for the given **Offset**.

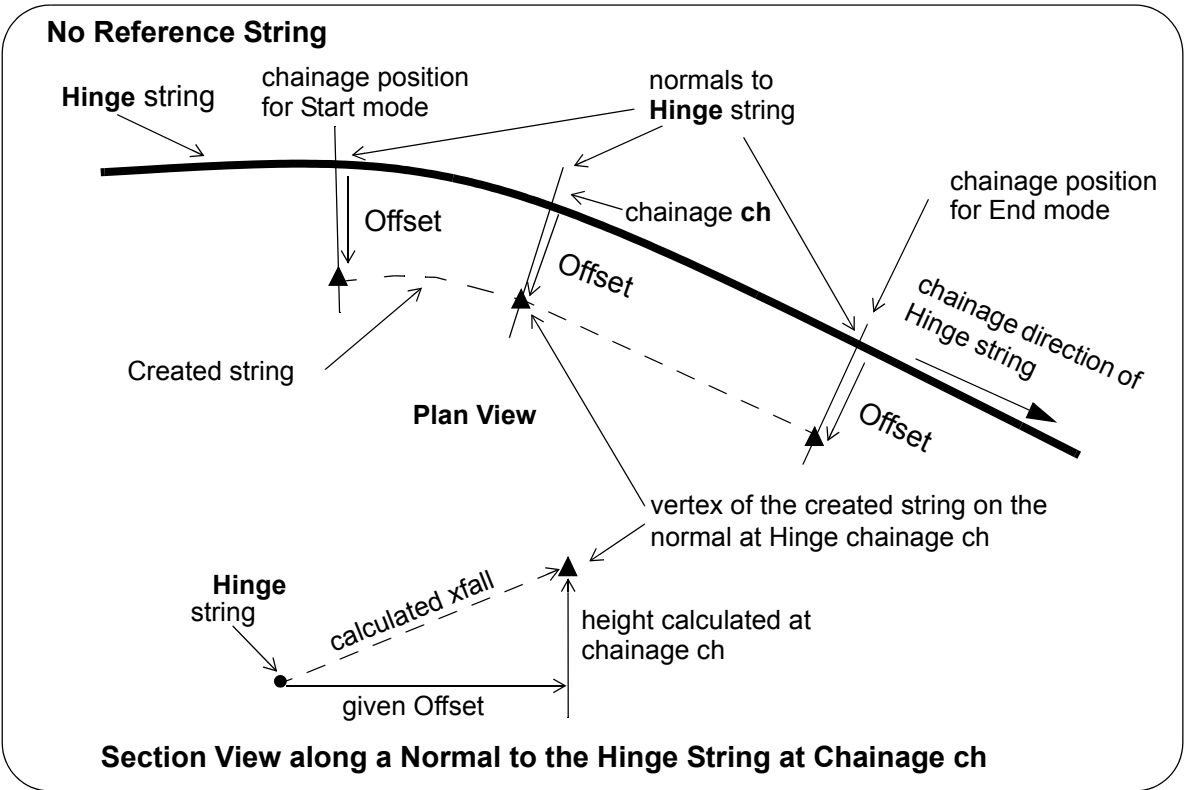
The **last vertex** of the created string is on the normal to the Hinge string at chainage **End mode**,

with an offset from the **Hinge** string of **Offset** and with a height of **End RL**.



The **heights** of the previous vertices of the created string are defined in (created string chainage, height) space, and lie on the line with grade negative **<-Grade** and going through the last vertex.

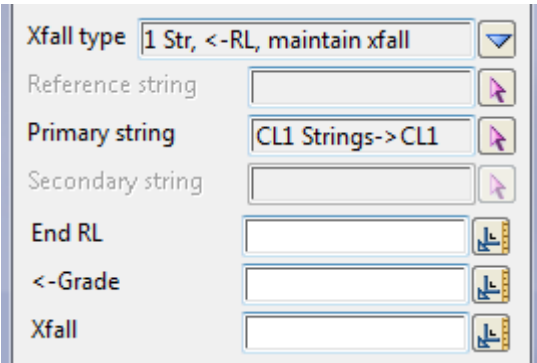




For information about the sign convention for offset and xfalls, go to [Sign Convention for Heights, Offsets and Xfalls in Create by Xfall and Grade](#).

Continue to the next choice [1 String, End RL and Grade, Fixed Xfall](#) or return to [Xfall Types](#) or [String by Xfall and Grade](#).

1 String, End RL and Grade, Fixed Xfall

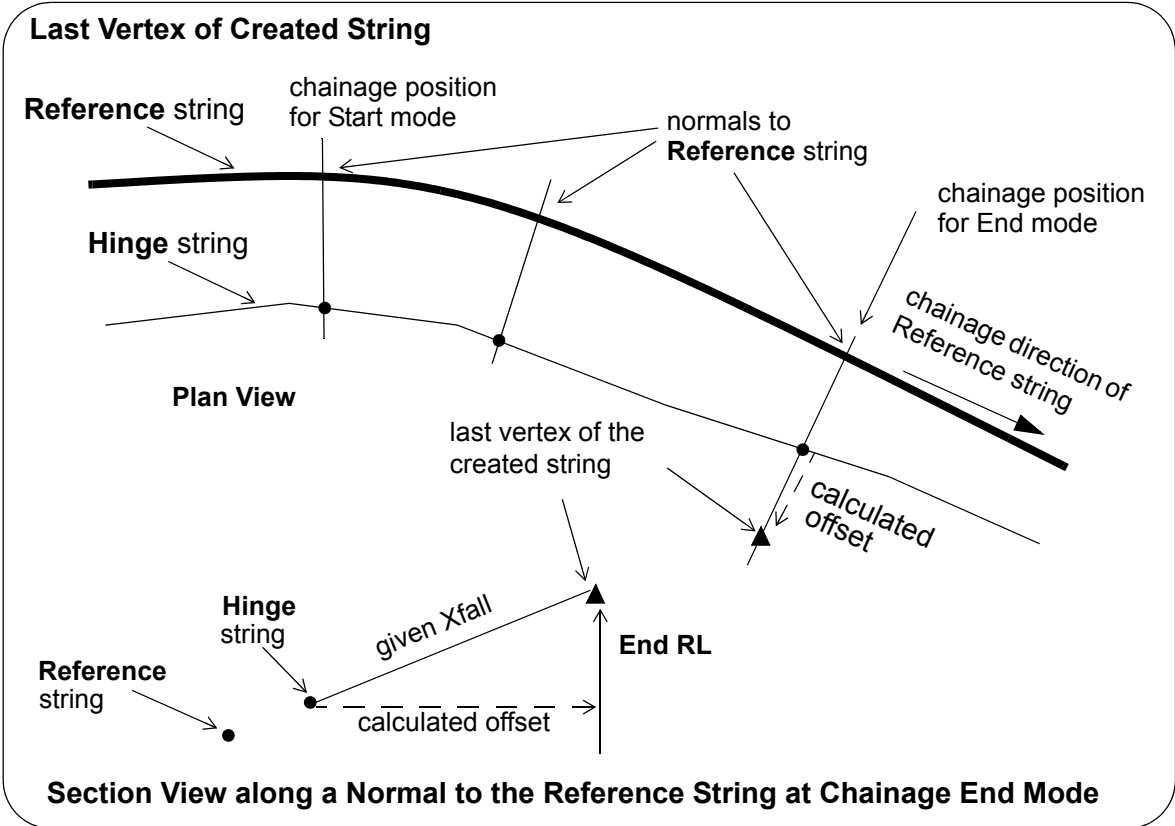


This option requires a **Hinge** string, an **End RL** and backward **Grade**, a **Xfall**, and an **optional Reference** string.

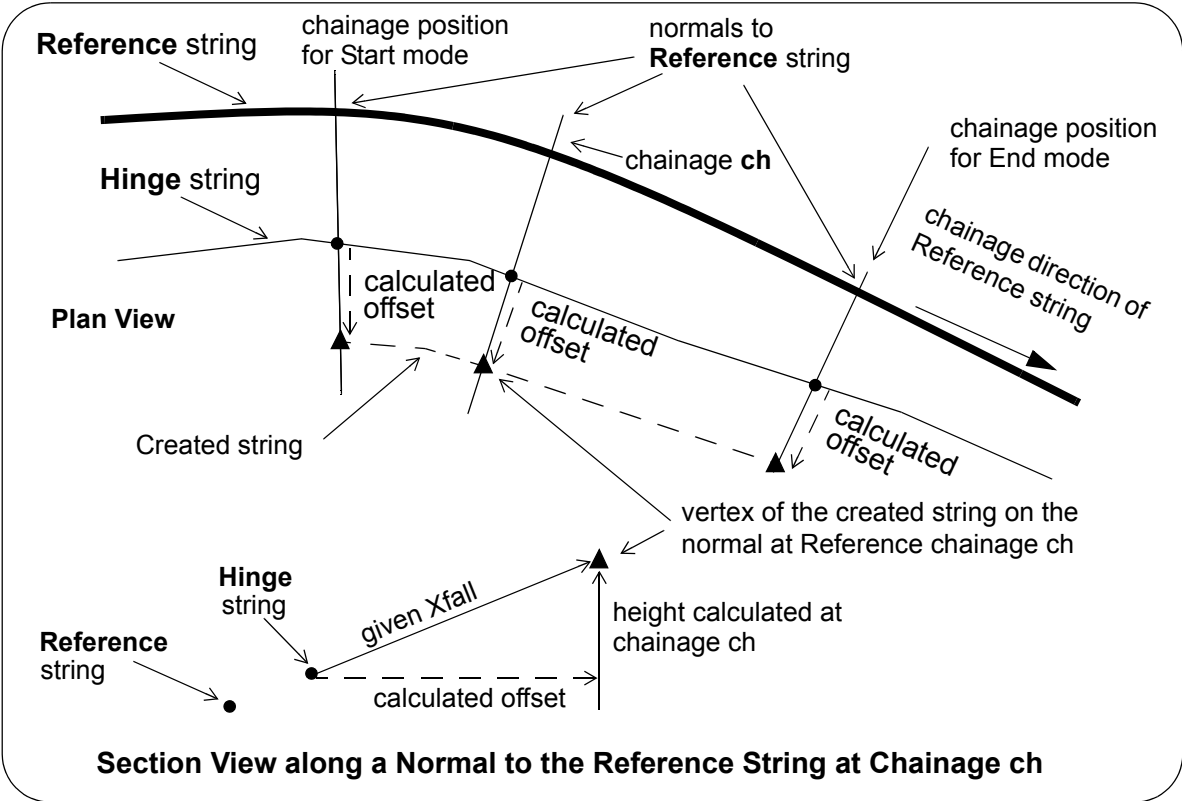
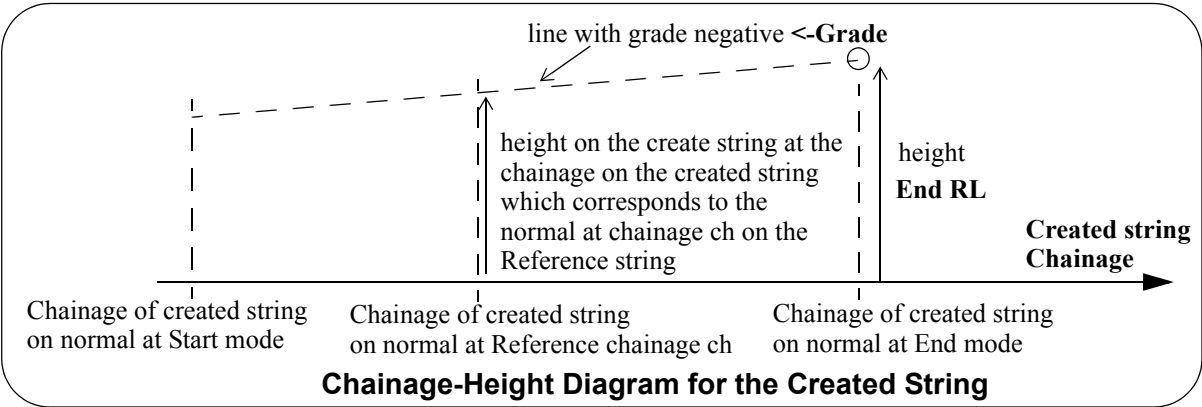
Reference String Selected

If a **Reference** string is selected then the **Start mode** and **End Mode** refer to the **Reference** string, and at the given chainage interval between the Start mode and the End mode, sections are taken **normal** (perpendicular) to the **Reference string** and cutting the **Hinge** string. The vertices of the created string lie on these normals.

The **last vertex** of the created string is on the normal to the Reference string and has a **height End RL**. The offset for the last vertex is calculated and is such that the given **Xfall** from Hinge string will give the vertex the height **End RL**.



The **heights** of the previous vertices of the created string are defined in (created string chainage, height) space, and lie on the line with grade negative **<-Grade** and going through the last vertex.



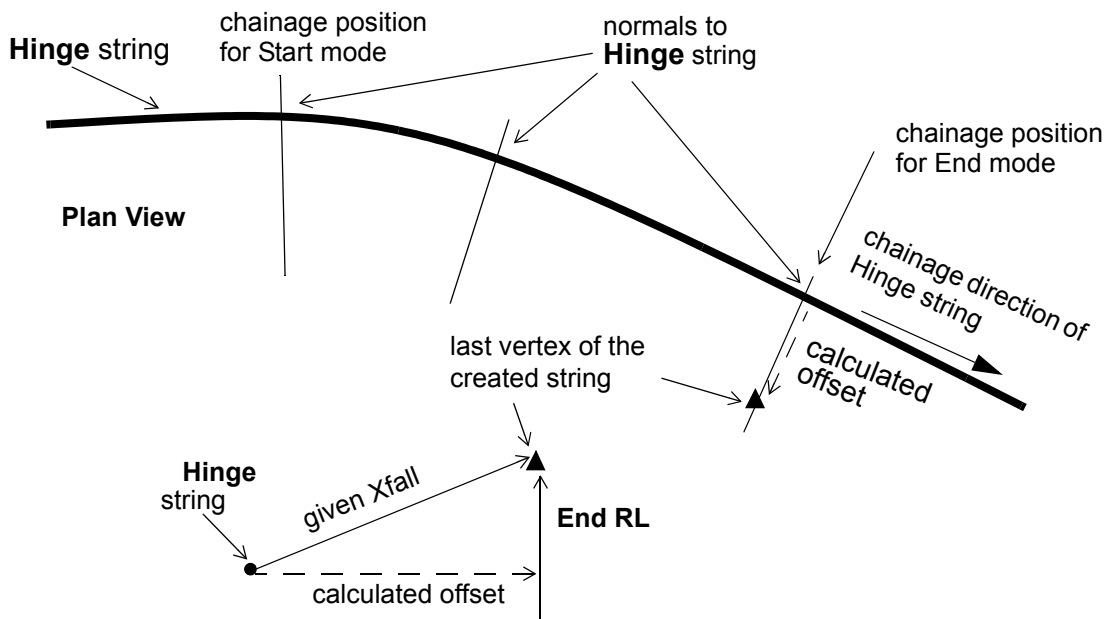
For information about the sign convention for offset and xfalls, go to [Sign Convention for Heights, Offsets and Xfalls in Create by Xfall and Grade](#).

Reference String NOT Selected

If a **Reference** string is **NOT** selected then the **Start mode** and **End Mode** refer to the **Hinge** string, and at the given chainage interval between the Start mode and the End mode, sections are taken **normal** (perpendicular) to the **Hinge string**. The vertices of the created string lie on these normals.

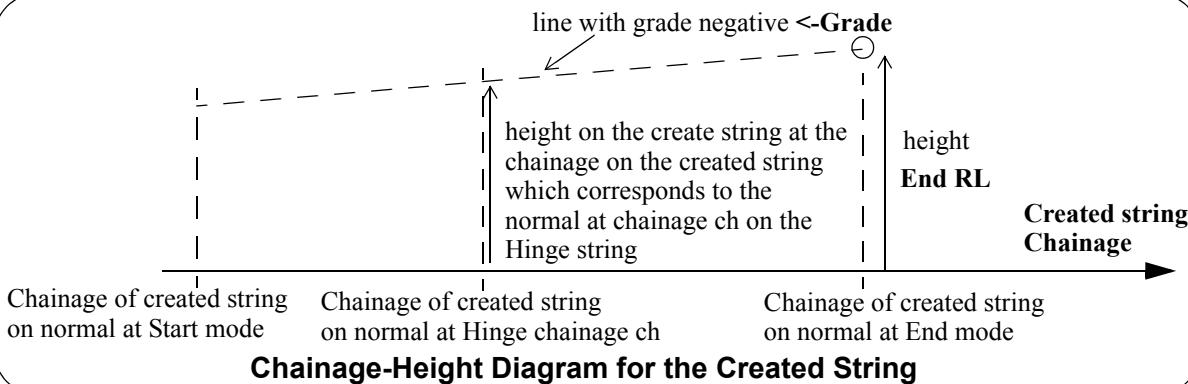
The **last vertex** of the created string is on the normal to the Hinge string and has a **height End RL**. The offset for the last vertex is calculated and is such that the given **Xfall** from Hinge string will give the vertex the height **End RL**.

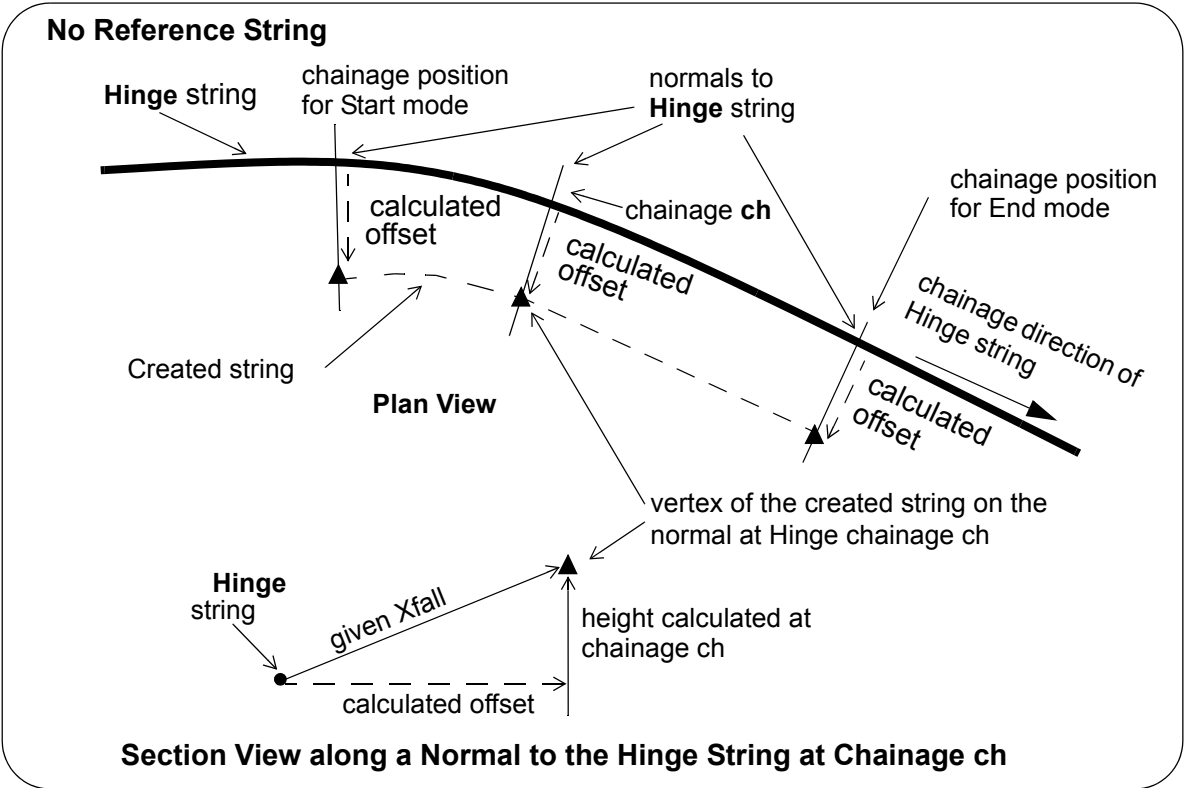
Last Vertex of Created String - No Reference String



Section View along a Normal to the Hinge String at Chainage End Mode

The **heights** of the previous vertices of the created string are defined in (created string chainage, height) space, and lie on the line with grade negative **<-Grade** and going through the last vertex.





For information about the sign convention for offset and xfalls, go to [Sign Convention for Heights, Offsets and Xfalls in Create by Xfall and Grade](#).

Continue to the next choice [2 Strings, Start RL & Grade, Equal Width, Normal to Reference or Hinge String](#) or return to [Xfall Types](#) or [String by Xfall and Grade](#).

2 Strings, Start RL & Grade, Equal Width, Normal to Reference or Hinge String

Xfall type 2 Str, RL->, =width, norm first

Reference string

Primary string

Secondary string

Start RL

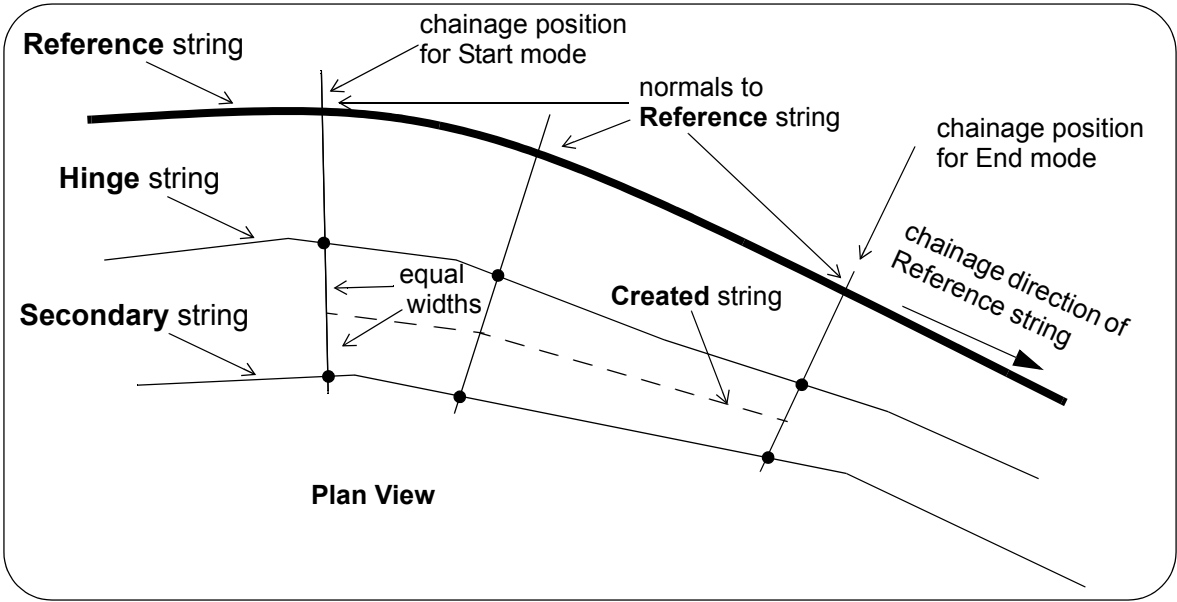
Grade->

This option requires a **Hinge** and a **Secondary** string, a **Start RL** and forward **Grade**, and an **optional Reference** string.

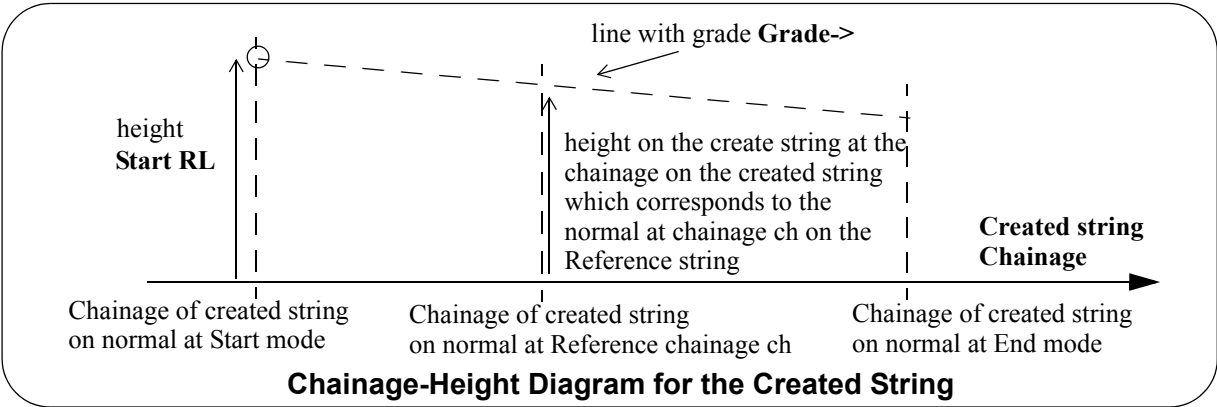
Reference String Selected

If a **Reference** string is selected then the **Start mode** and **End Mode** refer to the **Reference** string, and at the given chainage interval between the Start mode and the End mode, sections are taken **normal** (perpendicular) to the **Reference** string and cutting the **Hinge** and the **Secondary** strings. The vertices of the created string lie on these normals.

On this section, the plan position of the vertex of the new string is created so that it is halfway between the Hinge string and the Secondary string.



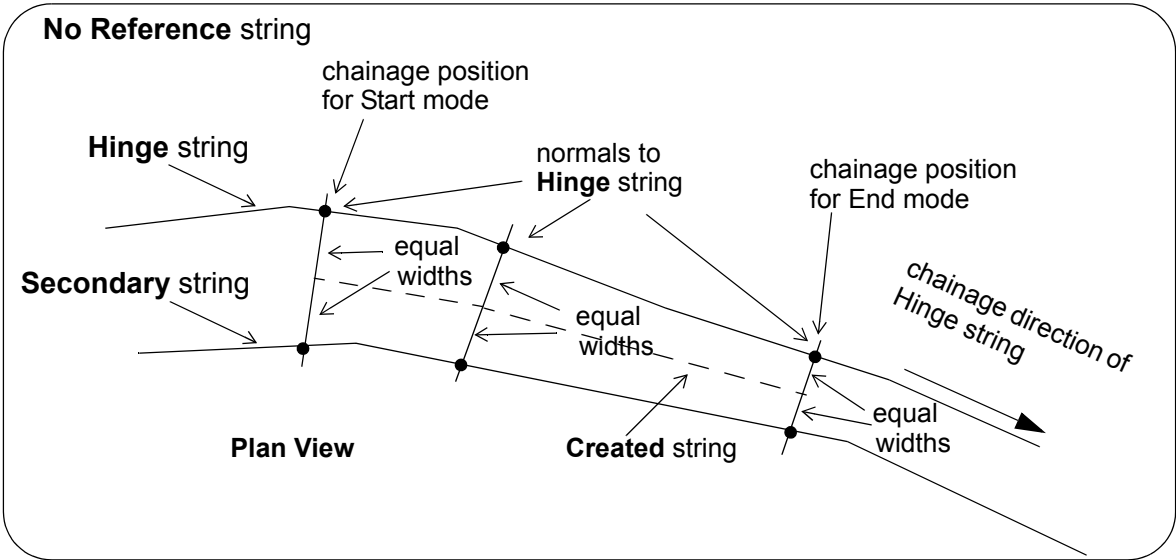
The **height** of the vertex on the section at chainage *ch*, is defined in (created string chainage, height) space, and is on the line with grade **Grade->** and going through the point (normal to Start mode, Start RL).



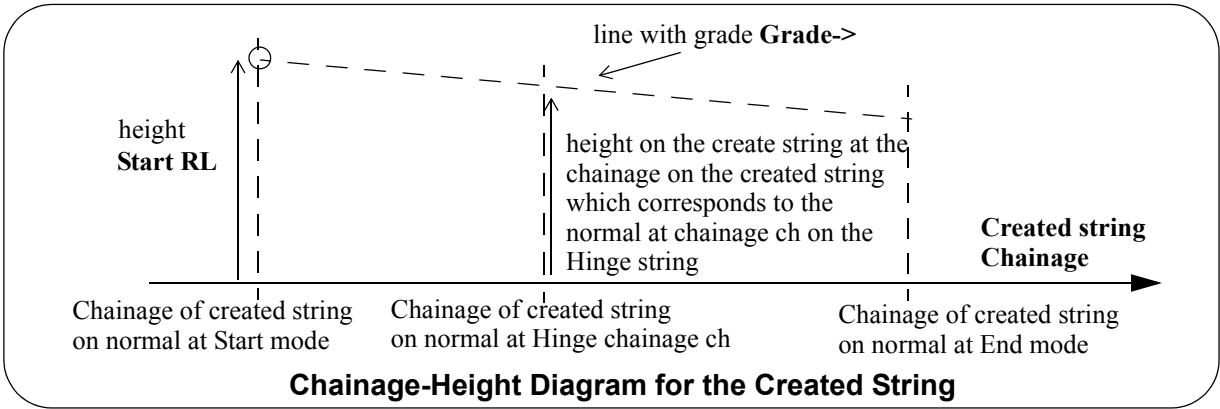
Reference String NOT Selected

If a **Reference** string is **NOT** selected then the **Start mode** and **End Mode** refer to the **Hinge** string, and at the given chainage interval between the Start mode and the End mode, sections are taken **normal** (perpendicular) to the **Hinge string**. The vertices of the created string lie on these normals.

On this section, the plan position of the vertex of the new string is created so that it is halfway between the Hinge string and the Secondary string.

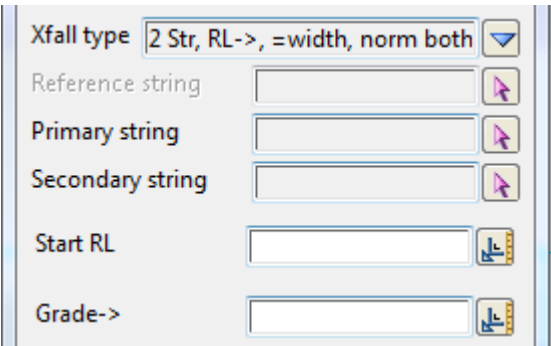


The **height** of the vertex on the section at chainage ch, is defined in (created string chainage, height) space, and is on the line with grade **Grade**-> and going through the point (normal to Start mode, Start RL).



Continue to the next choice [2 Strings, Start RL & Grade, Equal Width and Normal to Both](#) or return to [Xfall Types](#) or [String by Xfall and Grade](#).

2 Strings, Start RL & Grade, Equal Width and Normal to Both



This option requires a **Hinge** and a **Secondary** string, a **Start RL** and forward **Grade**, and an optional **Reference** string.

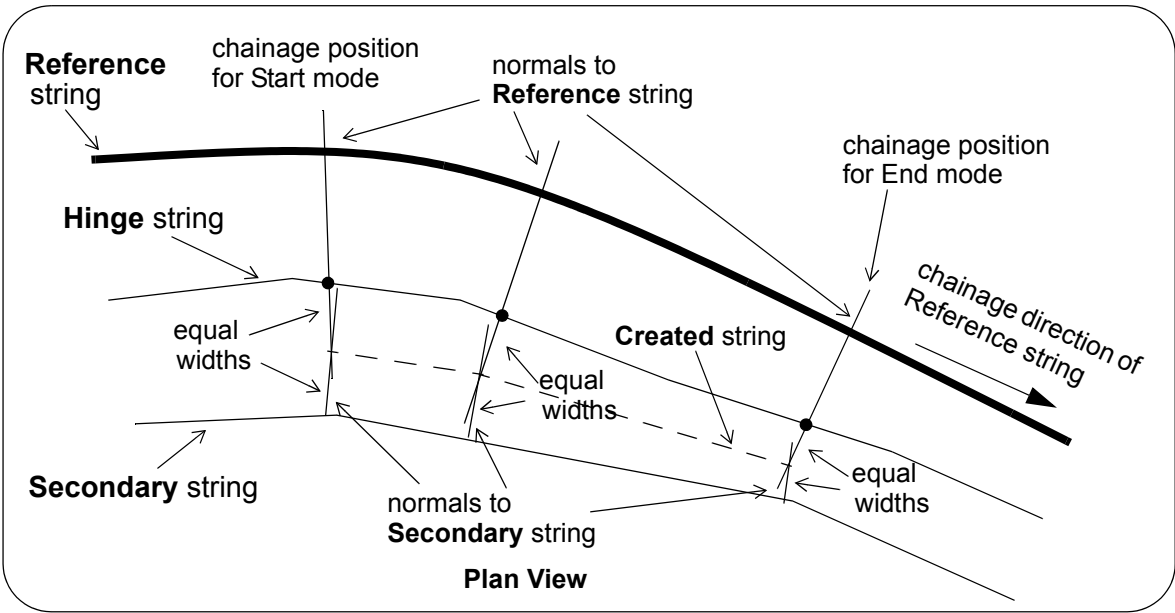
Reference String Selected

If a **Reference** string is selected then the **Start mode** and **End Mode** refer to the **Reference** string, and at the given chainage interval between the Start mode and the End mode, sections are taken **normal** (perpendicular) to the **Reference string** and cutting the **Hinge** string. The vertices of the created string lie on these normals.

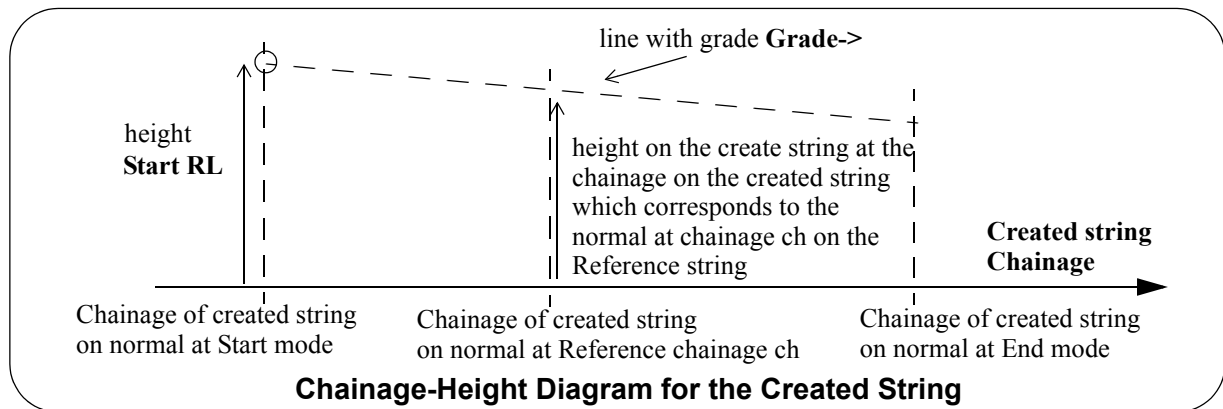
On this section, the plan position of the vertex of the new string is created so that it is halfway between the Hinge string and a normal to the Secondary string.

That is, a normal to the **Secondary** string is created that intersects in plan with the section from the Reference string so that the distance from the Hinge string is the same as the distance from the Secondary string. This gives the plan position of the new vertex of the new string.

Note - it may not be possible to find such an intersection point.



The **height** of the vertex on the section at chainage *ch*, is defined in (created string chainage, height) space, and is on the line with grade **Grade->** and going through the point (normal to Start mode, Start RL).



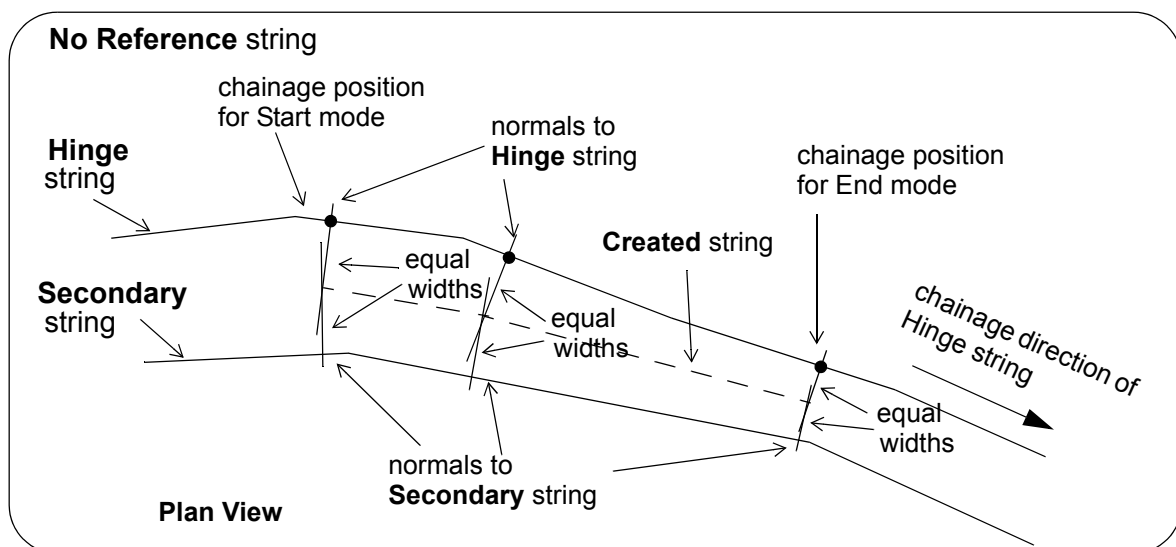
Reference String NOT Selected

If a **Reference** string is **NOT** selected then the **Start mode** and **End Mode** refer to the **Hinge** string, and at the given chainage interval between the Start mode and the End mode, sections are taken **normal** (perpendicular) to the **Hinge** string. The vertices of the created string lie on these normals.

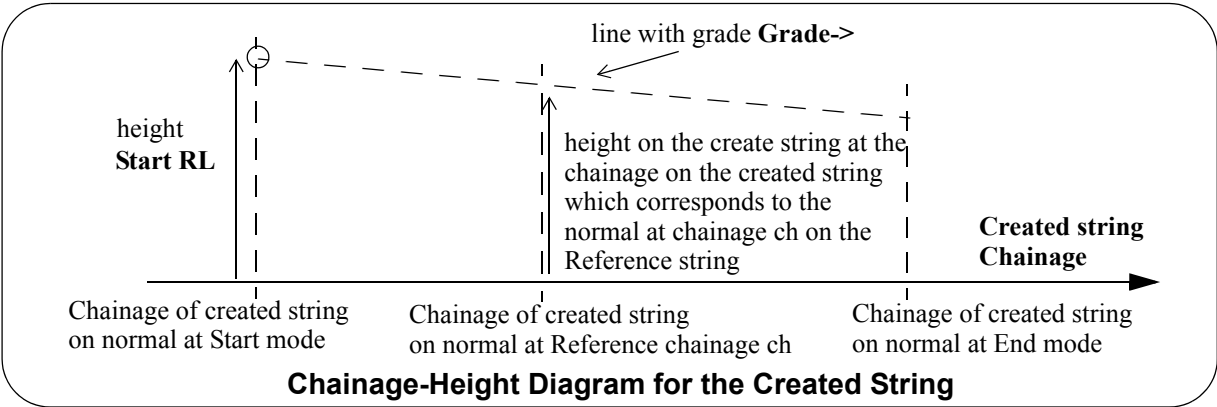
On this section, the plan position of the vertex of the new string is created so that it is halfway between the Hinge string and a **normal** to the **Secondary** string.

That is, a normal to the **Secondary** string is created that intersects in plan with the section from the Hinge string so that the distance from the Hinge string is the same as the distance from the **Secondary** string. This gives the plan position of the new vertex of the new string.

Note - it may not be possible to find such an intersection point.

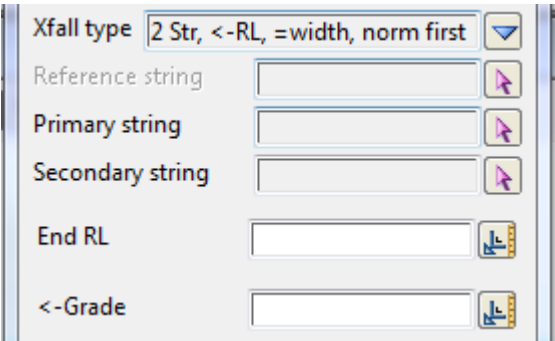


The **height** of the vertex on the section at chainage ch , is defined in (created string chainage, height) space, and is on the line with grade **Grade->** and going through the point (normal to Start mode, Start RL).



Continue to the next choice [2 Strings, End RL & Grade, Equal Width, Normal to Reference or Hinge String](#) or return to [Xfall Types](#) or [String by Xfall and Grade](#).

2 Strings, End RL & Grade, Equal Width, Normal to Reference or Hinge String

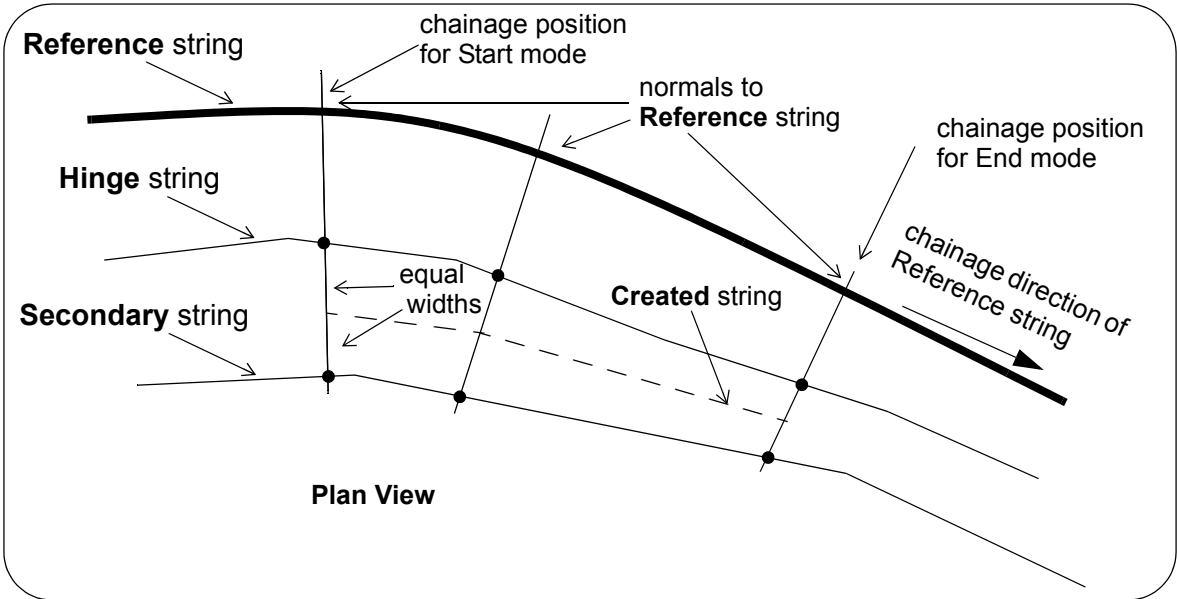


This option requires a **Hinge** and a **Secondary** string, a **End RL** and backward **Grade**, and an **optional Reference** string.

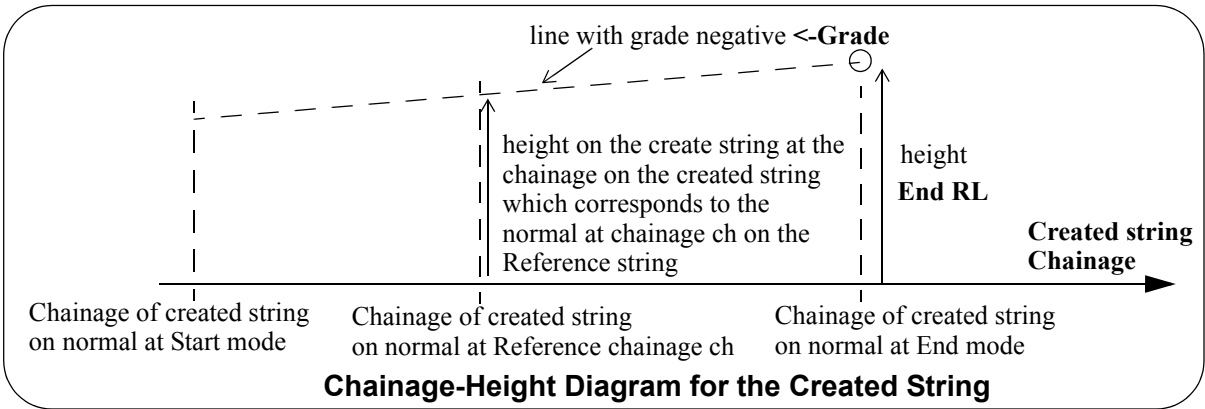
Reference String Selected

If a **Reference** string is selected then the **Start mode** and **End Mode** refer to the **Reference** string, and at the given chainage interval between the Start mode and the End mode, sections are taken **normal** (perpendicular) to the **Reference** string and cutting the **Hinge** and the **Secondary** strings. The vertices of the created string lie on these normals.

On this section, the plan position of the vertex of the new string is created so that it is halfway between the Hinge string and the Secondary string.



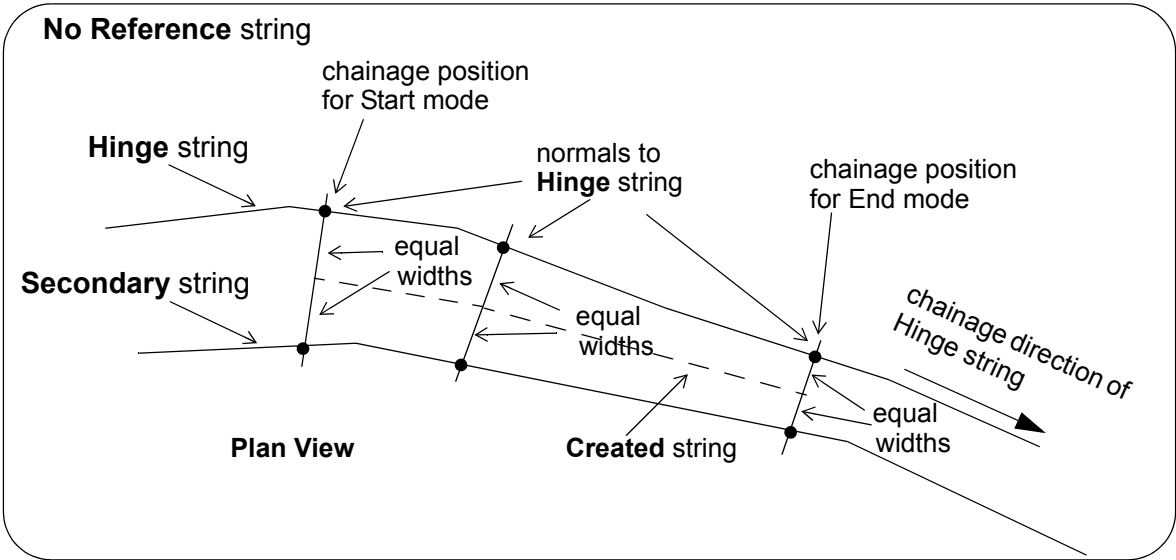
The **height** of the vertex on the section at chainage *ch*, is defined in (created string chainage, height) space, and is on the line with grade negative **<-Grade** and going through the point (normal to End mode, End RL).



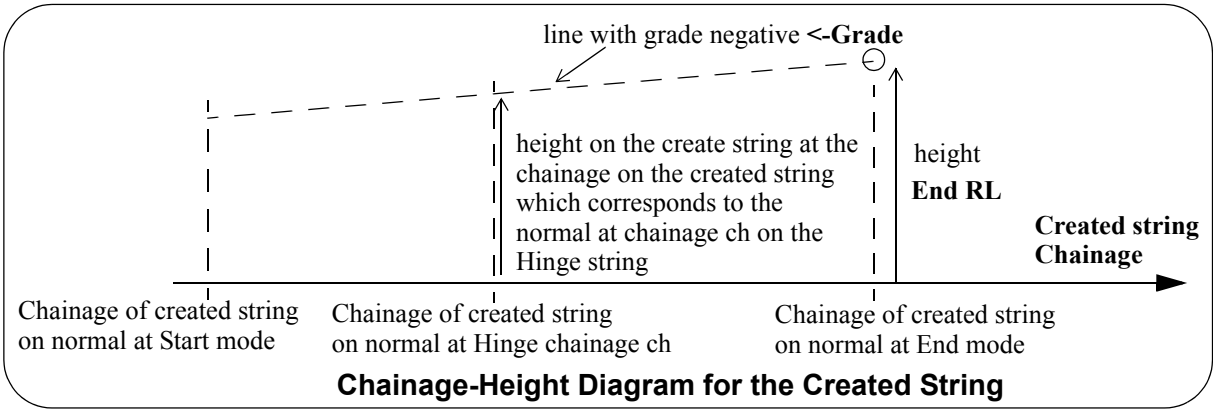
Reference String NOT Selected

If a **Reference** string is **NOT** selected then the **Start mode** and **End Mode** refer to the **Hinge** string, and at the given chainage interval between the Start mode and the End mode, sections are taken **normal** (perpendicular) to the **Hinge string** and cutting the **Secondary string**. The vertices of the created string lie on these normals.

On this section, the plan position of the vertex of the new string is created so that it is halfway between the Hinge string and the Secondary string.

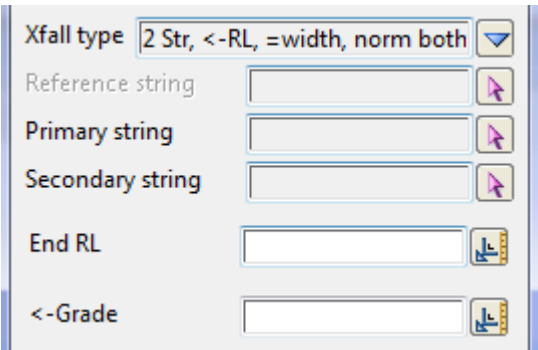


The **height** of the vertex on the section at chainage ch, is defined in (created string chainage, height) space, and is on the line with grade negative <-Grade and going through the point (normal to End mode, End RL).



Continue to the next choice [2 Strings, End RL & Grade, Equal Width and Normal to Both](#) or return to [Xfall Types](#) or [String by Xfall and Grade](#).

2 Strings, End RL & Grade, Equal Width and Normal to Both



This option requires a **Hinge** and a **Secondary** string, an **End RL** and backward **Grade**, and an optional **Reference** string.

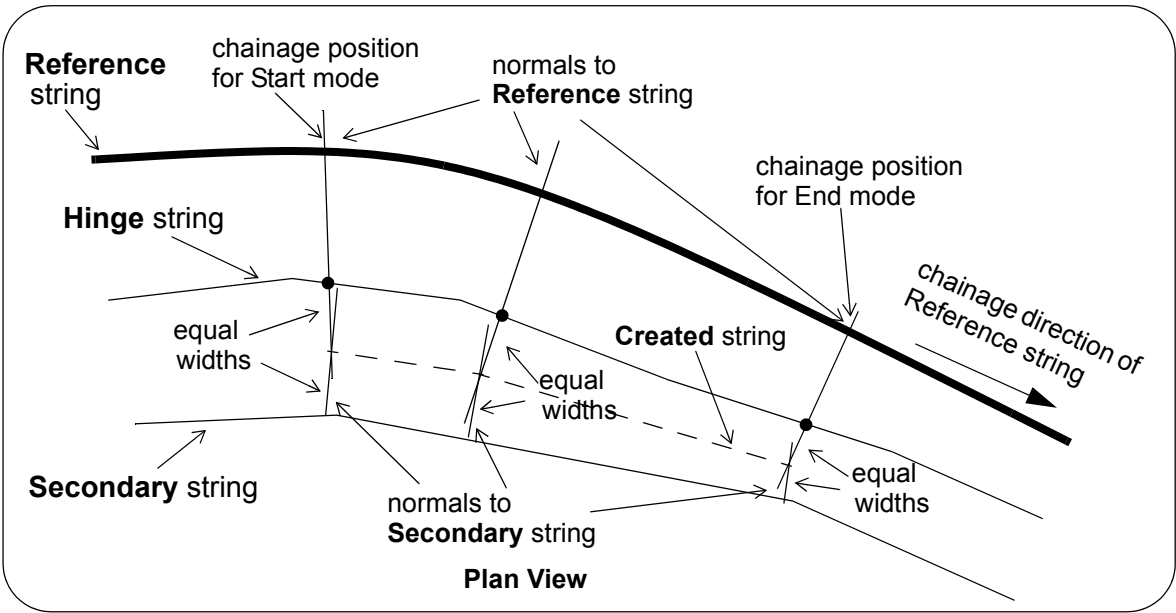
Reference String Selected

If a **Reference** string is selected then the **Start mode** and **End Mode** refer to the **Reference** string, and at the given chainage interval between the Start mode and the End mode, sections are taken **normal** (perpendicular) to the **Reference** string and cutting the **Hinge** string. The vertices of the created string lie on these normals.

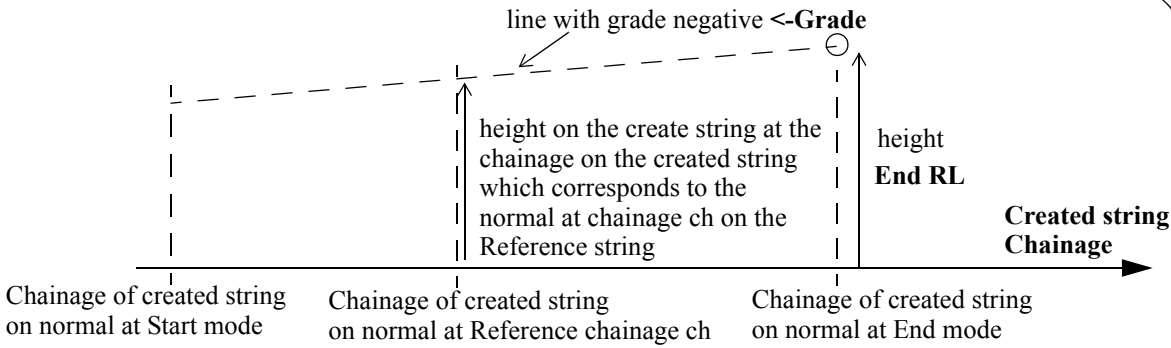
On this section, the plan position of the vertex of the new string is created so that it is halfway between the Hinge string and a normal to the Secondary string.

That is, a normal to the **Secondary** string is created that intersects in plan with the section from the Reference string so that the distance from the Hinge string is the same as the distance from the Secondary string. This gives the plan position of the new vertex of the new string.

Note - it may not be possible to find such an intersection point.



The **height** of the vertex on the section at chainage *ch*, is defined in (created string chainage, height) space, and is on the line with grade negative **<-Grade** and going through the point (normal to End mode, End RL).



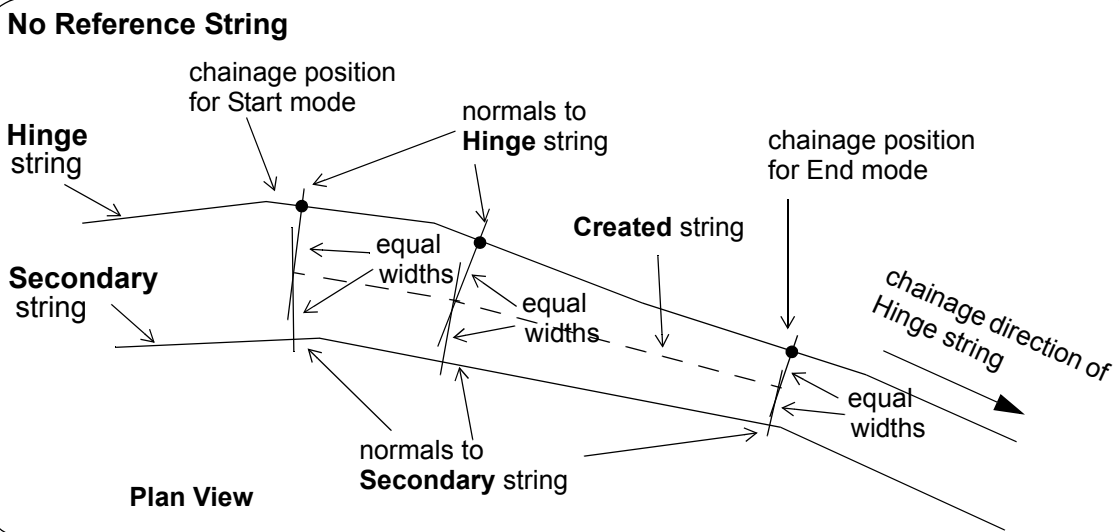
Reference String NOT Selected

If a **Reference** string is **NOT** selected then the **Start mode** and **End Mode** refer to the **Hinge** string, and at the given chainage interval between the Start mode and the End mode, sections are taken **normal** (perpendicular) to the **Hinge** string. The vertices of the created string lie on these normals.

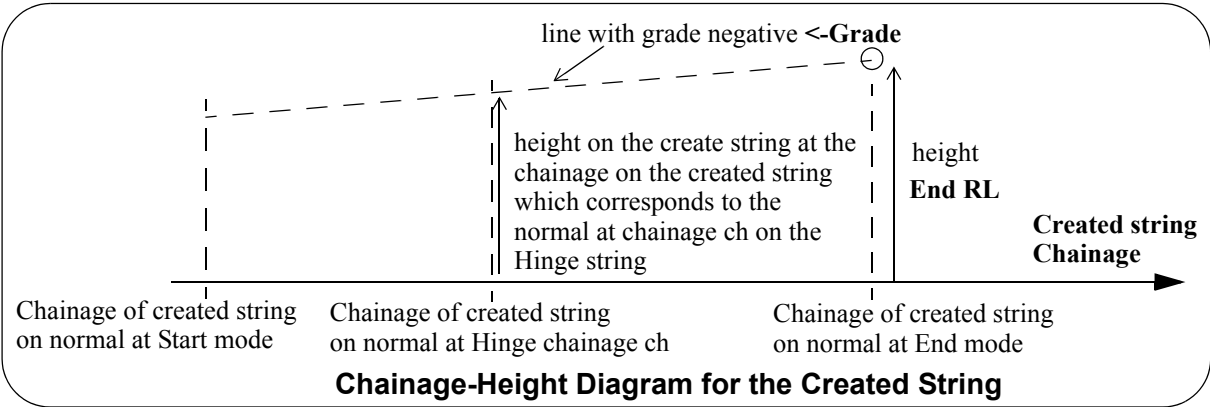
On this section, the plan position of the vertex of the new string is created so that it is halfway between the Hinge string and a **normal** to the Secondary string.

That is, a normal to the **Secondary** string is created that intersects in plan with the section from the Hinge string so that the distance from the Hinge string is the same as the distance from the Secondary string. This gives the plan position of the new vertex of the new string.

Note - it may not be possible to find such an intersection point.

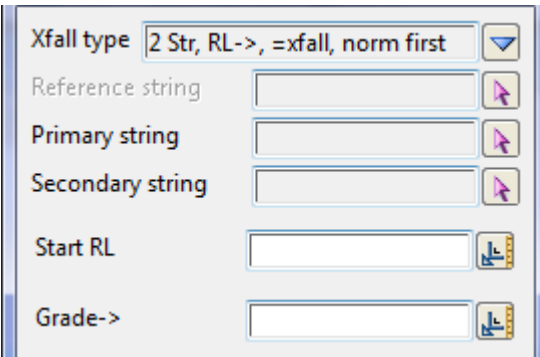


The **height** of the vertex on the section at chainage ch, is defined in (created string chainage, height) space, and is on the line with grade negative **<-Grade** and going through the point (normal to End mode, End RL).



Continue to the next choice [2 Strings, Start RL & Grade, Equal Xfall, Normal to Reference or Hinge String](#) or return to [Xfall Types](#) or [String by Xfall and Grade](#).

2 Strings, Start RL & Grade, Equal Xfall, Normal to Reference or Hinge String

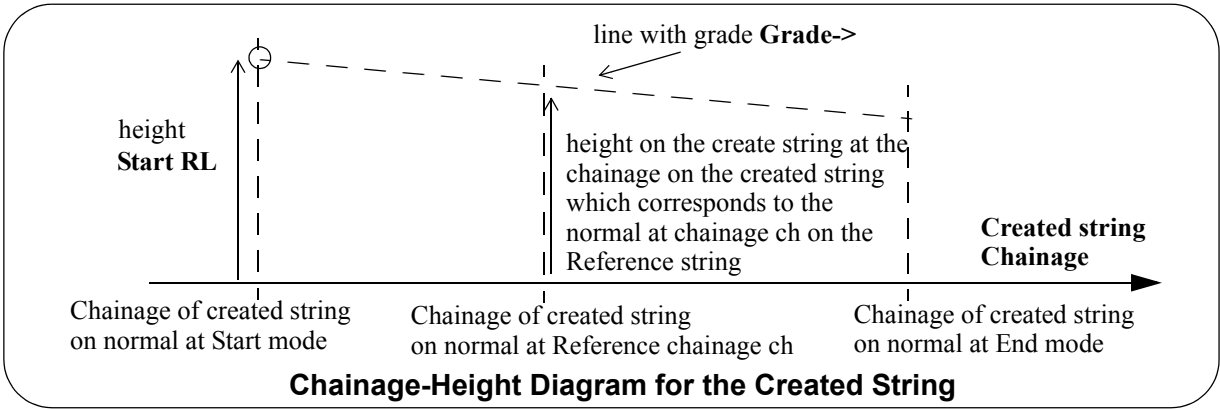


This option requires a **Hinge** and a **Secondary** string, a **Start RL** and forward **Grade**, and an **optional Reference** string.

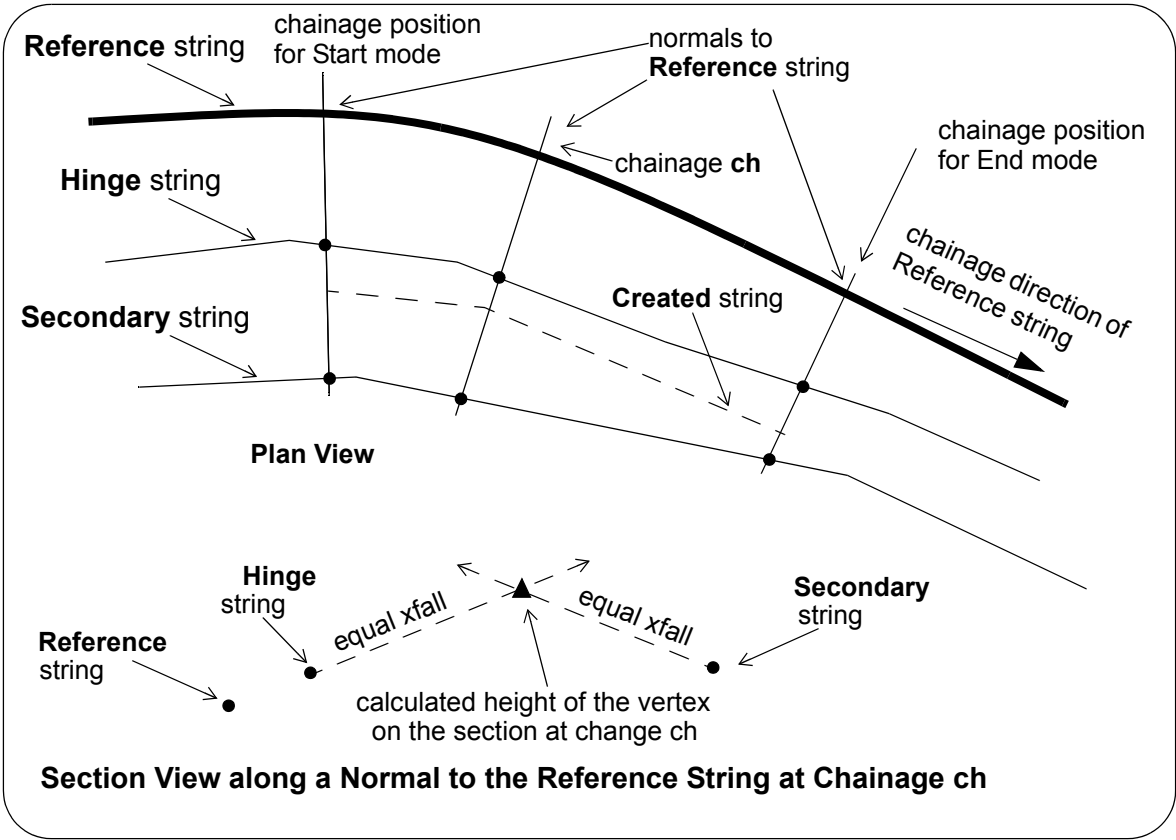
Reference String Selected

If a **Reference** string is selected then the **Start mode** and **End Mode** refer to the **Reference** string, and at the given chainage interval between the Start mode and the End mode, sections are taken **normal** (perpendicular) to the **Reference string** and cutting the **Hinge** and the **Secondary** strings. The vertices of the created string lie on these normals.

The height of the vertex of the created string on the section at chainage ch, is defined in (created string chainage, height) space, and is on the line with grade **Grade->** and going through the point (normal at Start mode, Start RL).



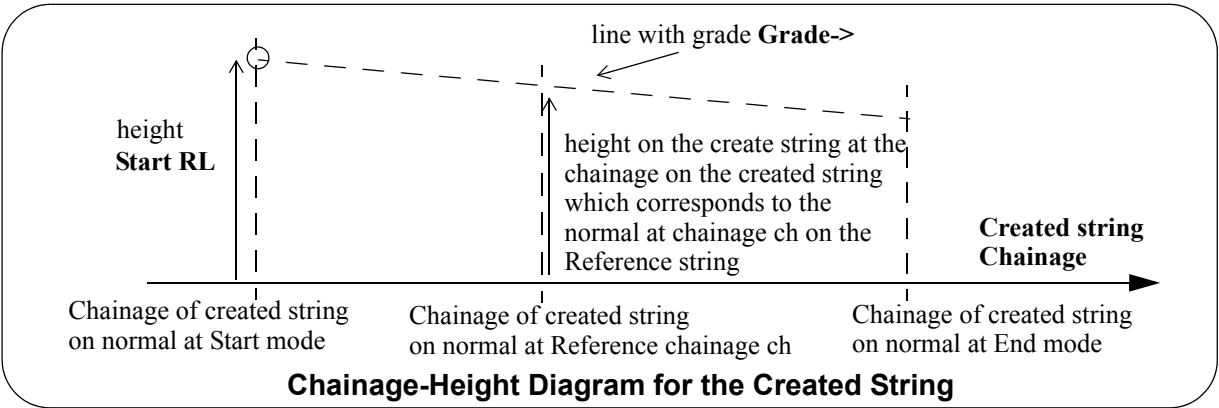
On the section normal to the Reference string at chainage ch, the plan position of the vertex (with the calculated height) is such that the absolute value of the xfall from the Hinge string to the vertex, and the vertex to the Secondary string, is the same. This gives the plan position of the new vertex of the new string.



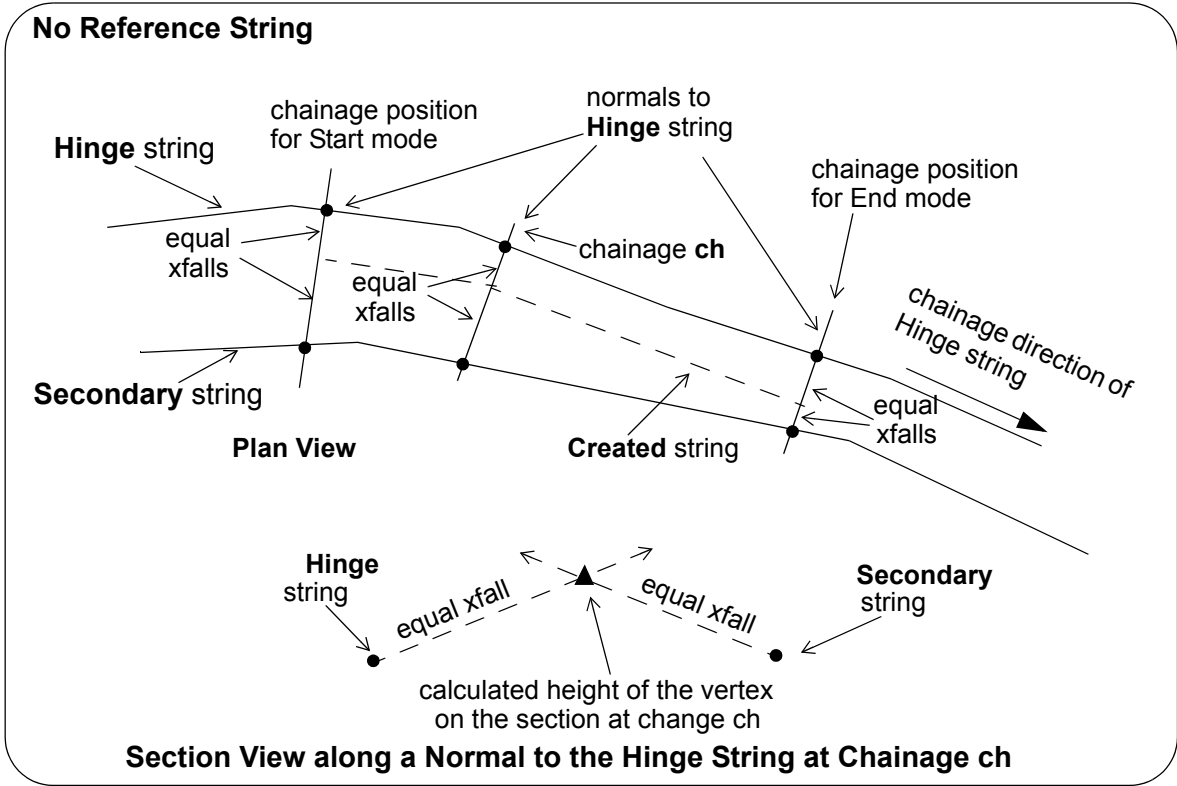
Reference String NOT Selected

If a **Reference** string is **NOT** selected then the **Start mode** and **End Mode** refer to the **Hinge** string, and at the given chainage interval between the Start mode and the End mode, sections are taken **normal** (perpendicular) to the **Hinge string** and cutting the **Secondary string**. The vertices of the created string lie on these normals.

The height of the vertex of the created string on the section at chainage ch, is defined in (created string chainage, height) space, and is on the line with grade **Grade->** and going through the point (normal at Start mode, Start RL).

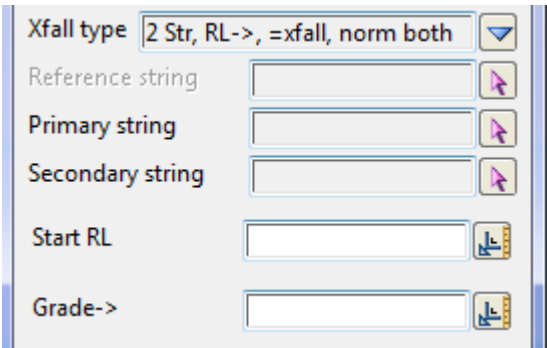


On the section normal to the Hinge string at chainage ch, the plan position of the vertex (with the calculated height) is such that the absolute value of the xfall from the Hinge string to the vertex, and the vertex to the Secondary string, is the same. This gives the plan position of the new vertex of the new string.



Continue to the next choice [2 Strings, Start RL & Grade, Equal Xfall and Normal to Both](#) or return to [Xfall Types](#) or [String by Xfall and Grade](#).

2 Strings, Start RL & Grade, Equal Xfall and Normal to Both

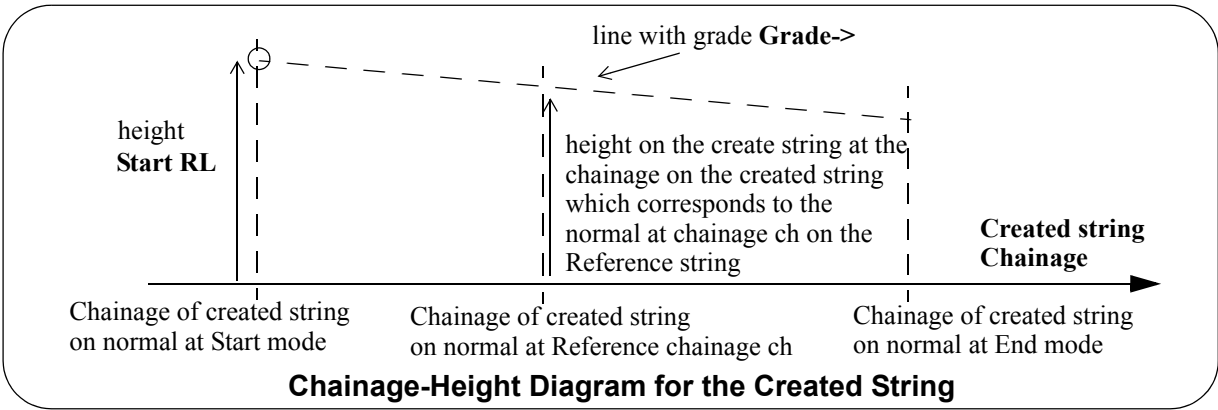


This option requires a **Hinge** and a **Secondary** string, a **Start RL** and forward **Grade**, and an optional **Reference** string.

Reference String Selected

If a **Reference** string is selected then the **Start mode** and **End Mode** refer to the **Reference** string, and at the given chainage interval between the Start mode and the End mode, sections are taken **normal** (perpendicular) to the **Reference string** and cutting the **Hinge** string. The vertices of the created string lie on these normals.

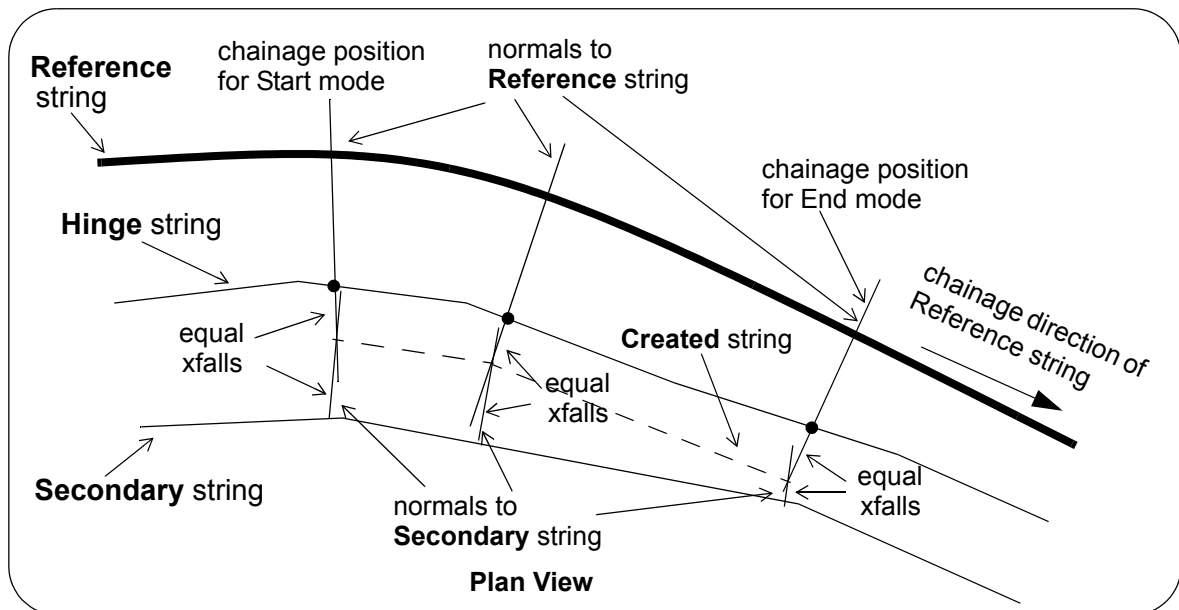
The height of the vertex of the created string on the section at chainage ch, is defined in (created string chainage, height) space, and is on the line with grade **Grade->** and going through the point (normal at Start mode, Start RL).



On the section at Reference chainage ch, the position of the vertex (with the calculated height) is such that the absolute value of the xfall from the vertex to the Hinge string, and the absolute xfall from the vertex to the **normal to the Secondary** string, is the same.

That is, a normal to the **Secondary** string is created that intersects in plan with the section from the Reference string so that the absolute value of the xfall from the Hinge string to the vertex (with the calculated height), is the same as the absolute grade from the vertex to the Secondary string. This gives the plan position of the vertex of the created string.

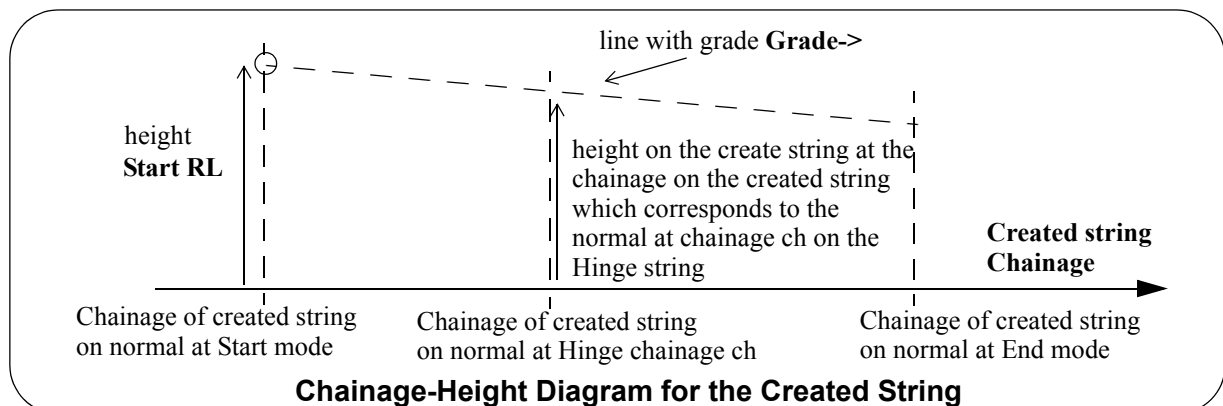
Note - it may not be possible to find such an intersection point.



Reference String NOT Selected

If a **Reference string** is **NOT** selected then the **Start mode** and **End Mode** refer to the **Hinge string**, and at the given chainage interval between the Start mode and the End mode, sections are taken **normal** (perpendicular) to the **Hinge string**. The vertices of the created string lie on these normals.

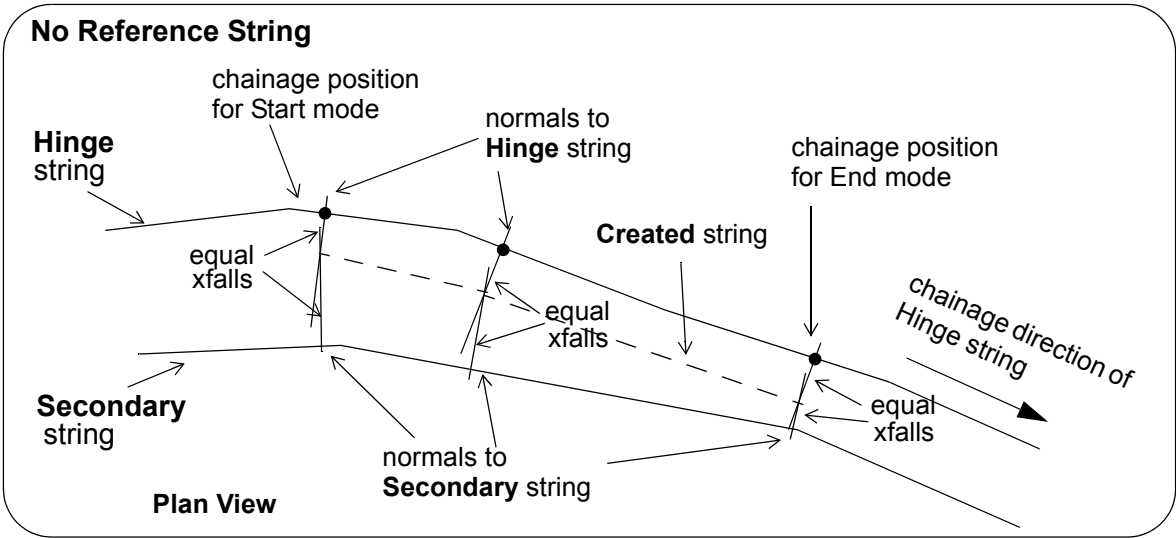
The height of the vertex of the created string on the section at chainage ch , is defined in (created string chainage, height) space, and is on the line with grade **Grade->** and going through the point (normal at Start mode, Start RL).



On the section at Hinge chainage ch , the position of the vertex (with the calculated height) is such that the absolute value of the xfall from the vertex to the Hinge string, and the absolute xfall from the vertex to the **normal to the Secondary string**, is the same.

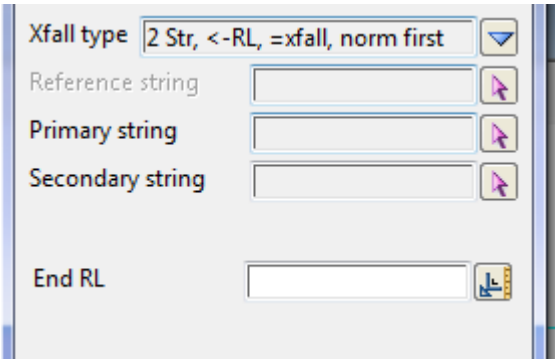
That is, a normal to the **Secondary string** is created that intersects in plan with the section from the Hinge string so that the absolute value of the xfall from the Hinge string to the vertex (with the calculated height), is the same as the absolute grade from the vertex to the Secondary string. This gives the plan position of the vertex of the created string.

Note - it may not be possible to find such an intersection point.



Continue to the next choice [2 Strings, End RL & Grade, Equal Xfall, Normal to Reference or Hinge String](#) or return to [Xfall Types](#) or [String by Xfall and Grade](#).

2 Strings, End RL & Grade, Equal Xfall, Normal to Reference or Hinge String

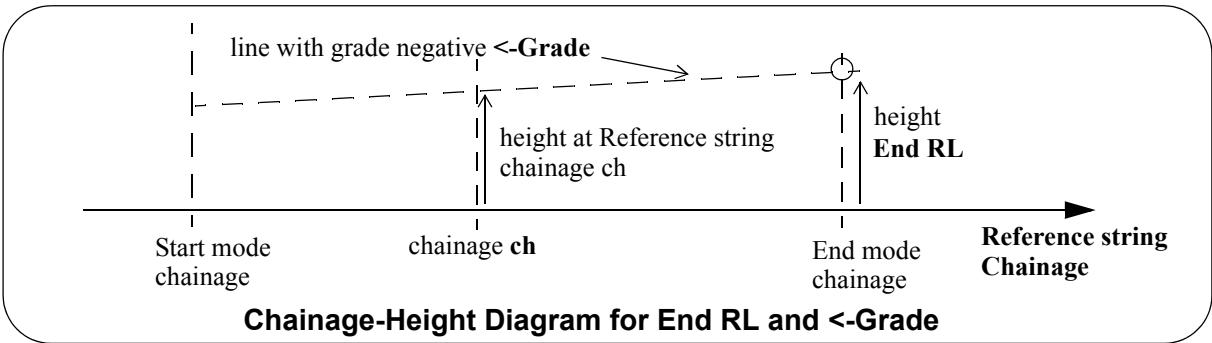


This option requires a **Hinge** and a **Secondary** string, a **End RL** and backward **Grade**, and an **optional Reference** string.

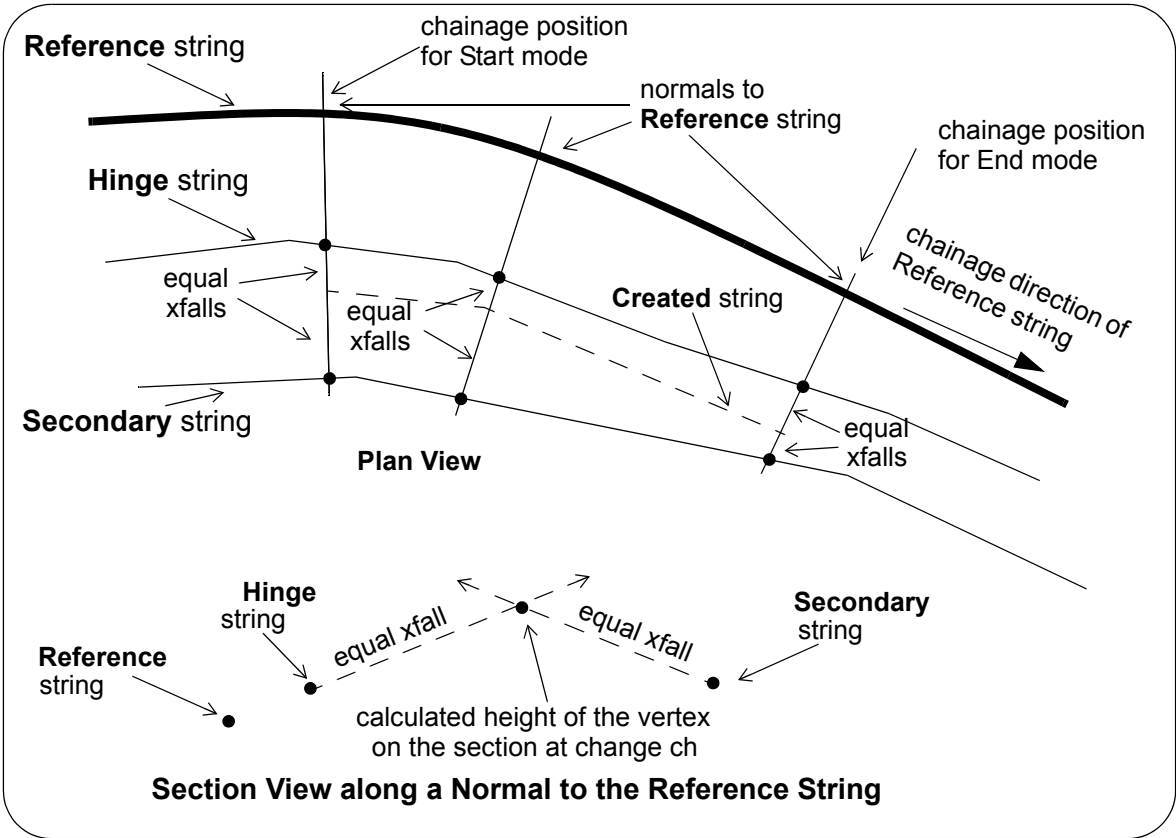
The height of the vertex (of the new string) on the section at chainage *ch*, is in (Reference string chainage, height) space, on the line with grade of negative **<-Grade** and going through the point (End mode, End RL).

That is,

the "height at *ch*" = End RL - <-Grade * (End mode - *ch*) / (End mode - Start mode) / 100



On the section normal to the Reference string at chainage *ch*, the position of the vertex with the calculated height is such that the absolute value of the xfall from the Hinge string to the vertex, and the absolute value of the xfall from the vertex to the Secondary string, are the same.



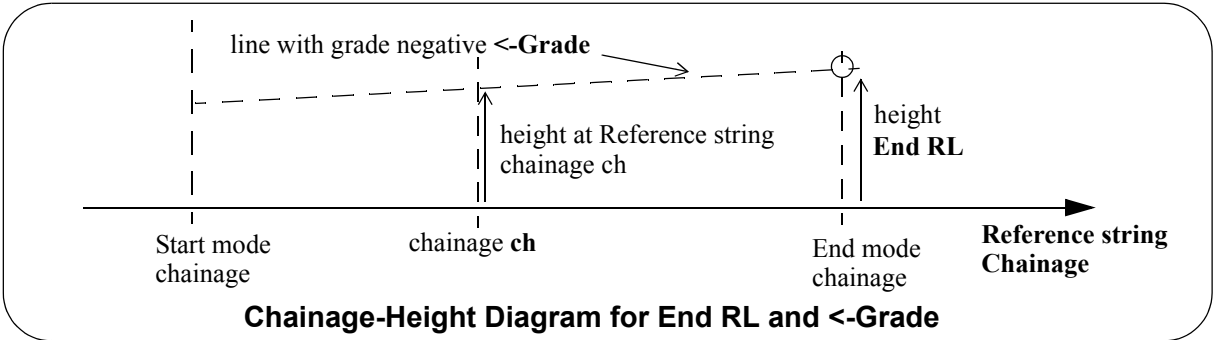
Reference String NOT Selected

If a **Reference** string is **NOT** selected then the **Start mode** and **End Mode** refer to **Hinge** string and at each chainage (ch), a section is taken **normal** (perpendicular) to the **Hinge** string and cutting the **Secondary** strings.

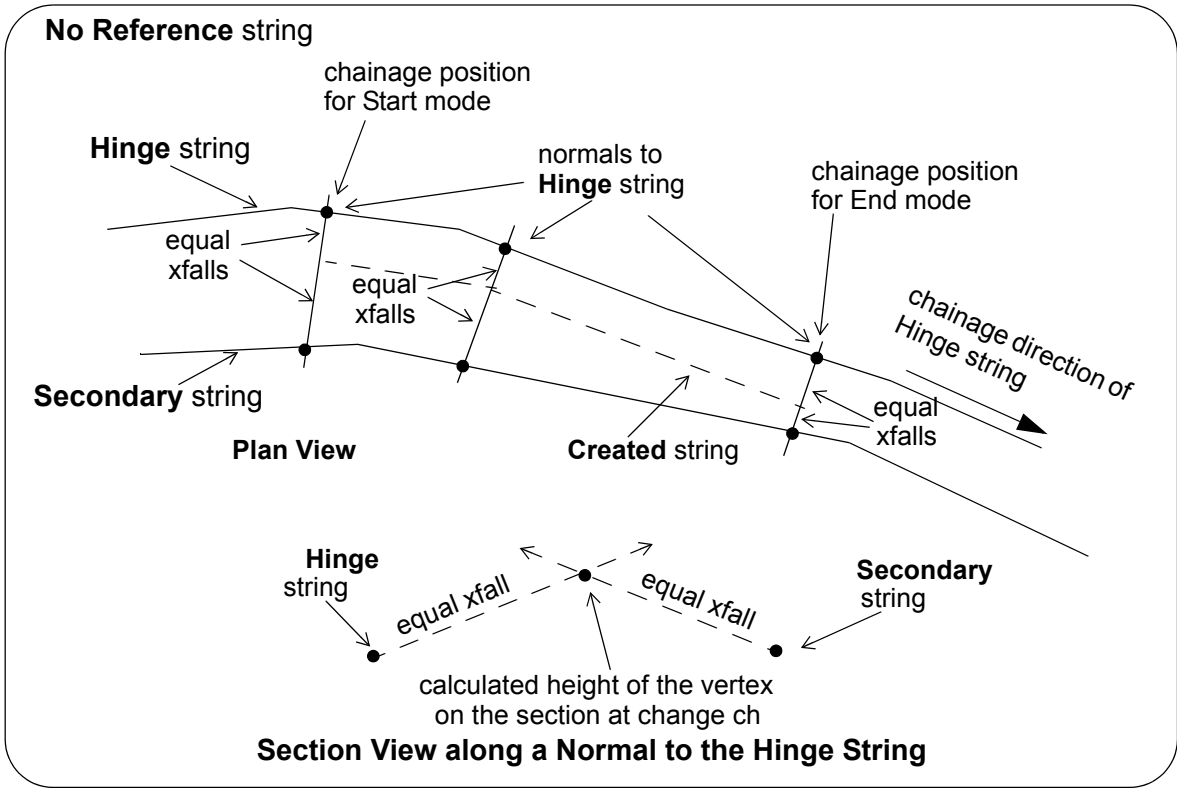
The height of the vertex (of the new string) on the section at chainage ch, is in (Hinge string chainage, height) space, on the line with grade of negative **<-Grade** and going through the point (End mode, End RL).

That is,

the "height at ch" = End RL - <-Grade *(End mode - ch)/(End mode - Start mode)/100

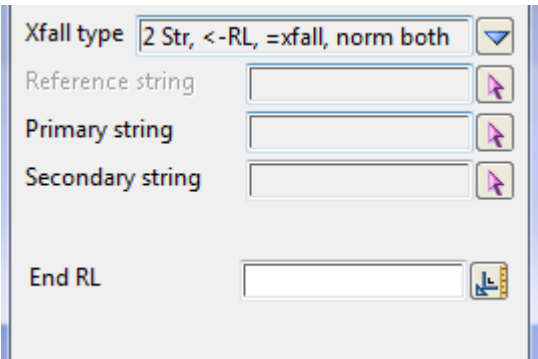


On the section normal to the Hinge string at chainage ch, the position of the vertex with the calculated height is such that the absolute value of the xfall from the Hinge string to the vertex, and the absolute value of the xfall from the vertex to the Secondary string, are the same.



Continue to the next choice [2 Strings, End RL & Grade, Equal Xfall and Normal to Both](#) or return to [Xfall Types](#) or [String by Xfall and Grade](#).

2 Strings, End RL & Grade, Equal Xfall and Normal to Both

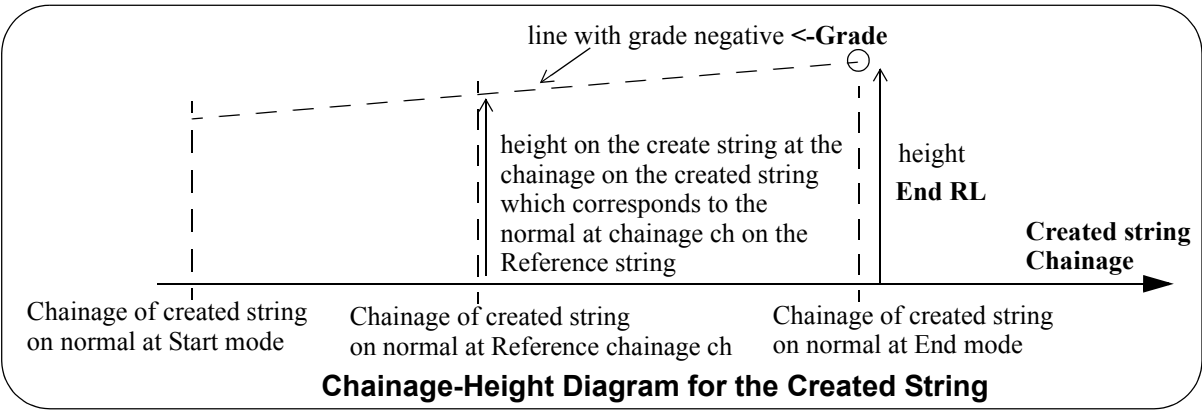


This option requires a **Hinge** and a **Secondary** string, an **End RL** and backward **Grade**, and an **optional Reference** string.

Reference String Selected

If a **Reference** string is selected then the **Start mode** and **End Mode** refer to the **Reference** string, and at the given chainage interval between the Start mode and the End mode, sections are taken **normal** (perpendicular) to the **Reference string** and cutting the **Hinge** string. The vertices of the created string lie on these normals.

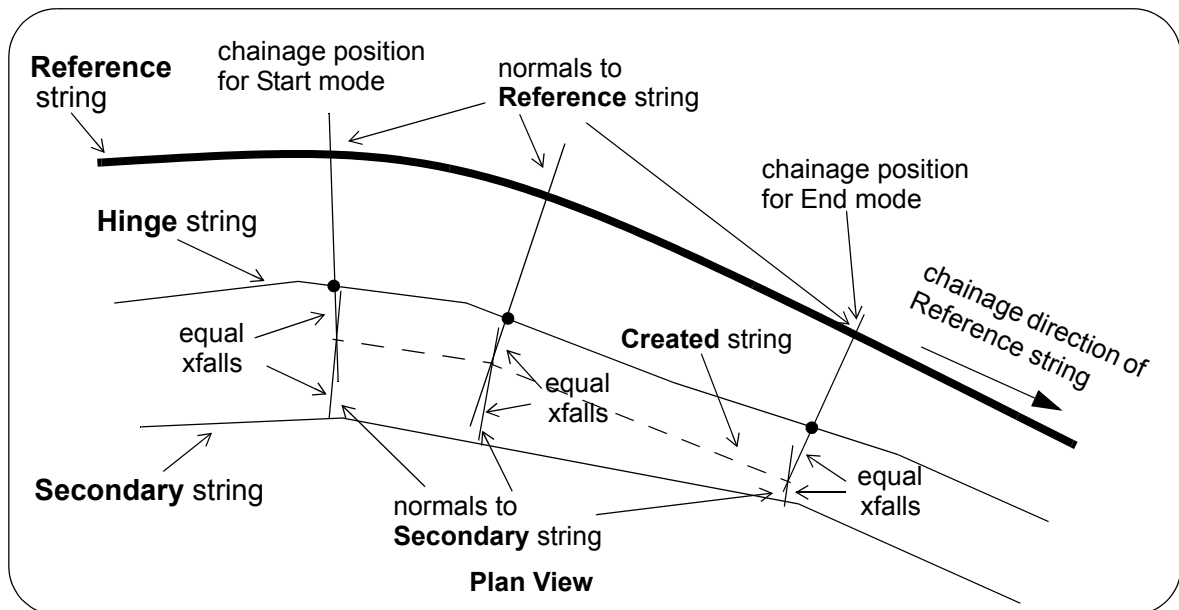
The **height** of the vertex on the section at chainage ch, is defined in (created string chainage, height) space, and is on the line with grade negative **<-Grade** and going through the point (normal to End mode, End RL).



On the section at Reference chainage ch, the position of the vertex (with the calculated height) is such that the absolute value of the xfall from the vertex to the Hinge string, and the absolute xfall from the vertex to the **normal to the Secondary** string, is the same.

That is, a normal to the **Secondary** string is created that intersects in plan with the section from the Reference string so that the absolute value of the xfall from the Hinge string to the vertex (with the calculated height), is the same as the absolute grade from the vertex to the Secondary string. This gives the plan position of the vertex of the created string.

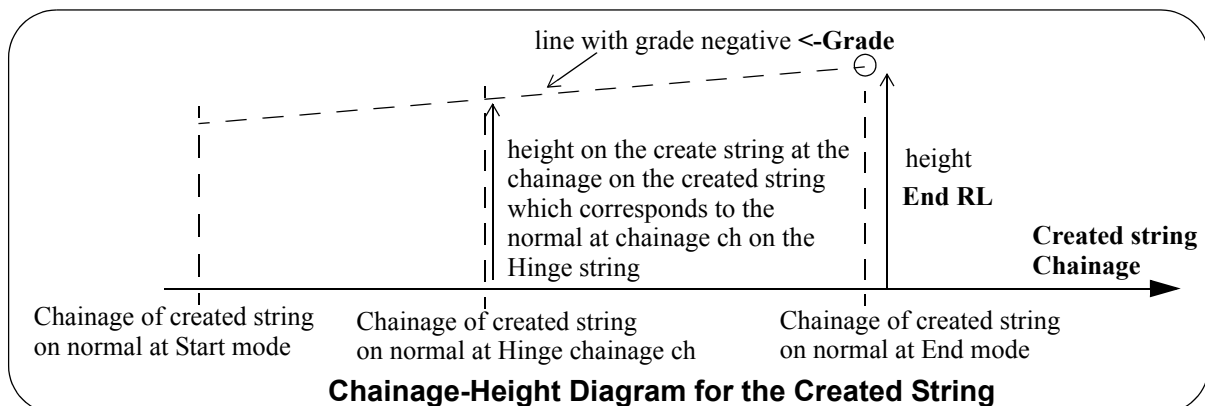
Note - it may not be possible to find such an intersection point.



Reference String NOT Selected

If a **Reference string** is **NOT** selected then the **Start mode** and **End Mode** refer to the **Hinge string**, and at the given chainage interval between the Start mode and the End mode, sections are taken **normal** (perpendicular) to the **Hinge string**. The vertices of the created string lie on these normals.

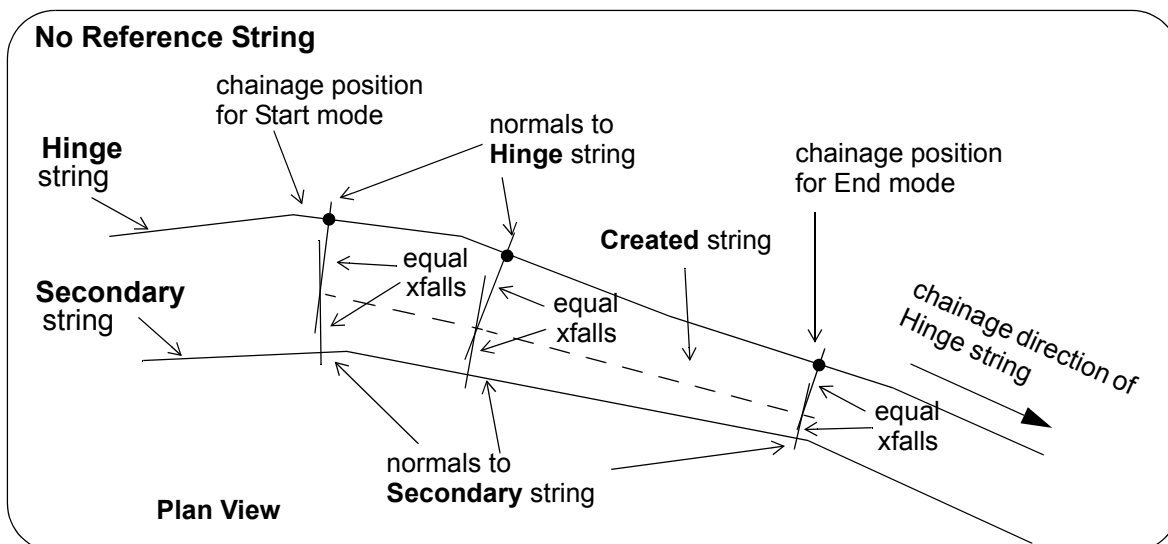
The **height** of the vertex on the section at chainage ch , is defined in (created string chainage, height) space, and is on the line with grade negative **<-Grade** and going through the point (normal to End mode, End RL).



On the section at Hinge chainage ch , the position of the vertex (with the calculated height) is such that the absolute value of the xfall from the vertex to the Hinge string, and the absolute xfall from the vertex to the **normal to the Secondary string**, is the same.

That is, a normal to the **Secondary string** is created that intersects in plan with the section from the Hinge string so that the absolute value of the xfall from the Hinge string to the vertex (with the calculated height), is the same as the absolute grade from the vertex to the Secondary string. This gives the plan position of the vertex of the created string.

Note - it may not be possible to find such an intersection point.



Continue to the next choice [2 Strings, Start Delta Height & Grade, Xfall from Secondary String, Normal to Reference or Hinge String](#) or return to [Xfall Types](#) or [String by Xfall and Grade](#).

2 Strings, Start Delta Height & Grade, Xfall from Secondary String, Normal to Reference or Hinge String

Xfall type: 2 Str, RL->, xfall from cut sec

Reference string: []

Primary string: []

Secondary string: []

Start delta height: []

Grade->: []

This option requires a **Hinge** and a **Secondary** string, a **Start delta height** and forward **Grade**, and an **optional Reference** string.

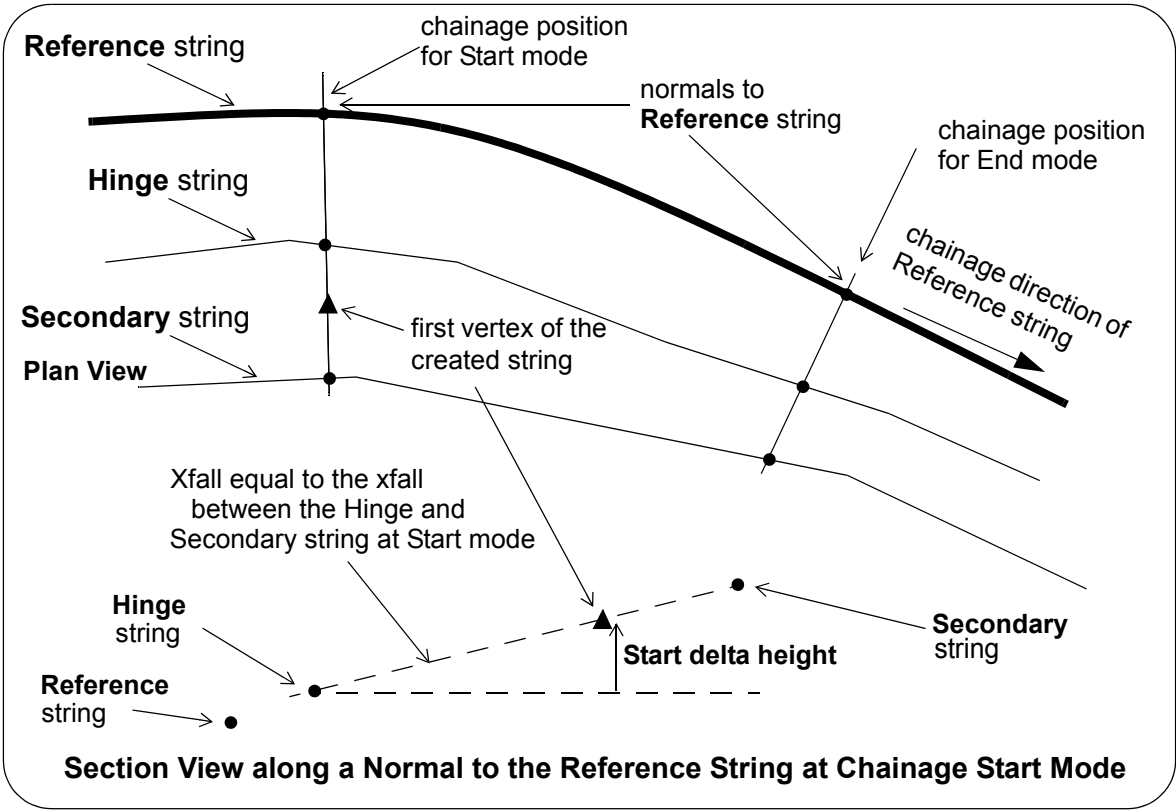
Reference String Selected

If a **Reference** string is selected then the **Start mode** and **End Mode** refer to the **Reference** string, and at the given chainage interval between the Start mode and the End mode, sections are taken **normal** (perpendicular) to the **Reference string** and cutting the **Hinge** and the **Secondary** strings. The vertices of the created string lie on these normals.

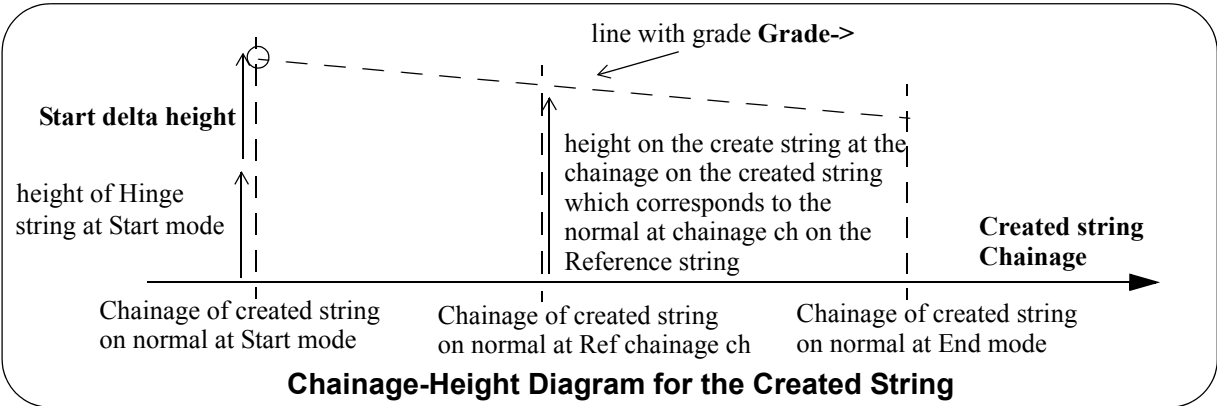
The **first vertex** of the created string is on the normal to the Reference string at chainage **Start mode**, and its **height** is the height of the Hinge string on the Start mode normal, plus Start delta height.

height of first vertex = height of Hinge string on Start mode normal + Start delta height

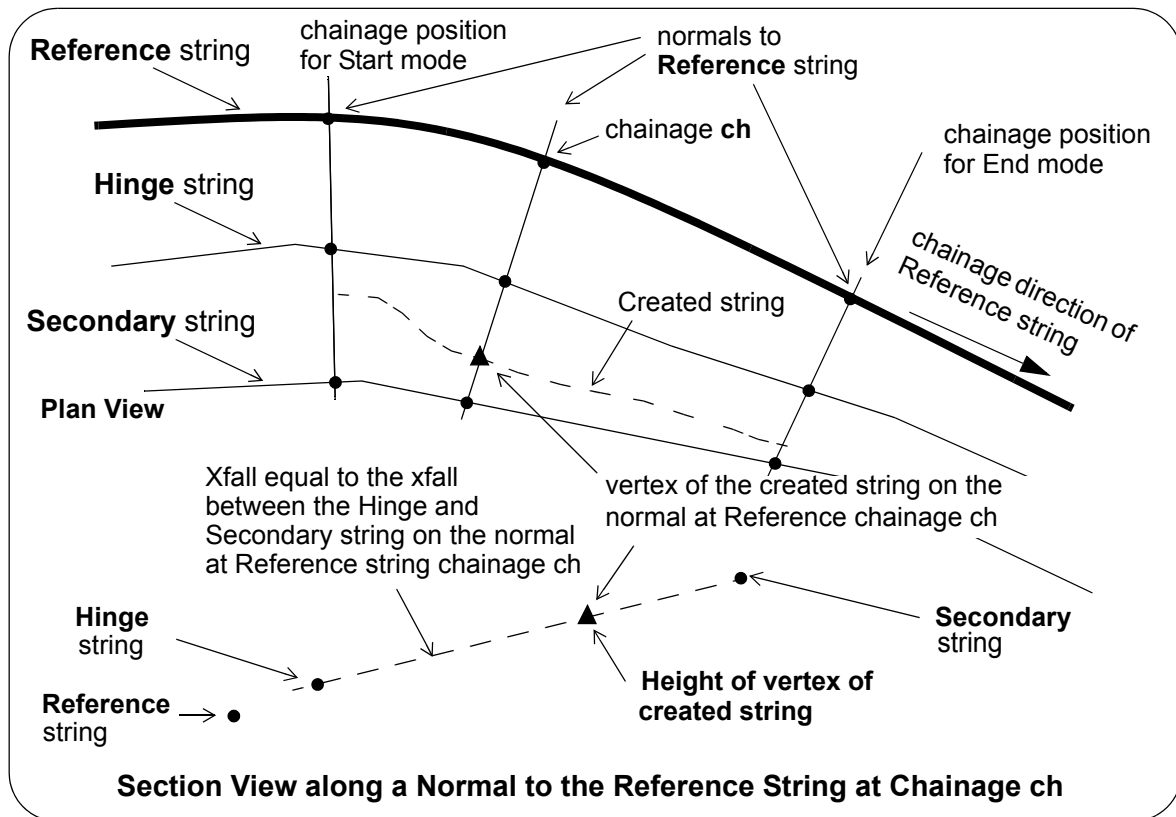
The plan position of the first vertex is on the Start mode normal, and with an offset from the Hinge string such that the Xfall is equal to the **xfall between the Hinge and Secondary strings**, and the change of height from the Hinge string is **Start delta height**.



The **heights** of the subsequent vertices of the created string are defined in (created string chainage, height) space, and lie on the line with grade **Grade->** and going through the first vertex.



The **plan** position of the vertex of the created string on the normal at Reference chainage **ch** is such that it is on the line through the Hinge string with xfall equal to the **xfall between the Hinge and Secondary strings**, and having the calculated height.



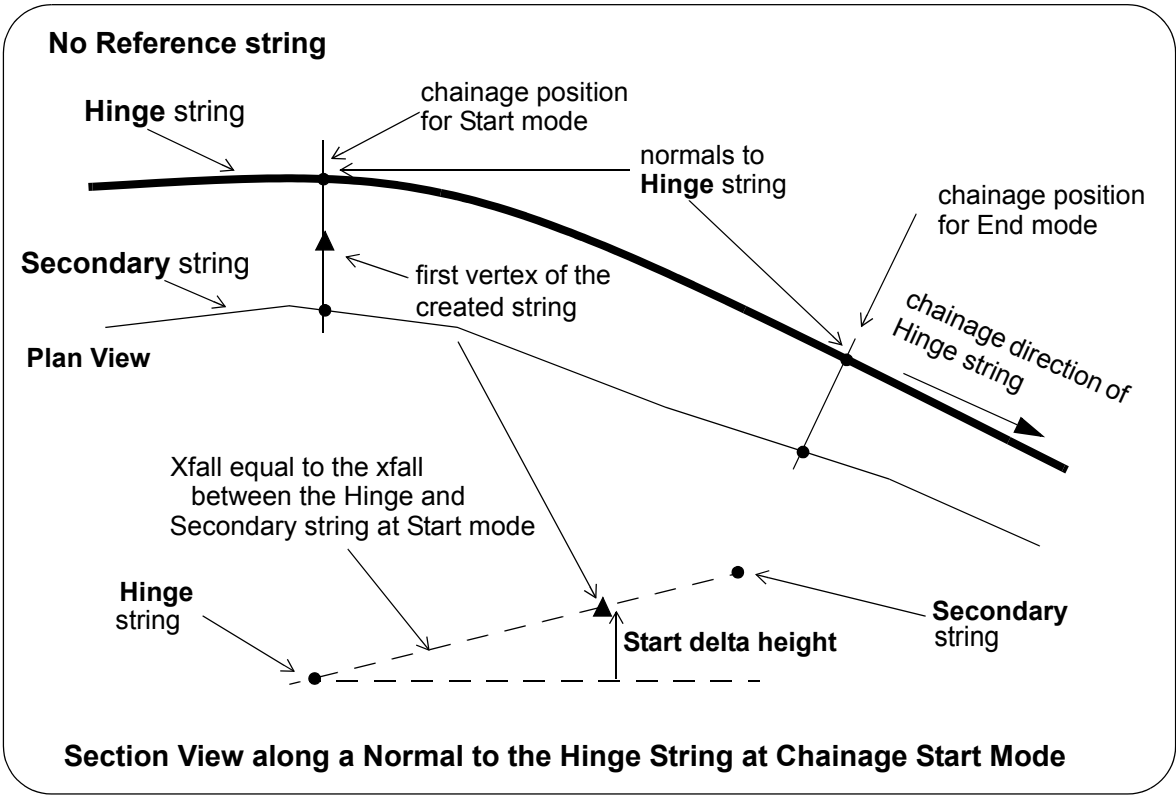
Reference String NOT Selected

If a **Reference** string is **NOT** selected then the **Start mode** and **End Mode** refer to the **Hinge** string, and at the given chainage interval between the Start mode and the End mode, sections are taken **normal** (perpendicular) to the **Hinge** string and cutting the **Secondary** string. The vertices of the created string lie on these normals.

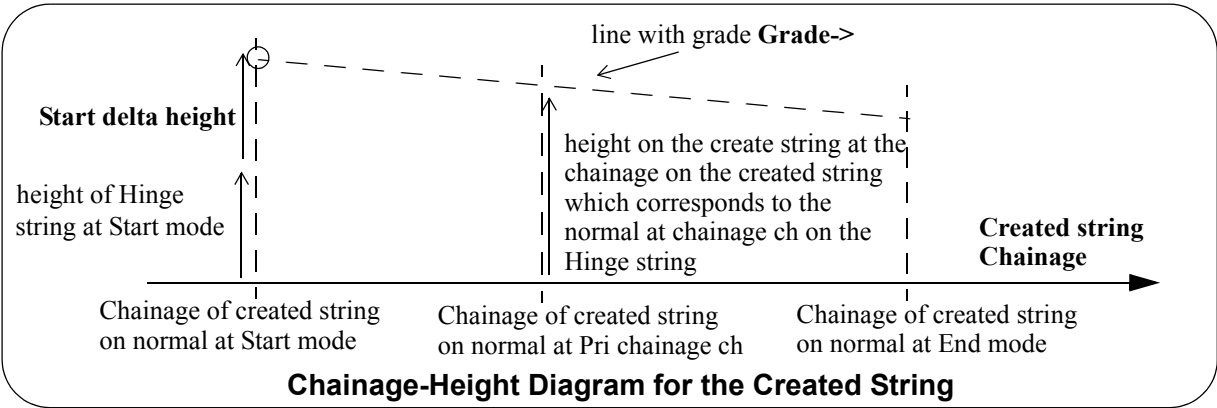
The **first vertex** of the created string is on the normal to the Hinge string at chainage **Start mode**, and its height is the height of the Hinge string on the Start mode normal, plus Start delta height.

height of first vertex = height of Hinge string on Start mode normal + Start delta height

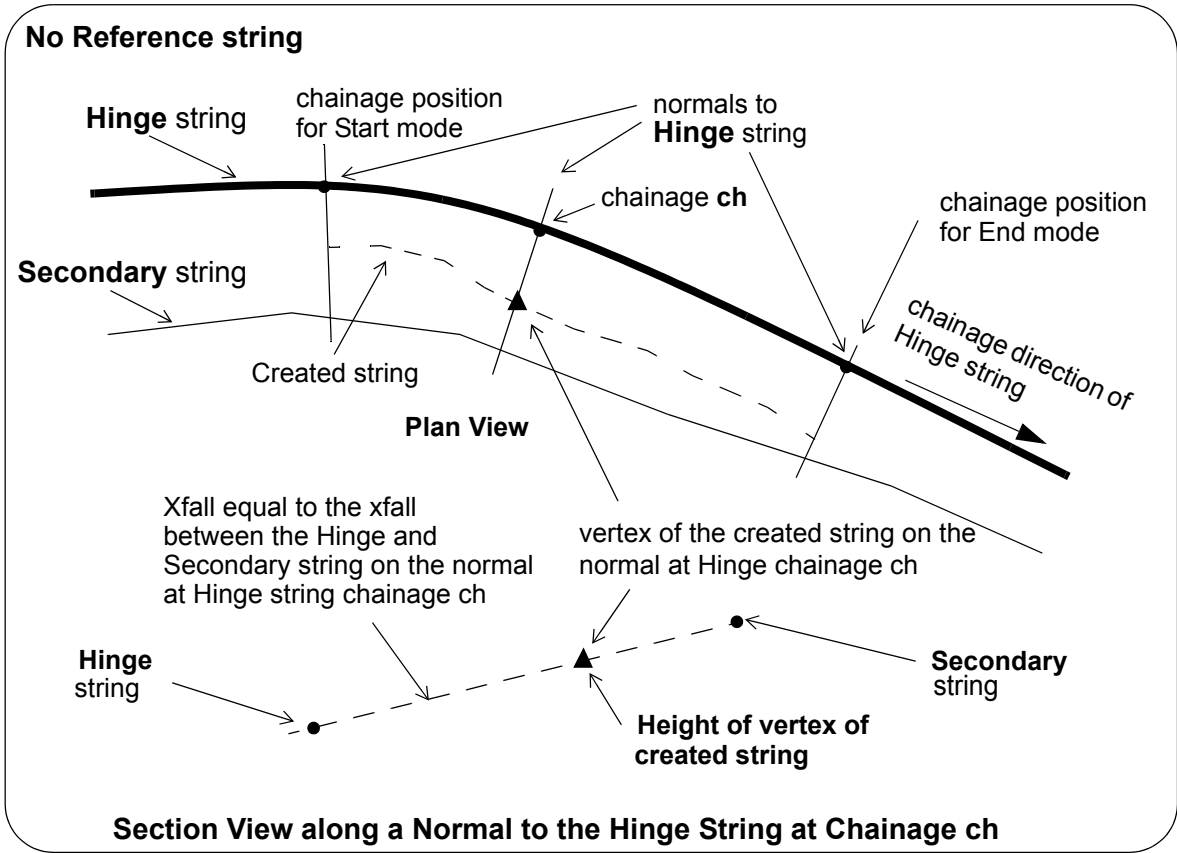
The plan position of the first vertex is on the Start mode normal, and with an offset from the Hinge string such that the **Xfall** is equal to the **xfall between the Hinge and Secondary strings**, and the change of height from the Hinge string is **Start delta height**.



The **heights** of the subsequent vertices of the created string are defined in (created string chainage, height) space, and lie on the line with grade **Grade->** and going through the first vertex.

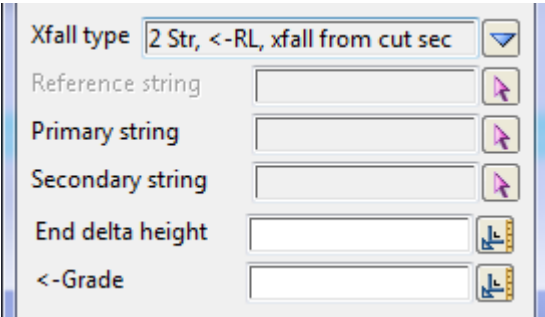


The **plan** position of the vertex of the created string on the normal at Hinge chainage **ch** is such that it is on the line through the Hinge string with **xfall** equal to the **xfall between the Hinge and Secondary strings**, and having the calculated height.



Continue to the next choice [2 Strings, End Delta Height & Grade, Xfall from Secondary String, Normal to Reference or Hinge String](#) or return to [Xfall Types](#) or [String by Xfall and Grade](#).

2 Strings, End Delta Height & Grade, Xfall from Secondary String, Normal to Reference or Hinge String



This option requires a **Hinge** and a **Secondary** string, an **End delta height** and backward **Grade**, and an **optional Reference** string.

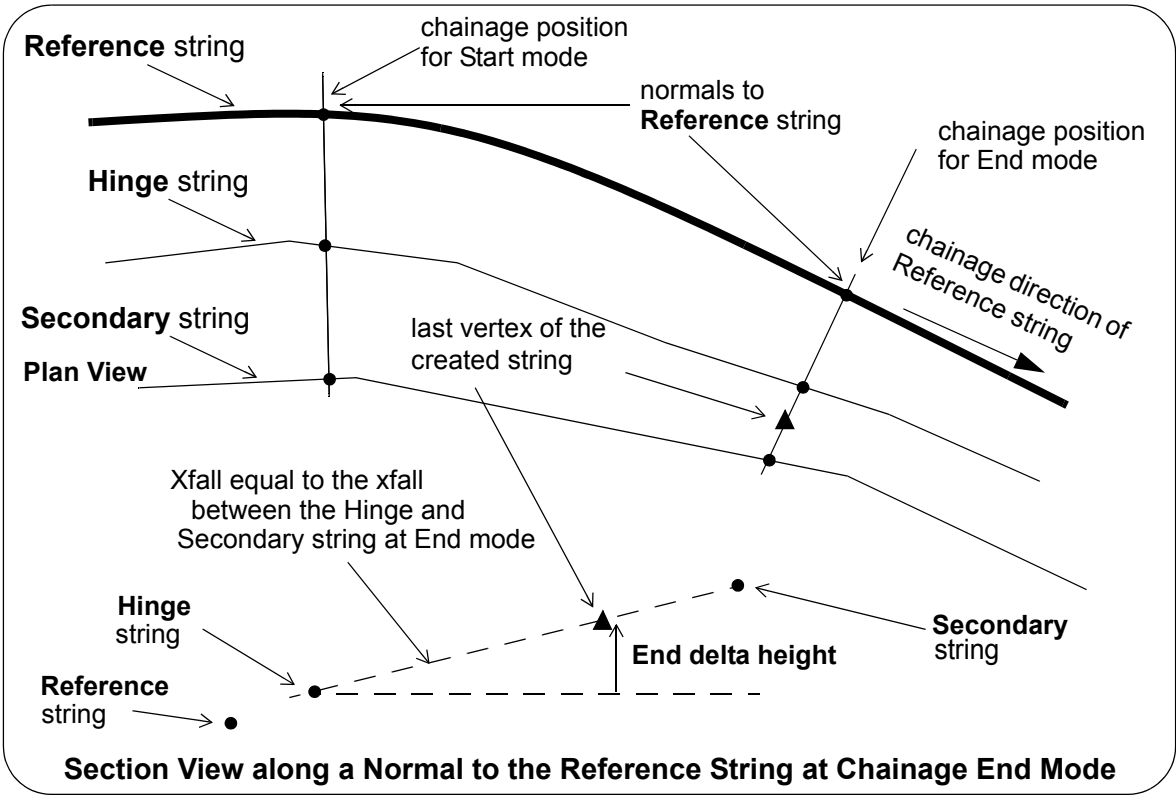
Reference String Selected

If a **Reference** string is selected then the **Start mode** and **End Mode** refer to the **Reference** string, and at the given chainage interval between the Start mode and the End mode, sections are taken **normal** (perpendicular) to the **Reference string** and cutting the **Hinge** and the **Secondary** strings. The vertices of the created string lie on these normals.

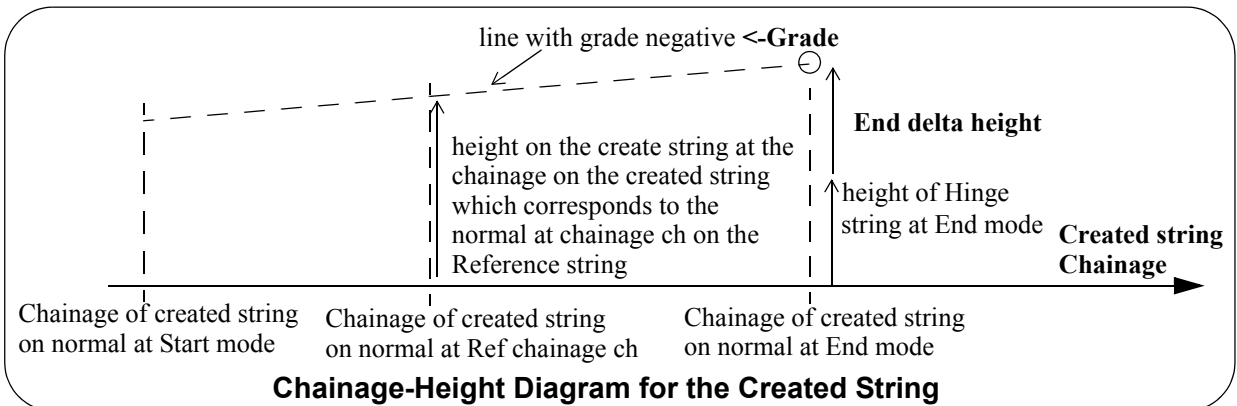
The **last vertex** of the created string is on the normal to the Reference string at chainage **End mode**, and its height is the height of the Hinge string on the End mode normal, plus End delta height.

height of last vertex = height of Hinge string on End mode normal + End delta height

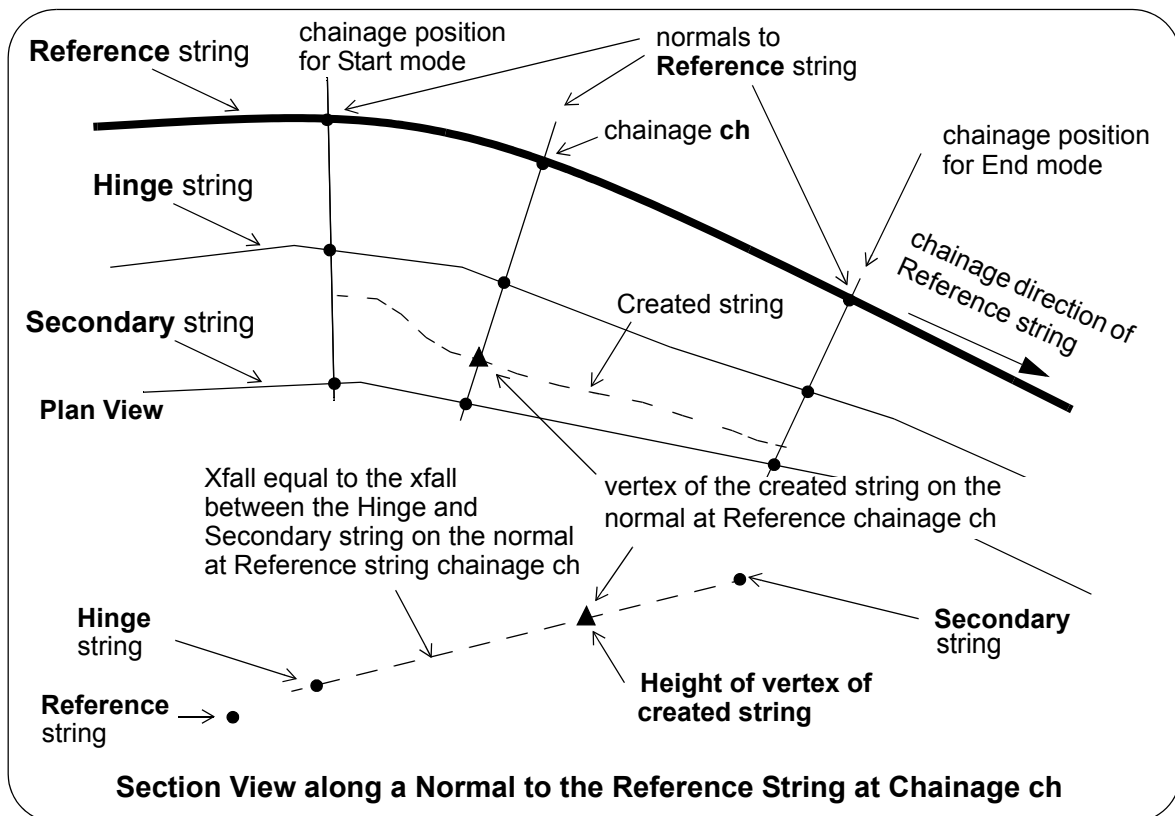
The plan position of the last vertex is on the End mode normal, and with an offset from the Hinge string such that the Xfall is equal to the **xfall between the Hinge and Secondary strings**, and the change of height from the Hinge string is **End delta height**.



The **heights** of the previous vertices of the created string are defined in (created string chainage, height) space, and lie on the line with grade negative **<-Grade** and going through the last vertex.



The **plan** position of the vertex of the created string on the normal at Reference chainage **ch** is such that it is on the line through the Hinge string with **xfall** equal to the **xfall between the Hinge and Secondary strings**, and having the calculated height.



Reference String NOT Selected

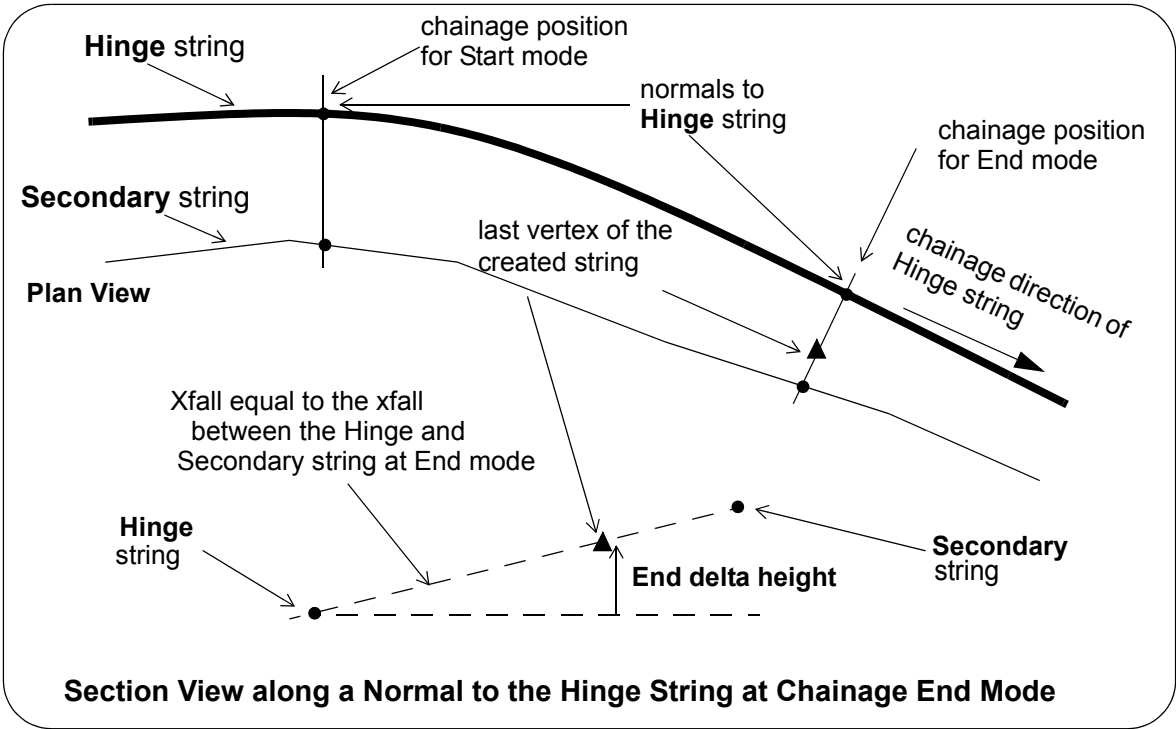
If a **Reference string** is **NOT** selected then the **Start mode** and **End Mode** refer to the **Hinge string**, and at the given chainage interval between the Start mode and the End mode, sections are taken **normal** (perpendicular) to the **Hinge string** and cutting the **Secondary string**. The vertices of the created string lie on these normals.

The **last vertex** of the created string is on the normal to the Hinge string at chainage **End mode**,

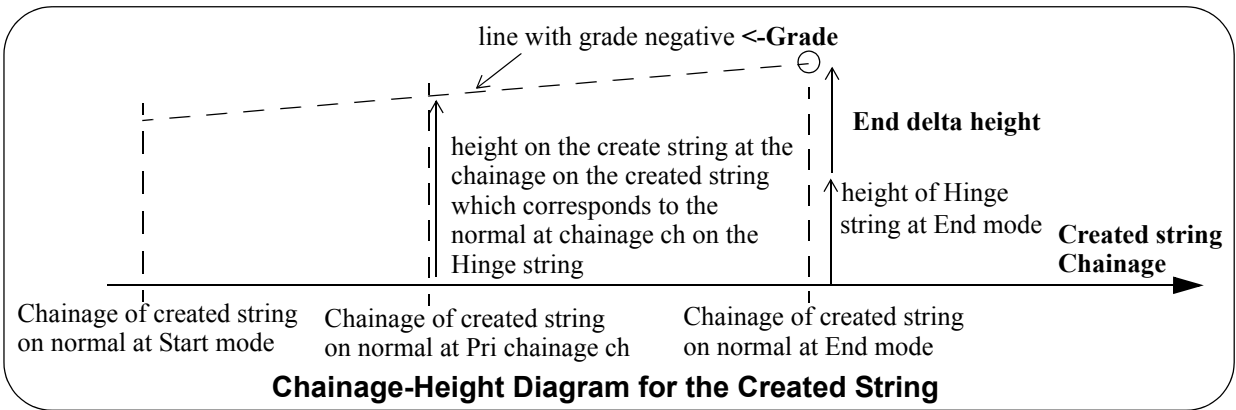
and its height is the height of the Hinge string on the End mode normal, plus End delta height.

height of last vertex = height of Hinge string on End mode normal + End delta height

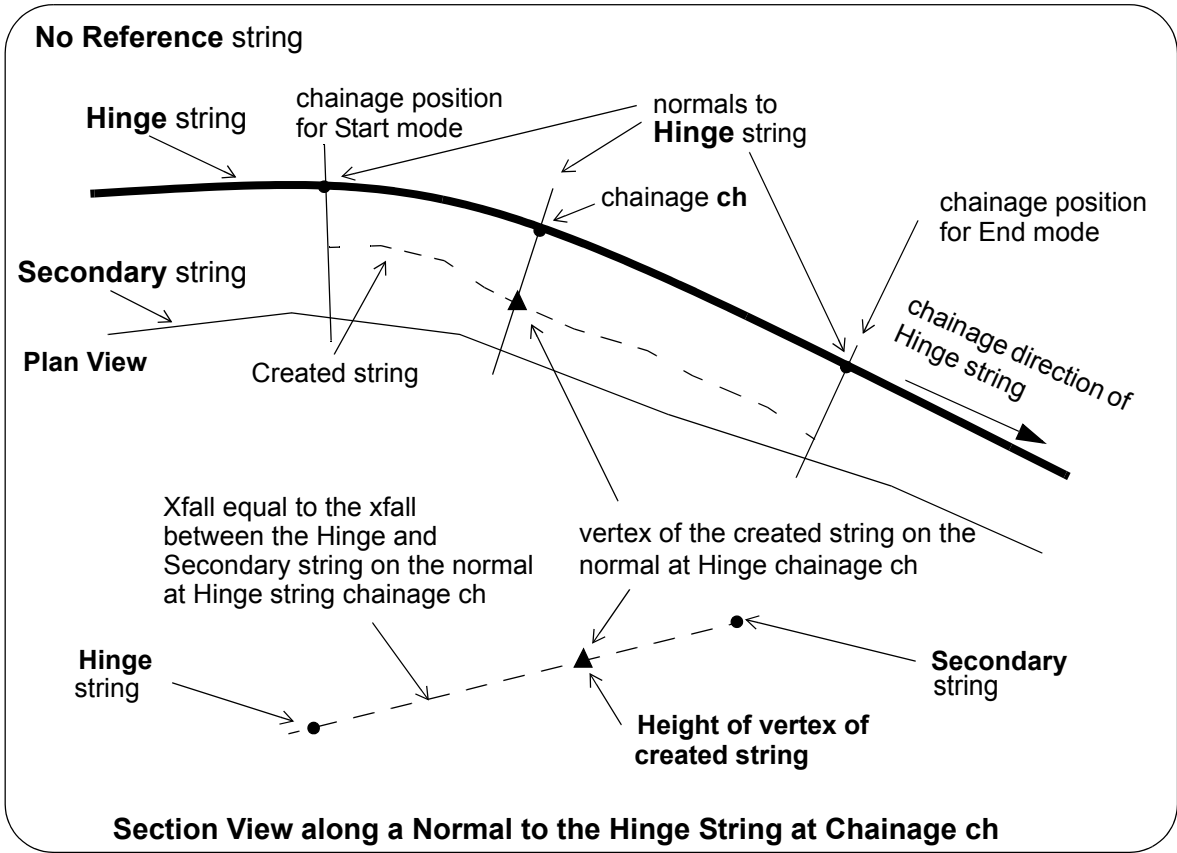
The plan position of the last vertex is on the End mode normal, and with an offset from the Hinge string such that the Xfall is equal to the **xfall between the Hinge and Secondary strings**, and the change of height from the Hinge string is **End delta height**.



The **heights** of the previous vertices of the created string are defined in (created string chainage, height) space, and lie on the line with grade negative **<-Grade** and going through the last vertex.

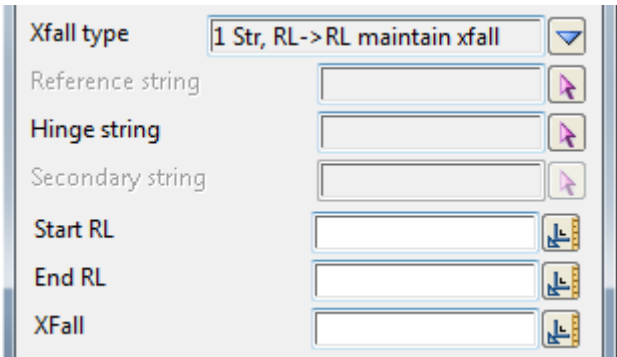


The **plan** position of the vertex of the created string on the normal at Hinge chainage **ch** is such that it is on the line through the Hinge string with xfall equal to the **xfall between the Hinge and Secondary strings**, and having the calculated height.



Continue to the next choice [1 String, Start RL and End RL, Fixed Xfall](#) or return to [Xfall Types](#) or [String by Xfall and Grade](#).

1 String, Start RL and End RL, Fixed Xfall

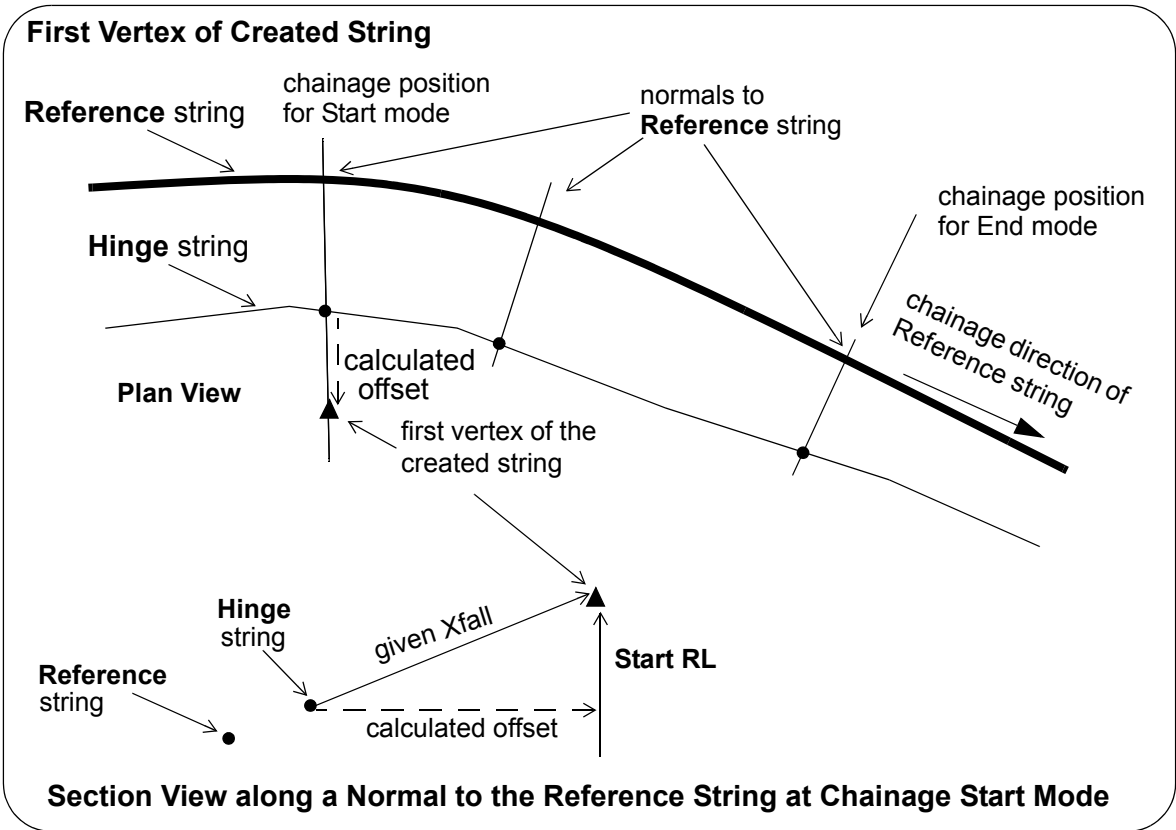


This option requires a **Hinge string**, a **Start RL** and **End RL**, a **Xfall**, and an optional **Reference string**.

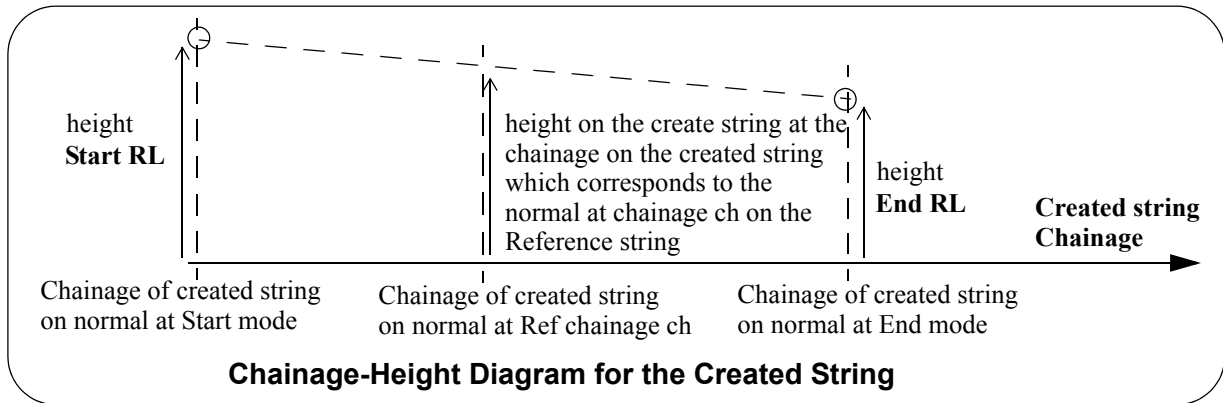
Reference String Selected

If a **Reference** string is selected then the **Start mode** and **End Mode** refer to the **Reference** string, and at the given chainage interval between the Start mode and the End mode, sections are taken **normal** (perpendicular) to the **Reference string** and cutting the **Hinge string**. The vertices of the created string lie on these normals.

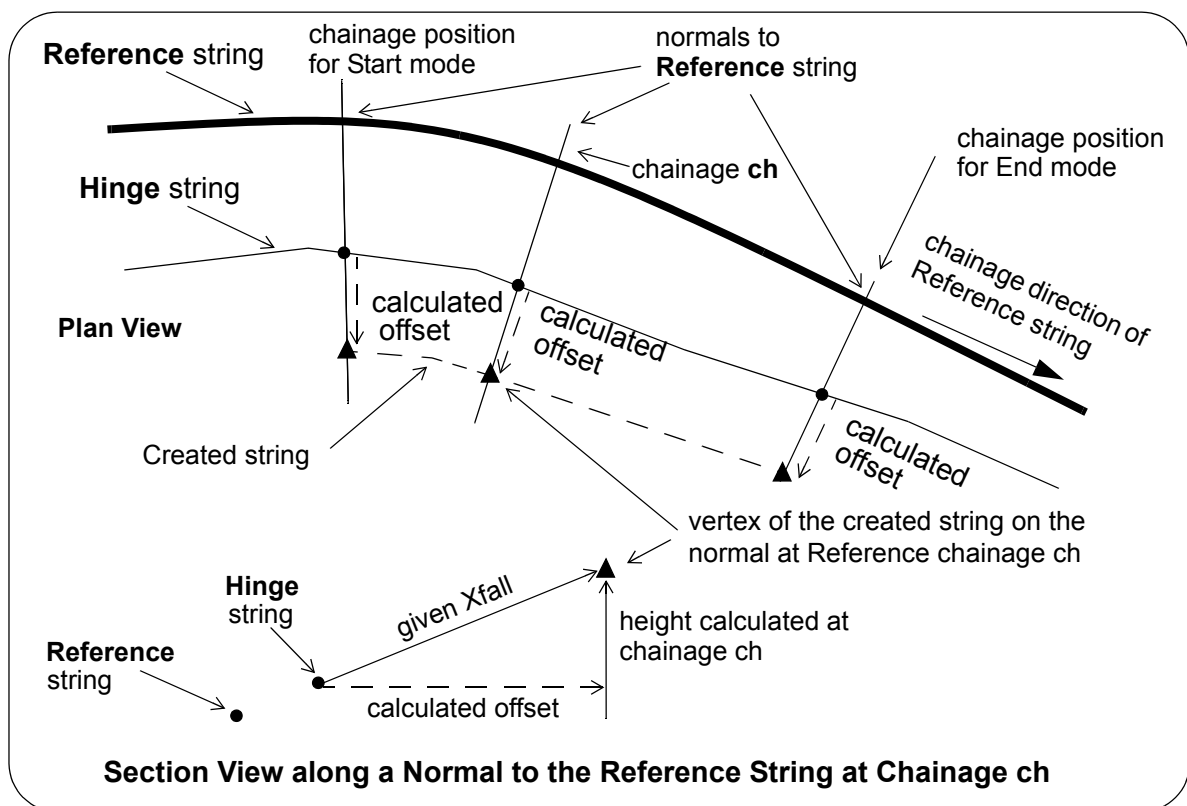
The **first vertex** of the created string is on the normal to the Reference string and has a **height Start RL**. The offset for the first vertex is calculated and is such that the given **Xfall** from Hinge string will give the vertex the height **Start RL**.



The **heights** of the subsequent vertices of the created string are defined in (created string chainage, height) space, and lie on the line with **Start RL**, and ending with **End RL** on the normal at End mode.



The **plan** position of the vertex of the created string on the normal at Reference chainage **ch** is constructed by going out from the hinge string with **xfall** equal to the **Xfall**, and for an offset so that the height is equal to the required height at chainage **ch**.



For information about the sign convention for offset and xfalls, go to [Sign Convention for Heights, Offsets and Xfalls in Create by Xfall and Grade](#).

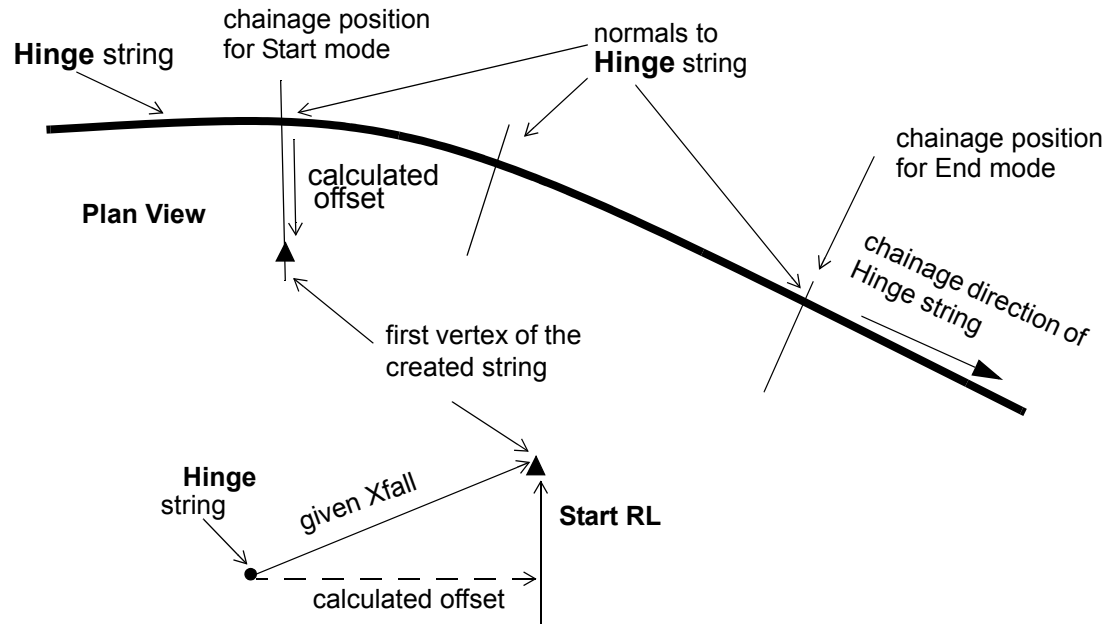
Reference String NOT Selected

If a **Reference string** is **NOT** selected then the **Start mode** and **End Mode** refer to the **Hinge string**, and at the given chainage interval between the Start mode and the End mode, sections are taken **normal** (perpendicular) to the **Hinge string**. The vertices of the created string lie on these normals.

The **first vertex** of the created string is on the normal to the Hinge string and has a **height Start RL**. The offset for the first vertex is calculated and is such that the given **Xfall** from Hinge string

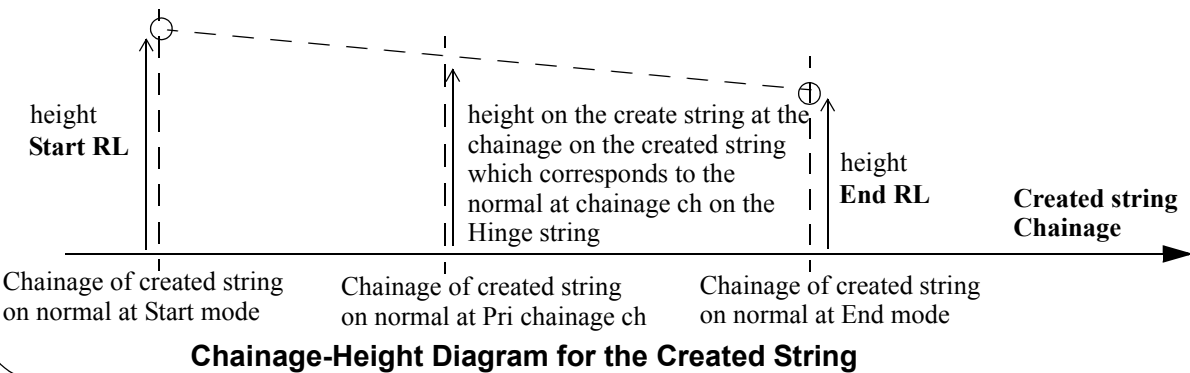
will give the vertex the height **Start RL**.

First Vertex of Created String - No Reference String

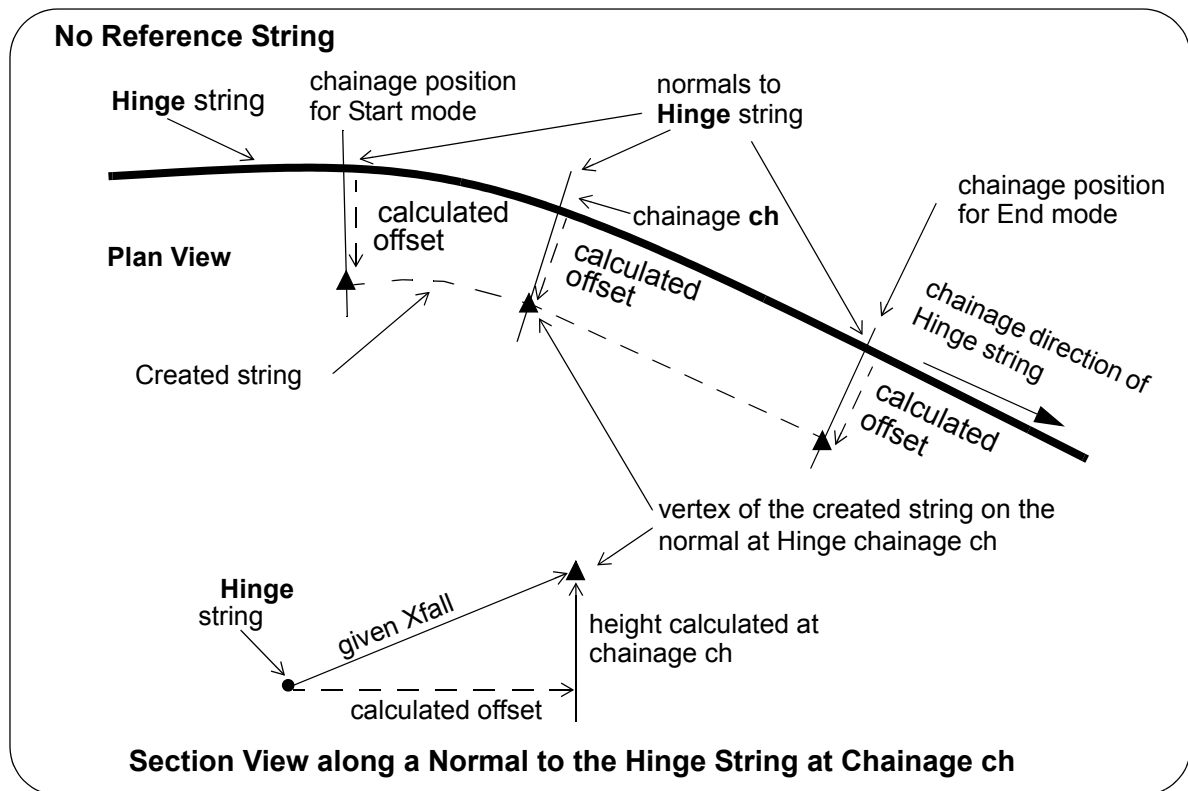


Section View along a Normal to the Hinge String at Chainage Start Mode

The **heights** of the subsequent vertices of the created string are defined in (created string chainage, height) space, and lie on the line with **Start RL**, and ending with **End RL** on the normal at End mode.



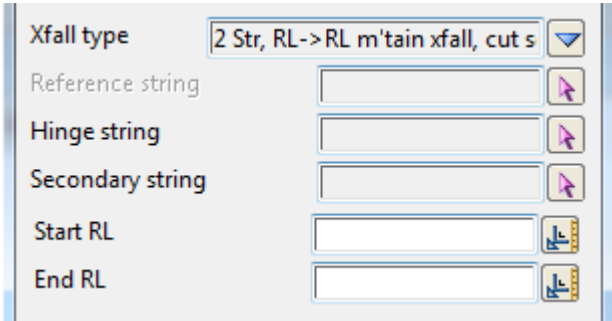
The **plan** position of the vertex of the created string on the normal at Hinge chainage **ch** is constructed by going out from the hinge string with **xfall** equal to the **Xfall** and for an offset so that the height is equal to the required height at chainage **ch**.



For information about the sign convention for offset and xfalls, go to [Sign Convention for Heights, Offsets and Xfalls in Create by Xfall and Grade](#).

Continue to the next choice [2 Strings, Start RL and End RL, Xfall from Secondary String, Normal to Reference or Hinge String](#) or return to [Xfall Types](#) or [String by Xfall and Grade](#).

2 Strings, Start RL and End RL, Xfall from Secondary String, Normal to Reference or Hinge String

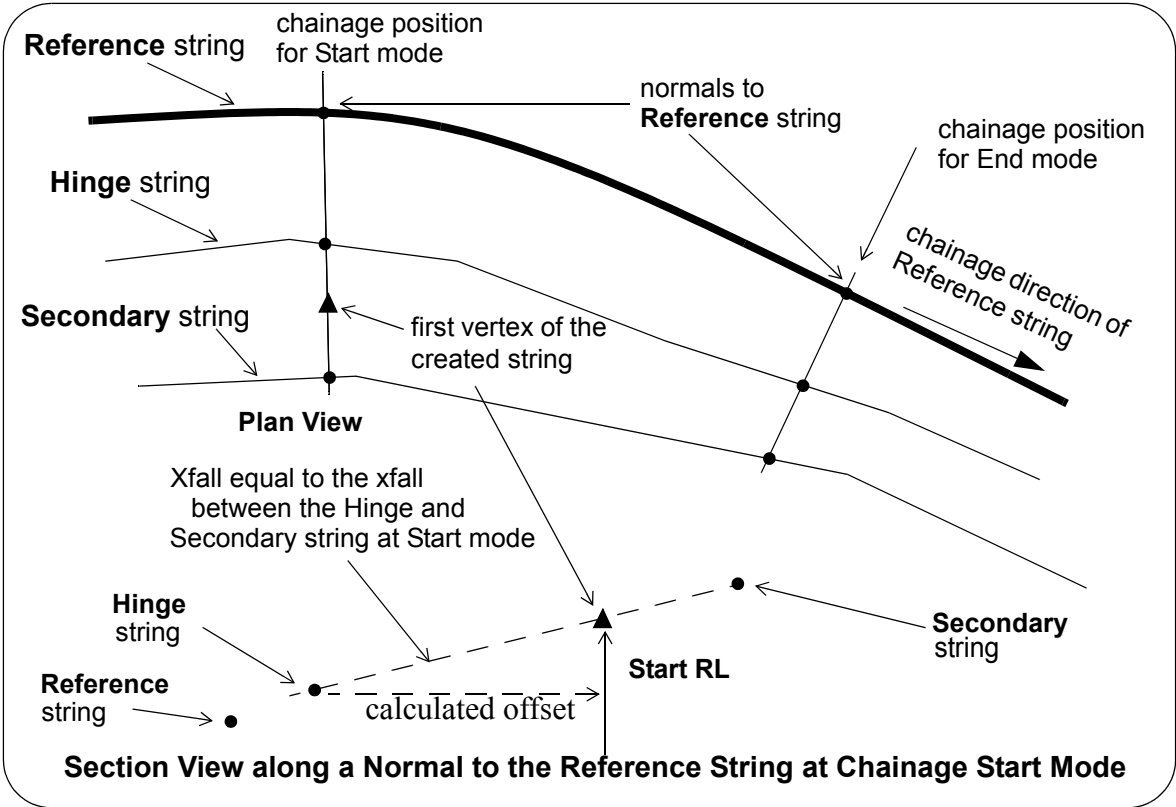


This option requires a **Hinge** and a **Secondary** string, a **Start RL** and **End RL**, and an **optional Reference** string.

Reference String Selected

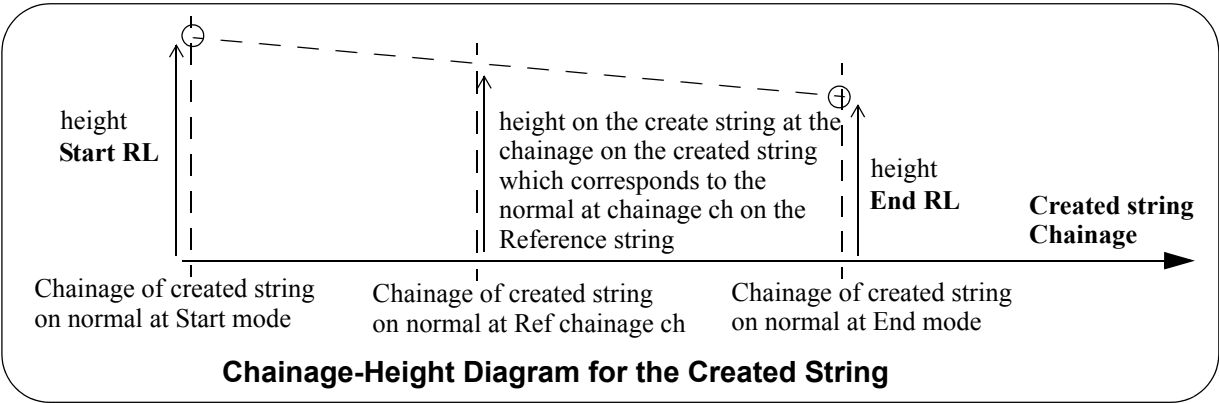
If a **Reference** string is selected then the **Start mode** and **End Mode** refer to the **Reference** string, and at the given chainage interval between the Start mode and the End mode, sections are taken **normal** (perpendicular) to the **Reference string** and cutting the **Hinge** and the **Secondary** strings. The vertices of the created string lie on these normals.

The **first vertex** of the created string is on the normal to the Reference string at chainage **Start mode**, with height **Start RL**. The plan position of the first vertex is constructed by going out from the hinge string with xfall equal to the **xfall between the Hinge and Secondary strings**, and for the required offset so that the height is **Start RL**.

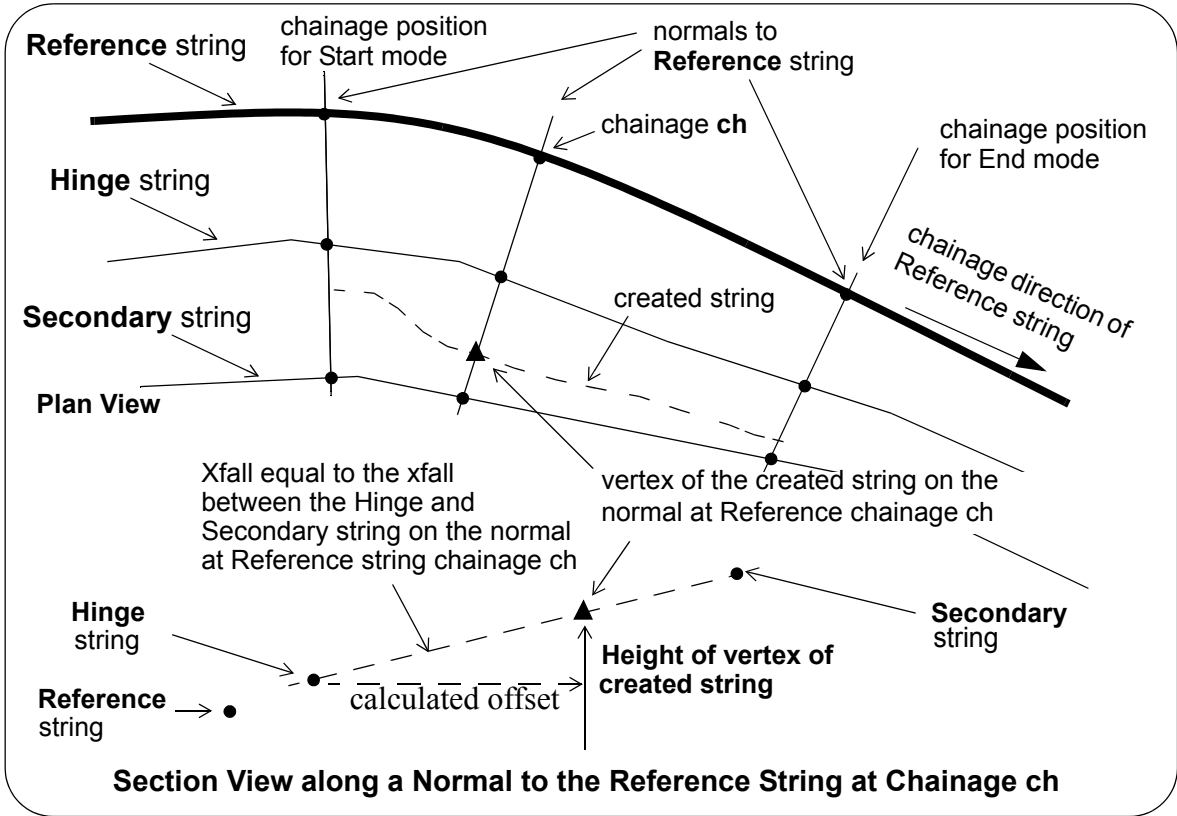


The **heights** of the subsequent vertices of the created string are defined in (created string chainage, height) space, and lie on the line with **Start RL**, and ending with **End RL** on the normal

at End mode.



The **plan** position of the vertex of the created string on the normal at Reference chainage **ch** is constructed by going out from the hinge string with **xfall** equal to the **xfall between the Hinge and Secondary strings** at chainage **ch**, and for an offset so that the height is equal to the required height at chainage **ch**.

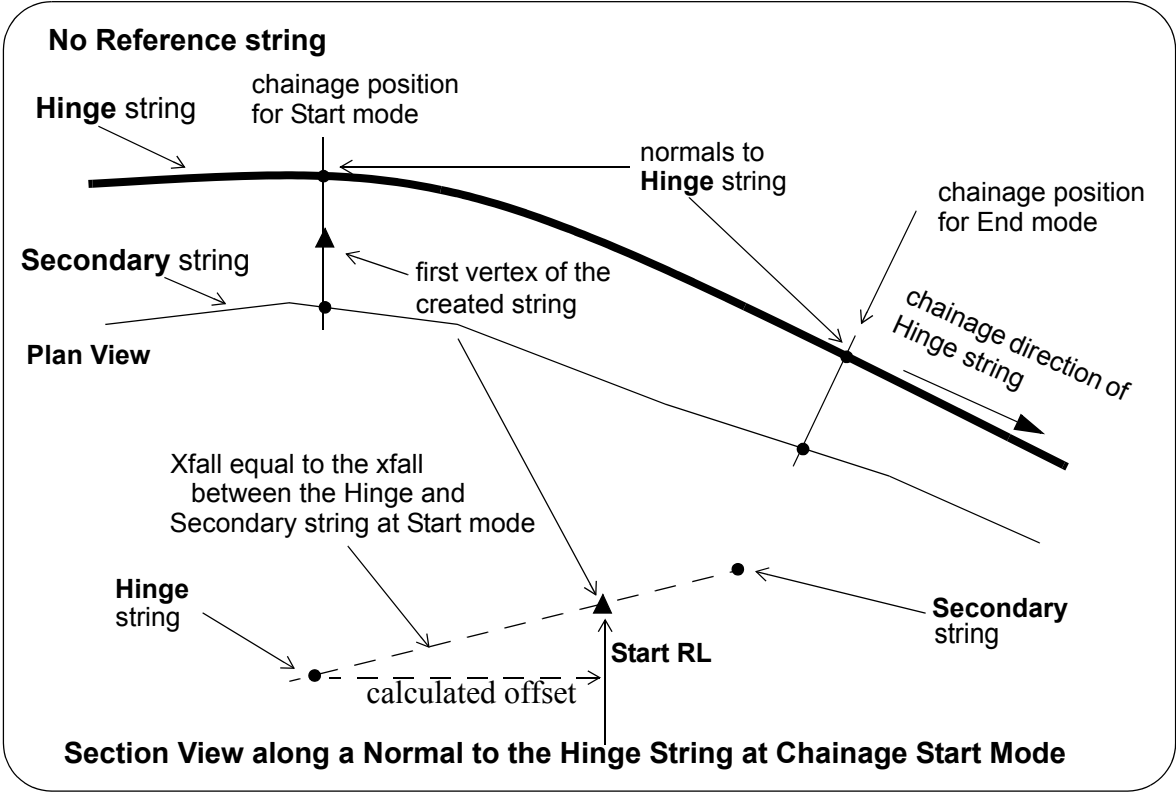


Reference String NOT Selected

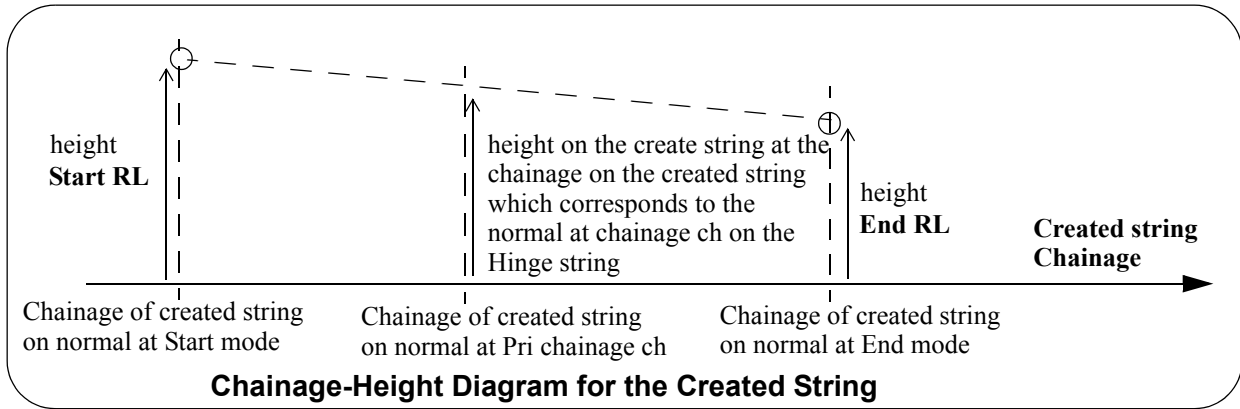
If a **Reference** string is **NOT** selected then the **Start mode** and **End Mode** refer to the **Hinge** string, and at the given chainage interval between the Start mode and the End mode, sections are taken **normal** (perpendicular) to the **Hinge string** and cutting the **Secondary string**. The vertices of the created string lie on these normals.

The **first vertex** of the created string is on the normal to the Hinge string at chainage **Start**

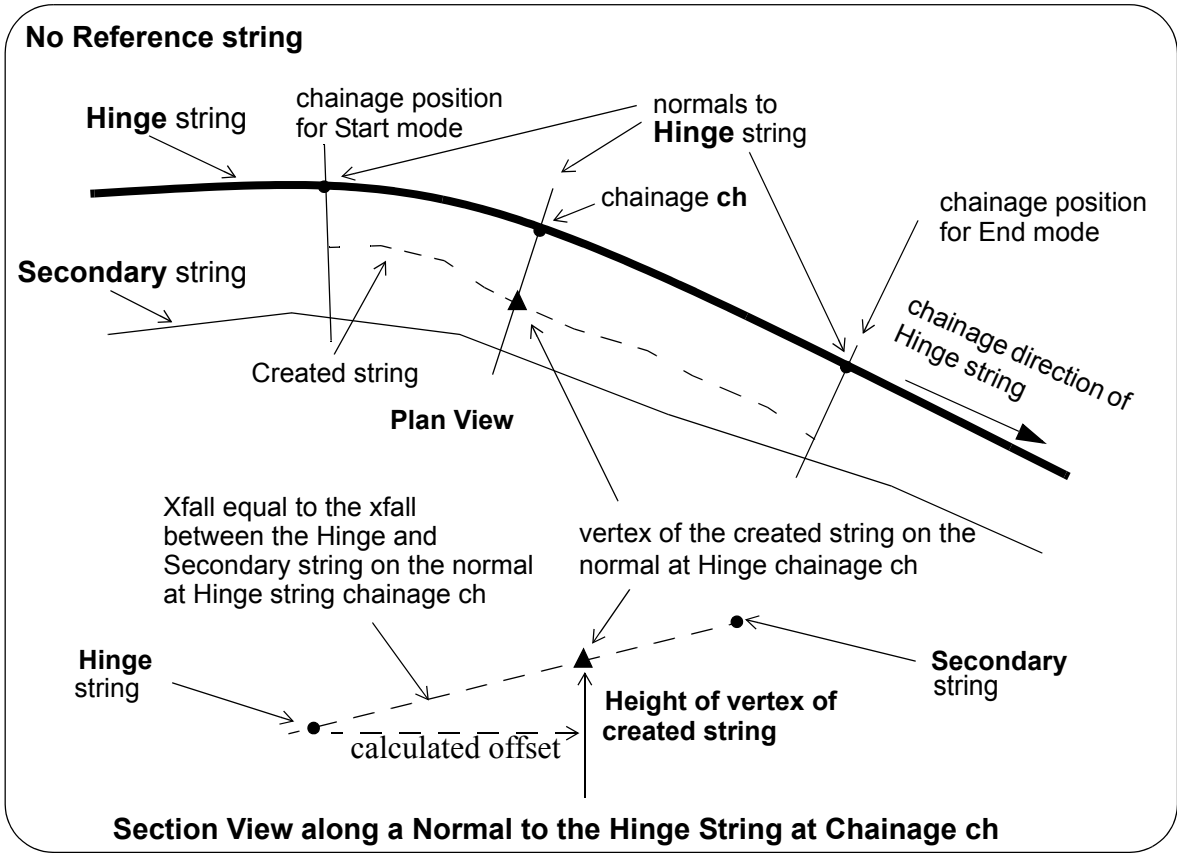
mode, with height **Start RL**. The plan position of the first vertex is constructed by going out from the hinge string with xfall equal to the **xfall between the Hinge and Secondary strings**, and for the required offset so that the height is **Start RL**.



The **heights** of the subsequent vertices of the created string are defined in (created string chainage, height) space, and lie on the line with **Start RL**, and ending with **End RL** on the normal at End mode.



The **plan** position of the vertex of the created string on the normal at Hinge chainage **ch** is constructed by going out from the hinge string with xfall equal to the **xfall between the Hinge and Secondary strings** at chainage **ch**, and for an offset so that the height is equal to the required height at chainage **ch**.



Continue to the next section [More Roads](#) or return to [Xfall Types](#) or [String by Xfall and Grade](#).

Sign Convention for Heights, Offsets and Xfalls in Create by Xfall and Grade

Because of the number of different ways **Create by Xfall and Grade** can be used, there is a strict sign convention followed for heights, offsets and xfalls.

In all cases, a positive height or delta height is **up** and a negative height or delta height is **down**.

For any string, there is a definition for the left and right of a string (see [Left and Right Side of a String](#)), and there is a definition of Offset and Xfall for just that string (see [Offset and Offset Distance for a String](#).)

However, **Create by Xfall and Grade** involves not just one string, but often two or three strings, so needs a standard sign convention of Offset and Xfall.

In **Create by Xfall and Grade**, if a Reference string is selected, then the direction of the Reference string is paramount and the sign convention for Offset and Xfall for a Hinge and Secondary string refers back to the Reference string. See [Offset and Xfall - When Controlled by a Reference String](#).

In **Create by Xfall and Grade**, if a Reference string is NOT selected, then the direction of the Hinge string is paramount and the sign convention for Offset and Xfall for the Hinge and Secondary string refer back to the Hinge string. See [Offset and Xfall - No Reference String and Controlled by Hinge String](#).

See [Height](#)

See [Left and Right Side of a String](#).

See [Offset and Offset Distance for a String](#)

See [Xfall for a String](#)

See [Offset and Xfall - When Controlled by a Reference String](#)

See [Offset and Xfall - No Reference String and Controlled by Hinge String](#)

Height

For any string a positive height or delta height is up and a negative height or delta height is down.

Left and Right Side of a String

For any string:

the **right** side of the string is defined to be to the right of the string when travelling down the string in the **direction of the increasing chainage**.

the **left** side of the string is defined to be to the left of the string when travelling down the string in the **direction of the increasing chainage**.

Offset and Offset Distance for a String

Offset at chainage *ch* on a particular string is plan distance measured normal (perpendicular) to the string, starting at zero on the string and **positive** when going out to the **right** of the string, and **negative** when going out to the **left** of the string. Offset is only a (x,y) plane distance. It does not involve z values.

The **offset distance** of a point (x,y,z) from a particular string is the plan distance from the point (x,y) to the position on the string calculated by dropping the point (x,y) perpendicularly in the (x,y) plane onto the string. The offset distance is positive if the point (x,y,z) is on the right of the string, and negative if the point (x,y,z) is on the left of the string.

Xfall for a String

For **Xfall**:

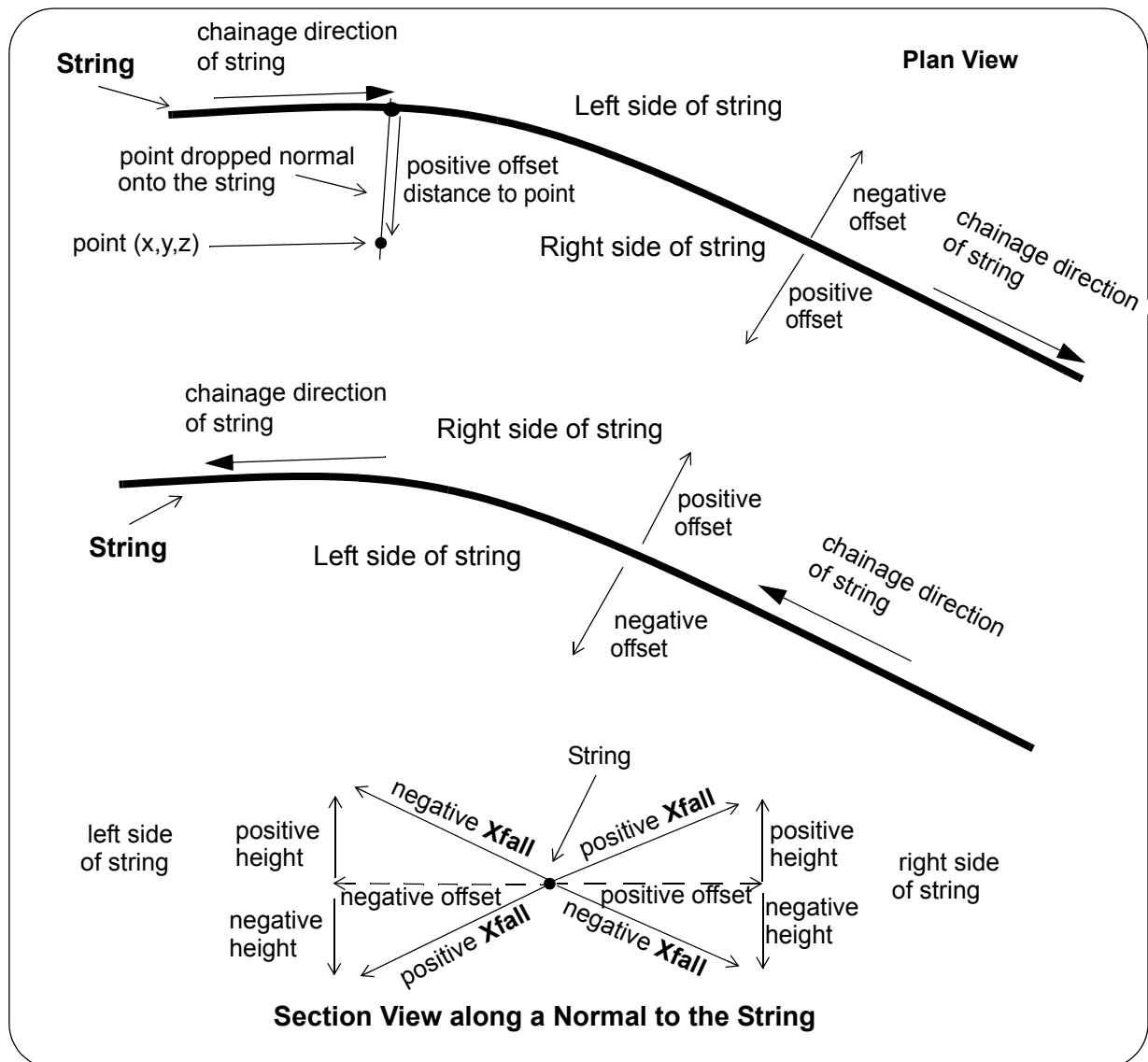
a **xfall** is **positive** when it is going up when measured in the direction of increasing positive

offset. That is, it is going up when going to the **right** of the string.

a **xfall** is **negative** when it is going down when measured in the direction of increasing positive offset. That is, it is going down when going to the **right** of the string.

a **xfall** is **negative** when it is going up in the direction of increasing negative offset (decreasing positive offset). That is, it is going up when going to the **left** of the string.

a **xfall** is **positive** when it is going down in the direction of increasing negative offset (decreasing positive offset). That is, it is going down when going to the **left** of the string.



Offset and Xfall - When Controlled by a Reference String

Offset

When a Reference string is selected, the **Reference** string is used to determine the sign convention for Offset and Xfall for the Hinge and Secondary strings. Hence the direction of the Hinge and Secondary strings are not used.

When a Reference string is selected:

an **offset** is **positive** when it is going in the direction of increasing positive offset with respect to the Reference string. That is, it is moving in the direction of going to the **right** of the

Reference string.

an **offset** is **negative** when it is going in the direction of increasing negative offset (decreasing positive offset) with respect to the Reference string. That is, it is moving in the direction of going to the **left** of the Reference string.

Xfall

When a Reference string is selected:

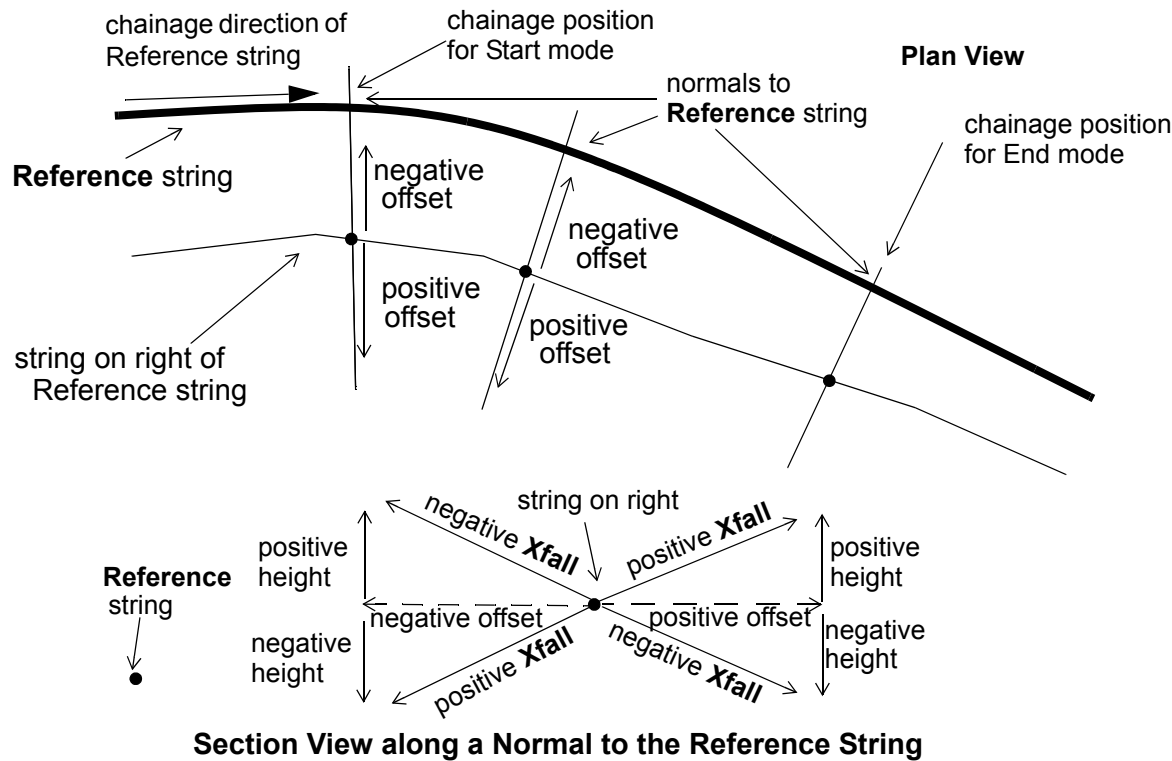
a **xfall** is **positive** when it is going up when measured in the direction of increasing positive offset with respect to the Reference string. That is, it is going up when moving in the direction of going to the **right** of the Reference string.

a **xfall** is **negative** when it is going down when measured in the direction of increasing positive offset with respect to the Reference string. That is, it is going down when moving in the direction of going to the **right** of the Reference string.

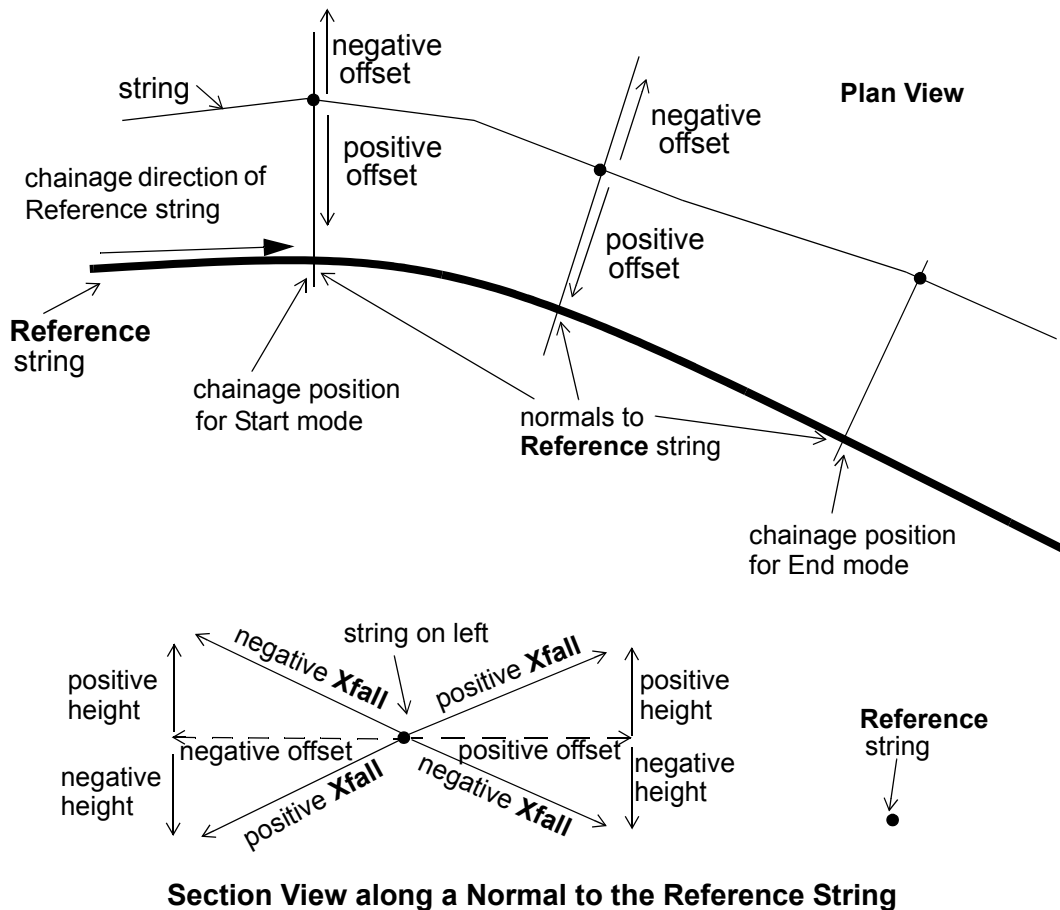
a **xfall** is **negative** when it is going up when measured in the direction of increasing negative offset (decreasing positive offset) with respect to the Reference string. That is, it is going up when moving in the direction of going to the **left** of the Reference string.

a **xfall** is **positive** when it is going down in the direction of increasing negative offset (decreasing positive offset) with respect to the Reference string. That is, it is going down when moving in the direction of going to the **left** of the Reference string.

String on Right of Reference String



String on Left of Reference String



Offset and Xfall - No Reference String and Controlled by Hinge String

When no Reference string is selected, then the Hinge string is used to determine the sign convention for Offset and Xfall for the Hinge and Secondary strings. Hence the direction of the Secondary strings is not used.

Offset

When no Reference string is selected then the Hinge string is used and:

an **offset** is **positive** when it is going in the direction of increasing positive offset with respect to the Hinge string. That is, it is moving in the direction of going to the **right** of the Hinge string.

an **offset** is **negative** when it is going in the direction of increasing negative offset (decreasing positive offset) with respect to the Hinge string. That is, it is moving in the direction of going to the **left** of the Hinge string.

Xfall

When no Reference string is selected then the Hinge string is used and:

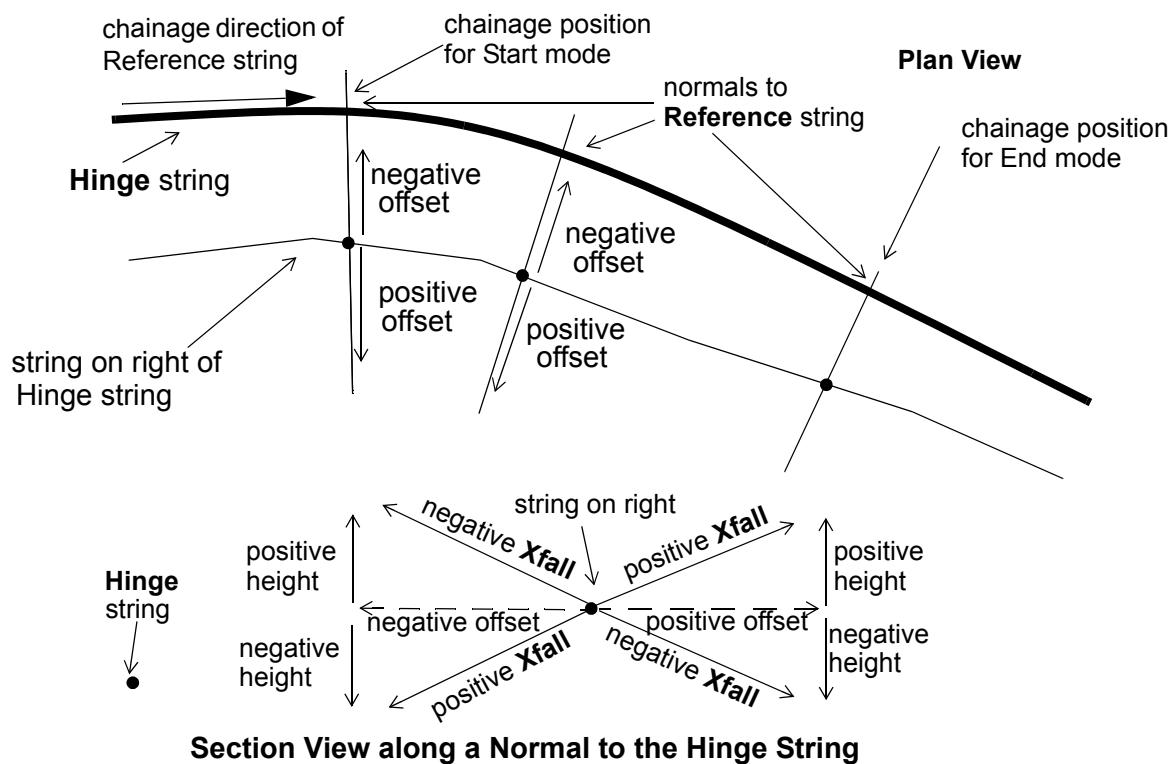
a **xfall** is **positive** when it is going up when measured in the direction of increasing positive offset with respect to the Hinge string. That is, it is going up when moving in the direction of going to the **right** of the Hinge string.

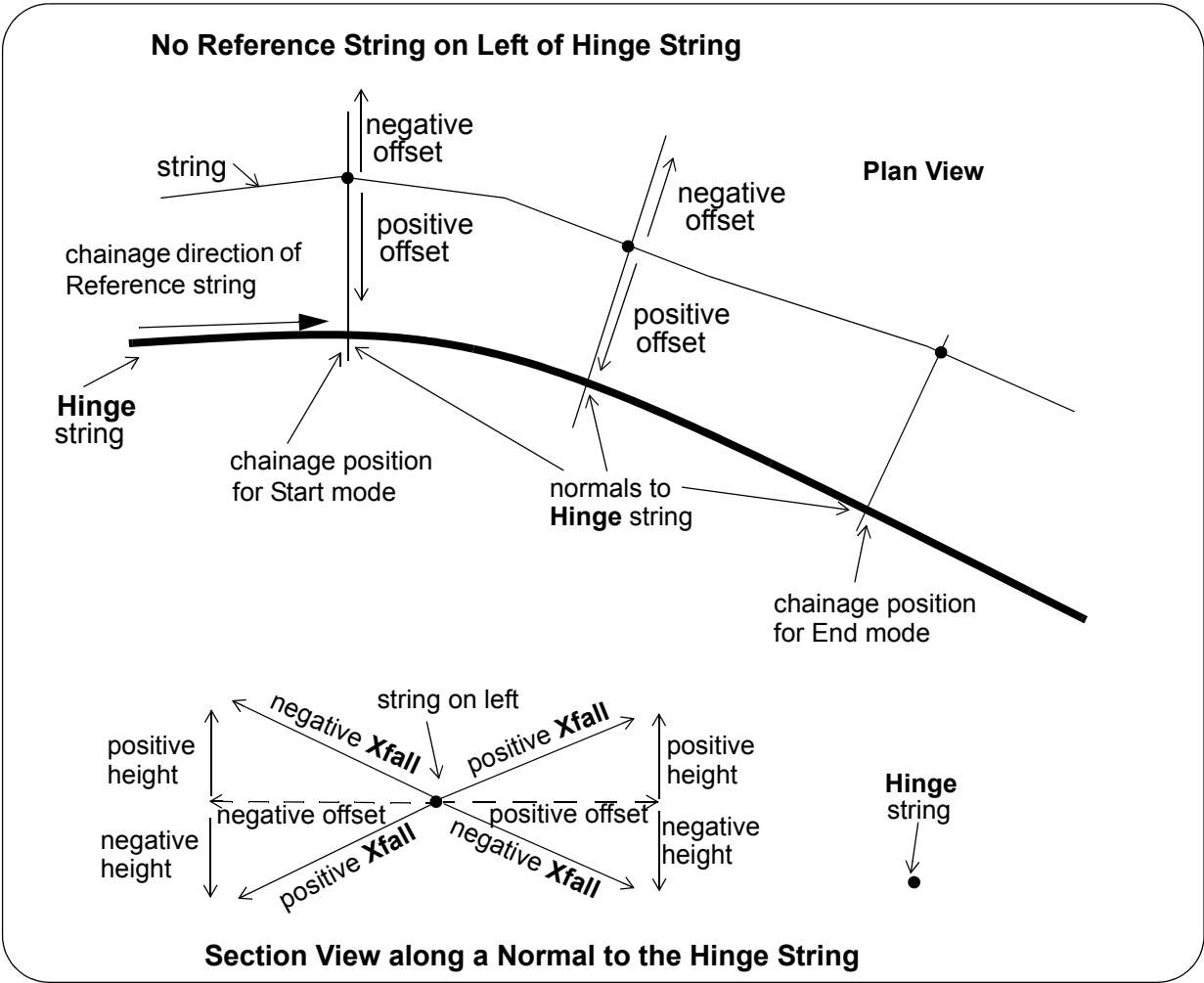
a **xfall** is **negative** when it is going down when measured in the direction of increasing positive offset with respect to the Hinge string. That is, it is going down when moving in the direction of going to the **right** of the Hinge string.

a **xfall** is **negative** when it is going up when measured in the direction of increasing negative offset (decreasing positive offset) with respect to the Hinge string. That is, it is going up when moving in the direction of going to the **left** of the Hinge string.

a **xfall** is **positive** when it is going down when measured in the direction of increasing negative offset (decreasing positive offset) with respect to the Hinge string. That is, it is going down when moving in the direction of going to the **left** of the Hinge string.

No Reference String - String on Right of Hinge String



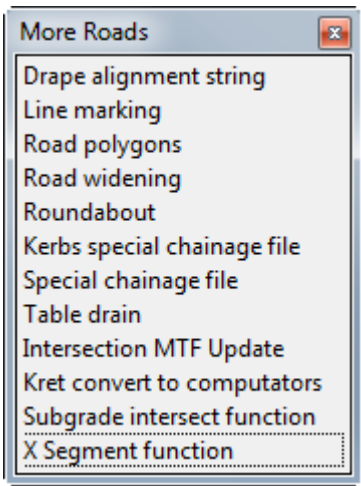


More Roads

Position of menu: **Design =>Roads =>More**

The **more roads** menu contains miscellaneous options to drape alignments, create line marking etc.

The **more roads** walk-right menu is



<i>Drape alignment string</i>	Drape Alignment (Macro) in the chapter Triangles
<i>Line marking</i>	Line Marking in the chapter Drafting
<i>Road polygons</i>	Polygons from Sections
<i>Road widening</i>	Road Widening with Minimum and Maximum Crossfall
<i>Roundabout</i>	Create Roundabout
<i>Kerbs special chainage file</i>	Kerb Special Chainage File
<i>Special chainage file</i>	Special Chainage File
<i>Table drain</i>	Table Drain - Intersection of Slopes from Two Strings
<i>Intersection MTF Update</i>	Intersection MTF Update
<i>Kret convert to computators</i>	Kret Convert to Computators
<i>Subgrade intersect function</i>	Subgrade Intersect Function
<i>X Segment function</i>	X Segment function

Drape Alignment

Position of option on menu: **Design =>Roads =>More =>Drape alignment string**

This option has already been documented in **Tins => Drape=> Drape align**.

For the option *Drape align*, please continue to the section [Drape Alignment \(Macro\)](#) in the chapter [Triangles](#).

Line Marking

Position of option on menu: **Design =>Roads =>More =>Line marking**

This option creates an alignment string for a traffic island and has already been documented as

Drafting => Line marking

For more information on the option *Line marking*, please continue to the section [Line Marking](#) in the chapter [Drafting](#).

Road Polygons

Position of option on menu: Design =>Roads =>More =>Road polygons

This option takes a model of cross-sections and create polygons between specified points on the cross-sections. This option is already documented under

Design => X-Sections =>Polygons from sections

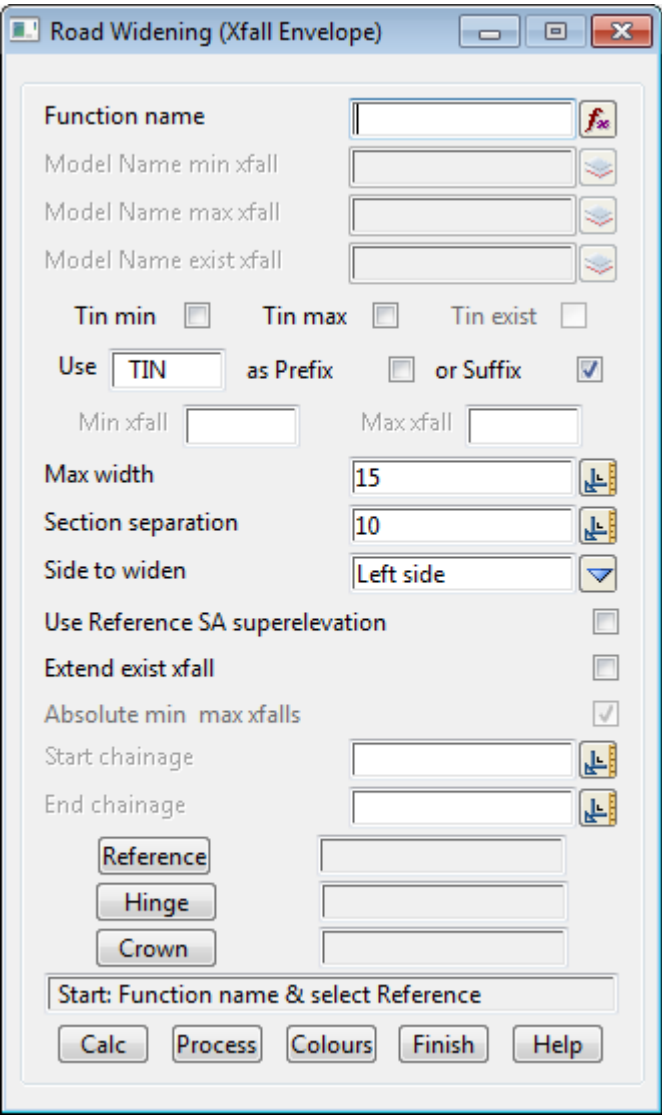
For more information on the option *Polygons from sections*, please go to the section [Polygons from Sections](#) in the this chapter

Road Widening with Minimum and Maximum Crossfall

Position of option on menu: Design =>Roads =>More =>Road widening

This option creates cross sections using the minimum and maximum cross-fall when going out from a selected reference string (usually and alignment string).

Adding these cross sections to a section view when designing the vertical geometry gives an envelope of maximum and minimum crossfall points.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Model name min/max xfall	model box		
<i>model for minimum/maximum cross fall cross sections.</i>			
Min xfall	input box	-2	
<i>minimum cross-fall (in %)</i>			
Max xfall	input box	-5	
<i>maximum cross-fall (in %)</i>			
Max width	input box	10	
<i>maximum width to go out at the minimum and maximum cross falls.</i>			
Chg interval	input box	20	

chainage interval for calculating the minimum and maximum cross fall cross sections.

View to add view box
view to add the created cross sections to.

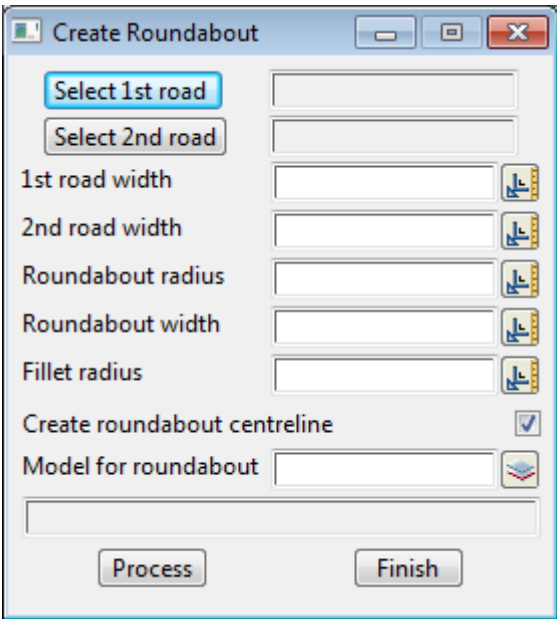
Reference string select
pick the reference string with direction for the x-sections to go out from. The cross sections are created to the right of the reference string as defined by the direction that the Reference string is picked. To get the sections on the other side, pick the reference string in the opposite direction.

Process button
create the minimum and maximum cross fall cross sections.

Create Roundabout

Position of option on menu: Design =>Roads =>More =>Roundabout

This option creates a roundabout between two alignment strings. The road widths for the two roads (the distance from the road centre line to the edge of the road) plus the roundabout radius (the distance from the centre of the roundabout to the centreline of the roundabout road), the roundabout width (added and subtracted from the roundabout width to give the inner and outer edges of the roundabout roadway - the inner and outer roundabout radii) and the fillet radius for the turning lanes.



The fields and buttons used in this panel have the following functions:

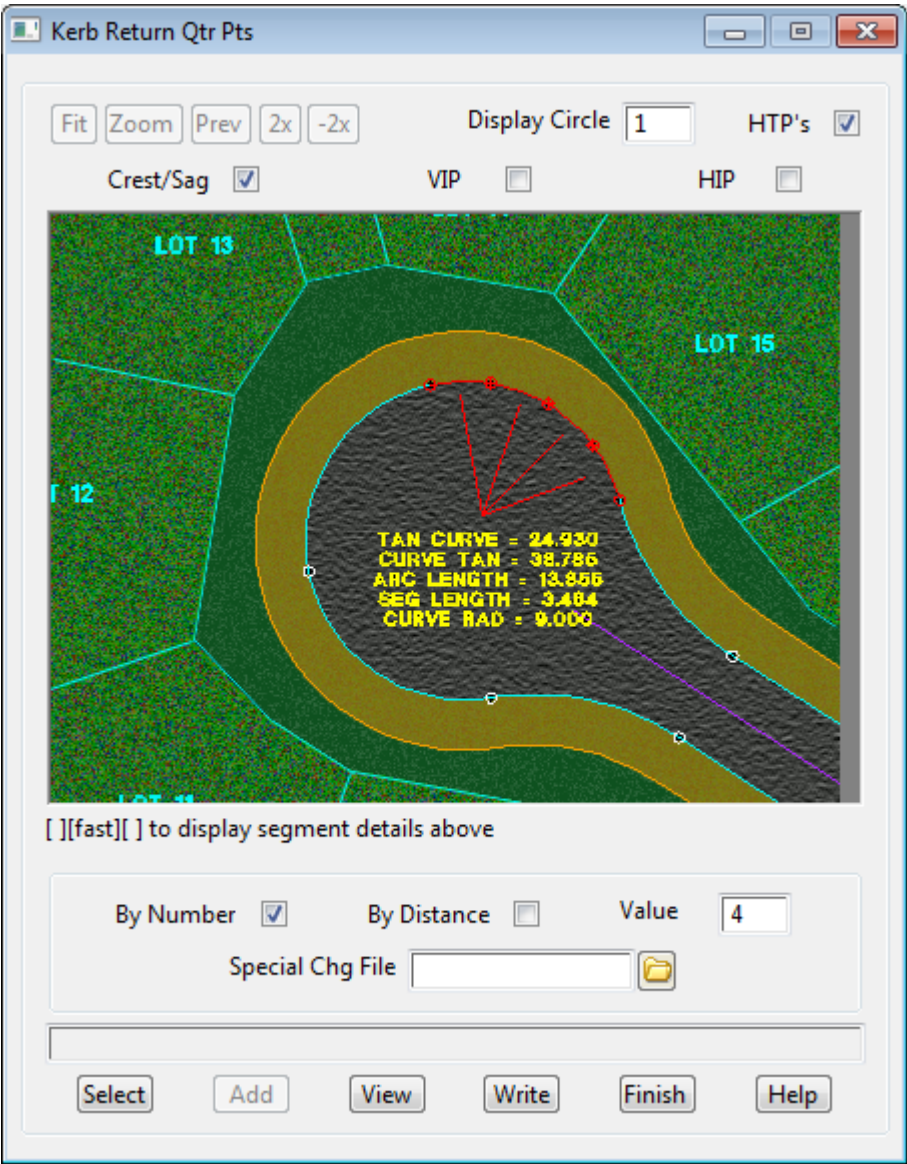
Field Description	Type	Defaults	Pop-Up
Select 1st road	string select		
<i>first alignment string for the roundabout.</i>			
Select 2nd road	string select		
<i>second alignment string for the roundabout.</i>			

1st road width	input box
<i>distance from the first alignment string to the edge of the road.</i>	
2nd road width	input box
<i>distance from the second alignment string to the edge of the road.</i>	
Roundabout radius	input box
<i>distance from the centre of the roundabout to the centreline of the roundabout road.</i>	
Roundabout width	input box
<i>distance to add and subtract from the roundabout width to give the inner and outer edges of the roundabout roadway (the roundabout radii).</i>	
Fillet radius	input box
<i>fillet radius of the turning lanes.</i>	
Create roundabout centreline	tick box
<i>if ticked, an alignment string is created for the centreline of the roundabout.</i>	
Model for roundabout	input box
<i>model for the created roundabout.</i>	
Process	button
<i>run the option.</i>	

Kerb Special Chainage File

Position of option on menu: **Design =>Roads =>More =>Kerb special chainage file**

This option is used to create a special chainage file for an alignment string. The method of creating the chainages is defined differently for each segment of the alignment string.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
By number	tick box	tick	
<i>if ticked, break the selected segment of the selected string into the number of pieces given by the Value field.</i>			
By distance	tick box		
<i>if ticked, break the selected segment of the selected string into pieces of length given by the Value field.</i>			
Value	tick box	tick	
<i>the number of pieces or the chainage length to break the selected segment into.</i>			
Special chg file	file box		

file to write chainages to

Select button

pick the alignment string to create chainages for. The alignment string is then drawn in the panel draw box. Each segment of the alignment string is selected by clicking MB over it in the panel draw box. The special chainages are then defined for that segment.

Add button

add the chainages given by number of length to the special chainages list

View button

view the special chainages list. The special chainages list can be edited

Write button

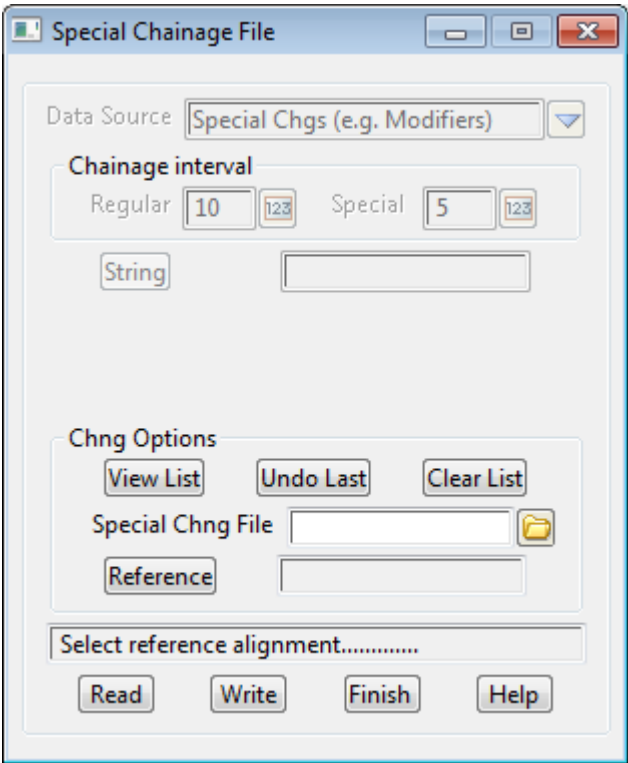
write the special chainages list to the special chainages file

Special Chainage File

Position of option on menu: Design =>Roads =>More =>Special chainage file

This option is used to create a special chainage file for an alignment string.

The chainages are created for a selected reference string but can then be defined by dropping strings and/or individual points onto the reference string.



The fields and buttons used in this panel have the following functions:

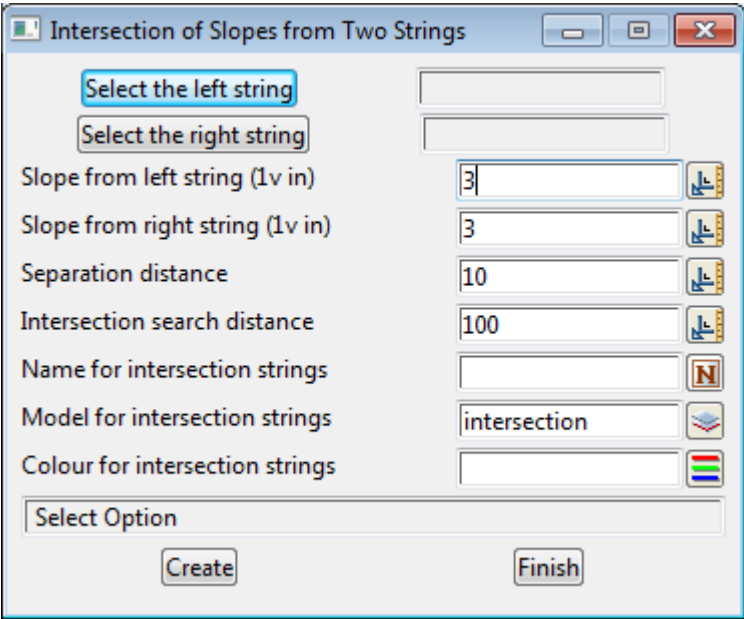
Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source	choice box	Special chainages	Special chainages String Points
Regular			
Special			
String	string select		
Reference	string select		
	<i>select the string to create special chainages for.</i>		
View list	button		
	<i>view the special chainage list.</i>		
Undo last	button		
	<i>undo the last set of created chainages.</i>		
Clear list	button		
	<i>clear the chainages list.</i>		
Special chng file	file box		
	<i>file to read chainages from or write chainages to</i>		
read	button		
	<i>read in a file of special chainages.</i>		
Write	button		
	<i>write the chainages list to the special chainages file.</i>		

Table Drain - Intersection of Slopes from Two Strings

Position of option on menu: Design =>Roads =>More =>Table drain

This option is used to create a string which is the intersection of slopes from a left and right string.



The fields and buttons used in this panel have the following functions.

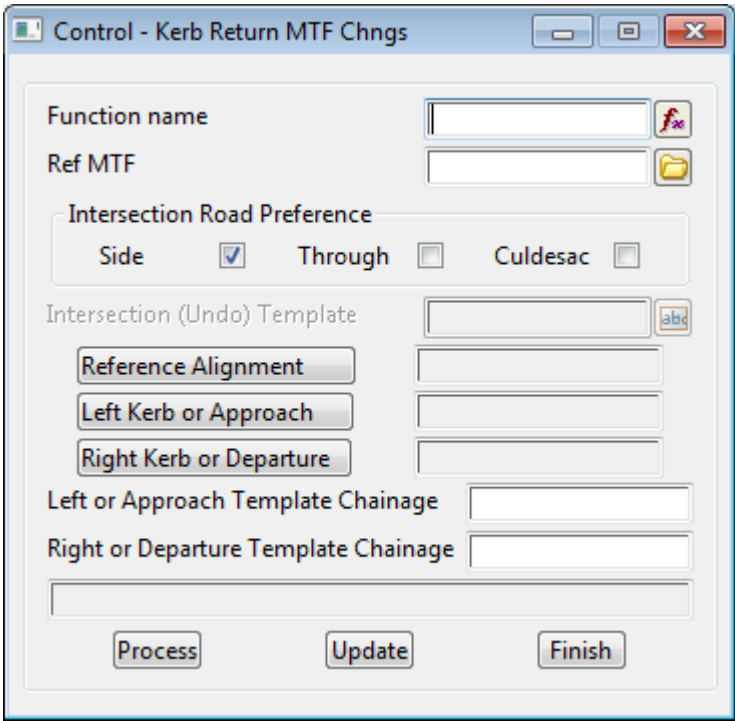
Field Description	Type	Defaults	Pop-Up
Select the left string <i>select the left hand side string</i>	string select		
Select the right string <i>select the right hand side string</i>	string select		
Cross fall (1 in...) from left/right string <i>batter slope to go from left/right string</i>	input box	3	
Separation distance <i>distance to create batter lines and find intersection</i>	input box	10	
Intersection search distance <i>distance to search to find an intersection of the batter slopes</i>	input box	100	
Name for intersection strings <i>name for the strings created by the intersection of the batters</i>	input box		
Model/Colour for intersection strings <i>model/colour for the intersection strings</i>		intersection	available models/colours

Create button

Create the intersection strings by battering of the left and right strings

Intersection MTF Update

Position of option on menu: Design =>Roads =>More =>Intersection MTF updates



The fields and buttons used in this panel have the following functions.

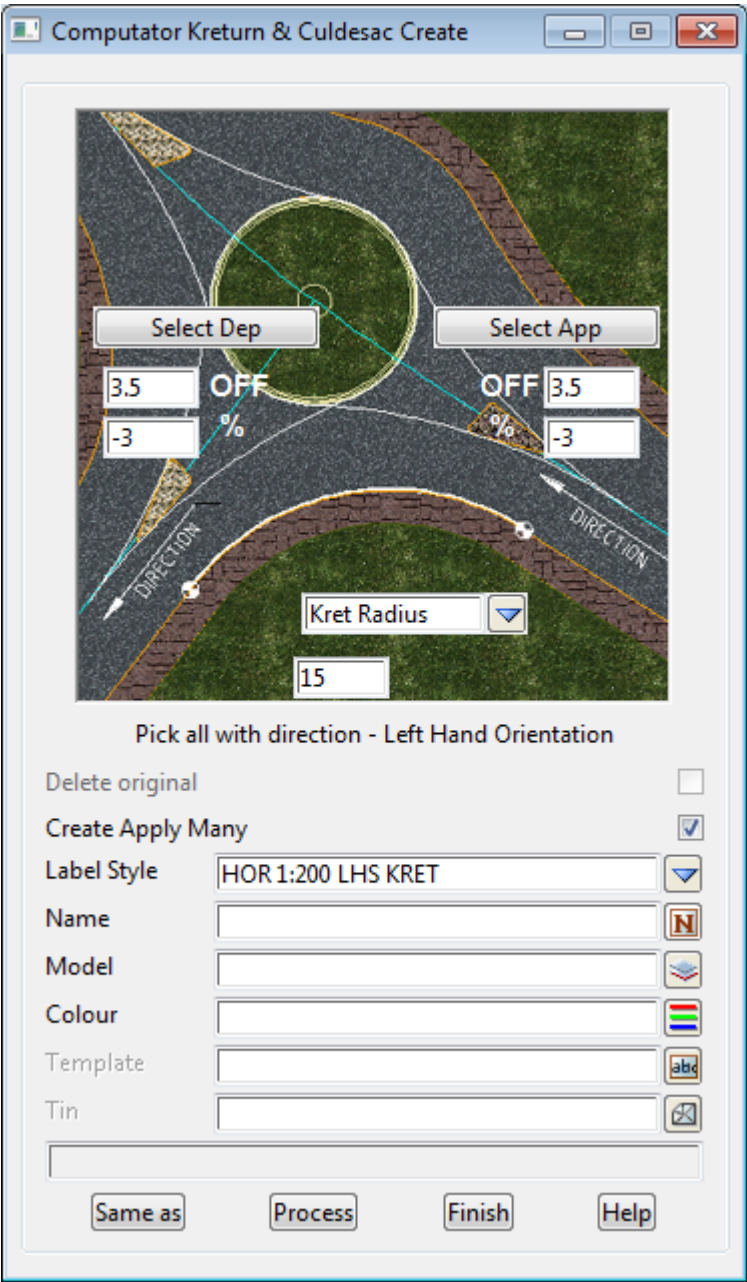
Field Description	Type	Defaults	Pop-Up
Function name <i>name for the function</i>	function box		available functions
Ref MTF	file box		*.mtf files
Reference <i>select the reference string</i>	string select		
Left kerb <i>select the left kerb string</i>	string select		
Right kerb <i>select the right kerb string</i>	string select		
Left template chainage	input		
Right template chainage	input		
Process	button		
Update	button		

Kret Convert to Computators

Position of option on menu: **Design =>Roads =>More =>Kret convert to computators**

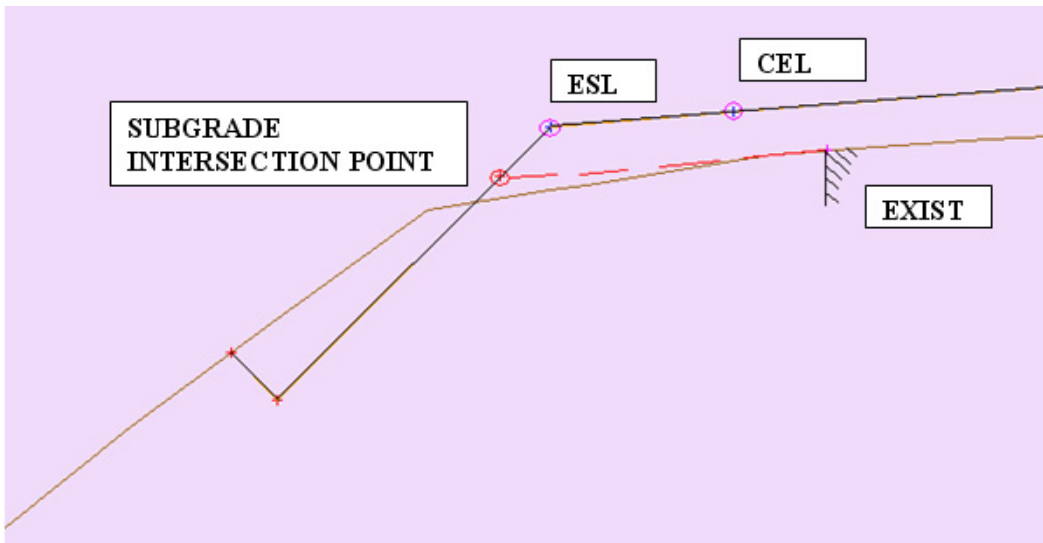
This section of documentation is a work in progress and will be updated in subsequent releases.

Selecting **Kret convert to computators**, displays the **Computator Kreturn & Culdesac Create** panel on the screen



Subgrade Intersect Function

Position of option on menu: **Design =>Roads =>More =>Subgrade Intersect Function**



Typical Application

1. Widening job where the intersection of the **design xfall** from the **existing road edge** and the **design batter** is required.
2. Design strings are **ESL** (shoulder edge) and **CEL** (carriageway edge)

This panel is used to create a string that could be used in the subgrade surface of a road design, in particular road widening.

The crossfall between these strings is calculated, and applied from the hinge string, offset by the subgrade depth, to intersect with the design tin specified.

The intersecting string created is placed on the selected model.

Selecting **Subgrade Intersect Function**, displays the **Subgrade Batter Intersection Create** panel.

Subgrade Batter Intersection Create

Function name

Name

Model

Colour

Design Tin

Start chainage

End chainage

Section separation

10

Side to search

Left Side

Special Chainage File

Subgrade depth

Copy Hinge

☐

Copy Strs 1 2

☐

Reference

Hinge

String 1

String 2

Process

Finish

Help

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Function name <i>name for use in recalc or chains</i>	function box		select function
Name <i>Name for string created</i>	name box		
Model <i>model name for string created</i>	model box		
Colour <i>Colour for string created</i>	input		available colours
Design Tin <i>Design surface above</i>	input		select tin
Start Chainage	measures box		At Point, Point to Point, String from Point, String

			to Point
	<i>Enter start chainage</i>		
End Chainage	measures box		At Point, Point to Point, String from Point, String to Point)
	<i>Enter end chainage</i>		
Section separation	measures box	10	At Point, Point to Point, String from Point, String to Point)
	<i>Distance along the reference to create points on the string created</i>		
Side to search	choice box	Left side	Left or Right
	<i>Side to search in relation to reference string</i>		
Special chainages	input		*.spf files
	<i>a file containing chainages, one per line, that are also used as chainages to create points on the string created</i>		
Subgrade Depth	measures box		At Point, Point to Point, String from Point, String to Point)
	<i>Depth below the design tin (in metres)</i>		
Copy Hinge	tick		
	<i>If ticked, makes a copy of the hinge in the model specified.</i>		
Copy Strs 1 2	tick		
	<i>If ticked, makes a copy at subgrade depth of strings 1 & 2 in the model specified.</i>		
Reference	string select		
	<i>Selection must be Super alignment, used to calculate chainages</i>		
Hinge string	string select		
	<i>selected as a start point for the subgrade (Existing bitumen or cutback strings e.g.)</i>		
String 1	string select		
	<i>string in the design surface, used in xfall calculations</i>		
String 2	string select		
	<i>string in the design surface, used in xfall calculations</i>		
Process	button		
	<i>runs the option</i>		

X Segment function

Position of option on menu: **Design =>Roads =>More =>X Segment function**

This option is used for the removal of segments on design and boxing cross sections.

Typically it is used where road widening has been applied to both sides of a roadway.

Design sections in this case would be created using "Cuts through strings", where the two widenings are now joined.

The design may also have a small overlay on the existing roadway and boxing definitions have been defined for each side of the widening.

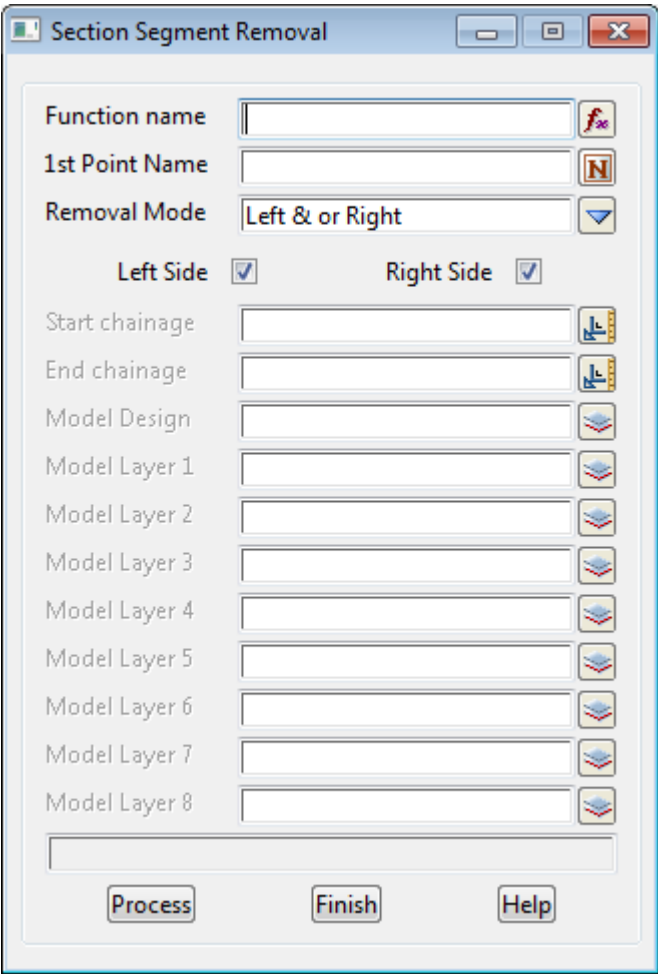
In each case again, the sections, especially the boxing subgrade, are joined.

The sections are converted to super strings and segments that need to be removed are defined at vertex points by name.

A point name is entered as the "First Point" and segments are defined as either left or right of that point or a second point along the section can be specified.

A "Design" section model can be entered along with multiple boxing models...Layer1, Layer2, Layer3 etc.

Selecting X Segment function, displays the **Section Segment Removal** panel on the screen



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Function Name	input		
<i>name for use in recalc or chains</i>			
1st point name	input		
<i>Point name on design section</i>			
Removal Mode	choice box	Left & or Right	Left & or Right, 2nd Point
<i>Removal type left or right of first point or to a second point</i>			
Left Side	tick box		
Right Side	tick box		
Start Chainage	real		
<i>if blank, then all the sections are used</i>			
End Chainage	real		
<i>if blank, then all the sections are used</i>			
Model Design	input		
<i>existing model name of design sections</i>			
Model Layer (n)	input		
<i>existing model name of boxing sections</i>			
Process	button		
<i>runs the option</i>			



Components

Position of menu: Design =>Roads =>Components

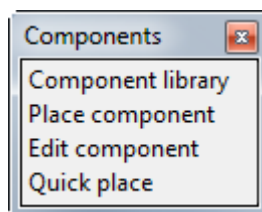
Components are parametric road objects that can be placed on existing design strings to generate complex geometry. This includes geometry for:

- Intersections
- Roundabouts
- Exit Ramps
- Entry Ramps
- Bus Bays
- Parking Bays
- CHR Intersections
- Culdesacs

Each component has a number of parameters that may be modified before and after they are placed to meet your requirements.

Components are stored in a library. Every time you place a component, you will reference the library definition. Once it is placed, if you wish to customise only that placed instance of the component, you may detach it from the library so that changes to the component will not affect the library component and vice versa.

The **Components** walk-right menu is



For the option *Component library*, go to

Place component

Edit component

Quick place

[Component Library](#)

[Place a Component](#)

[Edit a Placed Component](#)

[Component Quick Place](#)

For information on *Editing Components* go to

Specific Component Types

[Editing Components](#)

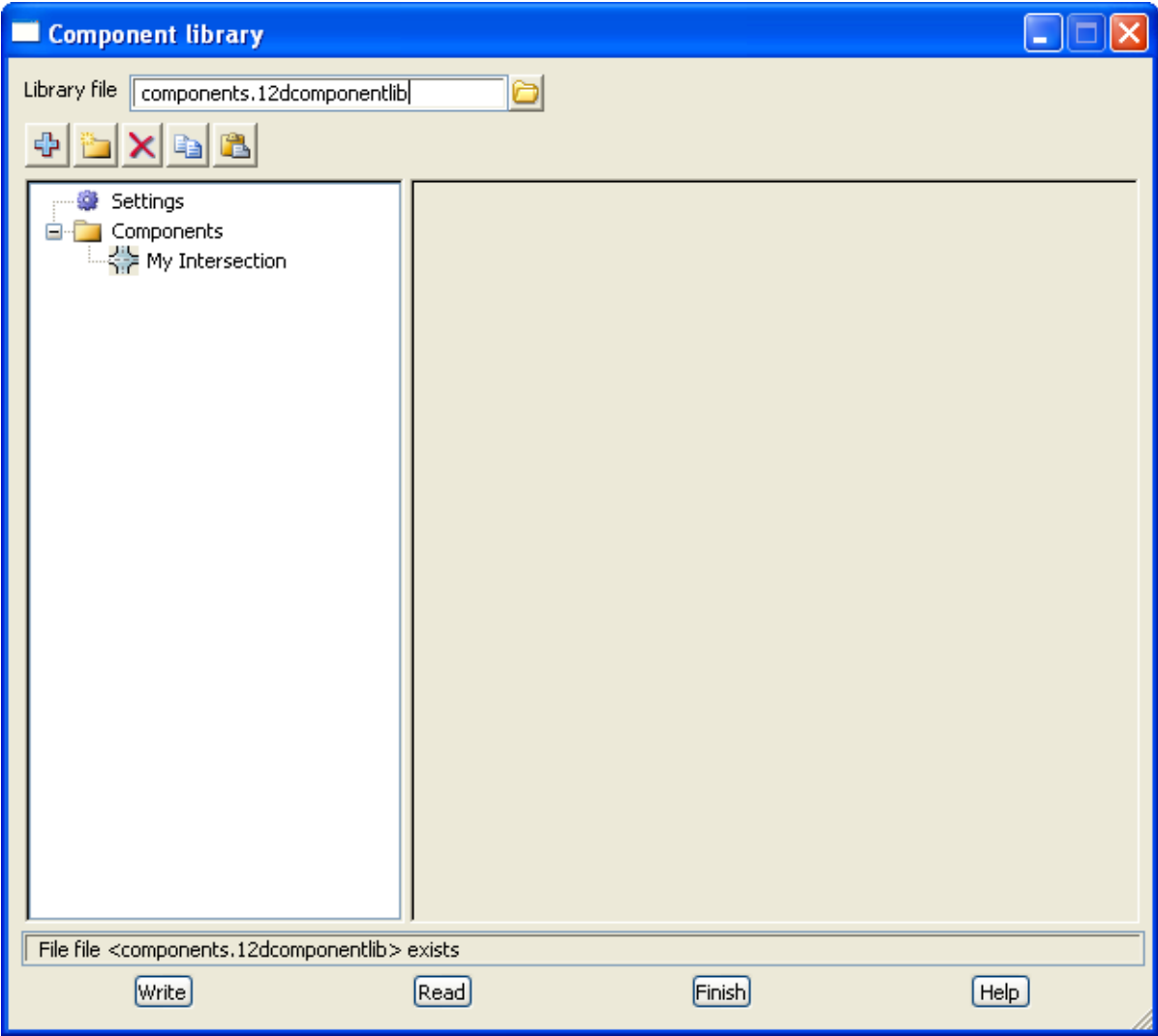
[Component Types](#)

Component Library

Position of option on menu: Design =>Roads =>Components => **Component library**

This panel is used to define the components in your current project. Components are initially based off predefined 'base' components (see [Base component](#)). Once you add a base or template component to your library, you may customise it as you require.

Selecting **Component library** brings up the **Component library** panel.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Library file	file		
<i>the current component library you are editing</i>			

 *Inserts a new component (See [New Component](#))*

Folder
Creates a new folder, for the purposes of grouping

Delete
Deletes the selected component or folder

Copy
copies the selected component or folder

Paste

pastes the selected component or folder at the current selected level

Write

writes the library

Read

reads the library

Nodes

Settings

This node defines library wide settings. Whenever you use a component from this library, these settings will apply.

Component String Naming

Each string generated as part of the component can be named. They can either be set to something static or they can be dynamically generated using a number of variables as part of the name field.

The variables generally concern which side of the road the string is being created for, whether it was the approach or departure or the '**source**' or '**destination**'.

For example, in a left turn, the '**source**' is the string a driver is leaving from and the '**destination**' is the string entering.

\$source_name - the name of the source string after the **source string name mask** is applied (see [Source String Name Mask](#))

\$destination_name - the name of the destination string after the **source string name mask** is applied (see [Source String Name Mask](#))

\$full_source_name - the full name of the source string

\$full_destination_name - the full name of the destination string

\$source_approach_or_departure - '**approach**' if we are generating strings for the approach of the source string, otherwise '**departure**'

\$destination_approach_or_departure - '**approach**' if we are generating strings for the approach of the destination string, otherwise '**departure**'

\$source_side - the side of the road we are currently generating strings for on the source string

\$destination_side - the side of the road we are currently generating strings for on the destination string

\$count[1-9] - allows up to 9 counters, of the form **%count1**, **\$count2** ... **\$count9**

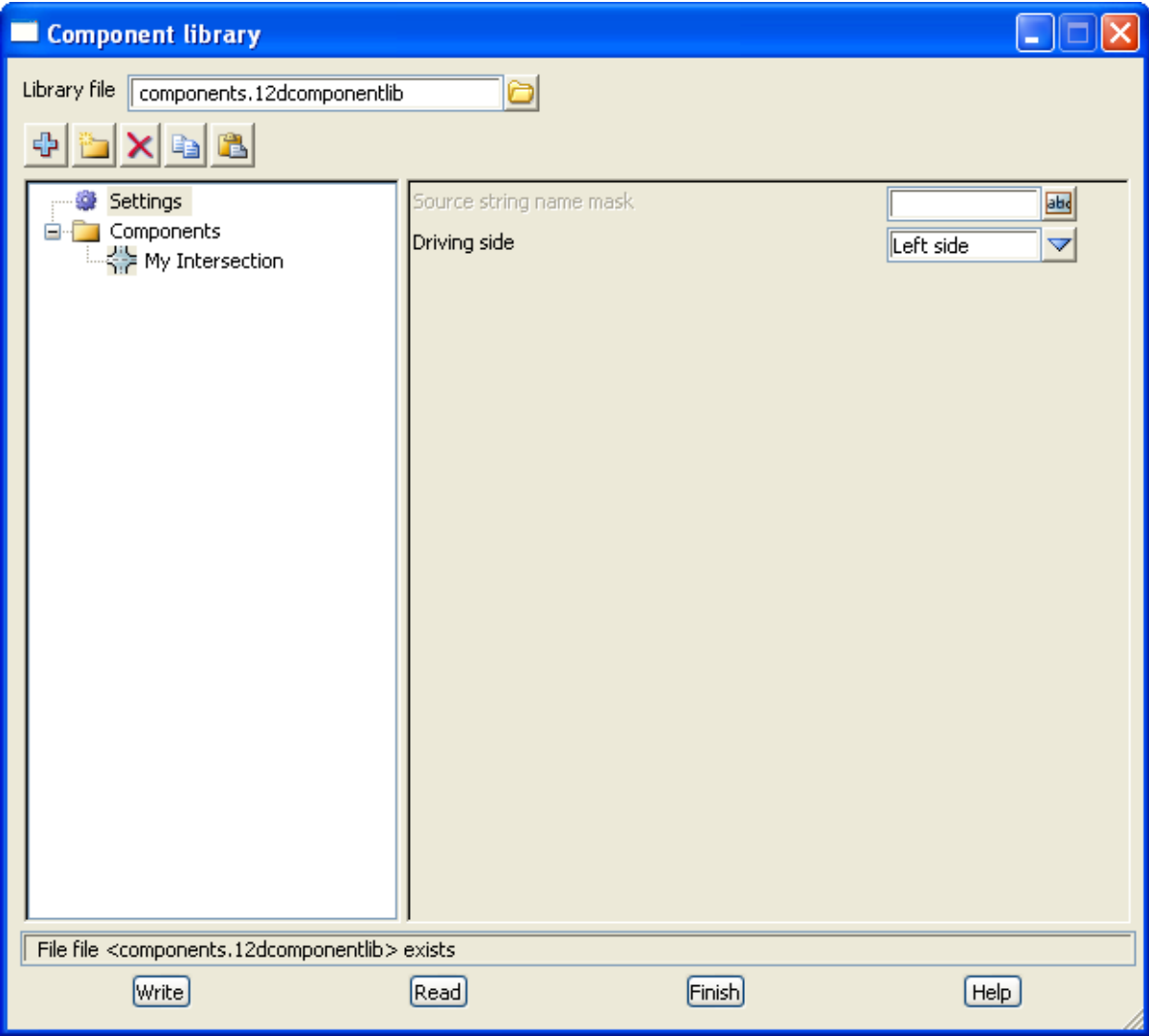
Each time this counter variable is seen, it's value is incremented by 1.

Source String Name Mask

The **source string name mask** is defined in the **Component Library**. It allows you to extract part of a centreline string name. This is quite useful to maintain your own naming conventions.

For example, if you have a centreline named **MC01** and you wish to name your left turn **MK01**, the part of the name that is common is **01**.

If you set the source string name mask to **MC***, the name used when you use the **\$source_name** or **\$destination_name** variables will be everything represented by the *****. In this case, **01**.

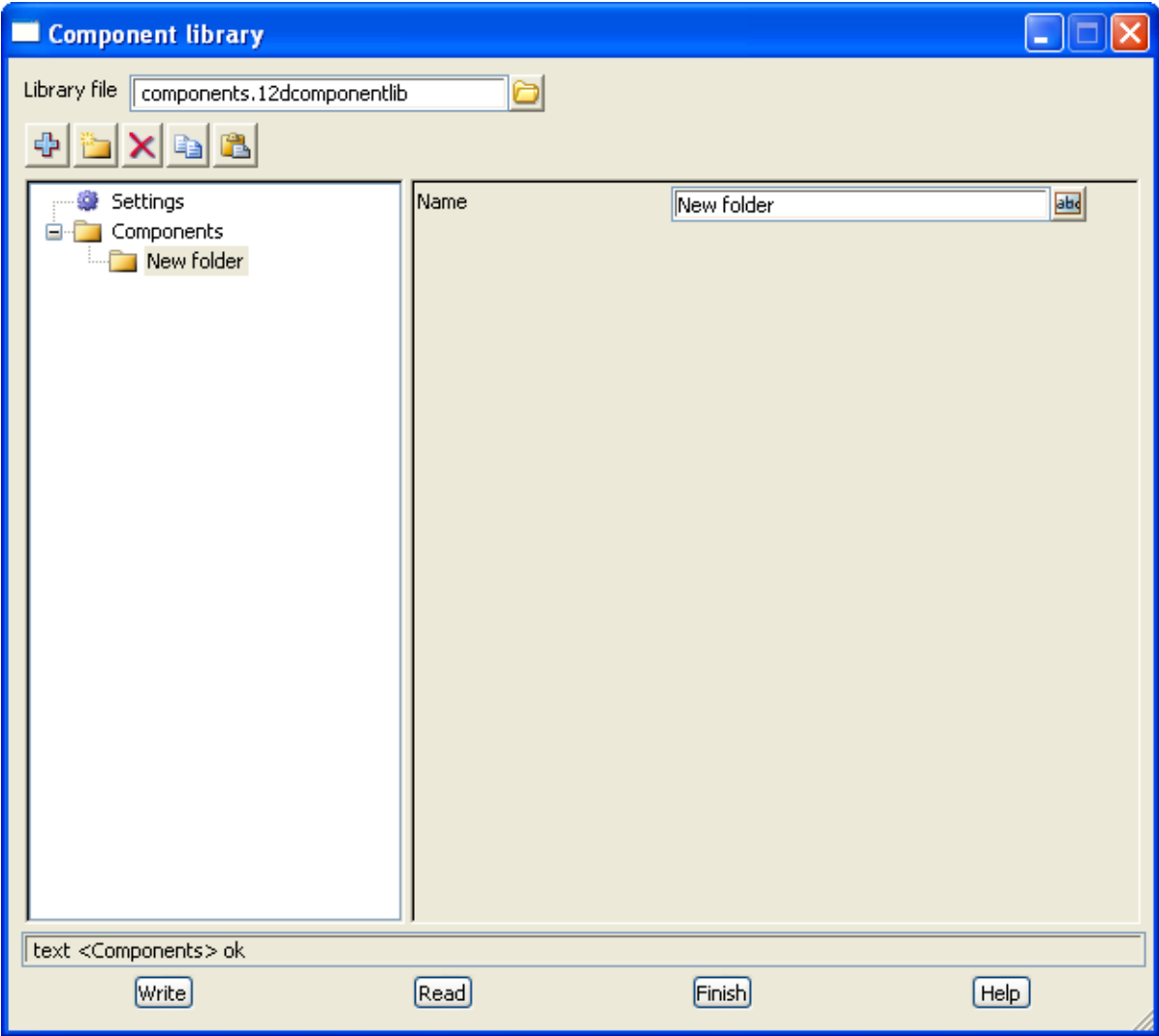


The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Source string name mask			
<i>an optional field used to assist in naming individual strings created as part of a component. See Source String Name Mask for more information.</i>			
Driving side	choice box	Left side	Left side, Right side
<i>whether or not the component should be created for left or right hand side driving.</i>			

Folder Nodes

Folders can be created to group components. You can create a folder and give it whatever name you wish.



The fields and buttons used in this panel have the following functions:

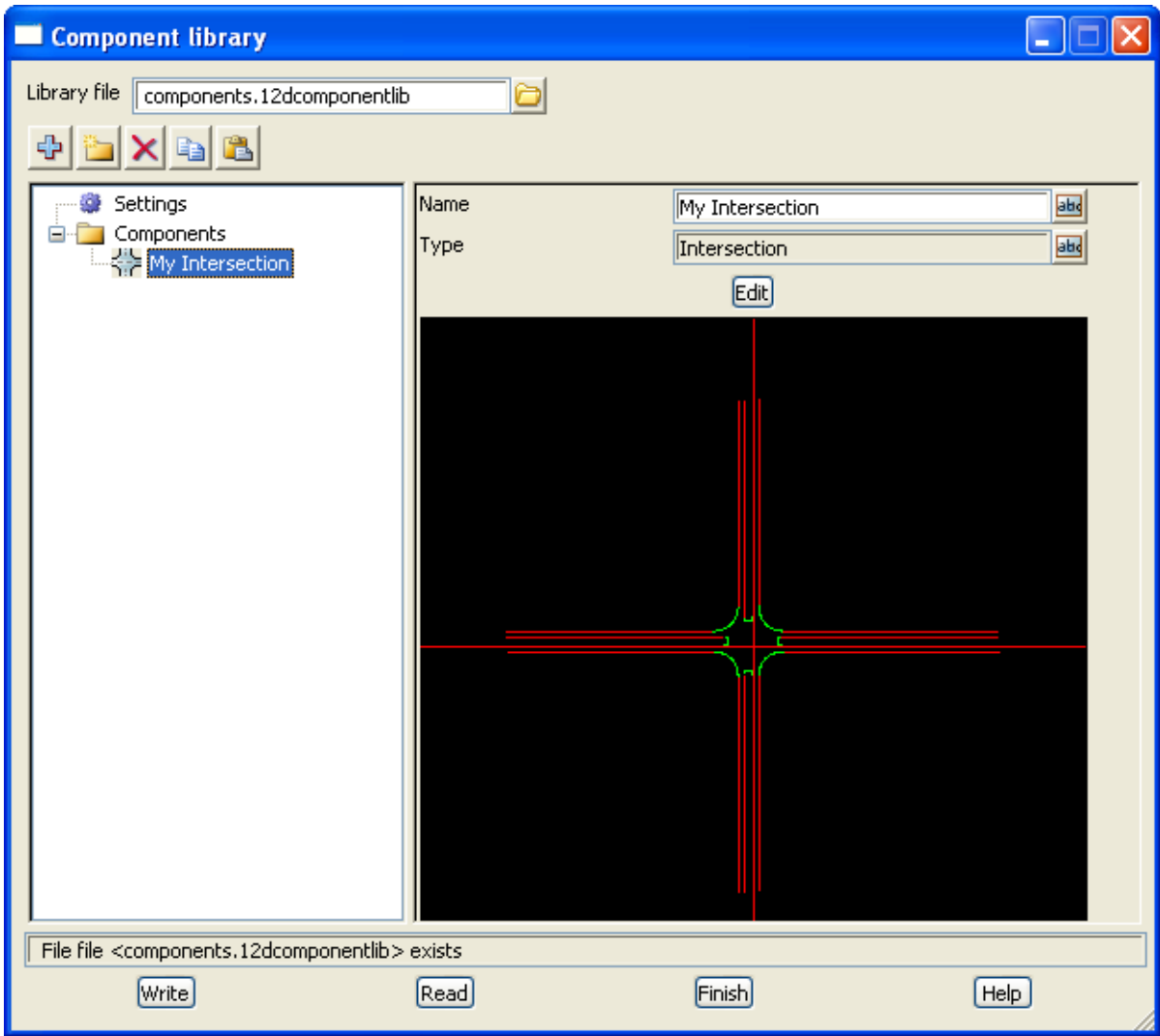
Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Name

the name of the folder

Components Node

Each component node displays the name and type of the component, as well as what it will look like on a theoretical set of centreline strings. The generated geometry will change when you place it depending on the selected strings but this view gives you an idea of what it may look like.

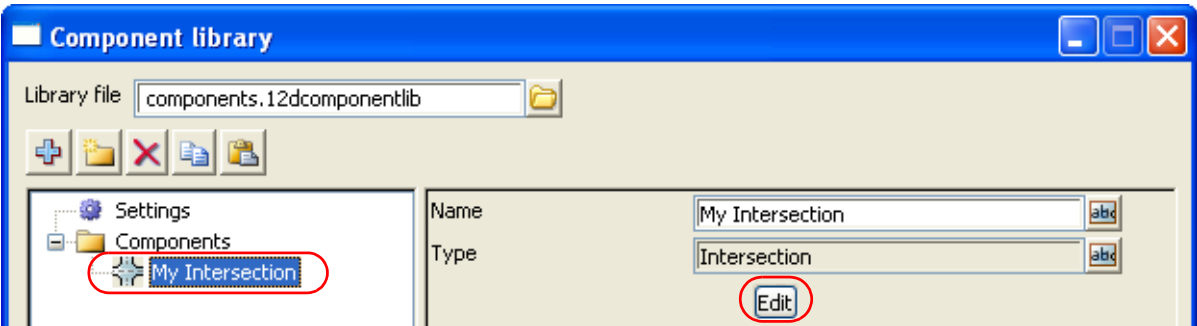


The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Name <i>the name of the component</i>			
-------------------------------------------------	--	--	--

Type <i>the type of the component - read only</i>			
-------------------------------------------------------------	--	--	--




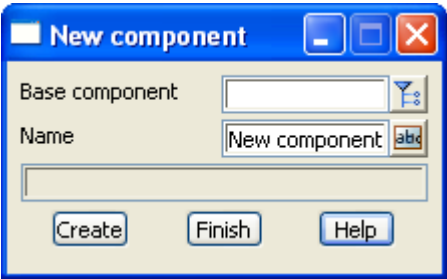
Edit button

edits the component. For more information please see [Editing in the Component library - Component Editor](#)

New Component

This panel allows you to create a new component from a base component. A base component may be from either one of your own library components, or a component shipped with **12d Model**.

Selecting  brings up the **New component** panel.

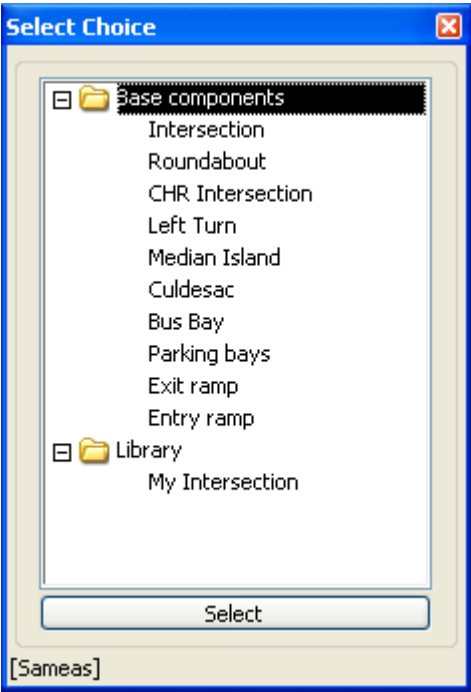


The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Base component

the component you wish your component to be based on



This may be either a **Base Component**, as shipped by 12d, or one from your **Library**.

For information on **Component Types** please go to the section [Component Types](#)

Name

the name of your component, which must be unique

Create

button

creates the component and adds it to the library

Component Types

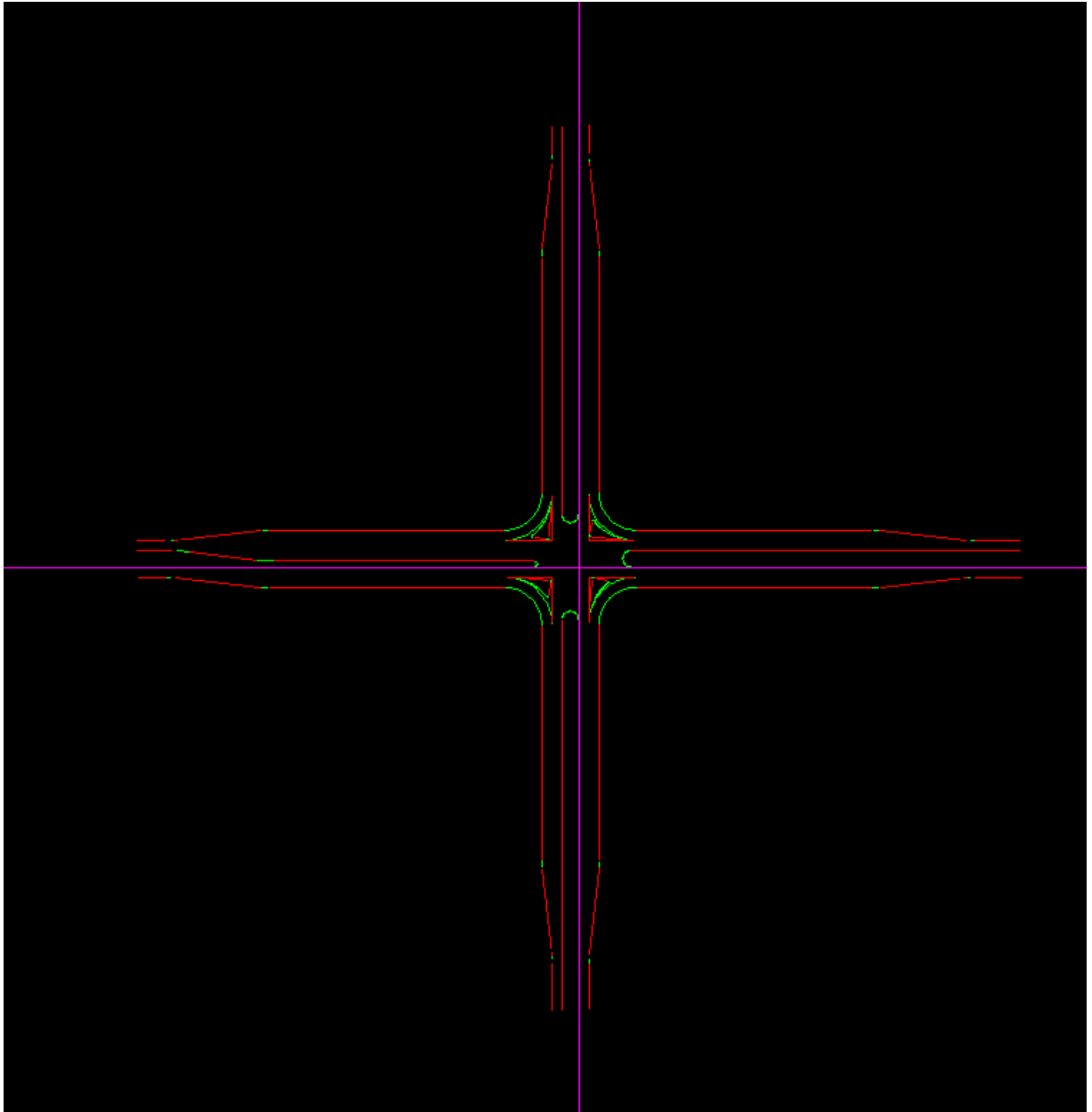
For Intersection, go to	Intersection
Roundabout	Roundabout
CHR Intersection	CHR Intersection
Left Turn	Left Turn
Median Island	Median Island
Culdesac	Culdesac
Bus Bay	Bus Bay
Parking bays	Parking Bays
Exit ramp	Exit Ramp
Entry ramp	Entry Ramp

Intersection

An intersection component can be edited via the [Component Library](#) or by editing the definition of a placed component. While an intersection is defined as a crossroad, the intersection will automatically close off any leg of the intersection that does not have valid strings.

For information on *Defining an Intersection* see
Placing Intersections

[Defining an Intersection](#)
[Placing Intersections](#)



Defining an Intersection

An intersection is broken into two roads - the **Major road** and the **Minor road**.
Each road, major or minor, may have an approach (the section of the road leading in to the intersection) and the departure (the section of the road leading away from the intersection).
The approach and departure for both the Major and Minor Road are defined by the same set of parameters.

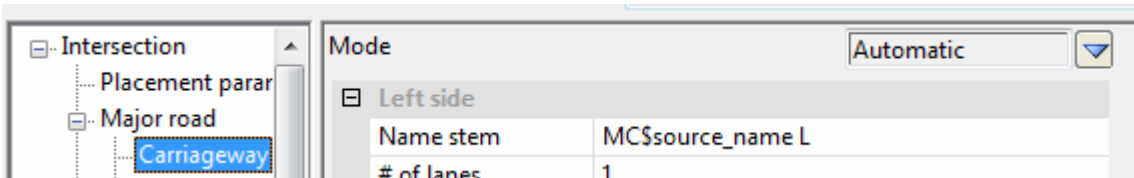
For information on:
Placement Parameters Node see [Placement Parameters](#)
Carriageway Node [Carriageway Node](#)
Approach / Departure => Left turn Node [Approach / Departure =>Left turn](#)
Approach / Departure => Left Turn =>Kerb Return Node [Approach / Departure =>Left Turn
=>Kerb Return Node](#)
Approach / Departure => Median / Right Turn Node [Approach / Departure =>Median / Right
Turn Node](#)

Placement Parameters

This node is only available when editing a placed component. For more information on the fields displayed here, see the section on [Placing Intersections](#).

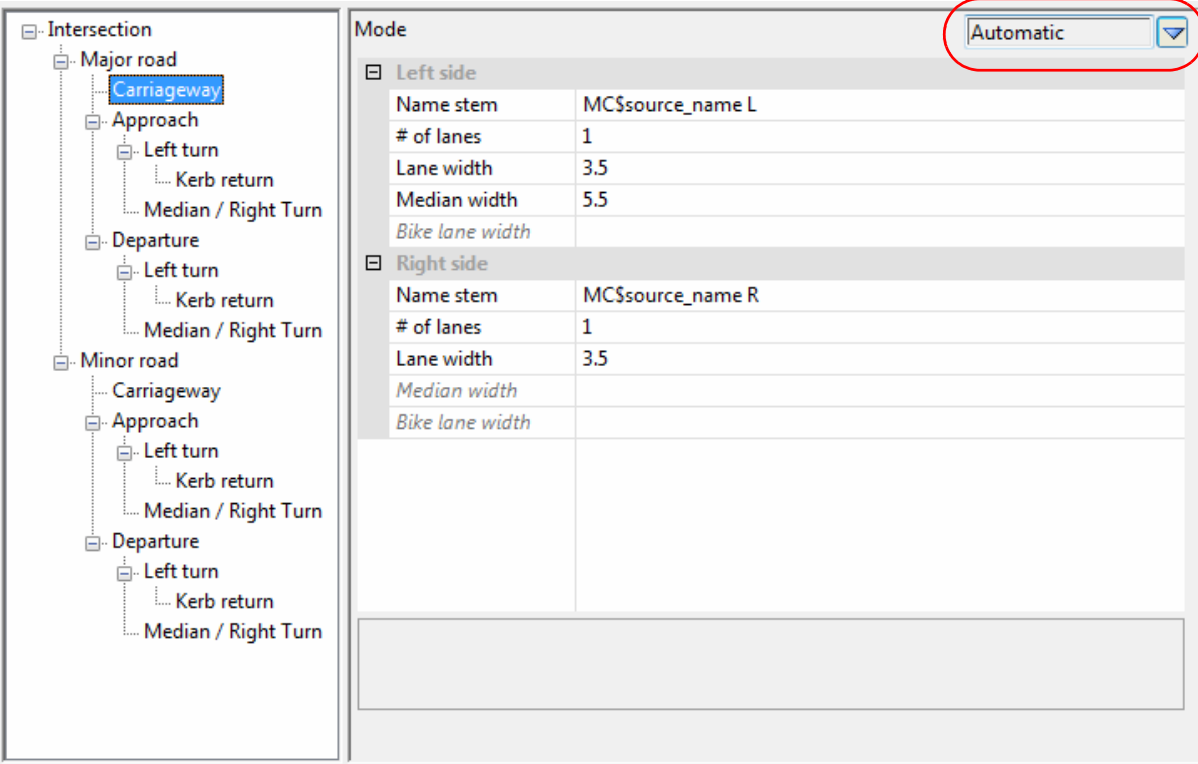
Carriageway Node

This node defines the carriageway of the road, in terms of the number of lanes and the type of lanes.
There are two modes for defining the carriageway: [Automatic Mode](#) and [Manual Mode](#).
Note that regardless of the mode, you can only define a median on one side of the carriageway.
If you place your intersection using dual carriageways, the width will be ignored.



Automatic Mode

Automatic mode does not allow you to define names for each lane of your carriageway and only allows a basic layout. It is the simplest and quickest way to define a carriageway.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Left Side

Name Stem

the name to apply to each created lane on the left side of the carriageway

of lanes

the number of lanes to create on the left side of the carriageway

Lane width

the lane width for each lane on the left side of the carriageway

Median width

the width for an optional median on the left side of the carriageway.

Bike lane width

the width for an optional bike lane on the left side of the median.

Right Side

Name Stem

the name to apply to each created lane on the right side of the carriageway

of lanes

the number of lanes to create on the right side of the carriageway

Lane width

the lane width for each lane on the right side of the carriageway

Median width

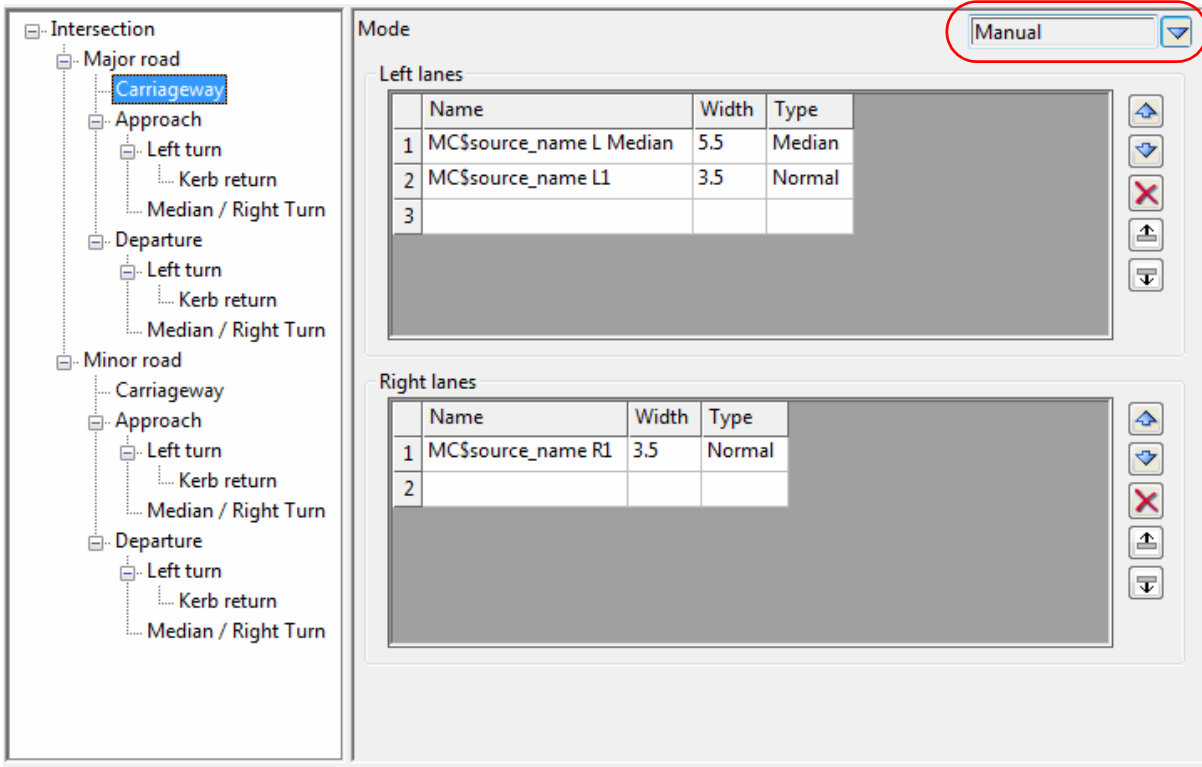
the width for an optional median on the right side of the carriageway.

Bike lane width

the width for an optional bike lane on the right side of the median

Manual Mode

Manual mode allows you to define the carriageway in more detail, by specifying each lane individually, along with its width and type.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Left Lanes Grid			
Name			
the name of the lane on the left side			
Width			

the width of the lane

Type

the type of lane (Normal, Bike or Median)

Right Lanes Grid**Name**

the name of the lane on the right side

Width

the width of the lane

Type

the type of lane (Normal, Bike or Median)

Approach / Departure =>Left turn

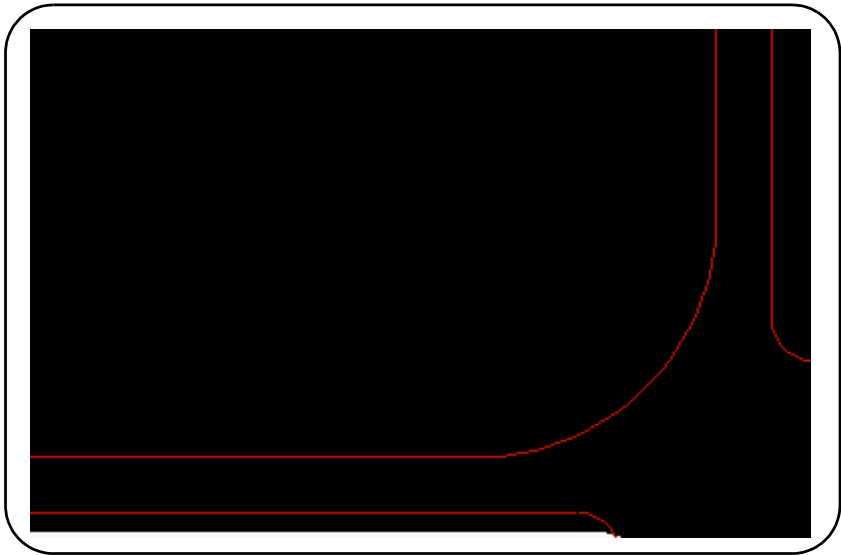
This node defines the **Left turn** of an intersection. If you are in Right Side driving mode, this will be called **Right Turn**.

There are three types of turns currently available:

1. Stand up - for more information go to [Stand Up Turn](#)
2. Free - for more information go to [Free Turn](#)
3. High entry - for more information go to [High Entry Turn](#)

Both **Stand up** and **Free** turns allow you to define the type of kerb return being used.

Stand Up Turn



Intersection

Major road

Carriageway

Approach

Left turn

Kerb return

Median / Right Turn

Turn details

Turn name	MK\$source_name
Turn type	Stand up

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Turn name			
<i>the name to use for created geometry</i>			

Turn type			
<i>the type of turn (in this case, Stand up)</i>			

Free Turn

A **Free turn** supports an optional diverging lane, a traffic island and an optional merging island.



Intersection

Placement parameters

Major road

Carriageway

Approach

Left turn

Kerb return

Median / Right Turn

Departure

Left turn

Kerb return

Median / Right Turn

Minor road

Carriageway

Approach

Left turn

Kerb return

Median / Right Turn

Departure

Left turn

Kerb return

Median / Right Turn

Turn details

Turn name	MK\$source_name
Turn type	Free

Diverging lane

Create?	yes
Name	
Lane width	3.5
Taper length	35
Taper approach radius	25
Taper departure radius	25
Parallel lane length	80
Dedicated turn lane?	no

Island

Island name	MT\$source_name
Offset 1	1
Offset 2	1
Offset 3	0.3
Offset 4	1
Offset 5	0.3
Offset 6	0
Width	3.5
Radius 1	0.5
Radius 2	0.6
Radius 3	0.3

Merging lane

Create?	yes
Name	
Lane width	3.5
Taper length	35
Taper approach radius	25
Taper departure radius	25
Parallel lane length	80

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Turn Details			

Turn name

the name to use for created geometry

Turn type

the type of turn (in this case, Free)

Diverging Lane

Create?

whether or not to create a diverging lane

Name

an optional name to use for the diverging lane

Lane width

the width of the diverging lane

Taper length

the length of the leading taper on the diverging lane

Taper approach radius

the approach radius of the taper

Taper Departure radius

the departure radius of the taper

Parallel lane length

the length of the parallel lane of the diverging lane

Dedicated turn lane?

whether or not to create a dedicated turn lane - only available if not creating a diverging lane

Island

Island name

the name of the island string

Offset 1

the first offset of the painted island from the internal island

Offset 2

the second offset of the painted island from the internal island

Offset 3

the third offset of the painted island from the internal island

Offset 4

the fourth offset of the painted island from the internal island

Offset 5

the fifth offset of the painted island from the internal island

Offset 6

the sixth offset of the painted island from the internal island

Width

the width of the island from the kerb return

Radius 1

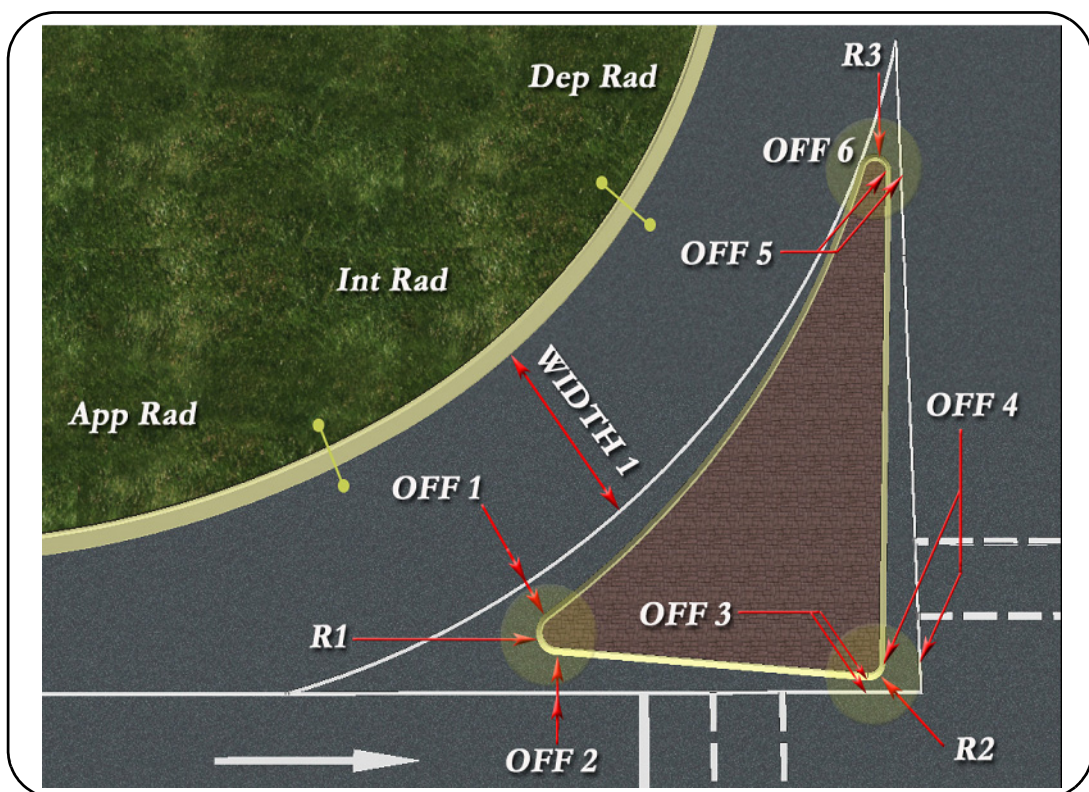
the first radius of the internal island

Radius 2

the second radius of the internal island

Radius 3

the third radius of the internal island



Merging Lane

Create?

whether or not to create a merging lane

Name

an optional name to use for the merging lane

Lane width

the width of the merging lane

Taper length

the length of the leading taper on the merging lane

Taper approach radius

the approach radius of the taper

Taper Departure radius

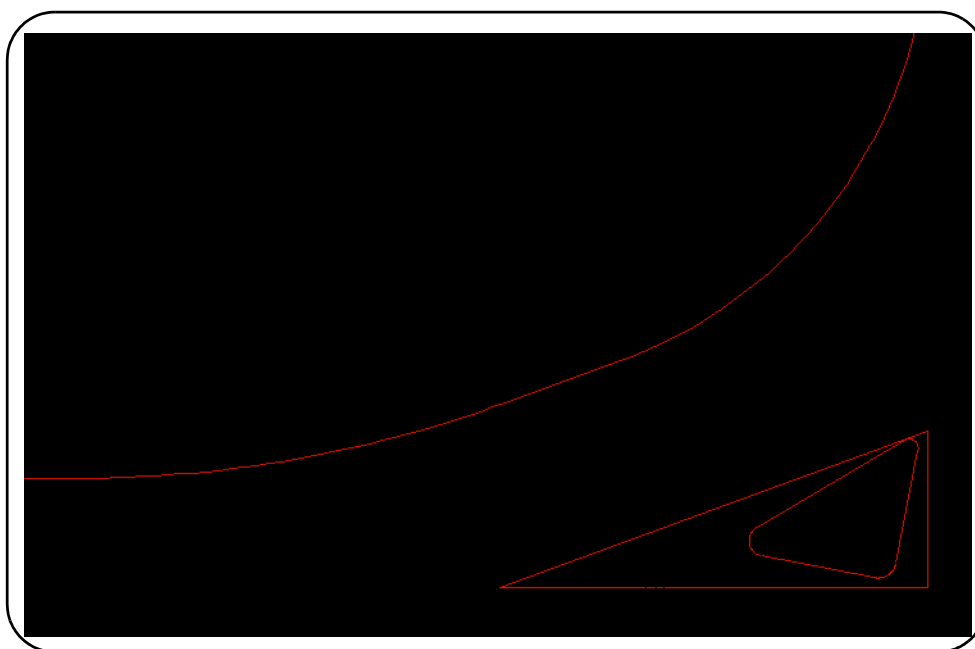
the departure radius of the taper

Parallel lane length

the length of the parallel lane of the merging lane

High Entry Turn

A **High Entry Turn** supports an island and optional diverging lane, as well as an optional dedicated turning lane when no diverging lane is used.



Intersection

Placement parameters

Major road

Carriageway

Approach

Left turn

Median / Right Turn

Departure

Left turn

Kerb return

Median / Right Turn

Minor road

Carriageway

Approach

Left turn

Kerb return

Median / Right Turn

Departure

Left turn

Kerb return

Median / Right Turn

Turn details

Turn name	MK\$source_name
Turn type	High entry

Parameters

Kerb radius 1	40
Kerb radius 2	15
Width 1	5.5
Width 2	5

Island

Island name	MT\$source_name
Offset 1	1
Offset 2	1
Offset 3	0.3
Offset 4	1
Offset 5	0.3
Offset 6	0
Radius 1	0.5
Radius 2	0.6
Radius 3	0.3

Diverging lane

Create?	yes
Name	
Lane width	3.5
Taper length	35
Taper approach radius	25
Taper departure radius	25
Parallel lane length	80
Dedicated turn lane?	no

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Turn Details

Turn name

the name to use for created geometry

Turn type

the type of turn (in this case, High entry)

Parameters

Kerb radius 1

the approach radius of the high entry kerb

Kerb radius 2

the departing radius of the high entry kerb

Width 1

the distance between the kerb return and the painted island

Width 2

the width of the painted island

Island

Island name

the name of the island string

Offset 1

the first offset of the painted island from the internal island

Offset 2

the second offset of the painted island from the internal island

Offset 3

the third offset of the painted island from the internal island

Offset 4

the fourth offset of the painted island from the internal island

Offset 5

the fifth offset of the painted island from the internal island

Offset 6

the sixth offset of the painted island from the internal island

Radius 1

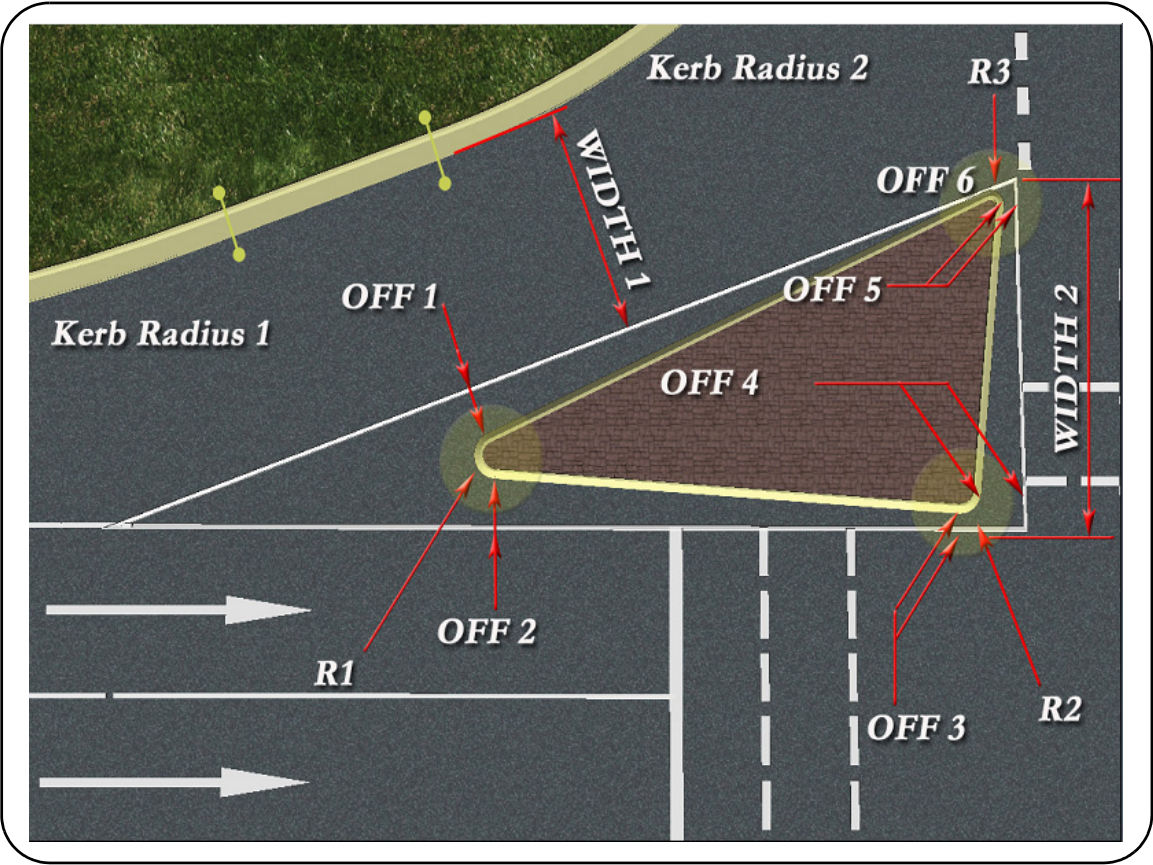
the first radius of the internal island

Radius 2

the second radius of the internal island

Radius 3

the third radius of the internal island



Approach / Departure =>Left Turn =>Kerb Return Node

The stand up and free left turn types allow you to define the kerb return to be used.

These options include [Fillet Kerb Return](#), [Two Centred Kerb Return](#) and [Three Centred Kerb Return](#)

Fillet Kerb Return

<div>Intersection</div> <div>Placement parameters</div> <div>Major road</div> <div>Carriageway</div> <div>Approach</div> <div>Left turn</div> <div>Kerb return</div>	Type	Fillet
	Radius	15

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

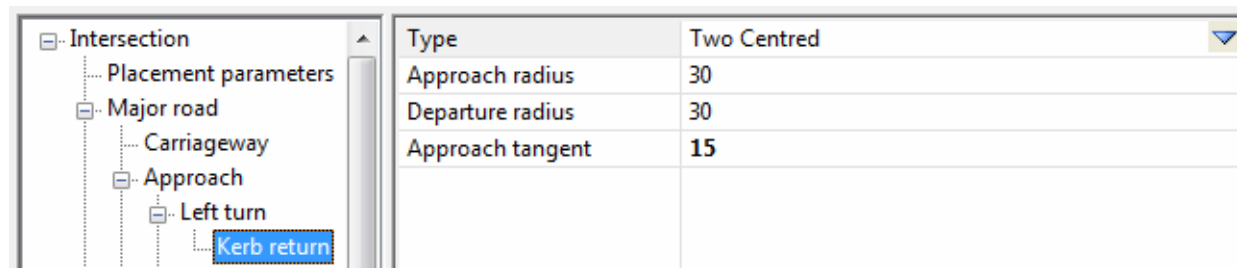
Type

*the type of kerb return to create (in this case, **Fillet**)*

Radius

the radius for the fillet kerb return

Two Centred Kerb Return



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Type

*the type of kerb return to create (in this case, **Two Centred**)*

Approach radius

the approach radius of the two centred curve

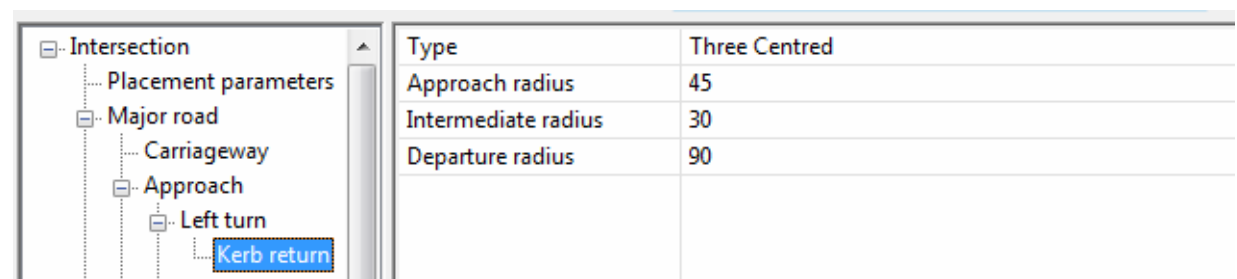
Departure radius

the departure radius of the two centred curve

Approach tangent

the approach tangent for the two centred curve

Three Centred Kerb Return



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Type

*the type of kerb to create (in this case, **Three Centred**)*

Approach radius

the approach radius of the three centred curve

Intermediate radius

the intermediate radius of the three centred curve

Departure radius

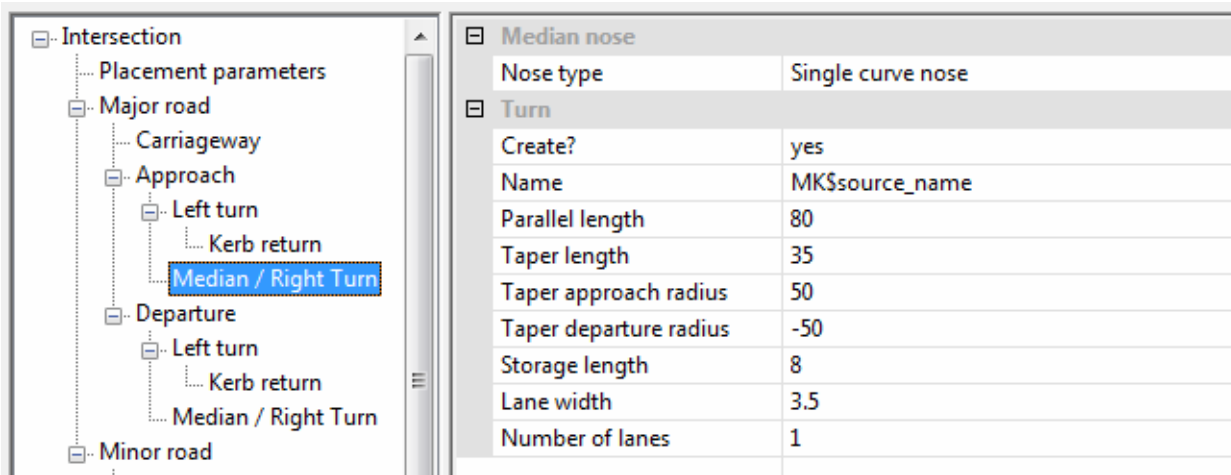
the departure radius of the three centred curve

Approach / Departure =>Median / Right Turn Node

This node is used to define the median and an optional right turn for an intersection road approach or departure.

Note that if you are using Right Side driving, then this will say Median / Left Turn.

This node is only used if a median has been defined as part of the carriageway.



The fields and buttons used in this panel have the following functions:

Field Description Type Defaults Pop-Up

Median Nose

Nose type

the type of nose to create for the median (see [Nose Types](#))

Turn

Create?

whether or not to create a right turn

Name

the name to apply to the turn

Parallel length

the length of the parallel lane

Taper

the length of the leading taper

Taper approach radius

the approach radius of the leading taper

Taper departure radius

the departure radius of the leading taper

Storage length

the storage length of the turn lane

Lane width

the width of the turn lane - must be less than the median width

Number of lanes

the number of turn lanes to create

Nose Types

For more information on *Single Curve Nose* see
Two Curve Nose
Three Curve Nose

[Single Curve Nose](#)
[Two Curve Nose](#)
[Three Curve Nose](#)

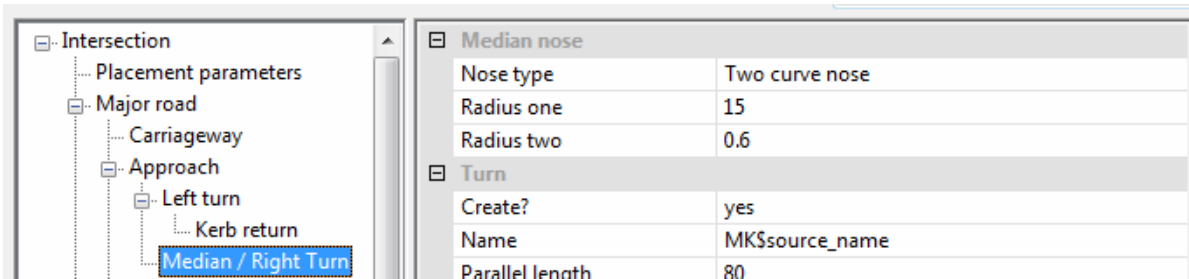
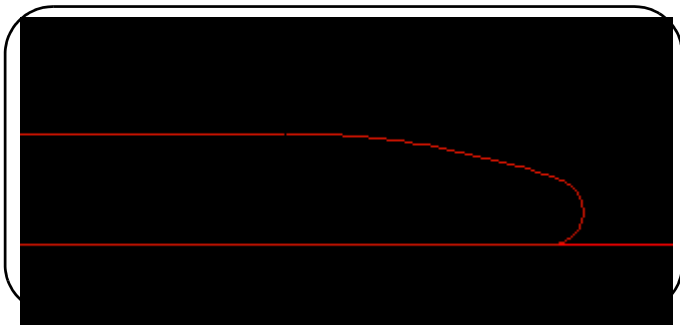
Single Curve Nose

a median nose created from a single fillet curve



Two Curve Nose

A median nose created from two curves



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Radius one

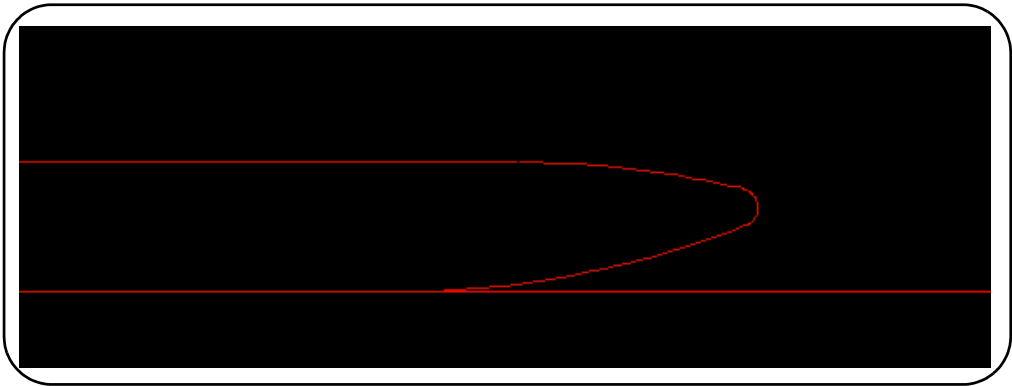
the radius of the first curve

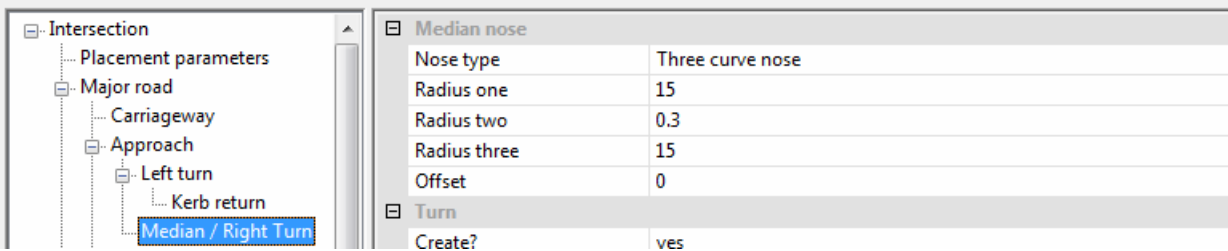
Radius two

the radius of the second curve

Three Curve Nose

A median nose created from three curves and an optional offset





The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Radius one

the radius of the first curve

Radius two

the radius of the second curve

Radius three

the radius of the third curve

Offset

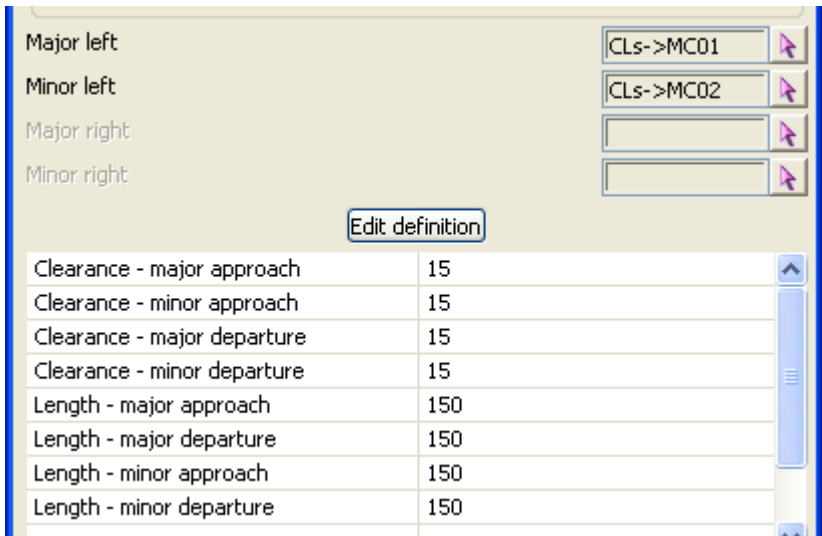
the offset of the nose from the centreline

Placing Intersections

When placing an intersection, there are several placement specific settings. This means they are separate from the definition but help define how the intersection is placed.

These are defined when placing the component, and may be edited from the [Placed Component Editor](#) Some of these are also available from the [Edit a Placed Component Definition](#) panel.

These parameters are shown below, as they are displayed when placing the component.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Major left

the left most major road

Minor left

the left most minor road

Major right

the right most major road (optional)

Minor right

the right most minor road (optional)

Major right and minor right can be set when there is a dual carriageway.

Edit definition	button
-----------------	--------

Selecting this button displays the **Edit a Placed Component Definition** panel. For more information please see [Edit a Placed Component Definition](#)

Clearance - major approach

the clearance of geometry on the approach of the major road, from the intersection

Clearance - minor approach

the clearance of geometry on the approach of the minor road, from the intersection

Clearance - major departure

the clearance of geometry on the departure of the major road, from the intersection

Clearance - minor departure

the clearance of geometry on the departure of the minor road, from the intersection

Length - major approach

the length of the geometry created for the approach of the major road

Length - minor approach

the length of the geometry created for the approach of the minor road

Length - major departure

the length of the geometry created for the departure of the major road

Length - minor departure

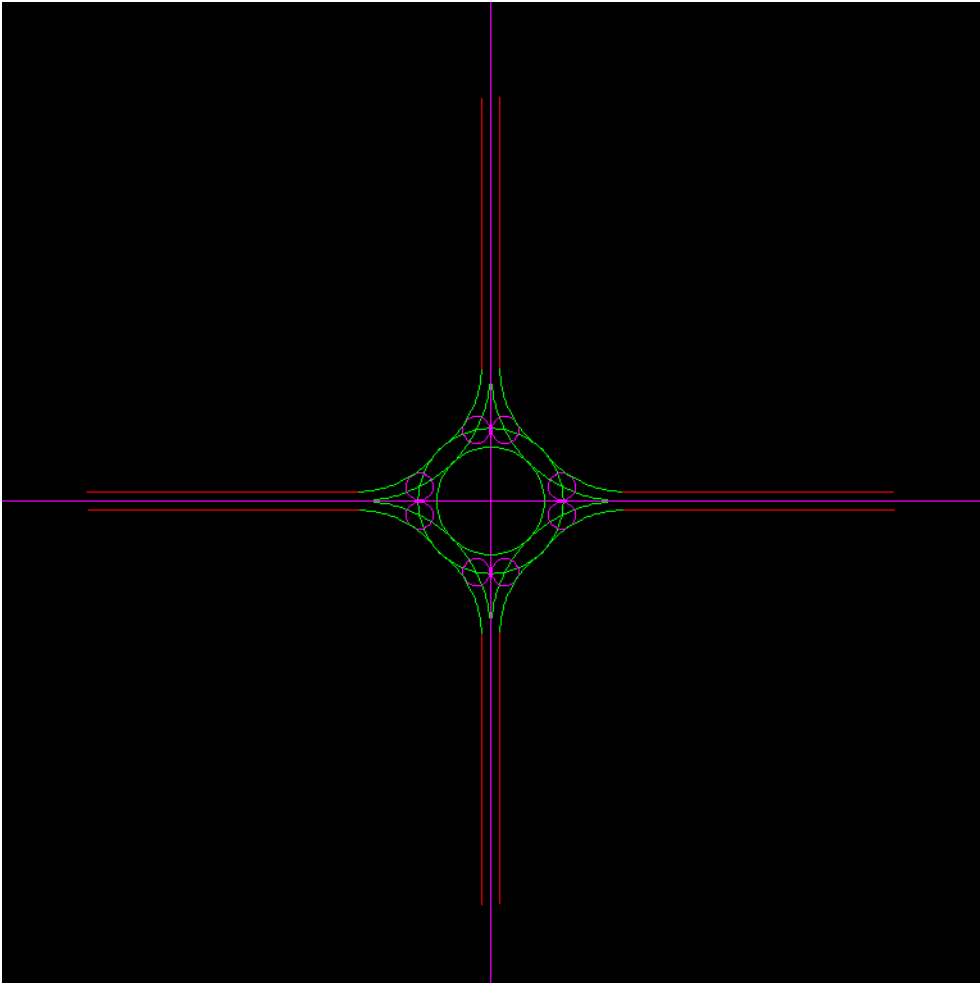
the length of the geometry created for the departure of the minor road

Roundabout

A Roundabout component can be edited via the [Component Library](#) or by editing the definition of a placed component.

For information on *Defining a Roundabout* see
Placing Roundabouts

[Defining a Roundabout](#)
[Placing Roundabouts](#)



Defining a Roundabout

A Roundabout is defined around two intersecting roads - the **Major road** and the **Minor road**. Each road, major or minor, may have an approach (the section of the road leading in to the roundabout) and the departure (the section of the road leading away from the roundabout).

The approach and departure for both the Major and Minor road are defined by the same set of parameters.

- For information on:
- Placement Parameters Node see

Centre Node

Approach/ Departure Node

Approach/ Departure => Kerb Node
- [Placement Parameters](#)

[Centre Node](#)

[Approach / Departure Node](#)

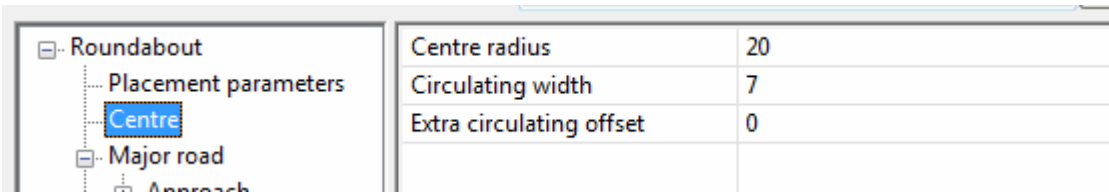
[Approach / Departure => Kerb Node](#)

Placement Parameters

This node is only available when editing a placed component. For more information on the fields displayed here, see the section on [Placing Roundabouts](#).

Centre Node

This node defines parameters for the centre of the roundabout.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

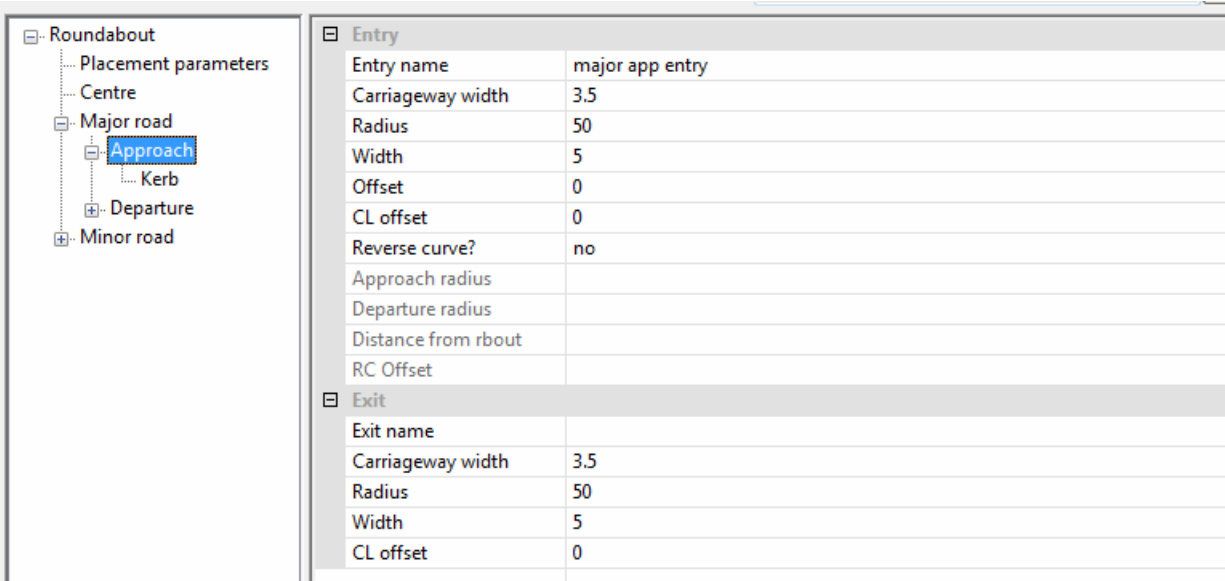
Centre radius
the radius of the centre island of the roundabout

Circulating width
the width around the centre island

Extra circulating offset
an additional offset to apply to throat and kerb return strings from the circulating width

Approach / Departure Node

This node defines parameters for the approach or departure of a specific Roundabout road. This node is made up of two sub parts - the **Entry** into the roundabout and the **Exit** from the roundabout. They can be configured independently.



The fields and buttons used in this panel have the following functions:

Field	Description	Type	Defaults	Pop-Up
Entry				
Entry name				
	<i>the name to apply to the entry string</i>			
Carriageway width				
	<i>the width of the carriageway at the entry to the roundabout</i>			
Radius				
	<i>the radius of the entry into the roundabout</i>			
Width				
	<i>the width of the entry throat into the roundabout</i>			
Offset				
	<i>an offset of the entry string from the centre of the roundabout</i>			
CL offset				
	<i>an offset of the entry from the centreline, for medians</i>			
Reverse curve?				
	<i>whether or not to create a reverse curve (yes or no)</i>			
Approach radius				
	<i>the approach radius for the reverse curve</i>			
Departure radius				
	<i>the departure radius of the reverse curve</i>			

Distance from about

the distance of the start of the reverse curve from the roundabout

RC Offset

the offset of the reverse curve from the centreline

Exit

Exit name

the name to apply to the exit string

Carriageway width

the width of the carriageway at the exit to the roundabout

Radius

the radius of the exit from the roundabout

Width

the width of the exit throat from the roundabout

CL Offset

an offset of the exit string from the centre of the roundabout

Approach / Departure => Kerb Node

This defines the kerb return between the entry at the approach / departure and the adjacent exit. There are several types of kerb returns available.

- | | |
|----------------------------------------------------|--------------------------------------------------------------|
| • Arc / Three Tangents / Arc see | Arc / Three Tangents / Arc |
| • Three Tangents / Locked Arc / Three Tangents see | Three Tangents / Locked Arc / Three Tangents |
| • Three Tangents / Arc / Three Tangents see | Three Tangents / Arc / Three Tangents |
| • Fillet see | Fillet |
| • Two Centre Curve see | Two Centre Curve |
| • Three Centre Curve see | Three Centre Curve |

Getting the geometry right for your roundabout can be complex. The geometry is not guaranteed to solve and you may need to try another kerb return type if the current one does not suit your needs.

Common Fields

Name

the name of the kerb return

Type

the type of kerb return

Arc / Three Tangents / Arc

This creates a kerb return with an approaching arc, an arc with three tangents (to the edge of the entry throat, the circulating width and the edge of the exit throat) and a departing arc.

<div><div>Roundabout</div><div>Placement parameters</div><div>Centre</div><div>Major road</div><div>Approach</div><div>Kerb</div><div>Departure</div></div>	Name	major app kerb
	Type	Arc / Three Tangents / Arc
	Approach radius	35
	Departure radius	35
	Alternate solution on approach	no
	Alternate solution on departure	no

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Approach radius

the radius of the approach arc

Departure radius

the radius of the departure arc

Alternate solution on approach

whether or not to attempt a different solution on the approach arc

Alternate solution on departure

whether or not to attempt a different solution on the departure arc

Three Tangents / Locked Arc / Three Tangents

This creates a kerb return with the following components:

- an arc tangential to the entry carriageway, the edge of the entry throat and the circulating width of the roundabout
- an arc with a radius locked to the radius of the circulating width
- an arc tangential to the circulating width of the roundabout, the edge of the exit throat and the exit carriageway

<div><div>Roundabout</div><div>Placement parameters</div><div>Centre</div><div>Major road</div><div>Approach</div><div>Kerb</div></div>	Name	major app kerb
	Type	Three Tangents / Locked Arc / Three Tangents
	Alternate solution on approach	no
	Alternate solution on departure	no

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Alternate solution on approach

whether or not to attempt a different solution on the approach arc

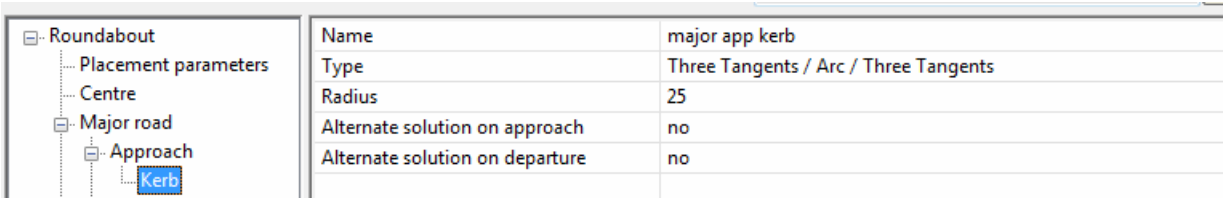
Alternate solution on departure

whether or not to attempt a different solution on the departure arc

Three Tangents / Arc / Three Tangents

This creates a kerb return with the following components:

- an arc tangential to the entry carriageway, the edge of the entry throat and the circulating width of the roundabout
- an arc with a user defined radius
- an arc tangential to the circulating width of the roundabout, the edge of the exit throat and the exit carriageway



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Radius

a user defined radius for the internal arc

Alternate solution on approach

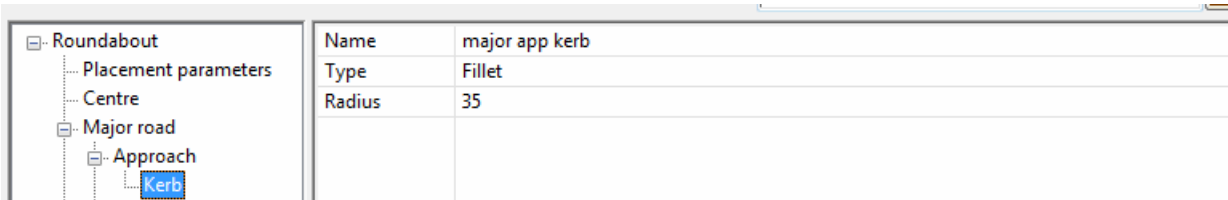
whether or not to attempt a different solution on the approach arc

Alternate solution on departure

whether or not to attempt a different solution on the departure arc

Fillet

This creates a kerb return as a simple fillet between the approach / departure and the adjacent carriageway.



The fields and buttons used in this panel have the following functions:

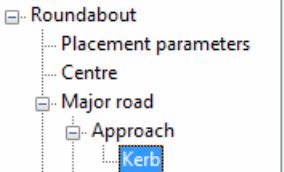
Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Radius

the radius to use for the fillet

Two Centre Curve

This creates a kerb return as a two centre curve.

	Name	major app kerb
	Type	Two Centre Curve
	Approach radius	30
	Departure radius	30
	Approach tangent	15

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Approach radius

the radius for the approach of the curve

Departure radius

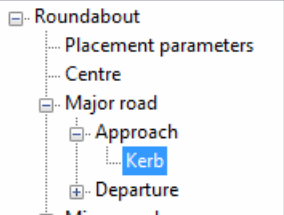
the radius for the departure of the curve

Approach tangent

the approach tangent to the curve

Three Centre Curve

This creates a kerb return as a three centre curve.

	Name	major app kerb
	Type	Three Centre Curve
	Intermediate radius	45
	Approach radius	30
	Departure radius	90
	Approach offset	0
	Departure offset	0

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Intermediate radius

the radius of the intermediate part of the curve

Approach radius

the radius of the approach part of the curve

Departure radius

the radius of the departure part of the curve

Approach offset

Departure offset



Placing Roundabouts

A roundabout is placed at the intersection of two roads - the Major and Minor road. When placing a roundabout, there are several placement specific settings. This means they are separate from the definition but help define how the roundabout is placed.

These are defined when placing the component, and may be edited from the [Placed Component Editor](#). Some of these are also available from the [Edit a Placed Component Definition](#) panel.

These parameters are shown below, as they are displayed when placing the component.

Alignments

Major road

CLs->MC01

Minor road

CLs->MC02

Component parameters

Length - major approach	150
Length - major departure	150
Length - minor approach	150
Length - minor departure	150

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Alignments			
Major road			
<i>the major road of the roundabout</i>			
Minor road			
<i>the minor road of the roundabout</i>			
Component parameters			
Length - major approach			
<i>the length strings to generate along the major approach</i>			
Length - major departure			
<i>the length strings to generate along the major departure</i>			
Length - minor approach			
<i>the length strings to generate along the minor approach</i>			
Length - minor departure			
<i>the length strings to generate along the minor departure</i>			

Note that setting a length to 0 will effectively close that leg of the roundabout.

Bus Bay

A **Bus Bay** component can be edited via the [Component Library](#) or by editing the definition of a placed component.

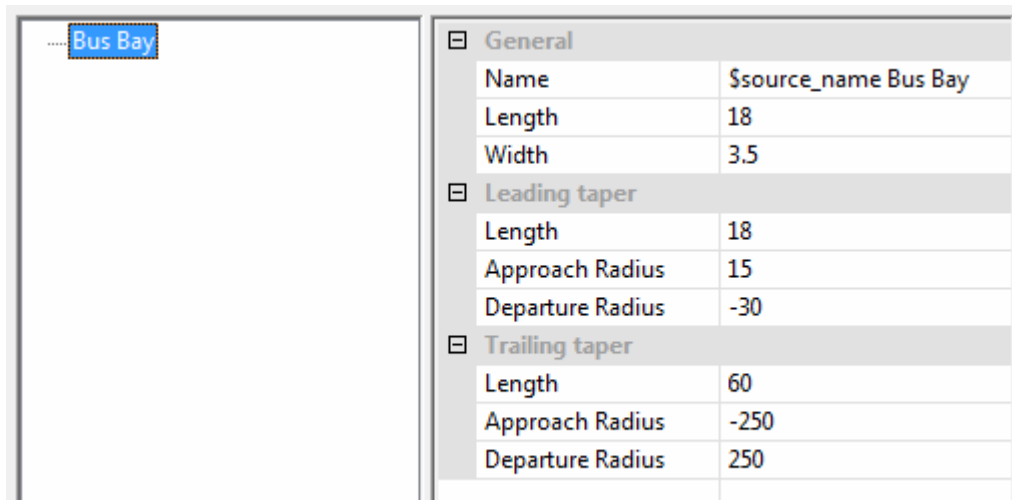


For information on *Defining a Bus Bay* see
Placing Bus Bays

[Defining a Bus Bay](#)
[Placing Bus Bays](#)

Defining a Bus Bay

A **Bus Bay** is defined as being created from a known chainage on one centreline string.



The fields and buttons used in this panel have the following functions:

Field	Description	Type	Defaults	Pop-Up
General				
Name				
	<i>the name of the Bus Bay string</i>			
Length				
	<i>the length of the Bus Bay</i>			
Width				
	<i>the width of the widest part of the Bus Bay</i>			
Leading Taper				
Length				
	<i>the length of the leading taper into the Bus Bay</i>			
Approach radius				
	<i>the approach radius of the leading taper into the Bus Bay</i>			
Departure radius				
	<i>the departing radius of the leading taper into the Bus Bay</i>			
Trailing Taper				
Length				

the length of the trailing taper from the Bus Bay

Approach radius

the approach radius of the trailing taper from the Bus Bay

Departure radius

the departing radius of the trailing taper from the Bus Bay

Placing Bus Bays

A **Bus Bay** is placed at a known chainage along one centreline string. When placing a **Bus Bay**, there are several placement specific settings. This means they are separate from the definition but help define how the **Bus Bay** is placed.

These are defined when placing the component, and may be edited from the [Placed Component Editor](#) some of these are also available from the [Edit a Placed Component Definition](#) panel.

These parameters are shown below, as they are displayed when placing the component.

Alignments

Centreline

CLs->MC02

Component parameters	
Chainage	0
Carriageway width	3.5
Side	Left

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Centreline

the centreline string on which the Bus Bay is created

Chainage

the chainage of the Bus Bay on the nominated centreline string

Carriageway width

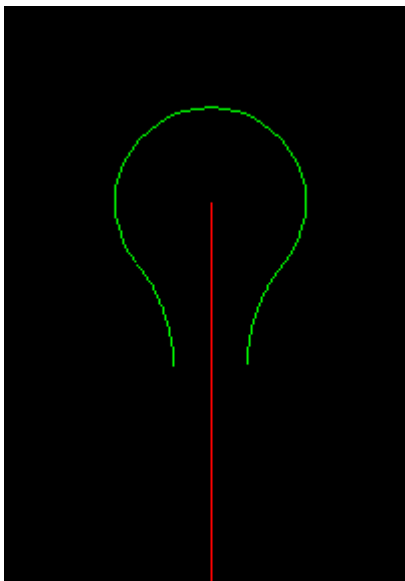
the width of the carriageway

Side

the side of the road on which the Bus Bay is created (Left or Right). This will influence the direction of the Bus Bay, depending on your drive side settings in your library.

Culdesac

A **Culdesac** component can be edited via the [Component Library](#) or by editing the definition of a placed component.



For information on *Defining a Culdesac* see
Placing Culdesac

[Defining a Culdesac](#)
[Placing Culdesacs](#)

Defining a Culdesac

<div>.....Culdesac</div>	Name	MK\$source_name
	Bulb radius	9
	Bulb offset	
	Left fillet radius	15
	Right fillet radius	15
	Approach width	3.5
	Left tangent length	
	Right tangent length	

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Name

the name of the culdesac string

Bulb radius

the radius of the bulb of the culdesac

Bulb offset

an optional offset of the bulb from the centreline

Left fillet radius

the radius of the left fillet of the culdesac

Right fillet radius

the radius of the right fillet of the culdesac

Approach width

the width of the carriageway approaching the culdesac

Left tangent length

an optional length of a tangent between the left fillet and the bulb

Right tangent length

an optional length of a tangent between the right fillet and the bulb

Placing Culdesacs

A **Culdesac** is placed either at the start or end of a road. When placing a culdesac, there are several placement specific settings. This means they are separate from the definition but help define how the culdesac is placed.

These are defined when placing the component, and may be edited from the [Placed Component Editor](#). Some of these are also available from the [Edit a Placed Component Definition](#) panel.

These parameters are shown below, as they are displayed when placing the component.

Alignments

Centreline

CLs->MC02

Component parameters

Chainage extension	0
Anchor	Start

The fields and buttons used in this panel have the following functions:

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Centreline

the centreline the culdesac is created for

Chainage extension

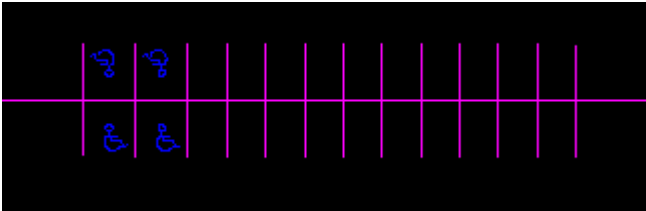
an extension from the anchor

Anchor

where the culdesac is anchored (Start or End)

Parking Bays

Parking Bays can be edited via the [Component Library](#) or by editing the definition of a placed component.



For information on *Defining a Parking Bay*
Placing Parking Bay

[Defining Parking Bays](#)
[Placing Parking Bays](#)

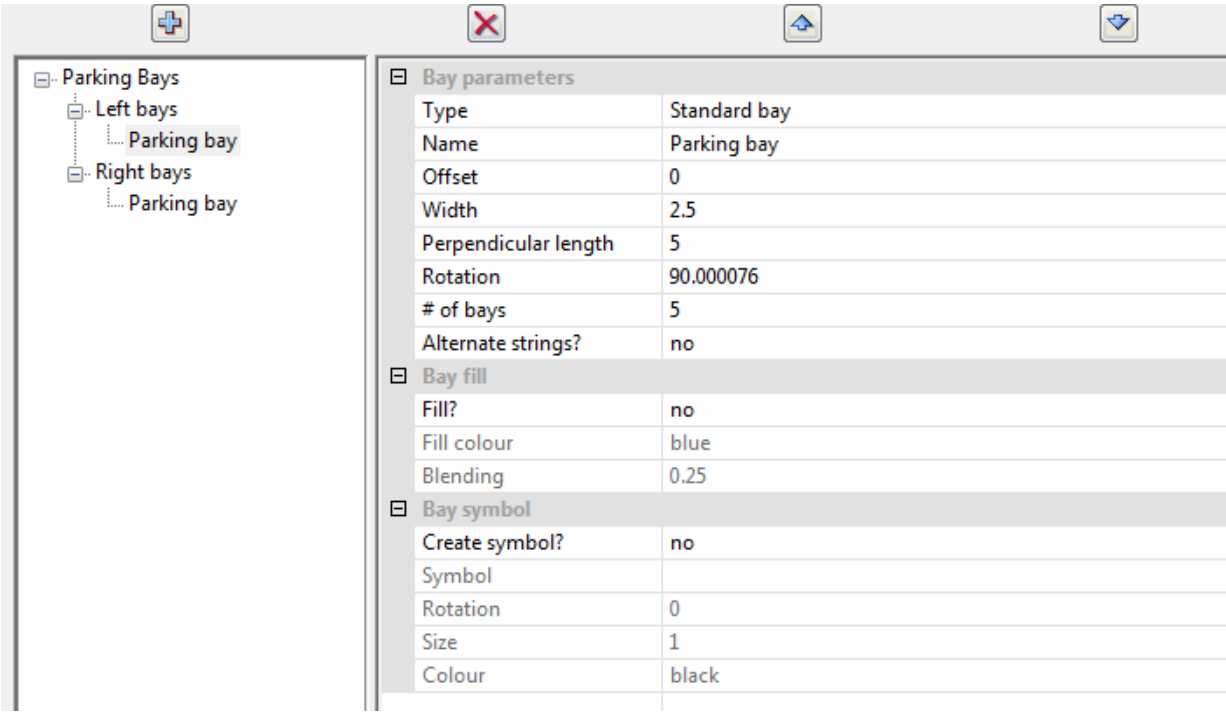
Defining Parking Bays


Parking Bays are created along a nominated centreline string. A **Parking Bays** component consists of a user defined number of 'sets of bays' on the left and right side.

A set of bays can consist of one or more actual parking bays. It is defined by a number of parameters for width, length, offset and rotation, as well as several cosmetic settings.





A set of bays can either be a [Standard Bay](#) or a [Separation](#).

Bays on the left and right side are defined in the same manner.



To add a set of bays to the left or right side, simply select either **Left Bays** or **Right Bays** and click the  button

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
 adds a bay set to the selected side			
 deletes the selected bay set			
 moves the selected bay definition up			
 moves the selected bay definition down			

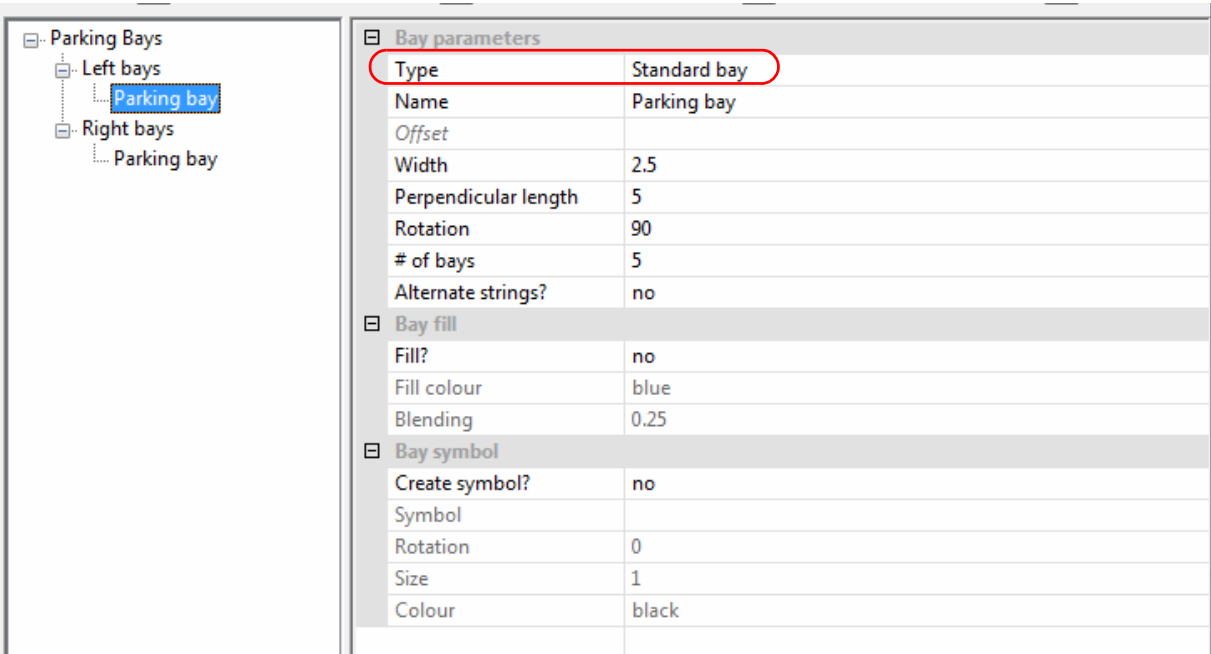
Bay Parameters

Type

the type of bay - Standard or Separation. For more information please see [Standard Bay](#) and

Separation

Standard Bay



The fields and buttons used in this panel have the following functions:

Field	Description	Type	Defaults	Pop-Up
Bay Parameters				
Name				
	<i>the name of the bay</i>			
Offset				
	<i>an optional offset of each bay from the centreline</i>			
Width				
	<i>the width of each bay</i>			
Perpendicular length				
	<i>the perpendicular length of each bay</i>			
Rotation				
	<i>the rotation of each bay</i>			
# of bays				
	<i>the number of bays to create for this set</i>			
Alternate strings?				
	<i>whether or not to create every other string</i>			

Bay fill

Fill?

whether or not to fill each bay with a colour

Fill Colour

the colour to use when filling

Blending

an optional blend to apply, for transparency

Bay symbol

Create symbol?

whether or not to create a symbol in the centre (yes or no)

Symbol

the symbol to place

Rotation

the additional rotation of the symbol. All symbols will be rotated to match the rotation of the parking bay.

Size

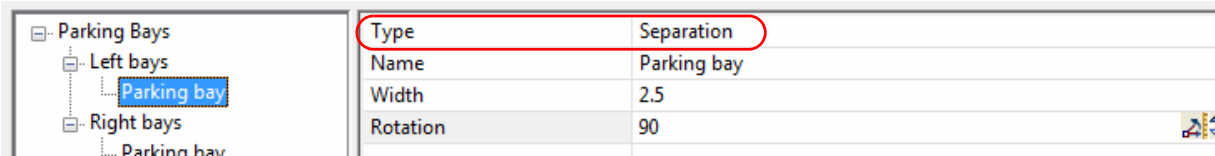
the size / scale of the symbol

Colour

the colour of the symbol

Separation

A separation represents a space between parking bays.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Name

the name of the separation

Width

the width of the separation

Rotation

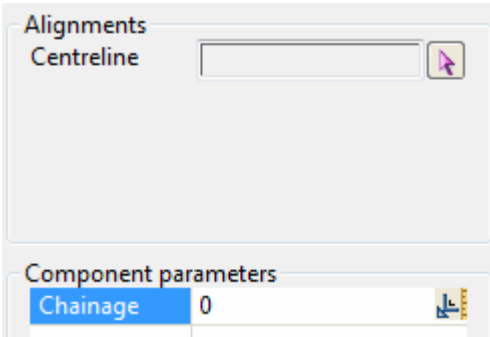
the rotation of the separation

Placing Parking Bays

Parking Bays are placed either at the start or end of a road. When placing a Parking Bay component, there are several placement specific settings. This means they are separate from the definition but help define how the Parking Bay is placed.

These are defined when placing the component, and may be edited from the [Placed Component Editor](#). Some of these are also available from the [Edit a Placed Component Definition](#) panel.

These parameters are shown below, as they are displayed when placing the component.



The fields and buttons used in this panel have the following functions:

Field	Description	Type	Defaults	Pop-Up
Centreline		string select		
	<i>the centreline along which the bays are created</i>			
Chainage				
	<i>the chainage at which the bays should start being created</i>			

Left Turn

A **Left Turn** is a subset of an intersection, comprising of just a **Left Turn**. A **Left Turn** can be edited via the [Component Library](#) or by editing the definition of a placed component.

For information on *Defining a Left Turn*

[Defining a Left Turn](#)

Placing Left Turns

[Placing Left Turns](#)

Defining a Left Turn

A **Left Turn** is only defined by the parameters involving the **Left Turn** - the type of turn and the kerb return.

For information on Placement Parameters see

[Placement Parameters](#)

Left Turn Node

[Left Turn](#)

Left Turn => Kerb Return Node

[Left Turn => Kerb Return](#)

Placement Parameters

This node is only available when editing a placed component. For more information on the fields displayed here, see the section on [Placing Left Turns](#).

Left Turn

A **Left Turn** is defined in the same way as the Intersection Left Turn. For more information, please see the section on the [Approach / Departure =>Left turn](#)

Left Turn => Kerb Return

A **Left Turn Kerb Return** is defined in the same was as the Intersection kerb return. For more information, please see the section on the [Approach / Departure =>Left Turn =>Kerb Return Node](#)

Placing Left Turns

Left Turns are placed at the intersection of two roads - a Major and a Minor, with an approach or departure. Like an intersection, they can also support dual carriageways. When placing a Left Turn component, there are several placement specific settings. This means they are separate from the definition but help define how the Left Turn is placed.

These are defined when placing the component, and may be edited from the [Placed Component Editor](#). Some of these are also available from the [Edit a Placed Component Definition](#) panel.

These parameters are shown below, as they are displayed when placing the component.

Alignments

Major left

Minor left

Major right

Minor right

Component parameters

Width - major

Width - minor

Clearance - major

Clearance - minor

Length - major

Length - minor

From

3.5

3.5

15

15

150

150

Approach

The fields and buttons used in this panel have the following functions:

Field	Description	Type	Defaults	Pop-Up
Alignments				
Major left				
	<i>the left most major road</i>			
Minor left				
	<i>the left most minor road</i>			
Major right				
	<i>the right most major road (optional)</i>			
Minor right				
	<i>the right most minor road (optional)</i>			

Major right and Minor right can be set when there is a dual carriageway.

Component parameters

Width - major

the width of the carriageway of the major road

Width - minor

the width of the carriageway of the minor road

Clearance - major

the clearance of geometry on major road

Clearance - minor

the clearance of geometry on minor road

Length - major

the length of the geometry created for major road

Length - minor

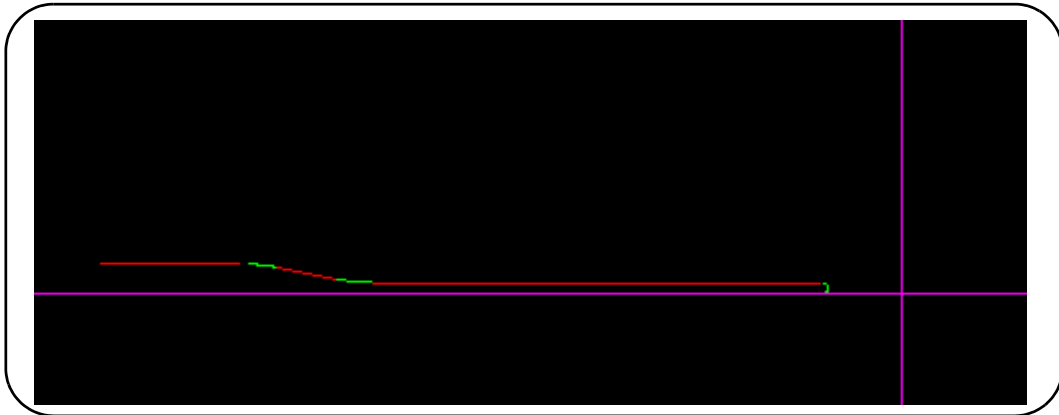
the length of the geometry created minor road

From

whether or not to create the left turn leading from the approach or the departure

Median Island

A **Median Island** is a subset of an intersection, comprising of just a median and an optional right hand turn. A **Median Island** can be edited via the [Component Library](#) or by editing the definition of a placed component.



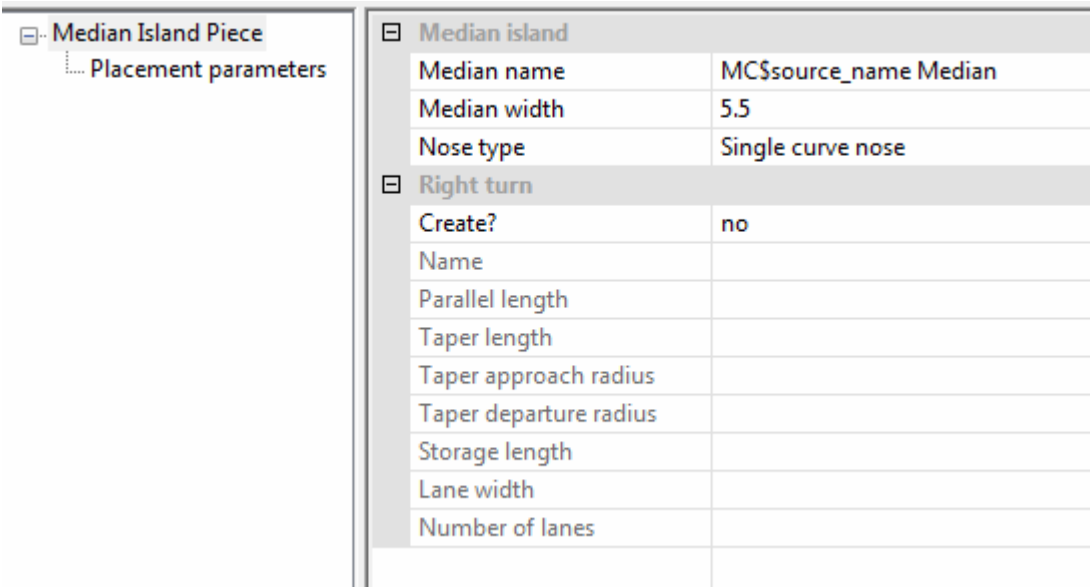
For information on *Defining a Median Island*
Placing Median Islands
Placement Parameters

[Defining a Median Island](#)
[Placing Median Islands](#)
[Placement Parameters](#)

Defining a Median Island

A median is only defined by the parameters involving the Median Island and the right hand turn.

Median Island Piece



The fields and buttons used in this panel have the following functions:

Field	Description	Type	Defaults	Pop-Up
Median island				
Median name				
	<i>the name of the median string to create</i>			
Median width				
	<i>the width of the median</i>			
Nose type				
	<i>the type of nose to create for the median (see Nose Types)</i>			
Right Turn				
Create?				
	<i>whether or not to create a right turn</i>			
Name				
	<i>the name to apply to the turn</i>			
Parallel length				
	<i>the length of the parallel lane</i>			
Taper length				

the length of the leading taper

Taper approach radius

the approach radius of the leading taper

Taper departure radius

the departure radius of the leading taper

Storage length

the storage length of the turn lane

Lane width

the width of the turn lane - must be less than the median width

Number of lanes

the number of turn lanes to create

Nose Types

For more information on Single Curve Nose see

[Single Curve Nose](#)

Two Curve Nose

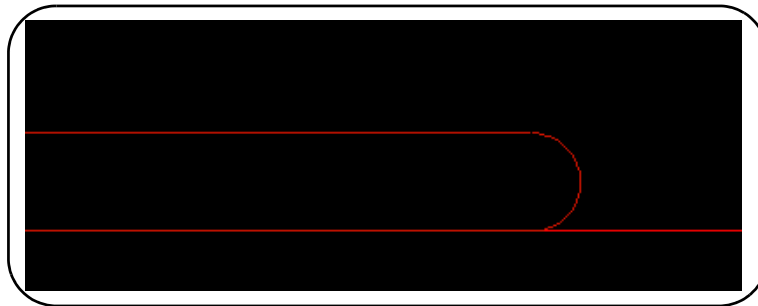
[Two Curve Nose](#)

Three Curve Nose

[Three Curve Nose](#)

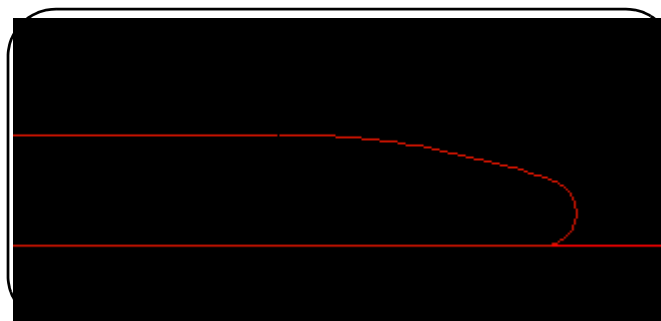
Single Curve Nose

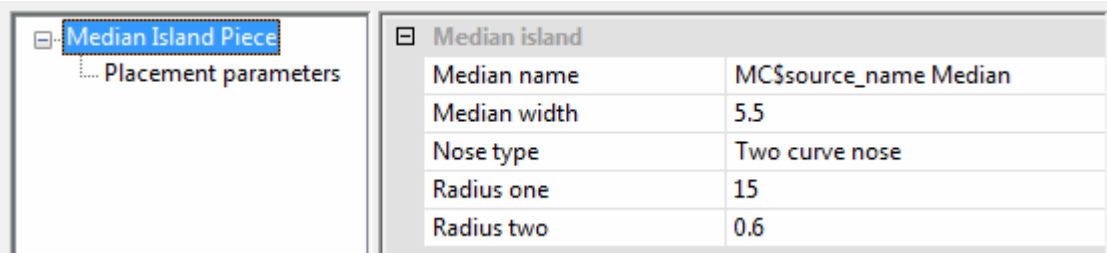
a median nose created from a single fillet curve



Two Curve Nose

a median nose created from two curves





The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Radius one

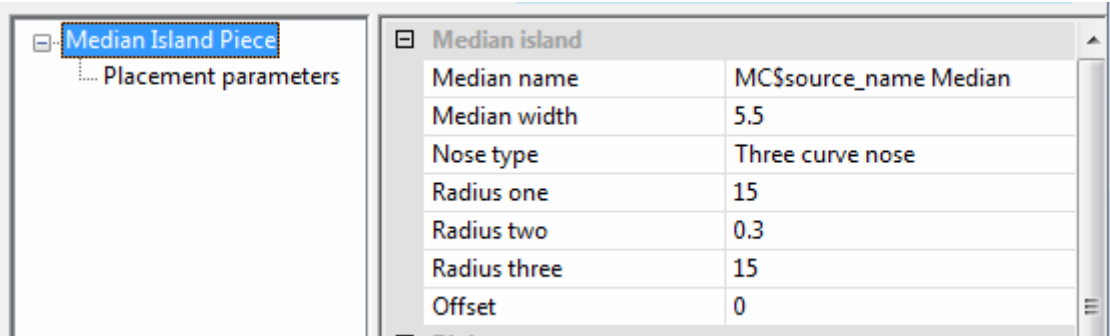
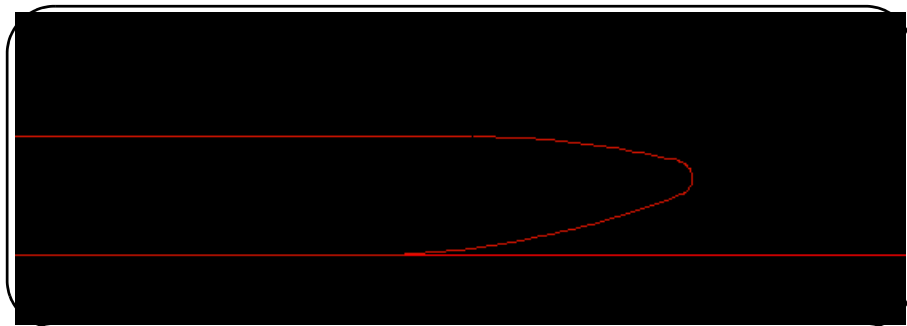
the radius of the first curve

Radius two

the radius of the second curve

Three Curve Nose

a median nose created from three curves and an optional offset



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Radius one <i>the radius of the first curve</i>			
Radius two <i>the radius of the second curve</i>			
Radius three <i>the radius of the third curve</i>			
Offset <i>the offset of the nose from the centreline</i>			

Placement Parameters

This node is only available when editing a placed component. For more information on the fields displayed here, see the section on [Placing Median Islands](#).

Placing Median Islands

Median Islands are placed at the intersection of two roads - a Major and a Minor, with an approach or departure. Like an intersection, they can also support dual carriageways. When placing a Median Island, there are several placement specific settings. This means they are separate from the definition but help define how the Median Island, is placed.

These are defined when placing the component, and may be edited from the [Placed Component Editor](#) Some of these are also available from the [Edit a Placed Component Definition](#) panel.

These parameters are shown below, as they are displayed when placing the component.

Alignments

Major left

CLs->MC01

Minor left

CLs->MC02

Major right

Minor right

Component parameters

Clearance	15
Length	150
From	Approach
Side	Left

The fields and buttons used in this panel have the following functions:

Field	Description	Type	Defaults	Pop-Up
Alignments				
Major left				
	<i>the left most major road</i>			
Minor left				
	<i>the left most minor road</i>			
Major right				
	<i>the right most major road (optional)</i>			
Minor right				
	<i>the right most minor road (optional)</i>			
Component parameters				
Clearance				
	<i>the distance from the intersection at which to start creating the median island</i>			
Length				
	<i>the length of the geometry to create</i>			
From				

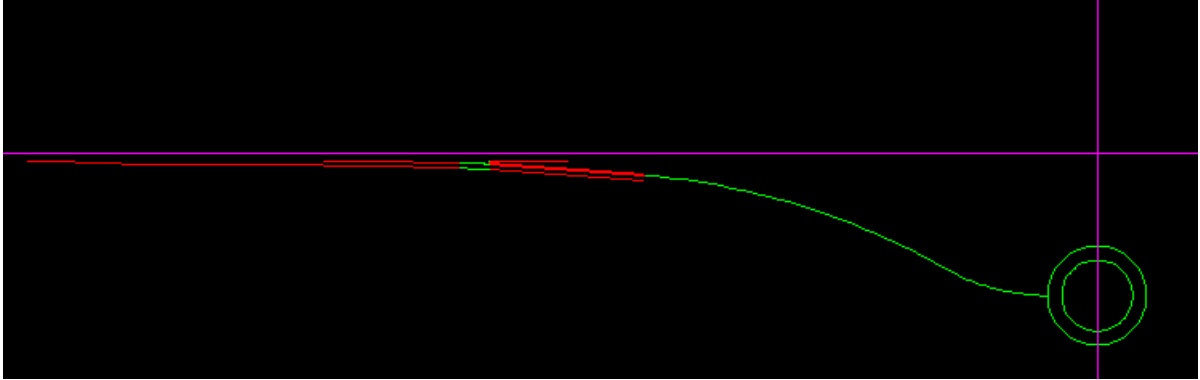
whether or not the median should be created on the approach or departure side of the major string

Side

the side on which the median should be bound

Entry Ramp

An **Entry Ramp** component creates an **Entry Ramp** from an overpass or other adjoining road to a freeway or other major road. It can be edited via the [Component Library](#) or by editing the definition of a placed component.



For information on *Defining an Entry Ramp*
Placing Entry Ramps

[Defining a Entry Ramp](#)
[Placing Entry Ramps](#)

Defining a Entry Ramp

An **Entry Ramp** is defined by the ramp itself, a shoulder, a merging lane and an optional connection.

- For information on Entry Ramp node see

Placement Parameters

Shoulder node

Merging lane node

Connection node
- [Entry Ramp Node](#)

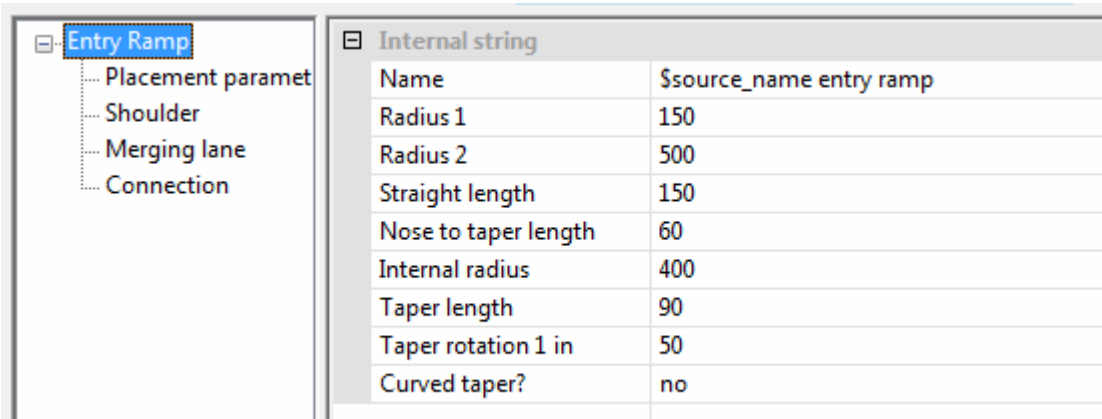
[Placement Parameters](#)

[Shoulder Node](#)

[Merging Lane Node](#)

[Connection](#)

Entry Ramp Node



The fields and buttons used in this panel have the following functions:

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Name
the name of the entry ramp string

Radius 1
the first radius of the entry reverse curve

Radius 2
the second radius of the entry reverse curve

Nose to taper length
The distance between the nose of the shoulder and the taper

Internal radius
the radius of the final, internal arc

Taper length
the length of the trailing taper

Taper rotation 1 in
the rotation of the trailing taper

Curved taper?

whether or not to use a curved taper (may be more suitable for curving centrelines)

Placement Parameters

This node is only available when editing a placed component. For more information on the fields displayed here, see the section on [Placing Entry Ramps](#).

Shoulder Node

This node defines properties for the shoulder of the **Entry Ramp**.

<div><div>Entry Ramp</div><div>Placement parameter</div><div>Shoulder</div><div>Merging lane</div><div>Connection</div></div>	Name	\$source_name island
	Nose offset from shoulder	2
	Nose offset from ramp	1
	Nose width	0.6

The fields and buttons used in this panel have the following functions:

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Name

the name of the shoulder string

Nose offset from shoulder

the offset of the island nose from the shoulder

Nose offset from ramp

the offset of the island nose from the ramp itself

Nose width

the width of the nose

Merging Lane Node

This node defines the parameters for the **Merging lane**.

<div><div>Entry Ramp</div><div>Placement parameter</div><div>Shoulder</div><div>Merging lane</div><div>Connection</div></div>	Name	\$source_name merging lane
	Lane width	4
	Radius	394
	Curve 1 radius	
	Parallel lane length	95
	Curve 2 radius	
	Curve 2 length	
	Taper length	100

The fields and buttons used in this panel have the following functions:

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Name

the name of the merging lane string

Lane width

the width of the merging lane

Radius

the radius used to construct the merging lane

Curve 1 radius

the radius of the first optional curve, before the parallel lane length

Parallel lane length

the length of the parallel lane

Curve 2 radius

the radius of the second optional curve, after the parallel lane

Curve 2 length

the length of the second optional curve, after the parallel lane

Taper length

the length of the taper at the end of the merging lane

Connection

This node defines the properties for an optional connection from the overpass / minor road.
At the moment, this supports either no connection strings or a roundabout.

Mode

the mode of the connection (either [Roundabout Mode](#) or [No Strings Mode](#))

Roundabout Mode

<div><div>Entry Ramp</div><div>Placement paramet</div><div>Shoulder</div><div>Merging lane</div><div>Connection</div></div>	Mode	Roundabout
	Offset	100
	Roundabout radius	25
	Circulating width	10

The fields and buttons used in this panel have the following functions:

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Offset

the offset from the intersection, along the minor road, that the connection should be created

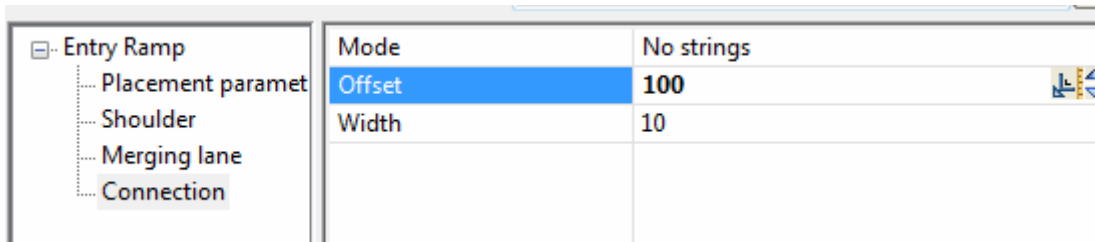
Roundabout radius

the radius of the roundabout

Circulating width

the circulating width of the roundabout

No Strings Mode



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Offset

the offset from the intersection, along the minor road, that the connection should be created

Width

how far away from the minor road the entry ramp should start

Placing Entry Ramps

Entry Ramps are placed at the intersection of two roads - a major freeway and a minor adjoining or overpass road. When placing an **Entry Ramp**, there are several placement specific settings. This means they are separate from the definition but help define how the **Entry Ramp** is placed.

These are defined when placing the component, and may be edited from the [Placed Component Editor](#). Some of these are also available from the [Edit a Placed Component Definition](#) panel.

These parameters are shown below, as they are displayed when placing the component

Major road

Entry road

EXAMPLE 7->MCC1

EXAMPLE 7->MCA1

Edit definition

Carriageway width	3.5
Distance from interchange	580
Approach/Departure	Approach

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Major road

the freeway or major road to enter

Entry road

the road to enter from

Edit definition	button
-----------------	--------

*Selecting this button displays the **Edit a Placed Component Definition** panel. For more information please see [Edit a Placed Component Definition](#)*

Carriageway width

the width of the freeway carriageway

Distance from interchange

the distance of the end of the entry ramp from the interchange

Approach/Departure

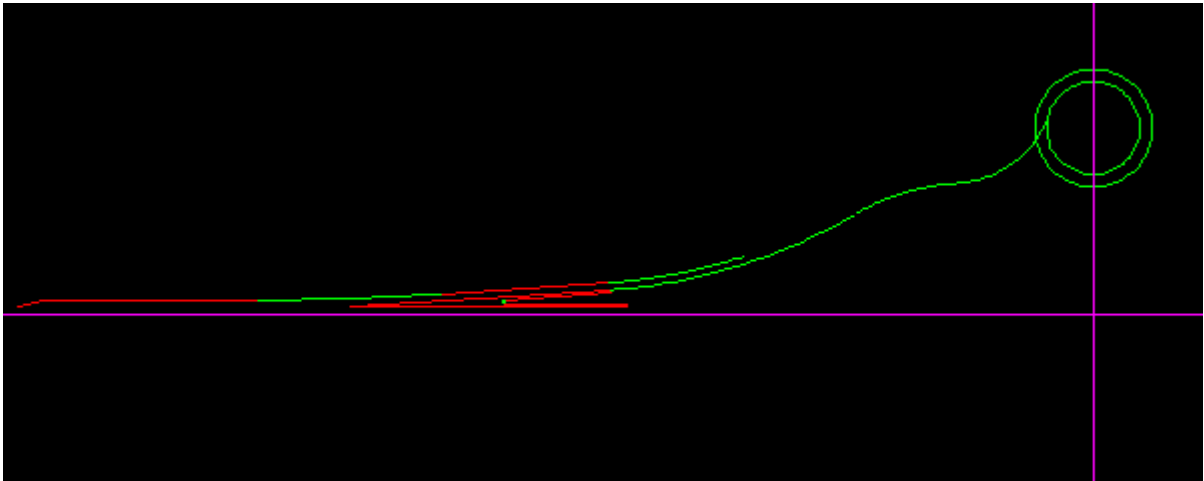
whether the entry ramp is bound to the approach or departure of the freeway / major road

Exit Ramp

An **Exit Ramp** component creates an **Exit Ramp** from a freeway or other major road to an overpass or other adjoining road. It can be edited via the [Component Library](#) or by editing the definition of a placed component.

For more information on Defining an Exit Ramp see
Placing an Exit Ramp

[Defining an Exit Ramp](#)
[Placing Exit Ramps](#)



Defining an Exit Ramp

An **Exit Ramp** is defined by the ramp itself, a shoulder, a diverging lane and an optional connection.

- For information on the Exit Ramp Node see

Placement Parameters Node

Shoulder Node

Diverging Lane Node

Connection Node
- [Exit Ramp Node](#)

[Placement Parameters](#)

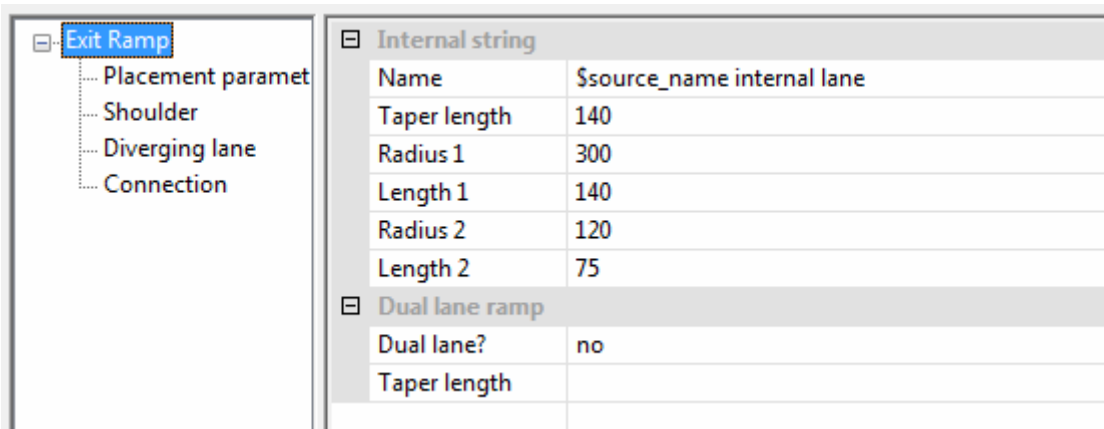
[Shoulder Node](#)

[Diverging Lane Node](#)

[Connection Node](#)

Exit Ramp Node

This node defines the ramp itself.



The fields and buttons used in this panel have the following functions:

Field	Description	Type	Defaults	Pop-Up
Internal String				
Name	<i>the name of the string to create</i>			
Taper length	<i>the length of the ramp taper</i>			
Radius 1	<i>the first radius of a reverse curve</i>			
Length 1	<i>the first length of a reverse curve</i>			
Radius 2	<i>the second radius of a reverse curve</i>			
Length 2				

the second length of a reverse curve

Dual Lane Ramp

Dual lane

whether or not this is a dual lane exit ramp

Taper length

the taper length on the dual lane exit ramp

Placement Parameters

This node is only available when editing a placed component. For more information on the fields displayed here, see the section on [Placing Exit Ramps](#).

Shoulder Node

This node defines the shoulder part of the exit ramp.

<div><div>Exit Ramp</div><div><div>Placement paramet</div><div>Shoulder</div><div>Diverging lane</div><div>Connection</div></div></div>	<table><tr><td>Name</td><td>\$source_name shoulder</td></tr><tr><td>Shoulder length</td><td>150</td></tr><tr><td>Nose radius</td><td>1</td></tr><tr><td>Nose offset from shoulder</td><td>2</td></tr><tr><td>Nose offset from ramp</td><td>1.5</td></tr></table>	Name	\$source_name shoulder	Shoulder length	150	Nose radius	1	Nose offset from shoulder	2	Nose offset from ramp	1.5
Name	\$source_name shoulder										
Shoulder length	150										
Nose radius	1										
Nose offset from shoulder	2										
Nose offset from ramp	1.5										

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Name

the name of the created shoulder string

Shoulder length

the length of the shoulder

Nose radius

the radius of the nose of the exit ramp island

Nose offset from shoulder

the offset of the island nose from the shoulder

Nose offset from ramp

the offset of the island nose from the ramp

Diverging Lane Node

This node defines the details for the diverging lane of the exit ramp.

<div><div>Exit Ramp</div><div>Placement paramet</div><div>Shoulder</div><div>Diverging lane</div><div>Connection</div></div>	Name	\$source_name diverging lane
	App. taper length	15
	Lane width	4
	Lane length	165
	Radius	1500

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Name
the name of the created string of the diverging lane

App. taper length
the length of approaching taper

Lane width
the width of the diverging lane

Lane length
the length of the diverging lane

Radius
the radius for the diverging lane

Connection Node

The connection node defines how the Exit Ramp connects to the adjoining road or overpass. There are two types of connection currently; either no visible connection or a Roundabout (see [Roundabout Connection](#)).

Component name		exit
<div><div>Exit Ramp</div><div>Placement paramet</div><div>Shoulder</div><div>Diverging lane</div><div>Connection</div></div>	Type	No connection

Roundabout Connection

<div><div>Exit Ramp</div><div>Placement paramet</div><div>Shoulder</div><div>Diverging lane</div><div>Connection</div></div>	Type	Roundabout
	Offset	100
	Roundabout radius	25
	Circulating width	6.6
	Connecting radius	55

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Offset

the offset of the roundabout from the major road

Roundabout radius

the radius of the centre of the roundabout

Circulating width

the circulating width around the roundabout

Connecting radius

the radius of an arc connecting the exit ramp to the roundabout

Placing Exit Ramps

Exit Ramps are placed at the intersection of two roads - a major freeway and a minor adjoining or overpass road. When placing an **Exit Ramp**, there are several placement specific settings. This means they are separate from the definition but help define how the **Exit Ramp** is placed.

These are defined when placing the component, and may be edited from the [Placed Component Editor](#). Some of these are also available from the [Edit a Placed Component Definition](#) panel.

These parameters are shown below, as they are displayed when placing the component.

Major road

ALIGNMENT MC10-

Exit road

ALIGNMENT MC60-

Edit definition

Carriageway width	3.5
Distance from interchange	400
Approach/Departure	Approach

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Major road

the freeway or major road to exit from

Exit road

the road the ramp leads to

Carriageway width

the width of the major road

Distance from interchange

the distance from the interchange that the exit ramp should start

Approach / Departure

whether the exit ramp is bound to the approach or departure of the major road

CHR Intersection

A **CHR** or **Channelised Rural Intersection** creates an intersection between two roads, typically in a T-Junction configuration. It can be edited via the [Component Library](#) or by editing the definition of a placed component.

For information on Predefined Values Node see

Major Road Node

Major Road => Kerb return Node

Minor Road Node

Placing CHR Intersections

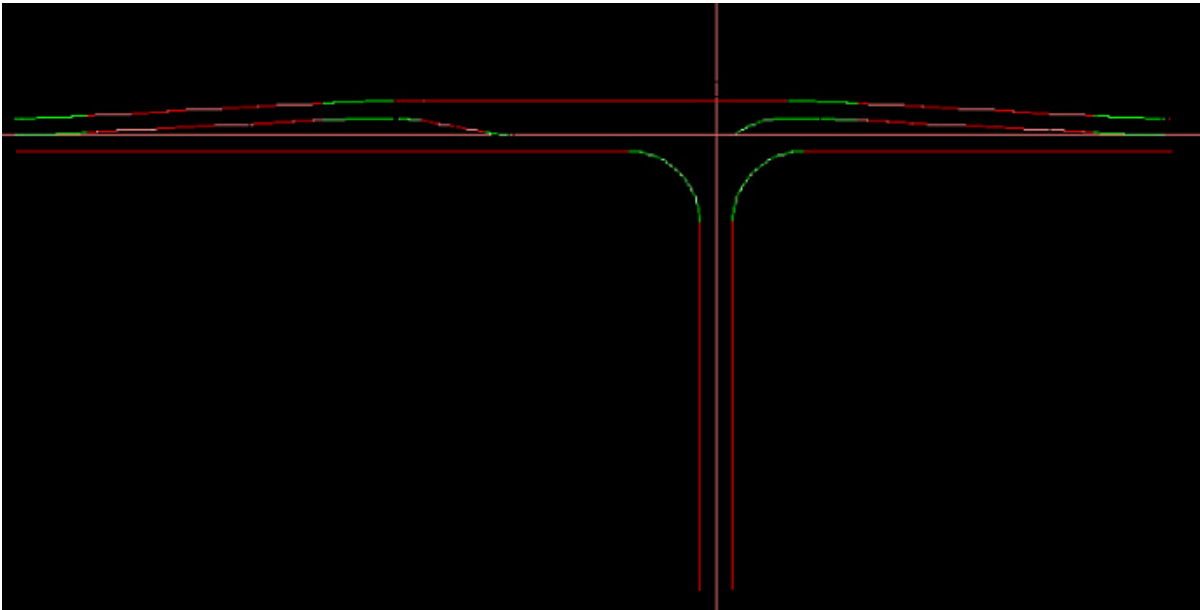
[Predefined Values Node](#)

[Major Road Node](#)

[Major Road => Kerb Return Node](#)

[Minor Road Node](#)

[Placing CHR Intersections](#)



Predefined Values Node

The Predefined Values node is used to populate the details of the **CHR** based on one of a set of predefined speeds and a supplied lane width.

Major Road Node

This defines the details for the major road.

CHR Intersection

Placement paramet

Predefined values

Major road

Kerb return

Minor road

Major road

Kerb name

Lane width3.5

Short CHR?no

Right turn

Turn name

Storage length8

Deceleration length45

Lane width3.5

Leading taper

Approach radius280

Departure radius280

Taper length80

Trailing taper

Approach radius280

Departure radius280

Taper length80

Islands

Approach radius30

Departure radius30

Taper length25

Leading island name

Trailing island name

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Major Road			

Kerb name
the name of the kerb string to create

Lane width
the width of the carriageway

Short CHR?
whether or not to create a short CHR

Right Turn

Turn name
the name of the right turn string

Storage length
the storage length of the right turn

Deceleration length
the deceleration length of the right turn

Lane width

the width of the right turn lane

Leading Taper

Approach radius

the approach radius of the leading taper

Departure radius

the departure radius of the leading taper

Taper length

the length of the leading taper

Trailing Taper

Approach radius

the approach radius of the trailing taper

Departure radius

the departure radius of the trailing taper

Taper length

the length of the trailing taper

Islands

Approach radius

the approach radius of the islands

Departure radius

the departure radius of the islands

Taper length

the taper length for the islands

Leading island name

the name of the leading island of the CHR

Trailing island name

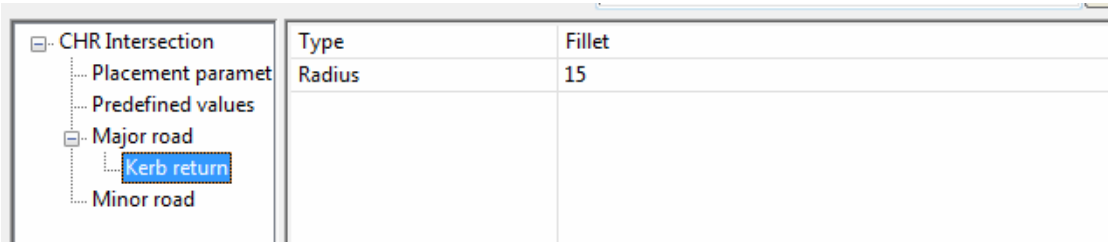
the name of the trailing island of the CHR

Major Road => Kerb Return Node

There are several different kerb return types available:

- Fillet
- Two Centred
- Three Centred
- [Fillet Kerb Return](#)
- [Two Centred Kerb Return](#)
- [Three Centred Kerb Return](#)

Fillet Kerb Return



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

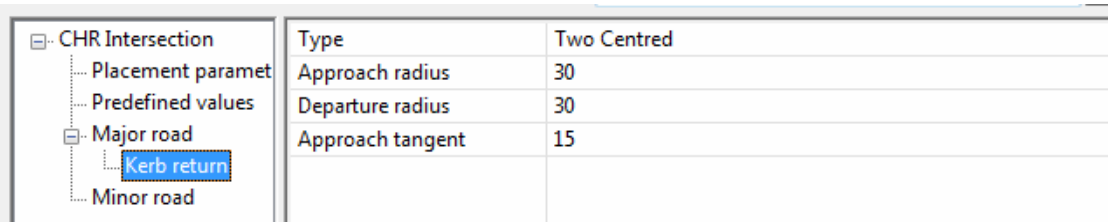
Type

*the type of kerb return to create (in this case, **Fillet**)*

Radius

the radius for the fillet kerb return

Two Centred Kerb Return



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Type

*the type of kerb return to create (in this case, **Two Centred**)*

Approach radius

the approach radius of the two centred curve

Departure radius

the departure radius of the two centred curve

Approach tangent

the approach tangent for the two centred curve

Three Centred Kerb Return

<div><div>CHR Intersection</div><div>Placement paramet</div><div>Predefined values</div><div>Major road</div><div>Kerb return</div><div>Minor road</div></div>	Type	Three Centred
	Approach radius	45
	Intermediate radius	30
	Departure radius	90

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Type

the type of kerb to create (in this case, **Three Centred**)

Approach radius

the approach radius of the three centred curve

Intermediate radius

the intermediate radius of the three centred curve

Departure radius

the departure radius of the three centred curve

Minor Road Node

This node defines the details for the Minor road.

<div><div>CHR Intersection</div><div>Placement paramet</div><div>Predefined values</div><div>Major road</div><div>Kerb return</div><div>Minor road</div></div>	Lane width	3.5
	Kerb return	
	Type	Fillet
	Radius	15

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Lane width

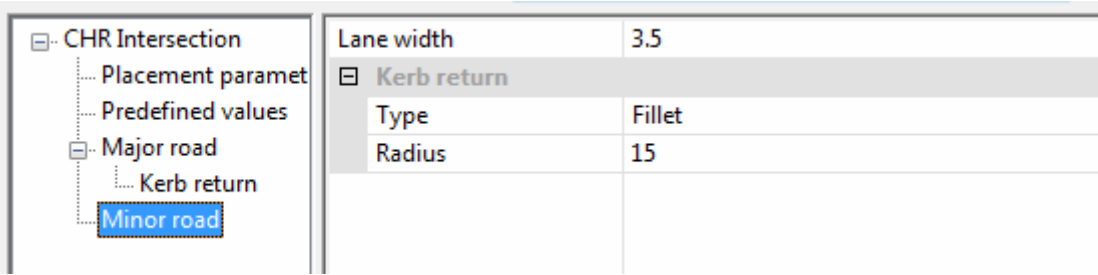
the width of the carriageway of the minor road

Kerb Return

There are several different kerb return types available:

- Fillet
- Two Centred
- Three Centred
- [Fillet Kerb Return](#)
- [Two Centred Kerb Return](#)
- [Three Centred Kerb Return](#)

Fillet Kerb Return



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

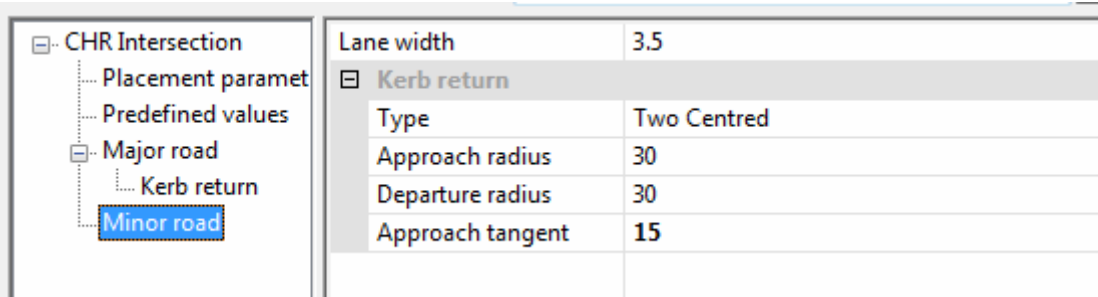
Type

*the type of kerb return to create (in this case, **Fillet**)*

Radius

the radius for the fillet kerb return

Two Centred Kerb Return



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Type

*the type of kerb return to create (in this case, **Two Centred**)*

Approach radius

the approach radius of the two centred curve

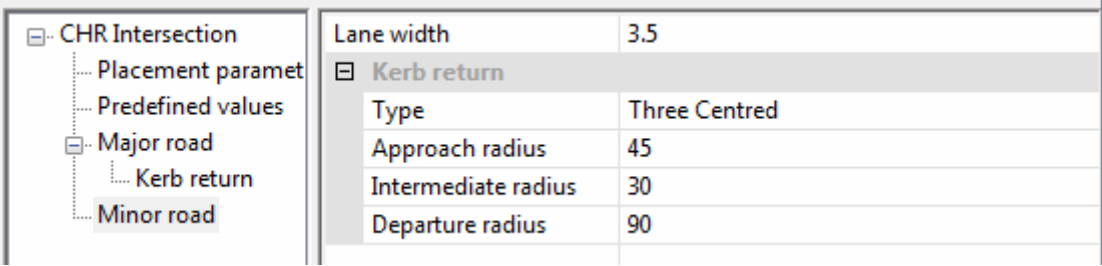
Departure radius

the departure radius of the two centred curve

Approach tangent

the approach tangent for the two centred curve

Three Centred Kerb Return



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Type

*the type of kerb to create (in this case, **Three Centred**)*

Approach radius

the approach radius of the three centred curve

Intermediate radius

the intermediate radius of the three centred curve

Departure radius

the departure radius of the three centred curve

Placing CHR Intersections

CHR Intersections are placed at the intersection of two roads - a major road and a minor road. Each road can be optionally defined with a second carriageway. When placing a CHR intersection, there are several placement specific settings. This means they are separate from the definition but help define how the CHR is placed.

These are defined when placing the component, and may be edited from the [Placed Component Editor](#) Some of these are also available from the [Edit a Placed Component Definition](#) panel.

These parameters are shown below, as they are displayed when placing the component.

Major left	12D SA EXAMPLE 7-	
Minor left	12D SA EXAMPLE 7-	
Major right		
Minor right		

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Major left <i>the left most major road</i>	string select		
Minor left <i>the left most minor road</i>	string select		
Major right <i>the right most major road (optional)</i>	string select		
Minor right <i>the right most minor road (optional)</i>	string select		

Major right and **Minor right** can be set when there is a dual carriageway.

Component parameters	
Lateral offset	0

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Lateral offset <i>an offset of the CHR intersection from the major left control line. This is useful when the control line is not the centreline.</i>			

Place a Component

Position of option on menu: **Design =>Roads =>Components => Place component**

The **Place a component** panel allows you to place a component from your library.

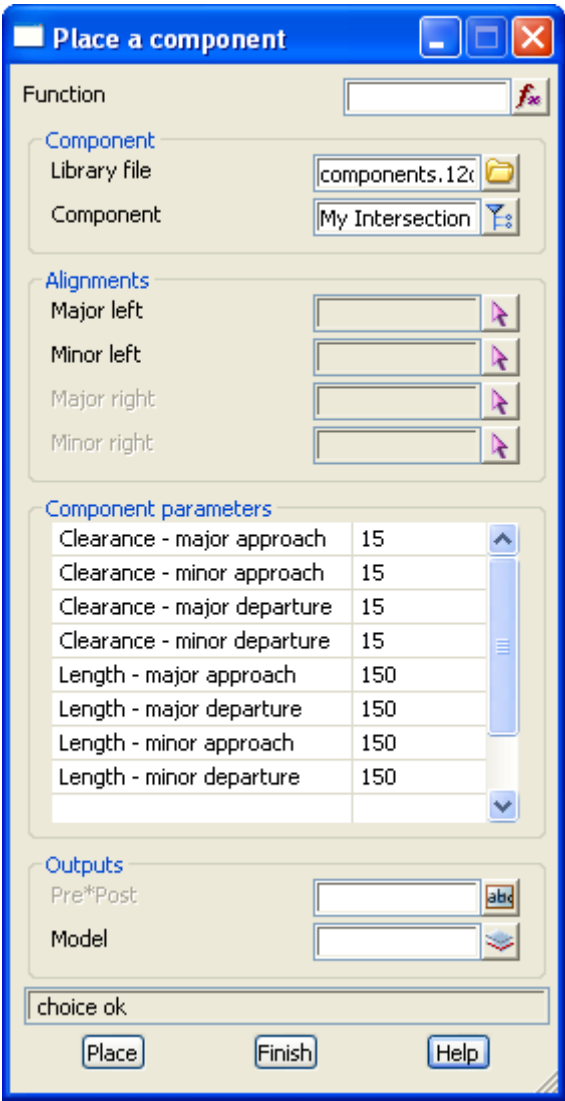
The placement specific parameters required will depend on which component you are attempting to place.

Each component is created as a function, which means you can easily recalc after you change the strings to which it is attached or make it part of a chain.

Please note that there are two types of parameters involved in defining a component:

- 1. **Component Specific** – meaning how the geometry is generated. These are edited via the library or by editing the definition of a placed component.
- 2. **Placement Specific** – how the component is placed. These are edited when placing a component on the **Place a component** panel or on **Editing a Placed Component**.

Selecting **Place component** brings up the **Place a component** panel.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Common Fields			

Function	function
<i>the function to create</i>	
Library file	file
<i>the library file to read components from</i>	
Component	choice box
<i>the component to place</i>	
Pre*Post	
<i>an optional pre*post to apply to generated strings</i>	
Model	model box
<i>the model to create the component strings in</i>	
Place	button
<i>places the components</i>	

For more information on the placement specific parameters required for each component, see the section on the specific component type (see [Component Types](#)).

Editing Components

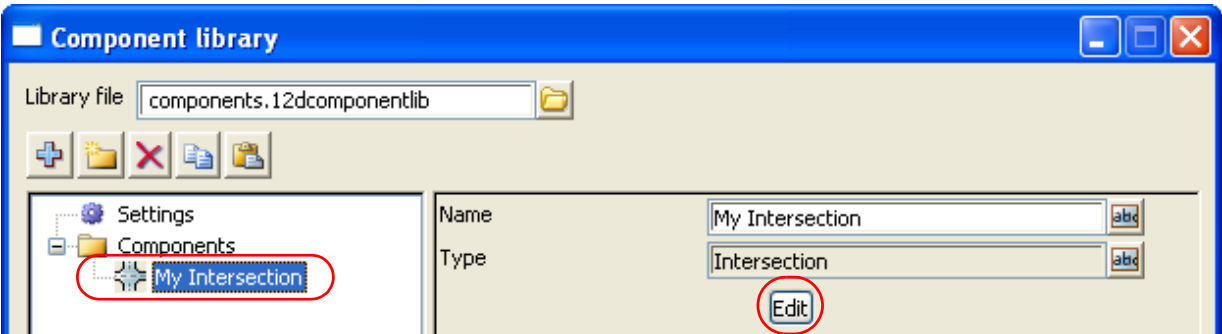
Components may be edited either in the library or directly from a placed component.

For information on **Editing in the Component library** go to [Editing in the Component library - Component Editor](#)

For information on **Editing a Placed Component** go to [Editing a Placed Component](#)

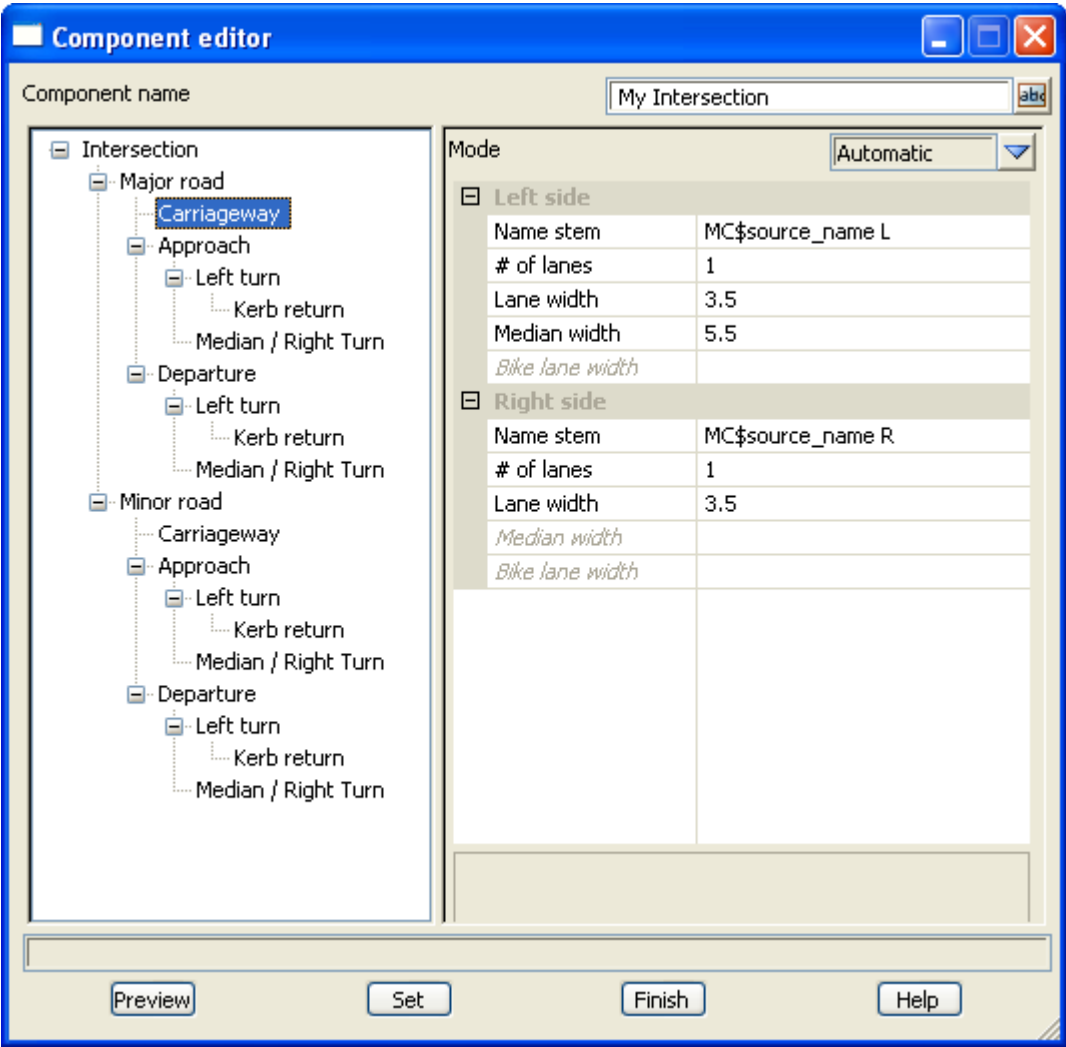
Editing in the Component library - Component Editor

Design =>Roads =>Components => Component library =>Component Node =>Edit button



To edit in the **Component Library**, select your component and then select the **edit** button, this brings up the **Component Editor** panel.

The **Component Editor** panel changes depending on the component, so for specific information on parameters, please see the section on that component type (see [Component Types](#)). The following example shows editing an intersection component.



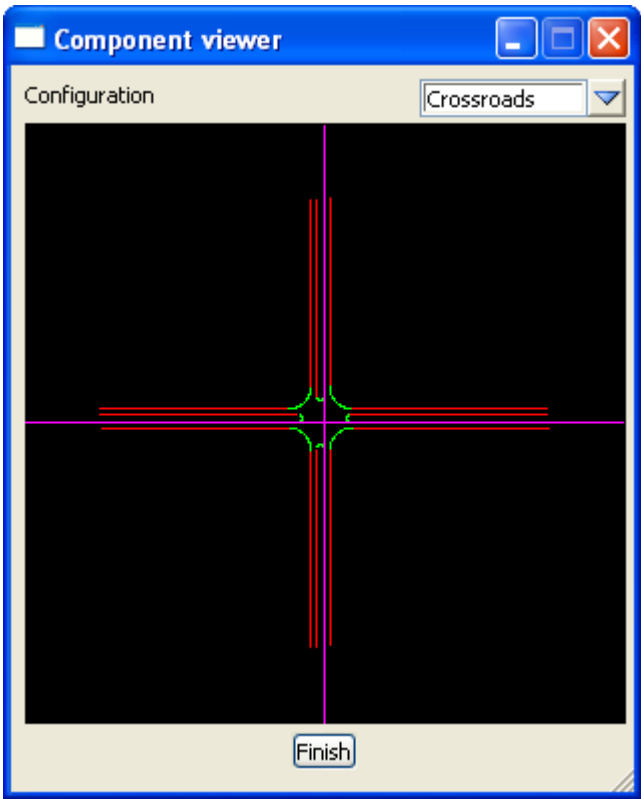
The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Common fields and buttons			
Component name			
<i>the name of the component</i>			
Preview	button		
<i>shows a preview of the component with theoretical centreline strings. For more information please go to Component Viewer.</i>			
Set	button		
<i>sets the component in the library</i>			

Component Viewer

The **Component viewer**, which is updated as you make changes to your library component, gives you an idea of what your component may look like when it is placed. The following example shows a standard intersection.

Selecting the **Preview** button on the **Component Editor** panel displays the **Component viewer** panel.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Configuration <i>this field allows you to change what strings are generated to show you how the component will change based on different centrelines.</i>	choice box		Crossroads, T Junction
<i>Options include: Crossroads and T-Junction</i>			

Note that this does not affect the component in anyway – this is only for previewing purposes.

Editing a Placed Component

You may edit a placed component, either by changing the placement specific parameters or by changing the definition itself.

A placed component may be edited by using the **Functions =>Editor (Utilities => Functions =>Editor)** or by using the **Edit Component** option on the **Components** menu (**Design =>Roads =>Components => Edit Component**).

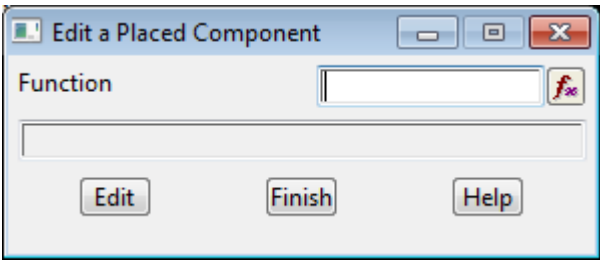
As when placing the component, the placement specific parameters will vary based on the type of component.

For more information on **Edit a Placed Component** please see [Edit a Placed Component](#)

Edit a Placed Component

Position of menu: **Design =>Roads =>Components => Edit Component**

The **Edit a Placed Component** panel, edits an existing component by its function.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Function

the component function

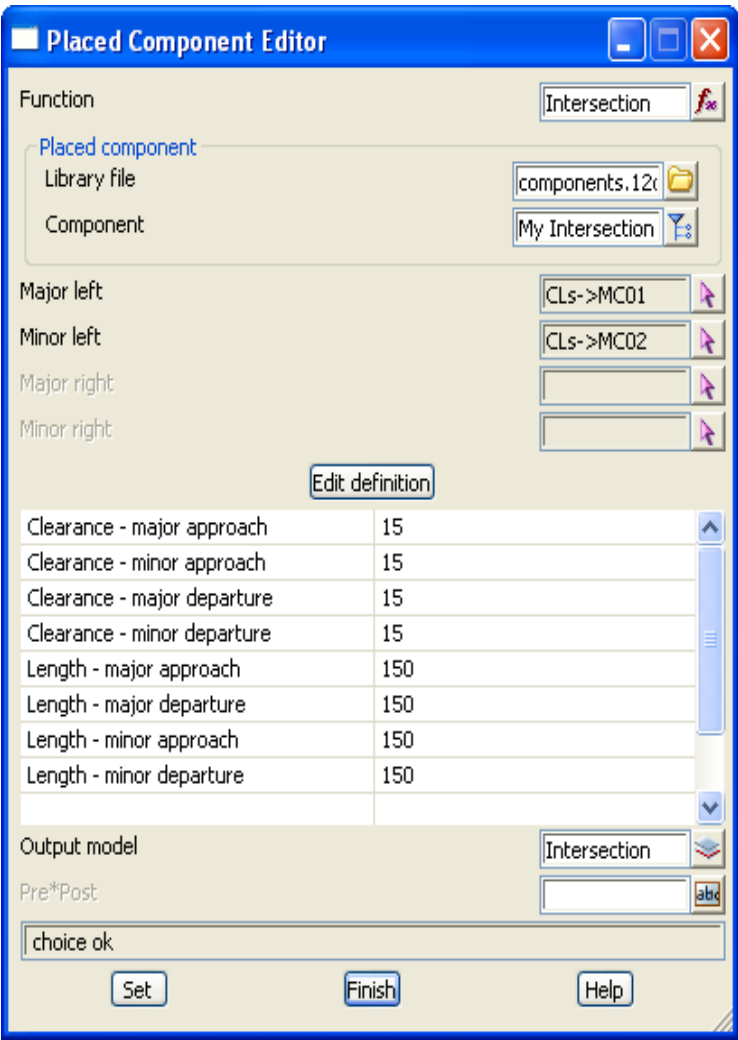
Edit

button

edits the placed component (see [Placed Component Editor](#)).

Placed Component Editor

This panel is only accessible by using the [Edit a Placed Component](#) (Design =>Roads =>Components => Edit Component) or by editing the function directly from the Utilities => Functions =>Editor.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Function	function		
<i>the function you wish to edit</i>			

Placed Component

Library	file
<i>the library your component is read from</i>	
Component	choice box
<i>the component that is being placed</i>	

Please note that Library and Component will be read only if you have opted to detach the

component from the library.

Edit Definition button

allows you to edit the definition of the placed component, which will detach it from the library. After you do this, any changes to the library component will not affect your component. For more information please see [Edit a Placed Component Definition](#)

For information on the placement specific parameters, please see the section for that component (see [Component Types](#)).

Output Model model box

the model the geometry will be generated into

Pre*Post

*an optional pre*post*

Set button

Sets the details

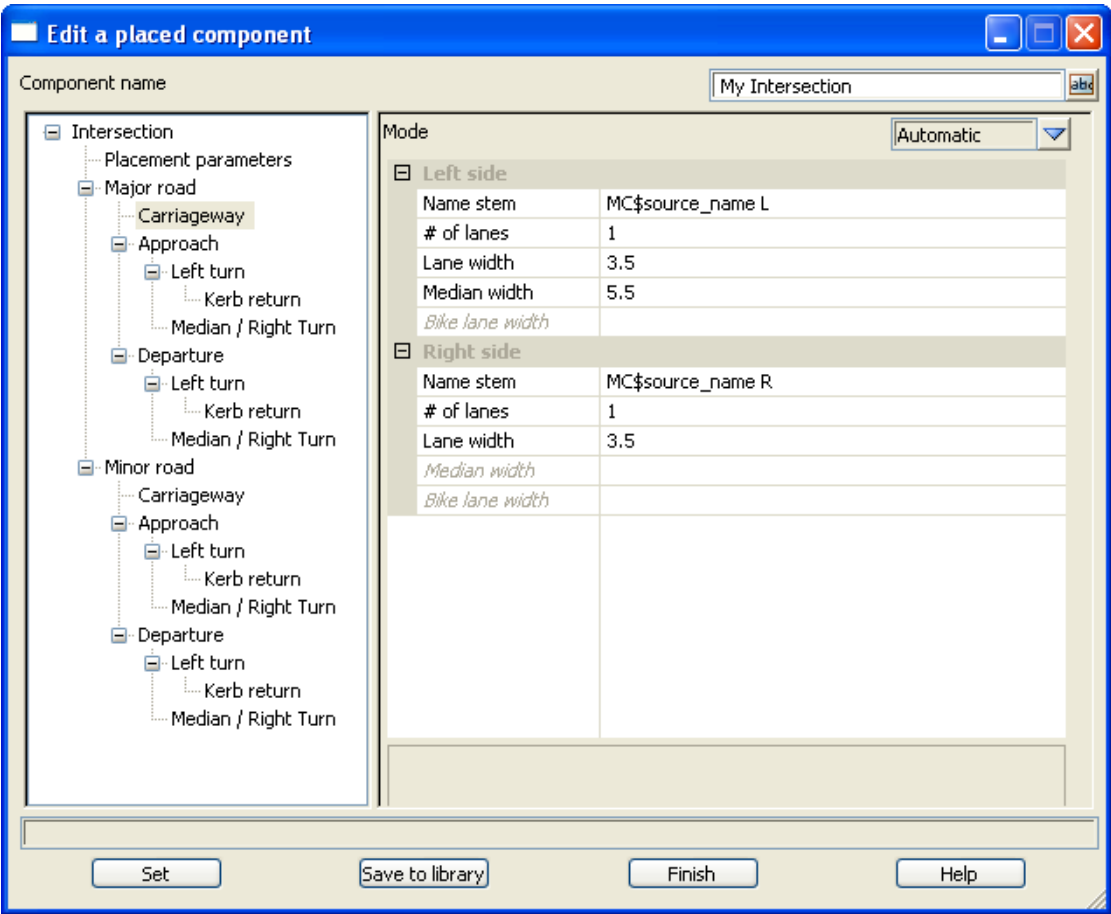
Edit a Placed Component Definition

To edit the definition of a placed component, you must edit the function (**Utilities => Functions => Editor or Design => Roads => Components => Edit Component**) and then select '**Edit Definition**' on the [Placed Component Editor](#) panel.

The following example shows the intersection editor. For details on the component specific parameters, see the section on that component type (see [Component Types](#)).

As you edit the component, your changes will be reflected on the component strings.

If you do not wish to keep the changes, simply press '**Finish**' without pressing '**Set**'.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Component name

the name of the component

Set	button
------------	--------

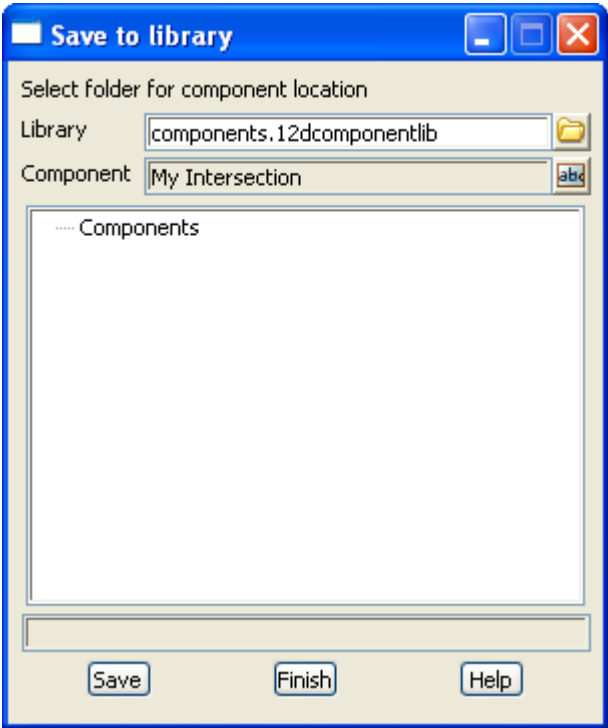
sets the component specific parameters

Save to library	button
------------------------	--------

allows you to save your component definition back into your library. This is useful after you have made changes which you wish to reuse in other components. For more information please see [Save to Library](#)

Save to Library

This panel allows you to save an edited definition back in to your library.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Library	file		
<i>the library file to save to</i>			

Component	
<i>the name of the component you are saving</i>	

The panel displays a list of all the folders in your library. Select which folder you wish to save it into.

Save	button
<i>saves the component into your library</i>	

Component Quick Place

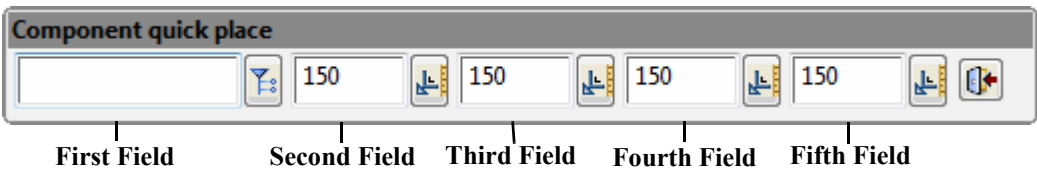
Position of option on menu: Design =>Roads =>Components => Quick place

The **Component quick place** toolbar is an easy way to quickly drop components on to existing strings.

Simply start the toolbar, pick your component and hover your mouse over where you would like the component created. If the placement point is correct, a preview of the component will be drawn on your view.

Once you have picked the position correctly, hitting **C** on your keyboard will create the component.

You can then press **E** to edit the component.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

First field

the list of components from your local library (searched for in the working directory, or in your library)

Second field

the length on the major approach (does not apply to all components)

Third field

the length on the major departure (does not apply to all components)

Fourth field

the length on the minor approach (does not apply to all components)

Fifth field

the length on the minor departure (does not apply to all components)

Last button

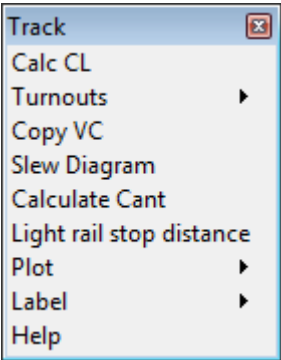
close the toolbar

Track

Position of menu: **Design =>Track**

The Track options are for working on rail design.

The Track walk-right menu is



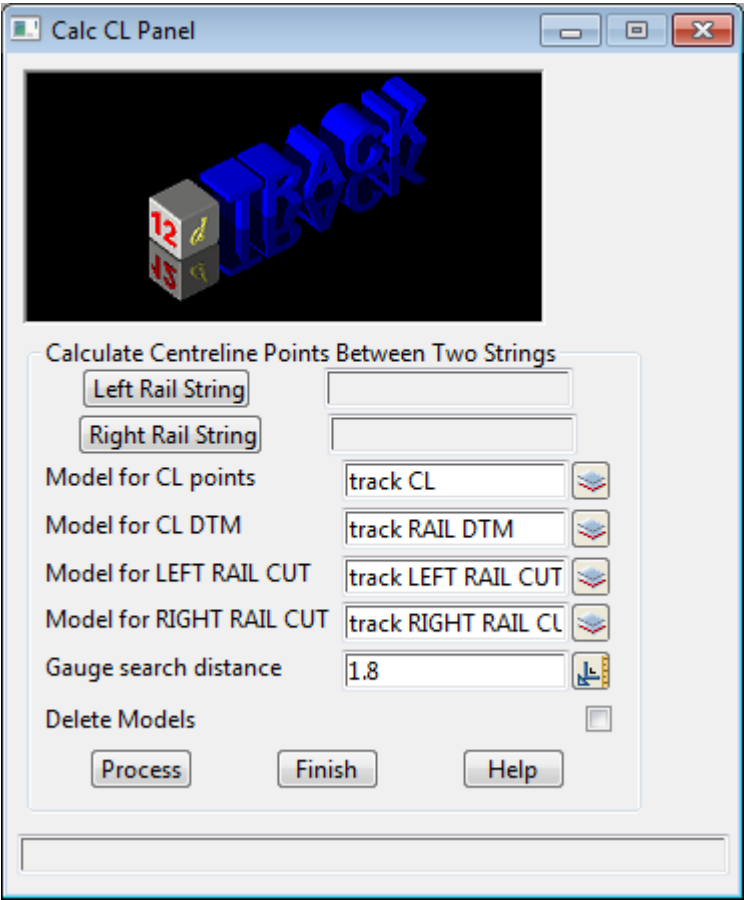
The **Track** options have their own Help system which is brought up by clicking on **Help** on the Track menu, or clicking **Help** on each of the **Track** panels.

For the option <i>Calc CL</i> , go to	Calc CL Panel
<i>Turnouts</i>	Track Turnouts
<i>Copy VC</i>	Copy VC
<i>Slew Diagram</i>	Rail Slew Calculator
<i>Calculate Cant</i>	Calculate Cant
<i>Light rail stop distance</i>	Light Rail Stopping Distance
<i>Plot</i>	Track Plot
<i>Label</i>	Track Label
<i>Help</i>	Help

Calc CL Panel

Position of menu: **Design =>Track =>Calc CL**

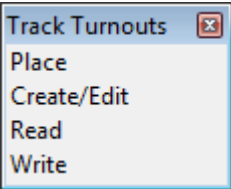
The **Track** options have their own Help system which is brought up by either clicking the **Help** button on the panel or by selecting the **Help** option on the Track menu.



Track Turnouts

Position of menu: Design =>Track =>Turnouts

The Track Turnouts walk-right menu is



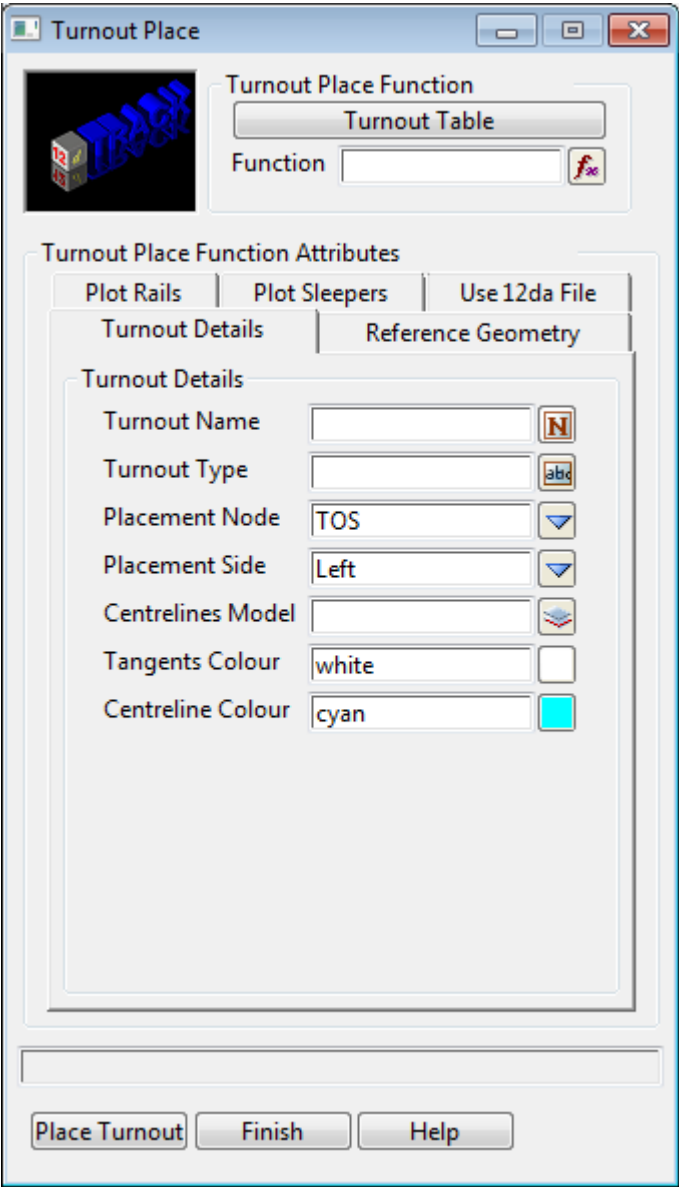
For the option *Place*, go to
Create/ Edit
Read
Write

[Turnout Place](#)
[Turnouts Create/ Edit](#)
[Read Turnouts](#)
[Write Turnouts File](#)

Turnout Place

Position of option on menu: Design =>Track =>Turnouts => Place

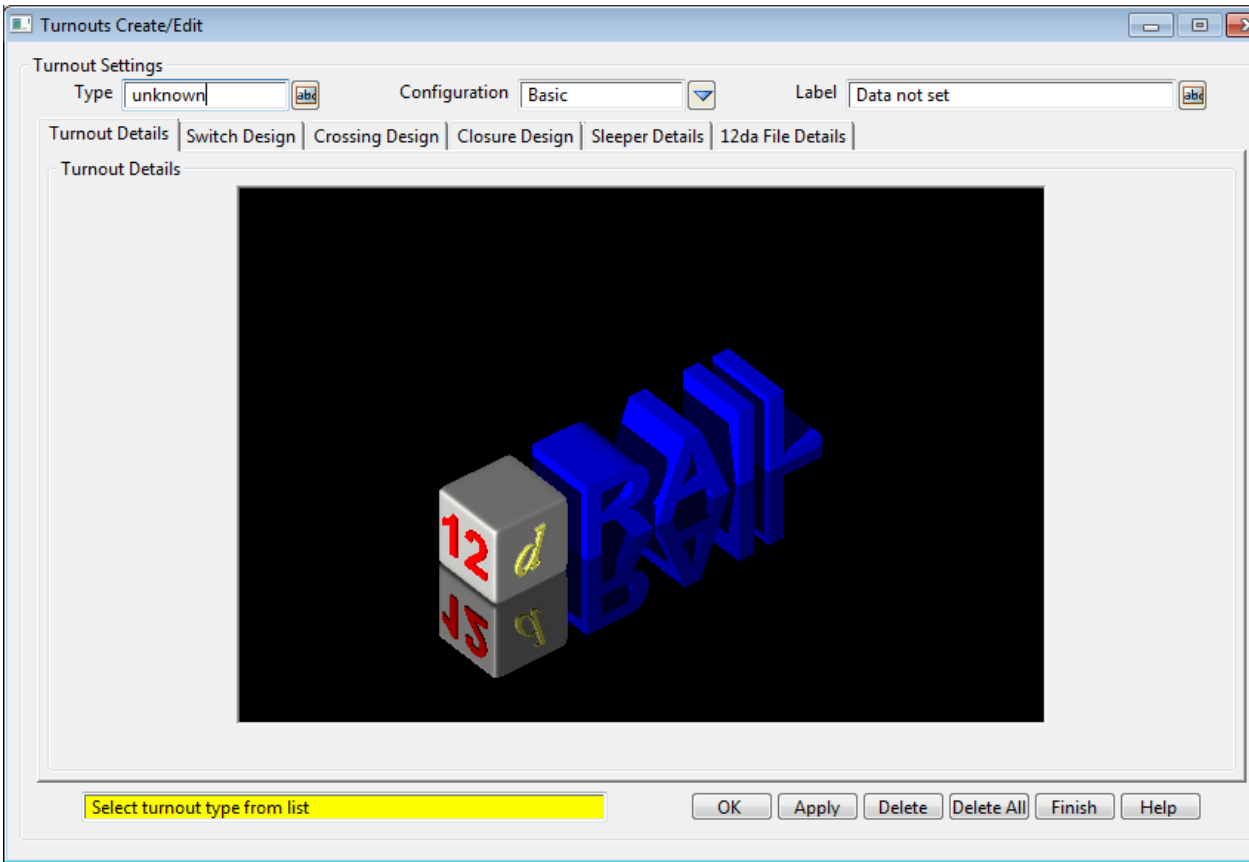
The **Track** options have their own Help system which is brought up by either clicking the **Help** button on the panel or by selecting the **Help** option on the Track menu.



Turnouts Create/ Edit

Position of option on menu: Design =>Track =>Turnouts =>Create/Edit

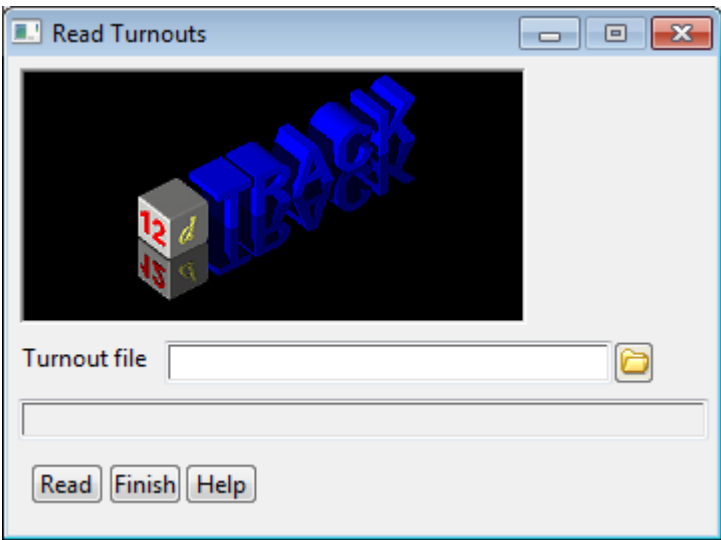
The **Track** options have their own Help system which is brought up by either clicking the **Help** button on the panel or by selecting the **Help** option on the Track menu.



Read Turnouts

Position of option on menu: **Design =>Track =>Turnouts =>Read**

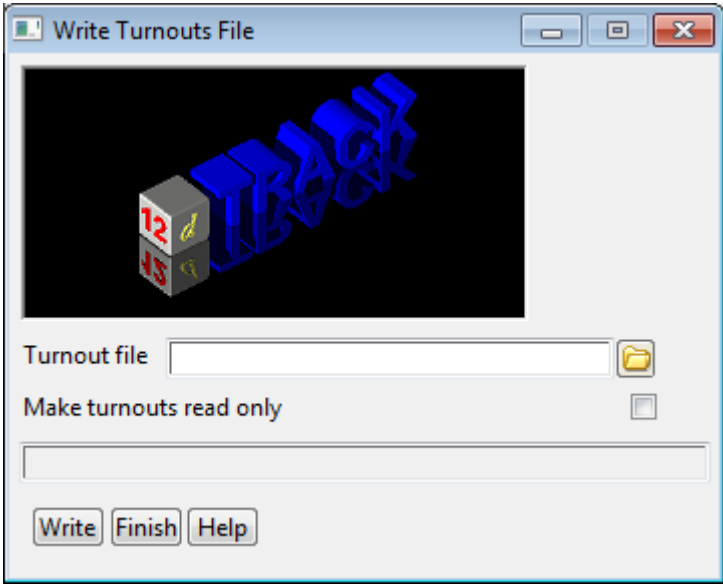
The **Track** options have their own Help system which is brought up by either clicking the **Help** button on the panel or by selecting the **Help** option on the **Track** menu.



Write Turnouts File

Position of option on menu: **Design =>Track =>Turnouts =>Write**

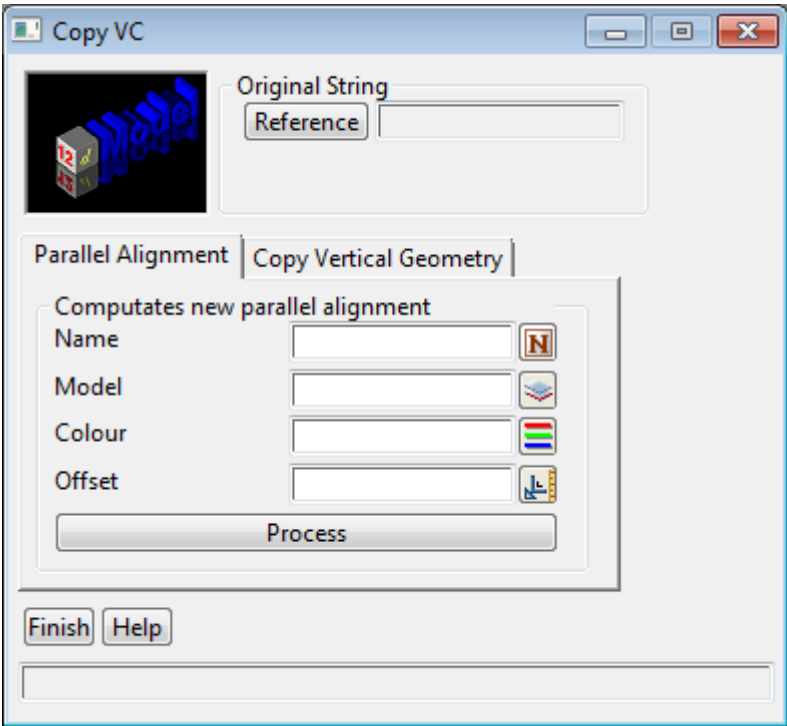
The **Track** options have their own Help system which is brought up by either clicking the **Help** button on the panel or by selecting the **Help** option on the **Track** menu.



Copy VC

Position of menu: **Design => Track => Copy VC**

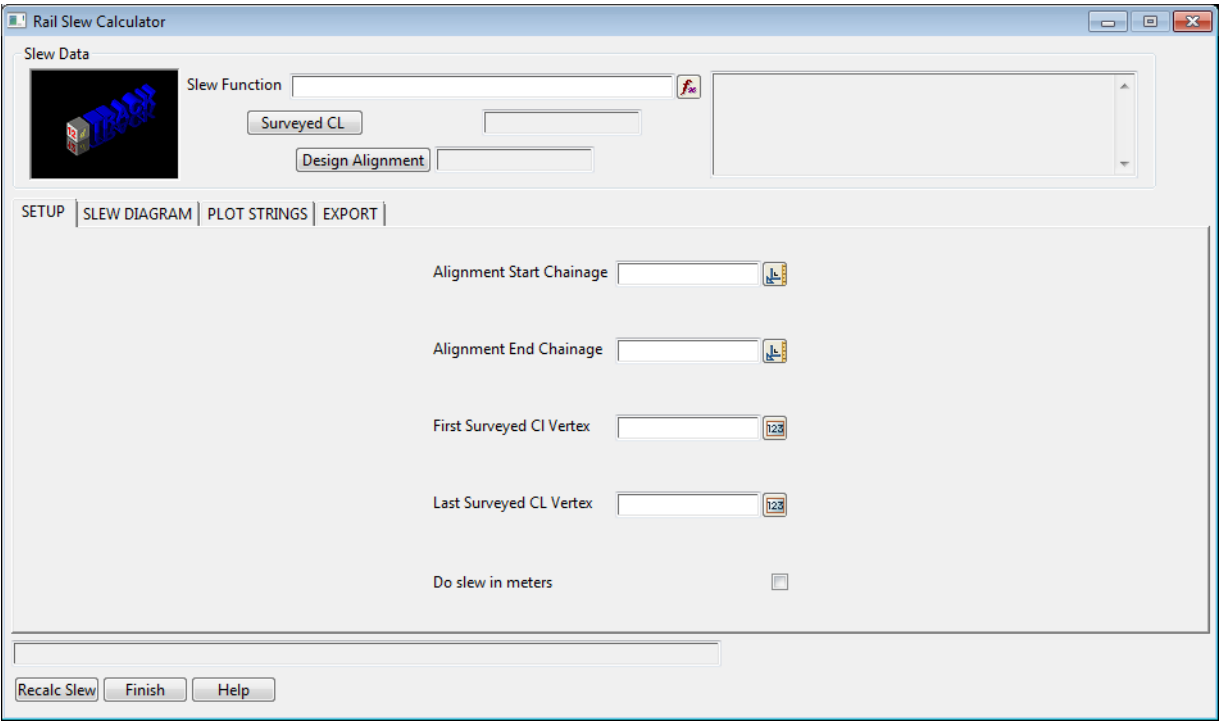
The **Track** options have their own Help system which is brought up by either clicking the **Help** button on the panel or by selecting the **Help** option on the **Track** menu.



Rail Slew Calculator

Position of menu: Design => Track => Slew Diagram

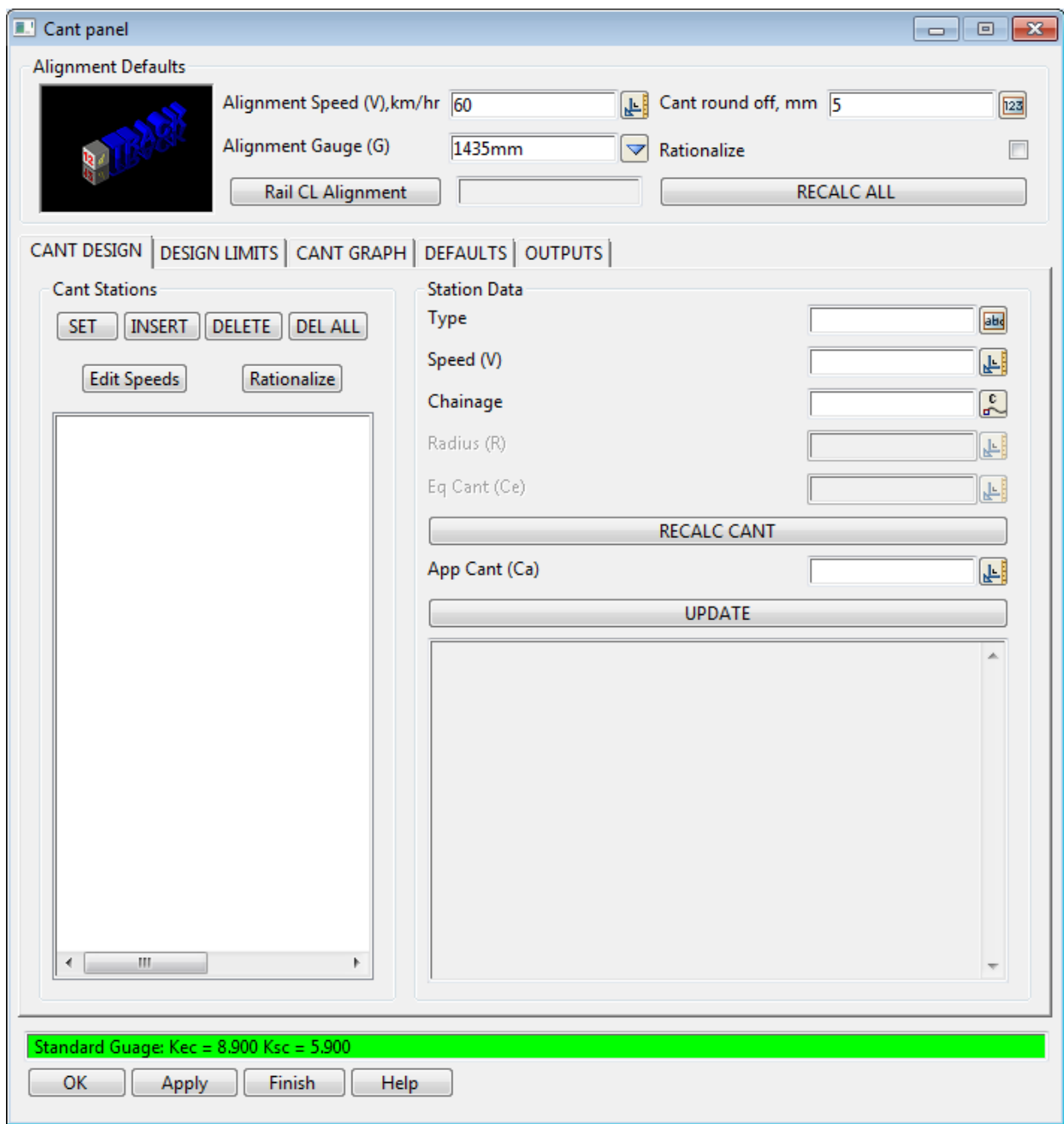
The **Track** options have their own Help system which is brought up by either clicking the **Help** button on the panel or by selecting the **Help** option on the Track menu.



Calculate Cant

Position of menu: Design => Track => Calculate Cant

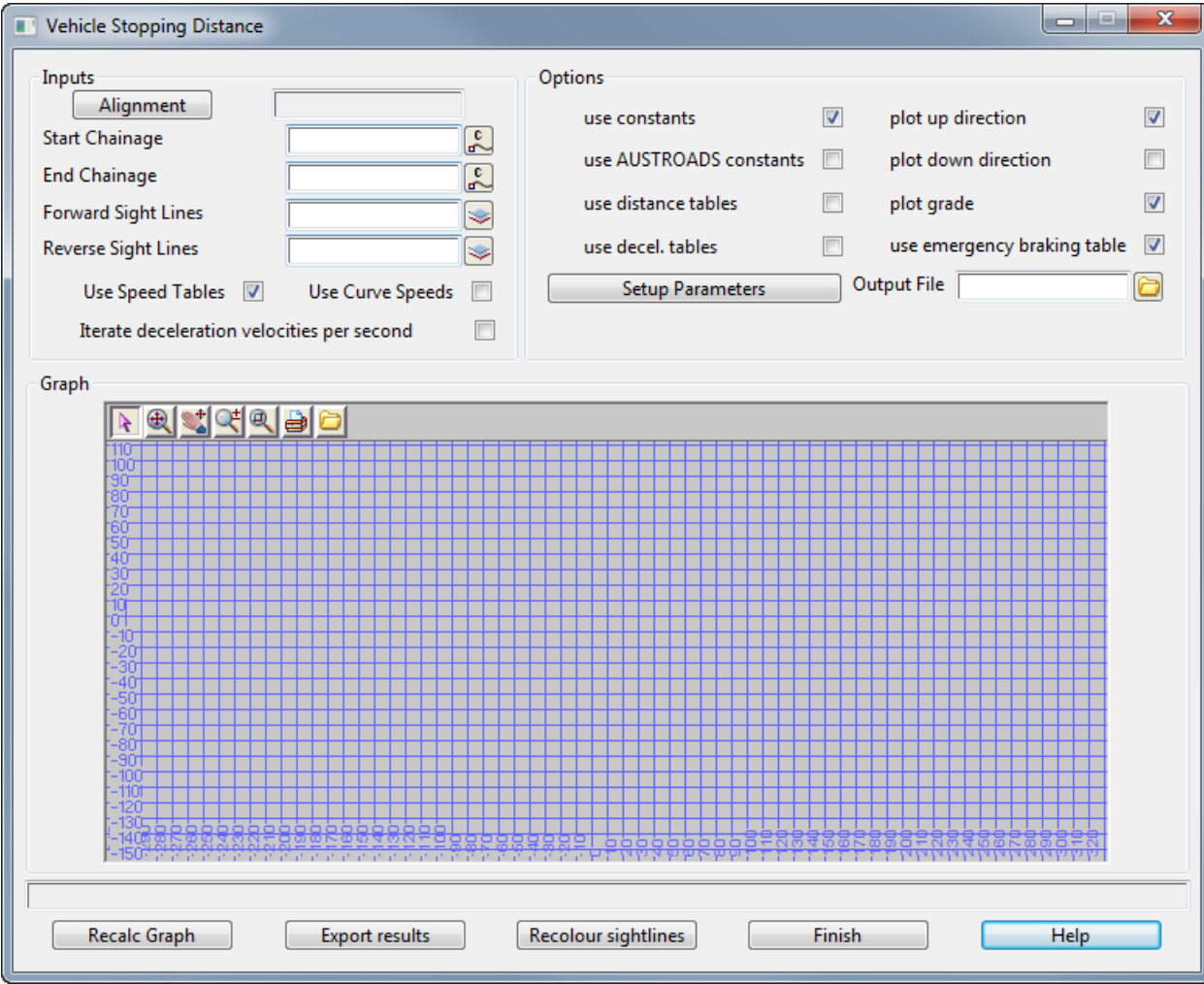
The **Track** options have their own Help system which is brought up by either clicking the **Help** button on the panel or by selecting the **Help** option on the Track menu.



Light Rail Stopping Distance

Position of menu: Design => Track => Light rail stop distance

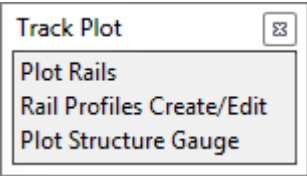
This section of documentation is a work in progress and will be updated in subsequent releases.



Track Plot

Position of menu: Design =>Track =>Plot

The Track Plot walk-right menu is



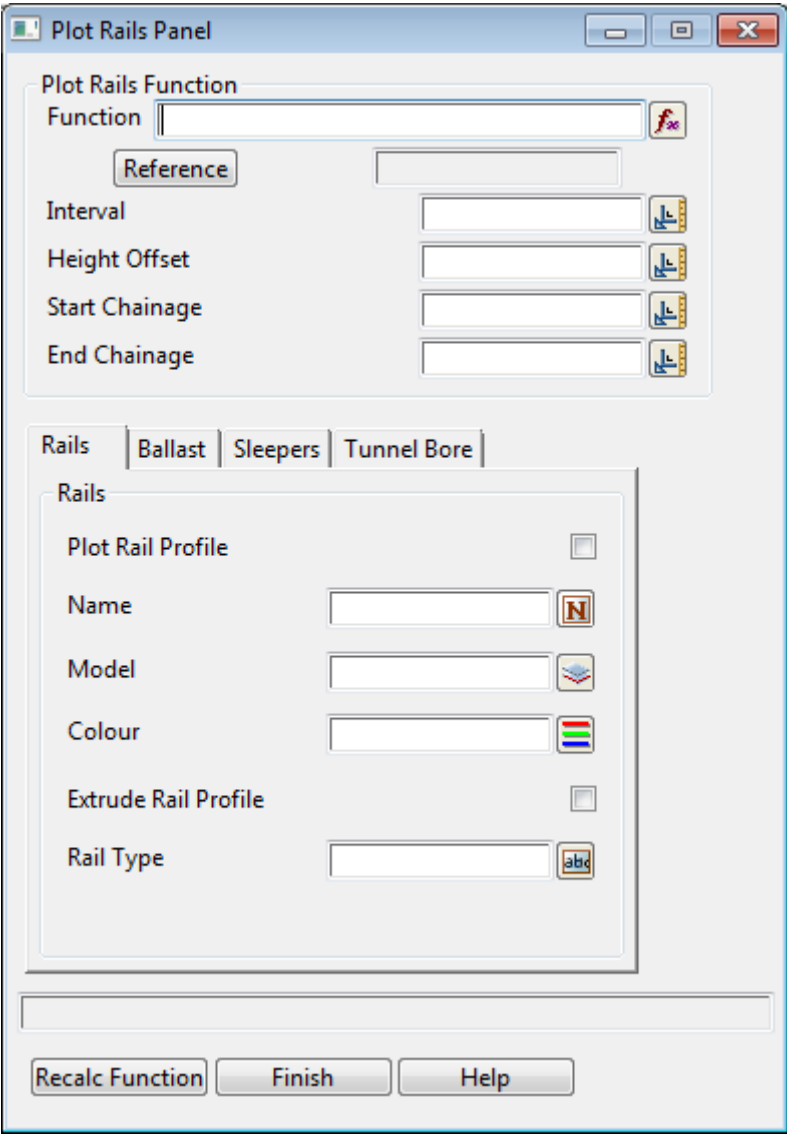
For the option *Plot Rails*, go to
Rail Profiles Create/Edit
Plot Structure Gauge

[Plot Rails Panel](#)
[Rail Create Profile Panel](#)
[Structure Gauge Panel](#)

Plot Rails Panel

Position of option on menu: Design =>Track =>Plot =>Plot Rails

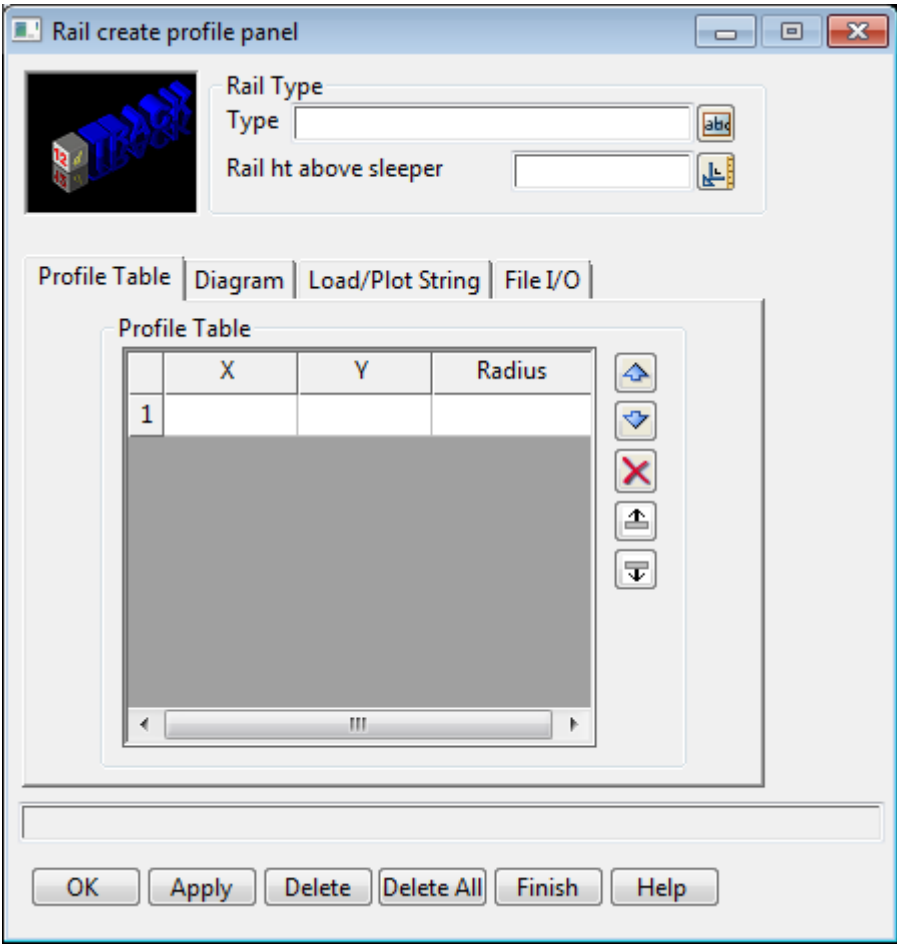
The **Track** options have their own Help system which is brought up by either clicking the **Help** button on the panel or by selecting the **Help** option on the Track menu.



Rail Create Profile Panel

Position of option on menu: Design =>Track =>Plot =>Rail Profiles Create/Edit

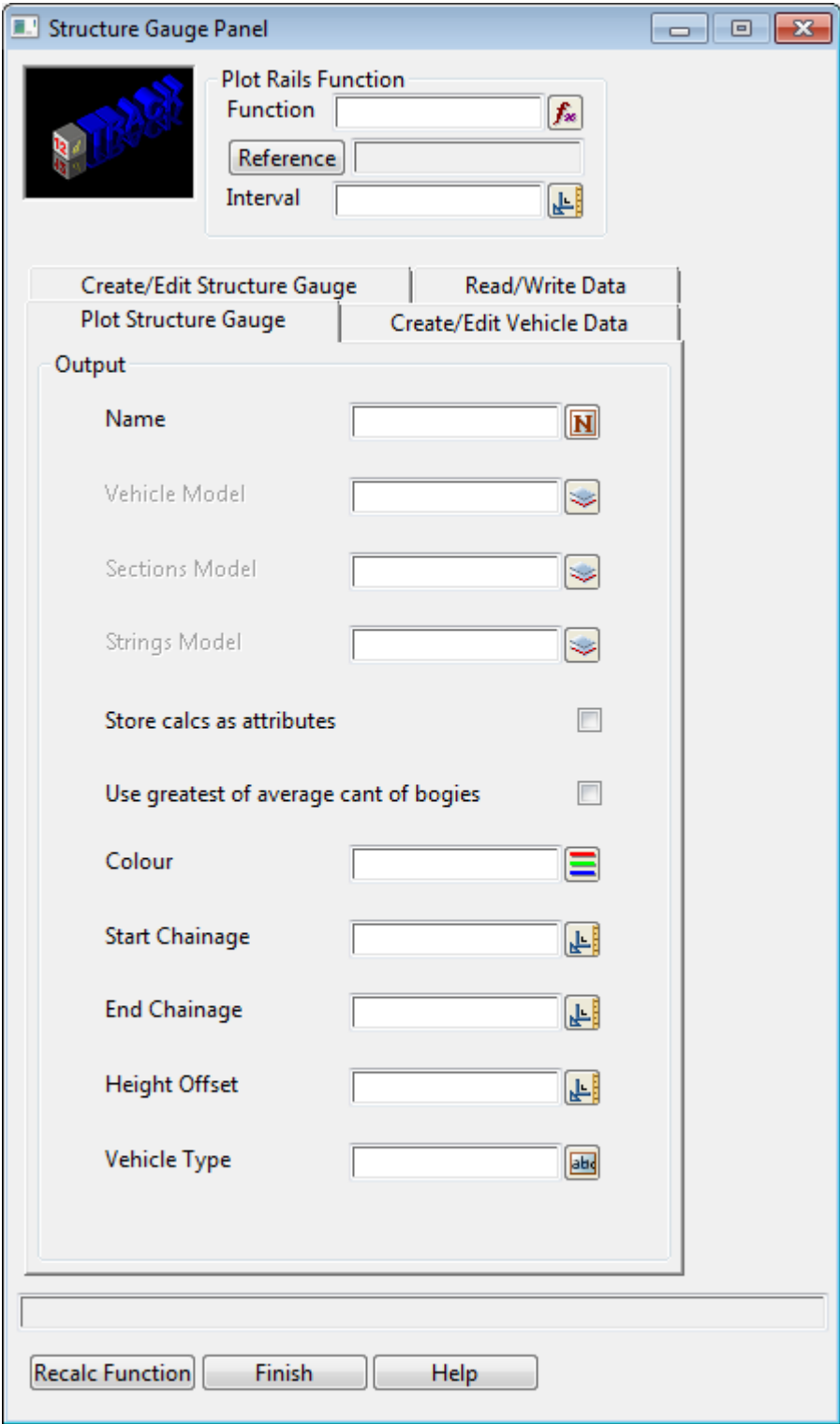
The **Track** options have their own Help system which is brought up by either clicking the **Help** button on the panel or by selecting the **Help** option on the Track menu.



Structure Gauge Panel

Position of option on menu: Design =>Track =>Plot=>Plot Structure Gauge

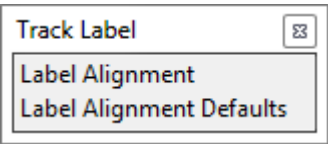
The **Track** options have their own Help system which is brought up by either clicking the **Help** button on the panel or by selecting the **Help** option on the Track menu.



Track Label

Position of menu: Design =>Track =>Label

The Track Label walk-right menu is



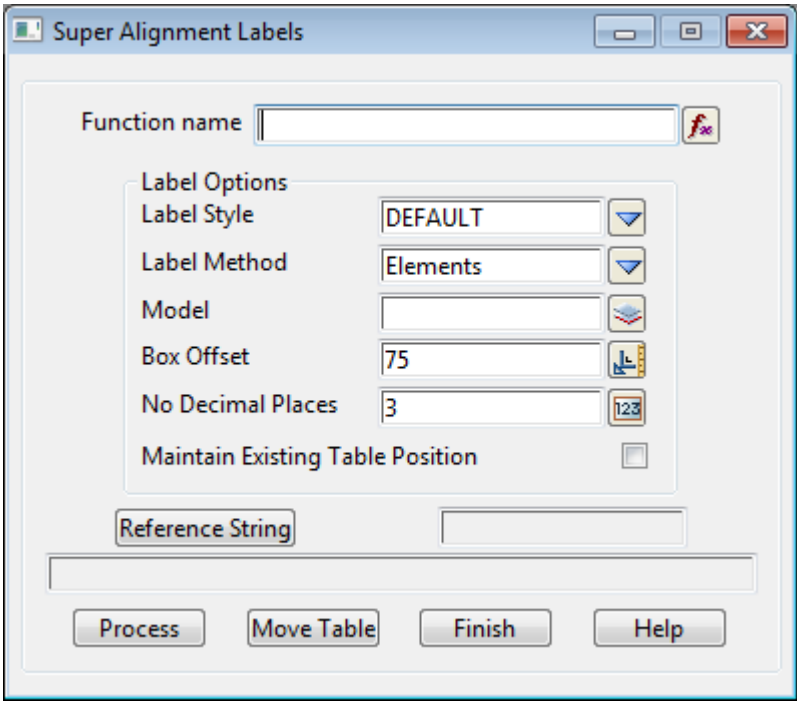
For the option *Label Alignment* go to
Label Alignment Defaults

[Super Alignment Labels](#)
[Super Alignment Style Extras Create/Edit](#)

Super Alignment Labels

Position of option on menu: Design =>Track =>Label=>Label Alignment

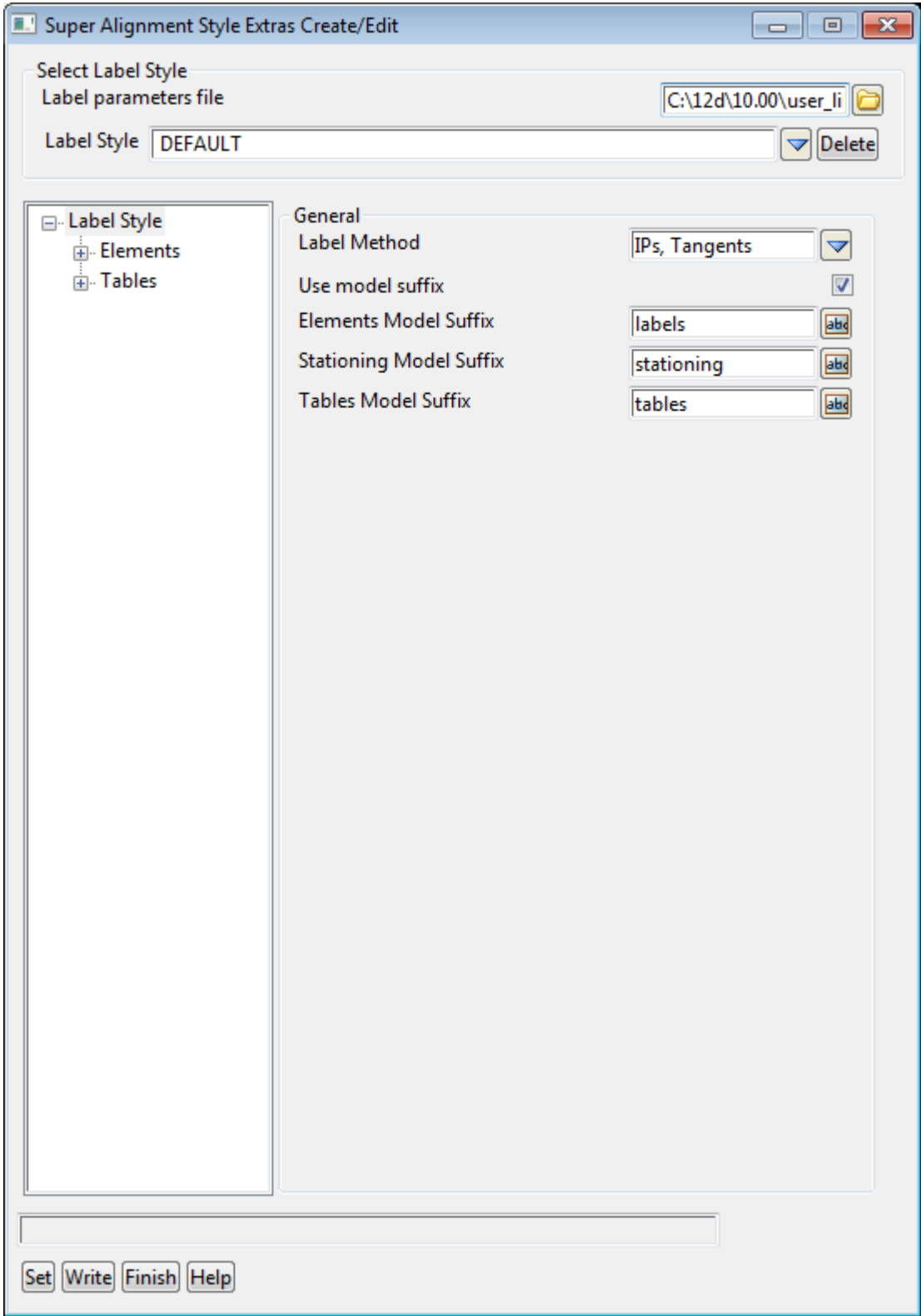
The **Track** options have their own Help system which is brought up by either clicking the **Help** button on the panel or by selecting the **Help** option on the Track menu.



Super Alignment Style Extras Create/Edit

Position of option on menu: Design =>Track =>Label=>Label Alignment Defaults

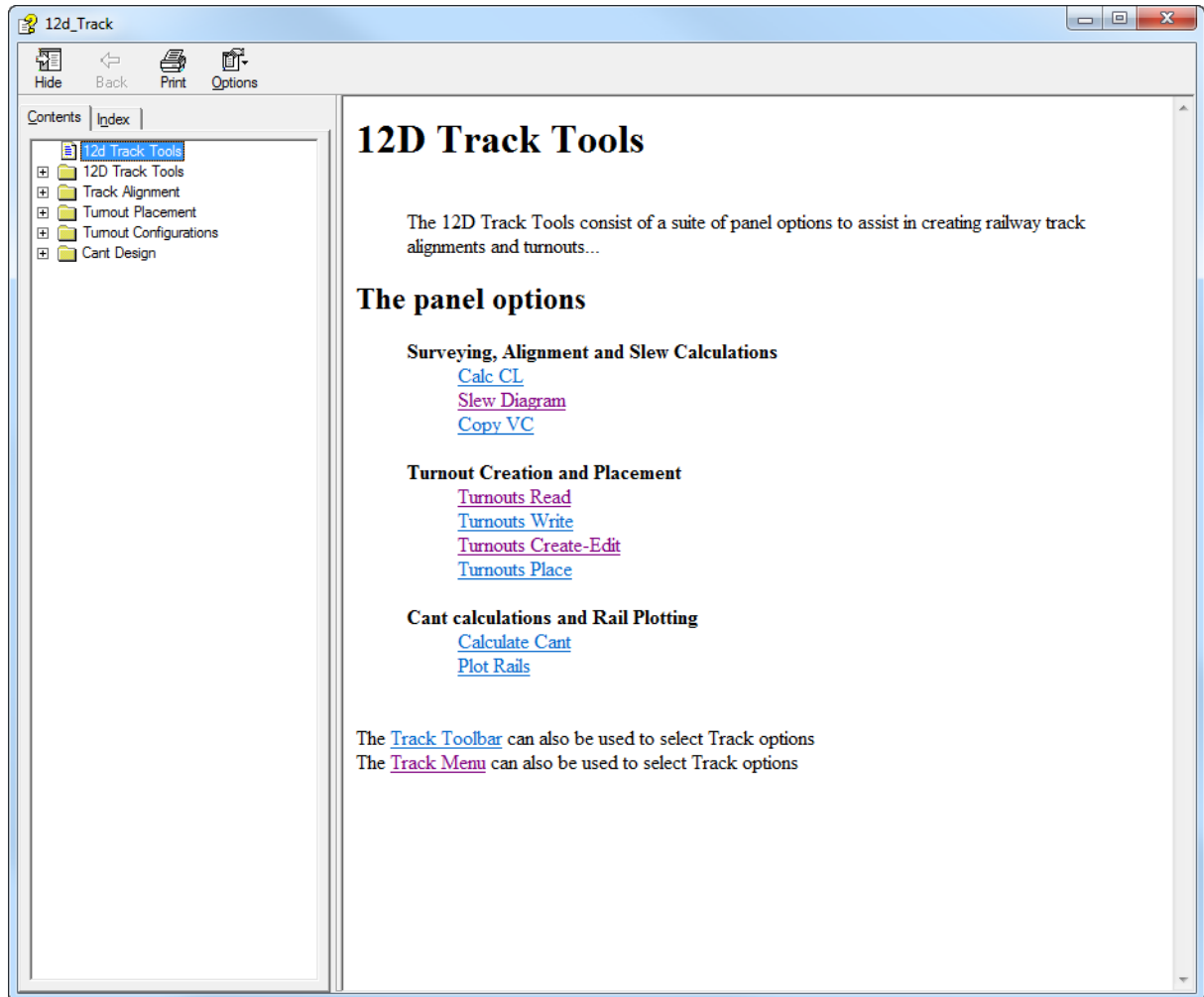
The **Track** options have their own Help system which is brought up by either clicking the **Help** button on the panel or by selecting the **Help** option on the Track menu.



Help

Position of menu: Design =>Track => Help

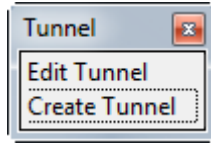
The **Track** options have their own Help system which is brought up by clicking on **Help** on the **Track** menu, or clicking **Help** on each of the **Track** panels.



Tunnel

Position of menu: **Design =>Tunnel**

The **Tunnel** walk-right menu is



For the option *Edit Tunnel*, go to
Create Tunnel

[Define Tunnel](#)

[Create Tunnel](#)

Define Tunnel

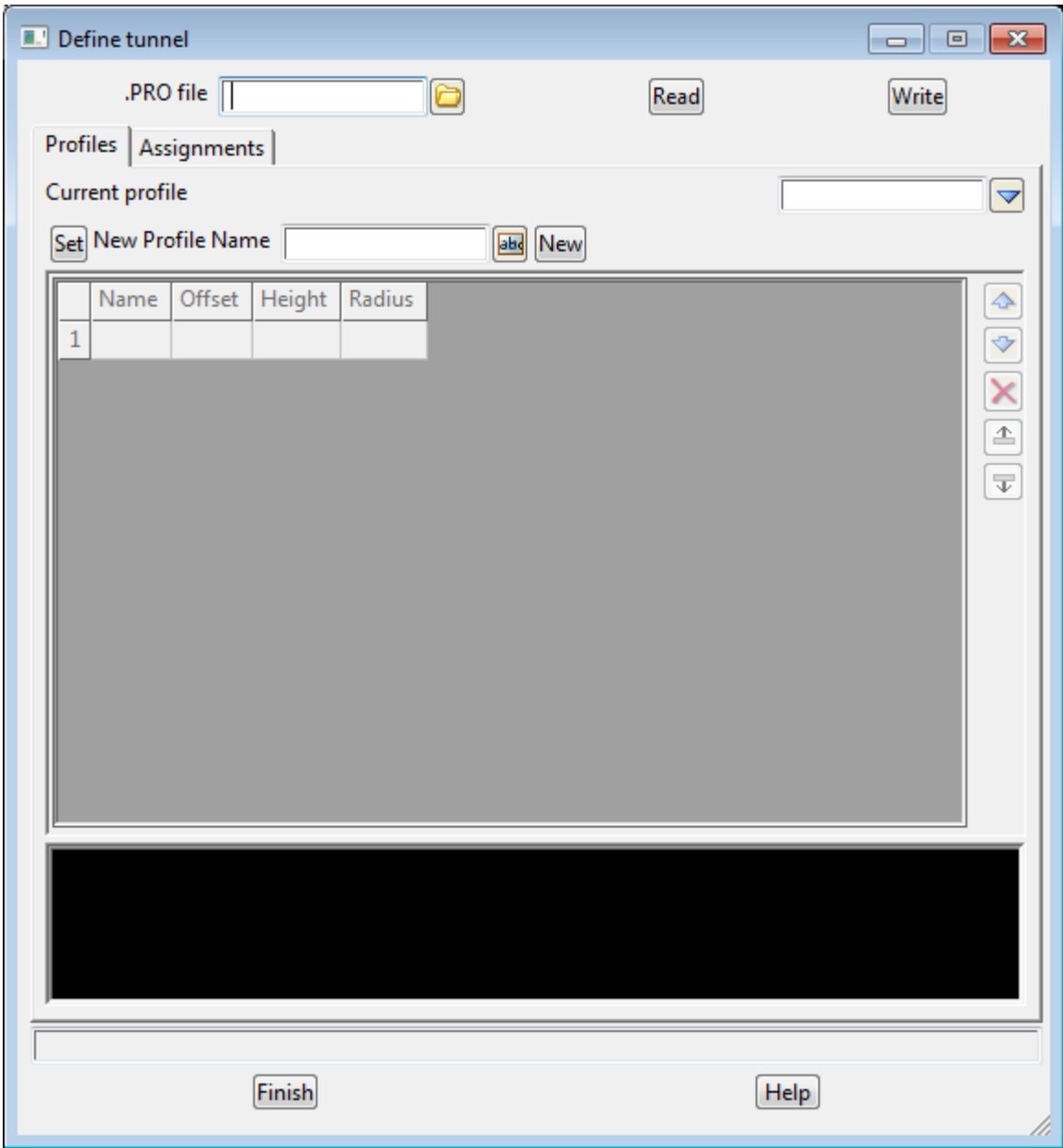
Position of option on menu: **Design =>Tunnel =>Edit Tunnel**

The **Define Tunnel** panel is used to create **PRO/PRA** tunnel definition files. These files are used by the **Create Tunnel** option and by **12dField** for tunnel setout.

Tunnels are defined by any ... n number of profiles and the chainages these profiles are assigned at, the profiles are stored in the **PRO** file and the assignments in the **PRA**.

For more information on **PRO/PRA** tunnel definition files please see [Definition of the PRO and PRA definition files](#)

Selecting **Edit Tunnel** brings up the **Define Tunnel** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
.PRO file	file		
<i>The name of the PRO/PRA files to be created/edited.</i>			
Read	button		
<i>Read in a pair of PRO/PRA files and populate the grids.</i>			
Write	button		
<i>Write the grids out to the PRO/PRA files, if an error is detected it will be displayed and the write will not occur.</i>			

The profiles tab

A tunnel can contain any number of profiles, the **profile** tab lets you create new profiles, pick existing profiles to edit and graphically display the shape of the profile for you.

Current Profile choice box list of available profiles in the current tunnel

Select the profile you wish to edit, the selected profile will be read in, the grid populated and the shape shown in the draw box.

Set button

*Sets the contents of the current grid to the overall tunnel structure, **set** must be pressed before moving to another profile or the contents of the current grid will be lost.*

New Profile Name

Enter the name of a new profile to create, this must be unique to the tunnel.

New

Create the new profile, a warning will appear if the name is not unique, if another profile already exists, the new profile will have the number of elements and their names created automatically.

Profiles grid

This grid is used to create the elements of a profile, profiles are constructed of straight and arc elements, all profiles in a tunnel must have the same number of elements with the same name.

Name

the name of the element, it must be unique to the profile.

Offset

the offset of the start of the element from the centreline, +ve is right of the centreline.

Height

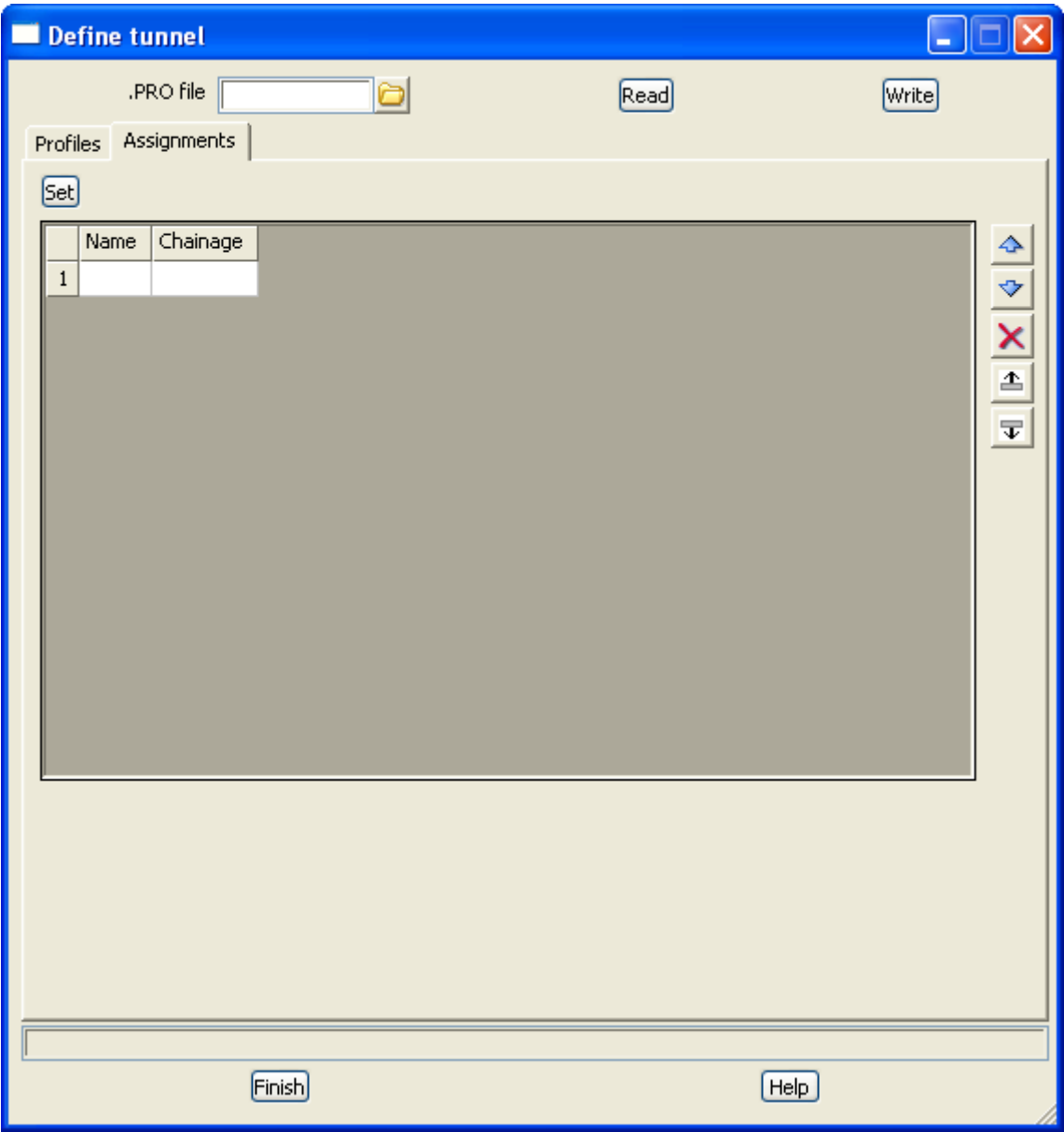
the height difference of the start of the element from the centreline, +ve is above the centreline.

Radius

the radius of the element, 0 is no radius and positive a right handed or clockwise curve.

The Assignments tab

This grid is used to define where the profiles are assigned on the centreline, the same profile can be assigned any number of times, the chainages must be in ascending order.



Set button
Write the contents of the grid to the tunnel structure.

Assignments grid

Name
The name of the profile.

Chainage
The chainage the profile is assigned at.

Finish button
Exit the panel, a warning will be displayed if the tunnel has been edited and not yet written to file.

Create Tunnel

Position of option on menu: **Design ==>Create Tunnel**

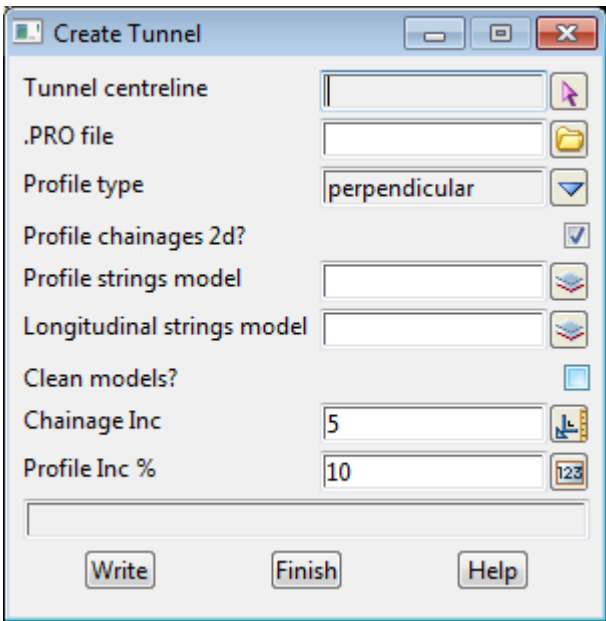
The **Create Tunnel** panel is used to create the longitudinal and profile strings defining the shape of a tunnel.

The tunnel is defined in a **PRO/PRA** file pair which can be generated using the [Define Tunnel](#) panel.

For more information on **PRO/PRA** tunnel definition files please see [Definition of the PRO and PRA definition files](#)

Tunnel strings can be generated normal/ perpendicular to the defined centreline resulting in a true 3d representation. Note a tunnel cannot be completely vertical, there must be some chainage difference in the vertical alignment, typically a difference of 0.01mm would suffice for most situations.

Selecting **Create Tunnel** brings up the **Create Tunnel** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Tunnel centreline

The centreline the tunnel definitions are applied to, the centreline must have valid vertical geometry for the chainage ranges in the PRA file.

.PRO file

*The **PRO/PRA** files containing the tunnel definition. For more information on **PRO/PRA** tunnel definition files please see [Definition of the PRO and PRA definition files](#)*

Profile type	choice box	perpendicular, vertical
---------------------	------------	-------------------------

perpendicular: the tunnel is calculated perpendicular/normal to the vertical alignment of the centreline resulting in a true 3d model.

vertical: the tunnel is calculated vertical to the vertical alignment of the centreline, this means

an effective loss of clearance on steeper grades.

Profile chainages 2d tick box

*if ticked the chainages in the **PRA** file are taken as plan chainages.*

if not ticked the chainages are interpreted as 3d, this is the plan/2d chainage of the 1st point where the horizontal and vertical geometry coincide plus the 3d length along the centreline from there.

Profile strings model model box

The model where the tunnel shape at a particular chainage is written.

Longitudinal strings model model box

The model where the strings generated on a specific point on a profile element for the entire length of the tunnel are written.

Clean models? tick box

if ticked the profile and longitudinal models will be cleaned before the new strings are created.

Chainage Inc

*The increment to create the profile and longitudinal points at, the actual range of the generated points is dependent on the assignments in the **PRA** file.*

Profile Inc%

Depending on the desired accuracy of the shape generated you can specify how many points should be created on each profile element, for example an increment of 5% would generate 20 points per element, 10% 10 points per element.

Write button

*Create the tunnel strings, if there is an error in the **PRO/PRA** files this will be displayed otherwise the strings generated.*

Finish button

Exit the panel.

Definition of the PRO and PRA definition files

Profiles (.PRO)

```
// Sample tunnel profile
//
// Lines starting with // are interpreted as comments and ignored
//
// Format
//
// <profile name> 8 characters or less
// <element name> <offset> <level diff> <radius> for the radius -ve /
// is left and 0=straight
// .
// .
// <element name> <offset> <level diff> <radius>
// <element name> <offset> <level diff> terminates when there is no /
// radius
//
// Each profile MUST have the same number of elements
// and the name of the elements must match.
//
// Generally speaking profiles are created anti-clockwise
//
// This profile is circular with dummy elements E2 and E5
// They transition into a straight element in the next profile
//
PROF_1
E1 0 1 -1
E2 1 2 0
E3 1 2 -1
E4 0 3 -1
E5 -1 2 0
E6 -1 2 -1
E7 0 1
// This profile has 4 metre vertical sides so transforms
// PROF_1 into an oval shape
//
PROF_2
E1 0 1 -1
E2 1 2 0
E3 1 6 -1
E4 0 7 -1
E5 -1 6 0
E6 -1 2 -1
E7 0 1
```

Profile Assignment File (.PRA)

```
// Sample tunnel profile assignment
//
// Lines starting with // are interpreted as comments and ignored
//
// Format
//
// <chainage> <profile name>
```



```
// <chainage> <profile name>
// .
// .
// <chainage> <profile name>
//
1000 PROF_1
1100 PROF_2
1400 PROF_2
1432.728 PROF_1
```

Overlay

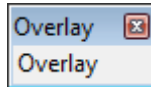
Position of menu: Design =>Overlay

The overlay options are for the design and optimisation of pavement overlay design.

The **Overlay** options is available to all users with the **Detailed Alignment Design** and **Volumes** modules.

The **Optimal Overlay** is under development and has not been released.

The **Overlay** walk-right menu is

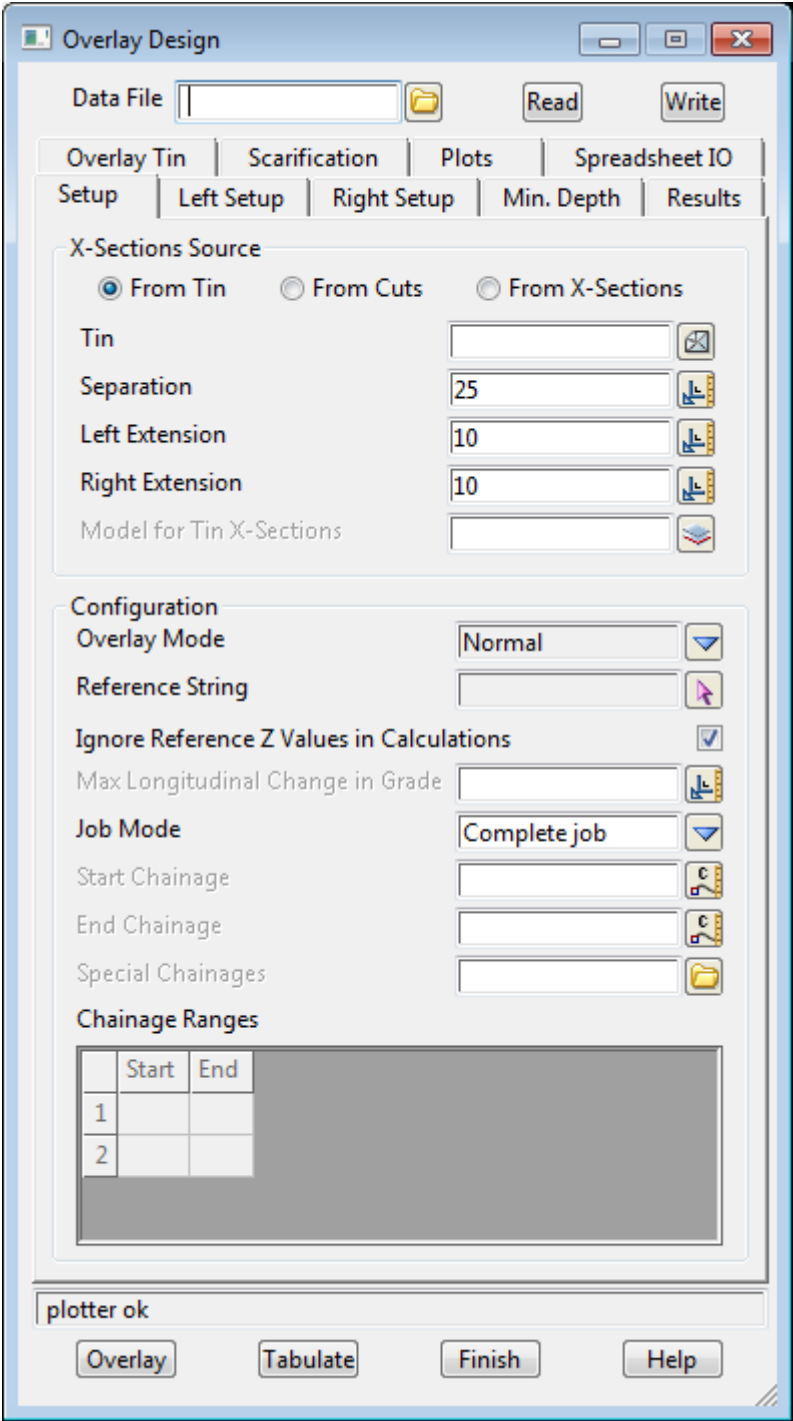


For the option *Overlay*, please continue to the section [Overlay Design](#)

Overlay Design

Position of option on menu: Design =>Overlay =>Overlay design

Selecting **Overlay** brings up the **Overlay Design** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data file	file box		*.ovd files
<i>file with all the settings used in the Overlay panel. Used for storing information between runs.</i>			
Read	button		
<i>read in a data file of settings for the panel</i>			
Write	button		

write out a data file of the settings in the panel

Buttons at bottom of panel

Overlay button

run the overlay.

Setup

Radio buttons

radio buttons to define how cross sections for existing road are produced

From Tin radio button

if **selected**, the road x-sections are created by taking sections though a tin. The following fields are displayed

Tin tin box available tins

sections are created through this tin to represent the existing road

Separation input

chainage distance between cross sections

Left/Right extension input

Left/Right distance to define the limits of the cross sections

Model for tin x-sections model box available models

model for the created cross sections

From Cuts radio button

if **selected**, the road x-sections are created by taking cuts through strings. The following fields are displayed

Strings model model box available models

sections are created by taking cuts through the strings in this model

Separation input

chainage distance between cross sections

Model for cuts model box available models

model for the created cross sections

From X-sections radio button

if **selected**, the road x-sections already exist. The following fields are displayed

X-sections model model box available models

existing model of x-sections to use for the road

Overlay mode choice box Normal Normal, Use Crossfalls Only
Use Reference Z Values and Crossfalls only

if **Normal**, at each section the left/right z-value is calculated so that the left/right crossfall and minimum overlay is obeyed. The z-value for the section is the maximum of the calculated z-values for the left and right.

If **User Crossfalls only**, the crossfalls from the Left and Right Setups tabs are used and no minimum overlay applied.

If **Reference Z values and Crossfalls only**, no overlay calculations are performed and the crossfalls in the Left and Rights Setups tabs are applied to the actual z-values on the reference string.

Reference string string select box

select the string for the centreline of the road

Ignore reference z values in calculations tick box

if not ticked, when the z-value is calculated at each section obeying just the minimum overlay criteria then use the maximum of the and the calculated z-value and the reference z-value at that section.

If ticked, use the calculated z-value at each section.

Start chainage input

chainage to start the overlay calculations

End chainage input

chainage to end the overlay calculations

Special chainages file box

special chainage file to define additional cross sections for overlay processing

Left/Right Setup tab

setup for the left/right side sections

Radio buttons

radio buttons to define how cross sections for existing road are produced

By offset radio button

*if **selected**, the width of the left/right cross sections is given in the **Offset** field*

Offset input

left/right offset distance to define the edge of the left/right section

By String radio button

*if **selected**, the width of the left/right cross section is defined by a selected **Edge** string minus the **Cut Back/Extension** value. The following fields are displayed*

Edge string string select

select the left/right edge string

Cut Back/Extension input

value to subtract from the distance to the edge string to define the left/right section

When **By String** is selected, the Chainage-Minimum X-Fall grid can also be automatically filled in by using the crossfall between the **Road Crown** and the **Edge String**.

Road crown string select
*select the road crown the use for calculating the cross fall to the **Edge string***

Only critical points tick box
*if ticked, the crossfall between the **Road crown** and the **Edge string** is only calculated at the tangent points of the Reference string.*
*If not ticked, the crossfall between the **Road crown** and the **Edge string** is calculated at the regular interval given by **Xfall Load Interval** and also at the tangent points of the Reference string.*

Xfall load interval input
regular interval to calculate crossfall

Load Xfalls from Strings button
*when selected, the **Chainage-Minimum X-Fall** grid is automatically filled in by using the crossfall between the **Road Crown** and the **Edge String***

By name radio button
*if **selected**, the width of the left/right cross section is defined by the name of a given string minus the **Cut Back/Extension** value. The following fields are displayed*

Name
name of the string to select as the left/right edge string

Cut Back/Extension input
value to subtract from the distance to the edge string to define the left/right section

Default Xfall input
*if **non blank**, the default crossfall to use for the left/right cross section.*
*If **blank**, the **Chainage-Minimum X-fall** grid is used.*

Chainage- Minimum Xfall grid
*this grid is only used if the **Default Xfall** is **blank***

Chainage input
chainage to use the Min xfall

Min X-fall input
minimum X-fall to use at that chainage

Min. Depth tab
there can be one minimum depth value for the entire job or the minimum depth can vary between chainages

Default depth input
*if **non blank**, the default minimum depth to use for the left and right cross section.*



If blank, the Chainage-Minimum Depth grid is used.

Chainage- Minimum Depth grid

*this grid is only used if the **Default depth** is blank*

Chainage input
chainage to start the minimum depth

Min Depth input

*minimum depth to start at this chainage and either go to the next chainage **or** if there is a **Min Depth 2**, interpolate to Min Depth 2 from this chainage to the next chainage*

Min Depth 2 input
minimum depth to end with at the next chainage

Results tab

Transfer Z-values to reference string ☐ tick box
if ticked, the calculated z-values are used to update the z-values on the reference string

Clean models before overlay tick box
if ticked, the models of results are cleaned before the overlay option is run

Model for overlay x-sections	model box	available models
<i>model for the created overlay x-sections</i>		

Model for overlay strings	model box	available models
<i>model for the created overlay strings</i>		

Colour	colour box	available colours
<i>colour for the created overlay strings</i>		

Model for xfall strings	model box	available models
<i>if non blank, left and right strings with z-value equal to the left/right crossfall are created and placed in this model</i>		

Model for min/max points	model box	available models
if non blank , points for the minimum and the maximum of the calculated z-values for the left and right sections are created and placed in this model		

X-sections depth range file	file box	available depth range files
<i>a depth range file used for colouring x-sections by the depth between the overlay and the road tin</i>		

Overlay report	file box	*.rpt files
<i>report on the overlay</i>		

Volumes report file box *.rpt files
volumes of overlay report

Write volumes as CSV tick box

if ticked, the volume report is written as a CSV file (for Excel)

Overlay Tin tab

the **Overlay Tin** tab controls the creation of an overlay tin and depth polygons

Create overlay tin	tick box	
if ticked, the fields in this tab are used to create an overlay tin		
Tin name	tin box	available tins
name for the tin created from the overlay strings and sections		
Tin colour	colour box	available colours
colour of the overlay tin		
Model for tin	model box	available models
model for the overlay tin		
Create depth polygons	tick box	
if ticked, depth polygons are created between the road tin and the overlay tin		
Depth range file	file box	*.drf files
depth range file used when creating polygons		
Model for depth polygons	model box	available models
model for the depth polygons		

Scarification tab

the **Scarification** tab controls any scarification to be applied to the road sections before calculating overlays

Perform scarification	tick box	
if ticked, scarification is performed on the road sections before overlay is calculated		
Model for scarified x-sections	model box	available models
if non blank , road x-sections after scarification are created and placed in this model		
Colour	colour box	available colours
colour of the scarified sections		
Clean scarification x-sections model	tick box	
if ticked, the clean the model of scarified sections before running calculations		
Default scarification depth	input	
if non blank , the default scarification depth to use for road cross section.		
If blank , the Overlay-Depth grid is used.		
Chainage- Minimum Depth grid		
this grid is only used if the Default scarification depth is blank		
Chainage	input	
chainage to start the scarification depth		

*scarification depth to start at this chainage and either go to the next chainage **or** if there is a **Depth 2**, interpolate to Min Depth 2 from this chainage to the next chainage*

scarification depth to end with at the next chainage

Plots tab

if ticked, long section plots are created

binary ppf file to use for the long section plots

type of plotter to use for the long section plots

Plot stem

the name to use for the plots - a number will be added when more than one page is produced

*if ticked and the **plotter type** is **model**, the plot models are cleaned before the plots are created*

if ticked, cross section plots are created

binary ppf file to use for the cross section plots

type of plotter to use for the cross section plots

Plot stem

the name to use for the plots - a number will be added when more than one page is produced

*if ticked and the **plotter type** is **model**, the plot models are cleaned before the plots are created*



X-Sections

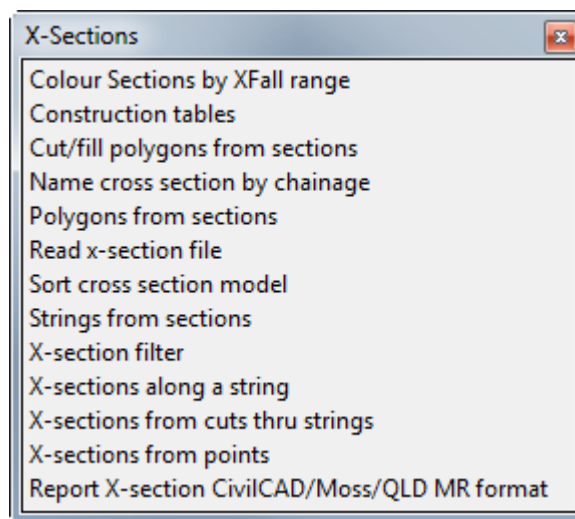
Position of menu: Design =>X-Sections

Cross sections can be created in a variety of ways including

- (a) sections through triangulations created with the options in the menu **Tins =>Sections**.
- (b) sections generated by cutting through strings with the options **Utilities =>A-G =>Cuts**.
- (c) design sections generated from options on the menu **Design =Apply**
- (d) sections generated by the end area volumes options **Design =>Volumes =>End area**

The x-sections menu contains options to read cross-sections in from a file and for working with cross sections in a variety of way.

Walking right on **X-Sections** bring up the X-Sections menu:



For Colour X-Sections by Xfall range go to

Construction tables

Cut/fill polygons from sections

Name cross sections by chainage

Polygons from sections

Read x-section file

Sort cross-section mode

Strings from sections

X-section filter

X-sections along a string

X-sections from cuts thru strings

X-sections from points

Report X-section CivilCAD/Moss/QLD MR format

[Colour Sections by XFall Range](#)

[Construction Tables](#)

[Cut/Fill Polygons from Sections](#)

[Name Cross Sections by Chainage](#)

[Polygons from Sections](#)

[Read X-Section Data](#)

[Sort X-Sections in a Model](#)

[Strings from Sections](#)

[X Section Filter \(Sections at Even Chainages\)](#)

[X-Sections](#) in the Chapter [Triangles](#)

[Cuts by Centreline](#) in the Chapter [Utilities](#)

[Sections from Points](#)

[X-Sections Report](#) in the chapter [Reports](#)

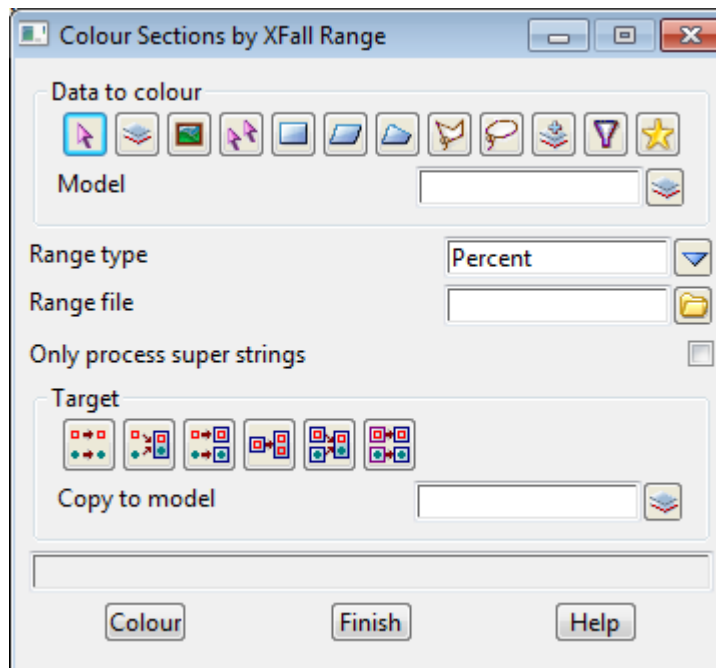
Colour Sections by XFall Range

Position of option on menu: Design =>X-Sections =>Colour X-Sections by Xfall range

Utilities =>A-G =>Colour X-Sections by Xfall range

This panel will colour the segments of a set of x-sections, based on their x-fall.

Selecting **Colour X-Sections by Xfall range** displays the **Colour Sections by XFall Range** panel.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data to colour

the set of x-sections to colour.

Data source type	Model
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>	
Data source	input
<i>source of data to be processed - for a full description go to Data Source in the chapter Tools and Concepts</i>	
Range type	choice box
<i>the type of range file to use</i>	
Range file	file
<i>the range file to use for colouring</i>	
Only process super stringstick box	
<i>whether or not to ignore non super strings</i>	
Target	

the target for the colour x-sections

Colour button
colours the x-sections

Construction Tables

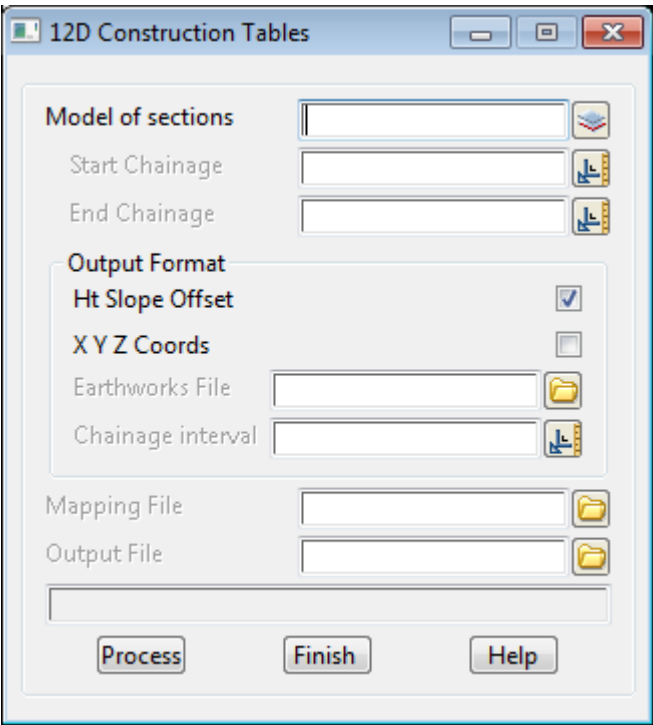
Position of option on menu: **Design =>X-Sections =>Construction tables**

This option is used to create construction tables from design cross section model.

Output can be in Ht, Slope or xfall, Offset or X,Y,Z.

A volume report file from the apply many road function can be used if Earthworks is required.

Selecting **Construction tables** brings up the **12D Construction Tables** panel:



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Model of Sections	input		
<i>model name for existing sections</i>			

Start Chainage	real		
<i>if blank, means optional and the extents of the sections are used instead</i>			

End chainage	real		
<i>if blank, means optional and the extents of the sections are used instead</i>			

Output Format

Height Slope Offset	tick	true	
----------------------------	------	------	--

XYZ Coords	tick	false	
-------------------	------	-------	--

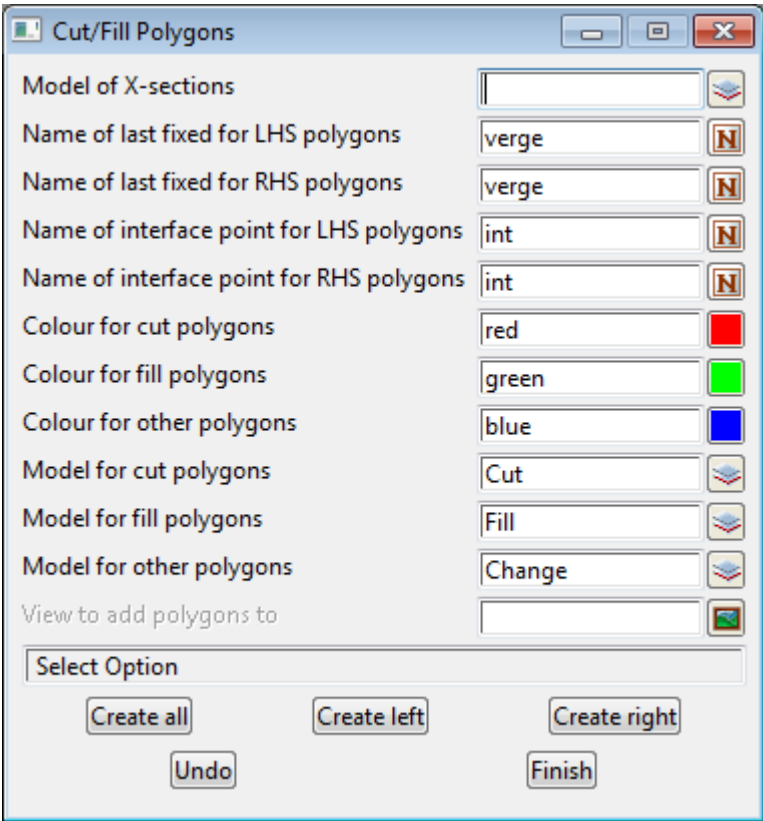
Earthworks File	file		
<i>if non-blank, file from apply many is used</i>			

Chainage Interval	real	if non-blank, value must be a multiple of chainages reported in the earthworks file
Mapping File	file	Please refer to the extra help file for details
Output File	file	Please refer to the extra help file for details
Process	button	runs the option

Cut/Fill Polygons from Sections

Position of option on menu: **Design =>X-Sections =>Cut/fill polygons from sections**

This option takes cross sections and by using the user-supplied names of points on the cross section, cut and fill polygons for the strings joining the named points in successive cross sections.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Model of x-sections <i>model containing the cross sections used to define the cut and fill polygons.</i>		model box	available models
Name of last fixed for LHS polygons	input		verge

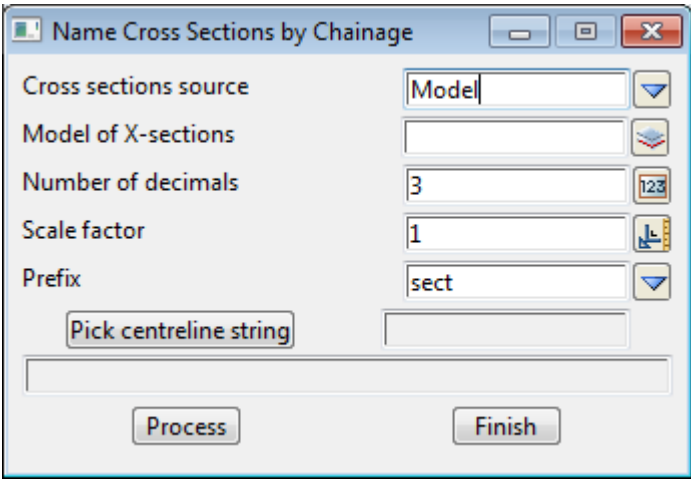
<i>Name of the cross section point to be the inner point of the left hand side polygons.</i>			
Name of last fixed for RHS polygons	input	verge	
<i>name of the cross section point to be the inner point of the right hand side polygons.</i>			
Name of interface point for LHS polygons	input	int	
<i>name of the cross section point to be the outer point of the left hand side polygons.</i>			
Name of interface point for RHS polygons	input	int	
<i>name of the cross section point to be the outer point of the right hand side polygons.</i>			
Colour for cut polygons	input	red	available colours
<i>colour for the cut polygons.</i>			
Colour for fill polygons	input	green	available colours
<i>colour for the fill polygons.</i>			
Colour for other polygons	input	blue	available colours
<i>colour for the polygons that are neither cut or fill – they are either flat or change from cut to fill.</i>			
Model for cut polygons	input	cut	available models
<i>model for the cut polygons.</i>			
Model for fill polygons	input	fill	available models
<i>model for the fill polygons.</i>			
Model for other polygons	input	other	available models
<i>model for the polygons that are neither cut or fill – they are either flat or change from cut to fill.</i>			
View to add polygons	input		available views
<i>if non-blank, the models of polygons are added to the view.</i>			
Create all	button		
<i>run the option and create left and right polygons.</i>			
Create left	button		
<i>run the option and only create the left polygons.</i>			
Create right	button		
<i>run the option and only create the right polygons.</i>			
Undo	button		
<i>undo the last set of polygons created whilst the panel has been up.</i>			
Finish	button		
<i>end the option and remove the panel. The undo capability for the polygons is terminated.</i>			

Name Cross Sections by Chainage

Position of option on menu: **Design =>X-Sections =>Name cross sections by chainage**

This option names cross-sections with the chainage from a selected string.

Note that the chainage from the string that the cross section comes from is in the name of the cross section so this option effectively gives the chainage to the cross section.



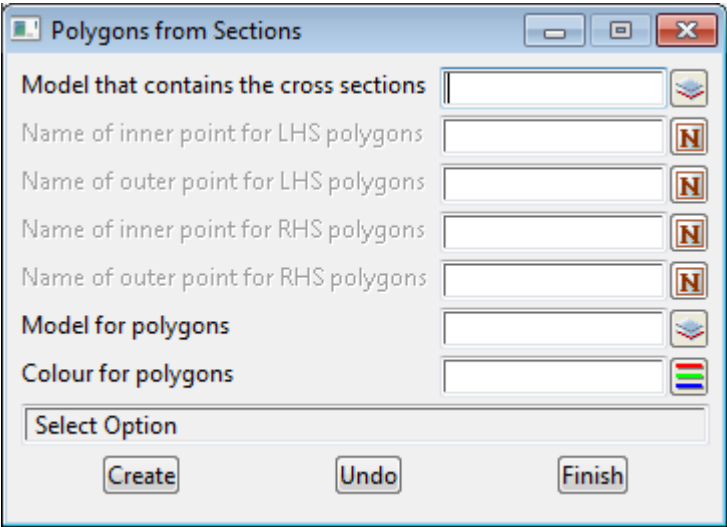
The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Cross sections source <i>type of data source.</i>	choice box	model	string, model, view
Model/String/View of x-sections <i>source of the cross section data.</i>	source box		
Number of decimals <i>number of decimal places to use in the chainage label.</i>	input box	3	
Scale factor <i>factor to multiply the chainage by before creating the label.</i>	input box	1	
Prefix <i>prefix for the chainage value - for cross-section options to work, this should be sect or design.</i>	choice box	sect	sect, design, none
Pick centreline string <i>select the string that is used to find a chainage for the cross sections.</i>	output box		
Process <i>run the option.</i>	button		

Polygons from Sections

Position of option on menu: **Design =>X-Sections =>Polygons from sections**

Option to take a model of cross-sections and create polygons between specified points on the cross-sections.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Model that contains the cross sections	model box		
<i>model of cross sections</i>			

Name of first/last point for lhs polygons	input box		
<i>name of the first/last point on left hand side of the cross-section to creating polygon for.</i>			

Name of first/last point for rhs polygons	input box		
<i>name of the first/last point on right hand side of the cross-section to creating polygon for.</i>			

Model/colour for polygons	input box		
<i>model/colour of the created polygons.</i>			

Create	button		
<i>create polygons between the first and last points on the left and right side of the cross-sections.</i>			

Undo	button		
<i>undo the last set of polygons created whilst the panel was up.</i>			

Read X-Section Data

Position of option on menu: **Design =>X-Sections =>Read x-section file**

This option is used to read in cross section data from a file and convert it to x-section strings (4d strings).

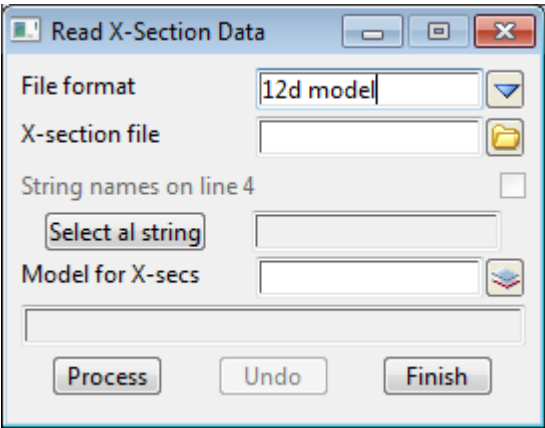
The data in the file is only centre-line chainage values, offset, heights and text (Code) so an alignment string needs to be selected to give an (x,y) position for the centre-line chainage and a direction (at right angles to the alignment string at the chainage) to convert the (offset, height) values into (x,y,z) points on a string.

NOTE - after reading in the x-section data and hence creating 4d strings, the

Design =>X-Sections =>Strings from sections

option can be run to create 3d strings by joining points with the same Code from adjacent x-sections. The created 3d strings are given the string name of the Code that they joined.

Selecting **Read x-section file** brings up the **Read X-Section Data** panel:



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
File format	input box	12d Model	12d Model, Alg, Moss, Chainage/Offset/Height/ Text

format of the x-section data in the file.

12d Model Format

The 12d Model format is a simple text file format with the text CH followed by one or more spaces and then the alignment chainage (centre line chainage) of the x-section, and then on the following lines, the Offset value followed by one or more spaces, the height at that offset followed by one or more spaces, and then the text (Code) for that point on the x-section. The x-section continues until the next Ch line. For example, the following defines two x-sections at chainage 10 and 20 respectively.

```
ch 10
-3 5 A
0 6 "Second label"
4 7 C
```

```
ch 20
-3.5 5.5 A
0 6 D
4.5 7.5 ""
```

Note that if the Code includes a space, then it must be enclosed in quotes. For example "Second label". Also the Code is not optional - if there is no code, put "".

Chainage/Offset/Height/Text Format

The Chainage/Offset/Height/Text format is a very simple text file format with each line containing the alignment chainage (centre line chainage) for the x-section followed by one or more spaces and then on the same line the Offset value followed by one or more spaces, the height at that offset followed by one or more spaces, and then optionally, the text (Code) for that point on the x-section. The x-section continues until the alignment chainage changes. For example, the following defines two x-sections at chainage 10 and 20 respectively.

```
10 -3 5 A
10 0 6 "Second label"
10 4 7 C
20 -3.5 5.5 A
20 0 6 D
20 4.5 7.5 E
```

Note that if the Code includes a space, then it must be enclosed in quotes. For example "Second label". Also the Code is optional (whereas it was compulsory for the **12d Model** format).

Moss (MX) Format

Please refer to Moss (MX) documentation or ask the group who supplied the data.

Alg Format

Not documented.

X-section file input box
file of x-section data.

String names on line 4 tick box
ONLY used for the ALG format which is not documented

Select al string string select
select the string that is used to define the (x,y) position of the zero offset of the x-section and also the bearing for the x-section.

Model for x-secs model box available models
model for the created x-sections

Process button
read the file and create the x-sections

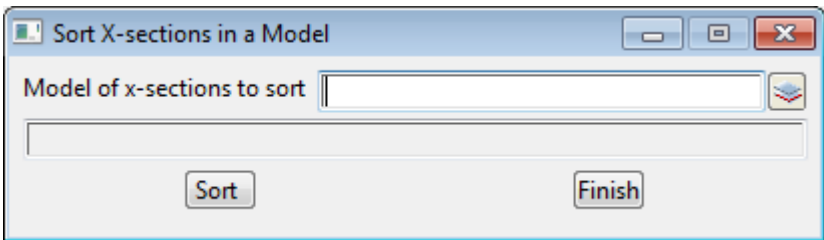
Undo button
undo the last set of x-sections created since the panel has been active

Sort X-Sections in a Model

Position of option on menu: **Design =>X-Sections =>Sort cross section model**

This option is used to sort cross sections in a model so that they are in the order of the chainages embedded in the cross section name.

Selecting **Sort cross section model** brings up the **Sort X-Sections in a Model** panel:



The fields and buttons used in this panel have the following functions:

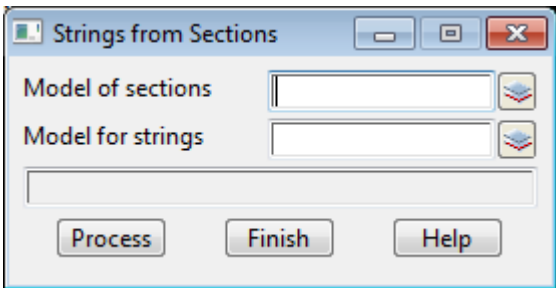
Field Description	Type	Defaults	Pop-Up
Model of x-sections <i>model containing the cross sections to be sorted into chainage order.</i>	model box		available models
Sort <i>run the option.</i>	button		

Strings from Sections

Position of option on menu: **Design =>X-Sections =>Strings from sections**

The **strings from sections** option creates strings by joining the common named points on successive 4d strings (usually generated as sections).

Selecting **strings from sections** fires up the **strings from sections** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Model of sections <i>model of the 4d strings (sections) to try and join common points from to form strings.</i>	input		available models

Model for string	input	available models
<i>model for the created strings to go to.</i>		
Process	button	
<i>try and join points with the same name from successive sections to form strings.</i>		

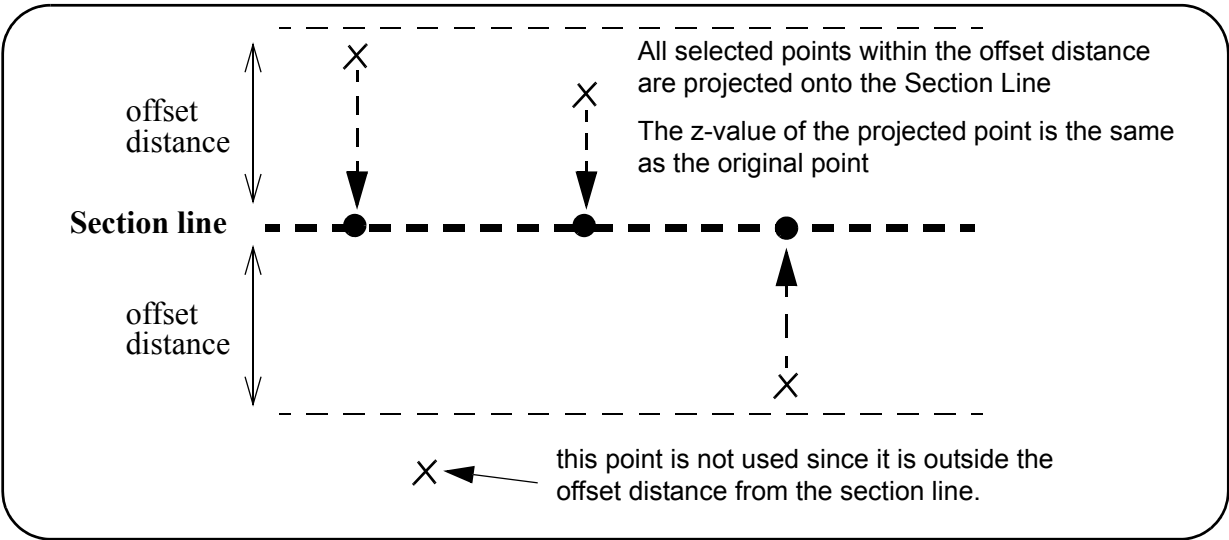
Sections from Points

Position of option on menu: **Design =>X-Sections =>X-sections from points**

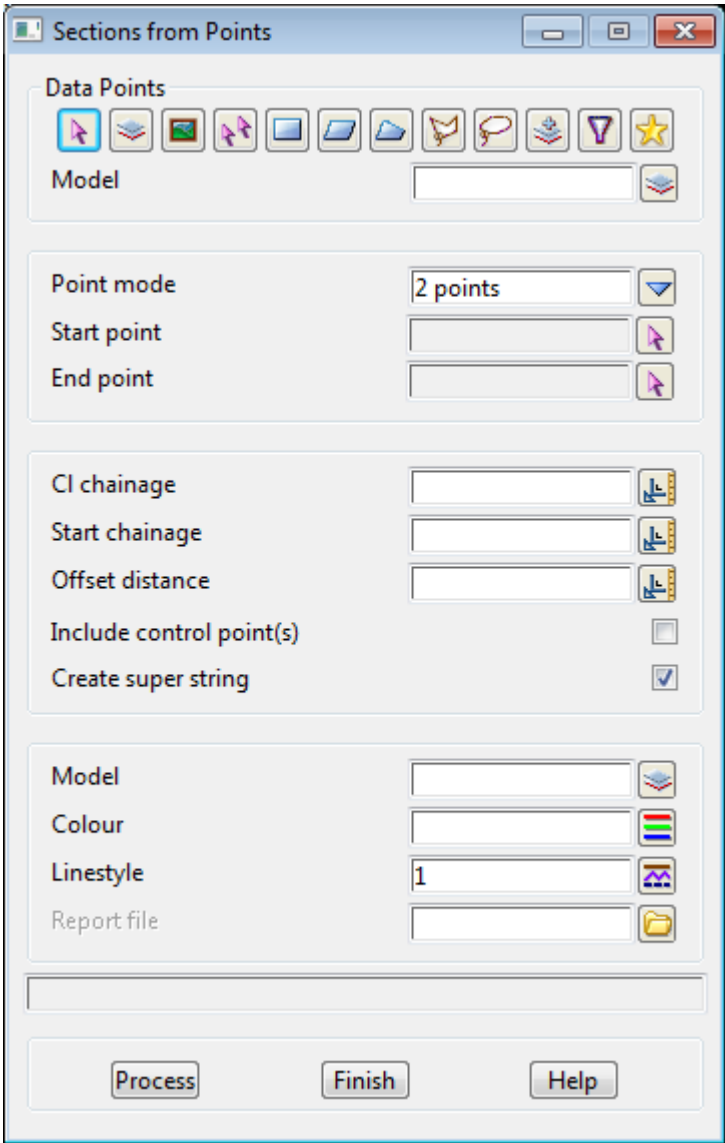
The **X-sections from points** option creates a cross section by first defining s section line and then dropping all selected points in a user defined offset distance from the section line, onto the section line.

- (a) The z-value for the dropped point is the same as for the original point.
- (b) The Point number (Vertex id) of the dropped point is the Point number (Vertex id) of the original point.
- (c) The Vertex text of the dropped is the code (string name) of the original point.

The user specifies the start chainage for the created section and the value for the "centreline chainage" of the section.



Selecting **Sections from points** fires up the **Sections from points** panel.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Data source type

data source type.

Data source

data source for points to create sections from.

Point mode

choice box

2 points

2 points,
1 point and bearing
point on centreline

*if 2 points, then the **Start point** and **End point** are selected. The section goes through the two points.*

*If 1 point and bearing, then the **Start point** is selected and a **Bearing** given. The section goes through the start point with the given bearing.*

*If point on centreline, then a **Centreline** is selected and a **point on the centreline** selected. The section goes through the selected point on the centreline and is perpendicular to the selected centreline at the*

selected point.

If Point mode is **2 points**:

- Start point**string select
- End point**string select

If Point mode is **1 point and bearing**:

- Start point**string select
- Bearing**angle box

If Point mode is **point on centreline**

- Centreline**string select
- depends on Point mode.*

- Point on cl**string select
- depends on Point mode.*

- Cl chainage**input
- the chainage to give to the created section*

- Start chainage**input
- the start chainage to give to the created section.*

- Offset distance**input
- distance to search either side of the section for points to project onto the section*

- Include contrl points (s)**tick box
- if ticked, the selected start and end points are included as part of the section.*

- Create super string**tick box
- if ticked, then the created section is a super string.*

- Model**model boxavailable models
- model for created sections.*

- Colour**colour boxavailable colours
- colour for the created sections.*

- Linestyle**linestyle boxavailable linestyles
- linestyle for the created sections.*

- Report file**file box
- a report.*

Process

button

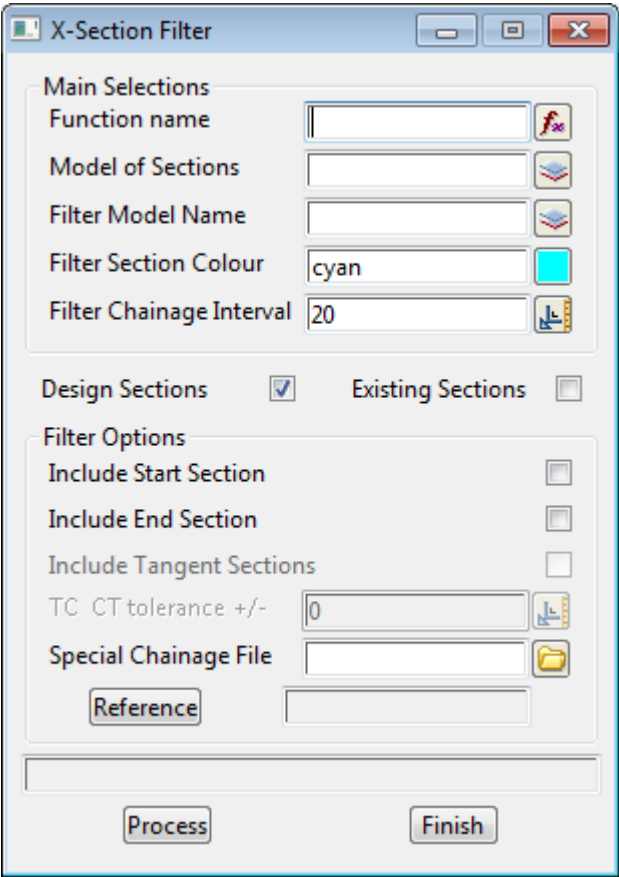
create a cross section from the selected points.

X Section Filter (Sections at Even Chainages)

Position of option on menu: **Design =>X-Sections =>X-section filter**

This panel selects user specified cross-sections from a model of cross-sections and copies them into another model. The cross sections must already exist - no new cross-sections are created.

It is a function so can be recalcd when the cross-section model is changed.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Function name			
<i>name of the function.</i>			
Model of sections	string select		
<i>model of existing cross sections to select some cross sections from.</i>			
Filter model name	model box		
<i>model for the selected cross sections</i>			
Filter section colour	colour box	cyan	
<i>colour for the filtered cross sections</i>			
Filter chainage interval	input	20	

*chainage interval to select cross sections. Sections are selected which are multiples of the **filter chainage interval**.*

Design/Existing sections radio button design sections

cross sections are 3d strings with the name

***Design** and the chainage of the cross-section (usually created by an Apply),*

*or **Sect** and the chainage of the cross-section (usually created by Tins =>Section =>X section)*

*If **Design sections** is selected, then sections starting with the name **Design** are selected.*

*If **Existing sections** is selected, then sections starting with the name **Sect** are selected.*

Include TC_CT sections tick box

if ticked, include cross sections at tangent points from the reference string.

Include start/end section tick box

include a cross section at the start/end chainage of the reference string

TC_CT tolerance +/- input box

*if **non-zero**, then regular cross sections (i.e. those selected by the filter chainage interval) are **not** included if they are closer than the given tolerance distance to a tangent point.*

Special chainage file input box

include cross sections with chainages given in the given special chainage file.

Reference output box

select reference string to use for the filter options requiring tangent points and start/end chainages.

Process button

copy the specified cross-sections to the Filtered Model.

X-Sections Along a String

Position of option on menu: Design =>X-Sections =>X-Sections along a string

This option has already been documented in **Tins => Sections=> X-Sections**

For the option **X-Sections along a string**, please continue to the section [X-Sections](#) in the Chapter [Triangles](#).

X-Sections from Cuts Through Strings

Position of option on menu: Design =>X-Sections =>X-Sections from cuts thru strings

This option has already been documented in **Utilities =>A-G =>Cuts =>by centreline**

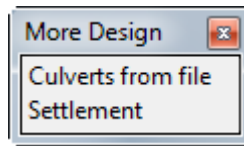
For more information please go to the section [Cuts by Centreline](#) in the Chapter [Utilities](#).

More Design

Position of menu: Design =>More

The **More Design** menu contains extra design options.

The **More Design** walk-right menu is



For the option *Culverts from file*, go to [Culverts from File.](#)
Settlement [Settlement](#)

Culverts from File

Position of option on menu: **Design =>More =>Culverts from file**

This option is currently under development.

Create Culverts from File

Culvert Details

Alignment

Chainage

Type

Size

Skew

Inlet

Level

Side

Offset

Outlet

Level

Side

Offset

Input File

Process all

☒

Read

Prev

Next

Process

Finish

Settlement

Position of option on menu: Design =>More =>Settlement

This option uses a tin of settlement values to adjust the z-values of strings.

The idea behind the option is that a number of string may have been surveyed as well as a number of control points. At a later date, the z-value at the control points is again measured and there is a major difference in the two z-value at each control point due to say settlement (subsidence) of the ground.

A tin of the **difference** of the z-values at each control point is called the **settlement** tin. The tin is not normally a constant value because *differential settlement* usually occurs. That is, the settlement is *different at each point over the surface*.

The Settlement option can adjust **all** the z-values of the selected data by the amount in the settlement tin.

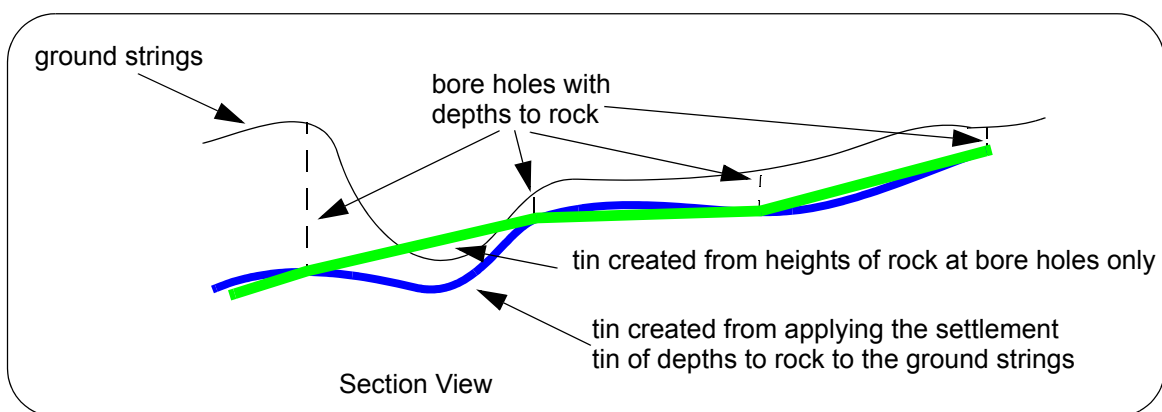
It can be applied to just to the vertices of the strings (mode **relative points**), or to the vertices and the segments of the strings (mode **relative string**). In **relative string** mode, where ever a segment crosses a triangle of the settlement tin, a new vertex is inserted into the string (with initial z-value interpolated from the adjacent string vertices) and the settlement tin value applied to the new vertex.

The **settlement tin** values can be added to, or subtracted from, the string values.

One interesting use of the **Settlement** option is when the settlement tin is constructed from the **depths** from the surface to a rock or soil strata (as given from **bore hole** logs).

The surface of the rock could be constructed by simply calculating the height of the rock at each bore hole and triangulating the heights. The original surface would have no affect on such a rock surface.

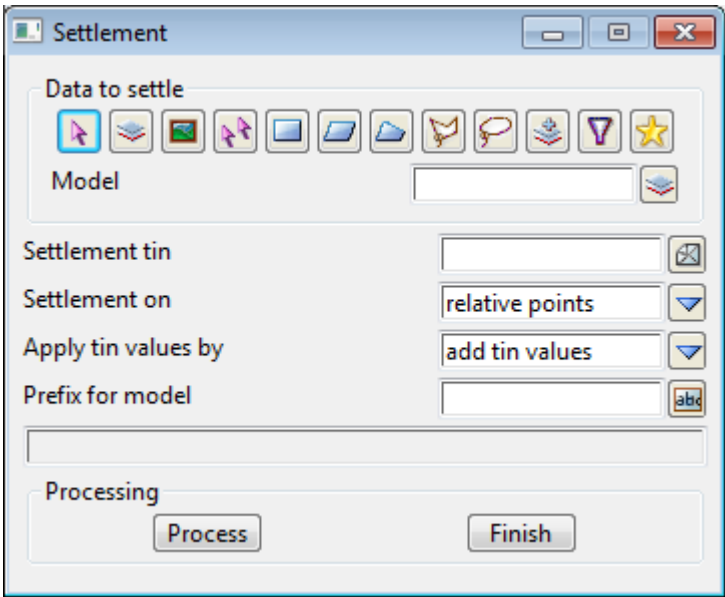
However by applying the **Settlement** option to the ground data, using the depths as the settlement tin, and then triangulating the resultant strings to give the rock surface, undulations in the ground data will also be reflected in the rock surface. This is what usually happens when the earth is folded and both surfaces fold in a similar manner.



The Settlement option can also be used **without** creating a tin of the difference of the z-values at each control point. A tin can simply be created from **the new z-values** of the control points.

In **absolute points** mode, each vertex of the strings are given the z-value from the tin. This is the same as draping just the vertices of strings onto a tin (see [Drape](#) in the chapter [Triangles](#))

In **absolute string** mode, not only do the string vertices take their z-values from the tin, but where ever a segment crosses a triangle of the tin, a new vertex is inserted into the string and the z-value for the new vertex is taken from the tin. This is the same as a draping the strings onto the tin (see [Drape](#) in the chapter [Triangles](#)).



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Data to settle			Model	

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data source	input
<i>source of data to be processed.</i>	

Settlement tin	available tins
<i>tin of values (settlement values) to be used to reduce/increase the z-values of strings by.</i>	

Settlement on	choice box	relative points	relative points relative strings absolute points absolute strings
----------------------	------------	-----------------	----------------------------------------------------------------------------

if Settlement on is:

relative points then for each point of a string, the value of the settlement string at that (x,y) position is added/subtracted from the z value at the point.

relative string then for each point of a string, the value of the settlement string at that (x,y) position is added/subtracted from the z value at the point plus for each visible segment joining points of the strings then if the segment crosses any edges of triangles from the settlement tin, a new point is inserted into the string which then has the settlement value applied to it (the initial z-value for the inserted point is interpolated from its adjacent points in the string).

absolute points then for each point of a string, the value of the settlement string at that (x,y) position is taken to be the z value at the point.

absolute string then for each point of a string, the value of the settlement string at that (x,y) position is taken to be the z value at the point plus for each visible segment joining points of the strings then if the segment crosses any edges of triangles from the settlement tin, a new point is inserted into the string which is given the settlement value at that point.

Apply tin values by	choice box	add tin values	add tin values subtract tin values
----------------------------	------------	----------------	---------------------------------------

if "add tin values", then the tin values are added to the string values.

If "subtract tin values", then the tin values are subtracted from the string values.

Prefix for models

prefix to apply to the name of each model in the data source to create new models for the processed data.

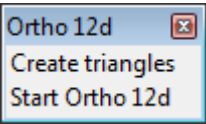
Process button
adjust the heights of the selected data.

Ortho 12d

Position of menu: Design =>Ortho 12d

The **Ortho 12d** menu contains the option to write out tins in a format suitable for the *Ortho 32* rectification software.

The **Ortho 12d** walk-right menu is



Continue to the next section [Create Triangles](#)

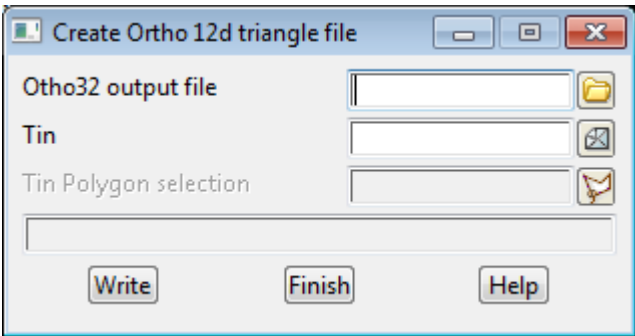
Create Triangles

Position of option on menu: Design =>Ortho 12d =>Create triangles

This option writes out a **12d Model** tin in a format suitable for the software **Ortho12d** software from Digital Mapping Systems (www.digmapsys.com).

Ortho12d is an image rectification package which can be used for ortho-rectifying photographs.

For more information on *Ortho12d*, please contact Ian Hall from Digital Mapping Systems on ian.hall@digmapsys.com



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>tin to write out in Ortho12d format</i>	tin box		available tins
Tin polygon selection <i>if used, only triangles whose centroid is inside the polygon are written out.</i>	Polygon select box		
Ortho12d output file <i>file to write the tin out to</i>	file box		*.T12 files
Write <i>write the tin out in the Ortho12d format</i>	button		

Moved/Reused Documentation

New Island Create (Function)

Position of option on menu: Design =>Roads =>More =>New Island Create (Function)

This option applies a kerb profile, either from the **12d** library or from a user defined file.

The template profile is applied to a Super Alignment, creating strings, and a triangulation.

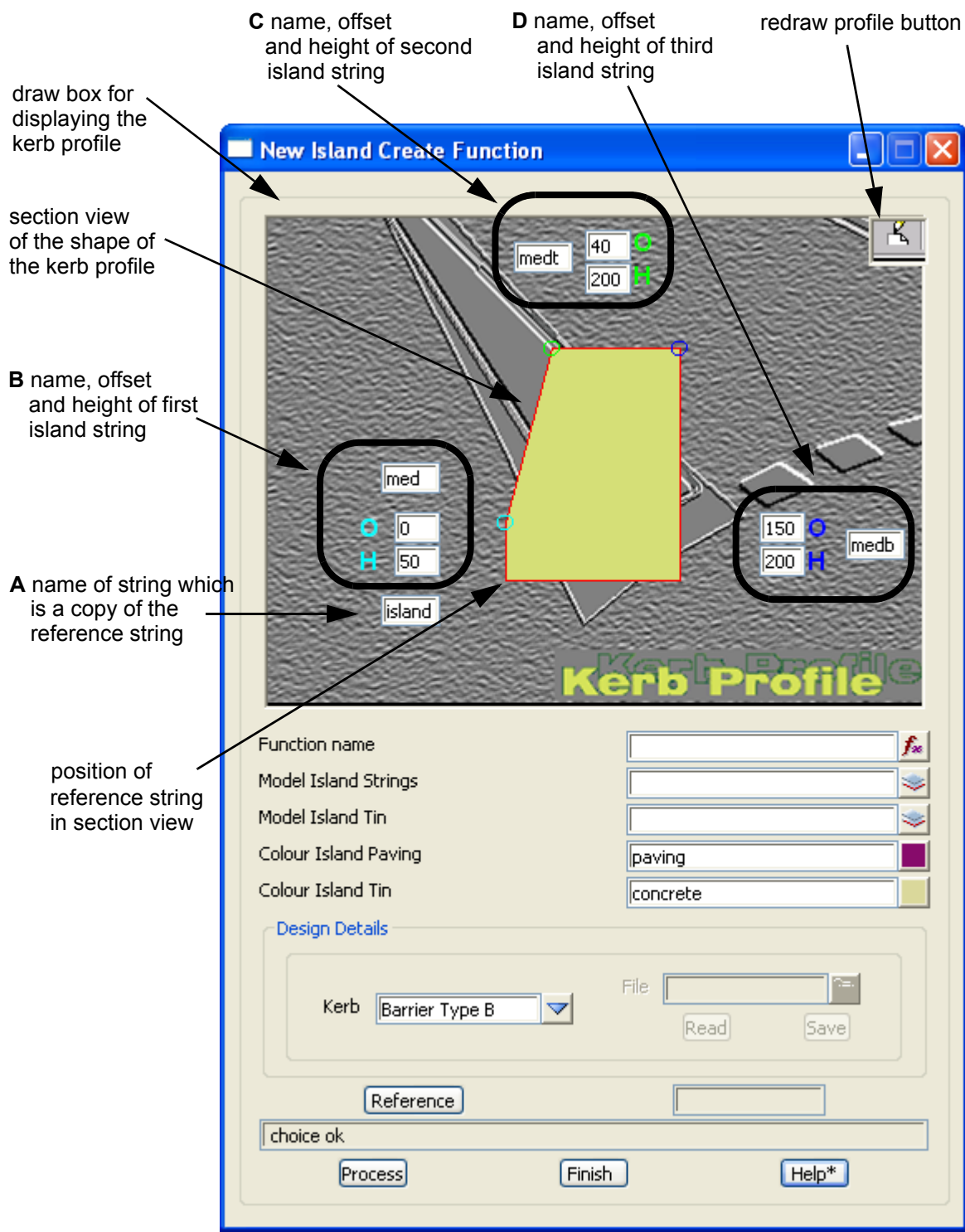
The option is saved as a function within **12d** and as a function can be re-run at any time if changes occur with the Super Alignment.

Some default kerb profiles are available under **Kerb** on the panel.

User defined kerbs are created by entering offset, height and string names in the fields in the draw box at the top of the panel, and then saved as a User Kerb Type file (*.ukt)

User Kerb Type files can then be written out, or read in as required.

On selecting the **New Island Create (Function)** option, the **New Island Create (Function)** panel is displayed.



The fields and buttons used in this panel have the following functions.

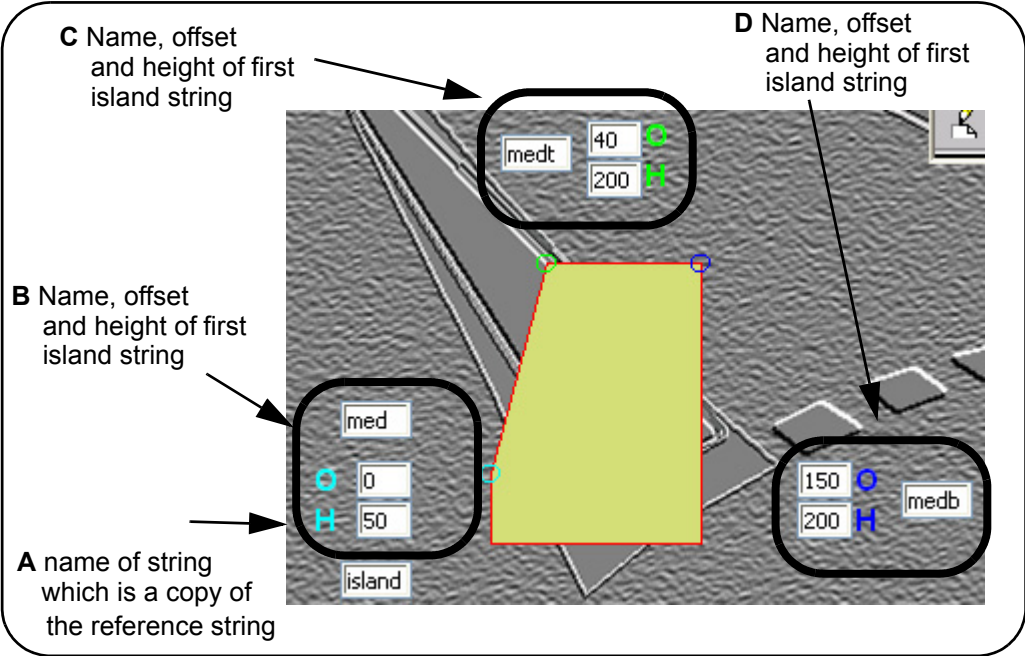
Field Description	Type	Default	Pop-Up
Function name <i>name of the Island Create function</i>	function		available functions
Model Island Strings	model box		available models

model for the created island strings

Model Island Tin model box
model for the tin of the created island

Colour Island Paving input paving available colours
if non-blank, then the colour is used to colour the island triangulation within innermost kerb string (D)

Colour Island Tin input concrete available colours
if non-blank, then the colour is the colour is used to colour the island triangulation between the strings defined by A and D.



In the drawing area:

- A**
a string is created which is a copy of the reference string and given this name. It is added to the Model Island Strings model.
- B**
name, offset and height from the reference string, of the first string of the island. It is added to the Model Island Strings model. If offset and height are both zero, then the string is not created.
- C**
name, offset and height from the reference string, of the second string of the island. It is added to the Model Island Strings model. If offset and height are both zero, then the string is not created.
- D**
name, offset and height from the reference string, of the third string of the island. It is added to the Model Island Strings model. If offset and height are both zero, then the string is not created.

Design Details

Kerb choice box Barrier Type A Barrier Type A, Barrier Type B, Mountable, Semi - Mountable, User

selected kerb type is displayed in draw box above

If Kerb is User then the File field and the Read and Save buttons are made active, and are used to read in an existing user defined Kerb type, or to create a new one.

File file box files ending in.ukt

name of the user kerb type file (ukt) to read in or create

Read button

Reads in the user defined kerb definition from the ukt file given in the File field and displays the profile and Offsets and Height in the draw box at the top of the Panel

Save button

Writes out the kerb profile information (O and H values, and string names) as a user defined kerb, into the file given in the File field.

Reference select pick

Select the reference alignment which will have the kerb profile applied to it to create the island. "pick with direction" in a clockwise manner as the kerb profile is always on the RHS.

Process button

runs the option which created the island string and the coloured island tin

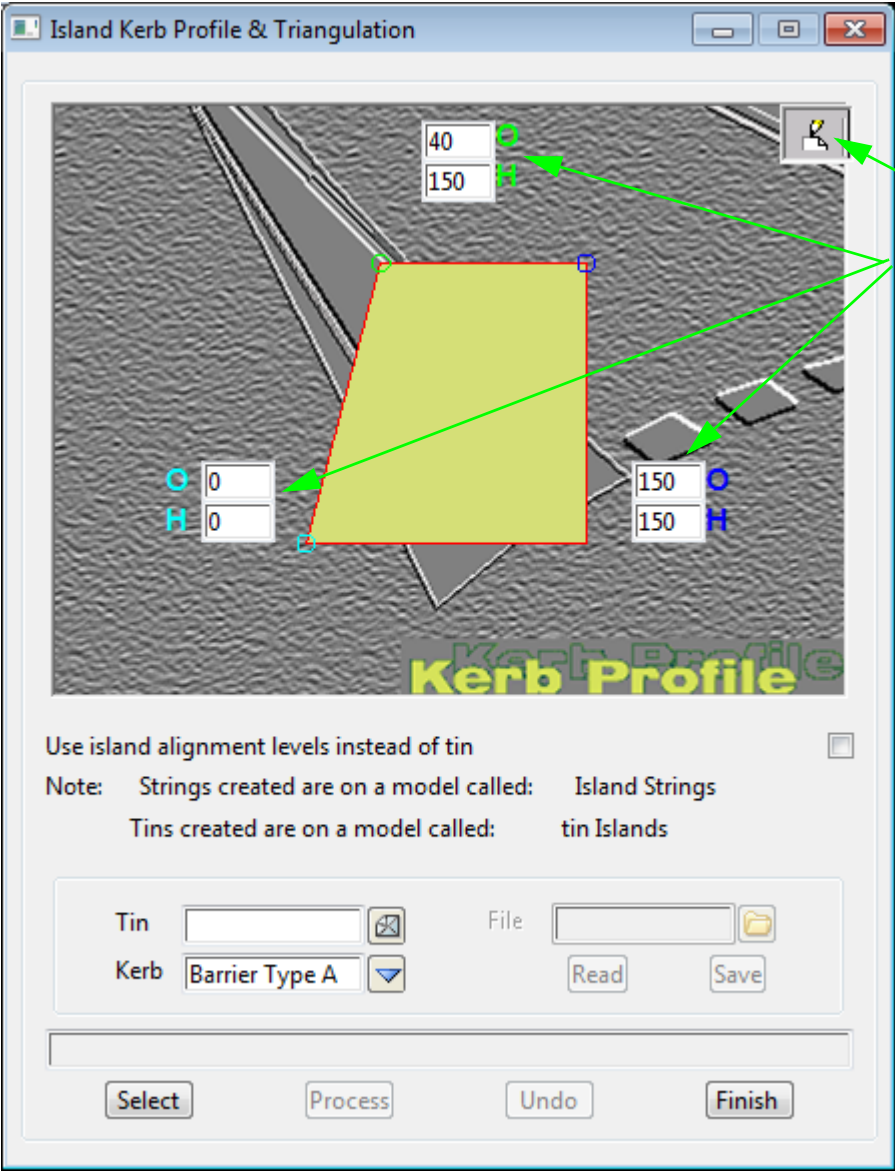
Note:

The New Island Create Function reads in the standard kerb profiles as templates and if required, creates a template from the ukt files. The function needs these templates because an apply is used (internally) to create the Island.

Traffic Island Profile and Triangulation Creation

Position of option on menu: Design =>Roads =>More =>Island profile/tin

This option creates strings by offsetting from a selected string using a kerb profile. The resultant strings are draped onto a given tin and then triangulated to form a traffic island.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Offset kerb face/top/back	input box		
<i>offset for kerb face/top/back for the selected kerb type.</i>			

Height kerb face/top/back	input box		
<i>height for kerb face/top/back.</i>			

Tin	tin box		available tins
<i>triangulation to drape the traffic island strings onto.</i>			

Kerb type	input box		
<i>type of kerb to apply to the reference string of the traffic island. If type User is selected from the pop-up list, a file which defines the kerb profile can be selected and used.</i>			

File	file box	*.ukt files
	<i>file to read/write the user defined kerb type to.</i>	
Read	button	
	<i>read the given File to define a kerb type.</i>	
Save	button	
	<i>save the kerb parameters to the given File.</i>	
Select	button	
	<i>select the string representing the traffic island.</i>	
Process	button	
	<i>create the traffic island strings and tin.</i>	
Undo	button	
	<i>undo the last traffic island created whilst the option was running.</i>	

Create Mass Haul String and Report

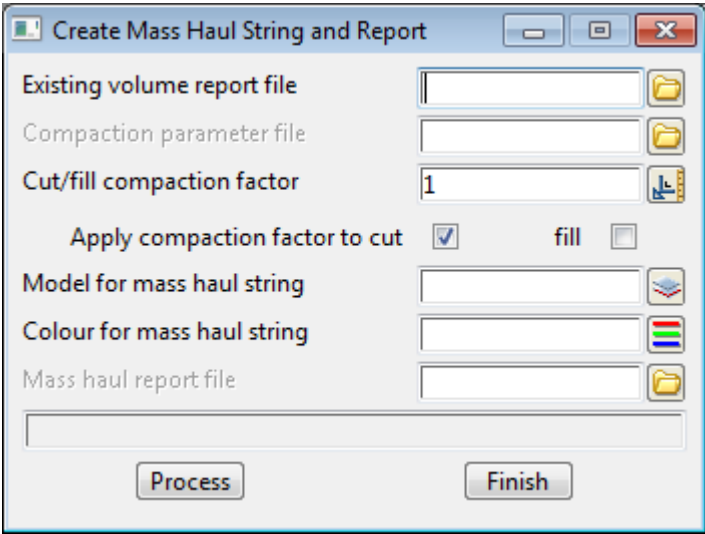
Position of option on menu: Design =>Roads =>More =>Mass haul

This option has been replaced by [Mass Haul String and Report](#).

This panel is used to read in a volumes report and optionally a cut/fill compaction parameter file and creates a mass haul string and a new volumes report with the compaction volumes.

The compaction parameter file simply contains the compaction factor for given chainage ranges. Either the cut volumes are multiplied by the compaction factor or the fill volumes are divided by the compaction factor, to give the compacted volumes in the new volumes report.

If the existing volume report contains an alignment string and that string can be found in the project then a new alignment string is created with the same horizontal geometry but with the accumulated volumes as the z-values.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Existing volume report file <i>name of the existing volumes report.</i>	file box		*.rpt files
Cut/fill compaction factor <i>cut/fill compaction factor for any chainages not in the compaction parameter file or if there is no file.</i>	input	1.0	
Compaction parameter file <i>file containing compaction factors to be used.</i>	input		*.mhf files
Apply compaction factor to <i>if cut, the cut volumes are multiplied by the compaction factors. If fill, the fill volumes are divided by the compaction factors.</i>	cut fill tick box		
Model for mass haul string <i>model for the created mass haul string.</i>	input		
Colour for mass haul string	input		

colour of the created mass haul string.

Mass haul report file input box
if non-blank, a mass haul volumes file is created.

Process button
run the option.

```
// Sample cut/fill compaction parameter file - the file ending
is .mhf
// All lines starting with // are comments and blank lines are
ignored
//
// A range is specified by a start and end chainage and a compaction
factor.
// A compaction factor of 1.0 means there is no compaction.
// A compaction factor of 0.9 means that 1.0 cubic metres of cut is
equivalent
// to 0.9 cubic metres of fill due to compaction.

// format is
// Start_ch      End_ch      Compaction_factor

          0          100          0.9
        100          500          1.0
        500         2000          1.1
```


20 Advanced Design

12d Model uses templates as a quick and easy method for defining design details along a string, and in the **Apply Many** option, modifiers are introduced to handle the most complex design details.

See [MTF - Many Templates File](#)

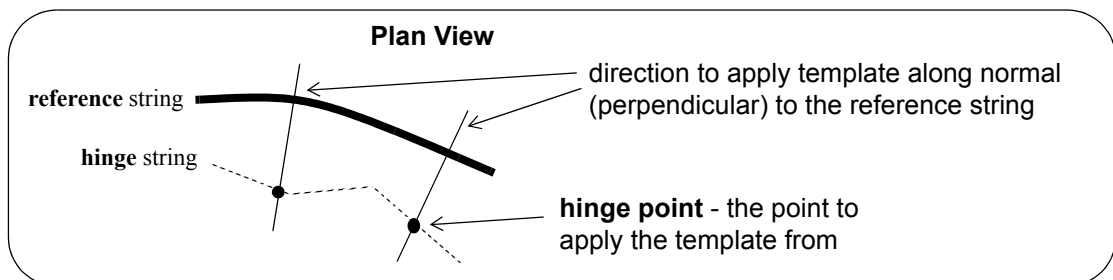
MTF - Many Templates File

12d Model uses templates as a quick and easy method for defining design details along a string.

The **Apply** options are used to create strings and sections using the **reference** string to define the chainage and what is perpendicular at each chainage, and a **hinge** string from where the template links are defined. The template defines a vertex (point) name and colour for each template link.

Cross sections can be created with point names corresponding to the template links, and strings formed by joining the same named vertices (points) from consecutive cross sections.

Note - the sections are stored as 4d super strings which have an (x,y,z) and a vertex text at each vertex.



For simple work, the **Design=>Apply=> Apply** option cuts a left and right template into a surface to produce a design.

For more complex work, the **Design=>Apply=> Apply many** option introduces **Modifiers** to allow more detailed control over the design process. In fact, it can be approached as string design and actually have no templates at all.

Note - the *Alignment* module is required to use the *Apply Many* option.

The **Apply Many** option uses a **file** (the **many templates file** or **MTF**) to describe

- (a) which templates are applied to the left and right side of the hinge string (with linear interpolation between templates and gaps allowed)
- (b) special chainages for creating extra cross sections
- (c) hinge modifiers for adjusting the hinge string
- (d) template modifiers for extra adjustment of the strings and sections created by the templates, or even to entirely replace the use of templates
- (e) stripping depths
- (f) up to eight layers of boxing
- (g) super elevation and widening
- (h) if removing loops from strings is required

- (i) width to define the limit of searches for strings
- (j) modifying the z-values of strings
- (k) applying a chainage shift

The **MTF** can be created and edited **interactively** from within **12d Model**, or it can be created and edited from a text editor, or any combination of the two methods.

A simple method for creating/editing an **MTF** is from the **Apply Many** option itself.

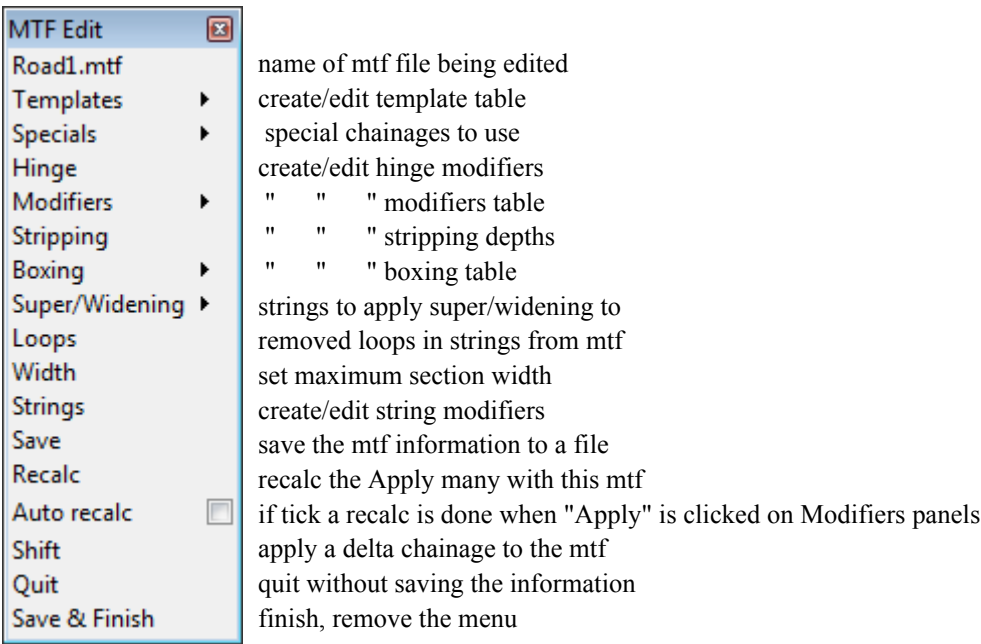
Once the **Apply Many** option has been selected and the **Apply Templates Function** panel is on the screen, simply enter the name of the mtf file into the **MTF file** field of the **Apply Templates Function** panel, click on **[+]** to bring up the pop-up menu and select **[Edit]** from the pop-up.

If the **MTF** does not exist, then the **Create MTF** panel (with the MTF file name already filled in) is placed on the screen and the user simply selects the **Create** button.

Alternatively, an **MTF** can be created inside **12d Model** using the **Create MTF** panel (Design =>MTF =>Create) and edited using the **MTF Edit** menu.

Finally, a text editor such as PFE can be used to create and/or edit an mtf.

When interactively creating the **MTF**, the **MTF Edit** menu contains all the options for (a) to (k). For example, the **MTF Edit** menu for the mtf file "Road1.mtf" is:



The documentation order will be the same as the order on the above **MTF Edit** menu.

The **interactive commands** for each of (a) to (k) will be described in the following sections.

Following the documentation of the **MTF** editor, how Boxing is applied is given in the section [What is Boxing ?](#), followed by the full definition of boxing in the section [Full Definition of Boxing](#) and the full definition of the **Decisions** button on **Template Create/Edit** panel in the section [Full Definition of Template Decisions](#).

There is a **text version** of the MTF file and it is given in the section [Text Format of the MTF File](#).

The text form of the MTF file can be edited with a text editor **supporting unicode**, and the text form does allow substitutions that can't be done via the interactive MTF Editor (see [Substitutions in the Many Templates File](#)). But most of the time, the Interactive MTF Editor is the easiest to use and covers all required situations.

For documentation on the option/menus on the MTF Edit menu:

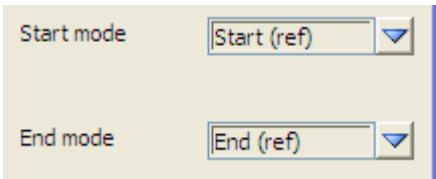
For the option <i>Templates</i> , go to	MTF Templates
<i>Specials</i>	MTF Specials
<i>Hinge</i>	MTF Hinge Modifiers
<i>Modifiers</i>	MTF Modifiers (Template Modifiers)
<i>Stripping</i>	MTF Stripping
<i>Boxing</i>	MTF Boxing
<i>Loops</i>	MTF Loops
<i>Super/Widening</i>	MTF Super/Widening
<i>Loops</i>	MTF Loops
<i>Width</i>	MTF Width
<i>Strings</i>	MTF String Modifiers
<i>Save</i>	MTF Save
<i>Recalc</i>	MTF Recalc
<i>Auto recalc</i>	MTF Auto Recalc
<i>Shift</i>	MTF Shift
<i>Quit</i>	MTF Quit
<i>Save & finish</i>	MTF Save and Finish

Please continue to the next section [Start and End Chainages](#).

Start and End Chainages

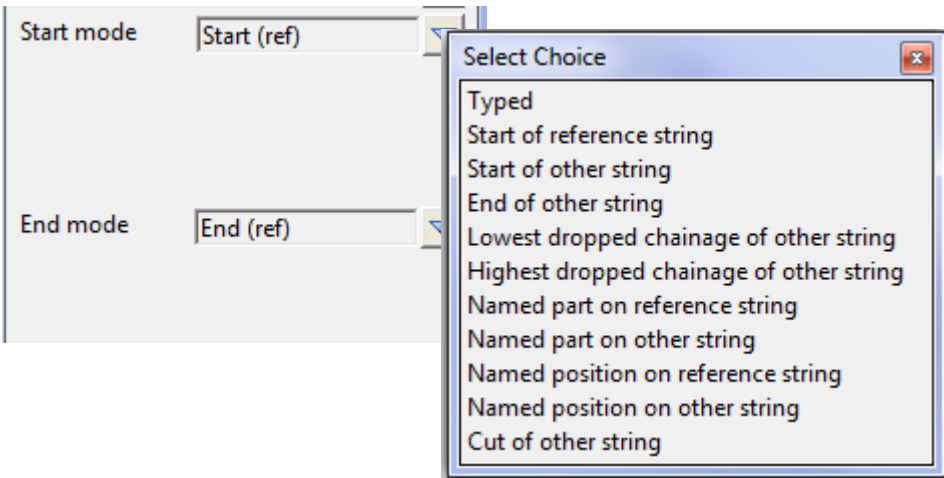
Many of the template options, particularly the left and right side modifiers, are applied from a chainage on the reference string (the **start chainage**) to a second, higher, chainage on the reference string (to **end chainage**).

There are a number of methods of defining the start and end chainages and the most common ones used on the panels use a **Start mode** and an **End mode**.



Start Mode

The **Start mode** is for defining the **start chainage**. The modes and their definitions are:



For **Typed** go to

- Start of reference string**
- Start of other string**
- End of other string**
- Lowest dropped chainage of other string**
- Highest dropped chainage of other string**
- Named part on reference string**
- Named part on other string**
- Named position on reference string**
- Named position on other string**
- Cut of other string**

[Start -Typed](#)

[Start - Start of reference string](#)

[Start - Start of other string](#)

[Start -End of other string](#)

[Start -Lowest dropped chainage of other string](#)

[Start -Highest dropped chainage of other string](#)

[Start -Named part on reference string](#)

[Start -Named part on other string](#)

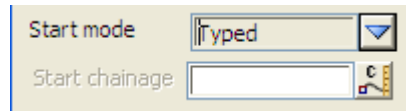
[Start -Named position on reference string](#)

[Start -Named position on other string](#)

[Start -Cut of other string](#)

Start -Typed

Selecting **Typed** adds a **Start chainage** panel field where a reference string chainage can be typed in. This is used as the **start chainage**.



If the **Start chainage** is left blank then the **start chainage of the reference string** is used as the **start chainage**.

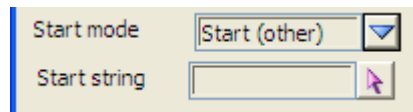
Start - Start of reference string

Selecting **Start of reference string** uses the **start chainage of the reference string** as the **start chainage**.

This is the default value for the **Start mode**.

Start - Start of other string

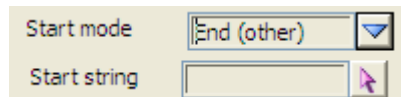
Selecting **Start of other string** adds a **Start string** panel field and another string is selected.



The **start** of the selected string is dropped onto the reference string and the dropped chainage from the reference string is used as the **start chainage**.

Start -End of other string

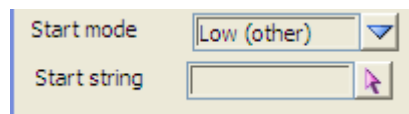
Selecting **End of other string** adds a **Start string** panel field and another string is selected.



The **end** of the selected string is dropped onto the reference string and the dropped chainage from the reference string is used as the **start chainage**.

Start -Lowest dropped chainage of other string

Selecting **Lowest dropped chainage of other string** adds a **Start string** panel field and another string is selected.



The **start** and **end** of the selected string are dropped onto the reference string and the lower of the two dropped chainages from the reference string is used as the **start chainage**.

Start -Highest dropped chainage of other string

Selecting **Highest dropped chainage of other string** adds a **Start string** panel field and another

string is selected.

Start mode

High (other)

Start string

The *start* and *end* of the selected string are dropped onto the reference string and the higher of the two dropped chainages from the reference string is used as the **start chainage**.

Start -Named part on reference string

Selecting Name part on reference string adds the two fields *Start part* and *Start extension* to the panel.

Start mode

Named part (ref)

Start part

Start extension

Named Part Builder

Part text

Part name

Sub part

Segment

Point

Set

Finish

Help

Clicking LB or RB on the + for *Start part* brings up the **Named Part Builder** for the reference string which is used to define exactly which section of a named part is required to define the chainage.

Either define the required chainage by the **Name Part Builder** and hit **Set**, or type in the syntax into the *Start part* field.

Start mode

Named part (ref)

Start part

First HIP.F.S.M

Start extension

End mode

End (ref)

Interval

Extra start

Extra end

Comment

Named position (ref)

1

Snippet:

KERB_SA_TERM_SK

yes

Named Part Builder

Part text

First HIP.F.S.M

Part name

First HIP

Sub part

the entire part (F)

Segment

the start segment (S)

Point

the mid point of the segment (M)

Set!

Set

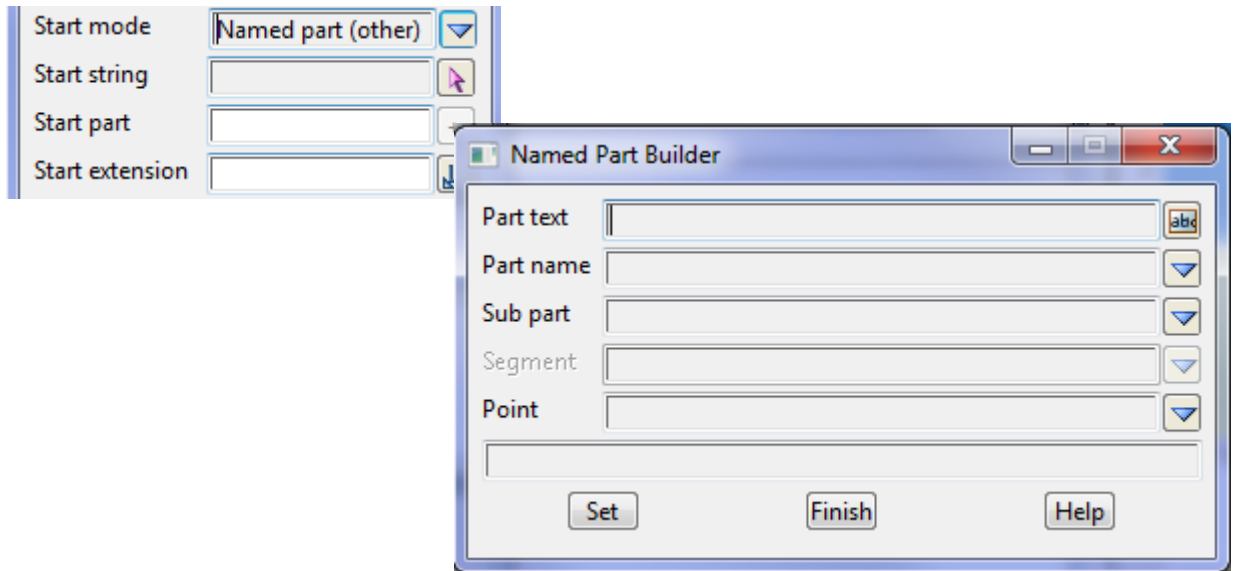
Finish

Help

The value in the **Start extension** field is added to the chainage calculated for the selected named part, and this becomes the **start chainage for the modifier**.

Start -Named part on other string

Selecting **Name part on other string** adds the three fields **Start string**, **Start part** and **Start extension** to the panel.



First click on the select button of the **Start string** panel field and select a string.

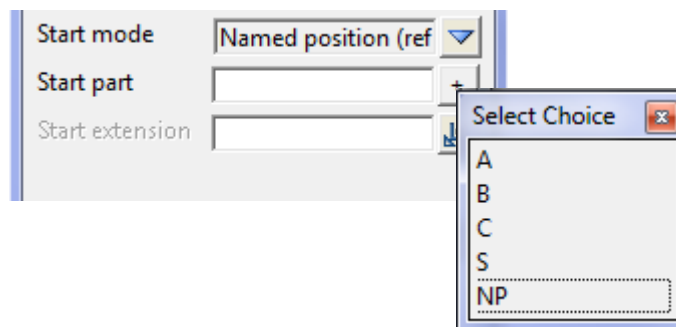
Clicking LB or RB on the **+** for **Start part** brings up the **Named Part Builder** for the selected string which is used to define exactly which section of a named part is required to define the chainage.

Either define the required chainage by the **Name Part Builder** and hit **Set**, or type in the syntax into the **Start part** field.

The value in the **Start extension** field is added to the chainage calculated for the selected named part, and this becomes the **start chainage for the modifier**.

Start -Named position on reference string

Selecting **Name position on reference string** adds the two fields **Start part** and **Start extension** to the panel.

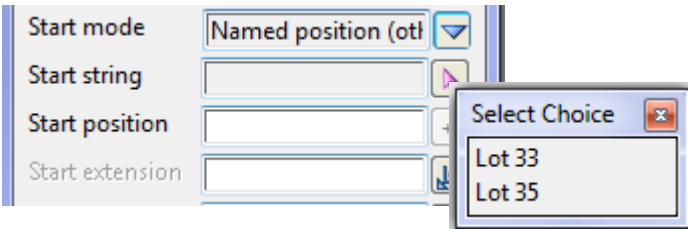


Clicking LB or RB on the **+** for **Start position** brings up the list of *Named positions* of the reference string. Either select from the list of named positions, or type the name of a Named position for the reference string into the **Start position** field

The value in the **Start extension** field is added to the chainage calculated for the selected named position, and this becomes the **start chainage for the modifier**.

Start -Named position on other string

Selecting Name position on other string adds the three fields **Start string**, **Start position** and **Start extension** to the panel.



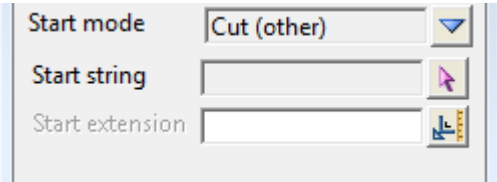
First click on the select button of the **Start string** panel field and select a string.

Clicking LB or RB on the **+** for **Start position** brings up the list of *Named positions* of the selected string. Either select from the list of named positions of the string, or type the name of a Named position of the string into the **Start part** field

The value in the **Start extension** field is added to the chainage calculated for the selected named position, and this becomes the **start chainage for the modifier**.

Start -Cut of other string

Selecting Cut of other string adds the two fields **Start string** and **Start extension** to the panel.



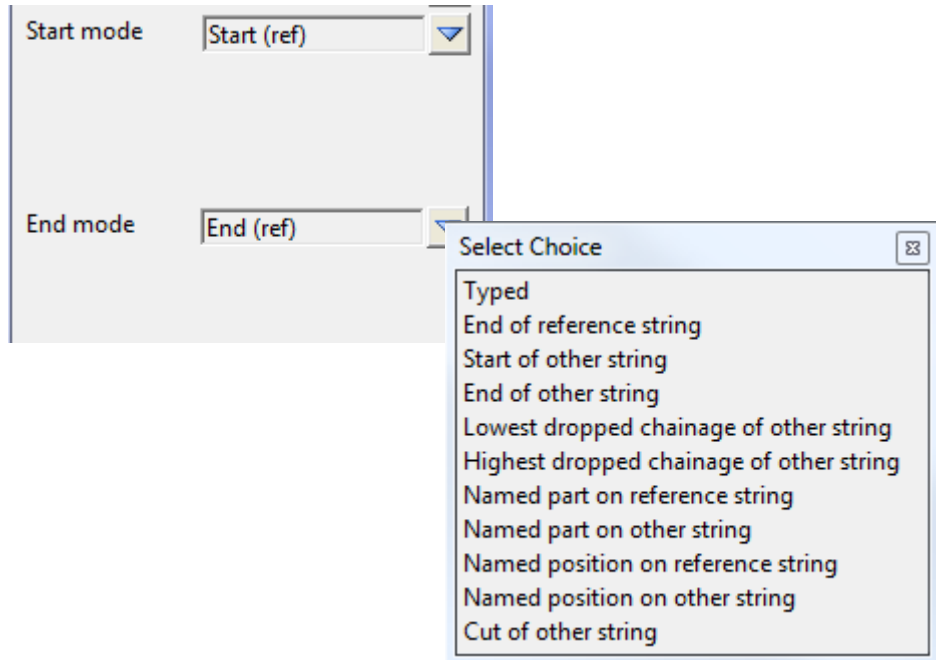
First click on the select button for the **Start string** panel field and select a string.

The value in the **Start extension** field is added to the chainage where the selected string cuts the reference string and this becomes the **start chainage for the modifier**.

Note - if the other string does not cut the reference string, or cuts it in more than one place, then the **Start mode** is invalid and an error message is generated.

End Mode

The **End mode** is for defining the **end chainage**. The modes and their definitions are:



For **Typed** go to

End of reference string

Start of other string

End of other string

Lowest dropped chainage of other string

Highest dropped chainage of other string

Named part on reference string

Named part on other string

Named position on reference string

Named position on other string

Cut of other string

[End - Typed](#)

[End - End of reference string](#)

[End - Start of other string](#)

[End - End of other string](#)

[End - Lowest dropped chainage of other string](#)

[End - Highest dropped chainage of other string](#)

[End - Named part on reference string](#)

[End - Named part on other string](#)

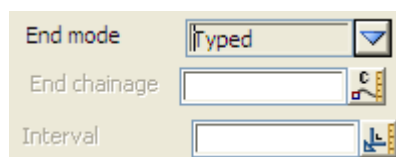
[End - Named position on reference string](#)

[End - Named position on other string](#)

[End - Cut of other string](#)

End - Typed

Selecting **Typed** adds a **End chainage** panel field where a reference string chainage can be typed in. This is used as the **end chainage**.



If the **End chainage** is left blank then the **end chainage of the reference string** is used as the **end chainage**.

End - End of reference string

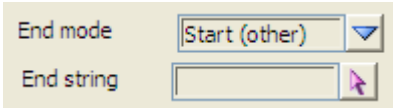
Selecting **End of reference string** uses the **end chainage of the reference string** as the **end chainage**.

This is the default value for the **End mode**.

End - Start of other string

Selecting **Start of other string** adds a **End string** panel field and another string is selected.

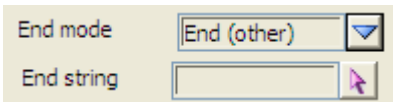
.



The *start* of the selected string is dropped onto the reference string and the dropped chainage from the reference string is used as the **end chainage**.

End - End of other string

Selecting **End of other string** adds a **End string** panel field and another string is selected.

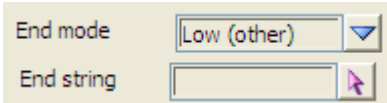


The *end* of the selected string is dropped onto the reference string and the dropped chainage from the reference string is used as the **end chainage**.

End - Lowest dropped chainage of other string

Selecting **Lowest dropped chainage of other string** adds a **End string** panel field and another string is selected.

.

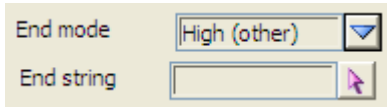


The *start* and *end* of the selected string are dropped onto the reference string and the lower of the two dropped chainages from the reference string is used as the **end chainage**.

End - Highest dropped chainage of other string

Selecting **Highest dropped chainage of other string** adds a **End string** panel field and another string is selected.

.

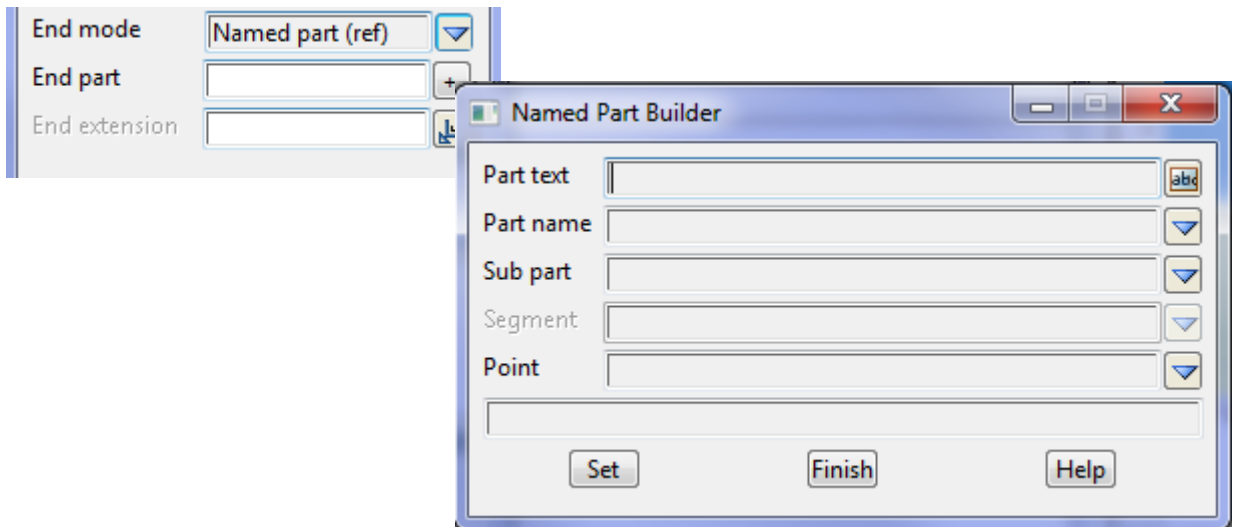


The *start* and *end* of the selected string are dropped onto the reference string and the higher of the two dropped chainages from the reference string is used as the **end chainage**.

End - Named part on reference string

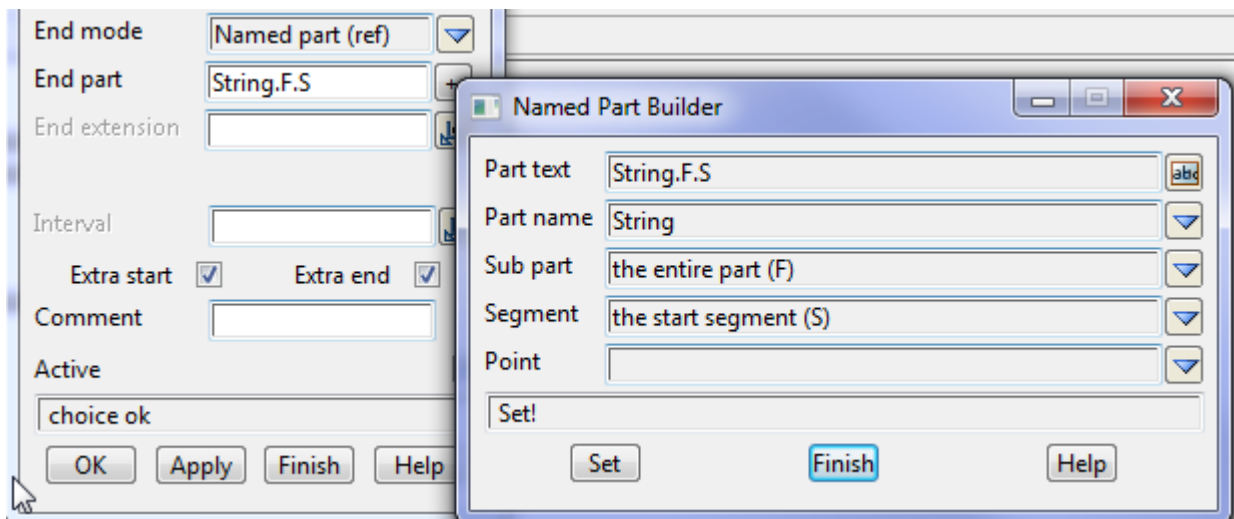
Selecting **Name part on reference string** adds the two fields **End part** and **End extension** to the panel.





Clicking LB or RB on the **+** for **End part** brings up the **Named Part Builder** for the reference string which is used to define exactly which section of a named part is required to define the chainage.

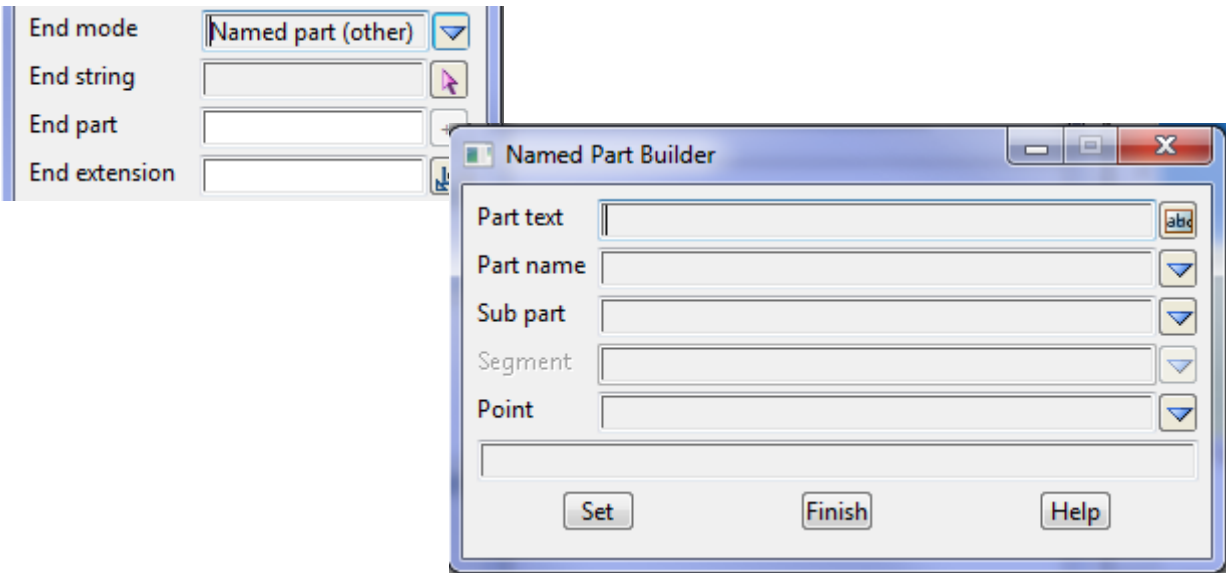
Either define the required chainage by the **Name Part Builder** and hit **Set**, or type in the syntax into the **End part** field.



The value in the **End extension** field is added to the chainage calculated for the selected named part, and this becomes the **end chainage for the modifier**.

End - Named part on other string

Selecting **Name part on other string** adds the three fields **End string**, **End part** and **End extension** to the panel.



First click on the select button of the **End string** panel field and select a string.

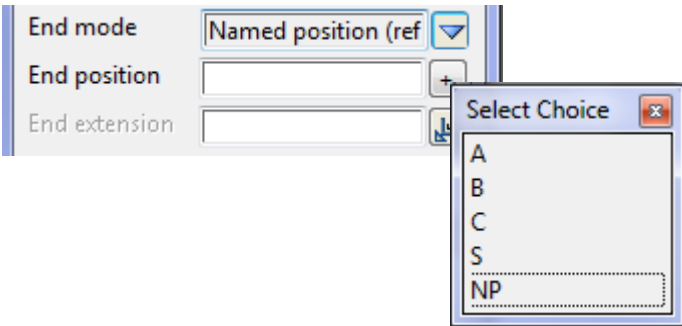
Clicking LB or RB on the **+** for **End part** brings up the **Named Part Builder** for the selected string which is used to define exactly which section of a named part is required to define the chainage.

Either define the required chainage by the **Name Part Builder** and hit **Set**, or type in the syntax into the **End part** field.

The value in the **End extension** field is added to the chainage calculated for the selected named part, and this becomes the **end chainage for the modifier**.

End - Named position on reference string

Selecting **Name position on reference string** adds the two fields **End part** and **End extension** to the panel.

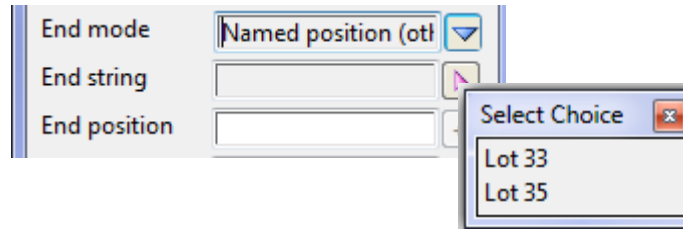


Clicking LB or RB on the **+** for **End position** brings up the list of **Named positions** of the reference string. Either select from the list of named positions, or type the name of a Named position for the reference string into the **End position** field

The value in the **End extension** field is added to the chainage calculated for the selected named position, and this becomes the **end chainage for the modifier**.

End - Named position on other string

Selecting **Name position on other string** adds the three fields **End string**, **End position** and **End extension** to the panel.



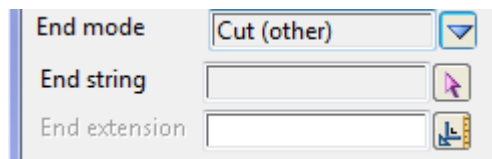
First click on the select button of the **End string** panel field and select a string.

Clicking LB or RB on the **+** for **End position** brings up the list of *Named positions* of the selected string. Either select from the list of named positions of the string, or type the name of a Named position of the string into the **End part** field

The value in the **End extension** field is added to the chainage calculated for the selected named position, and this becomes the **end chainage for the modifier**.

End - Cut of other string

Selecting **Cut of other string** adds the two fields **Start string** and **Start extension** to the panel.



First click on the select button for the **End string** panel field and select a string.

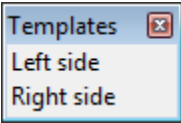
The value in the **End extension** field is added to the chainage where the selected string cuts the reference string and this becomes the **end chainage for the modifier**.

Note - if the other string does not cut the reference string, or cuts it in more than one place, then the **End mode** is invalid and an error message is generated.

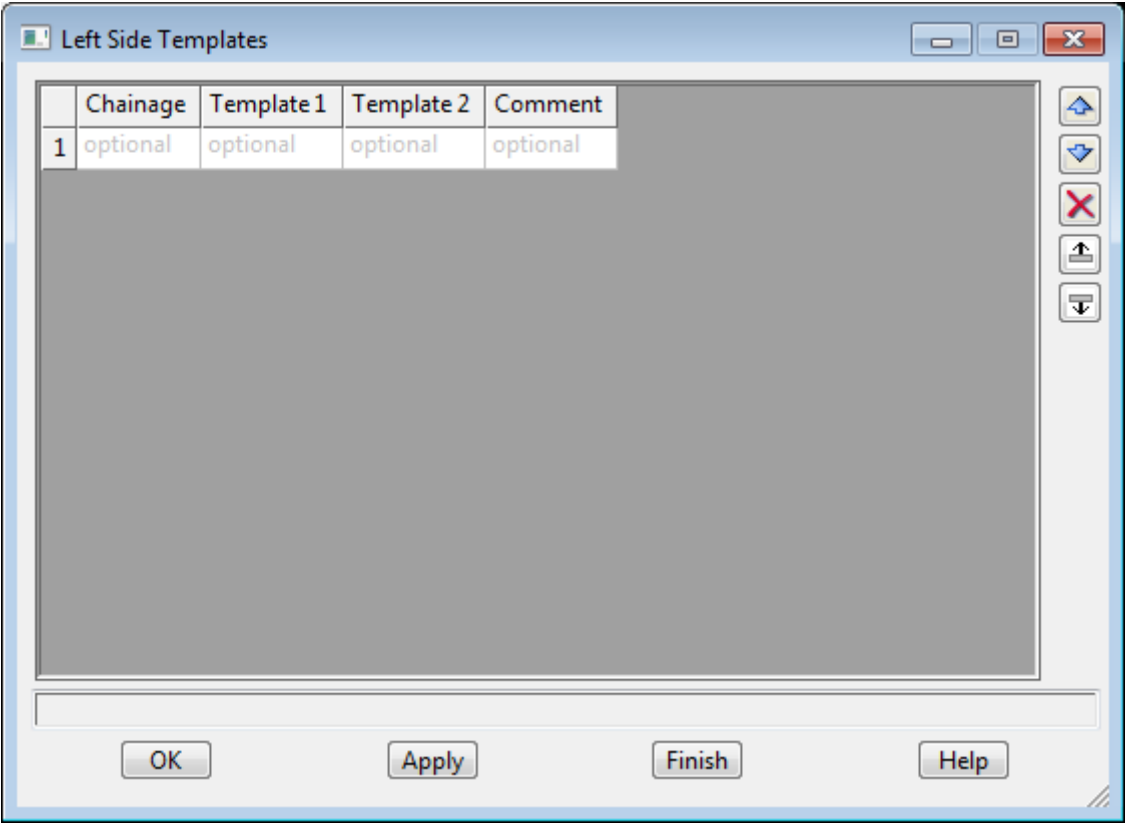
Please continue to the next section [MTF Templates](#).

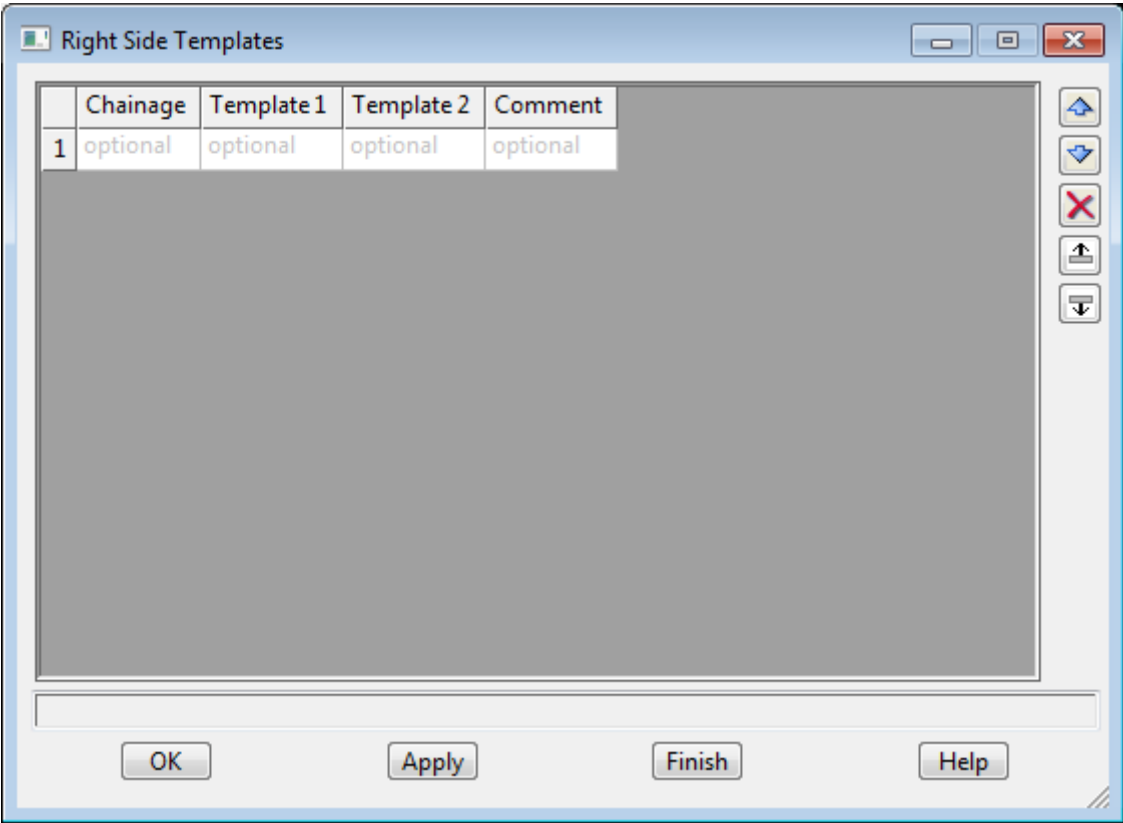
MTF Templates

The **Templates** walk-right brings up the **Templates** menu



and selecting the **Left side** or **Right side** option brings up the **Left Side Templates** or **Right Side Templates** panels respectively which are used to specify which templates are used, and over what chainage range, for the Left and Right sides.





The fields and buttons used in this panel have the following functions.

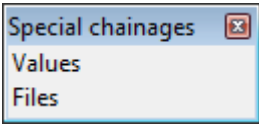
Field Description	Type	Defaults	Pop-Up
Chainage	column header		sort by chainage for the field - measure
<i>list of chainages for applying templates on the left/right hand side of the hinge string.</i>			
Template 1	column header		for the field - available templates
<i>template to start applying at the chainage on the same row. If template 2 is blank, then template 1 is applied until the next chainage in the chainage column.</i>			
Template 2	column header		for the field - available templates
<i>template to linearly interpolate to and finish with at the next chainage in the chainage column. In the file, the two templates will be separated by a comma.</i>			
<i>Note - template 2 must have the same number of fixed and variable links as template 1 otherwise a gap of the section separation length will be left between the end of template 1 and the start of template 2.</i>			
Comment	column header		
<i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>			
OK/Apply	button		
<i>OK stores the values in the fields and removes the panel.</i>			
<i>Apply stores the values and leaves the panel on the screen.</i>			
Please continue to the next section MTF Specials .			

MTF Specials

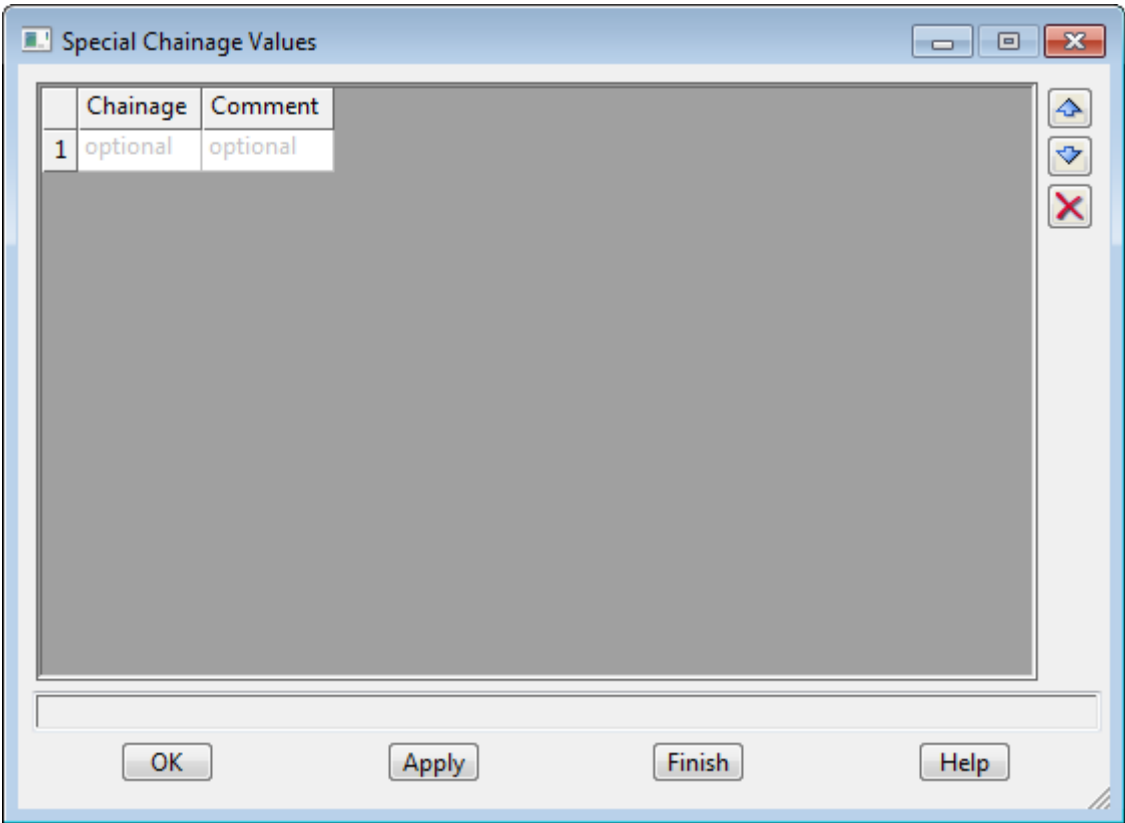
The **Apply Many** option automatically creates sections at a number of chainages including the supplied chainage interval, horizontal and vertical critical points, horizontal and vertical chord-arc tolerances, template change points and modifier change points.

However it is also possible to add extra sections at special chainages using the **Specials** option from the **MTF Edit** menu.

Walking right on the **Specials** menu brings up the **Special Chainages** walk-right menu:



Selecting **Values** brings up the **Special Chainage Values** panel

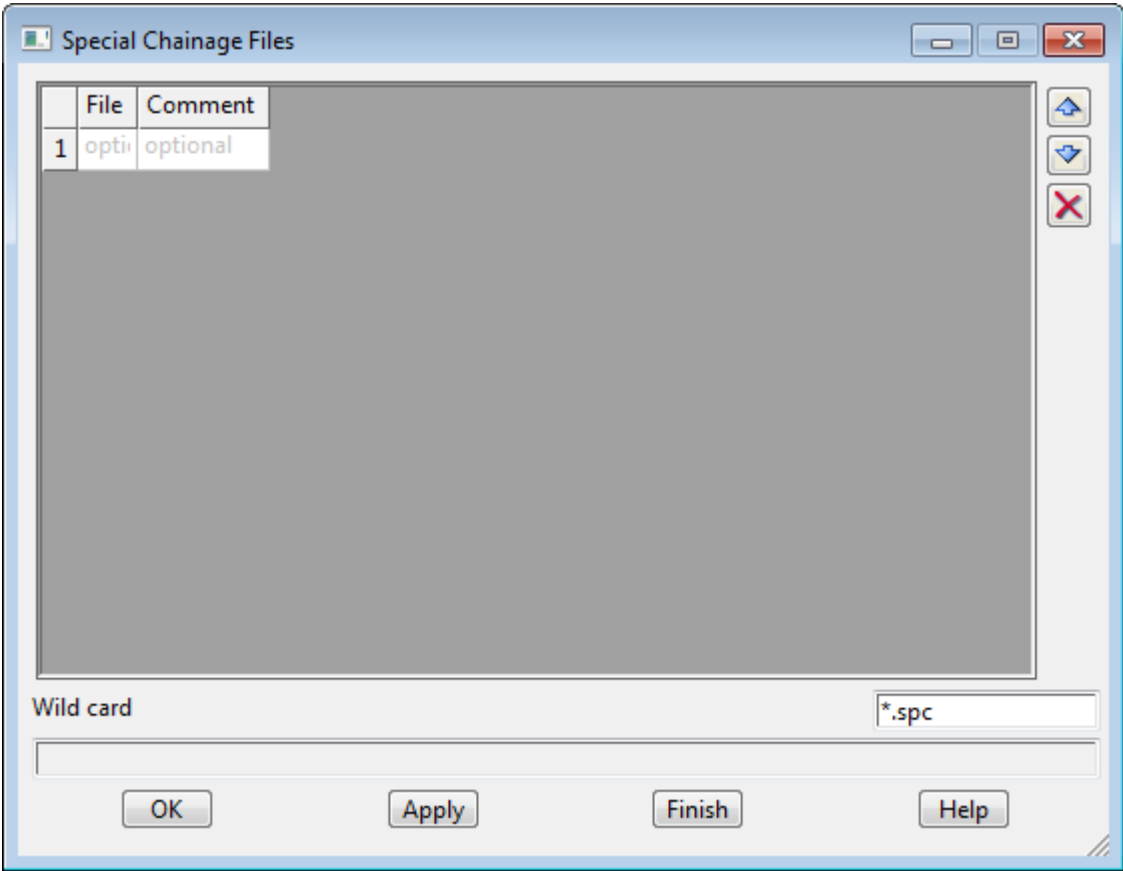


The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Chainage		column header		sort by chainage for the fields - measure
<i>list of special chainages for creating sections at.</i>				
Comment		column header		
<i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>				
OK/Apply		button		

OK stores the values in the fields and removes the panel.
Apply stores the values and leaves the panel on the screen.

Selecting **Files** brings up the **Special Chainage Files** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
File	column header		size menu for the fields - *.spc files

list of files of special chainages for creating sections at.

Comment	column header	
	<i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>	

Wild card	input	*.spc
	<i>the wild card used for pop-ups in the special chainage files fields.</i>	

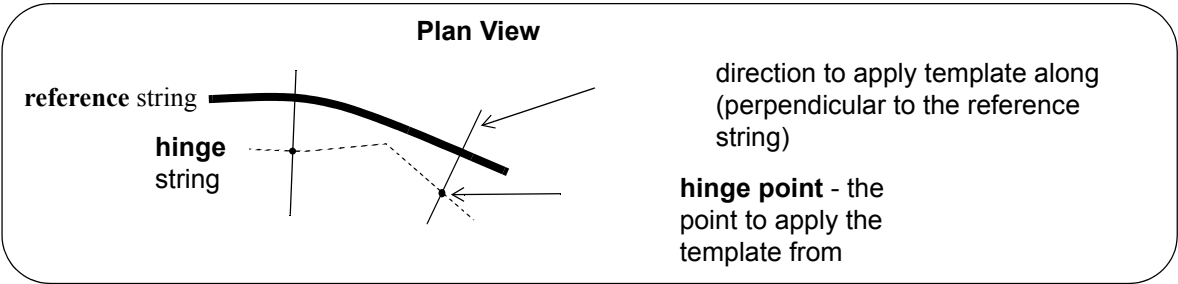
OK/Apply	button
OK stores the values in the fields and removes the panel.	
Apply stores the values and leaves the panel on the screen.	

Please continue to the next section [MTF Hinge Modifiers](#).

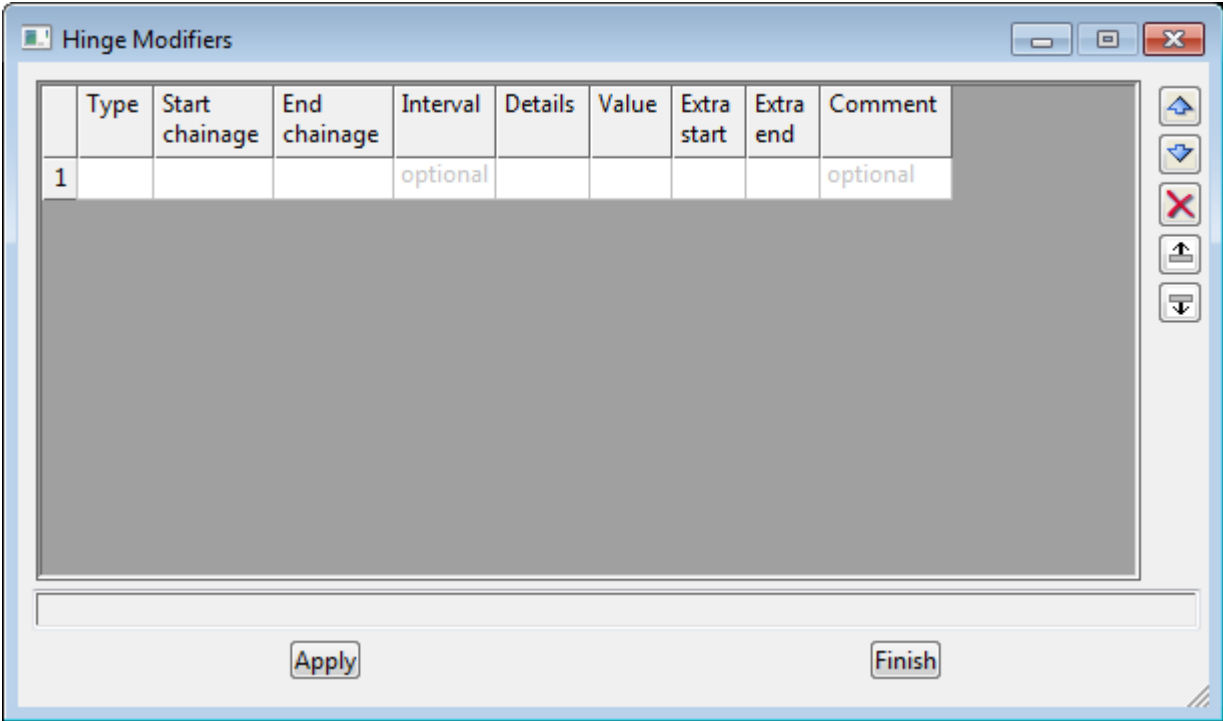
MTF Hinge Modifiers

The **hinge string** is selected using the **hinge** panel field in either the **Apply Template Function** or **Apply Templates Function** panels.

Hinge modifiers are used to **modify** the position of the point on the hinge string that templates are applied to (the **hinge point**).



Selecting **Hinge** from the **MTF Edit** menu brings up the **Hinge Modifiers** panel.

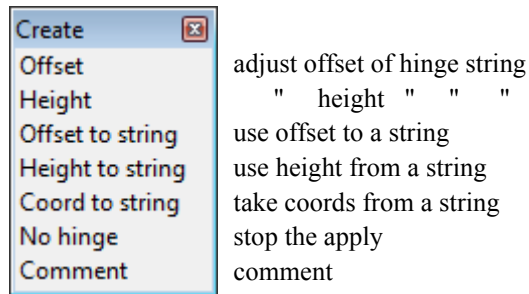


The **Hinge Modifiers** panel consists of a scrolling **command** fields and an **OK** or **Apply** button to record the results.

The **width** of the **command** area in the **Hinge Modifiers** panel is controlled by the environment variable `DEFAULT_TABLE_WIDTH_4D`.

The **commands** in the hinge modifier field can be **Offset**, **Height**, **Offset to string**, **Heights to string**, **Coord to string**, **No hinge** and **Comment**.

If the **command line** is **empty**, clicking **LB** in the **command line** will bring up the **Create** menu which contains all the available hinge commands.



Selecting a menu item will bring up an associated panel which displays the information required for the hinge command.

When the panel is filled in and **OK** or **Apply** selected, the panel information is written out to the **command line** in the correct format for that hinge command.

If the **command line** is **not empty**, clicking LB in the **command line** will bring up the associated panel for the hinge command in the **command line**.

The information in the panel can be modified and if **OK** or **Apply** is selected, the modified panel information is written out to the **command line** in the correct format for that hinge command.

Each of the panels created by selecting the command from the **Create** menu, will now be described.

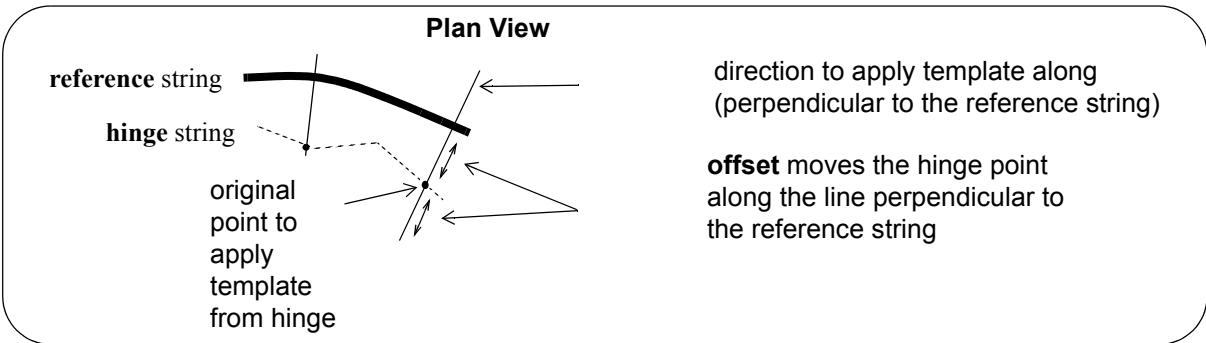
For documentation on the option on the Hinge modifier **Create** menus:

For the option <i>Offset</i> , go to	Offset
<i>Height</i>	Height
<i>Offset to string</i>	Offset to String
<i>Height to string</i>	Height to String
<i>Coord to sting</i>	Coord to String
<i>No hinge</i>	No Hinge
<i>Comment</i>	Comment

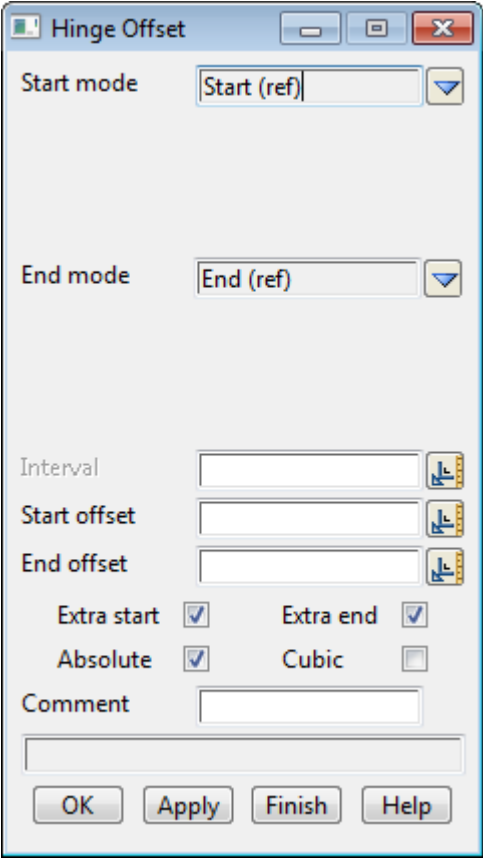
The typed form of the command will be given in the section [MTF Hinge Modifier File Format](#) and an example is given in the section [A Hinge Modifier Example](#)

Offset

The **offset** modifier will move the hinge point a given offset distance (perpendicular to the reference string) from its current plan position. A positive offset is to the right of the hinge string and a negative offset to the left.



Selecting **Offset** brings up the **Hinge Offset** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Start/End mode	choice box	Start (ref)/End (ref)	
<i>defines the start/end chainages on the reference string for modifying the offset from the hinge string. For more information on Start/End mode, see Start and End Chainages</i>			
Interval	input		

if **non blank**, the interval to use to create cross sections and strings over the given chainage range.
If **blank**, the **Section separation** value from the **Apply Many** panel is used.

Start/End offset input measures menu
start/end offset.

Extra start/end tick box tick
*if **ticked**, add an extra x-section 0.1 mm **before** the start/end chainage.*

Absolute tick box tick
*if **ticked**, the offset is set to the values given in the **start** and **end value** fields.
if **not ticked**, the values given in the **start** and **end value** fields are added to the existing offsets.*

Cubic tick box
*if **ticked**, the offset is varied as a reverse cubic between the start and end chainages.
if **not ticked**, the offset is varied linearly between the start and end chainages.*

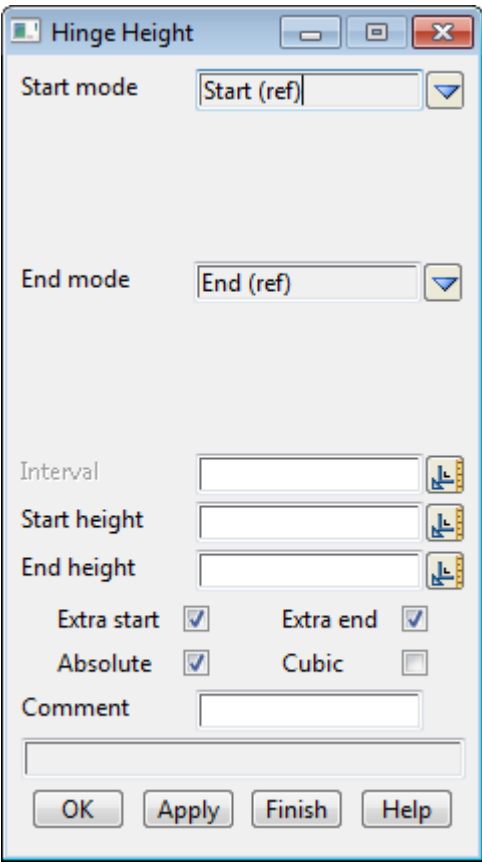
Comment input
comment to add to the end of the line. In the file, the comment will be preceded by //.

OK/Apply button
OK stores the values in the fields and removes the panel.
Apply stores the values and leaves the panel on the screen.

Go to the next section [Height](#) or return to [MTF Hinge Modifiers](#)

Height

The **Height** modifier varies the height of the hinge point between the given chainages. Selecting **Height** brings up the **Hinge Height** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Start/End mode	choice box	Start (ref)/End (ref)	
<i>defines the start/end chainages on the reference string for modifying the height of the hinge string. For more information on Start/End mode, see Start and End Chainages</i>			
Start/End height	input		measures menu
<i>start/end height.</i>			
Interval	input		
<i>if non blank, the interval to use to create cross sections and strings over the given chainage range. If blank, the Section separation value from the Apply Many panel is used.</i>			
Extra start/end	tick box	tick	
<i>if ticked, add an extra x-section 0.1 mm before the start/end chainage.</i>			
Absolute	tick box	tick	
<i>if ticked, the height is set to the values given in the start and end value fields. if not ticked, the values given in the start and end value fields are added to the existing heights.</i>			
Cubic	tick box		

if **ticked**, the height is varied as a reverse cubic between the start and end chainages.
if **not ticked**, the height is varied linearly between the start and end chainages.

Comment

comment to add to the end of the line. In the file, the comment will be preceded by //.

OK/Apply

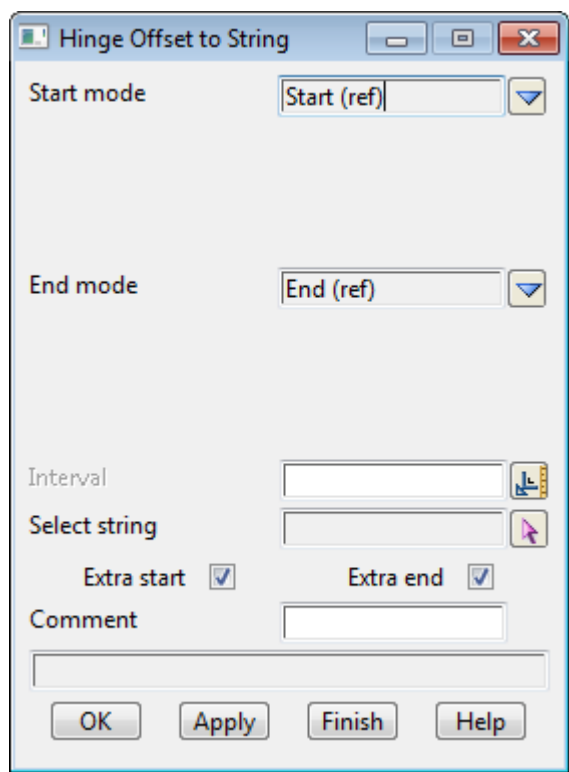
OK stores the values in the fields and removes the panel.

Apply stores the values and leaves the panel on the screen.

Go to the next section [Offset to String](#) or return to [MTF Hinge Modifiers](#)

Offset to String

Selecting **Offset to string** brings up the **Hinge Offset to String** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Start/End mode	choice box	Start (ref)/End (ref)	

*defines the start/end chainages for modifying the offset of the hinge string.
For more information on Start/End mode, see [Start and End Chainages except for this option](#):
When the **Start mode** is **Start (ref)**, or **Typed** and the chainage is **blank**, the modification begins at the low dropped chainage of the selected string.
When the **End mode** is **End (ref)**, or **Typed** and the chainage is **blank**, the modification ends at the high dropped chainage of the selected string.*

Interval	input
<i>if non blank, the interval to use to create cross sections and strings over the given chainage range. If blank, the Section separation value from the Apply Many panel is used.</i>	

String	string-select
<i>select string to use for defining offset from hinge.</i>	

Extra start/end	tick box	tick
<i>if ticked, add an extra x-section 0.1 mm before the start/end chainage.</i>		

Comment	input
<i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>	

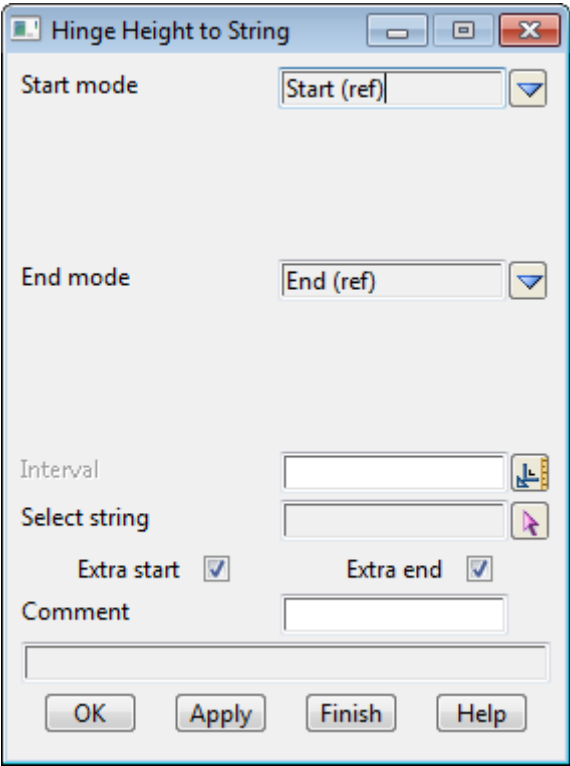
OK/Apply	button
<i>OK stores the values in the fields and removes the panel. Apply stores the values and leaves the panel on the screen.</i>	

Go to the next section [Height to String](#) or return to [MTF Hinge Modifiers](#)

Height to String

The height of the hinge point can also be specified by **taking the height from another 12d Model string**.

Selecting **Height to string** brings up the **Hinge Height to String** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Start/End mode	choice box	Start (ref)/End (ref)	
-----------------------	------------	-----------------------	--

*defines the start/end chainages for modifying the height of the hinge string.
For more information on Start/End mode, see [Start and End Chainages except for this option](#):
When the **Start mode** is **Start (ref)**, or **Typed** and the chainage is **blank**, the modification begins at the low dropped chainage of the selected string.
When the **End mode** is **End (ref)**, or **Typed** and the chainage is **blank**, the modification ends at the high dropped chainage of the selected string.*

Start/End mode	choice box	Start (ref)/End (ref)	
-----------------------	------------	-----------------------	--

*defines the start/end chainages for modifying the offset of the hinge string.
For more information on Start/End mode, see [Start and End Chainages](#)*

Interval	input		
-----------------	-------	--	--

*if **non blank**, the interval to use to create cross sections and strings over the given chainage range.
If **blank**, the **Section separation** value from the **Apply Many** panel is used.*

String	string-select		
---------------	---------------	--	--

select string to use for defining height of hinge.

Extra start/end	tick box	tick	
------------------------	----------	------	--

*if **ticked**, add an extra x-section 0.1 mm **before** the start/end chainage.*

Comment input

comment to add to the end of the line. In the file, the comment will be preceded by //.

OK/Apply button

OK stores the values in the fields and removes the panel.

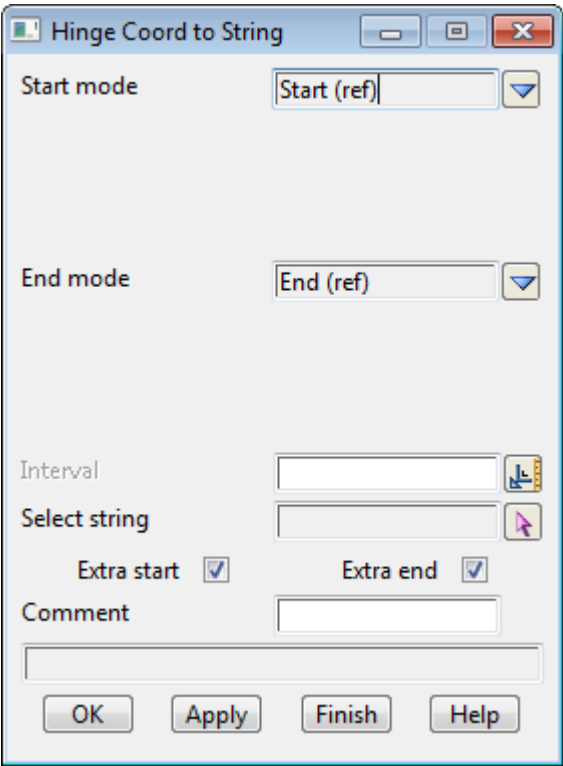
Apply stores the values and leaves the panel on the screen.

Go to the next section [Coord to String](#) or return to [MTF Hinge Modifiers](#)

Coord to String

The **Coord** modifier is used to replace the x, y and z position of the hinge point by the x, y and z position of **another 12d Model string** between given chainages. Hence **Coord** replaces the hinge string by another string between the given chainages.

Selecting **Coord to string** brings up the **Hinge Coord to String** panel



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Start/End mode	<i>defines the start/end chainages for modifying the coordinates of the hinge string. For more information on Start/End mode, see Start and End Chainages except for this option: When the Start mode is Start (ref), or Typed and the chainage is blank, the modification begins at the low dropped chainage of the selected string. When the End mode is End (ref), or Typed and the chainage is blank, the modification ends at the high dropped chainage of the selected string.</i>	choice box	Start (ref)/End (ref)	
Interval	<i>if non blank, the interval to use to create cross sections and strings over the given chainage range. If blank, the Section separation value from the Apply Many panel is used.</i>	input		
String	<i>select string to use for defining the coordinates of the hinge string.</i>	string-select		
Extra start/end	<i>if ticked, add an extra x-section 0.1 mm before the start/end chainage.</i>	tick box		
Comment	<i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>	input		
OK/Apply		button		

OK stores the values in the fields and removes the panel.

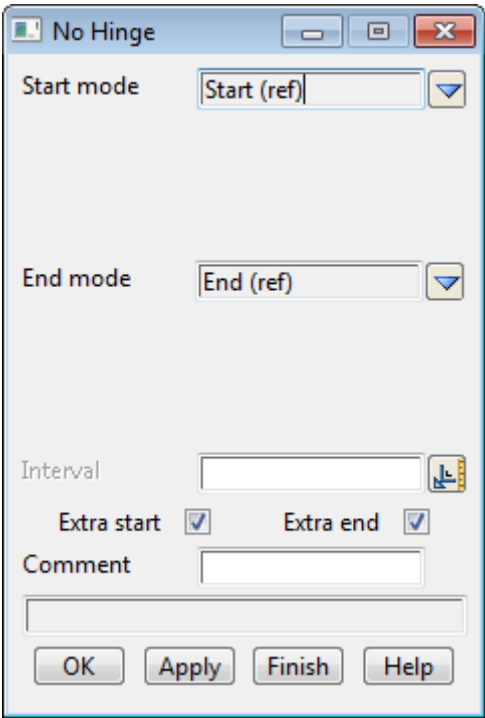
Apply stores the values and leaves the panel on the screen.

Go to the next section [No Hinge](#) or return to [MTF Hinge Modifiers](#)

No Hinge

The **Nohinge** modifier is used to **stop** the hinge string (and hence the apply) between given chainages. This will leave a gap in the strings created by the apply between the given chainages.

Selecting **No hinge** brings up the **No Hinge** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Start/End mode	choice box	Start (ref)/End (ref)	
-----------------------	------------	-----------------------	--

*defines the start/end chainages to stop the apply.
For more information on Start/End mode, see [Start and End Chainages](#)*

Interval	input		
-----------------	-------	--	--

*if **non blank**, the interval to use to create cross sections and strings over the given chainage range.
If **blank**, the **Section separation** value from the **Apply Many** panel is used.*

Extra start/end	tick box		
------------------------	----------	--	--

*if **ticked**, add an extra x-section 0.1 mm **before** the start/end chainage.*

Comment	input		
----------------	-------	--	--

comment to add to the end of the line. In the file, the comment will be preceded by //.

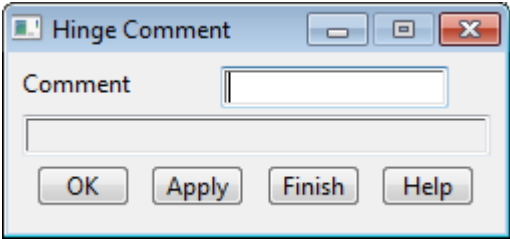
OK/Apply	button		
-----------------	--------	--	--

***OK** stores the values in the fields and removes the panel.
Apply stores the values and leaves the panel on the screen.*

Go to the next section [Comment](#) or return to [MTF Hinge Modifiers](#)

Comment

The **Comment** option inserts a comment line.
Selecting **Comment** brings up the **Hinge Comment** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Comment	input		
<i>comment line. In the file, the comment will be preceded by //.</i>			
OK/Apply	button		
<i>OK stores the values in the fields and removes the panel.</i>			
<i>Apply stores the values and leaves the panel on the screen.</i>			

Go to the next section [MTF Modifiers \(Template Modifiers\)](#) or return to [MTF Hinge Modifiers](#)

MTF Modifiers (Template Modifiers)

In its **simplest** form, the **MTF (Many Templates File** - so named because it was originally just for having more than one template) defines what templates are used on either side of the hinge string, where the templates stop and start with linear interpolation between two templates over a chainage range.

This simple information is given for the left side and the right side in the **Templates** section of the **MTF**.

For more complex work, **Modifiers** are used in the **MTF** to **modify** the strings defined in the templates, and even totally replace the use of templates. And just as the templates are defined on the left and the right side, the **Modifiers** are defined for the left and right side in the **Modifiers** section of the **MTF editor**.

That is, for the left side say, the application of templates is first defined for the left side in the **Left side** of the **Templates** section of the **MTF** and then can be **modified** by commands in the **Left side** of the **Modifiers** section of the **MTF**.

However, the modifiers **also include** commands to **insert** and **remove** template links, and insert templates independently of whether a template has been defined or not in the **Templates** section.

Hence the **left side modifiers** can be **self contained** without needing a **Templates** section.

Similarly for the right side.

The **Modifiers** can be used to

- insert a fixed, cut or fill link
- remove a fixed, cut or fill link
- insert the fixed, cut or fill section of a template
- insert snippets

and change the

- width/height/xfall of a fixed link
- width/height/slope of a variable cut or fill link
- width of the final link
- cut/fill slope of the final link

by a variety of methods.

Most of the modifiers have a common methodology:

- (a) an existing link from a template (referenced by its name from the template definition), or a new link that is created by an MTF Insert, can be removed or modified between a given start and end chainage on the reference string.
- (b) values being modified are given for the start chainage and the end chainage. How the values are interpreted depends on other parameters for the command.
- (c) more than one modifier may exist for a link at a given chainage and the modifiers are applied in the order that they appear in the modifiers grid.
- (d) if no modifier exists for a link at a given chainage, the link reverts back to the template definition (or the Insert link command), given by the left side or the right side.

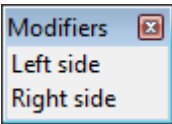
Notes

1. When a fixed link is defined, it is given as two of the three variables width, height and xfall. For most **Modifier commands**, only the two variables used to define the link can be changed by **Modifiers**.
2. Similarly, when a variable cut or fill link is defined, it is given as two of the three variables width, height and slope. For most **Modifier commands**, only the two variables used to define the link can be changed by **Modifiers**.

Please continue to the next section [Modifiers in MTF Edit](#).

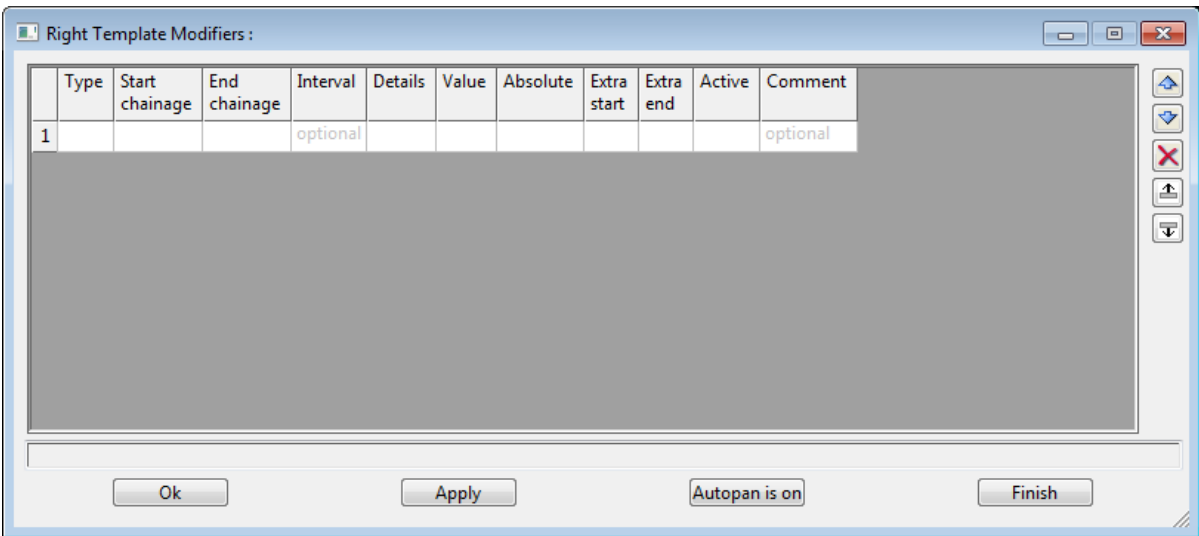
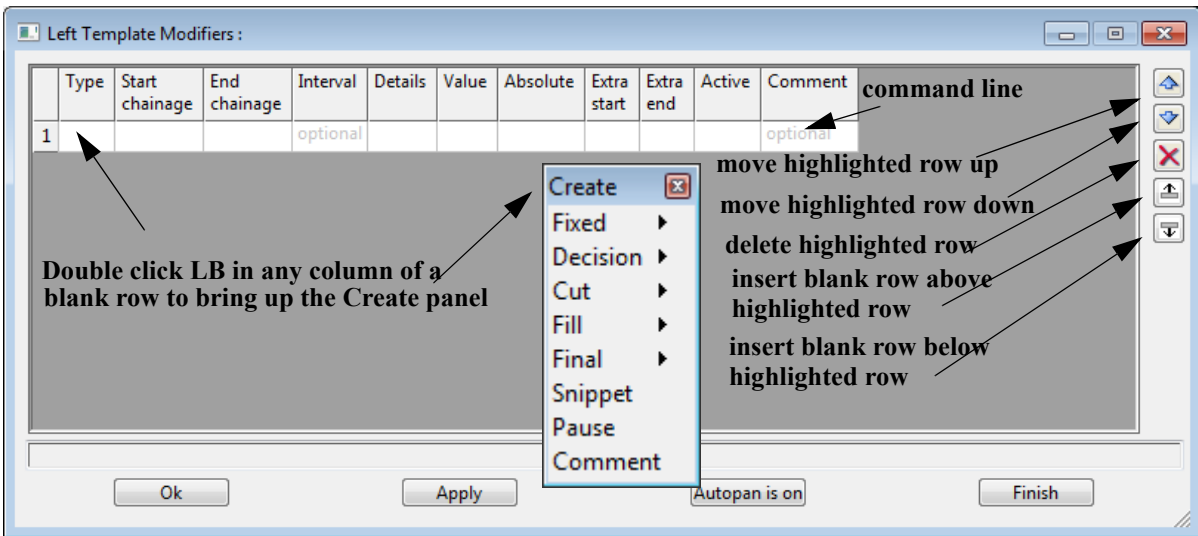
Modifiers in MTF Edit

The **Modifiers** walk-right *brings* up the **Modifiers** menu with options to modify the left side and right side sections of the MTF.



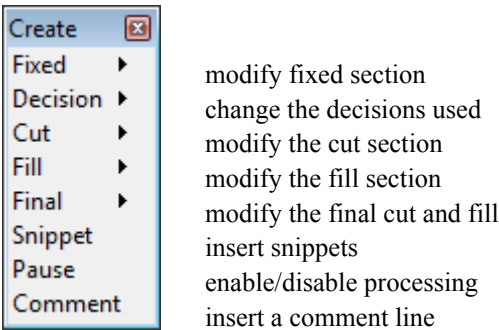
The **Left side** modifier option will be described in detail. The **right side** is exactly the same so will not be described.

Selecting **Left side** from the MT edit =>Left side menu brings up the **Left Template Modifiers** panel.



The **Left Template Modifiers** and **Right Template Modifiers** panels consists of a grid to display the command fields and an **Apply** button to record the results.

If the **command line** is **empty**, double clicking LB in any the **command line** will bring up the **Create** menu which contains all the available modifier commands.



Selecting a menu item will bring up an associated panel which displays the information required for the modifier command.

When the panel is filled in and **Apply** selected, the panel information is written out to the **command line** in the correct format for that modifier command.

If the **command line** is **not empty**, double clicking LB in the **Type** column of the **command line** will bring up the associated panel for the modifier command in the **command line**.

The information in the panel can be changed and if **Apply** is selected on the panel, the changed panel information is written out to the **command line** in the correct format for that modifier command.

For documentation on the button *Autopan*, go to [Start/End Highlighting and Autopan Button](#)

Each of the panels created by selecting a command from the **Create** menu, will now be described.

For the option <i>Fixed</i> , go to	Fixed Link Modifiers
<i>Decision</i>	Decision
<i>Cut</i>	Cut Link Modifiers
<i>Fill</i>	Fill Link Modifiers
<i>Final</i>	Final Modifiers
<i>Snippet</i>	Snippets
<i>Pause</i>	Pause
<i>Comment</i>	Comment

Please continue to the next section [Start/End Highlighting and Autopan Button](#).

Start/End Highlighting and Autopan Button

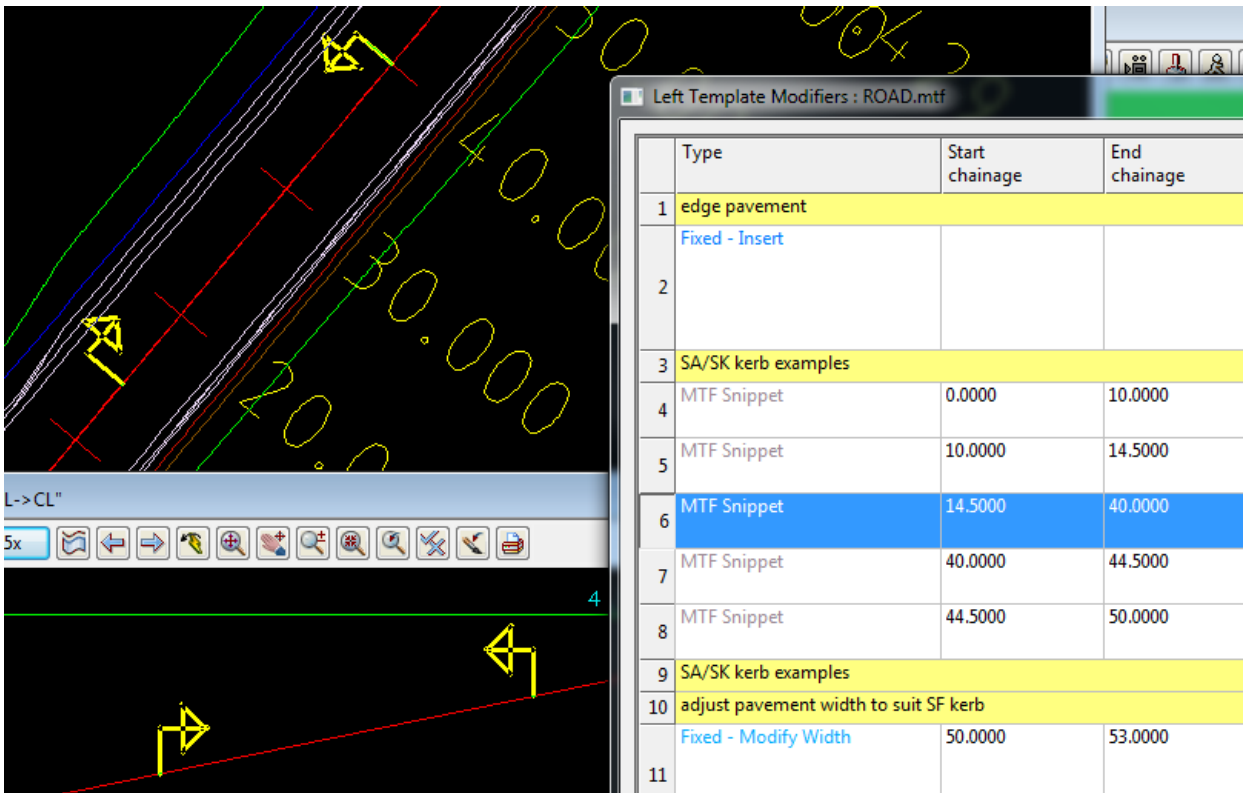
The **Autopan** button is at the button of the **Left/Right Template Modifiers** panels and clicking on the button will toggle between the **on/off** states.



The **Autopan** button is used in conjunction with clicking LB in the Type, Start chainage and End Chainage columns.

For all **plan** views that the **Reference string** for the MTF is on, and all **section views** where the **Reference string** is **profiled**., clicking in the grid on the **Left/Right Template Modifiers** panels will have the following effect:

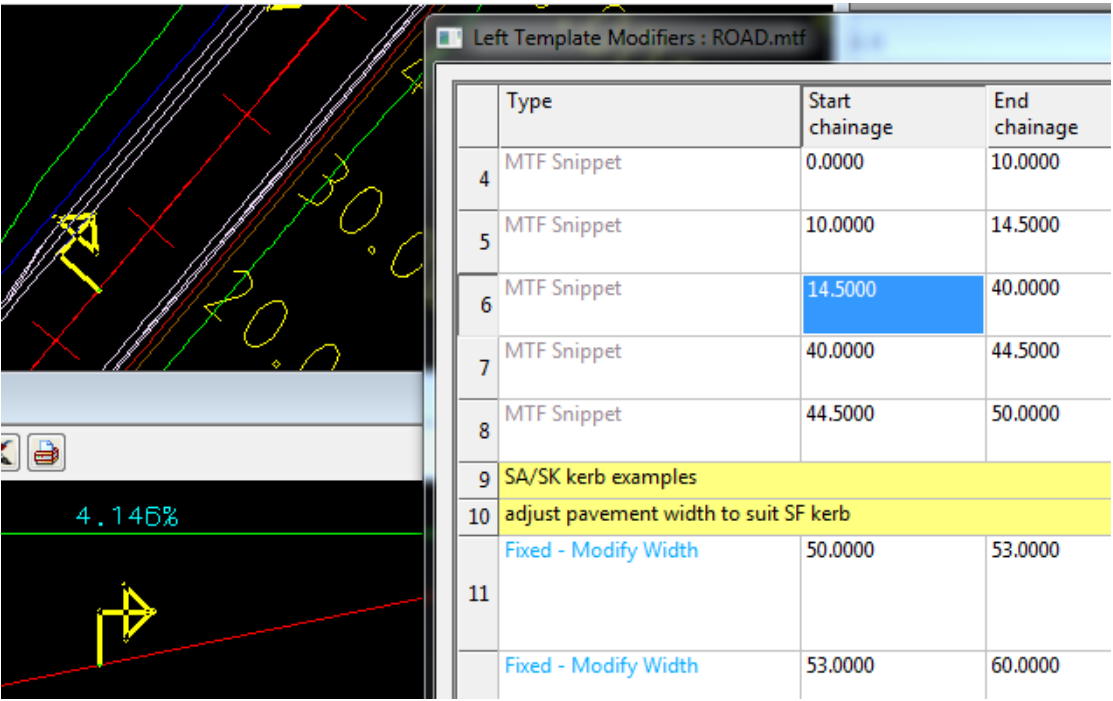
- (a) if LB is clicked on the **number** in the grid of a command then the entire line in the grid highlights, and highlight arrows are placed at the Start and End chainage of the command.



Important Note: the scale and the centre point of the views are not changed so if the Start/End chainage is not visible on the view, then the highlight arrow for the Start/End will not appear.

- (b) if LB is clicked in the **Start chainage** column of a command, then that cell of the grid highlights, and
If **Autopan is on** then the plan and/or section views will pan so that the Start chainage highlight arrow shows on the views.

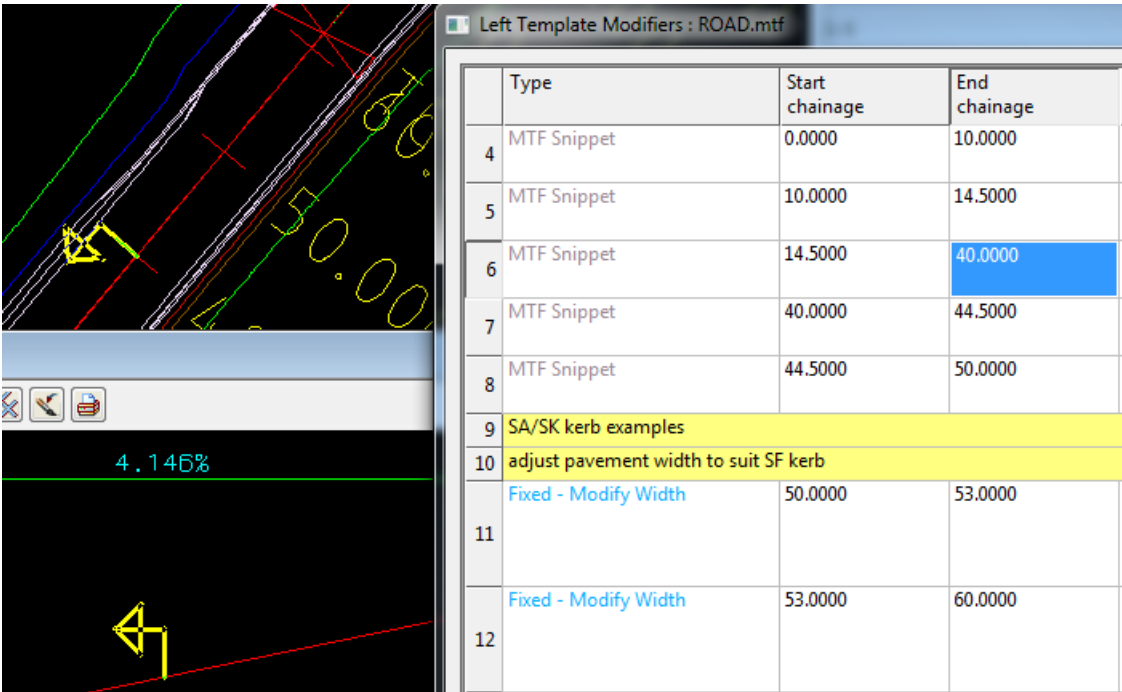
If **Autopan is off** then the Start chainage highlight arrow occurs but the view does not change. So the Start chainage highlight arrow will only show if the Start chainage is already visible on the plan and/or section views.



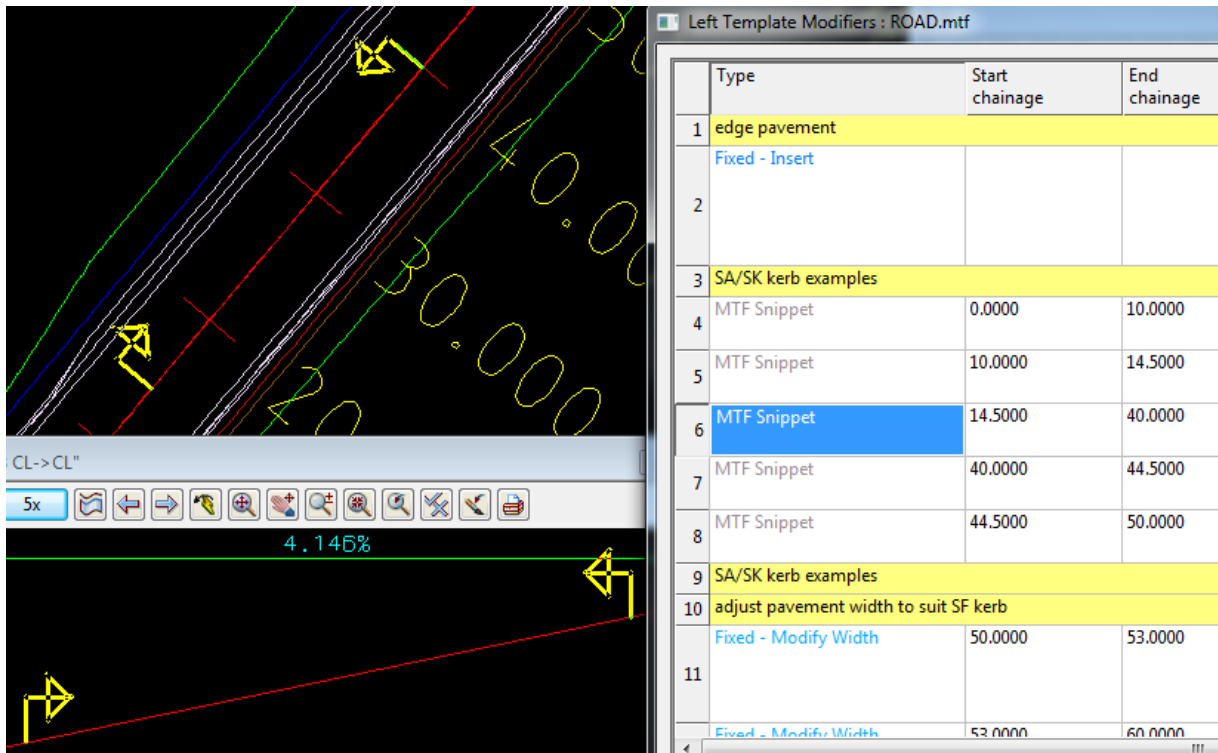
(c) if LB is clicked in the **End chainage** column of a command, then that cell of the grid highlights, and

If **Autopan is on** then the plan and/or section views will pan so that the End chainage highlight arrow shows on the views.

If **Autopan is off** then the End chainage highlight arrow occurs but the view does not change. So the End chainage highlight arrow will only show if the End chainage is already visible on the plan and/or section views.



- (d) if LB is clicked in the **Type** column of a command, then that cell of the grid highlights, and
- If **Autopan is on** then the plan and/or section views will do a fit about the Start chainage and End chainage so that both the Start chainage highlight arrow and the End chainage highlight arrow are visible in the plan and/or section views.
- If **Autopan is off** then the plan and/or section views do not change. The Start chainage highlight arrow and the End chainage highlight arrow are turned on but they will only be visible if the Start chainage and/or End chainage are already visible on the views.



LJG ??

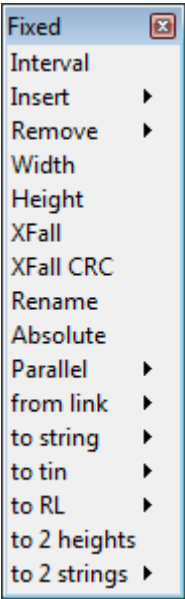
reference string If **Autopan is on** is showing AND the **Reference string** for the MTF is on a plan view:

- (a) whenever you click on **Type** column in the grid for a command that does not involve the entire string, the scale and centre of the view is modified so that the **Start** and **End** chainage extents of the command are displayed in the plan view (with the addition of an extra percentage that is set in env.4d)
- (b) whenever you click on **Start chainage** column of a command that does not involve the entire string, the scale and centre of the view is modified so that the **Start** and **End** chainage extents of the command are displayed in the plan view (with the addition of an extra percentage that is set in env.4d)

Return to [Modifiers in MTF Edit.](#)

Fixed Link Modifiers

The **Fixed** walk-right brings up the **Fixed** menu with options to modify the fixed links of the template.



To go straight to the documentation on each of the options on the **Fixed** modifier menu:

For <i>Interval</i> , go to	Change Interval
<i>Insert</i> , go to	Fixed Link - Insert
<i>Remove</i>	Fixed Link - Remove
<i>Width/Height</i>	Fixed Link - Modify Width or Height
<i>Xfall</i>	Fixed Link - Modify Xfall
<i>Xfall CRC</i>	Fixed Link - Modify Xfall by CRC Formula
<i>Rename</i>	Fixed Link - Rename Link
<i>Parallel</i>	Fixed Link- Parallel
<i>Absolute</i>	Fixed Link - Absolute
<i>from Link</i>	Fixed Link - from Link
<i>to String</i>	Fixed Link - to String
<i>to Tin</i>	Fixed Link - to Tin
<i>to RL</i>	Fixed Link - to RL
<i>to 2 heights</i>	Fixed Link - to Two Heights
<i>to 2 Strings</i>	Fixed Link - to Two Strings

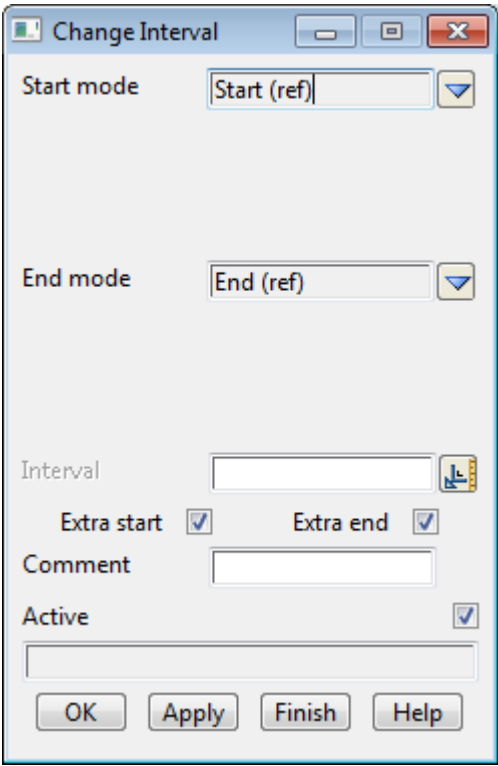
Each of the options from this menu will now described.

Change Interval

An interval can be specified to add extra cross sections and points in the create strings.

Selecting **Interval** brings up the **Change Interval** panel



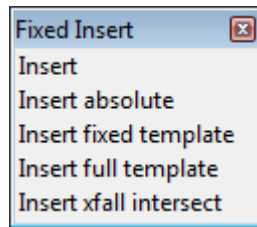


The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Start/End mode	choice box	Start (ref)/End (ref)	
<i>defines the start/end chainages for using the new Interval.</i> <i>For more information on Start/End mode, see Start and End Chainages</i>			
Interval	input		
<i>if non blank, the interval to use to create extra cross sections and strings over the given chainage range.</i>			
Extra start/end	tick box		
<i>if ticked, add an extra x-section 0.1 mm before the start/end chainage.</i>			
Comment	input		
<i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>			
Active	tick box	ticked	
<i>if ticked, use this modifier.</i> <i>if not ticked, don't use this modifier.</i>			
OK	button		
<i>OK stores the values in the fields and removes the panel BUT no recalc is done.</i>			
Apply	button		
<i>Apply stores the values and leaves the panel on the screen.</i> <i>If the MTF is being used in an Apply Many MTF and Auto recalc is ticked in the MTF, then whenever the Apply button is clicked, a recalc of the associated Apply Many for the MTF is done.</i>			
Return to Fixed Link Modifiers or Modifiers in MTF Edit .			

Fixed Link - Insert

The **fixed Insert** walk-right brings up the **fixed Insert** menu with options to insert fixed links, insert a fixed part of a template, and insert a full template.



To go straight to the documentation on each of the options on the **Fixed** modifier menu:

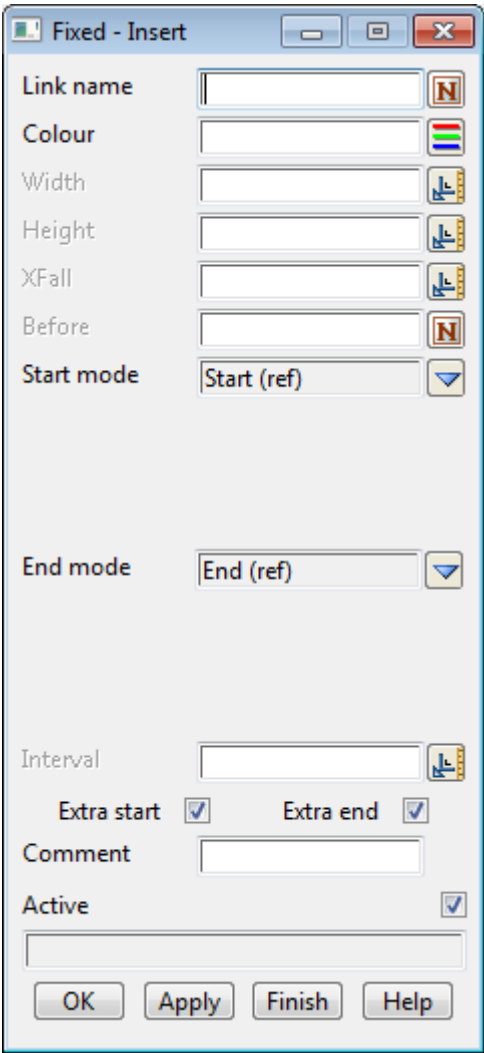
For <i>Insert</i> , go to	Insert a Fixed Link
<i>Insert absolute</i>	Insert a Fixed Link Absolute
<i>Insert fixed template</i>	Insert Fixed Links from a Template
<i>Insert full template</i>	Insert Full Template
<i>Insert xfall intersect</i>	Fixed Link - Insert Xfall Intersect

Insert a Fixed Link

Fixed links can be inserted by specifying either width and height, width and xfall, or height and xfall, where width/height/xfall are measured from the last fixed link before this link.

Note - height is not an absolute height (RL) but a delta height.

Selecting **Insert** brings up the **Fixed - Insert** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name <i>name of the link to create.</i>	names box		select name menu
Colour <i>colour of the link being created.</i>	colour box		available colours
Width /height/xfall <i>width/ height/ crossfall of the link being created - only use two of the three.</i>	input		measures menu
Before <i>if non-blank, the name of the string to insert the new string before. If blank, the link is appended to the end of the fixed part of the template.</i>	choice box		select name menu
Start/End mode <i>defines the start/end chainages for inserting the new template link. For more information on Start/End mode, see Start and End Chainages</i>	choice box	Start (ref)/End (ref)	
Interval <i>if non blank, the interval to use to create cross sections and strings over the given chainage range.</i>	input		

If *blank*, the **Section separation** value from the **Apply Many** panel is used.

Extra start/end tick box

if *ticked*, add an extra x-section 0.1 mm **before** the start/end chainage.

Comment input

comment to add to the end of the line. In the file, the comment will be preceded by //.

Active tick box tick

if *ticked*, use this modifier.
if *not ticked*, don't use this modifier.

OK button

OK stores the values in the fields and removes the panel BUT no **recalc** is done.

Apply button

Apply stores the values and leaves the panel on the screen.
If the **MTF** is being used in an **Apply Many MTF** and **Auto recalc** is ticked in the MTF, then whenever the **Apply** button is clicked, a **recalc** of the associated **Apply Many** for the MTF is done.

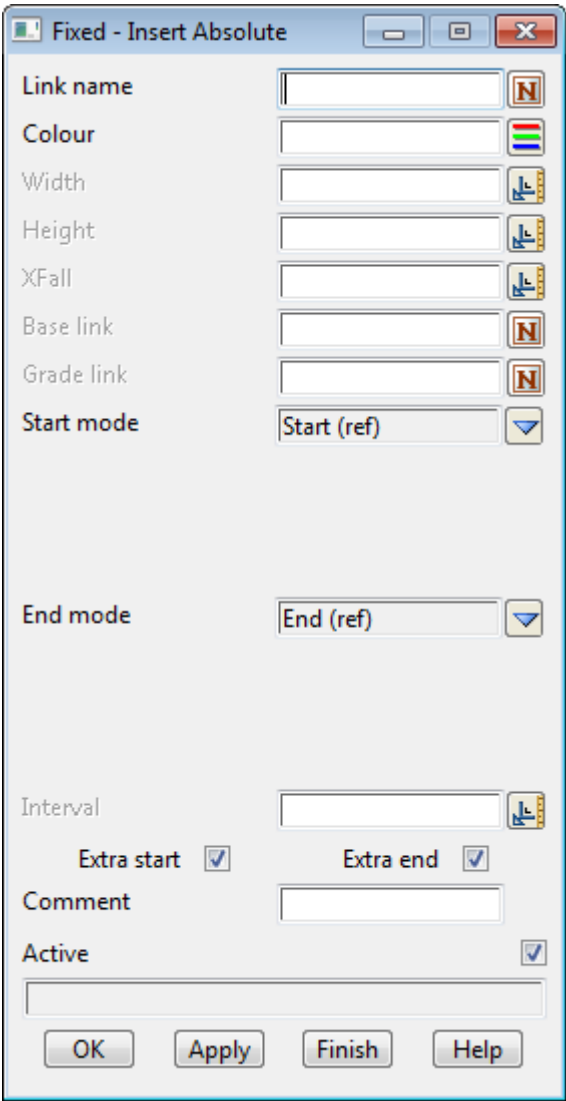
Insert a Fixed Link Absolute

Fixed links can be inserted by specifying either width and height, width and xfall, or height and xfall, where the width/height/xfall are measured from a **Base link**, or a combination of a **Base** link and a **Grade** link.

The new inserted link must end up outside any previous links.

Note - height is not an absolute height (RL) but a delta height.

Selecting **Insert absolute** brings up the **Fixed - Insert Absolute** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name <i>name of the link to create.</i> <i>Note: the new inserted link must end up outside any previous links.</i>	names box		select name menu
Colour <i>colour of the link being created.</i>	colour box		available colours
Width /height/xfall <i>width/ height/ crossfall of the link being created - only use two of the three.</i> <i>If a Grade link is given, only the combinations width and crossfall, or width and height, are allowed.</i> <i>If there is no Grade link, any two of the three can be used.</i>	input		measures menu
Base link, Grade link <i>If Grade link is blank:</i> <i>any combination of two of width, height an xfall can be used to define the new link.</i> <i>if Base link is non blank, then it is the name of the link to take the width/height/xfall from.</i> <i>If Base link is blank, then the option acts as a normal Insert and the width/height/xfall are taken</i>	names box		select name menu

from the last fixed link before this insert.

If **Grade link is not blank**:

only the combinations width and crossfall, or width and height, are allowed.

Width:

if Base link is non blank, then it is the name of the link to take the **width** from.

If Base link is blank, then the **width** is from the last fixed link before this insert.

Xfall or Height

If **xfall** is given, then the xfall is applied from the Grade link.

If **height** is given, then the height is added to the height of the Grade link.

Note: the new inserted link must end up outside any previous links.

Start/End mode choice box Start (ref)/End (ref)

defines the start/end chainages for inserting the new template link.

For more information on Start/End mode, see [Start and End Chainages](#)

Interval input

if **non blank**, the interval to use to create cross sections and strings over the given chainage range.

If **blank**, the **Section separation** value from the **Apply Many** panel is used.

Extra start/end tick box

if **ticked**, add an extra x-section 0.1 mm **before** the start/end chainage.

Comment input

comment to add to the end of the line. In the file, the comment will be preceded by //.

Active tick box tick

if **ticked**, use this modifier.

if **not ticked**, don't use this modifier.

OK button

OK stores the values in the fields and removes the panel BUT no **recalc** is done.

Apply button

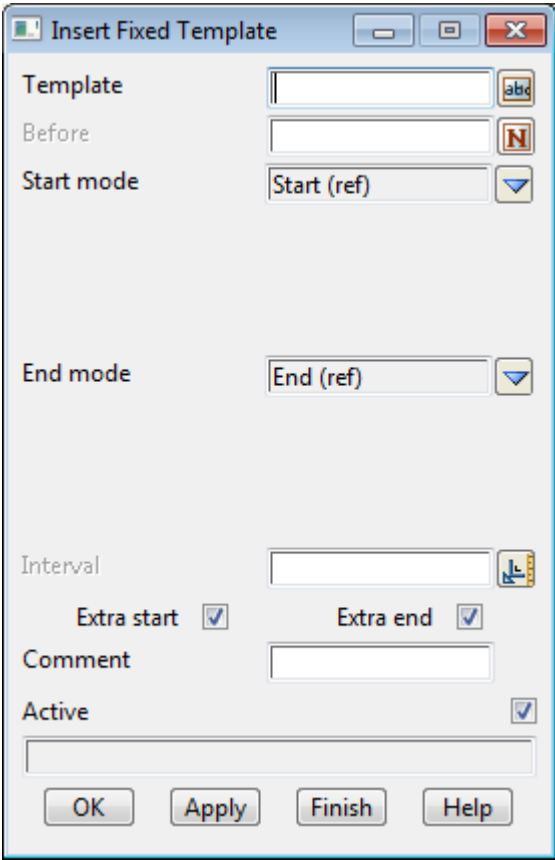
Apply stores the values and leaves the panel on the screen.

If the **MTF** is being used in an **Apply Many MTF** and **Auto recalc** is ticked in the MTF, then whenever the **Apply** button is clicked, a **recalc** of the associated **Apply Many** for the MTF is done.

Insert Fixed Links from a Template

All the fixed links from an existing template can be inserted by the **Insert fixed template** command.

Selecting **Insert fixed template** brings up the **Insert Fixed Template** panel



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Template	<i>the name of the template to take the fixed links from.</i>	template box		select template menu
Before	<i>if non-blank, the fixed links from the selected template are inserted before the given link. If blank, the fixed links from the selected template are appended to the end of the existing fixed links.</i>	input		select name menu
Start/End mode	<i>defines the start/end chainages for inserting the new template link. For more information on Start/End mode, see Start and End Chainages</i>	choice box	Start (ref)/End (ref)	
Interval	<i>if non blank, the interval to use to create cross sections and strings over the given chainage range. If blank, the Section separation value from the Apply Many panel is used.</i>	input		
Extra start/end	<i>if ticked, add an extra x-section 0.1 mm before the start/end chainage.</i>	tick box		
Comment		input		

comment to add to the end of the line. In the file, the comment will be preceded by //.

Active tick box tick

*if **ticked**, use this modifier.*

*if **not ticked**, don't use this modifier.*

OK button

OK stores the values in the fields and removes the panel BUT no **recalc** is done.

Apply button

Apply stores the values and leaves the panel on the screen.

*If the **MTF** is being used in an **Apply Many MTF** and **Auto recalc** is ticked in the MTF, then whenever the **Apply** button is clicked, a **recalc** of the associated **Apply Many** for the MTF is done.*

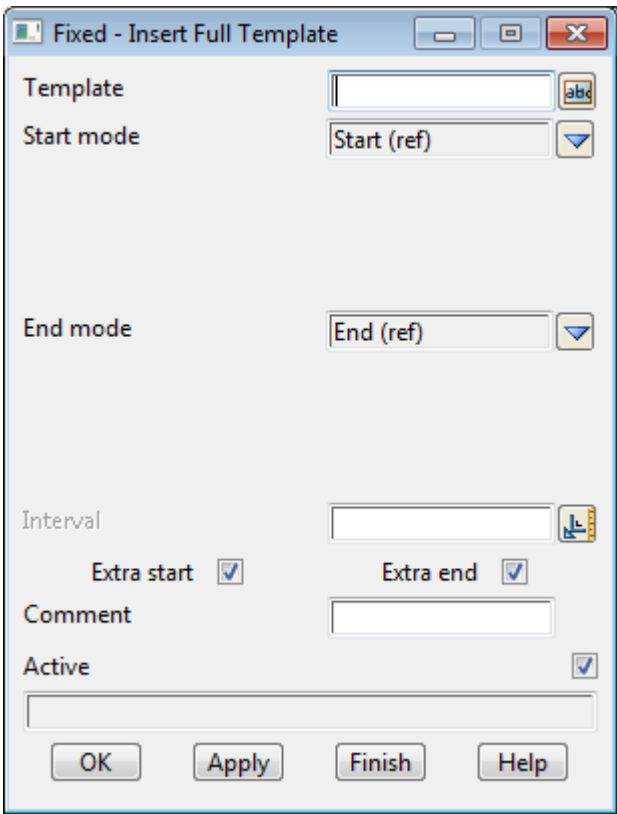
Return to [Fixed Link Modifiers](#) or [Modifiers in MTF Edit](#).

Insert Full Template

The **Insert Full Template** *inserts* all the fixed links from a selected template after the existing fixed links **AND** also *replaces* the decision, cut, fill and final cut/fill links of the existing template with those from the selected template.

So the option **leaves** the existing fixed links from the template but **removes the existing** decision, cut, fill and final cut/fill links in the template.

Selecting **Insert Full Template** brings up the **Fixed - Insert Full Template** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Template <i>the name of the template to take the fixed, decision, cut, fill and final cut/fill links from.</i>	template box		select template menu
Start/End mode <i>defines the start/end chainages for inserting the fixed template link.s and replacing the decision, cut, fill and final cut/fill links. For more information on Start/End mode, see Start and End Chainages</i>	choice box	Start (ref)/End (ref)	
Interval <i>if non blank, the interval to use to create cross sections and strings over the given chainage range. If blank, the Section separation value from the Apply Many panel is used.</i>	input		
Extra start/end <i>if ticked, add an extra x-section 0.1 mm before the start/end chainage.</i>	tick box		
Comment <i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>	input		

Active tick box tick

*if **ticked**, use this modifier.*
*if **not ticked**, don't use this modifier.*

OK button

OK stores the values in the fields and removes the panel BUT no **recalc** is done.

Apply button

Apply stores the values and leaves the panel on the screen.
*If the **MTF** is being used in an **Apply Many MTF** and **Auto recalc** is ticked in the MTF, then whenever the **Apply** button is clicked, a **recalc** of the associated **Apply Many** for the MTF is done.*

Continue to the next section [Fixed Link - Insert Xfall Intersect](#) or return to [Fixed Link Modifiers](#) or [Modifiers in MTF Edit](#).

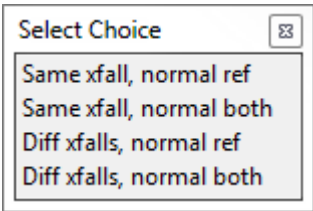
Fixed Link - Insert Xfall Intersect

The **Xfall insert** option **inserts** a new link.

And the new link is created by coming off the last link of the fixed template before the **Insert Xfall Intersect** command, and going out from that last fixed link in a variety of ways and meeting a **selected string**.

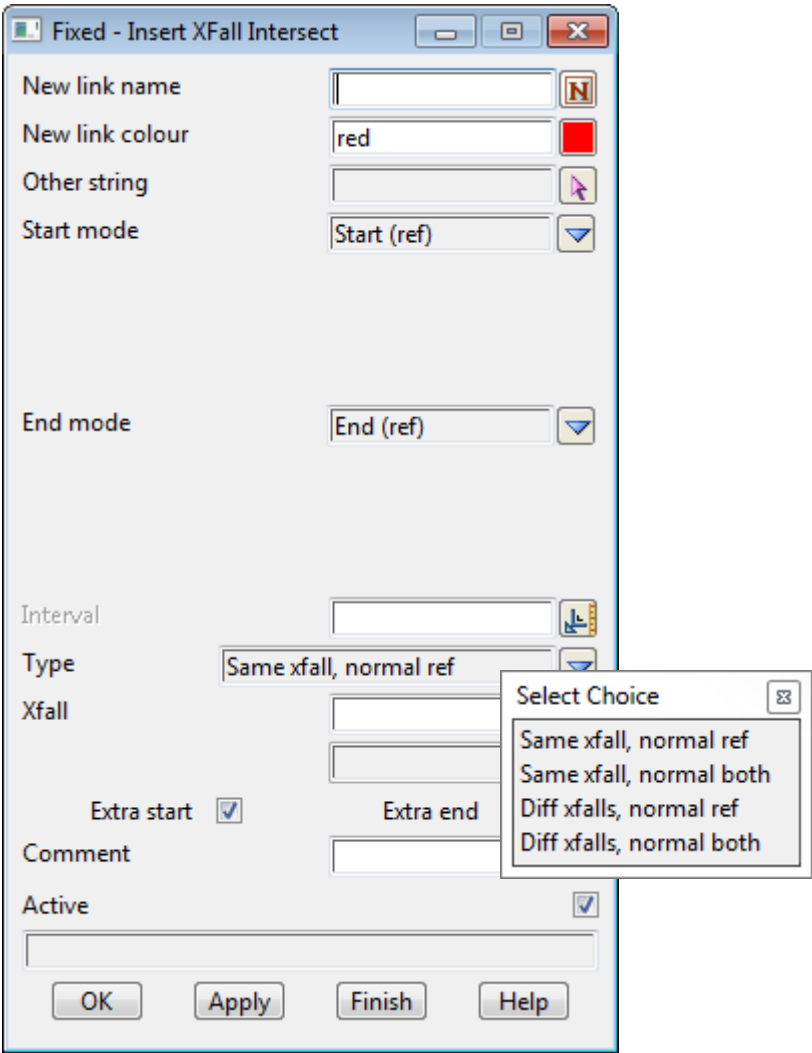
For example, over the chainage range, a given xfall is taken from the last link and the selected string, and the new link is the intersection of the two xfalls.

The different methods for creating the new link are:



and for the definitions go to [Fixed - Calculating the New Link for each Type](#).

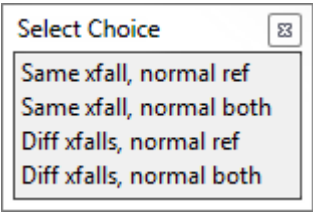
Selecting **Insert xfall intersect** brings up the **Fixed - Xfall Intersect** panel



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Link name	<i>name of the new link.</i>	name box		available names
Colour	<i>colour of the new link.</i>	colour box		available colours
Other String	<i>select the secondary string to use in the methods for creating the new link.</i>	string select		
Start/End mode	<i>defines the start/end chainages for creating the link. For more information on Start/End mode, see Start and End Chainages.</i>	choice box	Start (ref)/End (ref)	
Interval	<i>if non blank, the interval to use to create cross sections and strings over the given chainage range. If blank, the Section separation value from the Apply Many panel is used.</i>	input		

Type choice box



For the types of ways to create the new link, go to [Fixed - Calculating the New Link for each Type](#)

Xfall, Xfall hinge, Xfall sec etc

which of these fields are present, and what they are for, depends on **Type**.

Extra start/end tick box

if **ticked**, add an extra x-section 0.1 mm **before** the start/end chainage.

Comment input

comment to add to the end of the line. In the file, the comment will be preceded by //.

Active tick box tick

if **ticked**, use this modifier.
if **not ticked**, don't use this modifier.

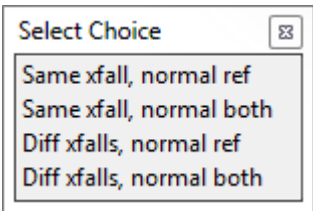
OK button

OK stores the values in the fields and removes the panel BUT no **recalc** is done.

Apply button

Apply stores the values and leaves the panel on the screen.
If the **MTF** is being used in an **Apply Many MTF** and **Auto recalc** is ticked in the MTF, then whenever the **Apply** button is clicked, a **recalc** of the associated **Apply Many** for the MTF is done.

Fixed - Calculating the New Link for each Type



for the definitions of the calculations for each choice

go to [Same Xfall and Normal to Reference String](#)
[Same Xfall and Normal to Reference String and to Other String](#)
[Two Xfalls and Normal to Reference String](#)
[Two Xfalls and Normal to Reference String and to Other String](#)

Same Xfall and Normal to Reference String

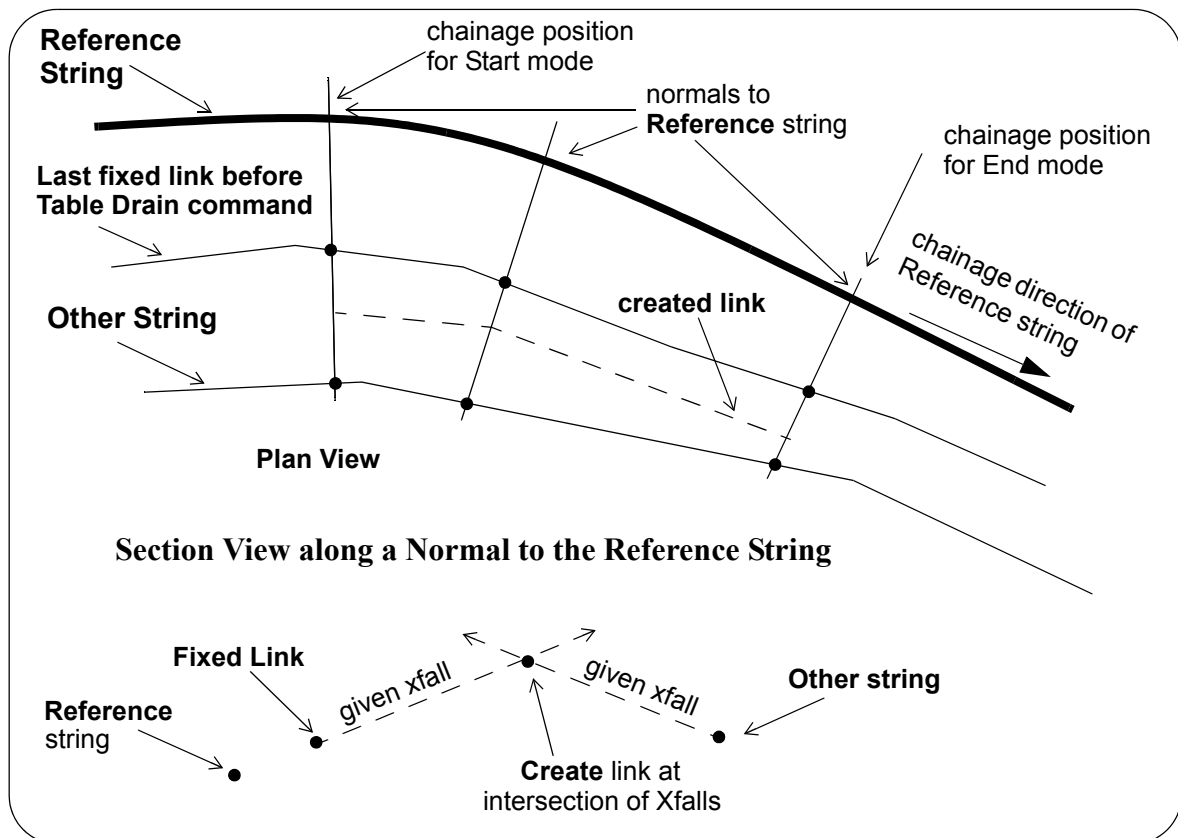
Type	Same xfall, normal b	
Xfall		

This option requires a **Xfall**.

The **Start mode** and **End Mode** refer to **Reference** string and at each chainage (ch) between the Start mode and the End mode, a section is taken **normal** (perpendicular) to the **Reference string** and cutting the **last fixed link before the Table Drain command**, and the **Other string**.

On this section, the given xfall **Xfall** is taken from the last fixed link, and the xfall of **negative Xfall** from **Other string**, and a vertex of the new link created where the xfalls intersect.

For information about the sign convention for offset and xfalls, go to [Sign Convention for Heights, Offsets and Xfalls in Create by Xfall and Grade](#) in the chapter [Design](#).



Same Xfall and Normal to Reference String and to Other String

Type	Same xfall, normal r	
Xfall		

This option requires a **Xfall**.

The **Start mode** and **End Mode** refer to **Reference** string and at each chainage ch between the

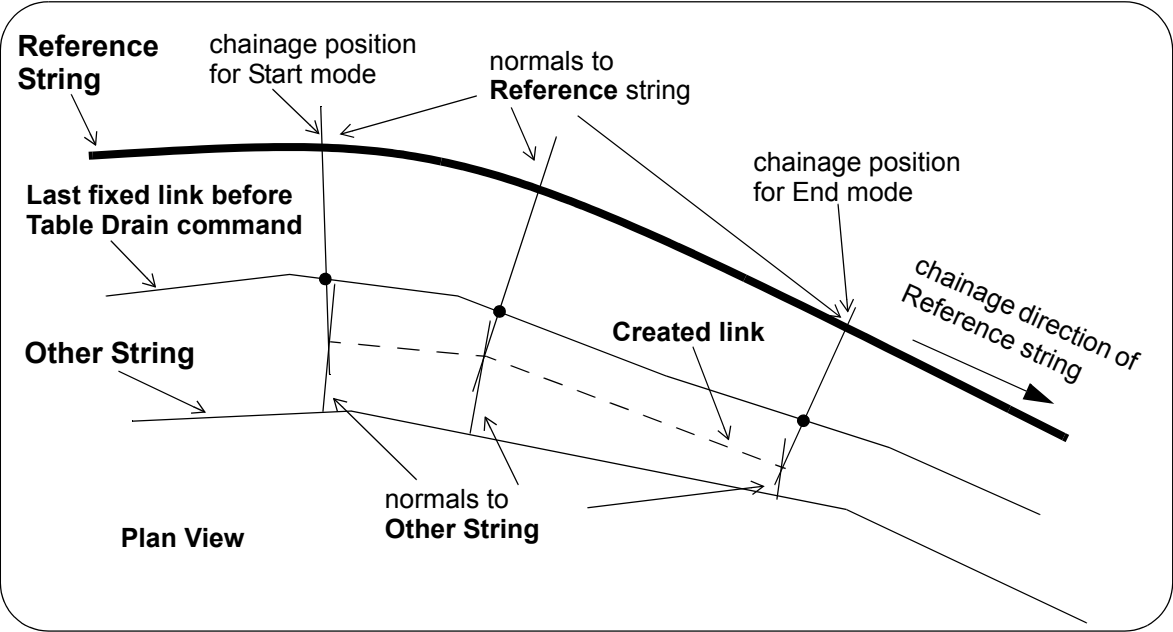
Start mode and the End mode, a section is taken **normal** (perpendicular) to the **Reference string** and cutting the **last fixed link before the Table Drain command**, and the xfall **Xfall** is taken from the cut with the last fixed link and along the section.

This is then intersected with a section **normal** to the **Other string** and with the xfall **negative Xfall**.

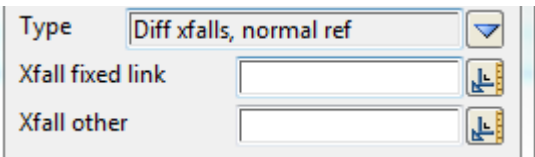
The new link is formed from the intersection points.

Note - it may not be possible to find such an intersection point.

For information about the sign convention for offset and xfalls, go to [Sign Convention for Heights, Offsets and Xfalls in Create by Xfall and Grade](#) in the chapter [Design](#).



Two Xfalls and Normal to Reference String

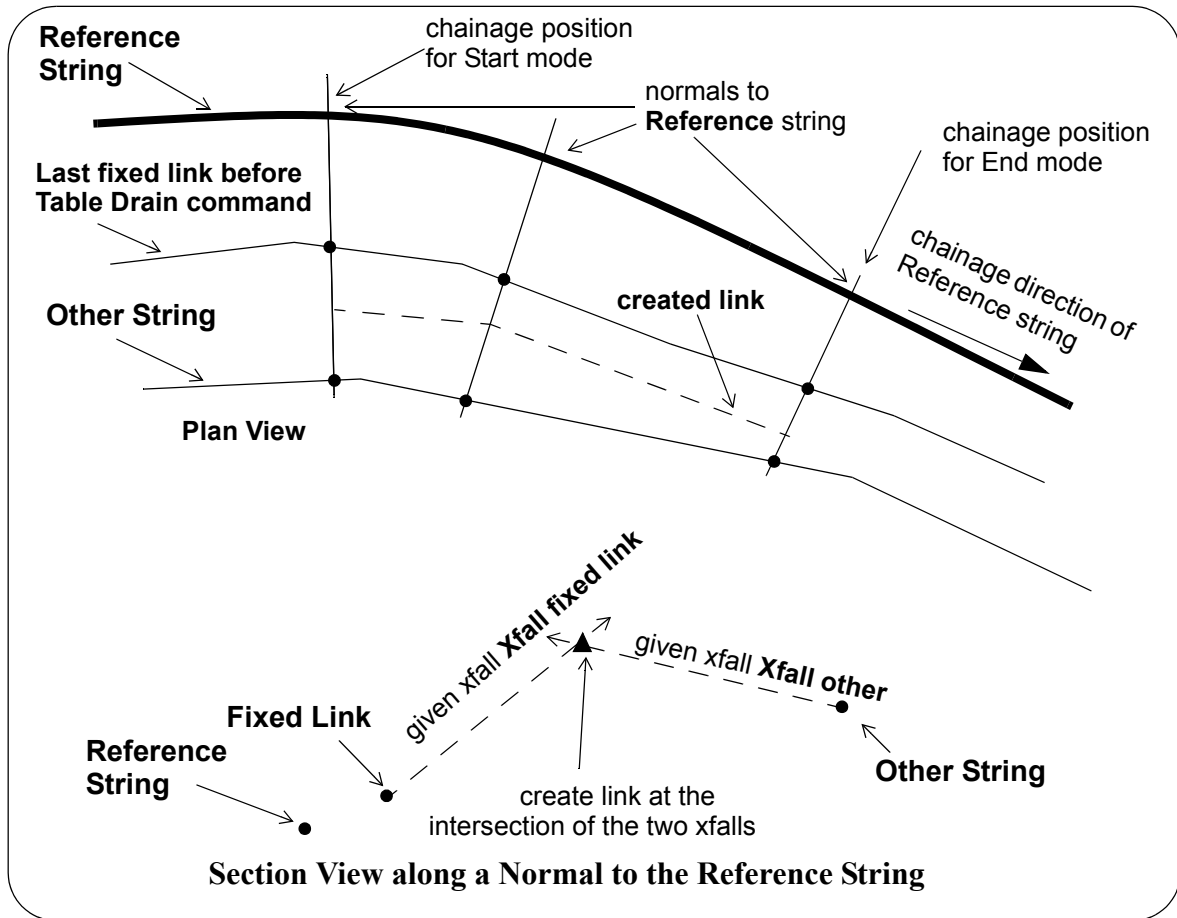


This option requires to xfalls: **Xfall fixed link** and **Xfall other**.

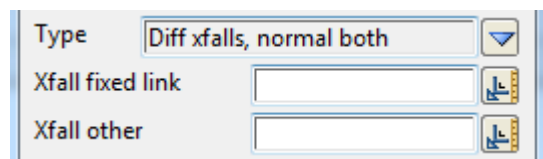
The **Start mode** and **End Mode** refer to **Reference** string and at each chainage (ch) between the Start mode and the End mode, a section is taken **normal** (perpendicular) to the **Reference string** and cutting the **last fixed link before the Table Drain command**, and the **Other string**.

On this section, the given xfall **Xfall fixed link** is taken from the last fixed link, and the xfall of **Xfall other** from **Other string**, and a vertex of the new link created where the xfalls intersect.

For information about the sign convention for offset and xfalls, go to [Sign Convention for Heights, Offsets and Xfalls in Create by Xfall and Grade](#) in the chapter [Design](#).



Two Xfalls and Normal to Reference String and to Other String



This option requires to xfalls: **Xfall fixed link** and **Xfall other**.

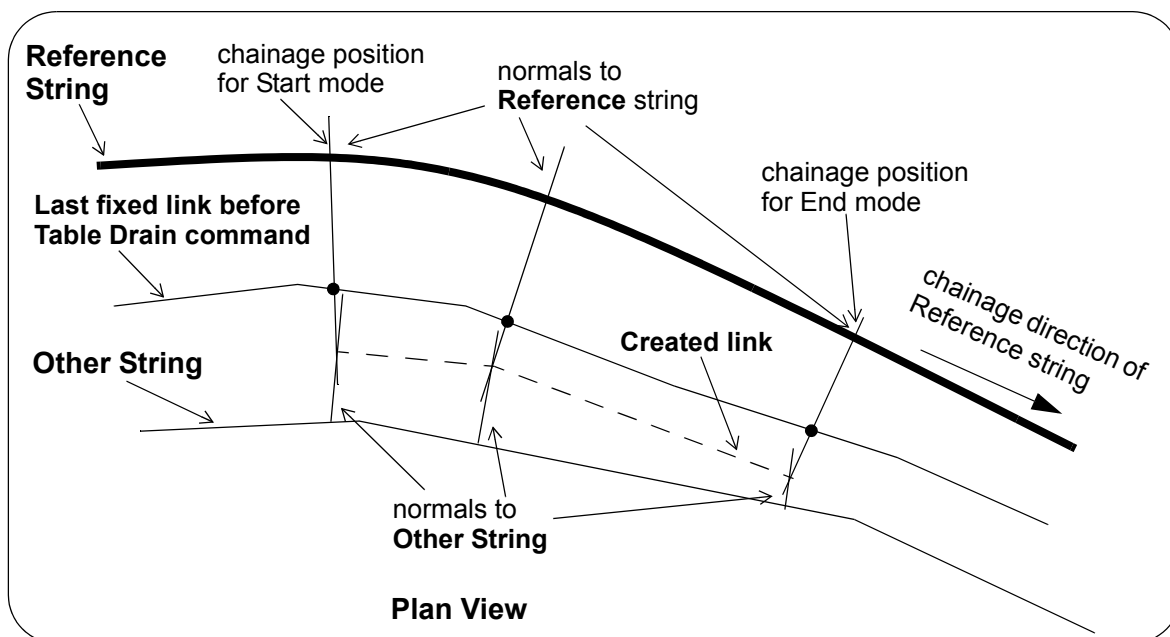
The **Start mode** and **End Mode** refer to **Reference** string and at each chainage *ch* between the Start mode and the End mode, a section is taken **normal** (perpendicular) to the **Reference string** and cutting the **last fixed link before the Table Drain command**, and the xfall **Xfall fixed link** is taken from the cut with the last fixed link and along the section.

This is then intersected with a section **normal** to the **Other string** and with the xfall **Xfall other**.

The new link is formed from the intersection points.

Note - it may not be possible to find such an intersection point.

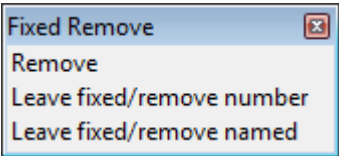
For information about the sign convention for offset and xfalls, go to [Sign Convention for Heights, Offsets and Xfalls in Create by Xfall and Grade](#) in the chapter [Design](#).



Continue to the next section [Fixed Link - Remove](#) or return to [Fixed Link Modifiers](#) or [Modifiers in MTF Edit](#).

Fixed Link - Remove

The **fixed Remove** walk-right brings up the **fixed Remove** menu with options to insert fixed links, insert a fixed part of a template, and insert a full template.

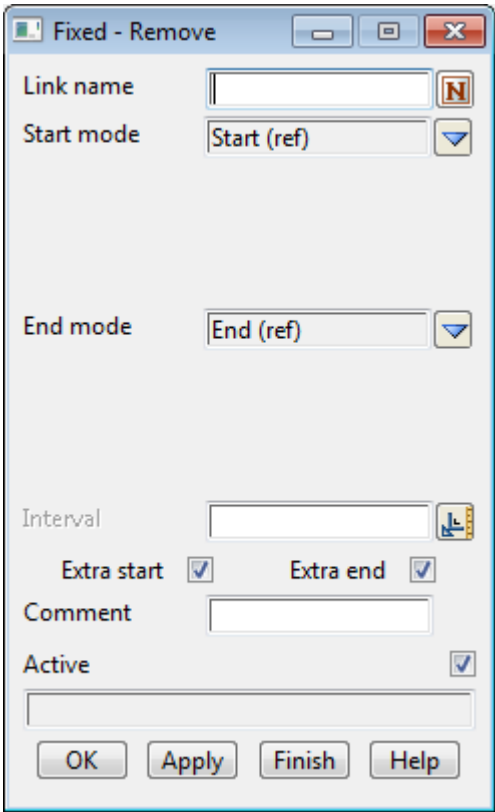


To go straight to the documentation on each of the options on the **Fixed** modifier menu:

- For *Remove* [Remove a Fixed link](#)
- Only Fixed [Fixed Link - Only Fixed Links](#)
- Only Fixed named [Fixed Link - Only Fixed Named](#)

Remove a Fixed link

Fixed links can be deleted between given chainages by using the **fixed Remove** option. Selecting **Remove** brings up the **Fixed - Remove** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name <i>name of the link to removed.</i>	input		select name menu
Start/End mode	choice box	Start (ref)/End (ref)	

For more information on Start/End mode, see [Start and End Chainages](#)

*if **non blank**, the interval to use to create cross sections and strings over the given chainage range. If **blank**, the **Section separation** value from the **Apply Many** panel is used.*

comment to add to the end of the line. In the file, the comment will be preceded by //.

*if **ticked**, use this modifier.*

*if **not ticked**, don't use this modifier.*

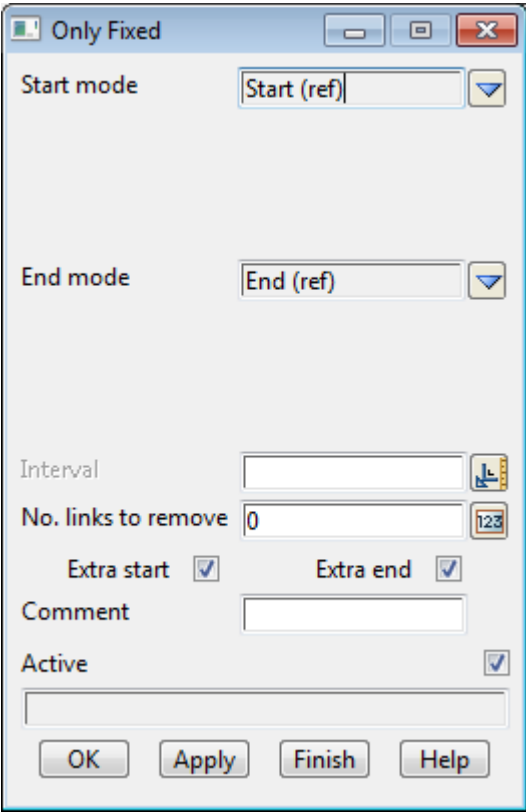
OK stores the values in the fields and removes the panel BUT no **recalc** is done.

*If the **MTF** is being used in an **Apply Many MTF** and **Auto recalc** is ticked in the MTF, then whenever the **Apply** button is clicked, a **recalc** of the associated **Apply Many** for the MTF is done.*

The **Only Fixed** option removes any of the variable cut and fill, final cut/fill links and decisions that have been defined up to this point in the modifiers grid. Starting from the outermost fixed link, it can also removed one or more of the remaining fixed links.

MTF Modifiers (Template Modifiers)





The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Start/End mode	choice box	Start (ref)/End (ref)	
<i>defines the start/end chainages for removing the cut, fill and final cut/fill links</i> <i>For more information on Start/End mode, see Start and End Chainages</i>			
Interval	input		
<i>if non blank, the interval to use to create cross sections and strings over the given chainage range.</i> <i>If blank, the Section separation value from the Apply Many panel is used.</i>			
No. links to remove	integer box	0	
<i>if greater than zero, then starting from the outside link of the fixed links, this number of fixed links are removed. If the number is larger than the number of fixed links, then it removes all the fixed links.</i> <i>So a large number will remove all the links - fixed, cut, fill and final cut/fill.</i> <i>If zero then no fixed links are removed.</i> <i>If less than zero, then starting from the first link of the fixed links, this number of fixed links are kept and the outer fixed links are removed. If the number is larger than the number of fixed links, then it removes all the fixed links. So a large number will remove all the links - fixed, cut, fill and final cut/fill.</i>			
Extra start/end	tick box		
<i>if ticked, add an extra x-section 0.1 mm before the start/end chainage.</i>			
Comment	input		
<i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>			
Active	tick box	tick	
<i>if ticked, use this modifier.</i> <i>if not ticked, don't use this modifier.</i>			

OK button

OK stores the values in the fields and removes the panel BUT no **recalc** is done.

Apply button

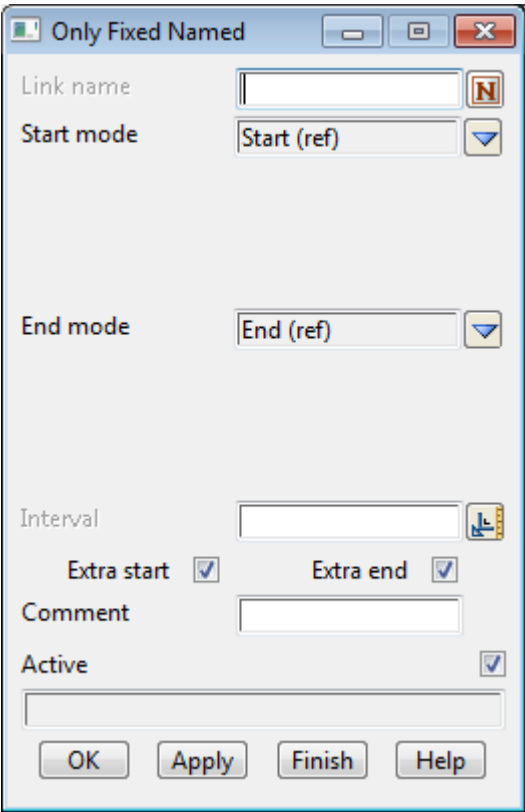
Apply stores the values and leaves the panel on the screen.

If the **MTF** is being used in an **Apply Many MTF** and **Auto recalc** is ticked in the MTF, then whenever the **Apply** button is clicked, a **recalc** of the associated **Apply Many** for the MTF is done.

Fixed Link - Only Fixed Named

The **Only Fixed Named** option removes any of the variable cut and fill, final cut/fill links and decisions that have been defined up to this point in the modifiers grid. It also removes a list of links from the remaining fixed links.

Selecting **Only Fixed Named** brings up the **Only Fixed Named** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name	name box		names.4d list
<i>if non blank, one or more link names can be entered separated by spaces. If the link name contains spaces then the link name must be surrounded by the quotes ". For example " EB 1".</i>			
<i>All the links listed in the Link name field are removed from the fixed links.</i>			
<i>If blank, all but the fixed links are removed (same as Only Fixed with 0 links).</i>			
Start/End mode	choice box	Start (ref)/End (ref)	
<i>defines the start/end chainages for removing the cut, fill and final cut/fill links</i>			
<i>For more information on Start/End mode, see Start and End Chainages</i>			

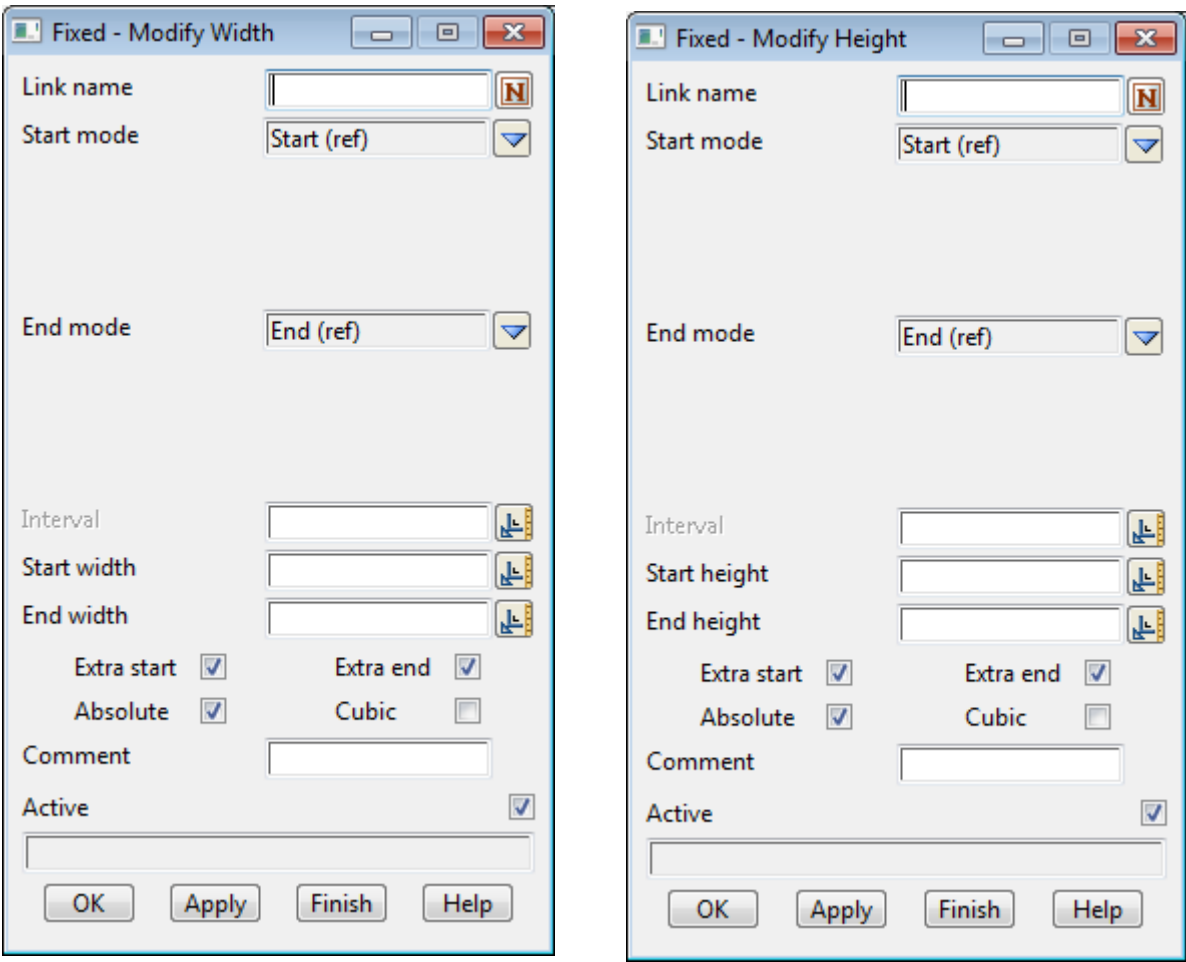
Interval	input	
<i>if non blank, the interval to use to create cross sections and strings over the given chainage range. If blank, the Section separation value from the Apply Many panel is used.</i>		
Extra start/end	tick box	
<i>if ticked, add an extra x-section 0.1 mm before the start/end chainage.</i>		
Comment	input	
<i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>		
Active	tick box	tick
<i>if ticked, use this modifier. if not ticked, don't use this modifier.</i>		
OK	button	
<i>OK stores the values in the fields and removes the panel BUT no recalc is done.</i>		
Apply	button	
<i>Apply stores the values and leaves the panel on the screen. If the MTF is being used in an Apply Many MTF and Auto recalc is ticked in the MTF, then whenever the Apply button is clicked, a recalc of the associated Apply Many for the MTF is done.</i>		
Continue to the next section Fixed Link - Modify Width or Height or return to Fixed Link Modifiers or Modifiers in MTF Edit .		

Fixed Link - Modify Width or Height

The **Width** modifier is used to **modify the width** of fixed links originally defined by width (*width and height* or *width and xfall*).

The **Height** modifier is used to **modify the height** of fixed links originally defined by height (*height and width* or *height and xfall*).

Selecting **width and height** brings up the **Fixed - Modify Width** and **Fixed - Modify Height** panels respectively.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name <i>name of the link to modify.</i>	input		select name menu
Start/End mode <i>defines the start/end chainages for modifying the link</i> <i>For more information on Start/End mode, see Start and End Chainages</i>	choice box	Start (ref)/End (ref)	
Interval <i>if non blank, the interval to use to create cross sections and strings over the given chainage range.</i> <i>If blank, the Section separation value from the Apply Many panel is used.</i>	input		
Start/End width/height <i>start/end width/height for modifying the template link.</i>	input		measures menu
Extra start/end <i>if ticked, add an extra x-section 0.1 mm before the start/end chainage.</i>	tick box		
Absolute <i>if ticked, the width/height is set to the values given in the start and end value fields.</i> <i>if not ticked, the values given in the start and end value fields are added to the existing widths/heights.</i>	tick box	tick	
Cubic	tick box		

if **ticked**, the width/height is varied as a reverse cubic between the start and end chainages.
 if **not ticked**, the width/height is varied linearly between the start and end chainages.

Comment input

comment to add to the end of the line. In the file, the comment will be preceded by //.

Active tick box tick

if **ticked**, use this modifier.
 if **not ticked**, don't use this modifier.

OK button

OK stores the values in the fields and removes the panel BUT no **recalc** is done.

Apply button

Apply stores the values and leaves the panel on the screen.

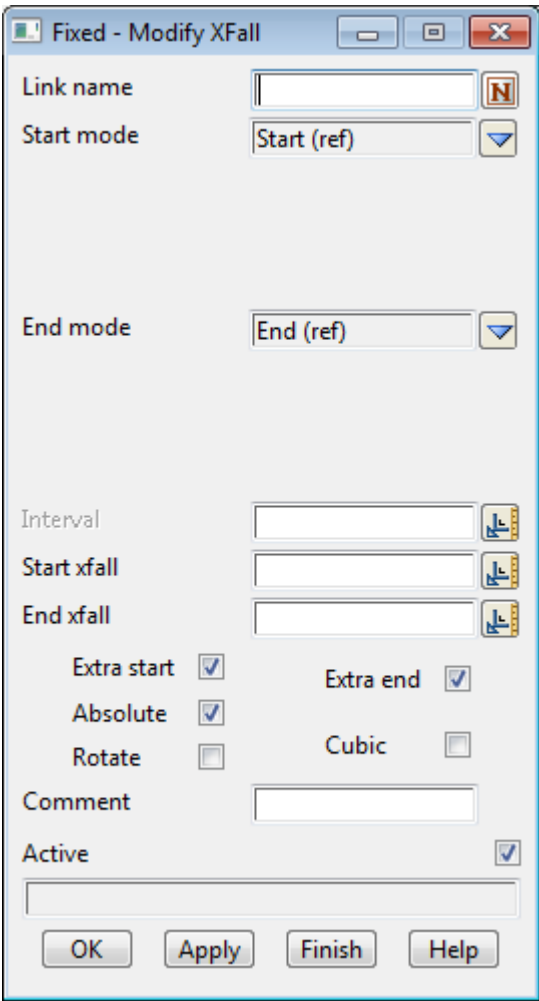
If the **MTF** is being used in an **Apply Many MTF** and **Auto recalc** is ticked in the MTF, then whenever the **Apply** button is clicked, a **recalc** of the associated **Apply Many** for the MTF is done.

Continue to the next section [Fixed Link - Modify Xfall](#) or return to [Fixed Link Modifiers](#) or [Modifiers in MTF Edit](#).

Fixed Link - Modify Xfall

The **Xfall** modifier is used to **modify the cross fall** of fixed links originally defined by cross fall (xfall and width or xfall and height).

Selecting **Xfall** brings up the **Fixed - Modify Xfall** panel



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Link name	<i>name of the link to modify.</i>	input		select name menu
Start/End mode	<i>defines the start/end chainages for modifying the link</i> <i>For more information on Start/End mode, see Start and End Chainages</i>	choice box	Start (ref)/End (ref)	
Interval	<i>if non blank, the interval to use to create cross sections and strings over the given chainage range.</i> <i>If blank, the Section separation value from the Apply Many panel is used.</i>	input		
Start/End xfall	<i>start/end crossfall for modifying the template link.</i>	input		measures menu
Extra start/end	<i>if ticked, add an extra x-section 0.1 mm before the start/end chainage.</i>	tick box		
Absolute	<i>if ticked, the xfall is set to the values given in the start and end xfall fields.</i> <i>if not ticked, the values given in the start and end xfall fields are added to the existing xfall.</i>	tick box	tick	

Only none or one of **Cubic** and **Rotate** can be set to **tick**.
The **default** is none - that is, **neither is ticked** and in the default case, the crossfall is varied **linearly with respect to crossfall** between the start and end chainages.

Rotate ☐ tick box

*if **ticked**, the x_{fall} is varied linearly **with respect to the angle**, between the start and end chainages.*

Active	tick box	tick
<i>if ticked, use this modifier:</i>		
<i>if not ticked, don't use this modifier:</i>		

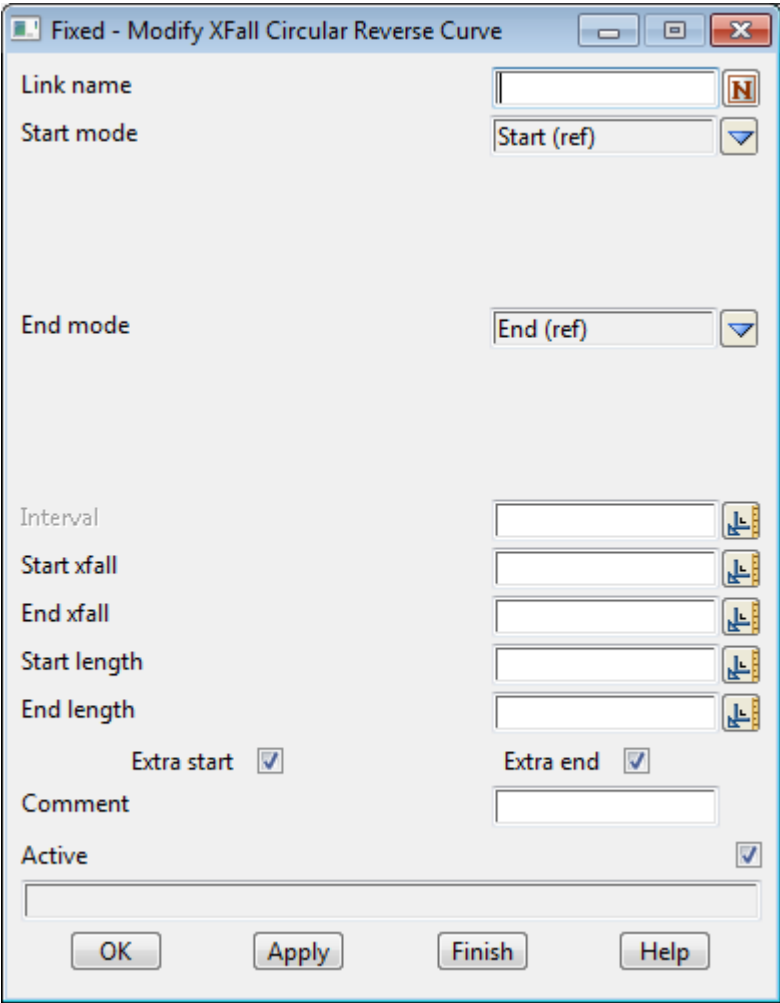
Apply button

Apply stores the values and leaves the panel on the screen.

If the **MTF** is being used in an **Apply Many MTF** and **Auto recalc** is ticked in the MTF, then whenever the **Apply** button is clicked, a **recalc** of the associated **Apply Many** for the MTF is done.

Fixed Link - Modify Xfall by CRC Formula

Selecting **Xfall CRC** brings up the **Fixed - Modify Xfall Circular Reverse Curve** panel



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Link name	<i>name of the link to modify.</i>	input		select name menu
Start/End mode	<i>defines the start/end chainages for modifying the link</i> <i>For more information on Start/End mode, see Start and End Chainages</i>	choice box	Start (ref)/End (ref)	
Interval	<i>if non blank, the interval to use to create cross sections and strings over the given chainage range.</i> <i>If blank, the Section separation value from the Apply Many panel is used.</i>	input		
Start/End xfall	<i>start/end crossfall for modifying the template link.</i>	input		measures menu
Start/End length	<i>start/end length for circular arcs.</i>	input		measures menu
Extra start/end	<i>if ticked, add an extra x-section 0.1 mm before the start/end chainage.</i>	tick box		
Comment		input		

comment to add to the end of the line. In the file, the comment will be preceded by //.

Active tick box tick

*if **ticked**, use this modifier.*

if not ticked, don't use this modifier.

OK button

OK stores the values in the fields and removes the panel BUT no **recalc** is done.

Apply button

Apply stores the values and leaves the panel on the screen.

*If the **MTF** is being used in an **Apply Many MTF** and **Auto recalc** is ticked in the MTF, then whenever the **Apply** button is clicked, a **recalc** of the associated **Apply Many** for the MTF is done.*

Continue to the next section [Fixed Link - Rename Link](#) or return to [Fixed Link Modifiers](#) or [Modifiers in MTF Edit](#).


Fixed Link - Rename Link


The **Rename Link** option renames a link to a new name.


If strings are created in the Apply Many then the original string stops and a string with the new name and colour is created between the two chainages. The original string starts again after the end chainage.


Selecting **Rename Link** brings up the **Fixed - Rename Link** panel.


Fixed - Rename Link

Old Link Name 

New Link Name 

Colour 

Start mode 

End mode 

Comment

Active ☒

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Old link name	name box		names.4d pop-up

the name of the link to rename between the chainages given by **Start mode** *and* **End mode**

New link name	name box	names.4d pop-up
----------------------	----------	-----------------

*the new name of the link between the chainages given by **Start mode** and **End mode**.*

If strings are created in the Apply Many then the old string will be stopped between the chainages, and a new string with the new name is created between the chainages.

Colour available colours

if non blank, the colour for the new link.

If blank, the new has the colour of the old link.

Start/End mode	choice box	Start (ref)/End (ref)
----------------	------------	-----------------------

defines the start/end chainages for removing the cut, fill and final cut/fill links

For more information on Start/End mode, see [Start and End Chainages](#)

Comment

comment to add to the end of the line. In the file, the comment will be preceded by //.

Active ☐ tick box ☒ tick

*if **ticked**, use this modifier.*

if not ticked, don't use this modifier.

OK button

OK stores the values in the fields and removes the panel BUT no **recalc** is done.

Apply button

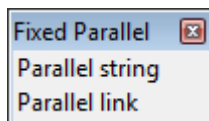
Apply stores the values and leaves the panel on the screen.

*If the **MTF** is being used in an **Apply Many MTF** and **Auto recalc** is ticked in the **MTF**, then whenever the **Apply** button is clicked, a **recalc** of the associated **Apply Many** for the **MTF** is done.*

Continue to the next section [Fixed Link- Parallel](#) or return to [Fixed Link Modifiers](#) or [Modifiers in MTF Edit](#).

Fixed Link- Parallel

The **Parallel** walk-right brings up the **fixed Parallel** menu with options to adjust all the links between specified fixed links and make them parallel offsets of a given link, of a selected string.



To go straight to the documentation on each of the options on the **Fixed** modifier menu:

For *Parallel string* Fixed Link - Parallel Links to String

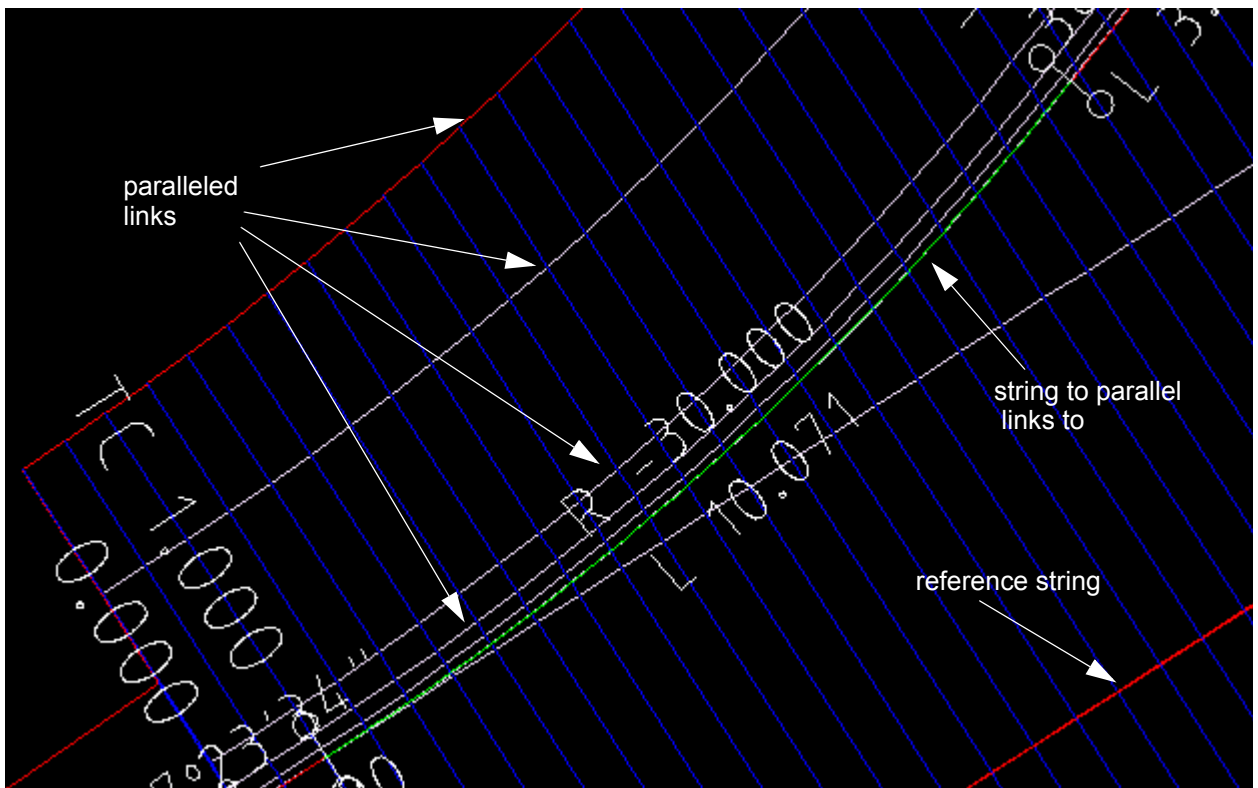
Parallel link Fixed Link - Parallel Links to Link

Fixed Link - Parallel Links to String

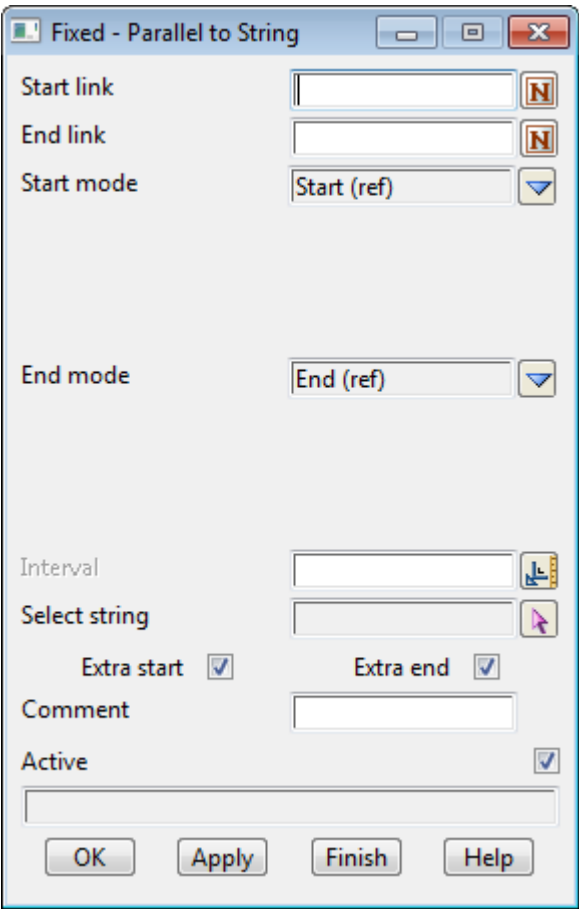
The **Parallel string** option takes all the fixed links between two nominated link names (inclusive) and adjusts them so that the specified widths, cross falls and heights between the links are calculated perpendicular to a selected string rather than measured perpendicular to the reference string.

If sections and strings are created in the **Apply Many**, then vertices are still created on the

section and on the strings **perpendicular** to the reference string.



Selecting **Parallel** brings up the **Fixed - Parallel to String** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Start link <i>the name of the link to start making the widths distances measure parallel to the selected string.</i>	name box		names.4d pop-up
To link <i>the name of the last link to make the widths distances measure parallel to the selected string.</i>	name box		names.4d pop-up
Start/End mode <i>defines the start/end chainages for removing the cut, fill and final cut/fill links For more information on Start/End mode, see Start and End Chainages</i>	choice box	Start (ref)/End (ref)	
Interval <i>if non blank, the interval to use to create cross sections and strings over the given chainage range. If blank, the Section separation value from the Apply Many panel is used.</i>	input		
String 1 <i>select the string to use to measure perpendicular to for the widths, cross falls and heights for the specified fixed links.</i>	string-select		
Extra start/end <i>if ticked, add an extra x-section 0.1 mm before the start/end chainage.</i>	tick box		
Comment <i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>	input		

Active tick box tick

*if **ticked**, use this modifier.*

*if **not ticked**, don't use this modifier.*

OK button

OK stores the values in the fields and removes the panel BUT no **recalc** is done.

Apply button

Apply stores the values and leaves the panel on the screen.

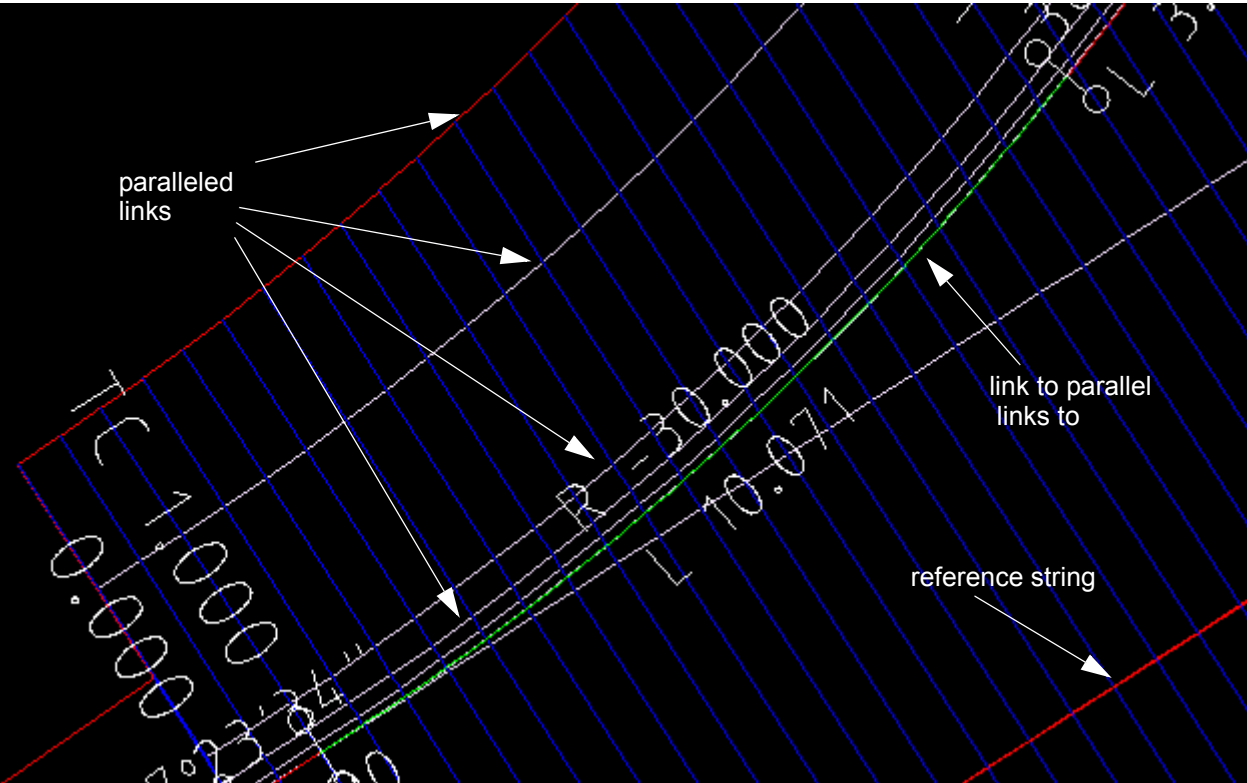
*If the **MTF** is being used in an **Apply Many MTF** and **Auto recalc** is ticked in the MTF, then whenever the **Apply** button is clicked, a **recalc** of the associated **Apply Many** for the MTF is done.*

Continue to the next section [Fixed Link - Parallel Links to Link](#) or return to [Fixed Link Modifiers](#) or [Modifiers in MTF Edit](#).

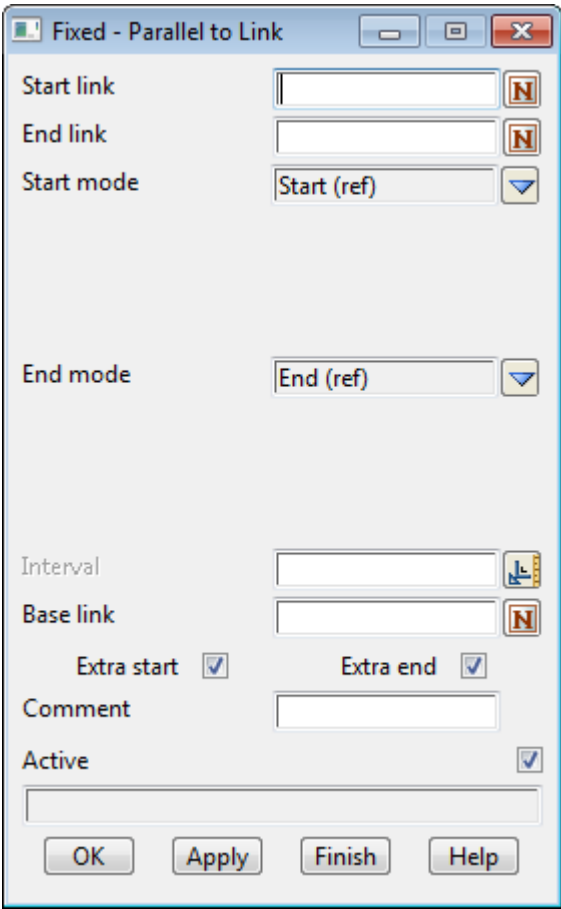
Fixed Link - Parallel Links to Link

The **Parallel link** option takes all the fixed links between two nominated link names (inclusive) and adjusts them so that the specified widths, cross falls and heights between the links are calculated perpendicular to a selected link **Base link** rather than measured perpendicular to the reference string.

If sections and strings are created in the **Apply Many**, then vertices are still created on the section and on the strings **perpendicular** to the reference string.



Selecting **Parallel link** brings up the **Fixed - Parallel to Link** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Start Link <i>the name of the link to start making the widths distances measure parallel to the Base link.</i>	name box		names.4d pop-up
To link <i>the name of the last link to make the widths distances measure parallel to the selected link.</i>	name box		names.4d pop-up
Start/End mode <i>defines the start/end chainages for removing the cut, fill and final cut/fill links For more information on Start/End mode, see Start and End Chainages</i>	choice box	Start (ref)/End (ref)	
Interval <i>if non blank, the interval to use to create cross sections and strings over the given chainage range. If blank, the Section separation value from the Apply Many panel is used.</i>	input		
Base link <i>select the link to use to measure perpendicular to for the widths, cross falls and heights for the specified fixed links.</i>	name box		
Extra start/end <i>if ticked, add an extra x-section 0.1 mm before the start/end chainage.</i>	tick box		
Comment <i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>	input		

Active tick box tick

*if **ticked**, use this modifier.*
*if **not ticked**, don't use this modifier.*

OK button

OK stores the values in the fields and removes the panel BUT no **recalc** is done.

Apply button

Apply stores the values and leaves the panel on the screen.
*If the **MTF** is being used in an **Apply Many MTF** and **Auto recalc** is ticked in the MTF, then whenever the **Apply** button is clicked, a **recalc** of the associated **Apply Many** for the MTF is done.*

Continue to the next section [Fixed Link - Absolute](#) or return to [Fixed Link Modifiers](#) or [Modifiers in MTF Edit](#).

Fixed Link - Absolute

For an existing link, the **Absolute** option has a number of methods for defining either the width, height or xfall of the link measured from a given Base link.

For example, over the chainage range, the width from the Base link can be set to a constant, be interpolated linearly between two widths, or have the width follow a parabolic, circular curve or cubic shape.

Selecting the **Absolute** brings up the **Fixed - Modify Absolute** panel.

Fixed - Modify Absolute

Modifier type

Width (Height fixed)

Link name

Base link

Start mode

Start (ref)

End mode

End (ref)

Interval

Type

Width

Width

S Ext

E Ext

Offset

Extra start

☒

Extra end

☒

Comment

Active

☒

OK

Apply

Finish

Help

Select Choice

Modify Width Maintain Height

Modify Width Maintain Xfall

Modify Height Maintain Width

Modify Height Maintain Xfall

Modify Xfall Maintain Width

Modify Xfall Maintain Height

Choices for Modifier Type

Choices for Type when Modifier type is

Modify Width

Select Choice

Width

Width -> Width

Parabola ->

Circular ->

<- Parabola

<- Circular

Cubic

Modify Height

Select Choice

Height

Height -> Height

Parabola ->

Circular ->

<- Parabola

<- Circular

Cubic

Modify Xfall

Select Choice

XFall

XFall -> XFall

Parabola ->

Circular ->

<- Parabola

<- Circular

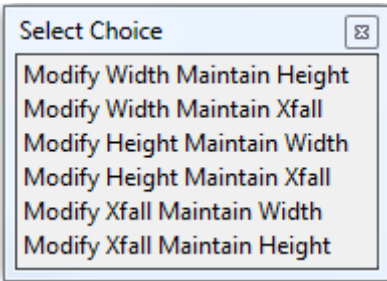
Cubic

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Modifier type choice box

- modify Width and take Height from selected link
- modify Width and take Xfall from selected link
- modify Height and take Width from selected link
- modify Height and take Xfall from selected link
- modify Xfall and take Width from selected link
- modify Xfall and take Height from selected link



the **Maintain** width/height/xfall is the part of the new definition of the selected link that is taken from the selected **Link name**. See [Fixed - Maintaining Width, Xfall or Height](#)

The **Modify** width/height/xfall is the part of the new definition of the selected link that is calculated by the method given by **Type**.

For the Modify Width choices, go to [For Modifier Types "Modify Width Maintain Height/Xfall"](#)

For the Modify Height choices, go to [For Modifier Types "Modify Height Maintain Width/Xfall"](#)

For the Modify Xfall choices, go to [For Modifier Types "Modify Xfall Maintain Width/Height"](#)

Link name name box names.4d pop-up

the name of the link to modify the width/height/xfall (by the method given in **Type**) with respect to the **Base link**, between the chainages given by **Start mode** and **End mode**.

Base link name box names.4d pop-up

the values of width/height/xfall calculated for **Link name** are applied from the string given by **Base link**.

Start/End mode choice box Start (ref)/End (ref)

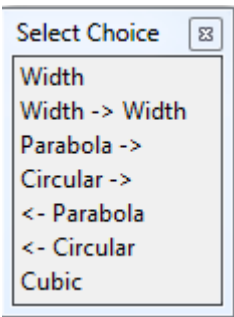
defines the start/end chainages for apply the new width/heights/xfalls.

For more information on Start/End mode, see [Start and End Chainages](#)

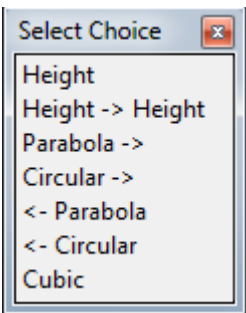
Interval input

if **non blank**, the interval to use to create cross sections and strings over the given chainage range.
If **blank**, the **Section separation** value from the **Apply Many** panel is used.

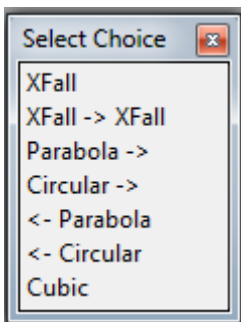
Type choice box



Modify Width



Modify Height



Modify Xfall

For the Modify Width choices, go to [For Modifier Types "Modify Width Maintain Height/Xfall"](#)

For the Modify Height choices, go to [For Modifier Types "Modify Height Maintain Width/Xfall"](#)

For the Modify Xfall choices, go to [For Modifier Types "Modify Xfall Maintain Width/Height"](#)

Extra start/end tick box

if **ticked**, add an extra x-section 0.1 mm **before** the start/end chainage.

Comment input

comment to add to the end of the line. In the file, the comment will be preceded by //.

Active tick box tick

*if **ticked**, use this modifier.*

*if **not ticked**, don't use this modifier.*

OK button

OK stores the values in the fields and removes the panel BUT no **recalc** is done.

Apply button

Apply stores the values and leaves the panel on the screen.

*If the **MTF** is being used in an **Apply Many MTF** and **Auto recalc** is ticked in the MTF, then whenever the **Apply** button is clicked, a **recalc** of the associated **Apply Many** for the MTF is done.*

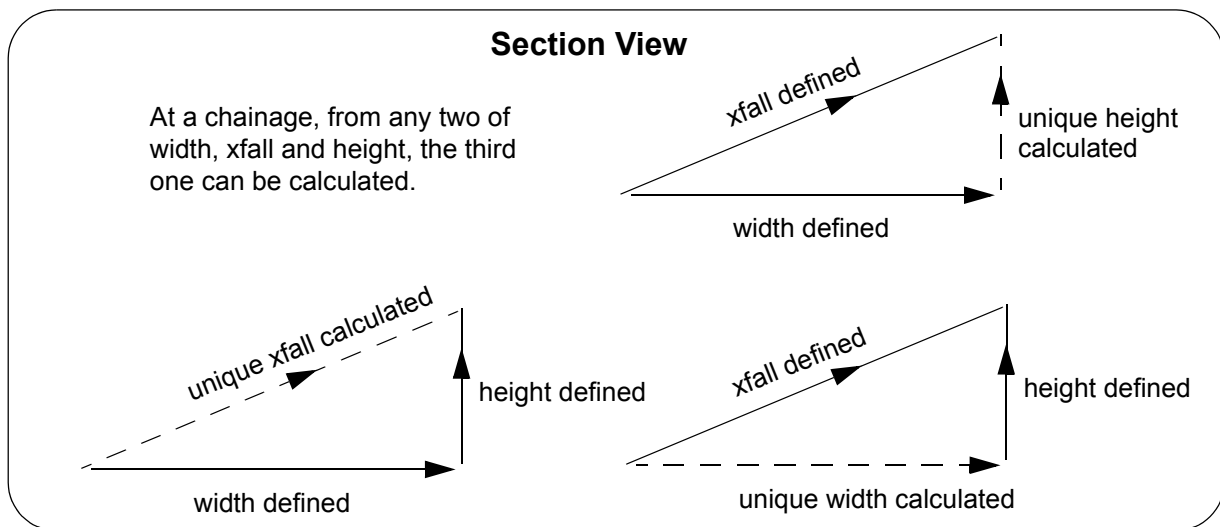
Continue to the next section [Fixed Link - from Link](#) or return to [Fixed Link Modifiers](#) or [Modifiers in MTF Edit](#).

Fixed - Maintaining Width, Xfall or Height

For the selected link, the **Absolute** command **modifies** one of width, height or xfall and another one of width, height or xfall is maintained (used) from the selected link. Together, the modified and the maintained define the new values for the selected link.

Luckily it doesn't matter which two of width, height and xfall are originally used to define the selected link, the **Absolute** option will internally convert the definition to what is required to be modified, or maintained from the selected fixed link.

For example, the fixed link may have been original defined by **xfall** and **height** and the **Absolute** option is used to **Modify Width** and **Maintain Xfall**. Although the existing fixed link is not defined by width, at each chainage the xfall and height values of the existing link **uniquely define a width** at that chainage.



So no matter how the link is originally defined, any one of width, height or xfall can be calculated and used (maintained) as the part that is maintained by the **Absolute** option.

Continue to the next section [Fixed Link - from Link](#) or return to [Fixed Link - Absolute](#), [Fixed Link Modifiers](#) or [Modifiers in MTF Edit](#).

For Modifier Types "Modify Width Maintain Height/Xfall"

Go to [Applying the Calculated Widths](#)

Go to [Calculating the Widths for each Type](#)

Applying the Calculated Widths

For Type Width		For other Types	
Type	Width	Start width	
Width		End width	
S Ext		S Ext	
E Ext		E Ext	
Offset		Offset	

Start width input measures menu

width at (Start mode + S Ext)

*Start width can be positive or negative. See diagram after **Offset***

S Ext and E Ext have no effect for Type Width.

End width input measures menu

width at (End mode + E Ext)

*End width can be positive or negative. See diagram after **Offset***

End width does not exist for Type Width.

S Ext/E Ext input measures menu

Start/End extension to add to the Start/end mode chainage. S Ext/E Ext can be positive or negative.

*See diagram after **Offset***

Offset input measures menu

Final offset to be added to the width calculated at each point. Offset can be positive or negative.

For a chainage **ch** between the **Start mode** and the **End mode**, a **width** is calculated at chainage **ch** and that **width** goes out from the Base Link **perpendicular** to the Centreline.

The definition for calculating the width is best described in a **Chainage-Width** diagram. That is, in a plot with **Centreline chainage** as the **x-axis**, and **Width** at that chainage as the **y-axis**. This is similar to a long section plot where centreline chainage is the x-axis and height is the y-axis.

Then for a point **A** at chainage **ch** on the centreline, the **Width** calculated at chainage **ch** in the Chainage-Width diagram is used for the Width measured from the Base link corresponding to the section *Modify Width Maintain Height*, to the Centreline at chainage **ch**.

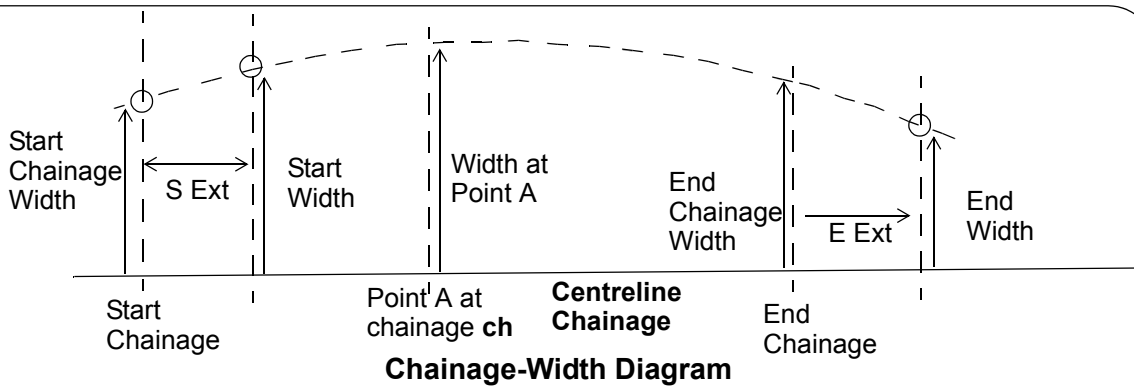
For the **Modify Width** commands, the method defining the widths may not be exactly at the Start/End mode chainages but at points a S Ext/E Ext chainage distance from the Start/End mode chainages.

Finally after the widths are calculated, a width Offset can be applied to all the widths.

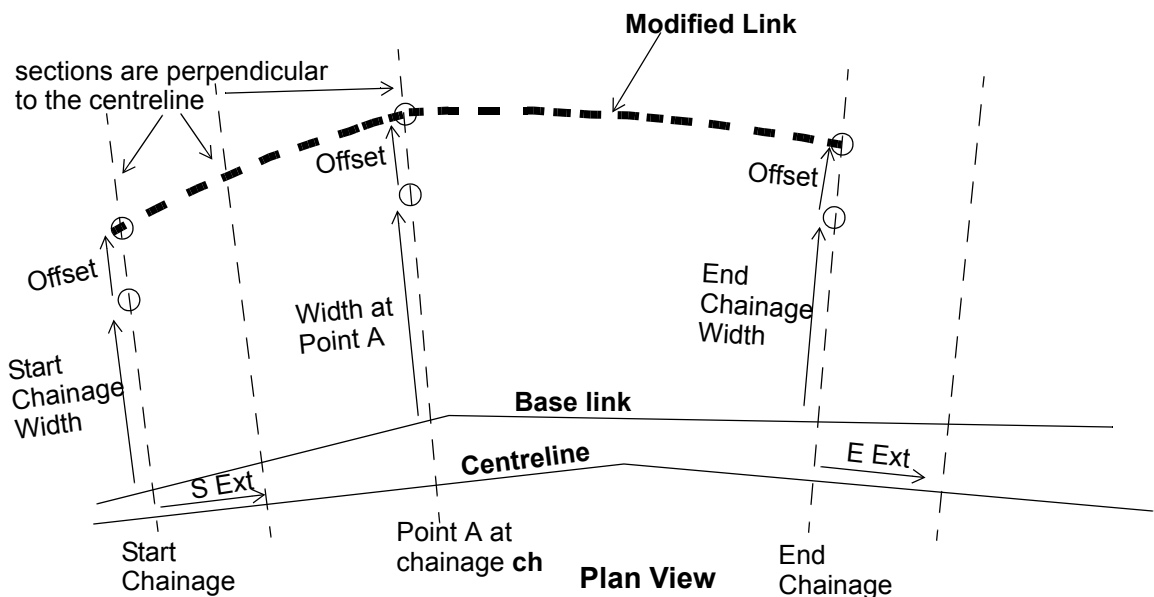
Although the definition for calculating the widths in the chainage-width diagram may involve points outside the Start mode/End mode chainage range, the calculated widths are **only applied** to the centreline **between** the **Start mode** chainage and the End mode chainage.

Please examine the diagrams below to help understand the process.

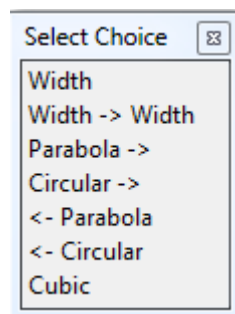
Relationship Between Chainage-Width Diagram and Centreline



The link is modified between Start and End Chainage.
 The **S Ext** and **E Ext** are only used in the way the width is defined



Calculating the Widths for each Type



For **Type** Width, Width->Width, go to [Calculation of Width for Types Width, Width -> Width](#)

For **Type** Parabola->, go to [Calculation of Width for Type Parabola ->](#)

For **Type** Circular->, go to [Calculation of Width for Type Circular->](#)

For **Type** <-Parabola, go to [Calculation of Width for Type <- Parabola](#)

For **Type** <-Circular, go to [Calculation of Width for Type <-Circular](#)

For **Type** Cubic, go to [Calculation of Width for Type Cubic](#)

Calculation of Width for Types Width, Width -> Width

In the chainage-width diagram, the **Start width** is the width at chainage **Start mode plus S Ext**, and **End width** is the width at chainage **End mode plus E Ext**.

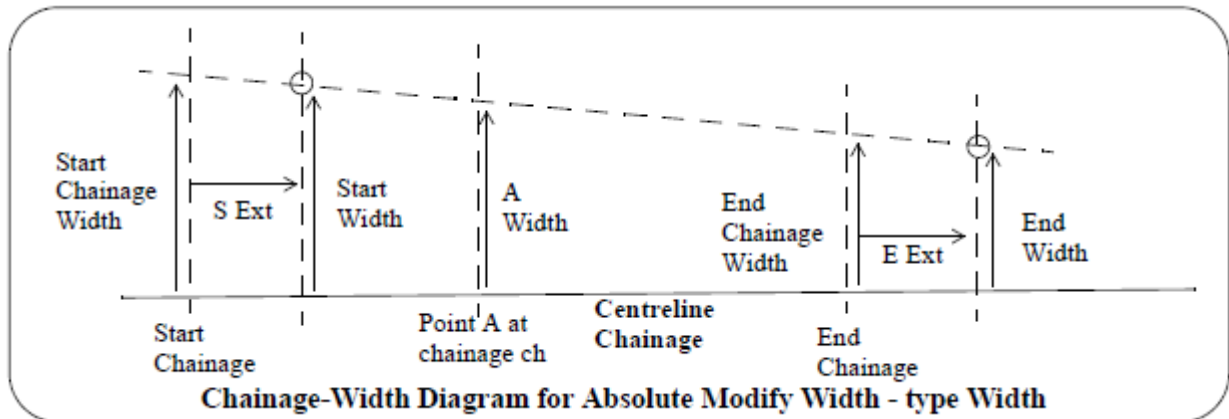
The width is **linearly** interpolated between the **Start width** and the **End width**, plus the given **Offset** in the chainage-width diagram.

That is, the rate change of width per unit chainage is

$$\text{rate of width change} = (\text{End Width} - \text{Start Width}) / (\text{End mode} + \text{E Ext} - \text{Start mode} - \text{S Ext})$$

and the width at chainage **ch** is

$$(\text{Start Width} + \text{Offset}) + (\text{ch} - \text{Start Mode chainage} - \text{S Ext}) * \text{rate of width change}$$



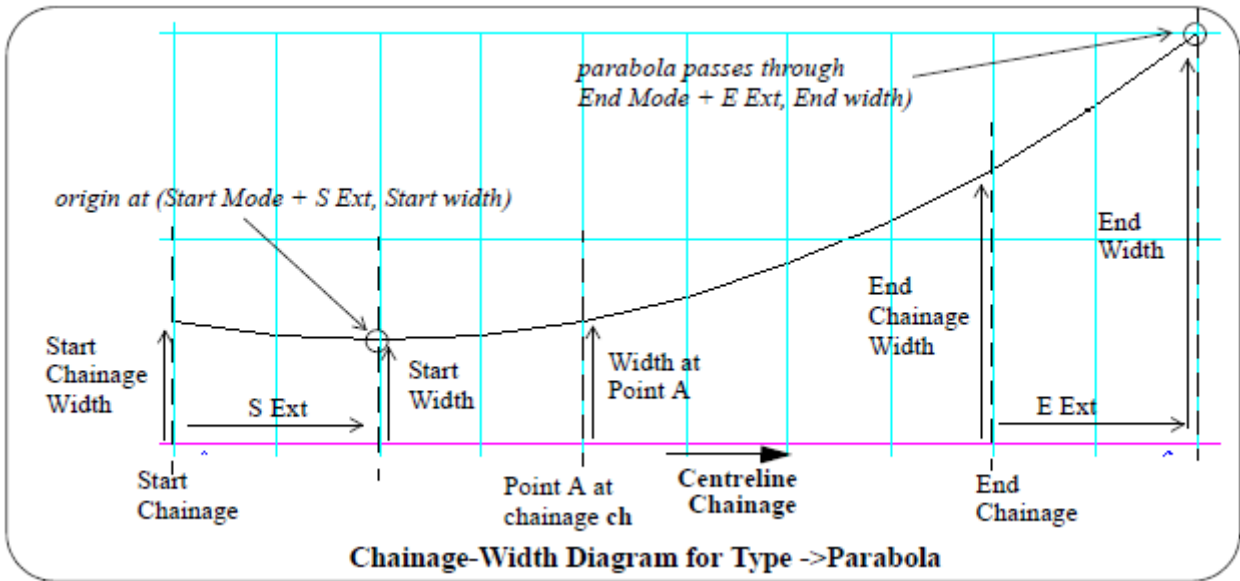
These widths and the **Offset** are then used for the link being modified as the width that the link is **from the Base Link** when measured along the section perpendicular to the centreline. See .

The Height/Xfall is maintained as that originally defined in the selected link.

Calculation of Width for Type Parabola ->

In the chainage-width diagram, the **Start width** is the width at chainage **Start mode plus S Ext**, and **End width** is the width at chainage **End mode plus E Ext**.

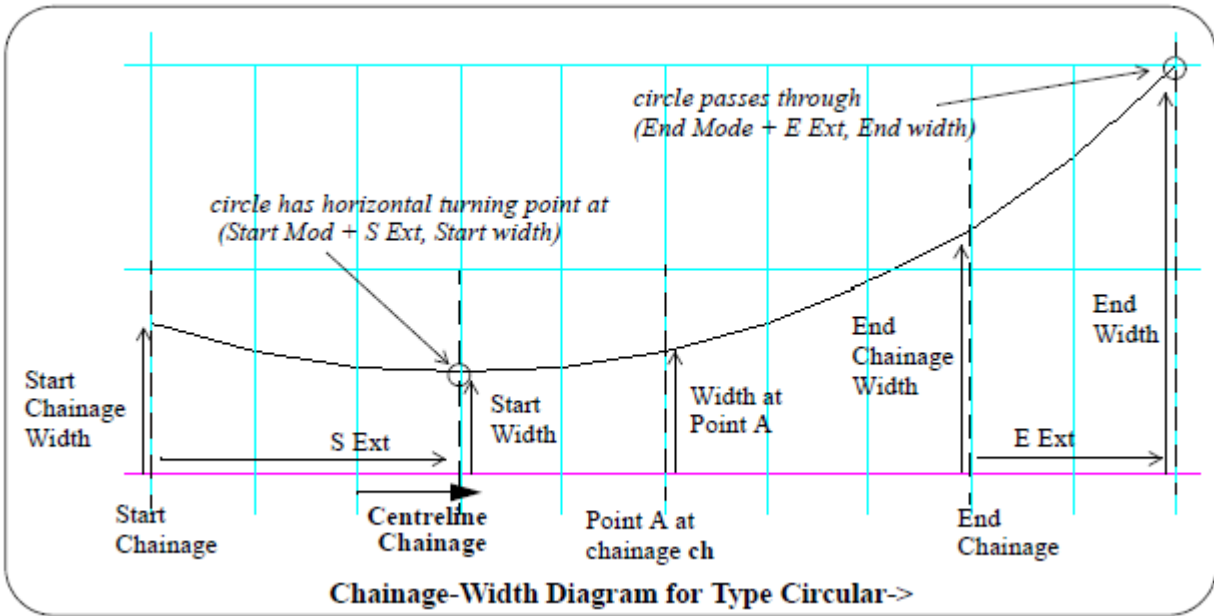
Between the start position (**Start mode + S Ext, Start width**), and the end position (**End mode + E Ext, End width**), the width varies as a **parabola** $a * X * X$ with its origin at (**Start mode + S Ext, Start width**) and going through (**End mode + E Ext, End width**).



These widths and the **Offset** are then used for the link being modified as the width that the link is **from the Base Link** when measured along the section perpendicular to the centreline. See The Height/Xfall is maintained as that originally defined in the selected link.

Calculation of Width for Type Circular->

In the chainage-width diagram, the **Start width** is the width at chainage **Start mode plus S Ext**, and **End width** is the width at chainage **End mode plus E Ext**. Between the start position (**Start mode + S Ext, Start width**), and the end position (**End mode + E Ext, End width**), the width varies as a **circle** with its horizontal turning point at (**Start mode + S Ext, Start width**) and going through (**End mode + E Ext, End width**).

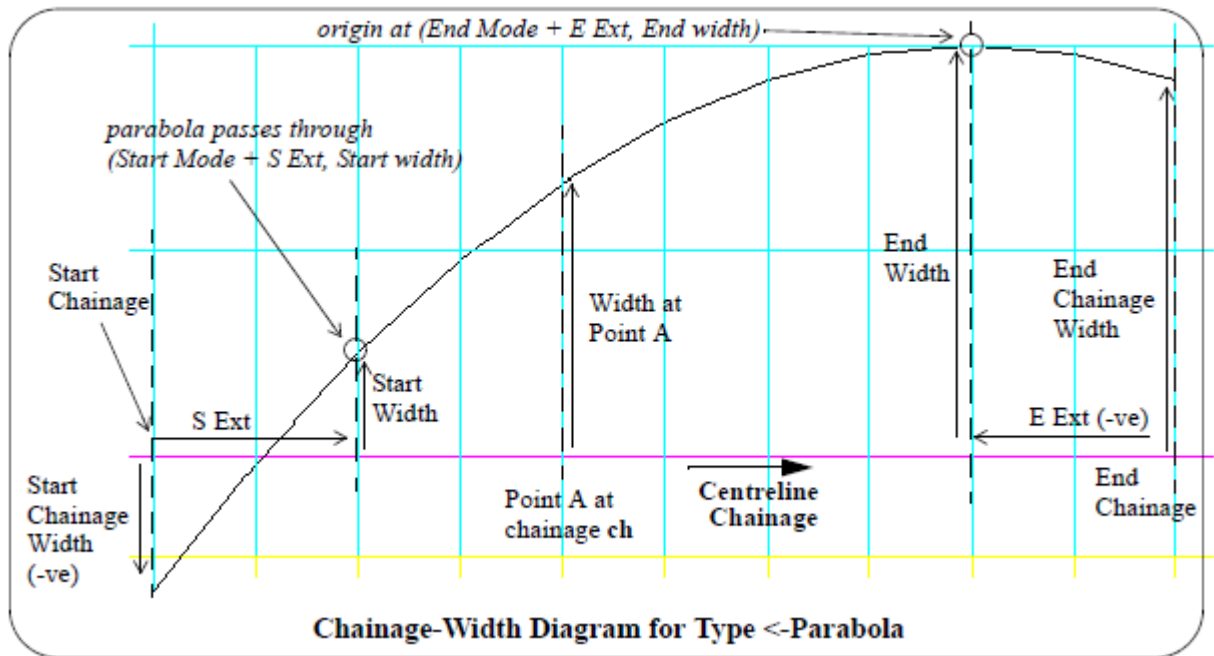


These widths and the **Offset** are then used for the link being modified as the width that the link is **from the Base Link** when measured along the section perpendicular to the centreline. See The Height/Xfall is maintained as that originally defined in the selected link.

Calculation of Width for Type <- Parabola

In the chainage-width diagram, the **Start width** is the width at chainage **Start mode plus S Ext**, and **End width** is the width at chainage **End mode plus E Ext**.

Between the start position (**Start mode + S Ext, Start width**), and the end position (**End mode + E Ext, End width**), the width varies as a **parabola** $a \cdot X^2$ with its origin at (**End mode + E Ext, End width**) and going through (**Start mode + S Ext, Start width**).

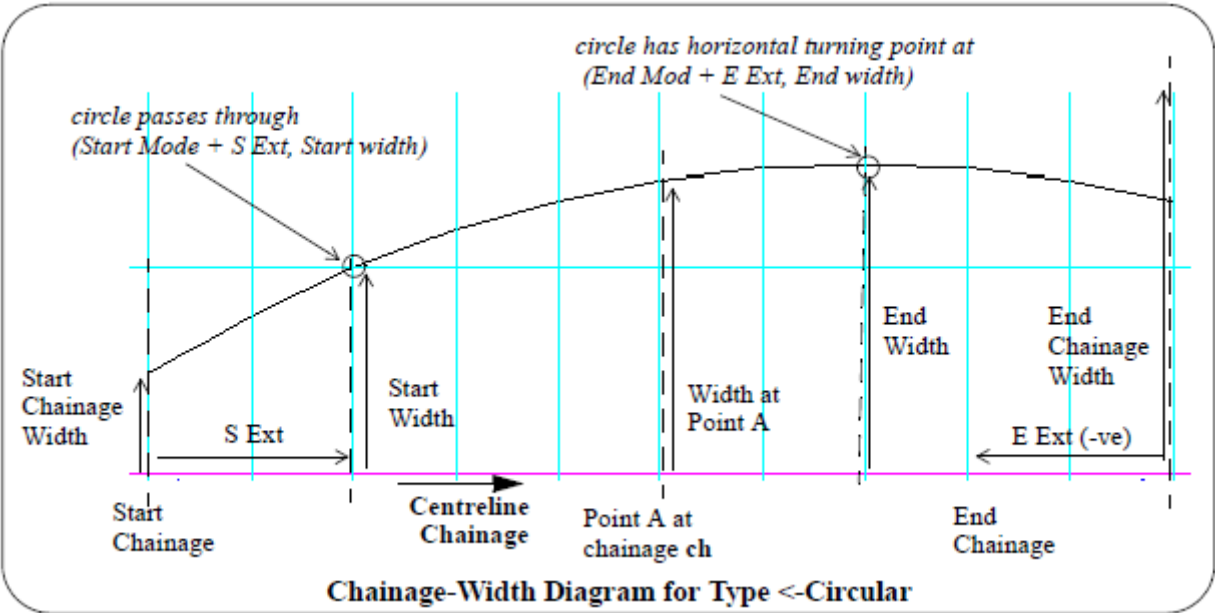


These widths and the **Offset** are then used for the link being modified as the width that the link is **from the Base Link** when measured along the section perpendicular to the centreline. See The Height/Xfall is maintained as that originally defined in the selected link.

Calculation of Width for Type <-Circular

In the chainage-width diagram, the **Start width** is the width at chainage **Start mode plus S Ext**, and **End width** is the width at chainage **End mode plus E Ext**.

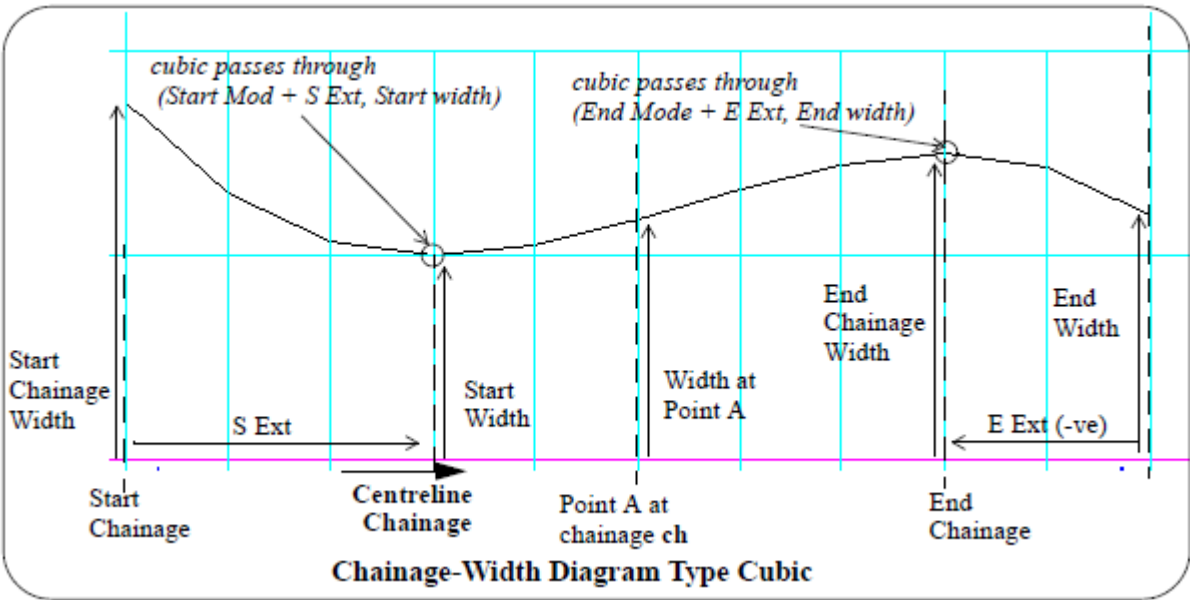
Between the start position (**Start mode + S Ext, Start width**), and the end position (**End mode + E Ext, End width**), the width varies as a **circle** with its horizontal turning point at (**End mode + E Ext, End width**) and going through (**Start mode + S Ext, Start width**).



These widths and the **Offset** are then used for the link being modified as the width that the link is **from the Base Link** when measured along the section perpendicular to the centreline. See The Height/Xfall is maintained as that originally defined in the selected link.

Calculation of Width for Type Cubic

In the chainage-width diagram, the **Start width** is the width at chainage **Start mode plus S Ext**, and **End width** is the width at chainage **End mode plus E Ext**. Between the start position (**Start mode + S Ext, Start width**), and the end position (**End mode + E Ext, End width**), the width varies as a **cubic** going through (**Start mode + S Ext, Start width**) and (**End mode + E Ext, End width**).



These widths and the **Offset** are then used for the link being modified as the width that the link is **from the Base Link** when measured along the section perpendicular to the centreline. See The Height/Xfall is maintained as that originally defined in the selected link.

For Modifier Types "Modify Height Maintain Width/Xfall"

Go to [Applying the Calculated Heights](#)
Go to [Calculating the Heights for each Type](#)

Applying the Calculated Heights

Type

Height

S Ext

E Ext

Height offset

Height

Start Height

End Height

S Ext

E Ext

Height offset

For Type Height

For other Types

- Start height

input

measures menu

height at (Start mode + S Ext)

Start height can be positive or negative. See diagram after Height Offset

S Ext and E Ext have no effect for Type Height.
- End width

input

measures menu

height at (End mode + E Ext)

End height can be positive or negative. See diagram after Height Offset

End height does not exist for Type Height.
- S Ext/E Ext

input

measures menu

Start/End extension to add to the Start/end mode chainage. S Ext/E Ext can be positive or negative.

See diagram after Offset
- Height offset

input

measures menu

Final height to be added to the height calculated at each point. Height offset can be positive or negative.

For a chainage **ch** between the *Start mode* and the *End mode*, a **height** is calculated for at **ch** chainage and that height is used for the link that goes out from the Base Link perpendicular to the Centreline.

The definition for calculating the height is best described in a **Chainage-Height** diagram. That is, in a plot with **Centreline chainage** as the **x-axis**, and **Height** at that chainage as the **y-axis**. This is similar to a long section plot.

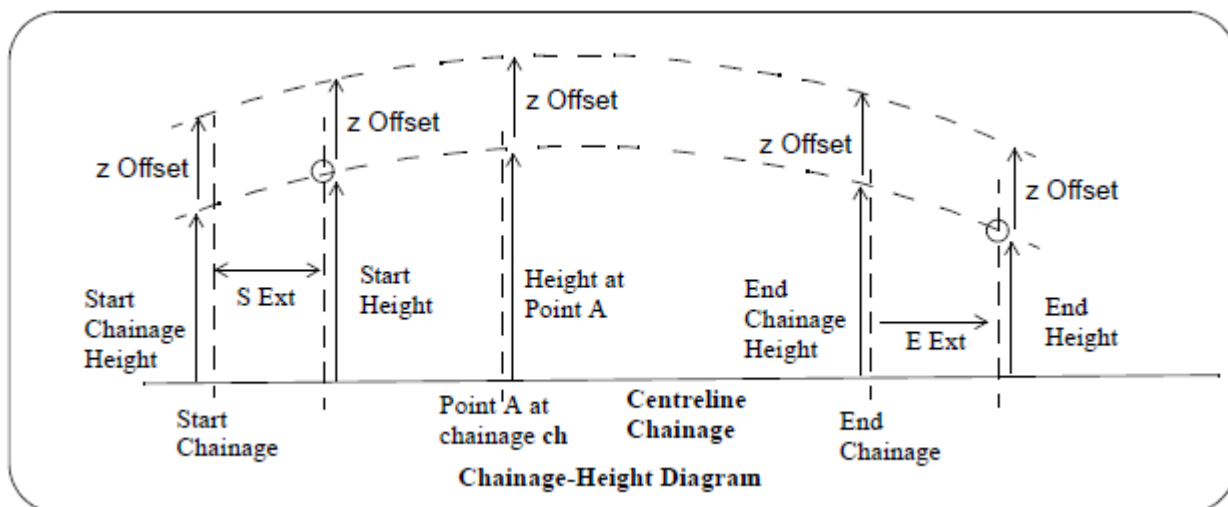
Then for a point **A** at a chainage **ch** on the centreline, the **Height** calculated at chainage **ch** in the Chainage-Height diagram is used for the Height measured from the Base link corresponding at the Centreline at chainage **ch**.

For the **Modify Height** commands, the method defining the heights may not be exactly at the Start/End mode chainages but at points a S Ext/E Ext chainage distance from the Start/End

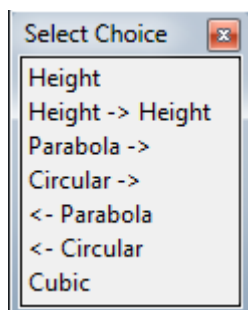
mode chainages.

Finally after the heights are calculated, *Height offset* is added to all the heights.

Although the definition for calculating the heights in the chainage-height diagram may involve points outside the Start mode/End mode chainage range, the calculated heights are **only applied** to the centreline **between** the **Start mode** chainage and the **End mode** chainage.



Calculating the Heights for each Type



For **Type** Height, Height->Height, go to [Calculation of Height for Types Height, Height -> Height](#)

For **Type** Parabola->, go to [Calculations for Type Parabola ->](#)

For **Type** Circular->, go to [Calculations for Type Circular->](#)

For **Type** <-Parabola, go to [Calculations for Type <- Parabola](#)

For **Type** <-Circular, go to [Calculations for Type <-Circular](#)

For **Type** Cubic, go to [Calculations for Type Cubic](#)

Calculation of Height for Types Height, Height -> Height

In the chainage-height diagram, the **Start height** is the height at chainage **Start mode plus S Ext**, and **End height** is the height at chainage **End mode plus E Ext**.

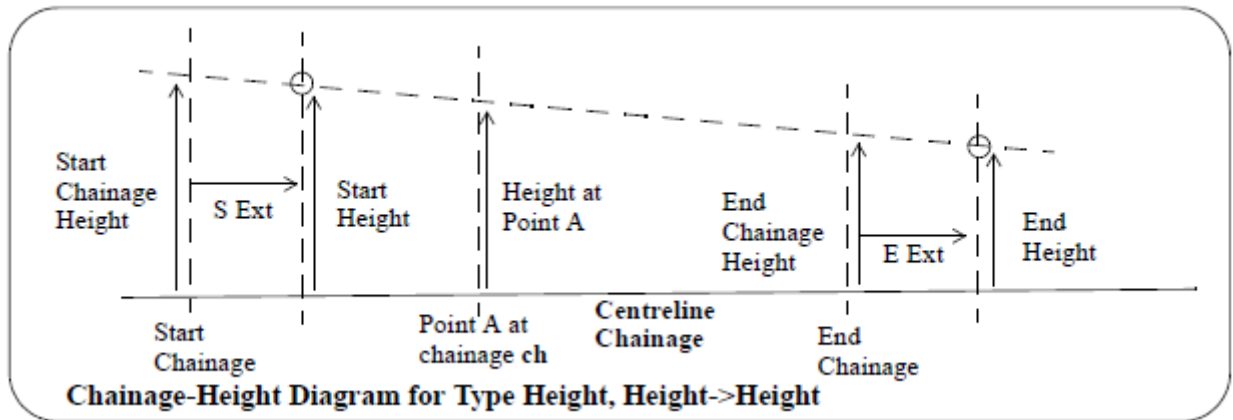
The height is **linearly** interpolated between the **Start height** and the **End height**, plus the given **Height offset** in the chainage-width diagram.

That is, the rate change of height per unit chainage is

$$\text{rate of height change} = (\text{End height} - \text{Start height}) / (\text{End mode} + \text{E Ext} - \text{Start mode} - \text{S Ext})$$

and the height at chainage ch is

$$(\text{Start height} + \text{Height offset}) + (ch - \text{Start Mode chainage} - S \text{ Ext}) * \text{rate of height change}$$



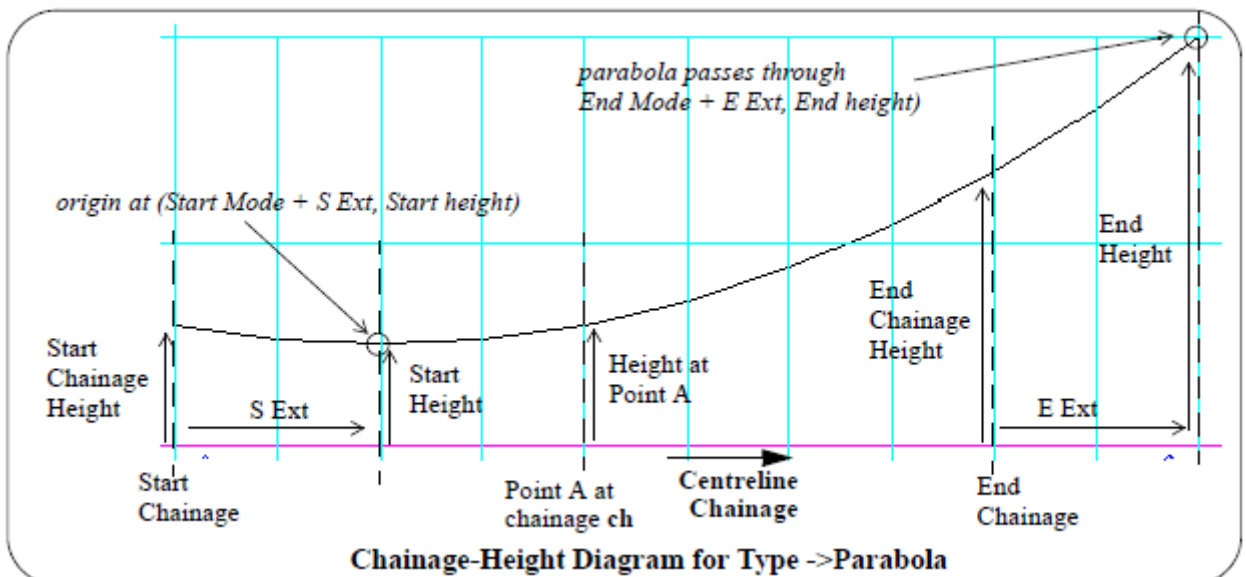
These heights and the **Height offset** are then used for the link being modified as the height that the link is **from the Base Link** when measured along the section perpendicular to the centreline.

The Width/Xfall is maintained as that originally defined in the selected link.

Calculations for Type Parabola ->

In the chainage-height diagram, the **Start height** is the height at chainage **Start mode plus S Ext**, and **End height** is the height at chainage **End mode plus E Ext**.

Between the start position (**Start mode + S Ext, Start height**), and the end position (**End mode + E Ext, End height**), the height varies as a **parabola** $a*X*X$ with its origin at (**Start mode + S Ext, Start height**) and going through (**End mode + E Ext, End height**).



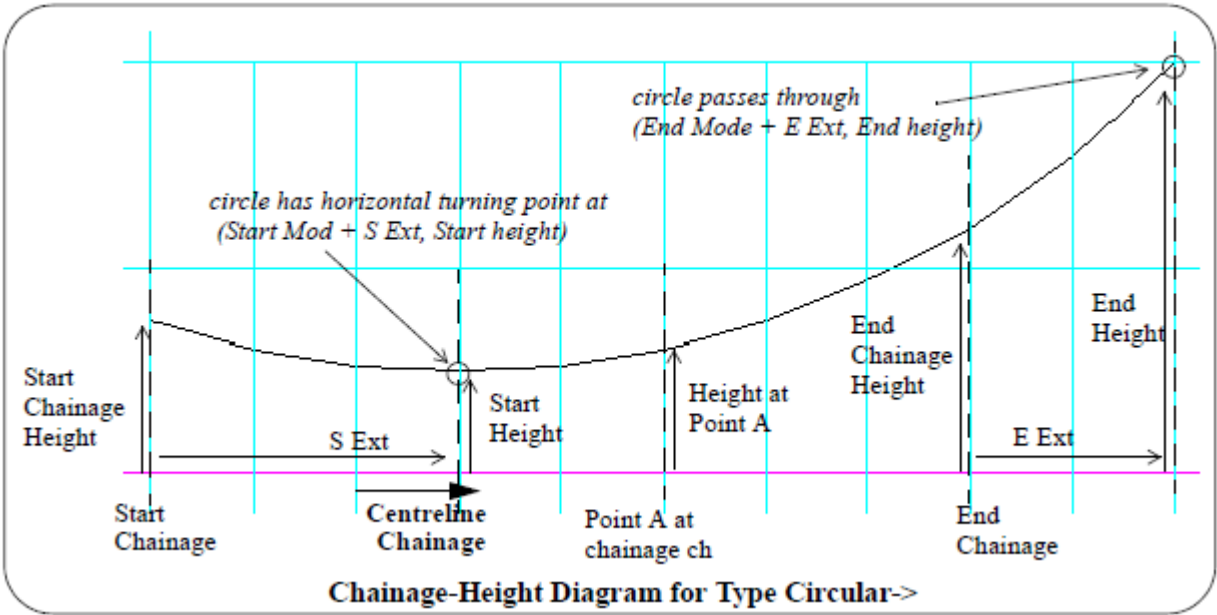
These heights and the **Height offset** are then used for the link being modified as the height that the link is **from the Base Link** when measured along the section perpendicular to the centreline.

The Width/Xfall is maintained as that originally defined in the selected link.

Calculations for Type Circular->

In the chainage-height diagram, the **Start height** is the height at chainage **Start mode plus S Ext**, and **End height** is the height at chainage **End mode plus E Ext**.

Between the start position (**Start mode + S Ext, Start height**), and the end position (**End mode + E Ext, End height**), the height varies as a **circle** with its horizontal turning point at (**Start mode + S Ext, Start height**) and going through (**End mode + E Ext, End height**).

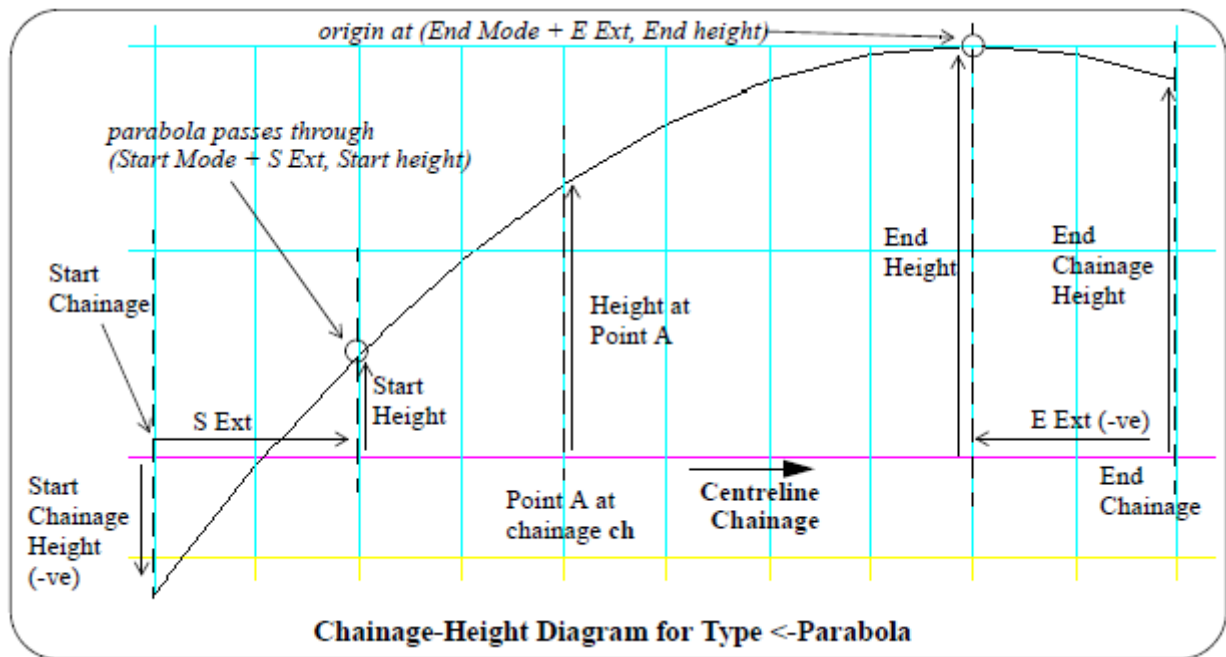


These heights and the **Height offset** are then used for the link being modified as the width that the link is **from the Base Link** when measured along the section perpendicular to the centreline.
The Width/Xfall is maintained as that originally defined in the selected link.

Calculations for Type <- Parabola

In the chainage-height diagram, the **Start height** is the height at chainage **Start mode plus S Ext**, and **End height** is the height at chainage **End mode plus E Ext**.

Between the start position (**Start mode + S Ext, Start height**), and the end position (**End mode + E Ext, End height**), the height varies as a **parabola** $a \cdot X^2$ with its origin at (**End mode + E Ext, End height**) and going through (**Start mode + S Ext, Start height**).



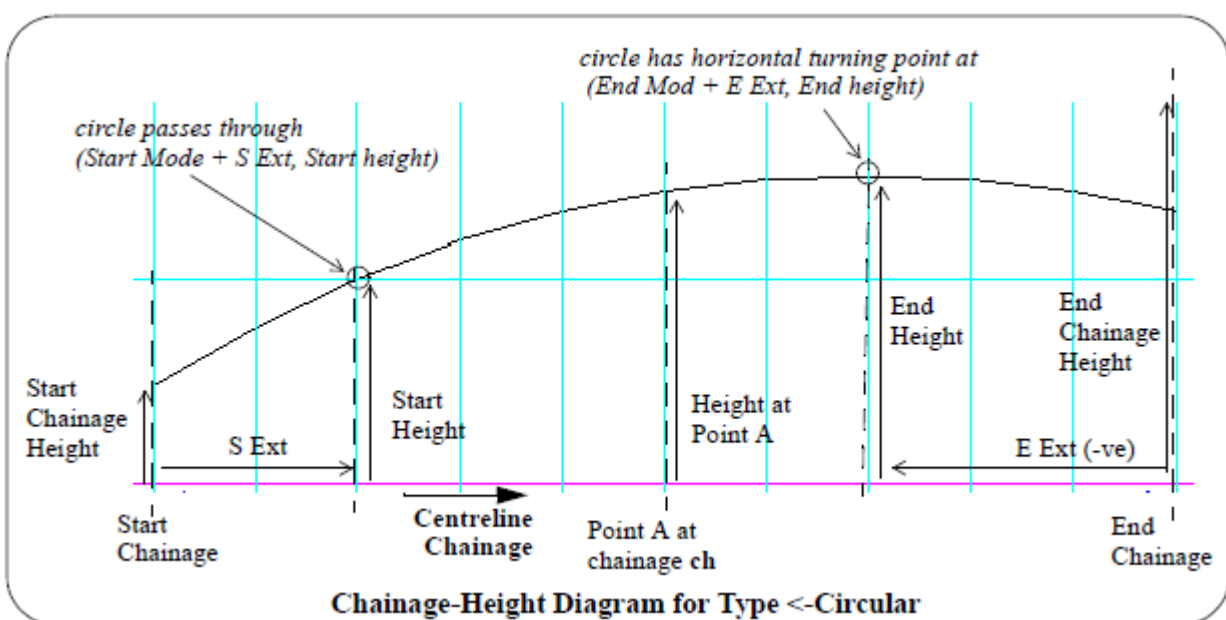
These heights and the **Height offset** are then used for the link being modified as the width that the link is **from the Base Link** when measured along the section perpendicular to the centreline.

The Width/Xfall is maintained as that originally defined in the selected link.

Calculations for Type <-Circular

In the chainage-height diagram, the **Start height** is the height at chainage **Start mode plus $S\ Ext$** , and **End height** is the height at chainage **End mode plus $E\ Ext$** .

Between the start position (**Start mode + $S\ Ext$, Start height**), and the end position (**End mode + $E\ Ext$, End height**), the height varies as a **circle** with its horizontal turning point at (**End mode + $E\ Ext$, End height**) and going through (**Start mode + $S\ Ext$, Start height**).

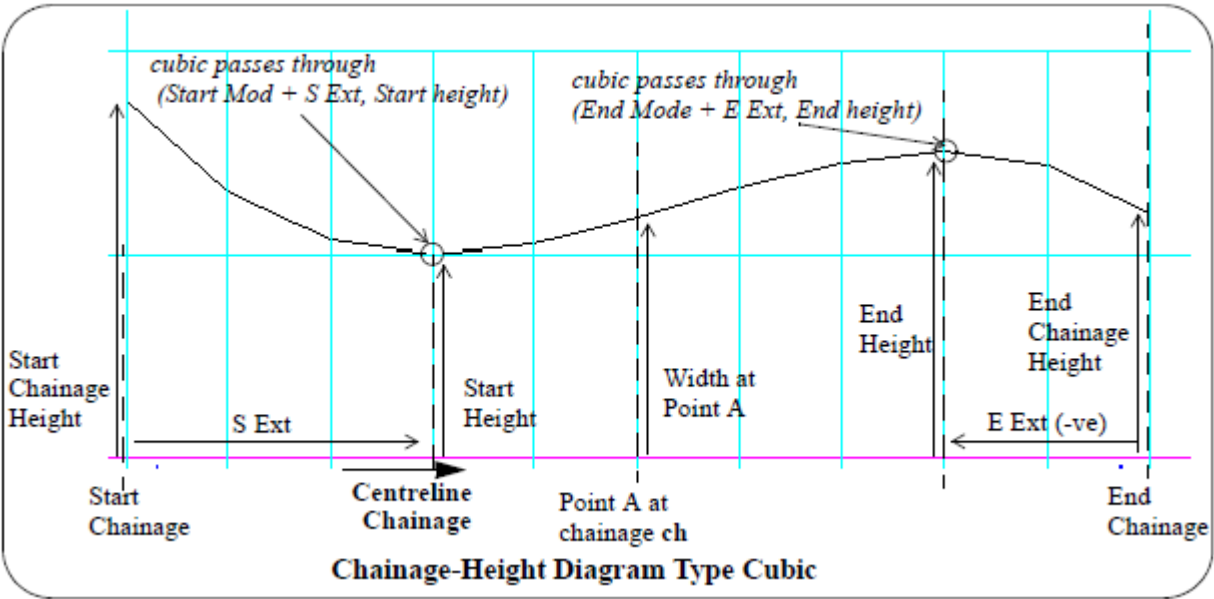


These heights and the **Height offset** are then used for the link being modified as the height that the link

is **from the Base Link** when measured along the section perpendicular to the centreline.
The Width/Xfall is maintained as that originally defined in the selected link.

Calculations for Type Cubic

In the chainage-height diagram, the **Start height** is the height at chainage **Start mode plus S Ext**, and **End height** is the height at chainage **End mode plus E Ext**.
Between the start position (**Start mode + S Ext, Start height**), and the end position (**End mode + E Ext, End height**), the height varies as a **cubic** going through (**Start mode + S Ext, Start height**) and (**End mode + E Ext, End height**).



These heights and the **Height offset** are then used for the link being modified as the height that the link is **from the Base Link** when measured along the section perpendicular to the centreline.
The Width/Xfall is maintained as that originally defined in the selected link.

For Modifier Types "Modify Xfall Maintain Width/Height"

- Go to [Applying the Calculated Xfall](#)
- Go to [Calculating the Xfall for each Type](#)

Applying the Calculated Xfall

XFall		<input type="text"/>		Start XFall		<input type="text"/>	
S Ext		<input type="text"/>		End XFall		<input type="text"/>	
E Ext		<input type="text"/>		S Ext		<input type="text"/>	
Height offset		<input type="text"/>		E Ext		<input type="text"/>	
				Height offset		<input type="text"/>	
For Type Xfall				For other Types			

Start xfall input measures menu

xfall at (Start mode + S Ext)

*Start xfall can be positive or negative. See diagram after **Height offset***

S Ext and E Ext have no effect for Type Xfall.

End xfall input measures menu

xfall at (End mode + E Ext)

*End xfall can be positive or negative. See diagram after **Offset***

End xfall does not exist for Type Xfall.

S Ext/E Ext input measures menu

Start/End extension to add to the Start/end mode chainage. S Ext/E Ext can be positive or negative.

*See diagram after **Offset***

Height offset input measures menu

*Final height offset to be added to the **height** calculated at each point. Height offset can be positive or negative.*

For a chainage **ch** between the *Start mode* and the *End mode*, a **xfall** is calculated at **ch** chainage and that xfall is used for the link that goes out from the Base Link perpendicular to the Centreline.

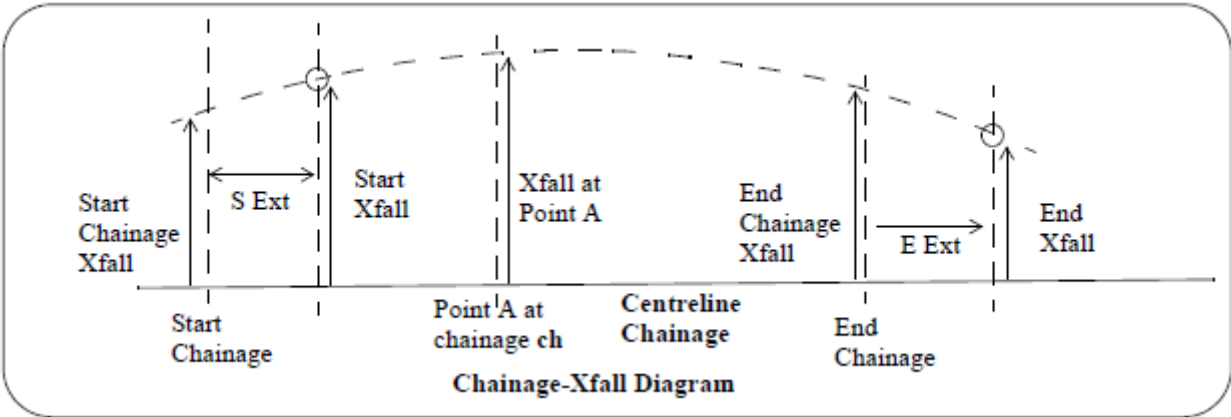
The definition for calculating the xfall is best described in a **Chainage-Xfall** diagram. That is, in a plot with **Centreline chainage** as the **x-axis**, and **Xfall** at that chainage as the **y-axis**. This is similar to a super elevation diagram where chainage is the x-axis and xfall is the y-axis.

Then for a point **A** at a chainage **ch** on the centreline, the **Xfall** calculated at chainage **ch** in the Chainage-Xfall diagram is used for the Xfall measured from the Base link corresponding at chainage **ch**.

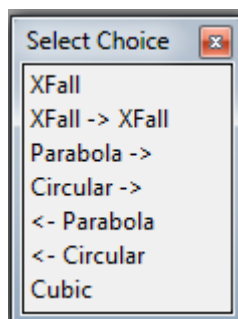
For the **Modify Xfall** commands, the method defining the xfalls may not be exactly at the Start/End mode chainages but at points a S Ext/E Ext chainage distance from the Start/End mode chainages.

Finally after the xfalls and height/widths are applied to the link, a Height offset is added **to all the heights**.

Although the definition for calculating the xfalls in the chainage-xfall diagram may involve points outside the Start mode/End mode chainage range, the calculated xfalls are **only applied** to the centreline **between the Start mode** chainage and the End mode chainage.



Calculating the Xfall for each Type



For **Type** Xfall, Xfall->Xfall, go to [Calculations of Xfalls for Types Xfall, Xfall -> Xfall](#)

For **Type** Parabola->, go to [Calculations for Type Parabola ->](#)

For **Type** Circular->, go to [Calculations for Type Circular->](#)

For **Type** <-Parabola, go to [Calculations for Type <- Parabola](#)

For **Type** <-Circular, go to [Calculations for Type <-Circular](#)

For **Type** Cubic, go to [Calculations for Type Cubic](#)

Calculations of Xfalls for Types Xfall, Xfall -> Xfall

In the chainage-xfall diagram, the **Start xfall** is the xfall at chainage **Start mode plus S Ext**, and **End xfall** is the xfall at chainage **End mode plus E Ext**.

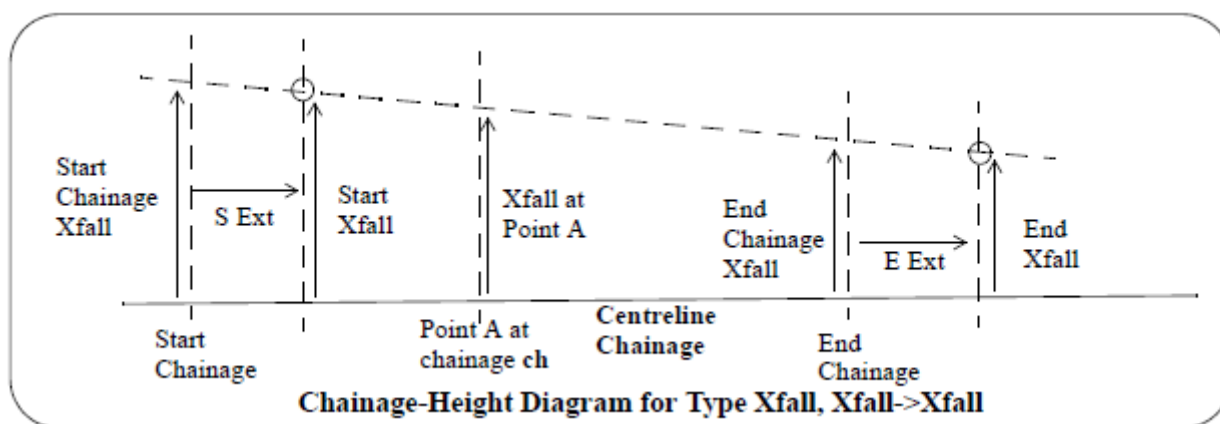
The xfall is **linearly** interpolated between the **Start xfall** and the **End xfall**, plus the given **Xfall offset** in the chainage-width diagram.

That is, the rate change of xfall per unit chainage is

$$\text{rate of xfall change} = (\text{End xfall} - \text{Start xfall}) / (\text{End mode} + \text{E Ext} - \text{Start mode} - \text{S Ext})$$

and the xfall at chainage **ch** is

$$(\text{Start xfall} + \text{Xfall offset}) + (\text{ch} - \text{Start Mode chainage} - \text{S Ex}) * \text{rate of xfall change}$$



These xfalls and the **Height offset** are then used for the link being modified as the xfall that the link is **from the Base Link** when measured along the section perpendicular to the centreline.

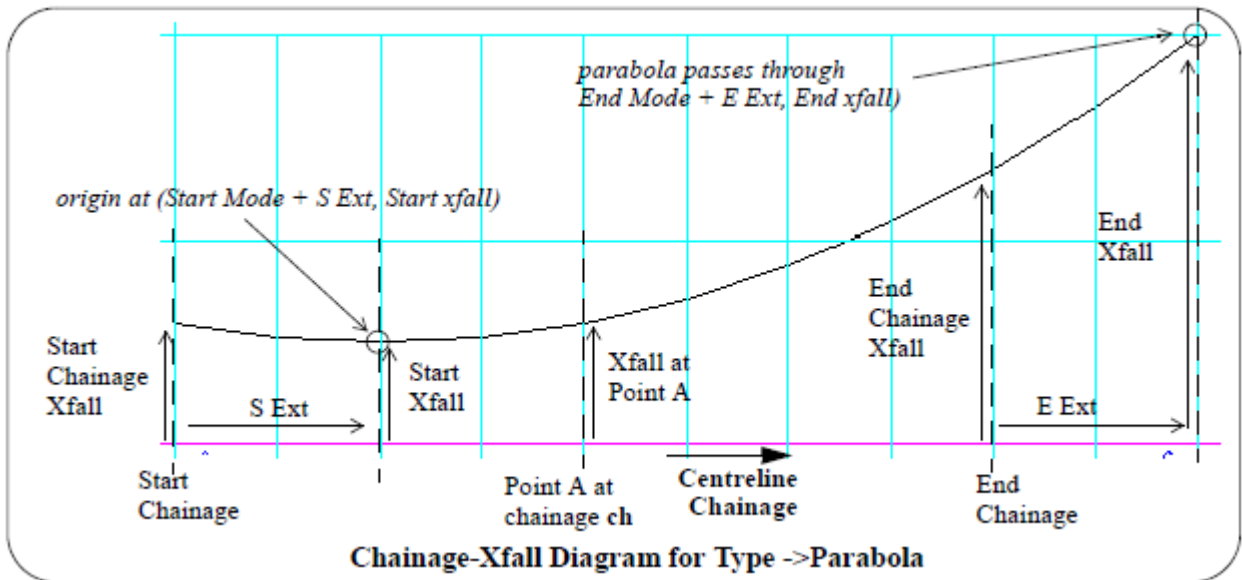
The Width/Height is maintained as that originally defined in the selected link.

Calculations for Type Parabola ->

In the chainage-xfall diagram, the **Start xfall** is the xfall at chainage **Start mode plus S Ext**, and **End xfall** is the xfall at chainage **End mode plus E Ext**.

Between the start position (**Start mode + S Ext, Start xfall**), and the end position (**End mode + E Ext,**

End xfall), the *xfall* varies as a **parabola** $a * X^2$ with its origin at (*Start mode* + *S Ext*, *Start xfall*) and going through (*End mode* + *E Ext*, *End xfall*).



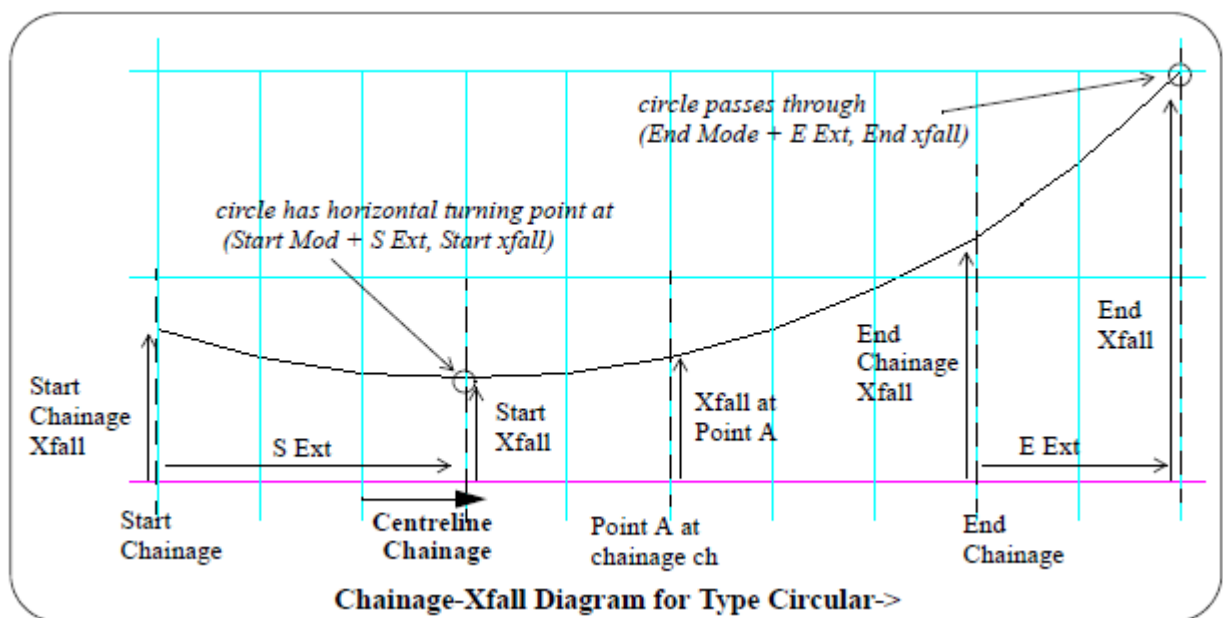
These *xfalls* and the **Height offset** are then used for the link being modified as the *xfall* that the link is **from the Base Link** when measured along the section perpendicular to the centreline.

The Width/Height is maintained as that originally defined in the selected link.

Calculations for Type Circular->

In the chainage-xfall diagram, the **Start xfall** is the *xfall* at chainage **Start mode plus S Ext**, and **End xfall** is the *xfall* at chainage **End mode plus E Ext**.

Between the start position (**Start mode + S Ext, Start xfall**), and the end position (**End mode + E Ext, End xfall**), the *xfall* varies as a **circle** with its horizontal turning point at (**Start mode + S Ext, Start xfall**) and going through (**End mode + E Ext, End xfall**).



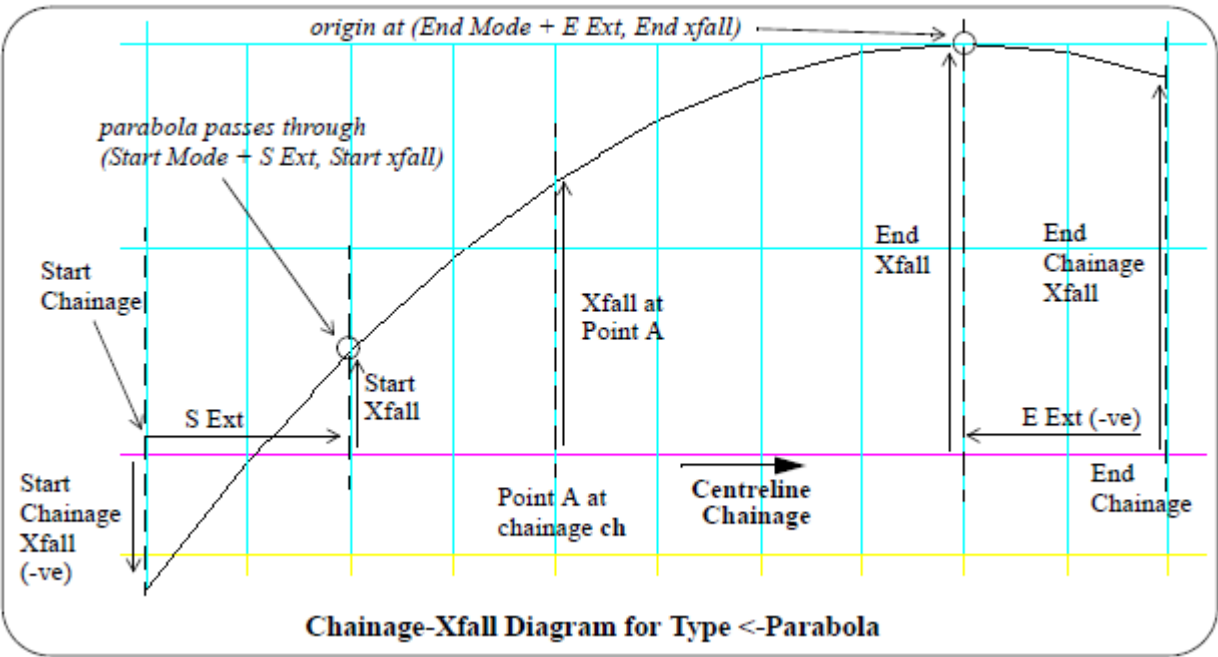
These *xfalls* and the **Height offset** are then used for the link being modified as the *xfall* that the link is

from the **Base Link** when measured along the section perpendicular to the centreline.

Calculations for Type <- Parabola

In the chainage-xfall diagram, the **Start xfall** is the xfall at chainage **Start mode plus S Ext**, and **End xfall** is the xfall at chainage **End mode plus E Ext**.

Between the start position (**Start mode + S Ext, Start xfall**), and the end position (**End mode + E Ext, End xfall**), the xfall varies as a **parabola $a \cdot X^2$** with its origin at (**End mode + E Ext, End xfall**) and going through (**Start mode + S Ext, Start xfall**).



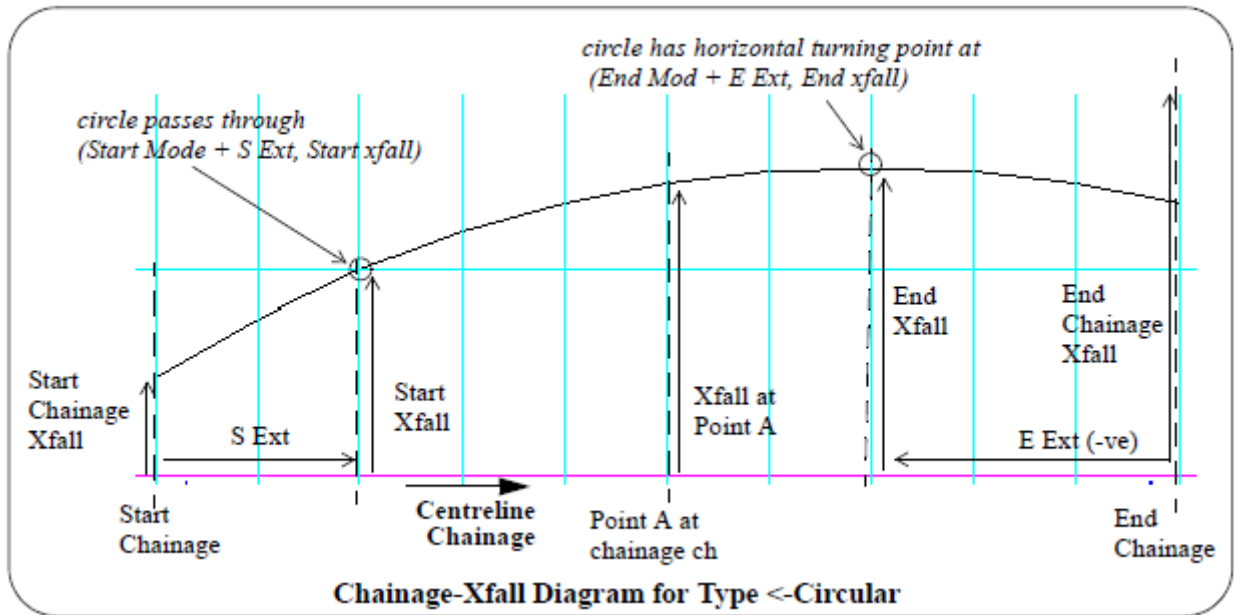
These xfalls and the **Height offset** are then used for the link being modified as the xfall that the link is from the **Base Link** when measured along the section perpendicular to the centreline.

The Width/Height is maintained as that originally defined in the selected link.

Calculations for Type <-Circular

In the chainage-xfall diagram, the **Start xfall** is the xfall at chainage **Start mode plus S Ext**, and **End xfall** is the xfall at chainage **End mode plus E Ext**.

Between the start position (**Start mode + S Ext, Start xfall**), and the end position (**End mode + E Ext, End xfall**), the xfall varies as a **circle** with its horizontal turning point at (**End mode + E Ext, End xfall**) and going through (**Start mode + S Ext, Start xfall**).



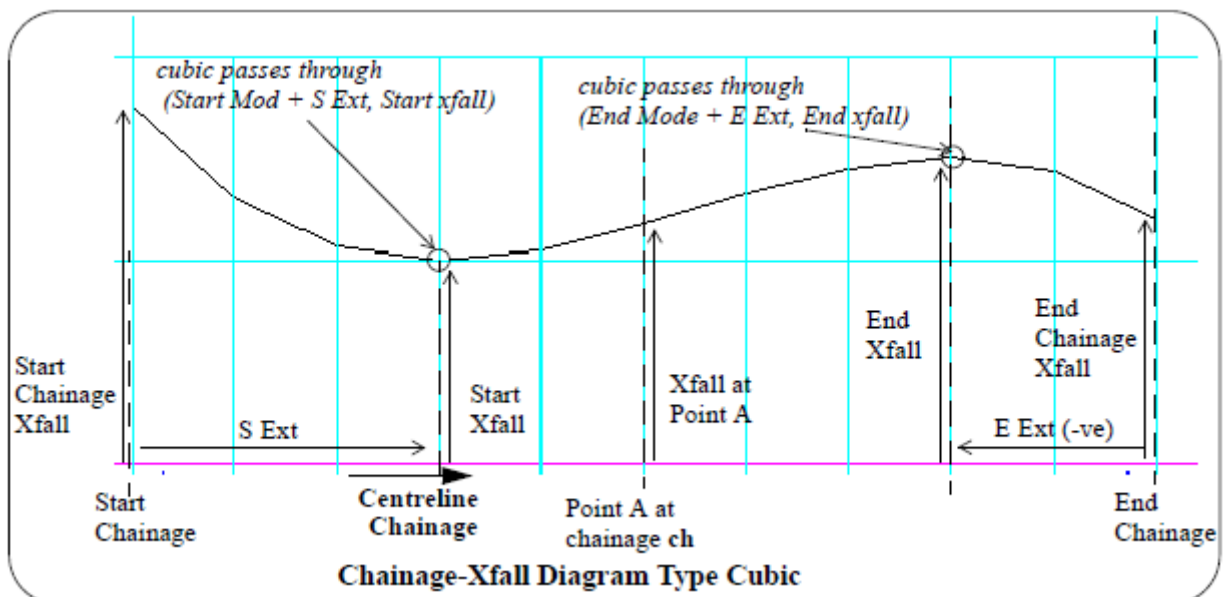
These xfalls and the **Height offset** are then used for the link being modified as the xfall that the link is **from the Base Link** when measured along the section perpendicular to the centreline.

The Width/Height is maintained as that originally defined in the selected link.

Calculations for Type Cubic

In the chainage-xfall diagram, the **Start xfall** is the xfall at chainage **Start mode plus $S\ Ext$** , and **End xfall** is the xfall at chainage **End mode plus $E\ Ext$** .

Between the start position (**Start mode + $S\ Ext$** , **Start xfall**), and the end position (**End mode + $E\ Ext$** , **End xfall**), the xfall varies as a **cubic** going through (**Start mode + $S\ Ext$** , **Start xfall**) and (**End mode + $E\ Ext$** , **End xfall**).



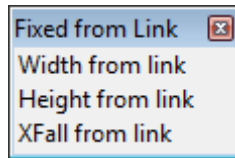
These xfalls and the **Height offset** are then used for the link being modified as the xfall that the link is **from the Base Link** when measured along the section perpendicular to the centreline.

The Width/Height is maintained as that originally defined in the selected link.

Continue to the next section [Fixed Link - from Link](#) or return to [Fixed Link Modifiers](#) or [Modifiers in MTF Edit](#).

Fixed Link - from Link

The **fixed from Link** walk-right brings up the **fixed from Link** menu with options to take the width, xfall or height from another link.



For *Width/Height/Xfall from link*, go to the next section [Fixed Link - Take Width, Height or Xfall from another Link](#)

Fixed Link - Take Width, Height or Xfall from another Link

Width from Link

The **Width from link** modifier is used to **modify the width** of fixed links originally defined by width (*width and height* or *width and xfall*) to be the same width as another link. That is, the width of the link is a **copy** of the **width** of another link.

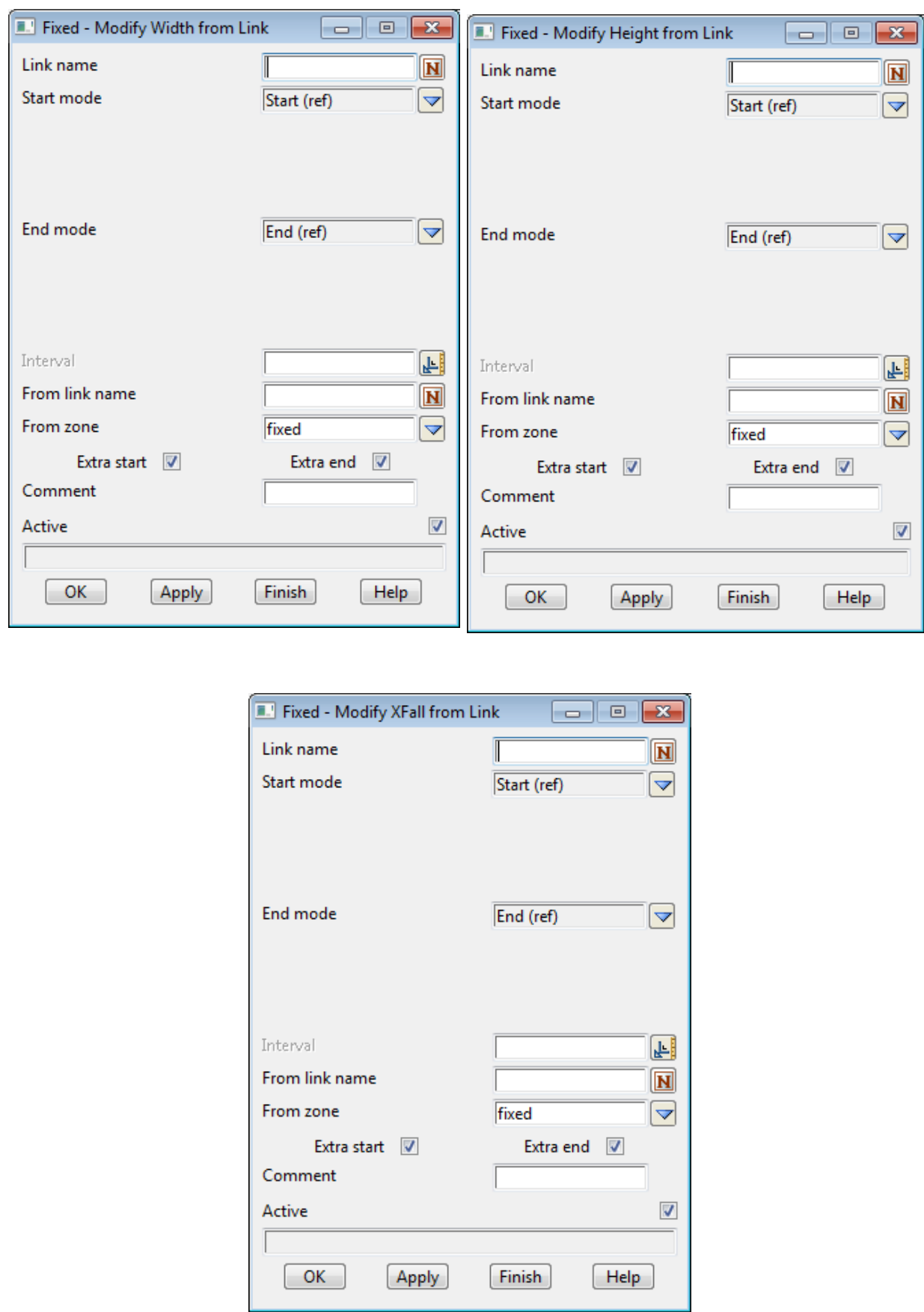
Height from Link

The **Height from link** modifier is used to **modify the height** of fixed links originally defined by height (*height and xfall* or *height and width*) to be the same height as another link. That is, the height of the link is a **copy** of the **height** of another link.

Xfall from Link

The **Xfall from link** modifier is used to **modify the cross fall** of fixed links originally defined by xfall (*xfall and height* or *xfall and width*) to be the same xfall as another link. That is, the cross fall of the link is a **copy** of the **cross fall** of another link. The link to copy cross fall from can be defined in terms of cross fall or slope. If the link to copy is defined by slope, then the cross fall is calculated to match the slope.

Selecting the **Width from link**, **Height from link** or **Xfall from link** option brings up the **Fixed - Modify Width from Link**, **Fixed- Modify Height from Link** and **Fixed- Modify Xfall from Link** panels respectively.

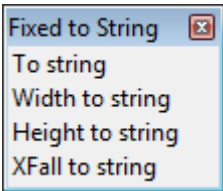


The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name <i>name of the link to modify.</i>	input		select name menu
Start/End mode <i>defines the start/end chainages for modifying the link</i> <i>For more information on Start/End mode, see Start and End Chainages</i>	choice box	Start (ref)/End (ref)	
Interval <i>if non blank, the interval to use to create cross sections and strings over the given chainage range.</i> <i>If blank, the Section separation value from the Apply Many panel is used.</i>	input		
From link name <i>template link to take width/height/xfall from.</i>	input		select name menu
From zone <i>zone that the template link to take width/height/xfall from, comes from.</i>	input	fixed	fixed, cut, fill
Extra start/end <i>if ticked, add an extra x-section 0.1 mm before the start/end chainage.</i>	tick box		
Comment <i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>	input		
Active <i>if ticked, use this modifier.</i> <i>if not ticked, don't use this modifier.</i>	tick box	tick	
OK <i>OK stores the values in the fields and removes the panel BUT no recalc is done.</i>	button		
Apply <i>Apply stores the values and leaves the panel on the screen.</i> <i>If the MTF is being used in an Apply Many MTF and Auto recalc is ticked in the MTF, then whenever the Apply button is clicked, a recalc of the associated Apply Many for the MTF is done.</i>	button		
Continue to the next section Fixed Link - to String or return to Fixed Link Modifiers or Modifiers in MTF Edit .			

Fixed Link - to String

The **fixed from string** walk-right brings up the **fixed from string** menu with options to take the width, xfall or height by going to another string.

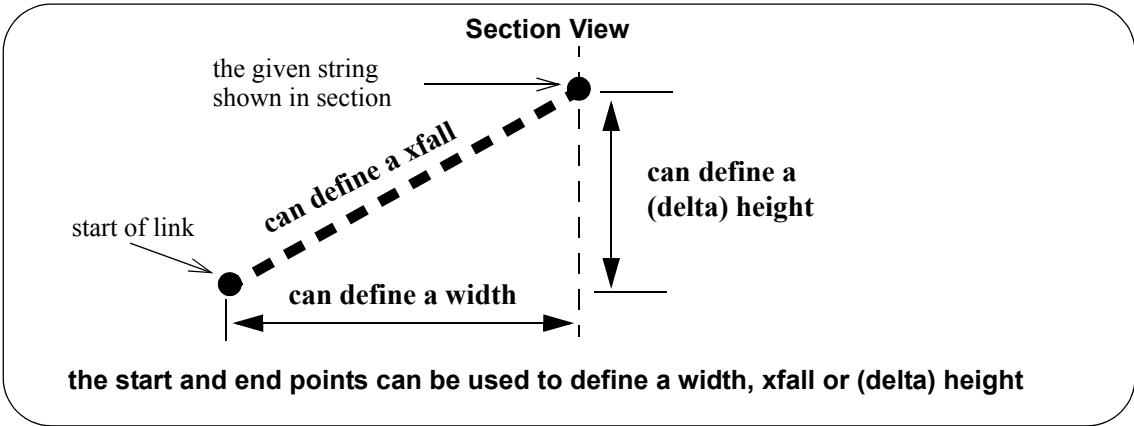


For *To string*, go to
Width/Height/Xfall to string

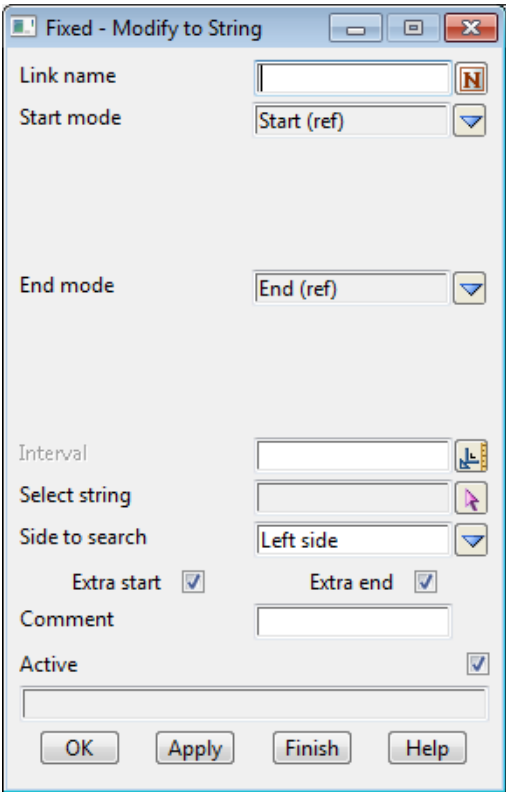
[Fixed Link - Modify To String](#)
[Fixed Link - Calculate Width, Height or Xfall to a String](#)

Fixed Link - Modify To String

For any fixed link, **To string** calculates the required width, height and/or xfall of the link needed to get from the start point of the link **to the selected string**.



Selecting **To string** bring up the **Fixed - Modify to String** panel.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Link name	<i>names of the links to modify.</i> <i>If there is more then one link name then the names must be separated by spaces. If the link name includes a space, then the name must be enclosed in the quotes " (eg "EB 1").</i>	input		select name menu
Start/End mode	<i>defines the start/end chainages for modifying the link</i> <i>For more information on Start/End mode, see Start and End Chainages except for this option:</i> <i>When the Start mode is Start (ref), or Typed and the chainage is blank, the modification begins at the low dropped chainage of the selected string.</i> <i>When the End mode is End (ref), or Typed and the chainage is blank, the modification ends at the high dropped chainage of the selected string.</i>	choice box	Start (ref)/End (ref)	
Interval	<i>if non blank, the interval to use to create cross sections and strings over the given chainage range.</i> <i>If blank, the Section separation value from the Apply Many panel is used.</i>	input		
String	<i>select string to use for defining width/height/crossfall for the link.</i>	string-select		
Side to search	<i>side of the hinge string to start searching to find the string to define width/height/crossfall.</i>	input	left side	left side, right side, both sides
Extra start/end	<i>if ticked, add an extra x-section 0.1 mm before the start/end chainage.</i>	tick box		
Comment		input		

comment to add to the end of the line. In the file, the comment will be preceded by //.

Active tick box tick

*if **ticked**, use this modifier.*
*if **not ticked**, don't use this modifier.*

OK button

OK stores the values in the fields and removes the panel BUT no **recalc** is done.

Apply button

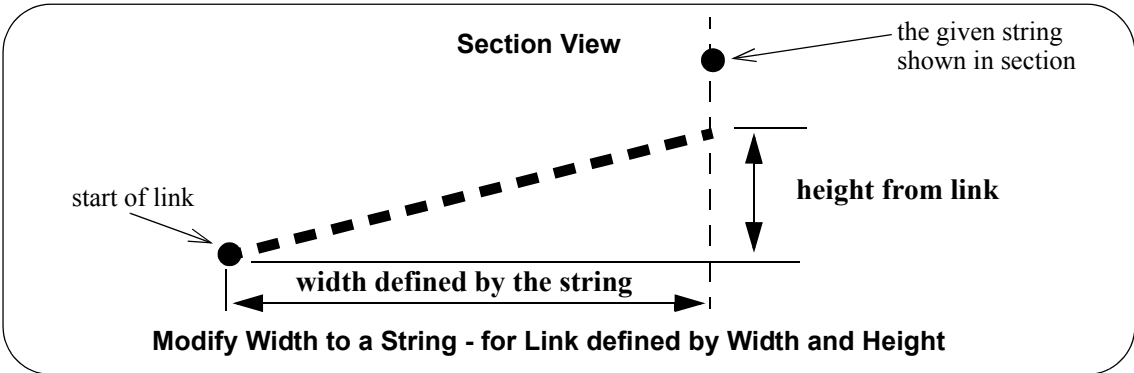
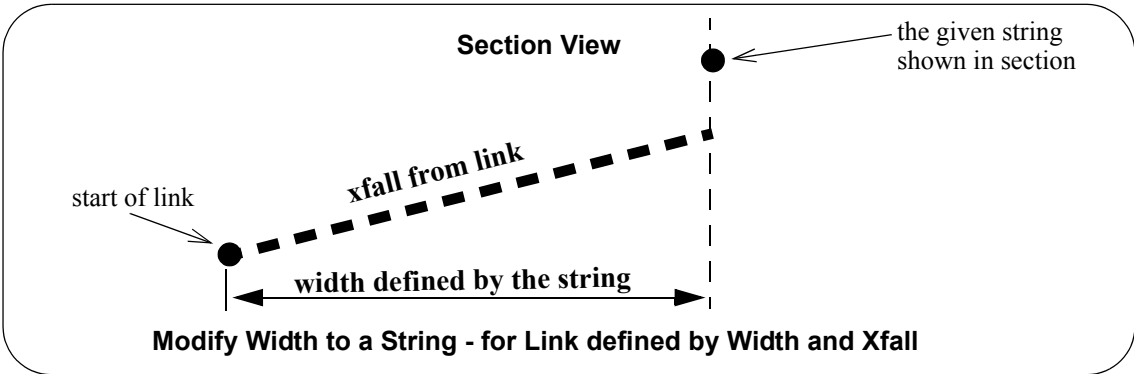
Apply stores the values and leaves the panel on the screen.

*If the **MTF** is being used in an **Apply Many MTF** and **Auto recalc** is ticked in the MTF, then whenever the **Apply** button is clicked, a **recalc** of the associated **Apply Many** for the MTF is done.*

Fixed Link - Calculate Width, Height or Xfall to a String

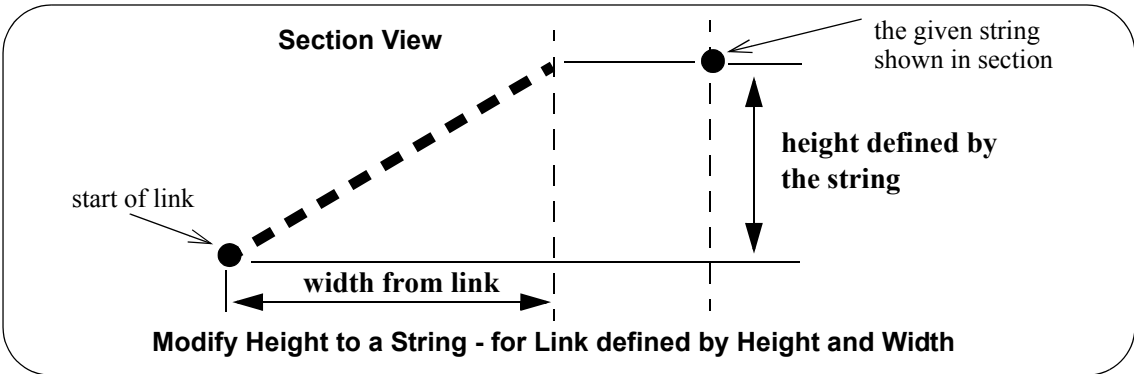
Width to String:

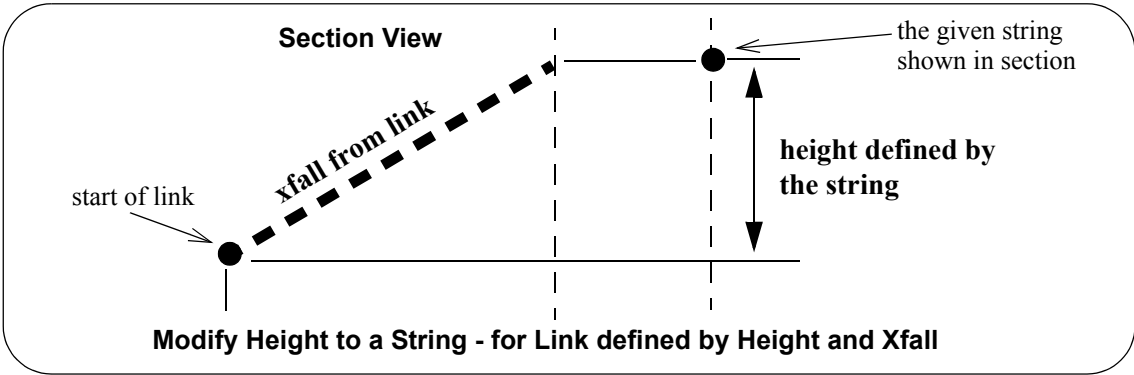
For a fixed link defined by *width* and *height* or *width* and *xfall*, **Width to string** calculates the **width** of the link as the width from the start point of the link, to the **to the selected string**. The *xfall* or *height* is taken from the link. The option will give an error for a link defined by *height* and *xfall*.



Height to String:

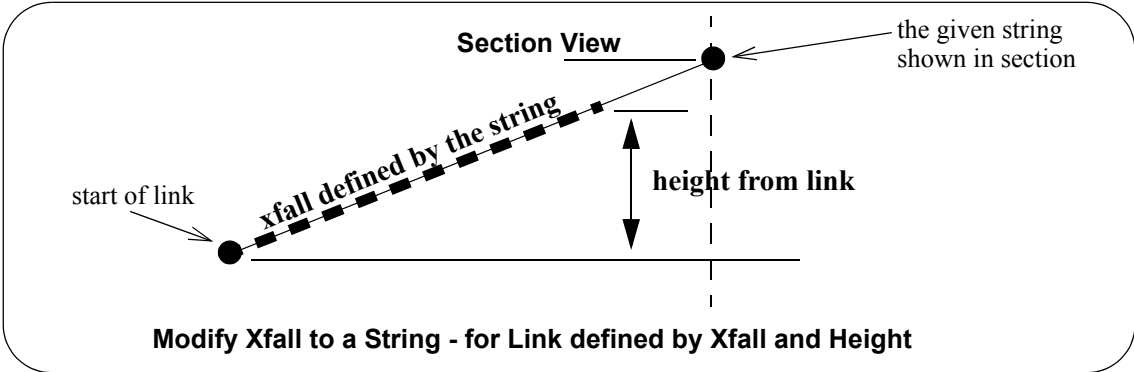
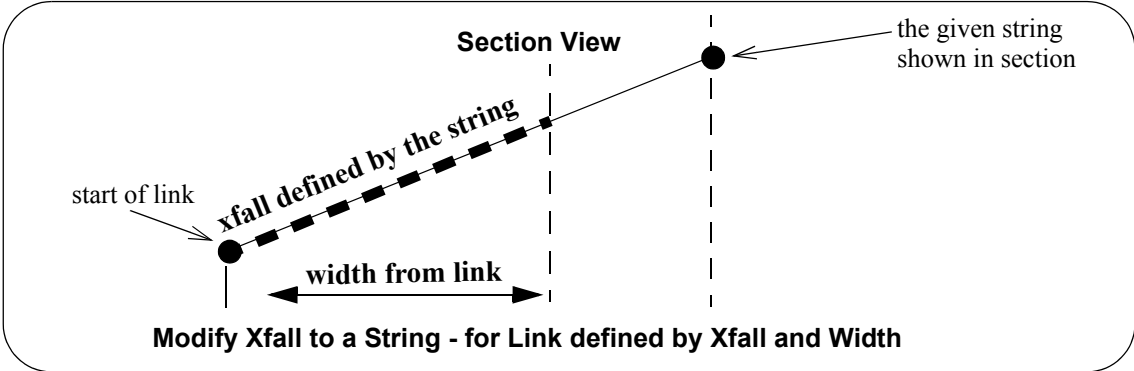
For a fixed link defined by *height* and *width* or *height* and *xfall*, **Height to string** calculates the **height** of the link as the difference in the height at the start point of the link, and the height **at the selected string**. The *xfall* or *width* is taken from the link. The option will give an error for a link defined by *width* and *xfall*.





Xfall to String:

For a fixed link defined by *xfall* and *width* or *xfall* and *height*, **Xfall to string** calculates the **xfall** of the link as the *xfall* from the start point of the link to the **selected string**. The *width* or *height* is taken from the link. The option will give an error for a link defined by *width* and *height*.



Note:

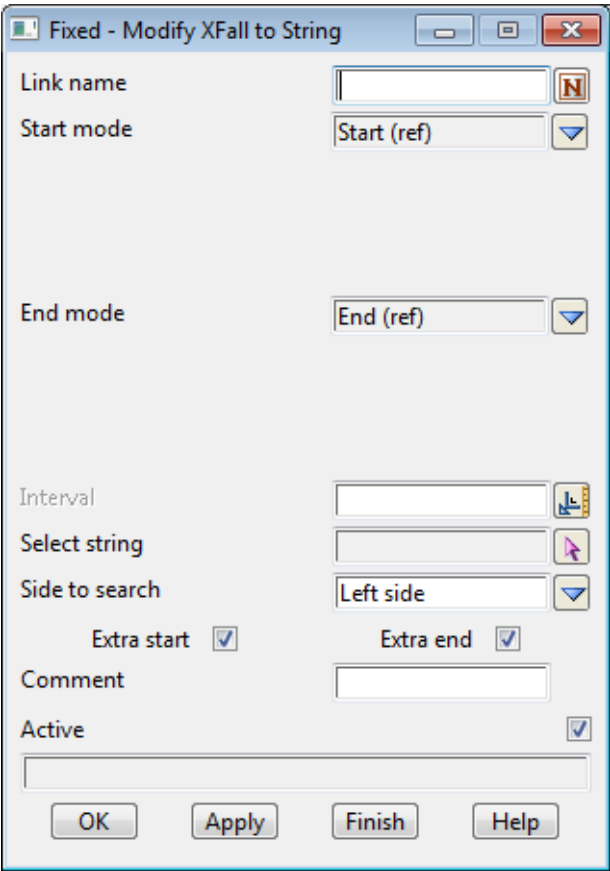
Using two of the above modifiers together and with the same string will place the end point of the link on the selected string. For example for a modifier defined by *width* and *xfall*, using *width to string* and a *xfall to string* with the same string will place the end of the link on that string.

But the To string option will do the same thing in one command. See [Fixed Link - Modify To String](#).

Selecting the **width to string**, **height to string** or **xfall to string** option brings up the **Fixed - Modify Width to String**, **Fixed - Modify Height to String** and **Fixed - Modify Xfall to String** panels respectively.

The image displays two side-by-side dialog boxes, both titled "Fixed - Modify Width to String" and "Fixed - Modify Height to String". Both dialog boxes have a similar layout with the following fields and controls:

- Link name:** A text input field with a small icon to its right.
- Start mode:** A dropdown menu showing "Start (ref)".
- End mode:** A dropdown menu showing "End (ref)".
- Interval:** A text input field with a small icon to its right.
- Select string:** A text input field with a small icon to its right.
- Side to search:** A dropdown menu showing "Left side".
- Extra start:** A checked checkbox.
- Extra end:** A checked checkbox.
- Comment:** A text input field.
- Active:** A checked checkbox.
- Buttons:** "OK", "Apply", "Finish", and "Help" buttons at the bottom.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name <i>name of the link to modify.</i>	input		select name menu
Start/End mode <i>defines the start/end chainages for modifying the link</i> <i>For more information on Start/End mode, see Start and End Chainages except for this option:</i> <i>When the Start mode is Start (ref), or Typed and the chainage is blank, the modification begins at the low dropped chainage of the selected string.</i> <i>When the End mode is End (ref), or Typed and the chainage is blank, the modification ends at the high dropped chainage of the selected string.</i>	choice box	Start (ref)/End (ref)	
Interval <i>if non blank, the interval to use to create cross sections and strings over the given chainage range.</i> <i>If blank, the Section separation value from the Apply Many panel is used.</i>	input		
String <i>select string to use for defining width/height/crossfall for the link.</i>	string-select		
Side to search <i>side of the hinge string to start searching to find the string to define width/height/crossfall.</i>	input	left side	left side, right side, both sides
Extra start/end <i>if ticked, add an extra x-section 0.1 mm before the start/end chainage.</i>	tick box		
Comment	input		

comment to add to the end of the line. In the file, the comment will be preceded by //.

Active tick box tick

*if **ticked**, use this modifier.*

*if **not ticked**, don't use this modifier.*

OK button

OK stores the values in the fields and removes the panel BUT no **recalc** is done.

Apply button

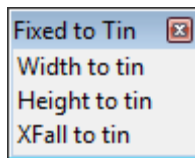
Apply stores the values and leaves the panel on the screen.

*If the **MTF** is being used in an **Apply Many MTF** and **Auto recalc** is ticked in the MTF, then whenever the **Apply** button is clicked, a **recalc** of the associated **Apply Many** for the MTF is done.*

Continue to the next section [Fixed Link - to Tin](#) or return to [Fixed Link Modifiers](#) or [Modifiers in MTF Edit](#).

Fixed Link - to Tin

The **fixed to tin** walk-right brings up the **fixed to Tin** menu with options to calculate the width, xfall or height to get to a given tin.

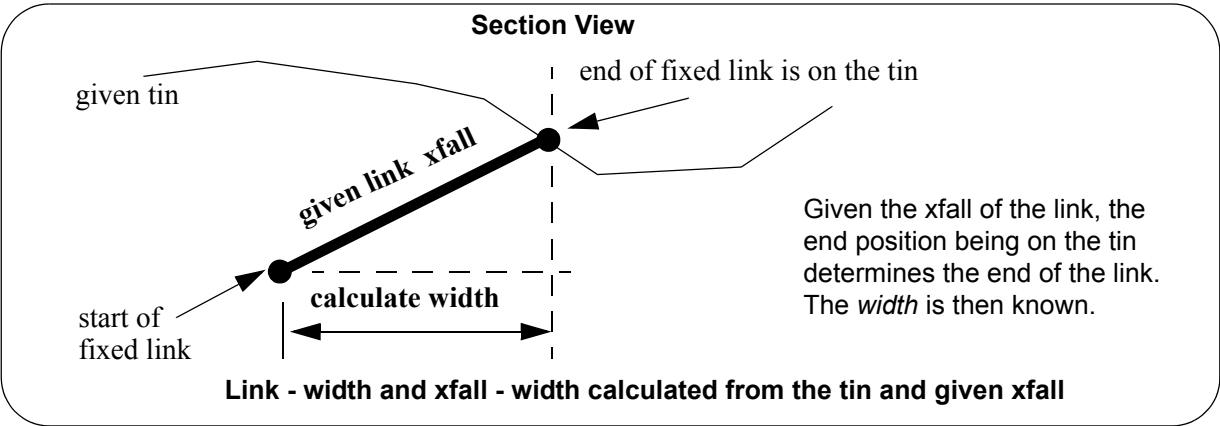
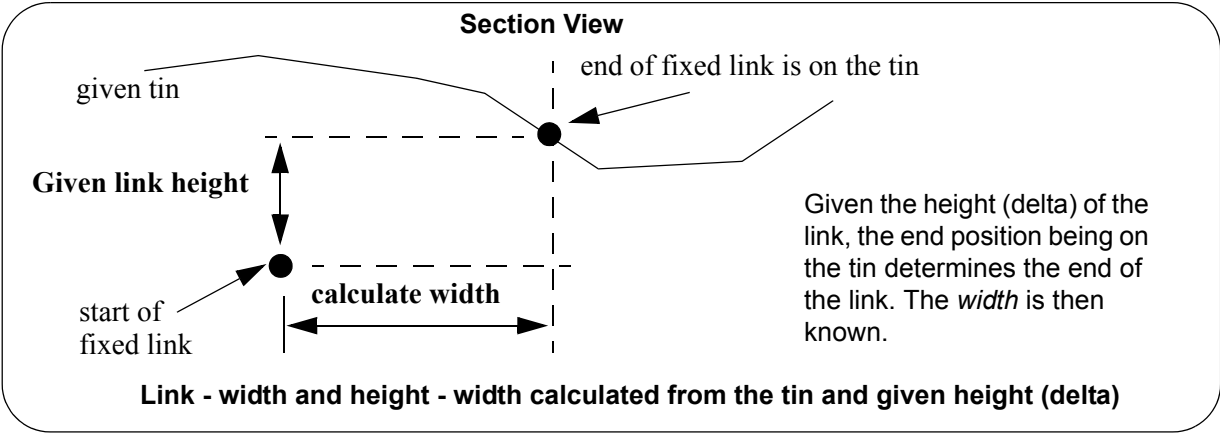


For *Width/Height/Xfall to tin*, go to the next section [Fixed Link - Modify Width, Height or Xfall to Sit on User Tin](#)

Fixed Link - Modify Width, Height or Xfall to Sit on User Tin

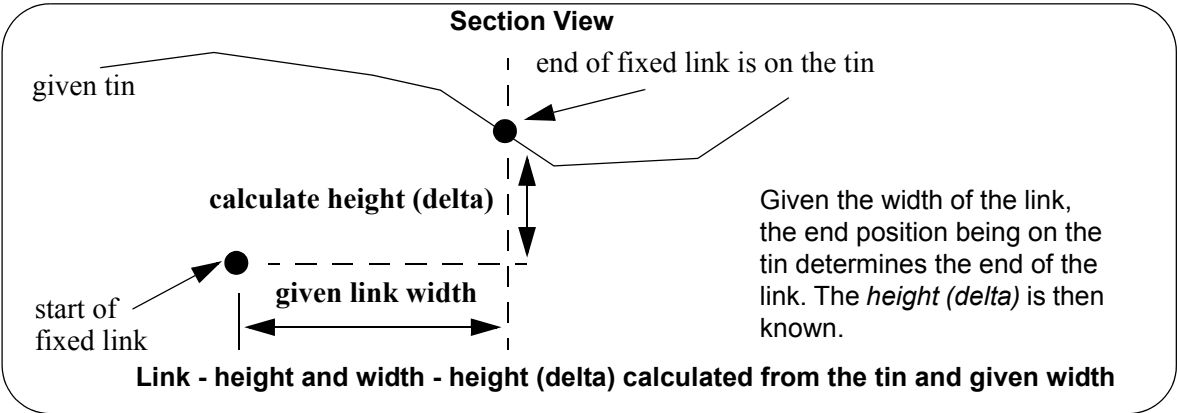
Width to Tin

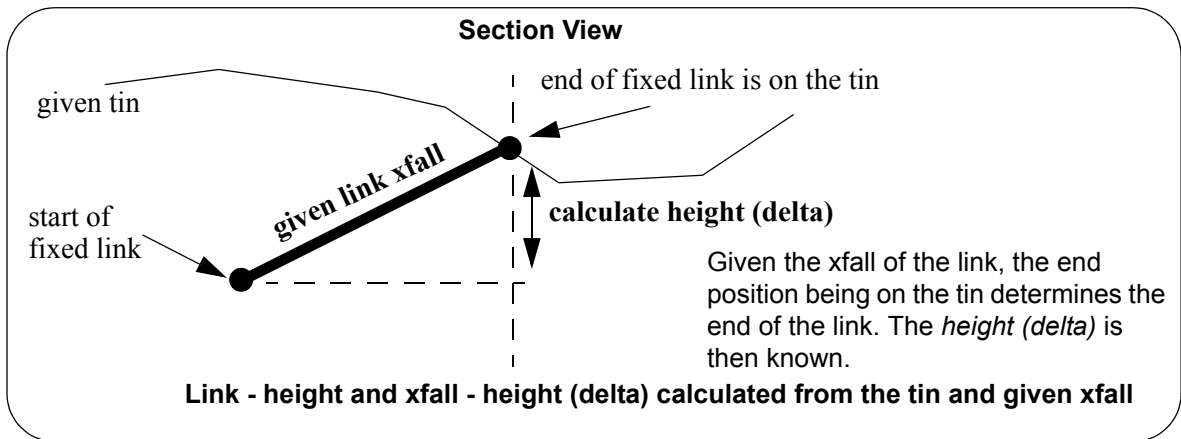
For a fixed link defined by *width* and *height* or *width* and *xfall*, **Width to tin** calculates the **width** of the link as the width required so that the link will sit on the user given tin at the **height/xfall given in the link**. The option gives an error for a link defined by *height* and *xfall*.



Height to Tin

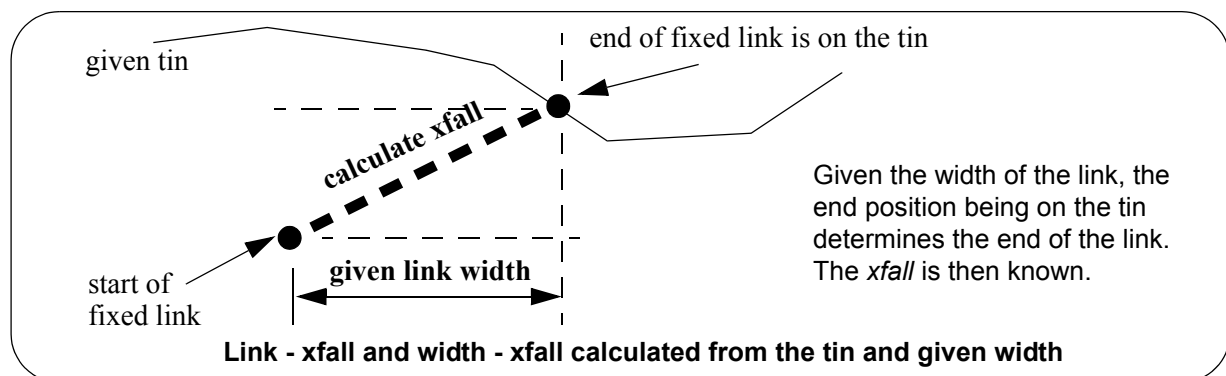
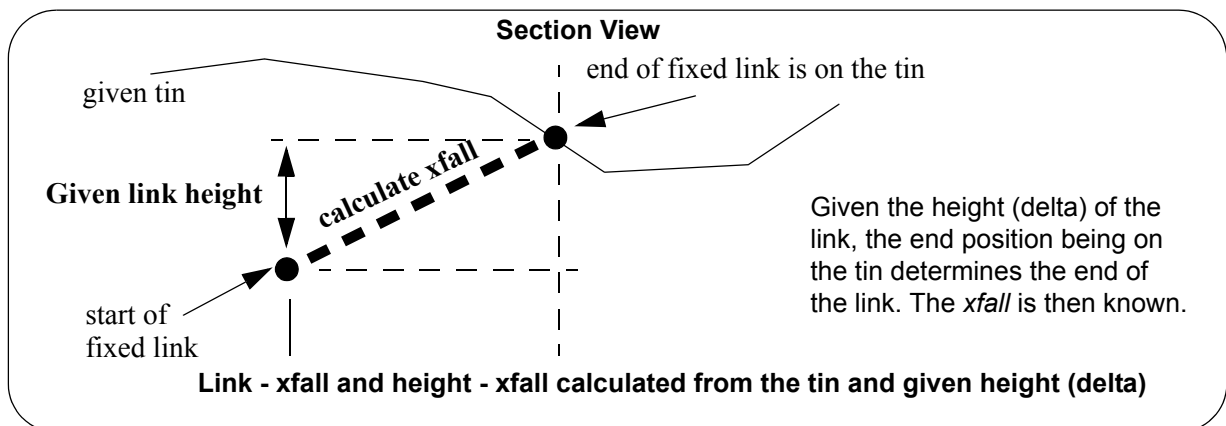
For a fixed link defined by *height* and *width* or *height* and *xfall*, the **Height to tin** calculates the **height** of the link as the difference in the height of the start point of the link, and the height that is required so that the link will sit on the user tin at the **width/xfall given in the link**. The option gives an error for a link defined by *width* and *xfall*.





Xfall to Tin

For a fixed link defined by *xfall* and *width* or *xfall* and *height*, **Xfall to tin** calculates the *xfall* of the link as the *xfall* required so that the link will sit on the user tin at the ***width/height given in the link***. The option gives an error for a link defined by *width* and *height*.



Selecting **Width to tin**, **Height to tin**, or **Xfall to tin** brings up the **Fixed - Modify Width to Tin**, **Fixed - Modify Height to Tin** and **Fixed - Modify Xfall to Tin** panels respectively.

Fixed - Modify Width to Tin

Link name

Start mode

Start (ref)

End mode

End (ref)

Interval

Tin

Extra start

☒

Extra end

☒

Comment

Active

☒

OK

Apply

Finish

Help

Fixed - Modify Height to Tin

Link name

Start mode

Start (ref)

End mode

End (ref)

Interval

Tin

Extra start

☒

Extra end

☒

Comment

Active

☒

OK

Apply

Finish

Help

Fixed - Modify XFall to Tin

Link name

Start mode

Start (ref)

End mode

End (ref)

Interval

Tin

Extra start

☒

Extra end

☒

Comment

Active

☒

OK

Apply

Finish

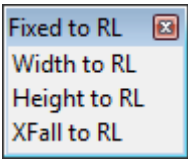
Help

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name <i>name of the link to modify.</i>	input		select name menu
Start/End mode <i>defines the start/end chainages for modifying the link</i> <i>For more information on Start/End mode, see Start and End Chainages</i>	choice box	Start (ref)/End (ref)	
Interval <i>if non blank, the interval to use to create cross sections and strings over the given chainage range.</i> <i>If blank, the Section separation value from the Apply Many panel is used.</i>	input		
Tin <i>the tin to use for defining the width/height/xfall</i>	input		available tins
Extra start/end <i>if ticked, add an extra x-section 0.1 mm before the start/end chainage.</i>	tick box		
Comment <i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>	input		
Active <i>if ticked, use this modifier.</i> <i>if not ticked, don't use this modifier.</i>	tick box	tick	
OK/Apply OK stores the values in the fields and removes the panel. Apply stores the values and leaves the panel on the screen.	button		
Continue to the next section Fixed Link - to RL or return to Fixed Link Modifiers or Modifiers in MTF Edit .			

Fixed Link - to RL

The **fixed to RL** walk-right brings up the **fixed to RL** menu with options to calculate the width, xfall or height to get to a given RL.



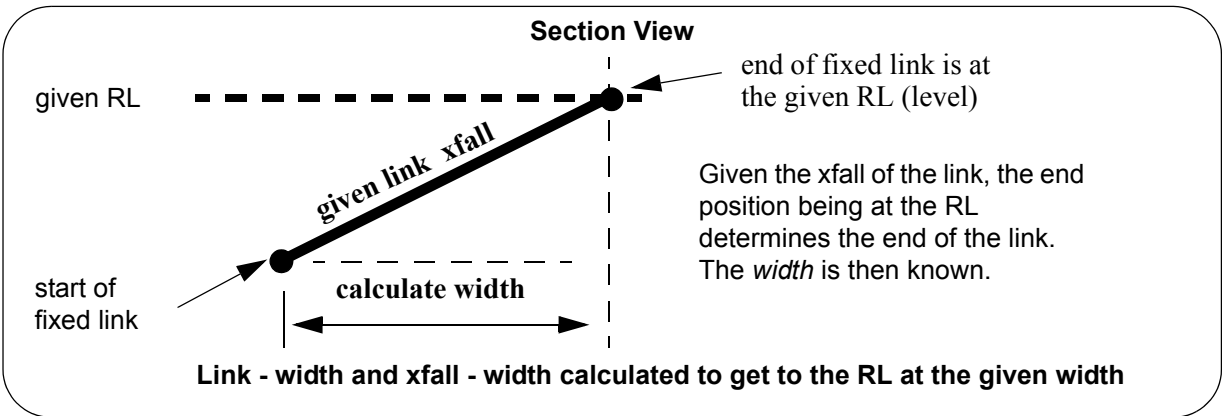
For *Width/Height/Xfall to tin*, go to the next section [Fixed Link - Modify Width, Height or Xfall to Get to an RL](#)

Fixed Link - Modify Width, Height or Xfall to Get to an RL

Width to RL

The **Modify Width to RL**, only applies to links defined by *Width and Xfall* NOT *Width and Height* or *Xfall and Height*.

For a fixed link defined by *width* and *xfall*, **Modify Width to RL** calculates the **width** required for the link to end at the given RL using the *xfall given in the link*.

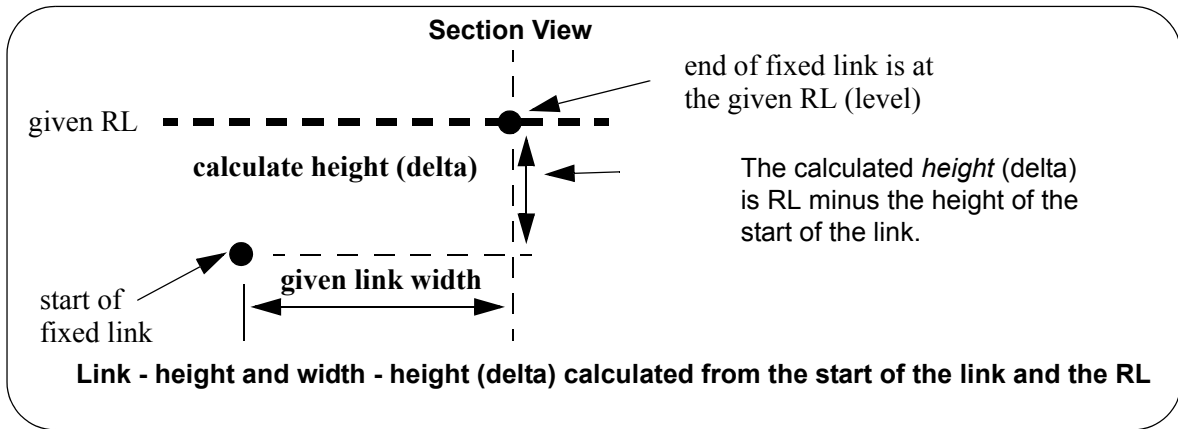


The **Modify Width to RL** gives an error for a link defined by *width and height* or *xfall and height*.

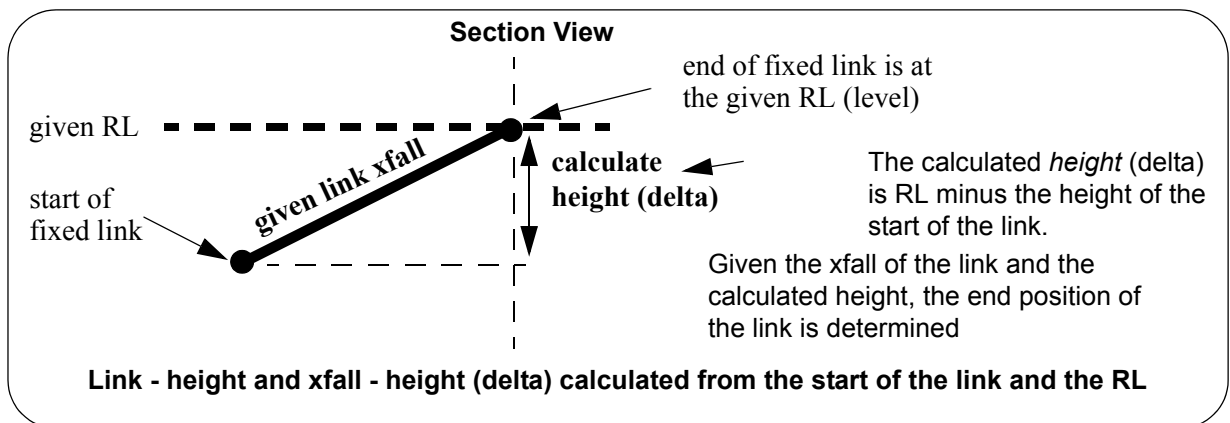
Height to RL

The **Modify Height to RL**, only applies to links defined by *Width and Height* and *Height* NOT *Width and Xfall*.

For a fixed link defined by *height and width*, the **Modify Height to RL** calculates the **height** required for the link to end at the given RL using the *width given in the link*. That is, the difference in the height of the start point of the link, and the height that is required so that the link will sit on the RL at the *given width*.



For a fixed link defined by *height* and *xfall*, the **Modify Height to RL** calculates the *height* required for the link to end at the given RL using the *xfall given in the link*. That is, the difference in the height of the start point of the link, and the height that is required so that the link will sit on the RL at the *given xfall*.

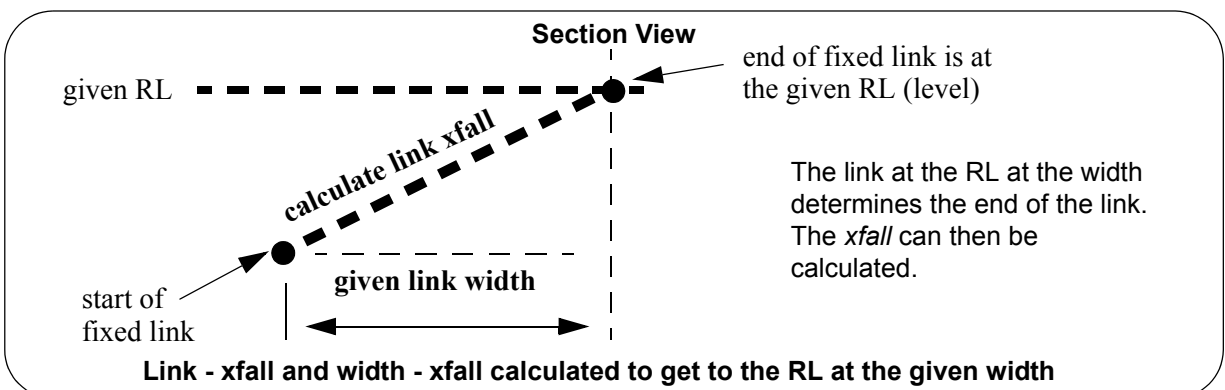


The **Modify Height to RL** gives an error for a link defined by *width* and *xfall*.

Xfall to RL

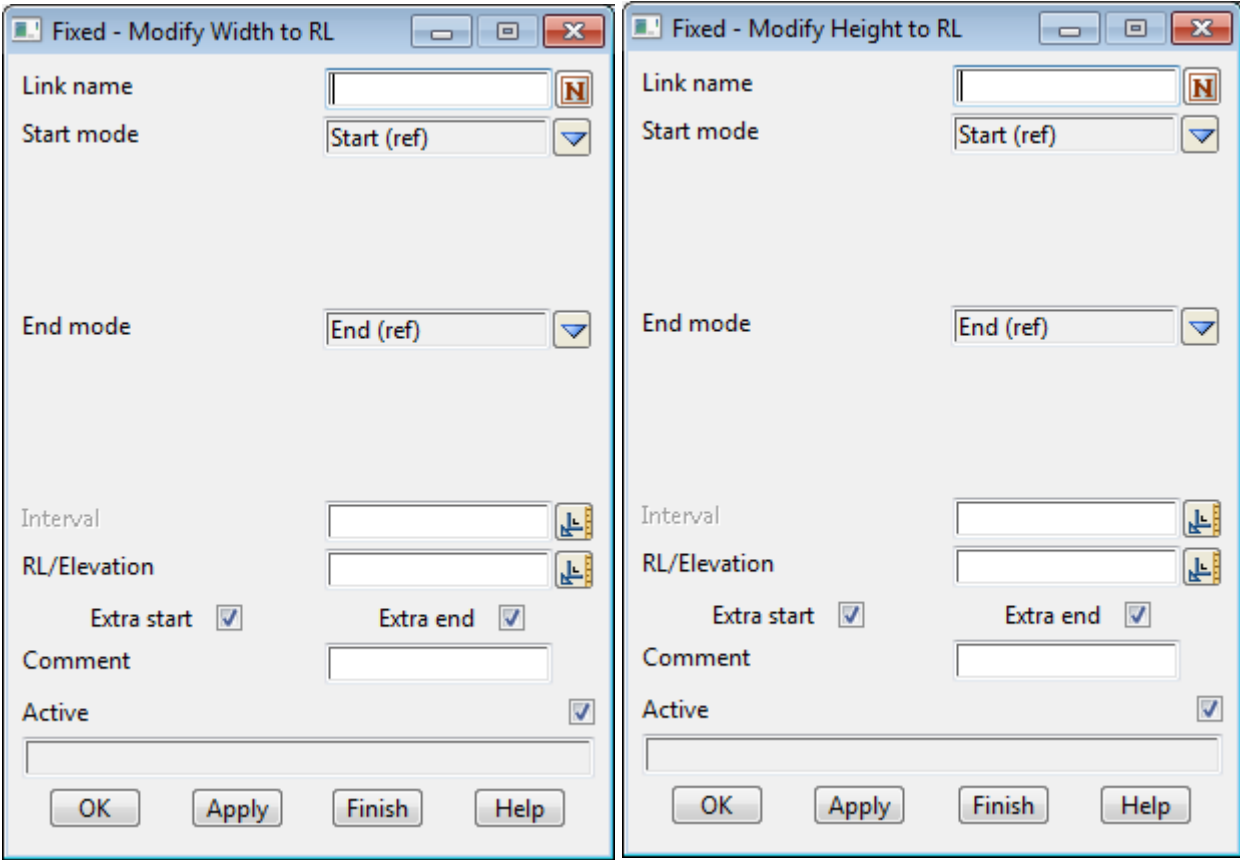
The **Modify Xfall to Get an RL**, only applies to links defined by *Xfall* and *Width*, NOT *Xfall* and *Height* or *Width* and *Height*.

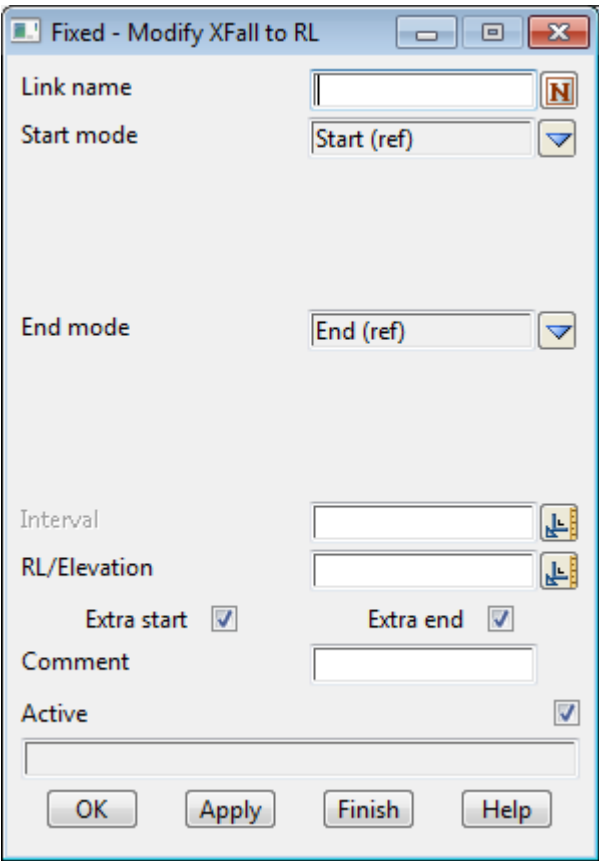
For a fixed link defined by *xfall* and *width*, **Modify Xfall to RL** calculates the *xfall* of the link required for the link to end at the given RL using the *width given in the link*.



The **Modify Xfall to RL** gives an error for a link defined by *xfall* and *height*, or *width* and *height*.

Selecting **Width to RL**, **Height to RL**, or **Xfall to RL** brings up the **Fixed - Modify Width to RL**, **Fixed - Modify Height to RL** and **Fixed - Modify Xfall to RL** panels respectively.





The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name <i>name of the link to modify.</i>	input		select name menu
Start/End mode <i>defines the start/end chainages for modifying the link</i> <i>For more information on Start/End mode, see Start and End Chainages</i>	choice box	Start (ref)/End (ref)	
Interval <i>if non blank, the interval to use to create cross sections and strings over the given chainage range.</i> <i>If blank, the Section separation value from the Apply Many panel is used.</i>	input		
RL/Elevation <i>the RL (Elevation) to be reached at the end of the link.</i>	double box		
Extra start/end <i>if ticked, add an extra x-section 0.1 mm before the start/end chainage.</i>	tick box		
Comment <i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>	input		
Active <i>if ticked, use this modifier.</i> <i>if not ticked, don't use this modifier.</i>	tick box	tick	
OK	button		

OK stores the values in the fields and removes the panel BUT no **recalc** is done.

Apply button

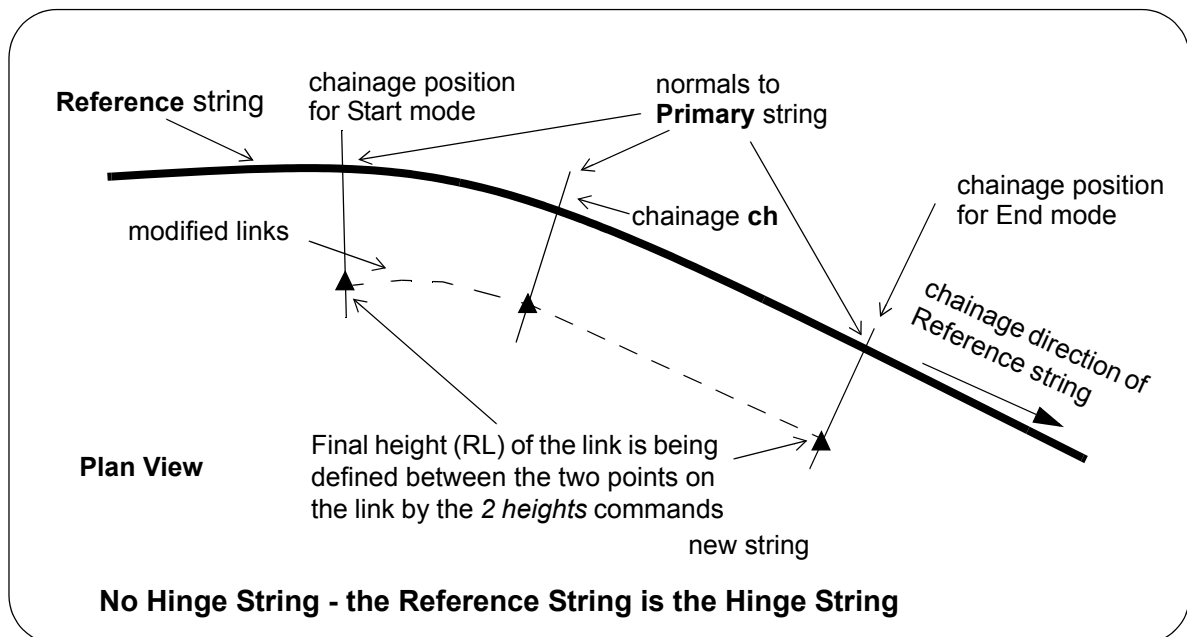
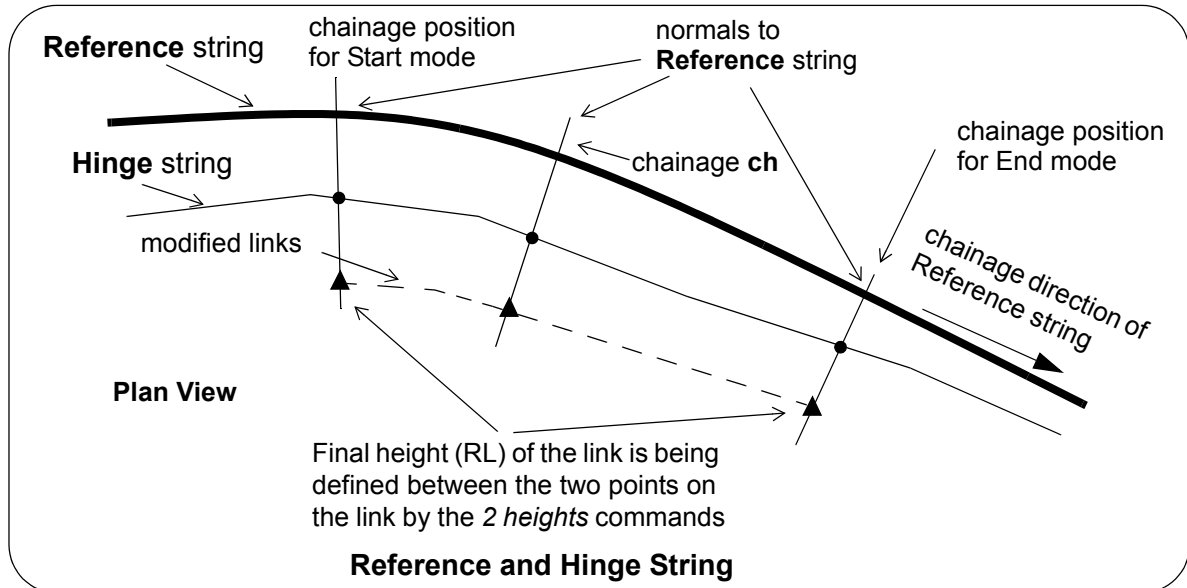
Apply stores the values and leaves the panel on the screen.

If the **MTF** is being used in an **Apply Many MTF** and **Auto recalc** is ticked in the MTF, then whenever the **Apply** button is clicked, a **recalc** of the associated **Apply Many** for the MTF is done.

Continue to the next section [Fixed Link - to Two Heights](#) or return to [Fixed Link Modifiers](#) or [Modifiers in MTF Edit](#).

Fixed Link - to Two Heights

For an existing link, the **to 2 heights** option has a number of methods for **defining the height** from the start mode chainage to the end mode chainage. For example, over the chainage range, the height can be interpolated between two given RL's.

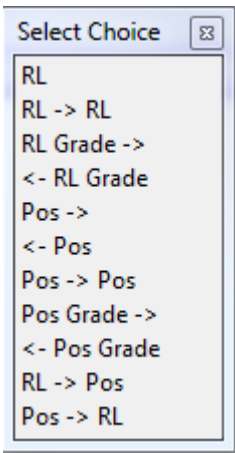


The modifier is similar to the *Width/Height/Xfall to RL* modifiers except that the RL is not constant between the vertex on the normal at *Start mode* and the vertex on the normal at *End mode*, but is determined by a given formula for the normal at each chainage value between *Start mode* and *End mode*.

In the Two Heights modifiers, the formula for the height is **not** given in the chainage of the Reference string, **but in terms of the chainage along the modified string**.

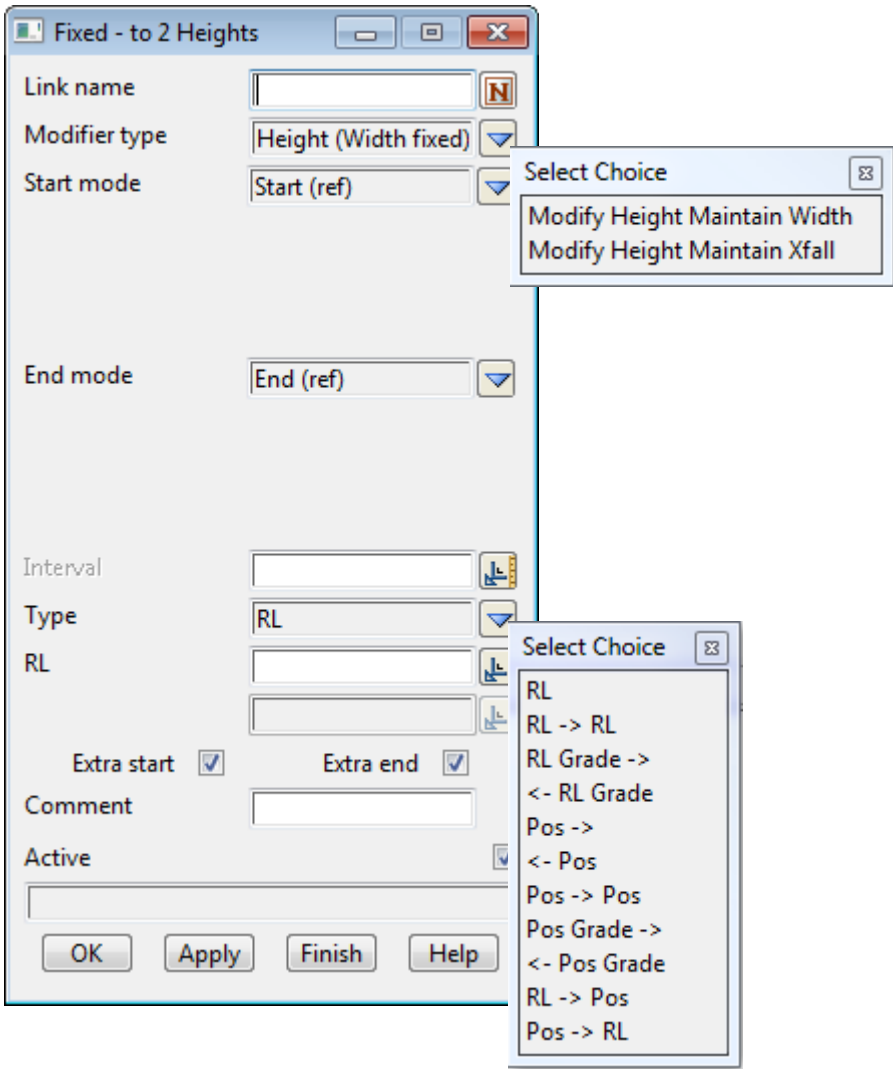
Note: the **2 Strings** modifiers work with two points in a **section**. See [Fixed Link - to Two Strings](#).

The different methods for calculating the RL at each chainage are:



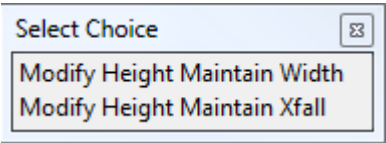
and for the definitions go to [Fixed - Calculating the Heights for each Type](#).

Selecting to 2 heights brings up the **Fixed - to 2 Heights** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name <i>name of the link to modify.</i>	input		select name menu
Modifier type	choice box		

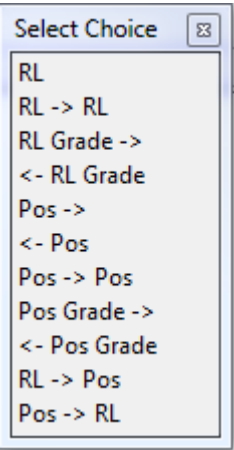


The **Maintain** Xfall/Width is the part of the new definition of the selected link that is taken from the selected **Link name**. See [Fixed - Maintaining Width or Xfall](#).
The **Height** for the selected link is calculated by the method given by **Type**.

Start/End mode <i>defines the start/end chainages for modifying the link. For more information on Start/End mode, see Start and End Chainages.</i>	choice box	Start (ref)/End (ref)
----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	------------	-----------------------

Interval <i>if non blank, the interval to use to create cross sections and strings over the given chainage range. If blank, the Section separation value from the Apply Many panel is used.</i>	input
-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-------

Type	choice box
-------------	------------



For the calculation of height for each type, go to [Fixed - Calculating the Heights for each Type](#)

Extra start/end	tick box	
<i>if ticked, add an extra x-section 0.1 mm before the start/end chainage.</i>		
Comment	input	
<i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>		
Active	tick box	tick
<i>if ticked, use this modifier.</i>		
<i>if not ticked, don't use this modifier.</i>		

OK <i>OK stores the values in the fields and removes the panel BUT no recalc is done.</i>	button
-------------------------------------------------------------------------------------------------------------------	--------

Apply <i>Apply stores the values and leaves the panel on the screen. If the MTF is being used in an Apply Many MTF and Auto recalc is ticked in the MTF, then whenever the Apply button is clicked, a recalc of the associated Apply Many for the MTF is done.</i>	button
-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--------

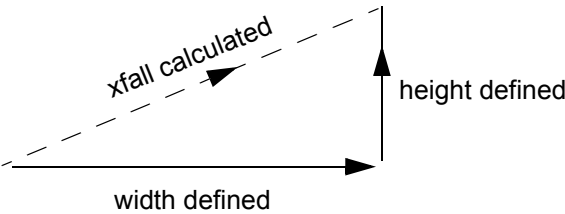
Fixed - Maintaining Width or Xfall

The option **to 2 heights** defines the **height** of the selected string so to completely define the link, only the width or the xfall is needed.

So from the selected link only the **width** or the **xfall** is used (maintained) - the height is calculated by the **to 2 heights** option.

If the selected link is defined by **width and height**, then at any chainage a **xfall** can be calculated from the width and height at that chainage.

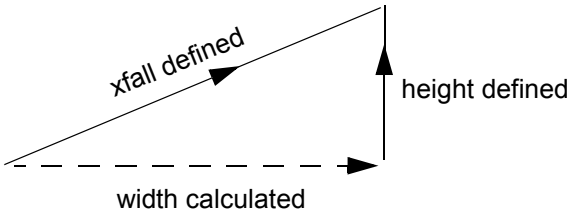
Section View



For links defined by width and height, the **xfall** at each chainage is uniquely defined

If the selected link is defined by **xfall and height**, then at any chainage a **width** can be calculated from the xfall and height at that chainage.

Section View

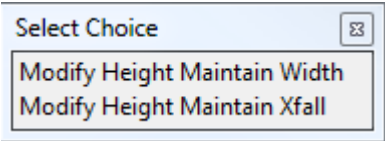


For links defined by xfall and height, the **width** at each chainage is uniquely defined

Hence it doesn't matter if the selected link is defined by **width and xfall**, **width and height**, or **xfall and height**, at each chainage a **width and xfall** are uniquely defined.

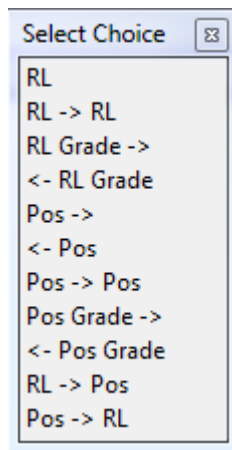
So no matter how the selected link is defined, at any chainage, a unique width or a xfall is known and it is that **Width** or **Xfall** can be maintained by the **to 2 heights** option.

So the choices for the option are:



Continue to the next section [Fixed Link - to Two Strings](#) or return to [Fixed Link - to Two Heights](#), [Fixed Link Modifiers](#) or [Modifiers in MTF Edit](#).

Fixed - Calculating the Heights for each Type



for the definitions of the calculations for each choice

go to if RL: keep a given RL

if RL -> RL: interpolate between two given RL's

if RL Grade ->: start with a given Start RL and continue on the line at grade Grade->

if <- RL Grade: all points are on a line with given grade and going through End RL

if Pos ->: all points have the same height as the start point

if <- Pos: all points have the same height as the end point

if Pos-> Pos: interpolate between the calculated start and end heights

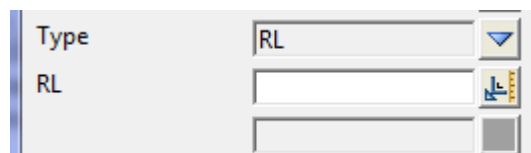
if Pos Grade ->: start with the calculated height and continue at a given grade

if <- Pos Grade: all points are on a line of given grade and going through the end point

if RL -> Pos: interpolate between a given start RL & the calculated end height

if Pos -> RL: interpolate between the calculated start height and a given RL at the end

if RL: keep a given RL



At the vertex of the link on the normal at each chainage *ch* between the **Start mode** and **End Mode**, the height at *ch* is that given in the **RL** panel field.

Hence the height is the same for all modified vertices between the *Start mode* and the *End mode*.

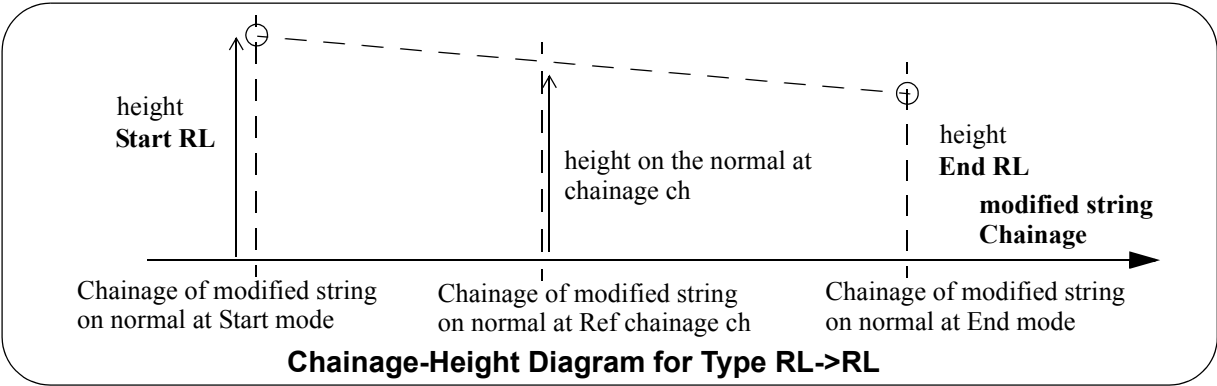
The modifiers of *Type RL* then work the same as the modifiers "*Width/Xfall/Height to RL*" with the RL being the *given RL* (see [Fixed Link - Modify Width, Height or Xfall to Get to an RL](#)).

if RL -> RL: interpolate between two given RL's

Type	RL -> RL	
Start RL		
End RL		

At each chainage ch between the **Start mode** and **End Mode**, the vertex of the modified string is on the normal to the Reference string at chainage ch.

The height at of the vertex on the normal to Reference chainage ch, is the *linear interpolation* of height with respect to the string being modified, between the given *Start RL* and the *End RL*.



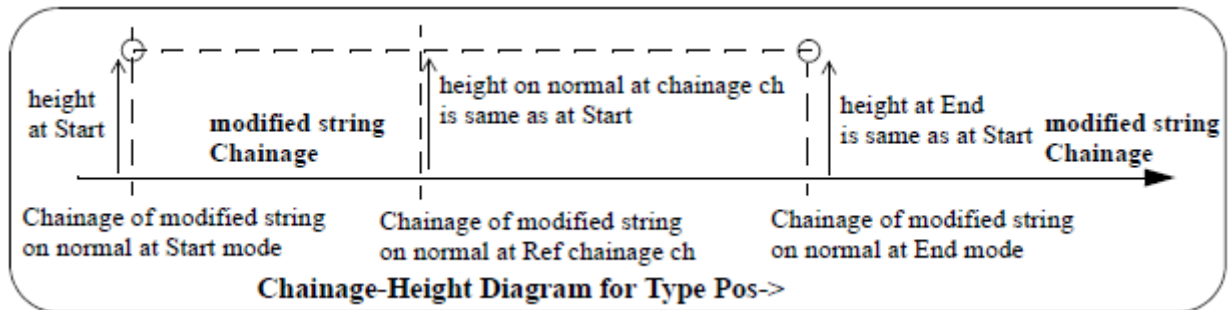
Hence for the modifiers of Type **RL->RL**, the calculations at chainage ch are the same as the modifiers "Width/Height/Xfall to RL" with the RL being the interpolated RL at chainage ch (see [Fixed Link - Modify Width, Height or Xfall to Get to an RL](#)).

if Pos ->: all points have the same height as the start point

Type	Pos ->	

First let **Start RL** be the actual height calculated at the vertex of the string at the normal to **Start mode** when all the modifiers before this modifier are applied.

Then for all vertices on the normals between **Start mode** and **End Mode**, the height of the vertex equal to **Start RL**.



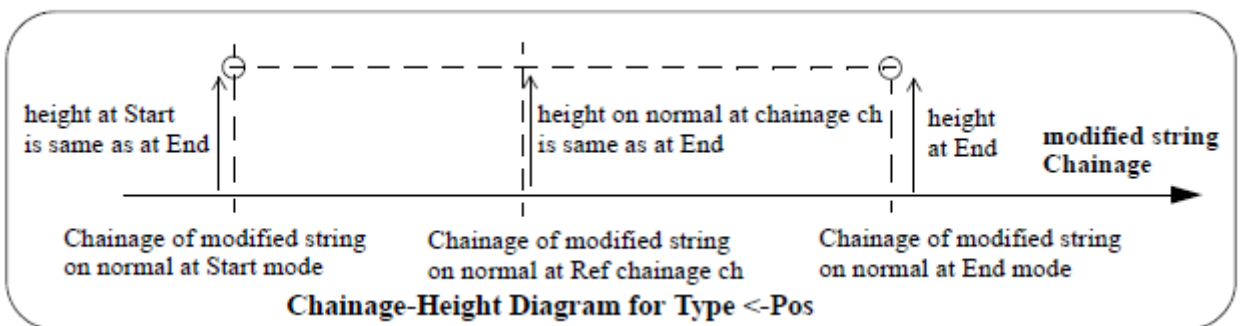
Hence the modifiers for Type **Pos->** are the same as the modifiers "Width/Xfall/Height to the RL" with RL being the Start RL (see [Fixed Link - Modify Width, Height or Xfall to Get to an RL](#)).

if <- Pos: all points have the same height as the end point



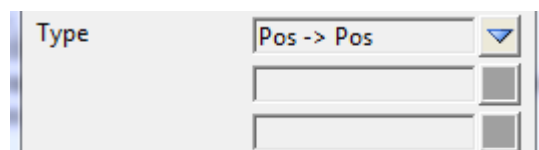
First let **End RL** be the actual height calculated at the vertex of the string at the normal to **End mode** when all the modifiers before this modifier are applied.

Then for all vertices on the normals between the **Start mode** and **End Mode**, the height of the vertex is equal to **End RL**.



Hence the modifiers for Type **<-Pos** are the same as the modifiers "Width/Xfall/Height to the RL" with RL being the End RL (see [Fixed Link - Modify Width, Height or Xfall to Get to an RL](#)).

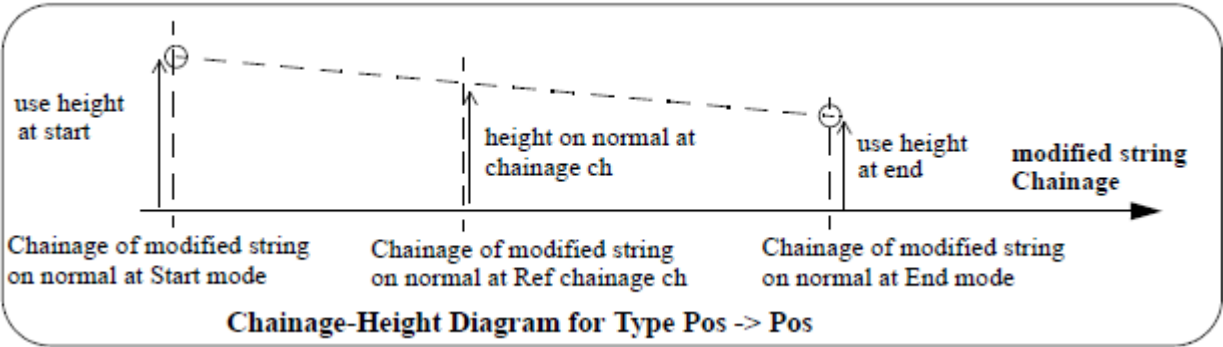
if Pos-> Pos: interpolate between the calculated start and end heights



First let **Start RL** be the actual height calculated at the vertex of the string at the normal to **Start mode** when all the modifiers before this modifier are applied.

Let **End RL** be the actual height calculated at the vertex of the string at the normal to **End mode** when all the modifiers before this modifier are applied.

Then for each vertex on the normals between **Start mode** and **End Mode**, the height of the vertex is the linear interpolation **with respect to modified string chainage** between the *Start RL* and the *End RL*.



Hence for the modifiers of *Type Pos -> Pos*, the calculations at chainage ch are the same as the modifiers "Width/Height/Xfall to RL" with the RL being the interpolated RL at chainage ch (see [Fixed Link - Modify Width, Height or Xfall to Get to an RL](#)).

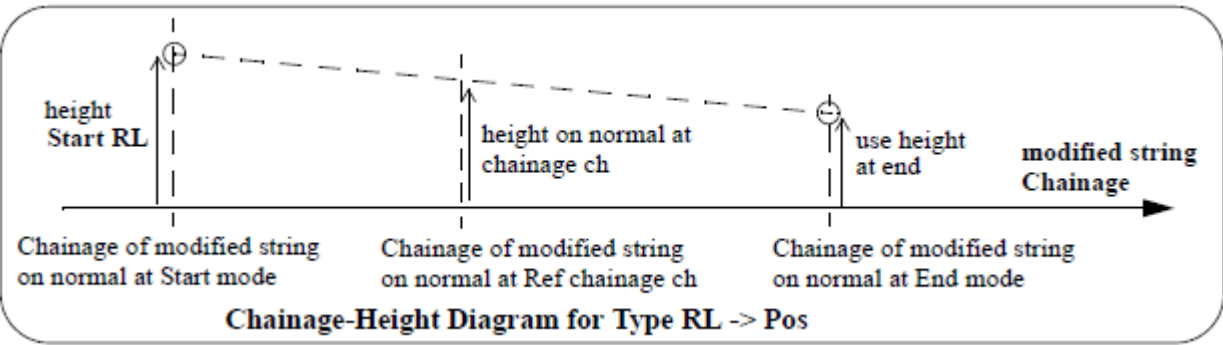
if RL -> Pos: interpolate between a given start RL & the calculated end height

Type	RL -> Pos	
Start RL	<input type="text"/>	
	<input type="text"/>	

The height at the vertex on the normal at **Start mode** is the given **Start RL**.

And **End RL** is the **actual** height calculated at the vertex on the modified string at the normal at **End mode** when all the modifiers before this modifier are applied.

Then at each vertex on the normals between **Start mode** and **End Mode**, the height of the vertex is the linear interpolation **with respect to modified string chainage** between the *Start RL* and the *End RL*.



Hence for the modifiers of *Type RL -> Pos*, the calculations at chainage ch are the same as the modifiers "Width/Height/Xfall to RL" with the RL being the interpolated RL at chainage ch (see [Fixed Link - Modify Width, Height or Xfall to Get to an RL](#)).

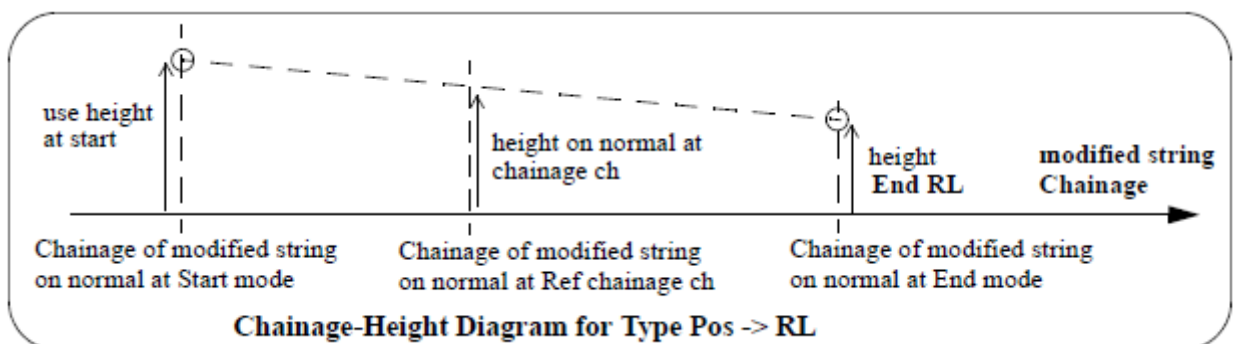
if Pos -> RL: interpolate between the calculated start height and a given RL at the end

Type	Pos -> RL	
End RL		

Start RL is the **actual** height calculated at the vertex on the normal at **Start mode** when all the modifiers before this modifier are applied.

The height at the vertex on the normal at **End mode** is the given **End RL**.

Then at each vertex on the normals between **Start mode** and **End Mode**, the height of the vertex is the linear interpolation **with respect to modified string chainage** between the *Start RL* and the *End RL*.



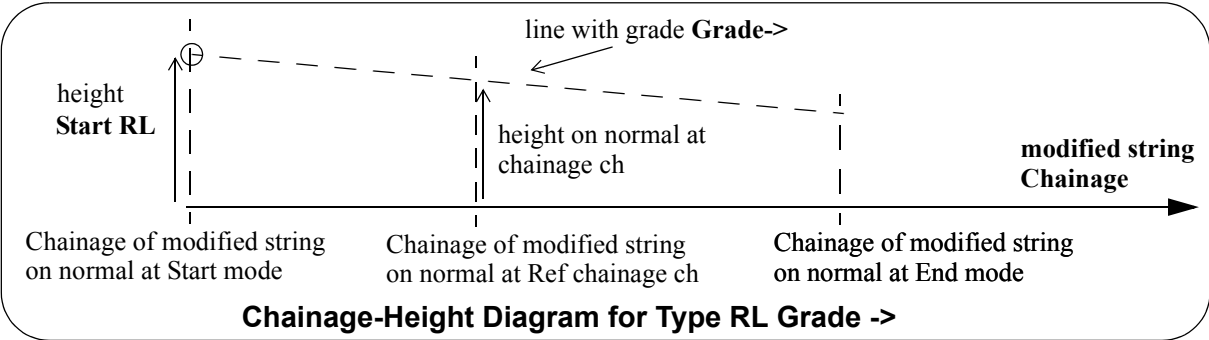
Hence for the modifiers of Type **Pos -> RL**, the calculations at chainage ch are the same as the modifiers "Width/Height/Xfall to RL" with the RL being the interpolated RL at chainage ch (see [Fixed Link - Modify Width, Height or Xfall to Get to an RL](#)).

if RL Grade ->: start with a given Start RL and continue on the line at grade Grade->

Type	RL Grade ->	
Start RL		
Grade ->		

The height at the vertex on the normal at **Start mode** is the **Start RL**.

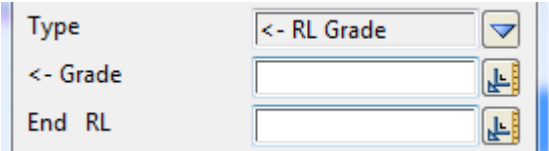
For each normal between the *Start mode* and the *End Mode*, the height of the vertex is on the line with grade **Grade->** with respect to the modified string, and going through the point (normal at Start mode, Start RL).



Hence for the modifiers of **Type RL Grade ->**, the calculations at chainage **ch** are the same as the modifiers "Width/Height/Xfall to RL" with the RL being that calculated at **ch** using the **Start RL** and the **Grade->** (see [Fixed Link - Modify Width, Height or Xfall to Get to an RL](#)).

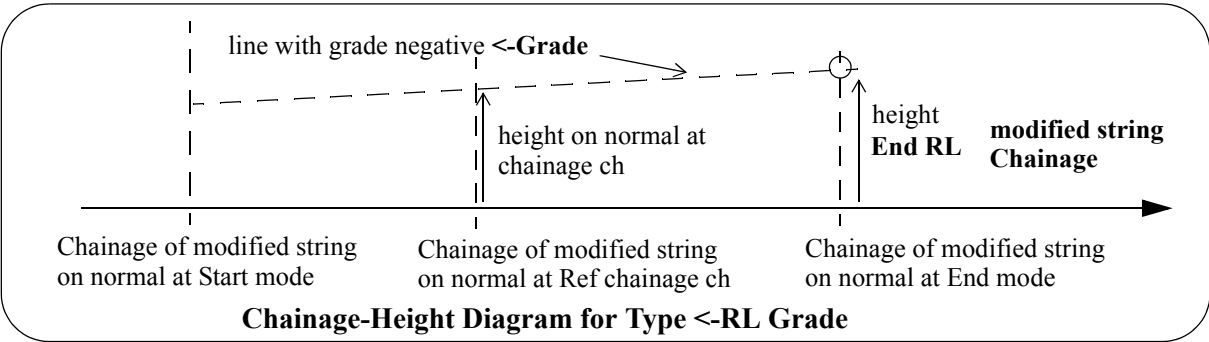
Important Note: Grade is calculated using **increasing Reference chainages**.

if <- RL Grade: all points are on a line with given grade and going through End RL



The height on the vertex at **End mode** is **End RL**.

For each normal between the **Start mode** and the **End Mode**, the height of the vertex is on the line with grade of negative **<-Grade** with respect to the modified string chainage, and going through the point (normal at End mode, End RL).



Hence for the modifiers for **Type <-RL Grade**, the calculations at chainage **ch** are the same as the modifiers "Width/Height/Xfall to RL" with the RL being that calculated at **ch** using the **End RL** and the **Grade** (see [Fixed Link - Modify Width, Height or Xfall to Get to an RL](#)).

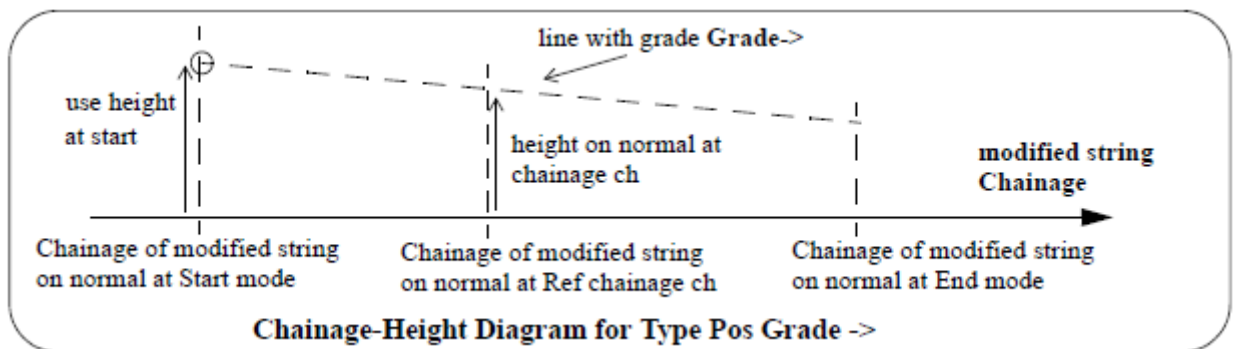
Important Note: **<-Grade** is calculated using **decreasing Alignment chainages**. So in a diagram with increasing chainage, the grade is negative **<-Grade**.

if Pos Grade ->: start with the calculated height and continue at a given grade

Type	Pos Grade ->	
Grade ->		

First let **Start RL** be the actual height calculated at the vertex on the normal at **Start mode** when all the modifiers before this modifier are applied.

Then the height of each vertex on each normal between the *Start mode* and the *End Mode* is on the line with grade **Grade->** with respect to the modified string chainage, and going through the point (normal at Start mode, Start RL).



Hence for the modifiers of Type **Pos Grade->**, the calculations at chainage ch are the same as for the modifiers "Width/Height/Xfall to RL" with the RL being calculated at ch using the **Start RL** and the **Grade** (see [Fixed Link - Modify Width, Height or Xfall to Get to an RL](#)).

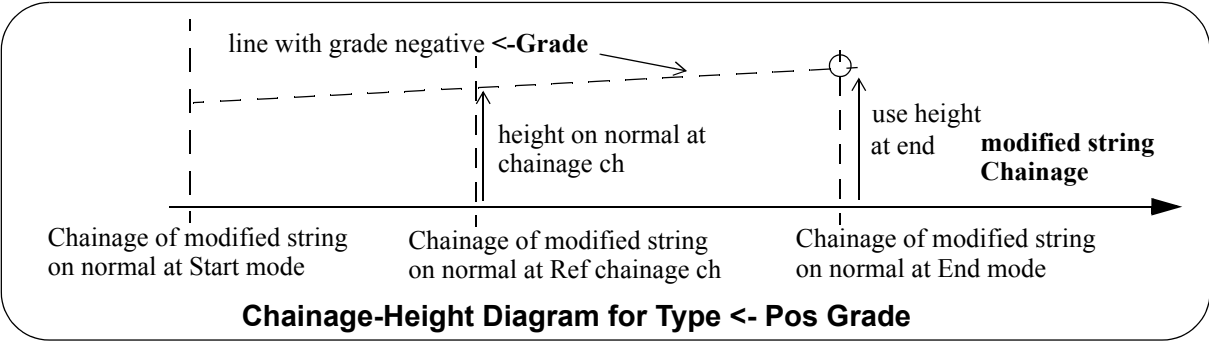
Important Note: Grade is calculated using **increasing Alignment chainages**.

if <- Pos Grade: all points are on a line of given grade and going through the end point

Type	<- Pos Grade	
<- Grade		

First let **End RL** be the actual height on the vertex on the normal at **End mode** when all the modifiers before this modifier are applied.

Then the height of each vertex on the normals between the *Start mode* and the *End Mode* is on the line with grade of negative **<-Grade** with respect to the modified string chainage, and going through the point (normal at End mode, End RL).



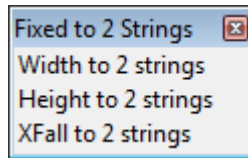
Hence for the modifiers of *Type <- Pos Grade*, the calculations at chainage ch are the same as the modifiers "Width/Height/Xfall to RL" with the RL being calculated at ch using the **End RL** and the **<-Grade** (see [Fixed Link - Modify Width, Height or Xfall to Get to an RL](#)).

Important Note: <-Grade is calculated using **decreasing Alignment chainages** and the **heights at the points** along the string being modified. So in a diagram with increasing chainage, the grade is negative **<-Grade**.

Continue to the next section [Fixed Link - to Two Strings](#) or return to [Fixed - Calculating the Heights for each Type](#), [Fixed Link - to Two Heights](#), [Fixed Link Modifiers](#) or [Modifiers in MTF Edit](#).

Fixed Link - to Two Strings

The **fixed to 2 strings** walk-right brings up the **fixed to 2 Strings** menu with options to calculate the width, xfall or height from two given strings.



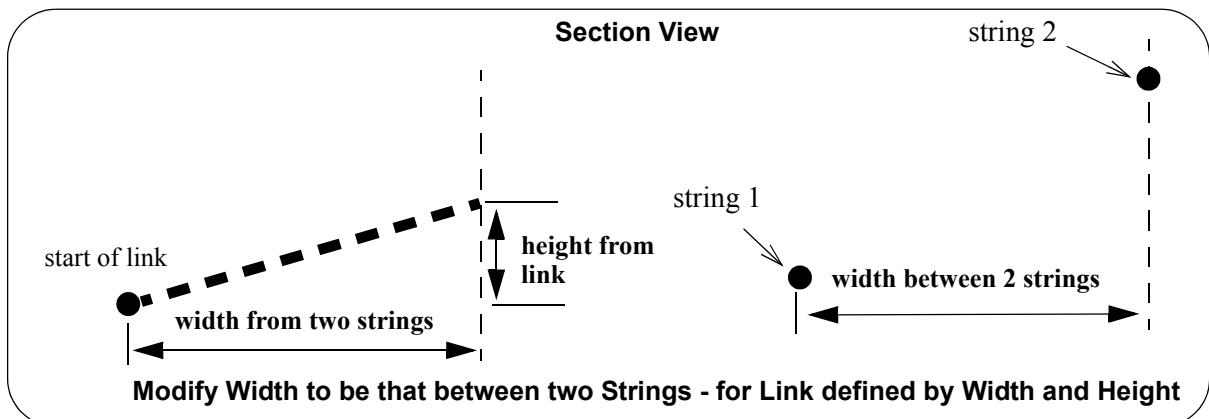
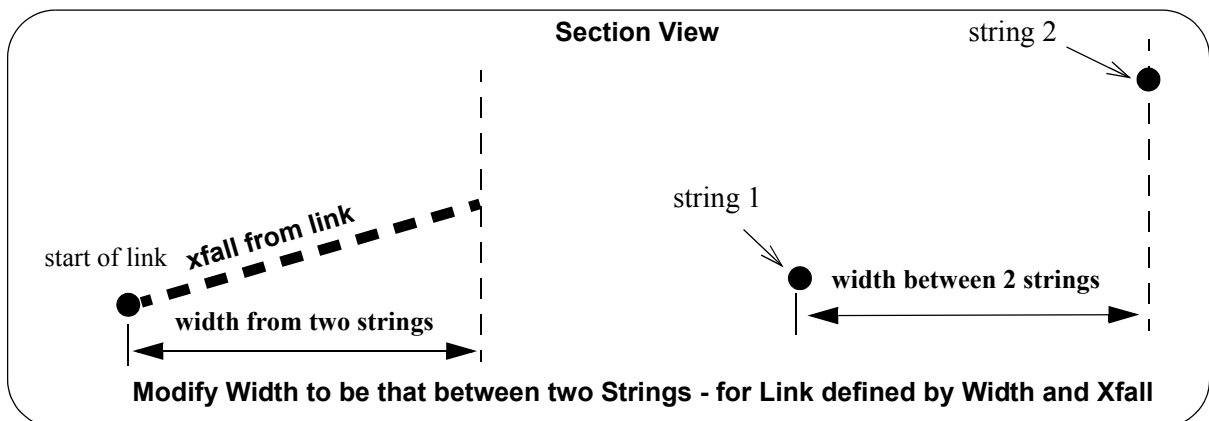
For *Width/Height/Xfall to 2 Strings*, go to the next section [Fixed Link - Width, Height or Xfall between Two Strings](#)

Fixed Link - Width, Height or Xfall between Two Strings

Width Between Two Strings

For a fixed link defined by *width* and *height* or *width* and *xfall*, **Width to 2 strings** sets the **width** for a link to be the **width between two** existing **12d Model** strings,

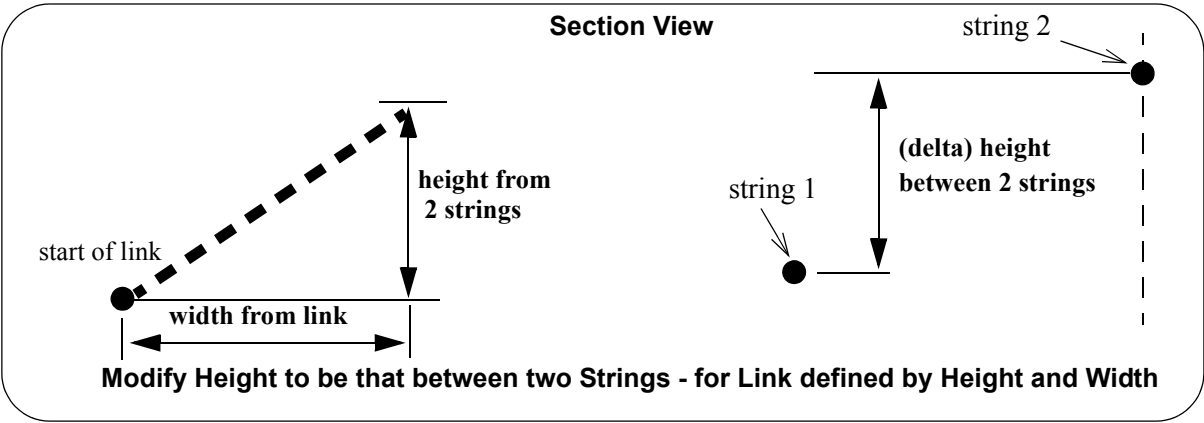
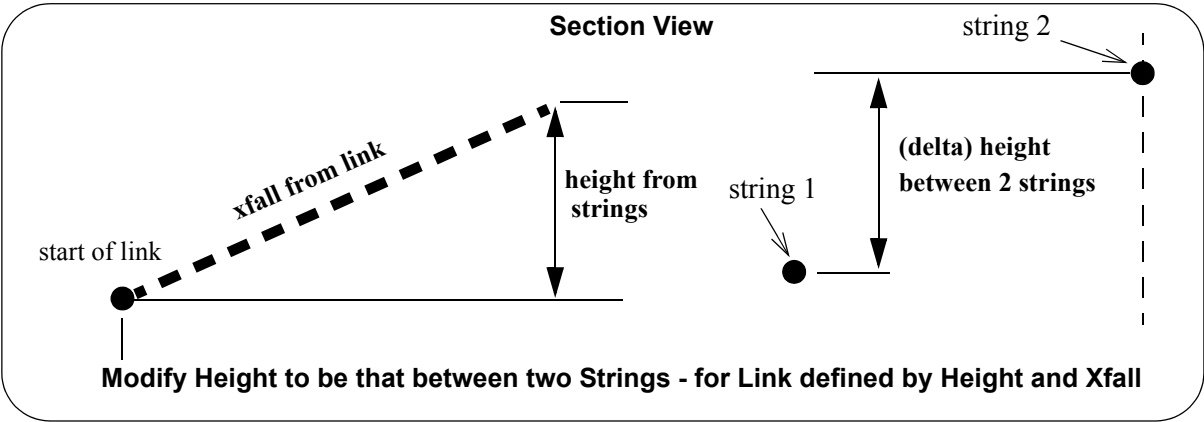
The option will give an error for a link defined by *height* and *xfall*.



Height Between Two Strings

For a fixed link defined by *height* and *width* or *height* and *xfall*, **Height to 2 strings** sets the **height** for the link to be the **height between two** existing **12d Model** strings,

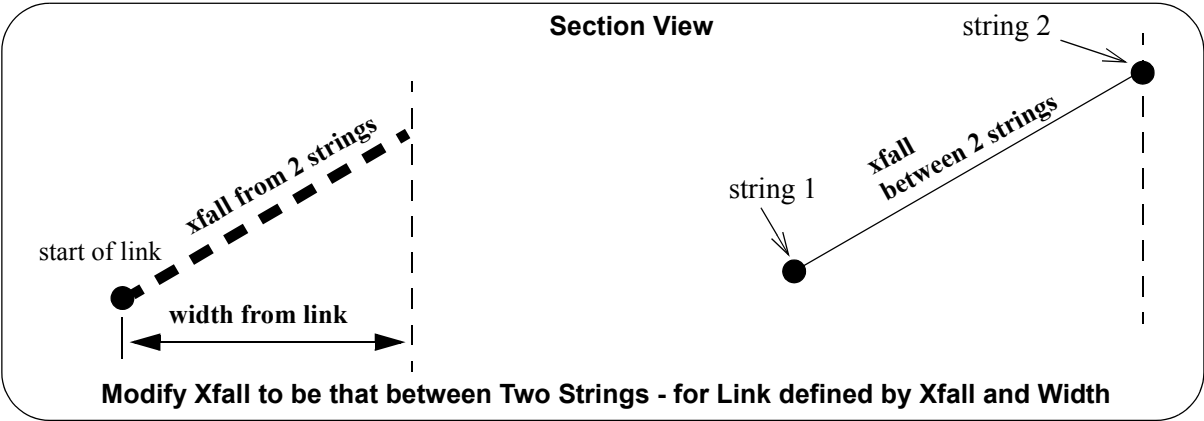
The option will give an error for a link defined by *width* and *xfall*.

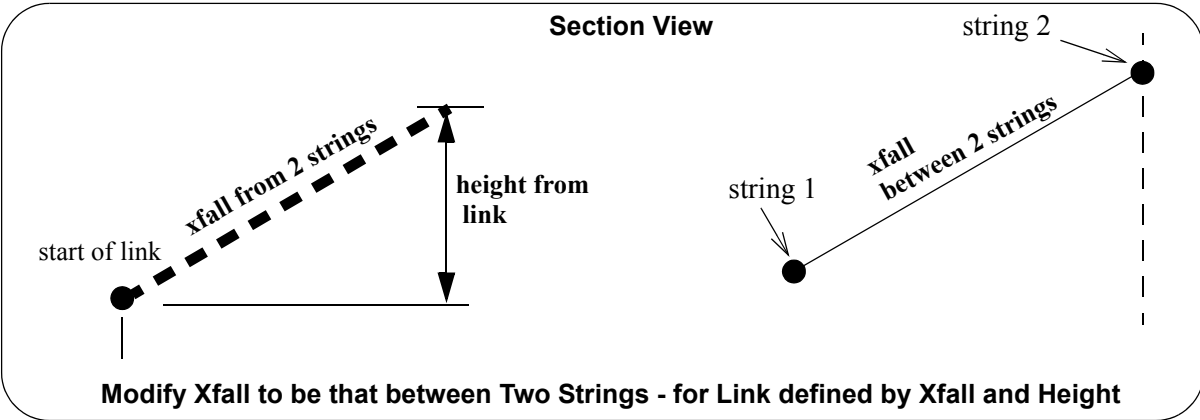


Xfall Between Two Strings

For a fixed link defined by *xfall* and *width* or *xfall* and *height*, **Xfall to 2 strings** sets the **xfall** for the link to be the **xfall between two** existing **12d Model** strings,

The option will give an error for a link defined by *width* and *height*.





Selecting the width to 2 strings, height to 2 strings or xfall to 2 strings option brings up the **Fixed - Modify Width to 2 Strings**, **Fixed - Modify Height to 2 Strings**, and **Fixed - Modify Xfall to 2 Strings** panels respectively.

Fixed - Modify Width to 2 Strings

Link name

Start mode

End mode

Interval

Select string 1

Select string 2

Side 1 to search

Side 2 to search

Extra start ☒ Extra end ☒

Comment

Active ☒

Fixed - Modify Height to 2 Strings

Link name

Start mode

End mode

Interval

Select string 1

Select string 2

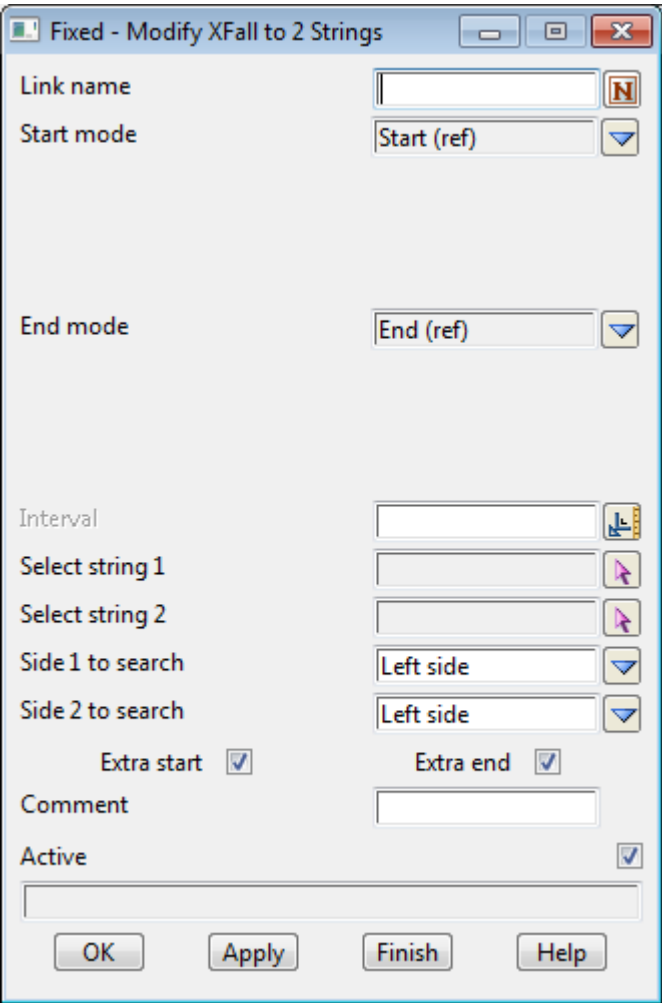
Side 1 to search

Side 2 to search

Extra start ☒ Extra end ☒

Comment

Active ☒



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Link name	<i>name of the link to modify.</i>	input		select name menu
Start/End mode	<i>defines the start/end chainages for modifying the link</i> <i>For more information on Start/End mode, see Start and End Chainages</i>	choice box	Start (ref)/End (ref)	
Interval	<i>if non blank, the interval to use to create cross sections and strings over the given chainage range.</i> <i>If blank, the Section separation value from the Apply Many panel is used.</i>	input		
String 1	<i>select the first string to use for defining width/height/crossfall for the link.</i>	string-select		
String 2	<i>select the second string to use for defining width/height/crossfall for the link.</i>	string-select		
Side 1 to search	<i>side of the hinge string to start searching to find string 1 to use in defining width/height/crossfall.</i>	input	left side	left side, right side, both sides
Side 2 to search		input	left side	left side, right side, both sides

side of the hinge string to start searching to find string 2 to use in defining width/height/crossfall.

Extra start/end tick box

if **ticked**, add an extra x-section 0.1 mm **before** the start/end chainage.

Comment input

comment to add to the end of the line. In the file, the comment will be preceded by //.

Active tick box tick

if **ticked**, use this modifier.

if **not ticked**, don't use this modifier.

OK button

OK stores the values in the fields and removes the panel BUT no **recalc** is done.

Apply button

Apply stores the values and leaves the panel on the screen.

If the **MTF** is being used in an **Apply Many MTF** and **Auto recalc** is ticked in the MTF, then whenever the **Apply** button is clicked, a **recalc** of the associated **Apply Many** for the MTF is done.

Continue to the next section [Decision](#) or return to [Fixed Link Modifiers](#) or [Modifiers in MTF Edit](#).

Fixed Link - Absolute - Superseded

These options were never released. They should be replaced in your MTF by the appropriate **Absolute** option.

Fixed Link - Width Absolute - Superseded

These options were never released. They should be replaced in your MTF by the appropriate **Absolute** option.

Return to [Fixed Link Modifiers](#) or [Modifiers in MTF Edit](#).

Fixed Link - to Two Points - Superseded

These options were never released. They should be replaced in your MTF by the appropriate to **2 heights** options.

Return to [Fixed Link Modifiers](#) or [Modifiers in MTF Edit](#).

Fixed Link - Modify to 2 Points - Superseded

These options were never released. They should be replaced in your MTF by the appropriate to **2 heights** options.

Return to [Fixed Link Modifiers](#) or [Modifiers in MTF Edit](#).

Fixed Link - Modify Width, Height or Xfall to 2 Points - - Superseded

These options were never released. They should be replaced in your MTF by the appropriate to **2 heights** options.

Return to [Fixed Link Modifiers](#) or [Modifiers in MTF Edit](#).

Decision

Decision Change

Each template is made up of the sections fixed, decisions, cut, fill and final cut/fill. If a template has a decisions section then by default the decisions section it is used instead of the cut, fill and final cut/fill sections.

Hence by default, if the decisions section of a template exists then it is used but if the decisions section does not exist, the cut, fill and final cut/fill sections of the template are used.

For an Apply Many, the template specified for a chainage range in the Templates section of the MTF (see [MTF Templates](#)) is called the *original* template for that chainage range.

Using the **decision** modifier, it is possible to **override** the defaults for the original template, and for a given chainage range:

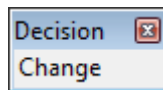
use the *decisions* section **from another** template instead of the decisions or cut/fill sections of the original template.

or

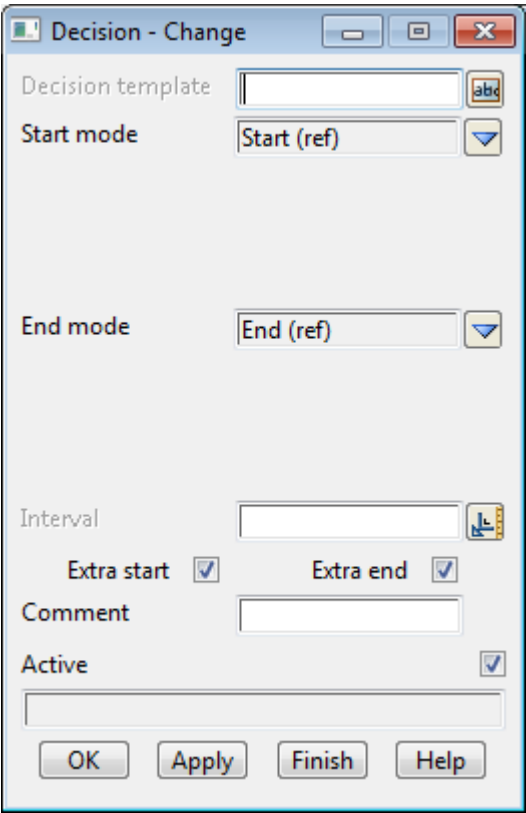
use the cut, fill and final cut/fill sections of the original template **instead** of the decisions section of the original template.

The fixed part of the *original* template is *still used* in either case.

The **Decision** walk-right brings up the **Decision** menu with the change option which nominates what decision templates are used for what chainage ranges.



Selecting **Change** brings up the **Decision Change** panel



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Decision template	<p>if non-blank, this is the template whose decisions section is used over the given chainage range.</p> <p>If blank, the cut, fill and final cut/fill sections of the original template are used over the chainage range instead of the decision section of the original template.</p> <p>Note that if the new template has no decisions, then the cut and fill section of the original template is used instead of the decisions section of the original template. That is, it is equivalent to leaving the Decisions template field blank.</p>	input		available templates
Start/End mode	<p>defines the start/end chainages for using decisions or cut/fill sections.</p> <p>For more information on Start/End mode, see Start and End Chainages</p>	choice box	Start (ref)/End (ref)	
Interval	<p>if non blank, the interval to use to create cross sections and vertices of the strings over the given chainage range.</p> <p>If blank, the Section separation value from the Apply Many panel is used.</p>	input		
Extra start/end	<p>if ticked, add an extra x-section 0.1 mm before the start/end chainage.</p>	tick box		
Comment	<p>comment to add to the end of the line. In the file, the comment will be preceded by //.</p>	input		
Active	<p>if ticked, use this modifier.</p> <p>if not ticked, don't use this modifier.</p>	tick box	tick	

OK/Apply button

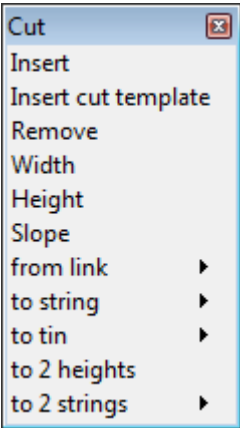
OK stores the values in the fields and removes the panel.

Apply stores the values and leaves the panel on the screen.

Continue to the next section [Cut Link Modifiers](#) or return to [Decision](#) or [Modifiers in MTF Edit](#).

Cut Link Modifiers

The **Cut** walk-right brings up the **Cut** menu with options to modify the cut links of the template.



For *Insert*, go to the section
Insert cut template
Remove
Width/Height
Slope
from link
to string
to tin
to 2 heights
to 2 strings

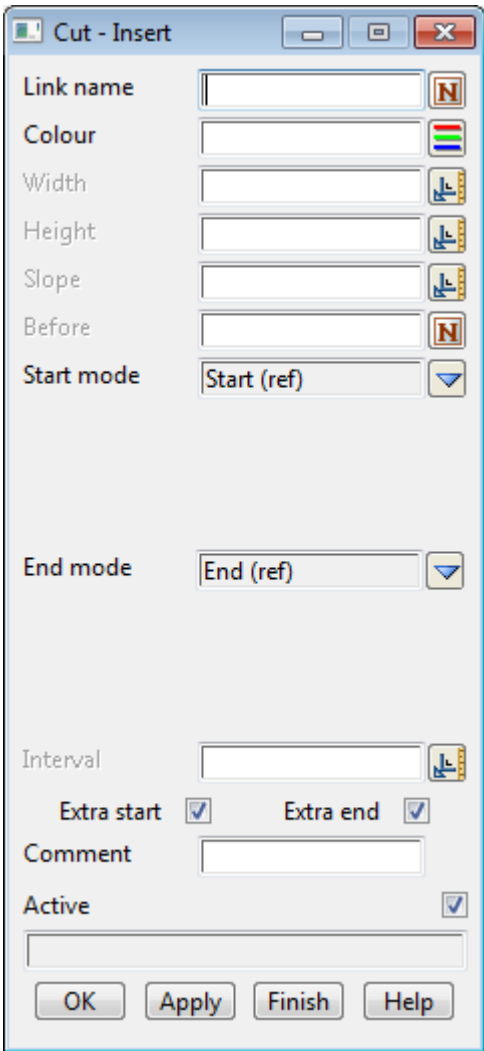
[Cut Link - Insert](#)
[Insert Cut Links from a Template](#)
[Cut Link - Remove](#)
[Cut Link - Modifier Width or Height](#)
[Cut Link - Modify Slope](#)
[Cut Link - from Link](#)
[Cut Link - to String](#)
[Cut Link - to Tin](#)
[Cut Link - to Two Heights](#)
[Cut Link - to 2 Strings](#)

Each of the options from this menu will now described.

Cut Link - Insert

Cut links can be created by the **cut Insert** command by specifying either the *width and height*, *width and slope* or *height and slope* for the link.

Selecting **Insert** brings up the **Cut - Insert** panel



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Link name	<i>name of the link to create.</i>	input		select name menu
Colour	<i>colour of the link being created.</i>	input		available colours
Width /height/slope	<i>width/ height/slope of the link being created - only use two of the three.</i>	input		measures menu
Before	<i>if non-blank, the name of the string to insert the new string before. If blank, the link is appended to the end of the fixed part of the template.</i>	input		select name menu
Start/End mode	<i>defines the start/end chainages for inserting the new cut link. For more information on Start/End mode, see Start and End Chainages</i>	choice box	Start (ref)/End (ref)	
Interval	<i>if non blank, the interval to use to create cross sections and vertices of the strings over the given</i>	input		

chainage range.
If **blank**, the **Section separation** value from the **Apply Many** panel is used.

Extra start/end tick box
*if **ticked**, add an extra x-section 0.1 mm **before** the start/end chainage.*

Comment input
comment to add to the end of the line. In the file, the comment will be preceded by //.

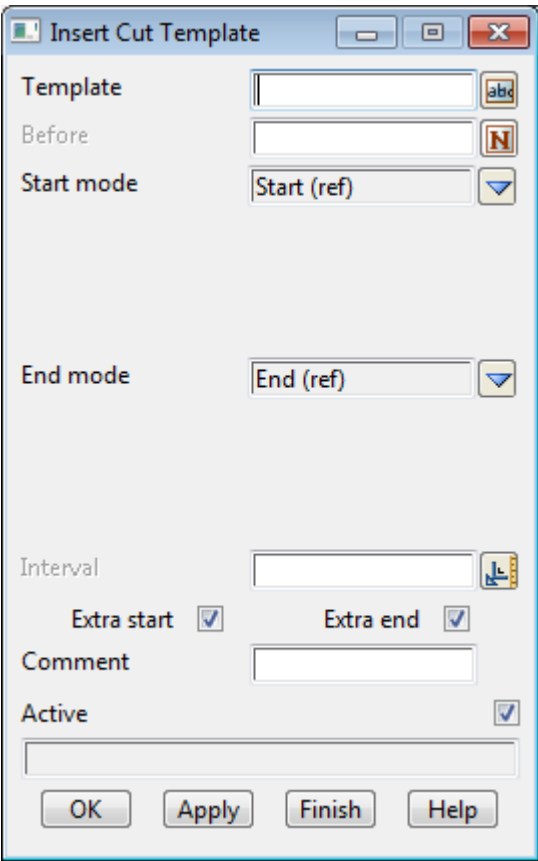
Active tick box tick
*if **ticked**, use this modifier.*
*if **not ticked**, don't use this modifier.*

OK/Apply button
OK stores the values in the fields and removes the panel.
Apply stores the values and leaves the panel on the screen.

Continue to the next section [Insert Cut Links from a Template](#) or return to [Cut Link Modifiers](#) or [Modifiers in MTF Edit](#).

Insert Cut Links from a Template

All the cut links from an existing template can be inserted by the **Insert cut template** command.
Selecting **Insert cut template** brings up the **Insert Cut Template** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Template	template box		select template menu

the name of the template to take the cut links from.

Before input select name menu

if **non-blank**, the cut links from the selected template are inserted before the given link.

If **blank**, the cut links from the selected template are appended to the end of the existing cut links.

Start/End mode choice box Start (ref)/End (ref)

defines the start/end chainages for inserting the new template links.

For more information on Start/End mode, see [Start and End Chainages](#)

Interval input

if **non blank**, the interval to use to create cross sections and strings over the given chainage range.

If **blank**, the **Section separation** value from the **Apply Many** panel is used.

Extra start/end tick box

if **ticked**, add an extra x-section 0.1 mm **before** the start/end chainage.

Comment input

comment to add to the end of the line. In the file, the comment will be preceded by //.

Active tick box tick

if **ticked**, use this modifier.

if **not ticked**, don't use this modifier.

OK/Apply button

OK stores the values in the fields and removes the panel.

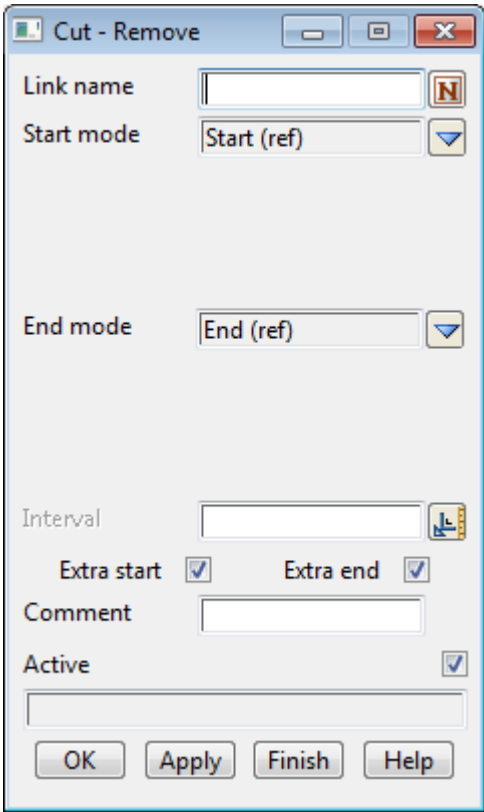
Apply stores the values and leaves the panel on the screen.

Continue to the next section [Cut Link - Remove](#) or return to [Cut Link Modifiers](#) or [Modifiers in MTF Edit](#).

Cut Link - Remove

Cut links can be deleted between given chainages by using the **Cut Remove** command.

Selecting **Remove** brings up the **Cut - Remove** panel



The fields and buttons used in this panel have the following functions.

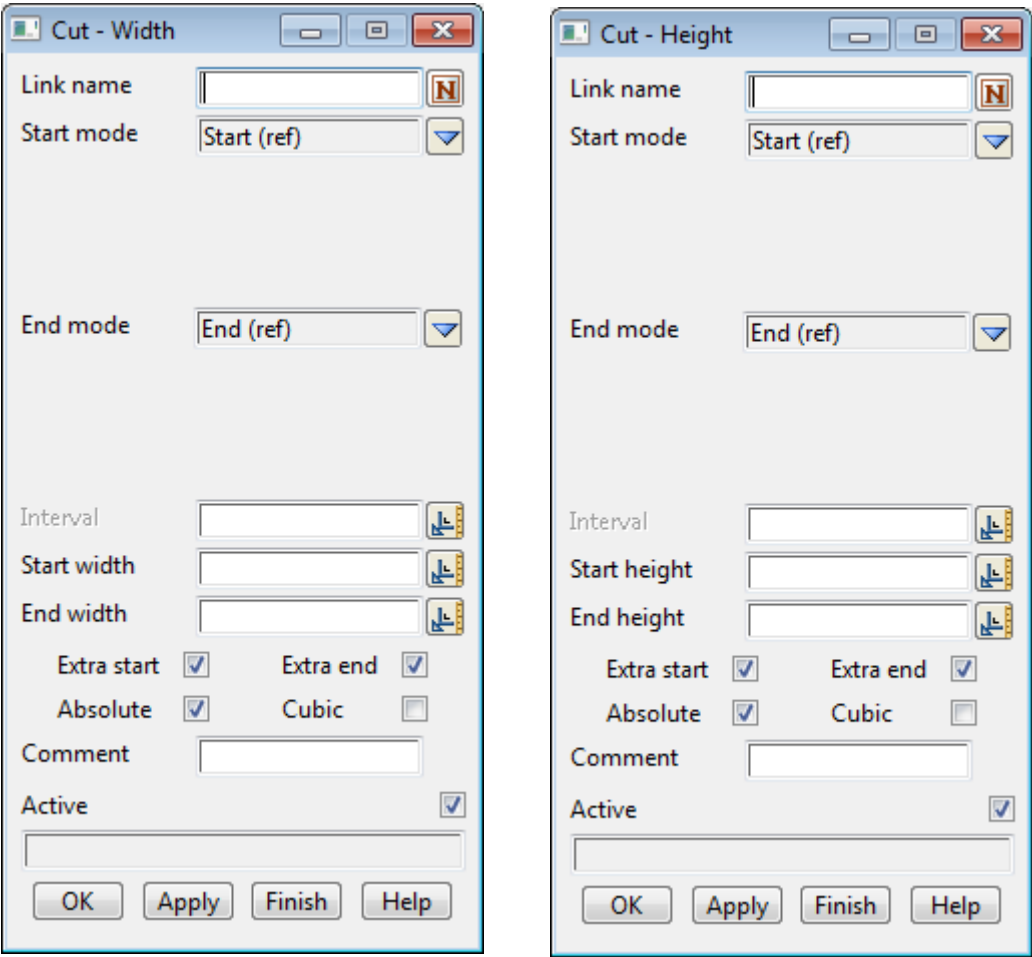
Field Description	Type	Defaults	Pop-Up
Link name <i>name of the link to removed.</i>	input		select name menu
Start/End mode <i>defines the start/end chainages for removing the cut link. For more information on Start/End mode, see Start and End Chainages</i>	choice box	Start (ref)/End (ref)	
Interval <i>if non blank, the interval to use to create cross sections and strings over the given chainage range. If blank, the Section separation value from the Apply Many panel is used.</i>	input		
Extra start/end <i>if ticked, add an extra x-section 0.1 mm before the start/end chainage.</i>	tick box		
Comment <i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>	input		
Active <i>if ticked, use this modifier. if not ticked, don't use this modifier.</i>	tick box	tick	
OK/Apply <i>OK stores the values in the fields and removes the panel. Apply stores the values and leaves the panel on the screen.</i>	button		
Continue to the next section Cut Link - Modifier Width or Height or return to Cut Link Modifiers or Modifiers in MTF Edit .			

Cut Link - Modifier Width or Height

The **cut width** modifier is used to modify the width of variable cut links originally defined by width. That is, links defined by *width and slope* or *width and height*.

Similarly the **cut height** modifier is used to modify the height of variable cut links originally defined by height. That is, links defined by *height and width* or *height and slope*.

Selecting **Width or Height** brings up the **Cut - Width** and **Cut - Height** panels respectively.



The fields and buttons used in this panel have the following functions.

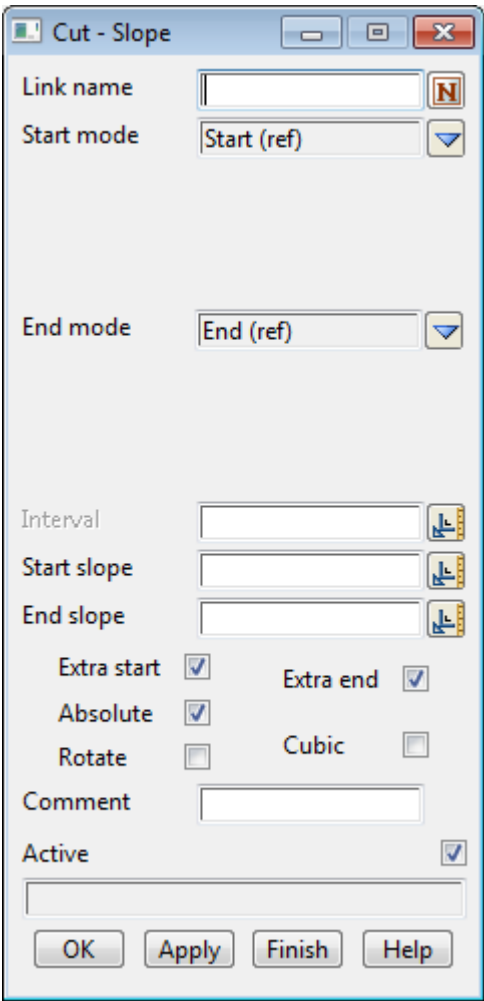
Field	Description	Type	Defaults	Pop-Up
Link name	<i>name of the link to modify.</i>	input		select name menu
Start/End mode	<i>defines the start/end chainages for modifying the links.</i> <i>For more information on Start/End mode, see Start and End Chainages</i>	choice box	Start (ref)/End (ref)	
Interval	<i>if non blank, the interval to use to create cross sections and strings over the given chainage range.</i> <i>If blank, the Section separation value from the Apply Many panel is used.</i>	input		
Start/End width/height	<i>start/end width/height for modifying the link.</i>	input		measures menu

Extra start/end	tick box	
<i>if ticked, add an extra x-section 0.1 mm before the start/end chainage.</i>		
Absolute	tick box	tick
<i>if ticked, the width/height is set to the values given in the start and end value fields.</i> <i>if not ticked, the values given in the start and end value fields are added to the existing widths/heights.</i>		
Cubic	tick box	
<i>if ticked, the width/height is varied as a reverse cubic between the start and end chainages.</i> <i>if not ticked, the width/height is varied linearly between the start and end chainages.</i>		
Comment	input	
<i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>		
Active	tick box	tick
<i>if ticked, use this modifier.</i> <i>if not ticked, don't use this modifier.</i>		
OK/Apply	button	
OK stores the values in the fields and removes the panel. Apply stores the values and leaves the panel on the screen.		
Continue to the next section Cut Link - Modify Slope or return to Cut Link Modifiers or Modifiers in MTF Edit .		

Cut Link - Modify Slope

The **cut slope** modifier is used to modify the slope of variable cut links originally defined by slope. That is, links defined by *slope and width* or *slope and height*.

Selecting **Slope** brings up the **Cut - Slope** panel



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Link name	<i>name of the link to modify.</i>	input		select name menu
Start/End mode	<i>defines the start/end chainages for modifying the link. For more information on Start/End mode, see Start and End Chainages</i>	choice box	Start (ref)/End (ref)	
Interval	<i>if non blank, the interval to use to create cross sections and strings over the given chainage range. If blank, the Section separation value from the Apply Many panel is used.</i>	input		
Start/End slope	<i>start/end slope for modifying the link.</i>	input		measures menu
Extra start/end	<i>if ticked, add an extra x-section 0.1 mm before the start/end chainage.</i>	tick box		
Absolute	<i>if ticked, the slope is set to the values given in the start and end slope fields. if not ticked, the slopes given in the start and end value fields are added to the existing slopes.</i>	tick box	tick	

Cut - Width from Link

Link name

N

Start mode

Start (ref)

End mode

End (ref)

Interval

From link name

N

From zone

fixed

Extra start

☒

Extra end

☒

Comment

Active

☒

OK

Apply

Finish

Help

Cut - Height from Link

Link name

N

Start mode

Start (ref)

End mode

End (ref)

Interval

From link name

N

From zone

fixed

Extra start

☒

Extra end

☒

Comment

Active

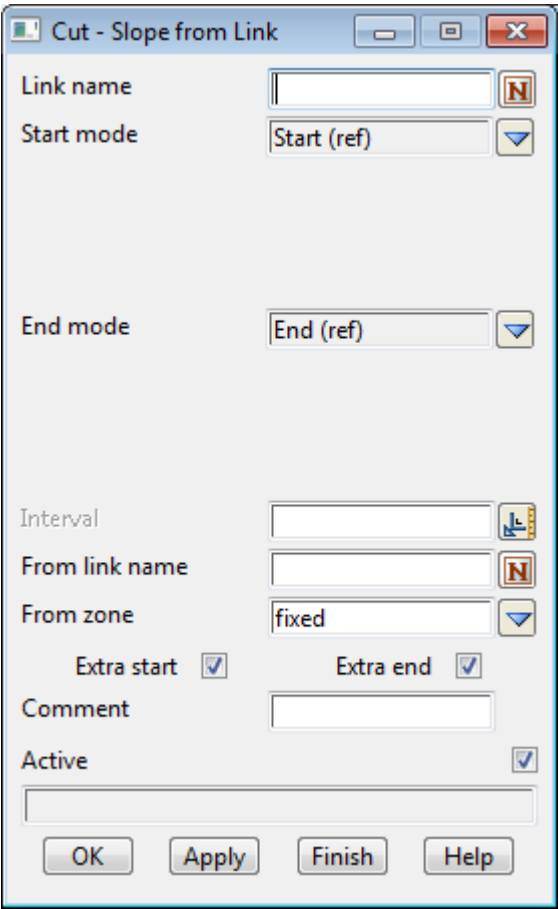
☒

OK

Apply

Finish

Help



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Link name	<i>name of the link to modify.</i>	input		select name menu
Start/End mode	<i>defines the start/end chainages for modifying the link.</i> <i>For more information on Start/End mode, see Start and End Chainages</i>	choice box	Start (ref)/End (ref)	
Interval	<i>if non blank, the interval to use to create cross sections and strings over the given chainage range.</i> <i>If blank, the Section separation value from the Apply Many panel is used.</i>	input		
From link name	<i>template link to take width/height/slope from.</i>	input		select name menu
From zone	<i>zone that the template link to take width/height/slope from, comes from.</i>	input	fixed	fixed, cut, fill
Extra start/end	<i>if ticked, add an extra x-section 0.1 mm before the start/end chainage.</i>	tick box		
Comment	<i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>	input		
Active		tick box	tick	

if **ticked**, use this modifier.
 if **not ticked**, don't use this modifier.

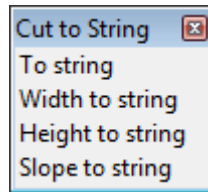
OK/Apply button

OK stores the values in the fields and removes the panel.
Apply stores the values and leaves the panel on the screen.

Continue to the next section [Cut Link - to String](#) or return to [Cut Link Modifiers](#) or [Modifiers in MTF Edit](#).

Cut Link - to String

The *Cut to string* walk-right brings up the **Cut to String** menu with options to take the width, height or slope by going to another string.



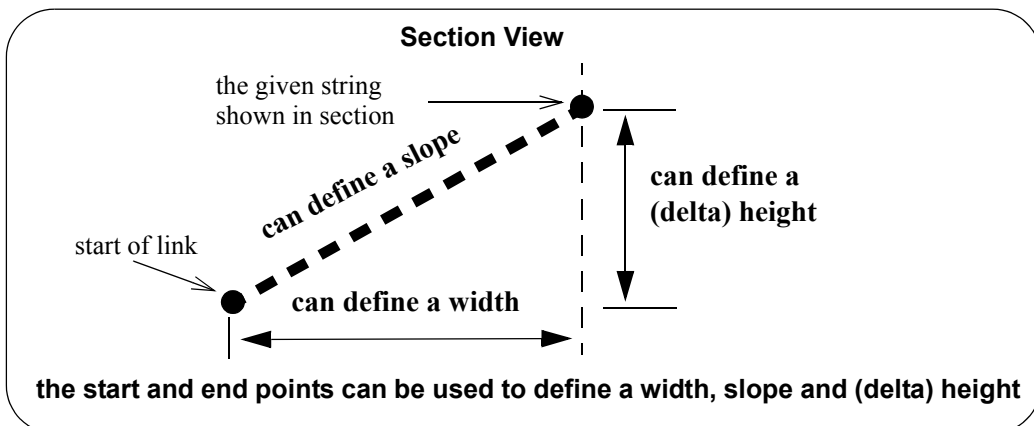
For *To string*, go to
Width/Height/Slope to string

[Cut Link - Modify To String](#)
[Cut Link - Calculate Width, Height or Slope to a String](#)

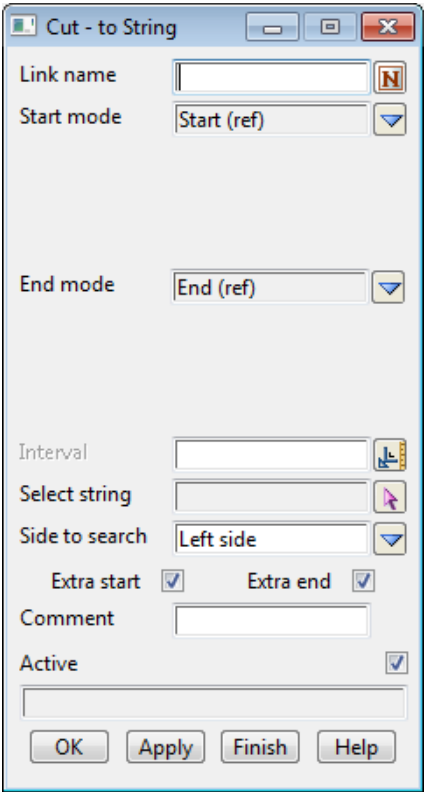
Cut Link - Modify To String

For any cut link, **To string** calculates the width, height and/or slope of the link needed to get from the start point of the link to the **to the selected string**.

However if the tin in the Apply Many is cut before reaching the string, the **cut link stops at the Apply Many tin**.



Selecting **To string** bring up the **Cut - to String** panel.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Link name	name of the link to modify.	input		select name menu
Start/End mode	defines the start/end chainages for modifying the link For more information on Start/End mode, see Start and End Chainages except for this option: When the Start mode is Start (ref) , or Typed and the chainage is blank , the modification begins at the low dropped chainage of the selected string. When the End mode is End (ref) , or Typed and the chainage is blank , the modification ends at the high dropped chainage of the selected string.	choice box	Start (ref)/End (ref)	
Interval	if non blank , the interval to use to create cross sections and strings over the given chainage range. If blank , the Section separation value from the Apply Many panel is used.	input		
String	select string to use for defining width/height/crossfall for the link.	string-select		
Side to search	side of the hinge string to start searching to find the string to define width/height/crossfall.	input	left side	left side, right side, both sides
Extra start/end	if ticked , add an extra x-section 0.1 mm before the start/end chainage.	tick box		
Comment	comment to add to the end of the line. In the file, the comment will be preceded by //.	input		

Active tick box tick

*if **ticked**, use this modifier.*

*if **not ticked**, don't use this modifier.*

OK/Apply button

OK stores the values in the fields and removes the panel.

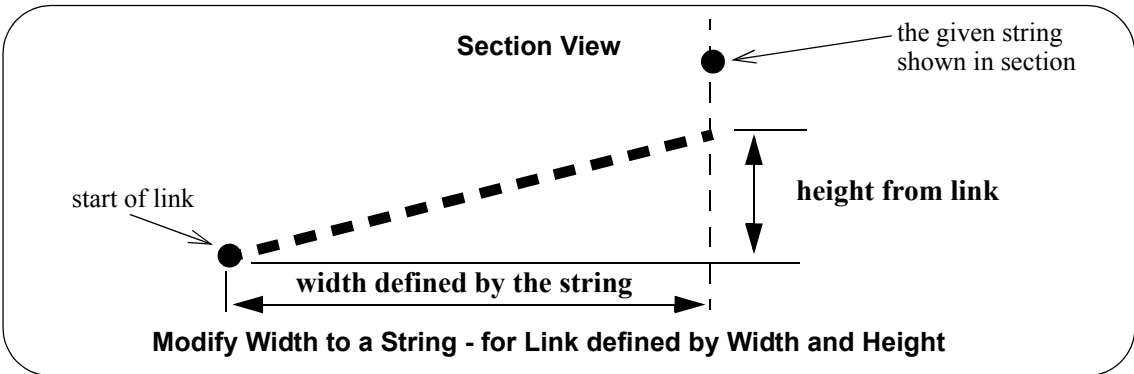
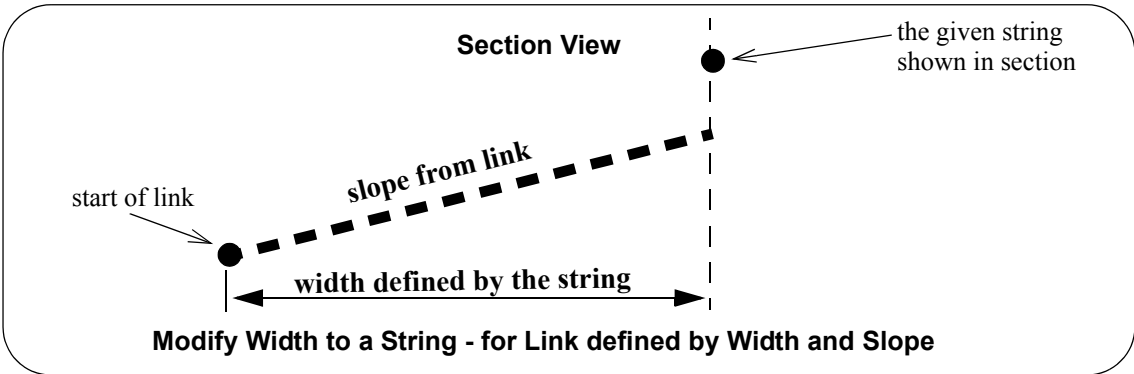
Apply stores the values and leaves the panel on the screen.

Cut Link - Calculate Width, Height or Slope to a String

Width to String:

For a cut link defined by *width and height* or *width and slope*, **Cut Width to string** calculates the **width** of the link as the width from the start point of the link, to the **to the selected string**. The *slope* or *height* is taken from the link. The option will give an error for a link defined by *height* and *slope*.

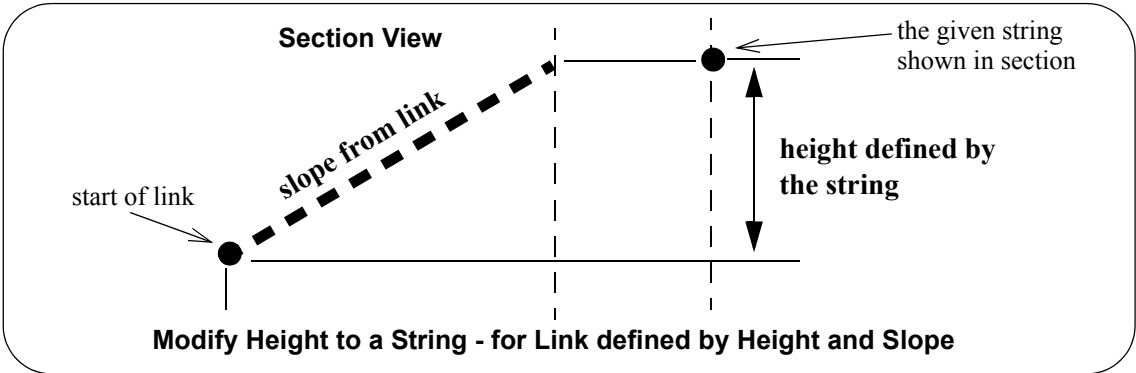
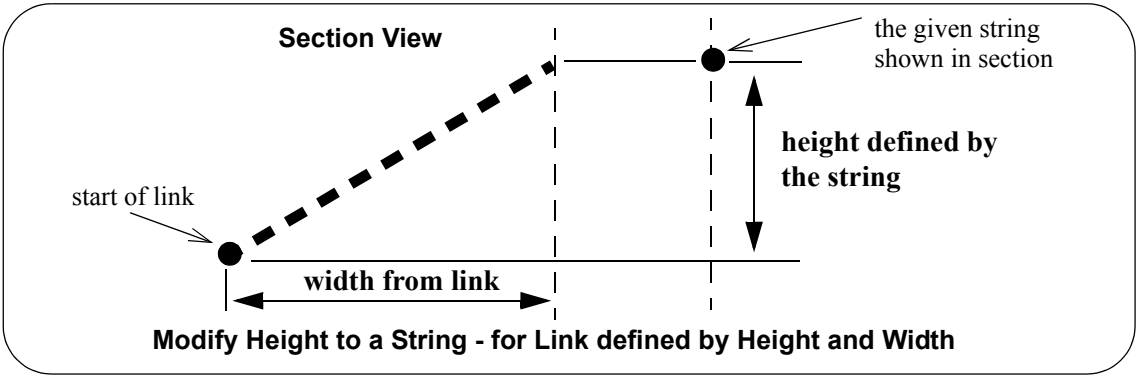
However if the tin in the Apply Many is cut before reaching the string, the **cut link stops at the Apply Many tin**.



Height to String:

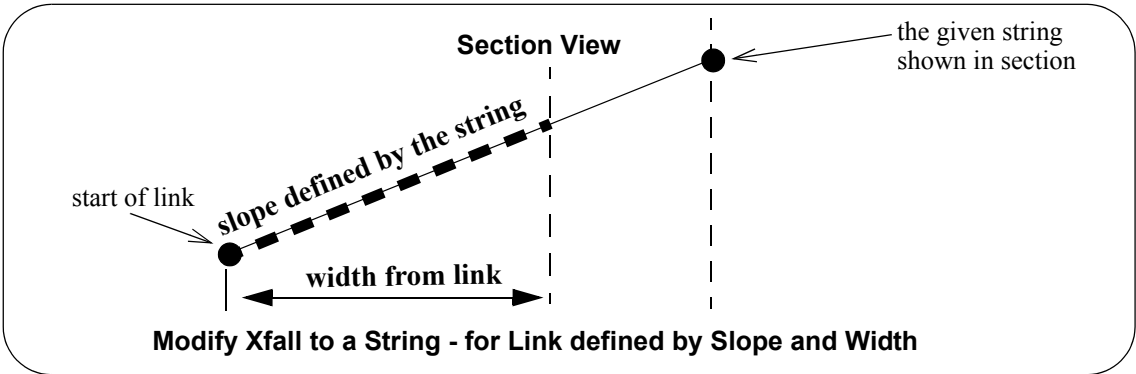
For a cut link defined by *height and width* or *height and slope*, **Cut Height to string** calculates the **height** of the link as the difference in the height at the start point of the link, and the height **at the selected string**. The *slope* or *width* is taken from the link. The option will give an error for a link defined by *width* and *slope*.

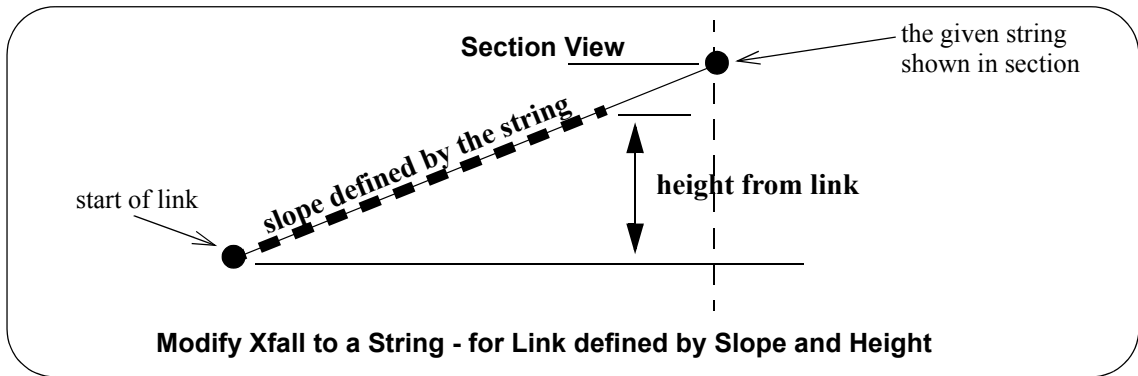
However if the tin in the Apply Many is cut before reaching the string, the **cut link stops at the Apply Many tin**.



Xfall to String:

For a cut link defined by *slope and width* or *slope and height*, **Cut Slope to string** calculates the **slope** of the link as the *slope* from the start point of the link to the **selected string**. The *width* or *height* is taken from the link. The option will give an error for a link defined by *width* and *height*. However if the tin in the Apply Many is cut before reaching the string, the **cut link stops at the Apply Many tin**.



**Note:**

Using two of the above modifiers together and with the same string will place the end point of the link on the selected string. For example for a modifier defined by *width* and *slope*, using *width to string* and a *slope to string* with the same string will place the end of the link on that string.

But the *To string* option will do the same thing in one command. See [Cut Link - Modify To String](#).

Selecting **Width to string**, **Height to string** or **Slope to string** brings up the **Cut - Width to String**, **Cut - Height to String** and **Cut - Slope to String** panels respectively.

Cut - Width to String

Link name

Start mode

End mode

Interval

Select string

Side to search

Extra start ☒ Extra end ☒

Comment

Active ☒

Cut - Height to String

Link name

Start mode

End mode

Interval

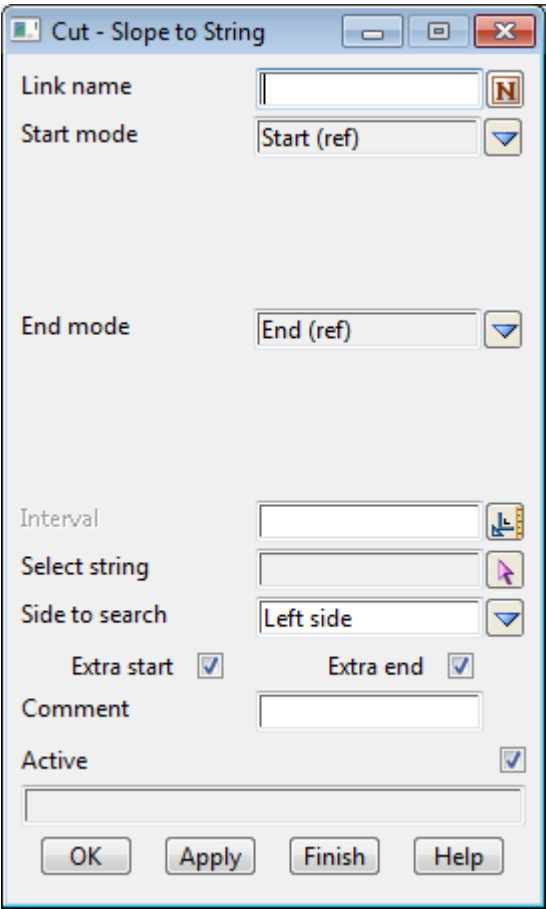
Select string

Side to search

Extra start ☒ Extra end ☒

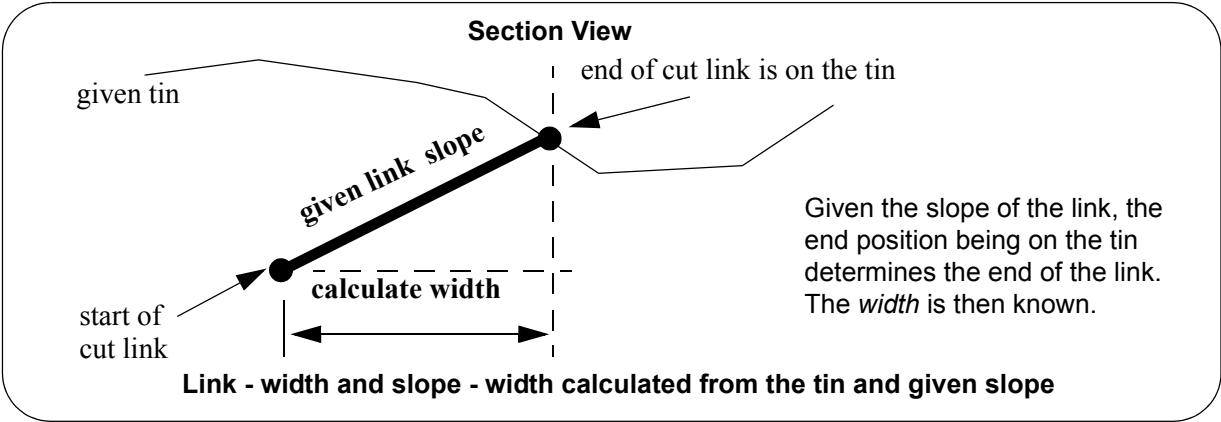
Comment

Active ☒



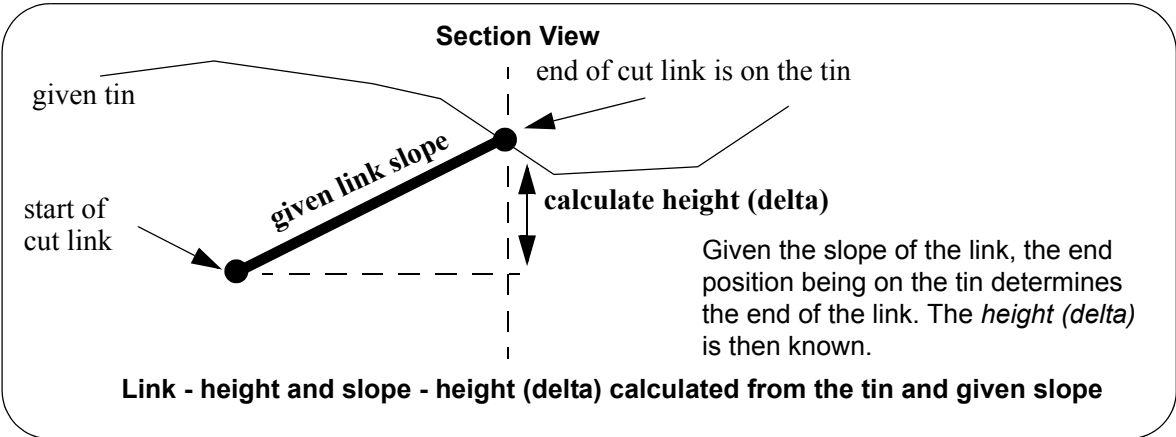
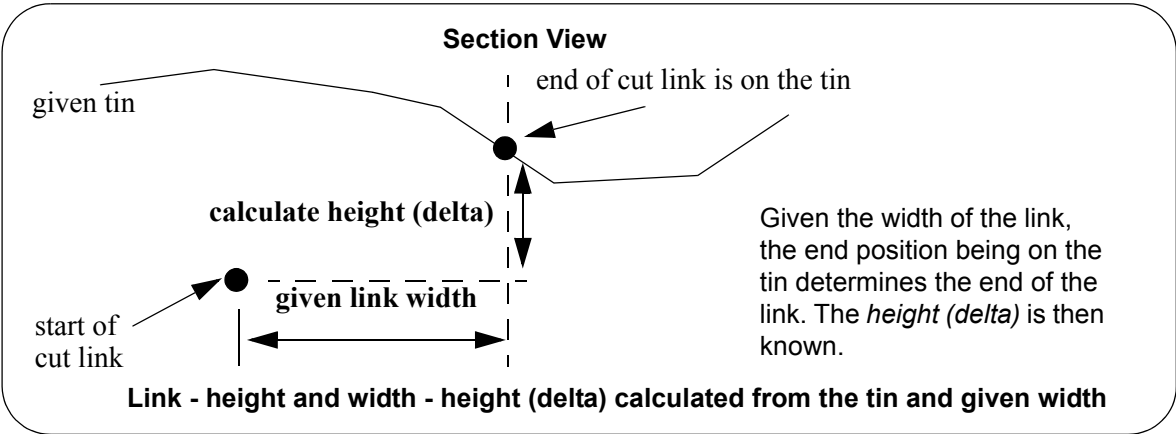
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name <i>name of the link to modify.</i>	input		select name menu
Start/End mode <i>defines the start/end chainages for modifying the link. For more information on Start/End mode, see Start and End Chainages except for this option: When the Start mode is Start (ref), or Typed and the chainage is blank, the modification begins at the low dropped chainage of the selected string. When the End mode is End (ref), or Typed and the chainage is blank, the modification ends at the high dropped chainage of the selected string.</i>	choice box	Start (ref)/End (ref)	
Interval <i>if non blank, the interval to use to create cross sections and strings over the given chainage range. If blank, the Section separation value from the Apply Many panel is used.</i>	input		
String <i>select string to use for defining width/height/slope for the link.</i>	string-select		
Side to search <i>side of the hinge string to start searching to find the string to define width/height/slope.</i>	input	left side	left side, right side, both sides
Extra start/end	tick box		



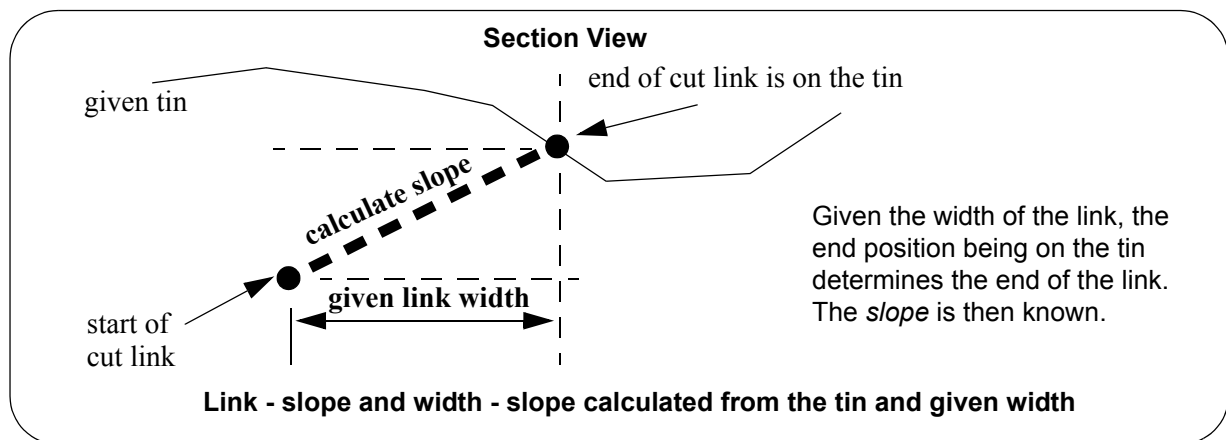
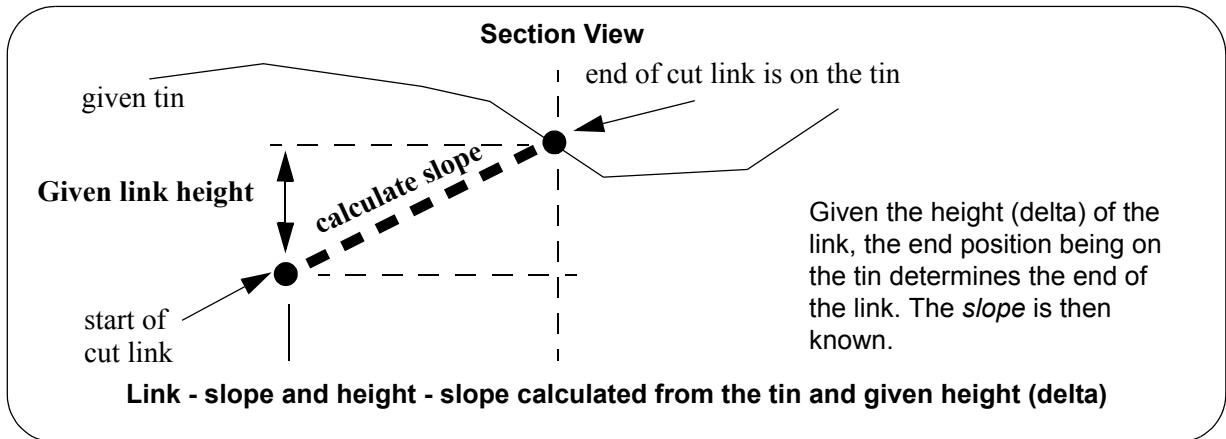
Height to Tin

For a cut link defined by *height* and *width* or *height* and *slope*, the **Height to tin** calculates the **height** of the link as the difference in the height of the start point of the link, and the height that is required so that the link will sit on the user tin at the **width/slope given in the link**. The option gives an error for a link defined by *width* and *xfall*.

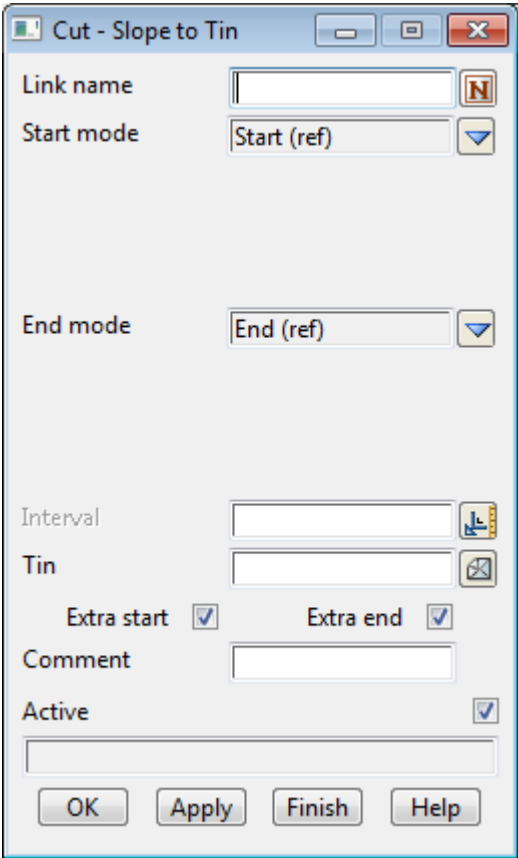
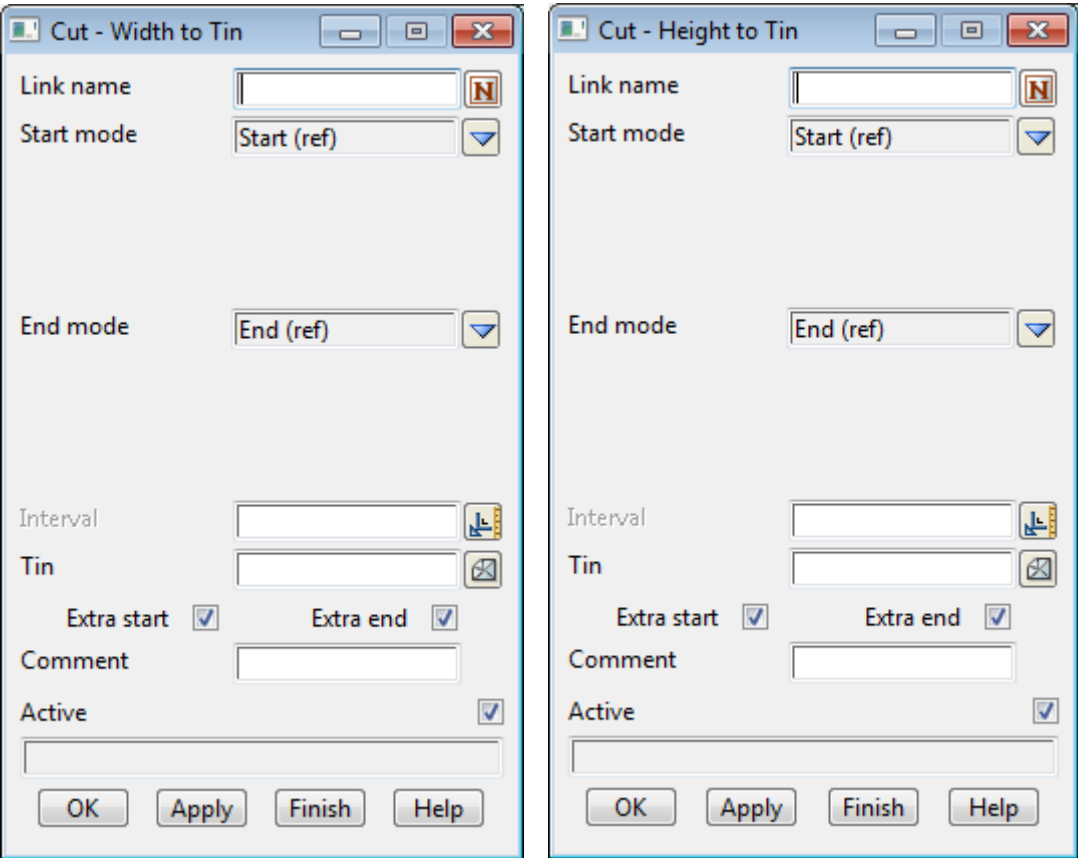


Slope to Tin

For a cut link defined by *slope* and *width* or *slope* and *height*, **Slope to tin** calculates the **slope** of the link as the *slope* required so that the link will sit on the user tin at the **width/height given in the link**. The option gives an error for a link defined by *width* and *height*.



Selecting **Width to tin**, **Height to tin**, or **Slope to tin** brings up the **Cut - Width to Tin**, **Cut - Height to Tin** and **Cut - Slope to Tin** panels respectively.



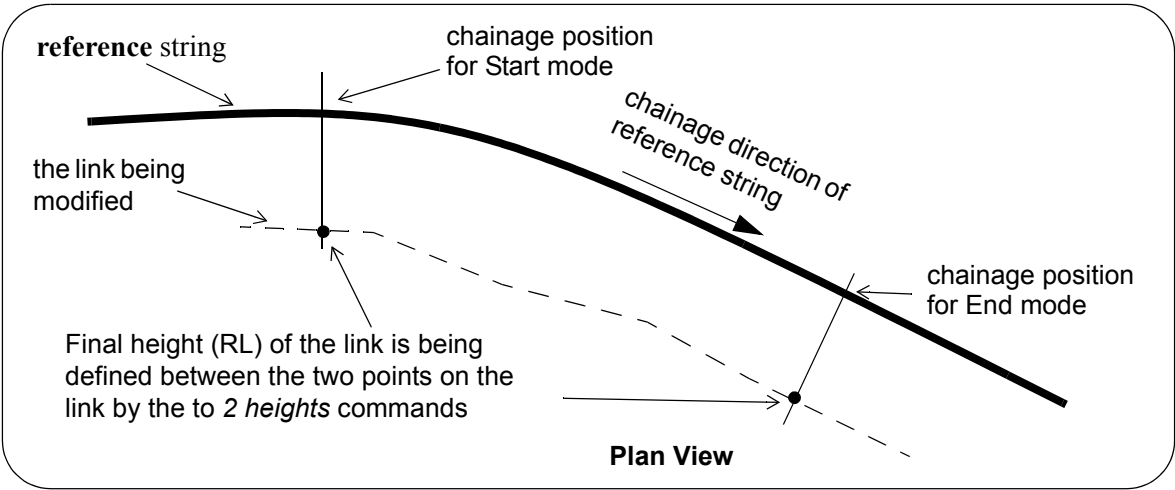
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name <i>name of the link to modify.</i>	input		select name menu
Start/End mode <i>defines the start/end chainages for modifying the link</i> <i>For more information on Start/End mode, see Start and End Chainages</i>	choice box	Start (ref)/End (ref)	
Interval <i>if non blank, the interval to use to create cross sections and strings over the given chainage range.</i> <i>If blank, the Section separation value from the Apply Many panel is used.</i>	input		
Tin <i>the tin to use for defining the width/height/slope</i>	input		available tins
Extra start/end <i>if ticked, add an extra x-section 0.1 mm before the start/end chainage.</i>	tick box		
Comment <i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>	input		
Active <i>if ticked, use this modifier.</i> <i>if not ticked, don't use this modifier.</i>	tick box	tick	
OK/Apply OK stores the values in the fields and removes the panel. Apply stores the values and leaves the panel on the screen.	button		
Continue to the next section Cut Link - to Two Heights or return to Cut Link Modifiers or Modifiers in MTF Edit .			

Cut Link - to Two Heights

For an existing link, the **to 2 heights** option has a number of methods for **defining the height** from the start mode chainage to the end mode chainage. For example, over the chainage range, the height can be interpolated between two given RL's.

However if the *Apply Many* tin is cut before reaching the end of the modified link, the **cut link stops at the tin**.



Note: the **2 Strings** modifiers work with two points in a **section**. See [Cut Link - to 2 Strings](#).

Selecting o 2 heights brings up the **Cut - to 2 Heights** panel

Cut - to 2 Heights

Link name

Modifier type

Start mode

End mode

Interval

Type

RL

Extra start

Extra end

Comment

Active

OK

Apply

Finish

Help

Select Choice

Modify Height Maintain Width

Modify Height Maintain Slope

Select Choice

RL

RL -> RL

RL Grade ->

<- RL Grade

Pos ->

<- Pos

Pos -> Pos

Pos Grade ->

<- Pos Grade

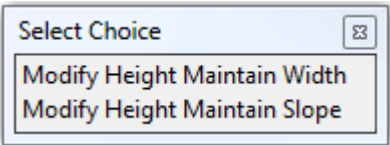
RL -> Pos

Pos -> RL

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name <i>name of the link to modify.</i>	input		select name menu

Modifier type choice box



The **Maintain Slope/Width** is the part of the new definition of the selected link that is taken from the selected **Link name**. See [Cut - Maintaining Width or Slope](#).

The **Height** for the selected link is calculated by the method given by **Type**.

Start/End mode choice box Start (ref)/End (ref)

defines the start/end chainages for modifying the link.

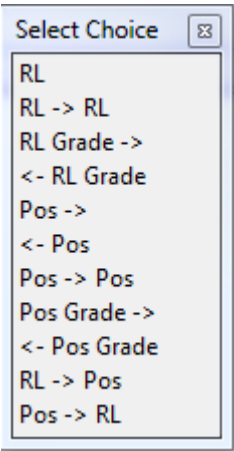
For more information on Start/End mode, see [Start and End Chainages](#).

Interval input

*if **non blank**, the interval to use to create cross sections and strings over the given chainage range.*

*If **blank**, the **Section separation** value from the **Apply Many** panel is used.*

Type choice box



For the calculation of height for each type, go to [Cut - Calculating the Heights for each Type](#)

Extra start/end tick box

*if **ticked**, add an extra x-section 0.1 mm **before** the start/end chainage.*

Comment input

*comment to add to the end of the line. In the file, the comment will be preceded by **//**.*

Active tick box tick

*if **ticked**, use this modifier.*

*if **not ticked**, don't use this modifier.*

OK/Apply button

OK stores the values in the fields and removes the panel.

Apply stores the values and leaves the panel on the screen.

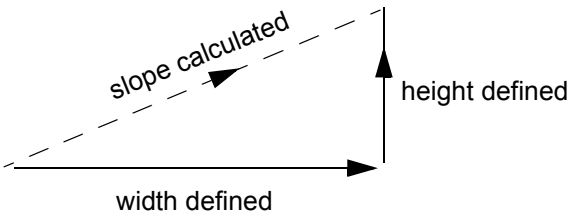
Cut - Maintaining Width or Slope

The option **to 2 heights** defines the **height** of the selected string so to completely define the link, only the width or the slope is needed.

So from the selected link only the **width** or the **xfall** is used (maintained) - the height is calculated by the **to 2 heights** option.

If the selected link is defined by **width and height**, then at any chainage a **slope** can be calculated from the width and height at that chainage.

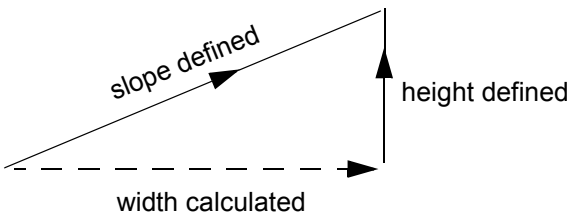
Section View



For links defined by width and height, the **slope** at each chainage is uniquely defined

If the selected link is defined by **slope and height**, then at any chainage a **width** can be calculated from the slope and height at that chainage.

Section View

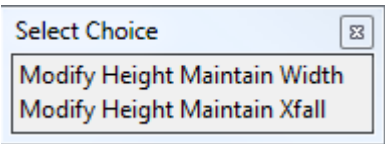


For links defined by slope and height, the **width** at each chainage is uniquely defined

Hence it doesn't matter if the selected link is defined by **width and slope**, **width and height**, or **slope and height**, at each chainage a **width and slope** are uniquely defined.

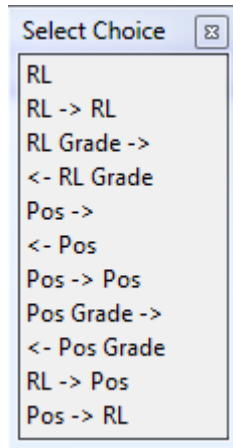
So no matter how the selected link is defined, at any chainage, a unique width or a slope is known and it is that **Width** or **Slope** can be maintained by the **to 2 heights** option.

So the choices for the option are:



Continue to the next section [Cut Link - to 2 Strings](#) or return to [Cut Link - to Two Heights](#), [Cut Link Modifiers](#) or [Modifiers in MTF Edit](#).

Cut - Calculating the Heights for each Type



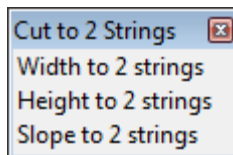
Important Note: Grade is calculated using **increasing Alignment chainages** and the **heights at the points** along the string being modifies. When going around a curve this will not be exactly the same as the grade along the string being modified.

The definitions of the calculations for each choice are the same as for the Fixed links. See [Fixed - Calculating the Heights for each Type](#).

Continue to the next section [Cut Link - to 2 Strings](#) or return to [Cut Link - to Two Heights](#), [Cut Link Modifiers](#) or [Modifiers in MTF Edit](#).

Cut Link - to 2 Strings

The *Cut to 2 strings* walk-right brings up the **Cut to 2 Strings** menu with options to calculate the width, height or slope from two given strings.



For *Width/Height/Slope to 2 Strings*, go to the next section [Cut Link - Width, Height or Slope Between Two Strings](#)

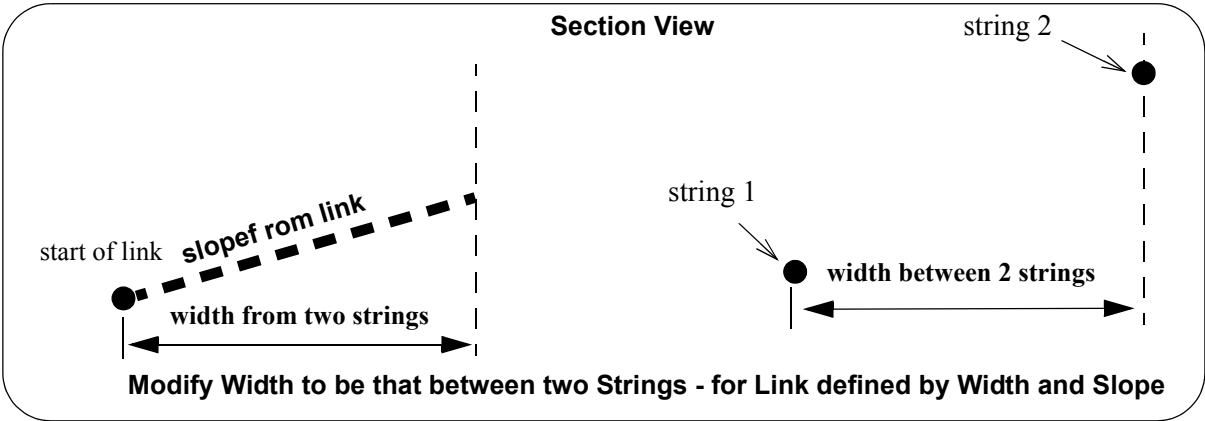
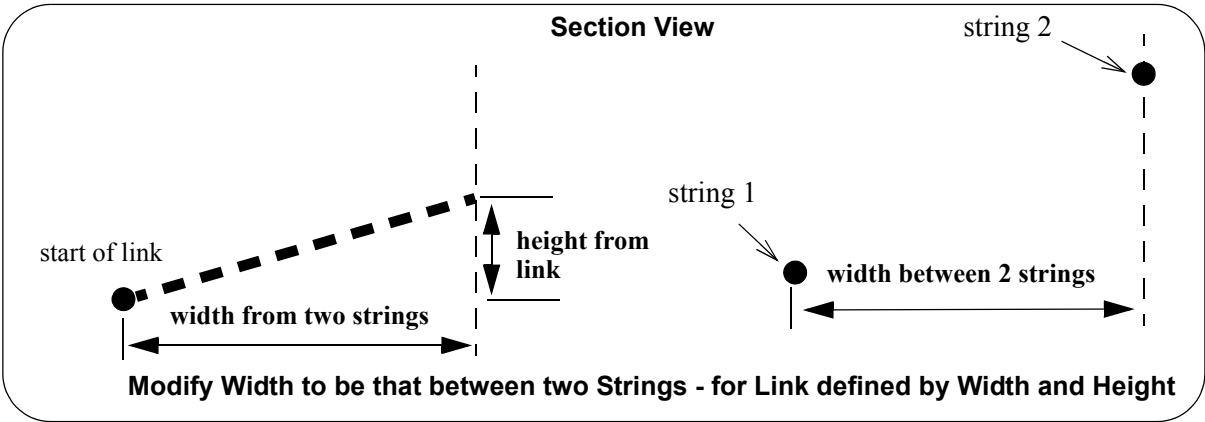
Cut Link - Width, Height or Slope Between Two Strings

Width Between Two Strings

For a cut link defined by *width* and *height* or *width* and *slope*, **Width to 2 strings** sets the **width** for a link to be the **width between two** existing **12d Model** strings,

However if the Apply Many tin is cut before reaching the string, the **cut link stops at the tin**.

The option will give an error for a link defined by *height* and *slope*.

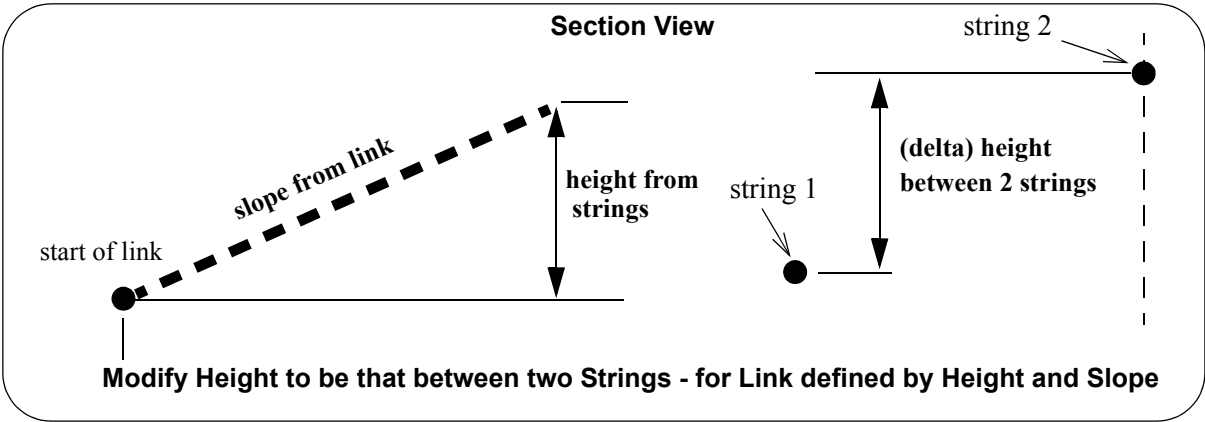


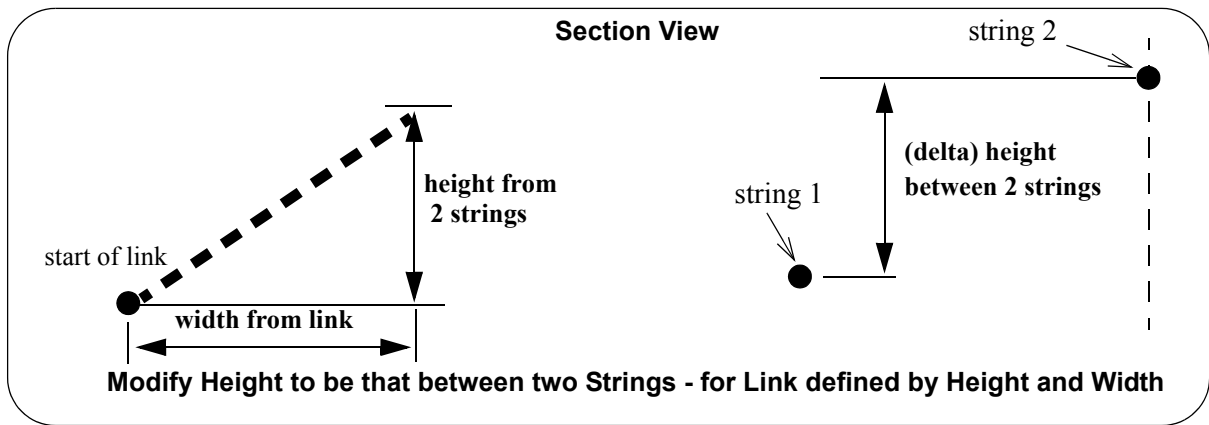
Height Between Two Strings

For a cut link defined by *height* and *width* or *height* and *slope*, **Height to 2 strings** sets the **height** for the link to be the **height between two** existing **12d Model** strings,

However if the Apply Many tin is cut before reaching the string, the **cut link stops at the tin**.

The option will give an error for a link defined by *width* and *slope*.



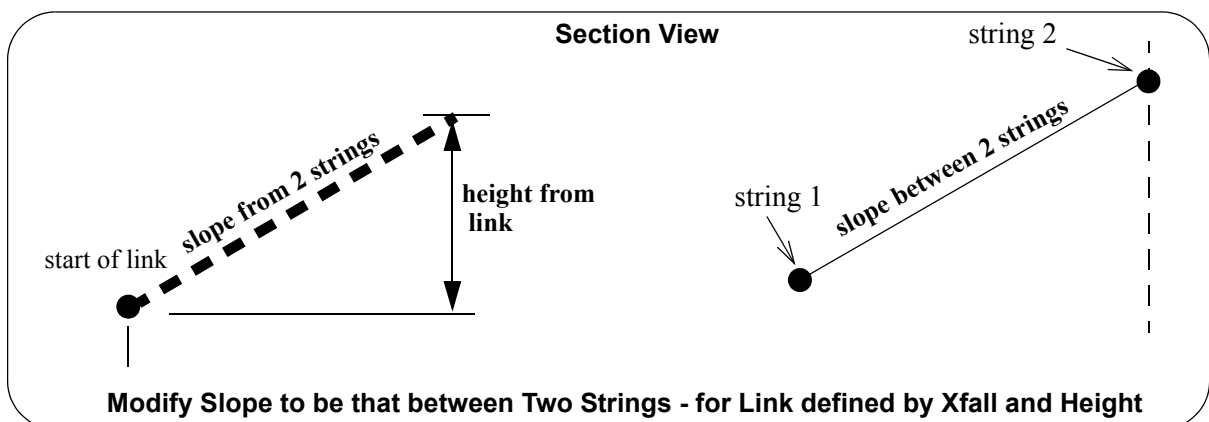
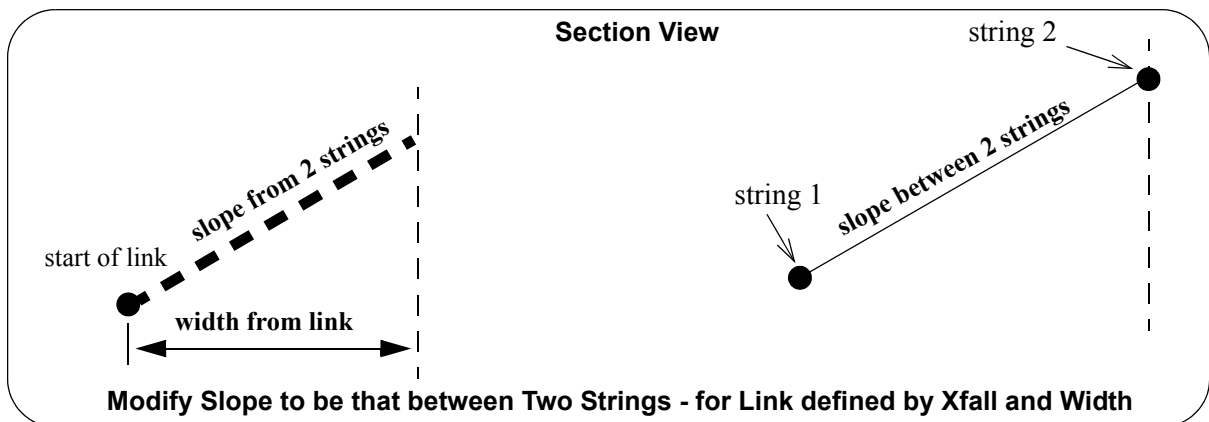


Slope Between Two Strings

For a cut link defined by *slope* and *width* or *slope* and *height*, *Slope to 2 strings* sets the **slope** for the link to be the **slope between two** existing **12d Model** strings,

However if the *Apply Many* tin is cut before reaching the string, the **cut link stops at the tin**.

The option will give an error for a link defined by *width* and *height*.



Selecting the **width to 2 strings**, **height to 2 strings** or **slope to 2 strings** option brings up the **Cut - Width to 2 Strings**, **Cut - Height to 2 Strings** and **Cut - Slope to 2 String** panels respectively.

Cut - Width to 2 Strings

Link name

Start mode

Start (ref)

End mode

End (ref)

Interval

Select string 1

Select string 2

Side 1 to search

Left side

Side 2 to search

Left side

Extra start

☒

Extra end

☒

Comment

Active

☒

OK

Apply

Finish

Help

Cut - Height to 2 Strings

Link name

Start mode

Start (ref)

End mode

End (ref)

Interval

Select string 1

Select string 2

Side 1 to search

Left side

Side 2 to search

Left side

Extra start

☒

Extra end

☒

Comment

Active

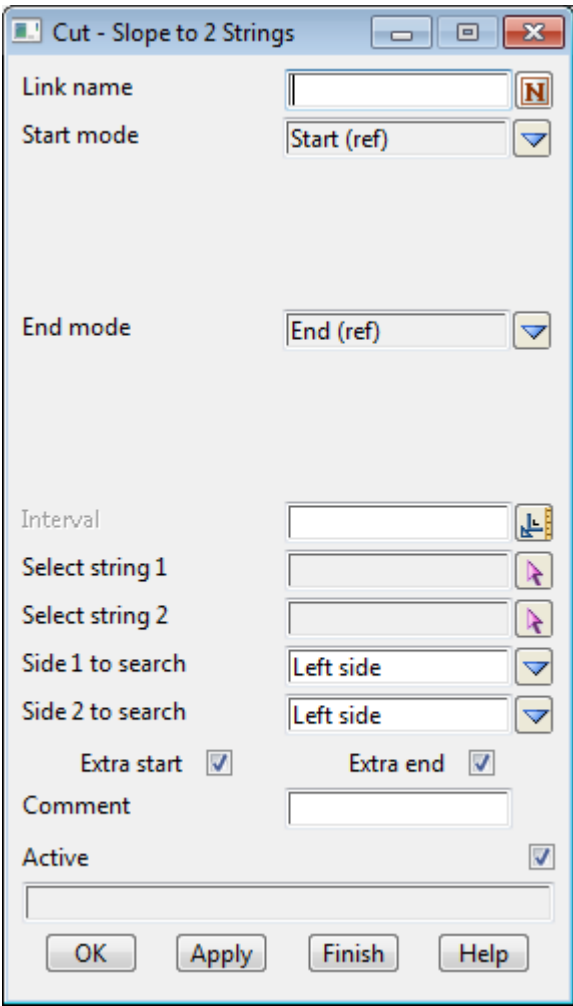
☒

OK

Apply

Finish

Help



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name <i>name of the link to modify.</i>	input		select name menu
Start/End mode <i>defines the start/end chainages for modifying the link</i> <i>For more information on Start/End mode, see Start and End Chainages</i>	choice box	Start (ref)/End (ref)	
Interval <i>if non blank, the interval to use to create cross sections and strings over the given chainage range.</i> <i>If blank, the Section separation value from the Apply Many panel is used.</i>	input		
String 1 <i>select the first string to use for defining width/height/slope for the link.</i>	string-select		
String 2 <i>select the second string to use for defining width/height/slope for the link.</i>	string-select		
Side 1 to search <i>side of the hinge string to start searching to find string 1 to use in defining width/height/slope.</i>	input	left side	left side, right side, both sides
Side 2 to search	input	left side	left side, right side, both sides

side of the hinge string to start searching to find string 2 to use in defining width/height/slope.

Extra start/end tick box

*if **ticked**, add an extra x-section 0.1 mm **before** the start/end chainage.*

Comment input

comment to add to the end of the line. In the file, the comment will be preceded by //.

Active tick box tick

*if **ticked**, use this modifier.*

*if **not ticked**, don't use this modifier.*

OK/Apply button

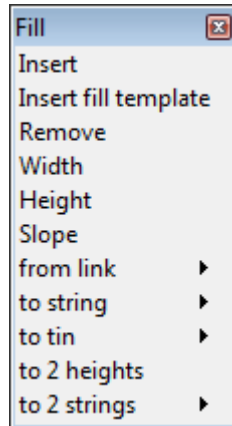
OK stores the values in the fields and removes the panel.

Apply stores the values and leaves the panel on the screen.

Continue to the next section [Fill Link Modifiers](#) or return to [Cut Link Modifiers](#) or [Modifiers in MTF Edit](#).

Fill Link Modifiers

The **Fill** walk-right brings up the **Fill** menu with options to modify the fill links of the template.



For *Insert*, go to
Insert fill template
Remove
Width/Height
Slope
from link
to string
to tin
to 2 heights
to 2 strings

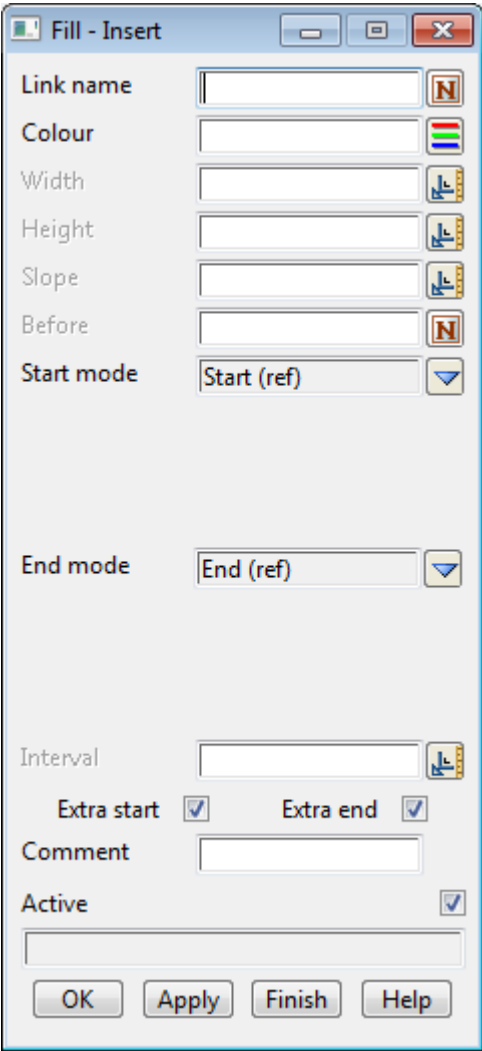
[Fill Link - Insert](#)
[Insert Fill Links from a Template](#)
[Fill Link - Remove](#)
[Fill Link - Modify Width or Height](#)
[Fill Link - Modify Slope](#)
[Fill Link - from Link](#)
[Fill Link - to String](#)
[Fill Link - to Tin](#)
[Fill Link - to Two Heights](#)
[Fill Link - to Two Strings](#)

Each of the options from this menu will now be described.

Fill Link - Insert

Fill links can be created by the **fill insert** modifier and by specifying either the width and height, width and slope or height and slope.

Selecting **Insert** brings up the **Fill - Insert** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name <i>name of the link to create.</i>	input		select name menu
Colour <i>colour of the link being created.</i>	input		available colours
Width /height/slope <i>width/ height/slope of the link being created - only use two of the three.</i>	input		measures menu
Before <i>if non-blank, the name of the string to insert the new string before. If blank, the link is appended to the end of the fixed part of the template.</i>	input		select name menu
Start/End mode <i>defines the start/end chainages for inserting the link For more information on Start/End mode, see Start and End Chainages</i>	choice box	Start (ref)/End (ref)	
Interval <i>if non blank, the interval to use to create cross sections and strings over the given chainage range.</i>	input		

If *blank*, the **Section separation** value from the **Apply Many** panel is used.

Extra start/end tick box
if *ticked*, add an extra x-section 0.1 mm *before* the start/end chainage.

Comment input
comment to add to the end of the line. In the file, the comment will be preceded by *//*.

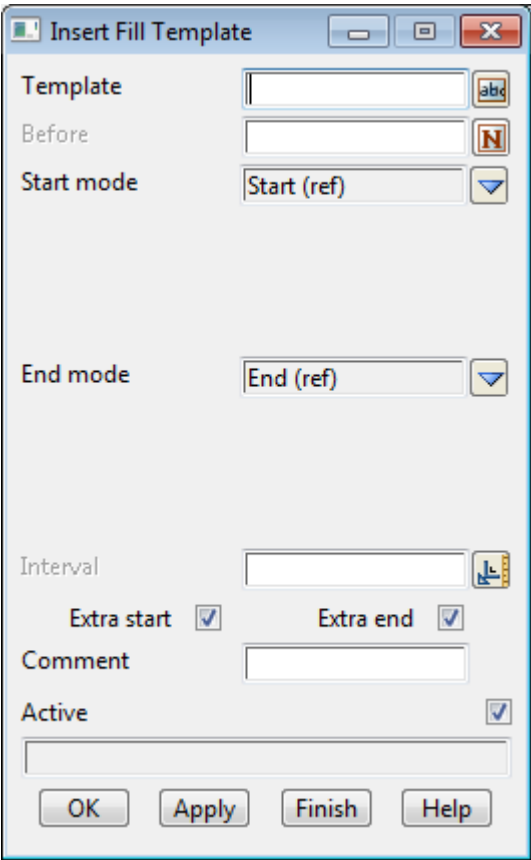
Active tick box tick
if *ticked*, use this modifier.
if *not ticked*, don't use this modifier.

OK/Apply button
OK stores the values in the fields and removes the panel.
Apply stores the values and leaves the panel on the screen.

Continue to the next section [Insert Fill Links from a Template](#) or return to [Fill Link Modifiers](#) or [Modifiers in MTF Edit](#).

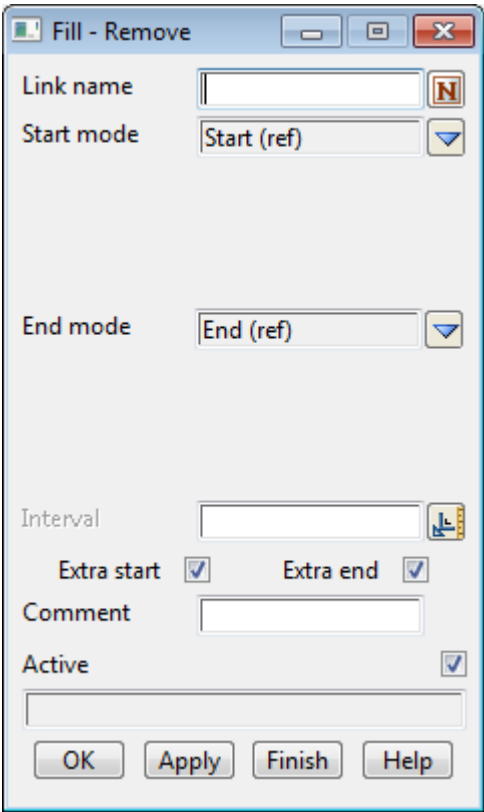
Insert Fill Links from a Template

All the fill links from an existing template can be inserted by the **Insert Template** command.
Selecting **Insert fill template** brings up the **Insert Fill Template** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Template	template box		select template menu
the name of the template to take the fill links from.			



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name <i>name of the link to removed.</i>	input		select name menu
Start/End mode <i>defines the start/end chainages for removing the link</i> <i>For more information on Start/End mode, see Start and End Chainages</i>	choice box	Start (ref)/End (ref)	
Interval <i>if non blank, the interval to use to create cross sections and strings over the given chainage range.</i> <i>If blank, the Section separation value from the Apply Many panel is used.</i>	input		
Extra start/end <i>if ticked, add an extra x-section 0.1 mm before the start/end chainage.</i>	tick box		
Comment <i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>	input		
Active <i>if ticked, use this modifier.</i> <i>if not ticked, don't use this modifier.</i>	tick box	tick	
OK/Apply <i>OK stores the values in the fields and removes the panel.</i> <i>Apply stores the values and leaves the panel on the screen.</i>	button		
Continue to the next section Fill Link - Modify Width or Height or return to Fill Link Modifiers or Modifiers in MTF Edit .			

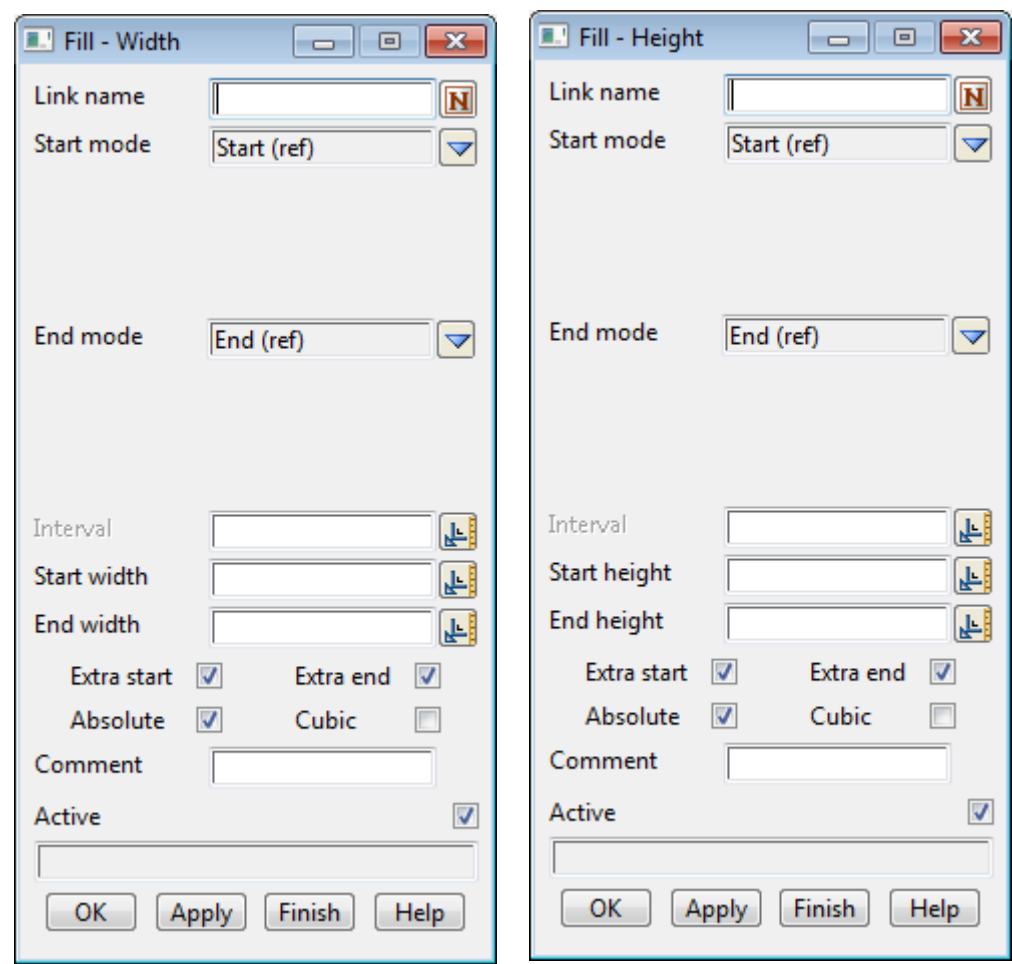
Fill Link - Modify Width or Height

The **fill width** modifier is used to modify the **width** of variable fill links originally defined by width. That is, links defined by *width and slope* or *width and height*.

Similarly the **fill height** modifier is used to modify the **height** of variable fill links originally defined by height. That is, links defined by *height and slope* or *height and width*.

Important Note - for a Fill link, a **positive** height is **down**.

Selecting the **width and height** option brings up the **Fill - Width** and **Fill - Height** panels respectively.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Link name	<i>name of the link to modify.</i>	input		select name menu
Start/End mode	<i>defines the start/end chainages for modifying the link</i> <i>For more information on Start/End mode, see Start and End Chainages</i>	choice box	Start (ref)/End (ref)	
Interval	<i>if non blank, the interval to use to create cross sections and strings over the given chainage range.</i> <i>If blank, the Section separation value from the Apply Many panel is used.</i>	input		
Start/End width/height		input		measures menu

start/end width/height for modifying the template link.

Important Note - for a fill link, height **positive** is down.

Extra start/end tick box

if **ticked**, add an extra x-section 0.1 mm **before** the start/end chainage.

Absolute tick box tick

if **ticked**, the width/height is set to the values given in the **start** and **end width/height** fields.

if **not ticked**, the values given in the **start** and **end height/width** fields are added to the existing widths/heights.

Cubic tick box

if **ticked**, the width/height is varied as a reverse cubic between the start and end chainages.

if **not ticked**, the width/height is varied linearly between the start and end chainages.

Comment input

comment to add to the end of the line. In the file, the comment will be preceded by //.

Active tick box tick

if **ticked**, use this modifier.

if **not ticked**, don't use this modifier.

OK/Apply button

OK stores the values in the fields and removes the panel.

Apply stores the values and leaves the panel on the screen.

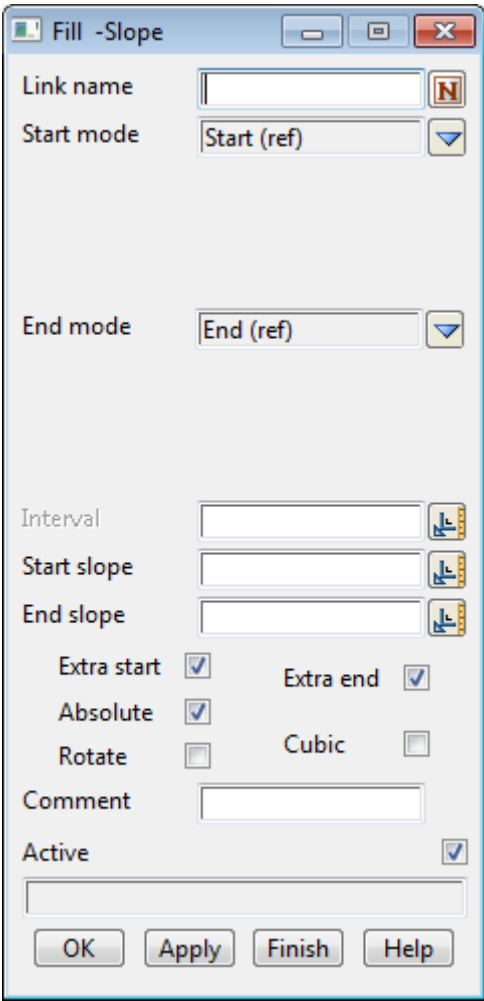
Continue to the next section [Fill Link - Modify Slope](#) or return to [Fill Link Modifiers](#) or [Modifiers in MTF Edit](#).

Fill Link - Modify Slope

The **fill slope** modifier is used to modify the **slope** of variable fill links originally defined by slope. That is, links defined by *slope and width* or *slope and height*.

Important Note - for a Fill link, a **positive** fill slope is **down**.

Selecting **slope** brings up the **Fill - Slope** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name	input		select name menu

name of the link to modify.

Start/End mode	choice box	Start (ref)/End (ref)
-----------------------	------------	-----------------------

defines the start/end chainages for modifying the link
For more information on Start/End mode, see [Start and End Chainages](#)

Interval	input
-----------------	-------

*if **non blank**, the interval to use to create cross sections and strings over the given chainage range.*
*If **blank**, the **Section separation** value from the **Apply Many** panel is used.*

Start/End slope	input	measures menu
------------------------	-------	---------------

start/end slope for modifying the template link.
Important Note - for a fill link, a **positive** slope is down.

Extra start/end	tick box
------------------------	----------

*if **ticked**, add an extra x-section 0.1 mm **before** the start/end chainage.*

Absolute	tick box	tick
-----------------	----------	------

*if **ticked**, the slope is set to the values given in the **start** and **end slope** fields.*
*if **not ticked**, the values given in the **start** and **end slope** fields are added to the existing slopes.*

Cubic and Rotate tick boxes:

Only **none** or **one** of **Cubic** and **Rotate** can be set to **tick**.

The **default** is **none** - that is, **neither is ticked** and in the default case, the slope is varied **linearly with respect to slope** between the start and end chainages.

Cubic tick box

if **ticked**, the slope is varied as a reverse cubic between the start and end chainages.

Rotate tick box

if **ticked**, the slope is varied linearly **with respect to the angle**, between the start and end chainages.

Comment input

comment to add to the end of the line. In the file, the comment will be preceded by //.

Active tick box tick

if **ticked**, use this modifier.

if **not ticked**, don't use this modifier.

OK/Apply button

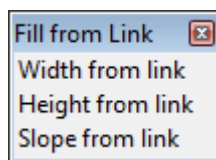
OK stores the values in the fields and removes the panel.

Apply stores the values and leaves the panel on the screen.

Continue to the next section [Fill Link - from Link](#) or return to [Fill Link Modifiers](#) or [Modifiers in MTF Edit](#).

Fill Link - from Link

The **Fill from link** walk-right brings up the **Fill from Link** menu with options to take the width, height or slope from another link.



For **Width/Height/Slope from link**, go to the next section [Fill Link - Take Width, Height or Slope from another Link](#)

Fill Link - Take Width, Height or Slope from another Link

The **Width from link** modifier is used to modify the **width** of fill links originally defined by width to be the same width as another link (**width and height** or **width and slope**). That is, the width of the link is a copy of the width of another link.

The **Height from link** modifier is used to modify the **height** of fill links originally defined by height to be the same height as another link (**height and width** or **height and slope**). That is, the height of the link is a copy of the height of another link.

The **Slope from link** modifier is used to modify the slope of fill links originally defined by slope to be the same slope as another link (**slope and width** or **slope and height**). That is, the slope of the link is a copy of the slope of another link. The link to copy slope from can be defined in terms of slope or cross fall. If the link to copy is defined by cross fall, then the slope is calculated to match the cross fall.

Selecting the **width from link**, **height from link** or **slope from link** option brings up the **Fill - Width from Link**, **Fill - Height from Link** and **Fill - Slope from Link** panels respectively.

Fill - Width from Link

Link name

Start mode

Start (ref)

End mode

End (ref)

Interval

From link name

From zone

fixed

Extra start

☒

Extra end

☒

Comment

Active

☒

OK

Apply

Finish

Help

Fill - Height from Link

Link name

Start mode

Start (ref)

End mode

End (ref)

Interval

From link name

From zone

fixed

Extra start

☒

Extra end

☒

Comment

Active

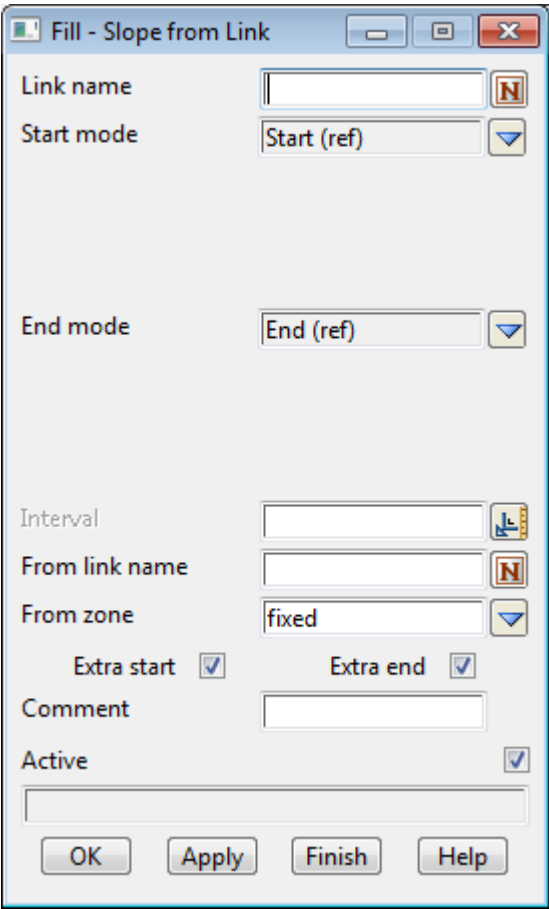
☒

OK

Apply

Finish

Help



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Link name	<i>name of the link to modify.</i>	input		select name menu
Start/End mode	<i>defines the start/end chainages for modifying the link</i> <i>For more information on Start/End mode, see Start and End Chainages</i>	choice box	Start (ref)/End (ref)	
Interval	<i>if non blank, the interval to use to create cross sections and strings over the given chainage range.</i> <i>If blank, the Section separation value from the Apply Many panel is used.</i>	input		
From link name	<i>template link to take width/height/slope from.</i>	input		select name menu
From zone	<i>zone that the template link to take width/height/slope from, comes from.</i>	input	fixed	fixed, cut, fill
Extra start/end	<i>if ticked, add an extra x-section 0.1 mm before the start/end chainage.</i>	tick box		
Comment	<i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>	input		
Active		tick box	tick	

if *ticked*, use this modifier.
if *not ticked*, don't use this modifier.

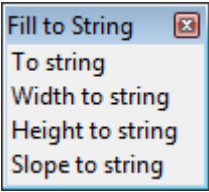
OK/Apply button

OK stores the values in the fields and removes the panel.
Apply stores the values and leaves the panel on the screen.

Continue to the next section [Fill Link - to String](#) or return to [Fill Link Modifiers](#) or [Modifiers in MTF Edit](#).

Fill Link - to String

The *Fill to string* walk-right brings up the **Fill to String** menu with options to take the width, height or slope by going to another string.

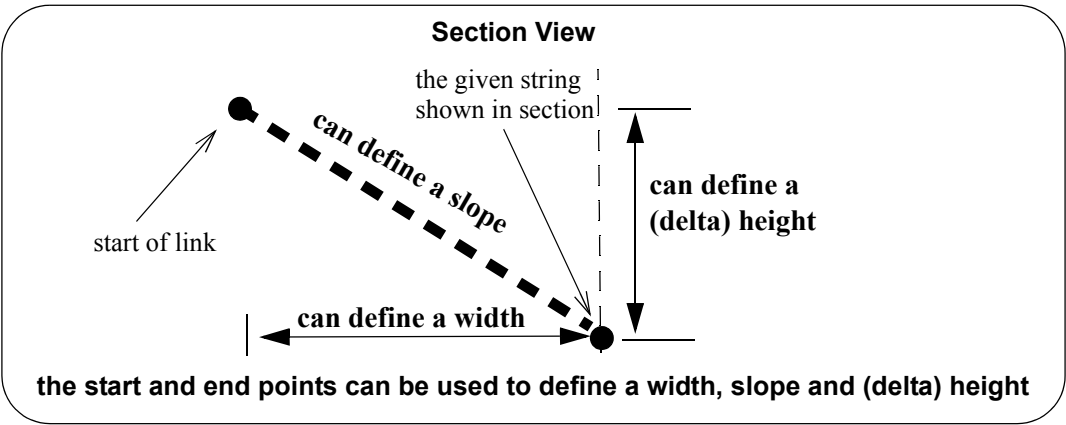


For *To string*, go to [Fill Link - Modify To String](#)
For *Width/Height/Slope to string*, go to [Fill Link - Calculate Width, Height or Slope to a String](#)

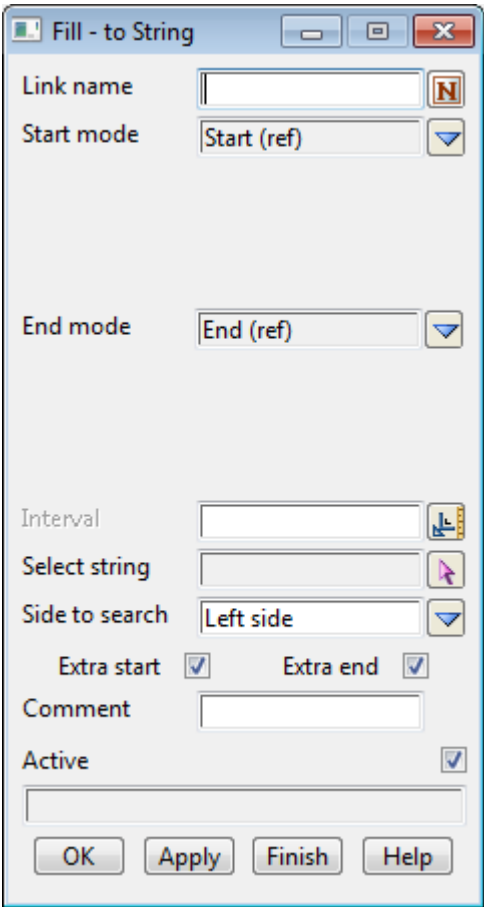
Fill Link - Modify To String

For any fill link, **To string** calculates the width, height and/or slope of the link needed to get from the start point of the link to the **to the selected string**.

However if the tin in the Apply Many is cut before reaching the string, the *cut link stops at the Apply Many tin*.



Selecting **To string** brings up the **Fill - to String** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name <i>name of the link to modify.</i>	input		select name menu
Start/End mode <i>defines the start/end chainages for modifying the link</i> <i>For more information on Start/End mode, see Start and End Chainages except for this option:</i> <i>When the Start mode is Start (ref), or Typed and the chainage is blank, the modification begins at the low dropped chainage of the selected string.</i> <i>When the End mode is End (ref), or Typed and the chainage is blank, the modification ends at the high dropped chainage of the selected string.</i>	choice box	Start (ref)/End (ref)	
Interval <i>if non blank, the interval to use to create cross sections and strings over the given chainage range.</i> <i>If blank, the Section separation value from the Apply Many panel is used.</i>	input		
String <i>select string to use for defining width/height/crossfall for the link.</i>	string-select		
Side to search <i>side of the hinge string to start searching to find the string to define width/height/crossfall.</i>	input	left side	left side, right side, both sides
Extra start/end <i>if ticked, add an extra x-section 0.1 mm before the start/end chainage.</i>	tick box		

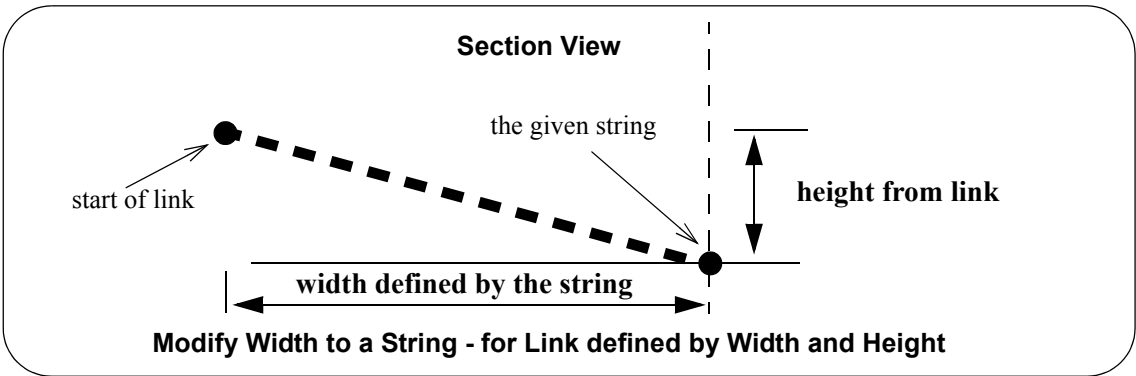
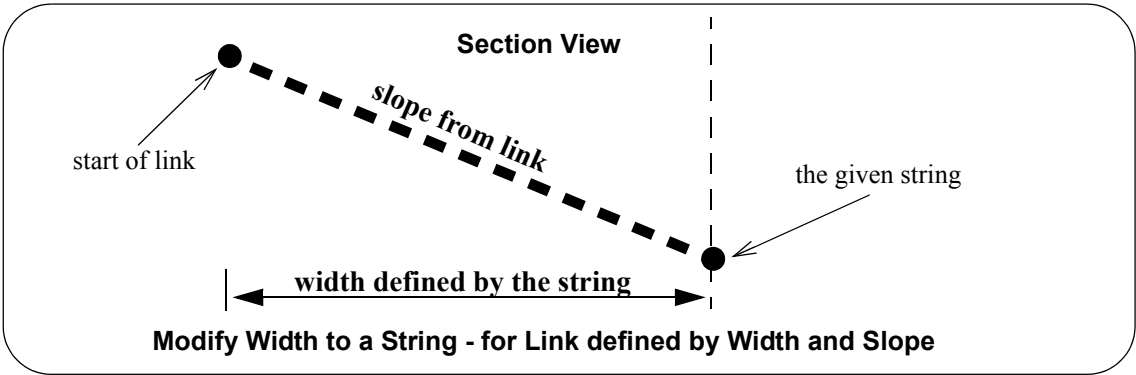
Comment	input	
<i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>		
Active	tick box	tick
<i>if ticked, use this modifier.</i>		
<i>if not ticked, don't use this modifier.</i>		
OK/Apply	button	
OK <i>stores the values in the fields and removes the panel.</i>		
Apply <i>stores the values and leaves the panel on the screen.</i>		

Fill Link - Calculate Width, Height or Slope to a String

Width to String:

For a fill link defined by *width and height* or *width and slope*, **Fill Width to string** calculates the **width** of the link as the width from the start point of the link, to the **to the selected string**. The *slope* or *height* is taken from the link. The option will give an error for a link defined by *height* and *slope*.

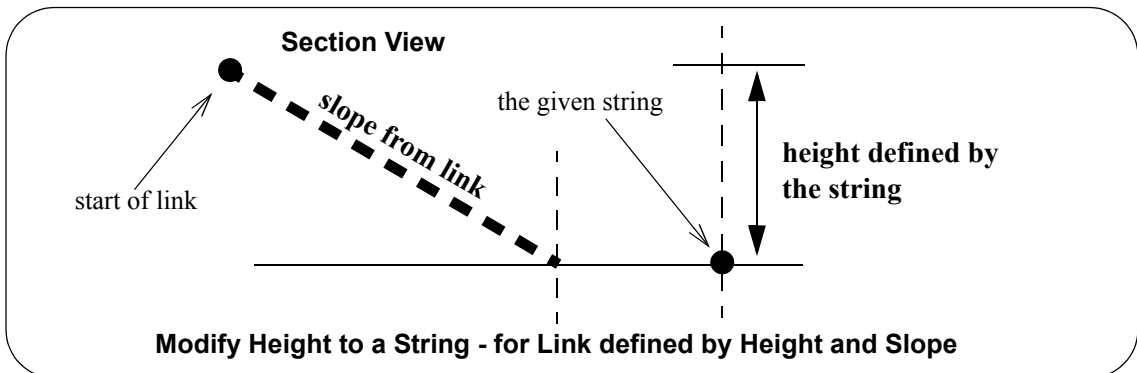
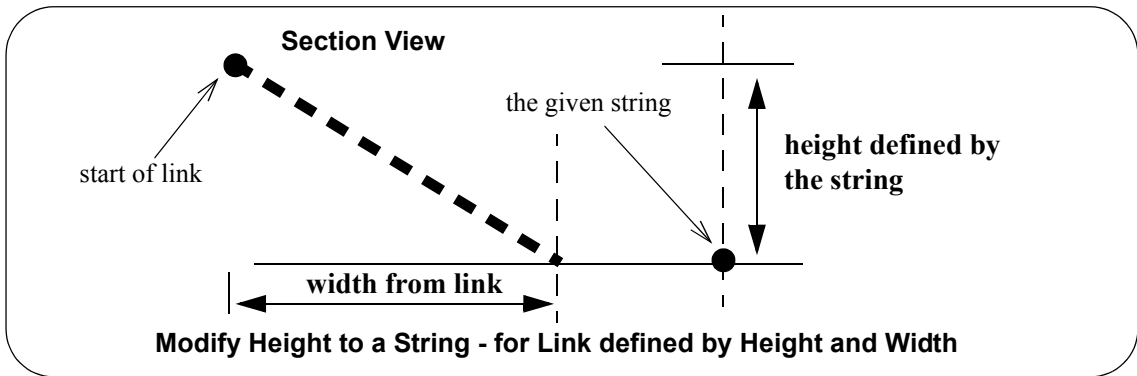
However if the tin in the Apply Many is cut before reaching the string, the **fill link stops at the Apply Many tin**.



Height to String:

For a fill link defined by *height and width* or *height and slope*, **Fill Height to string** calculates the **height** of the link as the difference in the height at the start point of the link, and the height **at the selected string**. The *slope* or *width* is taken from the link. The option will give an error for a link defined by *width* and *slope*.

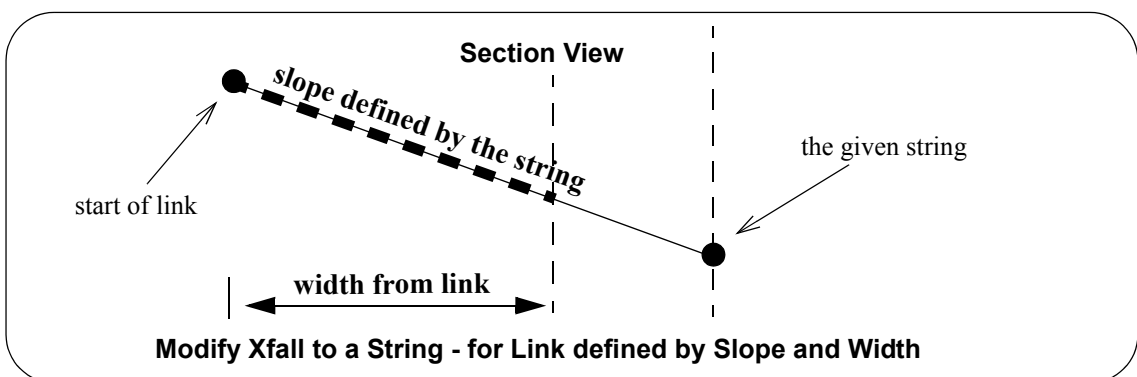
However if the tin in the Apply Many is cut before reaching the string, the **fill link stops at the Apply Many tin**.

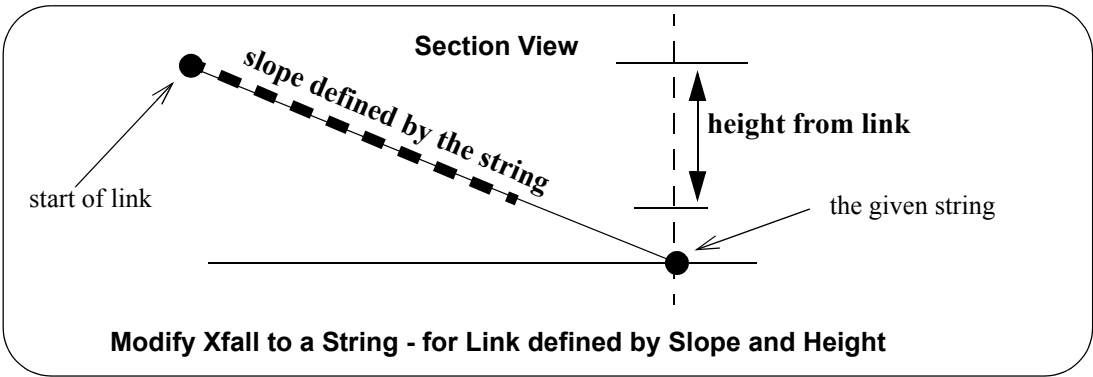


Slope to String:

For a fill link defined by *slope and width* or *slope and height*, Fill **Slope to string** calculates the **slope** of the link as the *slope* from the start point of the link to the **selected string**. The *width* or *height* is taken from the link. The option will give an error for a link defined by *width* and *height*.

However if the tin in the Apply Many is cut before reaching the string, the **fill link stops at the Apply Many tin**.



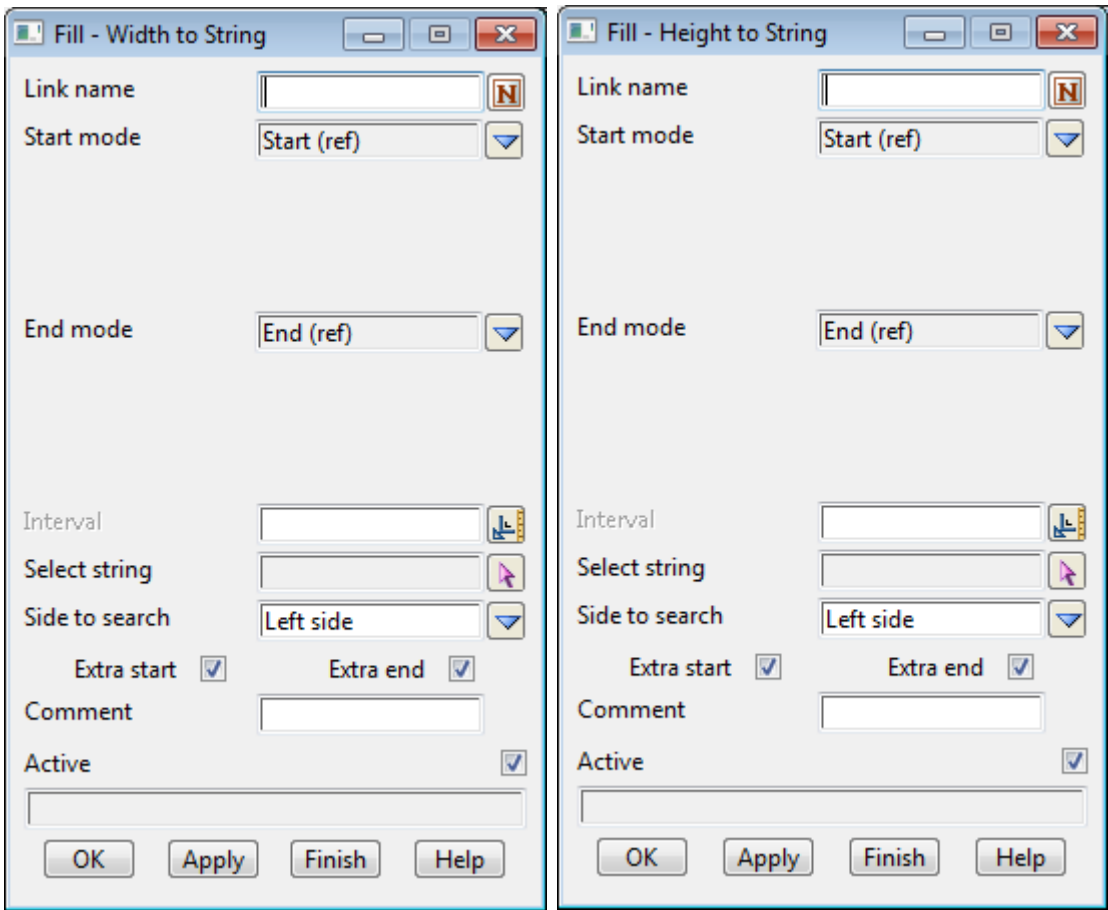


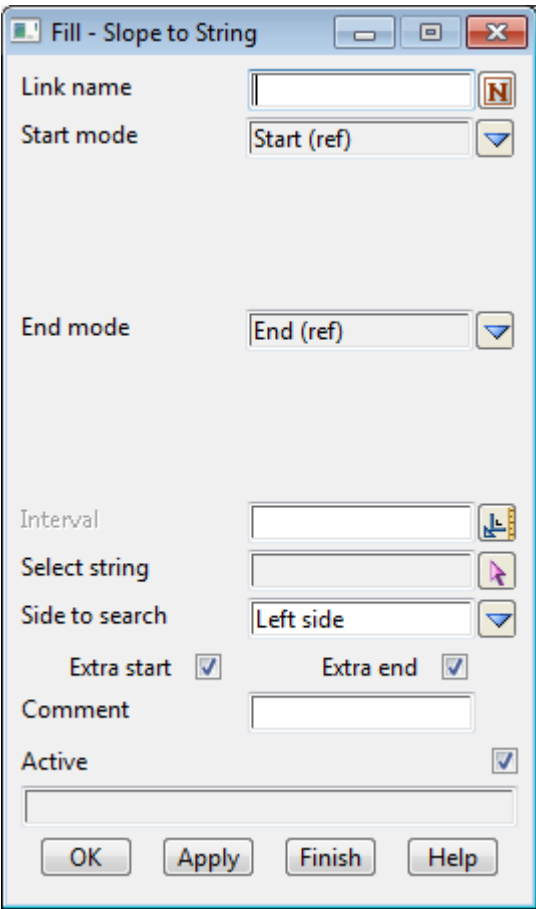
Note:

Using two of the above modifiers together and with the same string will place the end point of the link on the selected string. For example for a modifier defined by *width and slope*, using *width to string* and a *slope to string* with the same string will place the end of the link on that string.

But the To string option will do the same thing in one command. See [Cut Link - Modify To String](#).

Selecting the **width to string**, **height to string** or **slope to string** option brings up the **Fill - Width to String**, **Fill - Height to String** and **Fill - Slope to String** panels respectively.





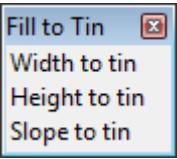
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name <i>name of the link to modify.</i>	input		select name menu
Start/End mode <i>defines the start/end chainages for modifying the link</i> <i>For more information on Start/End mode, see Start and End Chainages except for this option:</i> <i>When the Start mode is Start (ref), or Typed and the chainage is blank, the modification begins at the low dropped chainage of the selected string.</i> <i>When the End mode is End (ref), or Typed and the chainage is blank, the modification ends at the high dropped chainage of the selected string.</i>	choice box	Start (ref)/End (ref)	
Interval <i>if non blank, the interval to use to create cross sections and strings over the given chainage range.</i> <i>If blank, the Section separation value from the Apply Many panel is used.</i>	input		
String <i>select string to use for defining width/height/slope for the link.</i>	string-select		
Side to search <i>side of the hinge string to start searching to find the string to define width/height/slope.</i>	input	left side	left side, right side, both sides
Extra start/end <i>if ticked, add an extra x-section 0.1 mm before the start/end chainage.</i>	tick box		

Comment	input	
	<i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>	
Active	tick box	tick
	<i>if ticked, use this modifier.</i>	
	<i>if not ticked, don't use this modifier.</i>	
OK/Apply	button	
	OK stores the values in the fields and removes the panel.	
	Apply stores the values and leaves the panel on the screen.	
Continue to the next section Fill Link - to Tin or return to Fill Link Modifiers or Modifiers in MTF Edit .		

Fill Link - to Tin

The *Fill to tin* walk-right brings up the **Fill to Tin** menu with options to calculate the width, height or slope to get to a given tin (which doesn't have to be the Apply Many tin).

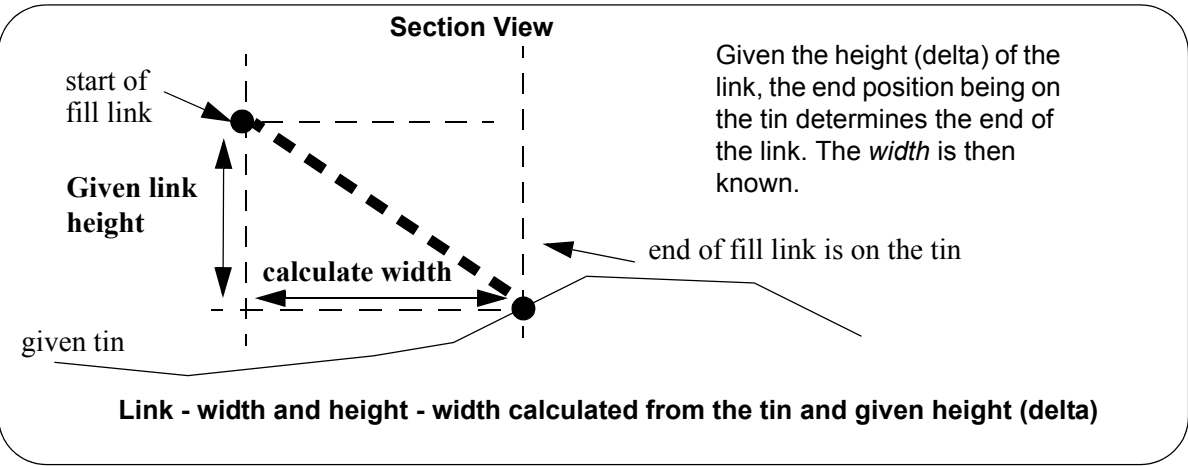


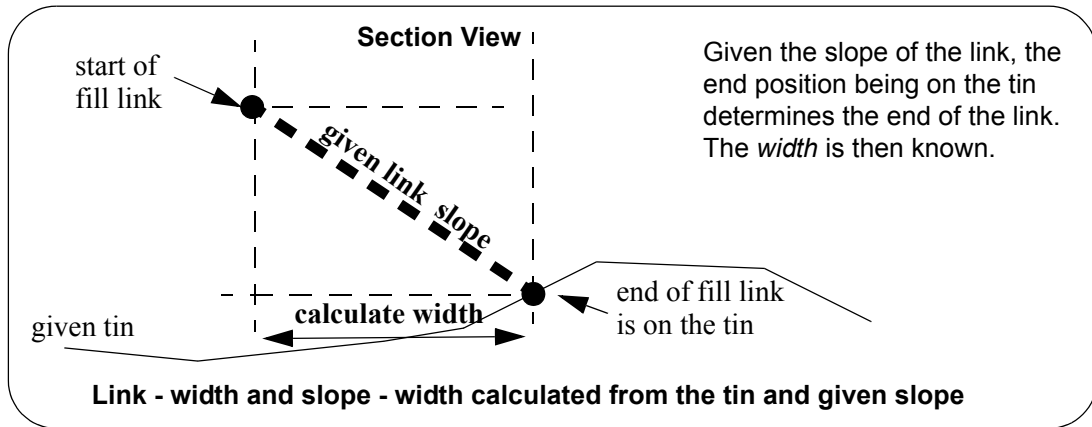
For *Width/Height/Tin to tin*, go to the next section [Fill Link - Modify Width, Height or Xfall to Sit on User Tin](#)

Fill Link - Modify Width, Height or Xfall to Sit on User Tin

Width to Tin

For a fill link defined by *width and height* or *width and slope*, **Width to tin** calculates the **width** of the link as the width required so that the link will sit on the user given tin at the **height/slope given in the link**. The option gives an error for a link defined by *height and slope*.

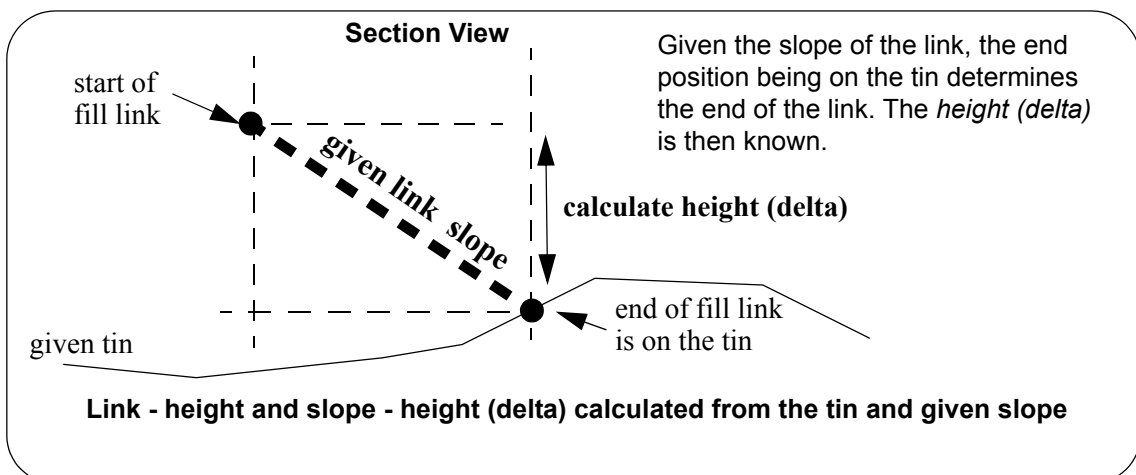
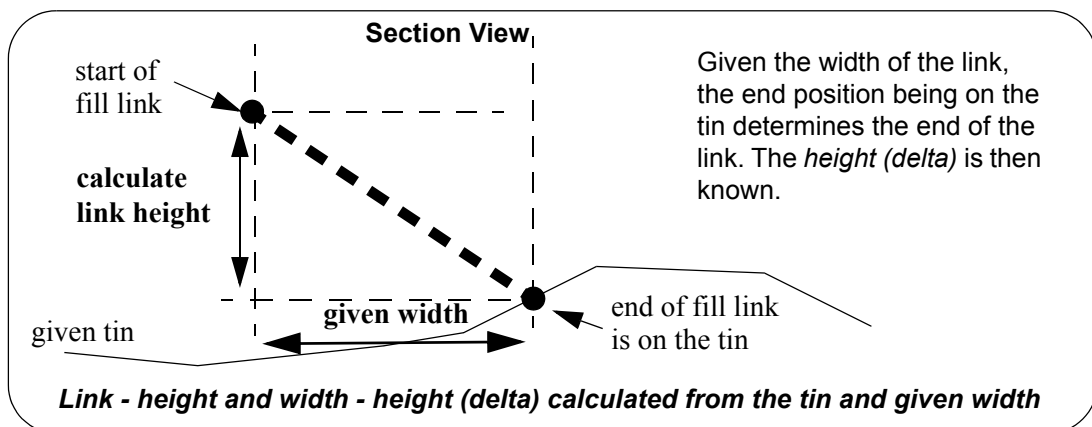




Height to Tin

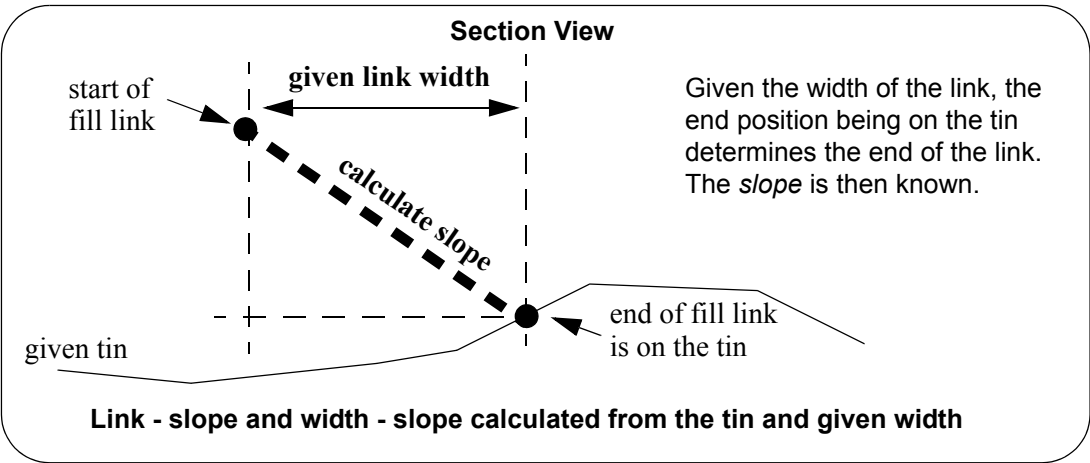
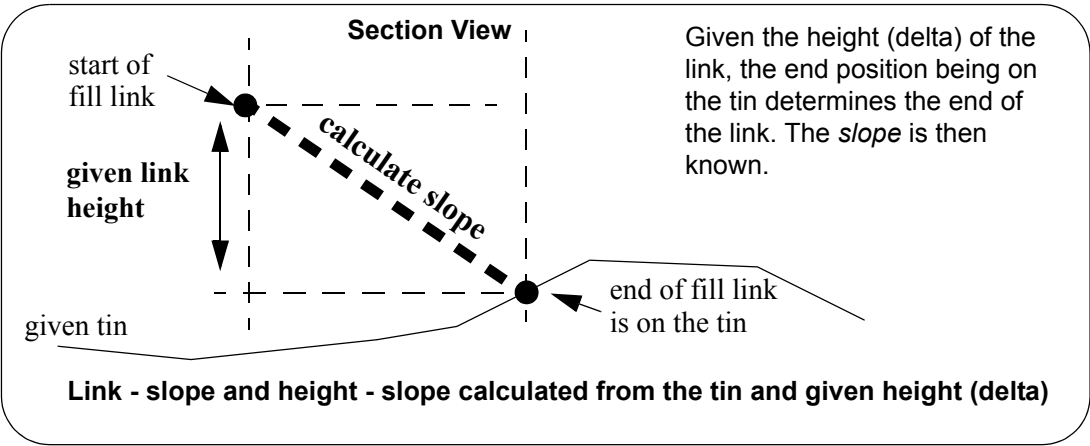
For a fill link defined by *height* and *width* or *height* and *slope*, the **Height to tin** calculates the **height** of the link as the difference in the height of the start point of the link, and the height that is required so that the link will sit on the user tin at the **width/slope given in the link**. The option gives an error for a link defined by *width* and *xfall*.

Important Note - for a Fill link, **positive** height and slopes are **down**.



Slope to Tin

For a fill link defined by *slope and width* or *slope and height*, **Slope to tin** calculates the **slope** of the link as the *slope* required so that the link will sit on the user tin at the **width/height given in the link**. The option gives an error for a link defined by *width and height*.



Selecting **Width to tin**, **Height to tin**, or **Slope to tin** brings up the **Fill - Width to Tin**, **Fill - Height to Tin** and **Fill - Slope to Tin** panels respectively.

Fill - Width to Tin

Link name

Start mode

End mode

Interval

Tin

Extra start ☒ Extra end ☒

Comment

Active ☒

OK Apply Finish Help

Fill - Height to Tin

Link name

Start mode

End mode

Interval

Tin

Extra start ☒ Extra end ☒

Comment

Active ☒

OK Apply Finish Help

Fill - Slope to Tin

Link name

Start mode

End mode

Interval

Tin

Extra start ☒ Extra end ☒

Comment

Active ☒

OK Apply Finish Help

The fields and buttons used in this panel have the following functions.

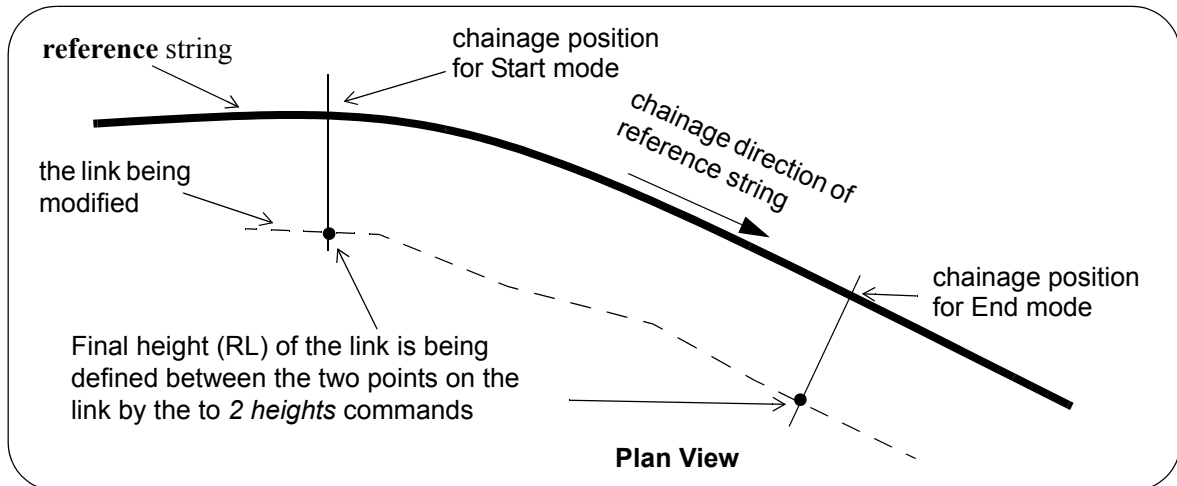
Field Description	Type	Defaults	Pop-Up
Link name <i>name of the link to modify.</i>	input		select name menu
Start/End mode <i>defines the start/end chainages for modifying the link</i> <i>For more information on Start/End mode, see Start and End Chainages</i>	choice box	Start (ref)/End (ref)	
Interval <i>if non blank, the interval to use to create cross sections and strings over the given chainage range.</i> <i>If blank, the Section separation value from the Apply Many panel is used.</i>	input		
Tin <i>the tin to use for defining the width/height/slope</i>	input		available tins
Extra start/end <i>if ticked, add an extra x-section 0.1 mm before the start/end chainage.</i>	tick box		
Comment <i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>	input		
Active <i>if ticked, use this modifier.</i> <i>if not ticked, don't use this modifier.</i>	tick box	tick	
OK/Apply OK stores the values in the fields and removes the panel. Apply stores the values and leaves the panel on the screen.	button		

Continue to the next section [Fill Link - to Two Heights](#) or return to [Fill Link Modifiers](#) or [Modifiers in MTF Edit](#).

Fill Link - to Two Heights

For an existing link, the **to 2 heights** option has a number of methods for **defining the height** from the start mode chainage to the end mode chainage. For example, over the chainage range, the height can be interpolated between two given RL's.

However if the *Apply Many* tin is cut before reaching the end of the modified link, the **fill link stops at the tin**.



Note: the **2 Strings** modifiers work with two points in a **section**. See [Fill Link - to Two Strings](#).

Selecting **o 2 heights** brings up the **Fill - to 2 Heights** panel

Fill - to 2 Heights

Link name:

Modifier type: **Height (Width fixed)**

Start mode: **Start (ref)**

End mode: **End (ref)**

Interval:

Type: **RL**

RL:

Extra start: ☒ Extra end: ☒

Comment:

Active: ☒

OK Apply Finish Help

Select Choice

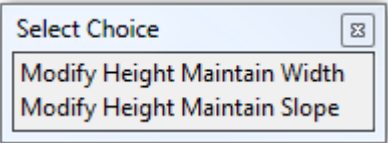
- Modify Height Maintain Width
- Modify Height Maintain Slope

Select Choice

- RL
- RL -> RL
- RL Grade ->
- <- RL Grade
- Pos ->
- <- Pos
- Pos -> Pos
- Pos Grade ->
- <- Pos Grade
- RL -> Pos
- Pos -> RL

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name <i>name of the link to modify.</i>	input		select name menu
Modifier type	choice box		



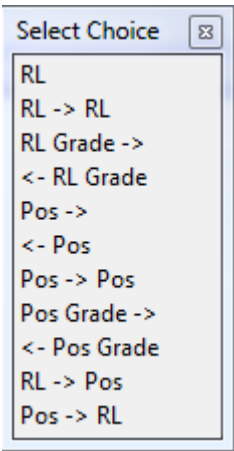
The **Maintain** Slope/Width is the part of the new definition of the selected link that is taken from the selected **Link name**. See [Fill - Maintaining Width or Slope](#).

The **Height** for the selected link is calculated by the method given by **Type**.

Start/End mode	choice box	Start (ref)/End (ref)
<i>defines the start/end chainages for modifying the link.</i>		
<i>For more information on Start/End mode, see Start and End Chainages.</i>		

Interval	input
<i>if non blank, the interval to use to create cross sections and strings over the given chainage range.</i>	
<i>If blank, the Section separation value from the Apply Many panel is used.</i>	

Type	choice box
-------------	------------



For the calculation of height for each type, go to [Fill - Maintaining Width or Slope](#)

Extra start/end	tick box	
<i>if ticked, add an extra x-section 0.1 mm before the start/end chainage.</i>		
Comment	input	
<i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>		
Active	tick box	tick
<i>if ticked, use this modifier.</i>		
<i>if not ticked, don't use this modifier.</i>		
OK/Apply	button	
OK stores the values in the fields and removes the panel.		
Apply stores the values and leaves the panel on the screen.		

Fill - Maintaining Width or Slope

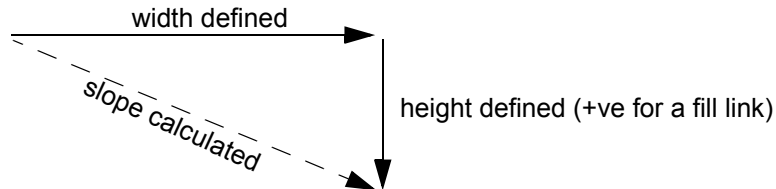
The option **to 2 heights** defines the **height** of the selected string so to completely define the link, only the **width** or the **slope** is needed.

So from the selected link only the **width** or the **xfall** is used (maintained) - the height is calculated by the **to 2 heights** option.

If the selected link is defined by **width and height**, then at any chainage a **slope** can be calculated from the width and height at that chainage.

Important note - for a **fill link**, for slope and heights, **positive is down**.

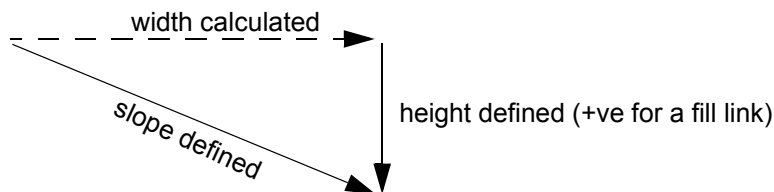
Section View



For links defined by width and height, the **slope** at each chainage is uniquely defined

If the selected link is defined by **slope and height**, then at any chainage a **width** can be calculated from the slope and height at that chainage.

Section View

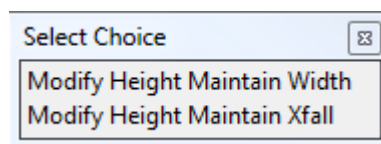


For links defined by slope and height, the **width** at each chainage is uniquely defined

Hence it doesn't matter if the selected link is defined by **width and slope**, **width and height**, or **slope and height**, at each chainage a **width and slope** are uniquely defined.

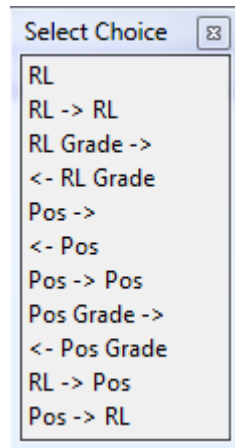
So no matter how the selected link is defined, at any chainage, a unique width or a slope is known and it is that **Width** or **Slope** can be maintained by the **to 2 heights** option.

So the choices for the option are:



Continue to the next section [Fill Link - to Two Strings](#) or return to [Fill Link - to Two Heights](#), [Fill Link Modifiers](#) or [Modifiers in MTF Edit](#).

Fill - Calculating the Heights for each Type



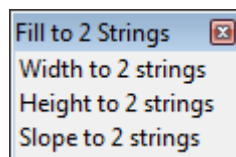
Important Note: Grade is calculated using **increasing Alignment chainages** and the **heights at the points** along the string being modifies. When going around a curve this will not be exactly the same as the grade along the string being modified.

The definitions of the calculations for each choice are the same as for the Fixed links. See [Fixed - Calculating the Heights for each Type](#).

Continue to the next section [Fill Link - to Two Strings](#) or return to [Fill Link - to Two Heights](#), [Fill Link Modifiers](#) or [Modifiers in MTF Edit](#).

Fill Link - to Two Strings

The *Fill to 2 strings* walk-right brings up the **Fill to 2 Strings** menu with options to calculate the width, height or slope from two given strings.



For *Width/Height/Slope to 2 Strings*, go to the next section [Fill Link - Width, Height or Slope Between Two Strings](#)

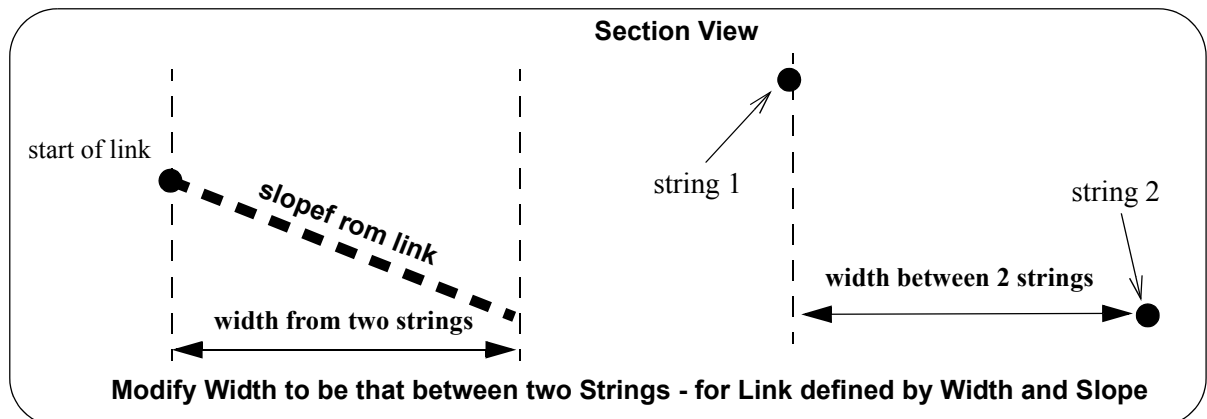
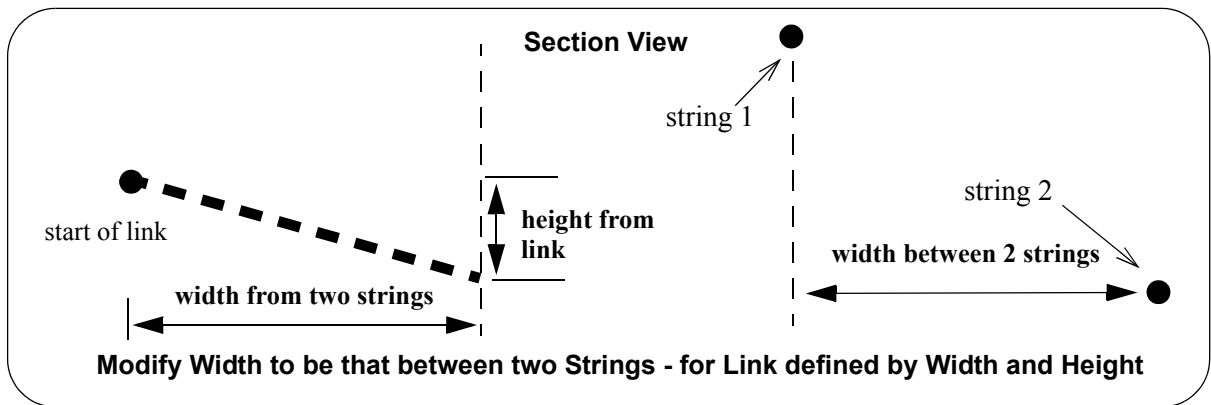
Fill Link - Width, Height or Slope Between Two Strings

Width Between Two Strings

For a fill link defined by *width* and *height* or *width* and *slope*, **Width to 2 strings** sets the **width** for a link to be the **width between two** existing **12d Model** strings,

However if the Apply Many tin is cut before reaching the string, the **fill link stops at the tin**.

The option will give an error for a link defined by *height* and *slope*.

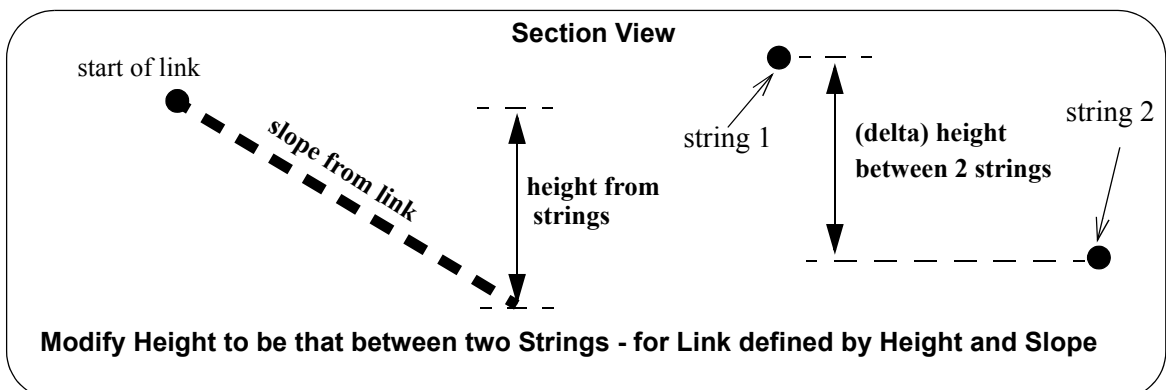


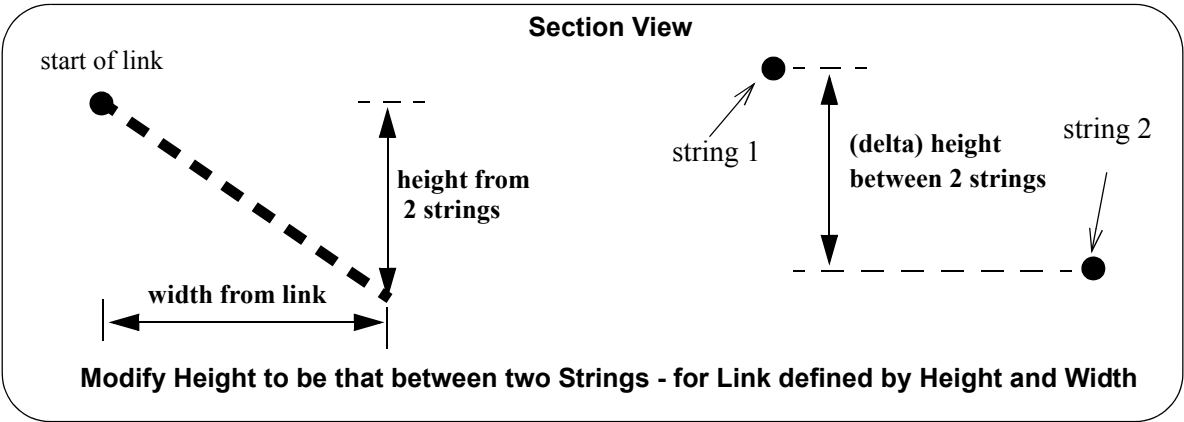
Height Between Two Strings

For a fill link defined by *height* and *width* or *height* and *slope*, **Height to 2 strings** sets the **height** for the link to be the **height between two** existing **12d Model** strings,

However if the Apply Many tin is cut before reaching the string, the **fill link stops at the tin**.

The option will give an error for a link defined by *width* and *slope*.



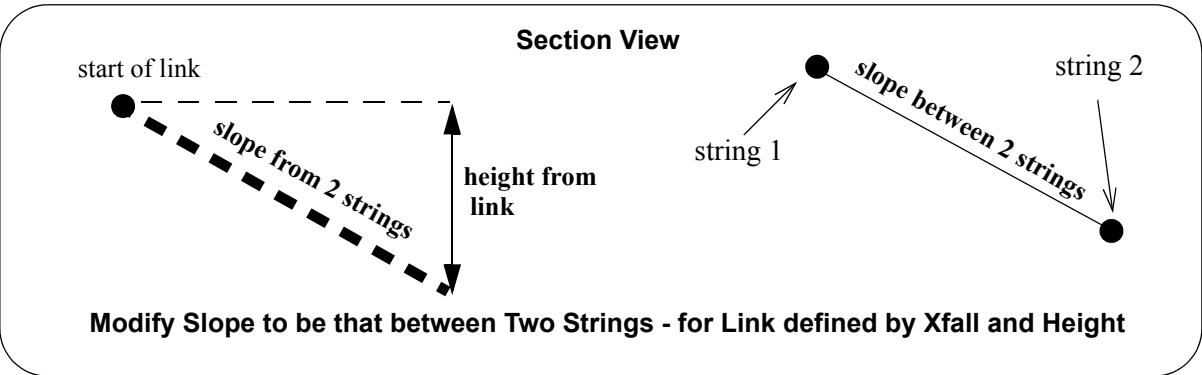
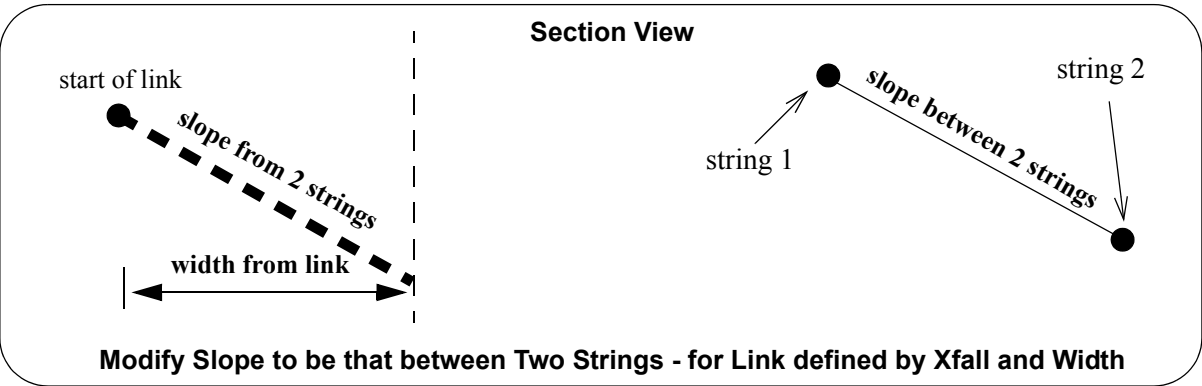


Slope Between Two Strings

For a cut link defined by *slope* and *width* or *slope* and *height*, **Slope to 2 strings** sets the **slope** for the link to be the **slope between two** existing **12d Model** strings,

However if the Apply Many tin is cut before reaching the string, the **cut link stops at the tin**.

The option will give an error for a link defined by *width* and *height*.



Selecting the **width to 2 strings**, **height to 2 strings** or **slope to 2 strings** option brings up the **Fill - Width to 2 Strings**, **Fill - Height to 2 Strings** and **Fill - Slope to 2 String** panels respectively.

Fill - Width to 2 Strings

Link name

Start mode

Start (ref)

End mode

End (ref)

Interval

Select string 1

Select string 2

Side 1 to search

Left side

Side 2 to search

Left side

Extra start

☒

Extra end

☒

Comment

Active

☒

OK

Apply

Finish

Help

Fill - Height to 2 Strings

Link name

Start mode

Start (ref)

End mode

End (ref)

Interval

Select string 1

Select string 2

Side 1 to search

Left side

Side 2 to search

Left side

Extra start

☒

Extra end

☒

Comment

Active

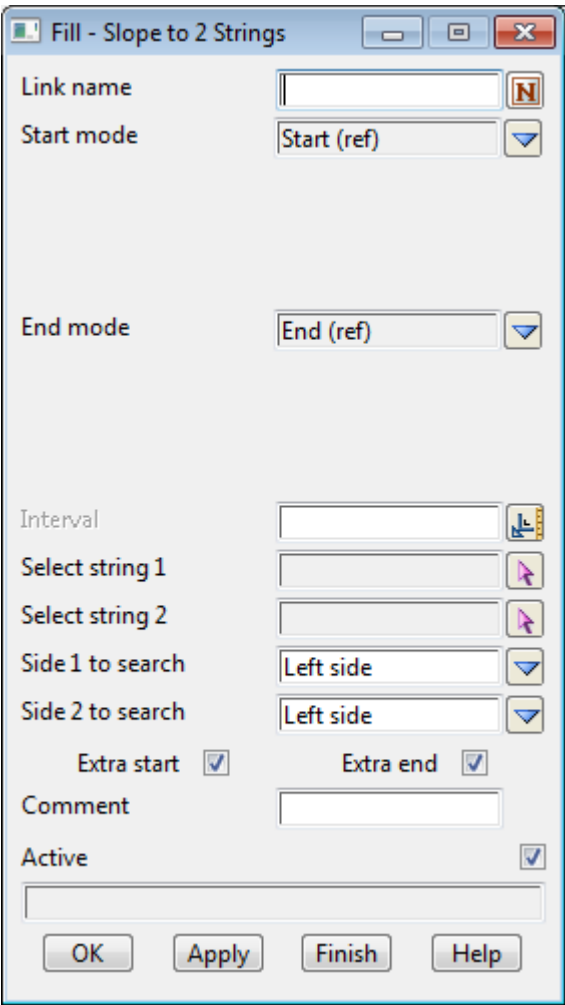
☒

OK

Apply

Finish

Help



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name <i>name of the link to modify.</i>	input		select name menu
Start/End mode <i>defines the start/end chainages for modifying the link</i> <i>For more information on Start/End mode, see Start and End Chainages</i>	choice box	Start (ref)/End (ref)	
Interval <i>if non blank, the interval to use to create cross sections and strings over the given chainage range.</i> <i>If blank, the Section separation value from the Apply Many panel is used.</i>	input		
String 1 <i>select the first string to use for defining width/height/slope for the link.</i>	string-select		
String 2 <i>select the second string to use for defining width/height/slope for the link.</i>	string-select		
Side 1 to search <i>side of the hinge string to start searching to find string 1 to use in defining width/height/slope.</i>	input	left side	left side, right side, both sides
Side 2 to search	input	left side	left side, right side, both sides

side of the hinge string to start searching to find string 2 to use in defining width/height/slope.

Extra start/end tick box

if **ticked**, add an extra x-section 0.1 mm **before** the start/end chainage.

Comment input

comment to add to the end of the line. In the file, the comment will be preceded by //.

Active tick box tick

if **ticked**, use this modifier.

if **not ticked**, don't use this modifier.

OK/Apply button

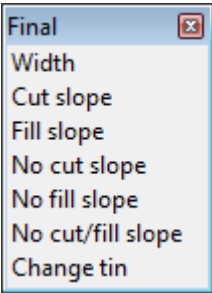
OK stores the values in the fields and removes the panel.

Apply stores the values and leaves the panel on the screen.

Continue to the next section [Final Modifiers](#) or return to [Fill Link Modifiers](#) or [Modifiers in MTF Edit](#).

Final Modifiers

The **final** walk-right brings up the **final** menu with options to modify the final cut and fill links of the template.



For <i>Width</i> , go to	Final Link - Width
<i>Cut slope</i>	Final Link - Cut or Final Fill Slope
<i>Fill slope</i>	Final Link - Cut or Final Fill Slope
<i>No cut slope</i>	Final Link - No Cut Slope or Final No Fill Slope or Final No Cut/Fill Slope
<i>No fill slope</i>	Final Link - No Cut Slope or Final No Fill Slope or Final No Cut/Fill Slope
<i>No cut/fill slope</i>	Final Link - No Cut Slope or Final No Fill Slope or Final No Cut/Fill Slope
<i>Change tin</i>	Change Final Tin
<i>Final link name</i>	Change Final Link Name

Each of the options from this menu will now described.

Final Link - Width

The *final* **Width** modifier varies the width of the *final* link of the template.

Selecting **Width** brings up the **Final - Width** panel.

Final - Width

Link name

Start mode

Start (ref)

End mode

End (ref)

Interval

Start width

End width

Extra start

☒

Extra end

☒

Absolute

☒

Cubic

☐

Comment

Active

☒

OK

Apply

Finish

Help

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name <i>name of the link to modify.</i>	input		select name menu
Start/End mode <i>defines the start/end chainages for modifying the link</i> <i>For more information on Start/End mode, see Start and End Chainages</i>	choice box	Start (ref)/End (ref)	
Interval <i>if non blank, the interval to use to create cross sections and strings over the given chainage range.</i> <i>If blank, the Section separation value from the Apply Many panel is used.</i>	input		
Start/End value <i>start/end width for modifying the template link.</i>	input		measures menu
Extra start/end <i>if ticked, add an extra x-section 0.1 mm before the start/end chainage.</i>	tick box		
Absolute <i>if ticked, the width is set to the values given in the start and end width fields.</i> <i>if not ticked, the width given in the start and end width fields are added to the existing widths.</i>	tick box	tick	
Cubic	tick box		

Field Description	Type	Defaults	Pop-Up
Link name <i>name of the link to modify.</i>	input		select name menu
Start/End mode <i>defines the start/end chainages for modifying the link</i> <i>For more information on Start/End mode, see Start and End Chainages</i>	choice box	Start (ref)/End (ref)	
Interval <i>if non blank, the interval to use to create cross sections and strings over the given chainage range.</i> <i>If blank, the Section separation value from the Apply Many panel is used.</i>	input		
Start/End slope <i>start/end slope for modifying the template link.</i> Important note: <i>For a cut link, positive slope is up.</i> <i>For a fill link, positive slope is down.</i>	input		measures menu
Extra start/end <i>if ticked, add an extra x-section 0.1 mm before the start/end chainage.</i>	tick box		
Absolute <i>if ticked, the slope is set to the values given in the start and end slope fields.</i> <i>if not ticked, the values given in the start and end slope fields are added to the existing slope.</i>	tick box	tick	
Cubic <i>if ticked, the slope is varied as a reverse cubic between the start and end chainages.</i>	tick box		
Rotate <i>if ticked, the slope is varied linearly with respect to the angle, between the start and end chainages.</i>	tick box		
Note - <i>Only one of cubic and rotate can be set to ticked.</i> <i>If both are set to not ticked, then the slope is varied linearly respect to slope between the start and end chainages (the default).</i>			
Comment <i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>	input		
Active <i>if ticked, use this modifier.</i> <i>if not ticked, don't use this modifier.</i>	tick box	tick	
OK/Apply <i>OK stores the values in the fields and removes the panel.</i> <i>Apply stores the values and leaves the panel on the screen.</i>	button		
Continue to the next section Final Link - No Cut Slope or Final No Fill Slope or Final No Cut/Fill Slope or return to Final Modifiers or Modifiers in MTF Edit .			

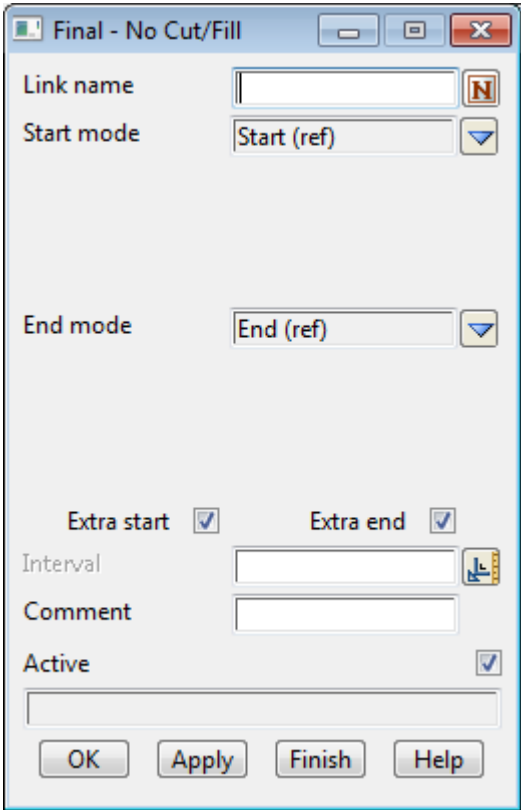
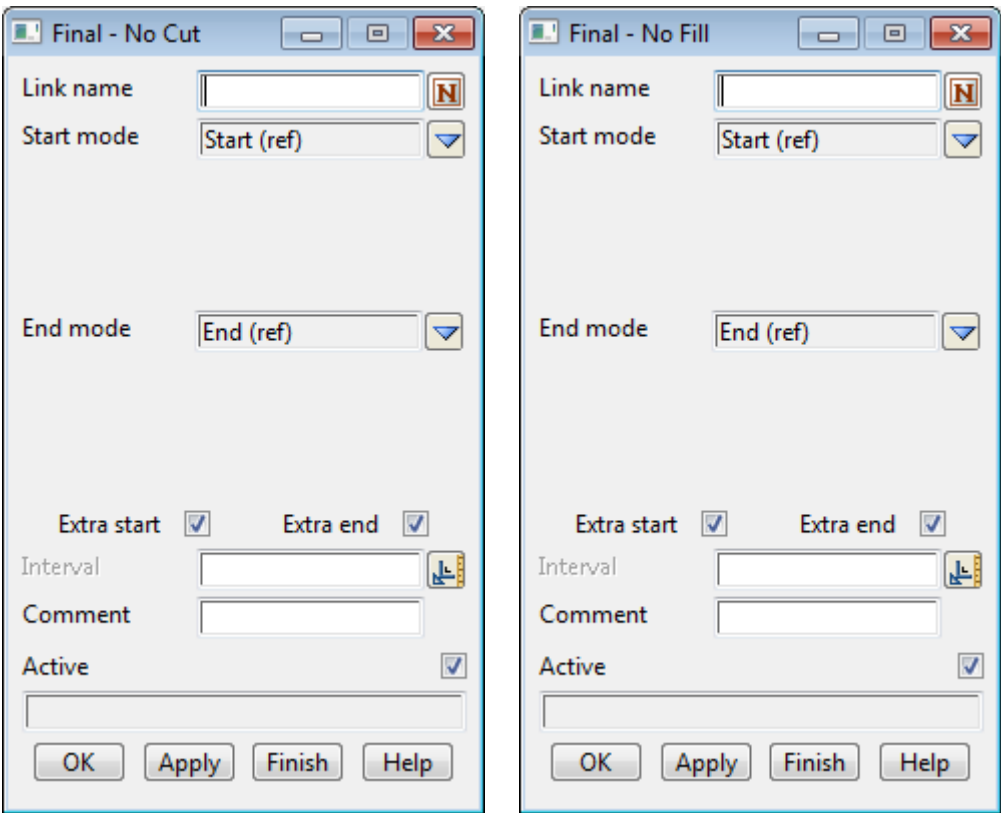
Final Link - No Cut Slope or Final No Fill Slope or Final No Cut/Fill Slope

The final link can be stopped altogether when it is in just cut or just fill or both.

The **no cut slope** modifier stops the final link when it is in *cut*, the **no fill slope** modifier stops the final link when it is in *fill* and the **no cut/fill fill slope** modifier stops the final link when it is in *cut* or *fill*.

Selecting No cut slope, No fill slope or No cut/fill slope brings up the **Final - No Cut**, **Final - No Fill** or

Final - No Cut/Fill panels respectively.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name <i>name of the link to modify.</i>	input		select name menu
Start/End mode <i>defines the start/end chainages for stopping the link</i> <i>For more information on Start/End mode, see Start and End Chainages</i>	choice box	Start (ref)/End (ref)	
Interval <i>if non blank, the interval to use to create cross sections and strings over the given chainage range.</i> <i>If blank, the Section separation value from the Apply Many panel is used.</i>	input		
Extra start/end <i>if ticked, add an extra x-section 0.1 mm before the start/end chainage.</i>	tick box		
Comment <i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>	input		
Active <i>if ticked, use this modifier.</i> <i>if not ticked, don't use this modifier.</i>	tick box	tick	
OK/Apply <i>OK stores the values in the fields and removes the panel.</i> <i>Apply stores the values and leaves the panel on the screen.</i>	button		

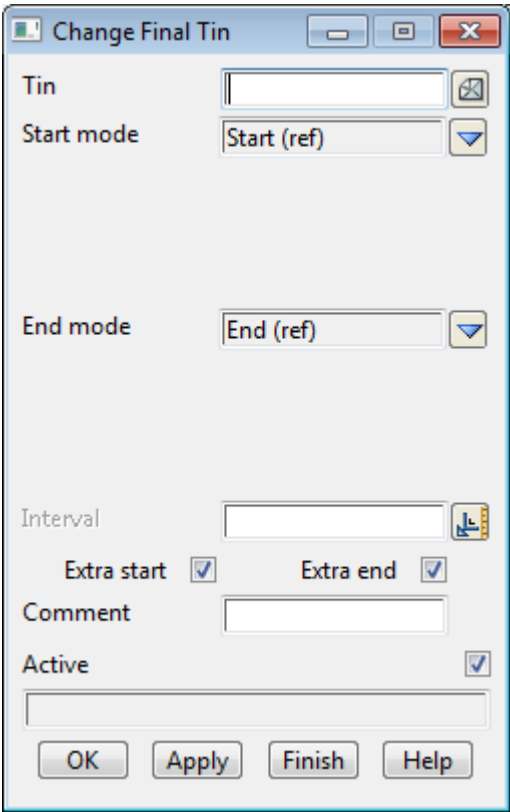
Continue to the next section [Change Final Tin](#) or return to [Final Modifiers](#) or [Modifiers in MTF Edit](#).

Change Final Tin

The tin that the final link batters to can be changed.

The **Change Final Tin** modifier changes the tin that the final cut and fill slopes batter to (the default tin is the tin from the Apply Many).

Selecting **Change tin** brings up the **Change Final Tin** panel.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Tin	<i>name of the tin for the final cut and fill links to batter to.</i>	tin box		available tins
Start/End mode	<i>defines the start/end chainages for stopping the link</i> <i>For more information on Start/End mode, see Start and End Chainages</i>	choice box	Start (ref)/End (ref)	
Interval	<i>if non blank, the interval to use to create cross sections and strings over the given chainage range.</i> <i>If blank, the Section separation value from the Apply Many panel is used.</i>	input		
Extra start/end	<i>if ticked, add an extra x-section 0.1 mm before the start/end chainage.</i>	tick box		
Comment	<i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>	input		
Active	<i>if ticked, use this modifier.</i> <i>if not ticked, don't use this modifier.</i>	tick box	tick	
OK/Apply	<i>OK stores the values in the fields and removes the panel.</i> <i>Apply stores the values and leaves the panel on the screen.</i>	button		

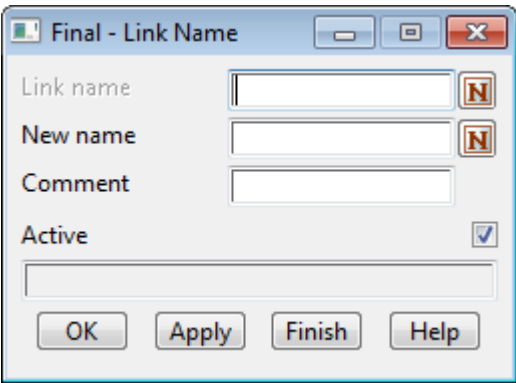
Continue to the next section [Change Final Link Name](#) or return to [Final Modifiers](#) or [Modifiers in MTF Edit](#).

Change Final Link Name

NOTE: THIS OPTION HAS NOT BEEN IMPLEMENTED.

The **Final Link Name** modifier changes the name of the interface string.

Selecting **Final link name** brings up the **Final - Link Name** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name <i>name of the tin for the final cut and fill links to batter to.</i>	name box		available names
New name	name box		available names
Comment <i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>	input		
Active <i>if ticked, use this modifier.</i> <i>if not ticked, don't use this modifier.</i>	tick box	tick	
OK/Apply OK stores the values in the fields and removes the panel. Apply stores the values and leaves the panel on the screen.	button		

Continue to the next section [Comment](#) or return to [Final Modifiers](#) or [Modifiers in MTF Edit](#).

Comment

Selecting **Comment** turns the line of the **Template Modifier** into a field that a comment can be typed into.

	Final - Width		optional	Link: Start: End:	"0.5" IAL 0.5000 0.5000	yes	yes	yes	i
2	The row where the Comment command was selected. A comment is typed into this area								
3									

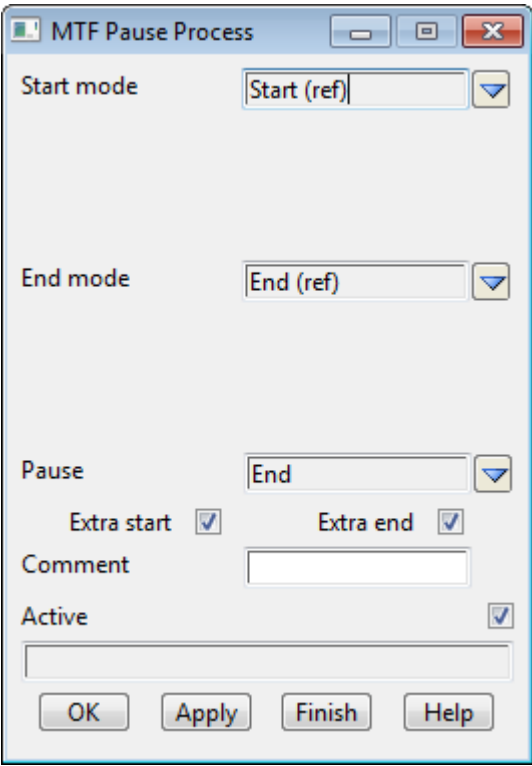
Typing will then enter a comment into this line and the entire line contains just the comment.

	Final - Width		optional	Link: Start: End:	"0.5" IAL 0.5000 0.5000	yes	yes	yes	i
2									
3	This is a comment								

Continue to the next section [Pause](#) or return to [Final Modifiers](#) or [Modifiers in MTF Edit](#).

Pause

Clicking on **Pause** brings up the **MTF Pause Process** panel which is used to enable/disable the processing of all the MTF commands in the given chainage range.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Start/End mode	choice box	Start (ref)/End (ref)	
<i>defines the start/end chainages for toggling processing commands on and off</i> <i>For more information on Start/End mode, see Start and End Chainages</i>			
Process	choice box	End	Start, End
<i>if Start, then for a given chainage ch in the chainage range, all commands after this command will be processed until a MTF Pause Process panel with Process set to End (and whose chainage range includes this chainage ch), is met.</i> <i>If End, then for a given chainage ch in the chainage range, all commands after this command will NOT be processed until a MTF Pause Process panel with Process set to Start (and whose chainage range includes this chainage ch) is met.</i>			
Extra start/end	tick box		
<i>if ticked, add an extra x-section 0.1 mm before the start/end chainage.</i>			
Comment	input		
<i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>			
Active	tick box	tick	
<i>if ticked, use this modifier.</i> <i>if not ticked, don't use this modifier.</i>			
OK/Apply	button		

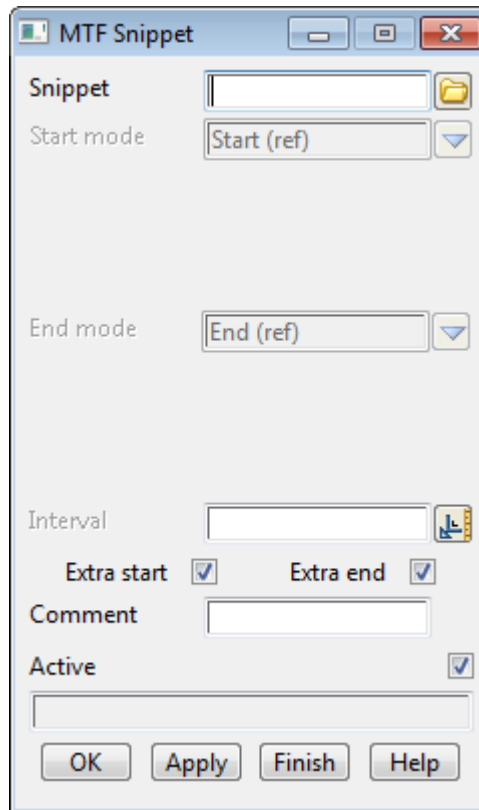
OK *stores the values in the fields and removes the panel.*

Apply *stores the values and leaves the panel on the screen.*

Continue to the next section [Snippets](#) or return to [Final Modifiers](#) or [Modifiers in MTF Edit](#).

Snippets

Clicking on **Snippet** brings up the **MTF Snippet** panel which is used to insert snippets.



For more information on the inserting and use of snippets, please go to the section [Defining and Using Snippets](#).

Defining and Using Snippets

The sections on snippets are:

[What are MTF Snippets?](#)
[Creating a Snippet](#)
[Creating a Snippet](#)
[An Example of a Snippet](#)
[How To Select a Snippet?](#)
[Start and End Modes for a Snippet](#)
[Snippet Parameters - Real, Text and String Types](#)
[Snippet Parameters - Choice Type](#)
[Snippet Parameters - Tick Type](#)
[Arithmetic in Snippets](#)
[#define in Snippets](#)
[Major Warning - You Will be Caught by This](#)

What are MTF Snippets?

A snippet is a collection of many single MTF modifiers that can be inserted as a group into an MTF file.

However unlike an MTF file or an insert in an MTF, values to be used inside the snippet can be passed down to the snippet via parameters whose values are specified each time the snippet is placed.

So snippets enable things such as driveway laybacks, kerb transitions, earthworks flares etc. to be a single entry in a MTF file thus educing the size of the MTF file and enhancing it's readability.

Setting up a snippet is the same complexity as creating MTF items but once a snippet is created, it can be reused over and over again.

Snippets can also be used to hide complex modifiers from novice users.

Go to the next section [Creating a Snippet](#) or back to [Defining and Using Snippets](#).

Creating a Snippet

There is currently no snippet Create/Editor in **12d Model** so for the moment snippets must be manually created as a text file. Snippet text files have the extension **MTFSNIPPET**.

Luckily the text file format for each command in a snippet is almost identical to the same modifier commands (with "named position" as the Start and End mode) as written out to the left_side_modifier or right_side_modifier section of a text MTF file.

So the easiest way to create a snippet file is to create the mtf inside **12d Model** with the modifiers to go in the snippet (with Start and End modes "named position"), and then pasting those modifiers from the left_side_modifier or right_side_modifier section of the text mtf file into the snippet file.

Thank heavens 12d left the old text definitions for the mtf file in the Help although they haven't been updated for some of the newer MTF options in V9 and V10 (e.g. named_position).

How to construct the additional information in the snippet file, and how a snippet works, will be explained in the following sections.

Go to the next section [An Example of a Snippet](#) or back to [Defining and Using Snippets](#).

An Example of a Snippet

The following is an example of a snippet called KERB_SA_DW places a layback at a driveway. It will be used as the example in describing the workings of a snippet.

```
// PARAMETER WIDTH REAL "Layback width" 0.6
// PARAMETER DEPTH REAL "Layback depth" -0.04

// drop into DW

insert "SAL" "grey" 0.001 0 unknown named_position "MODIFIER_START" 0 named_position
"MODIFIER_START" 0.5 absolute extra_start extra_end

insert "SAI" "grey" 0.5 $DEPTH unknown named_position "MODIFIER_START" 0 named_position
"MODIFIER_START" 0.5 absolute extra_start extra_end

insert "SAT" "grey" 0.03 0.15 unknown named_position "MODIFIER_START" 0 named_position
"MODIFIER_START" 0.5 absolute extra_start extra_end

insert "SAB" "grey" 0.18 0 unknown named_position "MODIFIER_START" 0 named_position
"MODIFIER_START" 0.5 absolute extra_start extra_end

// push out links

width "SAT" named_position "MODIFIER_START" 0 named_position "MODIFIER_START" 0.5 0.03 $WIDTH
absolute extra_start extra_end

width "SAB" named_position "MODIFIER_START" 0 named_position "MODIFIER_START" 0.5 0.18 0.0 absolute
extra_start extra_end

height "SAT" named_position "MODIFIER_START" 0 named_position "MODIFIER_START" 0.5 0.15 0.2 absolute
extra_start extra_end

height "SAB" named_position "MODIFIER_START" 0 named_position "MODIFIER_START" 0.5 0 0 absolute
extra_start extra_end

// DW to -0.5

insert "SKL" "grey" 0.001 0 unknown named_position "MODIFIER_START" 0.5 named_position
"MODIFIER_END" -0.5 absolute extra_start extra_end

insert "SKI" "grey" 0.5 $DEPTH unknown named_position "MODIFIER_START" 0.5 named_position
"MODIFIER_END" -0.5 absolute extra_start extra_end

insert "SKB" "grey" $WIDTH 0.2 unknown named_position "MODIFIER_START" 0.5 named_position
"MODIFIER_END" -0.5 absolute extra_start extra_end

//back out -0.5 to end

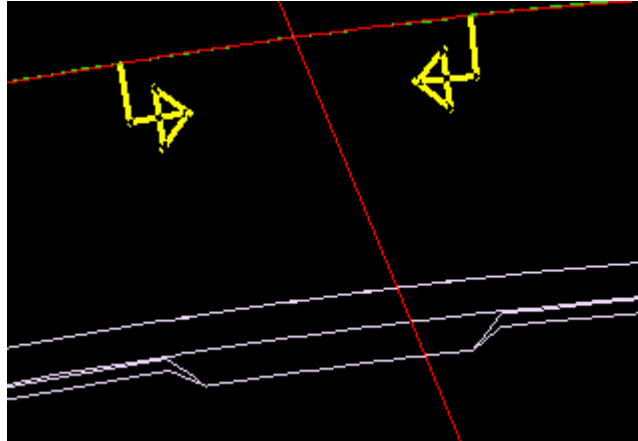
insert "SAL" "grey" 0.001 0 unknown named_position "MODIFIER_END" -0.5 named_position "MODIFIER_END"
0.0 absolute extra_start extra_end

insert "SAI" "grey" 0.5 $DEPTH unknown named_position "MODIFIER_END" -0.5 named_position
"MODIFIER_END" 0.0 absolute extra_start extra_end

insert "SAT" "grey" 0.03 0.15 unknown named_position "MODIFIER_END" -0.5 named_position
"MODIFIER_END" 0.0 absolute extra_start extra_end

insert "SAB" "grey" 0.18 0 unknown named_position "MODIFIER_END" -0.5 named_position "MODIFIER_END"
0.0 absolute extra_start extra_end
```

```
// push out links  
width "SAT" named_position "MODIFIER_END" -0.5 named_position "MODIFIER_END" 0.0 $WIDTH 0.03  
absolute extra_start extra_end  
width "SAB" named_position "MODIFIER_END" -0.5 named_position "MODIFIER_END" 0.0 0.0 0.18 absolute  
extra_start extra_end  
height "SAT" named_position "MODIFIER_END" -0.5 named_position "MODIFIER_END" 0.0 0.2 0.15 absolute  
extra_start extra_end  
height "SAB" named_position "MODIFIER_END" -0.5 named_position "MODIFIER_END" 0.0 0 0 absolute extra_start  
extra_end
```



Note: each line of the snippet is wrapping around because of the limited width of this document. Each line should be like:

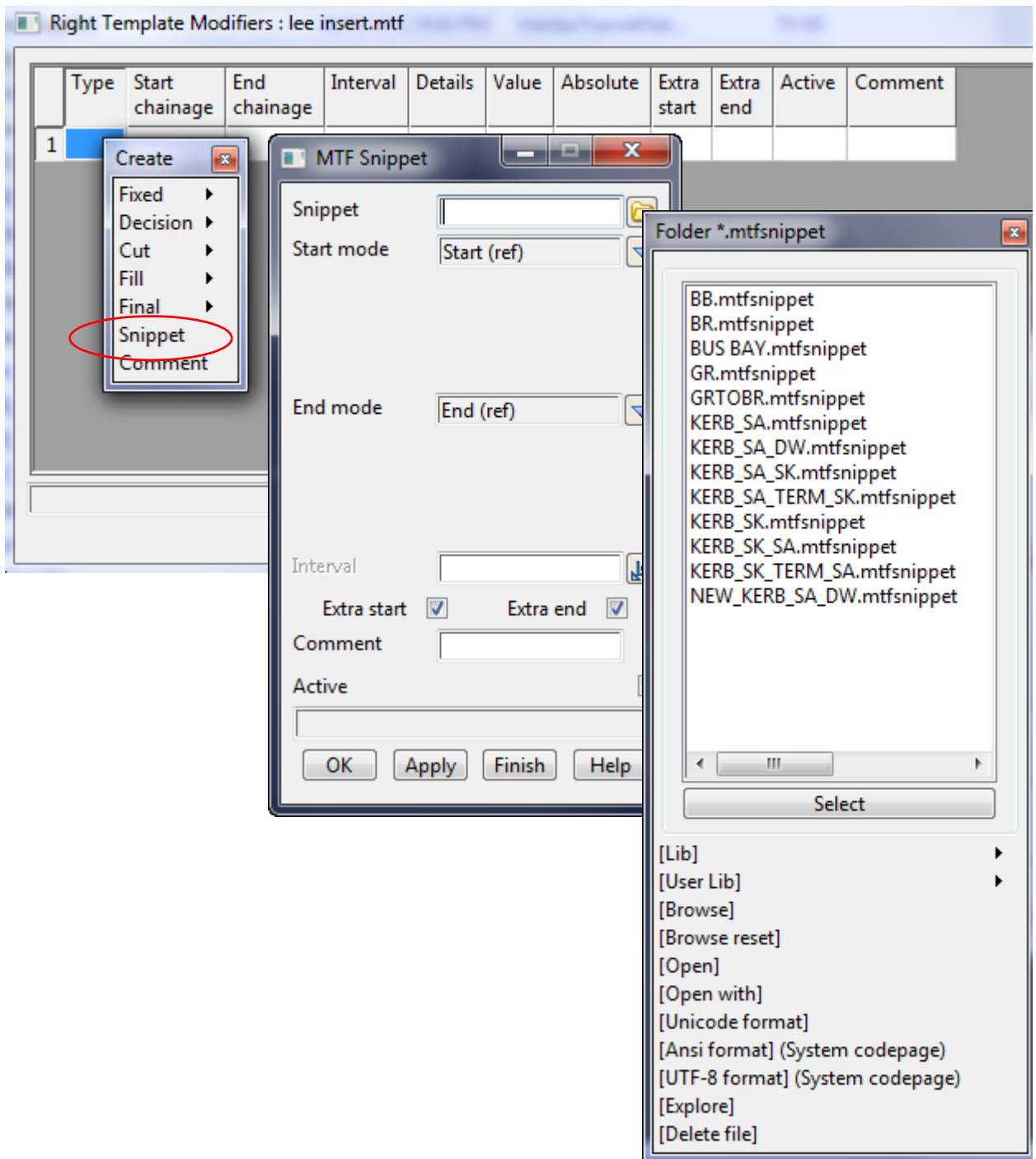
```
// drop into DW  
insert "SAL" "grey" 0.001 0 unknown named_position "MODIFIER_START" 0 named_position "MODIFIER_START" 0.5 absolute extra_start extra_end
```

But that would be impossible to read.

Go to the next section [How To Select a Snippet?](#) or back to [Defining and Using Snippets](#).

How To Select a Snippet?

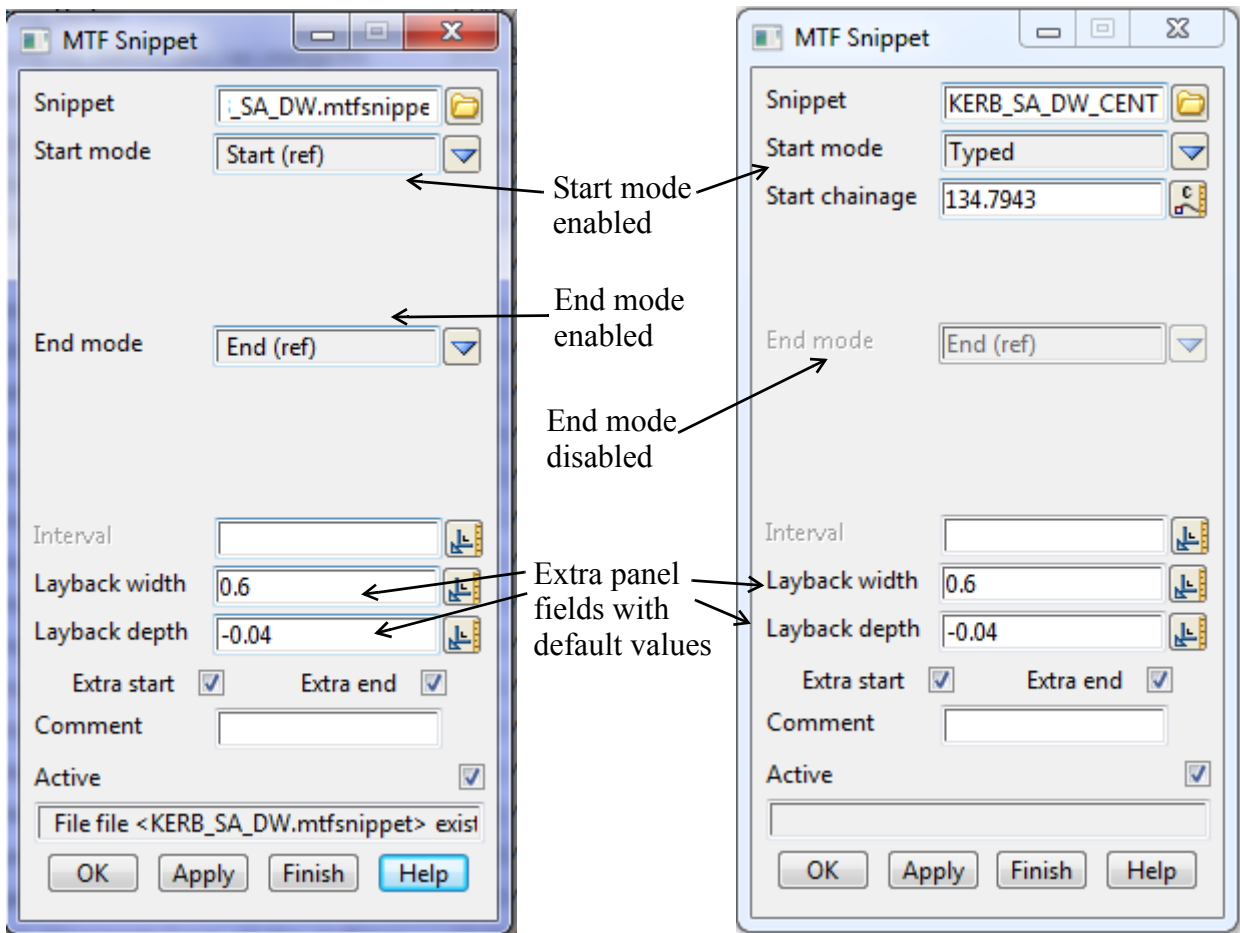
From the **Create** menu brought up from the grid in the **Right Template Modifiers** or **Left Template Modifiers** panel, select **Snippet** to bring up the **MTF Snippet** panel. And clicking on the folder icon in the *Snippet* field brings up the choice of snippets to use.



A snippet is then selected from the snippet pop-up list.

Selecting a snippet can modify the fields on the **MTF Snippet** panel. The **Start** and **End modes** may or may not be enabled, and there may be extra field on the panel, with or without values in them.

For example, selecting the *KERB_SA_DW* snippet modifies the **MTF Snippet** panel and there are two extra panel fields - **Layback width** with the value 0.6 and **Layback height** with the value - 0.4. Selecting the *KERB_SA_DW_CENT* snippet adds the extra panel fields but also disables the **End mode**.



If a Start mode or End mode is missing from the snippet, then the corresponding field will be left blank in the **Start chainage/End chainage** columns in the **Left** or **Right Templates Modifiers** panel. And the snippet name appears in the **Details** column.

Right Template Modifiers : ROAD.mtf							
	Type	Start chainage	End chainage	Interval	Details	Value	Absolut
5	MTF Snippet	Named position (ref) BB CL->CL S 104.5	Cut (other) ZZ->DW -2.5	1	Snippet:	KERB_SA_DW	yes
6	MTF Snippet	Cut (other) ZZ->DW -2.5		0.1	Snippet:	KERB_SA_DW_CENTRE	yes
7	MTF Snippet	Cut (other) ZZ->DW 2.5	Cut (other) ZZ->DW 10	1	Snippet:	KERB_SA	yes
8	Fixed Insert Full Template				Template:	BATTER	yes

is valid

Apply

Finish

A snippet with no End mode has nothing in the End chainage column.

Names of the snippets

How snippets control the **Start** and **End** modes is documented in the next section [Start and End Modes for a Snippet](#) and how the extra panel fields are created is discussed in the sections [Snippet Parameters - Real, Text and String Types](#), [Snippet Parameters - Choice Type](#) and [Snippet Parameters - Tick Type](#).

Go to the next section [Start and End Modes for a Snippet](#) or back to [Defining and Using Snippets](#).

Start and End Modes for a Snippet

The **Start** and **End** modes on the **MTF Snippet** panel calculate a position on the Alignment just like any other *MTF modifier* but how the values are specified inside the snippet file is slightly different to a standard MTF modifier.

Also unlike other MTF modifiers, some snippets only require *one* of the **Start mode** and **End mode** and if that is the case, the mode not required will be greyed out so that it can't be filled in.

The lines in the snippet file are similar to the normal MTF modifiers when "named position" has been selected for the **Start** and **End** modes. However the value of the "named position" in the text command needs to be replaced by either MODIFIER_START or MODIFIER_END followed by a real number.

So for example, the "named_postion" "name" "extension" in a MTF command is replaced by

"named_postion" MODIFIER_START snippet_extension

If a MODIFIER_START exists somewhere in the snippet then **Start mode** is enabled on the **MTF Snipped** panel.

If a MODIFIER_END exists somewhere in the snippet then **End mode** is enabled on the **MTF Snipped** panel.

Finally when a snippet runs, the chainage is calculated for the **Start mode/End mode** fields in the **MTF Snippet** panel and passed down to the snippet and where ever MODIFIER_START/MODIFIER_END appears, the passed chainage value PLUS the additional snippet_extension for each occurrence of the MODIFIER_START/MODIFIER_END is used as the chainage for that part of the snippet.

The following example for the KERB_SA_DW snippet shows how the snippet determines when a **Start mode** and/or **End mode** is needed., and how the extra snippet_extension is used.

```
// drop into DW
insert "SAL" "grey" 0.001 0   unknown named_position "MODIFIER_START" 0 named_position
"MODIFIER_START" 0.5 absolute extra_start extra_end

...

// DW to -0.5
insert "SKL" "grey" 0.001 0   unknown named_position "MODIFIER_START" 0.5 named_position
"MODIFIER_END" -0.5 absolute extra_start extra_end

...

// back out to -0.5 to end
insert "SAL" "grey" 0.001 0   unknown named_position "MODIFIER_END" -0.5 named_position
"MODIFIER_END" 0.0 absolute extra_start extra_end
```

These lines in the KERB_SA_DW snippet a lip of kerb through a driveway layback. It starts off as an SA style kerb, the layback is an SK style and then back to the SA style.

1. Looking at the first line: - the SA->SK transition:

```
insert "SAL" "grey" 0.001 0   unknown named_position "MODIFIER_START" 0 named_position
"MODIFIER_START" 0.5 absolute extra_start extra_end
```

In this line, the **"named_position" "MODIFIER_START" 0** replaces the standard chainage command in that position in the text modifier.

"named_position" "MODIFIER_START" - this tells the snippet to have a **Start mode** on the **MTF Snippet** panel. The calculated chainage for the **Start mode** field on the **MTF Snippet** panel is then passed to the snippet to be used as the chainage (plus the snippet_extension) in that **"named_position" MODIFIER_START** position in the modifier command.

0 - the value after MODIFIER_START is an additional value to add to the chainage calculated in from the **Start mode** in the **MTF Snippet** panel and passed down to the snippet.

So **"named_position" "MODIFIER_START" 0** is replaced by the chainage defined by the **Start mode** of the **MTF Snippet** panel.

Similarly the **"named_position" "MODIFIER_START" 0.5** replaces the standard chainage command in that position in the modifier and evaluates to being chainage defined by the **Start mode** of the **MTF Snippet** panel **plus 0.5**.

So this snippet line inserts a link from the chainage value passed in from the **Start mode** on the **MTF Snippet** panel, to **0.5 after** the chainage value passed in from the **Start mode** on the **MTF Snippet** panel.

2. Looking at the second line: - SK Layback:

```
insert "SKL" "grey" 0.001 0   unknown named_position "MODIFIER_START" 0.5
named_position "MODIFIER_END" -0.5 absolute extra_start extra_end
```

The difference to the previous line is that this line has the keywords **MODIFIER_START** and **MODIFIER_END** after "named_position" commands.

"named position" "MODIFIER_END" - this tells the snippet to have a **End mode** on the **MTF Snippet** panel. The calculated chainage for the **End mode** field on the **MTF Snippet** panel is then passed to the snippet to be used as the chainage (plus the snippet_extension) in that **"named_position" MODIFIER_END** position in the modifier command.

-0.5 - the value after MODIFIER_END is an additional value to add to the chainage calculated in from the **End mode** in the **MTF Snippet** panel and passed down to the snippet.

So this snippet line inserts a link from 0.5 past the chainage value passed from **Start mode** in the **MTF Snippet** panel through to 0.5 **before** the chainage value passed in from **End mode** in the **MTF Snippet** panel.

3. Looking at the third line: - SK ->SA transition:

```
insert "SAL" "grey" 0.001 0 unknown named_position "MODIFIER_END" -0.5 named_position
"MODIFIER_END" 0.0 absolute extra_start extra_end
```

So this snippet line inserts a link from 0.5 before the chainage value passed to the snippet from the **Start mode** in the **MTF Snippet** panel, to the chainage value passed to the snippet from the **Start mode** in the **MTF Snippet** panel.

Go to the next section [Snippet Parameters - Real, Text and String Types](#) or back to [Defining and Using Snippets](#).

Snippet Parameters - Real, Text and String Types

A powerful feature of snippets is that real and text values, and strings, can be defined as parameters in the snippet file and the parameters used throughout the snippet file.

To pass values for the parameters through to the snippet, each parameter is displayed in the **MTF Snippet** panel (with descriptive text defined in the snippet) so values for the parameters can be entered in the **MTF Snippet** panel and passed through to the snippet.

For each parameter defined in the parameter file, a field is displayed in the **MTF Snippet** panel and the syntax for a parameters in the snippet file is:

```
// PARAMETER param_name param_type param_description param_default_value
```

where

// - this is needed at the beginning of the line

PARAMETER - this is needed after the "//"

param_name - this is the name to use for the parameter. Where ever the parameter is to be used in the snippet, put **\$param_name**. The characters of the parameter name can only be alphanumeric (upper and lower case) and underscores, and the name cannot contain spaces. The name doesn't have quotes around it. The parameter names are not case sensitive so two names only differing by chase are considered to be identical. The parameters names must be unique in a snippet.

param_type - the type of the parameter. this can be REAL, INTEGER TEXT or SELECT.

If REAL then the parameter is a rea/floating point number.

If TEXT then the parameter is an integer number.

If TEXT then the parameter is text.

If SELECT then a string is to be selected for the parameter.

param_description - this description is written in the **MTF Snippet** panel for the field to enter values for this parameter. The description can include spaces and if it does then the description

must be enclosed in double quotes (").

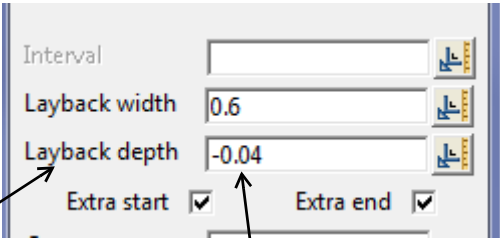
param_default_value - this value is **optional** but if it exists then this value is displayed as the value in the field for the parameter on the **MTF Snippet** panel. If the default value is text and it contains any spaces then the text must be enclosed in double quotes ("). If the default value is a string name, then it must be in the form "model_name->string_name".

The following lines from the KERB_SA_DW snippet define two REAL parameters WIDTH and DEPTH and the values for the parameters are then used inside the snippet commands by writing \$WIDTH and \$DEPTH.

```
// PARAMETER WIDTH REAL "Layback width" 0.6
// PARAMETER DEPTH REAL "Layback depth" -0.04
// drop into DW
...
// push out links
width "SAT" named_position "MODIFIER_START" 0 named_position "MODIFIER_START" 0.5
0.03 $WIDTH absolute extra_start extra_end
...
```

Extra panel fields in MTF Snippet panel because of the parameters WIDTH and DEPTH in the snippet

Description provided by the parameter definition in the snippet



Default value provided by the parameter definition in the snippet

The next example is of a SELECT parameter used in a different snippet.

```
// PARAMETER BB_STRING SELECT "Base string"
```

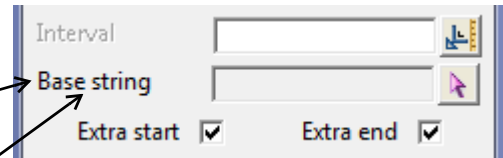
```
...
```

```
// parallel the selected string
```

```
fixed_parallel "SFML" "SFMB" named_position "MODIFIER_START" 0 named_position  
"MODIFIER_FINAL" 0 "$BB_STRING" interval 0.5 absolute extra_start extra_end
```

```
...
```

Extra string select panel fields in MTF Snippet panel because of the SELECT parameter BB_STRING in the snippet



Description provided by the parameter definition in the snippet

Here the parameter name is **BB_STRING**, its type is **SELECT** and so a Select box appears in the **MTF Snippet** panel with the panel field text **Base string**. The substitution point in the modifier is "**\$BB_STRING**".

Note for SELECT and TEXT type the \$parameter should be quoted in the modifier line.

WARNING - once a snippet with parameters has been saved in a MTF file, the parameters for the snippet are saved **in the MTF file**. Then when the apply many is run, the parameters and their values are read in from the MTF file and passed into the current snippet file.

Hence if the snippet file has been modified and parameter definitions added, modified or removed since the snippet was originally place in the MTF, these modifications of parameters will be **ignored** until the snippet panel is reopened in the MTF editor which forces the snippet file to be parsed again and the changes to the parameter definitions are then recognised.

Note that when the Apply Many for the MTF is run, the MTF used the **current** snippet file so if the snippet file has been modified since the snippet was placed in the MTF, the **modified** snippet file will be used (apart from any new parameter definitions and defaults)

Go to the next section [Snippet Parameters - Choice Type](#) or back to [Defining and Using Snippets](#).

Snippet Parameters - Choice Type

The Snippet Parameter of type Choice pops up a user defined list of choices for the user to select from in the **MTF Snippet** panel.

The syntax for type Choice is:

```
// PARAMETER param_name CHOICE param_description choice_1 choice_2 ... choice_n
```

where

// - this is needed at the beginning of the line

PARAMETER - this is needed after the "/"

param_name - this is the name to use for the parameter. Where ever the parameter is to be used in the snippet, put **\$param_name**. The characters of the parameter name can only be alphanumeric (upper and lower case) and underscores, and the name cannot contain spaces. The name doesn't have quotes around it. The parameter names are not case sensitive so two names only differing by chase are considered to be identical. The parameters names must be unique in a snippet.

CHOICE - the parameter type.

param_description - this description is written in the **MTF Snippet** panel for the field to enter values for this parameter. The description can include spaces and if it does then the description must be enclose in double quotes ("").

choice_1 choice_2 ... choice_n - the choices that will be displayed in the parameter pop-up in the **MTF Snippet** panel.

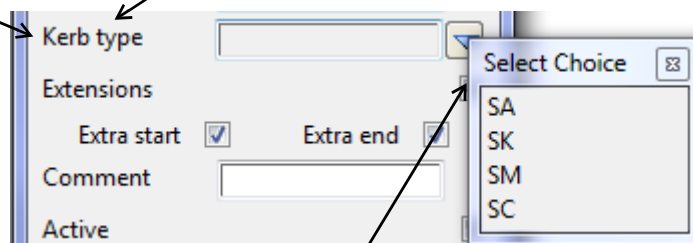
```
// PARAMETER KT CHOICE "Kerb type" "SA" "SK" "SM" "SC"
```

```
insert "$KT" "grey" 10 0 unknown named_position "MODIFIER_START" (0.0 - _E)
named_position "MODIFIER_END" _E absolute extra_start extra_end
```

...

Extra choice box panel field in the MTF Snippet panel because of the parameter KT

Description provided by the parameter definition in the snippet



Pop-up of choices from the parameter definition in the snippet

Go to the next section [Snippet Parameters - Tick Type](#) or back to [Defining and Using Snippets](#).

Snippet Parameters - Tick Type

The Snippet Parameter of type TICK places a tick box in the **MTF Snippet** panel.

The syntax for type Choice is:

```
// PARAMETER param_name TICK param_default
```

where

// - this is needed at the beginning of the line

PARAMETER - this is needed after the "/"

param_name - this is the name to use for the parameter. Where ever the parameter is to be used in the snippet, put **\$param_name**. The characters of the parameter name can only be alphanumeric (upper and lower case) and underscores, and the name cannot contain spaces. The name doesn't have quotes around it. The parameter names are not case sensitive so two names only differing by chase are considered to be identical. The parameters names must be unique in a snippet.

TICK - the parameter type.

param_description - this description is written in the **MTF Snippet** panel for the field to enter values for this parameter. The description can include spaces and if it does then the description must be enclose in double quotes ("").

param_default - this value is **optional** but if it exists then it must be 1 or a 0.

If 1, the tick box come up set to tick/on.

If 0, the tick box come up set to not ticked/off.

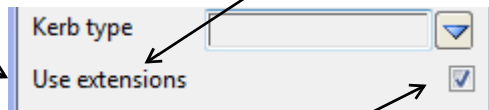
```
// PARAMETER KT CHOICE "Kerb type" "SA" "SK" "SM" "SC"
// PARAMETER TI TICK "Use extensions" 1
#if $TI
#define _E 3
#else
#define _E 0
#endif

insert "$KT" "grey" 10 0 unknown named_position "MODIFIER_START" (0.0 - _E)
named_position "MODIFIER_END" _E absolute extra_start extra_end

...
```

Extra tick box panel field in the MTF Snippet panel because of the parameter TI

Description provided by the parameter definition in the snippet



Pop-up of choices from the parameter definition in the snippet

Note that in the above example, the value of the Tick box parameter TI (\$TI), is used in a #define to set the value for **_E** (see [#define in Snippets](#)).

Go to the next section [Arithmetic in Snippets](#) or back to [Defining and Using Snippets](#).

Arithmetic in Snippets

Arithmetic expressions can be used for any of the real values in the lines of a snippet file as long as special rules are obeyed.

1. If a real value is replaced by an expression then the expression must be surrounded by round brackets. That is "(" and ")".
2. If the arithmetic operators plus **+**, minus **-**, multiplication ***** and division **/** are used then there must be a space on either side of them.

For example, **(\$TL - \$PL)** and **(0.0 - (\$DL / 2.0) - 0.5)**

Note that the negative of a number has the negative sign hard up against the number with no space in-between. For example **-0.5**

WARNING - a future interactive Snippet editor may not be able to support arithmetic in snippets. Those snippets with arithmetic will still need to be modified using a text editor.

An example of some lines from a snippet file using an arithmetic expression is:

```
// RTA Type F Half Kerb to SA transition

// PARAMETER TL REAL "Transition Length" 5.5
// PARAMETER PL REAL "Part Length" 1.340

// insert the links for the 'F' to 'short F' transition

insert "1" "grey" 0.001 0.000 unknown named_position "MODIFIER_START" 0.0 named_position
"MODIFIER_START" ($TL - $PL) absolute extra_start extra_end

insert "2" "grey" 0.499 -0.040 unknown named_position "MODIFIER_START" 0.0 named_position
"MODIFIER_START" ($TL - $PL) absolute extra_start extra_end

...
```

Go to the next section [#define in Snippets](#) or back to [Defining and Using Snippets](#).

#define in Snippets

#define can be used in a snippet file to define parameters for use inside the snippet file.

WARNING - a future interactive Snippet editor may not be able to support #define. Those snippets with #define will still need to be modified using a text editor.

The #define is placed at the beginning of a line, followed by one or more spaces and then the define_name to be used, and then one or more spaces and the expression that the define_name stands for.

```
#define define_name define_expression
```

Then the define_name can be used instead of the define_expression anywhere else in the snippet file following the #define.

Note - snippet parameters can be used in the define_expression as long as the definition of the parameter occurs before the #define.

For example

```
// PARAMETER DL REAL "Drive length" 3.0
// PARAMETER WD REAL "Layback width" 0.6
// PARAMETER DP REAL "Layback depth" -0.04

#define _DR1 (0.0 - ($DL / 2.0) - 0.5)
#define _DR2 (0.0 - ($DL / 2.0) )
#define _DR3 ( ($DL / 2.0) )
#define _DR4 ( ($DL / 2.0) + 0.5)

// drop into DW
insert "SAL" "grey" 0.001 0.000 unknown named_position "MODIFIER_START" _DR1
named_position "MODIFIER_START" _DR2 absolute extra_start extra_end
insert "SAI" "grey" 0.499 $DP unknown named_position "MODIFIER_START" _DR1
named_position "MODIFIER_START" _DR2 absolute extra_start extra_end
insert "SAT" "grey" 0.030 0.150 unknown named_position "MODIFIER_START" _DR1
named_position "MODIFIER_START" _DR2 absolute extra_start extra_end
insert "SAB" "grey" 0.180 0.000 unknown named_position "MODIFIER_START" _DR1
named_position "MODIFIER_START" _DR2 absolute extra_start extra_end

...
```

and the example using a Tick parameter:

```
// PARAMETER KT CHOICE "Kerb type" "SA" "SK" "SM" "SC"
// PARAMETER TI TICK "Use extensions" 1
#if $TI
#define _E 3
#else
#define _E 0
#endif

insert "$KT" "grey" 10 0 unknown named_position "MODIFIER_START" (0.0 - _E)
named_position "MODIFIER_END" _E absolute extra_start extra_end

...
```

Go to the next section [Major Warning - You Will be Caught by This](#) or back to [Defining and Using Snippets](#).

Major Warning - You Will be Caught by This

WARNING - once a snippet with parameters has been saved in a MTF file, the parameters for the snippet are saved *in the MTF file*. Then when the apply many is run, the parameters and their values are read in from the MTF file and passed into the current snippet file.

Hence if the snippet file has been modified and parameter definitions added, modified or removed since the snippet was originally placed in the MTF, these modifications of parameters will be **ignored** until the snippet panel is reopened in the MTF editor which forces the snippet file to be parsed again and the changes to the parameter definitions are then recognised.

Note that when the Apply Many for the MTF is run, the MTF used the **current** snippet file so if the snippet file has been modified since the snippet was placed in the MTF, the **modified** snippet file will be used (apart from any new parameter definitions and defaults)

Return to the MTF Snippets section [Snippets](#) or go to the next section [MTF Stripping](#).

MTF Stripping

A fixed stripping depth can be specified in the **Apply** option whilst the **Apply many** option allows for stripping depths that can **vary along the design**.

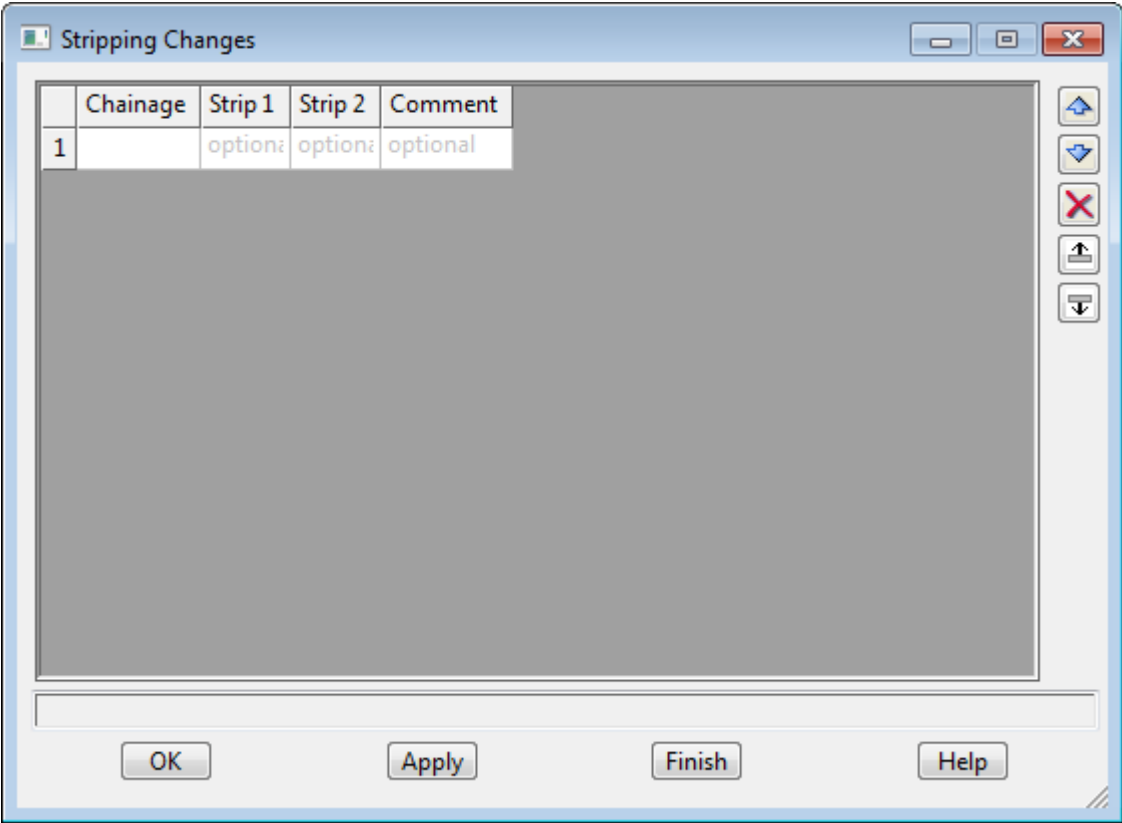
If a **non-zero stripping depth** exists at a chainage, the **cut** and **fill** calculations are done with respect to the section through the tin **dropped in height** by the stripping depth.

However, the **design strings** are generated by battering into the **unstripped** surface, and the stripping volume is the volume between the stripped and unstripped surface for the design.

Stripping depths are defined for chainages along the reference string and can be linearly interpolated between chainages.

NOTE: Cut and fill areas and volumes are adjusted for the stripping depths. The total stripping volume is given at the end of the volumes report.

Selecting the **Stripping** option on the **MTF edit** menu brings up the **Stripping Changes** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Chainage	column header		
<i>list of chainages for defining stripping depth.</i>			
Strip depth 1	column header		for the field - measures menu
<i>strip depth to apply at the chainage given for this row of information. If strip depth 2 is blank, then strip depth 1 is applied until the next chainage in the chainage column.</i>			
Strip depth 2	column header		for the field - measures menu

if **non-blank**, the strip depth to linearly interpolate to and finish with at the next chainage in the chainage column.

if blank, then strip depth 1 applies to the next chainage in the chainage column.

In the mtf file, the two depths will be separated by a comma.

Comment	column header

comment to add to the end of the line. In the file, the comment will be preceded by //.

OK/Apply button

OK stores the values in the fields and removes the panel.

Apply stores the values and leaves the panel on the screen.

Please continue to the next section [MTF Boxing](#).

MTF Boxing

In the **MTF**, up to eight (8) layers of boxing can be defined.

For each boxing layer, the boxing can be defined by

- (a) the Left boxing only
- (b) the Right boxing only
- (c) the Left and Right boxing.

For cases (a) and (b), the Left boxing or the Right boxing defines the boxing across the **entire** design section and then only one of Left boxing or Right boxing is needed.

For case (c) where **both** Left and Right boxing are defined for a design section, then the *last point of the left boxing* is automatically connected to the *first point of the right boxing*.

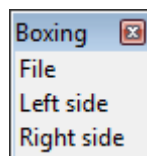
Warning for case (c), the Left boxing must end before the Right boxing begins. If there is an overlap, the Right boxing will be pushed to the **end** of the Left boxing.

Note - no interpolation or modifiers exist for boxing.

For a general discussion of Boxing, go to the section [What is Boxing ?](#), for the scenarios of applying Boxing, including but not restricted to the MTF, go to the section [Applying Boxing](#), and in particular [Scenario 1 - Design Generated by One Apply Many](#).

When boxing is used in the **Apply many**, the cut and fill areas and volumes are also calculated for all the inter-boxing layers. The **last layer** defined is also referred to as the **subgrade** layer and volumes are also given for the natural surface to the subgrade, and the design to the subgrade.

The **Boxing** walk-right in the **MTF Edit** menu brings up the **Boxing** menu with options to specify the file supplying the boxing definitions and options to apply the definitions to the Left and Right side of the design sections.



For the option *File*, go to

Left/Right side

Left/Right side for each layer

[MTF Boxing File](#)

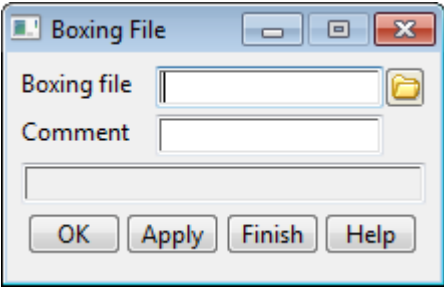
[Left Side and Right Side Boxing](#)

[Left Side and Right Side Boxing](#)

Each of the options from this menu will now described.

MTF Boxing File

Selecting **File** from the **Boxing** menu brings up the **Boxing File** panel for defining the file of **Boxing Definitions** to be used in this **Apply Many**.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Boxing file <i>name of the Boxing file containing the Boxing Definitions to be used for the MTF.</i>	input		*.bf files
Comment <i>comment to add to the end of the line. In the text mtf file, the comment will be preceded by //.</i>	column header		
OK/Apply OK stores the values in the fields and removes the panel. Apply stores the values and leaves the panel on the screen.	button		

The full definition of all the boxing command used in a **Boxing Definition** is given in the section [Full Definition of Boxing](#).

Please continue to the next section [Left Side and Right Side Boxing](#).

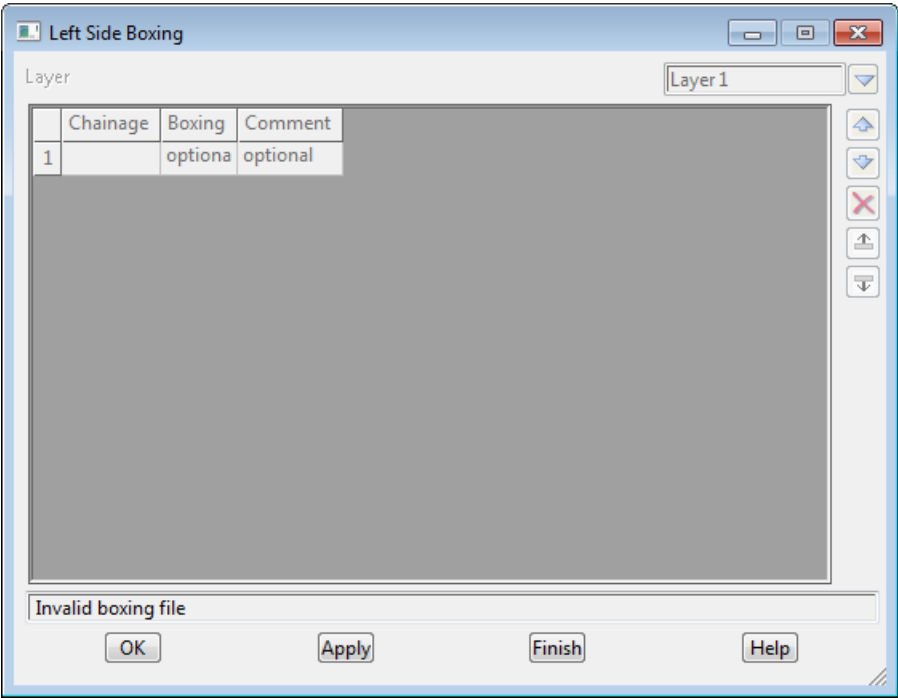
Left Side and Right Side Boxing

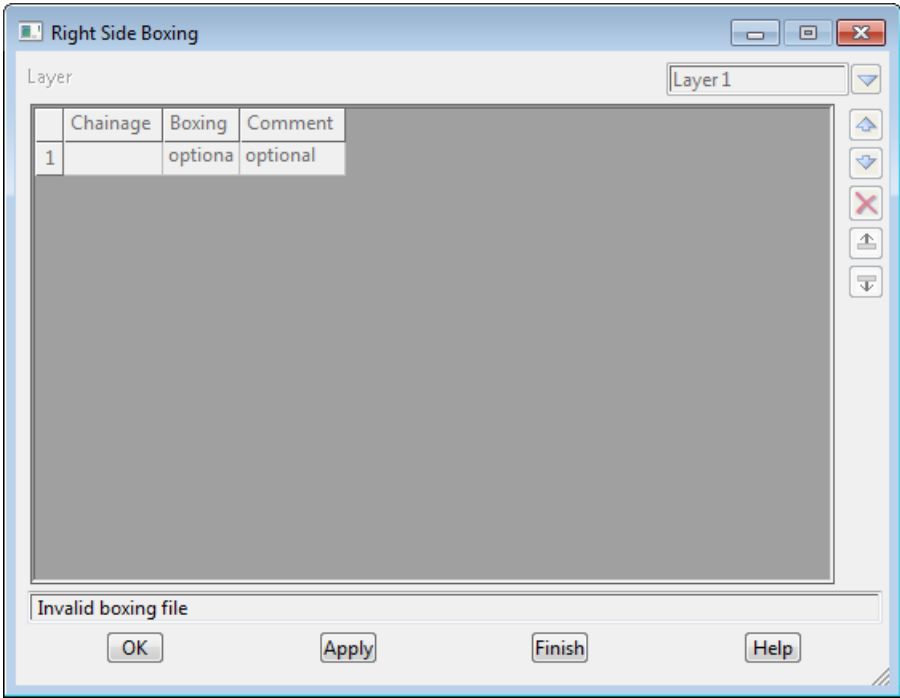
The panels brought up by selecting **Left side** or **Right side** from the **Boxing** menu brings up the **Left Side Boxing** and **Right Side Boxing** panels respectively. By default, this is for the first layer of boxing.

The **Left Side Boxing** and **Right Side Boxing** panels define for each boxing layer, what Boxing Definitions (from the boxing file) are applied, in what chainage ranges, along the reference string.

For the definition of boxing, go to the section [Full Definition of Boxing](#)

The panels are brought up by selecting **Left side** or **Right side** for **Layer 2** to **Layer 8** from the **Boxing** menu and then selecting the *Layer number* in the **Layer** choice box. Similar panels exist for *Left* and *Right*, and for each selected layer, and so won't be documented separately.





The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Chainage	column header		
<i>chainage to start applying the Boxing Definition given in the Boxing column.</i>			
Boxing	column header		for the fields - available boxing
<i>name of the Boxing Definition to apply from this chainage to the next chainage in the Chainage list.</i>			
Comment	column header		
<i>comment to add to the end of the line. In the text MTF file, the comment will be preceded by //.</i>			
OK/Apply	button		
OK stores the values in the fields and removes the panel.			
Apply stores the values and leaves the panel on the screen.			

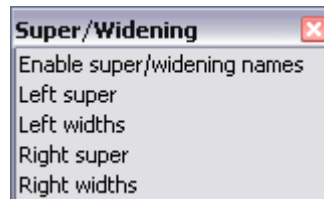
Please continue to the next section [MTF Super/Widening](#).

MTF Super/Widening

The **Super Alignment** string can define the super elevation and widening for a design.

This super elevation and widening can be applied to the strings defined by the Apply many rather than having to use MTF crossfall and width modifiers.

This section defines which strings in the apply have super elevation/widening from the super alignment applied to them



For the option *Enable super/widening names*, go to

Left super

Left widths

Right super

Right widths

[Enable Super/Widening Names](#)

[Left Super](#)

[Left Widths](#)

[Right Super](#)

[Right Widths](#)

Each of the options from this menu will now be described.

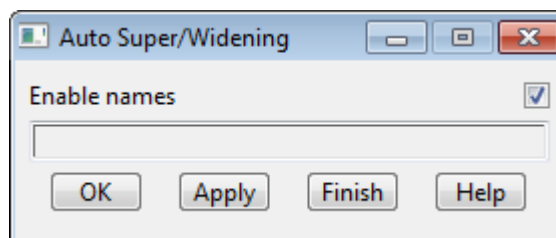
Enable Super/Widening Names

For **12d Model** Version 8, super elevation/widening from the super alignment was applied to strings in the fixed section of the template that were defined by crossfall.

For **12d Model** 9, this method was replaced by being able to **define by string name**, which strings have super elevation and/or widening applied to them.

For backward compatibility, this option allows the user to either use string names, or to revert to the cross fall method used in version 8. The default is to use string names.

Selecting **Enable super/widening names** from the menu displays the **Auto Super/Widening** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Enable names	tick box	tick	

*if ticked, the super elevation/widening in the super string is applied to the string names as given in the **Left/Right super** and/or **Left/Right widths** options.*

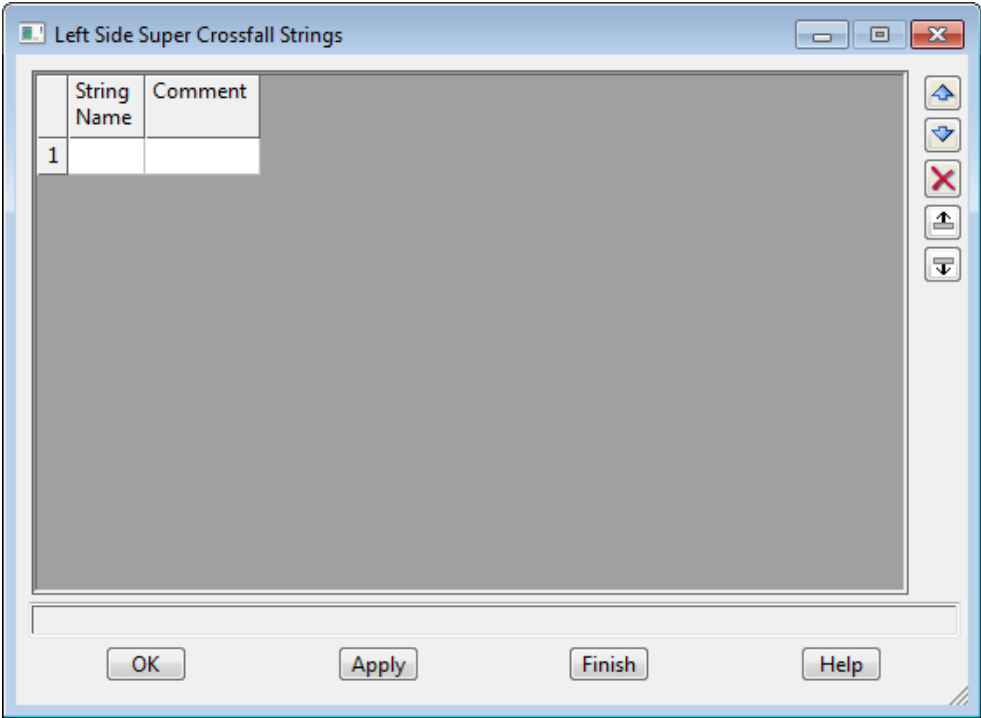
If not ticked, the super elevation/widening in the super string is applied to the string from the fixed

template that are defined by crossfall.

Left Super

This table defines the strings that have the left super elevation from the super alignment applied to them.

Selecting **Left Super** from the menu displays the **Left Side Super Crossfall Strings** panel.



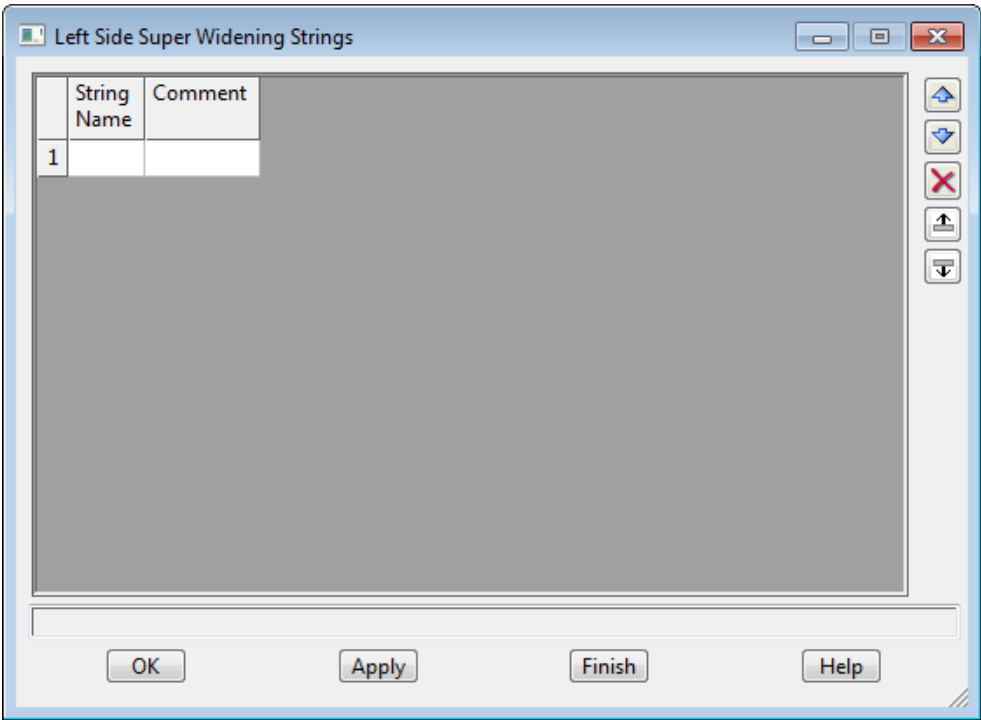
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
String name	column header		
<i>names of the strings to apply the left super elevation of the super alignment to.</i>			
Comment	column header		
<i>comment to be recorded.</i>			

Left Widths

This table defines the strings that have the left widening from the super alignment applied to them.

Selecting **Left widths** from the menu displays the **Left Side Super Widening Strings** panel.

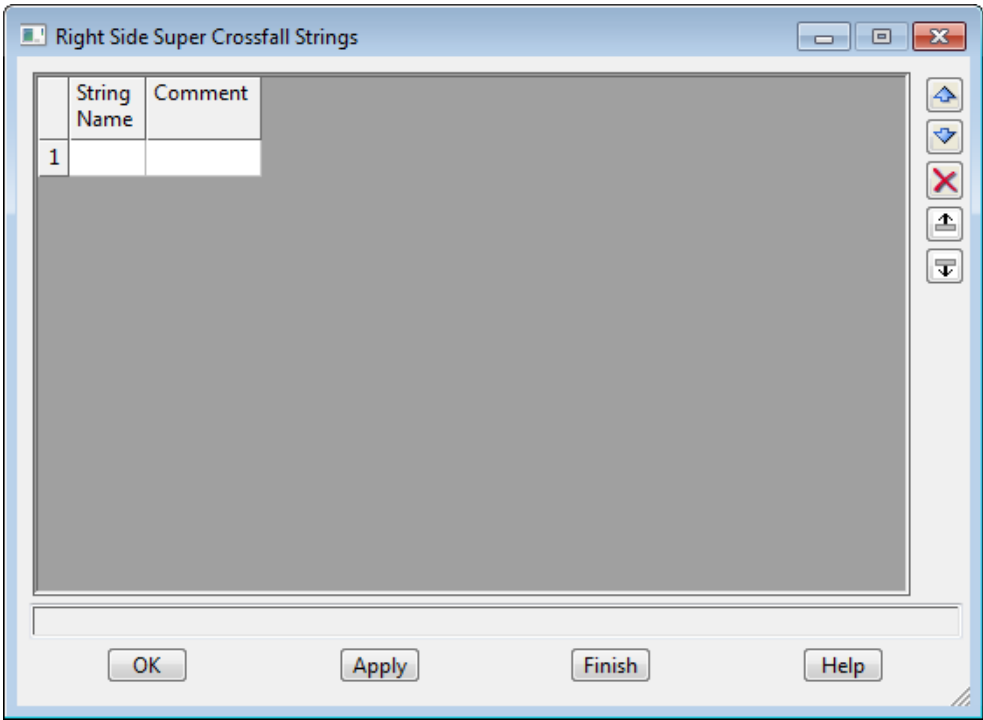


Field Description	Type	Defaults	Pop-Up
String name	column header		
<i>names of the strings to apply the left widening of the super alignment to.</i>			
Comment	column header		
<i>comment to be recorded.</i>			

Right Super

This table defines the strings that have the right super elevation from the super alignment applied to them.

Selecting **Right super** from the menu displays the **Right Side Super Crossfall Strings** panel.



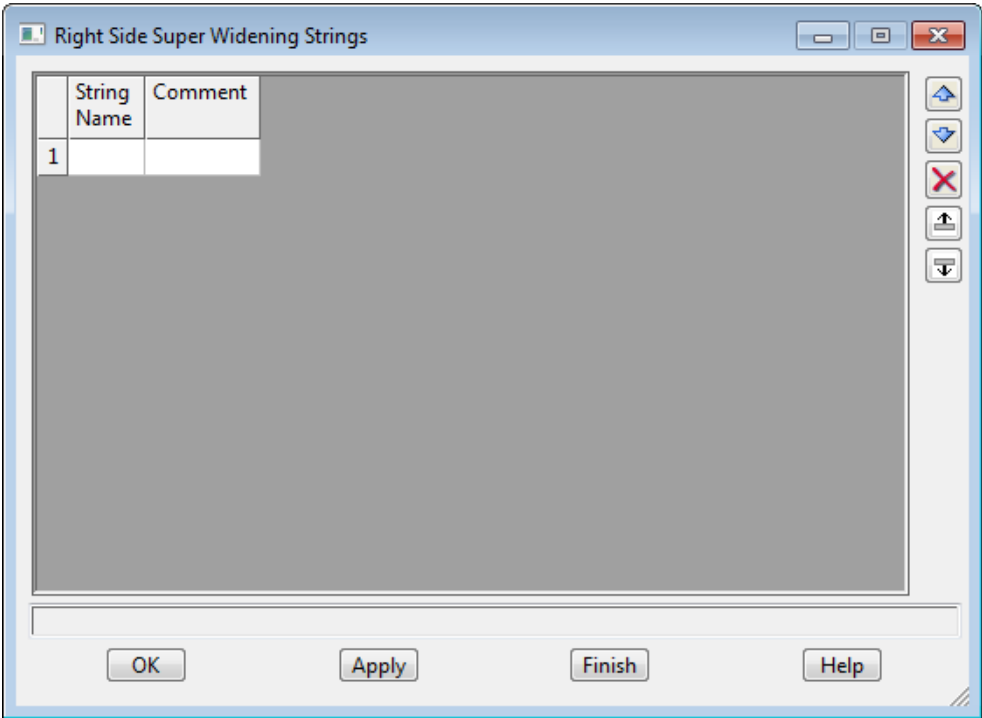
The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
String name		column header		
	<i>names of the strings to apply the right super elevation of the super alignment to.</i>			
Comment		column header		
	<i>comment to be recorded.</i>			

Right Widths

This table defines the strings that have the right widening from the super alignment applied to them.

Selecting **Right widths** from the menu displays the **Right Side Super Widening Strings** panel.



- String name** column header
names of the strings to apply the right widening of the super alignment to.
- Comment** column header
comment to be recorded.

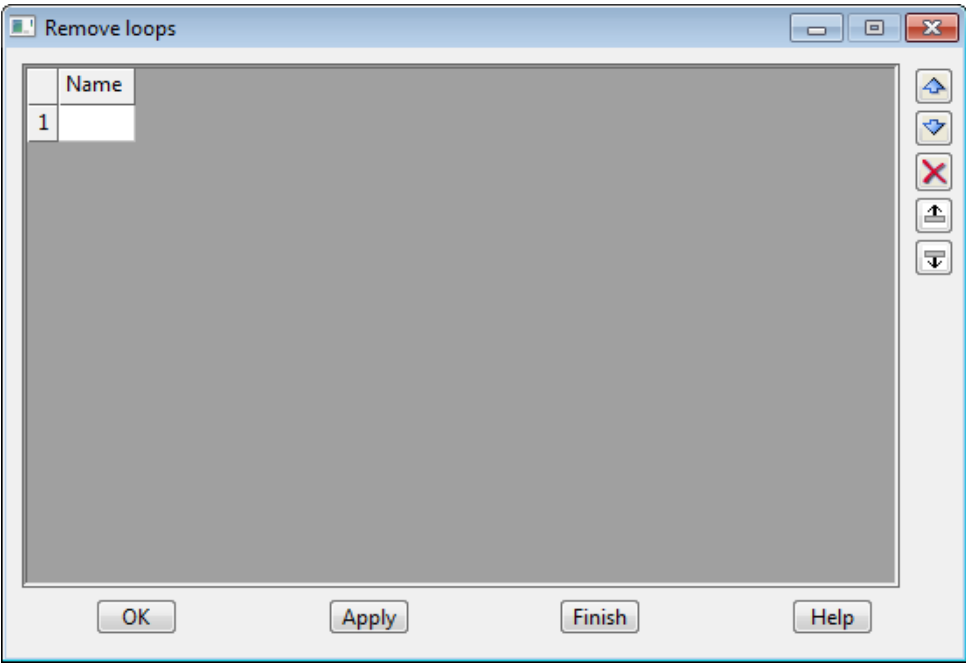
Please continue to the next section [MTF Loops](#).

MTF Loops

The Loops options tries to remove loops in nominated strings generated by the Apply Many.

Important Note - the sections generated from the Apply Many will not be modified and will still intersect each other. In that case, the sections can be generated after the **Apply Many** by cutting through strings. See [Cuts by Centreline](#).

Selecting **Loops** from the menu displays the **Remove loops** panel.



Name column header

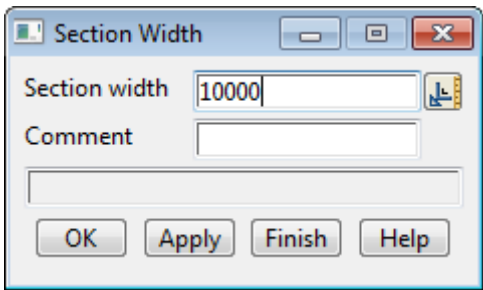
names of the strings to process to try and remove any loops from. The names can include wild cards () and wild characters (!).*

Please continue to the next section [MTF Width](#).

MTF Width

A **section width** is used to limit the distance to search along a section when trying to find strings used in any of the mtf commands.

Selecting **width** from the **mtf edit** men brings up the **section width** panel for setting the width.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Section width	input	10000	

***Section width** defines the perpendicular offset from the Hinge string. It is used to limit the search distance for strings when performing MTF modifier commands.*

Comment	column header
----------------	---------------

comment to add to the end of the line. In the file, the comment will be preceded by //.

OK/Apply	button
-----------------	--------

***OK** stores the values in the fields and removes the panel.*

***Apply** stores the values and leaves the panel on the screen.*

Please continue to the next section [MTF String Modifiers](#).

MTF String Modifiers

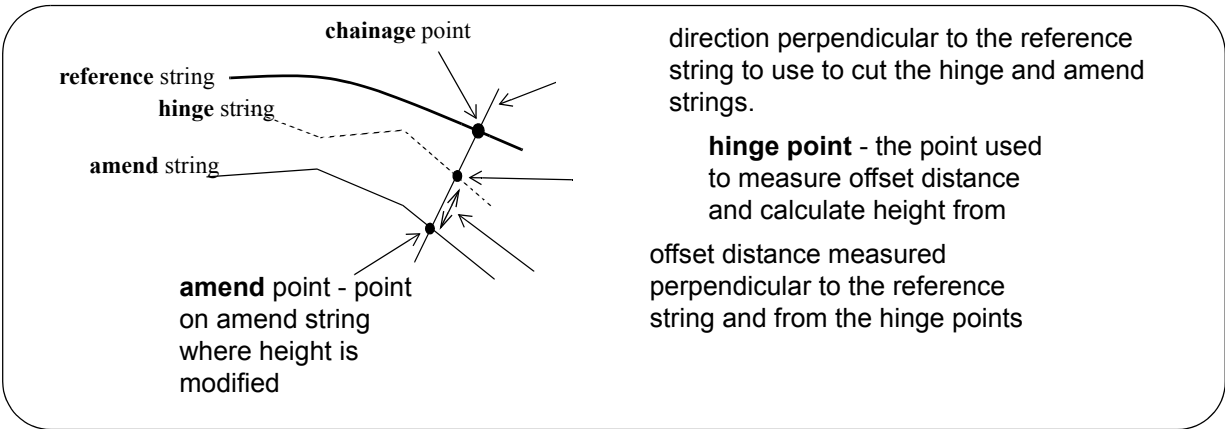
Unlike the other MTF options, the **string modifier** options modify the *heights* on an **existing** string called the **amend string**.

Like the apply options, a reference string is used to define chainage and what is perpendicular at each chainage. A hinge string is used to define offsets and heights. If no hinge string is selected, the reference string is also used as the hinge string.

For a given chainage on the reference string (chainage point), a line perpendicular to the reference string is constructed to cut through the hinge string and the amend string (the cut points are called the **hinge point** and the **amend point**).

Horizontal offset is defined as the offset value from the hinge point, and the height of the **amend** point is a modification of the height at the hinge point.

The string modifier options create and/or modify the heights of the **amend** points on the amend string.

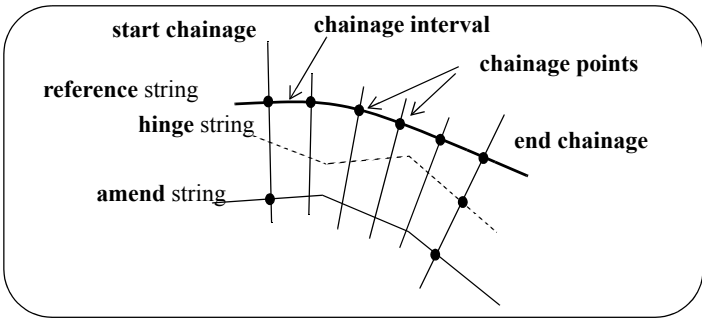


The *height* of the amend point is *derived from the hinge point* by starting with the height of the hinge point and applying a crossfall to it across the offset distance from the hinge string to the amend string.

The cross fall can be defined by either:

- (a) giving the cross fall
- or
- (b) using the cross fall between two user selected strings.

For the string options, the length of string being modified is restricted by giving a start and end reference chainage. A chainage interval can also be specified to define extra reference chainage points to use between the start and end chainages.



How and where the amend string is modified depends on the *type* of string and whether the chainage interval is blank (null) or not.

What Points are Modified

For 3d, 4d, polyline and super strings:

If the chainage interval is not blank:

- (a) The start and end chainage points are projected *from the reference string* and **inserted** into the **amend** string. The *heights* of the inserted points are defined by the string modifier command.
- (b) The chainage points at the given chainage interval are also projected from the reference string and **inserted** into the **amend** string. The *heights* of the inserted points are defined by the string modifier command.
- (c) Finally, the **vertices** of the **amend** string are dropped perpendicularly *back onto* the hinge and reference string and then those points used to modify the *heights* of the same vertices of the amend string.

If the chainage interval is blank:

- (a) The start and end chainage points are projected *from the reference string* and **inserted** into the **amend** string. The *heights* of the inserted points are defined by the string modifier command.
- (b) The **vertices** of the **amend** string are dropped perpendicular *back onto* the hinge and reference string and then those points used to modify the *heights* of the same vertices of the amend string.

For Alignment strings:

If the chainage interval is not blank:

- (a) All the vertical geometry is removed between the start and end chainages. That is, the vertical intersection points (VIP's) and their associated vertical curves are removed.
- (b) The start and end chainage points are projected *from the reference string* and **vertical intersection points (VIP's) inserted** into the **amend** string. The *height* of the inserted VIP points are defined by the string modifier command.

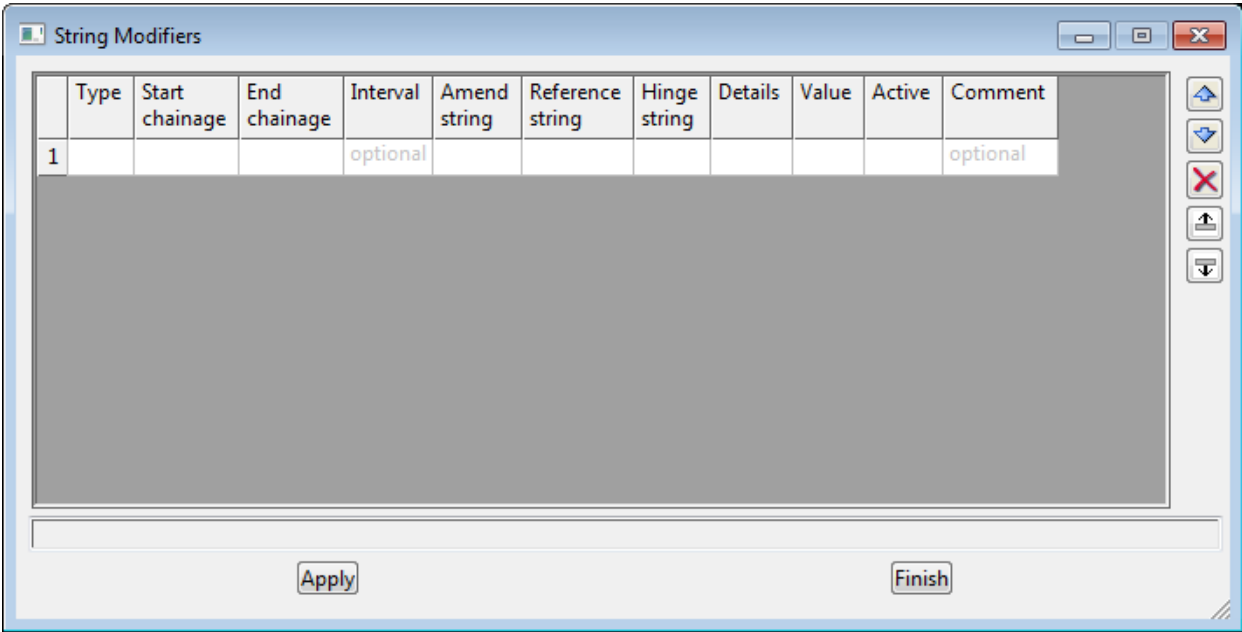
If the chainage interval is blank:

- (a) The start and end chainage points are projected *from the reference string* and **vertical intersection points (VIP's) inserted** into the **amend** string. The *heights* of the inserted VIP points are defined by the string modifier command.
- (b) The **vertical intersection points (VIP's)** of the **amend** string are dropped perpendicularly *back onto* the hinge and reference strings and then those points used to modify the *heights* of the same VIP's of the amend string. The vertical curves for the VIP's are not changed.

String Modifiers in MTF Edit

For information on how the String Modifiers in the MTF editor work, please go to the previous section [MTF String Modifiers](#).

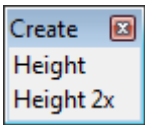
Selecting **Strings** from the **MTF Edit** menu brings up the **String Modifiers** panel.



The **String Modifiers** panel consists of a scrolling **command** fields and an **OK** or **Apply** button to record the results.

The **width** of the **command** area in the **String Modifiers** panel is controlled by the environment variable `DEFAULT_TABLE_WIDTH_4D`.

If the **command** line is **empty**, clicking LB in the **command** line will bring up the **Create** menu which contains the available String commands.



modify by xfall and height
modify by 2-strings

Selecting a menu item will bring up an associated panel which displays the information required for the modifier command.

When the panel is filled in and **OK** or **Apply** selected, the panel information is written out to the **command** line in the correct format for that modifier command.

If the **command** line is **not empty**, clicking LB in the **command** line will bring up the associated panel for the modifier command in the **command** line.

The information in the panel can be changed and if **OK** or **Apply** is selected, the changed panel information is written out to the **command** line in the correct format for that modifier command.

Each of the panels created by selecting a command from the **Create** menu, will now be described.

Height

The *height* the **Height** string modifier calculates for the amend point is given by:

- (a) if the absolute flag is not set, the height of the hinge point, otherwise zero.
- plus
- (b) the interpolated height for the user given heights at the start and end chainages
- plus
- (c) the interpolated height for the user given cross falls at the start and end chainage.

That is, if the absolute flag is not set:

$$\text{new height} = \text{hinge height} + (\text{interpolated height}) + (\text{interpolated xfall}) \times (\text{offset distance})$$

If the absolute flag is set:

$$\text{new height} = (\text{interpolated height}) + (\text{interpolated xfall}) \times (\text{offset distance})$$

Selecting **Height** brings up the **String Modify by Xfall Height** panel

String Modify by XFall Height

Select amend string

Select reference string

Select hinge string

Start mode: Start (ref)

End mode: End (ref)

Interval

Start xfall

End xfall

Start height

End height

Absolute ht

Active

Comment

OK Apply Finish Help

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Amend string <i>select string to have heights amended.</i>	string-select		
Reference string <i>select reference string.</i>	string-select		
Hinge string <i>select hinge string.</i>	string-select		
Start/End chainage <i>start/end chainage on the reference string for applying the modifier.</i>	input		measures menu
Interval <i>if non blank, the chainage separation to apply the modifier.</i> <i>If blank, the Section separation value from the Apply Many panel is used.</i>	input		
Start/End xfall <i>start/end crossfall for the modifier.</i>	input		measures menu
Start/End height <i>start/end height for modifier.</i>	input		measures menu
Absolute height <i>if ticked, the calculated height does not include the hinge height.</i> <i>if not ticked, the calculated height includes the hinge height.</i>	tick box		
Comment <i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>	input		
Active <i>if ticked, use this modifier.</i> <i>if not ticked, don't use this modifier.</i>	tick box	tick	
OK/Apply <i>OK stores the values in the fields and removes the panel.</i> <i>Apply stores the values and leaves the panel on the screen.</i>	button		

For more information on how the String Modifiers in the MTF editor work, please go to the section [MTF String Modifiers](#).

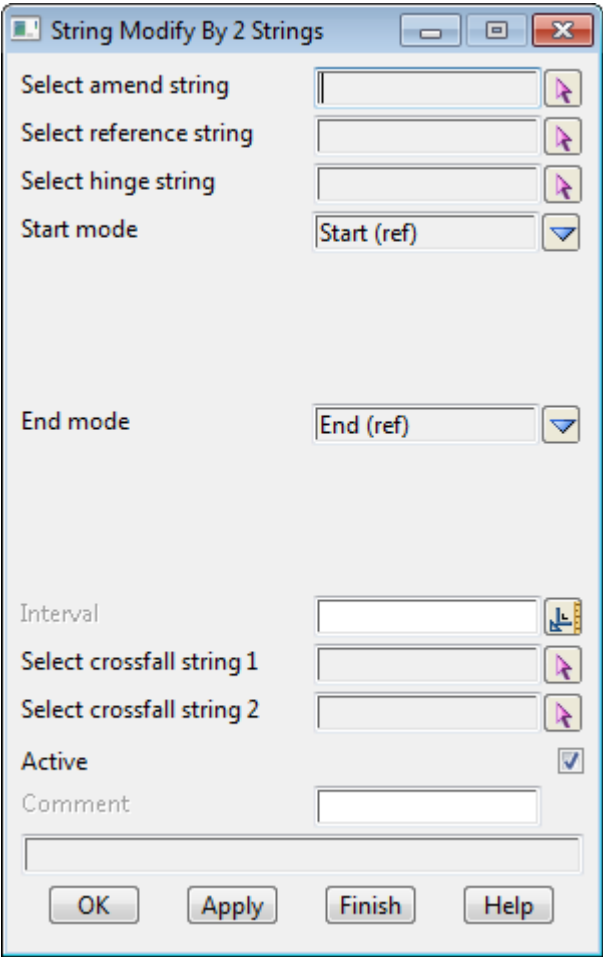
Height 2X

The *height* the **Height 2x** string modifier calculates for the amend point is given by:

- (a) the height of the hinge point
- plus
- (b) the offset distance multiplied by the cross fall between two user selected strings.

new height = hinge height + (xfall between string 1 and string 2) x (offset distance)

Selecting **Height 2x** brings up the **String Modify by 2 Strings** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Amend string <i>select string to have heights amended.</i>	string-select		
Reference string <i>select reference string.</i>	string-select		

Hinge string	string-select	
<i>select hinge string.</i>		
Start/End chainage	input	measures menu
<i>start/end chainage on the reference string for applying the modifier.</i>		
Interval	input	
<i>if non blank, the chainage separation to apply the modifier.</i>		
<i>If blank, the Section separation value from the Apply Many panel is used.</i>		
Crossfall string 1	string-select	
<i>select first string to define crossfall by.</i>		
Crossfall string 2	string-select	
<i>select second string to define crossfall by.</i>		
Comment	input	
<i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>		
Active	tick box	tick
<i>if ticked, use this modifier.</i>		
<i>if not ticked, don't use this modifier.</i>		
OK/Apply	button	
OK stores the values in the fields and removes the panel.		
Apply stores the values and leaves the panel on the screen.		

For more information on how the String Modifiers in the MTF editor work, please go to the section [MTF String Modifiers](#).

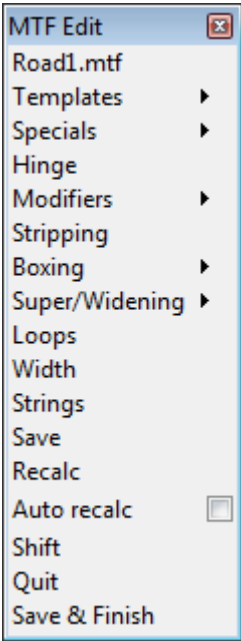
MTF Save

If **Save** is clicked, the MTF is saved to disk and the **MTF Edit** panel is left on the screen.

MTF Recalc

If **Recalc** is clicked, the **Apply Many** associated with the MTF is **recalced**.

MTF Auto Recalc



if tick a recalc is done when "Apply" is clicked on Modifiers panels

If **Auto recalc** is ticked, then whenever the **Apply** button is clicked on any of the panels for the **Modifiers - Left Side Modifiers** or **Modifiers - Right Side** or **Boxing Definitions** used in the **Boxing**, then a **recalc** of the associated **Apply Many** for the MTF is done.



MTF Shift

In an *mtf*, many modifiers are defined in terms of chainage on the reference string. For example, the width modifier is defined to apply between a given start and end chainage on the reference string.

If the horizontal geometry of the reference string is modified, many of the reference chainages in the mtf will be incorrect. **Shift** can help correct the chainages in the mtf file when modifications are made to the reference string horizontal geometry *after the mtf has been defined*.

For the *mtf* and all special chainage files referred to in the *mtf*, **Shift** adds a delta chainage (the *shift distance*) to chainages within a user specified range.

However depending on the type of modifications made to the reference string, **shift** may have to be applied a number of times over a number of different chainage ranges. And apart from a simple change of start chainage, there may be chainages that can not be corrected with **Shift**.

Before using **Shift**, it is necessary to know *how* the reference string has changed from its original position so to use shift it is advantageous to make a **copy** of the reference string **before** any changes are made.

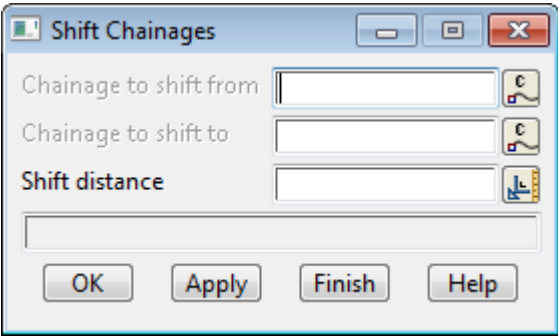
Examples Using **Shift**:

- 1. If only the start chainage of the reference string was modified, **shift** would be applied to the mtf for the entire **original** reference string and end chainages, with a *shift distance* equal to the difference between the new and the old start chainages for the reference string. For this case the horizontal geometry has not changed, just the chainages.
- 2. If the radius of a horizontal curve is changed in the middle of the reference string, all chainages from the beginning of the string up to point where the horizontal geometry starts to change would stay the same. At some point after the modified curve, the horizontal geometry of the string is unchanged and for this section of the mtf, a shift distance equal to the difference between the new and the old chainages of a non-modified point.

In all areas where the horizontal geometry has been modified, the chainages in the mtf would have to be carefully examined to see what changes are required.

Warning: **Shift** option is very powerful but is also very dangerous.

Selecting **Shift** brings up the **Shift Chainages** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Chainage to shift from	chainage box		measure chainage
<i>chainage in the mtf to start adding the Shift distance</i>			

*Any chainages in the mtf file (and any associated special chainage files) between the **Chainage to shift from** and the **Chainage to shift to** will have **Shift distance** added to them.*

Chainage to shift to chainage box measure chainage
*chainage in the mtf to stop adding the **Shift distance***

*Any chainages in the mtf file (and any associated special chainage files) between the **Chainage to shift from** and the **Chainage to shift to** will have **Shift distance** added to them.*

Shift distance input
*delta chainage to add to all the chainages in the mtf file and any special chainages that are between the **Chainage to shift from** and the **Chainage to shift to***

OK/Apply button

OK *applies the shift and removes the panel.*
Apply *applies the shift and leaves the panel on the screen.*

MTF Quit

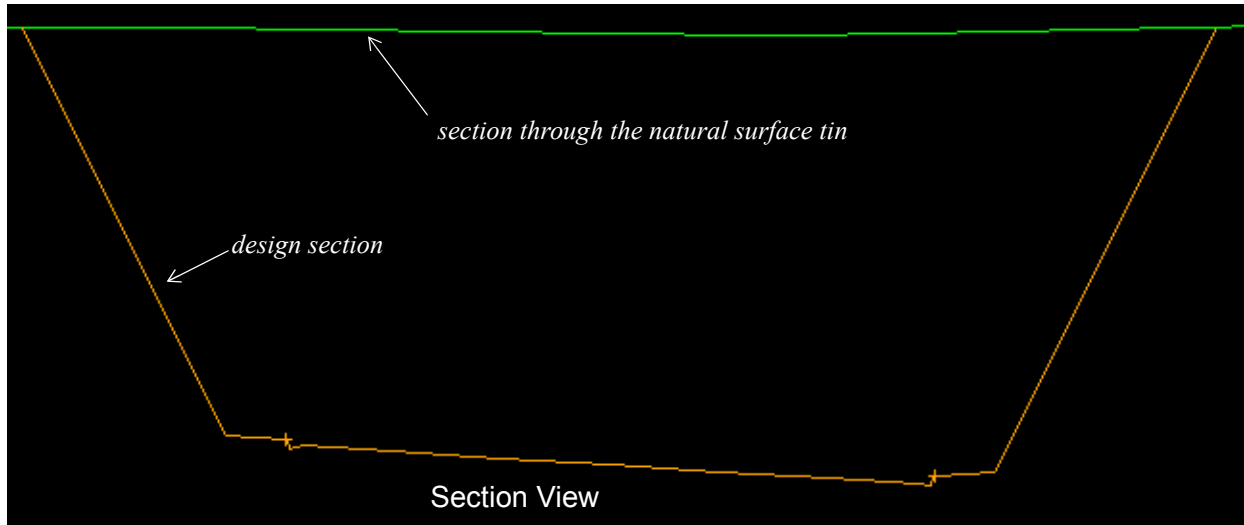
If **Quit** is clicked, the MTF is **not** saved to disk and the **MTF Edit** panel is closed.

MTF Save and Finish

If **Save & Finish** is clicked, the MTF **is** saved to disk and the **MTF Edit** panel then closed.

What is Boxing ?

A design is represented in 3d as a collection of strings. The design can also be approximated as a series of sections perpendicular to the centreline at various chainages. These are known as design cross section, or design sections.



Representing Cross Sections in 12d Model

In **12d Model**, cross sections, are represented as **4d super strings**.

A 4d super string has an (x,y,z) coordinate for each vertex, PLUS text at each vertex. Hence, there are four bits of information, an (x,y,z,text) value, for each vertex.

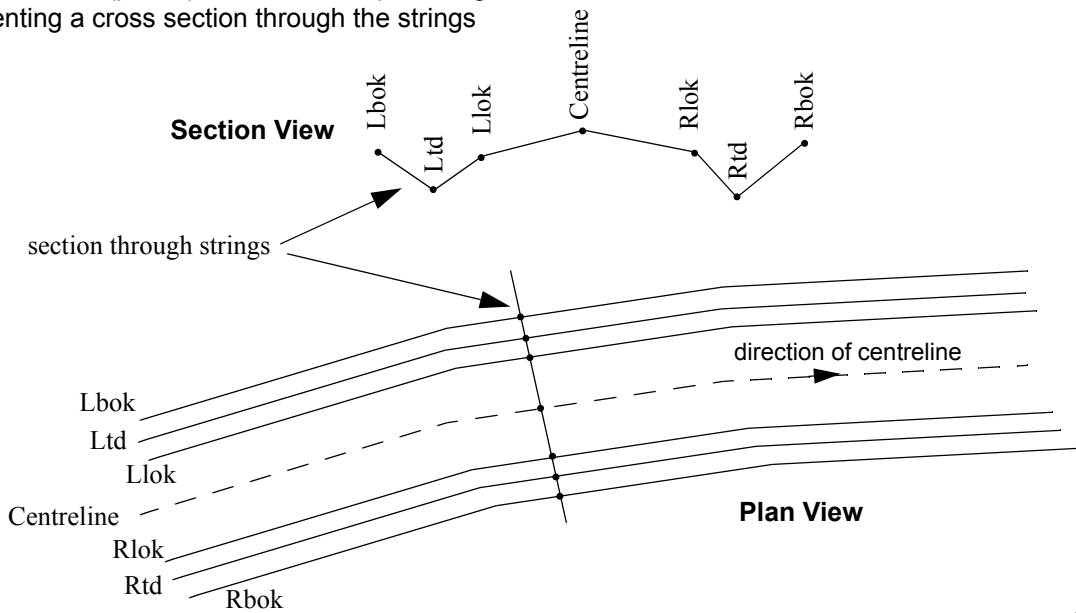
Cross sections are generated in **12d Model** by options such as

- (a) cuts through strings along a centreline (see [Cuts by Centreline](#))
- (b) the functions **Apply Many** (see [Apply Many](#)) or **Apply** (see [Apply](#))
- (c) the **Boxing Many Function** (see [Boxing Many Function](#))

For these cross sections, the **text** at each vertex of the 4d super string (vertex/point text), is the **name of the string** that the section cuts through at that vertex.

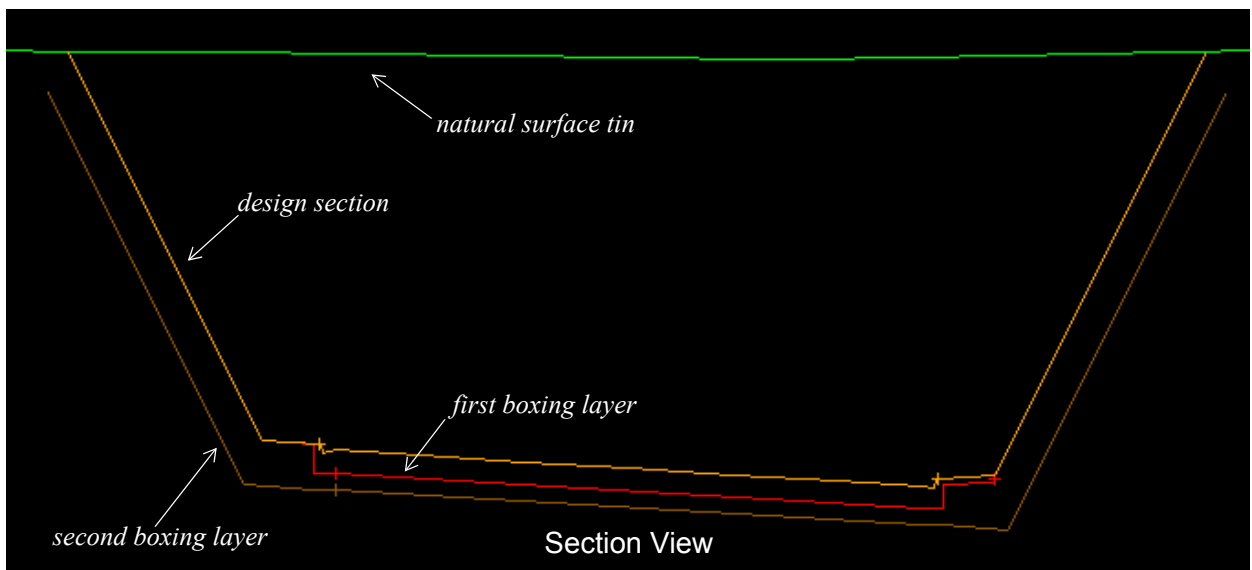
Also when the cross sections are generated by these options, the start chainage of the 4d string is set so that the chainages **along the 4d string** are the same as the **offset** of the vertices from the centreline used when generating the sections.

Named vertices (points) across a 4d super string representing a cross section through the strings



Boxing Layers

A Boxing Layer is simply another surface, usually modelling a construction material layer, under (or above) the design. The Boxing Layer is represented by strings, and also as a series of sections at the same chainages as the design sections.



Boxing Layers are normally defined in terms of the named vertices across the design section, offsets from the centreline, in terms of other boxing layers already specified, or in relationships to other strings.

When boxing is generated in the **Apply Many** or the **Boxing Many Function**, there can be up to **eight (8)** layers of boxing and the **last** layer defined is referred to as the **subgrade** layer.

In **12d Model** there are special commands called **Boxing Commands** that are be used to build a boxing layer.

A series of **12d Model** boxing commands are grouped together as a **Boxing Definition** and when a *Boxing Definition* is applied to a cross section, it generates a boxing section. That is, it generates a section that is part of a particular Boxing Layer.

Each **Boxing Definition** is given a name, and is stored in a **Boxing** file. The names of the *Boxing Definitions* must be unique within the *Boxing* file.

How the **Boxing** file and **Boxing Definitions** are applied in **12d Model** is described in the next section [Applying Boxing](#), and this is followed by the full definition of **12d Model** boxing and the **12d Model** boxing commands in the sections starting with [Full Definition of Boxing](#).

Applying Boxing

For any **12d Model** project there are a number of different data creation scenarios and the appropriate method to use to generate boxing depends on how the data has been created, or is available, inside **12d Model**.

See [Scenario 1 - Design Generated by One Apply Many](#)

See [Scenario 2 - More than One Apply Many Needed to Generate the Design](#)

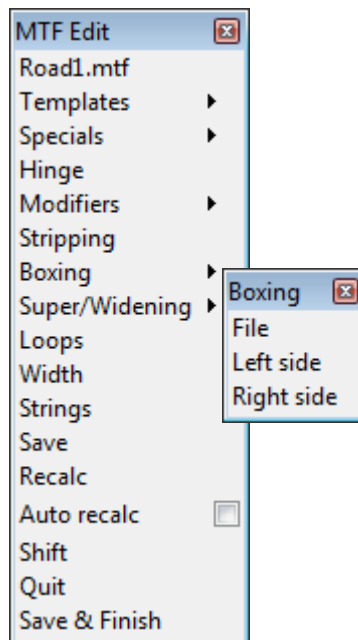
See [Scenario 3 - Design Provided as Strings Only](#)

See [Scenario 4 - Design Sections Already Exist](#)

Scenario 1 - Design Generated by One Apply Many

If a design is generated by just **one Apply Many** function, then up to eight (8) layers of boxing can also be generated at the same time by the **Apply Many** function.

In the **Apply many** option, the **MTF**, controls which **Boxing** file is used, and how the various Boxing Definitions from that file are used to create each layer of boxing.



In the **MTF Edit** menu, the **Boxing File** option specifies which **Boxing** file of **Boxing Definitions** is used.

For each boxing layer, the boxing can be defined by

(a) the Left boxing only

(b) the Right boxing only

or

(c) the Left and Right boxing.

For cases (a) and (b), the Left boxing or the Right boxing defines the boxing across the entire design section and then only Left boxing or Right boxing is needed.

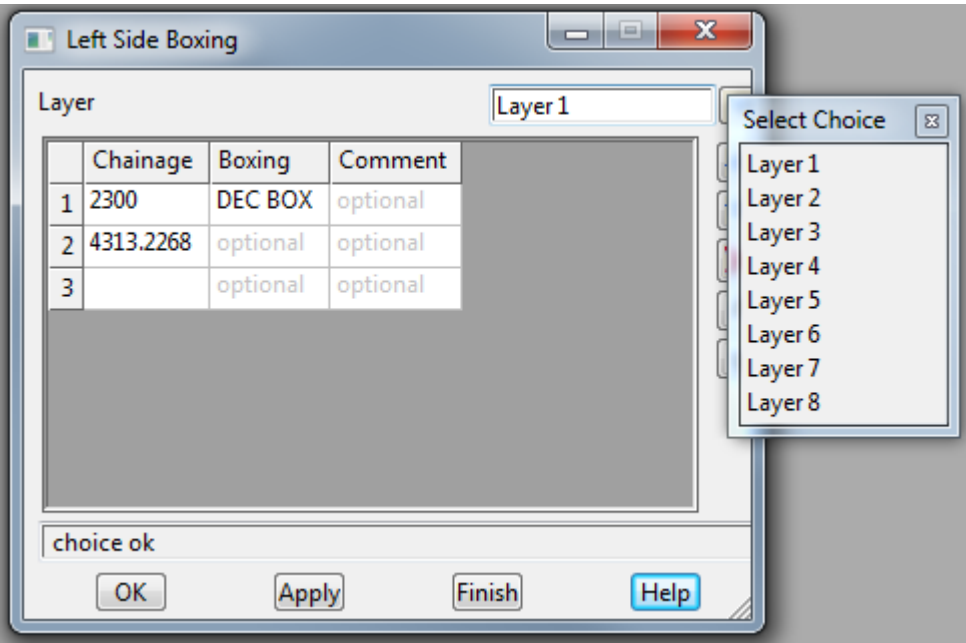
For case (c) where **both** Left and Right boxing are used to define the boxing across the design section, the **last point of the Left boxing** is automatically **connected** to the **first point of the Right boxing**.

Warning for case (c), the Left boxing must end before the Right boxing begins. If there is an

overlap, the Right boxing will be pushed to the **end** of the Left boxing.

Note - no interpolation or modifiers exist for boxing.

For each layer, the **Left side /Right side** specifies what Boxing Definition to use over what chainage range.



See [MTF - Many Templates File](#) and [MTF Boxing](#).

Go to the next section [Scenario 2 - More than One Apply Many Needed to Generate the Design](#) or back to [Applying Boxing](#).

Scenario 2 - More than One Apply Many Needed to Generate the Design

In more complex designs, a number of separate **Apply Many**'s may be needed, and even some strings hand crafted, to produce the final design. Hence the design is only fully represented by a **collection of strings**.

In this situation, design sections are produced as a **post process** using **Cuts through strings** by either

Utilities =>A-G =>Cuts =>by centreline

which can cut through a Data Source of strings (see [Cuts by Centreline](#)), or by

Design =>Boxing =>Boxing many (function)

which can only cut through one model of strings (see [Boxing Many Function](#)).

Note - the design sections produced by both options are **4d super strings** where the text at each vertex of the super string is the **name** of the string **cut** to create that vertex of the super string.

The methods described in [Scenario 4 - Design Sections Already Exist](#) are then used to generate boxing from the created design sections.

Go to the next section [Scenario 3 - Design Provided as Strings Only](#) or back to [Applying Boxing](#).

Scenario 3 - Design Provided as Strings Only

Sometimes you only have the strings defining the design (the design strings).

This case is similar to [Scenario 3 - Design Provided as Strings Only](#) and **design sections** are produced as 4d super string from the design strings using **Cuts through strings** by either

Utilities =>A-G =>Cuts =>by centreline

which can cut through a Data Source of strings (see [Cuts by Centreline](#)), or by

Design =>Boxing =>Boxing many (function)

which can only cut through one model of strings (see [Boxing Many Function](#)).

The methods described in [Scenario 4 - Design Sections Already Exist](#) are then used to generate boxing from the created design sections.

Go to the next section [Scenario 4 - Design Sections Already Exist](#) or back to [Applying Boxing](#).

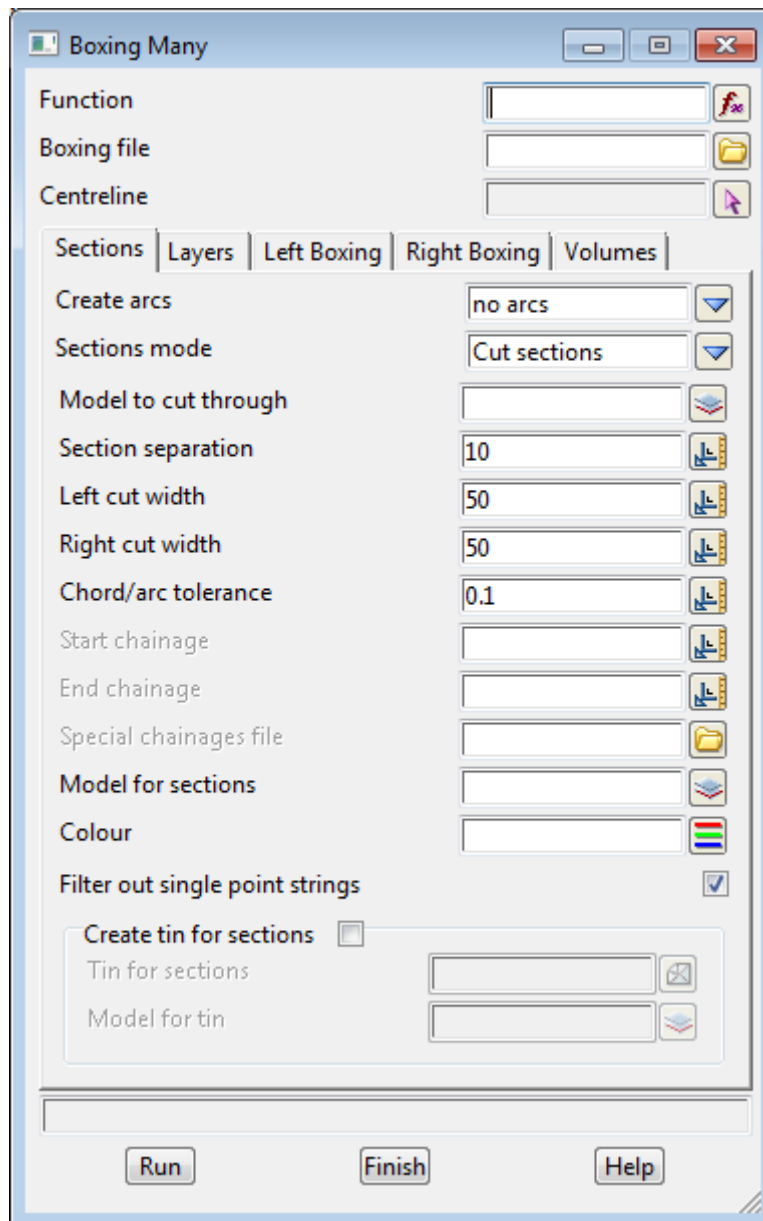
Scenario 4 - Design Sections Already Exist

There is the case where you already have the design sections as 4d super strings.

The design sections may have been created by an earlier **Apply Many** or **Apply** run, or generated by cuts through strings as in [Scenario 2 - More than One Apply Many Needed to Generate the Design](#) or [Scenario 3 - Design Provided as Strings Only](#), or simply provided.

Boxing can then be generated from the **design sections** using the options:

- (a) *Design =>Boxing =>Boxing many function*



The **Boxing Many Function** can generate up to eight layers of boxing, as well as calculating volumes. See [Boxing Many Function](#).

Note that the **Boxing Many Function** can also create the cuts through a model of strings to create the design sections and so can be used to cover [Scenario 2 - More than One Apply Many Needed to Generate the Design](#), [Scenario 3 - Design Provided as Strings Only](#) and [Scenario 4 - Design Sections Already Exist](#) in the one function.

(b) *Design =>Boxing =>Boxing many*

A simplified version of the *Boxing Many Function*.

For *Boxing Many*, an MTF is used to define the application of the Boxing Definitions, and the Boxing file containing the Boxing Definitions is either that defined in the MTF **or** a different Boxing file. See [Boxing Many](#).

The boxing can be applied to a model of sections, or just a **single selected section**.

(c) *Design =>Boxing =>Boxing*

An even more simplified version of the *Boxing Many Function*.

The **Boxing** option can only apply one Boxing Definition to all the design sections in a model. See [Boxing](#).

Note - in the case when only 4d super string are provided, the option

Design =>X-Sections =>Strings from sections

can be used to generate design strings from these sections (see [Strings from Sections](#)).

Go to the next section [Full Definition of Boxing](#) or back to [What is Boxing ?](#) or [Applying Boxing](#).

Full Definition of Boxing

In **12d Model** there are special commands called **Boxing Commands** that are be used to build up a boxing layer.

A series of **12d Model** boxing commands are grouped together as a **Boxing Definition** and when a *Boxing Definition* is applied to a cross section, it generates a boxing section. That is, it generates a section that is part of a particular Boxing Layer.

Each **Boxing Definition** (the rules for calculating a specific type of boxing) is given a name, and is stored in a **Boxing** file (with a file name ending in **.bf**).

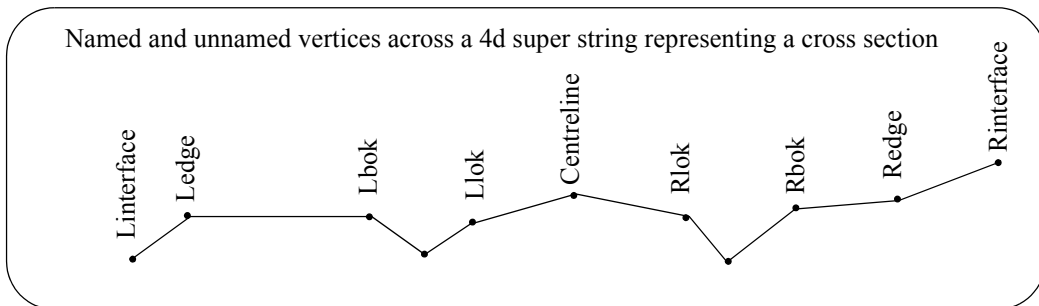
Any number of *Boxing Definitions* can be placed in the one *Boxing* file as long as each *Boxing Definition* in the **Boxing** file has a unique name.

Note that the same name of a *Boxing Definition* can appear in more than one *Boxing* file and even through they have the same name, the *Boxing Definition* in a different *Boxing* file can be completely different.

Please continue to the next section [Terminology Used in Boxing Commands](#)

Terminology Used in Boxing Commands

The **12d Model Boxing Commands** work on a cross section, which is a 4d super string (see [Representing Cross Sections in 12d Model](#)).



A **Boxing Definition** is a group of boxing commands and the boxing commands work from **left to right** across the cross section to produce a boxing section.

Most of the **boxing commands** apply from the **offset** specified at the beginning of that command (**Start Offset** for the command) to the start offset of the **next** boxing command (like chainages and templates in the MTF). That is, the start offset of a boxing command is the **End Offset** for the **previous** boxing command.

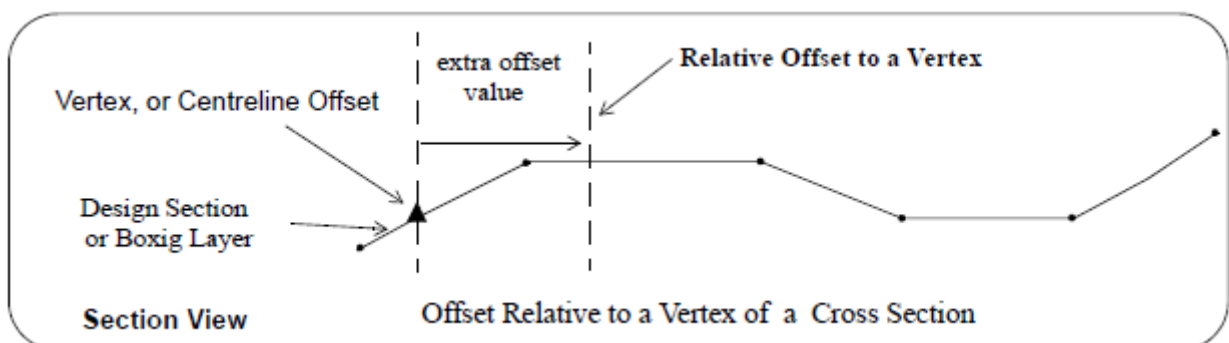
So most **boxing commands** go from the **Start Offset in the command** to the **Start Offset in the next boxing command**.

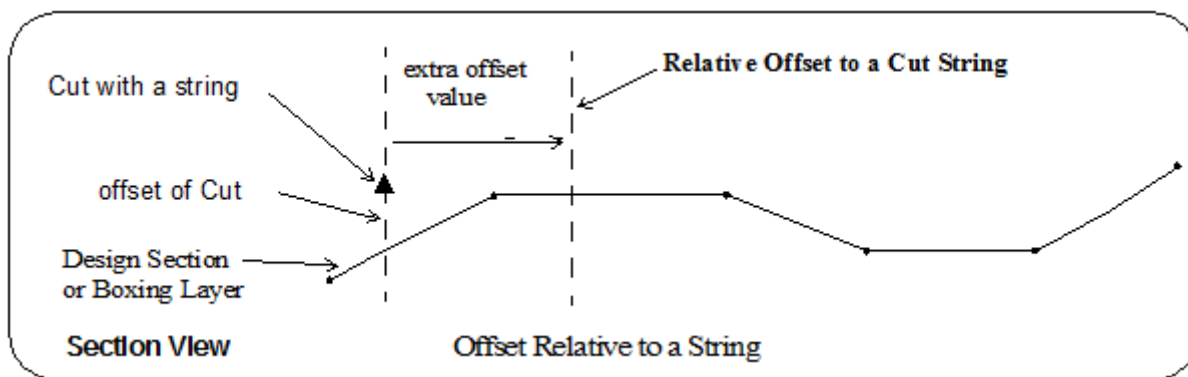
An **offset**, such as the **Start Offset**, can be defined as:

- (a) a **fixed** Centreline offset value (e.g. 10.5)
- (b) specified **relative to a vertex name** on a design cross section, or any boxing section (at the section chainage) in a Boxing Layer already created.
- (c) specified **relative to a selected string** that cuts the design cross section, or a specified Boxing Layer, in plan.

The **offset** represents a **plan** position on the cross section (a plan point on the cross section) which may or may not be the plan position of a vertex on the cross section.

The terminology used to specify such an offset is **relative offset** to a **vertex** or a **string**.





Note - if not all the vertex names and strings mentioned in a *Boxing Definition* are present in the cross section at the centreline chainage, then no boxing section is produced for that centreline chainage.

Hence

1. an **offset relative to a vertex name (relative vertex offset)** is defined to be the **offset** at a **given named vertex** on the design section, or a boxing section previously created, **plus** a **given offset value**.

That is

take the **offset at** the 4d vertex called "**vertex name**" and add "**offset value**" to it. The offset value can be positive or negative.

If the "vertex name" is blank, then the "**offset value**" is taken to be the *actual* offset on the 4d super string.

Hence the *offset* can be specified as either an actual **offset value** or given **relative to the name of a vertex** on the super string (**relative offset**).

For convenience, in both cases the offset will be denoted by **relative vertex offset**.

2. an **offset relative to string (relative string offset)** is defined to be the **offset** on the cross section where the string cuts the section in plan, **plus** a **given offset value**.

That is

take the **offset at** the plan cut of the section and the string and add "**offset value**" to it. The offset value can be positive or negative.

A major advantage of defining boxing in terms of vertex names and strings is that whenever the vertices or strings are modified using MTF modifiers, or string edits, the boxing across the section is also automatically modified on a recalc.

A *Boxing Definition* may be used in either a *Left Boxing* or *Right Boxing* in an **MTF**, or in a **Boxing Many Function** option, however unlike the case for MTF modifiers, the *Boxing Definition* is applied to the vertex names going from **left to right** regardless of whether the *Boxing Definition* is used on the left or the right. So it is possible to create the entire boxing with just the *Left Boxing* or *Right Boxing*. If both are used, the end of the *Left Boxing* is joined to the start of the *Right Boxing*.

Warning

For a *Boxing Definition* to work, any cross section vertex names referred to in the *Boxing Definition* must be **unique** for that cross section. Similarly any strings cut must have unique names.

In the *Apply Many* and *Apply*, the **LHS prefix** and **RHS prefix** panel files can be used to give vertices on cross sections different names even when the same Template is used on the left and the right side of the centreline.

Boxing **sections** are generated by the *Apply Many*, *Boxing Many Function*, *Boxing Many* and *Boxing options*, but **boxing strings** are only generated by the *Apply Many* and *Boxing Many Function*. For the other cases, the option **Strings=>Utilities=>Strings from sections** can be used to create boxing strings from the boxing sections.

Vertical Walls

If a *Boxing Definition* creates two different height values at the one offset (i.e. a wall), then an extra offset point is automatically inserted into the boxing section (at offset 0.1 mm from the first vertex) so that **no vertices in the created boxing section are on top of each other**.

So in effect a **vertical wall** is created.

And since no vertices are created that are directly above each other, the boxing sections can be triangulated.

Please continue to the next section [Edit Boxing File](#).

Edit Boxing File

The option

Design =>Boxing =>Create

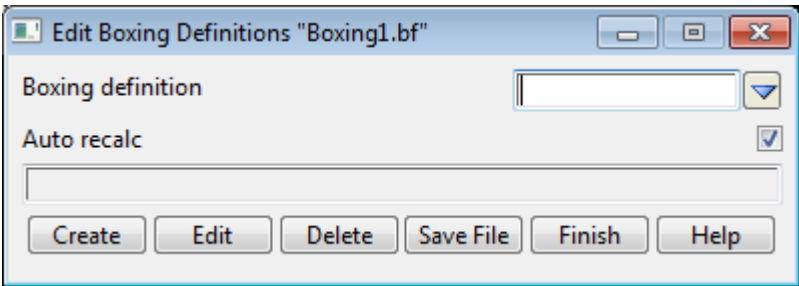
creates a **Boxing** file which contains **Boxing Definitions**, and then brings up the **Edit Boxing Definitions** panel to create the actual *Boxing Definitions* (rules) to save in the *Boxing* file.

Similarly selecting a *Boxing* file from the walk-right list of

Design =>Boxing =>Edit

also brings up the **Edit Boxing Definitions** panel to create/edit boxing definitions from the selected *Boxing* file.

The **Edit Boxing Definitions** panel is



The fields and buttons used in this panel have the following functions.

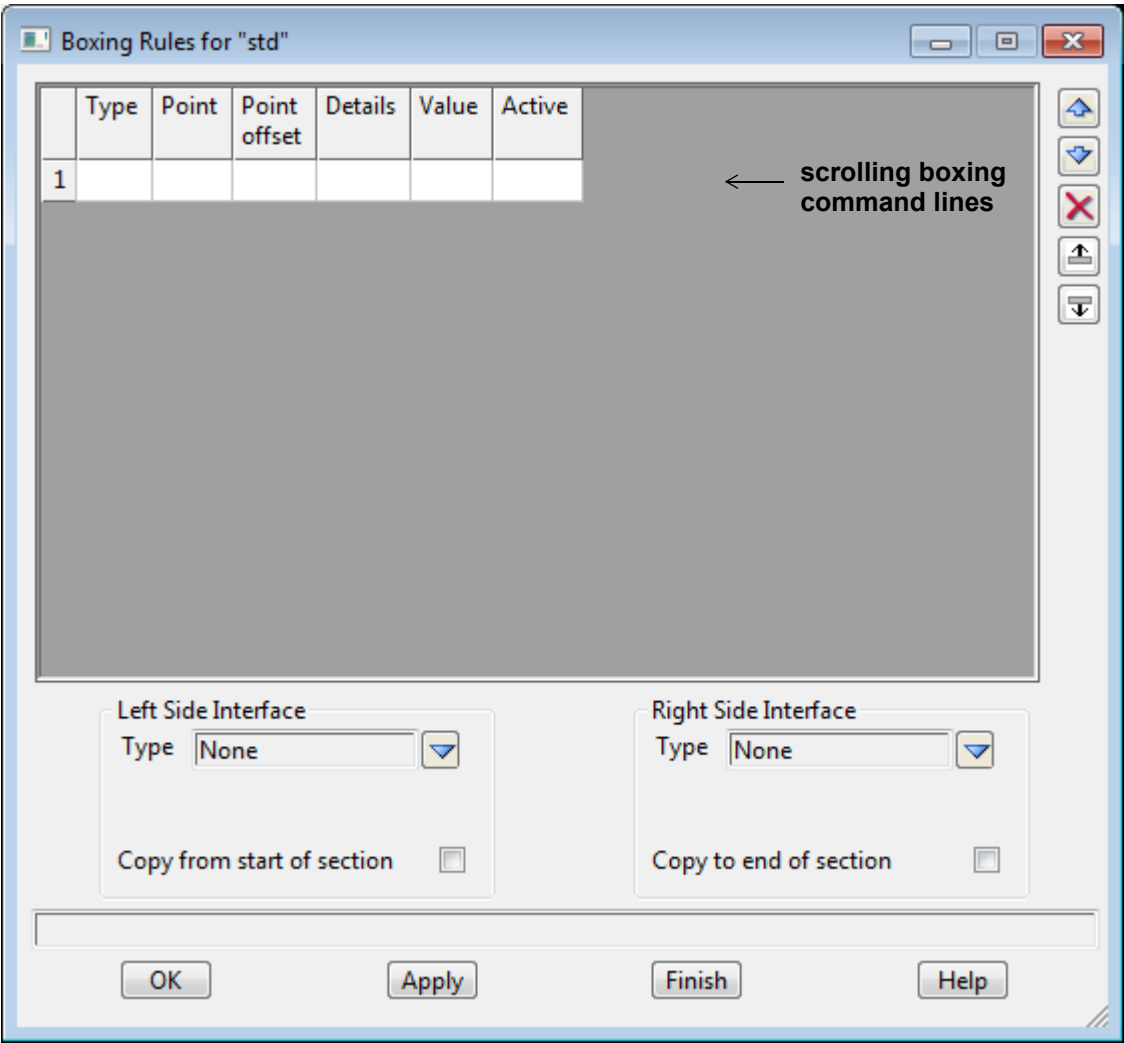
Field Description	Type	Defaults	Pop-Up
Boxing definition <i>name of the Boxing Definition (in the current boxing file) to create or edit. Each Boxing Definition must have a unique name in the Boxing file</i>	input		boxing definitions in file
Create	button		
<i>create a Boxing Definition with name given by the Boxing definition panel field</i> <i>If the Boxing Definition given in the Boxing definition field does not exist, then the Boxing Rules panel is placed on the screen and is used to created the new Boxing Definition for the Boxing file (see Boxing Rules Panel).</i> <i>If the Boxing Definition already exists, then nothing will happen when clicking on Create.</i>			
Edit	button		
<i>edit an existing Boxing Definition with name given in the Boxing definition panel field</i> <i>If the Boxing Definition given in the Boxing definition field exists, then the Boxing Rules panel is placed on the screen and is used to edit the existing Boxing Definition (see Boxing Rules Panel).</i> <i>If the Boxing Definition does not exist, then nothing happens when clicking on Edit.</i>			
Delete	button		
<i>delete the existing Boxing Definition with the name given in the Boxing definition panel field</i> <i>A Yes-No panel confirms the deletion.</i>			
Save file	button		
<i>save the Boxing file with the Boxing Definitions to disk.</i>			

For more information on how Boxing works in **12d Model**, go to the section [What is Boxing ?](#).

Boxing Rules Panel

Selecting the **Create** or **Edit** button on the **Edit Boxing Definitions** panel brings up the **Boxing Rules** panel which is used to build up/edit the nominated *Boxing Definition* from the **Boxing Commands**.

The operation of the **Boxing Rules** panel, and all the available *Boxing Commands*, will now be described.



The **Boxing Rules** panel consists of a scrolling **command** field, **Left Side Interface** and **Right Side Interface** areas, **Copy from start of section** and **Copy to end of section** tick boxes and an **OK** or **Apply** button to record the results.

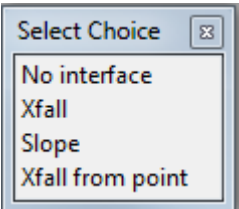
The other fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Commands	Scrolling table		

commands for defining the Boxing Definition. The commands will be described in the next section [Commands for Boxing Rules Panel](#).

Left Side Interface

Type choice box



If **No interface**:
nothing is done

If **Xfall**:

Xfall real box 0

if non-zero, a batter with the given xfall is applied going to the **left** from the first point of the boxing, and goes until it intersects the design section. The intersection point is added as the first point in the boxing. If no intersection is made, nothing is added to the boxing. A positive xfall is up and negative xfall down.

If **Slope**:

Slope real box 0

if non-zero, a batter with the given slope is applied going to the **left** of the first point of the boxing, and goes until it intersects the design section. The intersection point is added as the first point in the boxing. If no intersection is made, nothing is added to the boxing. A positive slope is up and negative slope down.

If **Xfall from point**:

Set point button

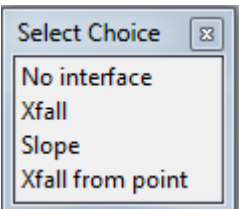
clicking on **Set point** brings up the **Boxing LHS Xfall** panel which allows the battering xfall to be defined in more complex ways. This is described in the section [Boxing Left Side Interface Xfall from Point](#).

Copy from start of section tick box

if ticked, then the part of the design section from the start of the design section to the offset that is the start of the boxing section, is copied and made the beginning of the boxing section.
Hence the **Copy from start of section** tick is used to begin the boxing section with the start of the design section to make a full width left side boxing section.
If not ticked, nothing is done

Right Side Interface

Type choice box



If **No interface**:
nothing is done

If **Xfall**:

Xfall real box

if non-blank, a batter with the given xfall is applied to the last point of the boxing and goes until it intersects the design section. The intersection point is added as the last point in the boxing. If

no intersection is made, nothing is added to the boxing. A xfall slope is up and negative xfall down.

If Slope:

Slope real box

if non-blank, a batter with the given slope is applied to the last point of the boxing and goes until it intersects the design section. The intersection point is added as the last point in the boxing. If no intersection is made, nothing is added to the boxing. A positive slope is up and negative slope down.

If Xfall from point:

Set point button

*clicking on **Set point** brings up the **Boxing RHS Xfall** panel which allows the battering xfall to be defined in more complex ways. This is described in the section [Boxing Right Side Interface Xfall from Point](#).*

Copy to end of section tick box

if ticked, then the part of the design section from the offset of the last boxing vertex to the last vertex on the design section, is copied and made the end of the boxing section.

Hence the RHS copy flag is used to continue the boxing section from the last boxing point, with the design section to the end of the design section to make a full width right side boxing section.

If not ticked, nothing is done.

OK button

***OK** stores the values in the fields and removes the panel BUT no **recalc** is done.*

Apply button

***Apply** stores the values and leaves the panel on the screen.*

*If the **Boxing Definition** is being used in an **Apply Many MTF** and **Auto recalc** is ticked in the MTF, then whenever the **Apply** button is clicked, then a **recalc** of the associated **Apply Many** for the MTF is done.*

*If the **Boxing Definition** is being used in a **Boxing Many Function** then whenever the **Apply** button is clicked, a **recalc** of the **Boxing Many Function** is done.*

Notes

1. When a Boxing Definition is applied on the Left side in the MTF of an **Apply Many**, or the Left side in a **Boxing Many Function**, any *Right Side Interface* and *Copy to end of section* is ignored. Similarly, when a Boxing Definition is applied on the right side the MTF of an **Apply Many**, or the Right side in a **Boxing Many Function**, any *Left Side Interface* and *Copy from start of section* is ignored.

*Hence a boxing definition can have all of *Left Side Interface*, *Copy from start of section* and *Right Side Interface*, *Copy to end of section* but which set is used depends on whether the boxing definition is used on the Left or the Right.*

*In **Apply Many**'s and **Boxing Many Functions**, if only the Left side boxing or only the Right side boxing exists, then the boxing for the entire design section can be created by just the Left/Right side boxing and then **all** of the *Left Side Interface* and the *Right Side Interface* is used.*

For more information on how Boxing works in **12d Model**, please go to the section [What is Boxing ?](#)

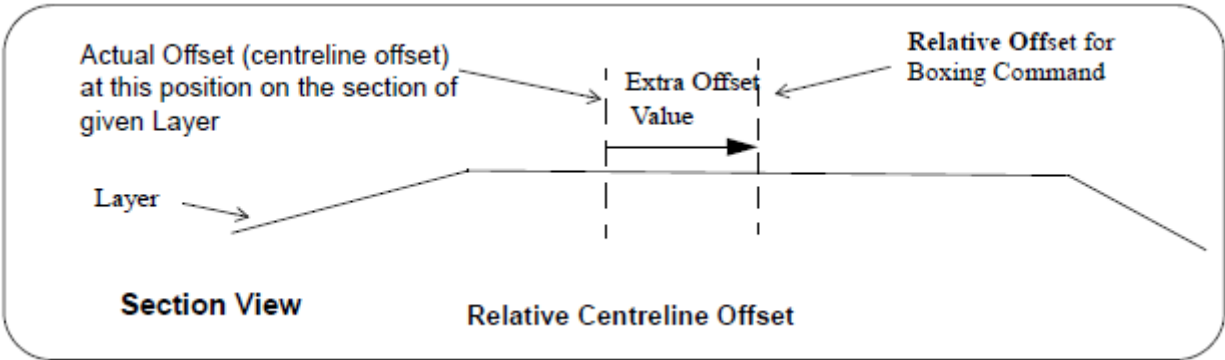
Defining Relative Offset for Boxing Commands

Most boxing commands use **Relative Offsets** to define offset positions across Design or Boxing Layers. For example, the **Start Offset** is a relative offset and is used in most boxing commands to specify where the boxing command starts.

There are a number of ways the **Relative Offset** can be defined:

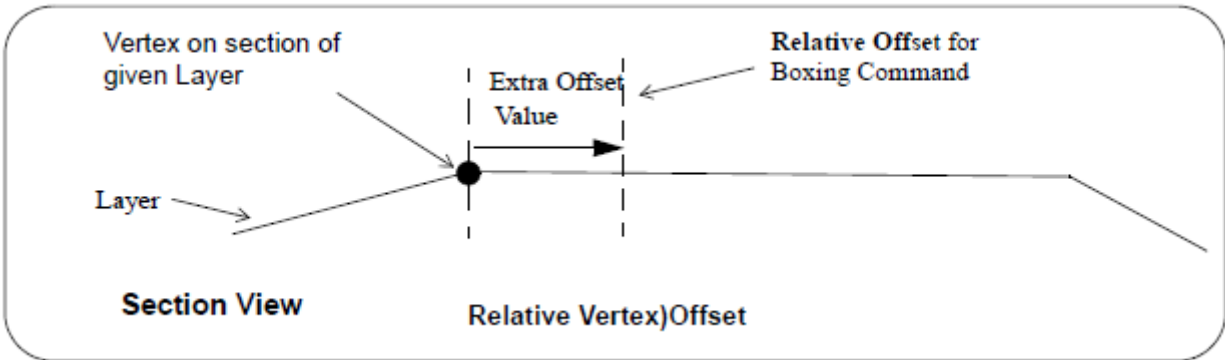
(a) **Offset from centreline**

Relative to an actual Offset for the Design or Boxing Layer - relative offset
Adding a given value to an actual Offset of the given Layer.



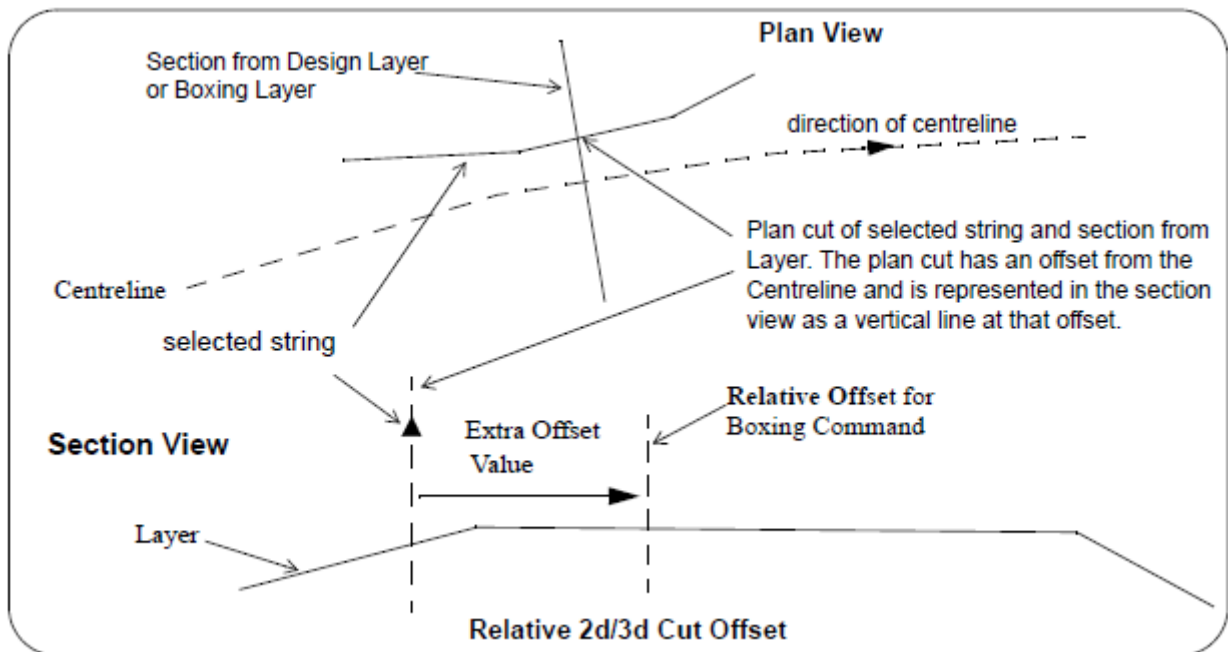
(b) **Vertex on section**

Relative to a vertex on the Design or Boxing Layer - relative vertex offset
The offset of the given vertex is calculated and then a user given value added to it to give the *relative vertex offset*.



(c) **2d cut of string**

Relative to **2d cut** of a selected string with a given Layer.
First calculate the offset on the selected Layer of the plan cut of a selected string (2d cut). A user given value is then added to it to give the *relative 2d offset*.

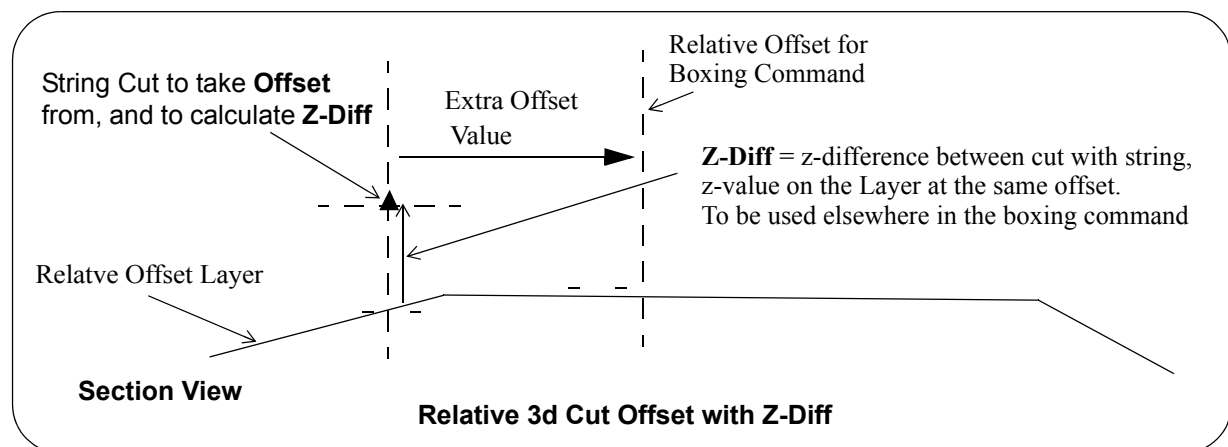


(d) Cut of string

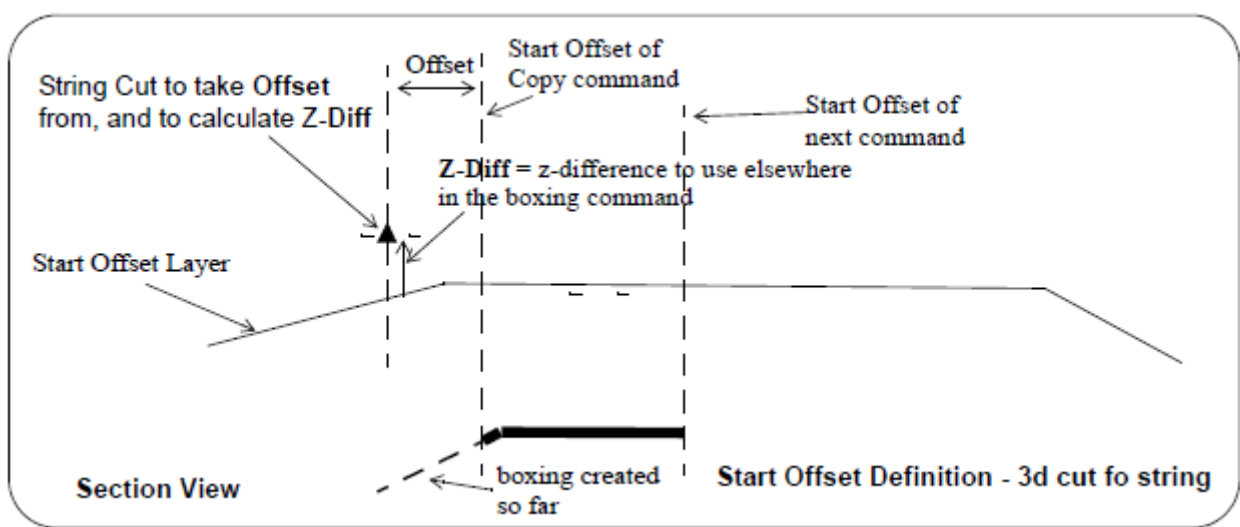
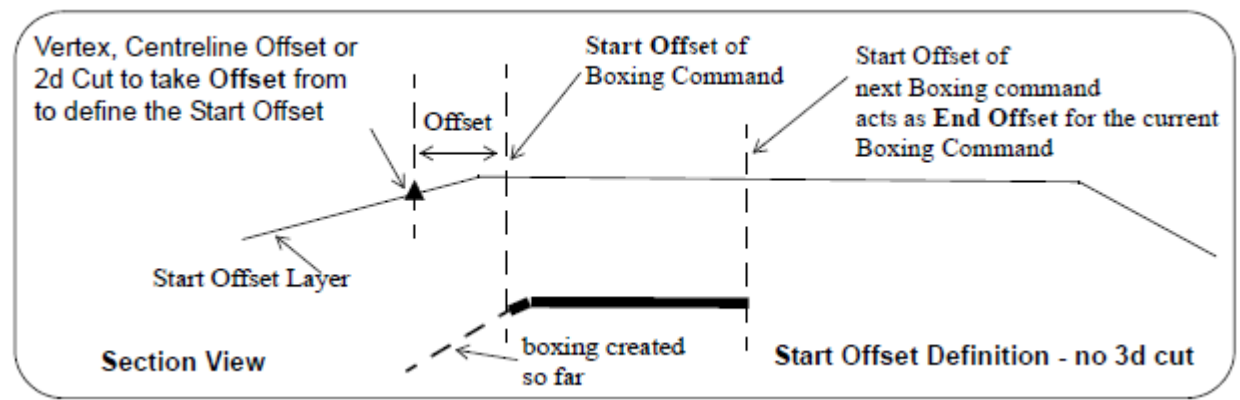
Relative to **3d cut** of a selected string

This is actually the same in **offset** value as the **2d cut** of a selected string but some boxing commands also take the **3d cut** of the selected string and use the **height difference** of the cut of the string and the height on the Layer elsewhere in the command. This is referred to as the **Z-Diff** of the 3d cut.

Note that some strings only have a horizontal (plan) definition and have no z-values at all. In that case, there is no 3d cut but there can be a 2d cut (plan cut). For example, a string with only null heights or a Super Alignment with no vertical geometry.

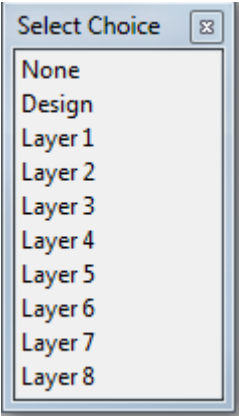


So for the case where Relative Offset is the **Start Offset**:



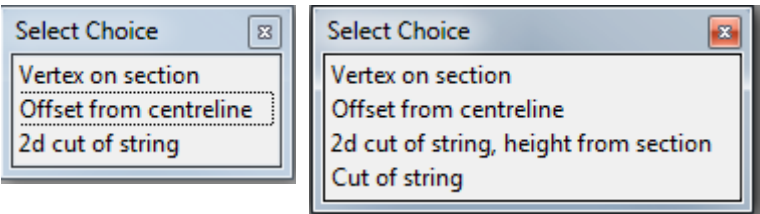
On a Boxing Command panel, the fields and buttons where a Relative Offset is required have the following functions:

Field Description	Type	Defaults	Pop-Up
Relative Offset (e.g. Start Offset, Xfall Offset etc)			
Layer - after Type	choice box		

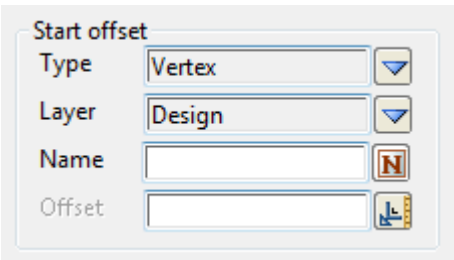


Layer to use with **Offset** to defined the Relative Offset.

Type choice box



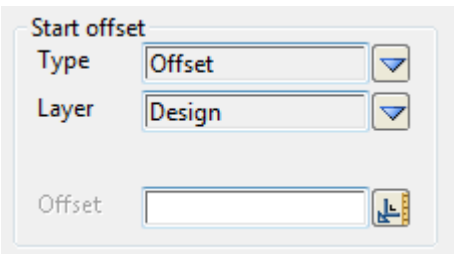
If *Vertex on section*:
this is the Relative (Vertex) Offset



Name name box
name of the vertex on the **Layer** to use with **Offset** to define the Start Offset.

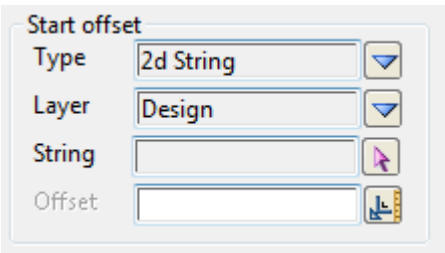
Offset real box
this value is added to the offset of the vertex given in the **Name** field to define the Relative Offset. **Offset** can be positive or negative as long as the final Start Offset is still **on Layer**.

If *Offset from centreline*:
this is the Relative (Centreline) Offset



Offset real box
an actual offset from centreline (actually just the chainage of the section). **Offset** can be positive or negative as long as it is still **on Layer**.

If *2d cut of string*:
this is the Relative (2d Cut) Offset



String string select

*the selected string needs to cut the **Layer** in plan wherever the boxing is being applied.*

Offset real box

*the Relative Offset is the offset of the plan cut of the selected string with the **Layer**, plus the **Offset** value. **Offset** can be positive or negative but the final position Relative Offset must still be on **Layer**.*

If Cut of string:

this is the Relative (3d Cut) Offset

String string select

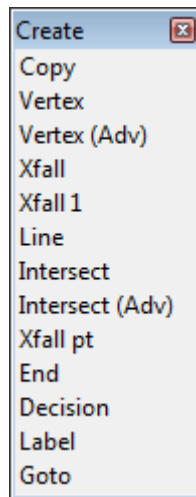
*the selected string needs to cut the sections of the selected **Layer** in plan wherever the boxing is being applied.*

Offset real box 0

*The Relative Offset is the offset of the plan cut of the selected string with the section, plus the **Offset** value. **Offset** can be positive or negative but the final position must still be on **Layer**. **Z-Diff** is the difference between the z-value of the cut string, and the z-value on the **Layer** at the same plan position as the cut with the string. The use of Z-Diff depends on the boxing command.*

Commands for Boxing Rules Panel

If the **command line** is **empty**, double clicking LB in the **command line** will bring up the **Create** menu which contains all the available boxing commands.



Selecting a menu item will bring up an associated panel which displays the information required for the boxing command.

When the panel is filled in and **OK** or **Apply** selected, the panel information is written out to the **command line** in the correct format for that boxing command.

If the **command line** is **not empty**, clicking LB in the **command line** will bring up the associated panel for the boxing command in the **command line**.

The information in the panel can be changed and if **OK** or **Apply** is selected, the changed panel information is written out to the **command line** in the correct format for that boxing command.

Each of the panels created by selecting a command from the **Create** menu, will now be described.

For documentation on the option/menus on the boxing **Create** menu:

For <i>Copy</i> , go to	Boxing Copy
<i>Vertex</i>	Boxing Vertex
<i>Vertex (Adv)</i>	Boxing Vertex Advanced
<i>X-fall</i>	Boxing Xfall - line through a point with a given crossfall
<i>X-fall 1</i>	Boxing Xfall 1 - line through a point with a crossfall taken from a point
<i>Line</i>	Boxing Line - line through two points
<i>Intersect</i>	Boxing Intersect - Intersection of Two Lines
<i>Intersect (Adv)</i>	Boxing Intersect Advanced
<i>Xfall pt</i>	Boxing Xfall Point
<i>Drop (kerb)</i>	Boxing Drop
<i>Decision</i>	Boxing Decision
<i>Label</i>	Boxing Label
<i>Goto</i>	Boxing Goto
<i>Comment</i>	Boxing Comment

<i>Extend tin</i>	Boxing Extend Tin
<i>End</i>	Boxing End

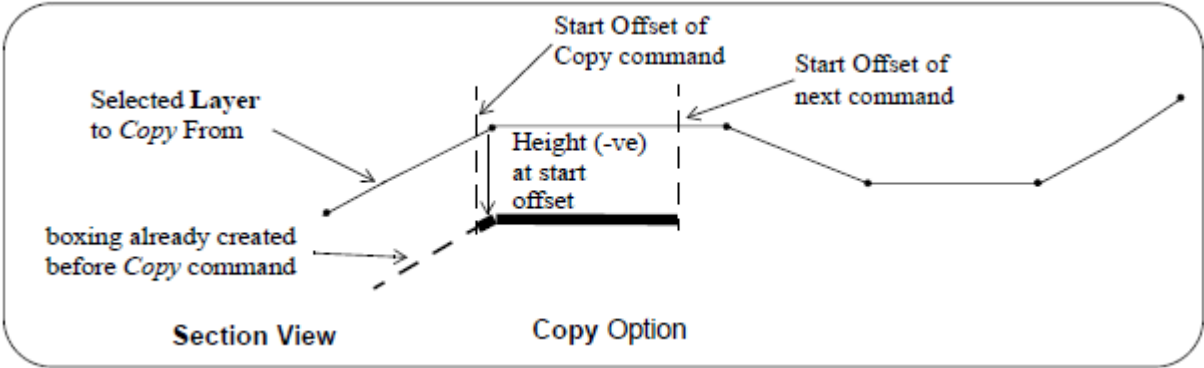
The text file format of all the Boxing Commands in the *Boxing* file is given in the section [Text Format of the Boxing File](#).

Boxing Copy

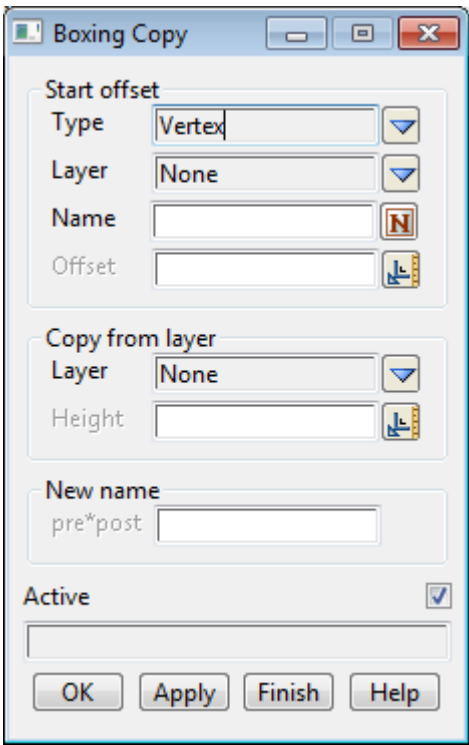
The *Copy* command copies part of the selected **Layer** from the **Start Offset** defined for the *Copy* command, to the **Start Offset of the next boxing command**.

The present slope of each segment is kept but the *height of each segment is adjusted* by a **constant** value provided by user.

Note: The height adjustment may be zero so that part of the selected **Layer** is copies as is.



Selecting **Copy** brings up the **Boxing Copy** panel

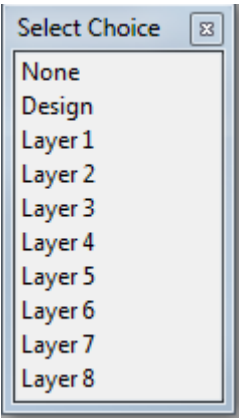


The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Start Offset <i>Start Offset defines where the Copy commands starts from.</i> <i>If the 3d cut of string is used (Cut of string), the Z-Diff is used with Height in determining how far the Layer is copied.</i>			
Type	choice box		
<i>If Last created:</i> <i>the Copy command starts at the Start Offset but for the boxing commands Intersect and Intersect Adv, the offset position for the vertex is calculated by intersection and its actual value may not be known.</i> <i>So for Last created, the offset is the offset of the last vertex of the selected Layer.</i>			
Offset <i>offset to add to the offset of the last vertex. Offset can be positive or negative but the final Start Offset must still be on Layer.</i>	real box	0	

Copy from layer

Layer choice box



Height real box 0

If Start Offset Type is NOT: **Cut of string:**
Height is added to the z-values of the part of the section of the Copy from layer **Layer** being copied to give the z-values of the boxing. For example, if Height is -0.3, the part of the Copy from layer **Layer** being copied is dropped by 0.3

If Start Offset Type is: **Cut of string:**
At the plan cut of the string and the START OFFSET **Layer**, **Z-Diff** (the difference of the z-values between the string and START OFFSET **Layer**) is calculated and **Height** added to it. This combined value is added to the z-values of the part of the COPY FROM LAYER **Layer** being copied, to give the z-values of the boxing

New name

Pre*post text input

when part of a section is copied for the boxing, the vertices of the boxing are given names from either the vertices of the section, or the selected strings that are used in limiting the section, or a unique number not related to vertices or strings.

These constructed boxing vertex names are then modified by the text given in the **Pre*post** field.

The text before the * is prepended to the vertex names, and the text after the * is postpendded to the vertex names.

Active tick box

if **ticked**, use this Boxing Command.
If **not ticked**, don't use this Boxing Command.

OK button

OK stores the values in the fields and removes the panel BUT no **recalc** is done.

Apply button

Apply stores the values and leaves the panel on the screen.

If the **Boxing Definition** is being used in an **Apply Many MTF** and **Auto recalc** is ticked in the MTF, then whenever the **Apply** button is clicked, then a **recalc** of the associated **Apply Many** for the MTF is done.

If the **Boxing Definition** is being used in a **Boxing Many Function** then whenever the **Apply** button is clicked, a **recalc** of the **Boxing Many Function** is done.

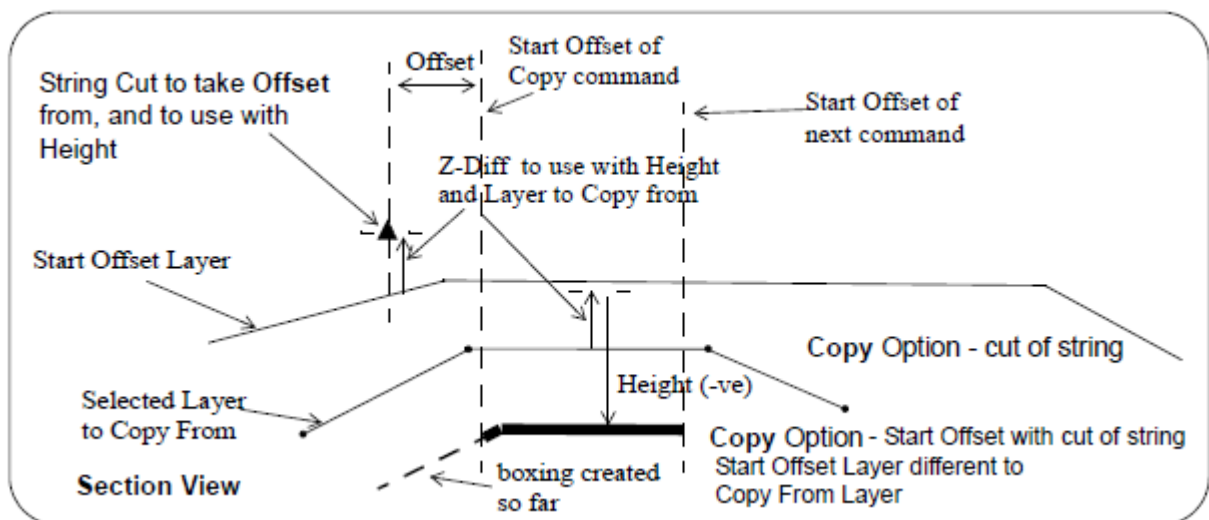
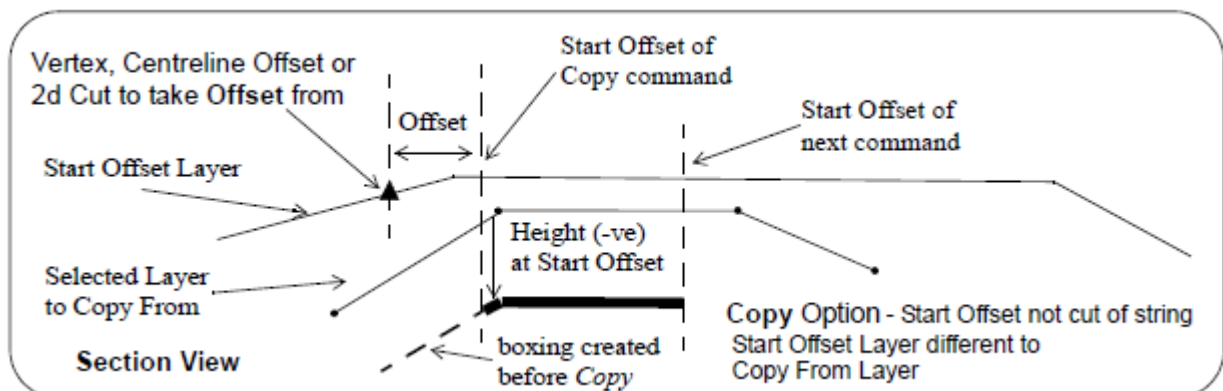
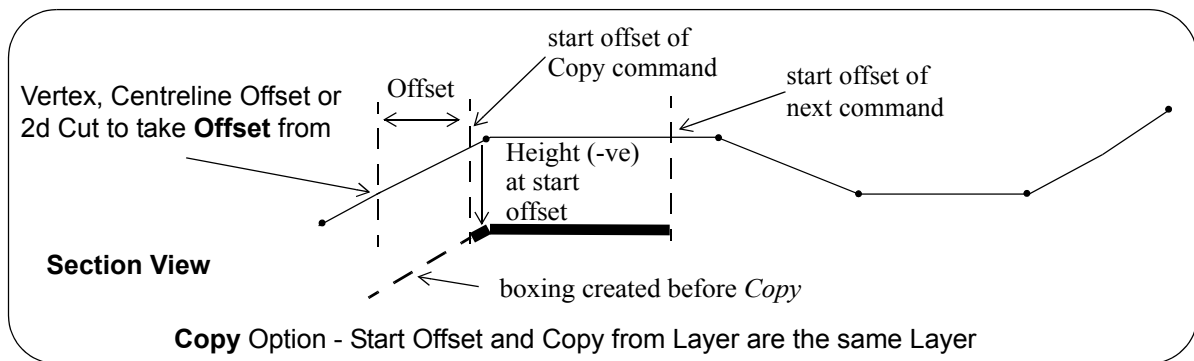
For the typed formats of the **Copy** and **Copy with height adjustment** commands created by this

panel, see [Text Format - Boxing Copy](#) and [Text Format - Boxing Copy with Height Adjustment](#).

For more information on how Boxing works in **12d Model**, please go to the section [What is Boxing ?](#).

Please go to the next section [Boxing Vertex](#) or back to [Edit Boxing File](#).

Copy diagrams for more methods of defining *Offsets*:

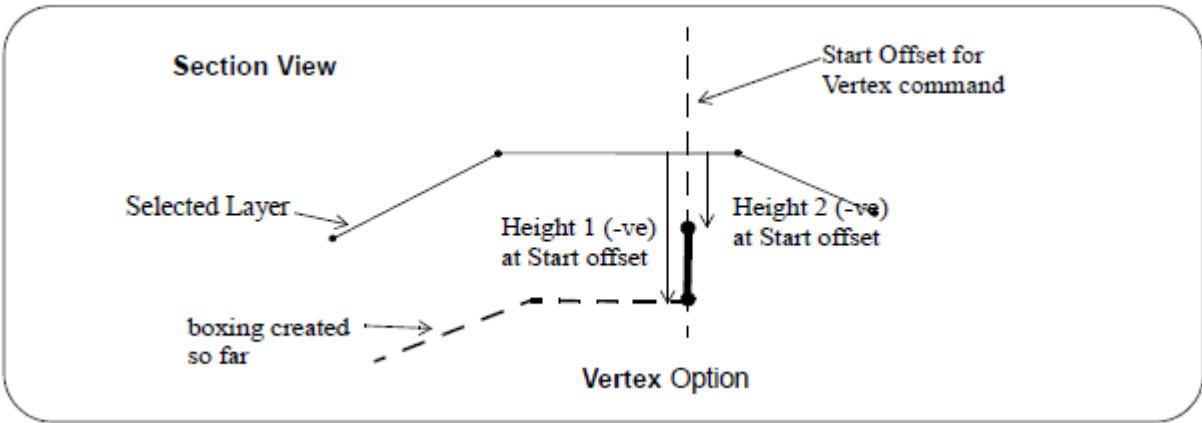




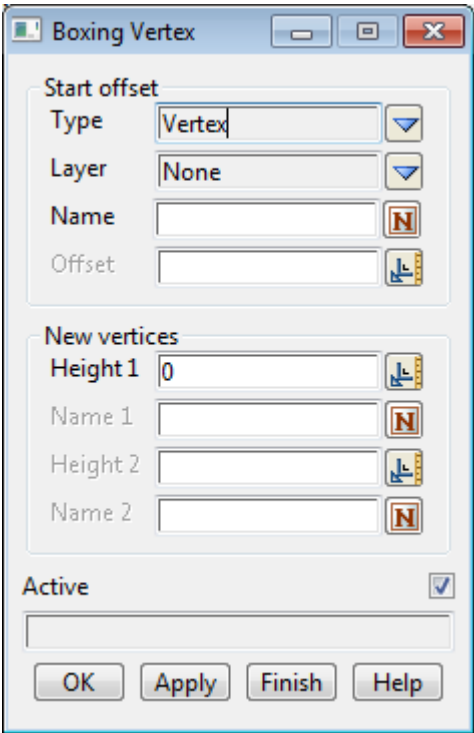
Boxing Vertex

The **Vertex** command inserts into the boxing section, one or two new vertices that are at the same *Start Offset*. So **Vertex** can be used to quickly create a vertical wall at a given *Start Offset*.

Note - to allow the boxing sections and strings to triangulate, **12d Model** increases the offset of the second vertex by ten thousandth of a unit.



Selecting **Vertex** brings up the **Boxing Vertex**



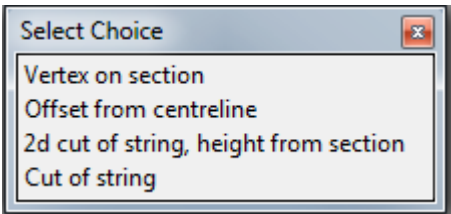
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Start Offset

Layer to use with **Offset** to defined the *Start Offset* where the one or two vertices are created.

Type choice box



For the documentation on the methods of defining the **Start Offset**, see [Defining Relative Offset for Boxing Commands](#)

New vertices

Height 1 real box

If Start Offset Type is NOT: **Cut of string:**

Height 1 is added to the z-value of the **Layer** at the Start Offset to give the z-values of the new boxing vertex. For example, if Height 1 is -0.3, the vertex is dropped by 0.3 from **Layer**.

If Start Offset Type is: **Cut of string:**

At the plan cut of the string and **Layer**, **Z-Diff** (the difference of the z-values between the string and the **Layer**) is calculated and **Height 1** added to it. This combined z-difference is added to z-value of the **Layer** at the **Start Offset** to give the z-value of the new boxing vertex.

Name 1 name box

if non blank, a vertex is created on the boxing section at Start Offset with this name and the appropriate height using Type and Height 1.

If blank, a vertex is created with a default name.

Height 2 real box

If Start Offset Type is NOT: **Cut of string:**

Height 2 is added to the z-value of the **Layer** at the Start Offset to give the z-values of the new boxing vertex. For example, if Height 2 is -0.5, the vertex is dropped by 0.5 from **Layer**.

If Start Offset Type is: **Cut of string:**

At the plan cut of the string and **Layer**, **Z-Diff** (the difference of z-values between the string and the **Layer**) is calculated and **Height 2** added to it. This combined z-difference is added to z-value of the **Layer** at the **Start Offset** to give the z-value of the new boxing vertex.

Name 2 name box

if non blank, a vertex is created on the boxing section at Start Offset with this name and the appropriate height using Type and Height 2.

If blank, no vertex is created.

Note - to allow the boxing sections and strings to triangulate, if two vertices are created, **12d Model** actually increases the offset of the second vertex by ten thousandth of a unit.

Active tick box

if **ticked**, use this Boxing Command.

If **not ticked**, don't use this Boxing Command.

OK button

OK stores the values in the fields and removes the panel BUT no **recalc** is done.

Apply button

Apply stores the values and leaves the panel on the screen.

If the **Boxing Definition** is being used in an **Apply Many MTF** and **Auto recalc** is ticked in the MTF,

then whenever the **Apply** button is clicked, then a **recalc** of the associated **Apply Many** for the MTF is done.

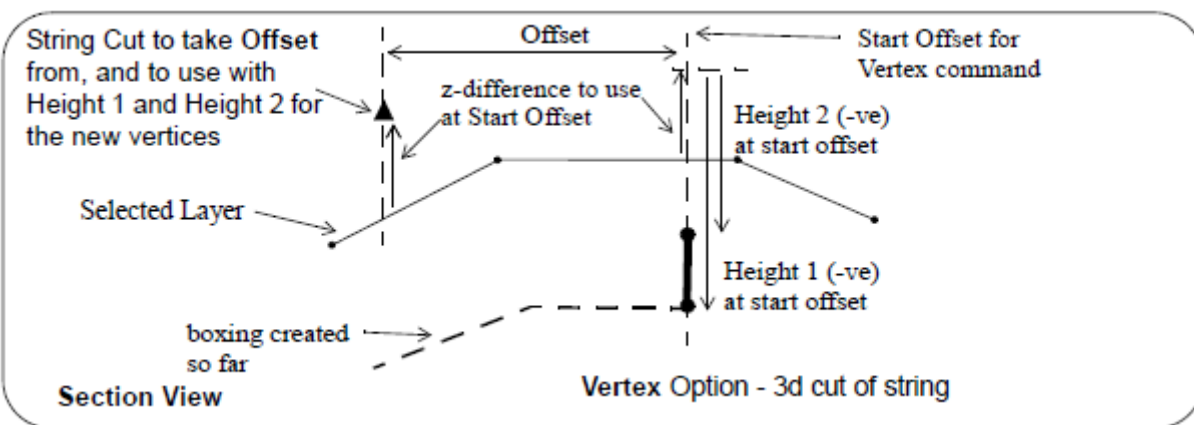
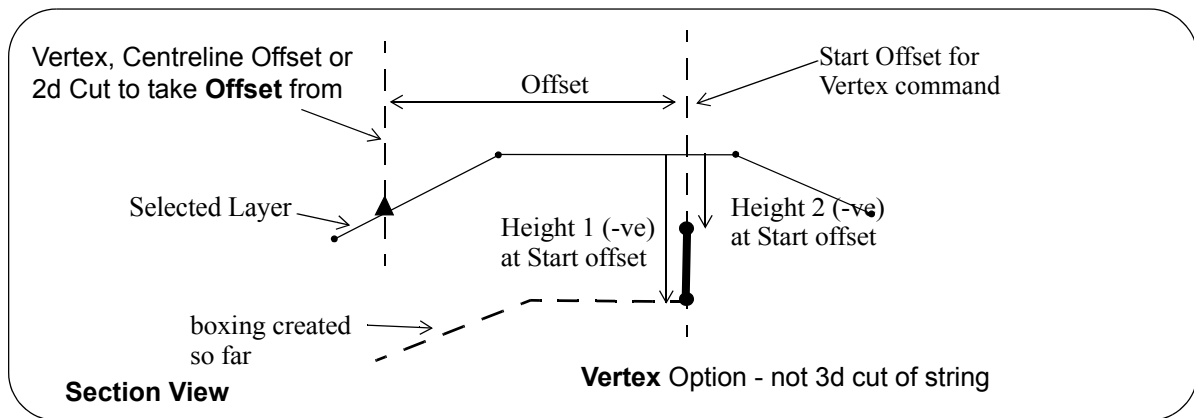
If the **Boxing Definition** is being used in a **Boxing Many Function** then whenever the **Apply** button is clicked, a **recalc** of the **Boxing Many Function** is done.

For the typed format of the **Vertex** command created by this panel, see [Text Format - Boxing Vertex](#).

For more information on how Boxing works in **12d Model**, please go to the section [What is Boxing ?](#).

Please go to the next section [Boxing Vertex Advanced](#) or back to [Edit Boxing File](#).

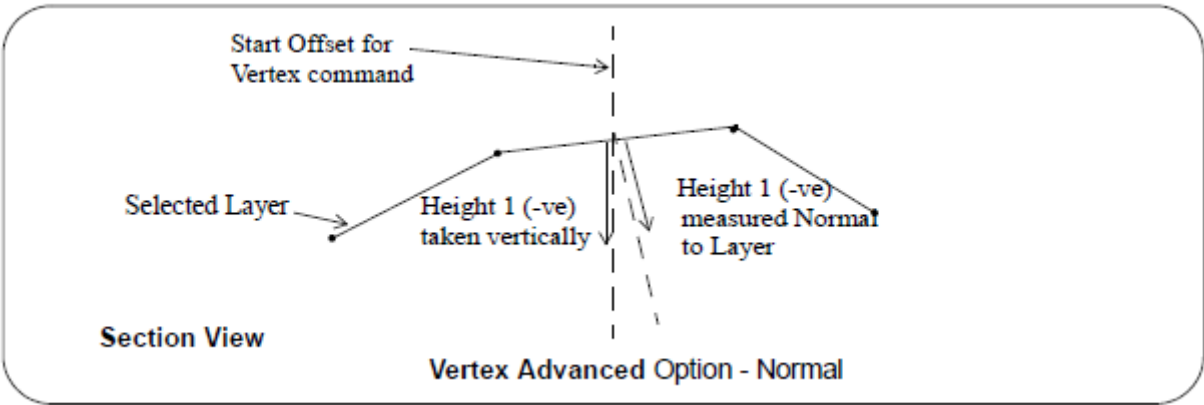
Vertex diagrams for more methods of defining **Offsets**:



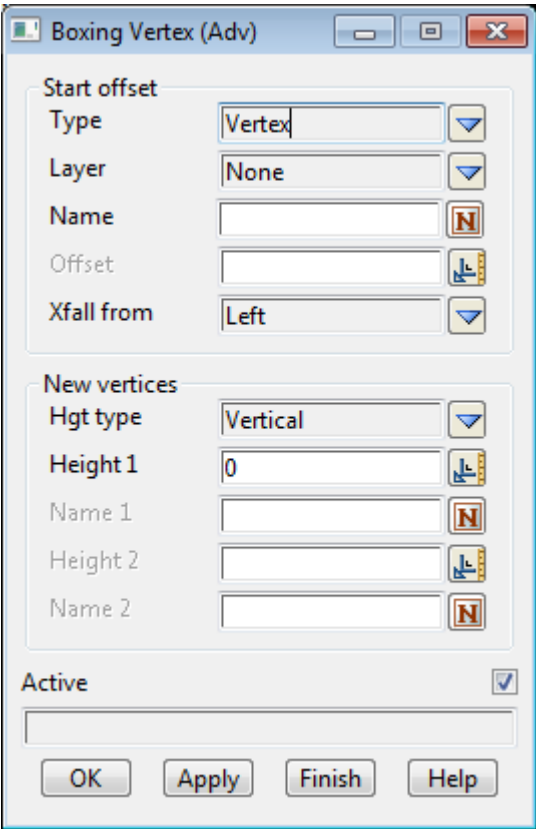
Boxing Vertex Advanced

The **Vertex Advanced** command allows a vertex to be placed where the distance is measured **NORMAL** or vertical or to a segment.

Vertex only allowed a vertical distance and not a normal distance.



Selecting **Vertex (Adv)** brings up the **Boxing Vertex (Adv)** panel



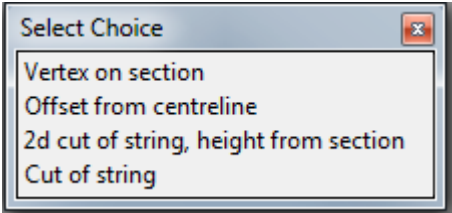
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Start Offset

Layer to use with **Offset** to defined the Start Offset where the one or two vertices are created.

Type choice box



For the documentation on the methods of defining the **Start Offset**, see [Defining Relative Offset for Boxing Commands](#)

Xfall from choice box Left, Right

When **Hgt type** is **Normal**:
if **Left**, the xfall to measure the distance **NORMAL** to is taken from the segment of the Start Offset layer that is slightly to the left of the Start Offset.
if **Right**, the xfall to measure the distance **NORMAL** to is taken from the segment of the Start Offset layer that is slightly to the right of the Start Offset.
When **Hgt type** is **Vertical**, **Xfall from** is not used.

New Vertices

Hgt type choice box Vertical, Normal

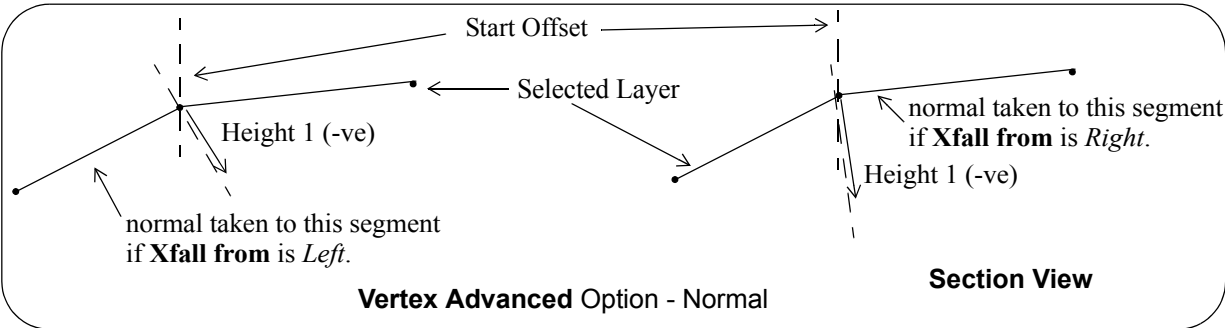
When **Hgt type** is **Normal**, the distance is measured **NORMAL** to a segment.
If **Xfall from** is **Left**, the xfall to measure the distance **NORMAL** to is taken from the segment of the Start Offset layer that is slightly to the left of the Start Offset.
If **Xfall from** is **Right**, the xfall to measure the distance **NORMAL** to is taken from the segment of the Start Offset layer that is slightly to the right of the Start Offset.
When **Hgt type** is **Vertical**, the distance is measured in the vertical plane and **Xfall from** is not used.

Name 1 name box

if non blank, a vertex is created on the boxing section with this name and the appropriate position using **Type**, **Xfall from**, **Hgt type** and **Height 1**.
If blank, a vertex is created with a default name.

Height 1 real box

If Start Offset Type is **NOT: Cut of string**:
If **Hgt type** is **Normal**, the distance **Height 1** is taken from the point on the **Layer** at the Start Offset, and going out **NORMAL** to the segment specified by Start Offset and **Xfall from**.



If **Hgt type** is **Vertical**, the distance **Height 1** is taken from the point on the **Layer** at the Start Offset, and going vertically. For example, if Height 1 is -0.5, the vertex is dropped by 0.5 from

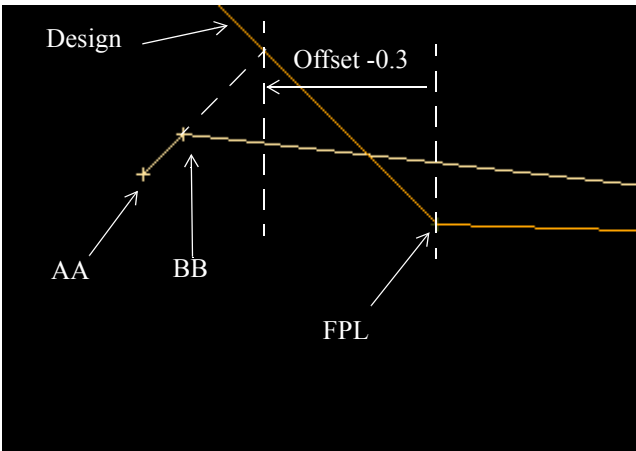
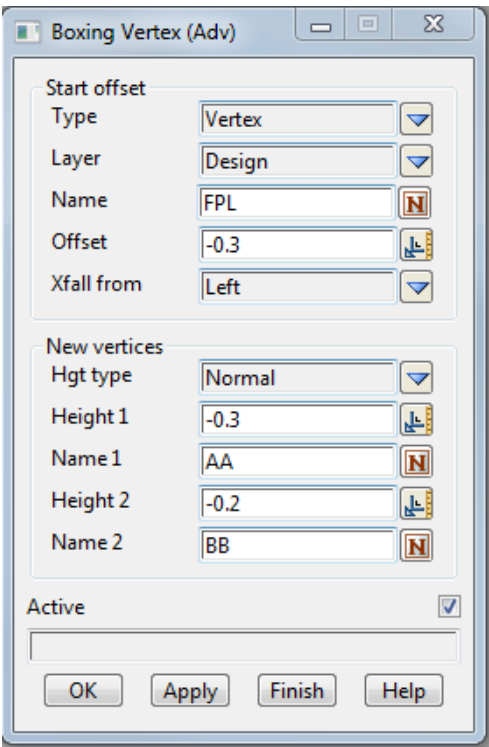
Layer.

If Start Offset Type is: **Cut of string:**
??

Name 2 name box
If blank, no vertex is created.

Height 2 real box
If Start Offset Type is NOT: **Cut of string:**

If **Hgt type** is **Normal**, the distance **Height 2** is taken from the point on the **Layer** at the Start Offset, and going out **NORMAL** to the segment specified by Start Offset and **Xfall from**.
If **Hgt type** is **Vertical**, the distance **Height 2** is taken from the point on the **Layer** at the Start Offset, and going vertically. For example, if Height 2 is -0.5, the vertex is dropped by 0.5 from **Layer**.



Vertex (Adv) - Normal to Design Layer

Active tick box
if **ticked**, use this Boxing Command.
If **not ticked**, don't use this Boxing Command.

OK button
OK stores the values in the fields and removes the panel BUT no **recalc** is done.

Apply button
Apply stores the values and leaves the panel on the screen.
If the **Boxing Definition** is being used in an **Apply Many MTF** and **Auto recalc** is ticked in the MTF, then whenever the **Apply** button is clicked, then a **recalc** of the associated **Apply Many** for the MTF is done.
If the **Boxing Definition** is being used in a **Boxing Many Function** then whenever the **Apply** button is clicked, a **recalc** of the **Boxing Many Function** is done.

Important Notes

1. the boxing vertices must be created from left to right so be careful that vertex Name 2 is not created to the left of vertex of Name 1. If it is then it will be moved to be slightly to the right of vertex Name 1.
2. to allow the boxing sections and strings to triangulate, if two vertices are created that are on top of each other, **12d Model** actually increases the offset of the second vertex by ten thousandth of a unit.

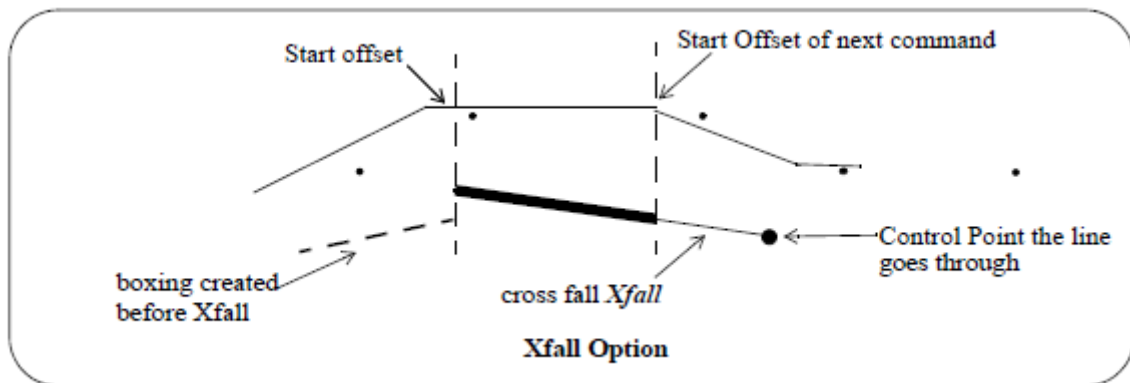
For more information on how Boxing works in **12d Model**, please go to the section [What is Boxing ?](#).

Please go to the next section [Boxing Xfall - line through a point with a given crossfall](#) or back to [Edit Boxing File](#).

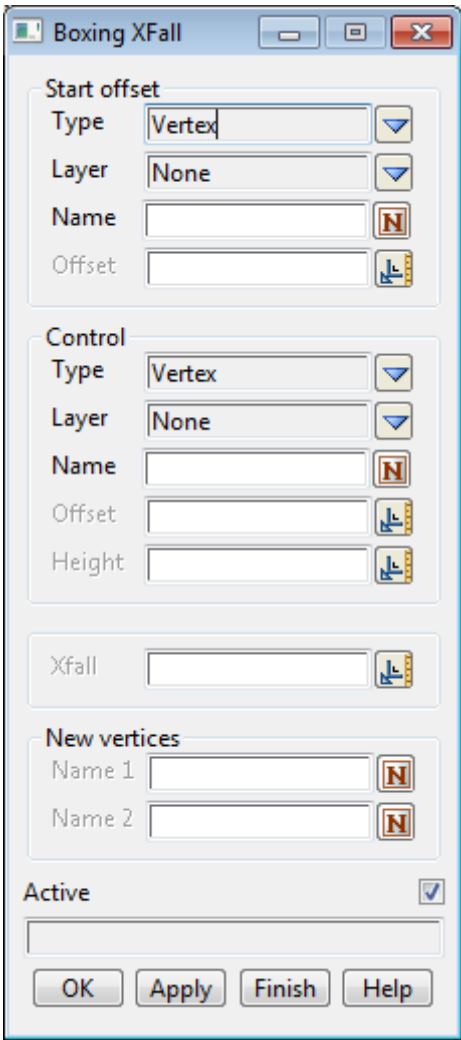
Boxing Xfall - line through a point with a given crossfall

The Xfall command creates a link from the Start Offset to the Start Offset on the *next* boxing command, with a

- (a) user given cross fall (Xfall)
- (b) start height given by projecting the line with a given xfall and going through a given control point, through to the Start Offset,

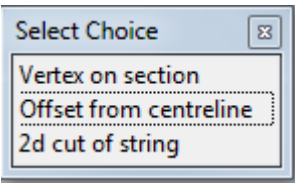


Selecting **Xfall** brings up the **Boxing Xfall** panel



The fields and buttons used in this panel have the following functions.

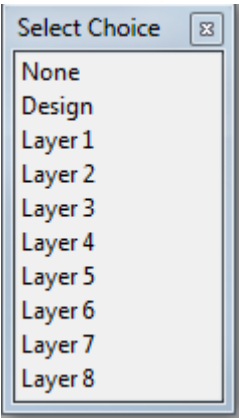
Field Description	Type	Defaults	Pop-Up
Start Offset <i>Start Offset defines the offset where the new line starts from.</i> <i>For the Xfall command, the 3d cut of string is not needed. Only 2d cut of string is required.</i>			
Type	choice box		



For the documentation on the methods of defining the Start Offset, see [Defining Relative Offset for Boxing Commands](#)

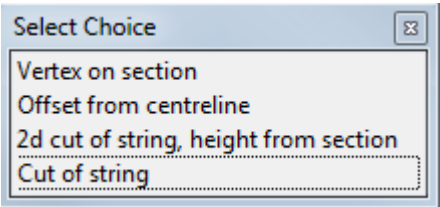
Control <i>the definition of the Control Point that the line goes through.</i>

Layer choice box



Layer to use with Control **Offset** to define the offset of the Control Point.

Type choice box



If *Vertex on section*:

Name name box

*name of the vertex on the Control **Layer** to use with **Offset** to defined the Control Offset. And used with **Height** to define the height of the Control Point*

Offset real box 0

*this value is added to the offset of the vertex given in the **Name** field to define the Control Offset. **Offset** can be positive or negative as long as the final Control Offset is still **on** the Control **Layer**.*

Height real box 0

*Height is added to the z-value of the Control **Layer** at the Control Offset to give the height of the Control Point.*

If *Offset from centreline*:

Offset real box 0

*an actual offset from centreline (actually just the chainage of the section) which is used as the Control Offset. **Offset** can be positive or negative as long as the Control Point is still on the Control **Layer**.*

Height real box 0

*Height is added to the z-value of the Control **Layer** at the Control Offset to give the height of the Control Point.*

If *2d cut of string, height from section*:

String string select

*the selected string needs to cut the Control **Layer** in plan wherever the boxing is being applied. The Control Offset is the offset of the plan cut of the selected string with the Control **Layer**, plus the **Offset** value. **Offset** can be positive or negative as long as the final Control Offset is still on the Control **Layer**.*

Offset real box 0

*offset to add to the offset of the plan cut of the Control **Layer** with the selected string to give the Start Offset. **Offset** can be positive or negative but the final Control Offset must still be on the Control **Layer**.*

Height real box 0

*Height is added to the z-value of the Control **Layer** at the Control Offset to give the height of the Control Point.*

If Cut of string:

String string select

*the selected string needs to cut the Control **Layer** in plan wherever the boxing is being applied. The Control Offset is the offset of the plan cut of the selected string with the Control **Layer**, plus the **Offset** value. **Offset** can be positive or negative but the final position must still be on the Control **Layer**.*

Offset real box 0

*offset to add to the offset of the plan cut of the section with the selected string to give the Control Offset. **Offset** can be positive or negative but the final Control Offset must still be on the section.*

Height real box 0

*At the plan cut of the string and the Control **Layer**, the difference of the z-values between the string and the Control **Layer** is calculated and **Height** added to it. This combined value is added to the z-values on the Control **Layer**, to give the z-value of the Control Point.*

Xfall input 0

xfall of the line going through the Control Point.

New vertices

Name 1 name box

*if non blank, the vertex created at the Start Offset is given this name
If blank, the vertex created at the Start Offset is given a default name.*

Name 2 name box

*if non blank, the vertex created at the End Offset (the Start Offset of the next command) is given this name
If blank, the vertex created at the End Offset is given a default name.*

Active tick box

*if **ticked**, use this Boxing Command.
If **not ticked**, don't use this Boxing Command.*

OK button

***OK** stores the values in the fields and removes the panel BUT no **recalc** is done.*

Apply button

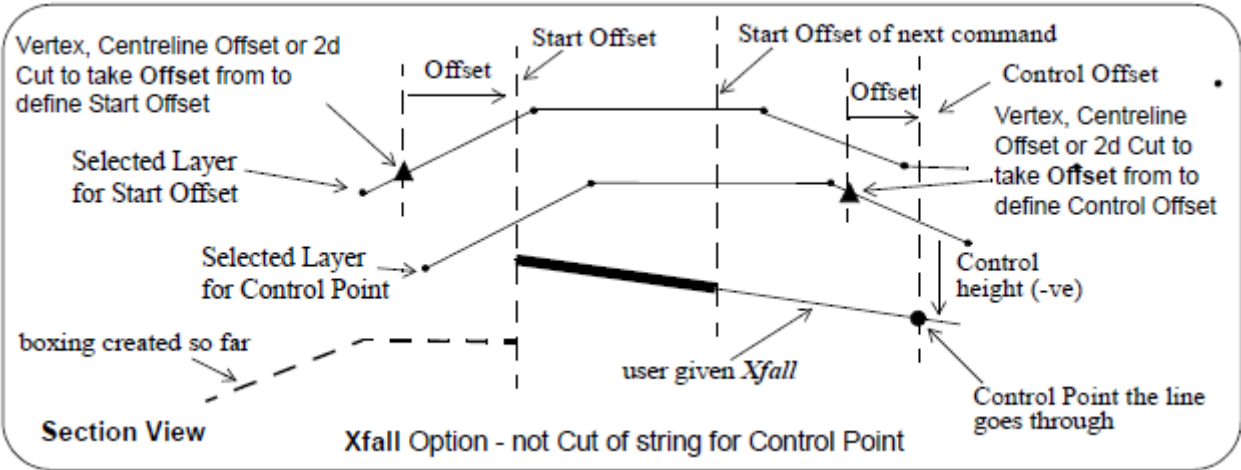
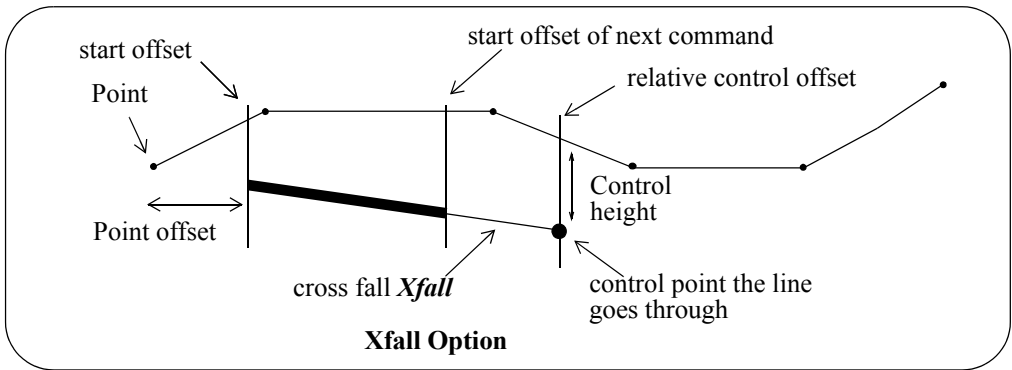
***Apply** stores the values and leaves the panel on the screen.
If the **Boxing Definition** is being used in an **Apply Many MTF** and **Auto recalc** is ticked in the MTF, then whenever the **Apply** button is clicked, then a **recalc** of the associated **Apply Many** for the MTF is done.
If the **Boxing Definition** is being used in a **Boxing Many Function** then whenever the **Apply** button is clicked, a **recalc** of the **Boxing Many Function** is done.*

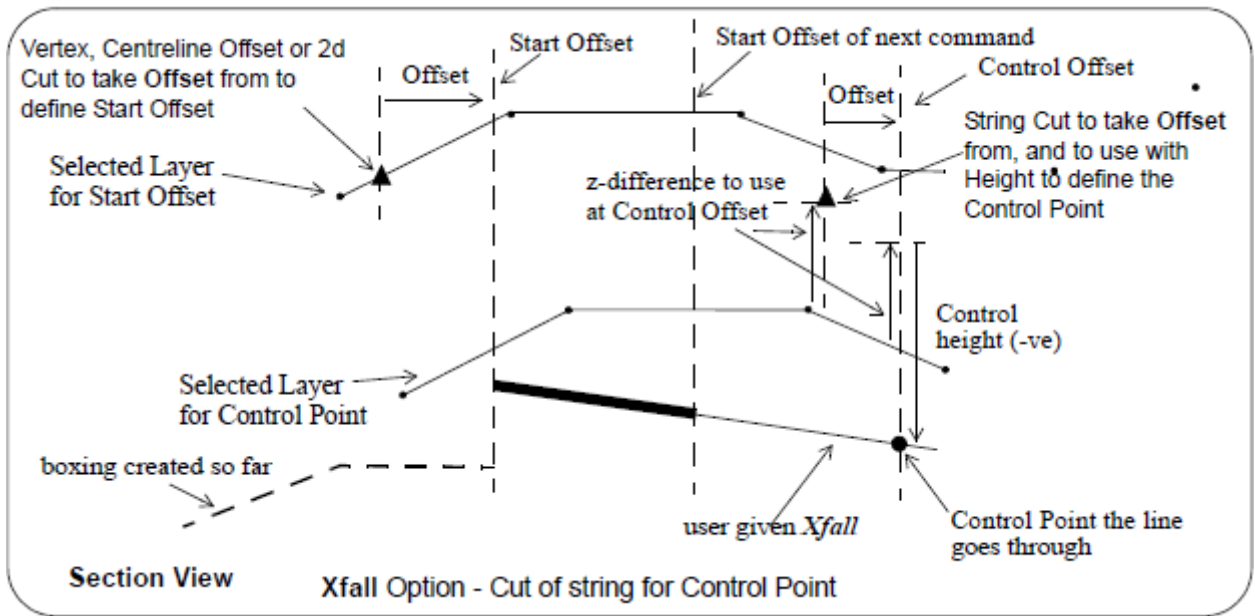
For the typed formats of the **Xfall** command created by this panel, see [Text Format - Boxing Xfall](#).

For more information on how Boxing works in **12d Model**, please go to the section [What is Boxing ?](#).

Please go to the next section [Boxing Xfall 1 - line through a point with a crossfall taken from a point](#) or back to [Edit Boxing File](#).

Xfall diagrams for more methods of defining **Offsets**:

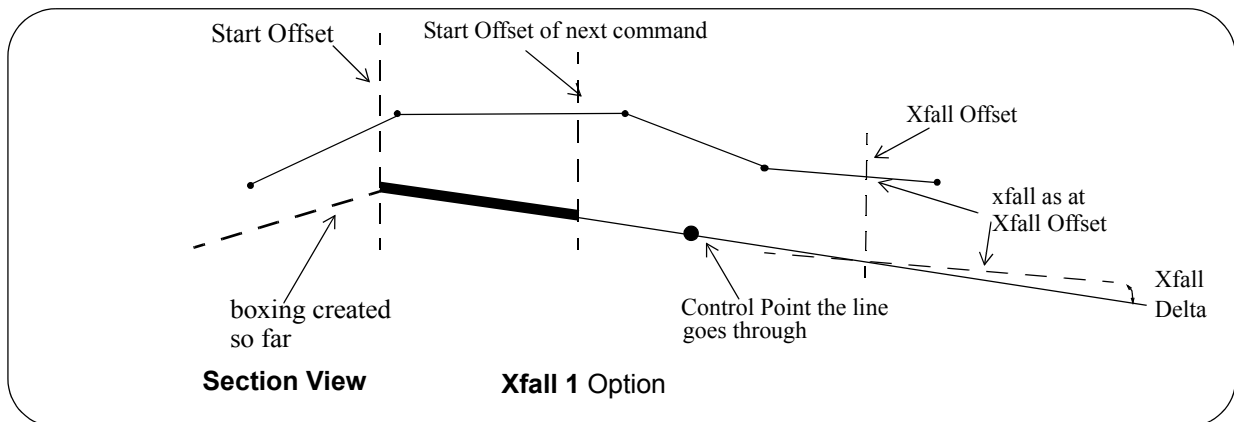




Boxing Xfall 1 - line through a point with a crossfall taken from a point

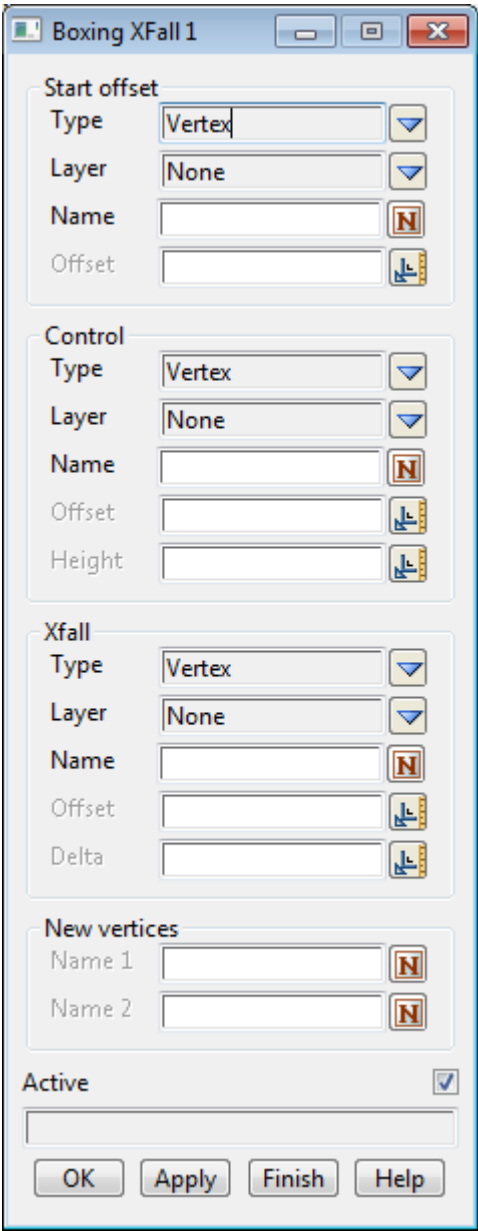
The **Xfall 1** command creates a link from the Start Offset, to the Start Offset on the *next* boxing command, with

- a Xfall which is the xfall at a given offset plus an additional xfall **Delta**
- a start height given by projecting to the Start Offset, the line with the specified Xfall and going through a given Control Point.



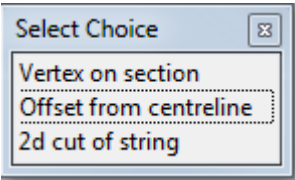
Note - the difference between the boxing commands **Xfall** and **Xfall 1** is that in the command **Xfall**, the user supplies the value of the xfall whereas in the command **Xfall 1**, the xfall is taken from a link on the Xfall Layer.

Selecting **Xfall 1** brings up the **Boxing Xfall 1** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Start offset			
<i>Start Offset defines the offset where the new line starts from.</i>			
<i>For the Xfall 1 command, the 3d cut of string is not needed. Only 2d cut of string is required.</i>			
Type	choice box		



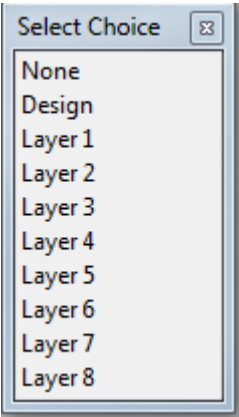
For the documentation on the methods of defining the Start Offset, see [Defining Relative Offset for Boxing Commands](#)

Control

the definition of the Control Point for the line to go through.

Layer

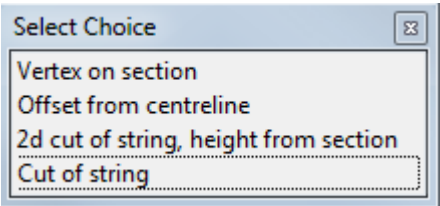
choice box



*Layer to use with Control **Offset** to define the offset of the Control Point.*

Type

choice box



*If **Vertex on section**:*

Name

name box

*name of the vertex on the Control **Layer** to use with **Offset** to defined the Control Offset. And used with **Height** to define the height of the Control Point*

Offset

real box

0

*this value is added to the offset of the vertex given in the **Name** field to define the Control Offset. **Offset** can be positive or negative as long as the final Control Offset is still **on** the Control **Layer**.*

Height

real box

0

*Height is added to the z-value of the Control **Layer** at the Control Offset to give the height of the Control Point.*

*If **Offset from centreline**:*

Offset

real box

0

*an actual offset from centreline (actually just the chainage of the section) which is used as the Control Offset. **Offset** can be positive or negative as long as the Control Point is still on the Control **Layer**.*

Height

real box

0

*Height is added to the z-value of the Control **Layer** at the Control Offset to give the height of the Control Point.*

*If **2d cut of string, height from section**:*

String

string select

*the selected string needs to cut the Control **Layer** in plan wherever the boxing is being applied.*

The Control Offset is the offset of the plan cut of the selected string with the Control **Layer**, plus the **Offset** value. **Offset** can be positive or negative as long as the final Control Offset is still on the Control **Layer**.

Offset real box 0

offset to add to the offset of the plan cut of the Control **Layer** with the selected string to give the Start Offset. **Offset** can be positive or negative but the final Control Offset must still be on the Control **Layer**.

Height real box 0

Height is added to the z-value of the Control **Layer** at the Control Offset to give the height of the Control Point.

If Cut of string:

String string select

the selected string needs to cut the Control **Layer** in plan wherever the boxing is being applied. The Control Offset is the offset of the plan cut of the selected string with the Control **Layer**, plus the **Offset** value. **Offset** can be positive or negative but the final position must still be on the Control **Layer**.

Offset real box 0

offset to add to the offset of the plan cut of the section with the selected string to give the Control Offset. **Offset** can be positive or negative but the final Control Offset must still be on the section.

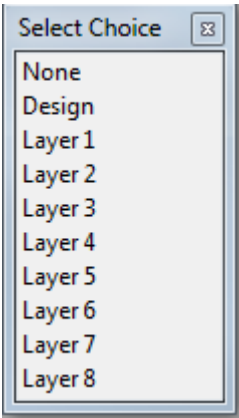
Height real box 0

At the plan cut of the string and the Control **Layer**, the difference of the z-values between the string and the Control **Layer** is calculated and **Height** added to it. This combined value is added to the z-values on the Control **Layer**, to give the z-value of the Control Point.

Xfall

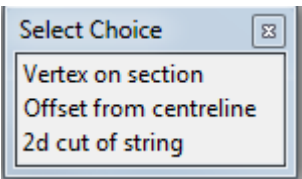
the xfall of the line going through the Control Point is:
the xfall of the Xfall **Layer** at Xfall Offset, plus the value Delta.

Layer choice box



Layer to use with **Offset** to defined the Xfall

Type choice box



If Vertex on section:

- Name** name box
*name of the vertex on Xfall **Layer** to use with **Offset** to define the Xfall Offset.*
- Offset** real box
*this value is added to the offset of the vertex given in the **Name** field to define the Xfall Offset.
Offset can be positive or negative as long as the final Xfall Offset is still **on** the Xfall **Layer**.*
- Delta** real box
*the Xfall of the line is the xfall of the Xfall **Layer** at Xfall Offset plus **Delta***

If Offset from centreline:

- Offset** real box
*an actual offset from centreline (actually just the chainage of the section) which is used as the Xfall Offset. **Offset** can be positive or negative as long as it is still on the Xfall **Layer**.*
- Delta** real box
*the Xfall of the line is the xfall of the segment of Xfall **Layer** at Xfall Offset plus **Delta***

If 2d cut of string:

- String** string select
*the selected string needs to cut the Xfall **Layer** in plan wherever the boxing is being applied.
The Xfall Offset is the offset of the plan cut of the selected string with the Xfall **Layer**, plus the **Offset** value. **Offset** can be positive or negative but the final position Xfall Offset must still be on the Xfall **Layer**.*
- Offset** real box
*offset to add to the offset of the plan cut of the Xfall **Layer** with the selected string to give the Xfall Offset. **Offset** can be positive or negative but the final Xfall Offset must still be on the Xfall **Layer**.*
- Delta** real box
*the Xfall of the line is the xfall of the segment of Xfall **Layer** at Xfall Offset plus **Delta**.*

New vertices

- Name 1** name box
*if non blank, the vertex created at the Start Offset is given this name
If blank, the vertex created at the Start Offset is given a default name.*
- Name 2** name box
*if non blank, the vertex created at the End Offset (the Start Offset of the next command) is given this name
If blank, the vertex created at the End Offset is given a default name.*
- Active** tick box
*if **ticked**, use this Boxing Command.
If **not ticked**, don't use this Boxing Command.*
- OK** button
***OK** stores the values in the fields and removes the panel BUT no **recalc** is done.*
- Apply** button

Apply stores the values and leaves the panel on the screen.

If the **Boxing Definition** is being used in an **Apply Many MTF** and **Auto recalc** is ticked in the MTF, then whenever the **Apply** button is clicked, then a **recalc** of the associated **Apply Many** for the MTF is done.

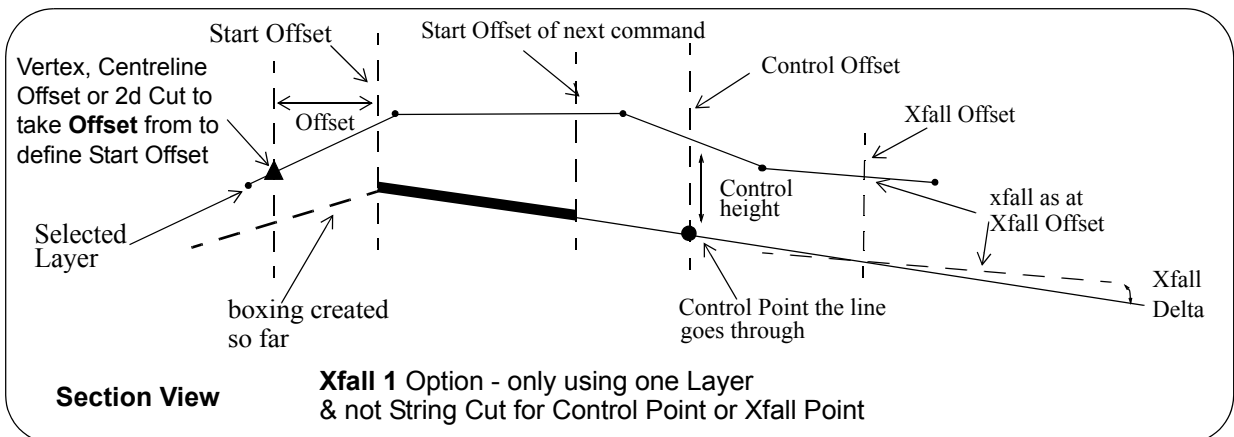
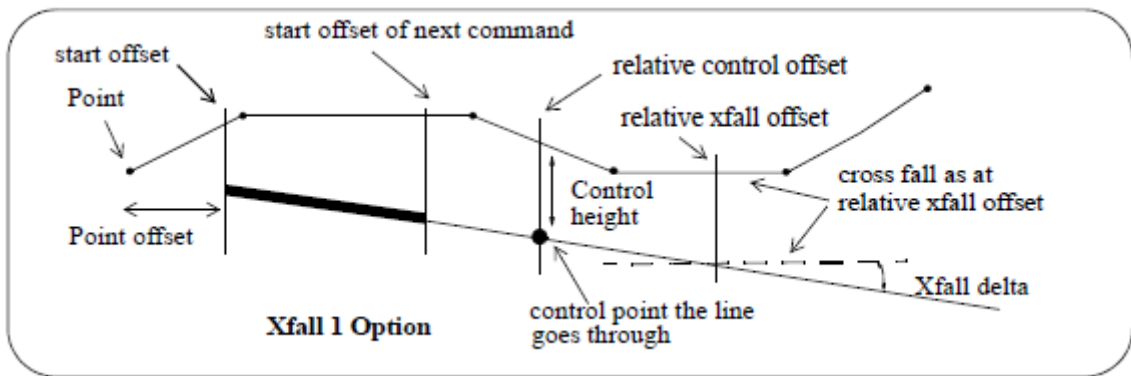
If the **Boxing Definition** is being used in a **Boxing Many Function** then whenever the **Apply** button is clicked, a **recalc** of the **Boxing Many Function** is done.

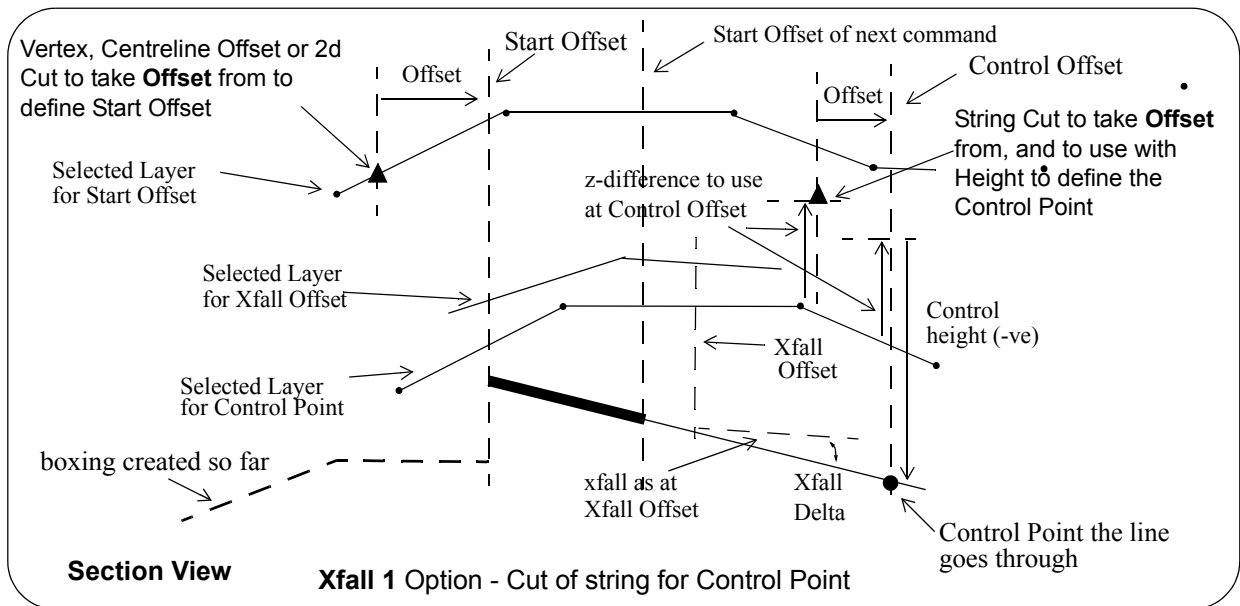
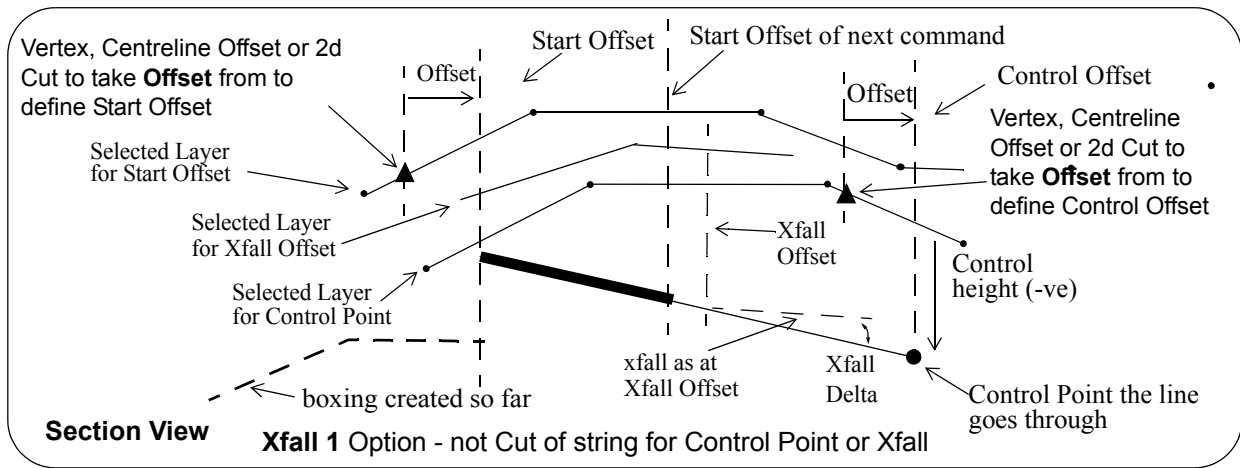
For the typed format of the **xfall1** command created by this panel, see [Text Format - Boxing Xfall1](#).

For more information on how Boxing works in **12d Model**, please go to the section [What is Boxing ?](#).

Please go to the next section [Boxing Line - line through two points](#) or back to [Edit Boxing File](#).

Xfall 1 diagrams for more methods of defining **Offsets**:





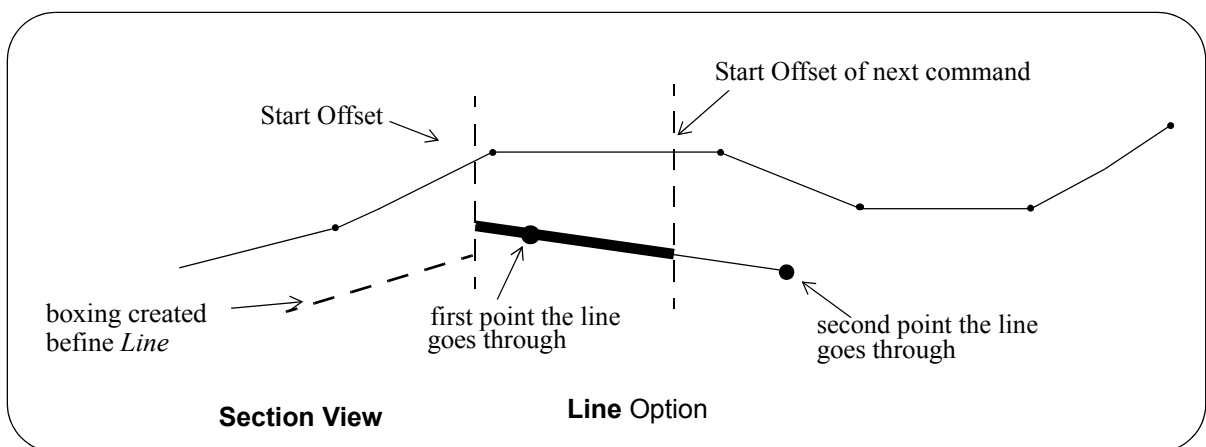
Boxing Line - line through two points

The Line command creates a line from the Start Offset to the Start Offset of the *next* boxing command, with a

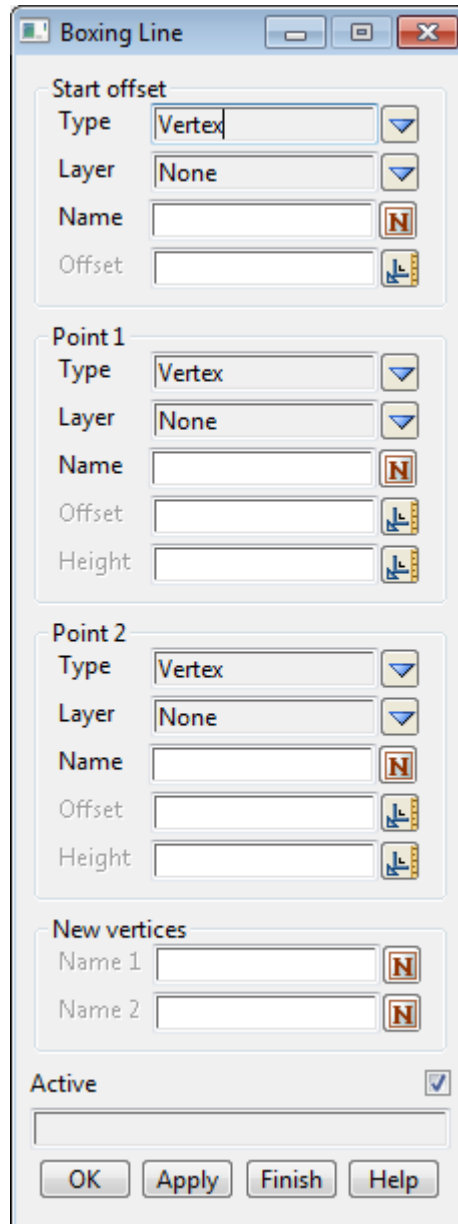
- (a) slope given by two points
- (b) start height given by projecting to the Start Offset, the line through the two points.

The first point defining the line has the offset **Point 1 Offset** which may be given in terms of a Vertex, or Cut with a string, and a height given by the height of a selected Layer, or at the Cut string, plus a given **Height**.

The second point defining the line has the offset **Point 2 Offset** which may be given in terms of a Vertex, or Cut with a string, and a height given by the height of a selected Layer, or at the Cut string, plus a given **Height**.



Selecting **Line** brings up the **Boxing Line** panel



The fields and buttons used in this panel have the following functions.

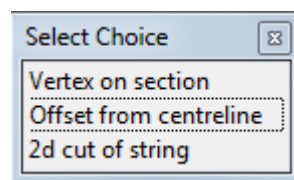
Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Start offset

Start Offset defines the offset where the new line starts from.

For the **Line** command, the 3d cut of string is not needed. Only **2d cut of string** is required.

Type	choice box
------	------------

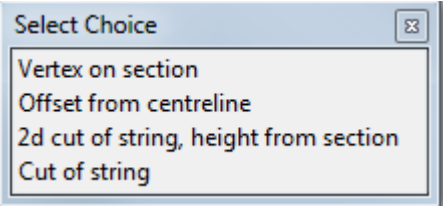


For the documentation on the methods of defining the Start Offset, see [Defining Relative Offset for Boxing Commands](#)

Point 1

the definition of the first point that the line goes through.

Type choice box



For the documentation on the methods of defining the Point 1 Offset, see [Defining Relative Offset for Boxing Commands](#)

If Vertex on section:

Height real box 0

Height is added to the z-value on the **Layer** at the Point 1 Offset to give the height of Point 1.

If Offset from centreline:

Height real box 0

Height is added to the z-value on the **Layer** at the Point 1 Offset to give the height of Point 1.

If 2d cut of string, height from section:

Height real box 0

Height is added to the z-value on the **Layer** at the Point 1 Offset to give the height of Point 1.

If Cut of string:

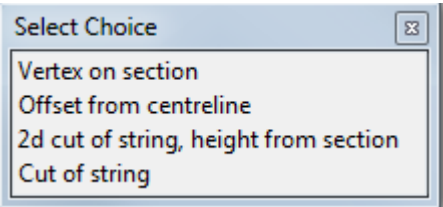
Height real box 0

Height is added to the z-value of the cut string to give the z-value of Point 1.

Point 2

the definition of the second point that the line goes through.

Type choice box



For the documentation on the methods of defining the Point 2 Offset, see [Defining Relative Offset for Boxing Commands](#)

If Vertex on section:

Height real box 0

Height is added to the z-value on the **Layer** at the Point 2 Offset to give the height of Point 2.

If Offset from centreline:

Height real box 0

Height is added to the z-value of the **Layer** at the Point 2 Offset to give the height of Point 2.

If 2d cut of string, height from section:

Height real box 0

*Height is added to the z-value on the **Layer** at the Point 2 Offset to give the height of Point 2.*

*If **Cut of string**:*

Height real box 0

Height is added to the z-value of the cut string to give the z-value of Point 2.

New Vertices

Name 1 name box

if non blank, the vertex created at the Start Offset is given this name

If blank, the vertex created at the Start Offset is given a default name.

Name 2 name box

if non blank, the vertex created at the End Offset (the Start Offset of the next command) is given this name

If blank, the vertex created at the End Offset is given a default name.

Active tick box

*if **ticked**, use this Boxing Command.*

*If **not ticked**, don't use this Boxing Command.*

OK button

***OK** stores the values in the fields and removes the panel BUT no **recalc** is done.*

Apply button

***Apply** stores the values and leaves the panel on the screen.*

*If the **Boxing Definition** is being used in an **Apply Many MTF** and **Auto recalc** is ticked in the MTF, then whenever the **Apply** button is clicked, then a **recalc** of the associated **Apply Many** for the MTF is done.*

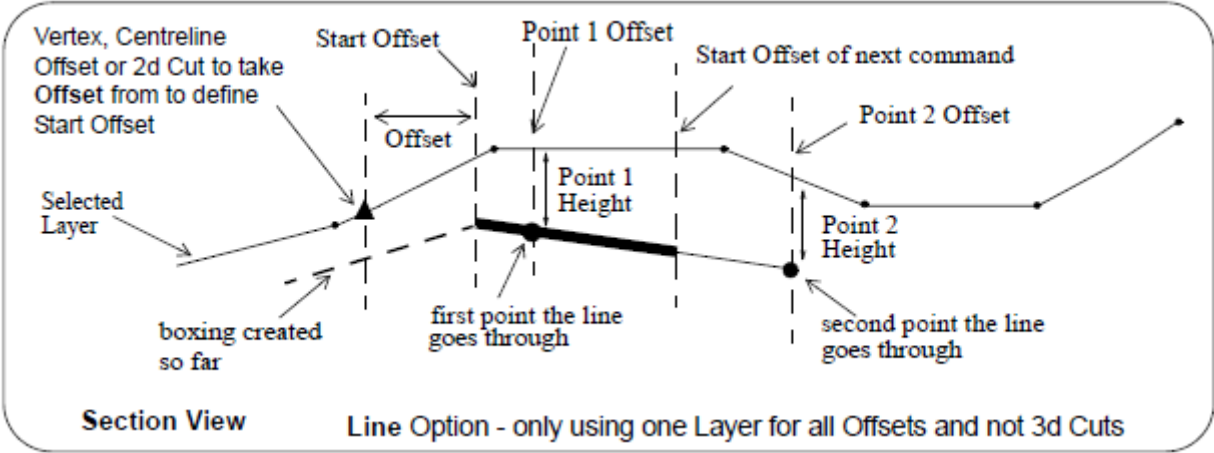
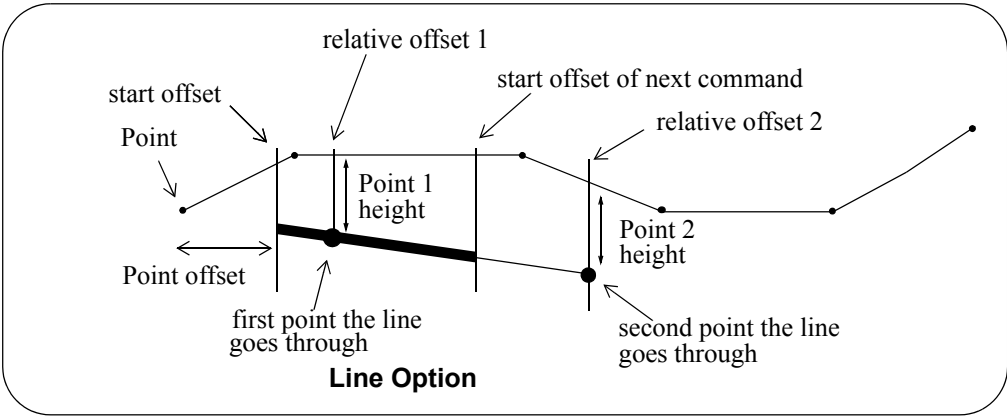
*If the **Boxing Definition** is being used in a **Boxing Many Function** then whenever the **Apply** button is clicked, a **recalc** of the **Boxing Many Function** is done.*

For the typed formats of the **Line** command created by this panel, see [Text Format - Boxing Line](#).

For more information on how Boxing works in **12d Model**, please go to the section [What is Boxing ?](#).

Please go to the next section [Boxing Intersect - Intersection of Two Lines](#) or back to [Edit Boxing File](#).

Line diagrams for more methods of defining **Offsets**:



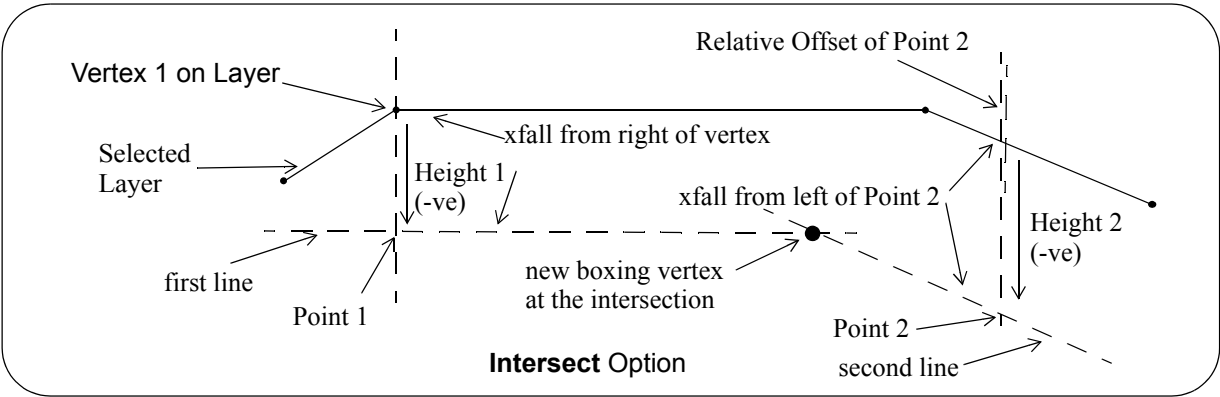
Boxing Intersect - Intersection of Two Lines

The **Intersect** command creates a vertex on the boxing section that is the **intersection** of two lines.

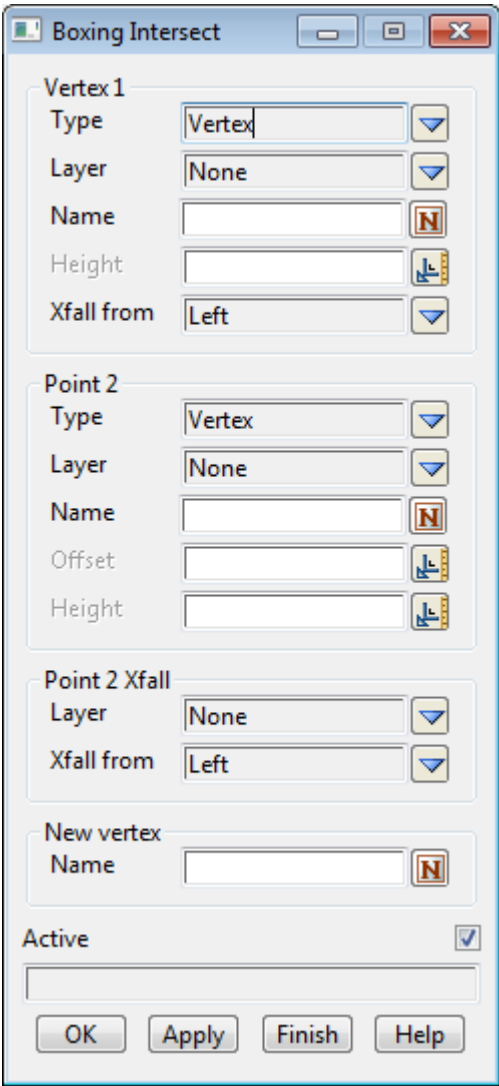
The first line goes through Point 1 where the offset for Point 1 is the offset of a vertex from a Layer, and the height at Point 1 is the height on the vertex plus of a given **Height**. The **xfall** of the line is taken from the Layer segment to either the Left or Right of the selected vertex.

The second line goes through Point 2 where the offset for Point 2 is a relative offset to a vertex or a selected string, and the height at Point 2 is either the height on the Layer section plus a given **Height**, or the height at the cut string, with the addition of a given **Height**. The **Xfall** of the line is taken from the Layer segment to either the Left or Right of the relative offset of Point 2.

A new boxing vertex is created at the intersection of the two lines.

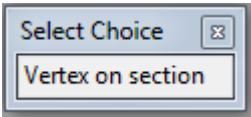


Selecting **Intersect** brings up the **Boxing Intersect** panel



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Vertex 1				
	<i>the definition of the point that the first line goes through. The point must be vertically over a vertex from a Layer</i>			
Layer		choice box		Design, Layer 1 ... Layer 8
	<i>Layer to select the vertex from to define the offset of the point the first line goes through.</i>			
Type		choice box		
	<i>If Vertex on section:</i>			
Name		name box		
	<i>name of the vertex on Layer to use with Height to defined the offset and height for point that the first line goes through</i>			
Height		real box		



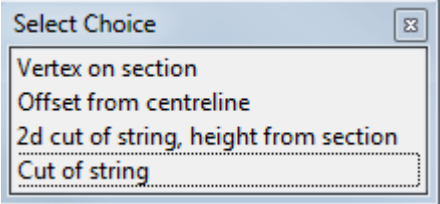
Height is added to the z-value of the selected vertex to give the point the first line goes through.

Xfall from choice box Left, Right
if Left, the xfall for the line is taken from the segment that is a little left of the selected vertex.
If Right, the xfall for the line is taken from the segment that is a little right of the selected vertex

Point 2
the definition of the point that the second line goes through

Layer choice box Design, Layer 1 ... Layer 8
Layer to select the vertex from to define the offset of the point the second line goes through.

Type choice box



If **Vertex on section**:

Name name box
name of the vertex on the cross section to use with **Offset** to defined the Point 2 Offset. And used with **Height** to define the height of the Point 2.

Offset real box 0
this value is added to the offset of the vertex given in the **Name** field to define the Point 2 Offset. **Offset** can be positive or negative as long as the final Point 2 Offset is still **on** the section.

Height real box 0
Height is added to the z-value of the section at the Point 2 Offset to give the height of Point 2.

If **Offset from centreline**:

Offset real box 0
an actual offset from centreline (actually just the chainage of the section) which is used as the Point 2 Offset. **Offset** can be positive or negative as long as the Point 2 Offset is still on the section.

Height real box 0
Height is added to the z-value of the section at the Point 2 Offset to give the height of Point 2.

If **2d cut of string, height from section**:

String string select
the selected string needs to cut the sections in plan wherever the boxing is being applied. The Point 2 Offset is the offset of the plan cut of the selected string with the section, plus the **Offset** value. **Offset** can be positive or negative as long as the final Point 2 Offset is still on the section.

Offset real box 0
this value is added to the offset of the plan cut of the section with the selected string to give the Point 2 Offset. **Offset** can be positive or negative but the final Point 2 Offset must still be on the section.

Height real box 0
Height is added to the z-value of the section at the Point 2 Offset to give the height of Point 2.

If Cut of string:

String	string select	
<i>the selected string needs to cut the sections in plan wherever the boxing is being applied.</i> <i>The Point 2 Offset is the offset of the plan cut of the selected string with the section, plus the</i> Offset <i>value. Offset can be positive or negative but the final position must still be on the</i> <i>section.</i>		
Offset	real box	0
<i>this value is added to the offset of the plan cut of the section with the selected string to give the</i> <i>Point 2 Offset. Offset can be positive or negative but the final Point 2 Offset must still be on the</i> <i>section.</i>		
Height	real box	0
<i>Height is added to the z-value of the cut string to give the z-value of Point 2.</i>		

Point 2 Xfall

the definition of xfall of the second line

Layer	choice box	Design, Layer 1 ... Layer 8
<i>Layer to select the vertex from to define the offset of the point the second line goes through.</i>		
Xfall from	choice box	Left, Right
<i>if Left, the xfall of the second line is taken from the segment that is a little to the left of the</i> <i>relative offset.</i> <i>If Right, the xfall of the second line is taken from the segment that is a little to the right of the</i> <i>relative offset</i>		

New vertex

a new vertex is created at the intersection of the two lines

Name	name box
<i>the vertex created at the intersection of the two lines is given this name</i>	

Active	tick box
<i>if ticked, use this Boxing Command.</i> <i>If not ticked, don't use this Boxing Command.</i>	

OK	button
OK <i>stores the values in the fields and removes the panel BUT no recalc is done.</i>	

Apply	button
Apply <i>stores the values and leaves the panel on the screen.</i> <i>If the Boxing Definition is being used in an Apply Many MTF and Auto recalc is ticked in the MTF,</i> <i>then whenever the Apply button is clicked, then a recalc of the associated Apply Many for the MTF is</i> <i>done.</i> <i>If the Boxing Definition is being used in a Boxing Many Function then whenever the Apply button is</i> <i>clicked, a recalc of the Boxing Many Function is done.</i>	

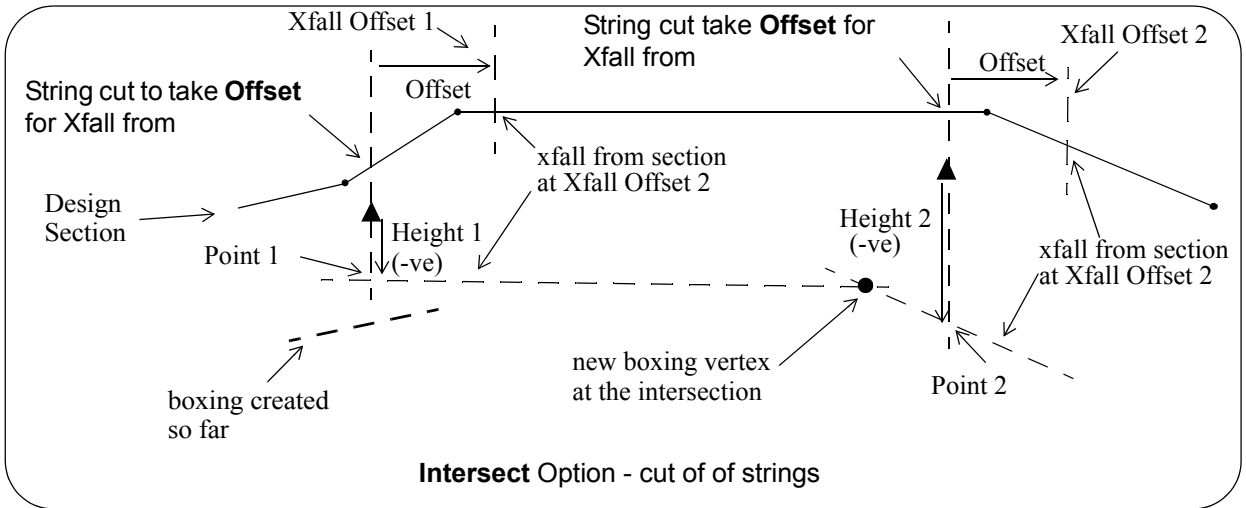
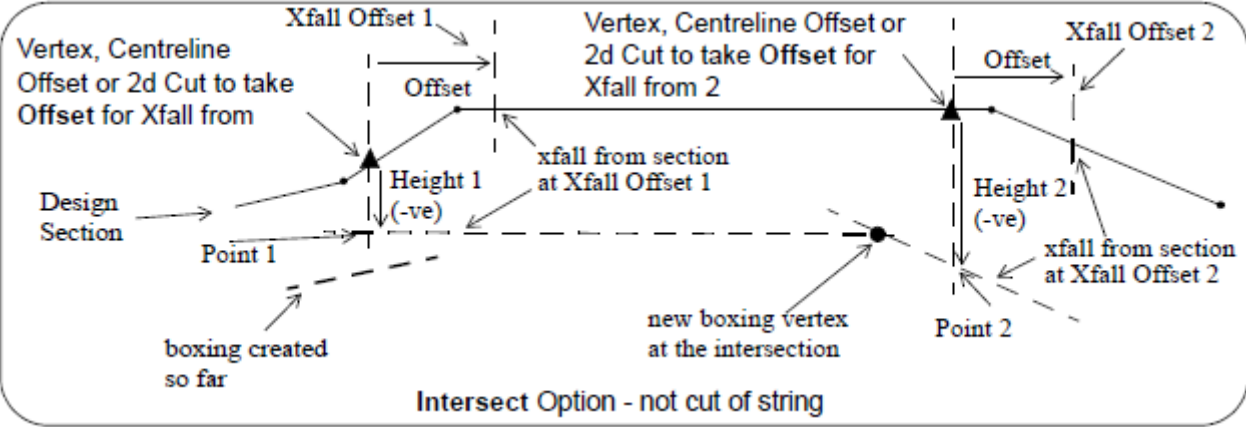
For the typed format of the **intersect** command created by this panel, see [Text Format - Boxing Intersect](#).

For more information on how Boxing works in **12d Model**, please go to the section [What is](#)

Boxing ?.

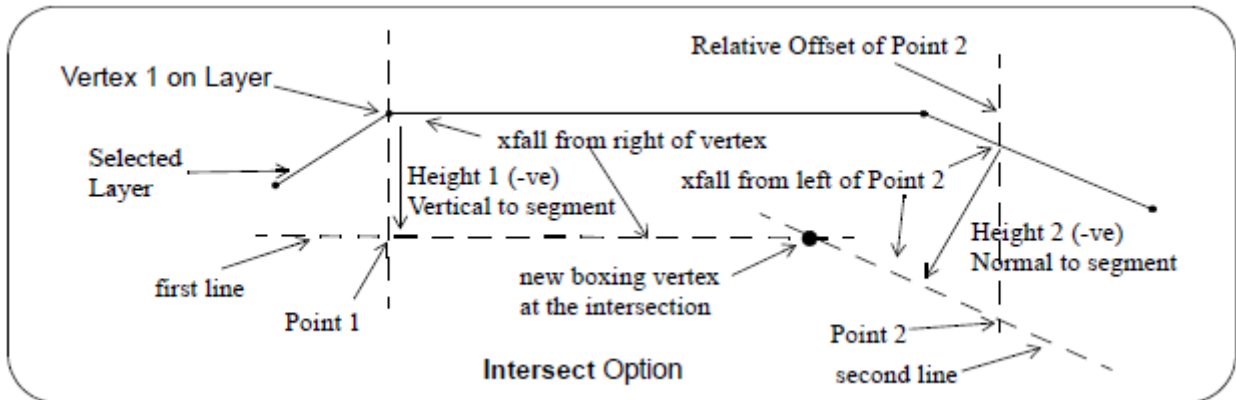
Please go to the next section [Boxing Intersect Advanced](#) or back to [Edit Boxing File](#).

Intersect diagrams for more methods of defining *Offsets*:



Boxing Intersect Advanced

The **Intersect Advanced** command is similar to the **Intersect** command where a vertex on the boxing section is the intersection of two lines. The major difference is that the distance of the lines from vertices etc can be measured NORMAL to a segment, not just a vertical distance (See [Boxing Intersect - Intersection of Two Lines](#)).



Selecting **Intersect (Adv)** brings up the **Boxing Intersect (Adv)** panel

Boxing Intersect (Adv)

Vertex 1

TypeVertex

LayerNone

Name

Height typeVertical

Height

Xfall fromLeft

Point 2

TypeVertex

LayerNone

Name

Offset

Height typeVertical

Height

Point 2 Xfall

LayerNone

Xfall from

Xfall

Intersect Type

Type

New vertex

Name

Active

OK

Apply

Finish

Help

The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Vertex 1	the definition of the point that the first line goes through. The point can be normal to a segment left or right of a vertex from a Layer.			
Layer - after Type		choice box		Design, Layer 1 ... Layer 8
	Layer to select the vertex from to define the offset of the point the first line goes through.			
Type		choice box		

Select Choice

Vertex on section

If Vertex on section:

- Name

name box

name of the vertex on Layer to use with Type, Xfall from, Height type and Height to define the offset and height for point that the first line goes through
- Height type

choice box

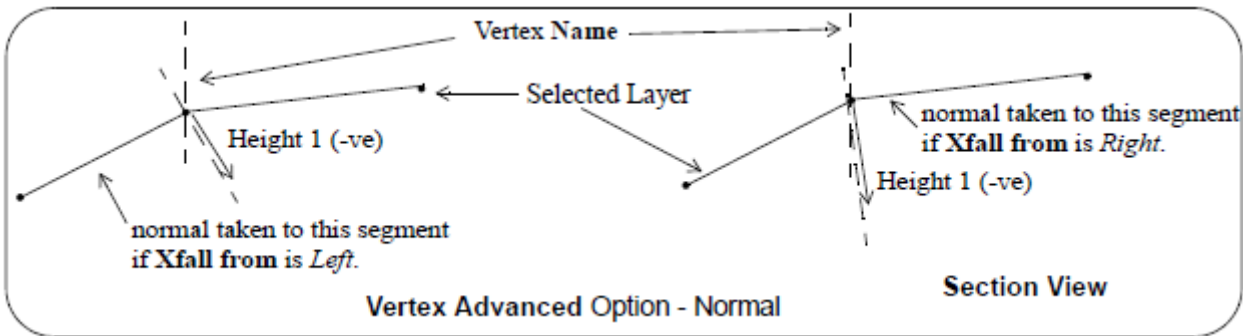
Vertical, Normal

When Height type is Normal, the distance is measured NORMAL to a segment.

If Xfall from is Left, the xfall to measure the distance NORMAL to is taken from the segment that is slightly to the left of Name.

If Xfall from is Right, the xfall to measure the distance NORMAL to is taken from the segment that is slightly to the right of Name.

When Height type is Vertical, the distance is measured in the vertical plane and Xfall from is not used. For example, if Height is -0.5, the vertex is dropped by 0.5 from Layer



- Height

real box

depending on Height type, Height is added to added vertically or normally to give the z-value of the point the first line goes through.
- Xfall from

choice box

Left, Right

if Left, the xfall for the line is taken from the segment that is a little left of the selected vertex.

If Right, the xfall for the line is taken from the segment that is a little right of the selected vertex

Point 2
the definition of the point that the second line goes through.

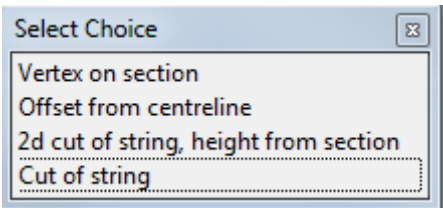
- Layer

choice box

Design, Layer 1 ... Layer 8

Layer to select in defining the offset of the point the second line goes through. The point can be normal to a segment left or right of the relative offset from Layer.
- Type

choice box



If Vertex on section:

- Name

name box

name of the vertex on the cross section to use with Offset to defined the Point 2 Offset. And used with Height type and Height to define the height of Point 2.

Offset real box 0

*this value is added to the offset of the vertex given in the **Name** field to define the Point 2 Offset. **Offset** can be positive or negative as long as the final Point 2 Offset is still **on** the section.*

If Offset from centreline:

Offset real box 0

*an actual offset from centreline (actually just the chainage of the section) which is used as the Point 2 Offset. **Offset** can be positive or negative as long as the Point 2 Offset is still on the section.*

If 2d cut of string, height from section:

String string select

*the selected string needs to cut the sections in plan wherever the boxing is being applied. The Point 2 Offset is the offset of the plan cut of the selected string with the section, plus the **Offset** value. **Offset** can be positive or negative as long as the final Point 2 Offset is still on the section.*

Offset real box 0

*this value is added to the offset of the plan cut of the section with the selected string to give the Point 2 Offset. **Offset** can be positive or negative but the final Point 2 Offset must still be on the section.*

If Cut of string:

String string select

*the selected string needs to cut the sections in plan wherever the boxing is being applied. The Point 2 Offset is the offset of the plan cut of the selected string with the section, plus the **Offset** value. **Offset** can be positive or negative but the final position must still be on the section.*

Offset real box 0

*this value is added to the offset of the plan cut of the section with the selected string to give the Point 2 Offset. **Offset** can be positive or negative but the final Point 2 Offset must still be on the section.*

Height type choice box Vertical, Normal

*When **Height type** is Normal, the distance is measured NORMAL to a segment.
If **Xfall from** is Left, the xfall to measure the distance NORMAL to is taken from the segment that is slightly to the left of the Point 2 offset.
If **Xfall from** is Right, the xfall to measure the distance NORMAL to is taken from the segment that is slightly to the right of the Point 2 offset.
When **Height type** is Vertical, the distance is measured in the vertical plane and **Xfall from** is not used. For example, if Height is -0.5, the vertex is dropped by 0.5 from **Layer***

Height real box 0

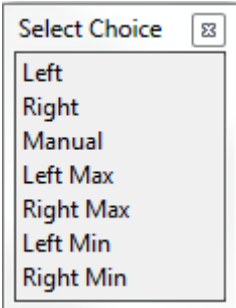
*depending on **Height type**, **Height** is added vertically or normally to give the z-value of the point the second line goes through.*

Point 2 Xfall
the definition of xfall of the second line. The xfall comes from the segment in the elected Layer slightly to the left or right of the Point 2 offset

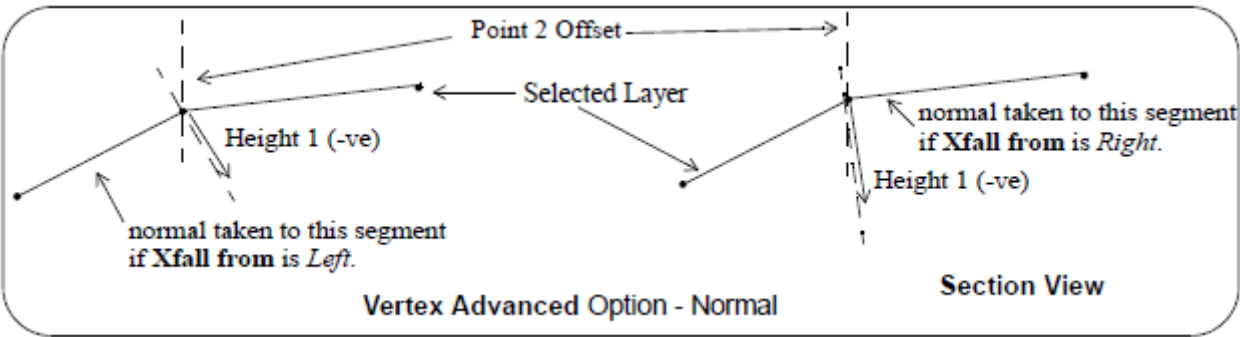
Layer choice box Design, Layer 1 ... Layer 8

Layer to select the xfall from for the second line.

Xfall from choice box



if Left, the xfall of the second line is taken from the segment that is a little to the left of Point 2 Offset.
If Right, the xfall of the second line is taken from the segment that is a little to the right of Point 2 Offset.



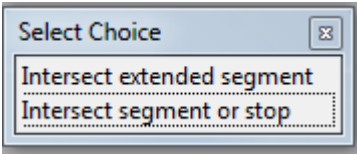
If Manual, the xfall is taken from the **Xfall** field.
If Left Max, the xfall on the left side of Point 2 will never exceed the value in the **Xfall** field. If the xfall is greater than the value in **Xfall** field then the xfall takes the value in the **Xfall** field.
If Right Max, the xfall on the right side of Point 2 will never exceed the value in the **Xfall** field. If the xfall is greater than the value in **Xfall** field then the xfall takes the value in the **Xfall** field.
If Left Min, the xfall on the left side of Point 2 will never be less than the value in the **Xfall** field. If the xfall is less than the value in **Xfall** field then the xfall takes the value in the **Xfall** field.
If Right Min, the xfall on the right side of Point 2 will never be less than the value in the **Xfall** field. If the xfall is less than the value in **Xfall** field then the xfall takes the value in the **Xfall** field.

For example, to force a crown in the subgrade no matter what the super elevation of the road is, you would use Left Min on the left hand side of the road and Right Max on the right side of the road.

Intersection Type

the definition of xfall of the second line. The xfall comes from the segment in the elected Layer slightly to the left or right of the Point 2 offset

Type choice box



if Intersect extended segment,
If Intersect segment stop,

New vertex

a new vertex is created at the intersection of the two lines

Name	name box
------	----------

the vertex created at the intersection of the two lines is given this name

Active ☒ tick box

*if **ticked**, use this Boxing Command.*

If not ticked, don't use this Boxing Command.

OK button

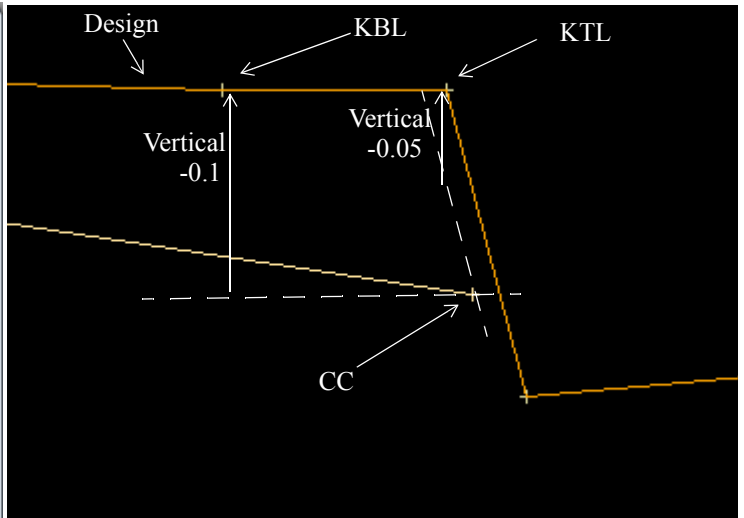
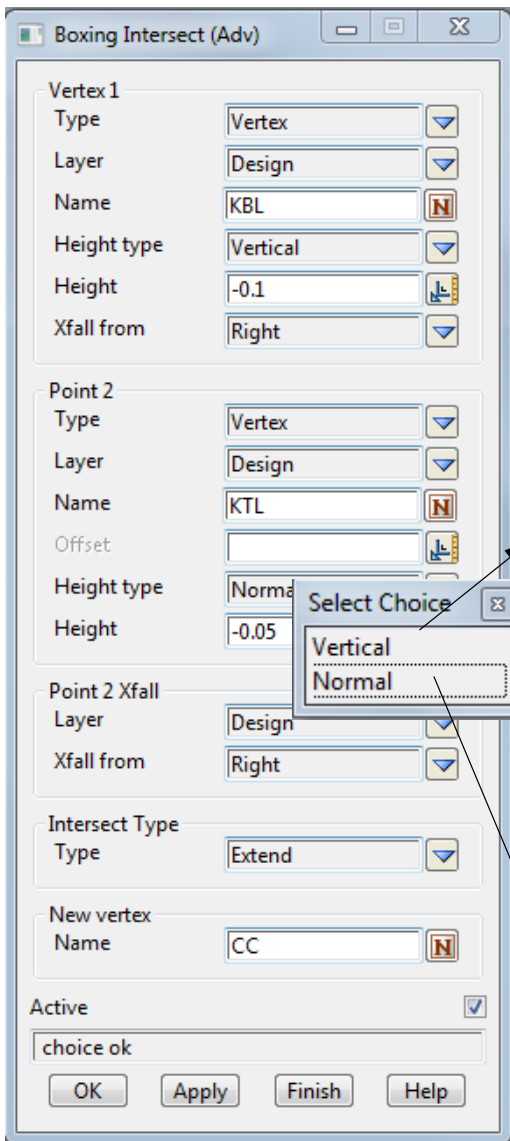
OK stores the values in the fields and removes the panel BUT no **recalc** is done.

Apply button

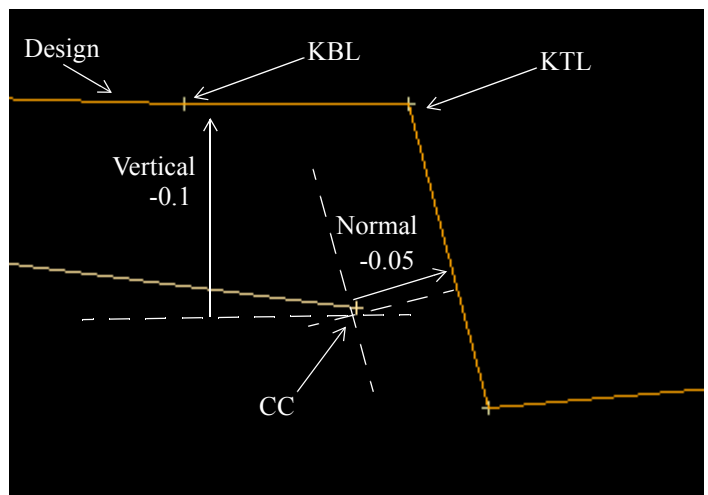
Apply stores the values and leaves the panel on the screen.

*If the **Boxing Definition** is being used in an **Apply Many MTF** and **Auto recalc** is ticked in the MTF, then whenever the **Apply** button is clicked, then a **recalc** of the associated **Apply Many** for the MTF is done.*

*If the **Boxing Definition** is being used in a **Boxing Many Function** then whenever the **Apply** button is clicked, a recalc of the **Boxing Many Function** is done.*



Intersect (Adv) - Point 2 Vertical to Design Layer



Intersect (Adv) - Point 2 Normal to Design Layer

For the typed format of the **intersect Advanced** command created by this panel, see [Text Format - Boxing Intersect](#).

For more information on how Boxing works in **12d Model**, please go to the section [What is Boxing ?](#).

Please go to the next section [Boxing Xfall Point](#) or back to [Edit Boxing File](#).

Intersect Adv diagrams for more methods of defining *Offsets*:

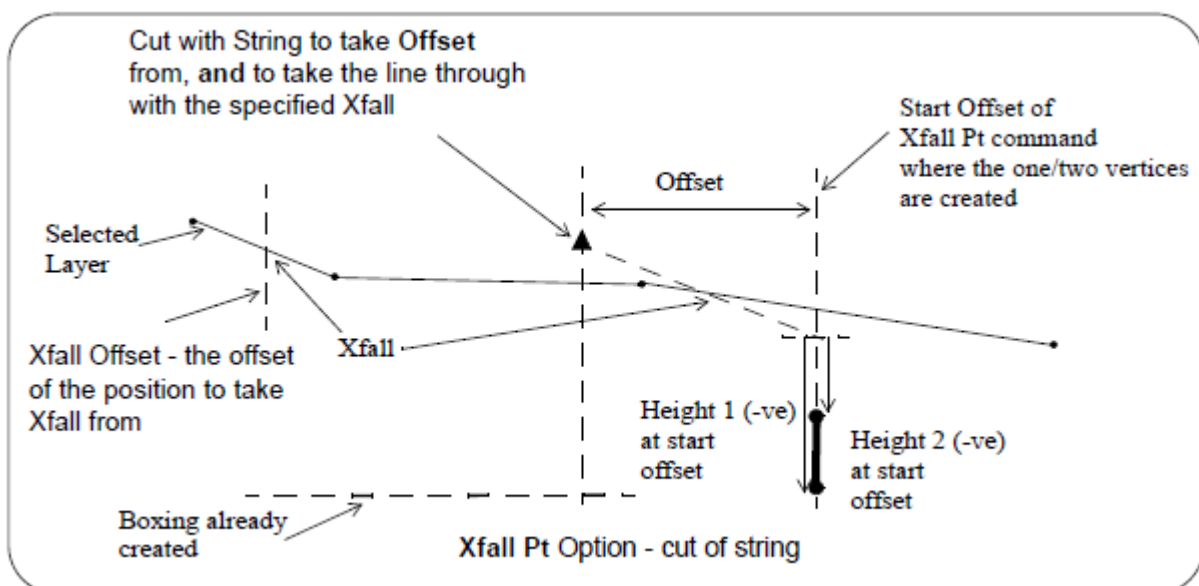
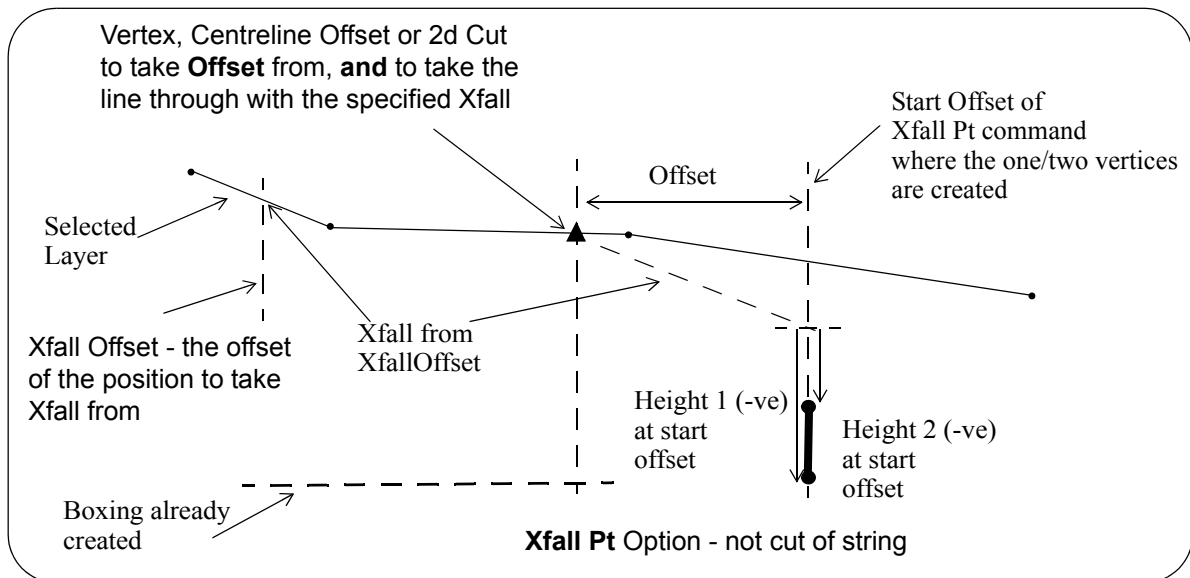
Boxing Xfall Point

The **Xfall Pt** command is similar to the **Vertex** command in that it inserts one or two new vertices at the given **Start Offset**.

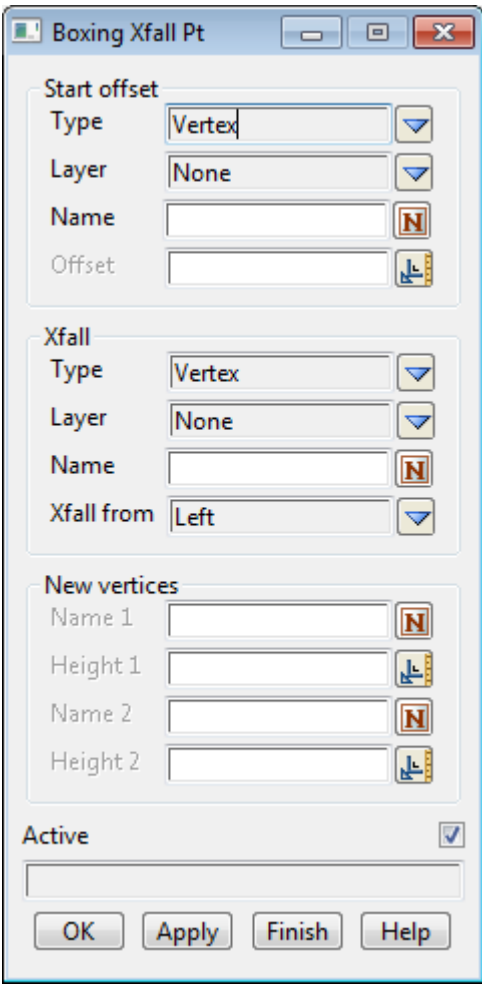
However, instead of adjusting the height from the z-value of the Layer, the **Xfall Pt** command extrapolates from the z-value of the selected Layer or 2d cut with a selected string (depending on Type) using the Xfall at the Xfall Offset given in the **Xfall Pt** command.

Like **Vertex**, **Xfall Pt** can be used to quickly create a vertical wall of two vertices.

Note - to allow the boxing sections and strings to triangulate, **12d Model** increases the offset of the second vertex by ten thousandth of a unit.

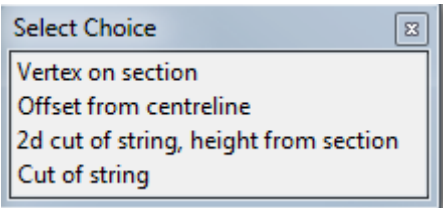


Selecting **Xfall pt** brings up the **Boxing Xfall Pt** panel



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Start offset				
<i>Start Offset defines the vertex, plan cut or cut string to define where the grade line start goes through, and then the Offset defines where the line is projected to and creates the one or two new vertices.</i>				
Layer - after Type		choice box		None, Design, Layer 1 ... Layer 8
<i>Layer to use with Type to select the point the line goes through, and for how far.</i>				
Type		choice box		



*If **Vertex on section**:*

Name name box

*name of the vertex on the given **Layer** that the line will go though. The line will have xfall given in the **Xfall** section. **Offset** is added to the offset of the vertex to defined the Start Offset, and the*

line is extended through the vertex to Start Offset.

Height 1/Height 2 are then used with the projected point to define the heights of the new boxing vertices.

Offset real box 0

this value is added to the offset of the vertex given in the **Name** field to define the Start Offset.

Offset can be positive or negative as long as the final Start Offset is still **on** the section.

Height 1/Height 2 real box 0

Height 1/Height 2 is added to the z-value of the line that is extended to Start Offset to give the z-values of the new boxing vertices.

If Offset from centreline:

Offset real box 0

an actual offset from centreline (actually just the chainage of the section) which is used as the Start Offset. **Offset** can be positive or negative as long as it is still on the section.

If Offset from centreline is used, the Xfall section is not used.

Height 1/Height 2 real box 0

Height 1/Height 2 is added to the z-value of the section at the Start Offset, to give the z-values of the new boxing vertices. For example, if Height is -0.3, the vertex is dropped by 0.3

If 2d Cut of string, height from section:

String string select

The Start Offset is the offset of the plan cut of the selected string with the section from **Layer**, plus the **Offset** value.

The **plan cut** on the section from **Layer** is used as the position to take a line through with xfall given at the Xfall Offset defined in the Xfall section. This goes through the plan cut on **Layer** and is extended through to the z-value at Start Offset.

Height 1/Height 2 are then added to the z-value at Start Offset to define the heights of the new boxing vertices.

The selected string needs to cut the sections from **Layer** in plan wherever the boxing is being applied.

Offset real box 0

offset to add to the offset of the plan cut of the section from **Layer** with the selected string to give the Start Offset. **Offset** can be positive or negative but the final Start Offset must still be on **Layer**.

Height 1/Height 2 real box 0

Height 1/Height 2 is used with the z-value of the extended line at the Start Offset to give the z-value of the new boxing vertices.

If Cut of string:

String string select

the Start Offset is the offset of the **plan** cut of the selected string with the section from **Layer**, plus the **Offset** value. **Offset** can be positive or negative but the final position must still be on the section.

The line goes through the **3d cut** with the xfall given at the Xfall Offset defined in the Xfall section. This line goes through the 3d cut point and is extended to Start Offset to give a z-value.

Height 1/Height 2 are then added to the projected point to define the heights of the new boxing vertices.

The selected string needs to cut the sections in plan wherever the boxing is being applied.

Offset real box 0

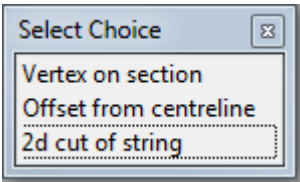
offset to add to the offset of the plan cut of the section with the selected string to give the Start Offset. **Offset** can be positive or negative but the final Start Offset must still be on the section.

Height 1/Height 2 real box 0

Height 1/Height 2 is used with the z-value of the extended line at the Start Offset to give the z-value of the new boxing vertices.

Xfall
the definition of the offset that Xfall is taken from.

Type choice box



For the documentation on the methods of defining the Xfall Offset, see [Defining Relative Offset for Boxing Commands](#).

The xfall is taken from the point on the section in **Layer** with offset Xfall Offset.

Name 1 name box

if non blank, a vertex is created on the boxing section at Start Offset with this name and the appropriate height.
If blank, no vertex is created.

Height 1 real box

Height 1 to used in the calculation height of the new boxing vertex

Name 2 name box

if non blank, a vertex is created on the boxing section at Start Offset with this name and the appropriate height.
If blank, no vertex is created.

Height 2 real box

Height 2 to used in the calculation height of the new boxing vertex

Note - to allow the boxing sections and strings to triangulate, if two vertices are created, **12d Model** actually increases the offset of the second vertex by ten thousandth of a unit.

Active tick box

if **ticked**, use this Boxing Command.
If **not ticked**, don't use this Boxing Command.

OK button

OK stores the values in the fields and removes the panel BUT no **recalc** is done.

Apply button

Apply stores the values and leaves the panel on the screen.
If the **Boxing Definition** is being used in an **Apply Many MTF** and **Auto recalc** is ticked in the MTF, then whenever the **Apply** button is clicked, then a **recalc** of the associated **Apply Many** for the MTF is done.
If the **Boxing Definition** is being used in a **Boxing Many Function** then whenever the **Apply** button is clicked, a **recalc** of the **Boxing Many Function** is done.

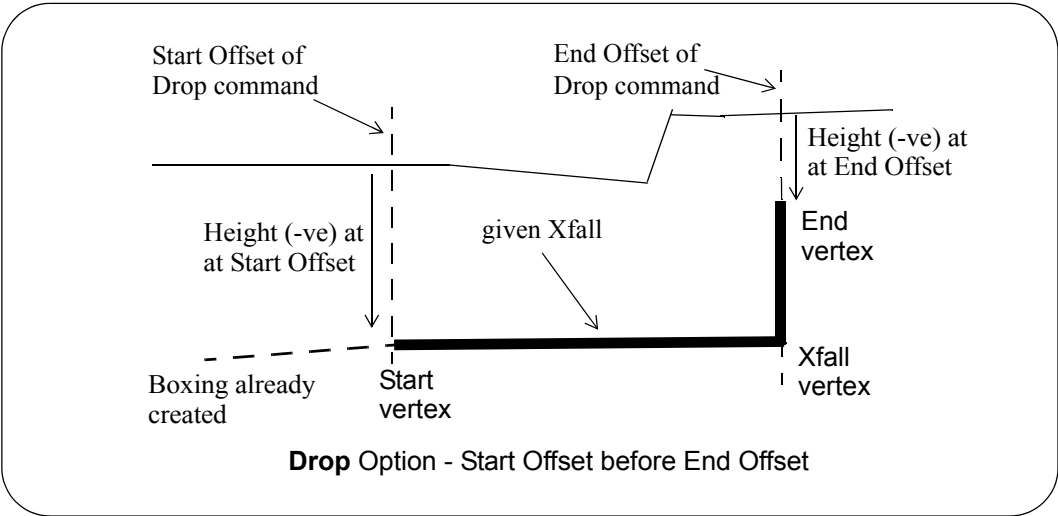
For the typed format of the **Xfall Point** command created by this panel, see [Text Format - Boxing Xfall Point](#).

For more information on how Boxing works in **12d Model**, please go to the section [What is Boxing ?](#).

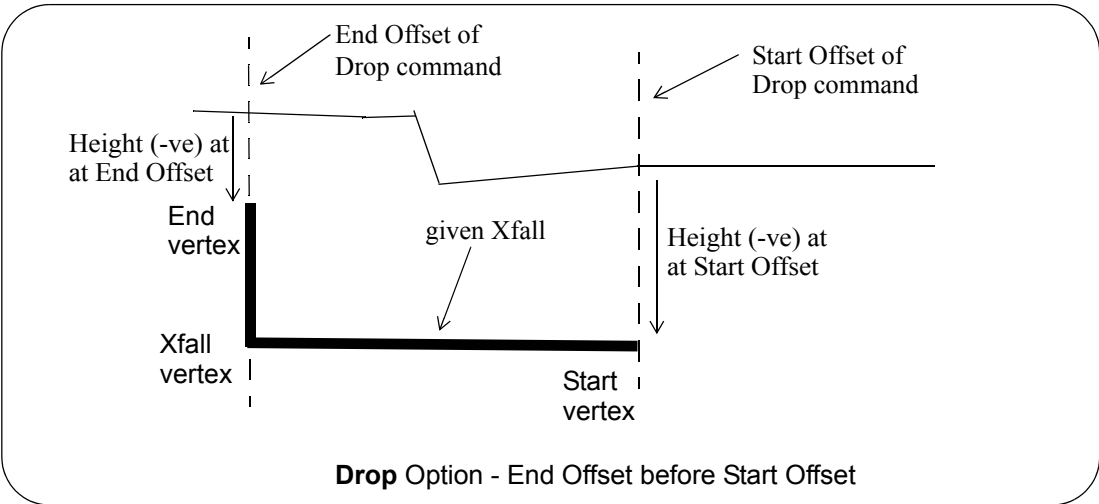
Please go to the next section [Boxing Drop](#) or back to [Edit Boxing File](#).

Boxing Drop

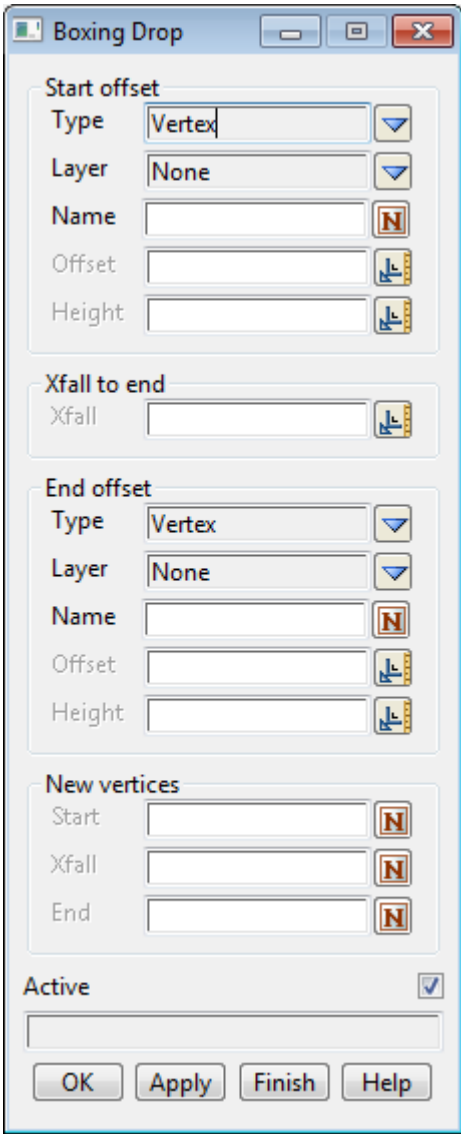
The **Drop** command is a quick way of creating three vertices, the first two on a line of given Xfall, and the third vertically above the second vertex.



If the **End Offset** is before the **Start Offset** then the **Drop** is done in reverse. That is, the line still goes through the Start vertex but it then goes to the **left**.

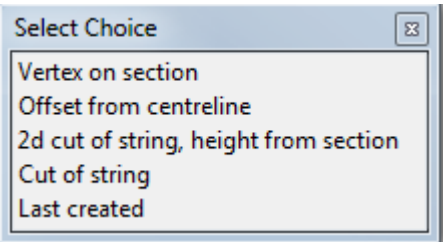


Selecting **Drop (kerb)** brings up the **Boxing Drop** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Start offset <i>the first vertex is created with offset Start Offset and z-value determined by Start Offset Type and Height.</i>			
Type	choice box		



For the documentation on the methods of defining the **Start Offset** except for **Last created**, see [Defining Relative Offset for Boxing Commands](#)

Height	real box	0
---------------	----------	---

If Start Offset Type is NOT: **Cut of string:**
the height of the first vertex is **Height** added to the z-values of the selected **Layer** at Start Offset.
For example, if Height is -0.3, the first vertex is 0.3 below the **Layer** at Start Offset.

If Start Offset Type is: **Cut of string:**
At the plan cut of the string and the **START OFFSET Layer, Z-Diff** (the difference of the z-values between the string and **START OFFSET Layer**) is calculated and **Height** added to it. This combined value is added to the z-value of **Layer** at the Start Offset to give the z-values of the first vertex

Xfall to end

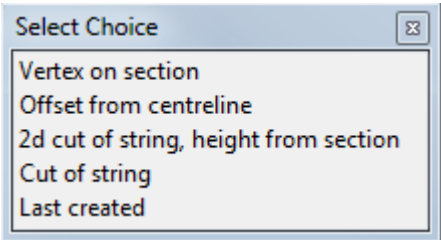
Xfall real box

a line is created going through the first vertex (the Start vertex) with the xfall given in the **Xfall** field.
Positive Xfall is up and negative Xfall is down.

End offset

the second vertex lies on the line through the first vertex when it is extrapolated to End Offset.
The third vertex is created with offset End Offset and z-value determined by End Offset Type and Height.

Type choice box



For the documentation on the methods of defining the **Start Offset** except for **Last created**, see [Defining Relative Offset for Boxing Commands](#)

Height real box 0

If End Offset Type is NOT: **Cut of string:**
the height of the last vertex is **Height** added to the z-value of the selected **Layer** at End Offset.
For example, if Height is -0.1, the third vertex is 0.1 below the **Layer** at End Offset.

If End Offset Type is: **Cut of string:**
At the plan cut of the string and the **END OFFSET Layer, Z-Diff** (the difference of the z-values between the string and **END OFFSET Layer**) is calculated and **Height** added to it. This combined value is added to the z-value of **Layer** at the End Offset to give the z-values of the third vertex

IMPORTANT NOTE: if the End Offset is **before** the Start Offset then the line from the first vertex is reversed and goes to the left rather than the right. The use of **Offset inside** the Start Offset and End Offset sections is also reversed so that a **positive offset goes to the left**.

New Vertices

Start name box

If **Start** is non blank then it is the name of the first vertex, otherwise a default name is used.

Xfall name box

If **Xfall** is non blank then it is the name of the second vertex, otherwise a default name is used.

End name box

If **End** is non blank then it is the name of the third vertex, otherwise a default name is used.

Active tick box

*if **ticked**, use this Boxing Command.*

*If **not ticked**, don't use this Boxing Command.*

OK button

OK stores the values in the fields and removes the panel BUT no **recalc** is done.

Apply button

Apply stores the values and leaves the panel on the screen.

*If the **Boxing Definition** is being used in an **Apply Many MTF** and **Auto recalc** is ticked in the MTF, then whenever the **Apply** button is clicked, then a **recalc** of the associated **Apply Many** for the MTF is done.*

*If the **Boxing Definition** is being used in a **Boxing Many Function** then whenever the **Apply** button is clicked, a **recalc** of the **Boxing Many Function** is done.*

For more information on how Boxing works in **12d Model**, please go to the section [What is Boxing ?](#).

Please go to the next section [Boxing Decision](#) or back to [Edit Boxing File](#).

Boxing Decision

A Test is specified and depending on the result, processing of the boxing commands is sent to a specified **Label** in the *Boxing Definition* where processing then continues from the next command after the Label, or no jump is made and processing continues to the next boxing command in the *Boxing Definition*.

Selecting **Decision** brings up the **Boxing Decision** panel

Boxing Decision

Type:

Test offset

Type:

Layer:

Name:


Offset:

Goto label:

When test is:

Active: ☒

Type	choice box
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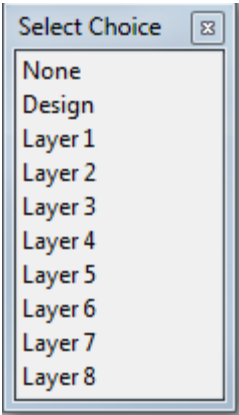


determines the type of test to be made.

*If **Type** is Test offset:*

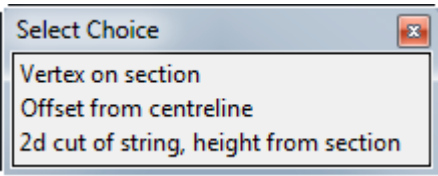
Test Offset

Layer - after Type choice box



Layer to use with **Type** to defined the test.

Type choice box



If **Vertex on section**:

the test is satisfied if the Test Offset defined by **Layer**, **Name** and **Offset** is still on **Layer**.

Name name box

name of the vertex on **Layer** to use with **Offset** to defined the Test Offset. If it is not a name of a vertex then the test is not satisfied.

Offset real box 0

this value is added to the offset of the vertex given in the **Name** field to define the Test Offset. **Offset** can be positive or negative.

If **Offset from centreline**:

the test is satisfied if the Offset is on **Layer**.

Offset real box 0

an actual offset from centreline (actually just the chainage on **Layer**) which is used as the Test Offset. **Offset** can be positive or negative.

If **2d Cut of string, height from section**:

the test is satisfied if the selected string cuts **Layer** in plan and the Test Offset given by the plan cut plus **Offset** is still on **Layer**.

String string select

the selected string needs to cut the sections of **Layer** in plan wherever the boxing decision is being applied.
The Test Offset is the offset of the plan cut of the selected string with **Layer**, plus the **Offset** value.

Offset real box 0

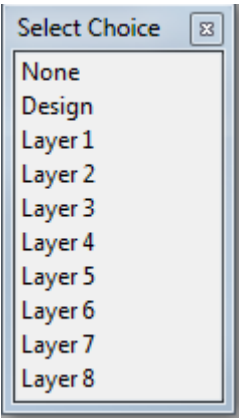
offset to add to the offset of the plan cut of the section from **Layer** with the selected string to give the Test Offset. **Offset** can be positive or negative but the final Test Offset must still be on **Layer**.

End of definition for **Type** equal to Test offset.

If **Type** is Above Tin or Below Tin:

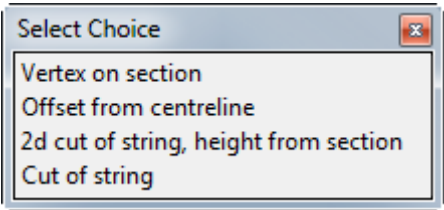
Above/Below Tin decision

Layer - Below Type choice box



Layer to use with **Type** to defined the height for the test.

Type choice box



If **Vertex on section**:

the test is satisfied if the **height** on the section at Test Offset defined by **Layer**, **Name** and **Offset** is **ABOVE/BELOW** the sum of the value given in the field **Tin height offset** and the height of the tin given in the field **Tin** at Test Offset.

Name name box

name of the vertex on **Layer** to use with **Offset** to defined the Test Offset. If it is not a name of a vertex then the test is not satisfied.

Offset real box 0

this value is added to the offset of the vertex given in the **Name** field to define the Test Offset. **Offset** can be positive or negative.

If **Offset from centreline**:

the test is satisfied if the height of the section at Offset is **ABOVE/BELOW** the sum of the value given in the field **Tin height offset** and the height of the tin given in the field **Tin** at Test Offset.

Offset real box 0

an actual offset from centreline (actually just the chainage on **Layer**) which is used as the Test Offset. **Offset** can be positive or negative.

If **2d Cut of string, height from section**:

the test is satisfied if the selected string cuts **Layer** in plan and the **height** of the section at Test Offset given by the plan cut plus **Offset** is **ABOVE/BELOW** the sum of the value given in the field **Tin height offset** and the height of the tin given in the field **Tin** at Test Offset.

String string select

the selected string needs to cut the sections of **Layer** in plan wherever the boxing decision is being applied.

The Test Offset is the offset of the plan cut of the selected string with **Layer**, plus the **Offset** value.

Offset real box 0

*offset to add to the offset of the plan cut of the section from **Layer** with the selected string to give the Test Offset. **Offset** can be positive or negative but the final Test Offset must still be on **Layer**.*

If Cut of string:

the selected string can not have only null z-values.

*The test is satisfied if the selected string cuts **Layer** in plan and the **height** on the cut string at Test Offset given by the plan cut plus **Offset** is **ABOVE/BELOW** the sum of the value given in the field **Tin height offset** and the height of the tin given in the field **Tin** at Test Offset.*

String string select

*the selected string needs to cut the sections of **Layer** in plan wherever the boxing decision is being applied.*

*The Test Offset is the offset of the plan cut of the selected string with **Layer**, plus the **Offset** value.*

Offset real box 0

*offset to add to the offset of the plan cut of the section from **Layer** with the selected string to give the Test Offset. **Offset** can be positive or negative but the final Test Offset must still be on **Layer**.*

*End of definition for **Type** equal to **Above Tin** or **Below Tin**.*

Goto label text box

the name of the Label in the Boxing Definition to pass control to.

When test is choice box True, False

*if **True**, then the Goto is done if the test **is** satisfied.*

*If **False**, then the Goto is done test **is not** satisfied.*

If the Goto is not done, then control passes to the next boxing command in the Boxing Definition.

Active tick box

*if **ticked**, use this Boxing Command.*

*If **not ticked**, don't use this Boxing Command.*

OK button

***OK** stores the values in the fields and removes the panel BUT no **recalc** is done.*

Apply button

***Apply** stores the values and leaves the panel on the screen.*

*If the **Boxing Definition** is being used in an **Apply Many MTF** and **Auto recalc** is ticked in the MTF, then whenever the **Apply** button is clicked, then a **recalc** of the associated **Apply Many** for the MTF is done.*

*If the **Boxing Definition** is being used in a **Boxing Many Function** then whenever the **Apply** button is clicked, a **recalc** of the **Boxing Many Function** is done.*

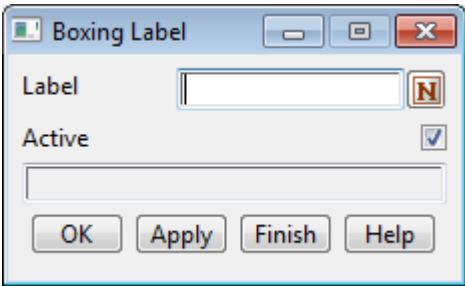
For more information on how Boxing works in **12d Model**, please go to the section [What is Boxing ?](#).

Please go to the next section [Boxing Label](#) or back to [Edit Boxing File](#).



Boxing Label

Selecting **Label** brings up the **Boxing Label** panel which is used to define a label for this line in the *Boxing Definition*, and control can be passed to via a **Goto** or a **Decision** boxing command.



The fields and buttons used in this panel have the following functions.

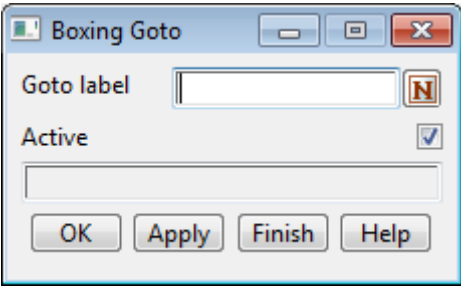
Field Description	Type	Default	Pop-Up
Goto Label	input		
<i>name of the label for this line in the Boxing Definition.</i>			
Active	tick box		
<i>if ticked, use this Boxing Command.</i>			
<i>If not ticked, don't use this Boxing Command.</i>			
OK	button		
<i>OK stores the values in the fields and removes the panel BUT no recalc is done.</i>			
Apply	button		
<i>Apply stores the values and leaves the panel on the screen.</i>			
<i>If the Boxing Definition is being used in an Apply Many MTF and Auto recalc is ticked in the MTF, then whenever the Apply button is clicked, then a recalc of the associated Apply Many for the MTF is done.</i>			
<i>If the Boxing Definition is being used in a Boxing Many Function then whenever the Apply button is clicked, a recalc of the Boxing Many Function is done.</i>			

For more information on how Boxing works in **12d Model**, please go to the section [What is Boxing ?](#).

Please go to the next section [Boxing Goto](#) or back to [Edit Boxing File](#).

Boxing Goto

Selecting **Goto** brings up the **Boxing Goto** panel which is used to transfer control to the line in the *Boxing Definition* with the **Label** given in the **Goto label** field of the panel.



The fields and buttons used in this panel have the following functions.

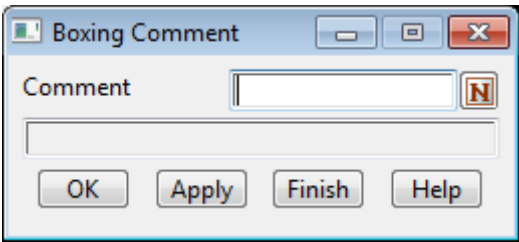
Field Description	Type	Default	Pop-Up
Goto label	input		
<i>name of the Label in the Boxing Definition to transfer control to.</i>			
Active	tick box		
<i>if ticked, use this Boxing Command.</i>			
<i>If not ticked, don't use this Boxing Command.</i>			
OK	button		
<i>OK stores the values in the fields and removes the panel BUT no recalc is done.</i>			
Apply	button		
<i>Apply stores the values and leaves the panel on the screen.</i>			
<i>If the Boxing Definition is being used in an Apply Many MTF and Auto recalc is ticked in the MTF, then whenever the Apply button is clicked, then a recalc of the associated Apply Many for the MTF is done.</i>			
<i>If the Boxing Definition is being used in a Boxing Many Function then whenever the Apply button is clicked, a recalc of the Boxing Many Function is done.</i>			

For more information on how Boxing works in **12d Model**, please go to the section [What is Boxing ?](#).

Please go to the next section [Boxing Comment](#) or back to [Edit Boxing File](#).

Boxing Comment

Selecting **Comment** brings up the **Boxing Comment** panel and the panel is used to insert a comment as a line of the *Boxing Definition*. Comments are not processed when running the boxing commands.



The fields and buttons used in this panel have the following functions.

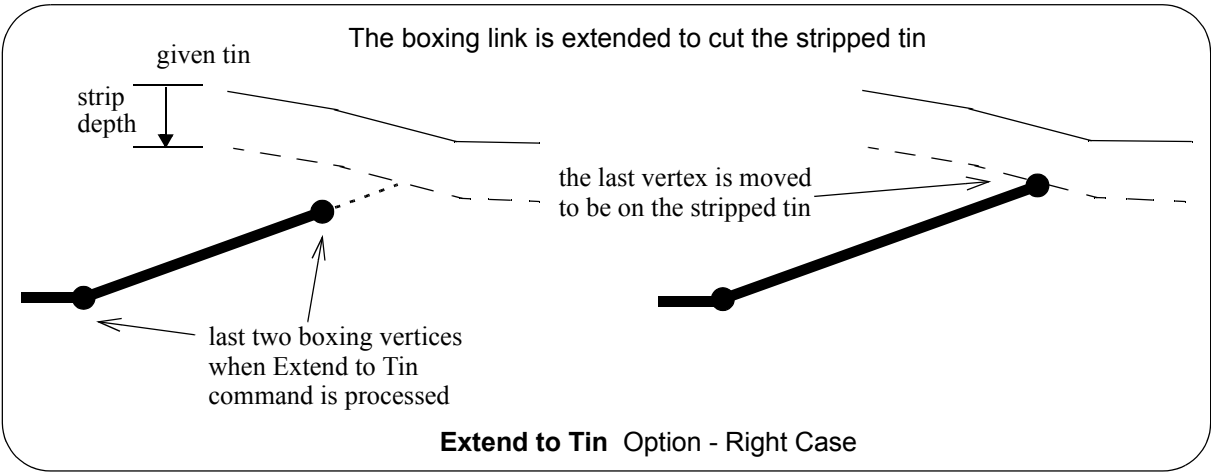
Field Description	Type	Default	Pop-Up
Comment	input		
<i>user comment - for information purposes only</i>			
OK	button		
<i>OK stores the values in the fields and removes the panel BUT no recalc is done.</i>			
Apply	button		
<i>Apply stores the values and leaves the panel on the screen.</i>			
<i>If the Boxing Definition is being used in an Apply Many MTF and Auto recalc is ticked in the MTF, then whenever the Apply button is clicked, then a recalc of the associated Apply Many for the MTF is done.</i>			
<i>If the Boxing Definition is being used in a Boxing Many Function then whenever the Apply button is clicked, a recalc of the Boxing Many Function is done.</i>			

For more information on how Boxing works in **12d Model**, please go to the section [What is Boxing ?](#).

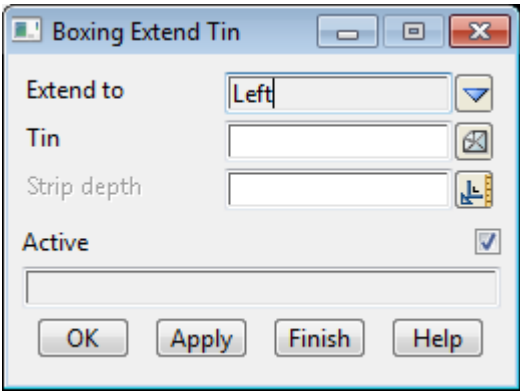
Please go to the next section [Boxing Extend Tin](#) or back to [Edit Boxing File](#).

Boxing Extend Tin

The *Extend to Tin* option is used to extend the link containing the last two vertices (or the first two vertices) already created in the boxing layer until it hits the selected **Stripped Tin**.



Selecting **Extend tin** brings up the **Boxing Extend Tin** panel.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Default	Pop-Up
Extend to		choice box		Left, Right
<p>if Right, then the link through the last two boxing vertices is extended until intersects the stripped tin. The last vertex is then moved to the intersection point. Other boxing commands can then follow.</p> <p>If Left, then the link through the first two boxing vertices is extended until intersects the stripped tin. The first vertex is then moved to the intersection point. Note that this is moving the first vertex of the boxing defined so far. The "Copy from start of section" with the Left Side Interface will add vertices before this vertex.</p> <p>Note - there must be at least two vertices in the boxing before this command can be used.</p> <p>If the extend fails, then no vertex is moved and an error message is written to the output window and the boxing processing terminated at that chainage.</p>				
Tin		tin box		available tins
<p>the tin, dropped by the Strip depth, to batter to.</p>				

Strip depth input

distance below the tin to stop at.

Active tick box

*if **ticked**, use this Boxing Command.*

*If **not ticked**, don't use this Boxing Command.*

OK button

OK stores the values in the fields and removes the panel BUT no **recalc** is done.

Apply button

Apply stores the values and leaves the panel on the screen.

*If the **Boxing Definition** is being used in an **Apply Many MTF** and **Auto recalc** is ticked in the MTF, then whenever the **Apply** button is clicked, then a **recalc** of the associated **Apply Many** for the MTF is done.*

*If the **Boxing Definition** is being used in a **Boxing Many Function** then whenever the **Apply** button is clicked, a **recalc** of the **Boxing Many Function** is done.*

For more information on how Boxing works in **12d Model**, please go to the section [What is Boxing ?](#).

Please go to the next section [Boxing End](#) or back to [Edit Boxing File](#).

Boxing End

Most Boxing commands go from the **Start Offset** defined with the command, to the *Start Offset* of the **next** Boxing command.

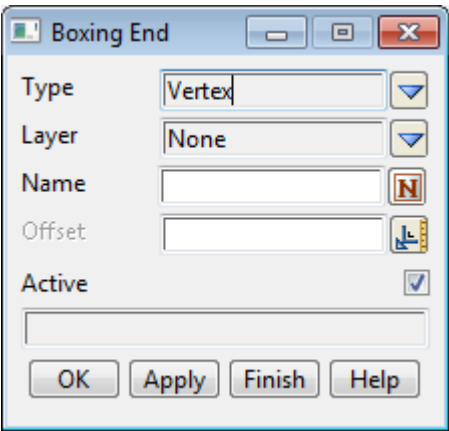
However sometimes a Boxing command needs to be stopped before the **Start Offset** of the next Boxing command.

The **End** command can be used to provide a "Start Offset" to act as the finishing position for the previous boxing command. So the **End** command simply terminates the previous Boxing command.

Apart from supplying the End Offset for the previous command, End is a "no operation" command.

Other Boxing commands can then follow the **End** command.

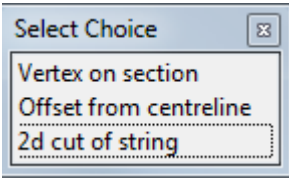
Selecting **End** brings up the **Boxing End** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
<i>the Relative Offset defined becomes the End Offset for the previous command.</i>			

Type	choice box
------	------------



For the documentation on the methods of defining the **Relative Offset** see [Defining Relative Offset for Boxing Commands](#)

OK	button
----	--------

OK stores the values in the fields and removes the panel BUT no **recalc** is done.

Apply	button
-------	--------

Apply stores the values and leaves the panel on the screen.

If the **Boxing Definition** is being used in an **Apply Many MTF** and **Auto recalc** is ticked in the MTF, then whenever the **Apply** button is clicked, then a **recalc** of the associated **Apply Many** for the MTF is done.

*If the **Boxing Definition** is being used in a **Boxing Many Function** then whenever the **Apply** button is clicked, a **recalc** of the **Boxing Many Function** is done.*

For the typed format of the **End** command created by this panel, see [Text Format - Boxing End](#).

For more information on how Boxing works in **12d Model**, please go to the section [MTF Boxing](#).

Boxing Left Side Interface Xfall from Point

The **Xfall from Point** command creates a line from the left hand end of the boxing already defined and then batters to the **left** at a specified xfall until it intersects the design surface. The xfall of the batter is defined as

- (a) the xfall on the section at a given section offset
- (b) the xfall on the section at a *relative vertex offset*
- (c) the xfall on the section at a *relative string offset*

plus in each case:

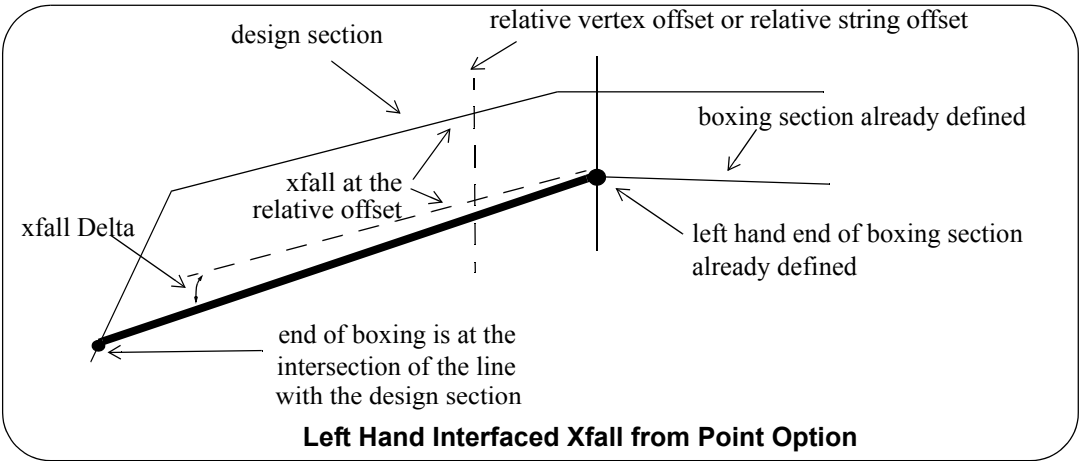
an additional xfall value **Delta**.

If the design surface is not intersected by the batter, then no extra line is created.

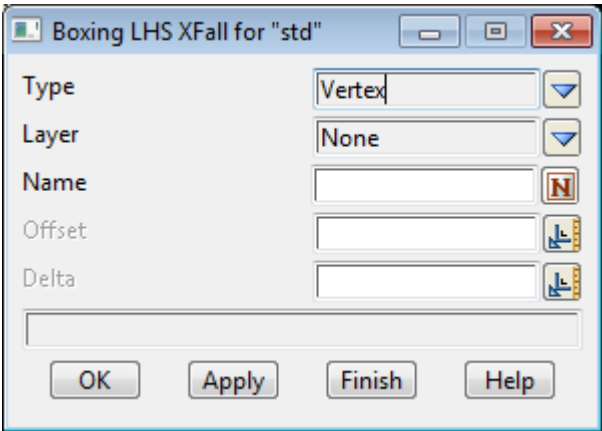
Xfall is percent cross-fall and a positive xfall is up and negative xfall is down.

Note that the **Xfall from Point** creates a line at the **beginning** of the boxing created by running all the boxing commands in the boxing grid. So it is applied **after** all the other boxing commands have been run.

If **Copy from start of section** is ticked, then the part of the design section from the start of the design section to the offset that is the start of the boxing section, is copied and made the beginning of the boxing section.

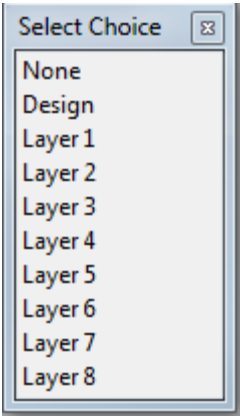


On the **Boxing Rules** panel, selecting the **Set Point** button when the *Left Side Interface Type* is **Xfall from Point** brings up the **Boxing LHS Xfall** panel



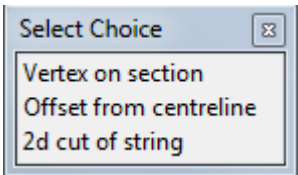
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Layer - after Type	choice box		



Layer of sections to use with **Type**.

Type	choice box
------	------------



If *Vertex on section*:

Name	name box
<i>name of the vertex on Layer to use with Offset to define the section offset to take the Xfall value from</i>	
Offset	real box
<i>this value is added to the offset of the vertex given in the Name field to define the section offset to take the Xfall value from. Offset can be positive or negative as long as the final section offset is still on the section from Layer.</i>	

If *Offset from centreline*:

Offset	real box
<i>an actual offset from centreline (actually just the chainage of the section) which is used as the section from Layer offset to take the Xfall value from. Offset can be positive or negative as long as it is still on the section. from Layer.</i>	

If *2d cut of string*:

String	string select
<i>the selected string needs to cut the sections from Layer in plan wherever the boxing is being applied.</i>	
<i>The section offset to take the Xfall value from is the offset of the plan cut of the selected string with the section from Layer, plus the Offset value. Offset can be positive or negative but the final section offset must still be on the section from Layer.</i>	
Offset	real box
<i>offset to add to the offset of the plan cut of the section from Layer with the selected string to give the section offset to take the Xfall value from. Offset can be positive or negative but the final section offset must still be on the section from Layer.</i>	

Delta	input	0
-------	-------	---

*add the value **Delta** to the *xfall* taken from the section from **Layer**.*

OK/Apply button

OK *stores the values in the fields and removes the panel.*

Apply *stores the values and leaves the panel on the screen.*

For the typed format of the **left_xfall** command created by this panel, see [Text Format - Boxing Left_Xfall](#), for **left_slope** see [Text Format - Boxing Left_slope](#) and **left_copy** see [Text Format - Boxing Left_copy](#).

For more information on how Boxing works in **12d Model**, please go to the section [MTF Boxing](#).

Boxing Right Side Interface Xfall from Point

The **Xfall from Point** command creates a line from the right hand end of the boxing already defined and then batters to the **right** at a specified xfall until it intersects the design surface. The xfall of the batter is defined as

- (a) the xfall on the section at a given section offset
- (b) the xfall on the section at a *relative vertex offset*
- (c) the xfall on the section at a *relative string offset*

plus in each case:

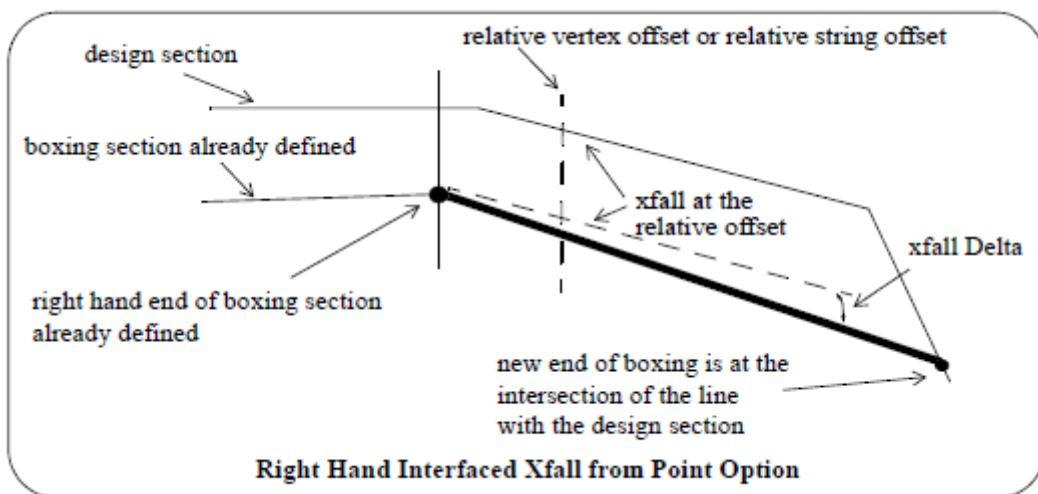
an additional xfall value **Delta**.

If the design surface is not intersected by the batter, then no extra line is created.

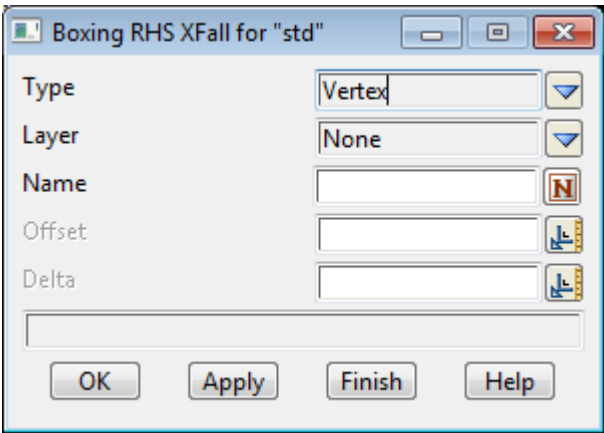
xfall is percent cross-fall and a positive xfall is up and negative xfall is down.

Note that the **Xfall from Point** creates a line at the **end** of the boxing created by running all the boxing commands in the boxing grid. So it is applied **after** all the other boxing commands have been run.

If **Copy to end of section** is ticked, then the part of the design section from the offset of the last boxing vertex to the last vertex on the design section, is copied and made the end of the boxing section.

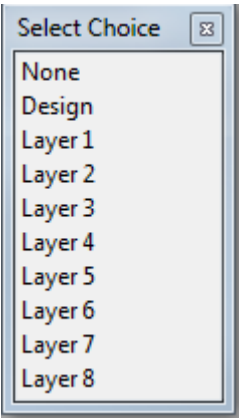


On the **Boxing Rules** panel, selecting the **Set Point** button when the *Right Side Interface Type* is **Xfall from Point** brings up the **Boxing RHS Xfall** panel



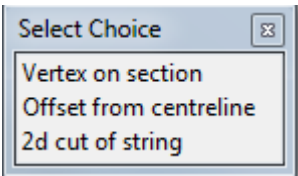
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Layer - after Type	choice box		



*Layer of sections to use with **Type**.*

Type	choice box
-------------	------------



*If **Vertex on section**:*

Name	name box
<i>name of the vertex on the section from Layer to use with Offset to define the section offset to take the Xfall value from</i>	

Offset	real box
<i>this value is added to the offset of the vertex given in the Name field to define the section from Layer offset to take the Xfall value from. Offset can be positive or negative as long as the final section offset is still on the section from Layer.</i>	

*If **Offset from centreline**:*

Offset	real box
<i>an actual offset from centreline (actually just the chainage of the section) which is used as the section from Layer offset to take the Xfall value from. Offset can be positive or negative as long</i>	

as it is still on the section from **Layer**.

If 2d cut of string:

String string select

*the selected string needs to cut the sections from **Layer** in plan wherever the boxing is being applied.*

*The section offset to take the Xfall value from is the offset of the plan cut of the selected string with the section from **Layer**, plus the **Offset** value. **Offset** can be positive or negative but the final section offset must still be on the section from **Layer**.*

Offset real box

*offset to add to the offset of the plan cut of the section from **Layer** with the selected string to give the section offset to take the Xfall value from. **Offset** can be positive or negative but the final section offset must still be on the section from **Layer**.*

Delta input 0

*add the value **Delta** to the xfall taken from the section from **Layer**.*

OK/Apply button

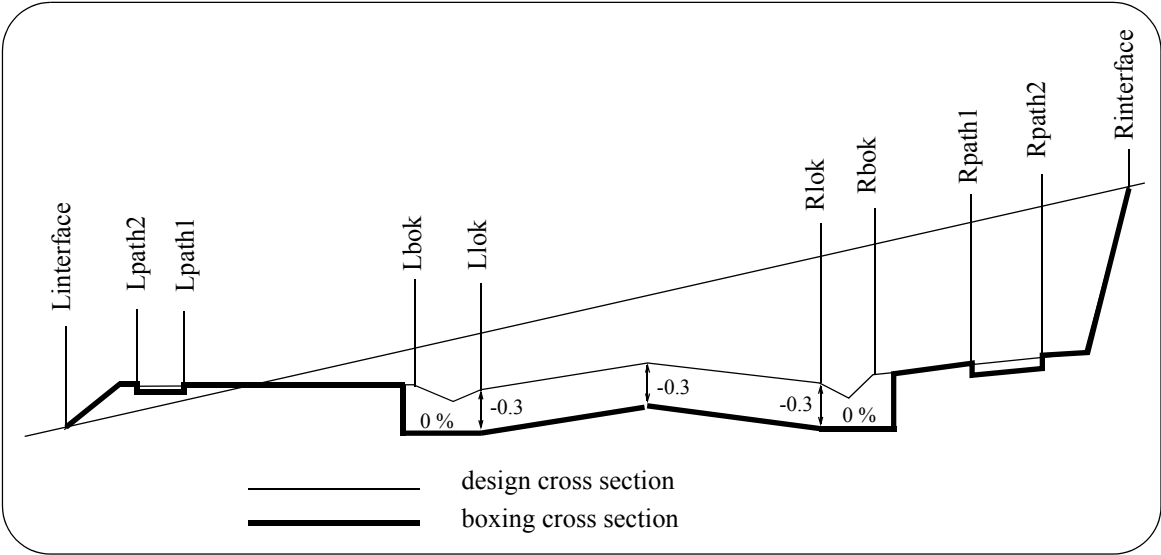
OK stores the values in the fields and removes the panel.

Apply stores the values and leaves the panel on the screen.

For the typed format of the **right_xfall** command created by this panel, see [Text Format - Boxing Right_Xfall](#), for **right_slope** see [Text Format - Boxing Right_slope](#) and **right_copy** see [Text Format - Boxing Right_copy](#).

For more information on how Boxing works in **12d Model**, please go to the section [MTF Boxing](#).

Boxing Definitions Examples



	Type	Point	Point offset	Details	Value	Active
1	Copy	Point Linterface	0	Height:	0.000	yes
2	Copy	Point Lpath2	0	Height:	-0.075	yes
3	Copy	Point Lpath1	0	Height:	0.000	yes
4	Xfall	Point Lbok	-0.15	Control name: Llok Control offset: 0.000 Control height: -0.300 Xfall: 0.000		yes
5	Copy	Point Llok	0	Height:	-0.300	yes
6	Xfall	Point Rlok	0	Control name: Rlok Control offset: 0.000 Control height: -0.300 Xfall: 0.000		yes
7	Copy	Point Rbok	0.15	Height:	0.000	yes
8	Copy	Point Rpath1	0	Height:	-0.095	yes
9	Copy	Point Rpath2	0	Height:	0.000	yes
10	End	Point Rinterface	0			yes

- Line 1
copy from “Linterface” to “Lpath2”
- Line 2
copy & drop by 0.075 from “Lpath 2” to “Lpath 1”
- Line 3
copy from “Lpath1” to 0.15 before “Lbok”
- Line 4
go from 0.15 before “Lbok” to “Llok” at depth 0.3 below “Llok”, with cross fall 0
- Line 5
copy and drop by 0.3 from “Llok” to “Rlok”
- Line 6
go from “Rlok” to 0.15 past “Rbok” at depth 0.3 below “Rlok”, with cross fall 0
- Line 7
copy from 0.15 past “Rbok” to “Rpath1”
- Line 8
copy & drop by 0.095 from “Rpath1” to “Rpath2”
- Line 9
copy from “Rpath2” to “Rinterface”
- Line 10
Just giving the End Offset for the Copy on Line 9

boxing “1” {

```

“Linterface”,      copy                                     // line 1
“Lpath2”,          copy,      -0.075                       // line 2
“Lpath1”,          copy                                     // line 3
“Lbok” - 0.15,     xfall,      “Llok”,      -0.3,      0    // line 4
“Llok”,           copy,      -0.3                       // line 5
“Rlok”,           xfall,      “Rlok”,      -0.3,      0    // line 6
“Rbok” + 0.15,     copy                                     // line 7
“Rpath1”,         copy      -0.095                       // line 8
“Rpath2”,         copy                                     // line 9
“Rinterface”,     end                                     // line 10
}

```

Description

- Line 1 copy from “Linterface” to “Lpath2”
- Line 2 copy and drop by 0.075 from “Lpath 2” to “Lpath 1”
- Line 3 copy from “Lpath1” to 0.15 before “Lbok”
- Line 4 go from 0.15 before “Lbok” to “Llok” at depth 0.3 below “Llok”, with cross fall 0
- Line 5 copy and drop by 0.3 from “Llok” to “Rlok”
- Line 6 go from “Rlok” to 0.15 past “Rbok” at depth 0.3 below “Rlok”, with cross fall 0
- Line 7 copy from 0.15 past “Rbok” to “Rpath1”
- Line 8 copy and drop by 0.095 from “Rpath1” to “Rpath2”
- Line 9 copy from “Rpath2” to “Rinterface”
- Line 10 just giving the End Offset for the Copy in Line 9

```
boxing "left narrow" {           // boxing defined from just before lkerb to m001
    "lkerb" - 0.7 ,              copy
    "m001" - 1.0,                copy ,    -0.6
    "m001",                      end
}

boxing "left" {                 // boxing defined from the left start of the section to m001 (the centreline say)
    "lkerb",    copy,            -0.6
    "m001",     end
    left_slope  5.0
    left_copy   1
}

boxing "right" {                // boxing defined from m001 to the far right of the section
    "m001",     copy,            0.6
    "rkerb",    end
    right_slope  5.0
    right_copy  1
}

boxing "full" {                 // a full width boxing - defines the entire boxing going from left to right
    "lkerb",    copy,            -0.6
    "rkerb",    end
    left_slope  5.0
    left_copy   1
    right_slope -5.0
    right_copy  1
}
```

For more information on how Boxing works in **12d Model**, please go to the section [MTF Boxing](#) or to the section [Applying Boxing](#).

Full Definition of Template Decisions

12d Model supports templates with an unlimited number of fixed links which are in the **Fixed** table of the **Temple** definition and they are processed first.

At the end of the fixed links, **12d Model** checks to see if a **Decisions** table exists.

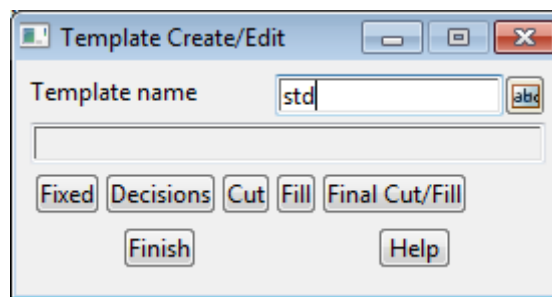
If a **Decisions** table exists, then it is used and the Decision commands processed.

If a **Continue Cut/Fill** command is reached in the decision command processing, then this stops the Decision command processing, and the processing moves onto the **Cut**, **Fill** and **Final Cut/Fill** tables.

If no **Continue Cut/Fill** command is reached in the decisions, then the processing stops after the decision commands are exhausted and the **Cut**, **Fill** and **Final Cut/Fill** tables **ARE NOT USED**.

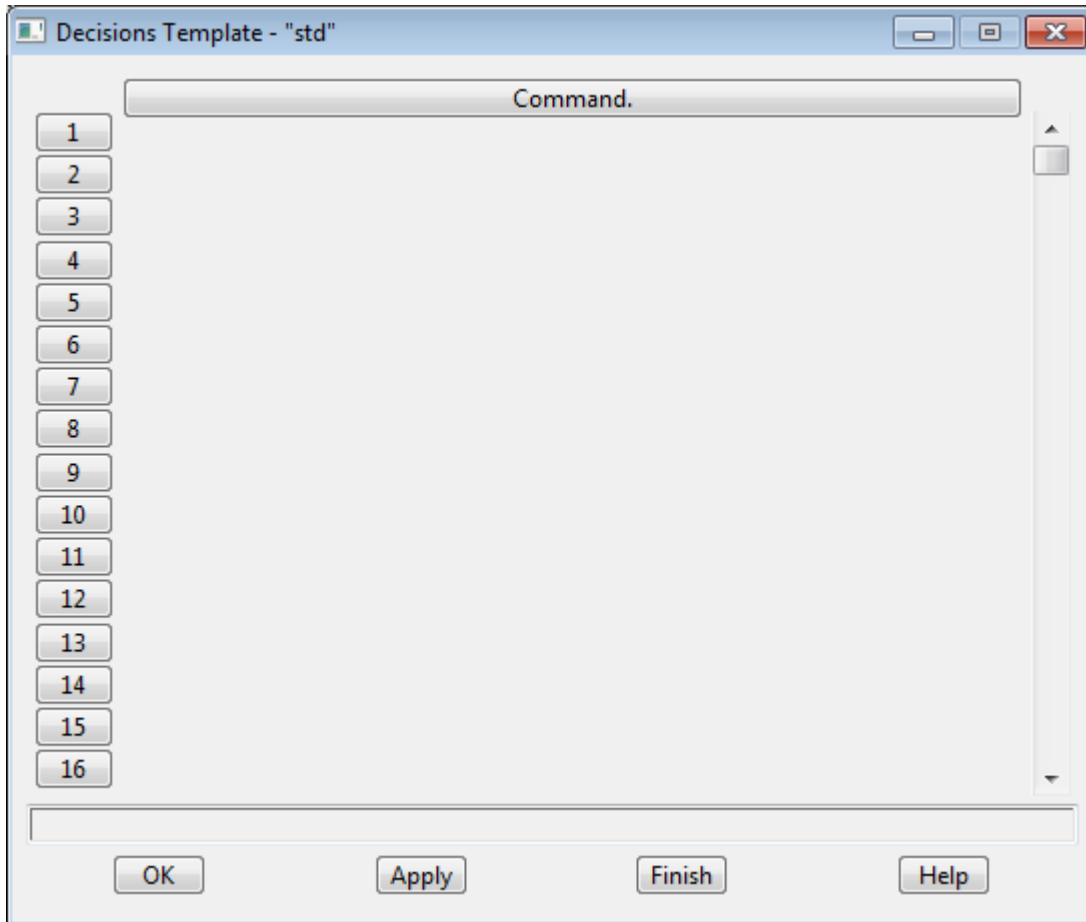
If no **Decisions** table exists, then the **Cut**, **Fill** and **Final Cut/Fill** tables are used after the **Fixed** table.

Templates are created and edited using the **Templates=>Create/edit** option which brings up the **Template Create/Edit** panel.



The description of the fields and the buttons **Fixed**, **Cut**, **Fill**, **Final Cut/Fill** in this panel were given in the chapter [Design](#).

The **Decisions** button and its associated panel, **Decisions Template**, which is created when the **Decisions** button is selected, will now be described.



The **Decisions Template** panel consists of scrolling **command** fields and a **OK** or **Apply** button to record the results.

The **width** of the **command** area in the **Decisions Template** panel is controlled by the environment variable `DEFAULT_TABLE_WIDTH_4D`.

The **commands** in the decision template form a simple language where the commands are processed sequentially unless control is passed to a labelled line from where sequential processing continues, or the processing is terminated by an **end** command.

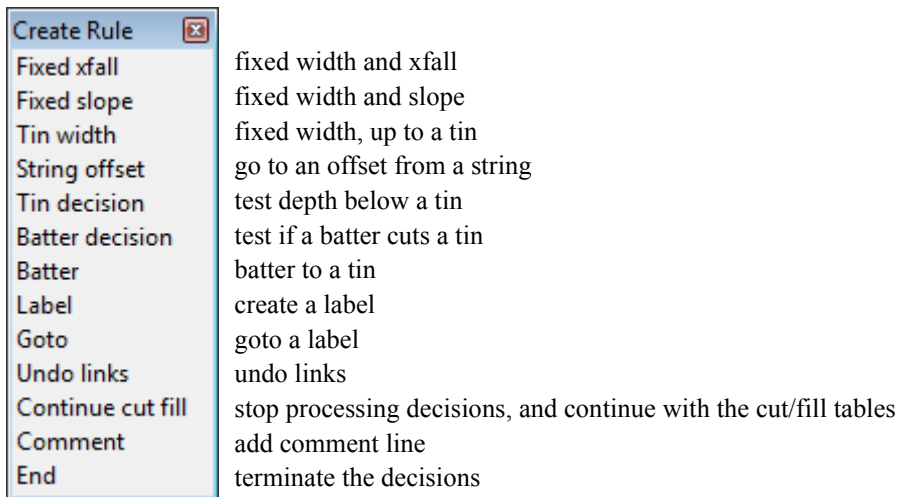
The decision template commands can:

- (a) create a fixed link - **fixed xfall** and **fixed slope**
- (b) create a link of fixed width but with a slope automatically selected so that the link reaches a given tin in the width - **tin width**
- (c) create a link that goes within an offset of a given string **string offset**
- (d) test for being between two depths below a tin, and transfer control if true - **tin decision**
- (e) test that a link would get within a given depth from a tin at a given offset, and transfer control if true - **batter decision**
- (f) create a link of set slope that batters to a depth below a tin at a given offset - **batter**
- (g) create a label which can have processing passed to - **label**
- (h) transfer processing to a given label - **goto**
- (i) end the processing of commands - **end**

The template decision commands can be typed into an text (ascii) file defining a

template (template file .tpl) or can be created and edited through panels.

If the **command line** is **empty**, clicking LB in the **command line** will bring up the **Create Rule** menu which contains all the available decisions commands.



Selecting a menu item will bring up an associated panel which displays the information required for the decisions command.

When the panel is filled in and **OK** or **Apply** selected, the panel information is written out to the **command line** in the correct format for that template decision command.

If the **command line** is **not empty**, clicking LB in the **command line** will bring up the associated panel for the template decisions command in the **command line**.

The information in the panel can be modified and if **OK** or **Apply** is selected, the modified panel information is written out to the **command line** in the correct format for that template decisions command.

If the template is written out using **File I/O=>Templates output** or **Templates=>Utilities=>Output**, the template decisions will be written out as they are displayed in the **command fields**.

Any of the commands in the templates file can be edited and the file read back into **12d Model**.

Each of the template decision commands will now be described and the associated panels created by selecting the command from the **Create Rule** menu.

The format of the decision commands that are written to the panel are given, as are the typed form of the command which is used in the templates file.

For examples of a using decisions, please go to the section [Decisions Examples](#).

For documentation on the option/menus on the **Create Rule** menu:

For <i>Fixed xfall</i> , go to	Decisions Fixed Xfall
<i>Fixed slope</i>	Decisions Fixed Slope
<i>Tin width</i>	Decisions Tin Width
<i>String offset</i>	Decisions String Offset
<i>Tin decision</i>	Decisions Tin Decision
<i>Batter decision</i>	Decisions Batter Decision
<i>Batter</i>	Decisions Batter
<i>Label</i>	Decisions Label

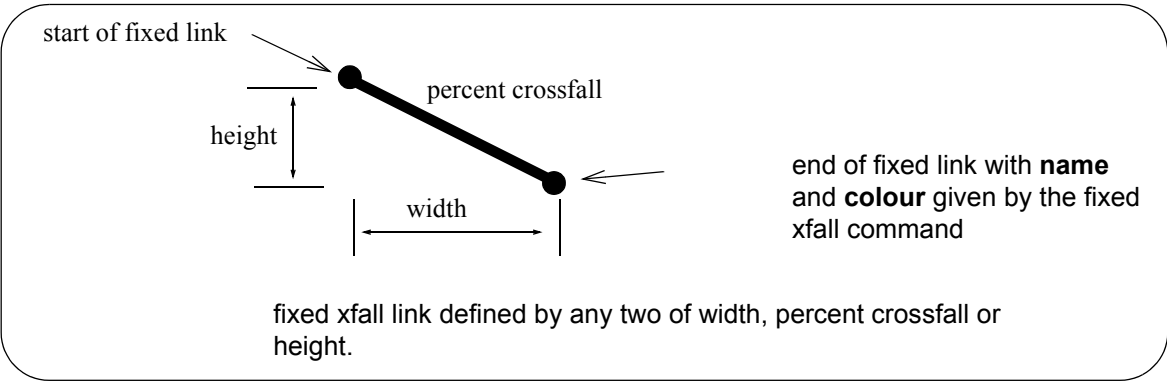
<i>Goto</i>	<u>Decisions Goto</u>
<i>Undo links</i>	<u>Decisions Undo</u>
<i>Continue cut fill</i>	<u>Decisions Continue Cut Fill</u>
<i>Comment</i>	<u>Decisions Comment.</u>
<i>End</i>	<u>Decisions End</u>

Please continue to the next section [Decisions Fixed Xfall.](#)

Decisions Fixed Xfall

Selecting **Fixed xfall** brings up the **Fixed Xfall** panel which is used to constructed the command for a fixed link with the possibility of using cross fall (xfall). The fixed link is defined by specifying values for two of the three fields width, height and x-fall.

Note - if defining a slope rather than a xfall is required, use **Fixed Slope** (see [Decisions Fixed Slope](#)).



The format of the Fixed Xfall command in the panel is

Fixed Xfall Width *value* Height *value* XFall *value* Name *text* Colour *colour* // *comment*

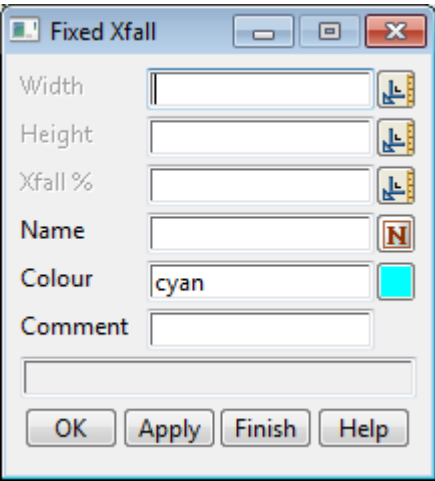
where only two of the three commands Width, Height and Xfall are used.

The format of the command typed into the template file is

Fixed_Xfall *width_value* *height_value* *xfall_value* *name* *colour* // **comment**

where one of *width_value*, *height_value* or *xfall_value* is the key word *unknown*.

The panel brought up when **Fixed xfall** is selected from the **Create Rule** menu is:



The fields and buttons used in this panel have the following functions.

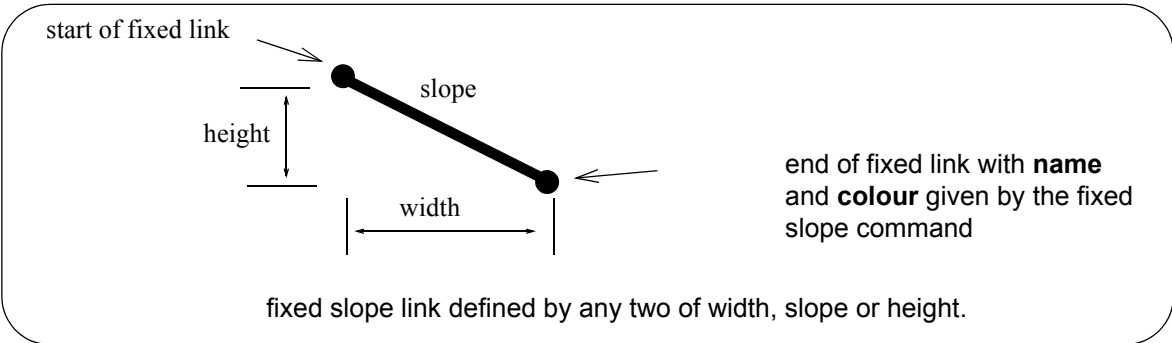
Field Description	Type	Default	Pop-Up
Width	input		
<i>the width for the link.</i>			

Height	input		
<i>the height for the link.</i>			
Xfall %	input		
<i>the x-fall, in percent cross-fall, of the link. Positive is up and negative down.</i>			
Name	input		
<i>the name to be used for the created point and string.</i>			
Colour	input	cyan	available colours
<i>the colour to be used for the created string</i>			
Comment	input		
<i>user comment - for information purposes only</i>			
OK/Apply	button		
OK stores the values in the fields and removes the panel.			
Apply stores the values and leaves the panel on the screen.			
Please continue to the next section Decisions Fixed Slope .			

Decisions Fixed Slope

Selecting **Fixed slope** brings up the **Fixed Slope** panel which is used to constructed a fixed link. The fixed link is defined by specifying values for two of the three fields width, height and slope.

Note - if defining a cross fall (xfall) rather than a slope is required, use **Fixed Xfall** (see [Decisions Fixed Xfall](#)).



The format of the Fixed Slope command in the panel is

Fixed Slope Width *value* Height *value* Slope *value* Name *text* Colour *colour* // *comment*

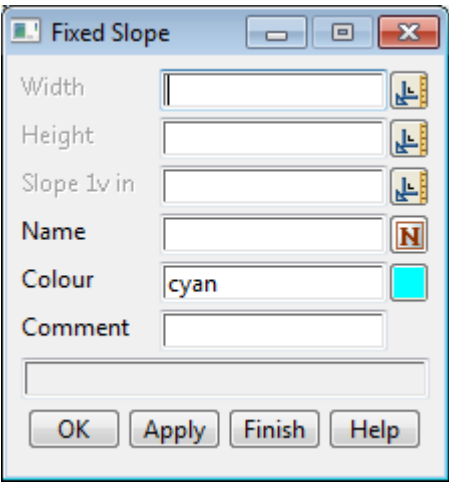
where only two of the three commands Width, Height and Slope are used.

The format of the command typed into the template file is

Fixed_Slope *width_value* *height_value* *slope_value* *name* *colour* // *comment*

where one of *width_value*, *height_value* or *slope_value* is the key word *unknown*

The panel brought up when **Fixed slope** is selected from the **Create Rule** menu is:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Default	Pop-Up
Width <i>the width for the link.</i>	input		
Height	input		

the height for the link.

Slope 1v in input

the slope, in 1v in, of the link. Positive is up and negative down.

Name input

the name to be used for the created point and string.

Colour input cyan available colours

the colour to be used for the created string

Comment input

user comment - for information purposes only

OK/Apply button

OK stores the values in the fields and removes the panel.

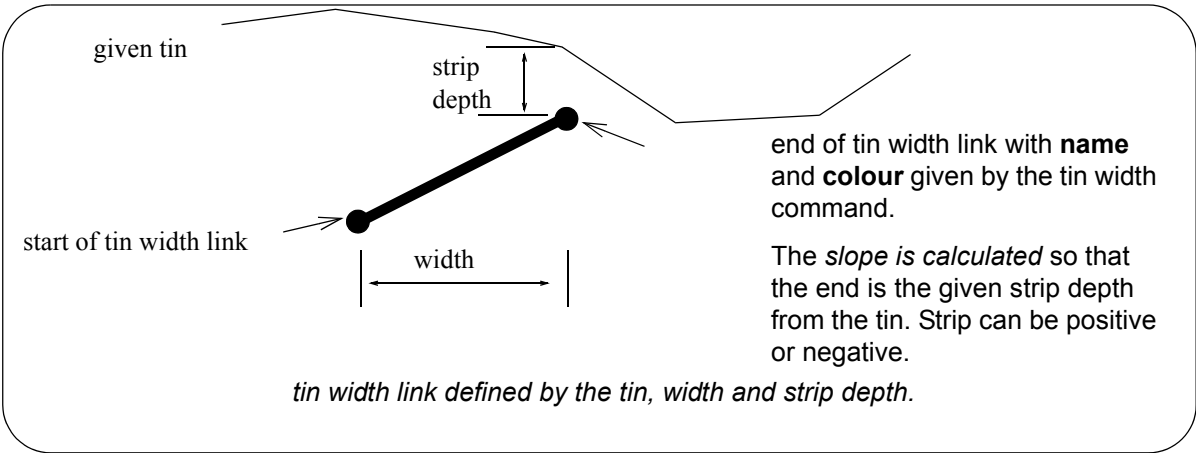
Apply stores the values and leaves the panel on the screen.

Please continue to the next section [Decisions Tin Width](#).

Decisions Tin Width

Selecting **Tin width** brings up the **Tin Width** panel which is used to construct a link which has a **given width** and stops at the depth **strip** below the tin. Control then passes to the next line of the table.

strip can be positive (end point is below the tin) or negative (end point is above the tin).



The format of the Tin Width command in the panel is

Tin Width *tin_name* Strip *value* Width *value* Name *text* Colour *colour* // *comment*

The format of the command typed into the template file is

Tin_Width *tin_name* *strip_value* *width_value* *name* *colour* // *comment*

The panel brought up when **Tin width** is selected from the **Create Rule** menu is:

The fields and buttons used in this panel have the following functions.

Field Description	Type	Default	Pop-Up
Tin <i>tin to batter to.</i>	input		available tins
Strip <i>distance below the tin to stop at (strip depth). strip can be positive (point is below the tin) or negative</i>	input	0	

(point is above the tin).

Width input 1
width of the link

Name input
the name to be used for the created point and string.

Colour input cyan available colours
the colour to be used for the created string

Comment input
user comment - for information purposes only

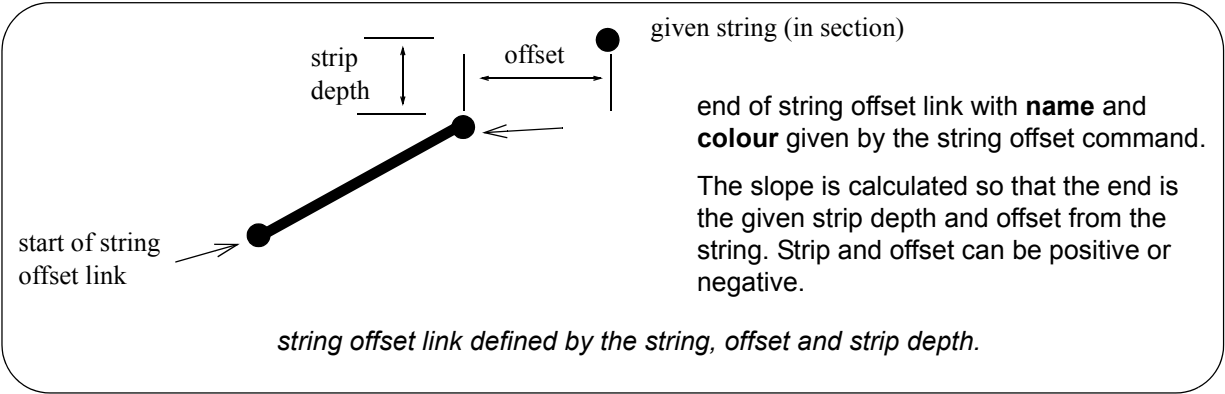
OK/Apply button
OK stores the values in the fields and removes the panel.
Apply stores the values and leaves the panel on the screen.

Please continue to the next section [Decisions String Offset](#).

Decisions String Offset

Selecting **String offset** brings up the **String Offset** panel which is used to construct a link which goes to a **given offset from string** and stops at the depth **strip below the string**. Control then passes to the next line of the table.

offset and **string** can be positive or negative.



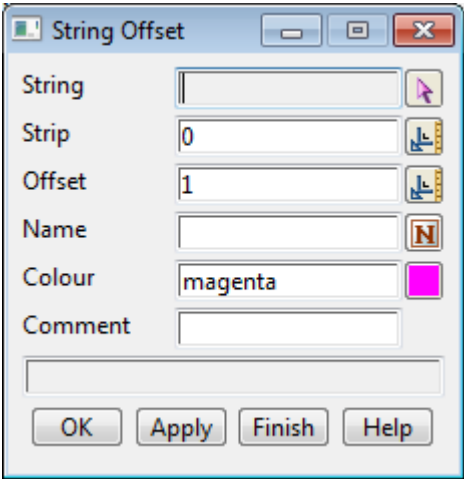
The format of the String Offset command in the panel is

String Offset *string_name* Strip *value* Offset *value* Name *text* Colour *colour* // *comment*

The format of the command typed into the template file is

String_Offset *string_name* *strip_value* *offset_value* *name* *colour* // *comment*

The panel brought up when **String offset** is selected from the **Create Rule** menu is:



The fields and buttons used in this panel have the following functions.

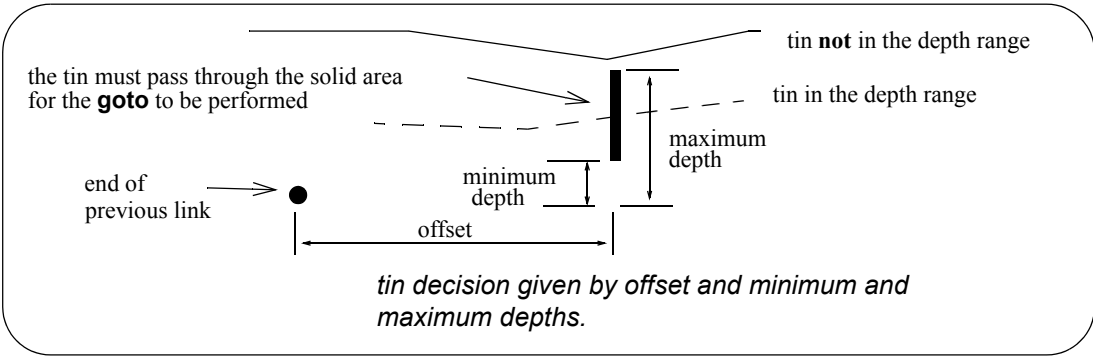
Field Description	Type	Default	Pop-Up
String <i>string to go to.</i>	string select		
Strip <i>distance below the string to stop at.</i>	input	0	

Offset	input	1	
<i>offset from the string to stop at.</i>			
Name	input		
<i>the name to be used for the created point and string.</i>			
Colour	input	cyan	available colours
<i>the colour to be used for the created string</i>			
Comment	input		
<i>user comment - for information purposes only</i>			
OK/Apply	button		
OK stores the values in the fields and removes the panel.			
Apply stores the values and leaves the panel on the screen.			
Please continue to the next section Decisions Tin Decision .			

Decisions Tin Decision

Selecting **Tin decision** brings up the **Tin Decision** panel which tests to see if the depth from the end of the previous link, offset by the amount given in the **offset** field, is between the two values given in the **minimum depth** and **maximum depth** fields. If the depth is between the values, then control is transferred to the line with the label given by the **goto** field. Otherwise, control passes to the next line of the table.

offset, **minimum** and **maximum** depth can be positive or negative.



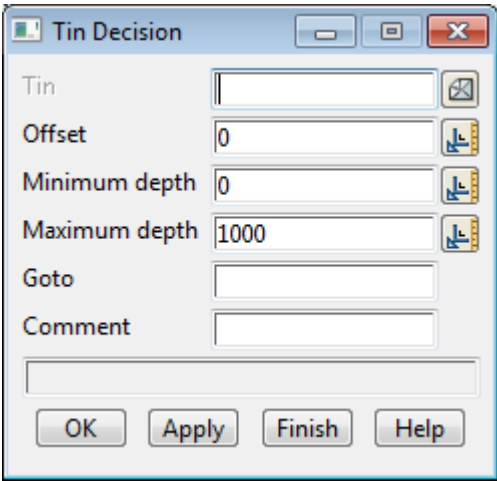
The format of the Tin Decision command in the panel is

Tin Decision *tin_name* Offset *value* Min *value* Max *value* Goto *label* // *comment*

The format of the command typed into the template file is

Tin_Decision *tin_name* *offset_value* *min_value* *max_value* *goto_label* // *comment*

The panel brought up when **Tin decision** is selected from the **Create Rule** menu is:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Default	Pop-Up
Tin <i>the tin to calculate the depth to.</i>	tin box		available tins
Offset <i>the depth is calculate at an offset distance of offset from the end of the previous link.</i>	input	0	

Minimum depth	input	0
<i>if the depth is between the minimum and maximum depth, then control is passed to the line with the label given in the goto field, otherwise control passes onto the next line of the table.</i>		
Maximum depth	input	1000
<i>see previous field.</i>		
Goto	input	
<i>label to go to if the depth is between the minimum and maximum depths.</i>		
Comment	input	
<i>user comment - for information purposes only</i>		
OK/Apply	button	
<i>OK stores the values in the fields and removes the panel.</i>		
<i>Apply stores the values and leaves the panel on the screen.</i>		

Please continue to the next section [Decisions Batter Decision](#).

Decisions Batter Decision

Selecting **Batter decision** brings up the **Batter Decision** panel which is used to test whether a given link comes within

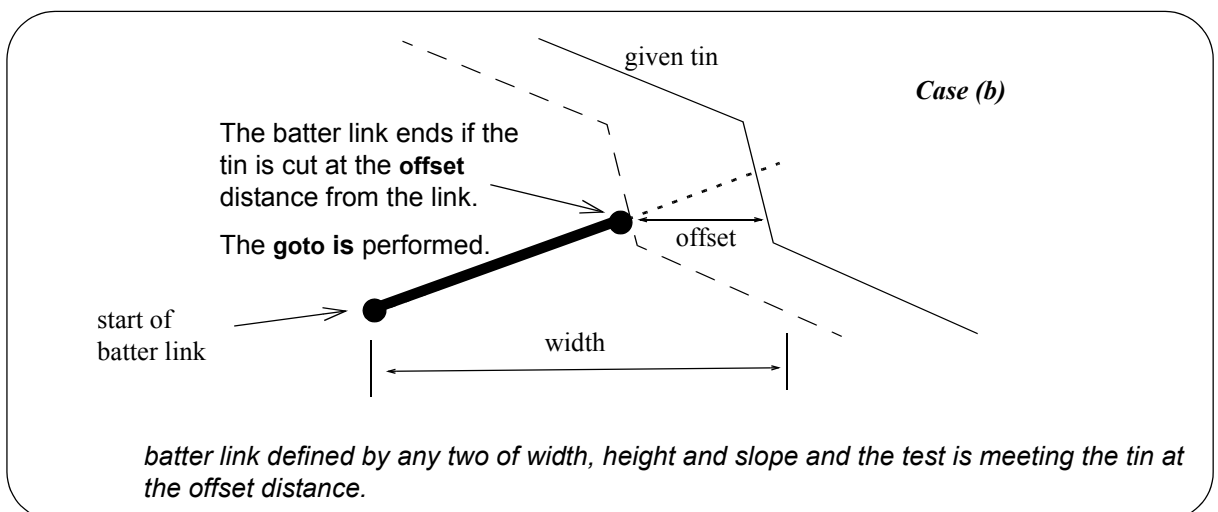
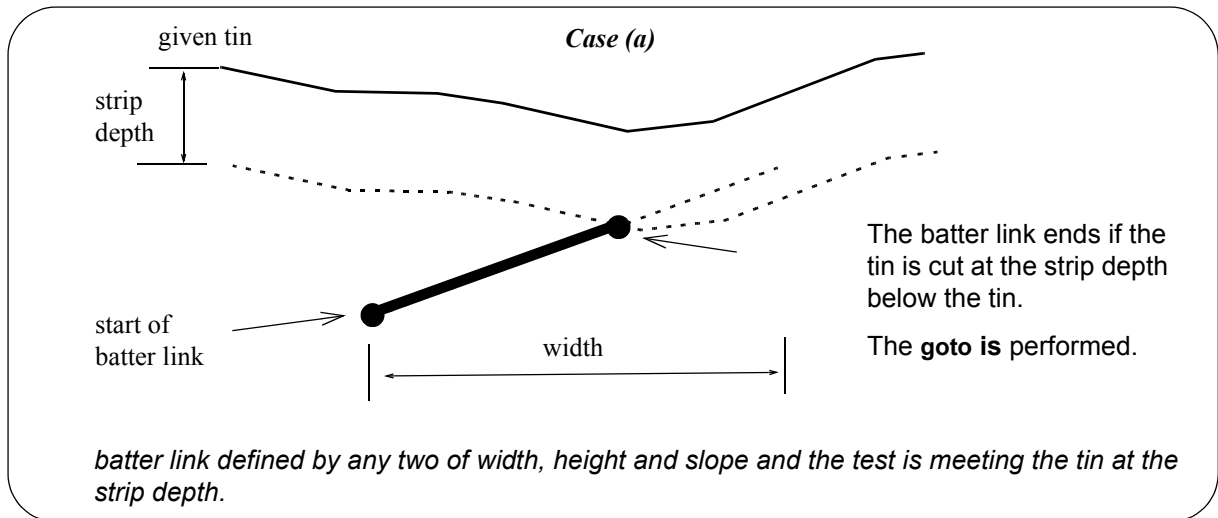
- (a) a **strip** depth of a tin
- (b) an offset distance from a tin.
- (c) a strip depth of a tin calculated at a given offset from the link.

If the test is satisfied, then control is transferred via a goto, otherwise control continues onto the next line in the table.

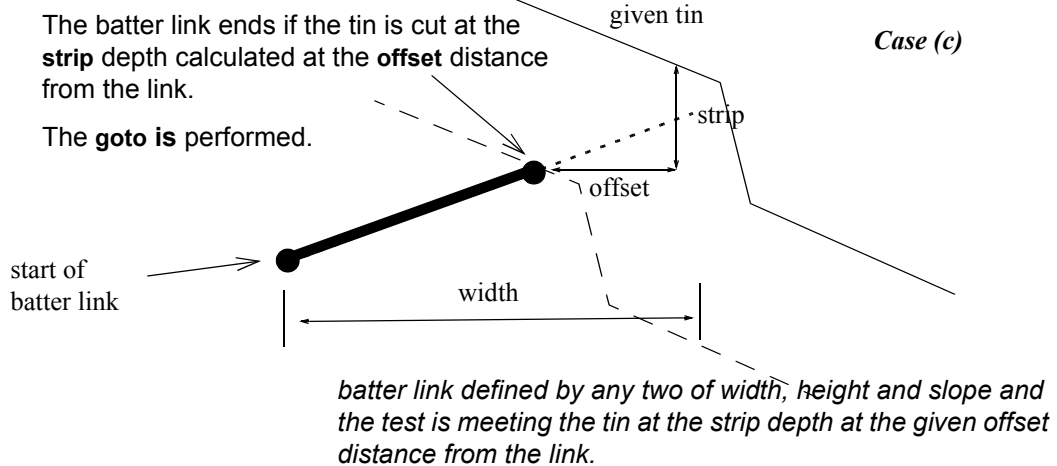
The **test link** is defined by specifying values for two of the three fields width, height and slope.

Notes

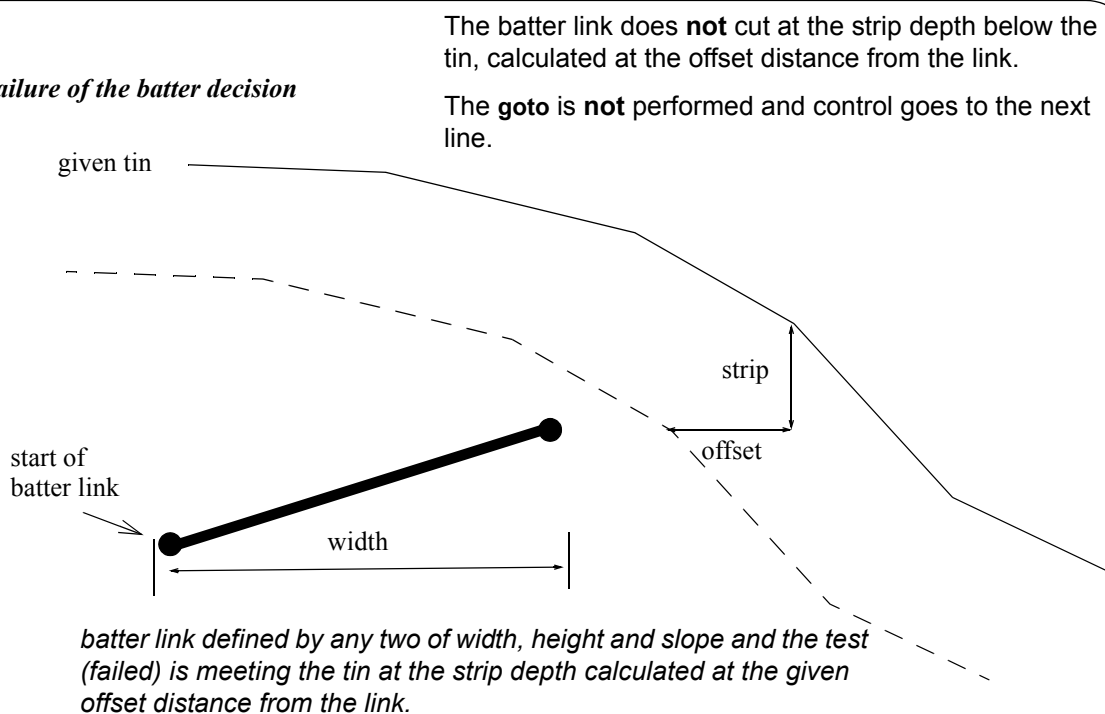
1. no link is created, just the test is performed
2. cases (a) and (b) are just special cases of (c)
3. the batter decision is mainly used to test if a batter will stop without performing the batter.



Case (c)



Failure of the batter decision



The format of the Batter Decision command in the panel is

Batter Decision *tin_name* *Strip value* *Offset value* *Width value* *Height value*
Slope value *Goto label* *// comment*

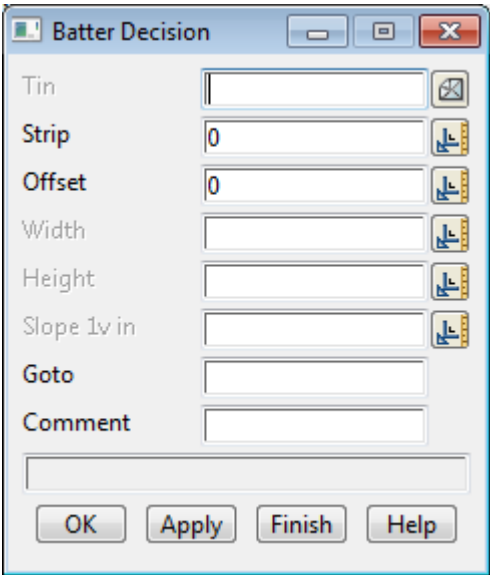
where only two of the three commands Width, Height and Slope are used.

The format of the command typed into the template file is

Batter_Decision *tin_name* *strip_value* *offset_value* *width_value* *height_value* *slope_value*
goto_label *// comment*

where one of *width_value*, *height_value* or *slope_value* is the key word *unknown*

The panel brought up when **Batter decision** is selected from the **Create Rule** menu is:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Default	Pop-Up
Tin <i>tin to test the batter to.</i>	tin box		available tins
Strip <i>distance below the tin to stop at.</i>	input	0	
Offset <i>offset distance from the link to check strip depth</i>	input	0	
Width <i>the width for the link.</i>	input		
Height <i>the height for the link.</i>	input		
Slope 1v in <i>the slope, in 1v in, of the link. Positive is up and negative down.</i>	input		
Goto <i>label to goto if the test link comes within the strip depth of the tin at the given offset distance.</i>	input		
Comment <i>user comment - for information purposes only</i>	input		
OK/Apply <i>OK stores the values in the fields and removes the panel. Apply stores the values and leaves the panel on the screen.</i>	button		

Please continue to the next section [Decisions Batter](#).

Decisions Batter

Selecting **Batter** brings up the **Batter** panel which is used to construct a link which stops if it comes within

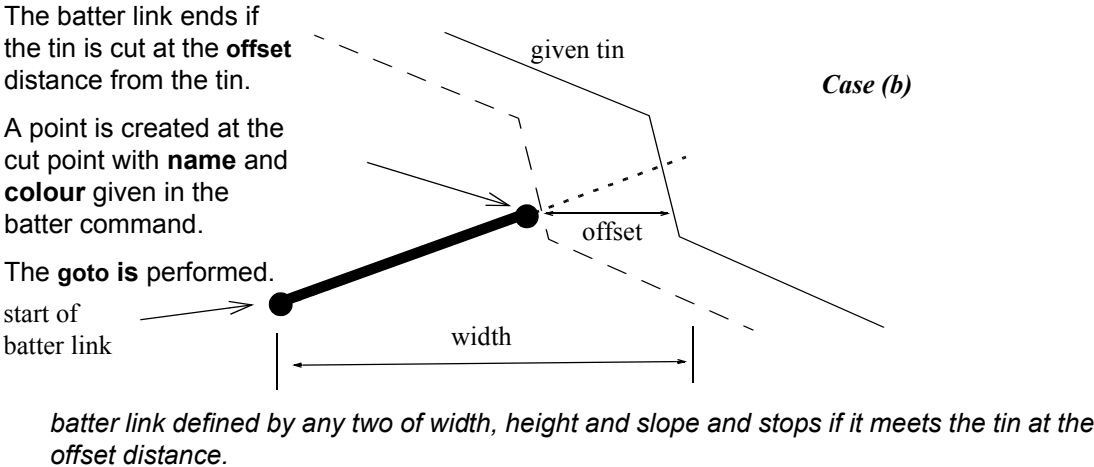
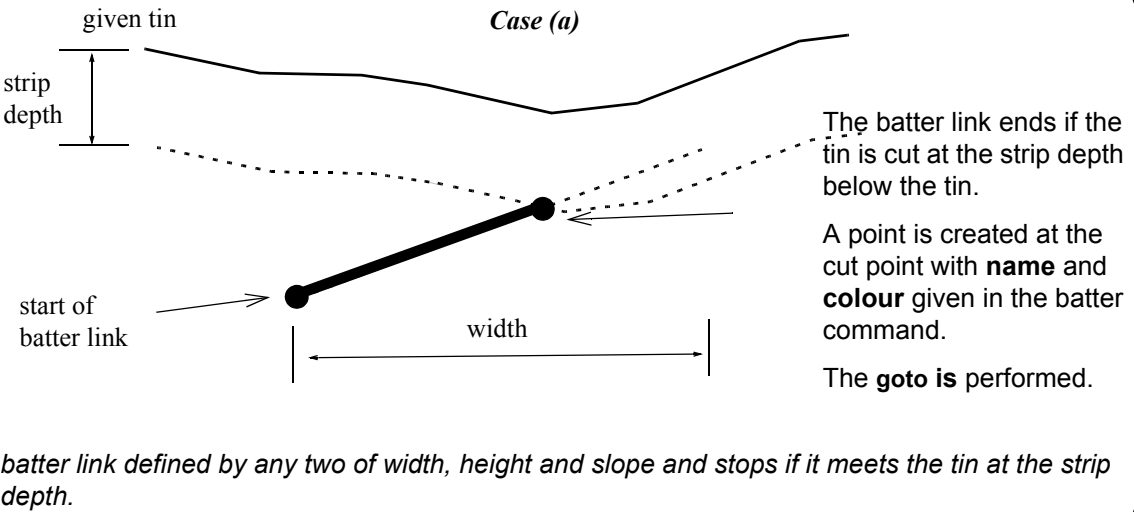
- (a) a **strip** depth of a tin
- (b) an offset distance from a tin.
- (c) a strip depth of a tin calculated at a given offset from the link.

If the link does stop, control is transferred via a goto, otherwise control continues onto the next line in the table.

The **batter** link is defined by specifying values for two of the three fields width, height and slope.

Notes

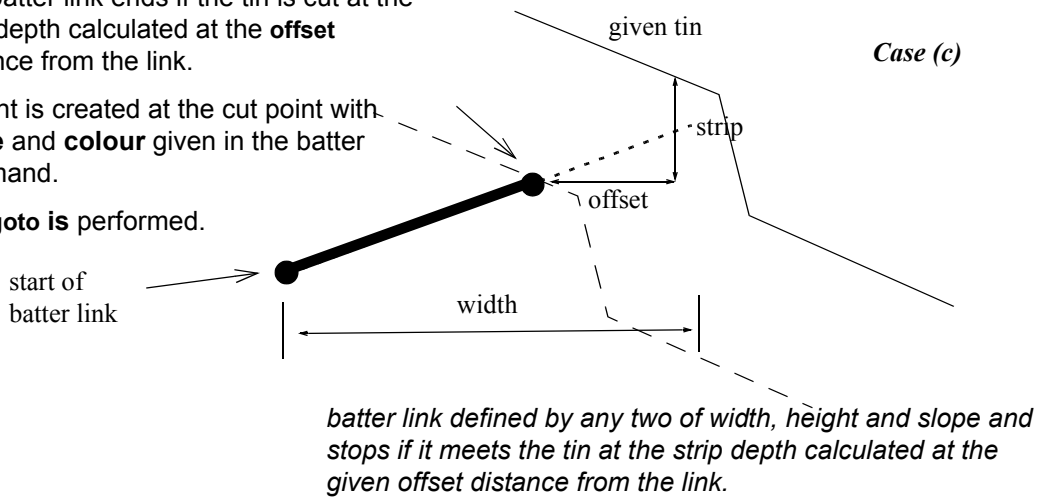
- 1. cases (a) and (b) are just special cases of (c)
- 2. strip and offset can be used to stop the link to allow for a fixed structure (such as a drain) to be inserted so that it ends up on the tin.



The batter link ends if the tin is cut at the **strip** depth calculated at the **offset** distance from the link.

A point is created at the cut point with **name** and **colour** given in the batter command.

The **goto** is performed.

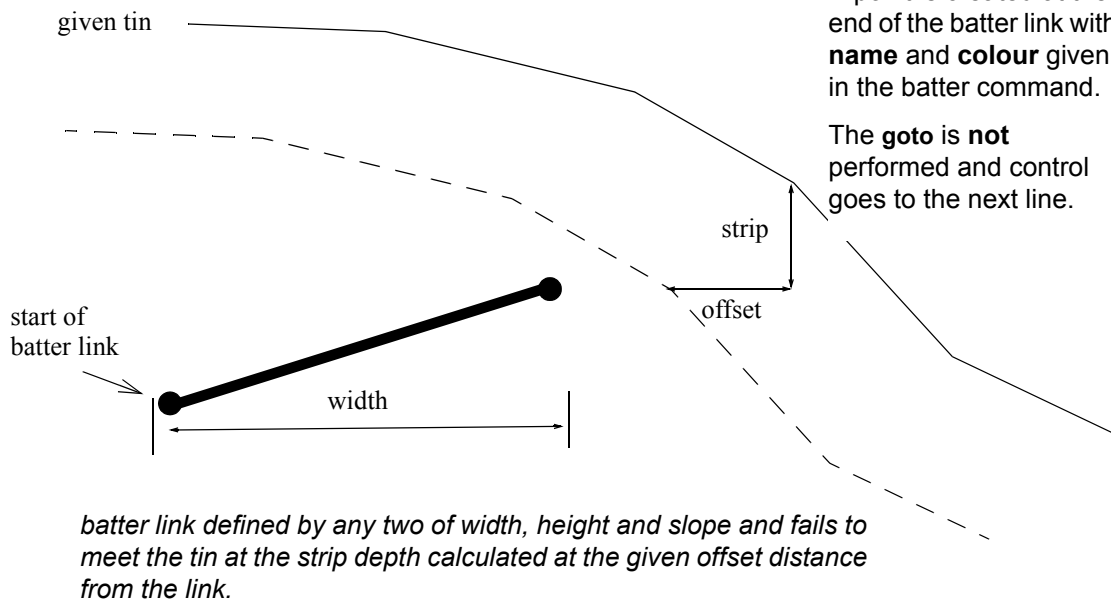


Failure of the batter

The batter link does **not** cut at the strip depth below the tin, calculated at the offset distance from the link.

A point is created at the end of the batter link with **name** and **colour** given in the batter command.

The **goto** is **not** performed and control goes to the next line.



The format of the Batter command in the panel is

Batter *tin_name* *Strip value* *Width value* *Height value* *Slope value* *Name text*
Colour colour *Goto label* *// comment*

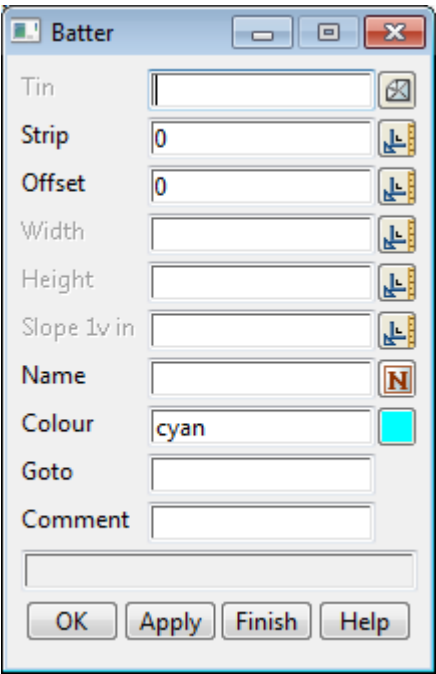
where only two of the three commands Width, Height and Slope are used.

The format of the command typed into the template file is

Batter *tin_name* *strip_value* *width_value* *height_value* *slope_value*
name colour goto_label // comment

where one of *width_value*, *height_value* or *slope_value* is the key word *unknown*

The panel brought up when **Batter** is selected from the **Create Rule** menu is:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Default	Pop-Up
Tin <i>tin to batter to.</i>	tin box		available tins
Strip <i>distance below the tin to stop at.</i>	input	0	
Offset <i>offset distance from the link to check strip depth</i>	input	0	
Width <i>the width for the link.</i>	input		
Height <i>the height for the link.</i>	input		
Slope 1v in <i>the slope, in 1v in, of the link. Positive is up and negative down.</i>	input		
Name <i>the name to be used for the created point and string.</i>	input		
Colour <i>the colour to be used for the created string</i>	colour box	cyan	available colours
Goto <i>label to goto if the batter link comes within the depth strip of the tin.</i>	input		
Comment <i>user comment - for information purposes only</i>	input		

OK/Apply button

OK stores the values in the fields and removes the panel.

Apply stores the values and leaves the panel on the screen.

Please continue to the next section [Decisions Label](#).

Decisions Label

Selecting **Label** brings up the **Label** panel which is used to define a label for the line for which control can be passed to via a goto.

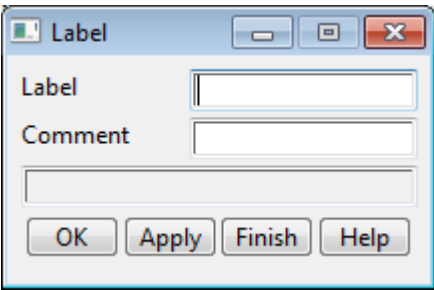
The format of the Label command in the panel is

```
Label  label_name  // comment
```

The format of the command typed into the template file is

```
Label  label_name  // comment
```

The panel brought up when **Label** is selected from the **Create Rule** menu is:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Default	Pop-Up
Label <i>name of the label for the line in the table.</i>	input		
Comment <i>user comment - for information purposes only</i>	input		
OK/Apply OK stores the values in the fields and removes the panel. Apply stores the values and leaves the panel on the screen.	button		

Please continue to the next section [Decisions Goto](#).

Decisions Goto

Selecting **Goto** brings up the **Goto** panel which is used to transfer control to the line with the label given in the **goto** field of the panel.

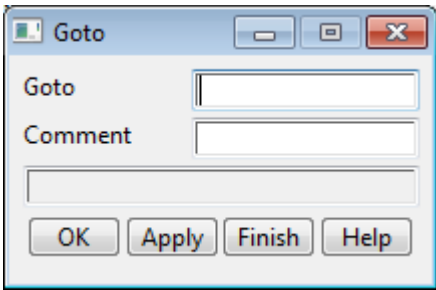
The format of the Goto command in the panel is

```
Goto  label_name  // comment
```

The format of the command typed into the template file is

```
Goto  label_name  // comment
```

The panel brought up when **Goto** is selected from the **Create Rule** menu is:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Default	Pop-Up
Goto	input		
<i>name of the label to transfer control to.</i>			
Comment	input		
<i>user comment - for information purposes only</i>			
OK/Apply	button		
OK stores the values in the fields and removes the panel.			
Apply stores the values and leaves the panel on the screen.			

Please continue to the next section [Decisions Undo](#).

Decisions Undo

Selecting **undo** brings up the **Undo Decision** panel which is used to delete a given number of points (and hence links) from the template being constructed.

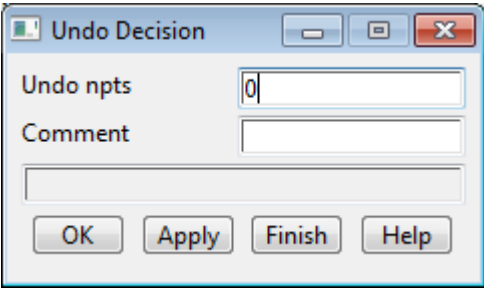
The format of the Label command in the panel is

```
Undo  number_of_points  // comment
```

The format of the command typed into the template file is

```
Undo  number_of_links  // comment
```

The panel brought up when **Undo** is selected from the **Create Rule** menu is:



The fields and buttons used in this panel have the following functions.

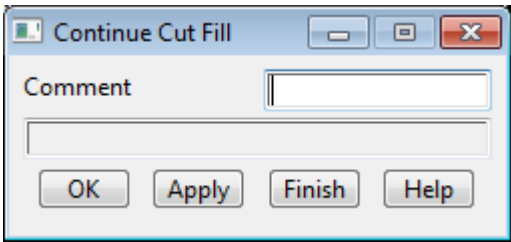
Field Description	Type	Default	Pop-Up
Undo npts	input	0	
<i>number of points to delete from the template, if the number is larger than the number of points in the template all points in the template are removed.</i>			
Comment	input		
<i>user comment - for information purposes only</i>			
OK/Apply	button		
OK stores the values in the fields and removes the panel.			
Apply stores the values and leaves the panel on the screen.			

Please continue to the next section [Decisions Continue Cut Fill](#).

Decisions Continue Cut Fill

If the **Continue Cut Fill** statement is reached when processing the decision commands, the decision section is terminated, and the processing continues to the Cut and Fill tables.

The panel brought up when **Continue Cut Fill** is selected from the **Create Rule** menu is:



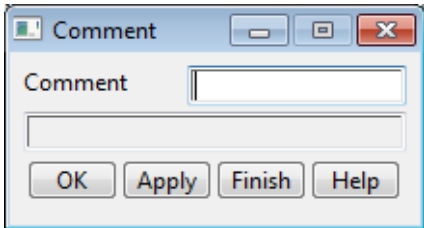
Clicking on **OK** or **Apply** inserts the **Continue Cut Fill**, and any *Comment*, into the current line of the *Command* table.

Please continue to the next section [Decisions Comment](#).

Decisions Comment

Selecting **Comment** brings up the **Comment** panel and inserts a comment into the line of the table. Comments are ignored by the decisions calculations.

The panel brought up when **Comment** is selected from the **Create Rule** menu is:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Default	Pop-Up
Comment	input		
<i>user comment - for information purposes only</i>			
OK/Apply	button		
<i>OK stores the values in the fields and removes the panel.</i>			
<i>Apply stores the values and leaves the panel on the screen.</i>			

Please continue to the next section [Decisions End](#).

Decisions End

Selecting **End** brings up the **End** panel and inserts an end command into the line of the table. When control reaches an **end** command, the decisions calculations are terminated.

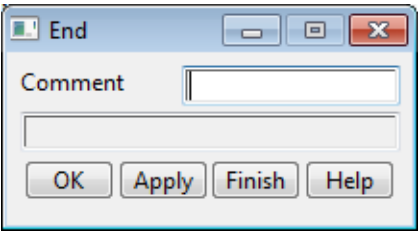
The format of the End command in the panel is

```
End    // comment
```

The format of the command typed into the template file is

```
End    // comment
```

The panel brought up when **End** is selected from the **Create Rule** menu is:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Default	Pop-Up
Comment	input		
<i>user comment - for information purposes only</i>			
OK/Apply	button		
<i>OK stores the values in the fields and removes the panel.</i>			
<i>Apply stores the values and leaves the panel on the screen.</i>			

Please continue to the next section [Decisions Examples](#).

Decisions Examples

One Tin Example

```
//From: 12D Solutions
//
//Basic Decisional Template for cut in 9m depth, 5m depth, and less
//Note the Tin Used is "SURVEY"
//
//
template "std" {
  fixed {
    link 5 unknown -3 cyan "eb"
  }
  decisional {
// if at offset 1m it is below "SURVEY" then goto drain
    Tin_Decision      "SURVEY" 1 0 1000 "drain"

    Fixed_Xfall        1 unknown -3 "edge1" cyan
    Batter              "SURVEY" 0 100 unknown -3 "fill" cyan "done"

// label drain
// create a table drain
    Label              "drain"
    Fixed_Slope         1 -0.5 unknown "invert" cyan
    Fixed_Slope         1 0.5 unknown "edge" cyan

// now at end of table drain, check depth of 5, 9
    Tin_Decision        "SURVEY" 0 0 5 "smallestcut"
    Tin_Decision        "SURVEY" 0 0 9 "smallcut"

// deeper than 9m, batter to within 9m of surface
    Batter              "SURVEY" 9 100 unknown 0.75 "cut1" cyan "bench"

// label smallcut -
    Label              "smallcut"
    Batter              "SURVEY" 5 100 unknown 0.75 "small" cyan "bench2"

// label smallestcut -
    Label              "smallestcut"
    Batter              "SURVEY" 0 100 unknown 2 "smallcut" cyan "done"

// label bench
    Label              "bench"
    Fixed_Slope         3 -0.3 unknown "bench1" cyan
    Batter              "SURVEY" 5 100 unknown 1.5 "cut2" cyan "bench2"

// label bench2 -
    Label              "bench2"
    Fixed_Slope         3 -0.3 unknown "bench2" cyan
    Batter              "SURVEY" 0 100 unknown 2 "cut3" cyan "done"

// label done -

    Label              "done"
    End
  }
}
```

```
final {  
    cut_slope na fill_slope na search_distance 100  
}  
}
```

Three Tins Example

```
//From: 4D Solutions  
//Date: 11/07/97  
//  
// Example with three surfaces - rock, shale, terrain  
// Assume that rock is below shale is below terrain  
  
template "std" {  
    fixed {  
        link 3 unknown -3 cyan "kerb"  
        link 1 unknown -4 magenta "shoulder"  
        link 2 unknown -5 purple "verge"  
    }  
    decisional {  
// test if in rock  
        Tin_Decision "rock" 0 0 1000 "cut_rock"  
  
// not in rock, test if in shale  
        Tin_Decision "shale" 0 0 1000 "cut_shale"  
  
// not in rock or shale, test if below or above terrain  
        Tin_Decision "terrain" 0 0 1000 "cut_terrain"  
  
// fill terrain - loop on creating some benches  
        Label "fill_terrain"  
        Batter "terrain" 0 0 8 unknown -3 "f1" blue "alldone"  
        Batter "terrain" 0 0 1 unknown 0 "f2" "dark green" "alldone"  
        Goto "fill_terrain"  
  
// cut rock  
        Label "cut_rock"  
        Tin_Decision "rock" 0 0 0.3 "cut_rock_done"  
        Batter "rock" 0.3 0 5 unknown 0.5 "r1" cyan "cut_rock_done"  
        Batter "rock" 0 0 2.5 unknown 0 "r2" yellow "cut_rock_done"  
        Goto "cut_rock"  
  
// cut rock done - work on shale  
        Label "cut_rock_done"  
        Tin_Decision "shale" 0 0 1000 "cut_shale"  
        Goto "cut_shale_done"  
  
// cut shale  
        Label "cut_shale"  
        Tin_Decision "shale" 0 0 0.6 "cut_shale_done"  
        Batter "shale" 0.6 0 6 unknown 1 "s1" magenta "cut_shale_done"  
        Batter "shale" 0 0 3 unknown 0 "s2" "dark red" "cut_shale_done"  
        Goto "cut_shale"
```

```

// cut shale done - work on terrain
  Label          "cut_shale_done"
  Tin_Decision   "terrain" 0 0 1000 "cut_terrain"
  Goto           "alldone"

// cut terrain
  Label          "cut_terrain"
  Batter         "terrain" 0 0 3 unknown 1.5 "t1" red "alldone"
  Batter         "terrain" 0 0 2 unknown 0 "t2" green "alldone"
  Goto           "cut_terrain"

// all done - end of decisional
  Label          "alldone"
}
final {
  cut_slope 1 fill_slope 2 search_distance 100
}
}
template "headwall" {
  fixed {
    link 3 unknown -3 cyan "kerb"
    link 1 unknown -4 magenta "shoulder"
    link 2 unknown -5 purple "verge"
  }
  decisional {
    Tin_Decision   "" 0 0 1000 "done" // should never happen
    Batter         "" 0 0 10 -100 unknown "int" cyan "done"
    Label          "done"
  }
  final {
    cut_slope na fill_slope na search_distance 100
  }
}
}

```

Placing Parts for Super Alignments

Placing a super alignment consists of:

- (a) defining the horizontal geometry which ultimately consisting of lines, arcs, transitions and tapers
- (b) defining the vertical geometry which ultimately consisting of lines, parabolas and arcs.

A simple way to create horizontal and vertical geometry for the super alignment is by using horizontal intersection points (HIPs) with arcs and transitions (eg spirals), and vertical intersection points (VIPs) with parabolas or arcs for placing the vertical geometry.

However the super alignment also allows for more **complex construction methods** to define the lines, arcs and transitions (the horizontal elements) that within **12d Model** are be grouped together to make up the Parts of the horizontal geometry.

For example, a horizontal line can be defined to be a given parallel offset of a selected line segment from another string. Or an arc of a known radius going through a point of another string and having a a leading and a trailing transition.

Similarly **complex construction methods** are available to define the lines, parabolas and arcs (the vertical elements) that are grouped together within **12d Model** to make up the vertical geometry.

So for a super alignment, the Horizontal Geometry is made up of **horizontal parts**, which may be as simple as a straight line between two points or an arc with a given centre and radius, or a horizontal intersection point with given leading and trailing transitions, or the **horizontal parts** can be very complicated where for example the points of a line are defined by the offset intersection of the two arcs from other strings.

Similarly for a super alignment, the Vertical Geometry is made up of **vertical parts**.

The definition of **parts** that are not fully defined are classified as being

- (a) **fixed** if the part is fully defined
- (b) **floating** if the part has one degree of freedom. That is, one unknown is still to be determined.
- (c) **free** if the part has two degrees of freedom. That is, two unknowns are still to be determined.

When the **parts** definitions have some degree of freedom, the extra restriction that the horizontal parts must be linked **tangentially** is imposed to try and fully defined the horizontal geometry.

If, with tangentiality, **12d Model** can fully determine the horizontal geometry then the horizontal geometry is said to **solve**. For more information, see [Fixed, Floating and Free, and Solving](#).

Once it solves, the horizontal geometry consists of linked known segments of types lines, arcs and transition, and so can be drawn in a plan view.

So the horizontal geometry is made up of the constructive definitions called **parts**, and if the horizontal geometry solves, it also contains the resultant **horizontal segments**.

For example, if a **Free Arc with Known Radius** (an arc with known radius and leading and trailing transitions of known lengths) is placed between two known lines then the tangentiality condition means that the position of the **Free Arc with Known Radius** (arc and two transitions) is uniquely defined as a arc and leading and trailing transitions on the intersection point of the two lines. Or just a fillet between the two lines if the two transitions have zero length.

Similarly the Vertical Geometry is made up of **parts**, which are made up of simple or complicated combinations of straight lines, arcs or a parabolas. Again the extra restriction that the vertical parts must be linked tangentially is often necessary to fully defined the vertical geometry. The vertical geometry is then said to be **solved** and the solved vertical geometry simply consists of

linked known segments of types lines, arcs and parabolas, and so can be drawn in a section view.

So the vertical geometry is made up of the constructive definitions called **parts**, and if the vertical geometry solves, it also contains the resultant **vertical segments**.

Important Note

The horizontal and vertical parts of a super alignment are only displayed when the super alignment is being edited. When the super alignment is not being edited, the segments of the solved parts are displayed and any unsolved parts are displayed as red crosses.

See [Fixed, Floating and Free, and Solving](#)

See [Types of Horizontal Parts](#)

See [Types of Vertical Parts](#)

See [Definitions of Super Alignment Horizontal Parts](#)

See [Definitions of Super Alignment Vertical Parts](#)

For the documentation of the options on the **Edit SA** toolbar, see [Edit Super Alignment](#).

Fixed, Floating and Free, and Solving

The definition of fixed and floating part has to do with how many unknowns, or degrees of freedom, exist for a part.

Fixed parts, as the names suggests, are totally fixed in position, radius etc.

Floating parts have one unknown, or one degree of freedom. Solving for that one unknown will then totally determine the part.

Free parts have two unknowns, or two degree of freedom. Solving for both unknowns then totally determines the part.

The most common examples for the major parts used in the horizontal and vertical geometry are:

Horizontal Geometry:

Fixed line - its position in space is totally defined

- (a) line given by two points on the line
- (b) line given by one point on the line and a bearing

Floating lines - one unknown

- (a) line going through one known point. The bearing of the line is unknown
- (b) line of a given bearing. A point that the line goes through is needed to fix it.

This unknown as the names suggests, are totally fixed in position, radius etc.

Free lines - a totally unconstrained line

Fixed arc - the arcs position in space and radius is totally defined

- (a) arc given by centre and radius
- (b) arc defined by three points on the arc
- (c) arc defined by centre and two points on the arc

Floating arc - one unknown

- (a) arc partially defined by one point on the arc and a radius.
- (b) two points on an arc.

This unknown as the names suggests, are totally fixed in position, radius etc.

Free arc - two unknowns

- (a) only the radius of the arc is known
- (b) only one point on the arc is known
- (c) only the arc length is known

Vertical Geometry:

Fixed line - its position and shape in (chainage, height) is totally defined

- (a) line given by two points on the line
- (b) line given by one point on the line and a grade

Floating lines - one unknown

- (a) line going through one known point. The grade of the line is unknown
- (b) line of a given grade. A point that the line goes through is needed to fix it.

Free lines - a totally unconstrained line

Fixed parabola - the parabolas position in (chainage, height) space is totally defined

- (a) parabola given by three points on the parabola
- (b) parabola defined by its apex and effective signed radius

Floating parabola - one unknown

- (a) one point on the parabola and K value are known
- (b) two points on an parabola are known.

Free parabola - two unknowns

- (a) only the K value of the arc is known
- (b) only one point on the parabola is known
- (c) only the length of the parabola is known

Fixed arc - the arcs position in (chainage, height) and radius is totally defined

- (a) arc given by centre and radius
- (b) arc defined by three points on the arc
- (c) arc defined by centre and two points on the arc

Floating arc - one unknown

- (a) arc partially defined by one point on the arc and a radius.
- (b) two points on an arc.

This unknown as the names suggests, are totally fixed in position, radius etc.

Free arc - two unknowns

- (a) only the radius of the arc is known
- (b) only one point on the arc is known
- (c) only the arc length is known

Solving

The horizontal and vertical geometry of a super alignment is made up of a series of Horizontal and Vertical Parts where the sequencing and types of the Parts, plus the condition that, if possible, each Part is **tangential** to the adjacent elements, allows **12d Model** to calculate and solve for all the unknowns in the Part definitions and totally define the super alignment.

The order and the whether adjacent parts are *Fixed*, *Floating* or *Free* is very important as only certain combinations will satisfy the tangentiality conditions and hence solve to give a super alignment.

If, with tangentiality, **12d Model** can fully determine the horizontal or vertical geometry then the horizontal or vertical geometry is said to **solve**.

Once it solves, the horizontal geometry consists of linked known segments of types lines, arcs and transition, and so can be drawn in a plan view.

So the horizontal geometry is made up of the constructive definitions called **parts**, and if the horizontal geometry solves, it also contains the resultant **horizontal segments**.

Similarly the vertical geometry is made up of the constructive definitions called **parts**, and if the vertical geometry solves, it also contains the resultant **vertical segments**.

The horizontal and vertical parts of a super alignment are only displayed when the super alignment is being edited. When the super alignment is not being edited, the solved segments are displayed and any unsolved parts are displayed as red crosses.

See [Types of Horizontal Parts](#)

See [Types of Vertical Parts](#)

See [Definitions of Super Alignment Horizontal Parts](#)

See [Definitions of Super Alignment Vertical Parts](#)

Types of Horizontal Parts

See [Horizontal IPs](#)

See [Horizontal Lines - Fixed](#)

See [Horizontal Lines - Floating](#)

See [Horizontal Lines - Fixed](#)

See [Horizontal Arcs - Fixed](#)

See [Horizontal Arcs - Floating](#)

See [Horizontal Arcs - Free](#)

See [Horizontal Transitions - Floating](#)

See [Horizontal Transitions - Free](#)

See [Horizontal Transitions - Compound](#)

Horizontal IPs

Speed, go to [HIP: Speed:](#)

Radius, go to [HIP: Radius:](#)

Length, go to [HIP: Arc Length](#)

Horizontal Lines - Fixed

Two points, go to [Fixed Line: Two Points](#)

Point & direction, go to [Fixed Line: Point & Direction](#)

Horizontal Lines - Floating

Through point, go to [Floating Line: Through a Point:](#)

Direction, go to [Floating Line: Known Direction](#)

From end, go to [Floating line: Known End and Nominal Length](#)

Horizontal Lines - Free

Free, go to [Free Line: No Constraints](#)

Horizontal Arcs - Fixed

Centre, radius and ends, go to [Fixed Arc: Known Centre, Radius and Start and End](#)

Three points, go to [Fixed Arc: Arc Passes through Three Known Points](#)

Point, radius & direction, go to [Fixed Arc: Known Start Point and Direction, Known Radius](#)

Horizontal Arcs - Floating

Point and radius, go to [Floating Arc: Known Radius and Passes through a Known Point](#)

Point and direction, go to [Floating Arc: Known Point and Tangent Direction at the Point](#)

Two points, go to [Floating Arc: Arc Passes through Two known Points](#)

From end through point, go to [Floating Arc: Arc Passes through Known point and End of Previous](#)

[or Next Element](#)

From end, radius and length, go to [Floating Arc: Arc has Know Radius and Length, and End of Previous or Next Element](#)

From end, radius and sweep, go to [Floating Arc: Arc has Know Radius and Sweep Angle, and End of Previous or Next Element](#)

Horizontal Arcs - Free

Radius, go to [Free Arc: Known Radius](#)

Through point, go to [Free Arc: Passes through Known Point](#)

Length, go to [Free Arc: Arc has a Known Length](#)

From end, go to [Free Arc: Arc has a Known End Point](#)

Horizontal Transitions - Floating

Arc to arc, go to [Floating Transition: From Arc to Arc](#)

Taper, go to [Floating Transition: Taper](#)

Transition, go to [Floating Transition: Known Length](#)

Horizontal Transitions - Free

Transition, go to [Free Transition: Unconstrained](#)

Back to back, go to [Free Transition: Back to Back Transitions of Known Lengths Between Lines](#)

Arc to arc, go to [Free Transition: Back to Back Transitions Between Two Arcs](#)

Taper, go to [Free Taper: Taper of Known Length](#)

Horizontal Transitions - Compound

Three centred, go to [Compound Transitions: Three Centre Curve](#)

Two centred, go to [Compound Transition: Two Centred Curve](#)

Compound transition, lengths, go to [Compound Transition: Two Transition Curves of Known Lengths](#)

Compound line length, go to [Compound Transition: Two Transitions Separated by Line of Known Length](#)

Compound curve, go to [Compound Transition: Two Arcs of Known Radii](#)

Compound taper, go to [Compound Transition: Two Arcs of Known Radii with a Taper](#)

Types of Vertical Parts

See [Vertical IPs](#)

See [Vertical Lines - Fixed](#)

See [Vertical Lines - Floating](#)

See [Vertical Lines - Free](#)

See [Vertical Parabolas - Fixed](#)

See [Vertical Parabolas - Floating](#)

See [Vertical Parabolas - Free](#)

See [Vertical Arcs - Fixed](#)

See [Vertical Arcs - Floating](#)

See [Vertical Arcs - Free](#)

Vertical IPs

Speed, go to [VIP: Speed](#)

Radius, go to [VIP: Radius](#)

K value, go to [VIP: K-value](#)

Length, go to [VIP: Length:](#)

Asymmetric, go to [VIP: Asymmetric](#)

Vertical Lines - Fixed

Two points, go to [Fixed Line: Two Points](#)

Point & grade, go to [Fixed Line: Known Point and Grade](#)

Vertical Lines - Floating

Point, go to [Floating Line: Known Point](#)

Grade, go to [Floating Line: Known Grade](#)

From end, go to [Floating Line: Known End and Nominal Length](#)

Vertical Lines - Free

Free, go to [Free line - No Constraints](#)

Vertical Parabolas - Fixed

Three points, go to [Fixed Parabola - Parabola Passes through Three Known Points](#)

Apex & radius, go to [Fixed Parabola: Known Apex and Effective Radius](#)

Vertical Parabolas - Floating

Two points, go to [Floating Parabola: Through Two Points](#)

Apex, go to [Floating Parabola: Known Apex](#)

Radius, go to [Floating Parabola: Known Point and Effective Radius](#)

Grade, go to [Floating Parabola: Known Point and Grade at that Point](#)

K value, go to [Floating Parabola: Known Point and K Value](#)

From end & grade, go to [Floating Parabola: Known Length and Grade at End](#)

From end & radius, go to [Floating Parabola: Known Radius and Nominal Length](#)

From end & point, go to [Floating Parabola: known Point and Known End](#)

Vertical Parabolas - Free

Through point, go to [Free Parabola: Known Point](#)

Length, go to [Free Parabola: Known Length](#)

Radius, go to [Free Parabola: Know Effective Radius](#)

RL, go to [Free Parabola: Known Parabolic Length/100](#)

K value, go to [Free Parabola: Known K Value](#)

Maximum length, go to [Free Parabola: Fit with Maximum Length](#)

Asymmetric, go to [Free Asymmetric Parabola: Two Known Lengths](#)

Compound, go to [Free Compound Parabola: Two Parabolas with Optional Total Parabolic Length](#)

Vertical Arcs - Fixed

Fixed, go to [Fixed Arc- Known Centre, Start and End Points](#)

Vertical Arcs - Floating

Point and radius, go to [Floating Arc: Known Point and Radius](#)

Point and grade, go to [Floating Arc: Known Point and Grade at Point](#)

Two points, go to [Floating Arc: Through Two Known Points](#)

Vertical Arcs - Free

Radius, go to [Free Arc: Known Radius](#)

Point, go to [Free Arc: Known Point on the Arc](#)

Length, go to [Free Arc: Known Length of Arc](#)

Definitions of Super Alignment Horizontal Parts

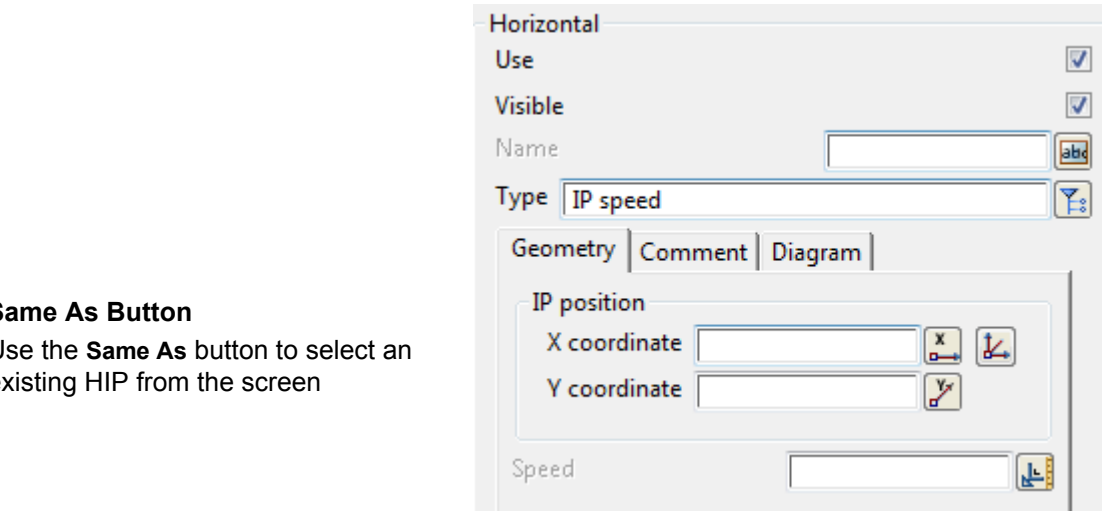
- See [Horizontal IPs](#)
- See [Horizontal Lines](#)
- See [Horizontal Arcs](#)
- See [Horizontal Transitions](#)
- See [Horizontal Computators](#)

Horizontal IPs

- See [HIP: Speed:](#)
- See [HIP: Radius:](#)
- See [HIP: Arc Length](#)

HIP: Speed:

A horizontal intersection point (HIP) is created and the sizes of the arc and transition curves for the HIP come from the Design Template of the super alignment.



Same As Button

Use the **Same As** button to select an existing HIP from the screen

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the horizontal geometry. If not ticked, the Part is not used in the horizontal geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the horizontal geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Horizontal Parts list.</i>	text box	blank	
Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box		types of horizontal parts

Geometry tab

the geometrical information defining the Part

X coordinate, Y coordinate

*the (x,y) coordinates for the HIP can be typed in, or selected using the **X**, **Y** or **XY** icons.*

Speed

*if **Speed** is not bank, then that is the speed used when looking up the Design Template for the HIP*

*If **Speed** is left bank, then the **Design Speed** for the super alignment is used when looking up the Design Template.*

Comment tab

the text type into the text box is stored as a comment for the Part.

***Note:** If a comment exists, a # is placed after the type of the part in the Horizontal Parts list.*

Set button

*the **Set** button must be clicked for the information for this Part to be used.*

Same As button

*after clicking the **Same As** button, an existing HIP can be selected from the screen and its information piped into the appropriate fields in the panel.*

HIP: Radius:

A horizontal intersection point (HIP) is created and the sizes of the arc and transition curves for the HIP are given.

Same As Button

Use the **Same As** button to select an existing HIP from the screen

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the horizontal geometry.</i> <i>If not ticked, the Part is not used in the horizontal geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the horizontal geometry.</i> <i>If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name.</i> <i>If blank then the Part has no name.</i> <i>Note: If the part has a name, then a ! is placed after the type of the part in the Horizontal Parts list.</i>	text box	blank	
Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box		types of horizontal parts

Geometry tab
the geometrical information defining the Part

X coordinate, Y coordinate
*the (x, y) coordinates for the HIP can be typed in, or selected using the **X**, **Y** or **XY** icons.*

Curve radius
if not blank, the radius used for the arc on the HIP.
If blank then no arc is used on the HIP.
***Note:** if the **Curve radius** is blank then the **Leading transition** and **Trailing transition** must also be blank. That is, there is **no arc or transitions** on the HIP.*

Leading transition

*if not blank, then it is the length of the leading transition on the HIP. This can only be non zero if the **Curve radius** is also non zero*

If blank then there is no leading transition on the HIP.

Leading transition

*if not blank, then it is the length of the trailing transition on the HIP. This can only be non zero if the **Curve radius** is also non zero*

If blank then no trailing transition on the HIP.

Comment tab

the text typed into the text box is stored as a comment for the Part.

***Note:** If a comment exists, a # is placed after the type of the part in the Horizontal Parts list.*

Set button

*the **Set** button must be clicked for the information for this Part to be used.*

Same As button

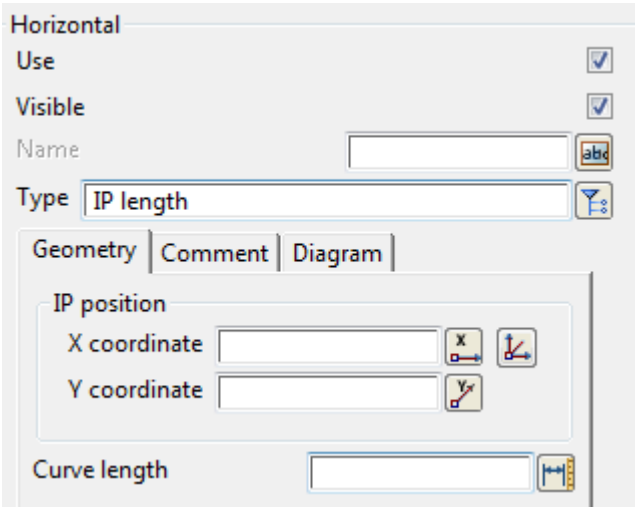
*after clicking the **Same As** button, an existing HIP can be selected from the screen and its information piped into the appropriate fields in the panel.*

HIP: Arc Length

A horizontal intersection point (HIP) is created with an arc of a given arc length.

Same As Button

Use the **Same As** button to select an existing HIP from the screen



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the horizontal geometry. If not ticked, the Part is not used in the horizontal geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the horizontal geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Horizontal Parts list.</i>	text box	blank	
Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box		types of horizontal parts

Geometry tab
the geometrical information defining the Part

X coordinate, Y coordinate
*the (x,y) coordinates for the HIP can be typed in, or selected using the **X**, **Y** or **XY** icons.*

Curve length
*the length used for the arc on the HIP. This field can not be left blank.
If zero then no arc is used on the HIP.*

Comment tab
*the text typed into the text box is stored as a comment for the Part.
Note: If a comment exists, a **#** is placed after the type of the part in the Horizontal Parts list.*

Set button
*the **Set** button must be clicked for the information for this Part to be used.*

Same As button

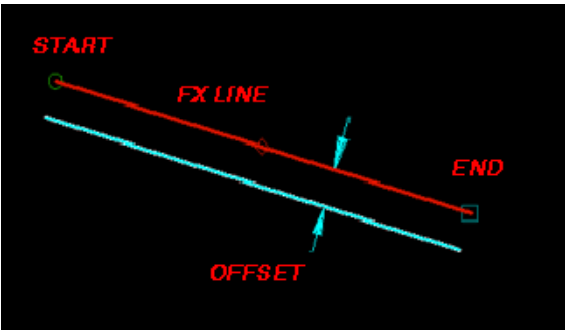
*after clicking the **Same As** button, an existing HIP can be selected from the screen and its information piped into the appropriate fields in the panel.*

Horizontal Lines

- See [Fixed Line: Two Points](#)
- See [Fixed Line: Point & Direction](#)
- See [Floating Line: Through a Point:](#)
- See [Floating Line: Known Direction](#)
- See [Floating line: Known End and Nominal Length](#)
- See [Free Line: No Constraints](#)

Fixed Line: Two Points

The *Fixed Line* is a given offset from a line that passes through two known points.



Offset:
-ve to the left of the line from start to end points
+ve to the right

Same As Button:
Use the **Same As** button to select an existing line segment from the screen

Horizontal

Use ☒

Visible ☒

Name

Type

Geometry | Comment | Diagram

Start

X coordinate

Y coordinate

End

X coordinate

Y coordinate

Offset

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use	tick box	ticked	
<i>if ticked, then the Part is used in the horizontal geometry.</i> <i>If not ticked, the Part is not used in the horizontal geometry.</i>			
Visible	tick box	ticked	
<i>if ticked, then the Part is drawn in the horizontal geometry.</i> <i>If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>			
Name	text box	blank	
<i>if not blank, then the Part is given this name.</i> <i>If blank then the Part has no name.</i> <i>Note: If the part has a name, then a ! is placed after the type of the part in the Horizontal Parts list.</i>			
Type	choice box		types of horizontal parts
<i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>			

Geometry tab

the geometrical information defining the Part

Start X coordinate, Y coordinate

*the start (x,y) coordinates for the line can be typed in, or selected using the **X**, **Y** or **XY** icons.*

End X coordinate, Y coordinate

*the end (x,y) coordinates for the line can be typed in, or selected using the **X**, **Y** or **XY** icons.*

Offset measure box Point to point or String to point
offset of the Fixed line from the line through the two points

Comment tab

the text typed into the text box is stored as a comment for the Part.

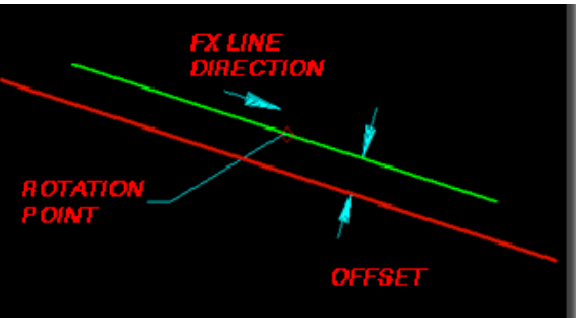
***Note:** If a comment exists, a **#** is placed after the type of the part in the Horizontal Parts list.*

Set button
*the **Set** button must be clicked for the information for this Part to be used.*

Same As button
*after clicking the **Same As** button, an existing segment can be selected from the screen and its start and end coordinates are piped into the appropriate fields in the panel.*

Fixed Line: Point & Direction

The *Fixed Line* is a given offset from a line going through a known point and with a known bearing.



Offset:
-ve to the left of the line
+ve to the right

Horizontal

Use☒

Visible☒

Name

Type

Geometry

Comment

Diagram

Point

X coordinate

Y coordinate

Direction

Relative start

Relative end

Offset

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the horizontal geometry. If not ticked, the Part is not used in the horizontal geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the horizontal geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Horizontal Parts list.</i>	text box	blank	
Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box		types of horizontal parts

Geometry tab
the geometrical information defining the Part

X coordinate, Y coordinate
*the (x,y) coordinates that the line goes through can be typed in, or selected using the **X**, **Y** or **XY** icons.*

Direction
the direction as a bearing can be typed in using [HP Notation](#) (dd.mmssss) or selected using the measure box.

- Relative start

measure box

available measures

the plan (2d) distance, relative to the given point, to start the line at. A negative value is to the left of the point, and a positive value is to the right of the point.
- Relative end

measure box

available measures

the plan (2d) distance, relative to the given point, to end the line at. A negative value is to the left of the point, and a positive value is to the right of the point.
- Offset

measure box

Point to point or String to point

offset of the Fixed line from the line through the two points
- Comment tab

the text typed into the text box is stored as a comment for the Part.
Note: If a comment exists, a # is placed after the type of the part in the Horizontal Parts list.
- Set

button

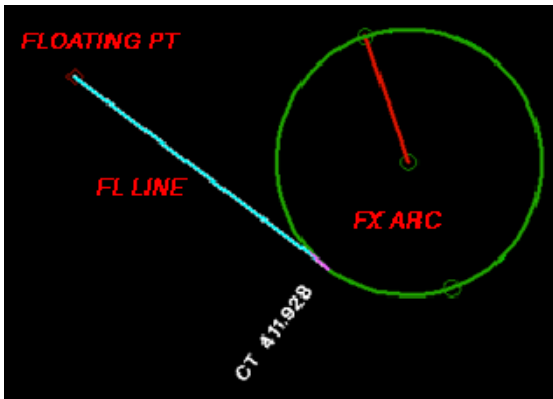
the Set button must be clicked for the information for this Part to be used.
- Same As

button

after clicking the Same As button, an existing HIP can be selected from the screen and its information piped into the appropriate fields in the panel.

Floating Line: Through a Point:

The *Floating Line* line passes through a **known point** but the bearing is unknown.



Horizontal

Use ☒

Visible ☒

Name

Type

Geometry | Comment | Diagram

Point

X coordinate

Y coordinate

Transition length

Attach to

Example:
Floating line from a point becomes a tangent to an arc when attached to a following fixed arc

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the horizontal geometry. If not ticked, the Part is not used in the horizontal geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the horizontal geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Horizontal Parts list.</i>	text box	blank	
Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box		types of horizontal parts
Geometry tab <i>the geometrical information defining the Part</i>			
X coordinate, Y coordinate <i>the (x,y) coordinates for the floating line can be typed in, or selected using the X, Y or XY icons.</i>			
Transition length <i>if non zero, a transition curve of this length is at the end of the Floating Line that Attach to specifies. If blank, no transition curve is used</i>	measure box		available measures
Attach to <i>the Part that the Floating Line is made tangential to. If there is a transition, it is at this end of the Floating line.</i>	choice box		previous part, next part

Comment tab

the text typed into the text box is stored as a comment for the Part.

***Note:** If a comment exists, a # is placed after the type of the part in the Horizontal Parts list.*

Set button

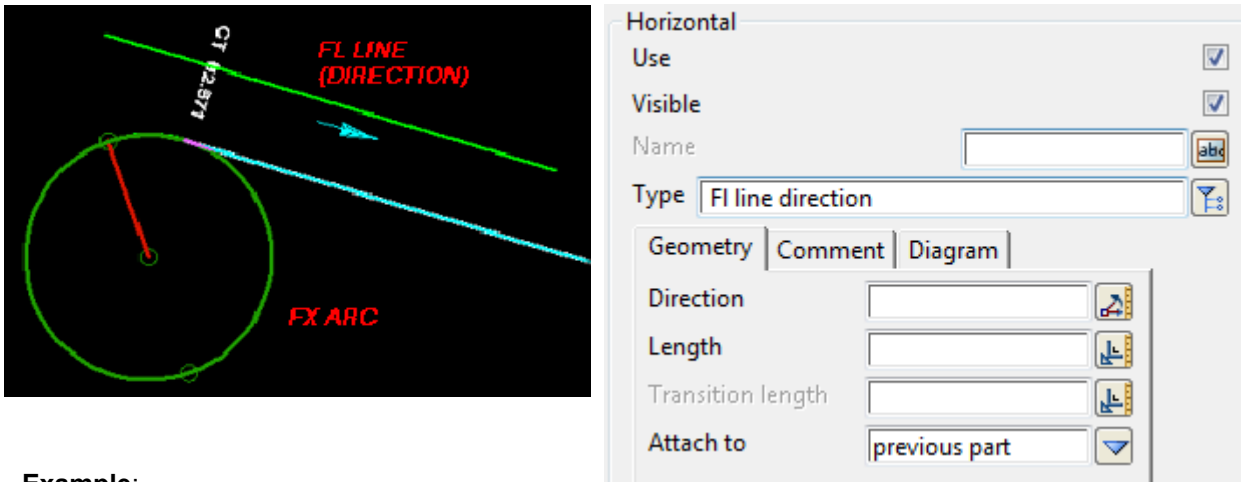
*the **Set** button must be clicked for the information for this Part to be used.*

Same As button

*after clicking the **Same As** button, an point is selected from the screen and its coordinates are piped into the appropriate fields in the panel.*

Floating Line: Known Direction

The *Floating Line* has a **known bearing** and a length.



Example:
Floating line with a direction becomes a tangent to an arc when attached to a previous fixed arc

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the horizontal geometry. If not ticked, the Part is not used in the horizontal geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the horizontal geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Horizontal Parts list.</i>	text box	blank	
Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box		types of horizontal parts

Geometry tab

the geometrical information defining the Part

Direction <i>the direction of the line as a bearing can be typed in using HP Notation (dd.mmssss) or selected using the measure box.</i>	measure box	available measures
Length <i>length of the Floating Line</i>	measure box	available measures
Transition length <i>if non zero, a transition curve of this length is at the end of the Floating Line that Attach to specifies. If blank, no transition curve is used</i>	measure box	available measures
Attach to <i>the Part that the Floating Line is made tangential to. If there is a transition, it is at this end of the</i>	choice box	previous part, next part

Floating line.

Comment tab

the text typed into the text box is stored as a comment for the Part.

Note: *If a comment exists, a # is placed after the type of the part in the Horizontal Parts list.*

Set button

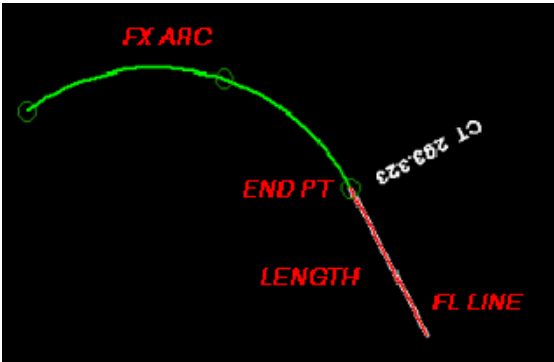
*the **Set** button must be clicked for the information for this Part to be used.*

Same As button

*after clicking the **Same As** button, an existing HIP can be selected from the screen and its information piped into the appropriate fields in the panel.*

Floating line: Known End and Nominal Length

The Floating Line has a **known nominal length** and is attached tangentially to the end of previous part or the beginning of the next part.



Example:
Extends from the end of a previous fixed arc for a given length

Horizontal

Use ☒

Visible ☒

Name

Type

Geometry

Comment

Diagram

Length

Rotation (cw)

Transition length

Attach to

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the horizontal geometry. If not ticked, the Part is not used in the horizontal geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the horizontal geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Horizontal Parts list.</i>	text box	blank	
Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box		types of horizontal parts

Geometry tab

the geometrical information defining the Part

Length <i>the nominal length of the Floating Line</i>	measure box	available measures
Rotation (cw) <i>if non zero then the bearing of the line is decreased by Rotation degrees (and is no longer tangential). The transition, if it exists, is still tangential to the Attach to part. See diagram at the end of this panel description.</i>	measure box	available measures
Transition length <i>if non zero, a transition curve of this length is at the end of the Part that Attach to specifies. So if the Floating Line is Attach to the Previous Part, then the Previous Part comes first, then the transition and then the line. If the Floating Line is Attach to the Next Part, then the line comes first and then the transition, and the Next Part.</i>	measure box	available measures

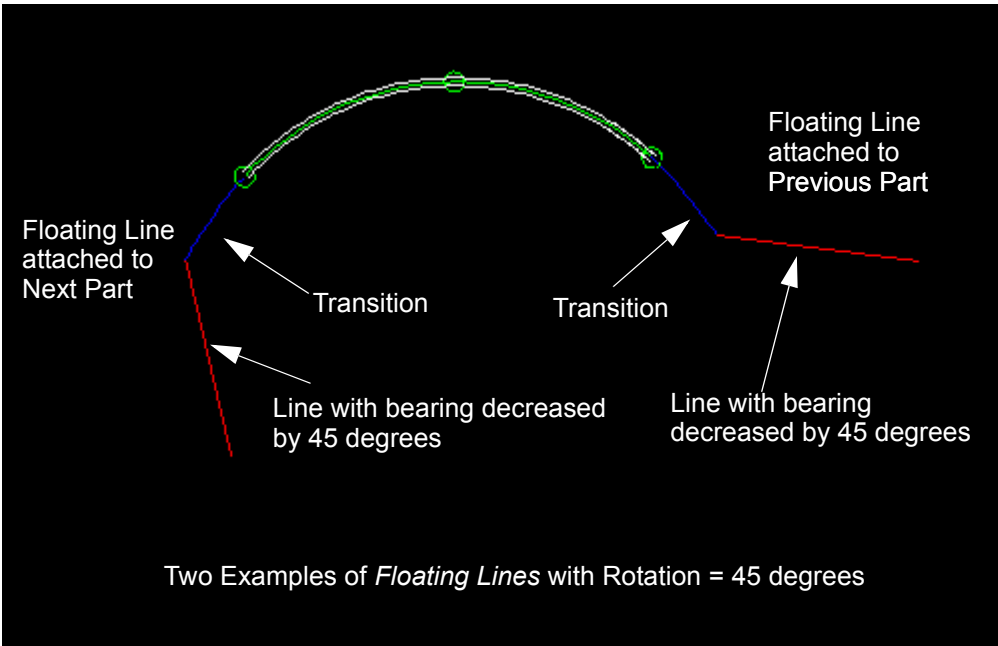
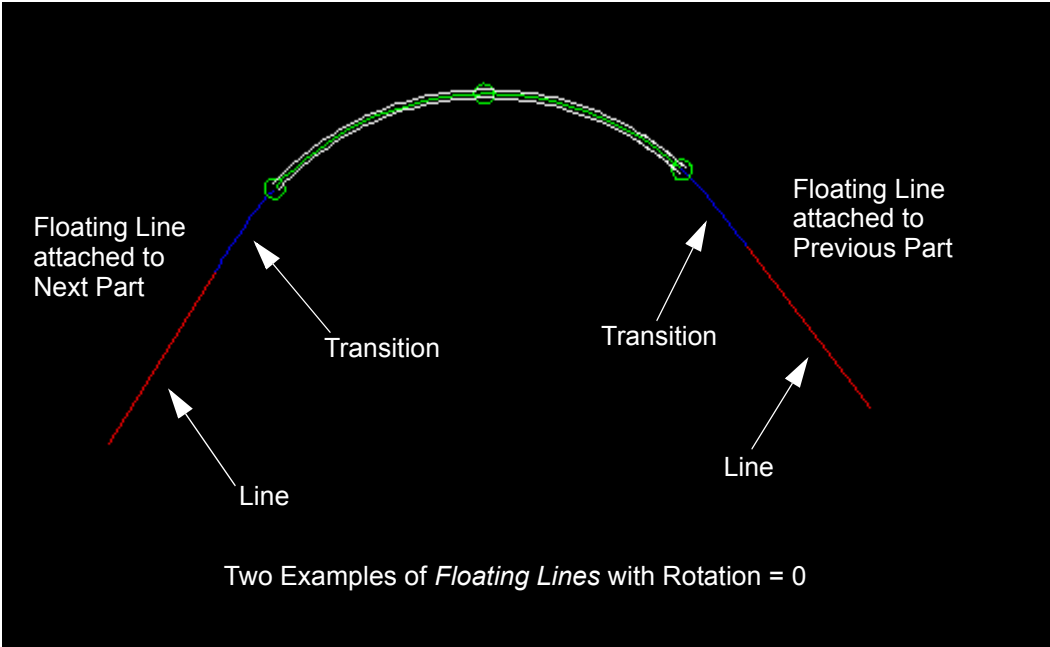
If blank, no transition curve is used

Attach to choice box previous part, next part
the Part that the Floating Line is attached to, and made tangential to. If there is a transition, it is at this end of the Floating line.

Comment tab
the text typed into the text box is stored as a comment for the Part.
Note: If a comment exists, a # is placed after the type of the part in the Horizontal Parts list.

Set button
the **Set** button must be clicked for the information for this Part to be used.

Same As button
not used for this Part



Free Line: No Constraints

The **Free Line** is not constrained. It is determined by having to be tangential to the Parts at either end of the Line.



Horizontal

Use ☒

Visible ☒

Name

Type

Geometry

Comment

Diagram

Leading transition

Trailing transition

Example:
Free line is a tangent from a previous fixed arc to the following fixed arc.

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use	tick box	ticked	
<i>if ticked, then the Part is used in the horizontal geometry. If not ticked, the Part is not used in the horizontal geometry.</i>			
Visible	tick box	ticked	
<i>if ticked, then the Part is drawn in the horizontal geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>			
Name	text box	blank	
<i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Horizontal Parts list.</i>			
Type	choice box		types of horizontal parts
<i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>			
Geometry tab <i>the geometrical information defining the Part</i>			
Leading transition	measure box		available measures
<i>if non zero, a transition curve of this length is at the beginning of the Free Line. If blank or 0, no leading transition curve is used.</i>			
Trailing transition	measure box		available measures
<i>if non zero, a transition curve of this length is at the end of the Free Line. If blank or 0, no trailing transition curve is used.</i>			
Comment tab <i>the text typed into the text box is stored as a comment for the Part. Note: If a comment exists, a # is placed after the type of the part in the Horizontal Parts list.</i>			

Set button

*the **Set** button must be clicked for the information for this Part to be used.*

Same As button

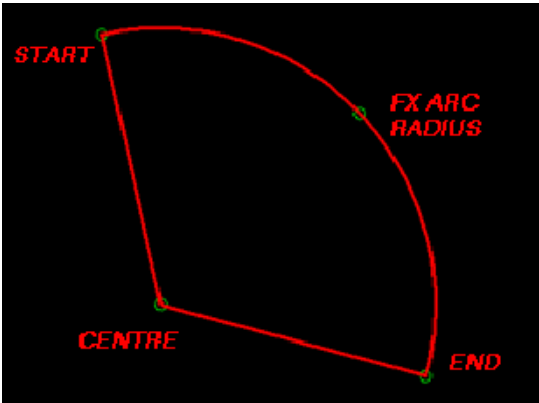
not used

Horizontal Arcs

See [Fixed Arc: Known Centre, Radius and Start and End](#)
See [Fixed Arc: Arc Passes through Three Known Points](#)

Fixed Arc: Known Centre, Radius and Start and End

The *Fixed Arc* is fully defined by a given offset from an arc with **known arc centre**, a **known radius** and **known start** and **end** points.



Offset:
-ve to the left of the arc: direction is start to end
+ve to the right of the arc

Same As Button:
Use the **Same As** button to select an existing arc from the screen

Horizontal

Use ☒

Visible ☒

Name

Type

Geometry | Comment | Diagram

Centre

X coordinate

Y coordinate

Radius

Start

X coordinate

Y coordinate

End

X coordinate

Y coordinate

Offset

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use	tick box	ticked	
<i>if ticked, then the Part is used in the horizontal geometry. If not ticked, the Part is not used in the horizontal geometry.</i>			
Visible	tick box	ticked	
<i>if ticked, then the Part is drawn in the horizontal geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>			
Name	text box	blank	
<i>if not blank, then the Part is given this name. If blank then the Part has no name.</i>			
<i>Note: If the part has a name, then a ! is placed after the type of the part in the Horizontal Parts list.</i>			

Type choice box types of horizontal parts
the type of this part. To change the Part type, choose another type from the pop-up list.

Geometry tab
the geometrical information defining the Part

Centre X coordinate, Y coordinate
*the centre (x,y) coordinates for the arc can be typed in, or selected using the **X**, **Y** or **XY** icons.*

Radius radius box Measure Radius
the radius of the arc. This can be typed in or selected using the Measure Radius pop-up.

Start X coordinate, Y coordinate
*the start (x,y) coordinates for the arc can be typed in, or selected using the **X**, **Y** or **XY** icons.*

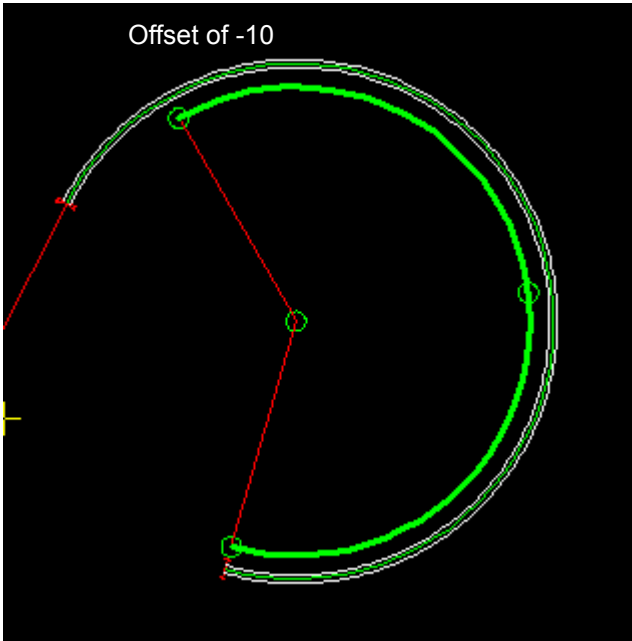
End X coordinate, Y coordinate
*the end (x,y) coordinates for the arc can be typed in, or selected using the **X**, **Y** or **XY** icons.*

Offset measure box Measure Length
offset of the Fixed Arc from the arc defined above by Centre, Radius, Start and End points
Positive offset is to the right of the arc going in the direction of the arc from Start point to End point.
Negative offset is to the left of the arc going in the direction of the arc from Start point to End point.

Comment tab
the text typed into the text box is stored as a comment for the Part.
***Note:** If a comment exists, a # is placed after the type of the part in the Horizontal Parts list.*

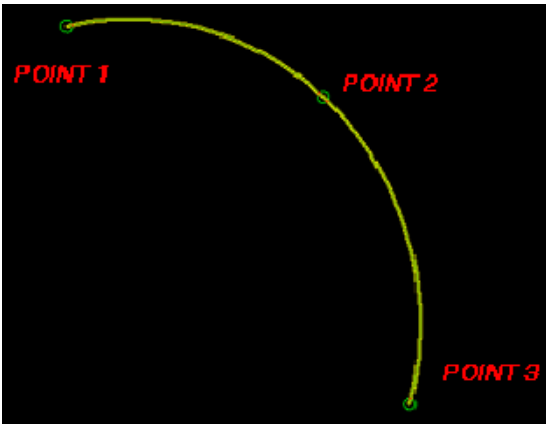
Set button
*the **Set** button must be clicked for the information for this Part to be used.*

Same As button
*after clicking the **Same As** button, an existing arc can be selected from the screen and its information piped into the appropriate fields in the panel.*



Fixed Arc: Arc Passes through Three Known Points

The *Fixed Arc* is fully defined by a given offset from an arc going through **three known points**.



Offset:

-ve to the left of the arc: direction is point 1 to 3
+ve to the right of the arc

Same As Button:

Use the **Same As** button to select an existing arc from the screen

Horizontal

Use☒

Visible☒

Name

TypeFx arc three points

GeometryCommentDiagram

Point 1

X coordinate

Y coordinate

Point 2

X coordinate

Y coordinate

Point 3

X coordinate

Y coordinate

Offset

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use	tick box	ticked	
<i>if ticked, then the Part is used in the horizontal geometry. If not ticked, the Part is not used in the horizontal geometry.</i>			
Visible	tick box	ticked	
<i>if ticked, then the Part is drawn in the horizontal geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>			
Name	text box	blank	
<i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Horizontal Parts list.</i>			
Type	choice box		types of horizontal parts
<i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>			

Geometry tab

the geometrical information defining the Part

Point 1 X coordinate, Y coordinate

*the (x,y) coordinates of the first point on the arc can be typed in, or selected using the **X**, **Y** or **XY** icons*

Point 2 X coordinate, Y coordinate

*the (x,y) coordinates of the second point on the arc can be typed in, or selected using the **X**, **Y** or **XY** icons*

Point 3 X coordinate, Y coordinate

*the (x,y) coordinates of the third point on the arc can be typed in, or selected using the **X**, **Y** or **XY** icons*

Offset

measure box

Measure Length

*offset of the Fixed Arc from the arc defined by the three points above.
Positive offset is to the right of the arc going in the direction of the arc from Point 1 to Point 3.
Negative offset is to the left of the arc going in the direction of the arc from Point 1 to Point 3.*

Comment tab

*the text typed into the text box is stored as a comment for the Part.
Note: If a comment exists, a # is placed after the type of the part in the Horizontal Parts list.*

Set

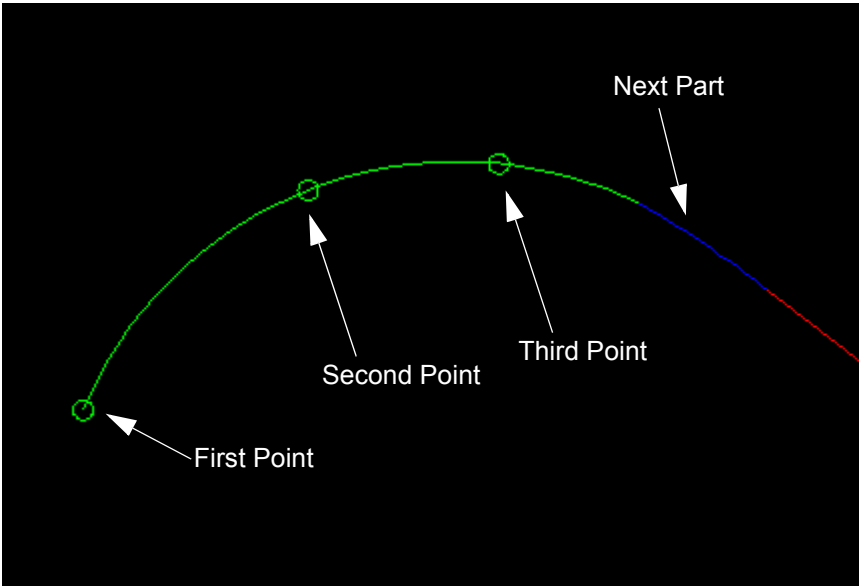
button

*the **Set** button must be clicked for the information for this Part to be used.*

Same As

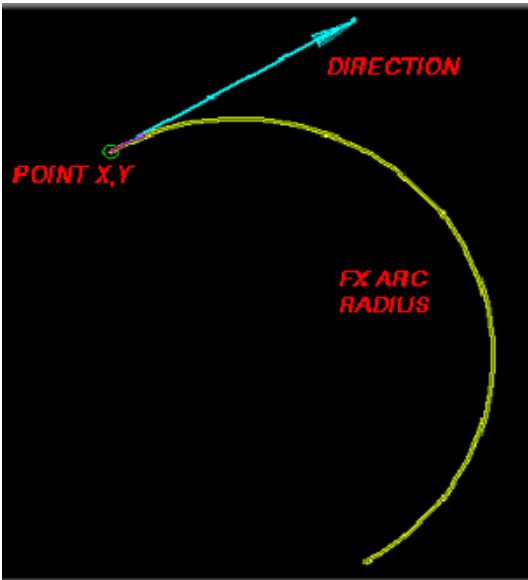
button

*after clicking the **Same As** button, an existing arc can be selected from the screen and its information piped into the appropriate fields in the panel.*



Fixed Arc: Known Start Point and Direction, Known Radius

The *Fixed Arc* is fully defined by a given offset from an arc **starting** at a **known point** with a **known direction** for the tangent to the arc at that point, and a **known radius**.



Horizontal

Use ☒

Visible ☒

Name

Type

Geometry | Comment | Diagram

Point

X coordinate

Y coordinate

Radius

Direction

Offset

Offset:

-ve to the left of the arc: direction is from given point
+ve to the right of the arc

Radius:

-ve to the left of direction
+ve to the right of the direction

Same As Button:

Use the **Same As** button to select an existing arc from the screen

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the horizontal geometry. If not ticked, the Part is not used in the horizontal geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the horizontal geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Horizontal Parts list.</i>	text box	blank	
Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box		types of horizontal parts

Geometry tab

the geometrical information defining the Part

X coordinate, Y coordinate

the (x,y) coordinates on the point on the arc can be typed in, or selected using the **X**, **Y** or **XY** icons.

- Radius

radius box

Measure Radius
- the radius of the arc. This can be typed in or selected using the Measure Radius pop-up.
- Direction

measure box

available measures
- the direction of the tangent of the point on the arc as a bearing can be typed in using [HP Notation](#) (dd.mmssss) or selected using the measure box.
- Offset

measure box

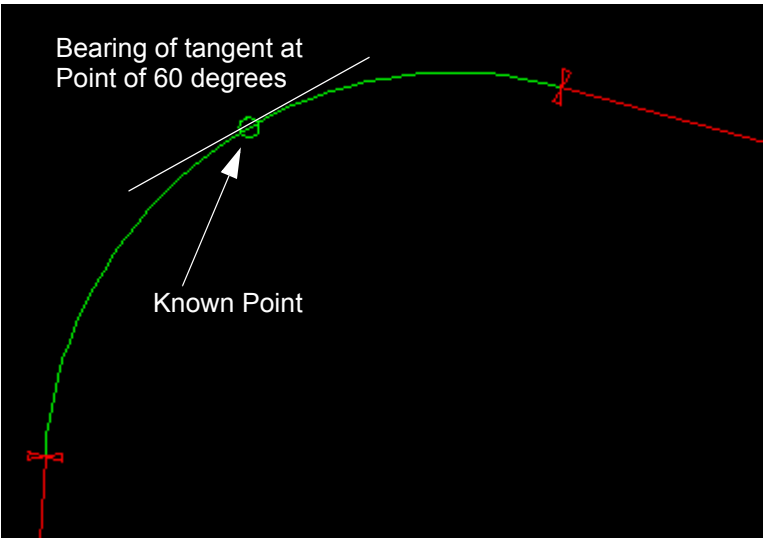
Measure Length
- offset of the Fixed Arc from the arc defined above by Point, Radius, and Direction (bearing) at Point. Positive offset is to the right of the arc going in the direction of the arc. Negative offset is to the left of the arc going in the direction of the arc.
- Comment tab

the text typed into the text box is stored as a comment for the Part.

Note: If a comment exists, a # is placed after the type of the part in the Horizontal Parts list.
- Set

button
- the **Set** button must be clicked for the information for this Part to be used.
- Same As

button
- after clicking the **Same As** button, an existing arc can be selected from the screen and its information piped into the appropriate fields in the panel.

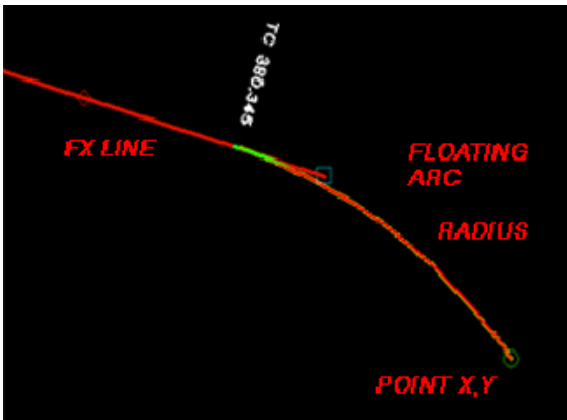


Floating Arc: Known Radius and Passes through a Known Point

The *Floating Arc* passes through a **known point** and has a **known radius**.

It may not always be possible for the *Floating Arc* to actually solve.

For example in the case where it follows a fixed line, if the perpendicular distance between the known point and the line is greater than the given radius, then there is no solution.



Example:
The Floating Arc may become fully defined when it is attached to a previous fixed line

Radius:
-ve to the left of direction
+ve to the right of the direction

Same As Button:
Use the **Same As** button to select an existing arc from the screen

Horizontal

Use☒

Visible☒

Name

TypeFI arc point & radius

GeometryCommentDiagram

Point

X coordinate

Y coordinate

Radius

Transition length

Attach toprevious part

Alternative solution☐

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the horizontal geometry. If not ticked, the Part is not used in the horizontal geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the horizontal geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Horizontal Parts list.</i>	text box	blank	
Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box		types of horizontal parts

Geometry tab
the geometrical information defining the Part

X coordinate, Y coordinate

*the (x,y) coordinates of the point on the arc can be typed in, or selected using the **X**, **Y** or **XY** icons.*

Radius radius box Measure Radius

the radius of the arc. This can be typed in or selected using the Measure Radius pop-up.

Transition length measure box available measures

*if non zero, a transition curve of this length is at the end of the Floating Arc that **Attach to** specifies.
If blank, no transition curve is used*

Attach to choice box previous part, next part

the Part that the Floating Arc is attached to, and made tangential to. If there is a transition, it is at this end of the Floating line.

Alternative solution tick box not ticked

*there can be two solutions. One solution is first shown.
If ticked, the other solution is shown.*

Comment tab

the text typed into the text box is stored as a comment for the Part.

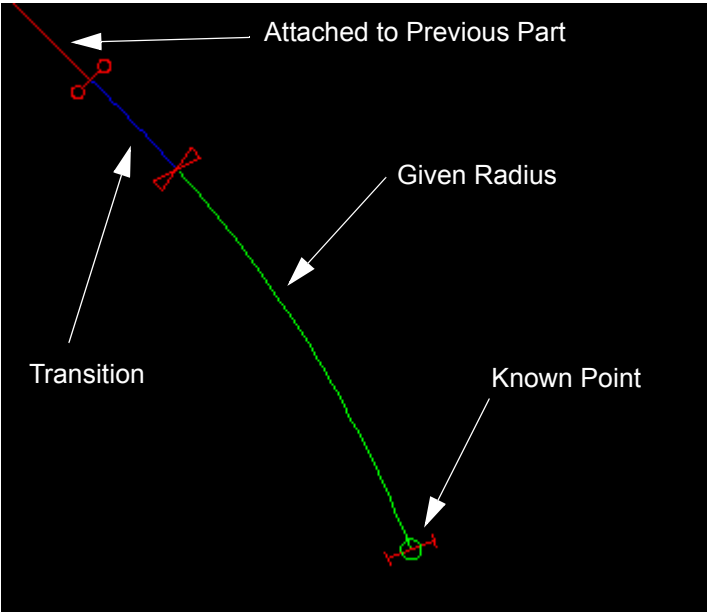
***Note:** If a comment exists, a # is placed after the type of the part in the Horizontal Parts list.*

Set button

*the **Set** button must be clicked for the information for this Part to be used.*

Same As button

*after clicking the **Same As** button, an existing arc can be selected from the screen and its information piped into the appropriate fields in the panel.*

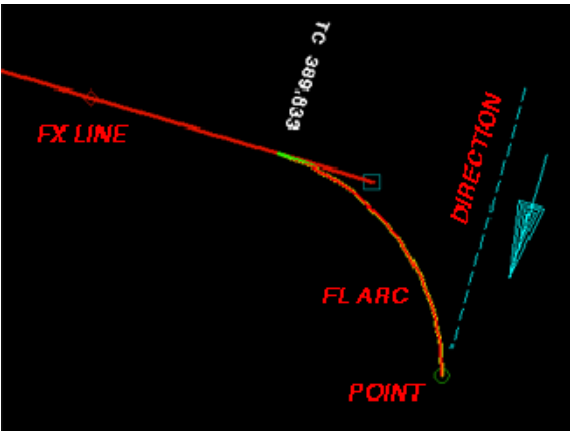


Floating Arc: Known Point and Tangent Direction at the Point

The *Floating Arc* passes through a **known point** and has a **known direction** for the **tangent** to the arc at the **known point**.

It may not always be possible for the *Floating Arc* to actually solve.

For example in the case where it follows a fixed line, if the perpendicular distance between the known point and the line is greater than the given radius, then there is no solution.



Example:
The Floating Arc may become fully defined when it is attached to a previous fixed line

Radius:
-ve to the left of direction
+ve to the right of the direction

Same As Button:
Use the **Same As** button to select an existing arc from the screen

Horizontal

Use☒

Visible☒

Name

TypeFl arc point & direction

Geometry | Comment | Diagram

Point

X coordinate

Y coordinate

Direction

Attach toprevious part

Alternative solution☐

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the horizontal geometry. If not ticked, the Part is not used in the horizontal geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the horizontal geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Horizontal Parts list.</i>	text box	blank	
Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box		types of horizontal parts

Geometry tab
the geometrical information defining the Part

X coordinate, Y coordinate

*the (x,y) coordinates for the point on the arc can be typed in, or selected using the **X**, **Y** or **XY** icons.*

Direction

measure box

available measures

the direction of the tangent of the point on the arc as a bearing can be typed in using [HP Notation](#) (dd.mmssss) or selected using the measure box.

Attach to

choice box

previous part, next part

the Part that the Floating Arc is attached to, and made tangential to.

Alternative solution

tick box

not ticked

there can be two solutions. One solution is first shown.

If ticked, the other solution is shown.

Comment tab

the text typed into the text box is stored as a comment for the Part.

***Note:** If a comment exists, a # is placed after the type of the part in the Horizontal Parts list.*

Set

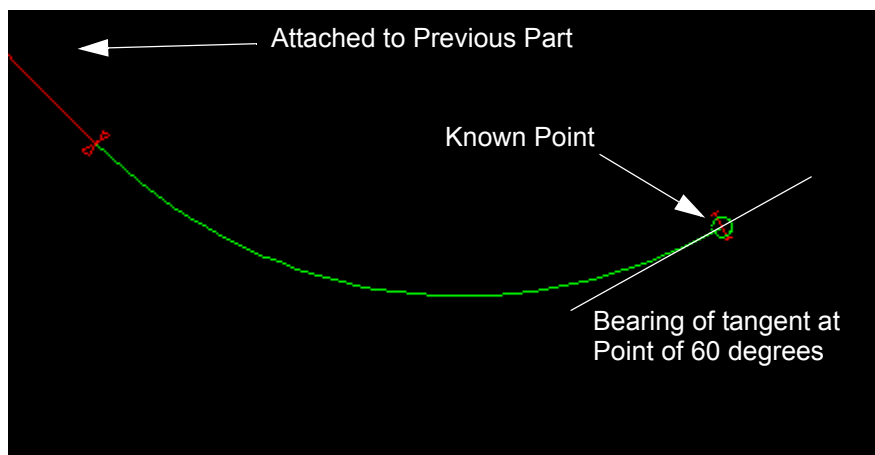
button

*the **Set** button must be clicked for the information for this Part to be used.*

Same As

button

*after clicking the **Same As** button, an existing arc can be selected from the screen and its information piped into the appropriate fields in the panel.*

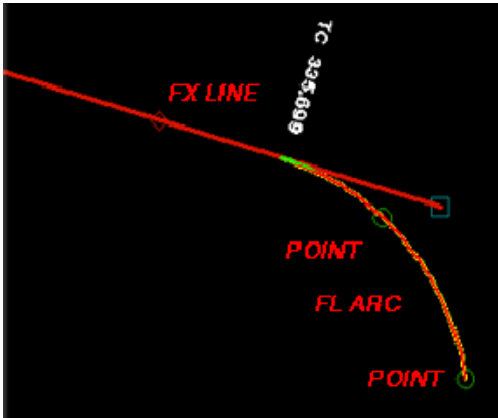


Floating Arc: Arc Passes through Two known Points

The *Floating Arc* passes through **two known points**.

It may not always be possible for the *Floating Arc* to actually solve.

For example in the case where it follows a fixed line and the two known points are on the lines, then there is no solution.



Example:
The Floating Arc may become fully defined when it is attached to a previous fixed line

Same As Button:
Use the **Same As** button to select an existing arc from the screen

Horizontal

Use☒

Visible☒

Name

TypeFI arc two points

Geometry

Comment

Diagram

Start

X coordinate

Y coordinate

End

X coordinate

Y coordinate

Transition length

Attach toprevious part

Alternative solution☐

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use	tick box	ticked	
<i>if ticked, then the Part is used in the horizontal geometry. If not ticked, the Part is not used in the horizontal geometry.</i>			
Visible	tick box	ticked	
<i>if ticked, then the Part is drawn in the horizontal geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>			
Name	text box	blank	
<i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Horizontal Parts list.</i>			
Type	choice box		types of horizontal parts
<i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>			
Geometry tab			
<i>the geometrical information defining the Part</i>			

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Placing Parts for Super Alignments

Start X coordinate, Y coordinate

*the (x,y) coordinates of the first point on the arc can be typed in, or selected using the **X**, **Y** or **XY** icons*

End X coordinate, Y coordinate

*the (x,y) coordinates of the second point on the arc can be typed in, or selected using the **X**, **Y** or **XY** icons*

Transition length

measure box

available measures

*if non zero, a transition curve of this length is at the end of the Floating Arc that **Attach to** specifies.
If blank, no transition curve is used*

Attach to

choice box

previous part, next part

the Part that the Floating Arc is attached to, and made tangential to. If there is a transition, it is at this end of the Floating line.

Alternative solution

tick box

not ticked

*there can be two solutions. One solution is first shown.
If ticked, the other solution is shown.*

Comment tab

the text typed into the text box is stored as a comment for the Part.

***Note:** If a comment exists, a **#** is placed after the type of the part in the Horizontal Parts list.*

Set

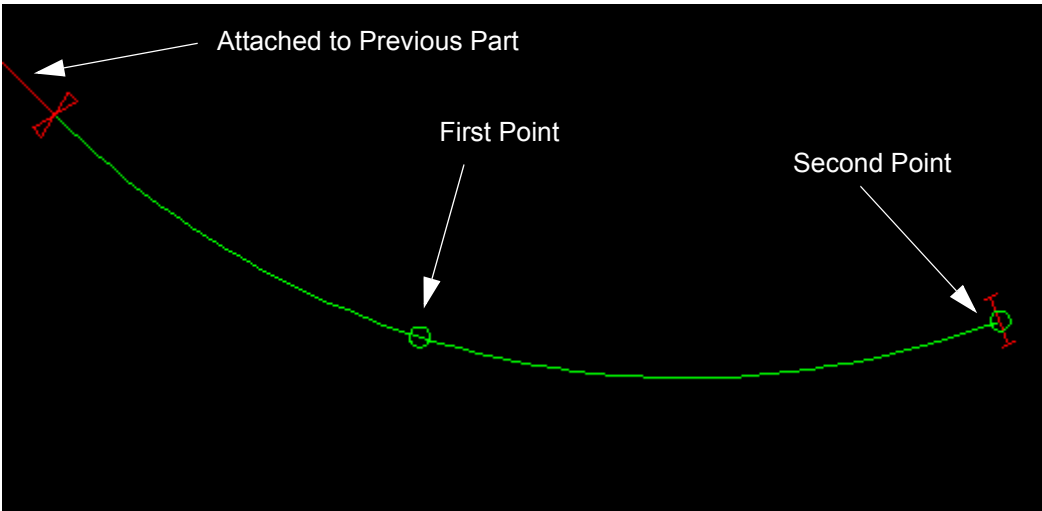
button

*the **Set** button must be clicked for the information for this Part to be used.*

Same As

button

*after clicking the **Same As** button, an existing arc can be selected from the screen and its information piped into the appropriate fields in the panel.*

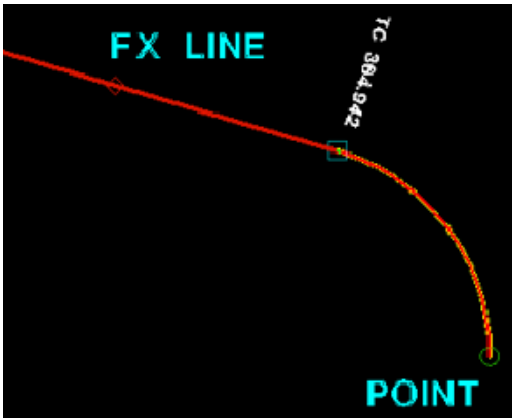


Floating Arc: Arc Passes through Known point and End of Previous or Next Element

The *Floating Arc* is attached to the actual end of the previous or next element and also passes through a **known point**.

It may not always be possible for the *Floating Arc* to actually solve.

For example in the case where it follows a fixed line and the known point is on the line, then there is no solution.



Example:
The Float Arcing may become fully defined when it is attached to a previous fixed line

Horizontal

Use☒

Visible☒

Name

TypeFI arc from end through point

Geometry

Comment

Diagram

Point

X coordinate

Y coordinate

Attach toprevious part

Same As Button:
Use the **Same As** button to select an existing arc from the screen

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use	tick box	ticked	
<i>if ticked, then the Part is used in the horizontal geometry. If not ticked, the Part is not used in the horizontal geometry.</i>			
Visible	tick box	ticked	
<i>if ticked, then the Part is drawn in the horizontal geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>			
Name	text box	blank	
<i>if not blank, then the Part is given this name. If blank then the Part has no name.</i>			
<i>Note: If the part has a name, then a ! is placed after the type of the part in the Horizontal Parts list.</i>			
Type	choice box		types of horizontal parts
<i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>			

Geometry tab
the geometrical information defining the Part

X coordinate, Y coordinate

*the (x,y) coordinates of a point on the arc can be typed in, or selected using the **X**, **Y** or **XY** icons*

Attach to choice box previous part, next part
the Part that the Floating Arc is attached to, and made tangential to.

Comment tab

the text typed into the text box is stored as a comment for the Part.

***Note:** If a comment exists, a # is placed after the type of the part in the Horizontal Parts list.*

Set button

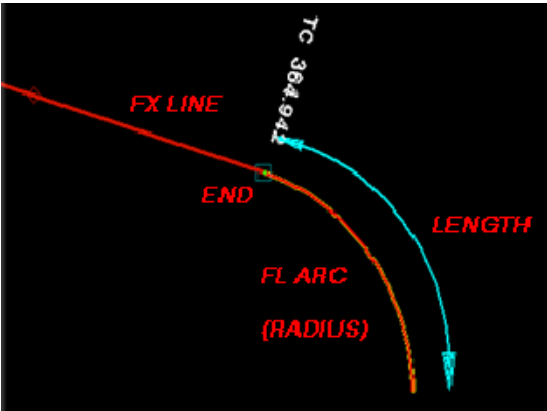
*the **Set** button must be clicked for the information for this Part to be used.*

Same As button

*after clicking the **Same As** button, an existing arc can be selected from the screen and its information piped into the appropriate fields in the panel.*

Floating Arc: Arc has Know Radius and Length, and End of Previous or Next Element

The *Floating Arc* is attached to the actual **end of** the previous or next **element** and also has a **known radius** and **known length**.



Horizontal

Use

☒

Visible

☒

Name

abc

Type

Fl arc from end, radius & length

Geometry

Comment

Diagram

Radius

Length

Transition length

Attach to

previous part

Example:

The Floating Arc may become fully defined when it is attached to a previous fixed line

Radius:

- ve to the left of direction of travel
- +ve to the right of the direction of travel

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use	tick box	ticked	
<i>if ticked, then the Part is used in the horizontal geometry. If not ticked, the Part is not used in the horizontal geometry.</i>			
Visible	tick box	ticked	
<i>if ticked, then the Part is drawn in the horizontal geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>			
Name	text box	blank	
<i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Horizontal Parts list.</i>			
Type	choice box		types of horizontal parts
<i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>			

Geometry tab

the geometrical information defining the Part

Radius	radius box	Measure Radius
<i>the radius of the arc. This can be typed in or selected using the Measure Radius pop-up.</i>		
Length	measure box	Measure Length
<i>the length of the arc.</i>		
Transition length	measure box	available measures
<i>if non zero, a transition curve of this length is at the end of the Floating Arc that Attach to specifies.</i>		

If blank, no transition curve is used

Attach to choice box previous part, next part

the Part that the Floating Arc is attached to, and made tangential to. If there is a transition, it is at this end of the Floating line.

Comment tab

the text typed into the text box is stored as a comment for the Part.

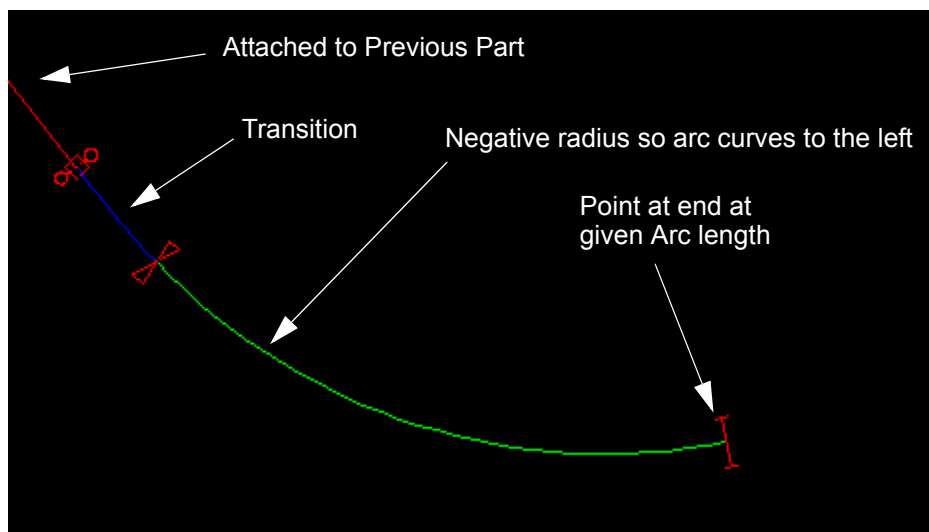
***Note:** If a comment exists, a # is placed after the type of the part in the Horizontal Parts list.*

Set button

*the **Set** button must be clicked for the information for this Part to be used.*

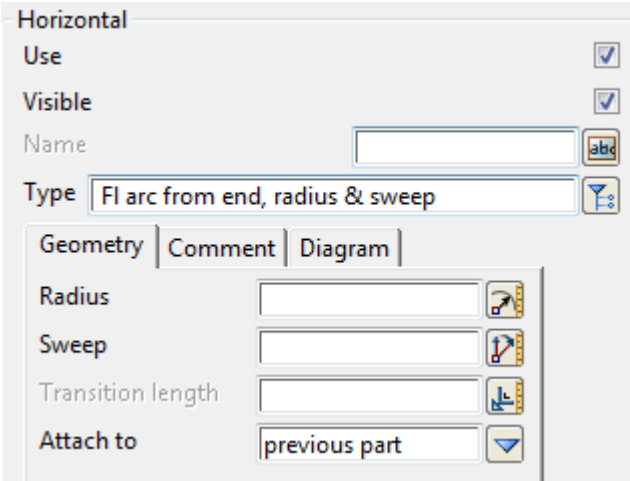
Same As button

*after clicking the **Same As** button, an existing arc can be selected from the screen and its information piped into the appropriate fields in the panel.*



Floating Arc: Arc has Know Radius and Sweep Angle, and End of Previous or Next Element

The *Floating Arc* is attached to the actual **end of** the previous or next **element**, has a **known radius** and **known sweep angle**.



Example:
The Floating Arc may become fully defined when it is attached to a previous fixed line

Radius:
-ve to the left of direction of travel
+ve to the right of the direction of travel

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the horizontal geometry. If not ticked, the Part is not used in the horizontal geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the horizontal geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Horizontal Parts list.</i>	text box	blank	
Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box		types of horizontal parts

Geometry tab
the geometrical information defining the Part

Radius <i>the radius of the arc. This can be typed in or selected using the Measure Radius pop-up.</i>	radius box	Measure Radius
Sweep <i>the angle in degrees in <u>HP Notation</u> (dd.mm.ssss)that the arc sweep through</i>	measure box	available measures

- Transition length

measure box

available measures
- if non zero, a transition curve of this length is at the end of the Floating Arc that **Attach to** specifies.*

If blank, no transition curve is used
- Attach to

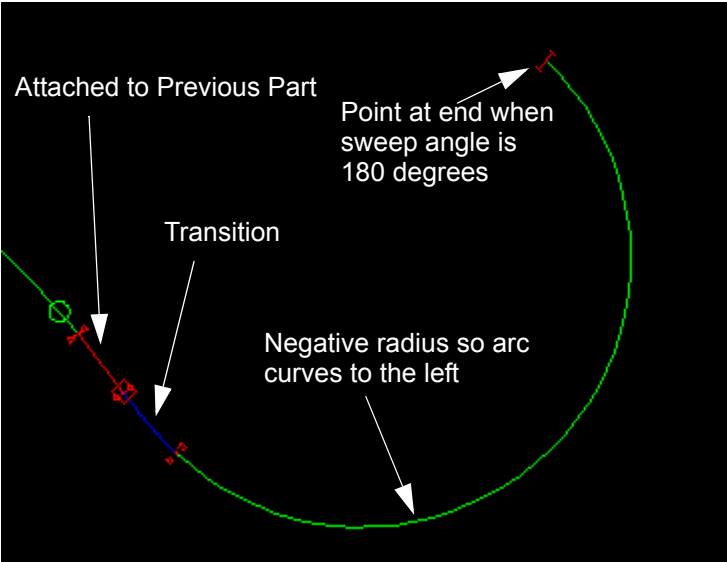
choice box

previous part, next part
- the Part that the Floating Arc is attached to, and made tangential to. If there is a transition, it is at this end of the Floating line.*
- Comment tab
- the text typed into the text box is stored as a comment for the Part.*

***Note:** If a comment exists, a # is placed after the type of the part in the Horizontal Parts list.*
- Set

button
- the **Set** button must be clicked for the information for this Part to be used.*
- Same As

button
- after clicking the **Same As** button, an existing arc can be selected from the screen and its information piped into the appropriate fields in the panel.*

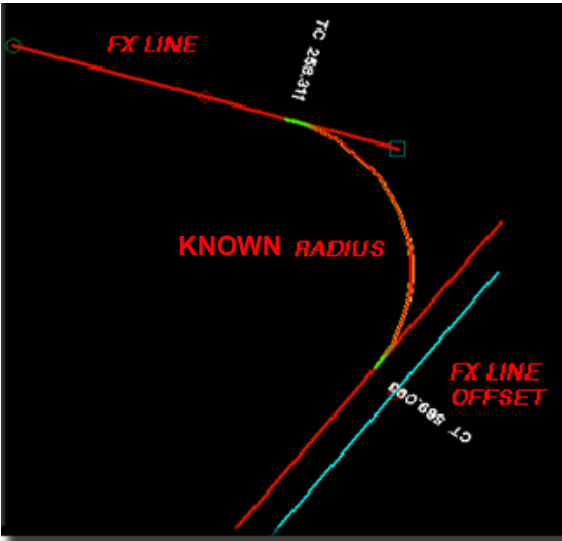


Free Arc: Known Radius

The *Free Arc* has a **known radius**.

It may not always be possible for the *Free Arc* to actually solve.

For example in the case where the *Free Arc* is between two fixed lines and the two lines are on top of each other.



Example:
The *Free Arc* become fully defined when it is placed between two fixed lines

Horizontal

Use☒

Visible☒

Name

TypeFr arc radius

GeometryCommentDiagram

Radius

Leading transition

Trailing transition

Alternative solution☐

Radius:
-ve to the left of direction of travel
+ve to the right of the direction of travel

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the horizontal geometry. If not ticked, the Part is not used in the horizontal geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the horizontal geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Horizontal Parts list.</i>	text box	blank	
Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box		types of horizontal parts

Geometry tab
the geometrical information defining the Part

Radius <i>the radius of the arc. This can be typed in or selected using the Measure Radius pop-up.</i>	radius box	Measure Radius
Leading transition <i>if non zero, a leading transition curve of this length is at the start of the Free Arc.</i>	measure box	available measures

If blank or zero, no leading transition curve is used

Trailing transition measure box available measures
*if non zero, a trailing transition curve of this length is at the end of the Free Arc.
 If blank or zero, no trailing transition curve is used.*

Alternative solution tick box not ticked
*there can be two solutions. One solution is shown first.
 If ticked, the other solution is shown.*

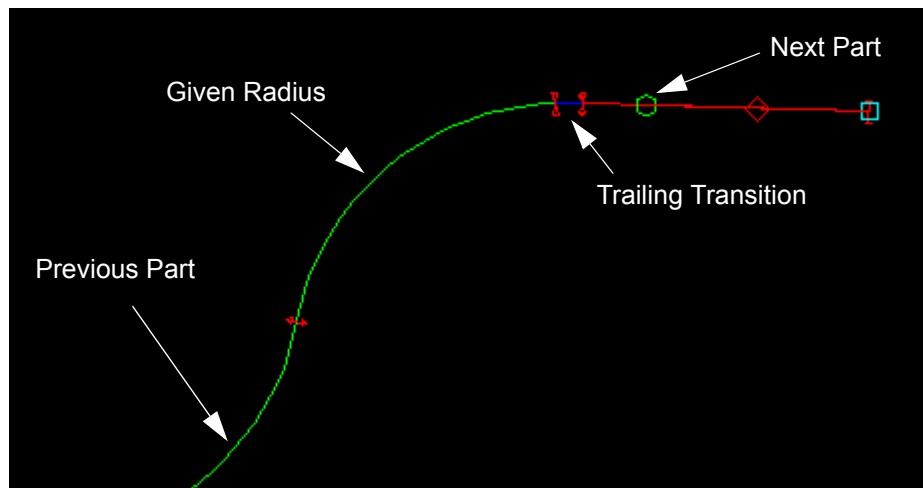
Comment tab

the text typed into the text box is stored as a comment for the Part.

***Note:** If a comment exists, a # is placed after the type of the part in the Horizontal Parts list.*

Set button
*the **Set** button must be clicked for the information for this Part to be used.*

Same As button
*after clicking the **Same As** button, an existing arc can be selected from the screen and its information piped into the appropriate fields in the panel.*

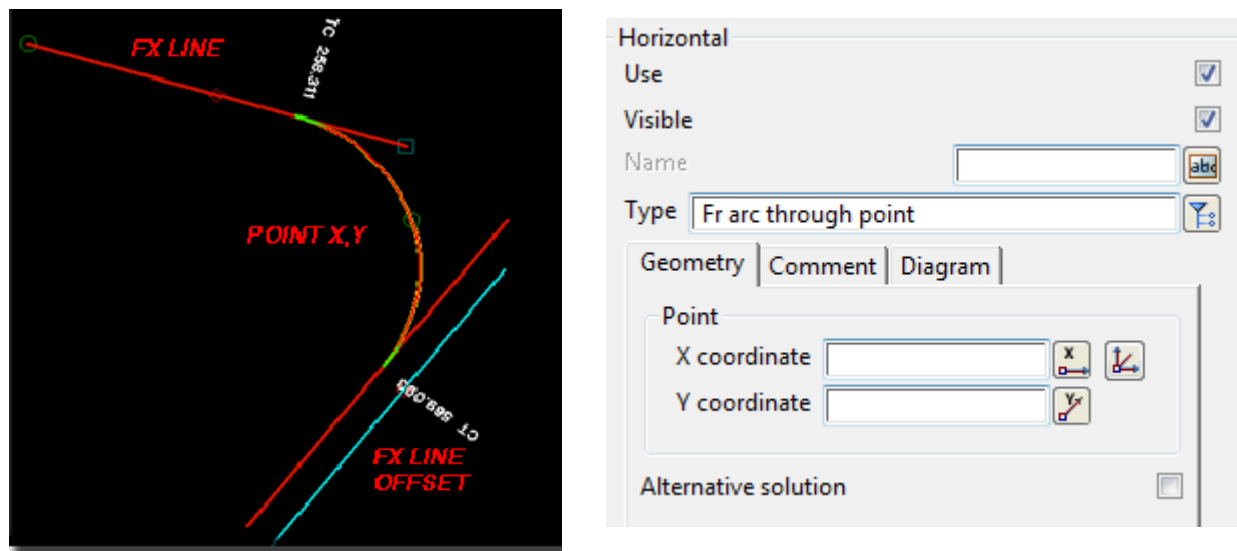


Free Arc: Passes through Known Point

The *Free Arc* passes through a **known point**.

It may not always be possible for the *Free Arc* to actually solve.

For example in the case where the *Free Arc* is between two fixed lines and the two lines are on top of each other.



Example:
The *Free Arc* become fully defined when it is placed between two fixed lines

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use	tick box	ticked	
<i>if ticked, then the Part is used in the horizontal geometry.</i> <i>If not ticked, the Part is not used in the horizontal geometry.</i>			
Visible	tick box	ticked	
<i>if ticked, then the Part is drawn in the horizontal geometry.</i> <i>If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>			
Name	text box	blank	
<i>if not blank, then the Part is given this name.</i> <i>If blank then the Part has no name.</i> Note: <i>If the part has a name, then a ! is placed after the type of the part in the Horizontal Parts list.</i>			
Type	choice box		types of horizontal parts
<i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>			
Geometry tab <i>the geometrical information defining the Part</i>			
X coordinate, Y coordinate <i>the (x,y) coordinates of a point on the arc can be typed in, or selected using the X, Y or XY icons.</i>			
Alternative solution	tick box	not ticked	
<i>there can be two solutions. One solution is shown first.</i>			

If ticked, the other solution is shown.

Comment tab

the text typed into the text box is stored as a comment for the Part.

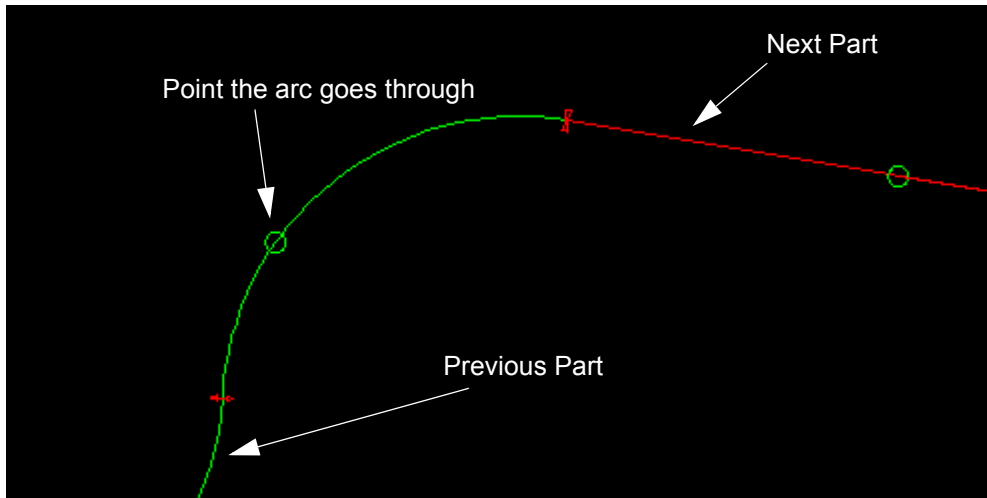
Note: *If a comment exists, a # is placed after the type of the part in the Horizontal Parts list.*

Set button

*the **Set** button must be clicked for the information for this Part to be used.*

Same As button

*after clicking the **Same As** button, an existing arc can be selected from the screen and its information piped into the appropriate fields in the panel.*

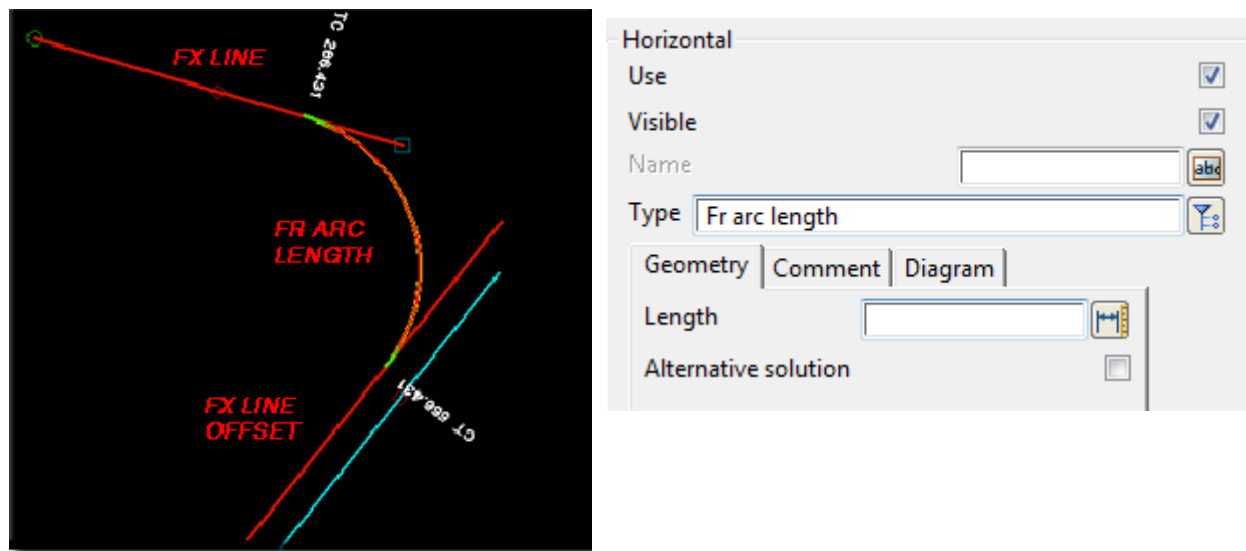


Free Arc: Arc has a Known Length

The *Free Arc* has a **known length**.

It may not always be possible for the *Free Arc* to actually solve.

For example in the case where the *Free Arc* is between two fixed lines and the two lines are on top of each other.



Example:
The *Free Arc* become fully defined when it is placed between two fixed lines

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the horizontal geometry. If not ticked, the Part is not used in the horizontal geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the horizontal geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Horizontal Parts list.</i>	text box	blank	
Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box		types of horizontal parts
Geometry tab <i>the geometrical information defining the Part</i>			
Length <i>the length of the arc. This can be typed in or selected using the Measure Length pop-up.</i>	length box		Measure Length

Alternative solution tick box not ticked

there can be two solutions. One solution is shown first.

If ticked, the other solution is shown.

Comment tab

the text typed into the text box is stored as a comment for the Part.

***Note:** If a comment exists, a # is placed after the type of the part in the Horizontal Parts list.*

Set button

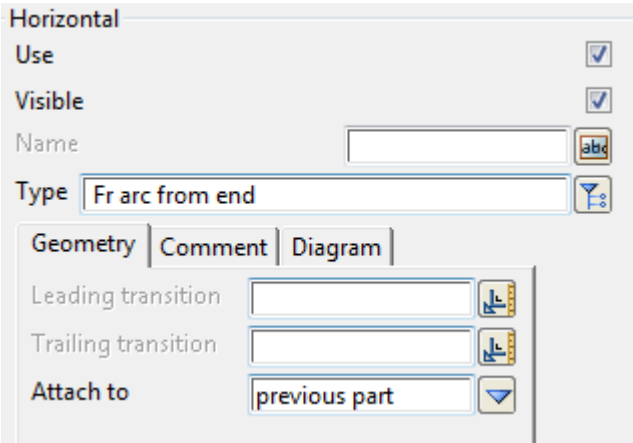
*the **Set** button must be clicked for the information for this Part to be used.*

Same As button

*after clicking the **Same As** button, an existing arc can be selected from the screen and its information piped into the appropriate fields in the panel.*

Free Arc: Arc has a Known End Point

The *Floating Arc* is attached to a **known end point** of a Previous or Next **Part**.



Example:
The Free Arc become fully defined when it is placed between two fixed lines

The fields and buttons used in the panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Use		tick box	ticked	
	<i>if ticked, then the Part is used in the horizontal geometry. If not ticked, the Part is not used in the horizontal geometry.</i>			
Visible		tick box	ticked	
	<i>if ticked, then the Part is drawn in the horizontal geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>			
Name		text box	blank	
	<i>if not blank, then the Part is given this name. If blank then the Part has no name.</i>			
	<i>Note: If the part has a name, then a ! is placed after the type of the part in the Horizontal Parts list.</i>			
Type		choice box		types of horizontal parts
	<i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>			

Geometry tab

the geometrical information defining the Part

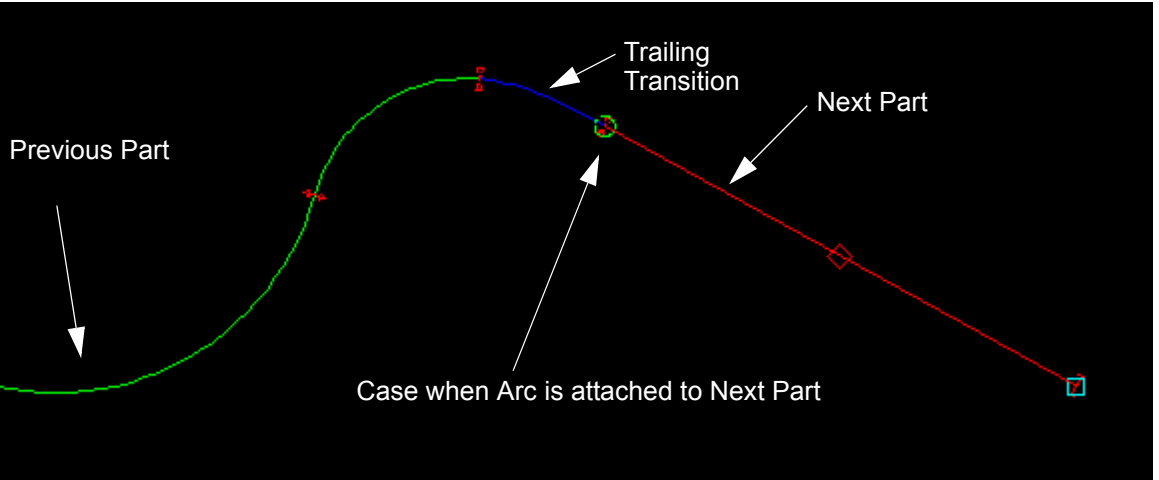
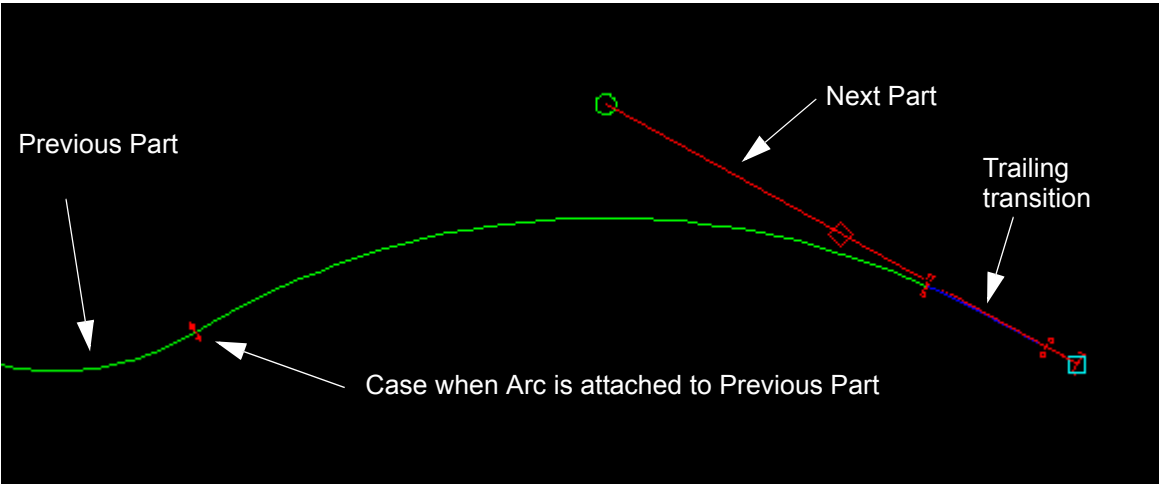
Leading transition	measure box	available measures
	<i>if non zero, a leading transition curve of this length is at the start of the Free Arc. If blank or zero, no leading transition curve is used</i>	
Trailing transition	measure box	available measures
	<i>if non zero, a trailing transition curve of this length is at the end of the Free Arc. If blank or zero, no trailing transition curve is used.</i>	

Attach to choice box previous part, next part
the Part that the Free Arc is attached to.

Comment tab
the text typed into the text box is stored as a comment for the Part.
Note: If a comment exists, a # is placed after the type of the part in the Horizontal Parts list.

Set button
the **Set** button must be clicked for the information for this Part to be used.

Same As button
after clicking the **Same As** button, an existing arc can be selected from the screen and its information piped into the appropriate fields in the panel.

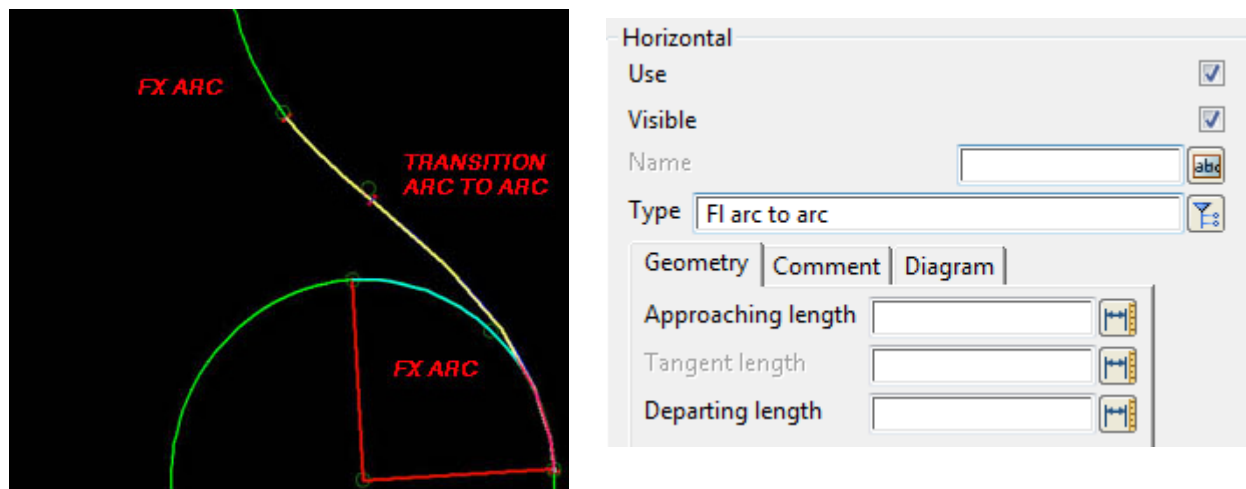


Horizontal Transitions

- See [Floating Transition: From Arc to Arc](#)
- See [Floating Transition: Taper](#)
- See [Floating Transition: Known Length](#)
- See [Free Transition: Unconstrained](#)
- See [Free Transition: Back to Back Transitions of Known Lengths Between Lines](#)
- See [Free Transition: Back to Back Transitions Between Two Arcs](#)
- See [Free Taper: Taper of Known Length](#)
- See [Compound Transitions: Three Centre Curve](#)
- See [Compound Transition: Two Centred Curve](#)
- See [Compound Transition: Two Transition Curves of Known Lengths](#)
- See [Compound Transition: Two Transitions Separated by Line of Known Length](#)
- See [Compound Transition: Two Arcs of Known Radii](#)
- See [Compound Transition: Two Arcs of Known Radii with a Taper](#)

Floating Transition: From Arc to Arc

The *Floating Transition* consists of one or two **transition curves** going **between two arcs**.



Example:
The Floating Transition become fully defined when it is placed between two arcs

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the horizontal geometry. If not ticked, the Part is not used in the horizontal geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the horizontal geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	

Name text box blank

*if not blank, then the Part is given this name.
If blank then the Part has no name.*

***Note:** If the part has a name, then a **!** is placed after the type of the part in the Horizontal Parts list.*

Type choice box types of horizontal parts
the type of this part. To change the Part type, choose another type from the pop-up list.

Geometry tab
the geometrical information defining the Part

Approaching length measure box Measure Length
*the length of the leading transition curve at the start of the Floating Transition. This must be non zero.
This will be tangential to the Previous Part.*

Tangent length length box Measure Length
*if non zero, a straight of this length is placed between the two transition curves.
This will be tangential to the Previous Part.*

Departing length measure box Measure Length
*the length of the trailing transition curve at the end of the Floating Transition. This must be non zero.
This will be tangential to the Next Part.*

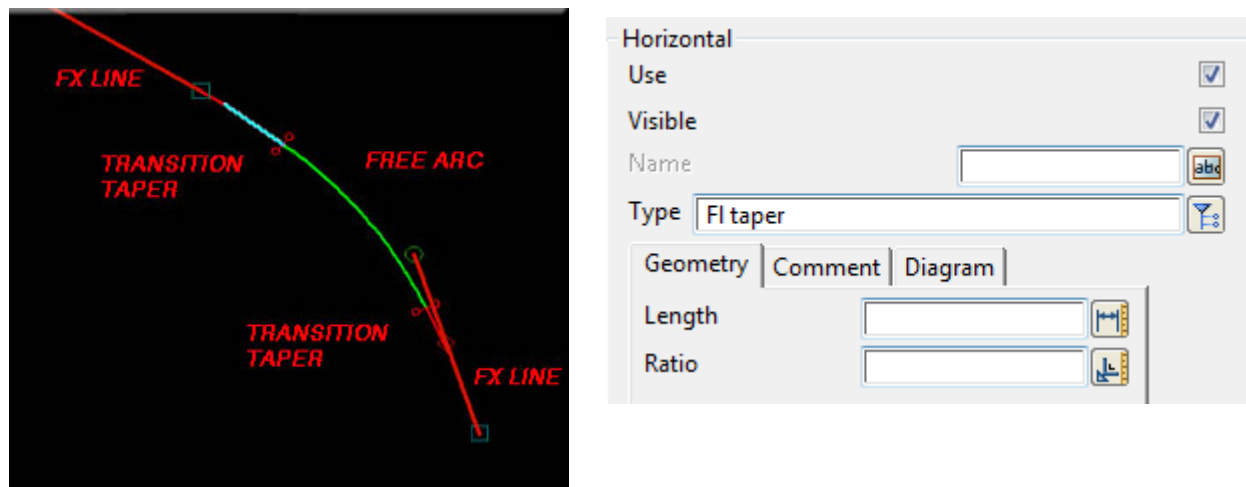
Comment tab
*the text typed into the text box is stored as a comment for the Part.
Note: If a comment exists, a **#** is placed after the type of the part in the Horizontal Parts list.*

Set button
*the **Set** button must be clicked for the information for this Part to be used.*

Same As button

Floating Transition: Taper

The *Floating Transition* consists of.



Example:
The Floating Taper become fully defined when it is placed between two fixed lines

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use	tick box	ticked	
<i>if ticked, then the Part is used in the horizontal geometry. If not ticked, the Part is not used in the horizontal geometry.</i>			
Visible	tick box	ticked	
<i>if ticked, then the Part is drawn in the horizontal geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>			
Name	text box	blank	
<i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Horizontal Parts list.</i>			
Type	choice box		types of horizontal parts
<i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>			
Geometry tab <i>the geometrical information defining the Part</i>			
Length	length box		Point to point, String to point
Ratio	measure box		available measures
Comment tab <i>the text typed into the text box is stored as a comment for the Part. Note: If a comment exists, a # is placed after the type of the part in the Horizontal Parts list.</i>			

Set button

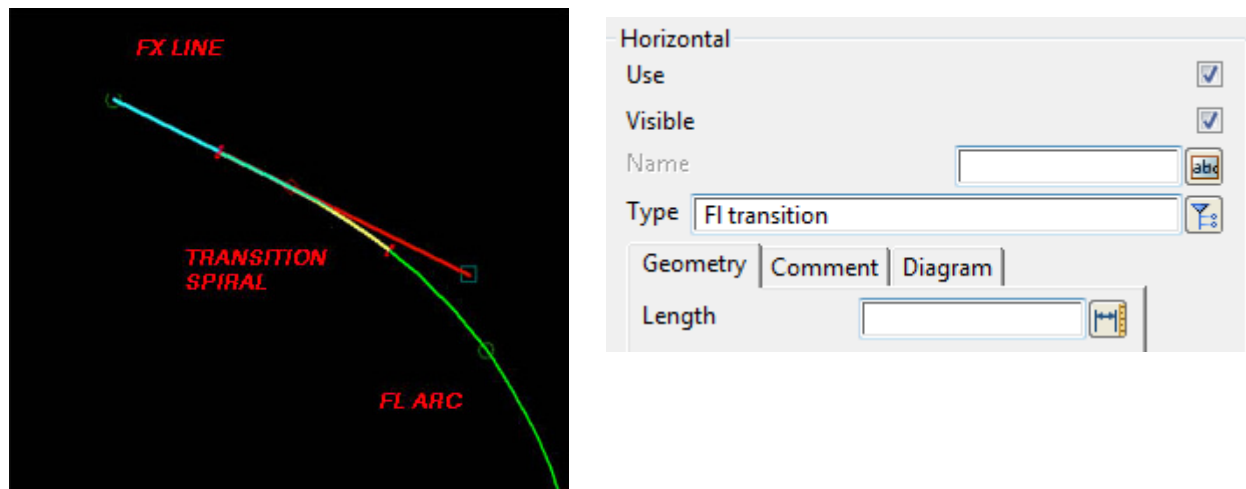
*the **Set** button must be clicked for the information for this Part to be used.*

Same As button

*after clicking the **Same As** button, an existing HIP can be selected from the screen and its information piped into the appropriate fields in the panel.*

Floating Transition: Known Length

The *Floating Transition* consists of a **transition curve** of **known length**.



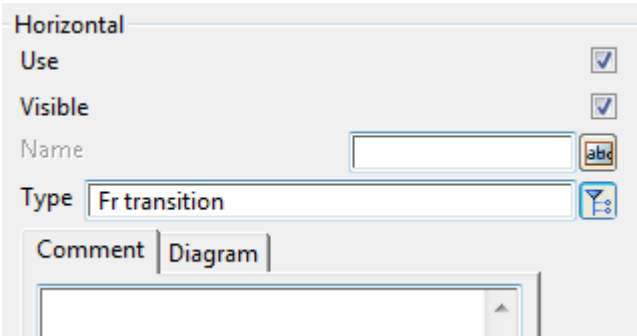
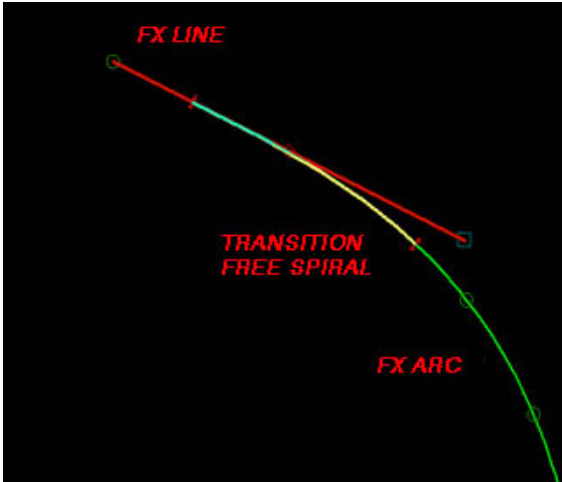
Example:
The Floating Transition become fully defined when it is placed between a fixed line and a floating arc

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the horizontal geometry. If not ticked, the Part is not used in the horizontal geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the horizontal geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Horizontal Parts list.</i>	text box	blank	
Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box		types of horizontal parts
Geometry tab <i>the geometrical information defining the Part</i>			
Length <i>the length of the transition. This must be non zero.</i>	length box		Measure Length
Comment tab <i>the text typed into the text box is stored as a comment for the Part. Note: If a comment exists, a # is placed after the type of the part in the Horizontal Parts list.</i>			
Set <i>the Set button must be clicked for the information for this Part to be used.</i>	button		
Same As	button		

Free Transition: Unconstrained

The *Free Transition* is unconstrained.



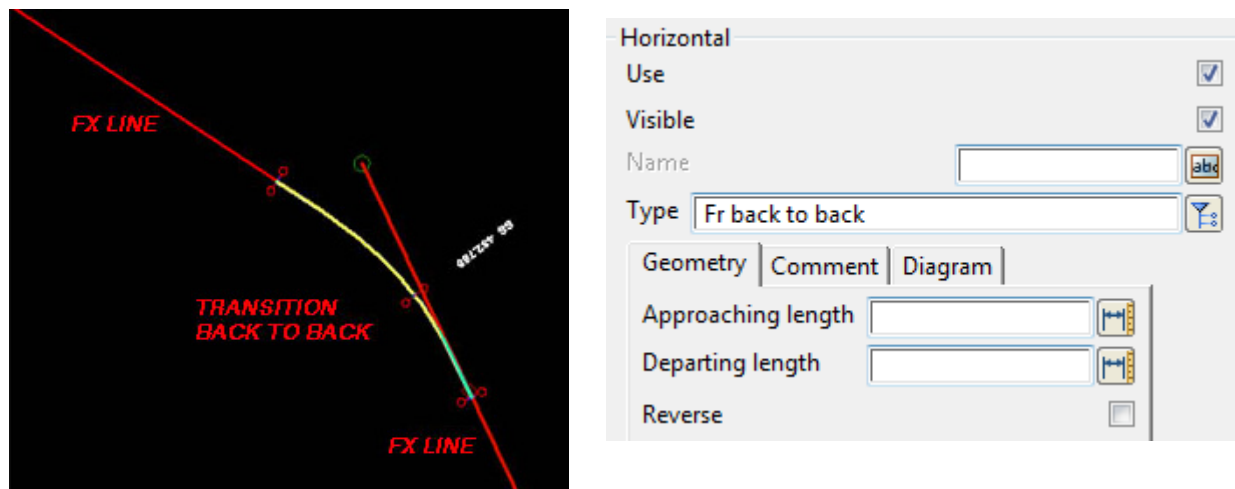
Example:
The Free Transition become fully defined when it is placed between a fixed line and a fixed arc

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use	tick box	ticked	
<i>if ticked, then the Part is used in the horizontal geometry. If not ticked, the Part is not used in the horizontal geometry.</i>			
Visible	tick box	ticked	
<i>if ticked, then the Part is drawn in the horizontal geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>			
Name	text box	blank	
<i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Horizontal Parts list.</i>			
Type	choice box		types of horizontal parts
<i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>			
Comment tab <i>the text typed into the text box is stored as a comment for the Part. Note: If a comment exists, a # is placed after the type of the part in the Horizontal Parts list.</i>			
Set	button		
<i>the Set button must be clicked for the information for this Part to be used.</i>			
Same As	button		

Free Transition: Back to Back Transitions of Known Lengths Between Lines

The *Free Transition* consists of a **two back to back transitions** of **known lengths between two lines**. The transitions can be the same hand or reversed.



Example:
The Free Transition become fully defined when it is placed between two fixed lines

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the horizontal geometry. If not ticked, the Part is not used in the horizontal geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the horizontal geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Horizontal Parts list.</i>	text box	blank	
Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box		types of horizontal parts

Geometry tab
the geometrical information defining the Part

Approaching length <i>the length of the leading transition curve at the start of the Floating Transition. This must be non zero. This will be tangential to the Previous Part.</i>	measure box	Measure Length
Departing length <i>the length of the trailing transition curve at the end of the Floating Transition. This must be non zero. This will be tangential to the Next Part.</i>	measure box	Measure Length
Reverse <i>if ticked, transitions of opposite hands are used</i>	tick box	not ticked

Comment tab

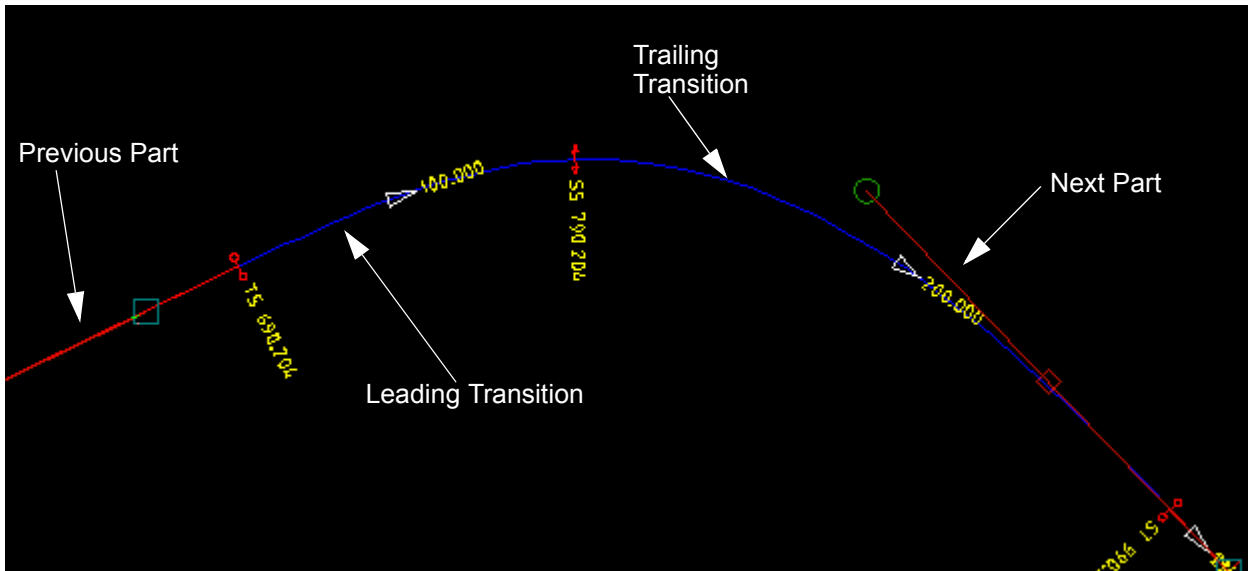
the text typed into the text box is stored as a comment for the Part.

***Note:** If a comment exists, a # is placed after the type of the part in the Horizontal Parts list.*

Set button

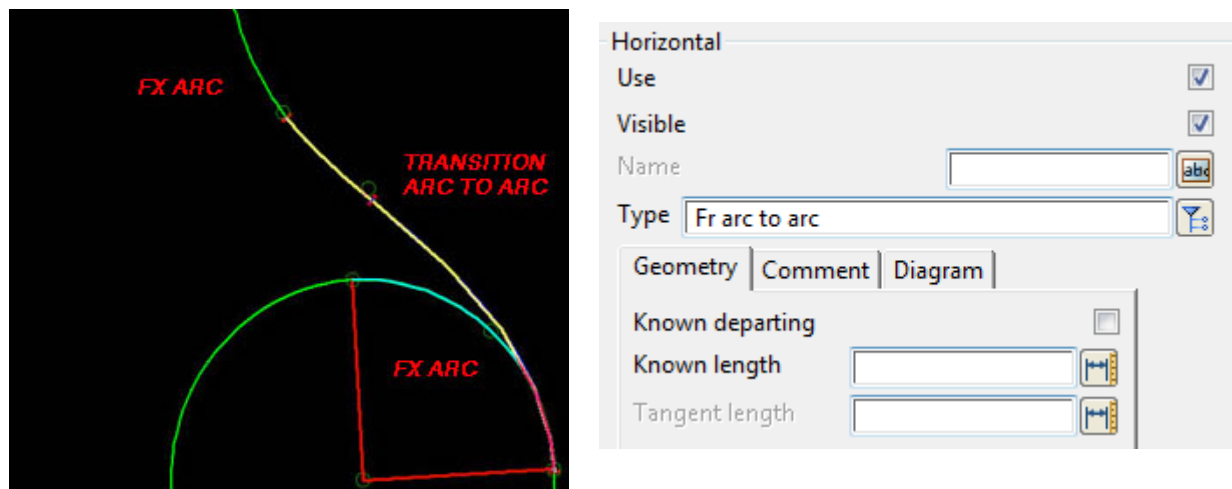
*the **Set** button must be clicked for the information for this Part to be used.*

Same As button



Free Transition: Back to Back Transitions Between Two Arcs

The *Free Transition* consists of a **two back to back transitions** between two **arcs**. The **length** of **one transition** is needed. The transitions can be the same hand or reversed.



Example:
The Free Transition become fully defined when it is placed between two fixed arcs.

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the horizontal geometry. If not ticked, the Part is not used in the horizontal geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the horizontal geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Horizontal Parts list.</i>	text box	blank	
Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box		types of horizontal parts

Geometry tab
the geometrical information defining the Part

Known departing <i>if ticked, If not ticked,</i>	tick box	not ticked	
Known length	length box		Point to point, String to point

Tangent length length box Point to point, String to point

Comment tab

the text typed into the text box is stored as a comment for the Part.

***Note:** If a comment exists, a # is placed after the type of the part in the Horizontal Parts list.*

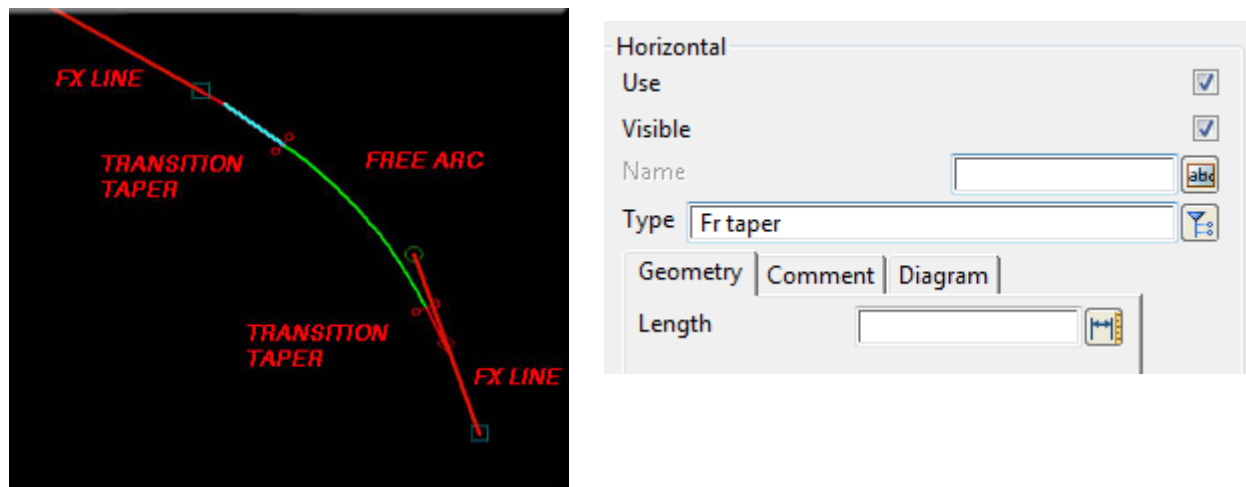
Set button

*the **Set** button must be clicked for the information for this Part to be used.*

Same As button

Free Taper: Taper of Known Length

The *Free Transition* consists of a **taper** of **known length**.



Example

The Free Transition Taper becomes fully defined when it is place

The fields and buttons used in the panel have the following functions.

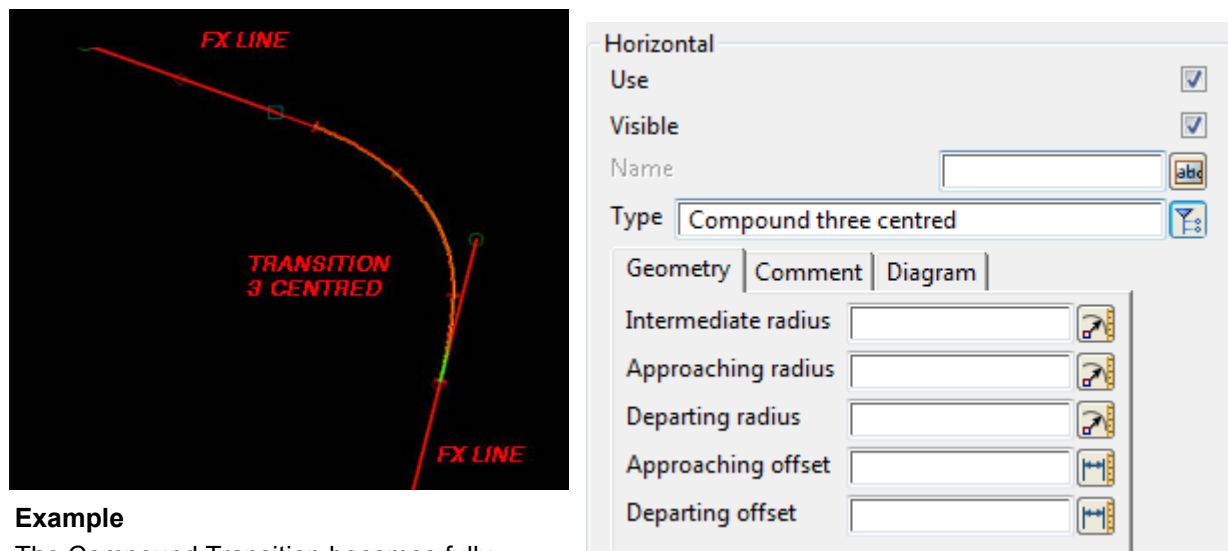
Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the horizontal geometry. If not ticked, the Part is not used in the horizontal geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the horizontal geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Horizontal Parts list.</i>	text box	blank	
Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box		types of horizontal parts
Geometry tab <i>the geometrical information defining the Part</i>			
Length	length box		Point to point, String to point
Comment tab <i>the text typed into the text box is stored as a comment for the Part. Note: If a comment exists, a # is placed after the type of the part in the Horizontal Parts list.</i>			
Set <i>the Set button must be clicked for the information for this Part to be used.</i>	button		

Same As

button

Compound Transitions: Three Centre Curve

The *Compound Transition* consists of a **three centred curve**. That is, **three arcs** with **given radii** and an **approaching** and **departing offset**.



Example

The Compound Transition becomes fully defined when it is place between two fixed lines

Radius and Offset

- ve to the left of the direction of travel
- +ve to the right of the direction of travel

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the horizontal geometry. If not ticked, the Part is not used in the horizontal geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the horizontal geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Horizontal Parts list.</i>	text box	blank	
Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box		types of horizontal parts

Geometry tab

the geometrical information defining the Part

Intermediate radius	radius box	Point, String from point
Approaching radius	radius box	Point, String from point

Departing radius	radius box	Point, String from point
Approaching offset	length box	Point to point, String to point
Departing offset	length box	Point to point, String to point

Comment tab

the text typed into the text box is stored as a comment for the Part.

***Note:** If a comment exists, a # is placed after the type of the part in the Horizontal Parts list.*

Set button

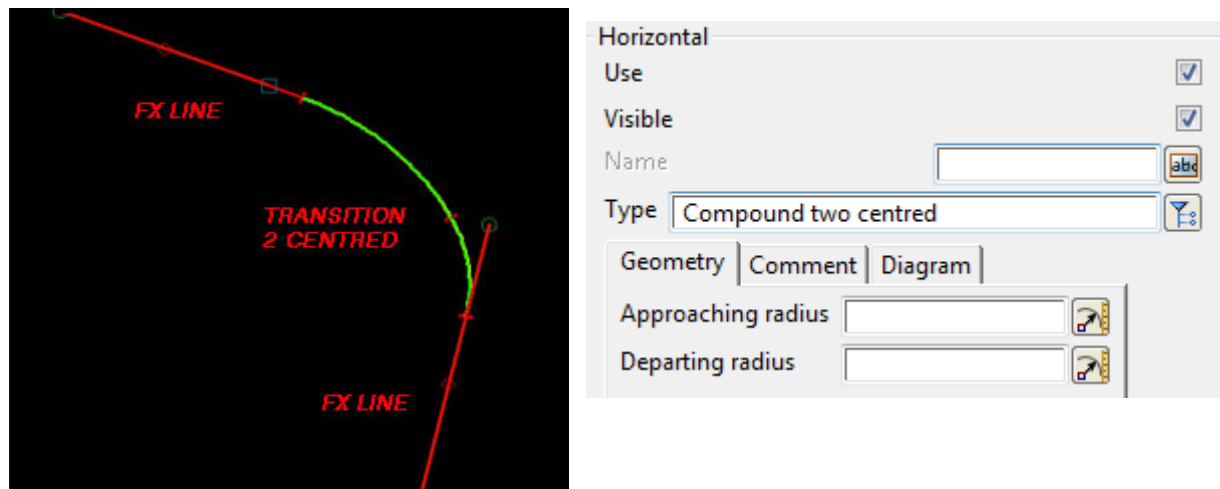
*the **Set** button must be clicked for the information for this Part to be used.*

Same As button

*after clicking the **Same As** button, an existing HIP can be selected from the screen and its information piped into the appropriate fields in the panel.*

Compound Transition: Two Centred Curve

The *Compound Transition* consists of a **two centred curve**. That is, **two arcs** with **given radii**.



Example

The Compound Transition becomes fully defined when it is place between two fixed elements

Radius

- ve to the left of the direction of travel
- +ve to the right of the direction of travel

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the horizontal geometry. If not ticked, the Part is not used in the horizontal geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the horizontal geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Horizontal Parts list.</i>	text box	blank	
Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box		types of horizontal parts
Geometry tab <i>the geometrical information defining the Part</i>			
Approaching radius	radius box		Point, String from point
Departing radius	radius box		Point, String from point
Comment tab <i>the text typed into the text box is stored as a comment for the Part. Note: If a comment exists, a # is placed after the type of the part in the Horizontal Parts list.</i>			

Set button

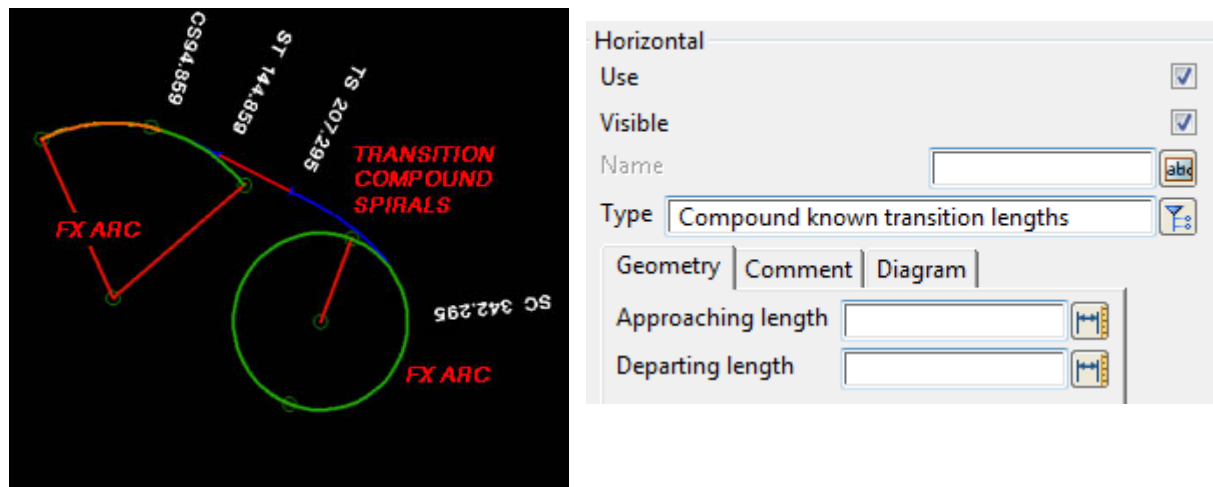
*the **Set** button must be clicked for the information for this Part to be used.*

Same As button

*after clicking the **Same As** button, an existing HIP can be selected from the screen and its information piped into the appropriate fields in the panel.*

Compound Transition: Two Transition Curves of Known Lengths

The *Compound Transition* consists of a **two transition curves** of **known lengths**.



Example

The Compound Transition becomes fully defined when it is place between two fixed elements

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the horizontal geometry. If not ticked, the Part is not used in the horizontal geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the horizontal geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Horizontal Parts list.</i>	text box	blank	
Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box		types of horizontal parts
Geometry tab <i>the geometrical information defining the Part</i>			
Approaching length	length box		Point to point, String to point
Departing length	length box		Point to point, String to point

Comment tab
*the text typed into the text box is stored as a comment for the Part.
Note: If a comment exists, a **#** is placed after the type of the part in the Horizontal Parts list.*

Set button

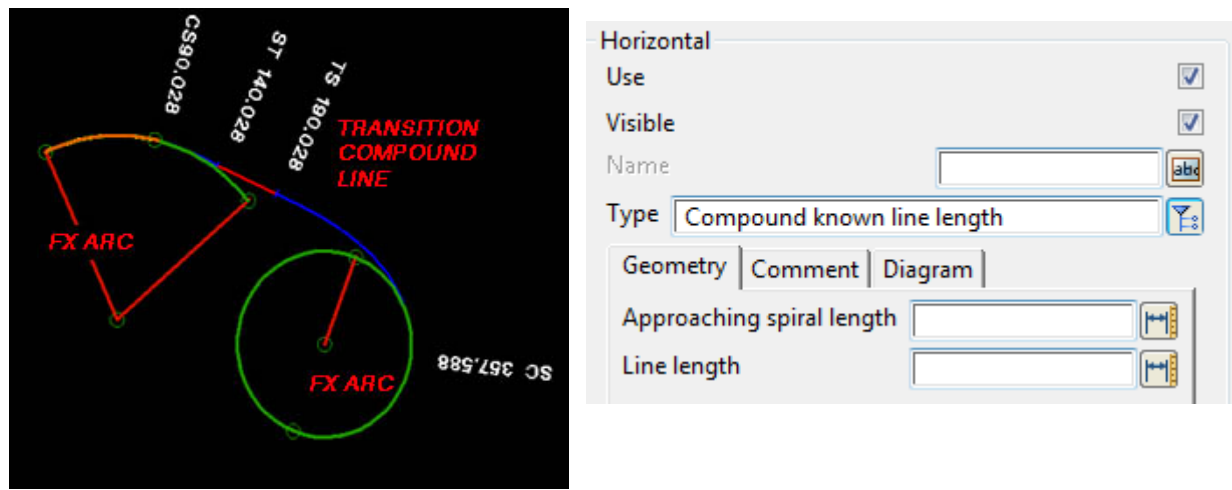
*the **Set** button must be clicked for the information for this Part to be used.*

Same As button

*after clicking the **Same As** button, an existing HIP can be selected from the screen and its information piped into the appropriate fields in the panel.*

Compound Transition: Two Transitions Separated by Line of Known Length

The *Compound Transition* consists of a **approaching transition curves** of **known length** followed by a **line of known length** and then a **departing transition curve** with a **calculated length**.



Example

The Compound Transition becomes fully defined when it is place between two fixed elements. The second transition curve length is calculated.

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use	tick box	ticked	
<i>if ticked, then the Part is used in the horizontal geometry. If not ticked, the Part is not used in the horizontal geometry.</i>			
Visible	tick box	ticked	
<i>if ticked, then the Part is drawn in the horizontal geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>			
Name	text box	blank	
<i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Horizontal Parts list.</i>			
Type	choice box		types of horizontal parts
<i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>			
Geometry tab <i>the geometrical information defining the Part</i>			
Approaching spiral length	length box		Point to point, String to point
Line length	length box		Point to point, String to point
Comment tab <i>the text typed into the text box is stored as a comment for the Part.</i>			

***Note:** If a comment exists, a # is placed after the type of the part in the Horizontal Parts list.*

Set button

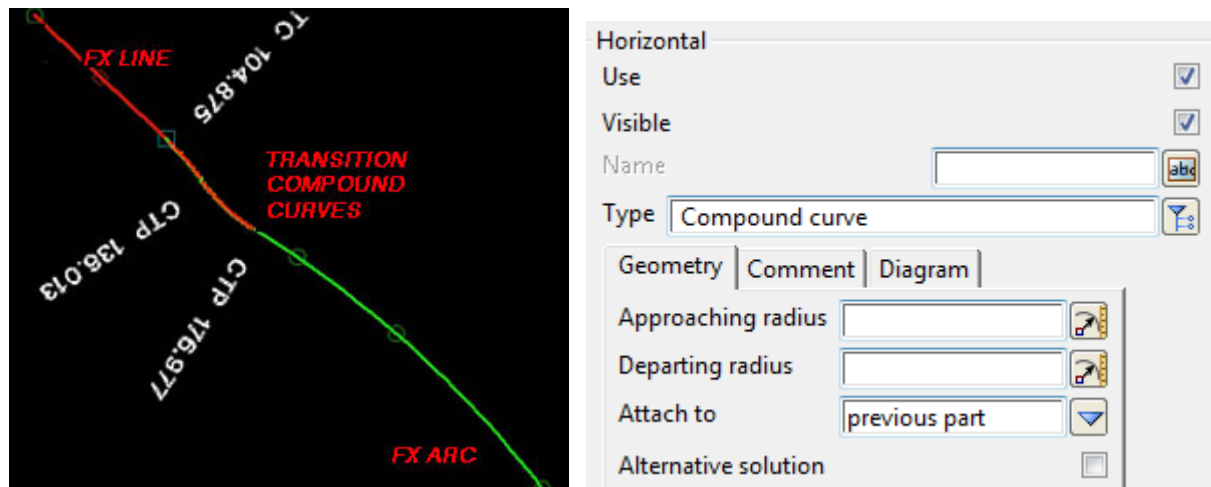
*the **Set** button must be clicked for the information for this Part to be used.*

Same As button

*after clicking the **Same As** button, an existing HIP can be selected from the screen and its information piped into the appropriate fields in the panel.*

Compound Transition: Two Arcs of Known Radii

The *Compound Transition* consists of **two arcs of known radii**.



Example
The Compound Transition between a fixed line and a fixed arc.

Radius
-ve to the left of the direction of travel
+ve to the right of the direction of travel

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the horizontal geometry. If not ticked, the Part is not used in the horizontal geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the horizontal geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Horizontal Parts list.</i>	text box	blank	
Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box		types of horizontal parts

Geometry tab
the geometrical information defining the Part

Approaching radius	radius box	Point, String from point
Departing radius	radius box	Point, String from point
Attach to	choice box	previous part, next part
Alternative solution	tick box	not ticked

Comment tab

the text typed into the text box is stored as a comment for the Part.

***Note:** If a comment exists, a # is placed after the type of the part in the Horizontal Parts list.*

Set button

*the **Set** button must be clicked for the information for this Part to be used.*

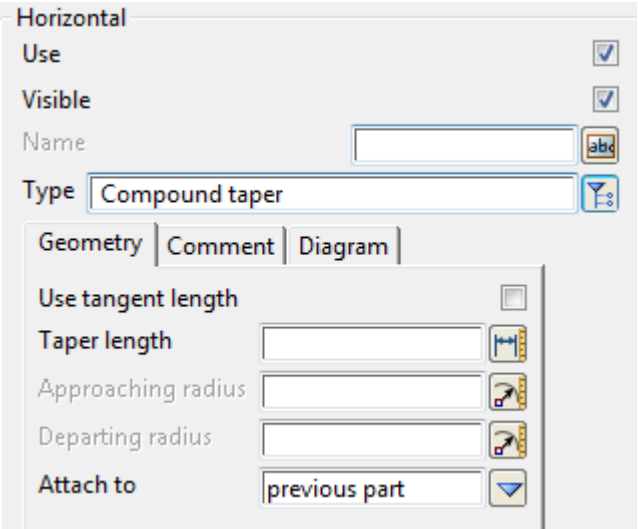
Same As button

*after clicking the **Same As** button, an existing HIP can be selected from the screen and its information piped into the appropriate fields in the panel.*

Compound Transition: Two Arcs of Known Radii with a Taper

The *Compound Transition* consists of

Example



Radius
-ve to the left of the direction of travel
+ve to the right of the direction of travel

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the horizontal geometry. If not ticked, the Part is not used in the horizontal geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the horizontal geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Horizontal Parts list.</i>	text box	blank	
Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box		types of horizontal parts
Geometry tab <i>the geometrical information defining the Part</i>			
Use tangent length <i>if ticked, If not ticked,</i>	tick box	not ticked	
Taper length	length box		Point to point, String to point

Approaching radius	radius box	Point, String from point
Departing radius	radius box	Point, String from point
Attach to	choice box	previous part, next part

Comment tab

the text typed into the text box is stored as a comment for the Part.

***Note:** If a comment exists, a # is placed after the type of the part in the Horizontal Parts list.*

Set button

*the **Set** button must be clicked for the information for this Part to be used.*

Same As button

*after clicking the **Same As** button, an existing HIP can be selected from the screen and its information piped into the appropriate fields in the panel.*

Horizontal Computators

Not yet documented.

Definitions of Super Alignment Vertical Parts

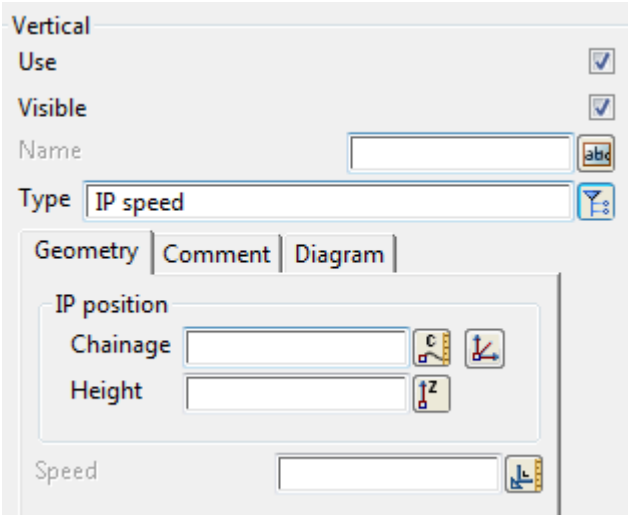
See [Vertical IPs](#)
See [Horizontal Lines](#)

Vertical IPs

See [VIP: Speed](#)
See [VIP: K-value](#)
See [VIP: Radius](#)
See [VIP: Length:](#)
See [VIP: Asymmetric](#)

VIP: Speed

A vertical intersection point (VIP) is created and the sizes of the parabolas for the VIP come from the Design Template of the super alignment.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use	tick box	ticked	
<i>if ticked, then the Part is used in the vertical geometry. If not ticked, the Part is not used in the vertical geometry.</i>			
Visible	tick box	ticked	
<i>if ticked, then the Part is drawn in the vertical geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>			
Name	text box	blank	
<i>if not blank, then the Part is given this name. If blank then the Part has no name.</i>			
Note: <i>If the part has a name, then a ! is placed after the type of the part in the Vertical Parts list.</i>			

Type choice box types of vertical parts
the type of this part. To change the Part type, choose another type from the pop-up list.

Geometry tab
the geometrical information defining the Part

Chainage, Height
*the (chainage,height) coordinates for the VIP can be typed in, or selected using the **C**, **Z** or **CZ** icons.*

Speed
*if **Speed** is not blank, then that is the speed used when looking up the Design Template for the VIP*
*If **Speed** is left blank, then the **Design Speed** for the super alignment is used when looking up the Design Template.*

Comment tab
the text typed into the text box is stored as a comment for the Part.
***Note:** If a comment exists, a # is placed after the type of the part in the Vertical Parts list.*

Set button
*the **Set** button must be clicked for the information for this Part to be used.*

Same As button
*after clicking the **Same As** button, an existing VIP can be selected from the screen and its information piped into the appropriate fields in the panel.*

VIP: Length:

A vertical intersection point (VIP) is created and either length of the parabola on the VIP is given, or the maximum allowable parabola is used.

The fields and buttons used in the panel have the following functions.

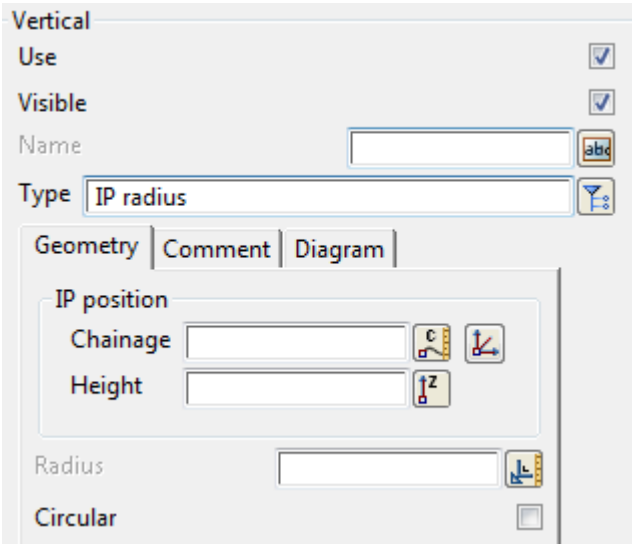
Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the vertical geometry. If not ticked, the Part is not used in the vertical geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the vertical geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Horizontal Parts list.</i>	text box	blank	
Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box		types of vertical parts
Geometry tab <i>the geometrical information defining the Part</i>			
Chainage, Height <i>the (chainage,height) coordinates for the VIP can be typed in, or selected using the C, Z or CZ icons.</i>			
Length (blank for max length) <i>the length used for the parabola on the VIP. This field can not be left blank. If zero then a parabola of maximum length is used on the VIP.</i>			
Comment tab <i>the text typed into the text box is stored as a comment for the Part. Note: If a comment exists, a # is placed after the type of the part in the Vertical Parts list.</i>			
Set <i>the Set button must be clicked for the information for this Part to be used.</i>	button		

Same As button

*after clicking the **Same As** button, an existing VIP can be selected from the screen and its information piped into the appropriate fields in the panel.*

VIP: Radius

A vertical intersection point (VIP) is created and the effective radius for the parabola on the VIP is given.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use	tick box	ticked	
<i>if ticked, then the Part is used in the vertical geometry.</i>			
<i>If not ticked, the Part is not used in the vertical geometry.</i>			
Visible	tick box	ticked	
<i>if ticked, then the Part is drawn in the vertical geometry.</i>			
<i>If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>			
Name	text box	blank	
<i>if not blank, then the Part is given this name.</i>			
<i>If blank then the Part has no name.</i>			
<i>Note: If the part has a name, then a ! is placed after the type of the part in the Vertical Parts list.</i>			
Type	choice box		types of vertical parts
<i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>			
Geometry tab			
<i>the geometrical information defining the Part</i>			
Chainage, Height			
<i>the (chainage,height) coordinates for the VIP can be typed in, or selected using the C, Z or CZ icons.</i>			
Radius			
<i>if not blank or non zero, the radius entered is used for the parabola/arc on the VIP.</i>			
<i>If blank or zero then no parabola/arc is used on the VIP.</i>			
Circular	tick box	not ticked	
<i>if ticked, then the curve on the VIP is an arc</i>			
<i>If not ticked, then the curve on the VIP is a parabola.</i>			

Comment tab

the text typed into the text box is stored as a comment for the Part.

***Note:** If a comment exists, a # is placed after the type of the part in the Vertical Parts list.*

Set button

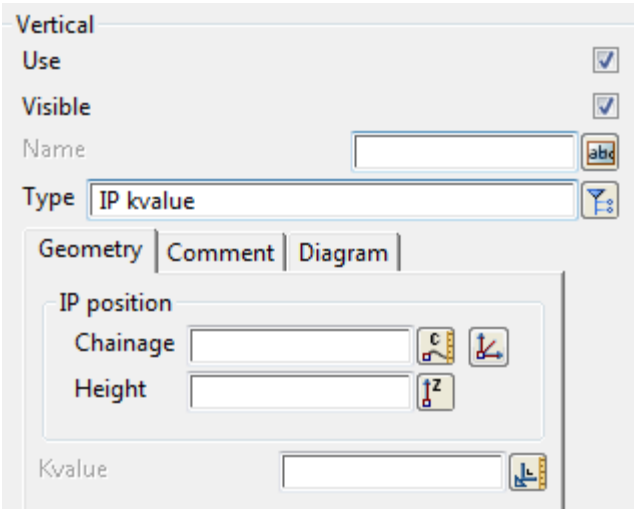
*the **Set** button must be clicked for the information for this Part to be used.*

Same As button

*after clicking the **Same As** button, an existing VIP can be selected from the screen and its information piped into the appropriate fields in the panel.*

VIP: K-value

A vertical intersection point (VIP) is created and the K value for the parabola on the VIP is given.



The fields and buttons used in the panel have the following functions.

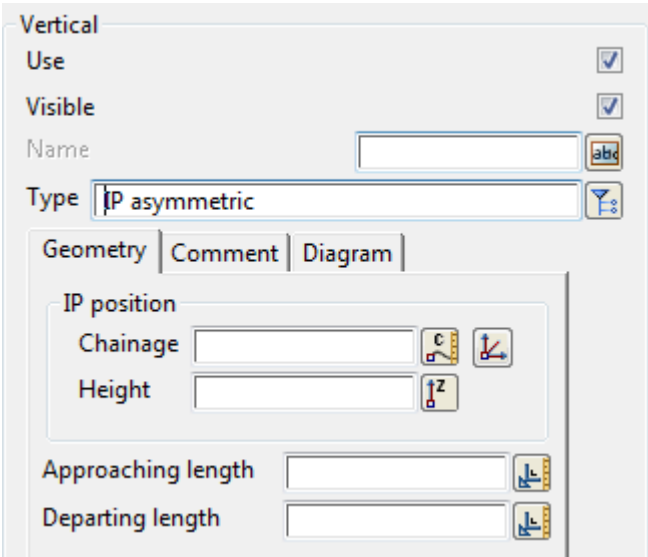
Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the vertical geometry. If not ticked, the Part is not used in the vertical geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the vertical geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Vertical Parts list.</i>	text box	blank	
Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box		types of vertical parts
Geometry tab <i>the geometrical information defining the Part</i>			
Chainage, Height <i>the (chainage,height) coordinates for the VIP can be typed in, or selected using the C, Z or CZ icons.</i>			
K-value <i>the K value to use for the parabola on the VIP</i>	measure box		available measures
Comment tab <i>the text typed into the text box is stored as a comment for the Part. Note: If a comment exists, a # is placed after the type of the part in the Vertical Parts list.</i>			
Set <i>the Set button must be clicked for the information for this Part to be used.</i>	button		

Same As button

*after clicking the **Same As** button, an existing VIP can be selected from the screen and its information piped into the appropriate fields in the panel.*

VIP: Asymmetric

A vertical intersection point (VIP) is created with an asymmetric parabola on the VIP. The two parabolic lengths are given for the asymmetric parabola.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the vertical geometry. If not ticked, the Part is not used in the vertical geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the vertical geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Vertical Parts list.</i>	text box	blank	
Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box		types of vertical parts
Geometry tab <i>the geometrical information defining the Part</i>			
Chainage, Height <i>the (chainage,height) coordinates for the VIP can be typed in, or selected using the C, Z or CZ icons.</i>			
Approaching length <i>the parabolic length of the first parabola of the asymmetric parabola. This parabola is tangential to the Previous Part.</i>	measure box		available measures
Departing length <i>the parabolic length of the second parabola of the asymmetric parabola. This parabola is tangential to the Next Part.</i>	measure box		available measures

Comment tab

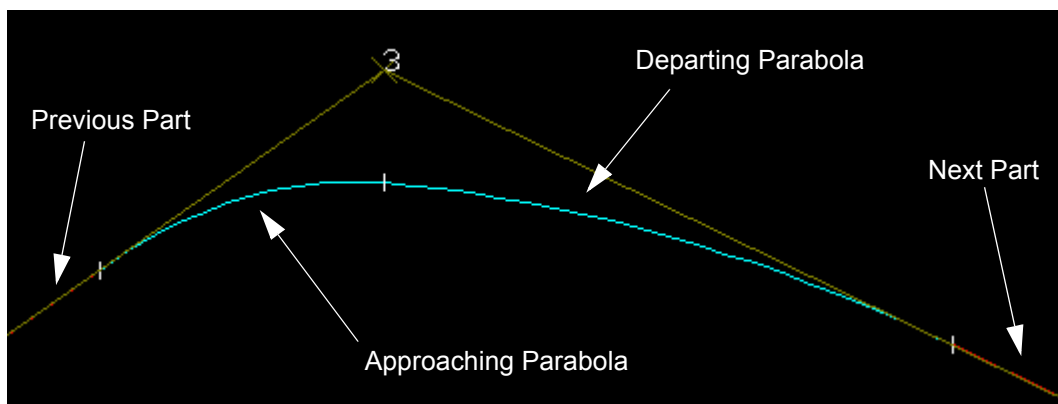
the text typed into the text box is stored as a comment for the Part.

***Note:** If a comment exists, a # is placed after the type of the part in the Vertical Parts list.*

Set button

*the **Set** button must be clicked for the information for this Part to be used.*

Same As button

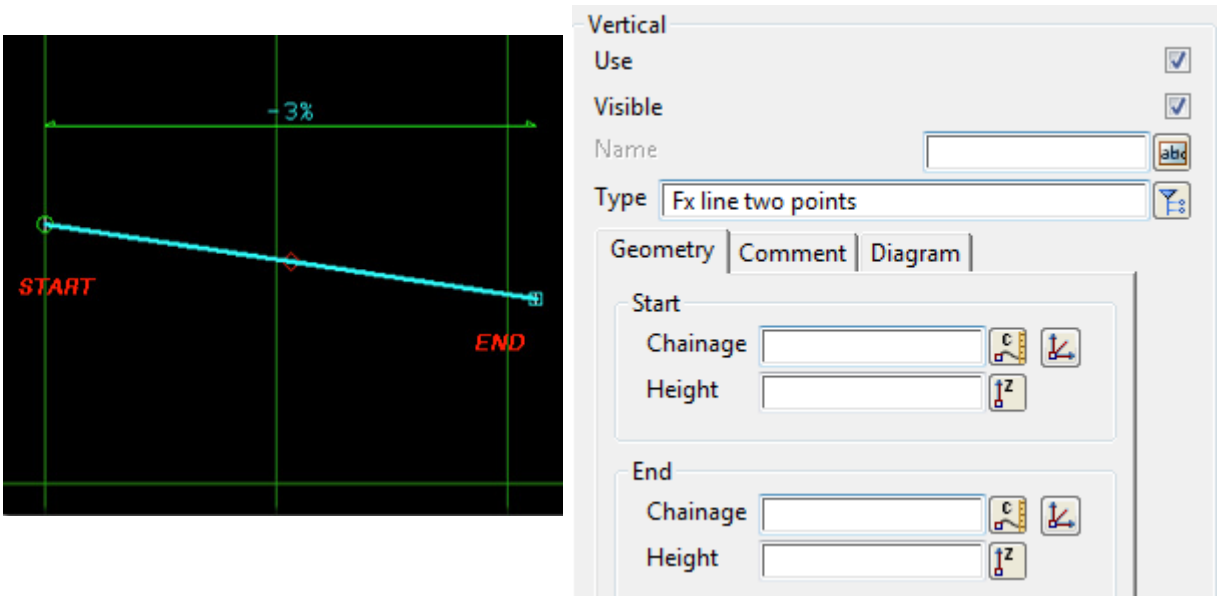


Vertical Lines

- See [Fixed Line: Two Points](#)
- See [Fixed Line: Known Point and Grade](#)
- See [Floating Line: Known Point](#)
- See [Floating Line: Known Grade](#)
- See [Floating Line: Known End and Nominal Length](#)
- See [Free line - No Constraints](#)

Fixed Line: Two Points

A *Fixed Line* is created by specifying two known points as the start and end points of the line.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the vertical geometry. If not ticked, the Part is not used in the vertical geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the vertical geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Vertical Parts list.</i>	text box	blank	
Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box		types of vertical parts
Geometry tab <i>the geometrical information defining the Part</i>			

Start Chainage, Height

*the coordinates in (chainage,height) of the start of the line can be typed in, or selected using the **C**, **Z** or **CZ** icons.*

End Chainage, Height

*the coordinates in (chainage,height) of the end of the line can be typed in, or selected using the **C**, **Z** or **CZ** icons.*

Comment tab

the text typed into the text box is stored as a comment for the Part.

***Note:** If a comment exists, a **#** is placed after the type of the part in the Vertical Parts list.*

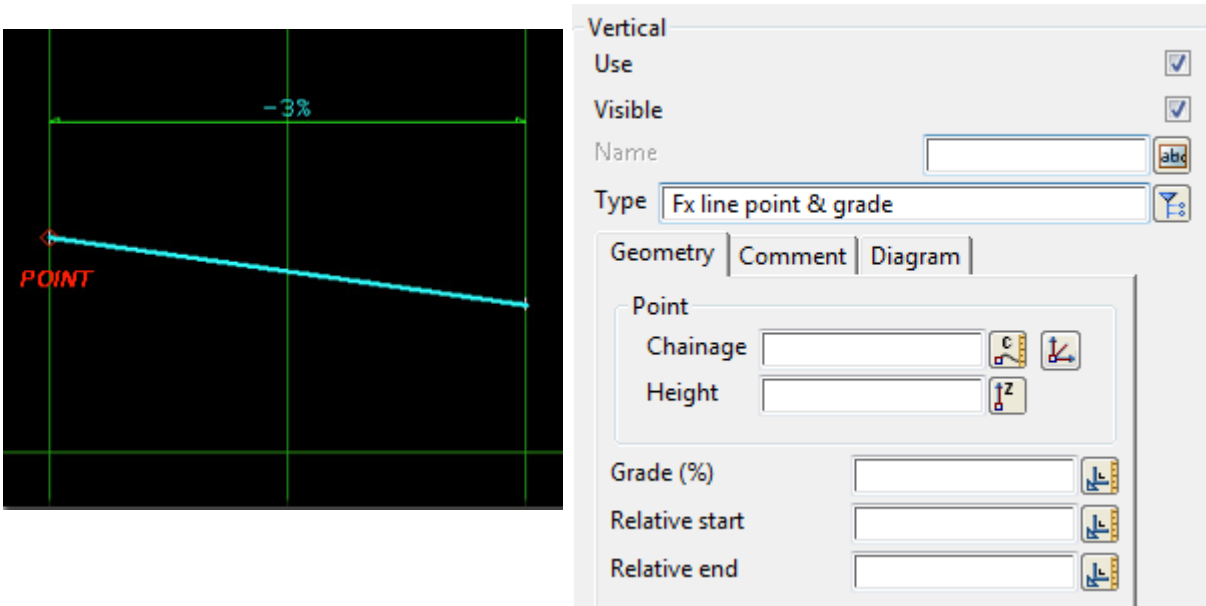
Set button

*the **Set** button must be clicked for the information for this Part to be used.*

Same As button

Fixed Line: Known Point and Grade

A *Fixed Line* is created by specifying a known point and a grade for the line.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the vertical geometry. If not ticked, the Part is not used in the vertical geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the vertical geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Vertical Parts list.</i>	text box	blank	
Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box		types of vertical parts
Geometry tab <i>the geometrical information defining the Part</i>			
Point Chainage, Height <i>the coordinates in (chainage,height) of the point that the line goes through can be typed in, or selected using the C, Z or CZ icons.</i>			
Grade (%) <i>the grade (in percent) of the line through the point</i>	measure box		available measures
Relative start <i>the chainage distance, relative to the given point, to start the line at. A negative value is to the left of the point, and a positive value is to the right of the point.</i>	measure box		available measures

Relative end measure box available measures

the chainage distance, relative to the given point, to end the line at. A negative value is to the left of the point, and a positive value is to the right of the point.

Comment tab

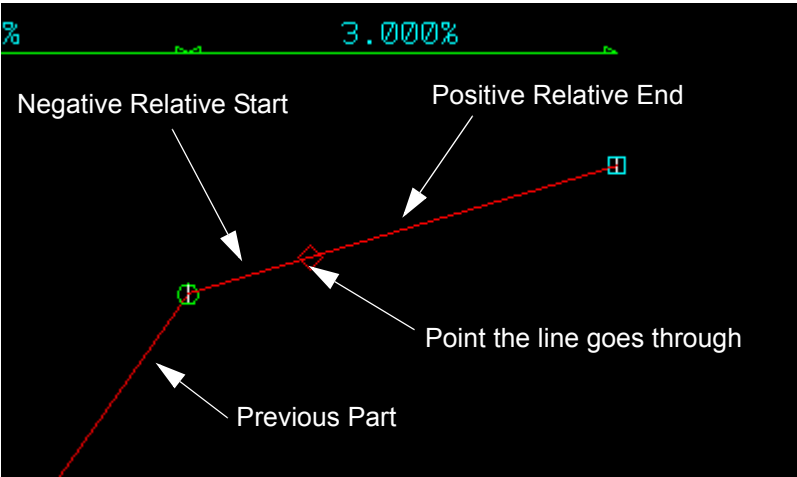
the text typed into the text box is stored as a comment for the Part.

***Note:** If a comment exists, a # is placed after the type of the part in the Vertical Parts list.*

Set button

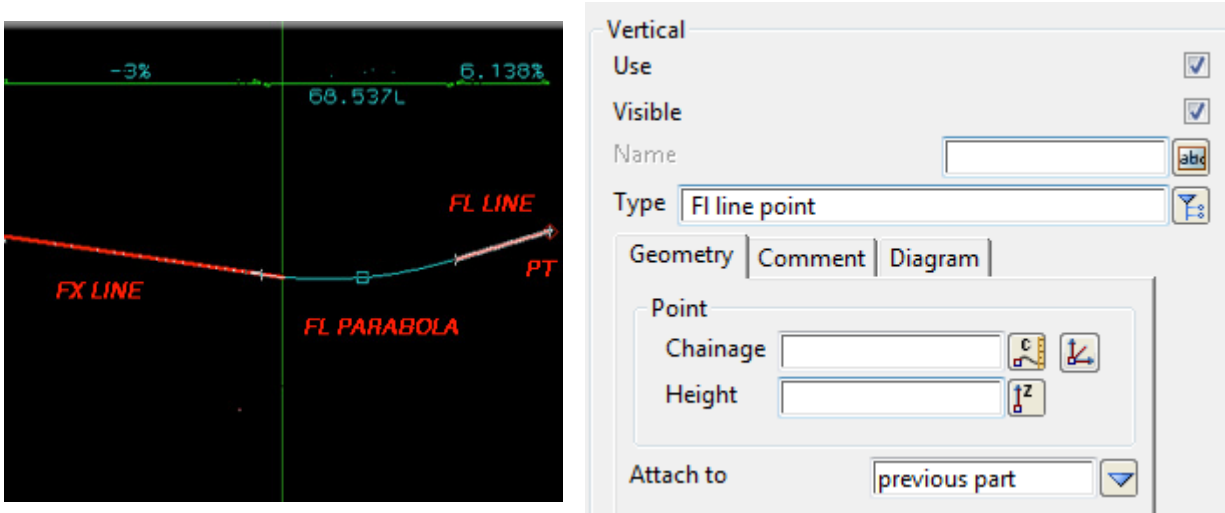
*the **Set** button must be clicked for the information for this Part to be used.*

Same As button



Floating Line: Known Point

The *Floating Line* line passes through a **known point** but the grade is unknown.



Example
Floating Line attached to the previous parabola

The fields and buttons used in the panel have the following functions.

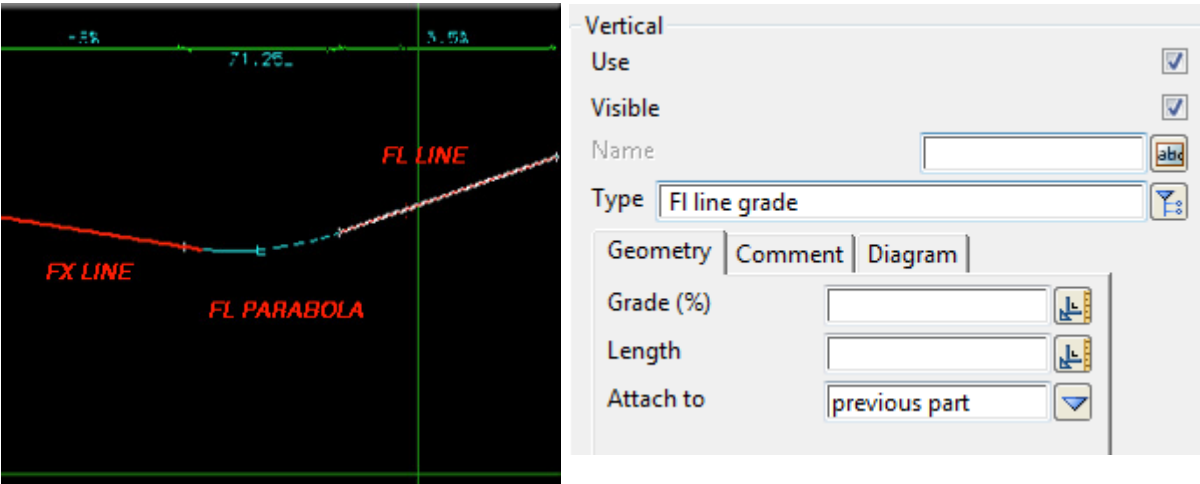
Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the vertical geometry. If not ticked, the Part is not used in the vertical geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the vertical geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Vertical Parts list.</i>	text box	blank	
Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box		types of vertical parts
Geometry tab <i>the geometrical information defining the Part</i>			
Chainage, Height <i>the (chainage,height) coordinates that the line passes through can be typed in, or selected using the C, Z or CZ icons.</i>			
Attach to <i>the Part that the Floating Line is attached to and tried to make tangential to</i>	choice box	previous part	previous part, next part
Comment tab <i>the text typed into the text box is stored as a comment for the Part. Note: If a comment exists, a # is placed after the type of the part in the Vertical Parts list.</i>			

Set button
*the **Set** button must be clicked for the information for this Part to be used.*

Same As button

Floating Line: Known Grade

The *Floating Line* line has a **known grade** but no point on the line is known.



Example
Floating Line attached to the previous parabola

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the vertical geometry. If not ticked, the Part is not used in the vertical geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the vertical geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Vertical Parts list.</i>	text box	blank	

Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box	types of vertical parts
-----------------------------------------------------------------------------------------------------------------	------------	-------------------------

Geometry tab
the geometrical information defining the Part

Grade (%) <i>the grade (in percent) of the line through the point</i>	measure box	available measures
---------------------------------------------------------------------------------	-------------	--------------------

Length <i>nominal length of the line</i>	measure box	available measures
----------------------------------------------------	-------------	--------------------

Attach to <i>the Part that the Floating Line is attached to and tried to make tangential to</i>	choice box	previous part	previous part, next part
-----------------------------------------------------------------------------------------------------------	------------	---------------	--------------------------

Comment tab
the text typed into the text box is stored as a comment for the Part.

Note: If a comment exists, a # is placed after the type of the part in the Vertical Parts list.

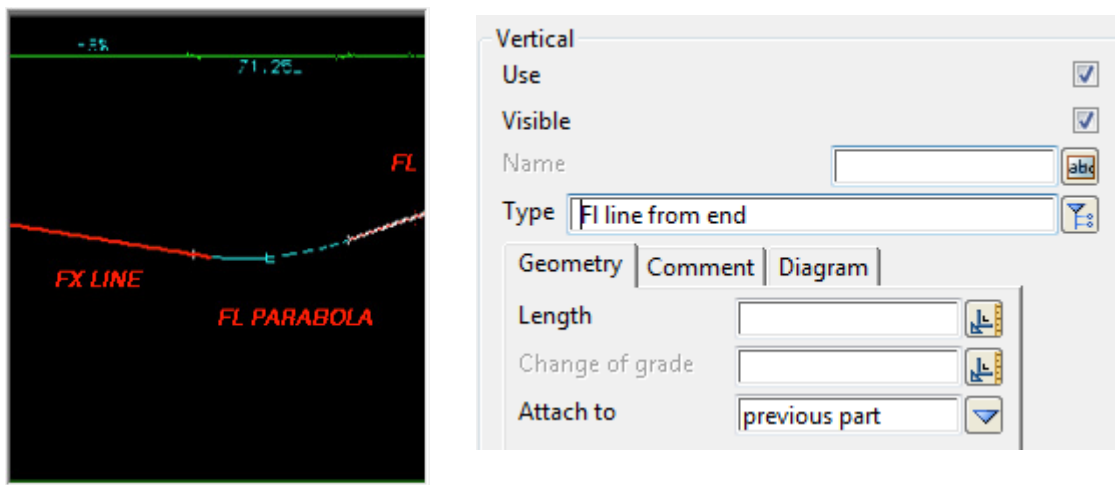
Set button

*the **Set** button must be clicked for the information for this Part to be used.*

Same As button

Floating Line: Known End and Nominal Length

The *Floating Line* has a **known nominal length** and is attached tangentially to the end of previous part or the beginning of the next part.



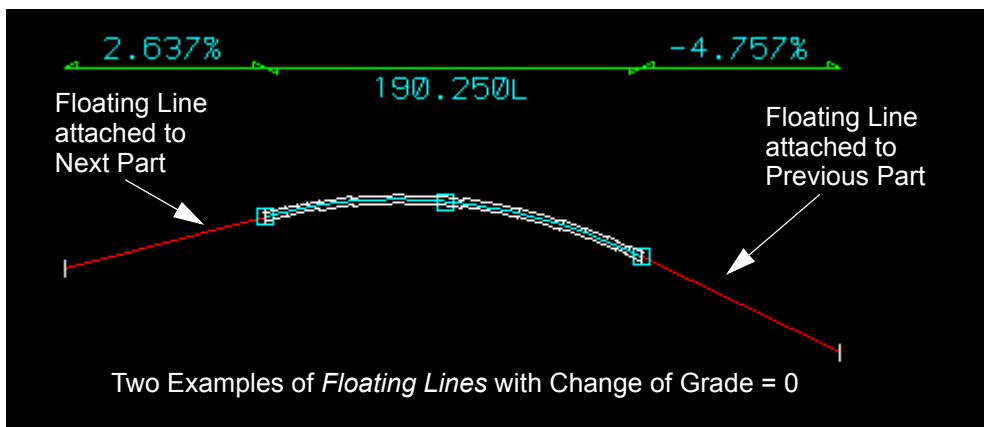
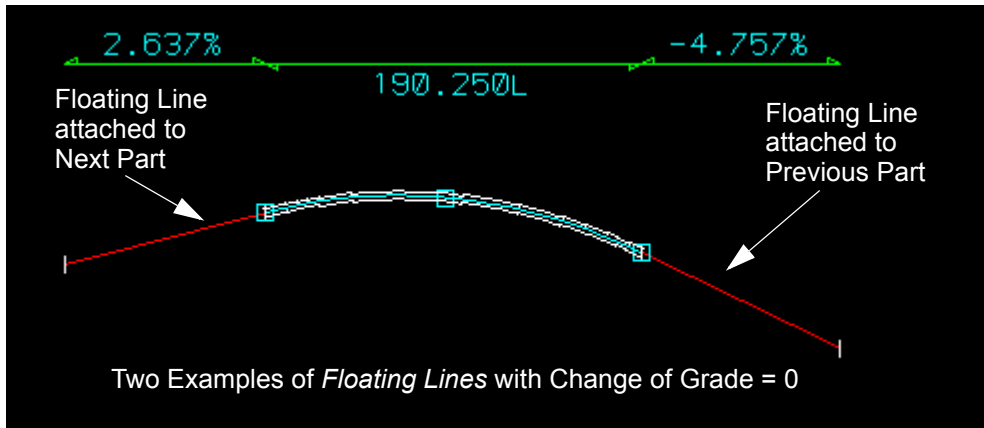
The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the vertical geometry. If not ticked, the Part is not used in the vertical geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the vertical geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Vertical Parts list.</i>	text box	blank	
Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box		types of vertical parts
Geometry tab <i>the geometrical information defining the Part</i>			
Length <i>the nominal length of the Floating Line. Must be non zero.</i>	measure box		available measures
Change of grade <i>LJG ??? if non zero then the grade of the line is increased by Change of grade (units of percent grade). It is no longer tangential to the Attach to part.</i>	measure box		available measures
Attach to <i>the Part that the Floating Line is attached to, and made tangential to. If there is a Change of grade, then after the line is calculated to be tangential, the Change of grade is added to the grade of the line.</i>	choice box		previous part, next part
Comment tab <i>the text typed into the text box is stored as a comment for the Part. Note: If a comment exists, a # is placed after the type of the part in the Vertical Parts list.</i>			

Set button

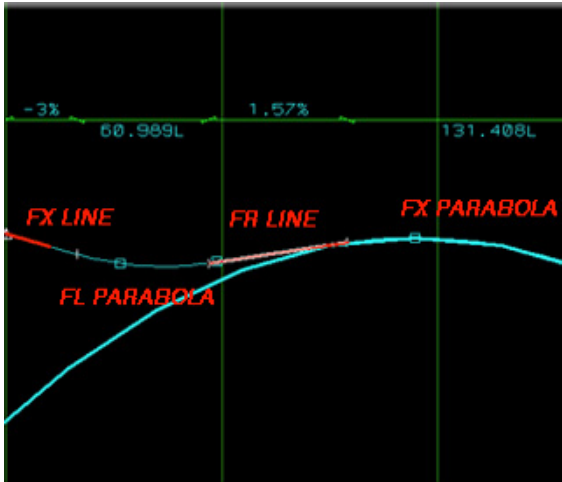
the **Set** button must be clicked for the information for this Part to be used.

Same As button



Free line - No Constraints

The *Free Line* is not constrained. It is determined by having to be tangential to the Parts at either end of the Line.



Example
Typical application is a Free Line tangent between two solved parts

Vertical

Use

Visible

Name

Type

Fr line

Comment

Diagram

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use	tick box	ticked	
<i>if ticked, then the Part is used in the vertical geometry.</i>			
<i>If not ticked, the Part is not used in the vertical geometry.</i>			
Visible	tick box	ticked	
<i>if ticked, then the Part is drawn in the vertical geometry.</i>			
<i>If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>			
Name	text box	blank	
<i>if not blank, then the Part is given this name.</i>			
<i>If blank then the Part has no name.</i>			
<i>Note: If the part has a name, then a ! is placed after the type of the part in the Vertical Parts list.</i>			
Type	choice box		types of vertical parts
<i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>			
Comment tab			
<i>the text typed into the text box is stored as a comment for the Part.</i>			
<i>Note: If a comment exists, a # is placed after the type of the part in the Vertical Parts list.</i>			

Set button
*the **Set** button must be clicked for the information for this Part to be used.*

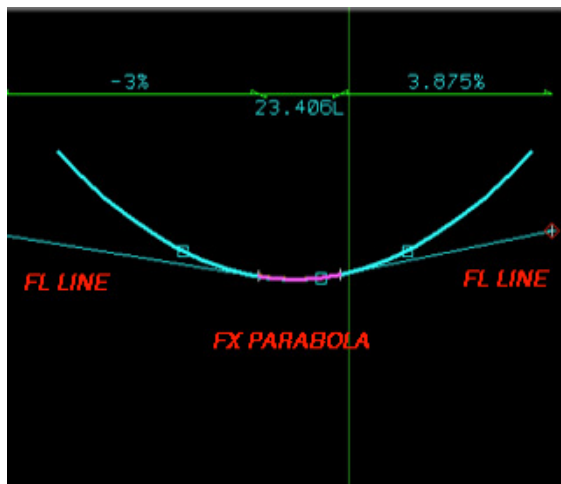
Same As button

Vertical Parabolas

- See [Fixed Parabola - Parabola Passes through Three Known Points](#)
- See [Fixed Parabola: Known Apex and Effective Radius](#)
- See [Floating Parabola: Through Two Points](#)
- See [Floating Parabola: Known Apex](#)
- See [Floating Parabola: Known Point and Effective Radius](#)
- See [Floating Parabola: Known Point and Grade at that Point](#)
- See [Floating Parabola: Known Point and K Value](#)
- See [Floating Parabola: Known Length and Grade at End](#)
- See [Floating Parabola: Known Radius and Nominal Length](#)
- See [Floating Parabola: known Point and Known End](#)
- See [Free Parabola: Known Point](#)
- See [Free Parabola: Known Length](#)
- See [Free Parabola: Know Effective Radius](#)
- See [Free Parabola: Known Parabolic Length/100](#)
- See [Free Parabola: Known K Value](#)
- See [Free Parabola: Fit with Maximum Length](#)
- See [Free Asymmetric Parabola: Two Known Lengths](#)
- See [Free Compound Parabola: Two Parabolas with Optional Total Parabolic Length](#)

Fixed Parabola - Parabola Passes through Three Known Points

The *Fixed Parabola* is fully defined by going through three known points.



Vertical

Use ☒

Visible ☒

Name

Type

Geometry | Comment | Diagram

Point 1

Chainage

Height

Point 2

Chainage

Height

Point 3

Chainage

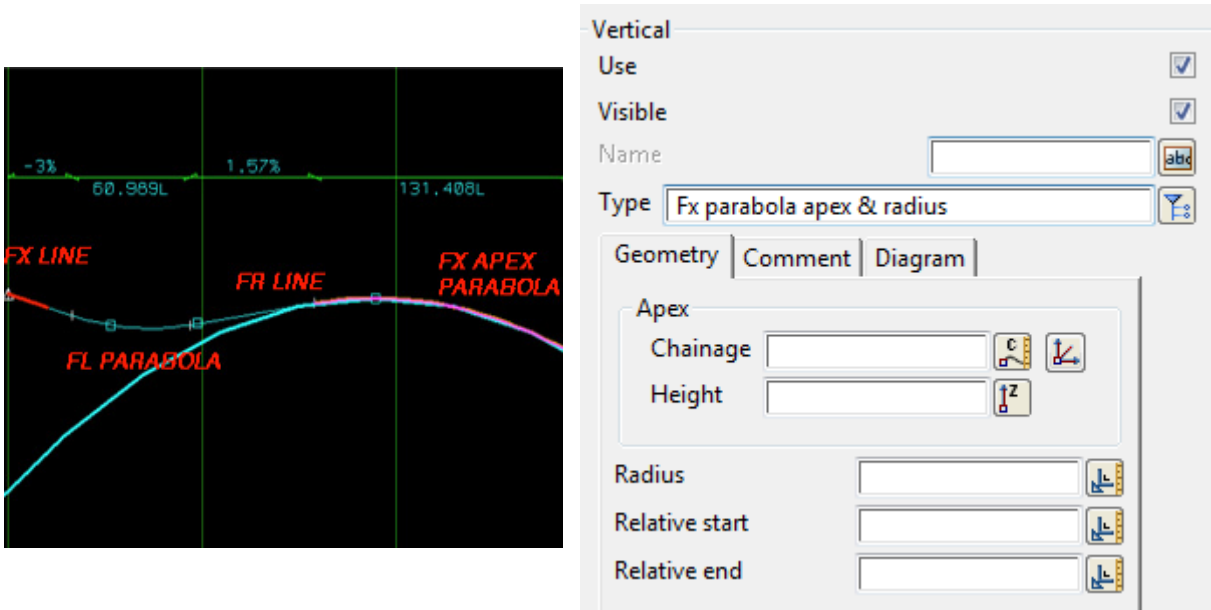
Height

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the vertical geometry. If not ticked, the Part is not used in the vertical geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the vertical geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Vertical Parts list.</i>	text box	blank	
Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box		types of vertical parts
Geometry tab <i>the geometrical information defining the Part</i>			
Point 1 Chainage, Height <i>the (chainage,height) coordinates for the first point the parabola goes through can be typed in, or selected using the C, Z or CZ icons.</i>			
Point 2 Chainage, Height <i>the (chainage,height) coordinates for the second point the parabola goes through can be typed in, or selected using the C, Z or CZ icons.</i>			
Point 3 Chainage, Height <i>the (chainage,height) coordinates for the third point the parabola goes through can be typed in, or selected using the C, Z or CZ icons.</i>			
Comment tab <i>the text typed into the text box is stored as a comment for the Part. Note: If a comment exists, a # is placed after the type of the part in the Vertical Parts list.</i>			
Set <i>the Set button must be clicked for the information for this Part to be used.</i>	button		
Same As	button		

Fixed Parabola: Known Apex and Effective Radius

The *Fixed Parabola* is fully defined by the known apex and effective radius of the parabola.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the vertical geometry. If not ticked, the Part is not used in the vertical geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the vertical geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Vertical Parts list.</i>	text box	blank	
Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box		types of vertical parts
Geometry tab <i>the geometrical information defining the Part</i>			
Apex Chainage, Height <i>the (chainage,height) coordinates for the apex of the parabola can be typed in, or selected using the C, Z or CZ icons.</i>			
Radius <i>the effective radius of the parabola (this is 100 times the K value). Positive radius for a sag point (minimum) and a Negative radius for a crest point (maximum).</i>	measure box		available measures
Relative start <i>the chainage distance, relative to the given apex, to start the parabola at. A negative value is to the left</i>	measure box		available measures

of the apex, and a positive value is to the right of the apex.

Relative end measure box available measures

the chainage distance, relative to the given apex, to end the parabola at. A negative value is to the left of the apex, and a positive value is to the right of the apex.

Comment tab

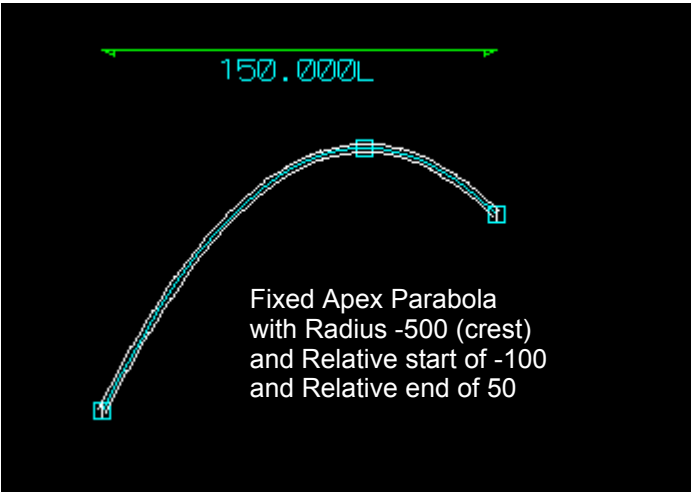
the text typed into the text box is stored as a comment for the Part.

Note: If a comment exists, a # is placed after the type of the part in the Vertical Parts list.

Set button

*the **Set** button must be clicked for the information for this Part to be used.*

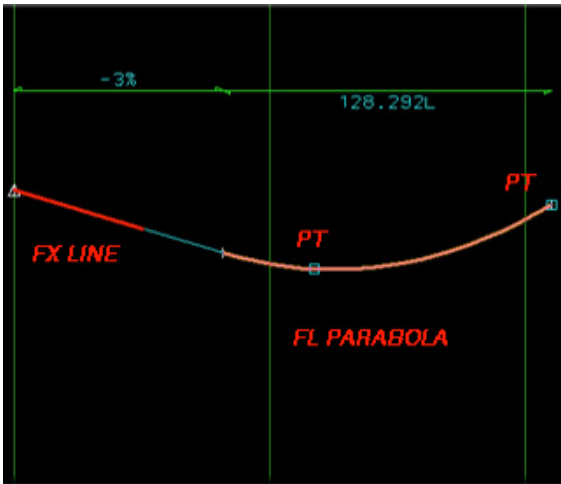
Same As button



Floating Parabola: Through Two Points

This *Floating Parabola* passes through two known points. It is fully determined by being tangential to either the previous part or the following part.

It may not always be possible for the Floating Parabola to actually solve.



Vertical

Use ☒

Visible ☒

Name

Type

Geometry | Comment | Diagram

Point 1

Chainage

Height

Point 2

Chainage

Height

Attach to

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the vertical geometry. If not ticked, the Part is not used in the vertical geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the vertical geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Vertical Parts list.</i>	text box	blank	
Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box		types of vertical parts
Geometry tab <i>the geometrical information defining the Part</i>			
Point 1 Chainage, Height <i>the (chainage,height) coordinates for the first point the parabola goes through can be typed in, or selected using the C, Z or CZ icons.</i>			

Point 2 Chainage, Height

*the (chainage,height) coordinates for the second point the parabola goes through can be typed in, or selected using the **C**, **Z** or **CZ** icons.*

Attach to choice box previous part, next part
the Part that the Floating Parabola is attached to, and made tangential to.

Comment tab

the text typed into the text box is stored as a comment for the Part.

Note: If a comment exists, a # is placed after the type of the part in the Vertical Parts list.

Set button

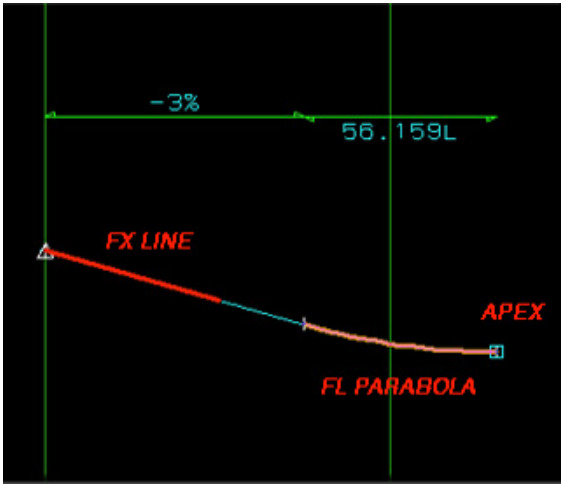
*the **Set** button must be clicked for the information for this Part to be used.*

Same As button

Floating Parabola: Known Apex

This *Floating Parabola* has a known apex. It is fully determined by being tangential to either the previous part or the following part.

It may not always be possible for the Floating Parabola to solve.



Vertical

Use ☒

Visible ☒

Name

Type

Geometry | Comment | Diagram

Apex

Chainage

Height

Attach to

The fields and buttons used in the panel have the following functions.

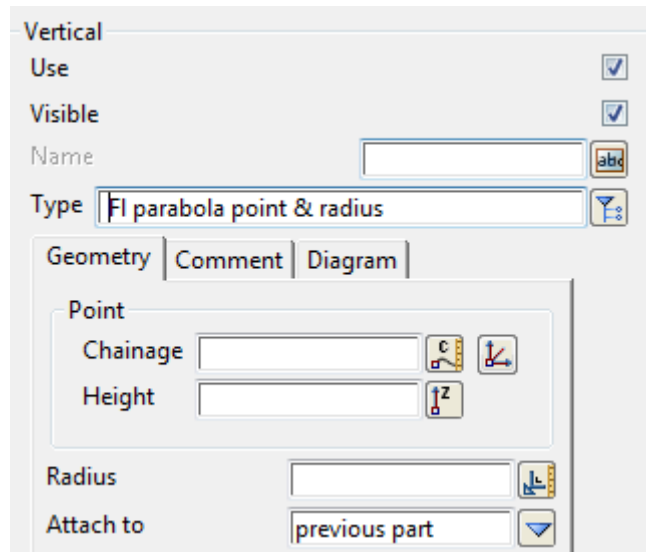
Field Description	Type	Defaults	Pop-Up
Use	tick box	ticked	
<i>if ticked, then the Part is used in the vertical geometry.</i>			
<i>If not ticked, the Part is not used in the vertical geometry.</i>			
Visible	tick box	ticked	
<i>if ticked, then the Part is drawn in the vertical geometry.</i>			
<i>If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>			
Name	text box	blank	
<i>if not blank, then the Part is given this name.</i>			
<i>If blank then the Part has no name.</i>			
<i>Note: If the part has a name, then a ! is placed after the type of the part in the Vertical Parts list.</i>			
Type	choice box		types of vertical parts
<i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>			
Geometry tab			
<i>the geometrical information defining the Part</i>			
Apex Chainage, Height			
<i>the (chainage,height) coordinates for the apex of the parabola can be typed in, or selected using the C, Z or CZ icons.</i>			
Attach to	choice box	previous part	previous part, next part
<i>the Part that the Floating Parabola is attached to, and made tangential to.</i>			
Comment tab			
<i>the text typed into the text box is stored as a comment for the Part.</i>			
<i>Note: If a comment exists, a # is placed after the type of the part in the Vertical Parts list.</i>			

Set button
*the **Set** button must be clicked for the information for this Part to be used.*

Same As button

This *Floating Parabola* goes through a known point and has a given effective radius. It is fully determined by being tangential to either the previous part or the following part.

It may not always be possible for the Floating Parabola to solve.



Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the vertical geometry. If not ticked, the Part is not used in the vertical geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the vertical geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Vertical Parts list.</i>	text box	blank	
Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box		types of vertical parts
Geometry tab <i>the geometrical information defining the Part</i>			
Chainage, Height <i>the (chainage,height) coordinates for the point on the parabola can be typed in, or selected using the C, Z or CZ icons.</i>			
Radius <i>the effective radius of the parabola (this is 100 times the K value).</i>	measure box		available measures
Attach to <i>the Part that the Floating Parabola is attached to, and made tangential to.</i>	choice box	previous part	previous part, next part

Comment tab

the text typed into the text box is stored as a comment for the Part.

***Note:** If a comment exists, a # is placed after the type of the part in the Vertical Parts list.*

Set button

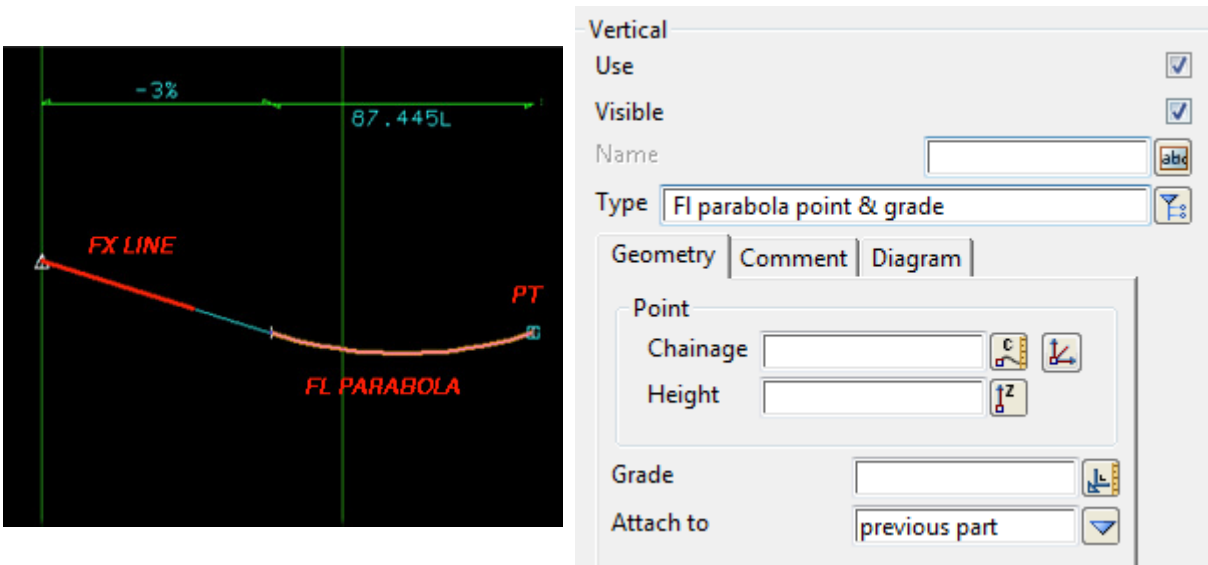
*the **Set** button must be clicked for the information for this Part to be used.*

Same As button

Floating Parabola: Known Point and Grade at that Point

This *Floating Parabola* goes through a known point and has a given at the known point. It is fully determined by being tangential to either the previous part or the following part.

It may not always be possible for the Floating Parabola to solve.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use	tick box	ticked	
<i>if ticked, then the Part is used in the vertical geometry.</i>			
<i>If not ticked, the Part is not used in the vertical geometry.</i>			
Visible	tick box	ticked	
<i>if ticked, then the Part is drawn in the vertical geometry.</i>			
<i>If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>			
Name	text box	blank	
<i>if not blank, then the Part is given this name.</i>			
<i>If blank then the Part has no name.</i>			
<i>Note: If the part has a name, then a ! is placed after the type of the part in the Vertical Parts list.</i>			
Type	choice box		types of vertical parts
<i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>			
Geometry tab			
<i>the geometrical information defining the Part</i>			
Chainage, Height			
<i>the (chainage,height) coordinates for the point on the parabola can be typed in, or selected using the C, Z or CZ icons.</i>			
Grade	measure box		available measures
<i>the grade of the parabola in units of percent grade</i>			
Attach to	choice box	previous part	previous part, next part
<i>the Part that the Floating Parabola is attached to, and made tangential to.</i>			

Comment tab

the text typed into the text box is stored as a comment for the Part.

***Note:** If a comment exists, a # is placed after the type of the part in the Vertical Parts list.*

Set button

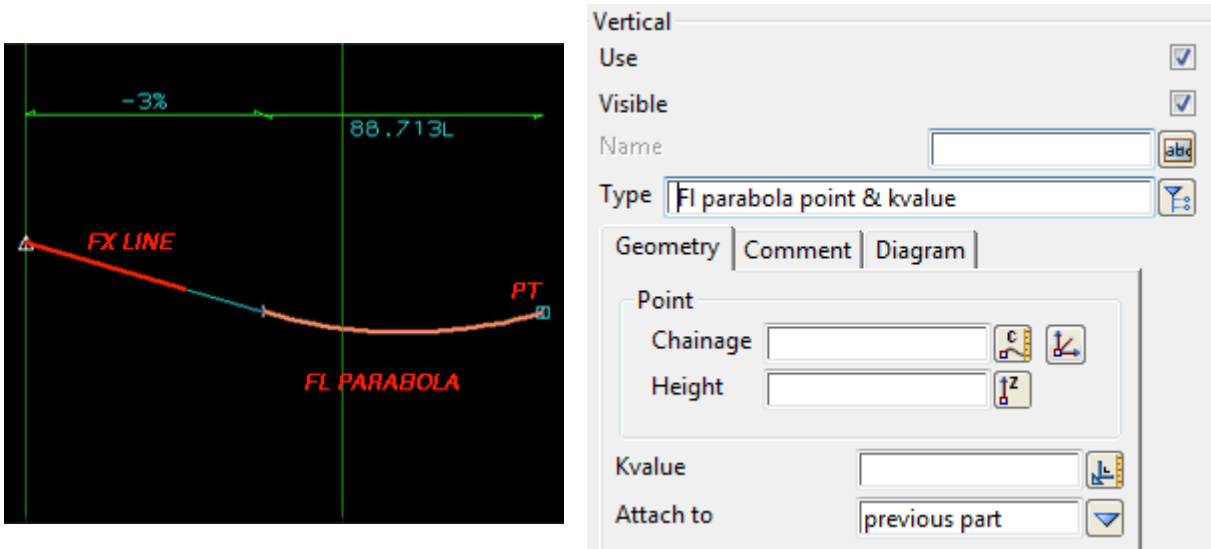
*the **Set** button must be clicked for the information for this Part to be used.*

Same As button

Floating Parabola: Known Point and K Value

This *Floating Parabola* goes through a known point and has a given K value. It is fully determined by being tangential to either the previous part or the following part.

It may not always be possible for the Floating Parabola to solve.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the vertical geometry. If not ticked, the Part is not used in the vertical geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the vertical geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Vertical Parts list.</i>	text box	blank	
Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box		types of vertical parts
Geometry tab <i>the geometrical information defining the Part</i>			
Chainage, Height <i>the (chainage,height) coordinates for the point on the parabola can be typed in, or selected using the C, Z or CZ icons.</i>			
K value <i>the K value of the parabola</i>	measure box		available measures
Attach to <i>the Part that the Floating Parabola is attached to, and made tangential to.</i>	choice box	previous part	previous part, next part

Comment tab

the text typed into the text box is stored as a comment for the Part.

***Note:** If a comment exists, a # is placed after the type of the part in the Vertical Parts list.*

Set button

*the **Set** button must be clicked for the information for this Part to be used.*

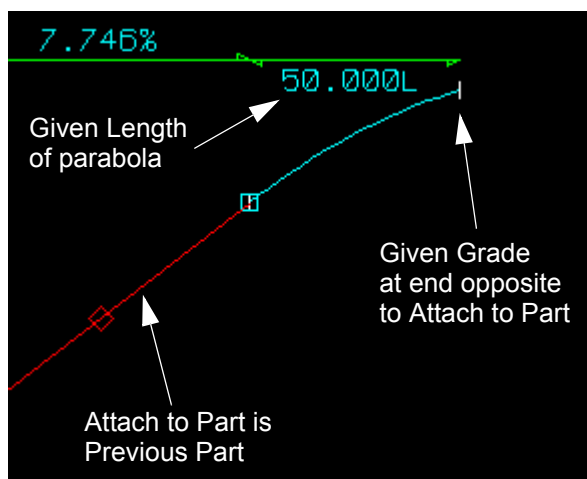
Same As button

*after clicking the **Same As** button, an existing VIP can be selected from the screen and its information piped into the appropriate fields in the panel.*

Floating Parabola: Known Length and Grade at End

This *Floating Parabola* has a known length and a given grade at the opposite end of the parabola to the *Attached To* part. It is fully determined by being tangential to either the previous part or the following part.

It may not always be possible for the Floating Parabola to solve.



The screenshot shows the 'Vertical' panel with the following fields and buttons:

- Use:** A tick box that is checked.
- Visible:** A tick box that is checked.
- Name:** A text box with a blank field and a 'tab' button.
- Type:** A choice box with the selected option 'Fl parabola from end & grade' and a pop-up button.
- Geometry tab:** Contains three fields:
 - Length:** A measure box with a blank field and a pop-up button.
 - Grade:** A measure box with a blank field and a pop-up button.
 - Attach to:** A choice box with the selected option 'previous part' and a pop-up button.

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use	tick box	ticked	
<i>if ticked, then the Part is used in the vertical geometry.</i>			
<i>If not ticked, the Part is not used in the vertical geometry.</i>			
Visible	tick box	ticked	
<i>if ticked, then the Part is drawn in the vertical geometry.</i>			
<i>If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>			
Name	text box	blank	
<i>if not blank, then the Part is given this name.</i>			
<i>If blank then the Part has no name.</i>			
Note: <i>If the part has a name, then a ! is placed after the type of the part in the Vertical Parts list.</i>			
Type	choice box		types of vertical parts
<i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>			
Geometry tab			
<i>the geometrical information defining the Part</i>			
Length	measure box		available measures
<i>the length of the Floating parabola. Must be non zero.</i>			
Grade	measure box		available measures
<i>the parabola has a given length Length and has the grade Grade at the opposite end from the Attach to part. The units for Grade is percent grade.</i>			
Attach to	choice box		previous part, next part
<i>the Part that the Floating Parabola is attached to, and made tangential to.</i>			

Comment tab

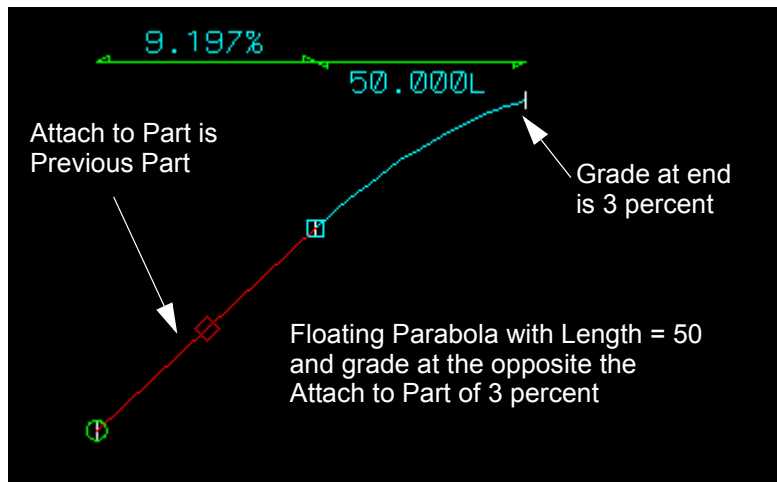
the text typed into the text box is stored as a comment for the Part.

***Note:** If a comment exists, a # is placed after the type of the part in the Vertical Parts list.*

Set button

*the **Set** button must be clicked for the information for this Part to be used.*

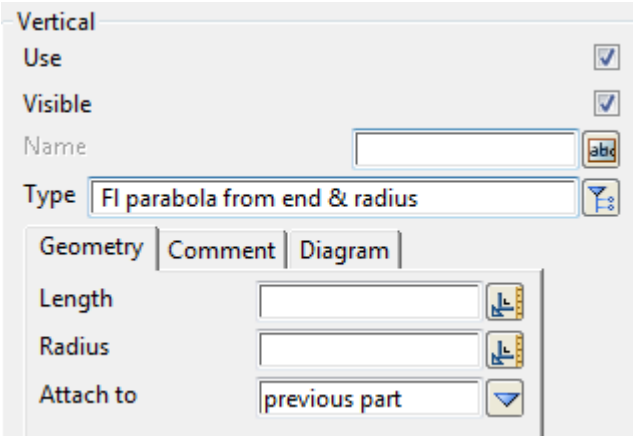
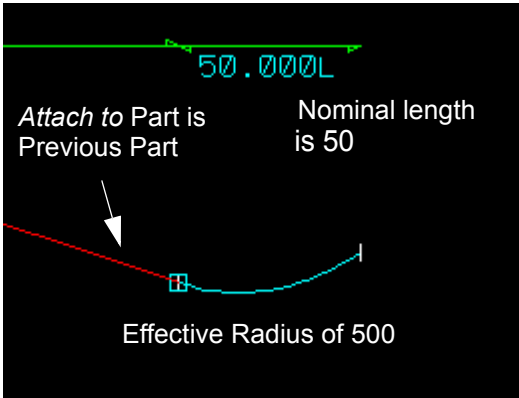
Same As button



Floating Parabola: Known Radius and Nominal Length

This *Floating Parabola* has a known effective radius (100 time K value). It is fully determined by being tangential to either the previous part or the following part.

It may not always be possible for the Floating Parabola to solve.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the vertical geometry. If not ticked, the Part is not used in the vertical geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the vertical geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Vertical Parts list.</i>	text box	blank	
Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box		types of vertical parts
Geometry tab <i>the geometrical information defining the Part</i>			
Length <i>the nominal length of the Floating Parabola. Must be non zero.</i>	measure box		available measures
Radius <i>the effective radius of the parabola (this is 100 times the K value).</i>	measure box		available measures
Attach to <i>the Part that the Floating Parabola is attached to, and made tangential to</i>	choice box	previous part	previous part, next part
Comment tab <i>the text typed into the text box is stored as a comment for the Part. Note: If a comment exists, a # is placed after the type of the part in the Vertical Parts list.</i>			

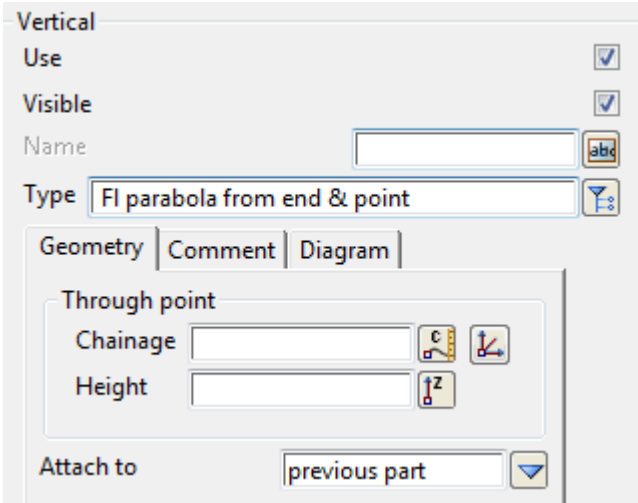
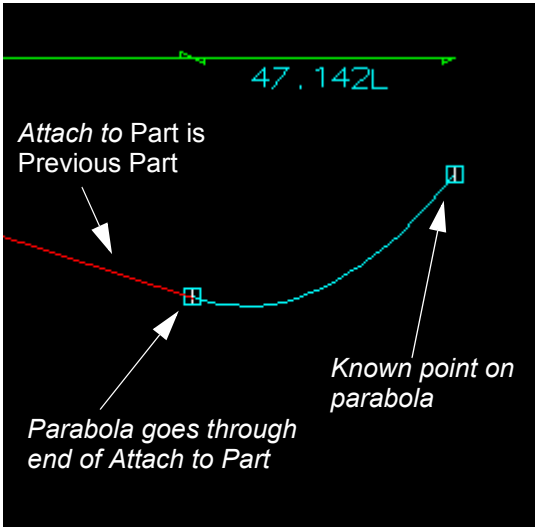
Set button
*the **Set** button must be clicked for the information for this Part to be used.*

Same As button

Floating Parabola: known Point and Known End

This *Floating Parabola* goes through a known point and it attached to another known point from either the previous part or the following part. Being tangential to the Part fully determines the Floating Parabola.

It may not always be possible for the Floating Parabola to solve.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the vertical geometry. If not ticked, the Part is not used in the vertical geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the vertical geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Vertical Parts list.</i>	text box	blank	

Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box	types of vertical parts
-----------------------------------------------------------------------------------------------------------------	------------	-------------------------

Geometry tab
the geometrical information defining the Part

Through point Chainage, Height
*the (chainage,height) coordinates for the point on the parabola can be typed in, or selected using the **C**, **Z** or **CZ** icons.*

Attach to <i>the Part that the Floating Parabola is attached to, and made tangential to</i>	choice box	previous part	previous part, next part
-------------------------------------------------------------------------------------------------------	------------	---------------	--------------------------

Comment tab
*the text typed into the text box is stored as a comment for the Part.
Note: If a comment exists, a **#** is placed after the type of the part in the Vertical Parts list.*

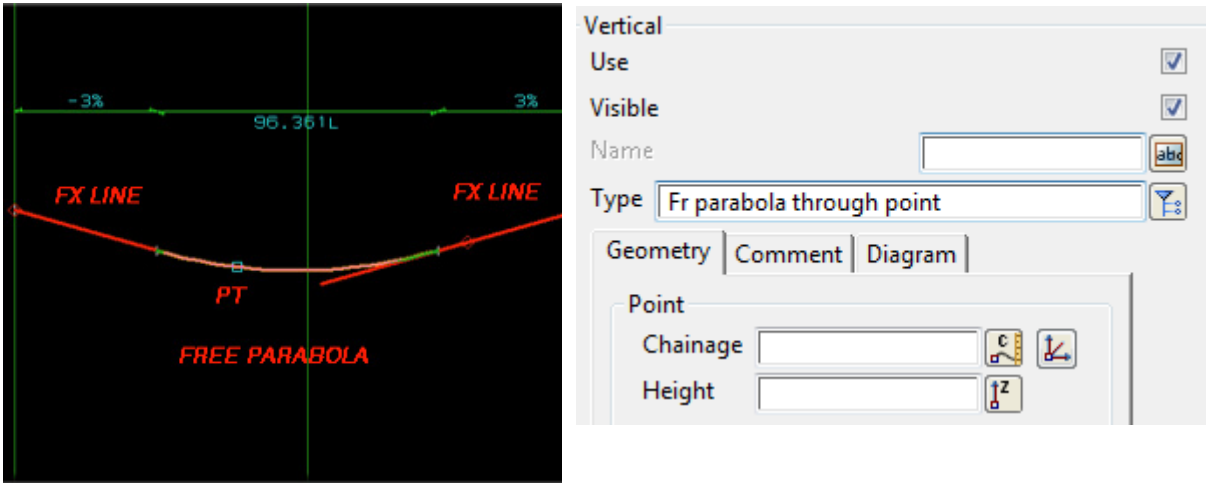
Set button
*the **Set** button must be clicked for the information for this Part to be used.*

Same As button

Free Parabola: Known Point

This Free Parabola passes through a known point. Being tangential to the parts on either side fully determines the parabola.

It may not always be possible for the Free Parabola to solve.



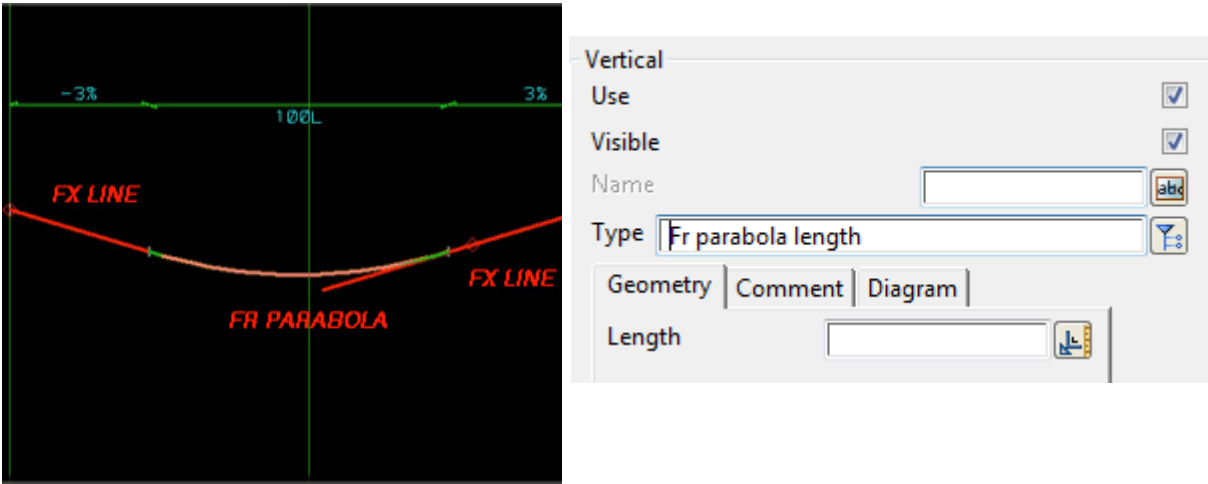
The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use	tick box	ticked	
<i>if ticked, then the Part is used in the vertical geometry.</i>			
<i>If not ticked, the Part is not used in the vertical geometry.</i>			
Visible	tick box	ticked	
<i>if ticked, then the Part is drawn in the vertical geometry.</i>			
<i>If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>			
Name	text box	blank	
<i>if not blank, then the Part is given this name.</i>			
<i>If blank then the Part has no name.</i>			
<i>Note: If the part has a name, then a ! is placed after the type of the part in the Vertical Parts list.</i>			
Type	choice box		types of vertical parts
<i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>			
Geometry tab			
<i>the geometrical information defining the Part</i>			
Chainage, Height			
<i>the (chainage,height) coordinates for the point on the parabola can be typed in, or selected using the C, Z or CZ icons.</i>			
Comment tab			
<i>the text typed into the text box is stored as a comment for the Part.</i>			
<i>Note: If a comment exists, a # is placed after the type of the part in the Vertical Parts list.</i>			
Set	button		
<i>the Set button must be clicked for the information for this Part to be used.</i>			
Same As	button		

Free Parabola: Known Length

This Free Parabola has a known length. Being tangential to the parts on either side fully determines the parabola.

It is not always possible for the Free Parabola to solve.



The fields and buttons used in the panel have the following functions.

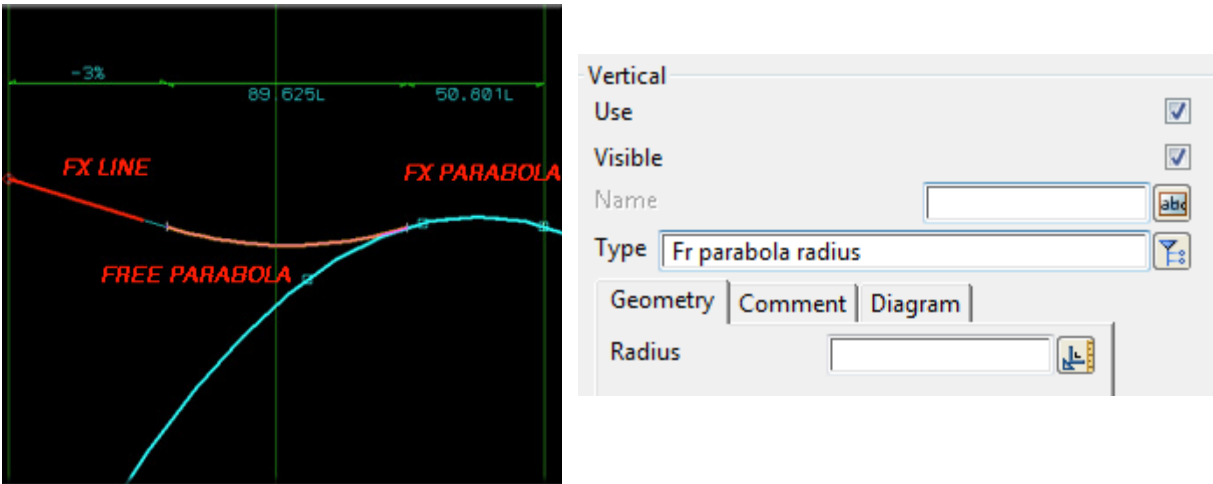
Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the vertical geometry. If not ticked, the Part is not used in the vertical geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the vertical geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Vertical Parts list.</i>	text box	blank	
Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box		types of vertical parts
Geometry tab <i>the geometrical information defining the Part</i>			
Length <i>the length of the Free Parabola. Must be non zero.</i>	measure box		available measures
Comment tab <i>the text typed into the text box is stored as a comment for the Part. Note: If a comment exists, a # is placed after the type of the part in the Vertical Parts list.</i>			
Set <i>the Set button must be clicked for the information for this Part to be used.</i>	button		
Same As	button		

Vertical Parabolas

Free Parabola: Know Effective Radius

This Free Parabola has a known effective radius. Being tangential to the parts on either side fully determines the parabola.

It is not always possible for the Free Parabola to solve.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the vertical geometry. If not ticked, the Part is not used in the vertical geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the vertical geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Vertical Parts list.</i>	text box	blank	
Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box		types of vertical parts
Geometry tab <i>the geometrical information defining the Part</i>			
Radius <i>the effective radius of the parabola (this is 100 times the K value).</i>	measure box		available measures
Comment tab <i>the text typed into the text box is stored as a comment for the Part. Note: If a comment exists, a # is placed after the type of the part in the Vertical Parts list.</i>			
Set <i>the Set button must be clicked for the information for this Part to be used.</i>	button		

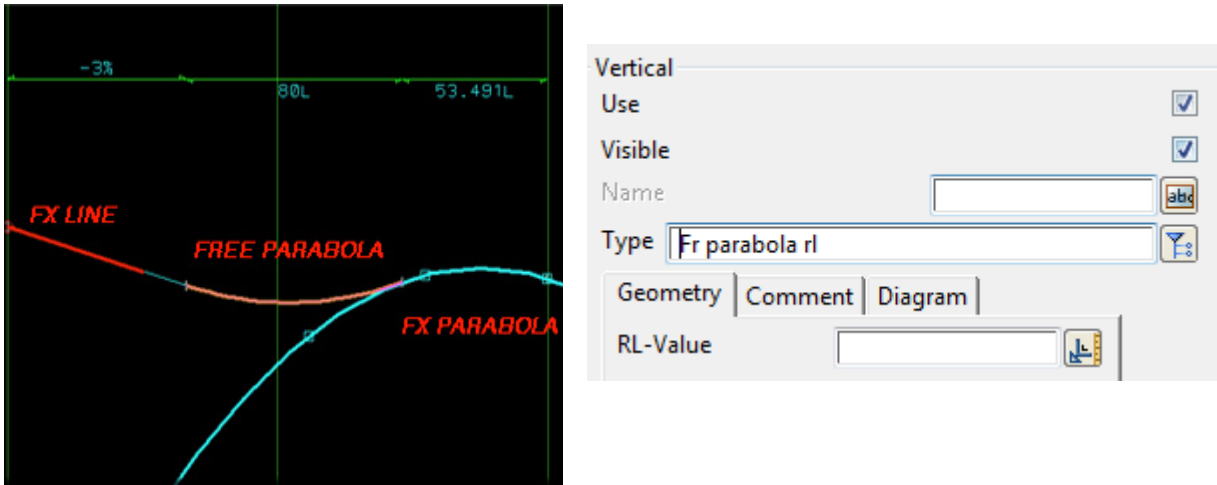
Same As

button

Free Parabola: Known Parabolic Length/100

This Free Parabola has a known parabolic length divided by 100. Being tangential to the parts on either side fully determines the parabola.

It is not always possible for the Free Parabola to solve.



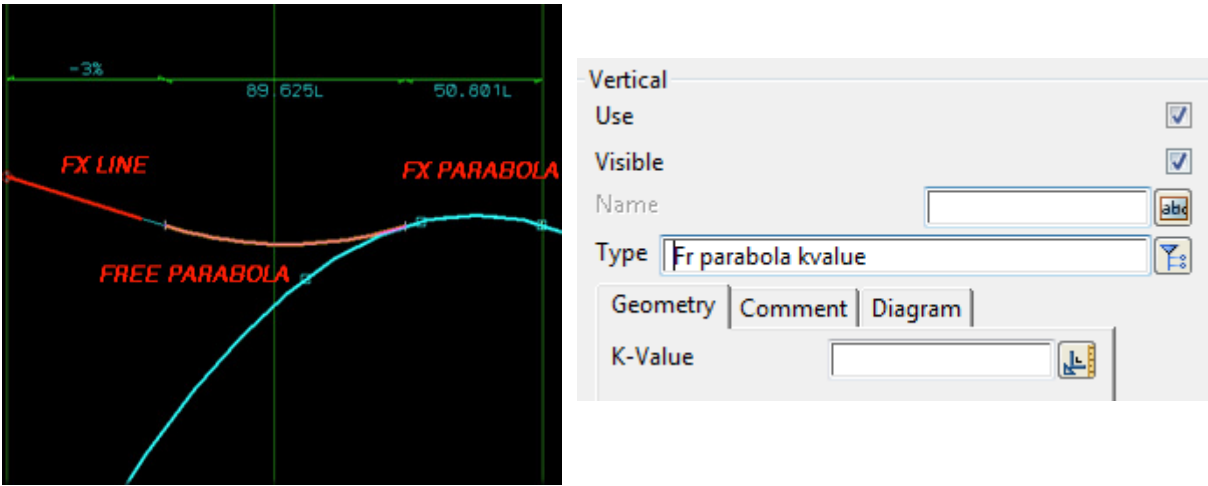
The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use	tick box	ticked	
<i>if ticked, then the Part is used in the vertical geometry. If not ticked, the Part is not used in the vertical geometry.</i>			
Visible	tick box	ticked	
<i>if ticked, then the Part is drawn in the vertical geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>			
Name	text box	blank	
<i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Vertical Parts list.</i>			
Type	choice box		types of vertical parts
<i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>			
Geometry tab <i>the geometrical information defining the Part</i>			
Length/100 Value	measure box		available measures
<i>the parabolic length divided by 100</i>			
Comment tab <i>the text typed into the text box is stored as a comment for the Part. Note: If a comment exists, a # is placed after the type of the part in the Vertical Parts list.</i>			
Set	button		
<i>the Set button must be clicked for the information for this Part to be used.</i>			
Same As	button		

Free Parabola: Known K Value

This Free Parabola has a known K value. Being tangential to the parts on either side fully determines the parabola.

It is not always possible for the Free Parabola to solve.



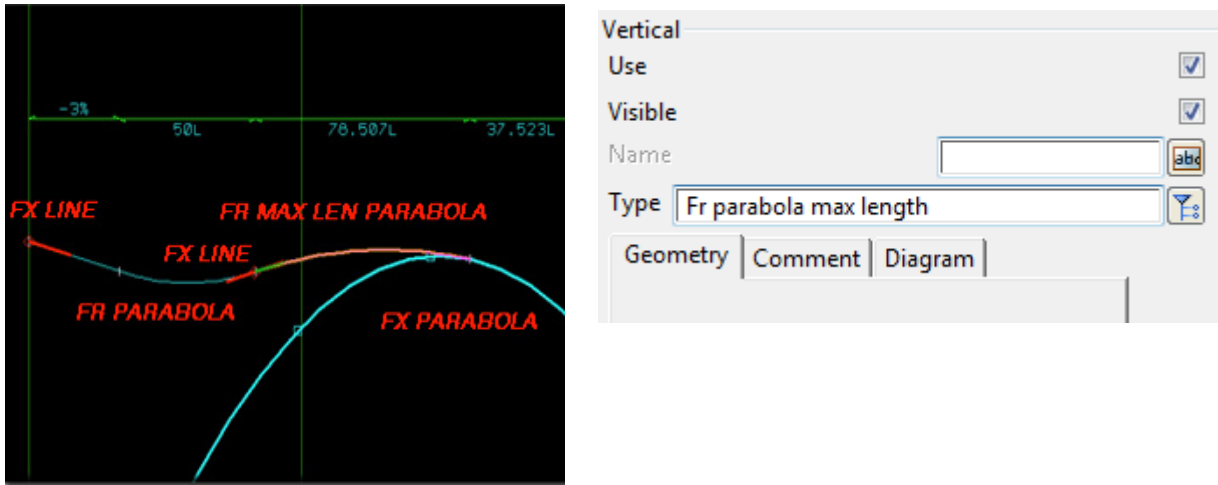
The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the vertical geometry. If not ticked, the Part is not used in the vertical geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the vertical geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Vertical Parts list.</i>	text box	blank	
Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box		types of vertical parts
Geometry tab <i>the geometrical information defining the Part</i>			
K-Value <i>the K value of the parabola</i>	measure box		available measures
Comment tab <i>the text typed into the text box is stored as a comment for the Part. Note: If a comment exists, a # is placed after the type of the part in the Vertical Parts list.</i>			
Set <i>the Set button must be clicked for the information for this Part to be used.</i>	button		
Same As	button		

Free Parabola: Fit with Maximum Length

This Free Parabola has a maximum parabolic length which will be determined by the parts on either side. Also being tangential to the parts on either side fully determines the parabola.

It is not always possible for the Free Parabola to solve.



Example:
The Free Transition is between the line of the left and the parabola on the right

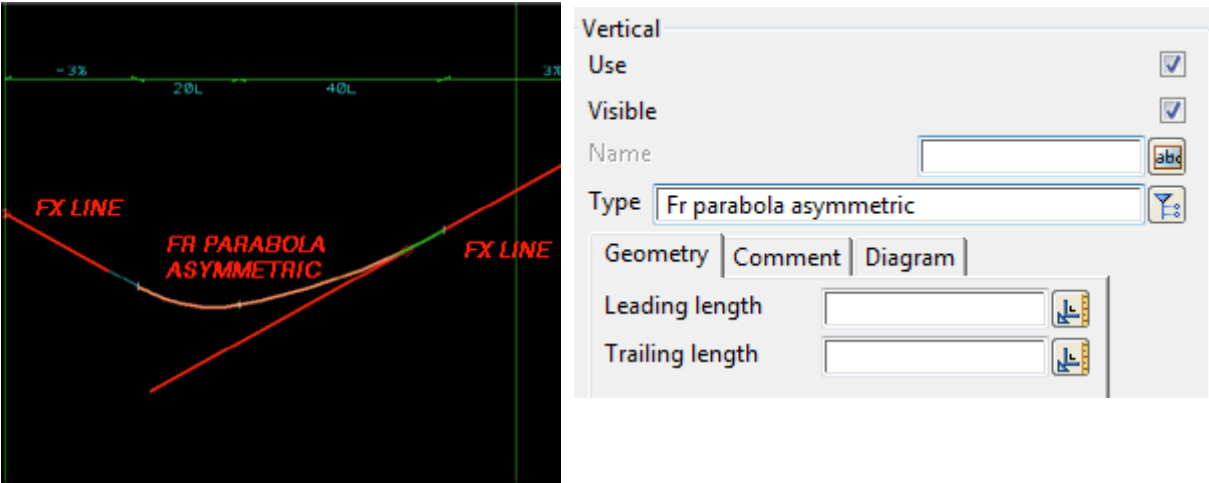
The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use	tick box	ticked	
<i>if ticked, then the Part is used in the vertical geometry.</i> <i>If not ticked, the Part is not used in the vertical geometry.</i>			
Visible	tick box	ticked	
<i>if ticked, then the Part is drawn in the vertical geometry.</i> <i>If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>			
Name	text box	blank	
<i>if not blank, then the Part is given this name.</i> <i>If blank then the Part has no name.</i> <i>Note: If the part has a name, then a ! is placed after the type of the part in the Vertical Parts list.</i>			
Type	choice box		types of vertical parts
<i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>			
Geometry tab <i>the geometrical information defining the Part</i>			
Comment tab <i>the text typed into the text box is stored as a comment for the Part.</i> <i>Note: If a comment exists, a # is placed after the type of the part in the Vertical Parts list.</i>			
Set	button		
<i>the Set button must be clicked for the information for this Part to be used.</i>			
Same As	button		

Free Asymmetric Parabola: Two Known Lengths

This Free Parabola has asymmetric parabolic with **known leading** and **trailing lengths**. Being tangential to the parts on either side fully determines the parabola.

It is not always possible for the Free Parabola to solve.

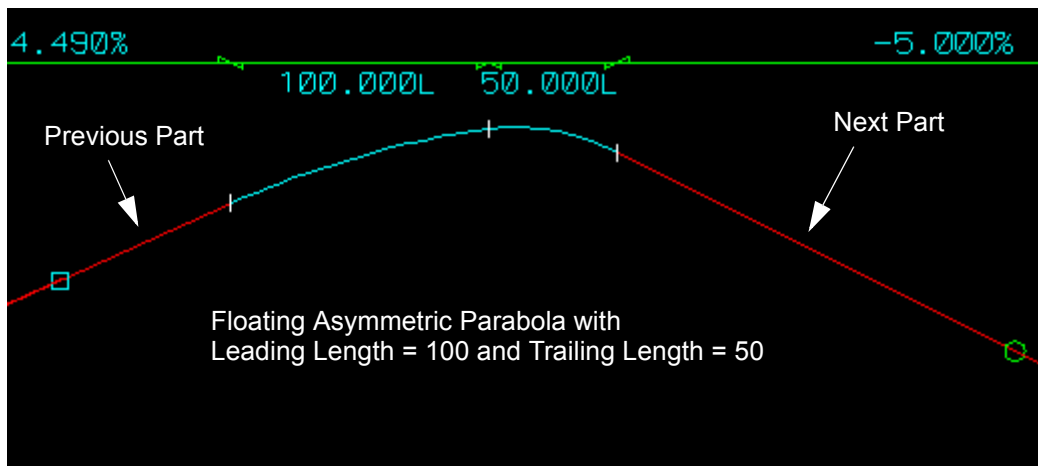


The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the vertical geometry. If not ticked, the Part is not used in the vertical geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the vertical geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Vertical Parts list.</i>	text box	blank	
Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box		types of vertical parts
Geometry tab <i>the geometrical information defining the Part</i>			
Leading length <i>the length of the leading parabola of the asymmetric parabola</i>	measure box		available measures
Trailing length <i>the length of the trailing parabola of the asymmetric parabola</i>	measure box		available measures
Comment tab <i>the text typed into the text box is stored as a comment for the Part. Note: If a comment exists, a # is placed after the type of the part in the Vertical Parts list.</i>			
Set <i>the Set button must be clicked for the information for this Part to be used.</i>	button		

Same As

button



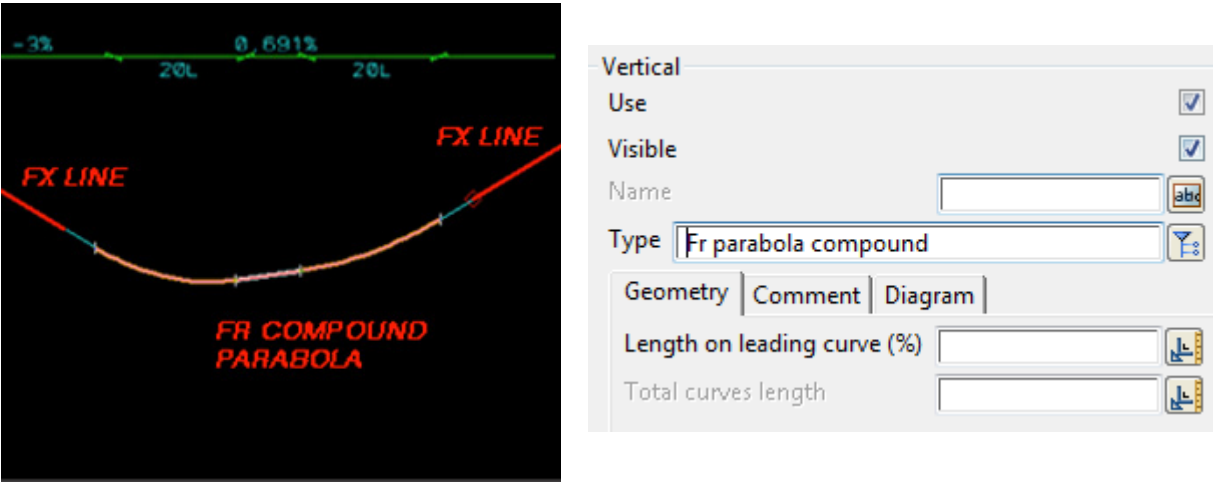
Free Compound Parabola: Two Parabolas with Optional Total Parabolic Length

This Free Parabola has two parabolas with a given total length and a ratio of the division between the two parabolas. There is an option total length of the two parabolas.

With a given Total Length, a straight between the two parabolas may need to be automatically inserted to get a solution.

Being tangential to the parts on either side fully determines the two parabolas and any necessary straight. The grades on the previous and next parts also determine if the parabolas are crest or sag parabolas.

It is not always possible for the Free Parabola to solve.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the vertical geometry. If not ticked, the Part is not used in the vertical geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the vertical geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Vertical Parts list.</i>	text box	blank	
Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box		types of vertical parts
Geometry tab <i>the geometrical information defining the Part</i>			
Length on leading curve (%) <i>the percentage of the total parabolic length going to the first parabola. Must be non zero.</i>	measure box		available measures
Total curves length <i>if blank, the two parabolic lengths are calculated in the given ratio to fit.</i>	measure box		available measures

If no zero, this value and the **Length on leading curve (%)** fully determines the lengths of the two parabolic curves but a straight between the two parabolas may need to be automatically inserted to get a solution.

Comment tab

the text typed into the text box is stored as a comment for the Part.

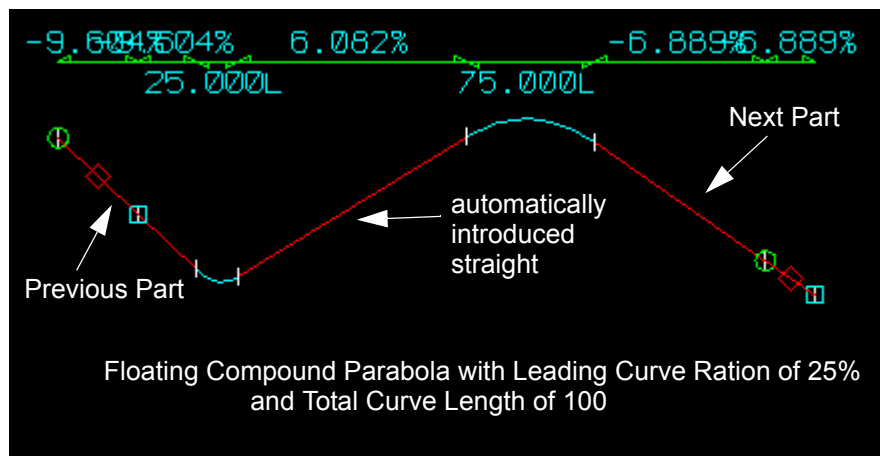
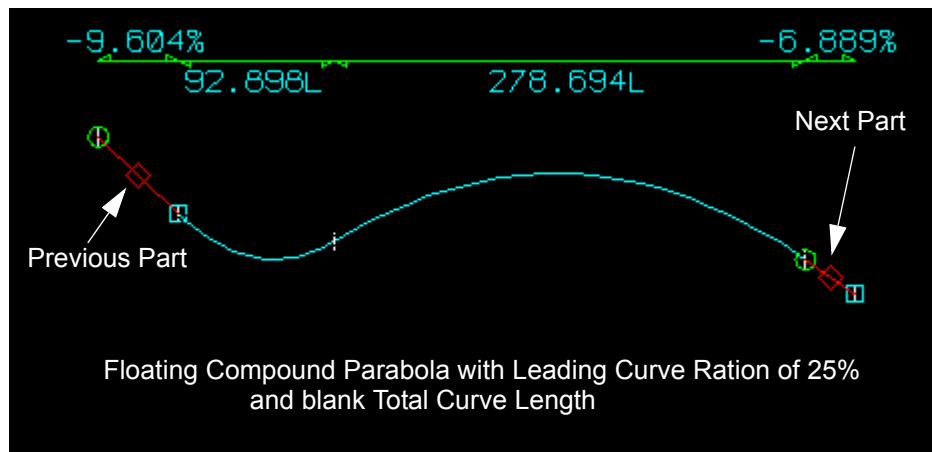
Note: If a comment exists, a # is placed after the type of the part in the Vertical Parts list.

Set button

the **Set** button must be clicked for the information for this Part to be used.

Same As button

after clicking the **Same As** button, an existing VIP can be selected from the screen and its information piped into the appropriate fields in the panel.

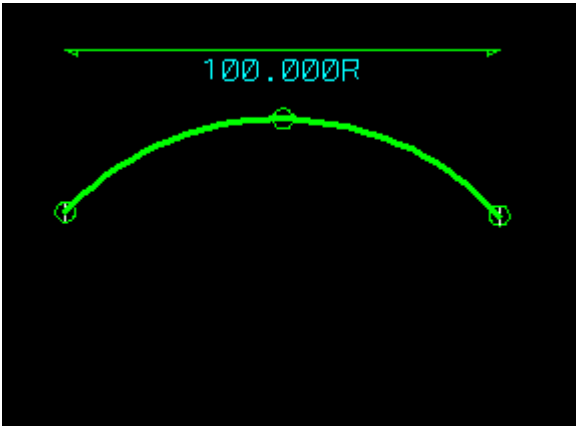


Vertical Arcs

- See [Fixed Arc- Known Centre, Start and End Points](#)
- See [Floating Arc: Known Point and Radius](#)
- See [Floating Arc: Known Point and Grade at Point](#)
- See [Floating Arc: Through Two Known Points](#)
- See [Free Arc: Known Radius](#)
- See [Free Arc: Known Point on the Arc](#)
- See [Free Arc: Known Length of Arc](#)

Fixed Arc- Known Centre, Start and End Points

The *Fixed Arc* is fully defined by a **known arc centre**, a **known radius** and **known start** and **end** points.



Example
Arc with radius of 100 and given
centre, start and end points.
Vertical Exaggeration = 1

Vertical

Use ☒

Visible ☒

Name

Type

Geometry | Comment | Diagram

Centre

Chainage

Height

Radius

Start

Chainage

Height

End

Chainage

Height

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the vertical geometry. If not ticked, the Part is not used in the vertical geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the vertical geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name.</i>	text box	blank	

If blank then the Part has no name.
Note: If the part has a name, then a **!** is placed after the type of the part in the Vertical Parts list.

Type choice box types of vertical parts
the type of this part. To change the Part type, choose another type from the pop-up list.

Geometry tab
the geometrical information defining the Part

Centre Chainage, Height
the (chainage,height) coordinates of the centre of the arc can be typed in, or selected using the **C**, **Z** or **CZ** icons

Radius radius box Measure Radius
radius of the arc. Must be non zero.

Start Chainage, Height
the (chainage,height) coordinates of the start of the arc can be typed in, or selected using the **C**, **Z** or **CZ** icons

End Chainage, Height
the (chainage,height) coordinates of the end of the arc can be typed in, or selected using the **C**, **Z** or **CZ** icons

Comment tab
the text typed into the text box is stored as a comment for the Part.

Note: If a comment exists, a **#** is placed after the type of the part in the Vertical Parts list.

Set button
the **Set** button must be clicked for the information for this Part to be used.

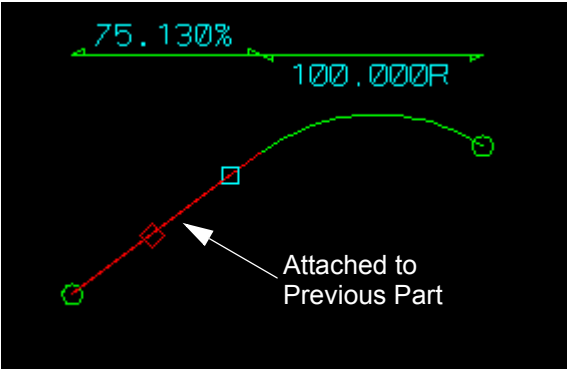
Same As button

Floating Arc: Known Point and Radius

The *Floating Arc* passes through a known point and has a known radius. Being tangential to a previous or next part is needed to fully determine the *Floating Arc*.

It is not always be possible for the *Floating Arc* to solve.

For example in the case where it follows a fixed line, if the perpendicular distance between the known point and the line is greater than the given radius, then there is no solution.



Example
Floating Arc going through a known point and with radius of 100.
Vertical Exaggeration = 1

Vertical

Use ☒

Visible ☒

Name

Type

Geometry | Comment | Diagram

Point

Chainage

Height

Radius

Attach to

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the vertical geometry. If not ticked, the Part is not used in the vertical geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the vertical geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Vertical Parts list.</i>	text box	blank	
Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box		types of vertical parts

Geometry tab
the geometrical information defining the Part

Chainage, Height
*the (chainage,height) coordinates of the point the arc goes through can be typed in, or selected using the **C**, **Z** or **CZ** icons*

Radius radius box Measure Radius
radius of the arc. Must be non zero.

Attach to choice box previous part previous part, next part
the Part that the Floating Arc is attached to, and made tangential to.

Comment tab
the text typed into the text box is stored as a comment for the Part.
***Note:** If a comment exists, a # is placed after the type of the part in the Vertical Parts list.*

Set button
*the **Set** button must be clicked for the information for this Part to be used.*

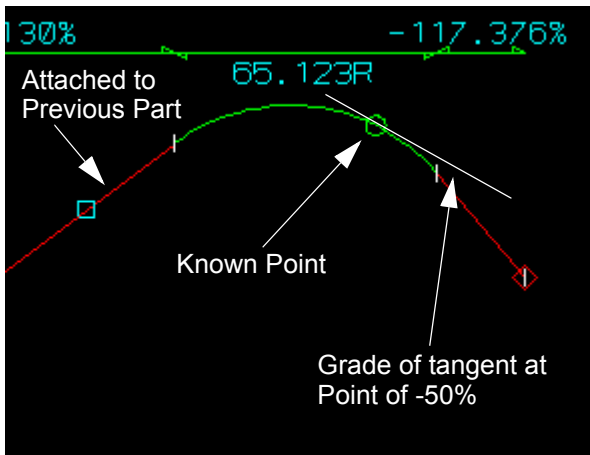
Same As button

Floating Arc: Known Point and Grade at Point

The *Floating Arc* passes through a known point and has a known grade for the tangent to the arc at the known point.

It may not always be possible for the Floating Arc to actually solve.

For example in the case where it follows a fixed line, if the perpendicular distance between the known point and the line is greater than the given radius, then there is no solution.



Vertical

Use ☒

Visible ☒

Name

Type

Geometry | Comment | Diagram

Point

Chainage

Height

Grade

Attach to

Example

Floating Arc going through a known point with a grade at that point of -50 per cent.

Vertical Exaggeration = 1

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the vertical geometry. If not ticked, the Part is not used in the vertical geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the vertical geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Vertical Parts list.</i>	text box	blank	
Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box		types of vertical parts

Geometry tab

the geometrical information defining the Part

Point Chainage, Height

the (chainage,height) coordinates of the point the arc goes through can be typed in, or selected using the C, Z or CZ icons

Grade measure box available measures
the grade (in percent grade) of the tangent at the given point

Attach to choice box previous part previous part, next part
the Part that the Floating Arc is attached to, and made tangential to.

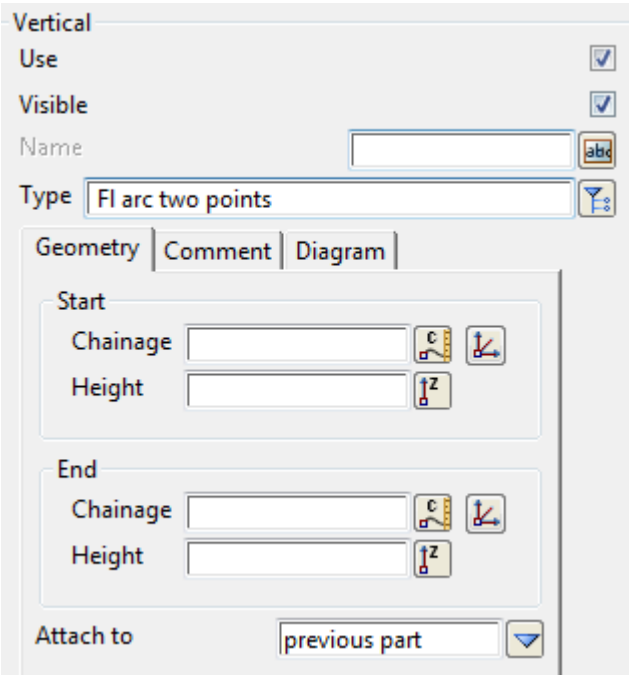
Comment tab
the text typed into the text box is stored as a comment for the Part.
***Note:** If a comment exists, a # is placed after the type of the part in the Vertical Parts list.*

Set button
*the **Set** button must be clicked for the information for this Part to be used.*

Same As button

Floating Arc: Through Two Known Points

The *Floating Arc* passes through two known points.
It is not always possible for the Floating Arc to solve.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the vertical geometry. If not ticked, the Part is not used in the vertical geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the vertical geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Vertical Parts list.</i>	text box	blank	
Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box		types of vertical parts

Geometry tab
the geometrical information defining the Part

Start Chainage, Height
*the (chainage,height) coordinates for the first point the parabola goes through can be typed in, or selected using the **C**, **Z** or **CZ** icons.*

End Chainage, Height
the (chainage,height) coordinates for the second point the parabola goes through can be typed in, or

*selected using the **C**, **Z** or **CZ** icons.*

Attach to choice box previous part previous part, next part
the Part that the Floating Arc is attached to, and made tangential to.

Comment tab
the text typed into the text box is stored as a comment for the Part.
***Note:** If a comment exists, a # is placed after the type of the part in the Vertical Parts list.*

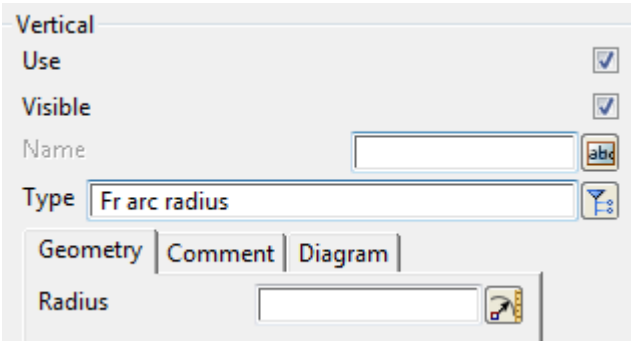
Set button
*the **Set** button must be clicked for the information for this Part to be used.*

Same As button

Free Arc: Known Radius

The *Free Arc* has a **known radius**. The Free arc is fully determined by being tangential to the parts on either side.

It is not always possible for the *Free Arc* to solve.



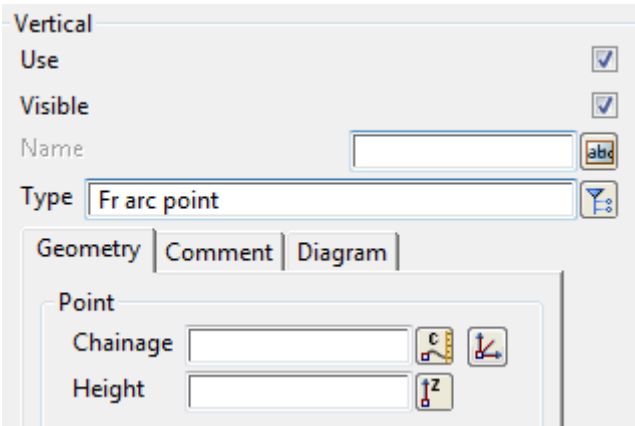
The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the vertical geometry. If not ticked, the Part is not used in the vertical geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the vertical geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Vertical Parts list.</i>	text box	blank	
Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box		types of vertical parts
Geometry tab <i>the geometrical information defining the Part</i>			
Radius <i>the radius of the arc</i>	radius box		Point, String from point
Comment tab <i>the text typed into the text box is stored as a comment for the Part. Note: If a comment exists, a # is placed after the type of the part in the Vertical Parts list.</i>			
Set <i>the Set button must be clicked for the information for this Part to be used.</i>	button		
Same As	button		

Free Arc: Known Point on the Arc

The *Free Arc* passes through a **known point**. The Free arc is fully determined by being tangential to the parts on either side.

It is not always possible for the *Free Arc* to solve.



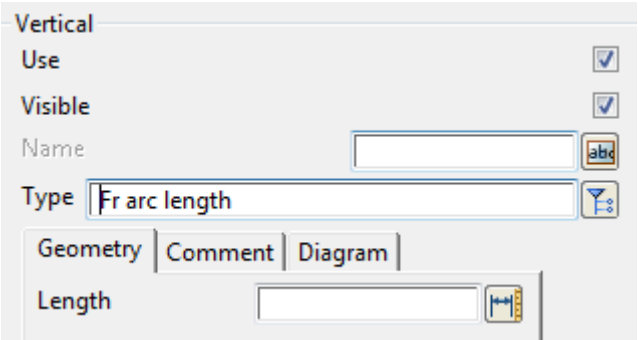
The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the vertical geometry. If not ticked, the Part is not used in the vertical geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the vertical geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Vertical Parts list.</i>	text box	blank	
Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box		types of vertical parts
Geometry tab <i>the geometrical information defining the Part</i>			
Point Chainage, Height <i>the (chainage,height) coordinates of the point that the arc goes through can be typed in, or selected using the C, Z or CZ icons.</i>			
Comment tab <i>the text typed into the text box is stored as a comment for the Part. Note: If a comment exists, a # is placed after the type of the part in the Vertical Parts list.</i>			
Set <i>the Set button must be clicked for the information for this Part to be used.</i>	button		
Same As	button		

Free Arc: Known Length of Arc

The *Free Arc* has a **known length**. The Free arc is fully determined by being tangential to the parts on either side.

It is not always possible for the *Free Arc* to solve.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use <i>if ticked, then the Part is used in the vertical geometry. If not ticked, the Part is not used in the vertical geometry.</i>	tick box	ticked	
Visible <i>if ticked, then the Part is drawn in the vertical geometry. If not ticked, then the Part is not drawn whenever all the Parts before it, or all the Parts after it, also have Visible not ticked. The effect may not be apparent until leaving the Editor and all the construction work is removed.</i>	tick box	ticked	
Name <i>if not blank, then the Part is given this name. If blank then the Part has no name. Note: If the part has a name, then a ! is placed after the type of the part in the Vertical Parts list.</i>	text box	blank	
Type <i>the type of this part. To change the Part type, choose another type from the pop-up list.</i>	choice box		types of vertical parts
Geometry tab <i>the geometrical information defining the Part</i>			
Length <i>the length of the Free arc. Must be non zero.</i>	length box		Point to point, String to point
Comment tab <i>the text typed into the text box is stored as a comment for the Part. Note: If a comment exists, a # is placed after the type of the part in the Vertical Parts list.</i>			
Set <i>the Set button must be clicked for the information for this Part to be used.</i>	button		
Same As	button		

Vertical Computators

Not yet documented.

Text Format of Files

Go to

[Text Format of the MTF File](#)

[Text Format of the Boxing File](#)

Text Format of the MTF File

In the text version of the mtf file, most of (a) to (h) begin with a key word, following by an equals sign (=) and then special commands enclosed in { }.

```
key_word  =  {
                commands
            }
```

The key words for each case above are

- (a) left_side, right_side
- (b) specials
- (c) hinge_modifier
- (d) left_side_modifier, right_side_modifier
- (e) stripping
- (f) boxing_file, left_boxing, right_boxing, left_boxing_2, right_boxing_2 ... left_boxing_8, right_boxing_8
- (g) auto_super_tables, left_auto_super, left_auto_width, right_auto_super, right_auto_width
- (h) loops
- (i) section_width
- (j) string_modifiers

If any of the key words exist, then they must be in the following order in the **mtf** file:

```
left_side           =  { ... }
right_side          =  { ... }
specials            =  { ... }
hinge_modifier      =  { ... }
left_side_modifier  =  { ... }
right_side_modifier =  { ... }
stripping           =  { ... }
boxing_file         =  "something.bf"
left_boxing         =  { ... }
right_boxing        =  { ... }
section_width       =  value
string_modifiers    =  { ... }
auto_super_tables   =  1 or 0
left_auto_super     =  { ... }
left_auto_width     =  { ... }
right_auto_super    =  { ... }
right_auto_width    =  { ... }
loop_removals       =  { ... }
```

The format for *boxing_file* is simply

```
boxing_file  =  "something.bf"
```

where *something.bf* is the name of a file containing boxing definitions to use for the mtf.

The format for (g) is simply

```
section_width  =  value           // default is 10000
```

where *value* is the distance to search from the hinge string for strings required in some options. If *section_width* is missing, then it takes the default value of 10000.

The key words, *left_side* and *right_side* which are for initially applying templates (for part (a)), have already been described under the **Design=>Apply=>Apply many** option but will be summarised in the next section [MTF Templates](#).

The documentation for the **text file syntax** of the MTF file now follows.

See [MTF Templates File Format](#)

[MTF Specials File Format](#)

[MTF Hinge Modifier File Format](#)

[MTF Template Modifiers File Format](#)

[MTF Stripping File Format](#)

[MTF Boxing File Format](#)

[MTF Width File Format](#)

[MTF String Modifiers File Format](#)

[Substitutions in the Many Templates File](#)

MTF Templates File Format

The templates on the left and right hand sides of the centre line (or Hinge string if one is selected) are specified separately in the many templates file. Apart from a key word denoting whether the following part of the definition is for the left side or the right side, the set out for the left-side is identical to the right-side. Hence, only the left-side will be described in detail.

The left-side definition begins with the key words

```
left_side =
```

A list of chainages (in ascending order, one per line) with corresponding template names then follows. This list of chainages and templates is enclosed in curly braces { }.

Note if the template name includes spaces, then the name must be enclosed in quotes ". For example, "left 1".

The chainage-template lists are assembled as follows

- (a) To represent a template starting at a given chainage, the chainage value followed by the template name is given. The chainage and name are separated by one or more spaces. For example, the template **std** starting at chainage 150 is represented by

```
150      std
```

The template is assumed to apply until the chainage given on the next line of the left-side definition.

If the template is to go to the end of the centre-line, add a line with a chainage greater than or equal to the end chainage. For example,

```
150      std
```

```
99999
```

- (b) if no template exists from a chainage, simply include the chainage with no template name following it. For example, if there is no template from chainage 250, this is represented by

```
250
```

The non-existence of a template is assumed to apply until the chainage given on the next line of the left-side definition

- (c) the case of a linear change from one template to another template over a specified chainage range is represented by giving the start chainage of the linear change, followed on the same line by the start template, a comma, and the end template. For example, if the template is to vary linearly between the template **std** and the template **left**, beginning at the chainage 350, then the line in the file would be

```
350      std, left
```

The linear change takes place over the interval beginning at the chainage given on the defining line and ending at the chainage given on the next line of the left-side. Distances and percent cross-falls are interpolated linearly and slopes are interpolated on the radian value of the slope angles.

Combining these rules, the following lines in a template file

```
left_side = {
    100      std
    200      std , "left 1"
    250      "left 1"
    300
    350      std
    99999
}
```

describes the situation

1. the left-hand side of the centre-line has no template from the beginning of the centre-line until chainage 100.
2. at chainage 100, the template **std** begins and continues until chainage 200.

3. there is a linear change from the template **std** to the template **left 1** between chainage 200 and chainage 250.
4. the template **left 1** goes from chainage 250 to chainage 300.
5. there is a gap between chainage 300 and chainage 350.
6. the template **std** goes from chainage 350 to chainage 99999, or if the end chainage is smaller than 99999, to the end of the centre-line.

The right-side template definition begins with the key word `right_side`. The rest of the definition follows the same rules at the left hand side of the centre-line. For example,

```
right_side = {  
    100      std  
    200      std , right  
    250      right  
    300      right , std  
    350      std  
    400  
}
```

The left and right sides can vary independently.

Restrictions on the Template File Definitions

1. If one template stops at the same chainage that another template begins, then the two templates must have the same number of fixed and variable links. The templates will be varied linearly from the stopping template to the starting template over one section separation distance.
2. If there is a linear variation between two templates, the two templates must have the same number of fixed and variable links.
3. If two templates do not have the same number of links, they must be separated by a gap, that is, by a region with no template.

Summarising:

The templates on the left and right hand sides of the centre line are specified separately in the many templates file.

The left-side (right-side) definition begins with the key words

`left_side =` `right_side =`

with a list of chainages (in ascending order, one per line) with template names. This list of chainages and templates is enclosed in curly braces `{ }`.

The chainage-template lists are assembled as follows

- (a) To represent a template starting at a given chainage, the chainage value followed by the template name is given. The chainage and name are separated by one or more spaces. For example, the template **std** starting at chainage 150 is represented by

150 std

The template is assumed to apply until the chainage given on the next line of the left-side definition.

If the template is to go to the end of the centre-line, add a line with a chainage greater than or equal to the end chainage. For example,

150 std
99999

- (b) if no template exists from a chainage, simply include the chainage with no template name

following it. For example, if there is no template from chainage 250, this is represented by

250

The non-existence of a template is assumed to apply until the chainage given on the next line of the left-side definition

- (c) the case of a linear change from one template to another template over a specified chainage range is represented by giving the start chainage of the linear change, followed on the same line by the start template, a comma, and the end template. For example, if the template is to vary linearly between the template **std** and the template **left**, beginning at the chainage 350, then the line in the file would be

350 std, left

The linear change takes place over the interval beginning at the chainage given on the defining line and ending at the chainage given on the next line of the left-side. Distances and percent cross-falls are interpolated linearly and slopes are interpolated on the radian value of the slope angles.

A Left and Right Side File Example

```
left_side = {
    100      std
    200      std , "left 1"
    250      "left 1"
    300
    350      std
    99999
}
right_side = {
    100      std
    200      std , right
    250      right
    300      right , std
    350      std
    400
}
```

The **left_side** describes the situation:

1. the left-hand side of the centre-line has no template from the beginning of the centre-line until chainage 100.
2. at chainage 100, the template **std** begins and continues until chainage 200.
3. there is a linear change from the template **std** to the template **left 1** between chainage 200 and chainage 250.
4. the template **left 1** goes from chainage 250 to chainage 300.
5. there is a gap between chainage 300 and chainage 350.
6. the template **std** goes from chainage 350 to chainage 99999, or if the end chainage is smaller than 99999, to the end of the centre-line.

Go to the next section [MTF Specials File Format](#) or back to [Text Format of the MTF File](#)

MTF Specials File Format

In the many templates file, the **specials** definition begins with the key word

```
specials  =
```

This is followed by a list of

(a) chainages, in any order, one per line

and/or

(b) the names of files (enclosed in quotes “”) which include lists of chainages (The default ending for a special chainage file is *.spc)

The list of chainages and/or file names is enclosed in curly braces {}.

A Specials Example

```
specials  = {  
           125.3  
           1925.4  
           “fred”           // file of chainages to read in  
           3007  
           “joe”  
        }
```

Go to the next section [MTF Hinge Modifier File Format](#) or back to [Text Format of the MTF File](#)

MTF Hinge Modifier File Format

In the many templates file, the **hinge modifier** definition begins with the key word

```
hinge_modifier =
```

followed by one or more of the hinge modifier commands **offset**, **height**, **coord** and **nohinge** enclosing curly braces {}.

```
hinge_modifier = {
    hinge modifier commands
}
```

The definition of the hinge modifier commands will now be given.

Offset

The **offset** modifier will move the hinge point a given offset distance (perpendicular to the reference string) from its current plan position. A positive offset is to the right of the hinge string and a negative offset to the left.

The format of the modifier to vary the **offset** is

```
offset    st_ch    end_ch    st_offset    end_offset    absrel    type    extra_start    extra_end
```

where

```
st_ch      start chainage for the modifier
end_ch     end chainage for the modifier
```

```
st_offset  offset to be used at the start modifier chainage, st_ch
end_offset offset to be used at the end modifier chainage, end_ch.
```

```
absrel     relative (default) or absolute
type       linear (default) or cubic
```

```
extra_start optional - adds in an extra x-section 0.1mm before start chainage
extra_end   optional - adds in an extra x-section 0.1mm before end chainage
```

If **absrel** is **relative** (the default) then

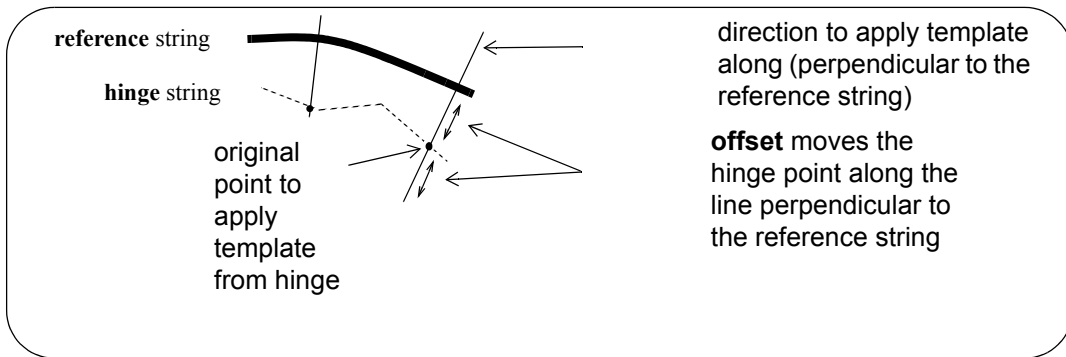
```
the st_offset is added to the current position of the hinge point at chainage st_ch.
the end_offset is added to the current position of the hinge point at chainage end_ch.
```

If **absrel** is **absolute**, then

```
the offset of the hinge point is taken with respect to the original position of the hinge
string at chainage st_ch.
the offset of the hinge point is taken with respect to the original position of the hinge
string at chainage end_ch.
```

If **type** is **linear** (the default), then the offset is varied linearly (with respect to the reference chainage) between the offsets at chainage st_ch and chainage end_ch.

If **type** is **cubic**, then the offset is varied as a reverse cubic (with respect to the reference chainage) between the offsets at chainage st_ch and chainage end_ch.



Offset to String

The offset for the hinge point can also be varied by **going out to another *12d Model* string**.

offset	st_ch	end_ch	full_string_name	extra_start	extra_end
---------------	--------------	---------------	-------------------------	--------------------	------------------

where

st_ch	start chainage for the modifier
end_ch	end chainage for the modifier

full_string_name name of a **12d Model** string to take the hinge point out to. The format of the string name is "model_name->string_name".

extra_start	optional - adds in an extra x-section 0.1mm before start chainage
extra_end	optional - adds in an extra x-section 0.1mm before end chainage

Height

The **height** modifier varies the height of the hinge point between the given chainages.

height	st_ch	end_ch	st_height	end_height	absrel	type	extra_start	extra_end
---------------	-------	--------	-----------	------------	--------	------	-------------	-----------

where

st_ch	start chainage for the modifier
end_ch	end chainage for the modifier

<code>st_height</code>	height to be used at the start modifier chainage, <code>st_ch</code>
<code>end_height</code>	height to be used at the end modifier chainage, <code>end_ch</code> .

absrel	relative (default) or absolute
type	linear (default) or cubic

extra_start	optional - adds in an extra x-section 0.1mm before start chainage
extra_end	optional - adds in an extra x-section 0.1mm before end chainage

If **absrel** is **relative** (the default) then

the st_height is added to the current height of the hinge point at chainage st_ch.
the end_height is added to the current height of the hinge point at chainage
end_ch.

If **absrel** is **absolute**, then

the height of the hinge point is set to `st_height` above the original hinge string at chainage `st_ch`.

the height of the hinge point is set to end_height above the original hinge string at chainage end ch.

If **type** is **linear** (the default), then the height is varied linearly (with respect to the reference

If **type** is **cubic**, then the height is varied as a reverse cubic (with respect to the reference chainage) between the height at chainage `st_ch` and chainage `end_ch`.

The height of the hinge point can also be specified by **taking the height from another 12d Model string**.

where

end_ch	end chainage for the modifier
--------	-------------------------------

extra_start	optional - adds in an extra x-section 0.1mm before start chainage
extra_end	optional - adds in an extra x-section 0.1mm before end chainage

The **coord** modifier is used to replace the x, y and z position of the hinge point by the x, y and z position of **another 12d Model string** between given chainages. Hence **coord** replaces the hinge string by another string between the given chainages.

where

`end_ch` end chainage for the modifier

extra_start	optional - adds in an extra x-section 0.1mm before start chainage
extra_end	optional - adds in an extra x-section 0.1mm before end chainage

The **nohinge** modifier is used to **stop** the hinge string (and hence the apply) between given chainages. This will leave a gap in the strings created by the apply between the given chainages.

where

```
end ch      end chainage for stopping the apply
```

extra_start	optional - adds in an extra x-section 0.1mm before start chainage
extra_end	optional - adds in an extra x-section 0.1mm before end chainage

Please continue to the next section [A Hinge Modifier Example](#).

```
hinge_modifier = {
    offset      0 250 0 3           // linearly offset the hinge by 0 to 3
```

```
                                // over the chainage range 0 to 250.
height    125  300  2    2      // add 2 to the hinge height
                                // over the chainage range 125 to 300.
coord     300  400  "mod->new_string" // use the position of the string
                                // new_string over the chainage
                                // range 300 to 400.
nohinge   400  500  2    2      // stop the apply between the chainages
                                // over the chainage range 400 to 500.
}
```

Go to the next section [MTF Template Modifiers File Format](#) or back to [Text Format of the MTF File](#)



MTF Template Modifiers File Format

In the many templates file, the **template modifier** definition begins with the key word

```
left_side_modifier  =
```

and/or

```
right_side_modifier  =
```

followed by one or more of the template modifier commands enclosing curly braces { }

- (a) fixed link modifiers - commands working on fixed links

insert

remove

**width, height, xfall, xfall_crc, copy_width, copy_height, copy_xfall,
tin_height, tin_xfall**

- (b) stop and start decisions commands

decision

- (c) variable cut and fill link modifiers - commands working on cut/fill links

insert_cut, insert_fill

remove_cut, remove_fill

**cut_width, cut_height, cut_slope, copy_cut_width, copy_cut_height,
copy_cut_slope, tin_cut_height, tin_cut_slope**

**fill_width, fill_height, fill_slope, copy_fill_width, copy_fill_height,
copy_fill_slope, tin_fill_height, tin_fill_slope**

- (d) final cut/fill link modifiers

final_width, final_cut_slope, final_no_cut_slope

final_fill_slope, final_no_fill_slope

- (e) snippets - inserting groups of modifier commands

snippet

That is,

```
left_side_modifier  = {
                        template modifier commands
                      }
```

and/or

```
right_side_modifier = {
                        template modifier commands
                      }
```

The definition of the template modifier commands and their file format will now be given.

For **Start mode and End mode**, go to the section [Start and End Chainages in the Modifier File Format](#).

For **Fixed Link** modifiers, go to the section [MTF Fixed Link Modifiers File Format](#).

For **Decision Link** modifiers, go to the section [Decision File Format](#).

For **Cut and Fill Link** modifiers, go to the section [Cut and Fill Variable Link Modifiers File Format](#).

For **Final Link** modifiers, go to the section [Final Link Modifiers File Format](#).

For **Snippets**, go to the section [Snippets File Format](#).

Please continue to the next section [Start and End Chainages in the Modifier File Format](#).

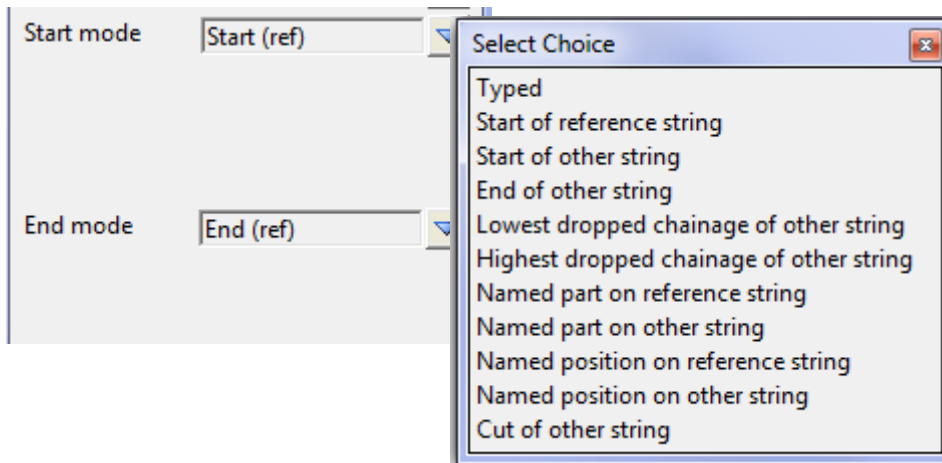
Start and End Chainages in the Modifier File Format

Modifiers work between two chainages and in each modifier command, the position of the start and end chainages for the commands are denoted by:

st_ch start chainage for the modifier
end_ch end chainage for the modifier

However there are a number of ways for defining the start and end chainages in the modifier command (called Start mode and End mode on the modifier panels).

Start Mode - st_ch



For each of the **Start modes**, the replacement for st_ch is:

- (a) Typed
the actual typed in chainage value
- (b) Start of reference string
\$null
- (c) Start of other string
chainage_start "model_of_string->string_name"
where model_of_string and string_name are the model and name of the string to take the start chainage from. The double quotes (") are needed.
- (d) End of other string
chainage_final "model_of_string->string_name"
where model_of_string and string_name are the model and name of the string to take the end chainage from. The double quotes (") are needed.
- (e) Lowest dropped chainage of other string
chainage_low "model_of_string->string_name"
where model_of_string and string_name are the model and name of the string to take the lowest dropped chainage from. The double quotes (") are needed.
- (f) Highest dropped chainage of other string
chainage_high "model_of_string->string_name"
where model_of_string and string_name are the model and name of the string to take the highest dropped chainage from. The double quotes (") are needed.
- (g) Named part of reference other string
named_part "part_specifier" start_extension_value
where part_specifier is the full specification of the part of the reference string to use. The

start_extension_value is added to the chainage. The double quotes (") are needed.

(h) Named part of other string

named_part "model_of_string->string_name" "part_specifier" start_extension_value

where model_of_string and string_name are the model and name of the string to take the name part from, and part_specifier is the full specification of the part from that string. The start_extension_value is added to the chainage. The double quotes (") are needed.

(i) Named position of reference

named_position "pos_name" start_extension_value

where pos_name is the name of the named position of the reference string to use. The start_extension_value is added to the chainage. The double quotes (") are needed.

(j) Named position on other string

named_position "model_of_string->string_name" "pos_name" start_extension_value

where model_of_string and string_name are the model and name of the string to take the name position from, and pos_name is the name of the named position from that string. The start_extension_value is added to the chainage. The double quotes (") are needed.

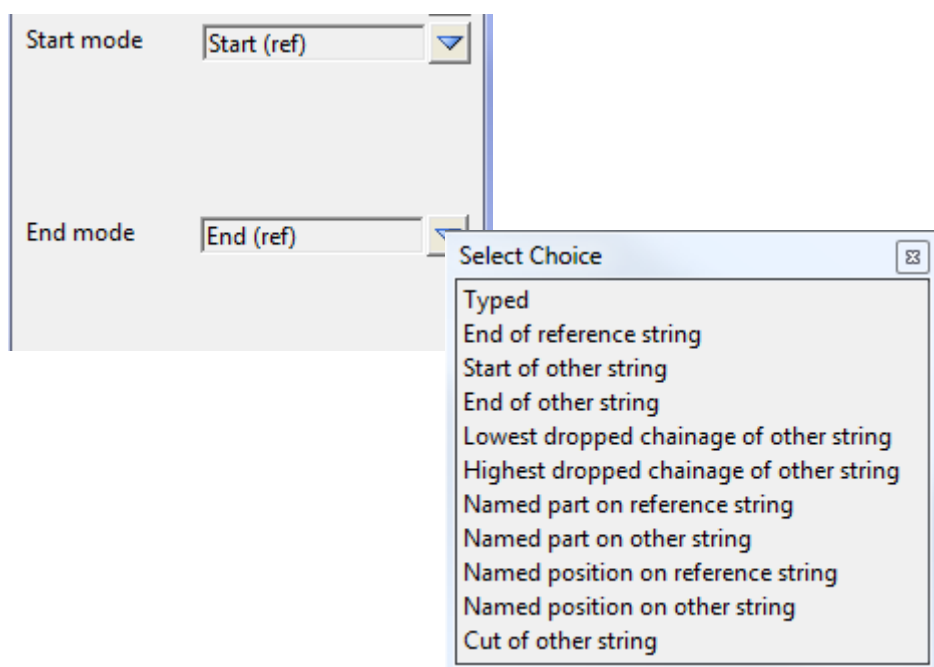
(k) Cut of other string

cut_other "model_of_string->string_name" "name" start_extension_value

where model_of_string and string_name are the model and name of the selected string. A chainage is calculated from the cut of the string with the reference string. The start_extension_value is added to the chainage. The double quotes (") are needed.

Note: If there are no cuts, or if there is more than one cut, then the command is not processed.

End Mode - end_ch



For each of the **End modes**, the replacement for end_ch is:

(a) Typed

the actual typed in chainage value

(b) End of reference string

\$null

(c) Start of other string

chainage_start "model_of_string->string_name"

where model_of_string and string_name are the model and name of the string to take the start chainage from. The double quotes (") are needed.

(d) End of other string

chainage_final "model_of_string->string_name"

where model_of_string and string_name are the model and name of the string to take the end chainage from. The double quotes (") are needed.

(e) Lowest dropped chainage of other string

chainage_low "model_of_string->string_name"

where model_of_string and string_name are the model and name of the string to take the lowest dropped chainage from. The double quotes (") are needed.

(f) Highest dropped chainage of other string

chainage_high "model_of_string->string_name"

where model_of_string and string_name are the model and name of the string to take the highest dropped chainage from. The double quotes (") are needed.

(g) Named part of reference other string

named_part "part_specifier" start_extension_value

where part_specifier is the full specification of the part of the reference string to use. The start_extension_value is added to the chainage. The double quotes (") are needed.

(h) Named part of other string

named_part "model_of_string->string_name" "part_specifier" end_extension_value

where model_of_string and string_name are the model and name of the string to take the name part from, and part_specifier is the full specification of the part from that string. The end_extension_value is added to the chainage. The double quotes (") are needed.

(i) Named position of reference

named_position "pos_name" end_extension_value

where pos_name is the name of the named position of the reference string to use. The end_extension_value is added to the chainage. The double quotes (") are needed.

(j) Named position on other string

named_position "model_of_string->string_name" "pos_name" end_extension_value

where model_of_string and string_name are the model and name of the string to take the name position from, and pos_name is the name of the named position from that string. The end_extension_value is added to the chainage. The double quotes (") are needed.

(k) Cut of other string

cut_other "model_of_string->string_name" "name" start_extension_value

where model_of_string and string_name are the model and name of the selected string. A chainage is calculated from the cut of the string with the reference string. The end_extension_value is added to the chainage. The double quotes (") are needed.

Note: is there is no cuts or more than one cut then the command is not processed.

Please continue to the next section [MTF Fixed Link Modifiers File Format](#).

MTF Fixed Link Modifiers File Format

Fixed - Link Insert

Fixed links can be created by one of three **insert** commands by specifying either width and height, width and xfall, or height and xfall.

insert link_name colour width height **unknown** st_ch end_ch *optional* // use width, height

insert link_name colour width **unknown** xfall st_ch end_ch *optional* // use width, xfall

insert link_name colour **unknown** height xfall st_ch end_ch *optional* // use height, xfall

where **unknown** takes the place of the one of width, height or xfall not being used, and

link_name	name of the link being created
colour	colour of the link being created
width, height, xfall	width, height or xfall of the created link
st_ch	start chainage for creating the link
end_ch	end chainage for creating the link

and *optional* can be none, one or more of the following

name	if non-blank, insert before the link name in the template if blank, then append after the last link of the fixed template table
interval	if interval exists, then sections are created at the interval_value for the range of this command if interval is missing, then the interval for the apply many is used
interval_value	only exists if <i>interval</i> exists
extra_start	optional - adds in an extra x-section 0.1 mm before start chainage
extra_end	optional - adds in an extra x-section 0.1 mm before end chainage
inactive	if <i>inactive</i> is there then the command is not processed. If <i>inactive</i> is not there then the command is processed
// text	the text is a comment

See [Start and End Chainages in the Modifier File Format](#) for the format for st_ch and end_ch.

Fixed - Link Remove

Fixed links can be deleted by the **remove** command:

remove link_list st_ch end_ch *optional*

where

link_list	one or more names of links to be removed, in the form name1 name2 ... namei
st_ch	start chainage for removing the link
end_ch	end chainage for removing the link

and *optional* can be none, one or more of

interval	if interval exists, then sections are created at the interval_value for the range of this command if interval is missing, then the interval for the apply many is used
interval_value	only exists if <i>interval</i> exists

extra_start	optional - adds in an extra x-section 0.1 mm before start chainage
extra_end	optional - adds in an extra x-section 0.1 mm before end chainage
inactive	if <i>inactive</i> is there then the command is not processed. If inactive is not there then the command is processed
// text	the text is a comment

See [Start and End Chainages in the Modifier File Format](#) for the format for st_ch and end_ch.

Fixed - Width

The **width** modifier is used to modify the width of fixed links originally defined by width.

The format of the modifier to vary the **width** of the fixed links given by link_list is

width link_list st_ch end_ch st_wid end_wid absrel type optional

where

link_list	one or more names of fixed links given in the template definition; with format name1 name2 ... namei
st_ch	start chainage for the modifier
end_ch	end chainage for the modifier
st_wid	width to be used at the start modifier chainage, st_ch
end_wid	width to be used at the end modifier chainage, end_ch.
absrel	relative (default) or absolute If absrel is relative (the default) then the st_wid is added to the current width of links in link_list at chainage st_ch. the end_wid is added to the current width of links in link_list at chainage end_ch. If absrel is absolute , then the width of links in link_list are set to st_wid at chainage st_ch. the width of links in link_list are set to end_wid at chainage end_ch.
type	linear (default) or cubic If type is linear (the default), then the width of links in link_list are varied linearly (with respect to the reference chainage) between the width at chainage st_ch and chainage end_ch. If type is cubic , then the width of links in link_list is varied as a reverse cubic (with respect to the reference chainage) between the width at chainage st_ch and chainage end_ch.

and *optional* can be none, one or more of

interval	if interval exists, then sections are created at the interval_value for the range of this command if interval is missing, then the interval for the apply many is used
interval_value	only exists if <i>interval</i> exists
extra_start	optional - adds in an extra x-section 0.1mm before start chainage
extra_end	optional - adds in an extra x-section 0.1mm before end chainage
inactive	if <i>inactive</i> is there then the command is not processed. If inactive is not there then the command is processed
// text	the text is a comment

The width for a link can also be varied by **going out to another 12d Model string** or by taking the **width between two 12d Model strings**.

width link_list st_ch end_ch full_string_name side optional

width link_list st_ch end_ch str_name_1 side_1 str_name_2 side_2 optional

where

link_list	one or more names of fixed links given in the template definition; with format name1 name2 ... namei
st_ch	start chainage for the modifier
end_ch	end chainage for the modifier
full_string_name	name of a 12d Model string to take links in link_list out to. The format of the string name is "model_name->string_name".
side	side to search for string: -1 for left, 0 for left and right, 1 for right
str_name_1	name of the first 12d Model string. The format of the string name is "model_name->string_name".
side_1	side to search for string_1: -1 for left, 0 for left and right, 1 for right
str_name_2	name of the second 12d Model string. The format of the string name is "model_name->string_name".
side_2	side to search for string_2: -1 for left, 0 for left and right, 1 for right

and *optional* can be none, one or more of

interval	if interval exists, then sections are created at the interval_value for the range of this command
interval_value	if interval is missing, then the interval for the apply many is used only exists if <i>interval</i> exists
extra_start	optional - adds in an extra x-section 0.1mm before start chainage
extra_end	optional - adds in an extra x-section 0.1mm before end chainage
inactive	if <i>inactive</i> is there then the command is not processed. If <i>inactive</i> is not there then the command is processed
// text	the text is a comment

The **width** of links in link_list are taken to be the distance between **str_name_1** and **str_name_2**.

See [Start and End Chainages in the Modifier File Format](#) for the format for st_ch and end_ch.

Fixed- Width from Link

The **width from link** modifier is used to modify the width of fixed links originally defined by width to be the same as another link. That is, the width of the link is a copy of the width of another link.

The format of the modifier to vary the **width from link** of the fixed links given by link_list is

copy_width link_list st_ch end_ch from_link zone optional

where

link_list	one or more names of fixed links given in the template definition; with format name1 name2 ... namei
st_ch	start chainage for the modifier
end_ch	end chainage for the modifier
from_link	name of link to take the width from

zone section of the template that the from_link is from (i.e. fixed, cut or fill)

and *optional* can be none, one or more of

interval	if interval exists, then sections are created at the interval_value for the range of this command
	if interval is missing, then the interval for the apply many is used
interval_value	only exists if <i>interval</i> exists
extra_start	optional - adds in an extra x-section 0.1mm before start chainage
extra_end	optional - adds in an extra x-section 0.1mm before end chainage
inactive	if <i>inactive</i> is there then the command is not processed.
	If inactive is not there then the command is processed
// text	the text is a comment

See [Start and End Chainages in the Modifier File Format](#) for the format for st_ch and end_ch.

Fixed - Height

The **height** modifier is used to modify the height of fixed links originally defined by height.

The format of the modifier to vary the **height** of the fixed links in the **link_list** is almost identical to varying the width and is:

height link_list st_ch end_ch st_ht end_ht absrel type optional

where

link_list one or more names of fixed links given in the template definition; with format name1 name2 ... namei

st_ch start chainage for the modifier

end_ch end chainage for the modifier

st_ht height to be used at the start modifier chainage, st_ch

end_ht height to be used at the end modifier chainage, end_ch.

absrel relative (default) or absolute

If **absrel** is **relative** (the default) then

the st_ht is added to the current height of links in link_list at chainage st_ch.

the end_ht is added to the current height of links in link_list at chainage

end_ch.

If **absrel** is **absolute**, then

the height of links in link_list are set to st_ht at chainage st_ch.

the height of links in link_list are set to end_ht at chainage end_ch.

type linear (default) or cubic

If **type** is **linear** (the default), then the height of links in link_list are varied linearly (with respect to the reference chainage) between the height at chainage st_ch and chainage end_ch.

If **type** is **cubic**, then the height of links in link_list is varied as a reverse cubic (with respect to the reference chainage) between the height at chainage st_ch and chainage end_ch.

and *optional* can be none, one or more of

interval	if interval exists, then sections are created at the interval_value for the range of this command
	if interval is missing, then the interval for the apply many is used
interval_value	only exists if <i>interval</i> exists
extra_start	optional - adds in an extra x-section 0.1mm before start chainage

extra_end	optional - adds in an extra x-section 0.1mm before end chainage
inactive	if <i>inactive</i> is there then the command is not processed. If <i>inactive</i> is not there then the command is processed
// text	the text is a comment

The height for a link can also be varied by **taking the height from a *12d Model* string** or by taking the **height between two *12d Model* strings**.

height link_list st_ch end_ch full_string_name side optional

height link_list st_ch end_ch str_name_1 side1 str_name_2 side2 optional

where

link_list	one or more names of fixed links given in the template definition; with format name1 name2 ... namei
st_ch	start chainage for the modifier
end_ch	end chainage for the modifier
full_string_name	name of a <i>12d Model</i> string to take links in link_list out to. The format of the string name is "model_name->string_name".
side	side to search for string: -1 for left, 0 for left and right, 1 for right
str_name_1	name of the first <i>12d Model</i> string. The format of the string name is "model_name->string_name".
side2	side to search for string: -1 for left, 0 for left and right, 1 for right
str_name_2	name of the second <i>12d Model</i> string. The format of the string name is "model_name->string_name".
side2	side to search for string: -1 for left, 0 for left and right, 1 for right

and *optional* can be none, one or more of

interval	if interval exists, then sections are created at the interval_value for the range of this command if interval is missing, then the interval for the apply many is used
interval_value	only exists if <i>interval</i> exists
extra_start	optional - adds in an extra x-section 0.1mm before start chainage
extra_end	optional - adds in an extra x-section 0.1mm before end chainage
inactive	if <i>inactive</i> is there then the command is not processed. If <i>inactive</i> is not there then the command is processed
// text	the text is a comment

The **height** of links in link_list are taken to be the height between **str_name_1** and **str_name_2**.

See [Start and End Chainages in the Modifier File Format](#) for the format for st_ch and end_ch.

Fixed - Height from Link

The **height from link** modifier is used to modify the height of fixed links originally defined by height to be the same height as another link. That is, the height of the link is a copy of the height of another link.

The format of the modifier to vary the **height from link** of the fixed links given by link_list is

copy_height link_list st_ch end_ch from_link zone optional

where

link_list one or more names of fixed links given in the template definition; with format
name1 name2 ... namei

st_ch start chainage for the modifier
end_ch end chainage for the modifier

from_link name of link to take the height from
zone section of the template that the **from_link** is from (i.e. fixed, cut or fill)

and *optional* can be none, one or more of

interval if interval exists, then sections are created at the **interval_value** for
the range of this command

interval_value if interval is missing, then the interval for the apply many is used
only exists if *interval* exists

extra_start optional - adds in an extra x-section 0.1mm before start chainage

extra_end optional - adds in an extra x-section 0.1mm before end chainage

inactive if *inactive* is there then the command is not processed.
If *inactive* is not there then the command is processed

// text the text is a comment

See [Start and End Chainages in the Modifier File Format](#) for the format for **st_ch** and **end_ch**.

Fixed - Cross Fall

The **xfall** modifier is used to modify the cross fall of fixed links originally defined by **xfall**.

The format of the modifier to vary the cross-fall of the fixed links in the **link_list** is almost identical to varying the width and is:

xfall link_list st_ch end_ch st_xfall end_xfall absrel type optional

where

link_list one or more names of fixed links given in the template definition; with format
name1 name2 ... namei

st_ch start chainage for the modifier
end_ch end chainage for the modifier

st_xfall xfall to be used at the start modifier chainage, **st_ch**
end_xfall xfall to be used at the end modifier chainage, **end_ch**.

absrel relative (default) or absolute

If **absrel** is **relative** (the default) then

the **st_xfall** is added to the current xfall of links in **link_list** at chainage **st_ch**.
the **end_xfall** is added to the current xfall of links in **link_list** at chainage **end_ch**.

If **absrel** is **absolute**, then

the xfall of links in **link_list** are set to **st_xfall** at chainage **st_ch**.
the xfall of links in **link_list** are set to **end_xfall** at chainage **end_ch**.

type linear (default) or cubic

If **type** is **linear** (the default), then the xfall of links in **link_list** are varied linearly (with respect to the reference chainage) between the xfall at chainage **st_ch** and chainage **end_ch**.

cubic, then the xfall of links in **link_list** are varied as a reverse cubic (with respect to the reference chainage) between the xfall at chainage **st_ch** and chainage **end_ch**.

rotate, then the angle of the xfall of the links in **link_list** is varied linearly (with respect to the reference chainage) between the angle of the xfall at chainage **st_ch** and

chainage end_ch.

and *optional* can be none, one or more of

interval	if interval exists, then sections are created at the interval_value for the range of this command
interval_value	if interval is missing, then the interval for the apply many is used only exists if <i>interval</i> exists
extra_start	optional - adds in an extra x-section 0.1mm before start chainage
extra_end	optional - adds in an extra x-section 0.1mm before end chainage
inactive	if <i>inactive</i> is there then the command is not processed. If inactive is not there then the command is processed
// text	the text is a comment

The **xfall** of a link can be defined by using the xfall from the **beginning of the link** (i.e. the end of the previous link or the hinge string if it is the first link) **to another 12d Model**, or by taking the **xfall between two 12d Model strings**.

```
xfall link_list st_ch end_ch full_string_name side optional
xfall link_list st_ch end_ch str_name_1 side1 str_name_2 side2 optional
```

where

link_list	one or more names of fixed links given in the template definition; with format name1 name2 ... namei
st_ch	start chainage for the modifier
end_ch	end chainage for the modifier
full_string_name	name of a 12d Model string to use to calculate xfall. The format of the string name is "model_name->string_name".
side	side to search for string: -1 for left, 0 for left and right, 1 for right
str_name_1	name of the first 12d Model string. The format of the string name is "model_name->string_name".
side1	side to search for string_1: -1 for left, 0 for left and right, 1 for right
str_name_2	name of the second 12d Model string.
side2	side to search for string_2: -1 for left, 0 for left and right, 1 for right

and *optional* can be none, one or more of

interval	if interval exists, then sections are created at the interval_value for the range of this command
interval_value	if interval is missing, then the interval for the apply many is used only exists if <i>interval</i> exists
extra_start	optional - adds in an extra x-section 0.1mm before start chainage
extra_end	optional - adds in an extra x-section 0.1mm before end chainage
inactive	if <i>inactive</i> is there then the command is not processed. If inactive is not there then the command is processed
// text	the text is a comment

See [Start and End Chainages in the Modifier File Format](#) for the format for st_ch and end_ch.

The **xfall_crc** modifier is used to modify the cross fall of fixed links originally defined by **xfall** using the circular reverse curve formula.

xfall_crc link_list st_ch end_ch st_xfall end_xfall st_len end_len optional

link_list	one or more names of fixed links given in the template definition; with format name1 name2 ... namei
-----------	---------------------------------------------------------------------------------------------------------

`end_ch` end chainage for the modifier

`end_xfall` xfall to be used at the end modifier chainage, `end_ch`.

end_len length of the end circular arc to finish at the end modifier chainage, **st_ch**.

interval value	if interval is missing, then the interval for the apply many is used only exists if <i>interval</i> exists
----------------	---------------------------------------------------------------------------------------------------------------

extra_end optional - adds in an extra x-section 0.1mm before end chainage

If inactive is not there then the command is processed

See [Start and End Chainages in the Modifier File Format](#) for the format for `st ch` and `end ch`.

The format of the modifier to vary the **xfall from link** of the fixed links given by link list is

where

end ch end chainage for the modifier

from_link	number of the link to take material from
zone	section of the template that the from link is from (i.e. fixed, cut or fill)

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interval	if interval exists, then sections are created at the interval_value for the range of this command
interval_value	if interval is missing, then the interval for the apply many is used only exists if <i>interval</i> exists
extra_start	optional - adds in an extra x-section 0.1mm before start chainage
extra_end	optional - adds in an extra x-section 0.1mm before end chainage
inactive	if <i>inactive</i> is there then the command is not processed. If inactive is not there then the command is processed
// text	the text is a comment

Important Note

The link to copy cross fall from can be defined in terms of cross fall or slope.
If the link to copy is defined by slope, then the cross fall is calculated to match the slope.
See [Start and End Chainages in the Modifier File Format](#) for the format for st_ch and end_ch.

Fixed - Tin Height

The **tin height** modifier is used to modify the height of the link so that the link will sit on the tin at the given width.

The tin height can only be used for a fixed link defined by width and height.

The format of the modifier to vary the **tin height** of the fixed links in the **link_list** is:

tin_height link_list st_ch end_ch tin_name optional

where

link_list	one or more names of fixed links given in the template definition; with format name1 name2 ... namei
st_ch	start chainage for the modifier
end_ch	end chainage for the modifier
tin_name	name of the tin to be used in defining the height.

and *optional* can be none, one or more of

interval	if interval exists, then sections are created at the interval_value for the range of this command
interval_value	if interval is missing, then the interval for the apply many is used only exists if <i>interval</i> exists
extra_start	optional - adds in an extra x-section 0.1mm before start chainage
extra_end	optional - adds in an extra x-section 0.1mm before end chainage
inactive	if <i>inactive</i> is there then the command is not processed. If inactive is not there then the command is processed
// text	the text is a comment

See [Start and End Chainages in the Modifier File Format](#) for the format for st_ch and end_ch.

Fixed - Tin Xfall

The **tin xfall** modifier is used to modify the xfall of the link so that the link will sit on the tin at the given width.

The tin xfall can only be used for a fixed link defined by width and xfall.

The format of the modifier to vary the **tin xfall** of the fixed links in the **link_list** is:

tin_xfall link_list st_ch end_ch tin_name

where

link_list one or more names of fixed links given in the template definition; with format
name1 name2 ... namei

st_ch start chainage for the modifier

end_ch end chainage for the modifier

tin_name name of the tin to be used in defining the xfall.

and *optional* can be none, one or more of

interval if interval exists, then sections are created at the interval_value for
the range of this command

interval_value if interval is missing, then the interval for the apply many is used
only exists if *interval* exists

extra_start optional - adds in an extra x-section 0.1mm before start chainage

extra_end optional - adds in an extra x-section 0.1mm before end chainage

inactive if *inactive* is there then the command is not processed.

If inactive is not there then the command is processed

// text the text is a comment

Please continue to the next section [Decision File Format](#).

See [Start and End Chainages in the Modifier File Format](#) for the format for st_ch and end_ch.

Decision File Format

Each template is made up of the sections fixed, decisions, cut, fill and final cut/fill. If a template has a decisions section then by default it is used instead of the cut, fill and final cut/fill sections.

Hence by default, either the
decisions section

or

the cut, fill and final cut/fill sections

from the template being used over the chainage range.

Using the **decision** modifier, it is possible to override the default and for a given chainage range use the cut, fill and final cut/fill sections **instead** of the decisions section

or

use the decisions section **from another** template instead of the current templates sections.

The format of the decision modifier is

decision template_name st_ch end_ch *optional*

decision " " st_ch end_ch *optional*

where

template_name name of template to take the decision section from.

If the template name is given as " ", then the decision section for the template being used in the chainage range is ignored, and the cut, fill and final cut/fill tables for the template are used instead. Hence this overrides the default of using the decisions section in preference to the cut, fill and final cut/fill sections of the template.

st_ch start chainage for applying/removing the decision

end_ch end chainage for applying/removing the decision

and *optional* can be none, one or more of

interval if interval exists, then sections are created at the interval_value for the range of this command

interval_value if interval is missing, then the interval for the apply many is used only exists if *interval* exists

extra_start optional - adds in an extra x-section 0.1mm before start chainage

extra_end optional - adds in an extra x-section 0.1mm before end chainage

inactive if *inactive* is there then the command is not processed.

If inactive is not there then the command is processed

// text the text is a comment

See [Start and End Chainages in the Modifier File Format](#) for the format for st_ch and end_ch.

Note

The full description of the **Decisions** section of a template is given in [Full Definition of Template Decisions](#).

Please continue to the next section [Cut and Fill Variable Link Modifiers File Format](#).

Cut and Fill Variable Link Modifiers File Format

Cut and Fill Link Insert

Cut and fill links can be created by one of three **insert** commands by specifying either width and height, width and slope, or height and slope.

insert_cut link_name colour width height **unknown** st_ch end_ch *optional* // width, ht

insert_fill link_name colour width height **unknown** st_ch end_ch *optional* // width, ht

insert_cut link_name colour width **unknown** slope st_ch end_ch *optional* // width, slope

insert_fill link_name colour width **unknown** slope st_ch end_ch *optional* // width, slope

insert_cut link_name colour **unknown** height slope st_ch end_ch *optional* // ht, slope

insert_fill link_name colour **unknown** height slope st_ch end_ch *optional* // ht, slope

where **unknown** takes the place of the one of width, height or slope not being used, and

link_name	name of the link being created
colour	colour of the link being created
width, height, slope	width, height or slope of the created link
st_ch	start chainage for creating the link
end_ch	end chainage for creating the link

and *optional* can be none, one or more of the following

name	if non-blank, insert before the link name in the template if blank, then append after the last link of the fixed template table
interval	if interval exists, then sections are created at the interval_value for the range of this command if interval is missing, then the interval for the apply many is used
interval_value	only exists if <i>interval</i> exists
extra_start	optional - adds in an extra x-section 0.1mm before start chainage
extra_end	optional - adds in an extra x-section 0.1mm before end chainage
inactive	if <i>inactive</i> is there then the command is not processed. If <i>inactive</i> is not there then the command is processed
// text	the text is a comment

See [Start and End Chainages in the Modifier File Format](#) for the format for st_ch and end_ch.

Cut and Fill Link Remove

Cut and fill links can be deleted by the **remove** commands:

remove_cut link_list st_ch end_ch *optional*

remove_fill link_list st_ch end_ch *optional*

where

link_list	one or more names of links to be removed, in the form name1 name2 ... namei
st_ch	start chainage for removing the link
end_ch	end chainage for removing the link

and *optional* can be none, one or more of

interval	if interval exists, then sections are created at the interval_value for the range of this command
interval_value	if interval is missing, then the interval for the apply many is used only exists if <i>interval</i> exists
extra_start	optional - adds in an extra x-section 0.1mm before start chainage
extra_end	optional - adds in an extra x-section 0.1mm before end chainage
inactive	if <i>inactive</i> is there then the command is not processed. If inactive is not there then the command is processed
// text	the text is a comment

See [Start and End Chainages in the Modifier File Format](#) for the format for st_ch and end_ch.

Cut and Fill Width

The **cut_width** modifier is used to modify the width of variable cut links originally defined by width. Similarly the **fill_width** modifier is used to modify the width of variable fill links originally defined by width.

The format of the modifier to vary the width of the variable cut/fill links in **link_list** is

cut_width link_list st_ch end_ch st_wid end_wid absrel type optional
fill_width link_list st_ch end_ch st_wid end_wid absrel type optional

where

link_list	one or more names of cut/fill links given in the template definition; with format name1 name2 ... namei
st_ch	start chainage for the modifier
end_ch	end chainage for the modifier
st_wid	width to be used at the start modifier chainage, st_ch
end_wid	width to be used at the end modifier chainage, end_ch.
absrel	relative (default) or absolute

If **absrel** is **relative** (the default) then

the st_wid is added to the current width of links in link_list at chainage st_ch.
the end_wid is added to the current width of links in link_list at chainage end_ch.

If **absrel** is **absolute**, then

the width of links in link_list are set to st_wid at chainage st_ch.
the width of links in link_list are set to end_wid at chainage end_ch.

type linear (default) or cubic

If **type** is **linear** (the default), then the width of links in link_list are varied linearly (with respect to the reference chainage) between the width at chainage st_ch and chainage end_ch.

If **type** is **cubic**, then the width of links in link_list are varied as a reverse cubic (with respect to the reference chainage) between the width at chainage st_ch and chainage end_ch.

and *optional* can be none, one or more of

interval	if interval exists, then sections are created at the interval_value for the range of this command
interval_value	if interval is missing, then the interval for the apply many is used only exists if <i>interval</i> exists
extra_start	optional - adds in an extra x-section 0.1mm before start chainage



extra_end optional - adds in an extra x-section 0.1mm before end chainage

inactive if *inactive* is there then the command is not processed.
If inactive is not there then the command is processed

// text the text is a comment

The **width** for a variable link can also be varied by **going out to another 12d Model string**.

cut_width link_list st_ch end_ch full_string_name side optional
fill_width link_list st_ch end_ch full_string_name side optional

where

link_list one or more names of cut/fill links given in the template definition; with format
name1 name2 ... namei

st_ch start chainage for the modifier
end_ch end chainage for the modifier

full_string_name name of a **12d Model** string to take links in link_list out to. The
format of the string name is "model_name->string_name".

side side to search for string: -1 for left, 0 for left and right, 1 for right

and *optional* can be none, one or more of

interval if interval exists, then sections are created at the interval_value for
the range of this command
if interval is missing, then the interval for the apply many is used

interval_value only exists if *interval* exists

extra_start optional - adds in an extra x-section 0.1mm before start chainage
extra_end optional - adds in an extra x-section 0.1mm before end chainage

inactive if *inactive* is there then the command is not processed.
If inactive is not there then the command is processed

// text the text is a comment

The **width** for a link can also be varied by using the **width between two 12d Model strings str_name_1 and str_name_2**.

cut_width link_list st_ch end_ch str_name_1 side1 str_name_2 side2 optional
fill_width link_list st_ch end_ch str_name_1 side1 str_name_2 side2 optional

See [Start and End Chainages in the Modifier File Format](#) for the format for st_ch and end_ch.

Cut and Fill Width from Link

The cut and fill **width from link** modifiers are used to modify the width of cut and fill links originally defined by width, to be the same as another link. That is, the width of the link is a copy of the width of another link.

The format of the modifier to vary the cut and fill **width from link** of the fixed links given by link_list is

copy_cut_width link_list st_ch end_ch from_link zone optional
copy_fill_width link_list st_ch end_ch from_link zone optional

where

link_list	one or more names of fixed links given in the template definition; with format name1 name2 ... namei
st_ch	start chainage for the modifier
end_ch	end chainage for the modifier
from_link	name of the link to take the width from
zone	section of the template that the from_link is from (i.e. fixed, cut or fill)
and <i>optional</i> can be none, one or more of	
interval	if interval exists, then sections are created at the interval_value for the range of this command if interval is missing, then the interval for the apply many is used
interval_value	only exists if <i>interval</i> exists
extra_start	optional - adds in an extra x-section 0.1mm before start chainage
extra_end	optional - adds in an extra x-section 0.1mm before end chainage
inactive	if <i>inactive</i> is there then the command is not processed. If inactive is not there then the command is processed
// text	the text is a comment

See [Start and End Chainages in the Modifier File Format](#) for the format for st_ch and end_ch.

Cut and Fill Height

The **cut_height** modifier is used to modify the height of variable cut links originally defined by height. Similarly the **fill_height** modifier is used to modify the height of variable fill links originally defined by height.

The format of the modifier to vary the height of the variable cut/fill links in **link_list** is

cut_height link_list st_ch end_ch st_ht end_ht absrel type optional
fill_height link_list st_ch end_ch st_ht end_ht absrel type optional

where

link_list	one or more names of cut/fill links given in the template definition; with format name1 name2 ... namei
st_ch	start chainage for the modifier
end_ch	end chainage for the modifier
st_ht	height to be used at the start modifier chainage, st_ch
end_ht	height to be used at the end modifier chainage, end_ch.
absrel	relative (default) or absolute

If **absrel** is **relative** (the default) then

the st_ht is added to the current height of links in link_list at chainage st_ch.
the end_ht is added to the current height of links in link_list at chainage
end_ch.

If **absrel** is **absolute**, then

the height of links in link_list are set to st_ht at chainage st_ch.
the height of links in link_list are set to end_ht at chainage end_ch.

type linear (default) or cubic

If **type** is **linear** (the default), then the height of links in link_list are varied linearly (with respect to the reference chainage) between the height at chainage st_ch and chainage end_ch.

If **type** is **cubic**, then the height of links in link_list are varied as a reverse cubic (with respect to the reference chainage) between the height at chainage st_ch and chainage

end_ch.

and *optional* can be none, one or more of

interval	if interval exists, then sections are created at the interval_value for the range of this command
interval_value	if interval is missing, then the interval for the apply many is used only exists if <i>interval</i> exists
extra_start	optional - adds in an extra x-section 0.1mm before start chainage
extra_end	optional - adds in an extra x-section 0.1mm before end chainage
inactive	if <i>inactive</i> is there then the command is not processed. If inactive is not there then the command is processed
// text	the text is a comment

The **height** for a variable link can also be varied by **taking the height from a 12d Model string**.

cut_height link_list st_ch end_ch full_string_name side optional
fill_height link_list st_ch end_ch full_string_name side optional

where

link_list	one or more names of cut/fill links given in the template definition; with format name1 name2 ... namei
st_ch	start chainage for the modifier
end_ch	end chainage for the modifier
full_string_name	name of a 12d Model string to take links in link_list out to. The format of the string name is "model_name->string_name".
side	side to search for string: -1 for left, 0 for left and right, 1 for right

and *optional* can be none, one or more of

interval	if interval exists, then sections are created at the interval_value for the range of this command
interval_value	if interval is missing, then the interval for the apply many is used only exists if <i>interval</i> exists
extra_start	optional - adds in an extra x-section 0.1mm before start chainage
extra_end	optional - adds in an extra x-section 0.1mm before end chainage
inactive	if <i>inactive</i> is there then the command is not processed. If inactive is not there then the command is processed
// text	the text is a comment

The **height** for a link can also be varied by using the **height between two 12d Model strings str_name_1 and str_name_2**.

cut_height link_list st_ch end_ch str_name_1 side1 str_name_2 side2 optional
fill_height link_list st_ch end_ch str_name_1 side1 str_name_2 side2 optional

See [Start and End Chainages in the Modifier File Format](#) for the format for st_ch and end_ch.

Cut and Fill Height from Link

The cut and fill **height from link** modifiers are used to modify the height of cut and fill links originally defined by height, to be the same as another link. That is, the height of the link is a copy

of the height of another link.

The format of the modifier to vary the cut and fill **height from link** of the fixed links given by `link_list` is

copy_cut_height `link_list st_ch end_ch from_link zone optional`

copy_fill_height `link_list st_ch end_ch from_link zone optional`

where

`link_list` one or more names of fixed links given in the template definition; with format
 name1 name2 ... namei

`st_ch` start chainage for the modifier

`end_ch` end chainage for the modifier

`from_link` name of the link to take the height from

`zone` section of the template that the `from_link` is from (i.e. fixed, cut or fill)

and *optional* can be none, one or more of

`interval` if `interval` exists, then sections are created at the `interval_value` for
 the range of this command

 if `interval` is missing, then the interval for the apply many is used

`interval_value` only exists if *interval* exists

`extra_start` optional - adds in an extra x-section 0.1mm before start chainage

`extra_end` optional - adds in an extra x-section 0.1mm before end chainage

`inactive` if *inactive* is there then the command is not processed.

 If *inactive* is not there then the command is processed

`// text` the text is a comment

See [Start and End Chainages in the Modifier File Format](#) for the format for `st_ch` and `end_ch`.

Cut and Fill Slope

The **cut_slope** modifier is used to modify the slope of variable cut links originally defined by slope. Similarly the **fill_slope** modifier is used to modify the slope of variable fill links originally defined by slope.

The format of the modifier to vary the cut/fill slope of the variable links in **link_list** is

cut_slope `link_list st_ch end_ch st_slope end_slope absrel type optional`

fill_slope `link_list st_ch end_ch st_slope end_slope absrel type optional`

where

`link_list` one or more names of cut/fill links given in the template definition; with format
 name1 name2 ... namei

`st_ch` start chainage for the modifier

`end_ch` end chainage for the modifier

`st_slope` slope to be used at the start modifier chainage, `st_ch`

`end_slope` slope to be used at the end modifier chainage, `end_ch`.

`absrel` relative (default) or absolute

 If **absrel** is **relative** (the default) then

 the `st_slope` is added to the current slope of links in `link_list` at chainage `st_ch`.

 the `end_slope` is added to the current slope of links in `link_list` at chainage

`end_ch`.

 If **absrel** is **absolute**, then

 the slope of links in `link_list` is set to `st_slope` at chainage `st_ch`.

the slope of links in link_list is set to end_slope at chainage end_ch.

type linear (default) or cubic

If **type** is **linear** (the default), then the slope of links in link_list is varied linearly (with respect to the reference chainage) between the slope at chainage st_ch and chainage end_ch.

cubic, then the angle of the slope of links in link_list are varied as a reverse cubic (with respect to the reference chainage) between the angle of the slope at chainage st_ch and chainage end_ch.

rotate, then the angle of the slope of the links in link_list are varied linearly (with respect to the reference chainage) between the angle of the slope at chainage st_ch and chainage end_ch.

and *optional* can be none, one or more of

interval	if interval exists, then sections are created at the interval_value for the range of this command
	if interval is missing, then the interval for the apply many is used
interval_value	only exists if <i>interval</i> exists
extra_start	optional - adds in an extra x-section 0.1mm before start chainage
extra_end	optional - adds in an extra x-section 0.1mm before end chainage
inactive	if <i>inactive</i> is there then the command is not processed. If inactive is not there then the command is processed
// text	the text is a comment

The **slope** of a link can also be defined by using the slope from the **beginning of the link** (i.e. the end of the previous link or the hinge string if its the first link) to a given **12d Model** string.

cut_slope link_list st_ch end_ch full_string_name side optional

fill_slope link_list st_ch end_ch full_string_name side optional

where

link_list	one or more names of cut/fill links given in the template definition; with format name1 name2 ... namei
st_ch	start chainage for the modifier
end_ch	end chainage for the modifier
full_string_name	name of a 12d Model string to use to calculate slope. The format of the string name is "model_name->string_name".
side	side to search for string: -1 for left, 0 for left and right, 1 for right

and *optional* can be none, one or more of

interval	if interval exists, then sections are created at the interval_value for the range of this command
	if interval is missing, then the interval for the apply many is used
interval_value	only exists if <i>interval</i> exists
extra_start	optional - adds in an extra x-section 0.1mm before start chainage
extra_end	optional - adds in an extra x-section 0.1mm before end chainage
inactive	if <i>inactive</i> is there then the command is not processed. If inactive is not there then the command is processed
// text	the text is a comment

The **slope** of a link can also be defined by using the slope **between two 12d Model strings** **str_name_1** and **str_name_2**.

cut_slope link_list st_ch end_ch str_name_1 side1 str_name_2 optional
fill_slope link_list st_ch end_ch str_name_1 side1 str_name_2 side2 optional

See [Start and End Chainages in the Modifier File Format](#) for the format for st_ch and end_ch.

Cut and Fill Slope from Link

The cut and fill **slope from link** modifiers are used to modify the slope of cut and fill links originally defined by slope, to be the same **slope** or **xfall** as another link. That is, the slope of the link is a copy of the slope of another link.

The format of the modifier to vary the cut and fill **slope from link** of the fixed links given by link_list is

copy_cut_slope link_list st_ch end_ch from_link zone optional
copy_fill_slope link_list st_ch end_ch from_link zone optional

where

link_list	one or more names of fixed links given in the template definition; with format name1 name2 ... namei
st_ch	start chainage for the modifier
end_ch	end chainage for the modifier
from_link	name of the link to take the slope or xfall from
zone	section of the template that the from_link is from (i.e. fixed, cut or fill)

and *optional* can be none, one or more of

interval	if interval exists, then sections are created at the interval_value for the range of this command if interval is missing, then the interval for the apply many is used
interval_value	only exists if <i>interval</i> exists
extra_start	optional - adds in an extra x-section 0.1mm before start chainage
extra_end	optional - adds in an extra x-section 0.1mm before end chainage
inactive	if <i>inactive</i> is there then the command is not processed. If inactive is not there then the command is processed
// text	the text is a comment

Important Note

The link to copy slope from can be defined in terms of slope or **cross fall**.

If the link to copy is defined by cross fall, then the slope is calculated to match the cross fall.

Hence this command can be used with cut and fill slopes to match to rotation of cross fall of fixed links for super-elevation.

See [Start and End Chainages in the Modifier File Format](#) for the format for st_ch and end_ch.

Cut and Fill Tin Height

The **cut and fill tin height** modifiers are used to modify the height of the link so that the link will sit on the tin at the given width.

The tin height can only be used for a cut or fill link defined by width and height.

The format of the modifiers to vary the **cut** and **fill tin height** of the links in the **link_list** are:

tin_cut_height link_list st_ch end_ch tin_name optional
tin_fill_height link_list st_ch end_ch tin_name optional

where

link_list one or more names of cut/fill links given in the template definition; with format
 name1 name2 ... namei
 st_ch start chainage for the modifier
 end_ch end chainage for the modifier
 tin_name name of the tin to be used in defining the height.

and *optional* can be none, one or more of

interval if interval exists, then sections are created at the interval_value for
 the range of this command
 if interval is missing, then the interval for the apply many is used
 interval_value only exists if *interval* exists
 extra_start optional - adds in an extra x-section 0.1mm before start chainage
 extra_end optional - adds in an extra x-section 0.1mm before end chainage
 inactive if *inactive* is there then the command is not processed.
 If inactive is not there then the command is processed
 // text the text is a comment

See [Start and End Chainages in the Modifier File Format](#) for the format for st_ch and end_ch.

Cut and Fill Tin Slope

The **cut and fill tin slope** modifier is used to modify the slope of the link so that the link will sit on the tin at the given width.

The cut and fill tin slope can only be used for a cut/fill link defined by width and slope.

The format of the modifiers to vary the **cut** and **fill tin slope** of the links in the **link_list** are:

tin_cut_slope link_list st_ch end_ch tin_name optional
tin_fill_slope link_list st_ch end_ch tin_name optional

where

link_list one or more names of fixed links given in the template definition; with format
 name1 name2 ... namei
 st_ch start chainage for the modifier
 end_ch end chainage for the modifier
 tin_name name of the tin to be used in defining the slope.

and *optional* can be none, one or more of

interval if interval exists, then sections are created at the interval_value for
 the range of this command
 if interval is missing, then the interval for the apply many is used
 interval_value only exists if *interval* exists
 extra_start optional - adds in an extra x-section 0.1mm before start chainage
 extra_end optional - adds in an extra x-section 0.1mm before end chainage
 inactive if *inactive* is there then the command is not processed.
 If inactive is not there then the command is processed
 // text the text is a comment

See [Start and End Chainages in the Modifier File Format](#) for the format for st_ch and end_ch.
Please continue to the next section [Final Link Modifiers File Format](#).

Final Link Modifiers File Format

Final Width

The format of the modifier to **vary the width** of the final cut and fill link `link_name` is

final_width `link_name` `st_ch` `end_ch` `st_wid` `end_wid` `absrel` `type` `optional`

where

<code>link_name</code>	name of final link given in the template definition
<code>st_ch</code>	start chainage for the modifier
<code>end_ch</code>	end chainage for the modifier
<code>st_wid</code>	width to be used at the start modifier chainage, <code>st_ch</code>
<code>end_wid</code>	width to be used at the end modifier chainage, <code>end_ch</code> .
<code>absrel</code>	relative (default) or absolute

If **absrel** is **relative** (the default) then

the `st_wid` is added to the current width of `link_name` at chainage `st_ch`.

the `end_wid` is added to the current width of `link_name` at chainage `end_ch`.

If **absrel** is **absolute**, then

the width of `link_name` is set to `st_wid` at chainage `st_ch`.

the width of `link_name` is set to `end_wid` at chainage `end_ch`.

`type` linear (default) or cubic

If **type** is **linear** (the default), then the width of `link_name` is varied linearly (with respect to the reference chainage) between the width at chainage `st_ch` and chainage `end_ch`.

If **type** is **cubic**, then the width of `link_name` is varied as a reverse cubic (with respect to the reference chainage) between the width at chainage `st_ch` and chainage `end_ch`.

and *optional* can be none, one or more of

<code>interval</code>	if <code>interval</code> exists, then sections are created at the <code>interval_value</code> for the range of this command
<code>interval_value</code>	if <code>interval</code> is missing, then the interval for the apply many is used only exists if <i>interval</i> exists
<code>extra_start</code>	optional - adds in an extra x-section 0.1mm before start chainage
<code>extra_end</code>	optional - adds in an extra x-section 0.1mm before end chainage
<code>inactive</code>	if <i>inactive</i> is there then the command is not processed. If <i>inactive</i> is not there then the command is processed
<code>// text</code>	the text is a comment

See [Start and End Chainages in the Modifier File Format](#) for the format for `st_ch` and `end_ch`.

Final Cut and Fill Slope

The format of the modifier to vary the cut/fill slope of the final link **link_name** is

final_cut_slope `link_name` `st_ch` `end_ch` `st_slope` `end_slope` `absrel` `type` `optional`

final_fill_slope `link_name` `st_ch` `end_ch` `st_slope` `end_slope` `absrel` `type` `optional`

where

<code>link_name</code>	name of final link given in the template definition
<code>st_ch</code>	start chainage for the modifier
<code>end_ch</code>	end chainage for the modifier
<code>st_slope</code>	slope to be used at the start modifier chainage, <code>st_ch</code>

end_slope slope to be used at the end modifier chainage, end_ch.

absrel relative (default) or absolute

If **absrel** is **relative** (the default) then

the st_slope is added to the current slope of link_name at chainage st_ch.

the end_slope is added to the current slope of link_name at chainage end_ch.

If **absrel** is **absolute**, then

the slope of link_name is set to st_slope at chainage st_ch.

the slope of link_name is set to end_slope at chainage end_ch.

type linear (default) or cubic

If **type** is **linear** (the default), then the slope of link_name is varied linearly (with respect to the reference chainage) between the slope at chainage st_ch and chainage end_ch.

cubic, then the angle of the slope of link_name is varied as a reverse cubic (with respect to the reference chainage) between the angle of the slope at chainage st_ch and chainage end_ch.

and *optional* can be none, one or more of

interval if interval exists, then sections are created at the interval_value for the range of this command

interval_value if interval is missing, then the interval for the apply many is used only exists if *interval* exists

extra_start optional - adds in an extra x-section 0.1mm before start chainage

extra_end optional - adds in an extra x-section 0.1mm before end chainage

inactive if *inactive* is there then the command is not processed.

If inactive is not there then the command is processed

// text the text is a comment

See [Start and End Chainages in the Modifier File Format](#) for the format for st_ch and end_ch.

Stopping Final Cut and Fill Slope

The final link can be stopped altogether in either cut or fill.

The format of the modifier to stop the cut/fill slope of the final link link_name is

final_no_cut_slope link_name st_ch end_ch optional

final_no_fill_slope link_name st_ch end_ch optional

where

link_name name of final link given in the template definition

st_ch start chainage for the final link to stop

end_ch end chainage for the final link to stop

and *optional* can be none, one or more of

interval if interval exists, then sections are created at the interval_value for the range of this command

interval_value if interval is missing, then the interval for the apply many is used only exists if *interval* exists

extra_start optional - adds in an extra x-section 0.1mm before start chainage

extra_end optional - adds in an extra x-section 0.1mm before end chainage

inactive if *inactive* is there then the command is not processed.

If inactive is not there then the command is processed

// text the text is a comment

See [Start and End Chainages in the Modifier File Format](#) for the format for st_ch and end_ch.

Please continue to the next section [Snippets File Format](#).

Snippets File Format

Snippets are a method of inserting groups of modifiers at once. Snippets can have parameter but the values of the parameters are saved in the actual MTF.

snippet snippet_file st_ch end_ch param_name_1 param_value_1...
param_name_n param_value_n *optional*

where **unknown** takes the place of the one of width, height or xfall not being used, and

snippet_file	file containing the snippet definition
st_ch	start chainage for creating the link
end_ch	end chainage for creating the link
param_name_n	name of the nth parameter - must be in quotes ("")
param_value_n	value for the nth parameter - must be in quotes

and *optional* can be none, one or more of

interval	if interval exists, then sections are created at the interval_value for the range of this command if interval is missing, then the interval for the apply many is used
interval_value	only exists if <i>interval</i> exists
extra_start	optional - adds in an extra x-section 0.1mm before start chainage
extra_end	optional - adds in an extra x-section 0.1mm before end chainage
inactive	if <i>inactive</i> is there then the command is not processed. If <i>inactive</i> is not there then the command is processed
// text	the text is a comment

See [Start and End Chainages in the Modifier File Format](#) for the format for st_ch and end_ch.

Please continue to the next section [A Template Modifier File Example](#).

A Template Modifier File Example

```

left_side = {
    -99999.9    "std"
    99999.9
}

right_side = {
    -99999.9    "std"
    99999.9
}

//                                     -- assumes ---

left_side_modifier = {
    width "kerb" 103 203.0 0.0 3.0 absolute linear// widen from width 0 to width 3 - linear
    width "kerb" 203.0 303.0 3.0 3.0 absolute // keep width at 3
    width "kerb" 303.0 403.0 3.0 0.0 absolute // widen from width 3 to width 0 - linear
    width "kerb" 153.0 253.0 0.0 9.0 cubic relative
    width "kerb" 253.0 353.0 9.0 0.0 cubic // relative is default
    xfall "kerb" 53.0 153.0 0.0 6.0 relative linear
    xfall "kerb" 153.0 353.0 6.0 6.0 relative // linear
    xfall "kerb" 353.0 453.0 6.0 0.0 // relative & linear
    width "kerb" 440.0 480.0 "table drain->table drain" extra_start extra_end
    xfall "kerb" 440.0 480.0 "table drain->table drain" extra_start extra_end
    width "kerb" 440.0 480.0 1.0 1.0 relative
    cut_width "a" 103.0 203.0 0.0 9.0
    cut_width "a" 203.0 303.0 9.0 9.0
    cut_width "a" 303.0 403.0 9.0 0.0
    cut_slope "a" 103.0 203.0 0.0 3.0
    cut_slope "a" 203.0 303.0 3.0 3.0
    cut_slope "a" 303.0 403.0 3.0 0.0
    cut_width "a" 500.0 520.0 "table drain->table drain" extra_start extra_end
    cut_slope "a" 500.0 520.0 "table drain->table drain" extra_start extra_end
    fill_width "a" 103.0 203.0 0.0 9.0
    fill_width "a" 203.0 303.0 9.0 9.0
    fill_width "a" 303.0 403.0 9.0 0.0
    fill_slope "a" 103.0 203.0 0.0 3.0
    fill_slope "a" 203.0 303.0 3.0 3.0
    fill_slope "a" 303.0 403.0 3.0 0.0
    fill_width "a" 560.0 610.0 "table drain->table drain" extra_start extra_end
    fill_slope "a" 560.0 610.0 "table drain->table drain" extra_start extra_end
    final_width "final" 103.0 403.0 100.0 50.0
    final_cut_slope "final" 103.0 403.0 0.0 3.0
    final_fill_slope "final" 103.0 403.0 0.0 2.0
    final_no_cut_slope "final" 190.0 310.0 extra_start extra_end
    final_no_fill_slope "final" 190.0 310.0 extra_start extra_end
}

right_side_modifier = {

```

}

Go to the next section [MTF Stripping File Format](#) or back to [Text Format of the MTF File](#)

MTF Stripping File Format

The stripping depth is given in the many templates file (*.mtf) and is similar to the format for applying templates except there is no separate left and right side.

The stripping definition begins with the key words

stripping =

A list of chainages (in ascending order, one per line) with corresponding stripping depth then follows. The list of chainages and stripping depths is enclosed in curly braces {}.

The chainage-stripping lists are assembled as follows

- (a) to represent a stripping depth starting at a given chainage, the chainage value followed by the stripping depth is given. The chainage and stripping depth are separated by one or more spaces. For example, the stripping depth **0.03** starting at chainage 150 is represented by

150 0.03

The stripping depth is assumed to apply until the chainage given on the next line of the stripping definition.

If the stripping depth is to go to the end of the reference string, add a line with a chainage greater than or equal to the end chainage. For example

150 0.03
9999 0.0

Warning - unlike applying templates, a stripping depth **must exist** after a chainage, however the stripping depth can be zero.

- (b) linearly varying stripping depth between chainages is represented by giving the **start chainage** for the variation followed on the same line by the **start depth** and the **end depth** separated by a comma.

The linear change takes place over the interval beginning at this chainage and ending at the chainage given on the next line of the stripping definition.

For example, to linearly vary the stripping depth from 0.02 to 0.03 between the chainages 350 and 500, use

350 0.02 , 0.03
500 0.03

A Stripping Example

An example of a stripping command is

stripping = {
-999 0.03
30 0.0
70 0.03,0.05
110.5 0.05
999 0.05
}

Go to the next section [MTF Boxing File Format](#) or back to [Text Format of the MTF File](#)

MTF Boxing File Format

Apart from a key word specifying whether the following part of the definition is for the left or the right, the set out for the left boxing is identical to the right boxing. Hence only the left boxing will be described in detail.

The left boxing definition begins with the key words

left_boxing =

A list of chainages (in ascending order, one per line) with corresponding boxing names then follows. The list of chainages and boxing is enclosed in curly braces { }.

The chainage-boxing lists are assembled as follows

- (a) to represent a boxing starting at a given chainage, the chainage value followed by the boxing name is given. The chainage and boxing name are separated by one or more spaces. For example, the boxing **left** starting at chainage 150 is represented by

150 left

The boxing is assumed to apply until the chainage given on the next line of the left_boxing definition.

- (b) if no boxing exists from a chainage, simply include the chainage with no boxing name following it. For example, if there is no boxing from chainage 250, this is represented by

250

The non-existence of boxing is assumed until the chainage given on the next line of the left_side definition.

If the boxing is to go to the end of the reference string, add a line with a chainage greater than or equal to the end chainage. For example

150 left
9999

When using the **apply many** option, the name of the boxing definitions file is given by a **boxing_file** command in the **many templates file**.

boxing_file = boxing_definitions_file

When using the **boxing many** option, if a file name is given in the **boxing file** panel field, it is used for the boxing definitions file, otherwise the boxing_file command in the many templates file is used.

Note - if the boxing name includes spaces, then the name must be enclosed in quotes ". For example, "left 1".

An Applying Boxing Example

```
boxing_file = "boxing_for_client.bf"
left_boxing = {
    -999 left
    30
    70 "left narrow"
    110.5 left
    999
}
right_boxing = {
    -999 right
    30
```


	70	"right narrow"
	110.5	right
	999	
}		

Warning - no interpolation or modifiers exist for boxing.

Go to the next section [MTF Width File Format](#) or back to [Text Format of the MTF File](#)

MTF Width File Format

The format for **section width** in the mtf file is simply

```
section_width    =    value           // default is 10000
```

where *value* is the distance to search from the hinge string for strings required in some options. If section_width is missing, then it takes the default value of 10000.

For example

```
section_width    =    100.0
```

Go to the next section [MTF String Modifiers File Format](#) or back to [Text Format of the MTF File](#)

MTF String Modifiers File Format

In the many templates file, the **string modifiers** definition begins with the key word

string_modifiers =

followed by one or more occurrences of the string modifier command **height** enclosed by curly braces { }

The definition of the string modifier commands will now be given.

Height

The *height* the **Height** string modifier calculates for the amend point is given by:

- (a) if the absolute flag is not set, the height of the hinge point, otherwise zero.
- plus
- (b) the interpolated height for the user given heights at the start and end chainages
- plus
- (c) the interpolated height for the user given cross falls at the start and end chainage.

That is, if the absolute flag is not set:

$$\text{new height} = \text{hinge height} + (\text{interpolated height}) + (\text{interpolated xfall}) \times (\text{offset distance})$$

If the absolute flag is set:

$$\text{new height} = (\text{interpolated height}) + (\text{interpolated xfall}) \times (\text{offset distance})$$

The format of the **Height** string modifier is

height amend_str ref_str hinge_str st_ch end_ch ch_int st_xfall end_xfall st_ht end_ht
absolute

where

amend_str	name of a 12d Model string to take the hinge point out to. The format of the string name is "model_name->string_name".
ref_str	name of reference string. The format of the string name is "model_name->string_name".
hinge_str	name of hinge string. The format of the string name is "model_name->string_name".
st_ch	start chainage for the modifier
end_ch	end chainage for the modifier
ch_int	interval between chainage points - can be the word <i>null</i>
st_xfall	xfall to be used at the start modifier chainage, st_ch
end_xfall	xfall to be used at the end modifier chainage, end_ch.
st_ht	height to be used at the start modifier chainage, st_ch
end_ht	height to be used at the end modifier chainage, end_ch.
absolute	<i>optional</i> - if it exists, include the height of the hinge string

Height and Two Strings

The *height* the **Height 2x** string modifier calculates for the amend point is given by:

- (a) the height of the hinge point
- plus
- (b) the offset distance multiplied by the cross fall between two user selected strings.

$$\text{new height} = \text{hinge height} + (\text{xfall between string 1 and string 2}) \times (\text{offset distance})$$

The format of the **Height 2x** string modifier is

height amend_str ref_str hinge_str st_ch end_ch ch_int xfall_str1 xfall_str2
where

amend_str	name of a 12d Model string to take the hinge point out to. The format of the string name is "model_name->string_name".
ref_str	name of reference string. The format of the string name is "model_name->string_name".
hinge_str	name of hinge string. The format of the string name is "model_name->string_name".
st_ch	start chainage for the modifier
end_ch	end chainage for the modifier
ch_int	interval between chainage points - can be the word <i>null</i>
xfall_str_1	name of first string to calculate cross fall between. The format of the string name is "model_name->string_name".
xfall_str_2	name of second string to calculate cross fall between. The format of the string name is "model_name->string_name".

Go to the next section [Substitutions in the Many Templates File](#) or back to [Text Format of the MTF File](#)

Substitutions in the Many Templates File

The **many template variables** are special variables standing for information about the reference string used in the apply many operation.

The many template variables are only evaluated when the many template file is used in an **apply many** operation and provide a mechanism to generalize the many template file.

The many template file also recognizes the CCCP preprocessor rules including #include, #define, #if etc.

Many Template Variables

The list of the many template variables is:

\$tangent_curve_n	chainage of the tangent curve point for the nth HIP
\$tangent_spiral_n	tangent spiral
\$curve_spiral_n	curve spiral
\$spiral_curve_n	spiral curve
\$curve_spiral_n	curve spiral
\$spiral_tangent_n	spiral tangent
\$curve_tangent_n	curve tangent
\$start_spiral_n	length of the start spiral on the nth HIP point
\$end_spiral_n	length of the end spiral
\$radius_n	absolute radius of the curve
\$signed_radius_n	signed radius of the curve
\$vertical_tangent_curve_n	chainage of the tangent curve point for the nth VIP
\$vertical_curve_tangent_n	chainage of the curve tangent point for the nth VIP
\$vertical_sag_n	chainage of the sag point for the nth HIP
\$vertical_crest_n	crest
\$vertical_crest_sag_n	crest or sag

For example,

\$tangent_spiral_3 get the chainage for the tangent spiral on HIP 3.

The variables can be used in expressions with the arithmetic operations +, -, * and / as long as the expression is surrounded by round brackets ().

For example, in the width command:

width E (\$tangent_spiral_2 - 50) (\$tangent_spiral_2 + 50) 3 5 absolute

the expression (\$tangent_spiral_2 - 50) will yield the chainage of fifty metres before the tangent spiral point of the second HIP point.

The variables can also be used in **#define**'s and **#include**'s according to the following CCCP rules.

(a) **#define** NAME Expansion of NAME

if the `#define` is longer than one line, the backslash character `\` is added to the end of each line that has another line of the `#define` following to indicate that the `#define` continues to the next line.

- (b) **#define** can be used to define a block of things with more than one argument

For example,

```
#define SUPER(name,ip,xf1,xf2) \
\
xfall name START_TAPER(ip) xf1 xf2 absolute \
xfall name FIXED_TAPER(ip) xf2 xf2 absolute \
xfall name END_TAPER(ip) xf2 xf1 absolute
```

means that `SUPER("EB",3,-3.0,3.0)` will be expanded to the three lines:

```
xfall "EB" START_TAPER(3) -3.0 3.0 absolute
xfall "EB" FIXED_TAPER(3) 3.0 3.0 absolute
xfall "EB" END_TAPER(3) 3.0 -3.0 absolute
```

Note that `\` is used to indicate that the `#define` continues to the next line.

- (c) **(if (express) {expression1 } else {expression 2})**

is an expression *express*, which evaluates to

if *express* is true, then the value of the expression is *expression1* otherwise *expression 2*.

- (d) **word##p**

is equivalent to **wordp**

- (e) **#include file_name**

A number of `#defines` can be placed in a file and included in the mtf by using the `#include`.

As an example combining the above rules, the meaning of

```
LEADING_TAPER_START(2)
```

given by the following `$define`:

```
#define LEADING_TAPER_START(ip) ( if($radius_##ip < 75) {$tangent_spiral_##ip - 50}\
else { $tangent_spiral_##ip - 75 } )
```

is

if the radius of the second HIP is less than 75, then set `LEADING_TAPER_START(2)` to the chainage of the tangent spiral point of the second HIP point, less fifty metres, **otherwise** `LEADING_TAPER_START(2)` is set to the chainage of the tangent spiral point of the second HIP point, less seventy five metres

A more complicated example now follows which shows how `#defines` can be used to easily apply super-elevation according to rules involving leading and trailing spirals.

```
// -----
#define LEADING_TAPER_START(ip) ( if($radius_##ip < 75)\
{ $tangent_spiral_##ip - 50 } else { $tangent_spiral_##ip - 75 })

// Note: LEADING_TAPER_START evaluates to a chainage.
#define LEADING_TAPER_END(ip) ( if($radius_##ip < 75)\
{ $tangent_spiral_##ip + 10 } else { $tangent_spiral_##ip + 25 })

// Note: LEADING_TAPER_END evaluates to a chainage.
#define TRAILING_TAPER_START(ip) ( if($radius_##ip < 75)\
{ $spiral_tangent_##ip - 10 } else { $spiral_tangent_##ip - 25 })
```

```

// Note: TRAILING_TAPER_START evaluates to a chainage.
#define TRAILING_TAPER_END(ip)      ( if($radius_##ip < 75)\
  { $spiral_tangent_##ip + 50 } else { $spiral_tangent_##ip + 75 })

// Note: TRAILING_TAPER_END evaluates to a chainage.
#define START_TAPER(ip) LEADING_TAPER_START(ip)\
  LEADING_TAPER_END(ip)

// Note: START_TAPER evaluates to two chainages:      chainge1  chainage2.
#define FIXED_TAPER(ip) LEADING_TAPER_END(ip)\
  TRAILING_TAPER_START(ip)

// Note: FIXED_TAPER evaluates to two chainages:      chainge1  chainage2.
#define END_TAPER(ip)    TRAILING_TAPER_START(ip)\
  TRAILING_TAPER_END(ip)

// Note: TRAILING_TAPER evaluates to two chainages:      chainge1  chainage2.

#define SUPER(name,ip,x1,x2) \
\
  xfall name START_TAPER(ip) x1 x2 absolute \
  xfall name FIXED_TAPER(ip) x2 x2 absolute \
  xfall name END_TAPER(ip)    x2 x1 absolute

```

With the above #defines, SUPER evaluates to three lines of xfall template modifiers which rotates cross-fall, keeps it constant and then counter-rotates the cross-fall about leading and trailing spirals for an HIP point.

For example,

```
SUPER(EB,2,-3,3)
```

would give expand to the following three lines of xfall commands for link **EB** which will rotate xfall from -3 to 3, hold it at 3 and then rotate it back form 3 to -3, all about the leading and trailing spirals for horizontal intersection point number two:

```

xfall EB begin_chainage_for_start_taper end_chainage_for_start_taper -
3 3 absolute

xfall EB begin_chainage_for_fixed_taper end_chainage_for_fixed_taper_ch 3 3 absol
ute

xfall EB begin_chainage_for_end_taper end_chainage_for_end_taper 3 -
3 absolute

```

The above definitions of SUPER could be placed in a file, say

```
f:\12d\12dmodel\library\super_mtf.def
```

and then simply included into a mtf file using the a #include:

```
#include f:\12d\12dmodel\library\super_mtf.def
```

Examples of Substitutions in the Many Templates File

The following example shows how #defines can be used to easily apply super-elevation according to rules involving leading and trailing spirals.

The definition of SUPER is given in the file, f:\12d\12dmodel\library\super_mtf.def, which is simply included in the mtf file using a #include.

```
// -----  
// include the file containing the definition of SUPER  
// -----  
  
#include "f:\12d\12dmodel\library\super_mtf.def"  
  
// -----  
// apply templates left and right and then modifier them  
// -----  
  
left_side = {  
    -999999 std  
    999999  
}  
  
right_side = {  
    -999999 std  
    999999  
}  
  
specials = {  
}  
  
hinge_modifier = {  
}  
  
left_side_modifier = {  
    // linearly widen the link EB by 12 metres and bring it back  
    // in again.  
  
width EB ($tangent_spiral_2 - 50) ($tangent_spiral_2 + 50) 0 12  
width EB ($tangent_spiral_2 + 50) ($spiral_tangent_7 - 50) 12 12  
width EB ($spiral_tangent_7 - 50) ($spiral_tangent_7 + 50) 12 0  
  
    // define superelevation  
  
    SUPER(EB,2,-3,3)  
    SUPER(EB,4,-3,3)  
    SUPER(EB,5,-3,3)  
    SUPER(EB,6,-3,3)  
}  
  
right_side_modifier = {  
  
    SUPER(EB,3,-3,3)  
    SUPER(EB,7,-3,3)  
}  
stripping = {  
}  
//boxing_file = "yourfile.bf"  
left_boxing = {  
}  
right_boxing = {  
}
```



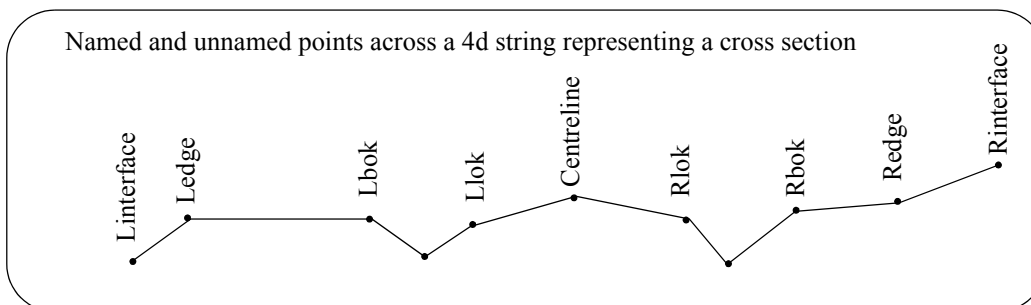
```
string_modifiers = {  
    }  
//section_width = 10000.0
```

Text Format of the Boxing File

The interactive editor for creating the *Boxing Definitions* in the *Boxing* file has been given in the previous sections [Edit Boxing File](#).

This section will describe the text layout of the text boxing file.

Boxing is defined by a series of commands going from **left to right** across the points of a cross section. (Cross sections are generated as 4d strings by options such as **apply** and **cuts**).



The definitions of boxing cross sections are set up in a file ending in **.bf** (called the boxing file) and any number of boxing definitions can be placed in the boxing file as long as each boxing definition is given a unique name.

In the boxing file, a *Boxing Definition* with name **boxing_name** is set out as

```
boxing    boxing_name {
                                boxing commands
}
```

The boxing commands apply from the offset specified at the beginning of that command (**start offset** for the command) to the start offset of the **next** command in the file (like chainages and templates in the apply many file). Hence the **end offset** for a command is the start offset of the following command in the file.

For example, in the sequence

```
offset1,    command1
offset2,    command2
```

command1 goes from offset1 (the start offset for command1) to offset2 (the end offset for command1).

The **offsets** can be **fixed** values or can be specified **relative** to a point name on the 4d string representing the x-section. One restriction is that all the points mentioned in a boxing definition, must be present in each x-section the boxing definition is applied to.

The notation used to specify an actual offset, or offset relative to a point name is

```
offset_value
or      "point_name"
or      "point_name" +/- offset_value
```

and means in the first case

take the specified **offset** value (offset_value can be positive or negative).

and for the other two relative cases

take the **offset at** the string or 4d point called **point_name** and add **offset_value** to it (offset_value can be positive or negative).

Hence the offset can be specified as either a value or given **relative to point_name** (relative

offset). For convenience, the offset will be denoted by **rel_off**.

The major advantage of defining boxing in terms of point names is that whenever the points are modified using template modifiers, the boxing across the section is also automatically modified.

Since the offset part of a command can consist of text plus or minus a number, commas are used to separate each field of the command.

A boxing definition may be used in either a `left_boxing` or `right_boxing` mtf command (see the section, creating boxing), however unlike the case for templates, the boxing definition is applied to the point names going from left to right regardless of whether the boxing definition is used on the left or the right.

In practice, the definitions for left and right boxing are usually different because of the necessity of having unique point names across the entire cross section.

Vertical Walls

If a boxing definition creates two different height values at the one offset (i.e. a wall), then extra offset points are automatically inserted into the boxing x-section (at 0.1 mm from the previous point) so that no points are on top of each other.

So in effect a vertical wall is created but since no points are created that are directly above each other, the data can be triangulated.

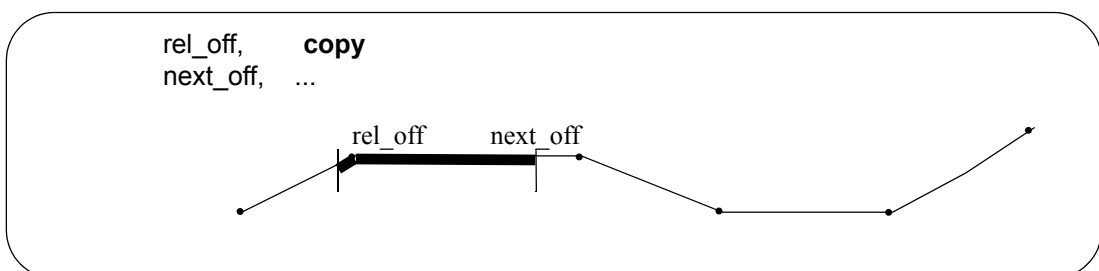
The commands in the boxing definition are:

- see [Text Format - Boxing Copy](#)
- see [Text Format - Boxing Copy with Height Adjustment](#)
- see [Text Format - Boxing Line](#)
- see [Text Format - Boxing Xfall](#)
- see [Text Format - Boxing Xfall1](#)
- see [Text Format - Boxing End](#)
- see [Text Format - Boxing Right_Xfall](#)
- see [Text Format - Boxing Right_slope](#)
- see [Text Format - Boxing Right_copy](#)
- see [Text Format - Boxing Left_Xfall](#)
- see [Text Format - Boxing Left_slope](#)
- see [Text Format - Boxing Left_copy](#)
- see [Text Format - Boxing Definitions Example](#)

Text Format - Boxing Copy

rel_off, copy

This copies the links (or parts of links) from the start offset **rel_off** to the offset on the next line, keeping the present crossfall and height of each link

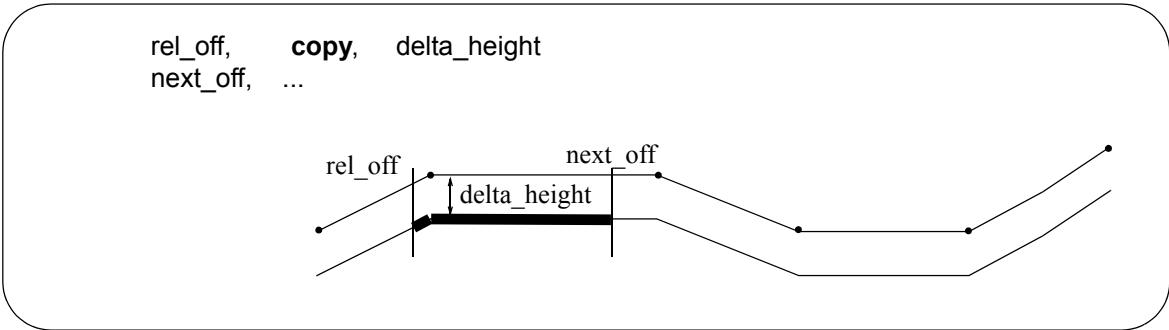


For the boxing panel that creates this boxing command, see [Boxing Copy](#).

Text Format - Boxing Copy with Height Adjustment

`rel_off, copy, delta_height`

This copies the links (or parts of links) from the start offset **rel_off** to the offset on the next line, keeping the present slope of each link but adjusting the height of each link by **delta_height**.



For the boxing panel that creates this boxing command, see [Boxing Copy](#).

Text Format - Boxing Vertex

For the boxing panel that creates this boxing command, see [Boxing Vertex](#).

Text Format - Boxing Line

Line Through Two Given Points

`rel_off, line, rel_off_1, delta_height_1, rel_off_2, delta_height_2`

This creates a link from the start offset **rel_off** to the offset on the next line, with a

- (a) slope given by two points
- (b) start height given by projecting to the start offset, the line through the two points.

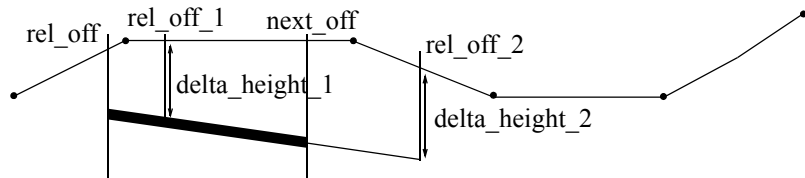
The first point defining the line has an offset **rel_off_1** and a height given by the height of the design x-section at offset **rel_off_1** adjusted by **delta_height_1**.

The second point defining the line has an offset **rel_off_2** and a height given by the height of the design x-section at offset **rel_off_2** adjusted by **delta_height_2**.

The typed format of the **line** commands created by this panel is (all on one line):

`point_name + point_offset,line, point_1_name + point_1_offset,delta_height_1,
point_2_name + point_2_offset,delta_height_2`

```
rel_off,    line, rel_off_1, delta_height_1, rel_off_2,
delta_height_2
next_off,   ...
```



For the boxing panel that creates this boxing command, see [Boxing Line - line through two points](#).

Text Format - Boxing Xfall

Line Through a Given Point with a Given Crossfall

```
rel_off,    xfall,    rel_off_1,    delta_height_1,    xfall_value
```

This creates a link from the start offset to the offset on the next line, with a

- (a) user given xfall
- (b) start height given by projecting to the start offset, the line with a given xfall and going through a given point.

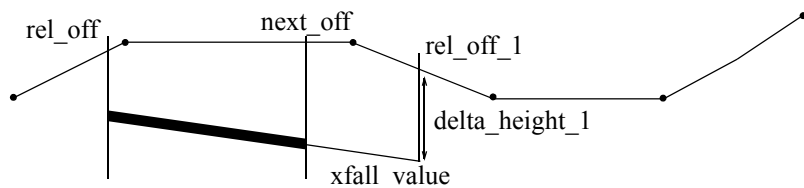
The point defining the line has an offset **rel_off_1** and a height given by the height of the design x-section at offset **rel_off_1** adjusted by **delta_height_1**.

The typed formats of the **xfall** commands created by this panel is:

```
point_name + point_offset,    xfall,    control_name + control_offset,    control_height,    xfall
```

The crossfall of the line is given by **xfall_value**

```
rel_off,    xfall, rel_off_1, delta_height_1, xfall_value
next_off,   ...
```



For the boxing panel that creates this boxing command, see [Boxing Xfall - line through a point with a given crossfall](#).

Text Format - Boxing Xfall1

Line Through a Given Point with Crossfall Taken from a Point

rel_off, **xfall1**, rel_off_1, delta_height_1, rel_off_2, delta_xfall

This creates a link from the start offset **rel_off** to the offset on the next line, with a

(a) xfall which is the xfall at a given offset plus an addition given xfall

and

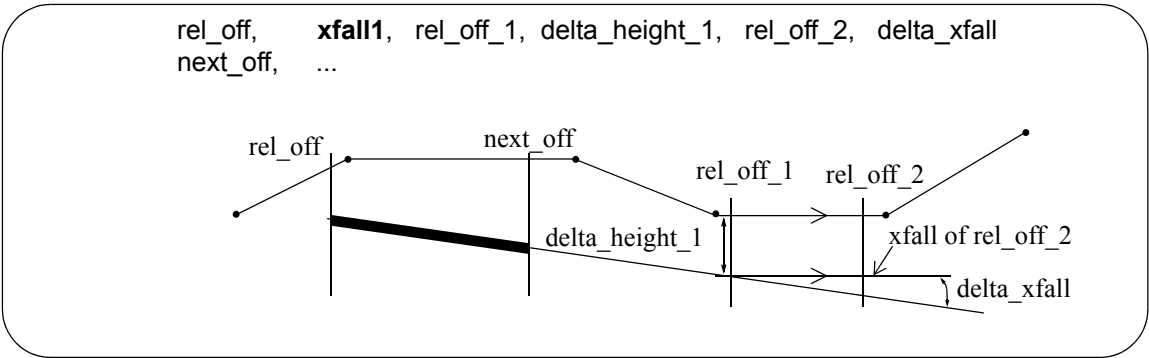
(b) start height given by projecting to the start offset, the line with the given xfall and going through a given point.

The point defining the line has offset **rel_off_1** and a height given by the height of the design x-section at offset **rel_off_1** adjusted by **delta_height_1**

The typed formats of the **xfall1** commands created by this panel is:

point_name + point_offset, **xfall1**, control_name + control_offset, control_height,
 xfall_name + xfall_offset, xfall_delta

The xfall of the line is **delta_xfall** added to the xfall on the design x-section at the offset **rel_off_2**



For the boxing panel that creates this boxing command, see [Boxing Xfall 1 - line through a point with a crossfall taken from a point](#).

Text Format - Boxing Intersect

For the boxing panel that creates this boxing command, see [Boxing Intersect - Intersection of Two Lines](#).

Text Format - Boxing Xfall Point

For the boxing panel that creates this boxing command, see [Boxing Xfall Point](#).

Text Format - Boxing End

rel_off, **end**

The typed format of the **line** commands created by this panel is:

point_name + point_offset, **end**

This command is used to give an end offset for any of the above commands when no command follows to use for the end offset. That is, the offset **rel_off** is used as the **end offset** for the **previous command**.

end doesn't begin another command and none of the above commands can follow an **end** command.

All of the above boxing commands are known as **standard** commands. Hence the **end** command is the **last** standard command.

For the boxing panel that creates this boxing command, see [Boxing End](#).

Text Format - Boxing Right_Xfall

Batter off Right End of Boxing with Crossfall Taken from a Point

The **right_xfall** command has two versions - providing a fixed cross fall or using the crossfall from part of the design x-section.

right_xfall rel_off, delta_xfall

right_xfall xfall_value

The typed formats of the **right_xfall** commands created by this panel is:

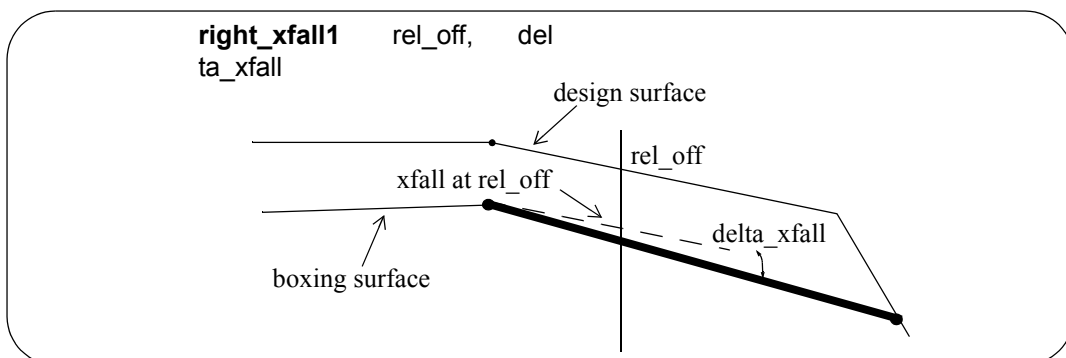
right_xfall, xfall_name + xfall_offset, xfall_delta

For the first case, the **right_xfall** command batters off the right end of the boxing using the xfall from the design section at a given offset **rel_off** plus an additional given xfall **delta_xfall**, until the design section is intersected. The intersection point is used as the next point in the boxing.

Hence the xfall of the batter is **delta_xfall** added to the xfall on the design x-section at the offset **rel_off**

For the second case, the **right_xfall** command batters off to the right end of the boxing at the given xfall **xfall_value** until the design section is intersected. The intersection point is used as the next point in the boxing.

In the **right_xfall** command, the xfall is percent cross-fall and a positive xfall is up and negative down.



For the boxing panel that creates this boxing command, see [Boxing Right Side Interface Xfall from Point](#).

Text Format - Boxing Right_slope

Batter Off the Right End of Boxing with a Given Slope

right_slope slope_value

The **right_slope** commands batter off to the right end of the boxing at the given slope **slope_value** until the design section is intersected. The intersection point is used as the next point in the boxing. In this command, a positive slope is up and negative down.

For the boxing panel that creates this boxing command, see [Boxing Right Side Interface Xfall from Point](#).

Text Format - Boxing Right_copy

Copy from the Last Boxing Point to the end of Design Section

right_copy value

If value is non-zero, the **right_copy** command copies from the last boxing point to the last point on the design section. Hence the **right_copy** command is used to continue the boxing section from the intersection point with the design section to the end of the design section (a full width boxing section).

Note

The **right_xfall** command **takes precedence over** the **right_slope** command. That is, if both commands exist then only the **right_xfall** command is used.

For the boxing panel that creates this boxing command, see [Boxing Right Side Interface Xfall from Point](#).

Text Format - Boxing Left_Xfall

Batter off Left End of Boxing with Crossfall Taken from a Point

left_xfall rel_off, delta_xfall

left_xfall xfall_value

The typed formats of the **left_xfall** commands created by this panel is:

left_xfall, xfall_name + xfall_offset, xfall_delta

The **left_xfall** is identical to the **right_xfall** command except that it is applied at the beginning of the boxing definition and batters off to the left rather than to the right.

In the **left_xfall** command, the xfall is percent cross-fall and a positive xfall is up and negative down.

For the boxing panel that creates this boxing command, see [Boxing Left Side Interface Xfall from Point](#).

Text Format - Boxing Left_slope

Batter Off the Left End of Boxing with a Given Slope

left_slope slope_value

The **left_slope** is identical to the **right_slope** command except that it is applied at the beginning of the boxing definition and batters off to the left rather than to the right. In this command, a positive slope is up and negative down.

The **left_slope** and **left_copy** are identical to the **right_slope** and **right_copy** except that they are applied at the beginning of the boxing definition and batter off and copy to the left rather than to the right. In this command, a positive slope is up and negative down.

The **left_copy** command must come before the **left_slope** command but they both come after all of the standard commands.

Note

The **left_xfall** command **takes precedence over** the **left_slope** command. That is, if both commands exist then only the **left_xfall** command is used.

For the boxing panel that creates this boxing command, see [Boxing Left Side Interface Xfall from Point](#).

Text Format - Boxing Left_copy

Copy from the Start of Design Section to the First Boxing Point

left_copy value

The **left_copy** is identical to the **right_copy** except that it is applied at the beginning of the boxing definition and copies to the left rather than to the right.

If *value* is non-zero, the **left_copy** command copies from the last boxing point to the last point on the design section. Hence the **left_copy** command is used to continue the boxing section from the first boxing point to the start of the design section (a full width boxing section).

Note

The **left_xfall**, **left_slope**, **left_copy**, **right_xfall**, **right_slope** and **right_copy** commands should come after all of the standard commands.

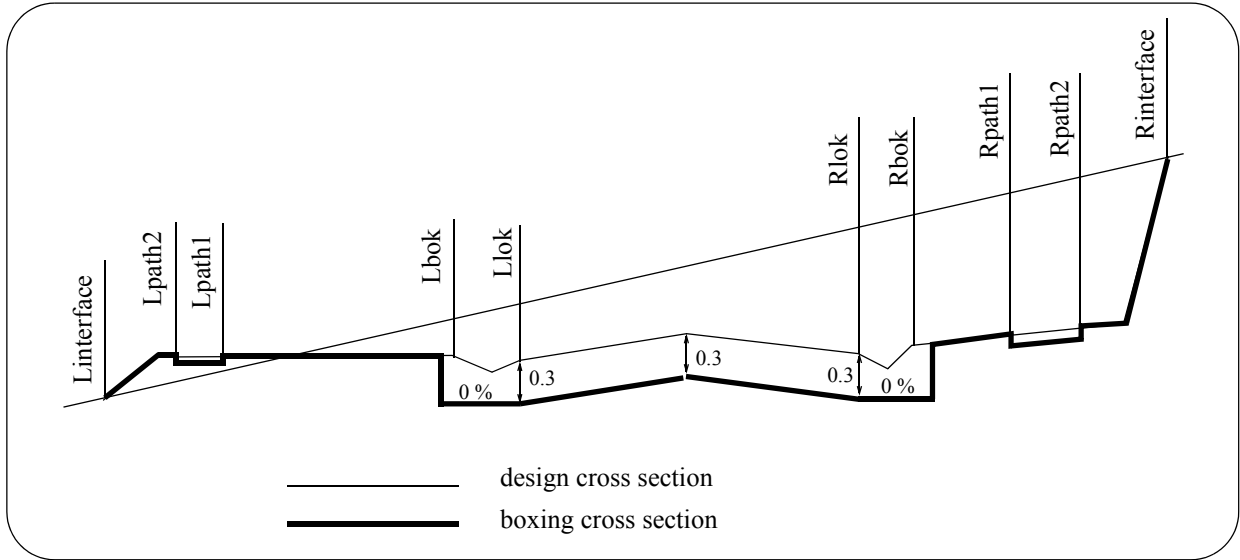
When a boxing definition is applied on the left side, any **right_xfall**, **right_slope** or **right_copy** is ignored. Similarly, when a boxing definition is applied on the right side, any **left_xfall**, **left_slope** or **left_copy** is ignored.

Hence a boxing definition can have a **left_xfall**, **left_slope**, **left_copy** and a **right_xfall**, **right_slope**, **right_copy** but which set is used depends on whether the boxing definition is used on the left or the right.

When the **boxing** panel is used to create the boxing, only one boxing definition is needed and all of the **right_xfall**, **right_slope**, **right_copy**, **left_xfall**, **left_slope** and **left_copy** commands are used.

For the boxing panel that creates this boxing command, see [Boxing Left Side Interface Xfall from Point](#).

Text Format - Boxing Definitions Example



boxing "1" {

```

    "Linterface",      copy                                // line 1
    "Lpath2",          copy,      -0.075                  // line 2
    "Lpath1",          copy                                // line 3
    "Lbok" - 0.15,     xfall,      "Llok",      -0.3,      0 // line 4
    "Llok",            copy,      -0.3                    // line 5
    "Rlok",            xfall,      "Rlok",      -0.3,      0 // line 6
    "Rbok" + 0.15,     copy                                // line 7
    "Rpath1",          copy      -0.095                   // line 8
    "Rpath2",          copy                                // line 9
    "Rinterface",      end                                // line 10
}
```

Description

- Line 1 copy from "Linterface" to "Lpath2"
- Line 2 copy and drop by 0.075 from "Lpath 2" to "Lpath 1"
- Line 3 copy from "Lpath1" to 0.15 before "Lbok"
- Line 4 go from 0.15 before "Lbok" to "Llok" at depth 0.3 below "Llok", with cross fall 0
- Line 5 copy and drop by 0.3 from "Llok" to "Rlok"
- Line 6 go from "Rlok" to 0.15 past "Rbok" at depth 0.3 below "Rlok", with cross fall 0
- Line 7 copy from 0.15 past "Rbok" to "Rpath1"
- Line 8 copy and drop by 0.095 from "Rpath1" to "Rpath2"
- Line 9 copy from "Rpath2" to "Rinterface"

```

boxing "left narrow" {                                // boxing defined from just before lkerb to m001
    "lkerb" - 0.7 ,      copy
    "m001" - 1.0,      copy ,      -0.6
    "m001",      end
}
```

boxing "left" { // boxing defined from the left start of the section to m001 (the centreline say)

```

        "lkerb",    copy,      -0.6
        "m001",    end
        left_slope  5.0
        left_copy   1
    }
    boxing "right" {           // boxing defined from m001 to the far right of the section
        "m001",    copy,      0.6
        "rkerb",   end
        right_slope 5.0
        right_copy  1
    }
    boxing "full" {           // a full width boxing - defines the entire boxing going from left to right
        "lkerb",    copy,      -0.6
        "rkerb",    end
        left_slope  5.0
        left_copy   1
        right_slope -5.0
        right_copy  1
    }
}

```

For more information on how Boxing works in **12d Model**, please go to the section [MTF Boxing](#).



21 Drainage and Sewer

Position of menu: Design =>Drainage-Sewer

The **Drainage-Sewer** option is used to place drainage and sewer networks within a subdivision, along highways and culverts for cross drainage. Pumps may also be included in the network. The network is placed in three dimensions including manholes (maintenance holes), and for sewer work, lot controls and house connections can be defined. A 12d drainage string is used for all of these options.

If used in conjunction with the services on a section view, interference with neighbouring pipe strings can be taken into consideration when placing the network.

Note that the drainage string and plots capabilities are only available with the drainage and sewer options and the sewer extensions (property control, house controls and Melbourne Water plots) are only available with the sewer option.

The **drainage string** is based on a **polyline** string so that **arcs** can exist between manholes (maintenance holes). The manholes may be placed anywhere along the polyline but generally manholes are located at the polyline indices.

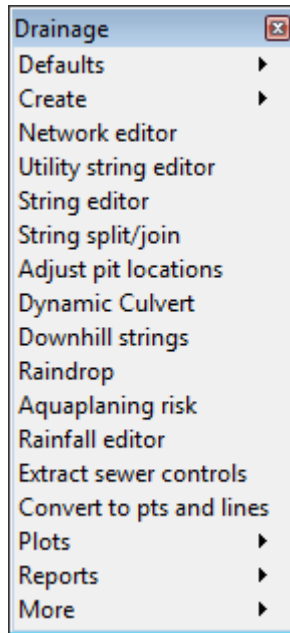
The use of the drainage string for drainage is only a subset of its use for sewer so the steps for the sewer will be given since they cover drainage as well.

The sewer process consists of a number of steps (the drainage process does not use steps 2 and 3):

1. creating the drainage or sewer network
2. Vertical alignment, pipe cover and utility clash checking using the [Drainage Network Editor](#),
3. checking that residential blocks are controlled by the sewer network
4. creating the house connections for the sewer
5. network design using custom routines, spread sheets or advanced network analysis packages via the [Drainage Network Editor](#)
6. producing [Drainage Plots](#) (plan and long section) and [Reports](#) (material quantity reports, excavation volumes and manhole construction reports)

These steps are described in the rest of this chapter.

The **Drainage** walk-right menu is laid out to reflect the standard sequence of placing drainage and wastewater pipes, *i.e.* creating, editing and plotting.



For a description of the drainage string in 12d Model, please go to the section [Drainage Strings](#)

For a definition of a drainage network and a junction in 12d Model, please go to the section [Networks and Junctions](#).

For a description of the drainage defaults in 12d Model, please go to the section [Drainage Definitions - Manholes and Pipes](#)

For a description of the drainage design import/export interface, please go to the section ["Drainage import/export"](#)

For the option *Defaults*, please continue to the section [Defaults](#).

Create, please continue to the section [Create](#).

Editor, please continue to the section [String Editor](#).

Network editor, please continue to the section [Drainage Network Editor](#).

Utility string editor, please continue to the section [Utility String Editor](#).

Rainfall editor, please continue to the section [Rainfall File ppf Editor](#).

Adjust Pit Locations, please continue to the section [Adjust Pit Locations](#).

Extract Sewer Property Controls, please continue to the section [Extract Sewer Property Controls](#).

Plots, please continue to the section [Drainage Plots](#).

Reports, please continue to the section [Reports](#).

More, please continue to the section [More Drainage](#)

Drainage Strings

A **drainage string** consists of a series of manholes (maintenance holes) at user selected (x,y,z) positions. The manholes can be joined by either straight or curved pipes.

Manholes may be any type of drainage structure and are represented by circles or rectangles. Drainage inlets, pump wet wells, gross pollutant traps, soak away pit, open channel changes in direction are all examples of manholes. The manholes have cover, grate and sump levels as well as wall and bottom thicknesses.

Pipes are the conduits connecting the manholes. Round pipes, box culverts, trapazoidal channels, pump rising mains, basin links, weirs and orifices are all examples of pipes.

Like all **12d** Model strings, the drainage string has an implied direction, starting at the first manhole and going in the direction towards the next manhole in the drainage string. This order is normally determined by the creation order (or string order) of the manholes.

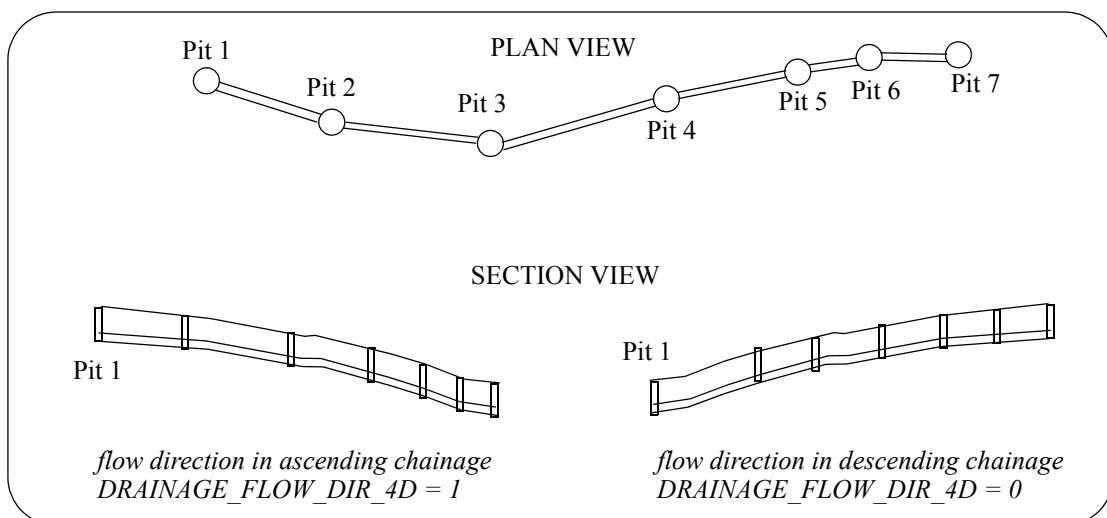
The chainage of the drainage string starts at the **first** manhole and then increases along the direction of the drainage string.

In **12d** Model, drainage strings have a property indicating

- (a) the most upstream manhole is entered as the first point of the string and hence the water flows in the direction of ascending string chainage. The flow direction is said to be in ascending chainage.

or

- (b) the most downstream manhole is entered as the first point of the string and hence the water flows in the direction of descending chainage. The flow direction is said to be in descending chainage)



When a drainage string with flow direction in ascending order is profiled in a section view, the left hand side of a manhole is normally upstream and the right hand side of a manhole downstream.

It is recommended that drainage strings are entered with the flow direction in ascending chainage so that the minimum grade and cover can be satisfied as the drainage string is being placed.

That is, if the drainage string flow is in ascending chainage direction, then as manholes are appended, minimum *cover* and minimum *grade* can be automatically maintained. In all cases the invert levels can be recalculated using the [Drainage Network Editor](#).

Pipes

A pipe is automatically created when a second or additional manhole is added to a drainage string. The properties of the pipe follow:

Type

Size (diameter, width, top width and natural channel shapes (dynamic only)).

Inverts Levels

Wall Thickness

Minimum cover limit

Length

The pipe length by default is set to manhole centre to manhole centre. This length is displayed in the DNE and on the section view (Toggle->Grades) when the drainage string is profiled.

The pipe length maybe be also be calculated from the inside edge of the drainage manhole by using pit connections points enabled in the [Drainage Network Editor](#) on the Global Tab.

Grade

The pipe grade is calculated from the length and invert properties discussed above. This grade is displayed on the section view (Toggle->Grades) when the drainage string is profiled. It is shown as % or 1 in via

Section View Menu View => Settings =>Grade annot

Please continue to the next section [Networks and Junctions](#).

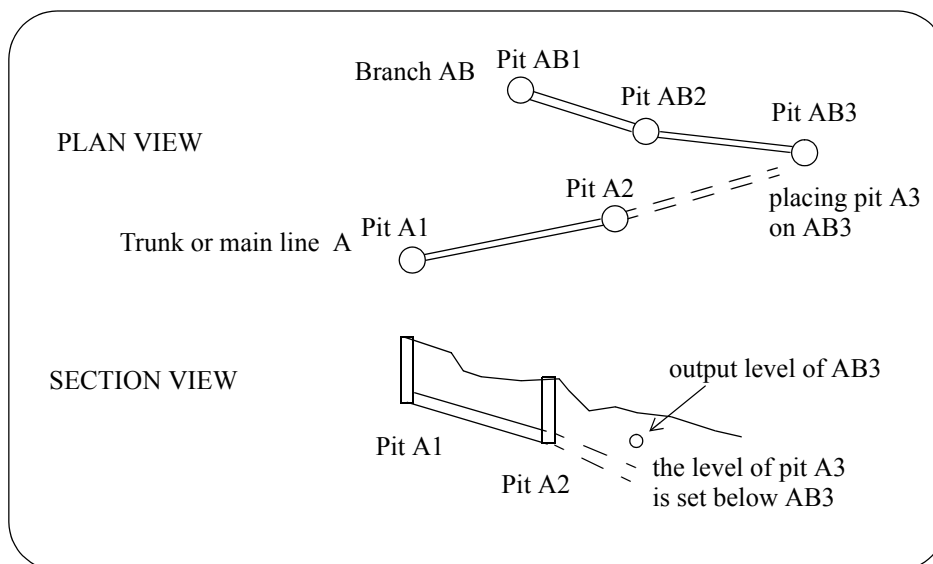
Networks and Junctions

In **12d** Model, a **drainage network** consists of one or more drainage strings in the *same* model. Consequently, all the drainage strings in the same model are considered to be part of the same drainage network. It is suggested that **all** drainage strings in a network be entered with the same flow direction.

If two drainage strings from the same model have a manhole at exactly the same (x,y) location, then **12d** Model assumes that the co-incident manholes **are** the same manhole and that the situation represents a **junction**. Most junction manholes are at the ends of the drainage strings. A junction may have a maximum of one manhole that is not at the end of the drainage string.

When water flows into a drainage string (from a branch drainage string) it is referred to as a trunk line. A trunk line may be a branch for another downstream trunk line.

Also for a network, if all the drainage strings are entered with the flow direction in ascending chainage, not only can minimum cover and minimum grade be maintained as manholes are appended, but if the branches are laid down before the trunk, then as you connect each branch to the trunk, the invert level for the trunk will be set to below the invert level of the branch line (less the default drop for the manholes). In all cases the invert levels for the entire network be recalculated using the [Drainage Network Editor](#).



Please continue to the next section [Drainage Definitions - Manholes and Pipes](#).

Drainage Definitions - Manholes and Pipes

A file of pipe and manhole (maintenance hole) definitions is used to create pipe and manhole (maintenance hole) types to allow tailoring for a particular project. The manhole or pipe type is one method to set many of the objects properties such as inlet capacity, thickness and roughness along with the objects user defined attributes.

When 12d Model starts up, it checks to see if an environment variable called DRAINAGE_4D exists and if it does, then the file it points to is used to provide the available types of manholes (maintenance holes) and pits.

If the environment variable is not set, then 12d Model searches for a file called **drainage.4d** in the standard 12d Model search sequence for set up files.

The drainage definitions file format is an ascii format and consists of one or more pipe and manhole definitions. Each definition in the file begins with the key word **Pipe** or **Manhole**, followed by the pipe or manhole type and then curly braces { }. The order that the definitions appear in the file determines the order they appear in the drop down lists inside 12d Model.

IMPORTANT: the file is only read when 12d Model starts up. When the file is changed while, 12d Model is running, you must restart 12d Model for the changes to become active. If any syntax errors have been made editing the file, the line number will be displayed in the output window. The error generally slightly above this line. The most common errors are missing curly braces { } and forgetting quotes around entries containing spaces

A minimal example of a drainage definitions file is:

```
// -----  
// drainage.4d                1/6/96  
// Used to define the types of Pipes and Manholes  
// -----  
Pipe "PVC" {  
}  
  
Pipe "VC" {  
}  
Pipe "PVC Extra Heavy" {  
}  
Pipe "Plastic" {  
}  
  
Manhole "CONC COVER" {  
}  
Manhole "Gatic" {  
}  
Manhole "Rubber" {  
}
```

Notes

1. spaces in text - any text string that includes spaces or only numbers, must be enclosed in double quotes "".
2. comments - anything after // until the end of the line is ignored.
3. blank lines - blank lines are ignored
4. Duplicate definitions are not allowed.

Please continue to the next section [Drainage Definitions - Manhole Types](#).

Drainage Definitions - Manhole Types

Manhole types may be used to set the following manhole properties via the DNE.

- s manhole diameter, length/width and thickness
- s manhole description, notes, group, ku/kw method, ku/kw values, rational engine design freeboard,
- s manhole level modes for cover level, grate level, survey setout level and sump levels,
- s survey setout xy modes and road chainage modes
- s user defined manhole attributes

Each definition (manhole block) in the file begins with the key word **Manhole**, followed by the manhole type and then curly braces { }. The order that the definitions appear in the file determines the order they appear in the drop down lists inside **12d Model**.

The minimum requirement for a pit type definition is

```
Manhole "type name" {
}
```

The type name must be unique and the braces {} cannot be () or [].

Optional manhole commands may be placed inside the braces. These commands include may include [Manhole Editor Commands](#), [Manhole Drainage Network Editor Commands](#) and Manhole Calculation Commands.

Manhole Editor Commands

These optional commands change the properties of the manhole objects. Changes to these commands will be used in creating new drainage strings and the [Drainage Network Editor](#) will prompt you to update the object if these settings are different to the strings current settings. A list of these commands follows

```
mhdiam x.x      set the manhole as circular (internal diameter in base units)
mhsize x.x y.y  set the manhole as rectangular (over rides mhdiam) length and width in base units
mhthickness {
  diam_thickness x.xxx a.aaa b.bbb c.ccc d.ddd
}
x.xxx          nominal diameter choices will appear in the DNE->Pipe->Diameter drop down
a.aaa          optional front thickness (base units) 0.000 if omitted
b.bbb          optional back thickness (base units) front thickness if omitted
c.ccc          optional left thickness in direction of chainage (base units) front thickness if
omitted
d.ddd          optional right thickness in direction of chainage (base units) front thickness if
omitted
```

Manhole Level Modes

There are several modes that may be used to calculate x,y, and z values for the manholes. A description of each follows.

FS tin the manhole centre x,y location is used to obtain the level from the drainage finished

	surface tin
NS tin	the manhole centre x,y location is used to obtain the level from the drainage natural surface tin
Setout string	the manhole centre x,y location is dropped perpendicular onto the setout string. The x,y or z value is then obtained from this string. If this string is missing then the pit x,y location or finished surface tin level is used instead.
Centre string	the manhole centre x,y location is dropped perpendicular onto the road centre string and the chainage value is obtained. If this string is missing an problem message will be created in the output window.
Sz + Setout string	the manhole centre x,y location is dropped perpendicular onto the setout string. The Sz value for the manhole is then added to the z value obtained from this string. If this string is missing the Sz value is added to the finished surface tin level at the pit centre x,y location.
Manual	the x,y,z or chainage value is manually entered by the user.
Cover RL	the z level is set the the Cover RL level (after it has been recalculated).
Max Obvert	The maximum obvert level from off the conduits connected to this manhole is used.
Floating sump	the manhole sump level is set to the lowest invert of all the conduits connected to this manhole + the sump offset

Manhole Drainage Network Editor Commands

These optional commands store user defined data on the manholes or change the calculation modes available in the [Drainage Network Editor](#). The set pit details button in the editor will recalculate these for all manholes in the network. A list of these commands follows

mhdesc "description"	creates a pit text attribute "pit type description" and is used in the drainage pit schedule report.
mhnotes "note"	creates a pit text attribute "pit type remarks" and is used in the drainage pit schedule report.
mhgroup "group"	routines that select manholes will select from a manhole belonging to the same group
attribute_integer "attribute name1" x	x is an integer value (no decimal, stored exactly by computers
attribute_real "attribute name2" x.xxx	x is a real value (used to store numbers with decimals or very large or very small numbers
attribute_text "attribute name3" "text"	text is a series of words or numbers not intended for calculations

Note: If a non-special attribute name is set for some, but not all manhole types, that attribute will be deleted on all manholes with types where the attribute is not defined.

The following special attribute commands create/modify an attribute as described above but these attributes also control calculations performed by the set pit details button on the [Drainage Network Editor](#). The DNE fields will be locked when these attributes are defined for the selected pit type. If these attribute are not defined for the selected pit type the DNE field will not be locked and remain unchanged.

attribute_integer	"cover rl mode" x	DNE field ->Pit=>Main=>Cover RL mode
	Mode	x
	FS tin	0
	Setout string	1
	Manual	2
	NS tin	3
	Max Obvert	4
	Sz + setout string	8
attribute_integer	"grate rl mode" x	DNE field ->Pit=>Main=>Grate RL mode
	Mode	x
	FS tin	0
	Setout string	1
	Manual	2
	NS tin	3
	Max Obvert	4
	Cover RL	7
	Sz + setout string	8
attribute_real	"sump offset" x.xx if sump RL mode is floating then this is the offset (negative down) from the lowest pipe invert <base units>	DNE field ->Pit=>Main=>Sump offset
attribute_integer	"ku method"	DNE field is Pit=>Main=>Ku method
	Mode x Description	
	Direct 0	user enters the ku value stored as pit real attribute "ku"
	Ku,Kw - Missouri/Hare Charts	
	1	ku calculated during analysis
	Ku,Kw>0 - Missouri/Hare Charts	
	2	ku calculated during analysis (ku < 0.0 changed to 0.0)
	Ku - Culvert Inlet - Generic (101 or 201)	
	3	Culvert analysis using inlet control and backwater control (entrance and exit losses automatically set)
	Remaining xxx	Culvert analysis - use numbers from DNE drop down list
attribute_real	"ku" x.xx x.xx is used to calculate pit upstream hgl when ku method is Direct	DNE field is Pit=>Main=>Ku
attribute_real	"kw" x.xx x.xx is used to calculate pit hgl when ku method is Direct	DNE field is Pit=>Main=>Kw
attribute_integer	"setout xy mode" x	DNE field is Pit=>Setout=>Setout xy mode
	Mode	x
	FS tin	0
	Setout string	1
	Manual	2
	attribute_integer "setout z mode" x	DNE field is Pit=>Setout=>Setout z mode
	Mode	x
	FS tin	0
	Setout string	1
	Manual	2
	NS tin	3
	Max Obvert	4
	Cover RL	7
	Sz + setout string	8
attribute_integer	"road chainage mode"	DNE field is Pit=>Setout=>Chainage mode
	Mode	x
	No Road	0
	Centre string	1
	Manual	2

attribute_real	"setout adjustment"	DNE field is Pit=>Setout=>Sxy
attribute_real	"setout adjustment z"	DNE field is Pit=>Setout=>Sz
attribute_real	"design freeboard" at US pit	DNE field is Pipe=>Design=>Freeboard limit

The following example of a channel ip point is given below. The setout modes are set, the cover and grate level modes are set and the ku (losses) are set. Finally, the inlet capacity is set to an on-grade pit with 200% inlet capacity so that even in a major storm with a choke factor of 0.5 it will still have 100% inlet capacity.

```
Manhole "CHNL auto" {  
  
    mhdesc "channel hip-vip"  
    attribute_text "lplot description1" "OPEN CHANNEL"  
  
    mhsize 0.0  
    mhdiam 0.0  
    attribute_integer "setout xy mode"      0 // centre of the channel  
    attribute_integer "setout z mode"      6 // sump invert is the bottom of the channel  
    attribute_integer "cover rl mode"      4 // max obvert - top of the channel  
    attribute_integer "grate rl mode"      4 // max obvert - top of the channel  
    attribute_integer "ku method"          0 // direct  
    attribute_real "ku"                    0.0 // zero unless interested in bend losses  
  
    cap_config G  
  
    cap_percent 200 // if a choke factor of 0.5 is applied then it will still have 100% inlet capacity  
}  
  
// attribute_real "design freeboard"      Pipe=>Design=>Freeboard limit at US pit
```

Manhole Drainage Analysis Inlet Capacity Commands

Manhole inlet configuration and bypass pit entries determine if these inlet capacity commands are used. Both may be set in the [Drainage Network Editor](#).

cap_config

The inlet configuration may be set via the following command

cap_config	x	x
	Mode	
	Manhole	m
	Ongrade	g
	Sag	s

Inlet Configuration = manhole - no water will enter the pit through the grate. Commands not used.

Inlet configuration = on grade or sag

Bypass pit not set - 100% of the approach flow will enter the pit. Commands not used.

Bypass pit is entered. The following commands define the stormwater inlet capacity characteristics.

Inlet Capacity Equation

The inlet capacity equation is built up with optional components (**single polynomial + curve polynomial + curve coordinates**). Generally, only one of the components is used for each manhole type but they may all be used if desired.

inlet capacity = inlet efficiency * inlet multiplier *
[**single polynomial + curve multiplier (curve polynomial + curve coordinates)**]

An inlet efficiency (choke factor) is specified in the [Drainage Network Editor](#). An inlet efficiency (choke factor) of 0 would stop all water from entering the inlet.

The inlet multiplier is specified with a cap_multi parameter.

Multipliers

cap_multi x.x inside a cap_curve_grade block or cap_curve_sag block, the curve inlet capacity is multiplied by this value
outside a cap_curve_grade or cap_curve_sag, the total inlet capacity is multiplied by this value

Single Polynomial

The inlet capacity for an inlet may be specified by a single polynomial equation based on the approach flow. This is the most simplistic method and generally used for percentage capture or fixed capture rates.

$$\begin{aligned}\text{inlet capacity} = & \text{cap_fixed} \\ & + \text{cap_percent} * 0.01 * Q_a \\ & + \text{cap_coeff} * Q_a^{\text{cap_power}}\end{aligned}$$

Example

This example creates an inlet with a fixed inlet capacity of 0.010 (cms or cfs).

```
Manhole "fixed inlet capacity" {  
    cap_fixed 0.010  
}
```

Default values

```
cap_multi  = 1.0  
cap_fixed  = 0.0  
cap_percent = 0.0  
cap_coeff  = 0.0  
cap_power  = 1.0
```

Curve Polynomial

For on-grade inlets, the polynomial parameters may change with road grade and cross fall threshold values. The formula is the same for cap_fixed, cap_percent, cap_coef and cap_power. Note that each curve may have its own curve multiplier specified with a cap_multi parameter (discussed below). Some hydraulic model tests have their on grade inlet results converted to polynomial equations.

Example

This example creates an inlet where the inlet capacity polynomials have been determined for 2 road grades (1% and 3%). Note that the road_grade 0.0 command is used for the 1% road grade. Since this is the flattest road grade curve we have calculated we will start using it at a road grade of 0%.

Note that the second curve "NJ G3" will be used when the road grade reaches 2.5. The threshold value where 12d should change to the next curve is generally slight less than the road grade from the source.


```

Manhole "On grade pit type NJ" {
    cap_config G

    cap_curve_grade "NJ 1G" {
        road_grade 0
        cap_coeff 0.215
        cap_power 0.67
    }

    cap_curve_grade "NJ 3G" {
        road_grade 2.5
        cap_coeff 0.24
        cap_power 0.673
    }
}

```

Curve Coordinates (On grade and SAG)

For on-grade and sag inlets, the inlet capacity may be determined by entering coordinates along the inlet capacity curve. These coordinates are usually obtained from hydraulic model studies or analytical methods such as HEC-22.

For on grade inlets, the coordinates are Qapproach and Qin, and the curves may change with road grade and cross fall threshold values. The inlet capacity curves are never extrapolated.

Example

```

Manhole "Ongrade coordinates" {
    cap_config G
    cap_curve_grade "0.5G" {
        road_grade 0
        coord 0.000 0.000
        coord 0.060 0.060
        coord 0.140 0.112
        coord 0.260 0.174
        coord 0.430 0.244
        coord 0.500 0.270
    }
    cap_curve_grade "1G" {
        road_grade 0.75
        coord 0.000 0.000
        coord 0.060 0.060
        coord 0.140 0.108
        coord 0.260 0.164
        coord 0.430 0.227
        coord 0.500 0.248
    }
}

```

For sag inlets, the coordinates are Depth (base units) and Qin, and there is only one curve. Each curve has a curve multiplier specified with a cap_multi parameter (discussed below).

Example

```
Manhole "SAG coordinates" {
    cap_config S
    cap_curve_sag "SAG" {
        coord 0.000 0.040
        coord 0.045 0.101
        coord 0.070 0.151
        coord 0.095 0.245
        coord 0.120 0.302
        coord 0.170 0.347
        coord 0.220 0.371
        coord 0.270 0.391
    }
}
```

Polynomial Inlet Capacity Commands

The following commands are used to set the parameters in the following polynomial equation

inlet capacity =			cap_fixed
			+ cap_percent*0.01*Qa
			+ cap_coeff*Qa^cap_power
cap_fixed	x.x	cms or cfs	
cap_percent	x.x	percentage (0 to 100)	
cap_coeff	x.x	multiplier	
cap_power	x.x	exponent	

Inlet Curve Block Commands

Inlet curve blocks may be specified for both on-grade or sag inlets. Inside the curve block you may include the [Polynomial Inlet Capacity Commands](#) and [Coordinate Inlet Capacity Commands](#).

```
cap_curve_grade "unique name for the pit type" {
    road_grade x.xx
    road_xfall x.xx
}
```

Inside the cap_curve_grade block the road grade and road crossfal threshold values (percent) may be set. The road grade and crossfall are calculated by the [Drainage Network Editor](#). When the 12d analysis engine selects the inlet curve, all curves with the same road_xfall are grouped together and then within the crossfall group the road_grade curves is selected. The inlet curve with the maximum grade threshold that is less than or equal to the road grade is selected.

- Rules for 'cap_curve_grade' entries:
- Only applicable to on-grade pits.
 - All cap_curve_grade names must be unique within a Manhole block
 - If both 'road_grade' and 'road_xfall' entries are omitted, only one cap_curve_grade entry is allowed within a pit.
 - The cap_curve_grade 'coord' entries (if used) must be in order of increasing Qa.

```
cap_curve_sag "unique name for the pit type" {
}
```

Rules for 'cap_curve_sag' entries:

Only applicable to sag pits.

Only one cap_curve_sag entry is allowed within a pit, and it must have a valid name.

Coordinate Inlet Capacity Commands

The coord command must be used inside the cap_curve_grade or cap_curve_sag grouping

coord x.xx y.yy

x.xx must be in increasing order.

For cap_curve_grade group, the coord command has the parameters Qapproach and Qin

For cap_curve_sag group, the coord command has the parameters Depth and Qin

Please continue to the next section [Drainage Definitions - Pipe Types](#).

Drainage Definitions - Pipe Types

Pipe types may be used to set the following pipe properties via the DNE.

- s pipe nominal/actual diameters and thickness
- s roughness method and value
- s rational method design mode and design percent depth
- s minimum pipe height for the rational design engine
- s user defined pipe attributes

Each definition (pipe block) in the file begins with the key word **Pipe**, followed by the pipe type and then curly braces { }. The order that the definitions appear in the file determines the order they appear in the drop down lists inside **12d Model**.

The minimum requirement for a pipe type definition is

```
Pipe "name" {
}
```

The name must be unique and the braces {} cannot be () or [].

Example:

```
Pipe "CHNL GRASS PROPOSED" { //Open Channel created below the tin. cover set in cover
file to 0.0
```

```
roughness_n 0.040
```

```
attribute_integer "design size mode" 3 // open channel mode
```

```
}
```

Pipe Drainage Network Editor Commands

Pipe Thickness

```
pipethickness {
    diam_thickness x.xxx y.yyy a.aaa b.bbb c.ccc d.ddd
}
```

x.xxx nominal diameter choices will appear in the DNE->Pipe->Diameter drop down
y.yyy internal diameter (base units) will be entered into the DNE->Pipe->Diameter
field

a.aaa optional top thickness (base units) 0.000 if omitted

b.bbb optional bottom thickness (base units) top thickness if omitted

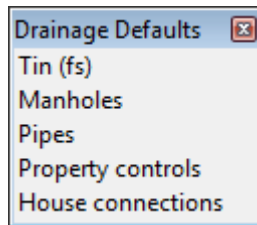
c.ccc optional left thickness in direction of chainage (base units) top thickness if

Defaults

Position of menu: Design =>Drainage-Sewer =>Defaults

The **defaults** menu sets default tin, manhole (maintenance hole) information, drainage pipe information, property control (sewer module only) and house connection (sewer module only) defaults which are all used when defining drainage networks.

The **Defaults** walk-right menu is



For the option *Tins (fs)*, please continue to the section [Tin \(fs\)](#).

Manholes, please continue to the section [Manholes \(Maintenance Holes\)](#).

Pipes, please continue to the section [Pipes](#).

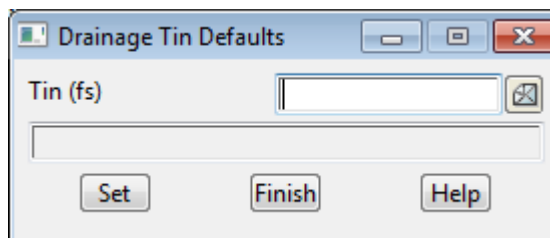
Property controls, please continue to the section [Property Controls](#).

House connections, please continue to the chapter [House Connections](#).

Tin (fs)

Position of option on menu: Design =>Drainage-Sewer =>Defaults =>Tin (fs)

On selecting the **Tin (fs)** option, the **Drainage Tin Defaults** panel is displayed.



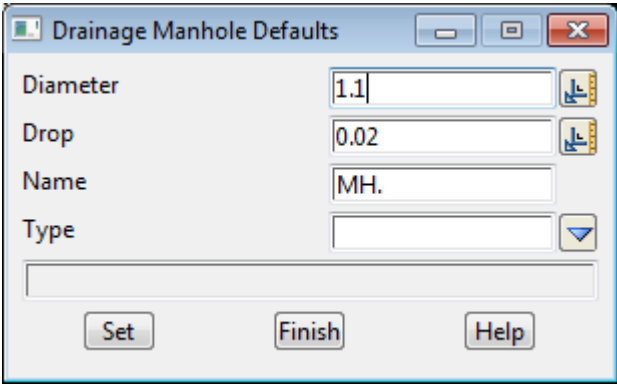
This panel is for setting the default finished surface tin in the **Create Drainage Strings** panel which is used for creating a new drainage string.

For the drainage string, the finished surface tin is used as the surface that manholes automatically sit on when z float is set on, and for defining cover when placing controls and connections.

Manholes (Maintenance Holes)

Position of option on menu: Design =>Drainage-Sewer =>Defaults =>Manholes

On selecting the **Manholes** option, the **Drainage Manhole Defaults** panel is displayed.

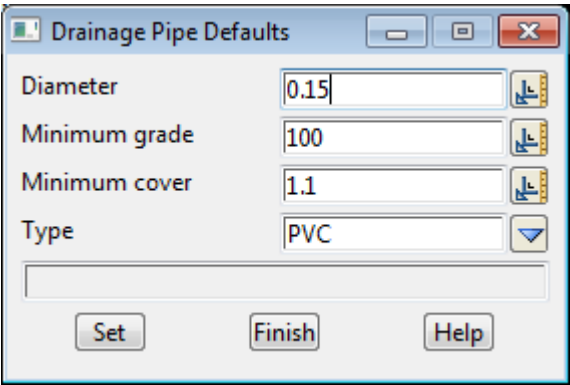


These defaults are used when creating a manhole in a drainage string. The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Diameter <i>default diameter of a drainage manhole</i>	input	1.1	
Drop <i>drop (metres) through the manhole</i>	input	0.02	
Name <i>default name for the manhole Note that if a manhole name is EOL or eol, then the diameter of the manhole is forced to be zero.</i>	input	MH.	
Type <i>the default cover or lid type of the manholes</i>	input	CONC COVER	CONC COVER, GATIC
Set <i>set the drainage manhole defaults to the values in the above fields.</i>	button		

Pipes

Position of option on menu: Design =>Drainage-Sewer =>Defaults =>Pipes
On selecting the Pipes option, the **Drainage Pipes Defaults** panel is displayed.



This panel is for setting the default drainage pipe diameter, grade, cover and type. These defaults are used when creating a pipe in a drainage string.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Diameter <i>default diameter of the pipe.</i>	input	0.1	
Minimum grade <i>the minimum grade (measured as 1: value) used when laying down the pipe.</i>	input	1.0	
Minimum cover <i>the minimum cover, measured in world units from the surface to the top of the pipe (obvert); used when laying down the pipe.</i>	input	1.0	
Type <i>the default type of the pipe</i>	input	PVC	PVC, VC, PVC X/HEAVY
Set <i>set the drainage pipe defaults to the values in the above fields.</i>	button		

IMPORTANT NOTE.

If the drainage string is laid down in the direction of flow (and hence the flow direction is in ascending chainage), then the minimum grade and minimum cover along the pipe are maintained as the drainage string is created. Otherwise the minimum grade and cover cannot be maintained.

Cover for the pipe segment can also be calculated and/or set afterwards by the **pipe=>cover** option in the drainage string editor.

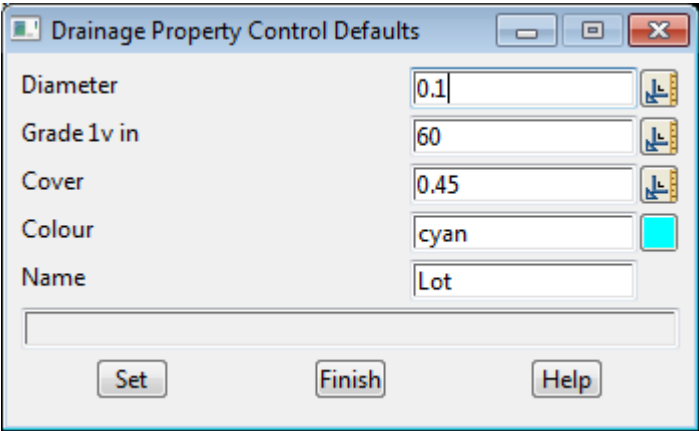
Minimum cover and minimum grade for the pipe segment to the end of the line can be set afterwards by the **pipe=>default grading** option in the drainage string editor.

Property Controls

Position of option on menu: Design =>Drainage-Sewer =>Defaults =>Property Controls

On selecting the **Property controls** option, the **Drainage Property Control Defaults** panel is displayed.

On a section view, the *Profile =>One substring* and *Profile =>Many substrings* options will profile the property control. Note that the centre (axis) of the property control is drawn on the section view, not the invert (bottom) or the obvert (top).



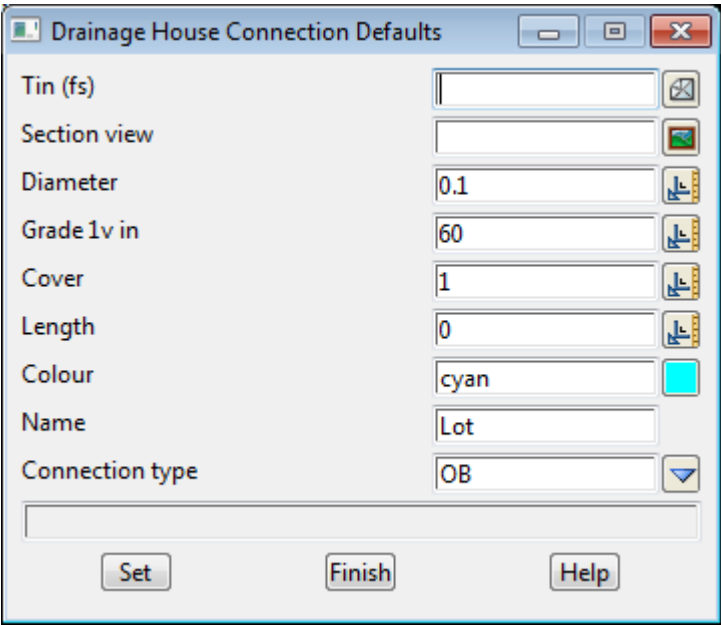
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Diameter <i>default diameter of the property control.</i>	input	0.1	
Grade 1v in <i>grade (units are "1v in" given value) to use for the property control</i>	input	60	
Cover <i>cover measured from the surface to the top of the property control (world units) to be maintained from the end of the property control in the house block to the drainage string.</i>	input	1.0	
Colour <i>colour to use to draw the property control</i>	input	cyan	available colours
Name <i>name for the property control - usually the lot number</i>	input	Lot	
Set <i>set the property control defaults to the values in the above fields.</i>	button		

House Connections

Position of option on menu: Design ==>Drainage-Sewer ==>Defaults ==>House connections

On selecting the **House connections** option, the **Drainage House Connection Defaults** panel is displayed.



This panel is for setting the default information used for connections from the drainage pipe to the house blocks.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin (fs) <i>name of the tin to automatically add to the section view used for drawing the profile along the house connection.</i>	input	drainage tin	available tins
Section view <i>the section view used to profile along the house connections as they are placed in plan view.</i>	input		
Diameter <i>default diameter of the house connection.</i>	input	0.1	
Grade 1v in <i>grade (units are "1v in") to use for the house connection</i>	input	60	
Cover <i>cover (world units) to use for the house connection</i>	input	1.0	
Length <i>length (metres) to use for some types of house connections</i>	input	2.0	
Colour <i>default colour used for the house connection</i>	input	cyan	available colours
Name <i>name for the house connection - usually the lot number</i>	input	Lot	
Connection type <i>the default type of house connection, Please continue to the section House Connection Types for a description of each connection type</i>	input	A special	A, A special, B, C, OB, Special Jump Up

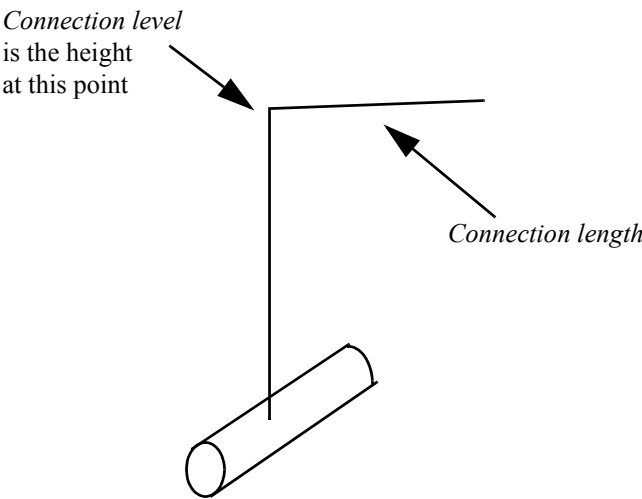
Set button

set the house connection defaults to the values in the above fields.

House Connection Types

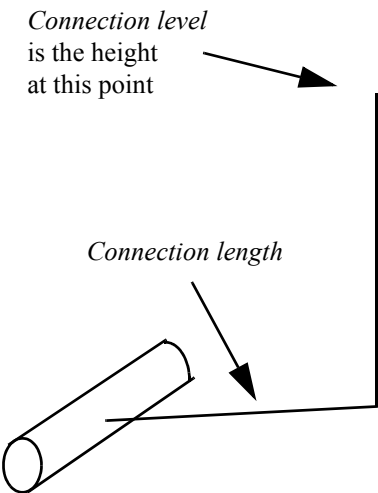
All house connection calculations do not take into account any thickness of pipe, joint sizes or actual entry points into the sewer. Hence they are **approximate only** and should only ever be used as a guide. Any quantities calculations should allow for a suitable margin of error.

House Connection -Type A



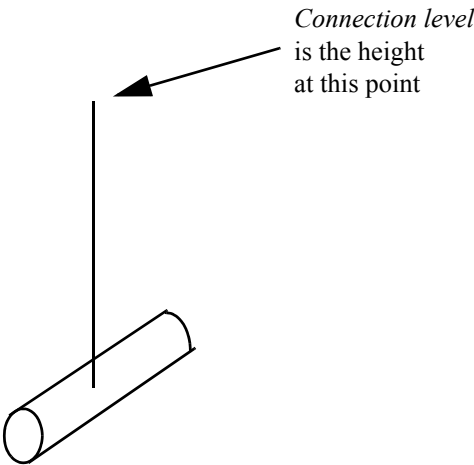
House Connection: Type A

House Connection - Type A Special



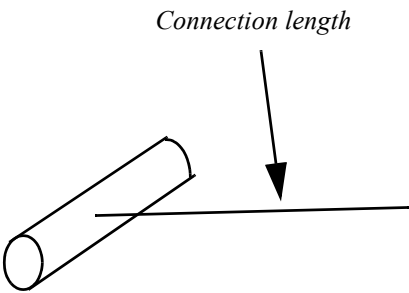
House Connection: Type A Special

House Connection - Type B



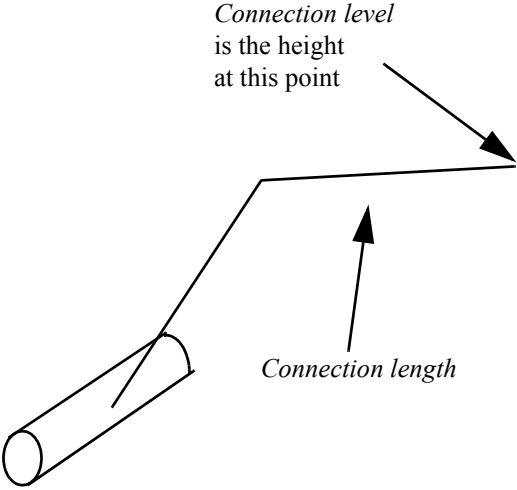
House Connection: Type B

House Connection - Type C



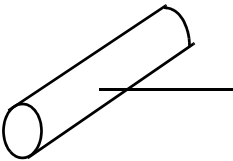
House Connection: Type C

House Connection - Type Special Jump Up



House Connection: Type Special Jump Up

House Connection - Type OB (Oblique)



House Connection: Type OB

Please continue to the next section [Create](#).

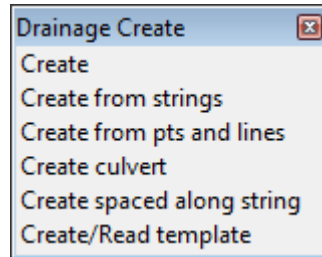


Drainage Create

Position of menu: Design =>Drainage-Sewer =>Create

The Create menu has various options for creating drainage and sewer strings.

The Drainage Create walk-right menu is



For *Create* please go to the section [Create](#)

Create from strings [Create from strings](#)

Create from pts and lines [Create from Points and Lines](#)

Create culvert

Create spaced along string [Create Drainage Spaced Along String](#)

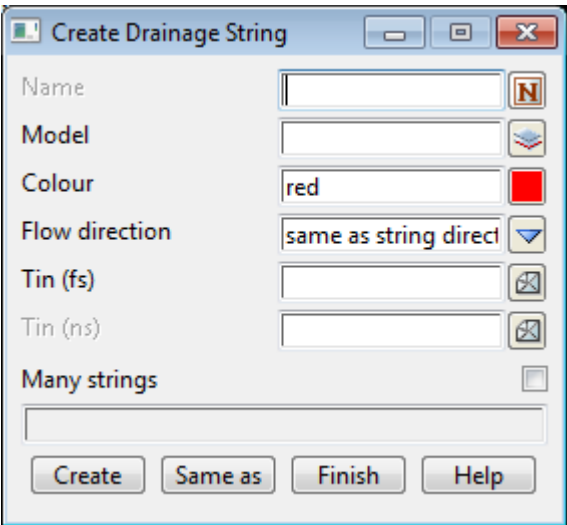
Create/Read template [Create/Read Template](#)

Create

Position of option on menu: Design =>Drainage-Sewer =>Create => Create

The **Create** option is used to produce **new** drainage strings and networks. If a drainage string already exists, the **Editor** option is used to modify it.

On selecting the **Create** option, the **Create Drainage String** panel is displayed.



To create a new drainage string, the name, colour, model and style of the new string are entered into the appropriate fields, plus the finished surface triangulation that the manholes are normally flush with, the natural surface triangulation, and the **Create** button selected.

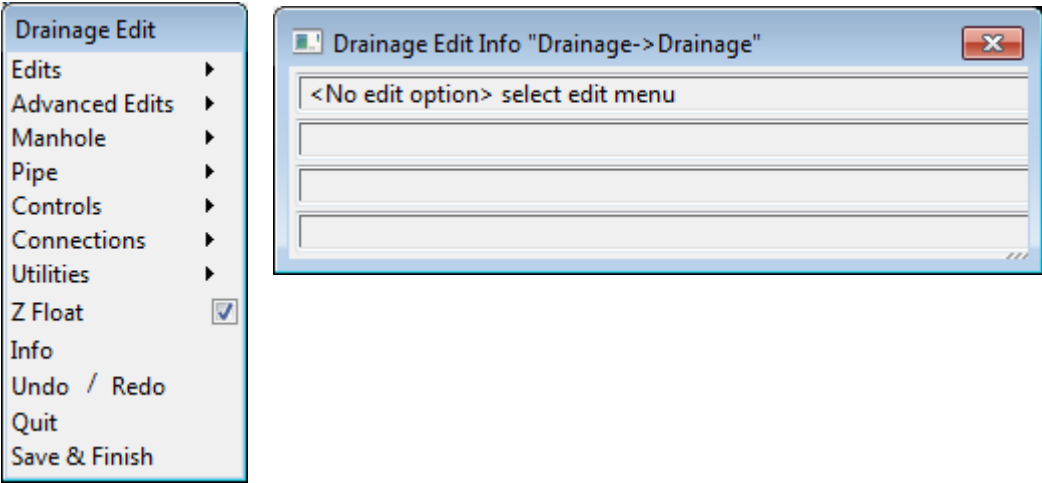
The new fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Flow direction	input	ascending chainage	ascending chainage descending chainage
<i>if ascending chainage, then the flow direction is in ascending chainage (recommended) if descending chainage, then the flow direction is in descending chainage.</i>			
Tin (fs)	input	drainage=>defaults=>tinavailable tins	
<i>the finished surface tin. If manholes are "floating", the top of the manhole is automatically place on the tin surface ("floated" on the surface).</i>			
Tin (ns)	input		available tins
<i>the natural surface tin used in longsection plots.</i>			

The **Create Drainage String** panel is then removed and the **Drainage Edit** menu and **Drainage Edit Info** panel fired up.

As for a 3d string, to create a new drainage string with some of the **same** name, colour, model and style as an existing string (not necessarily a drainage), the **Same as** button is chosen and the appropriate string selected.

The **Drainage Edit** menu contains all the available options for editing a drainage string and its associated block controls and house connections. The **Drainage Edit Info** panel contains information areas. The **Drainage Edit** menu and **Drainage Edit Info** panel are



To create a new drainage string, the user selects the **Append** option from the **Edits** walk right menu on the **Drainage Edit** menu.

Since the **Drainage Edit** menu and **Drainage Edit Info** panel are the same as those used when editing a drainage string, the options will be discussed under the drainage **Edit** option.

For documentation on editing Drainage string, please continue to the next section [String Editor](#).
For drainage utilities and import/export see [More Drainage](#)

Create from strings

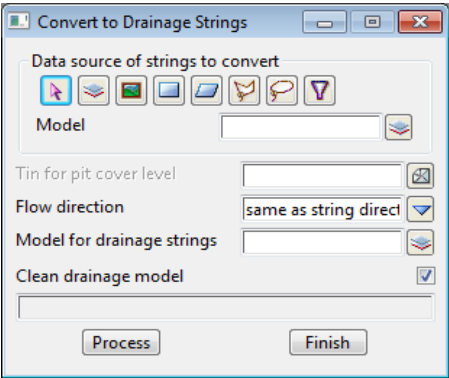
Position of option on menu: **Design =>Drainage-Sewer=>Create=>Create from strings**

12d will convert the super strings into 12d drainage strings. The default pipe, pit and tin data will be used to set the levels for the network. Do not use the other string convert commands found on the menu system.

See Also

[Drainage overview](#)

On selecting the **Create from strings** option, the **Convert to Drainage Strings** panel is displayed.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Data source <i>data source for strings to be converted</i>	source box	model	
Model for drainage strings	model box		<i>The new drainage strings will be added to this model. If it does not exist it will be created.</i>
Tin for pit cover level	tin box		<i>The new drainage manhole cover level will be set to the tin level at the manhole centre (optional)</i>
Flow direction same as string direction <i>if the strings have been drawn in the direction of water flow</i> opposite to string direction <i>if the strings are drawn opposite to the direction of flow.</i>	choice box	same as string direction	
Clean drainage model	tick box		<i>When selected, all strings in the model will be deleted before creating the new strings.</i>
Process <i>Converts the strings to the drainage strings.</i>		button	
Finish <i>Removes the panel from the screen.</i>		button	

Important notes:

The imported strings must all be drawn in the same direction. Either all in the direction the water flows or all opposite the direction of flow.

Pits are created at all vertices on the strings.

Trunk lines must have a vertex where the branch lines join.

String names can be used to control the order in when the drainage lines are numbered. These names will be transferred to the 12d drainage strings. Later, the string names can be changed in the [Drainage Network Editor](#).

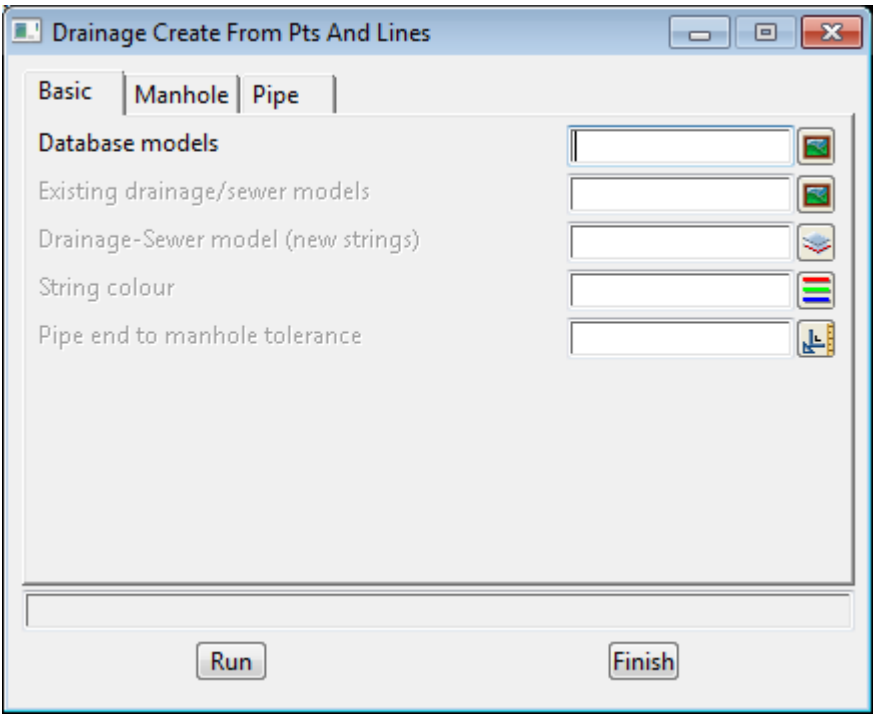
Pits can always be renamed in 12d after the import is complete.

The drainage lines must have string names to use the [Set Pit Names](#) feature on the [network editor](#).

Create from Points and Lines

Drainage_Create_From_Pts_And_Lines Position of option on menu: **Design =>Drainage-Sewer=>Create=>Create from pts and lines**

This section of documentation is a work in progress and will be updated in subsequent releases.
Selecting the **Create from pts and lines** brings up the **Drainage Create From Pts and Lines** panel:



Create Drainage Spaced Along String

Position of option on menu: **Design =>Drainage-Sewer =>Create =>Create spaced along string**

This option creates Drainage strings (pipes or channels) with “pits” variably spaced along selected design strings (which must have valid and variable z values). The user picks the design string at the downstream extent of the desired Drainage string, and the option works its way upstream (*i.e.* in increasing z direction) to a high point on the design string, at which point the full extent of the Drainage string is created automatically. The pit spacing may be controlled by the grades measured from the design string at each pit location, or from a default value. The pit cover levels and pipe invert levels are set relative to the levels on the design string.

On selecting the **Create spaced along string** menu option, the **Create Drainage Spaced Along String** panel is displayed.

Create Drainage Spaced Along String

Drainage string name

Drainage string colour

Flow direction

Pit type

Pipe type

Pit cover level offset

Pipe obvert depth

Diam/Height

Width

Top Width

Lock cover RLs

Lock pipe inverts

Lock grate RLs to cover RLs

Lock pipe sizes

Default pit spacing

Grade vs Spacing Lookup Table

	Grade (%) more than	Pit spacing
1		
2		
3		
4		
5		
6		

Model for drainage strings

Pick

Finish

Help

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Drainage string name	input text		
Name for created Drainage string. If unspecified, string will be created with no name.			
Drainage string colour	input text		available colours
Colour for created Drainage string. If unspecified, string will be created with a default colour.			
Flow direction	choice box	same as	same as string direction
Determines whether created Drainage string flows in, or opposite to, the direction of increasing chainage. Note that for Drainage strings, the terms upstream and downstream refer to the flow direction, not the string direction. Also note that the downstream end of the created Drainage string			
			opposite to string direction

will always be at the point selected on the graded design string.

Pit type choice-box available pit types

Pit type to apply to every created Drainage pit. If unspecified, the pit type will be adopted from the project default value set via Design=>Drainage-Sewer=>Defaults=>Manholes.

Pipe type choice-box available pipe types

Pipe type to apply to every created Drainage pipe. If unspecified, the pipe type will be adopted from the project default value set via Design=>Drainage-Sewer=>Defaults=>Pipes.

Pit cover level offset input real

Vertical distance of pit cover levels from design string (positive up, zero if unspecified). For pipes, this value should typically be zero. For channels, if the picked design string represents the channel invert, this value should be set to the height of the channel; if the picked design string represents the channel obvert, this value should be zero.

Pipe obvert depth input real 0.6

Vertical distance of pipe obverts from pit cover levels (positive down, zero if unspecified). For pipes, this value should typically be set to the required pipe cover limit. For channels, this value should typically be zero.

Diam/Height input real 0.375

Diameter of circular conduits or height of box/vee/trapezoid conduits (in base units).

Width input real

Width of box conduits or bottom width of trapezoid conduits (in base units). Leave blank for circular/vee conduits.

Top width input real

Top width of vee/trapezoid conduits (in base units). Leave blank for circular/box conduits.

Lock cover RLs tick box OFF

If ticked, sets the explicit Cover RL mode to "Manual", on each pit, for subsequent use in the Drainage Network Editor.

Lock grate RLs to cover RLs tick box OFF

If ticked, sets the explicit Grate RL mode to "Cover RL", on each pit, for subsequent use in the Drainage Network Editor.

Lock pipe inverts tick box OFF

If ticked, sets the both the Lock US Invert and Lock DS Invert tick boxes to ticked, on each pipe, for subsequent use in the Drainage Network Editor.

Lock pipe sizes tick box OFF

If ticked, sets the Lock pipe size tick box to ticked, on each pipe, for subsequent use in the Drainage Network Editor.

Default pit spacing input real 50

Pit spacing to apply between pits, if not found in the Grade vs Spacing Lookup Table.

Grade (%) more than input real column

Column of grades in percent. If not already, the Grade vs Spacing Lookup Table will be sorted (internally) in ascending grade order. The grade is measured from the design string at each new pit location, and the matching row is looked up in the table. If the design grade is greater than or equal to the row's grade, but less than the next row's grade, the matching row has been found.

Pit spacing input real column

Column of pit spacings. The pit spacings to apply between each pit and its next upstream pit, corresponding to the grade specified in the Grade vs Spacing Lookup Table.

Model for drainage strings output model box available models

Model in which to add the created Drainage string.

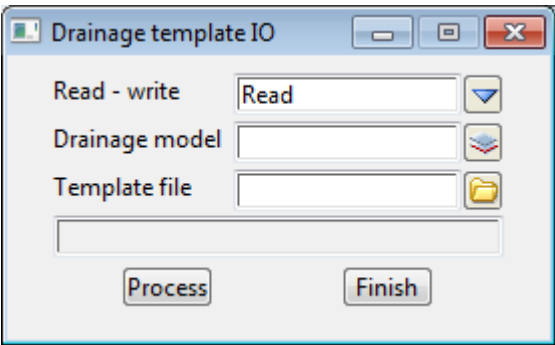
Pick pick button

Starts a string-pick process to select the design string, along which the Drainage string will be created. The coordinates of the selected point on the design string will be adopted as the downstream end of the created Drainage string. Once the point on the design string is accepted, the panel is validated and the Drainage string is created. The string-pick process is then re-started, allowing selection of another design string. Additional information is written to the Output Window, providing feedback to the user.

Create/Read Template

Drainage_template_IOPosition of option on menu: **Design =>Drainage-Sewer=>Create=>Create/Read template**

This section of documentation is a work in progress and will be updated in subsequent releases.
On selecting the **Create/Read template** option, the **Drainage template IO** panel is displayed.

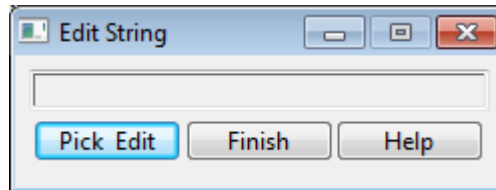


String Editor

Position of option on menu: Design =>Drainage-Sewer =>String editor

This is the same option as **Editor** from the **Strings** walk-right menu on the **12d** Model menu.

The string editor is used to modify any **12d** Model strings. After selecting the **Editor** option, the **Edit String** panel is placed on the screen to record any error messages.



The option is already in the **pick** mode (the **pick & edit** button only needs to be selected if the pick was cancelled) and the user simply picks and accepts the string to be edited.

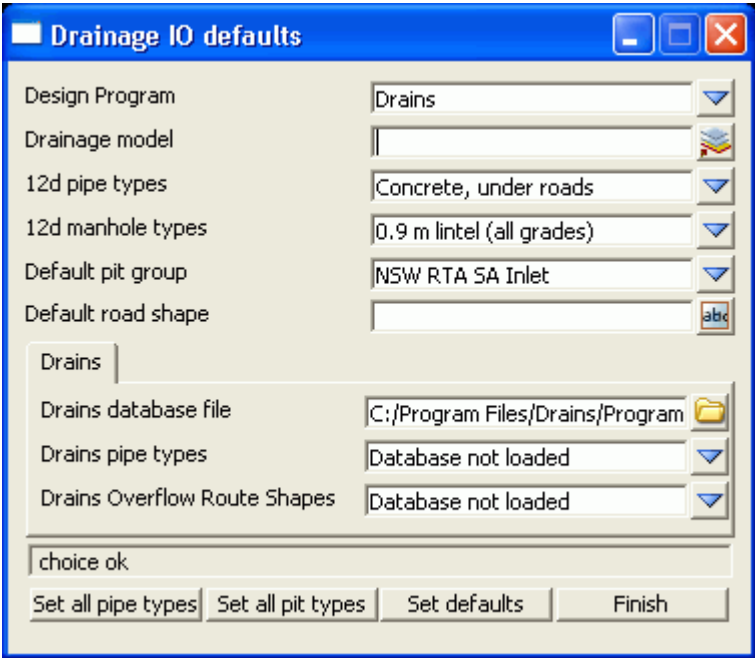
From the picked string's type, the editor is able to determine the edits that apply to the string and list them in the string's **Edit** menu.

If a drainage string is selected, the **Drainage Edit** menu and **Drainage Edit** panel (as shown in the previous section) are placed on the screen.

The individual edit operations for a drainage string will now be discussed in detail.

Please continue to the next section [Drainage Edit](#).

Drainage IO Defaults



Drainage Network Editor

Position of option on menu: Design =>Drainage-Sewer =>Drainage Network=>Drainage network editor

The drainage network editor enables the user to edit all of the drainage strings in a model (a network). The global and default settings may be stored and loaded via. There are five main tabs and plus function buttons on the bottom of the panel.

Using the Drainage [Network Editor](#)

Recommended order to use the tabs and Buttons.

(This is not required but it will lead you through the process in an systematic method.)

<u>Tab</u>	<u>Function Buttons</u>
1. Global tab	3. Set Pit Names
2. Defaults tab	4. Set Catchments
5. Pipe tab	8. Set Pit Details
6. Pit tab	9. Regrade Network
7. Catchment	Storm Analysis
	Plot
	Import/Export

For information on specific tasks see the following sections,

[Manhole Setout Settings](#)

[Road Design File for Pit Setout - x,y, level, road chainage and setout offset](#)

Hydrology Settings

[Catchment Areas](#)

[Checking the Automatic Catchment Linking](#)

[Coefficients of Runoff](#)

[Percent Impervious](#)

[Times of Concentration Methods](#)

[Tc Path Strings](#)

Hydraulic Design Settings

[Pipe Friction Method](#)

[Pipe Friction Values and Freeboard Limit](#)

[Setout to Grate Offset](#)

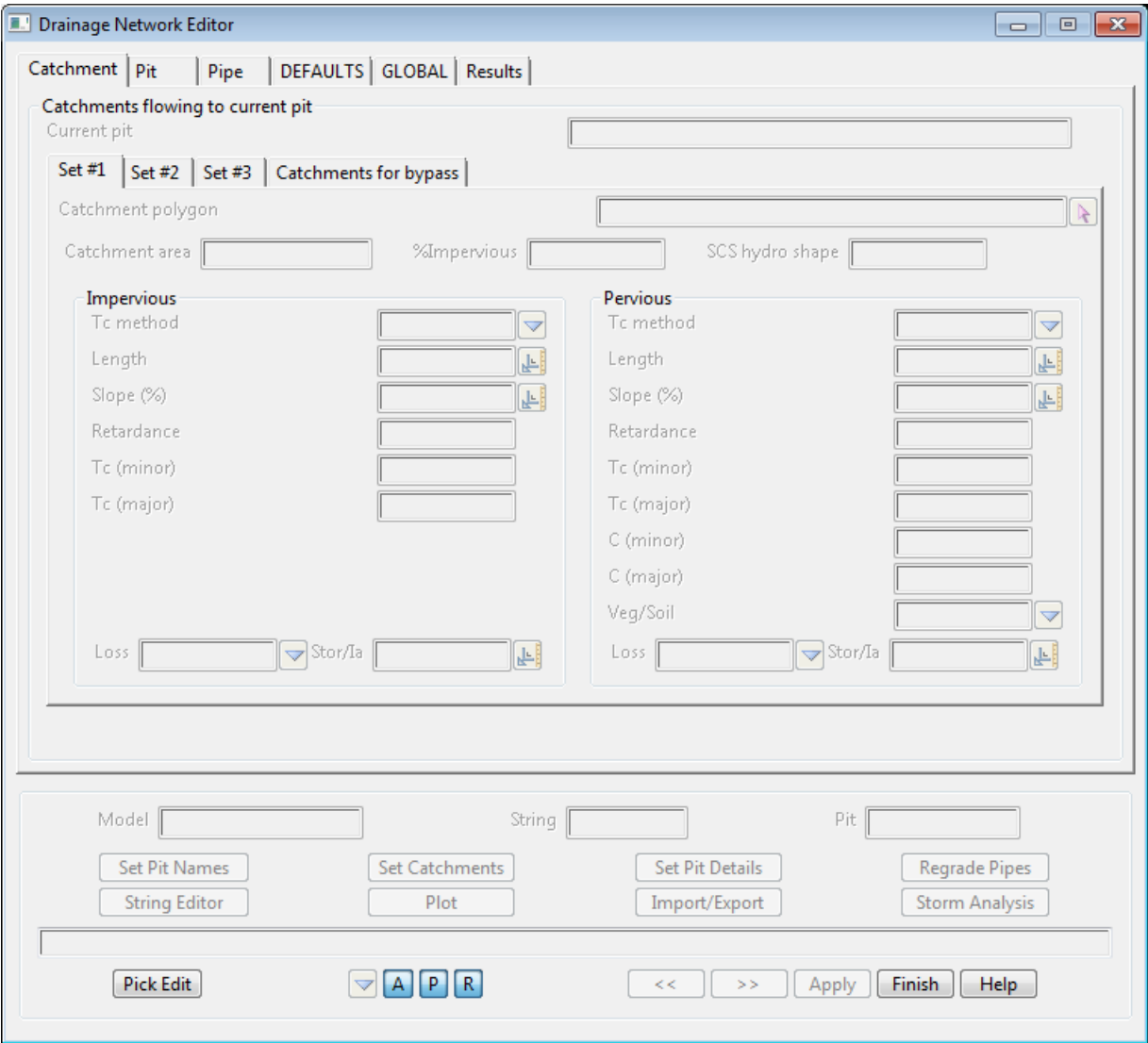
[Pit Losses Ku, and Direct Flow](#)

[Outlet and Tailwater Conditions](#)

[Pipe Design Parameters](#)

[Bypass Flow Settings](#)

On selecting the Drainage network editor option, the Drainage network editor panel is displayed.



Global Tab

Design values for the hydrology and hydraulics calculations are set either globally (one value for the entire network) or via Defaults for the manholes or pipes. Defaults values may be overridden by explicit settings found on the catchment, pits or pipes tab. Explicit manhole/pipe settings need only be specified if the default value is not desired.ragg

There are 4 sub tabs. See [Main tab](#), [Utility Models tab](#), [Notes tab](#) and [Display tab](#)

Main tab

Universal data Group

Units - Metric or US. Catchment areas in ha/acres and rainfall-infiltration-storage in mm/in

Viscosity - Used with Colebrook-White energy loss calculations

TUFLOW file - with the dynamic drainage analysis and TUFLOW modules this specifies the TUFLOW tcf file to be used for the 2d storm analysis.

Att group (minor) - results from the storm analysis (minor event) may be contained within this pit/pipe attribute group

Att group (major) - results from the storm analysis (major event) may be contained within this pit/pipe attribute group

Use pit connection pts - when not selected, pipes connect at the centre of the manhole. When

selected the pipes connect at the pit connection points. See [Pit Connection Points](#) for more details.

Finished surface tin - used for determining pipe cover and surface levels for the manholes.

Natural surface tin - specified so that it can be included on the drainage longsection plots

Clear attributes - when selected all pit/pipe attributes will be deleted before the Apply/AutoApply saves the data currently in the panel.

Drainage Network Editor

Catchment

Pit

Pipe

DEFAULTS

GLOBAL

Results

Global drainage data

Main

Utility Models

Display

Notes

Universal data

Units

Viscosity

Att group(minor)

Att group(major)

FS tin

NS tin

Use pipe end to end length☐

Use pit connection pts☐

Clear attributes☐

Catchment data

Runoff method

Runoff C method

1hr-10yr Intensity

Rainfall file

TUFLOW file

Impv C (minor)

Impv C (major)

C maximum

AMC pt (minor)

AMC pt (major)

Zone filter

Catchments for bypass☐

Enable TUFLOW☐

Allowable velocity ranges

Vn (part full) :

Min

Max

Vn (full flow) :

Min

Max

Vcap :

Min

Max

Model

String

Pit

Set Pit Names

Set Catchments

Set Pit Details

Regrade Pipes

String Editor

Plot

Import/Export

Storm Analysis

Pick Edit

A

P

R

<<

>>

Apply

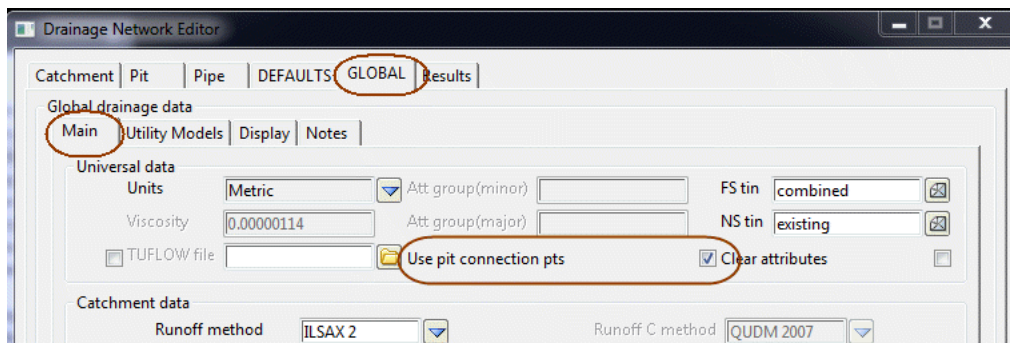
Finish

Help

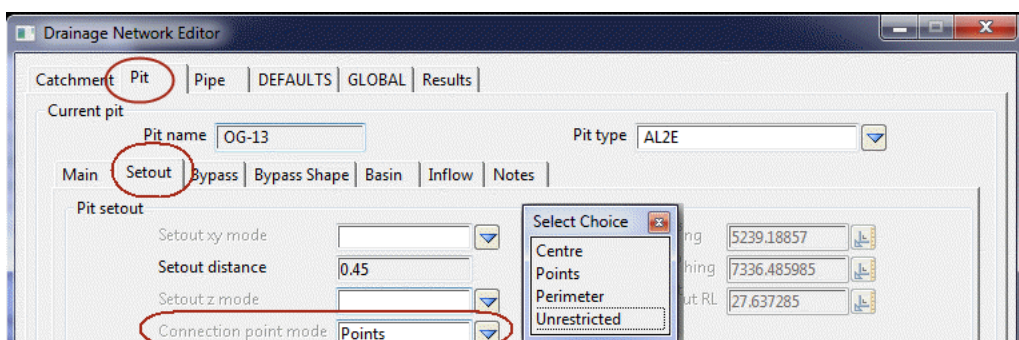
Catchment data Group
see [Coefficients of Runoff](#)
For **Global pipe data** see [Pipe Friction Method](#).

Pit Connection Points

Pit Connection points allow the pipes connected to the pit to join at locations other than the inside perimeter of the pit wall. This feature is off by default and may be enabled on the **DNE->Global->Main** tab.



All pits have their connection point initially set to **Points**. This setting is found on the **DNE->Pits->Setout** tab.



Pit Connection Point Modes

Pit connection points may be moved via **Strings->Points Edit->Move** (except for **Centre** mode described below). The other modes constrain the movement of the connection points. If a pipe is manually moved to a new connection point, it will be locked to the connection point and will not move if the pit or neighbouring pit is moved (see exceptions below).

Centre (rectangle and circular) - This mode is the same as having the **Use connection points** turned off. The connection points will be located on the inside perimeter of the pit wall with the centre line of the pipe intersecting the centre of the pit. In this mode the connection points may not be adjusted.

Points (rectangle) - A connection point is created at the mid point of each internal side of the pit. This may be changed for a **Pit type** by using the **con_points** command in the drainage.4d file. In this mode the pipe ends will snap to the connection points. It is possible to place more than one pipe on the same connection point (the elevation of the pipes is not checked for clashes).

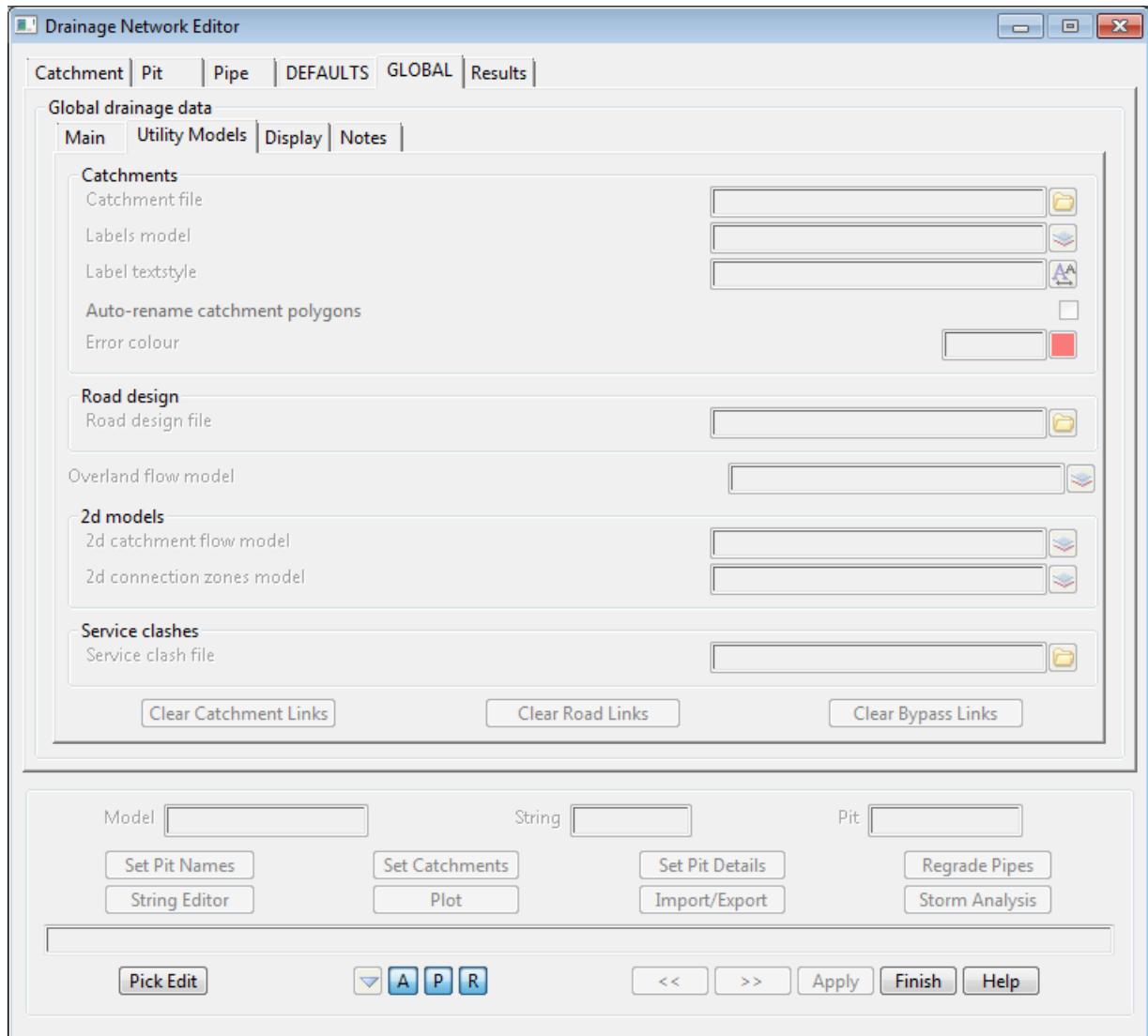
Points (circular) - The connection point may be moved anywhere around the pit internal wall as there are no connection points on the circular pits. Again, it is possible to place more than one pipe on the same connection location (the elevation of the pipes is not checked for clashes).
If the manhole centre is moved the connection point locks are removed.

Perimeter (rectangular and circular) - Same as **Points** (circular) above.

Unrestricted (rectangular and circular) - There are no constraints on the location of the pit connection points. This mode is intended for irregular shapes such as GPT structures and stormwater basins.

Utility Models tab

The utility models tab is used to specify the following data:



Catchment polygons, the catchment slope strings, catchment labelling data

Bypass flow strings

Road setout strings., road centre line strings and crossfall/grade offsets

Service/utility models and the allowable clearances

Additional details

[Catchments Areas](#)

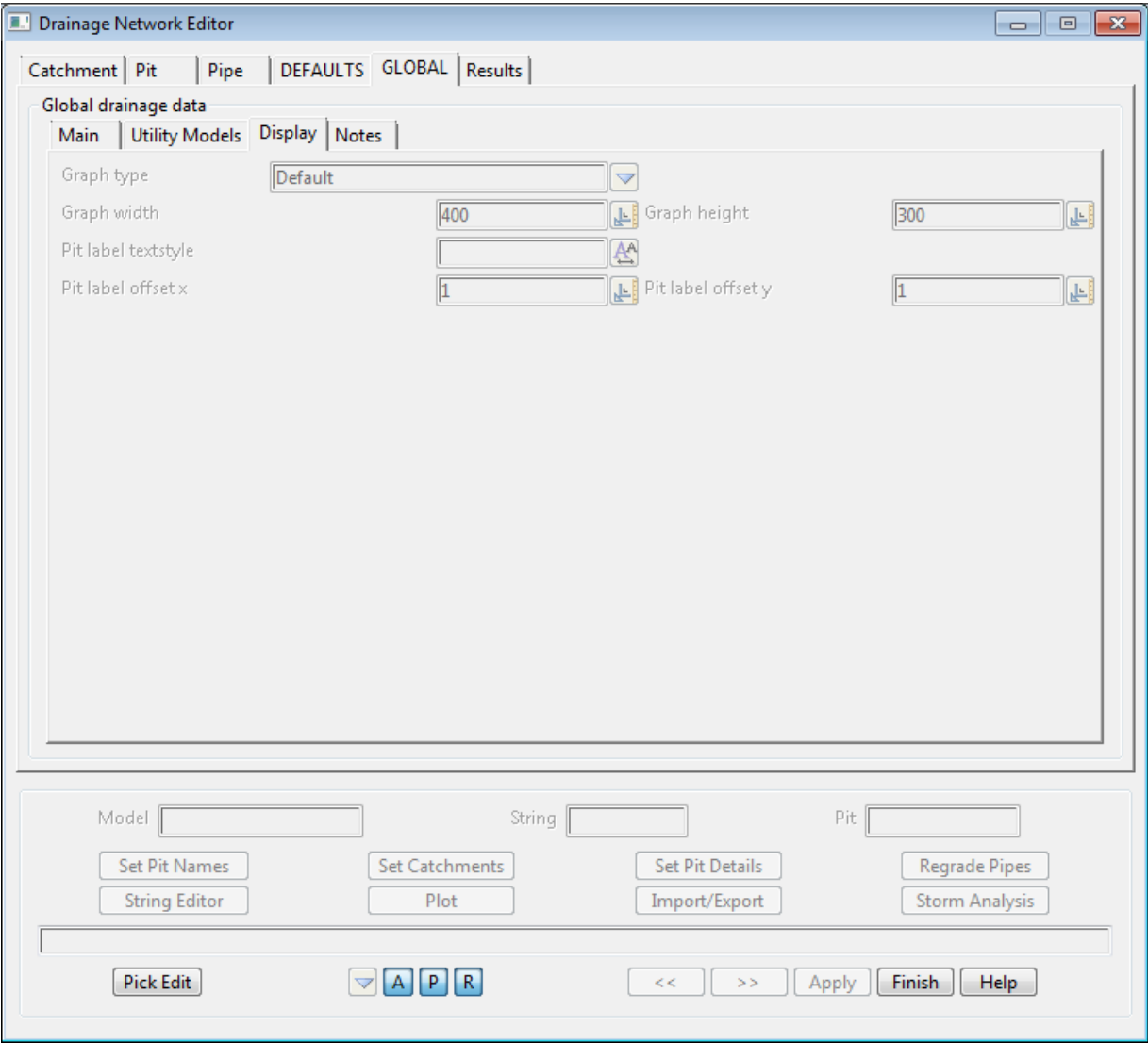
[Bypass flow](#)

[Manhole setout via setout strings](#)

[Service and Utility Clashes](#)

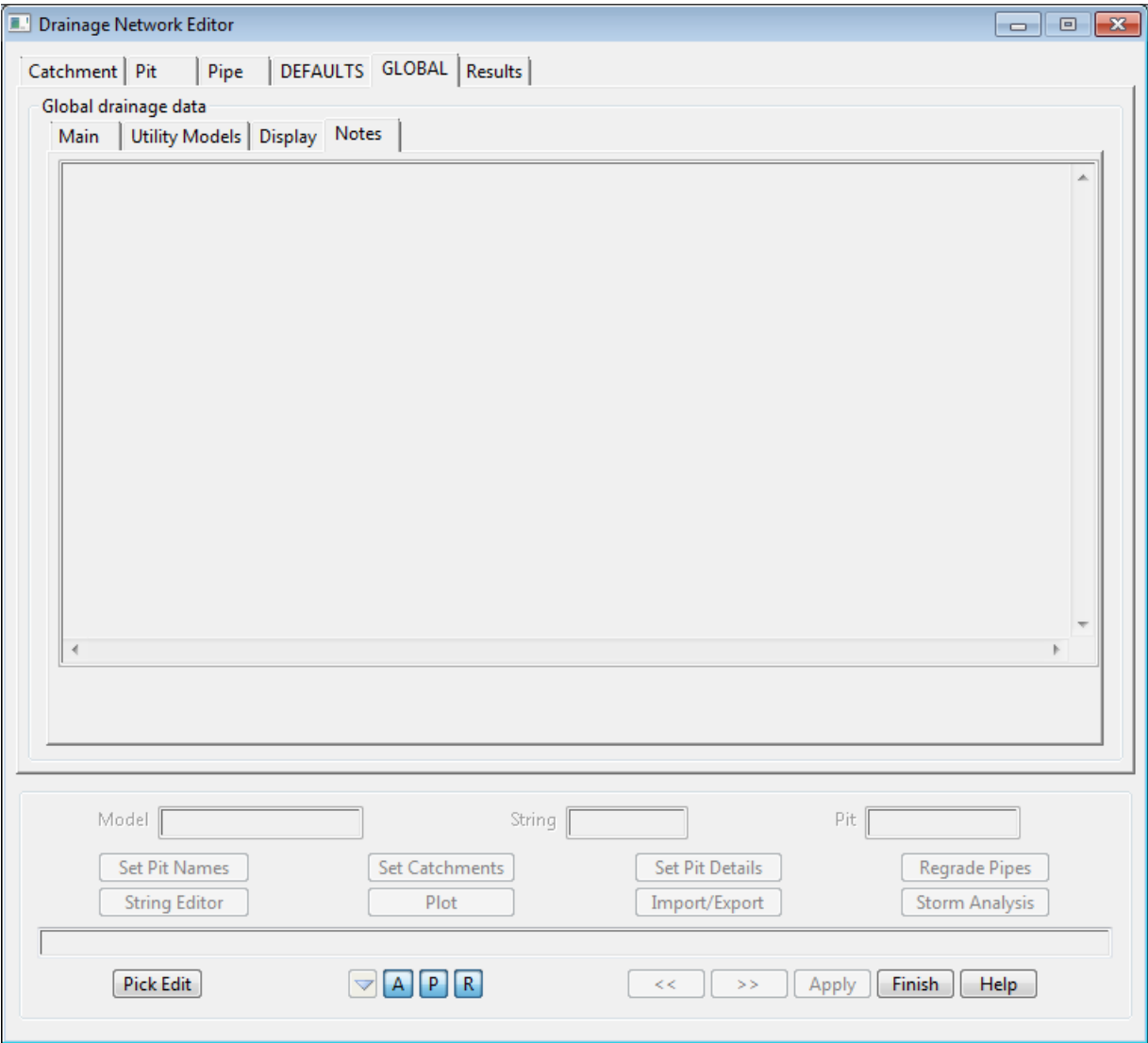
Display tab

The display tab is used to specify the following data:



Notes tab

The notes tab is used to specify the following data:



Defaults tab

The values on the defaults tabs are used unless the values are explicitly set on the **Main** Catchment, Pit and Pipe tabs.

Catchment subtab

The Catchment subtab is used to specify the following data:

Drainage Network Editor

Catchment | Pit | Pipe | DEFAULTS | GLOBAL | Results

Default data for blank fields

Catchment | Pits | Pipes

Catchments flowing to current pit

Set #1 | Set #2 | Set #3

%Impervious

SCS hydro shape

Impervious

Tc method

Length

Slope (%)

Retardance

Tc (minor)

Tc (major)

Loss

Stor/Ia

Pervious

Tc method

Length

Slope (%)

Retardance

Tc (minor)

Tc (major)

C (minor)

C (major)

Veg/Soil

Loss

Stor/Ia

Model

String

Pit

Set Pit Names

String Editor

Set Catchments

Plot

Set Pit Details

Import/Export

Regrade Pipes

Storm Analysis

Pick Edit

A

P

R

<<

>>

Apply

Finish

Help

- Catchment Areas
- Percent Impervious
- Times of Concentration Methods
- Coefficients of Runoff

Pits subtab

The Pits subtab is used to specify the following data:

Page 3810

String Editor

Drainage Network Editor

Catchment

Pit

Pipe

DEFAULTS

GLOBAL

Results

Default data for blank fields

Catchment

Pits

Pipes

Main

Bypass Shape

Cover RL mode

Ku method

Basin elev inc

Grate RL mode

Ku config

Sump offset

Ku

Inlet data

Qdg

On-grade chokes:

Sag chokes:

(minor)

(major)

Bypass data

Distance

LOST grade

Mannings n

Setout data

Setoutxy mode

Setout adjustment:

Setoutz mode

Sxy (+ve DS)

Road ch mode

Sz

Model

String

Pit

Set Pit Names

Set Catchments

Set Pit Details

Regrade Pipes

String Editor

Plot

Import/Export

Storm Analysis

Pick Edit

A

P

R

<<

>>

Apply

Finish

Help

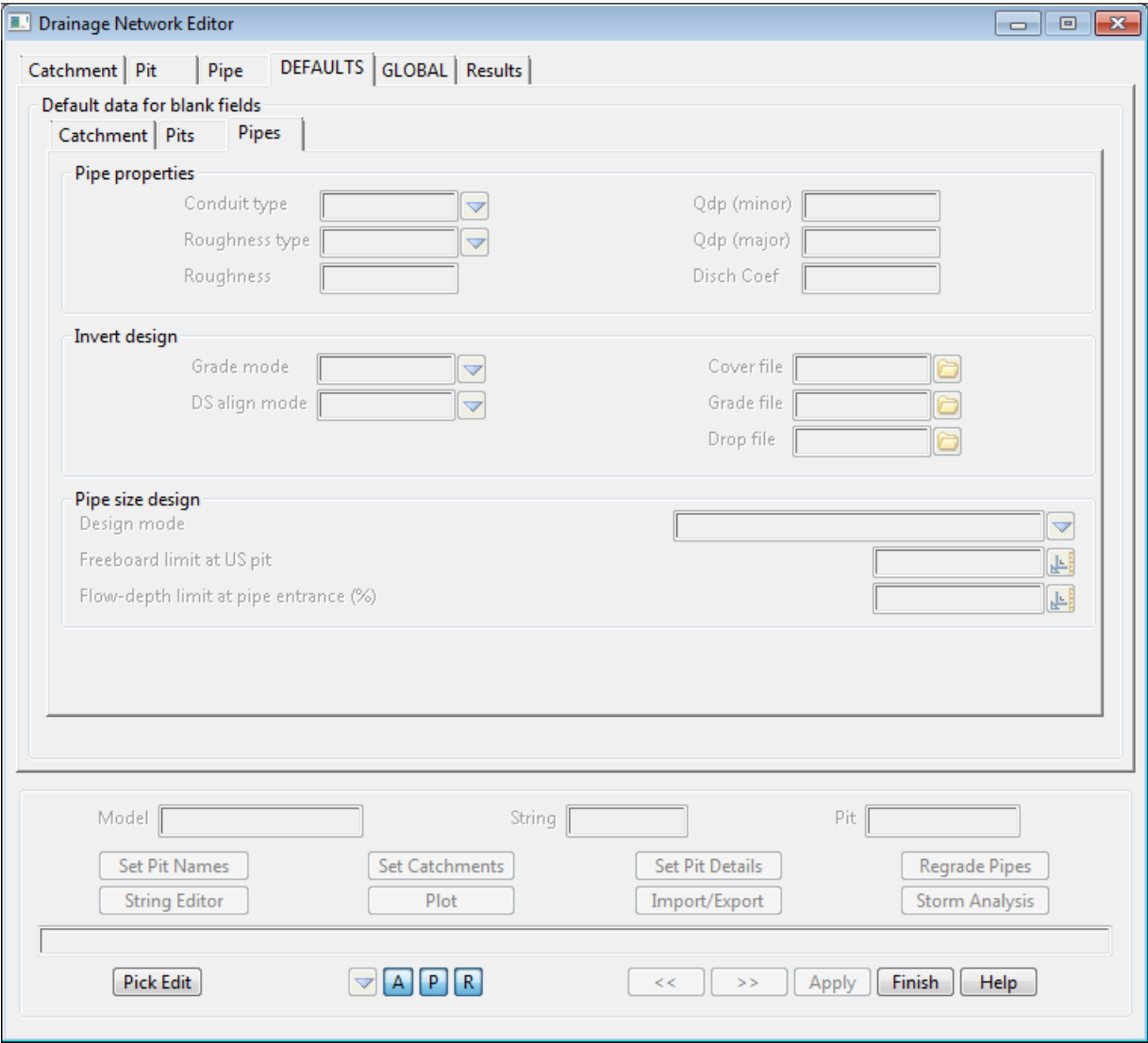
[Manhole Setout Settings](#)

[Pit Losses Ku, and Direct Flow](#)

[Setout to Grate Offset](#)

Pipes subtab

The Pipes subtab is used to specify the following data:



- [Pipe Friction Method](#)
- [Pipe Friction Values and Freeboard Limit](#)
- [Pit Losses Ku, and Direct Flow](#)
- [Pipe Design Parameters](#)

Catchment tab

The Catchment tab is used to specify the following data:

Drainage Network Editor

Catchment | Pit | Pipe | DEFAULTS | GLOBAL | Results

Catchments flowing to current pit

Current pit

Set #1 | Set #2 | Set #3 | Catchments for bypass

Catchment polygon

Catchment area %Impervious SCS hydro shape

Impervious

Tc method Length Slope (%) Retardance Tc (minor) Tc (major)

Pervious

Tc method Length Slope (%) Retardance Tc (minor) Tc (major) C (minor) C (major) Veg/Soil Loss Stor/Ia

Model String Pit

Set Pit Names Set Catchments Set Pit Details Regrade Pipes

String Editor Plot Import/Export Storm Analysis

Pick Edit A P R << >> Apply Finish Help

The pit tab has the explicit settings for the values entered on the Defaults catchment tab. When these fields are blank the default value is used. Three catchment sets are available. Typically the user will use one set for different types of catchment areas. For example: Set 1-Road area, Set 2-Lots, Set 3-Parks.

All 3 sets use the same default values except the percent impervious which has a separate default for each set.

Catchment Areas

Pit tab

The Pit tab is used to specify the following data:

Drainage Network Editor

Catchment

Pit

Pipe

DEFAULTS

GLOBAL

Results

Current pit

Pit name

Pit type

Main

Setout

Bypass

Bypass Shape

Basin

Inflow

Notes

Cover RL mode

Cover RL

Diameter/length

Grate RL mode

Grate RL

Width

Sump RL mode

floating

Sump RL

Sump offset

Initial depth

2d connection

None

2d analysis graph

Colour

Inlet data

Ku method

Inlet config

On-grade Pit

Qdg (minor)

Ku config

Ku

Kw

Qdg (major)

Outlet data

Tailwater mode

Ko

TW tide gate

TW level (minor)

TW series (minor)

TW level (major)

TW series (major)

Basin

=

f

Model

String

Pit

Set Pit Names

Set Catchments

Set Pit Details

Regrade Pipes

String Editor

Plot

Import/Export

Storm Analysis

Pick Edit

A

P

R

<<

>>

Apply

Finish

Help

The pit tab has the explicit settings for the values entered on the Defaults pit tab. When these fields are blank the default value is used.

- [Manhole Setout Settings](#)
- [Pit Losses Ku, and Direct Flow](#)
- [Setout to Grate Offset](#)
- [Outlet and Tailwater Conditions](#)
- [Pipe Design Parameters](#)
- [Bypass Flow Settings](#)

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String Editor

Setout subtab

Drainage Network Editor

Catchment

Pit

Pipe

DEFAULTS

GLOBAL

Results

Current pit

Pit name

Pit type

Main

Setout

Bypass

Bypass Shape

Basin

Inflow

Notes

Pit setout

Setout xy mode

Setout distance

Setout z mode

Symbol bearing mode

Connection point mode

Easting

Northing

Setout RL

Symbol bearing

Pit road chainage

Chainage mode

Road name

Chainage

Offset

String selection

Setout string

Centre string

Setout adjustment: Sxy (+ve DS)

Sz

Model

String

Pit

Set Pit Names

Set Catchments

Set Pit Details

Regrade Pipes

String Editor

Plot

Import/Export

Storm Analysis

Pick Edit

A

P

R

<<

>>

Apply

Finish

Help

Bypass subtab

Drainage Network Editor

Catchment

Pit

Pipe

DEFAULTS

GLOBAL

Results

Current pit

Pit name

Pit type

Main

Setout

Bypass

Bypass Shape

Basin

Inflow

Notes

Bypass flow / Inlet capacity factors

Bypass pit

Manning's n

Section

Distance

Lost grade

US invert

DS invert

On-grade pit

Manual

Manual

☐ Road grade (%)

☐ Road xfall (%)

Choke (minor)

Choke (major)

Sag pit

Manual

☐ Max pond depth

Choke (minor)

Choke (major)

Model

String

Pit

Set Pit Names

Set Catchments

Set Pit Details

Regrade Pipes

String Editor

Plot

Import/Export

Storm Analysis

Pick Edit

A

P

R

<<

>>

Apply

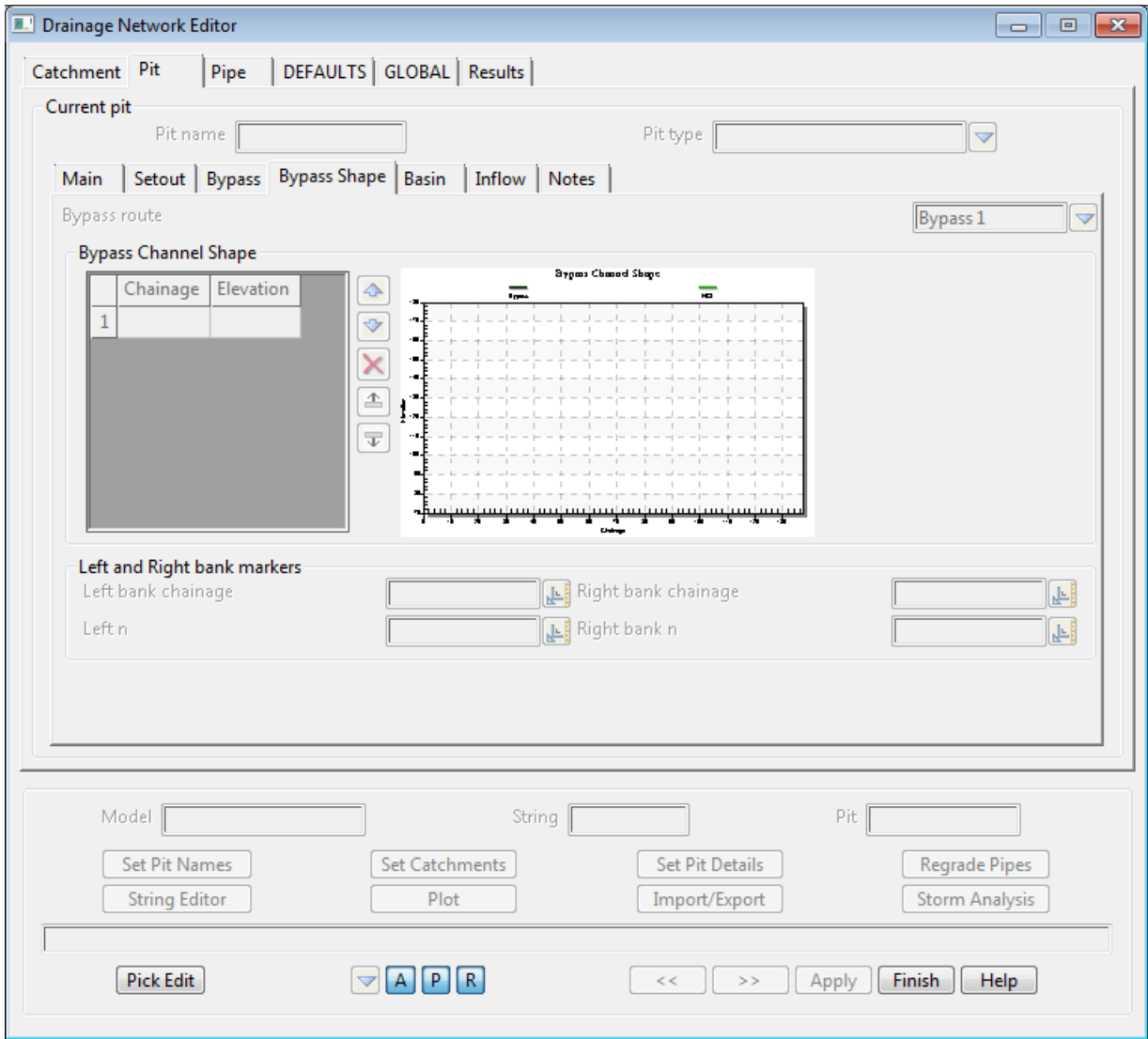
Finish

Help

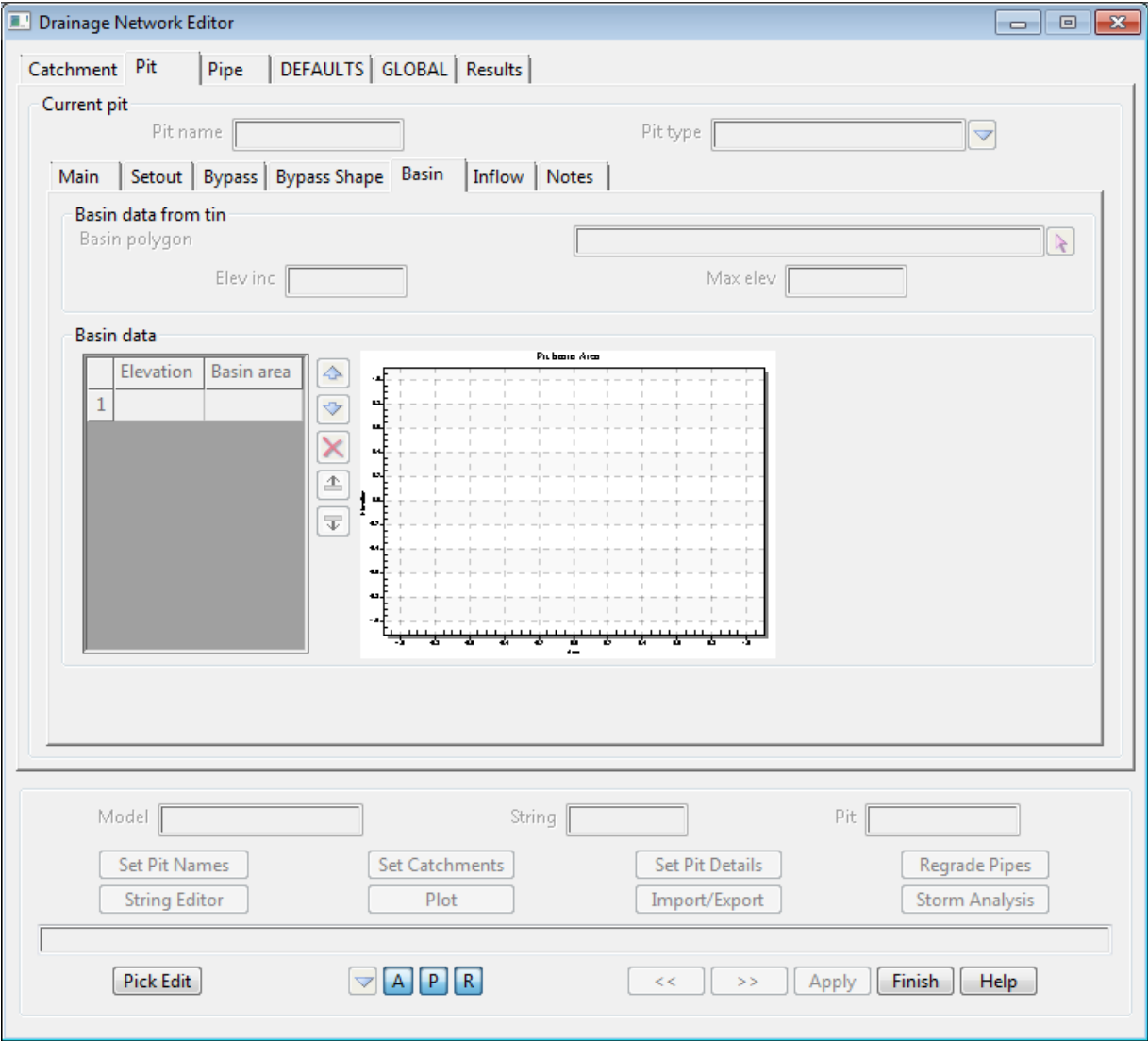
Bypass Shape subtab

Page 3816

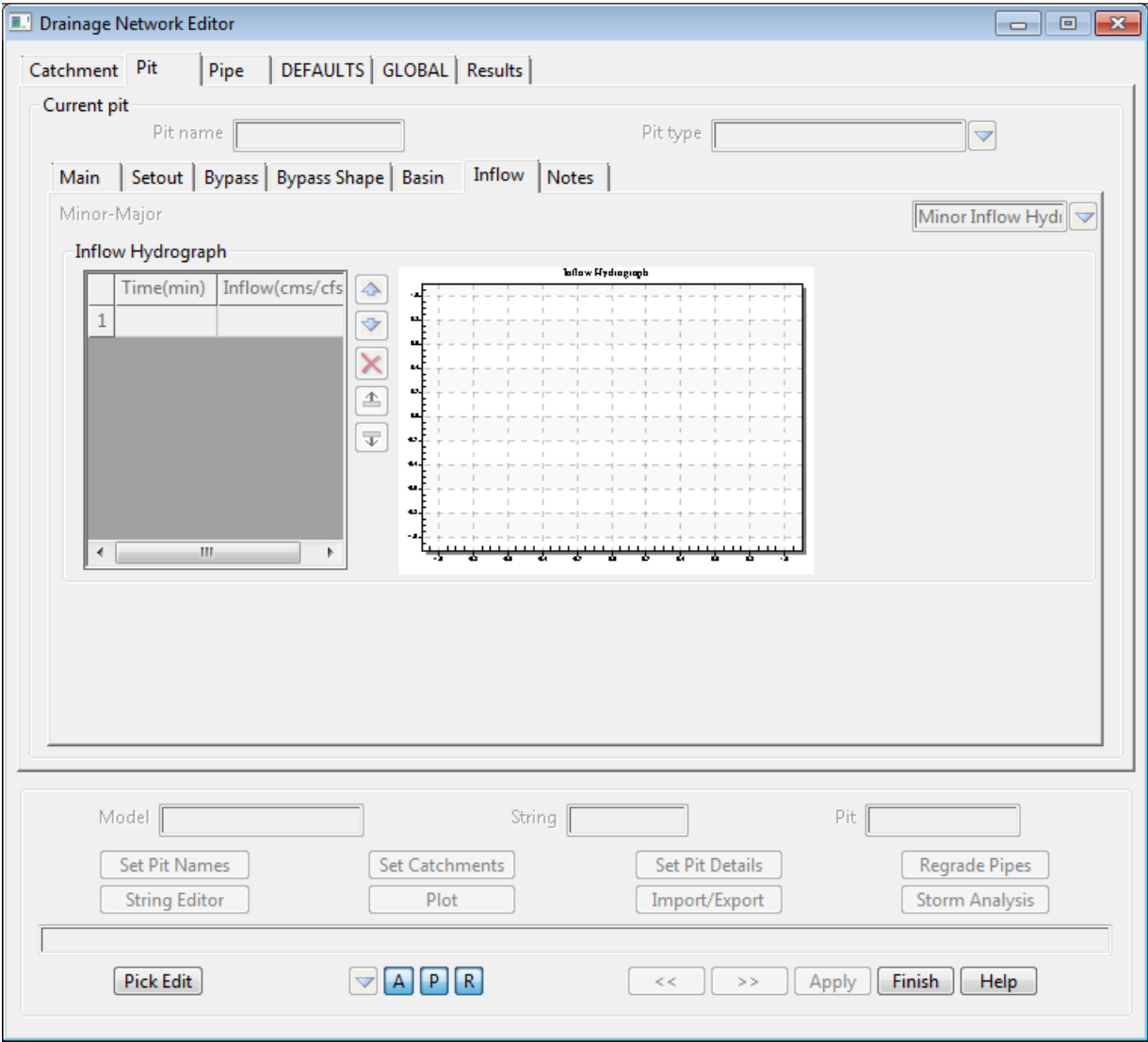
String Editor



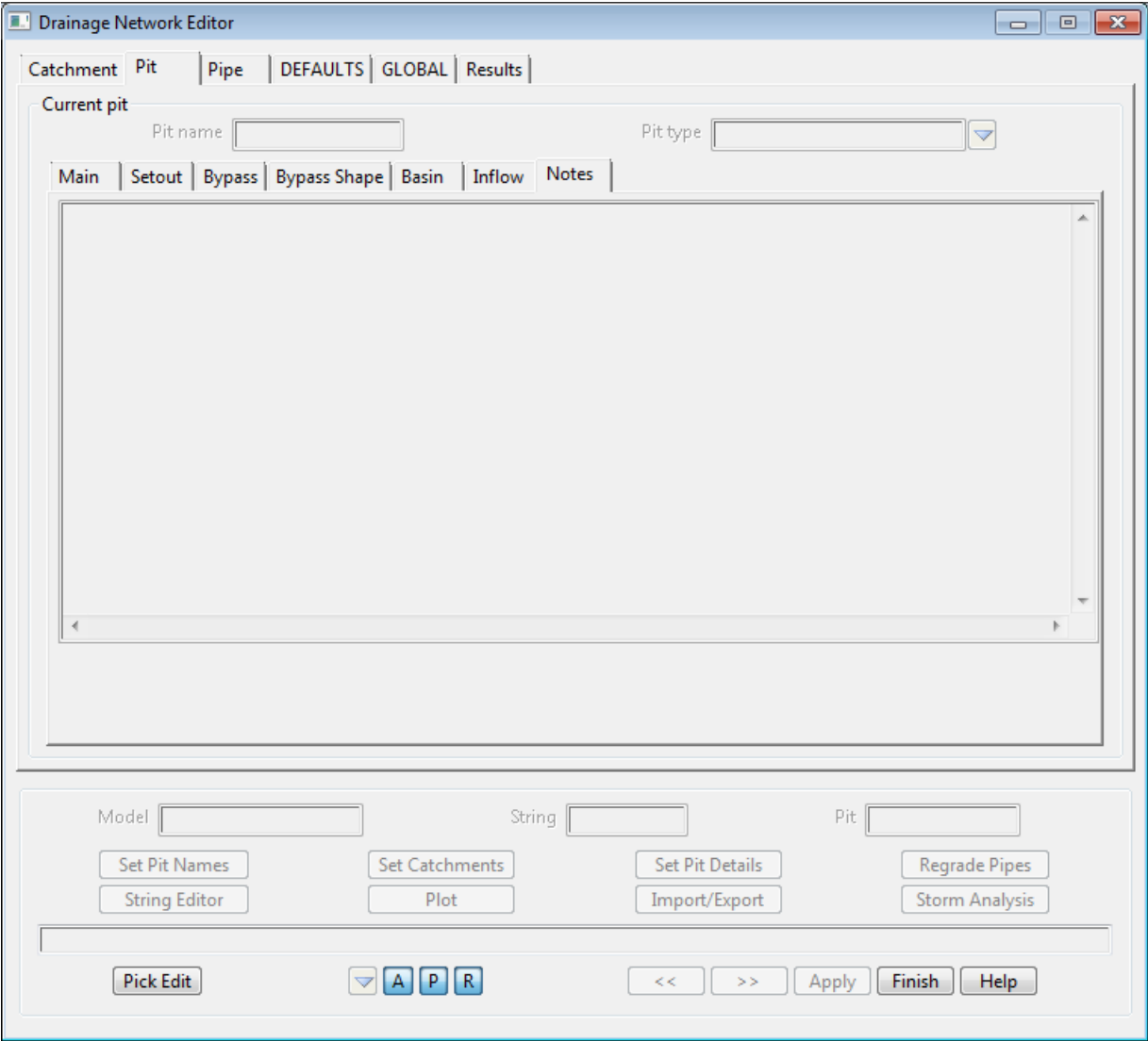
Basin subtab



Inflow subtab



Notes subtab



Pipe tab

The Pipe tab is used to specify the following data:

Drainage Network Editor

Catchment | Pit | **Pipe** | DEFAULTS | GLOBAL | Results

Pipe downstream of current pit

Pipe ID Locks: US Invert ☐ DS Invert ☐ Pipe size ☐ Pipe type

Main | Design | Channels | Notes

Invert levels

US Invert DS Invert

Dimensions

Diam/Height Num of Mode
Width Length Disch Coef
Top width Separation Colour

Other properties

Roughness type Qdp (minor) US defl.
Roughness Qdp (major) DS defl.

Pumps

Pump name Start level
Initial state Stop level

Model String Pit

Set Pit Names Set Catchments Set Pit Details Regrade Pipes
String Editor Plot Import/Export Storm Analysis

Pick Edit A P R << >> Apply Finish Help

The pipe tab has the explicit settings for the values entered on the Defaults pipe tab. When these fields are blank the default value is used. It has 2 sub tabs.

Pipe:Main subtab

[Pipe sizes, Max pipe height and Multiple Pipes and Box Culverts](#)

Pipe:Design subtab

Drainage Network Editor

Catchment

Pit

Pipe

DEFAULTS

GLOBAL

Results

Pipe downstream of current pit

Pipe ID

Locks: US Invert☐ DS Invert☐ Pipe size☐ Pipe type

Main

Design

Channels

Notes

Invert design

Grade mode

DS vert defl

DS align mode

Skip cover dist US

Cover limit

Min grade (%)

Align drop

Skip cover dist DS

Pipe size design

Min pipe height

Max pipe height

Design mode

Freeboard limit at US pit

Flow-depth limit at pipe entrance (%)

Model

String

Pit

Set Pit Names

Set Catchments

Set Pit Details

Regrade Pipes

String Editor

Plot

Import/Export

Storm Analysis

Pick Edit

A

P

R

<<

>>

Apply

Finish

Help

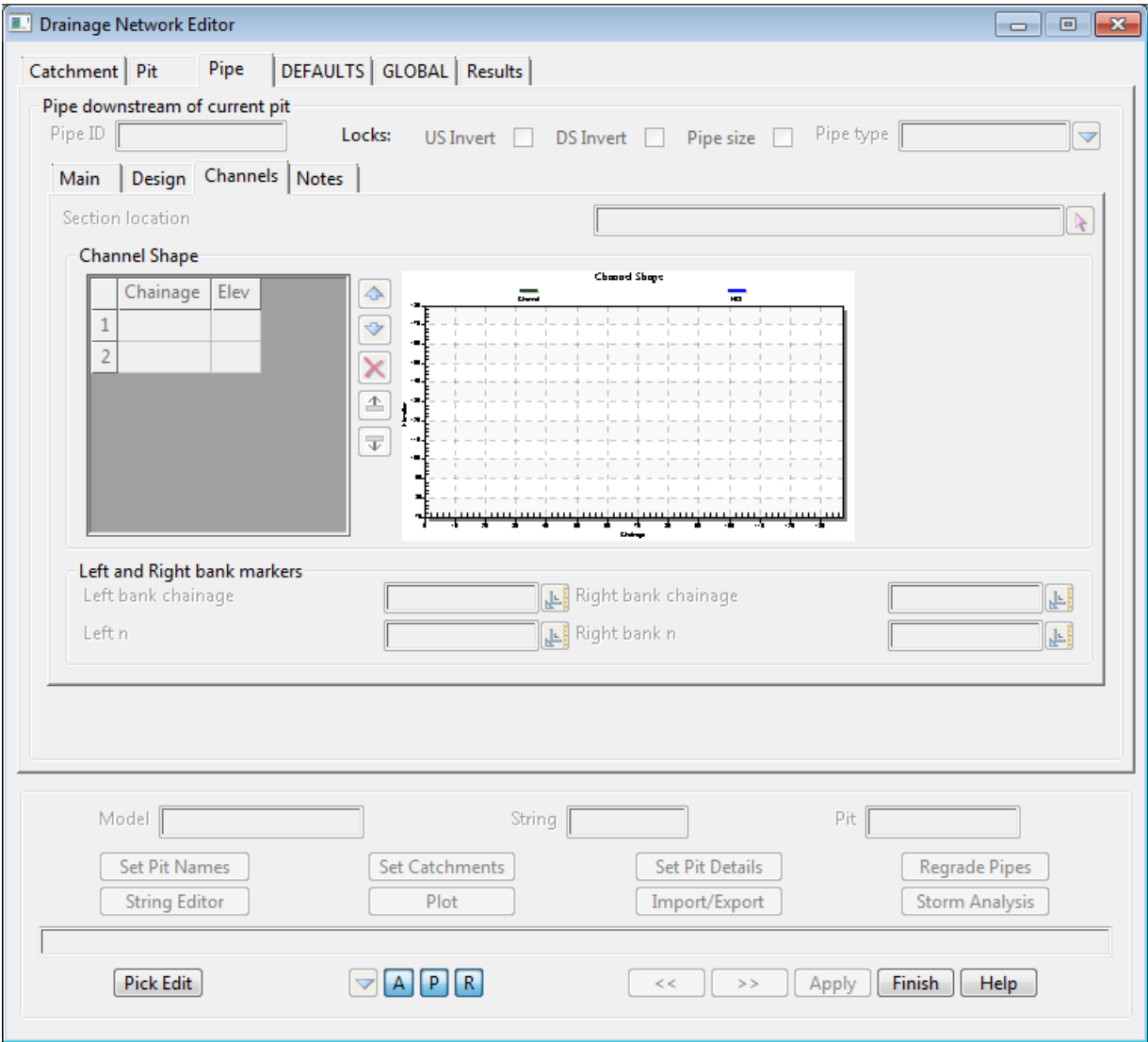
[Pipe Friction Values and Freeboard Limit](#)

[Pipe Friction Method](#)

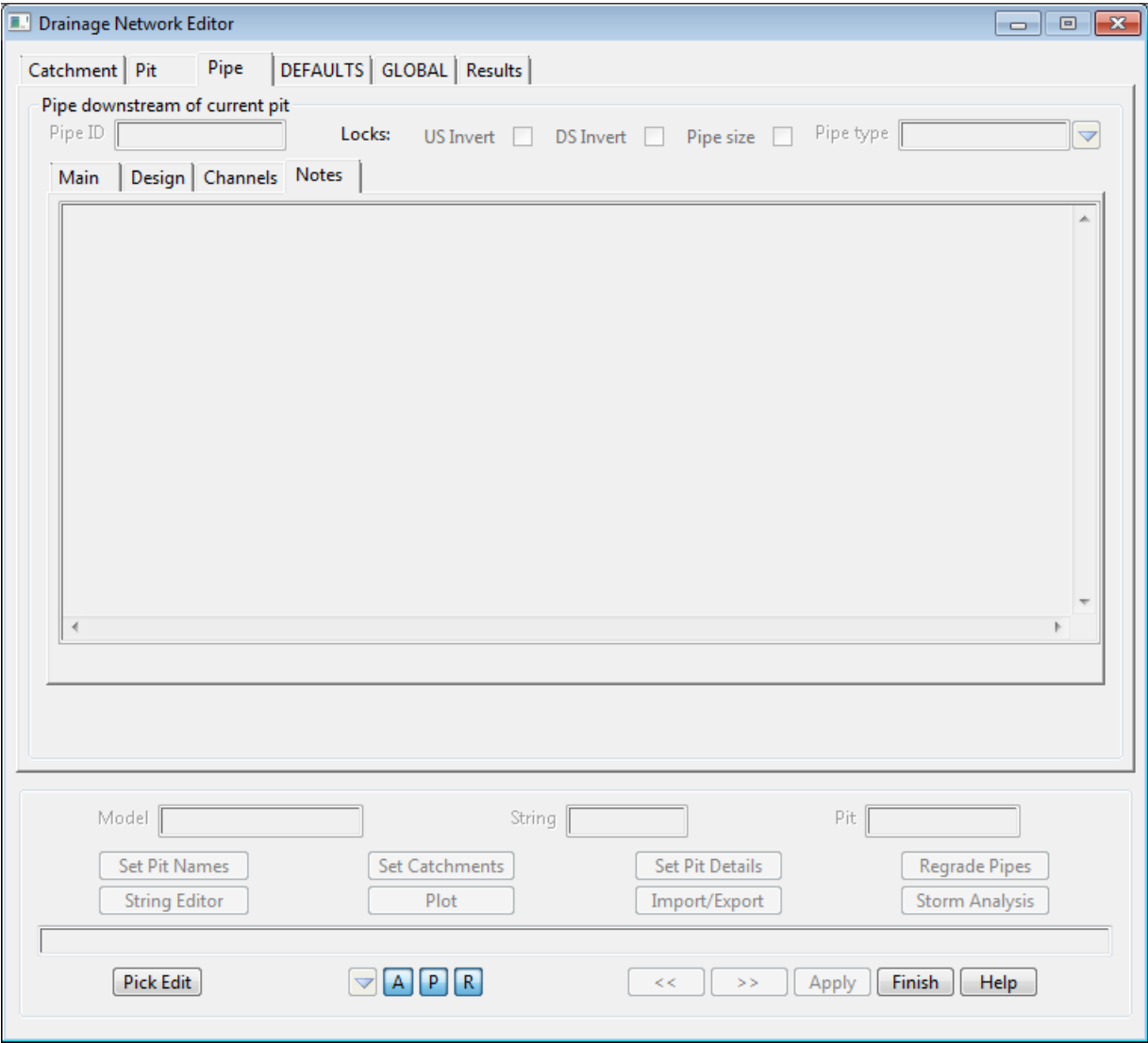
[Pipe Friction Values and Freeboard Limit](#)

[Pipe Design Parameters](#)

Pipe:Channels subtab



Pipe: Notes subtab



Set Catchments

This selection links the catchment strings to the manholes and recalculates the areas. For SAG pits the catchments strings from all 3 sets are draped onto the design surface to locate the lowest overflow point. This level is used for the ponding depth. Information messages are written to the output window during this process.

See [Set Catchments](#)

Regrade Network

This option resets the pipe invert levels using the [pipe design parameters](#). Information, warning and problem messages will be displayed in the output window. These messages will include pipe cover warnings, service crossing data and invert alignment messages. The user may place too many restraints using the regrade options results in no feasible solutions to the grading. These messages will also be shown.

Set Pit Details

This option resets the following manhole values: cover level. If activated the following are also

set: road design string, setout x,y and z, road centre line chainage and offset, the manhole symbol rotation, the road grade and crossfall, the bypass pit,

Plot

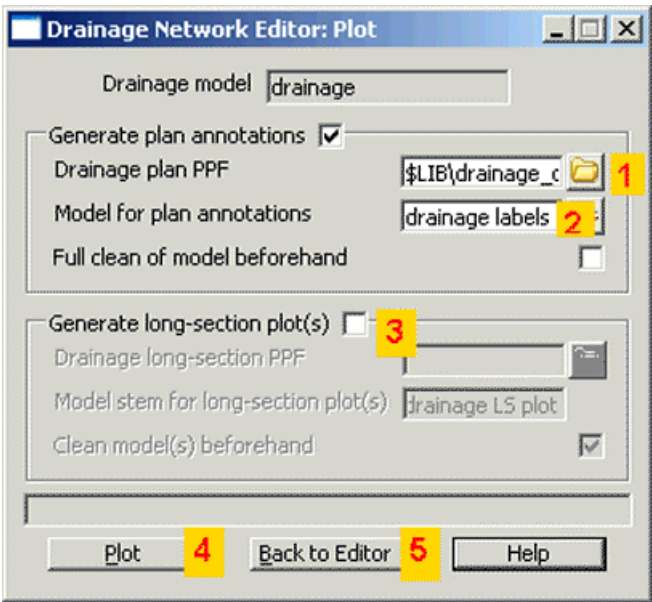
This plotting option will create a drainage plan and/or long section using the ppf files entered. The ppf editors can be launched from this panel by selecting the More Information folder icon beside the ppf field.

Set Pit Names

Tin for pit cover level tin box

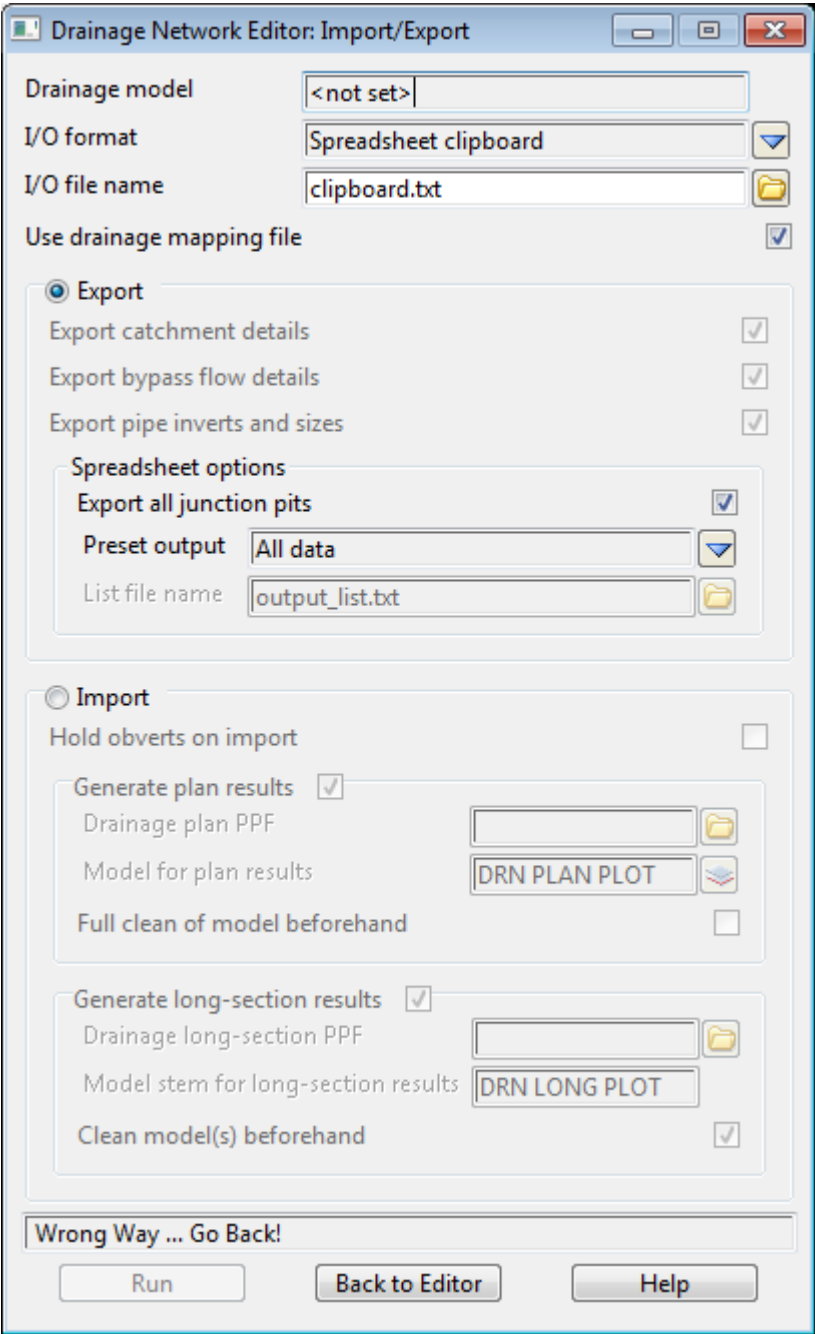
The new drainage manhole cover level will be set to the tin level at the manhole centre (optional)

Plot



See [Using Drainage Network Plot Button](#)

Import/Export

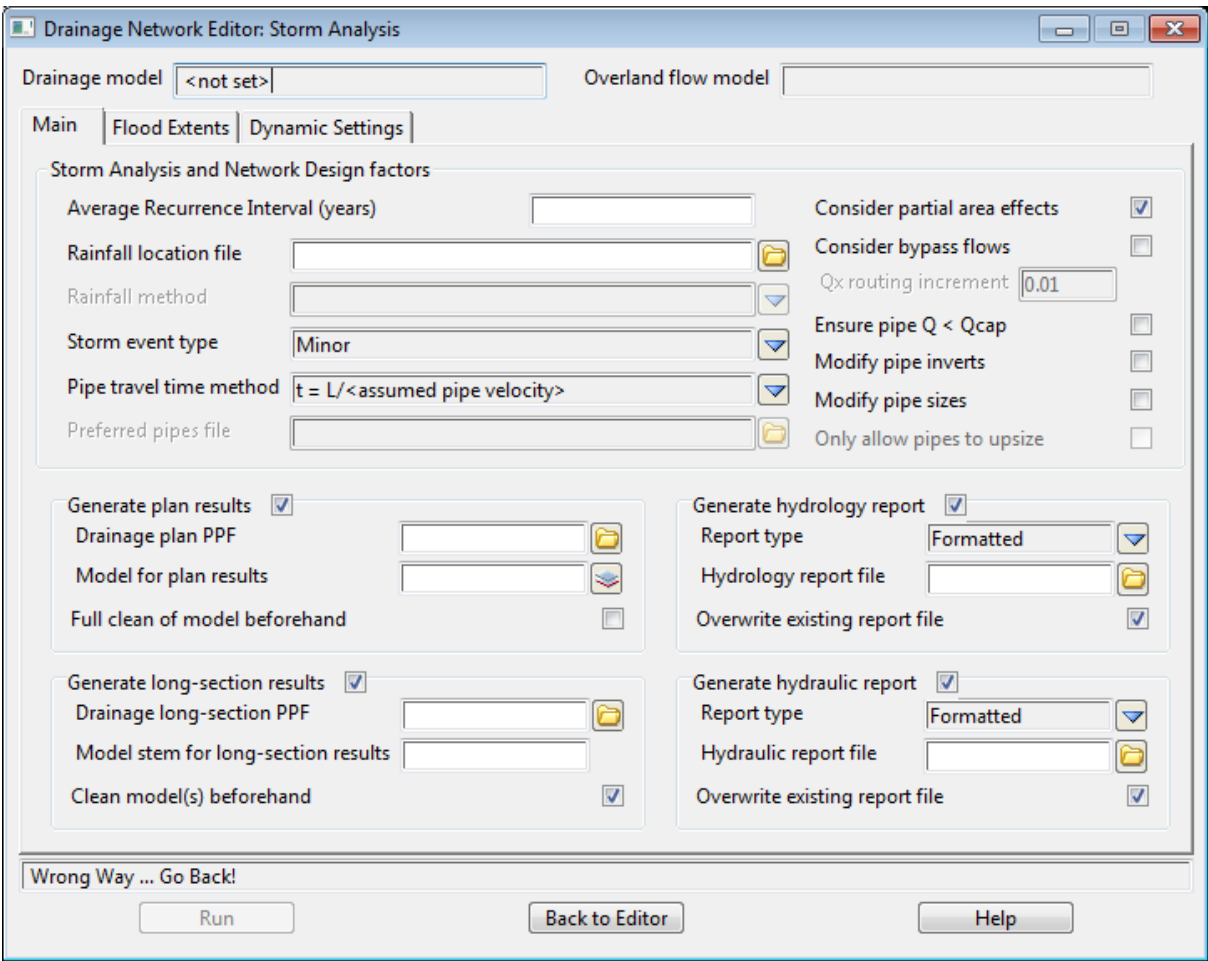


See [Drainage Export and Import to Design Software](#)

Drainage Network Design

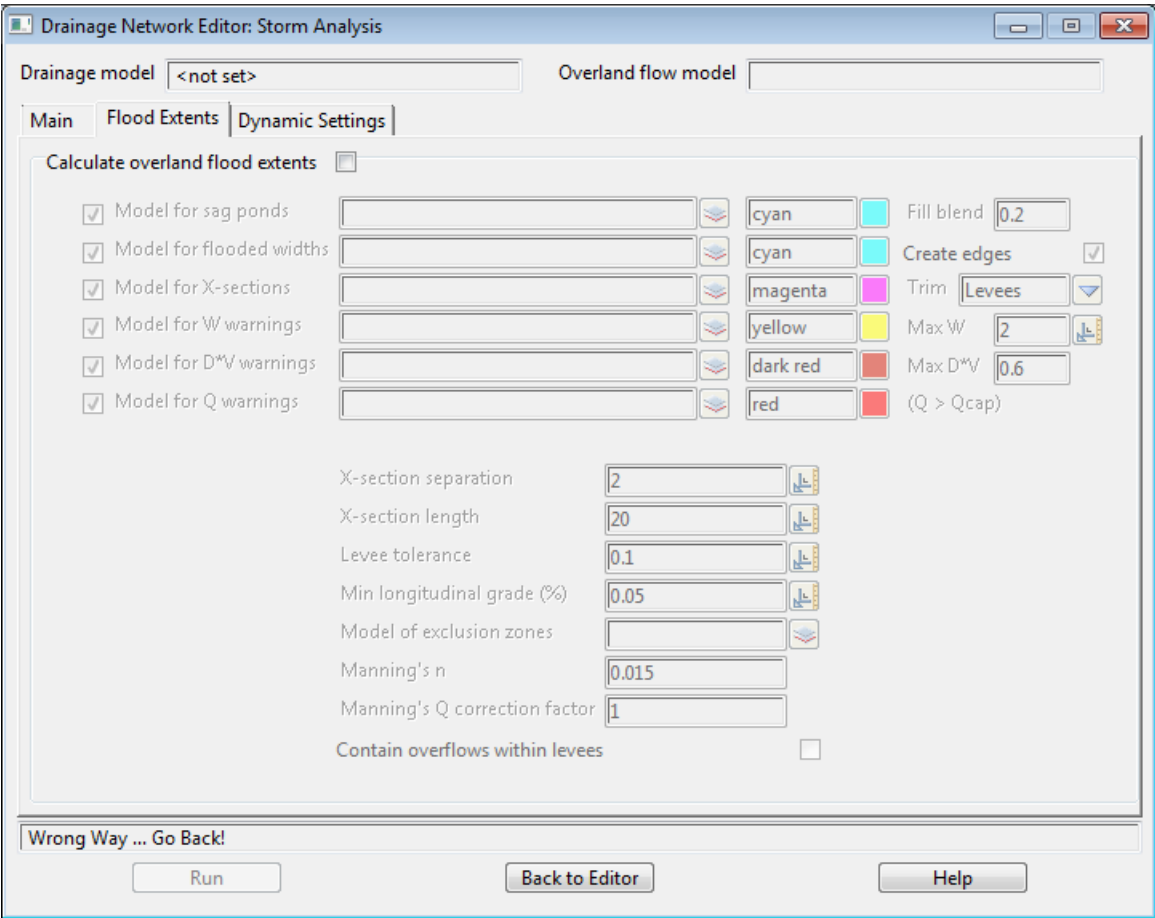
See Also Using [Drainage Design in 12d Drainage Design](#)

On selecting the Storm Analysis button, the Drainage Network Design panel is displayed.



Field Description	Type	Defaults	Pop-Up
Run	button		
<i>Run 12d hydrology and hydraulic check routine</i>			
Edit	button		
<i>return to the Drainage Network Editor</i>			
Finish	button		
<i>removes the panel</i>			
Help	button		
<i>displays this help page</i>			

Flood Extents Tab



Dynamic Settings Tab

Drainage Network Editor: Storm Analysis

Drainage model

<not set>

Overland flow model

Main

Flood Extents

Dynamic Settings

Maximum time step (sec)

2

Travel time to lengthen conduit (sec)

2

Extra run time (min)

0

Results time step (sec)

0

Initialisation run time (min)

0

Wrong Way ... Go Back!

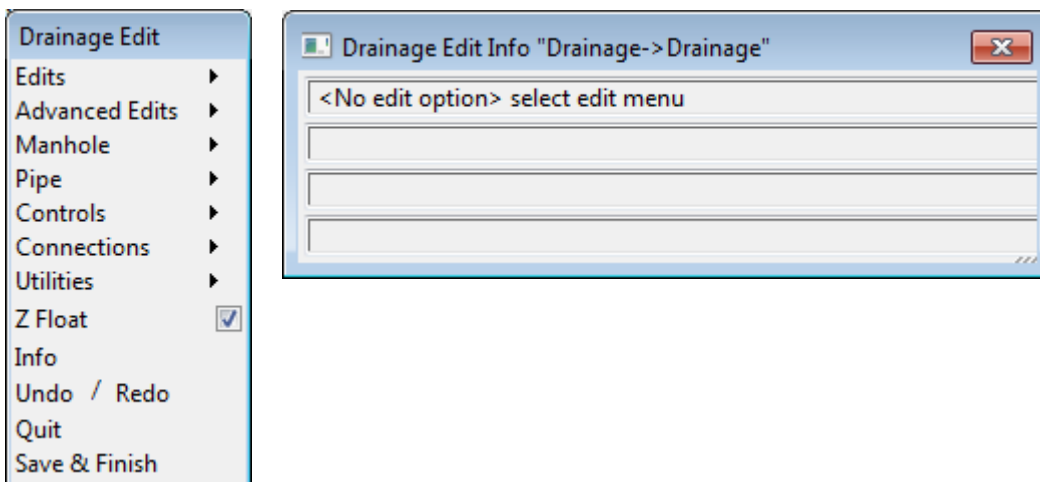
Run

Back to Editor

Help

Drainage Edit

On picking a drainage string when in the string **Editor** option, or by selecting **Create** in the **Create Drainage String** panel, the **Drainage Edit** menu and panel are placed on the screen.



The edit is **cancelled** by selecting the **Quit**. No changes to the string are recorded and the **Drainage Edit** option terminates.

The edit is **finished** and the changes recorded when the **Finish** is chosen. The **Drainage Edit** option then terminates.

When either button is selected, a **Yes-No-Cancel** panel is displayed and the user must confirm the selection.

The **Drainage Edit Info** panel is principally used to display information and messages during the creation and editing of the drainage string. It is toggled on and off by **Info** on the **Drainage Edit** menu.

The main message area indicates the purpose of the mouse buttons at each step.

Message area 1 displays the current Drainage Edit option and message area 4 indicate the next step in the edit option.

Message areas 2 and 3 are used to display information about the string as the cursor is moved near the drainage string and the drainage manholes.

Each of the options in the **Drainage Edit** menu will now be described.

For the option *Edits*, please continue to the section [Edits](#).

Advanced Edits, please continue to the section [Advanced Edits](#).

Manholes, please continue to the section [Manhole \(Maintenance Hole\)](#).

Pipes, please continue to the section [Pipe](#).

Controls, please continue to the section [House Connections](#).

Connections, please continue to the chapter [House Connections](#).

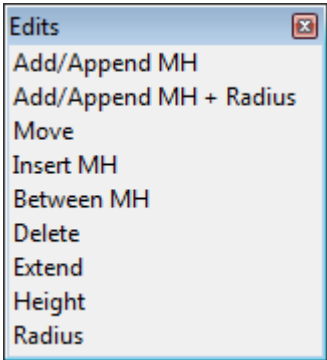
Utilities, please continue to the chapter [Utilities](#).

Z float, please continue to the chapter [Z Float](#).

Edits

The options in the **Edits** menu are used for placing the initial manholes of a new drainage string, editing a new drainage string once the initial manholes are placed or editing an existing drainage string.

The **Edits** walk-right menu is



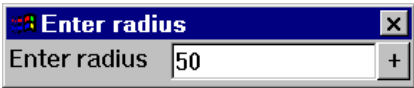
Append, Append+Radius

The **Append**, **Append+Radius** operations for a drainage string are similar to the **Append** options for a polyline string except that manholes are also automatically placed at each added point.

Note - a manhole can be removed from the point afterwards using the **Manhole=>Remove** option. The point will still be there but without a manhole on it.

If the **Append + Radius** option selected, then before each point is appended, an enter radius typed-input box is placed on the screen.

The enter radius typed-input box looks like



The radius is entered into the typed-input box, terminated with <enter>. The entered value is taken as the radius of the arc to the next drainage string point and the arc will be drawn correctly as the cursor is moved to the next point.

A **radius** value of **0** is taken to mean no arc.

If **z Float** is set to tick, then the top of the manhole is automatically placed on the terrain given in the tin field for the drainage string.

If height snap is toggled on in the **Snaps** menu, the height will be displayed and a new height entered but the new height will only be used if **z Float** is turned off for the manhole.

Each manhole in the string is connected by a drainage pipe. The diameter, type and cover at each end of the **drainage pipe** are taken from the **Drainage Pipe Defaults** panel.

The **Append** options are terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit**, **Finish**, or a new option from the **Drainage Edit** menu.

Move

If used in a plan view, the **Move** option is used to move the (x,y) position of a manhole.

If used in a section view, the **Move** option can be used to change the height of the top of any manhole or the height of either end of the drainage pipe connecting adjacent manholes in the drainage string.

After the **Move** option is chosen, the user selects either a manhole in a plan view or the top of a manhole or

a pipe end in a section view.

If a manhole is selected from a plan view, then the plan position of the selected manhole will move with the cursor. The new position for the top of the manhole can be chosen by either cursor selection or typed input in exactly the same way as for moving a point on a 3d string.

If the top of a manhole or the end of a pipe connecting adjacent manholes is chosen in a section view, then only the height of the selected point can be modified. That is, if a point is selected in a section view, then it is constrained to move in the z-direction only.

The **Move** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit**, **Finish**, or a new option from the **Drainage Edit** menu.

Insert

The **Insert** option is designed to place a new manhole between two adjacent manholes (note that the inserted manhole does not have to be on the line joining the two adjacent manholes).

To insert a new manhole, the two adjacent manholes are chosen by selecting the line connecting the two manholes. Once the **line** is selected, the new manhole is assumed to be at the current cursor position. As the cursor is moved, the drainage string is redrawn reflecting the changing position of the inserted manhole.

The **Insert** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit**, **Finish**, or a new option from the **Drainage Edit** menu.

Between

The **Between** option is similar to the **Insert** option except that the inserted manhole **does** have to be on the line joining the two adjacent manholes. To accomplish this, the cursor position is projected onto the manhole-manhole line to give the new manhole position.

Note - once the manhole is placed, it is no longer constrained to be on the one straight or arc joining adjacent manholes. If this is required, then the manhole is placed using the **Manhole=>Add** option.

The **Between** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit**, **Finish**, or a new option from the **Drainage Edit** menu.

Delete

The **Delete** option is used to delete manholes/and or points from the drainage string.

The manhole/point to be deleted is selected with the cursor and when the selection is accepted (MB), it is **deleted**.

Once a manhole/point has been deleted, the delete option is still current and can be repeated without re-selecting the **Delete** option.

The string, minus the deleted manhole/point, is redrawn after each deletion.

The **Delete** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit**, **Finish**, or a new option from the **Drainage Edit** menu.

Extend

The **Extend** option is used to move a manhole/point along the line joining the manhole/point to one of its adjacent manhole/point.

That is, the bearing of the manhole/point-manhole/point line is kept constant and the manhole/point moved along that line either **towards** or **away** from its neighbouring manhole/point.

Extending, like moving a manhole/point, is a two step process.

Step (a) - selecting the manhole/point-manhole/point line and the manhole/point to be moved along that line

Step (b) - selecting the final position for the manhole

Both steps are identical to extending an point in a polyline string.

Once the extend is completed, the extend option is still current and can be repeated without re-selecting the extend option.

The **Extend** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit, Finish**, or a new option from the **Drainage Edit** menu.

Note - Extend can be used on the end manholes of the drainage string

Height

The **Height** option is used to modify the height (z value) of the top of any manhole, or the height of the ends of the pipes connecting adjacent manholes in the drainage string.

The top of the manhole can be selected in either a plan or a section view. The pipe ends can only be selected in a section view.

After the **Height** option is chosen, the user must select the manhole top or pipe end that is going to have its height modified.

Once the manhole or pipe end has been selected, a New height typed-input box is displayed on the screen with the items current height (z value) in it.

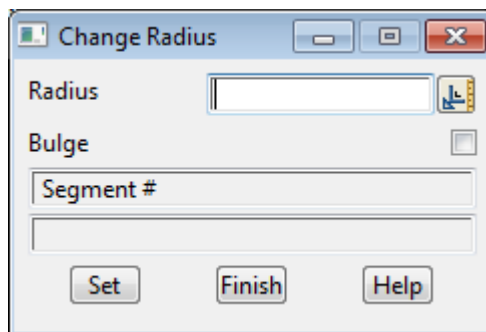


The required height is entered into the typed-input box, terminated with <enter>. The entered value is taken as the height of the manhole or pipe and the string redrawn with the new height at that point. The typed-input box then disappears.

The **Height** option is terminated by selecting **Quit, Finish**, or a new option from the **Drainage Edit** menu.

Radius

Selecting **Radius** brings up the **Change Radius** panel which is used to modify the radius of any arc/line joining adjacent manhole points.



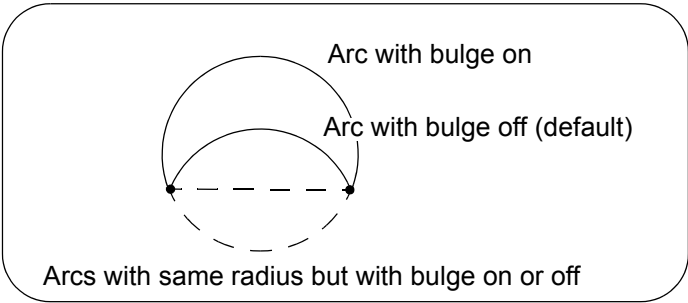
After selecting the **Radius** option, the user selects the arc/straight to be modified and the current arc radius and bulge setting will be displayed in the **Change Radius** panel.

New values can then be entered and the arc modified by selecting the **Set** button.

If the radius is positive, the arc is drawn from the start point to the next point on the polyline in a clockwise direction. If the radius is negative, the arc is drawn from the start point to the next point on the polyline in a counter-clockwise direction.

For a given radius (positive or negative), there are two possible cases for the arc- one where the arc is less than a semi-circle, the other when the arc is greater than a semi-circle.

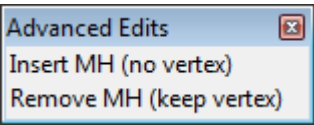
If bulge is turned on, the larger arc is used. The default is bulge turned off.



Advanced Edits

The options in the **Advanced Edits** menu are used for placing the adding manholes at locations other than a vertex and removing these manholes.

The **Advanced Edits** walk-right menu is



Insert MH (no vertex)

The **Insert MH (no vertex)** operation for a drainage adds a manhole on the existing string. When either of the 2 adjacent manholes with a vertex are moved, this manhole will move as well.

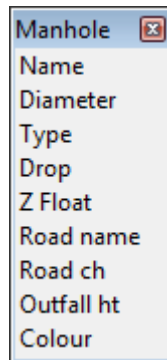
Remove MH (no vertex)

The **Remove MH (no vertex)** operation for a drainage removes a manhole on the existing string. If the manhole is on a vertex the vertex remains in the horizontal geometry but does not affect the vertical geometry.

Manhole (Maintenance Hole)

The options in the **Manhole** menu are used to modify information about individual manholes in the drainage string.

The **Manhole** walk-right menu is



Add

The **add** option is similar to the **Edits=>Between** option in that a new manhole is created that must be on the line or arc between two adjacent manholes.

However, once the manhole is placed, it is **always constrained** to be on the one straight or arc joining its adjacent manholes.

To **add** a new manhole, the two adjacent manholes are chosen by selecting the line connecting the two manholes. Once the **line** is selected, the new manhole is assumed to be at the current cursor position. As the cursor is moved, the drainage string is redrawn reflecting the changing position of the inserted manhole.

The **add** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit**, **Finish**, or a new option from the **Drainage Edit** menu.

Remove

The **Remove** option is used to remove manholes from the drainage string but unlike the **Edits=>Delete** option, the underlying point on the drainage string remains. Hence only the manhole is deleted, but not the polyline point underneath.

The manhole to be removed is selected with the cursor and when the selection is accepted (MB), it is **removed**.

Once a manhole has been removed, the **Remove** option is still current and can be repeated without re-selecting the **Remove** option.

The string, minus the deleted manhole/point, is redrawn after each removal.

The **Remove** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit**, **Finish**, or a new option from the **Drainage Edit** menu.

Name

The **Name** option is used to change a manhole's label.

After selecting the option, the mouse is used to pick the manhole to have a name change.

Once a manhole has been selected, an Enter text typed-input box is displayed on the screen containing the selected manhole's name.



The new name is entered into the typed-input box, terminated with <enter>. The typed-input box then disappears.

The **Name** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit, Finish**, or a new option from the **Drainage Edit** menu.

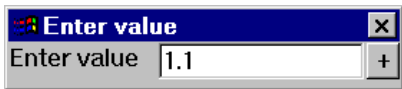
NOTE - if the name of the manhole is *EOL* or *eol* then the diameter of the manhole is forced to zero.

Diameter

The **Diameter** option is used to change a manhole's diameter.

After selecting the option, the mouse is used to pick the manhole to have its diameter modified.

Once a manhole has been selected, an **Enter value** typed-input box is placed on the screen displaying the selected manhole's current diameter.



The new diameter is entered into the typed-input box, terminated with <enter>. The typed-input box then disappears.

The **Diameter** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit, Finish**, or a new option from the **Drainage Edit** menu.

Type

The **Type** option is used to change the type of the cover (lid) placed on a manhole.

After selecting the option, the mouse is used to pick the manhole to have its cover type modified.

Once a manhole has been selected, a **Manhole type** typed-input box is displayed on the screen containing the selected manhole's cover type.



The list of common covers for the manhole can be obtained by clicking the **[+]** in the **Manhole type** input box and getting a menu of valid cover types.

The new cover type is entered into the typed-input box, terminated with <enter>. The typed-input box then disappears.

The **Type** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit, Finish**, or a new option from the **Drainage Edit** menu.

Drop

The **Drop** option is used to change the vertical distance between the bottom of the pipes on either side of a manhole, i.e., the difference in the invert levels of the pipe.

Since the drop is simply the difference in vertical distance between two pipes on either side of a manhole, the actual value of the drop can be changed by moving either of the pipes up or down the manhole.

After selecting the option, the end of the pipe to be moved is selected with the mouse.

Once the pipe end been selected, an enter value typed-input box is displayed containing the drop across the manhole that the pipe end connects into.



The new drop type is entered into the typed-input box, terminated with <enter>.

If the end of the pipe was on the upstream side of the manhole (normally the right hand side of a manhole in a section view), the end of the pipe will be moved upward until the drop across the manhole equals the entered value.

If the end of the pipe was on the downstream side of the manhole (normally the left hand side of a manhole in a section view), the end of the pipe will be moved down until the drop across the manhole equals the entered value.

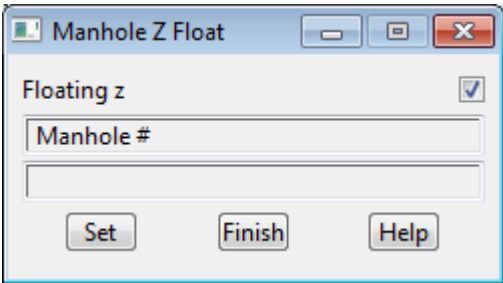
The typed-input box then disappears.

The **Drop** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit**, **Finish**, or a new option from the **Drainage Edit** menu.

Z Float

A **floating manhole** takes the z-value for the top of the manhole from the tin selected for the drainage string. Hence as a floating manhole moves around in a plan view, the top of manhole will automatically change to suit the new z-value of the drainage string tin.

Selecting **Z float** brings up the **Manhole Z Float** panel which is used to change a manhole from floating to non-floating and vice-versa.



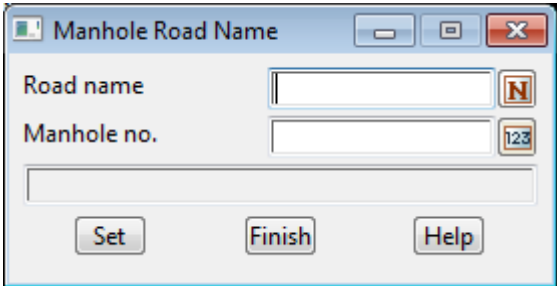
After selecting the **Z Float** option, the user selects the manhole to be modified and the current **floating z status** is displayed in the **Manhole Z Float** panel.

The tick box can then be changed and the manhole modified by then selecting the **Set** button.

Road Name

A **road name** can be set for a manhole of the line.

Selecting **Road name** brings up the **Manhole Road Name** panel which is used to give and change a road name for a manhole.



The option is running as soon as the panel is on the screen and the user is asked to selected a

manhole.

<Select manhole> [picks][Menu]

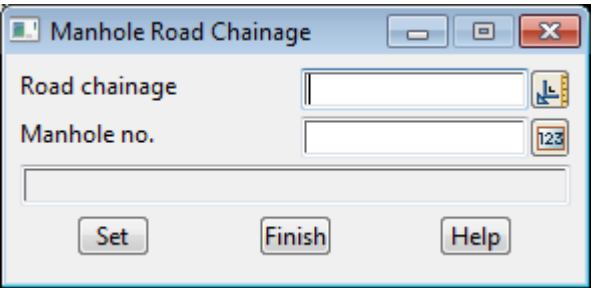
When the manhole is selected, any existing road name and the manhole number is placed in the road name and vertex no. fields respectively of the **Manhole Road Name** panel.

A new **road name** is then typed into the road name panel field and the **Set** button selected to record the road name with the manhole.

Road Chainage

A **road chainage** can be set for a manhole of the line.

Selecting **Road ch** brings up the **Manhole Road Chainage** panel which is used to give and change a road chainage for a manhole.



The option is running as soon as the panel is on the screen and the user is asked to selected a manhole.

<Select manhole> [picks][Menu]

When the manhole is selected, any existing road chainage and the manhole number is placed in the road chainage and vertex no. fields respectively of the **Manhole Road Chainage** panel.

A new **road chainage** is then typed into the road chainage panel field and the **Set** button selected to record the road chainage with the manhole.

Outfall Height

When a drainage string is created, the furthest downstream is often an outfall and the height of the outfall known.

When the furthest downstream manhole is considered to be an outfall, the **Outfall ht** option is used to set and change the outfall height. Once set, the outfall height is taken to be the height at the *bottom* of the furthest downstream manhole.

If this option is not used, the outfall height is left undefined.

After selecting the option, an enter value typed-input box is displayed on the screen containing the existing outfall height or **null** if no outfall height has been set.

The new outfall height is entered into the typed-input box, terminated with <enter>.

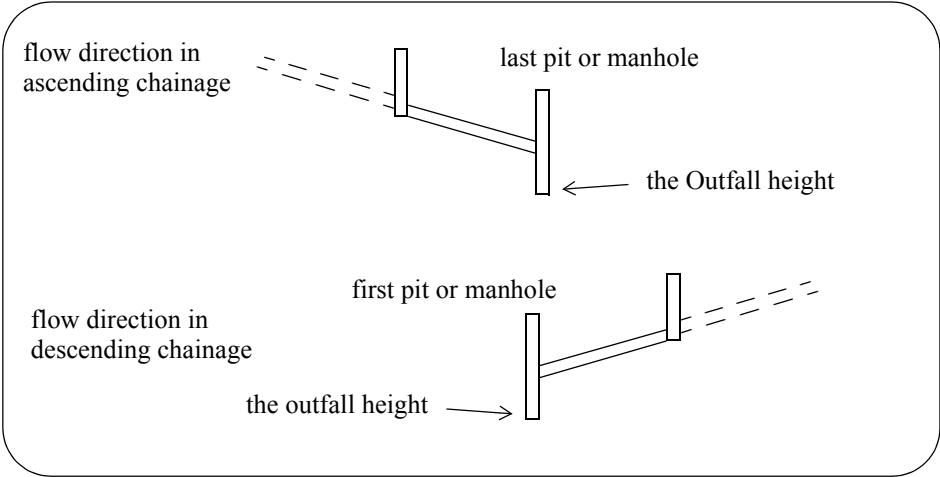
The height of the bottom of the furthest downstream manhole in the drainage string is then set to the given height and the typed-input box removed.

The **Outfall ht** option automatically terminates after use.

Note:

For a drainage string with flow direction in ascending chainage, the furthest downstream manhole is the *last* manhole.

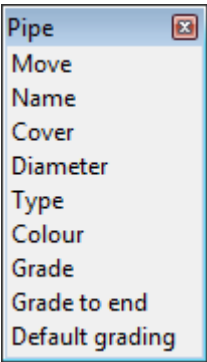
For a drainage string with flow direction in descending chainage, the furthest downstream manhole is the *first* manhole.



Pipe

The options in the **Pipe** menu are used to modify information about the pipes joining adjacent manholes in the drainage string.

The **Pipe** walk-right menu is



Move

The **Move** option is used to move a pipe connecting two manholes whilst keeping the grade of the pipe constant.

After selecting the option, the mouse is used to pick the pipe to be moved.

Once a pipe has been selected, the pipe will be moved up or down so that the cursor remains on the pipe (or on the extension of the pipe if the cursor is on the other side of the manholes at either end of the pipe). The grade of the pipe is kept constant.

The manholes at either end of the pipe will also be extended if necessary so that the pipe still connects into the adjacent manholes.

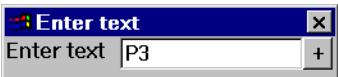
The **Move** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit**, **Finish**, or a new option from the **Drainage Edit** menu.

Name

The **Name** option is used to change a pipe's label.

After selecting the option, the mouse is used to pick the pipe to have a name change.

Once a pipe has been selected, an Enter text typed-input box is displayed on the screen containing the selected pipe's name.



The new name is entered into the typed-input box, terminated with <enter>. The typed-input box then disappears.

The **Name** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit**, **Finish**, or a new option from the **Drainage Edit** menu.

Cover

The **Cover** option is used to place the selected pipe so that minimum cover is maintained along the top of the pipe (obvert) with respect to the finished surface tin (tin (fs)).

After selecting the option, the pipe to set the cover for is selected with the mouse.

Once a pipe has been selected, an Enter value typed-input box is displayed on the screen

containing the existing cover.



The new cover is entered into the typed-input box, terminated with <enter>. The typed-input box then disappears and the pipe is adjusted so that the specified cover is maintained for the full length of the pipe at the pipes existing grade.

The **Cover** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit**, **Finish**, or a new option from the **Drainage Edit** menu.

Diameter

The **Diameter** option is used to change a drainage pipe's diameter.

After selecting the option, the mouse is used to pick the pipe to be modified.

Once a drainage pipe has been selected, an Enter value typed-input box is placed on the screen displaying the selected pipe's current diameter.



The new diameter is entered into the typed-input box, terminated with <enter>. The typed-input box then disappears

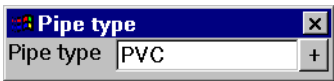
The **Diameter** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit**, **Finish**, or a new option from the **Drainage Edit** menu.

Type

The **Type** option is used to change the type of material that the pipe is made of.

After selecting the option, the mouse is used to pick the pipe to have its material type modified.

Once a pipe has been selected, a Pipe type typed-input box is placed on the screen displaying the selected pipes material type.



The list of common materials for the pipe can be obtained by clicking B3 in the type input box and getting a menu of valid material types.

The new material type is entered into the typed-input box, terminated with <enter>. The typed-input box then disappears.

The **Type** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit**, **Finish**, or a new option from the **Drainage Edit** menu.

Grade

The **Grade** option is used to specify an exact grade for a drainage pipe. The value for the grade is entered using typed input and is in the units "1v in".

In this option, the new grade is given to a pipe by keeping one end fixed and raising or lowering the other end by the amount required to give the pipe the new grade.

After the **Grade** option is selected, the pipe whose grade is to be modified is selected **at the end that is going to be moved**.

Once the pipe end has been selected, an enter value typed-input box is displayed on the screen

containing the current grade of the pipe. The new grade is entered into the typed-input box, terminated with <enter>.

The selected end of the drainage pipe is then moved up or down so that the pipe has the new grade.

If necessary, the manhole at the moved end of the pipe will be lengthened so that the pipe still connects into the adjacent manholes.

The **Grade** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit**, **Finish**, or a new option from the **Drainage Edit** menu.

Grade to End

The **Grade to end** option is used to specify a **fixed** grade for all the drainage pipes from a selected pipe to the **low chainage** end (beginning) of the line. That is, it grades from *right to left* on a long section of the drainage string.

The value for the grade is entered using typed input and is in the units "1v in".

This option was originally written for pipes with flow direction in descending chainage direction which is the reason why it works from the selected pipe back towards the beginning of the line.

Hence **Grade to end** should only be run on pipes with flow in descending chainage direction. If the flow is in ascending chainage direction, use the reverse string option (**string=>strings edit=>reverse**) before using this option, and then reverse the string again after the option is run. Note that the **Default grading** option looks at maintaining minimum *grade* and minimum *cover* for flow in either ascending or descending chainage direction and supersedes **Grade to end**.

In this option, the new grade is given to a pipe by keeping the high chainage end of the selected pipe fixed and raising or lowering the low chainage end by the amount required to give the pipe the new grade. The minimum cover is over ridden during this process. If necessary, the bottom of the manhole will be lowered so that the pipe still connects into its adjacent manholes.

The next lower chainage pipe is then dropped through the default drop and given the new grade. The drop is measured from the lowest pipe invert of all pipes in the network entering the manhole.

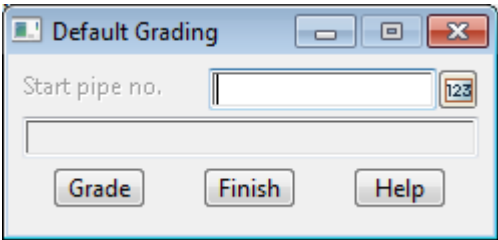
This process is repeated until the low chainage end (beginning) of the line is reached.

After the **Grade to end** option is selected, the first pipe whose grade is to be modified is selected.

Once the pipe end has been selected, an enter value typed-input box is displayed on the screen containing the current grade of the selected pipe. The new grade is entered into the typed-input box, terminated with <enter>. The option then does the grading.

The **Grade to end** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit**, **Finish**, or a new option from the **Drainage Edit** menu.

Default Grading



The **Default grading** option starts at the given pipe and then works to the end of the line when the flow direction is in ascending chainage, or the beginning of the line when the flow direction is in descending chainage. The **Default grading** option maintains minimum grade and minimum cover.

Default grading is not designed to optimise the placement of the pipes but provides one solution preserving minimum grade and cover.

Property Controls

Property, block or lot **controls** are trial connections from a sewer line (drainage string) to a user specified plan point.

The property controls are used as checks that selected house blocks can be serviced by the sewer line. That is, they are used to test if the house block is under the control of the sewer line.

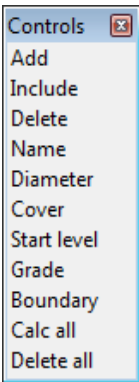
For the trial connection, once the cover (measured from the finished surface to the top of the property connection line) that the property connection must maintain and the grade are specified, the position and depth that the trial property connection must have at the sewer line can be calculated, and where the height of the *centre line* of the property control when it reaches the sewer line is displayed in any section view containing a profile of the sewer line.

If the calculated depth of the trial property connection at the sewer line (drainage string) is below the sewer pipe, then no such connection would be feasible and the house block would not be totally controlled by the sewer line.

On a section view, the *Profile =>One substring* and *Profile =>Many substrings* options will profile the property control. Note that the *centre line* (axis) of the property control is drawn on the section view, not the invert (bottom) or the obvert (top).

NOTE - property controls are only accessible by the **Sewer module**.

The options in the **Controls** menu are used to place and modify the trial connections. The **Controls** walk-right menu is



Add

The **Add** option is used to create a new trial control line going from a selected drainage pipe to a user specified plan position (the free end of the connection).

After selecting the option, the mouse is used to pick the plan position of the connection point on the drainage pipe, and then the points defining the path to the plan position of the free end of the trial connection.

After the free end has been selected, the property name typed-input box is displayed on the screen so that a label for the control can be entered (this usually consists of the lot number).

When the property name box is placed on the screen, it will already have some text in it. This text comes from the name field in the **Drainage Property Control Defaults** panel.



A z-value equal to the drainage tin value minus the default control cover depth is automatically given to the free end of the control. The default control grade is then used to define z-values along the trial path (ensuring that the default control cover depth is always observed) to give a z-

value back at the drainage pipe (the connection height of the control).

A cross at the calculated connection height is displayed whenever the drainage string is profiled on a section view.

The colour for the new control is taken from the **Drainage Property Control Defaults** panel.

The **Add** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit, Finish**, or a new option from the **Drainage Edit** menu.

Include

The **Include** option is used to make a control out of an existing polyline string.

The polyline string must start at the connection point on the drainage string and end at the free end (use *Strings=>Strings Edit=>Reverse* if the string's direction is incorrect).

After selecting the option, the mouse is used to pick the polyline string and its plan position is copied and used to define a new control.

A z-value equal to the default drainage tin at that point, minus the default control cover depth is automatically given to the free end of the new control. The default control grade is then used to define z-values along the trial path (ensuring that the default control cover depth is always observed) to give a z-value back at the drainage pipe.

The **Include** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit, Finish**, or a new option from the **Drainage Edit** menu.

Delete

The **Delete** option is used to delete a control.

After selecting the option, the mouse is used to pick the block control to be deleted.

Once a block control has been selected, it will be deleted and removed from the screen.

The **Delete** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit, Finish**, or a new option from the **Drainage Edit** menu.

Name

The **Name** option is used to change the **Property name** of a control.

After selecting the option, the mouse is used to pick the control that will have a name change.

Once a control has been selected, an enter text typed- input box is displayed on the screen containing the selected control's name.



The new name is entered into the typed-input box, terminated with <enter>. The typed-input box then disappears.

The **Name** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit, Finish**, or a new option from the **Drainage Edit** menu.

Diameter

The **Diameter** option is used to change the diameter of a control.

After selecting the option, the mouse is used to pick the control that will have its diameter modified.

Once a control has been selected, an Enter value typed- input box is placed on the screen displaying the

selected control's current diameter.



The new diameter is entered into the typed-input box, terminated with <enter>. The typed-input box then disappears.

The **Diameter** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit**, **Finish**, or a new option from the **Drainage Edit** menu.

Cover

The **Cover** option is used to change the distance that the control is below the tin (fs) for the drainage string.

After selecting the option, the cursor is used to pick the control whose cover will be modified.

Once a control has been selected, an Enter value typed- input box is placed on the screen displaying the selected block control's current cover.



The new cover is entered into the typed-input box, terminated with <enter>. The typed-input box then disappears and the new connection height using the new cover calculated.

The **Cover** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit**, **Finish**, or a new option from the **Drainage Edit** menu.

Grade

The **Grade** option is used to change the grade of a control (units "1v in").

After selecting the option, the mouse is used to pick the control whose grade will be modified.

Once a control has been selected, an enter value typed- input box is placed on the screen displaying the selected control's grade.

The new grade is entered into the typed-input box, terminated with <enter>. The typed-input box then disappears and the new connection height using the new grade calculated.

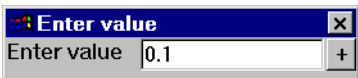
The **Grade** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit**, **Finish**, or a new option from the **Drainage Edit** menu.

Boundary

The **Boundary** option is used to specify a boundary trap depth which is used as a final drop at the drainage pipe end of the control.

After selecting the option, the mouse is used to pick the control whose boundary depth will be modified.

Once a control has been selected, an Enter value typed- input box is placed on the screen displaying the selected boundary depth.



The new boundary trap depth is entered into the typed-input box, terminated with <enter>. The typed-input box then disappears and the new connection height using the new boundary trap depth is calculated.

The **Boundary** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit**, **Finish**, or a new option from the **Drainage Edit** menu.

Calc all

The **Calc all** option is used to re-calculate the connection heights for all controls of the drainage line.

The calculation uses the plan layout of the control, the control's cover, grade and boundary trap depth and the default tin for the drainage line.

The **Calc bc's** option automatically terminates after use.

Delete All

The **Delete all** option is used to remove all the controls defined for the drainage line being edited.

The **Delete all** option automatically terminates after use.

House Connections

The **Connections** option is used to create the connections from the sewer line (drainage string) to the house blocks in a subdivision.

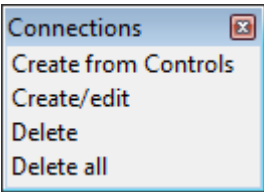
When placing a house connection, the user indicates the two corners of the frontage of the block to allow the cross-fall of the block to be calculated and allow the frontage to be used in positioning the house connection.

When placing house connections, a section view is used to automatically display the connection to facilitate checking the type of connection used and any obstructions that may need to be avoided.

NOTES

- 1. House connections are only accessible by the *Sewer module*.
- 2. All house connection calculations do not take into account any thickness of pipe, joint sizes or actual entry points into the sewer. Hence they are *approximate only* and should only ever be used as a guide. Any quantities calculations should allow for a suitable margin of error.

The **Connections** walk-right menu is

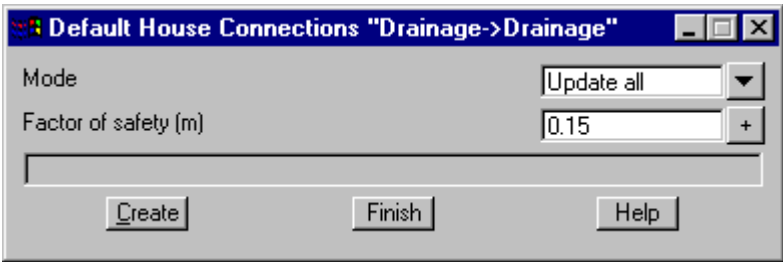


The process for creating a house connection will now be described in detail.

Create from Controls

The **Create from Controls** option is used to create a new house connection from existing controls. or modify an existing house connection.

After selecting the **Create from Controls** option, the **Default House Connections** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Mode	input	update all	remove existing first, update new, update all
<i>if remove existing first, all the existing connections are deleted before new ones are created from the controls.</i>			
<i>if update new, connections are only created from controls with names different from any existing connection.</i>			
<i>if update all, connections are created from all controls.</i>			
Factor of safety	input	0.15	

the connection height for the control is adjust by this depth from the control connection depth.

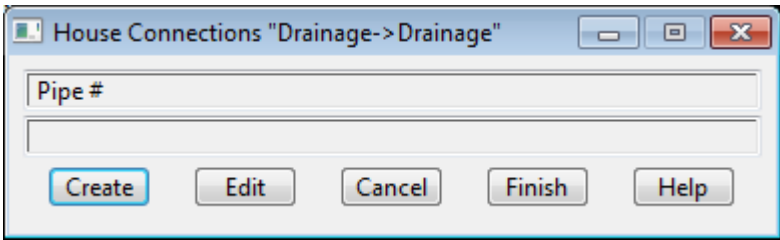
Create button

*after selecting **Create**, the connections are created from the selected controls.*

Create/Edit

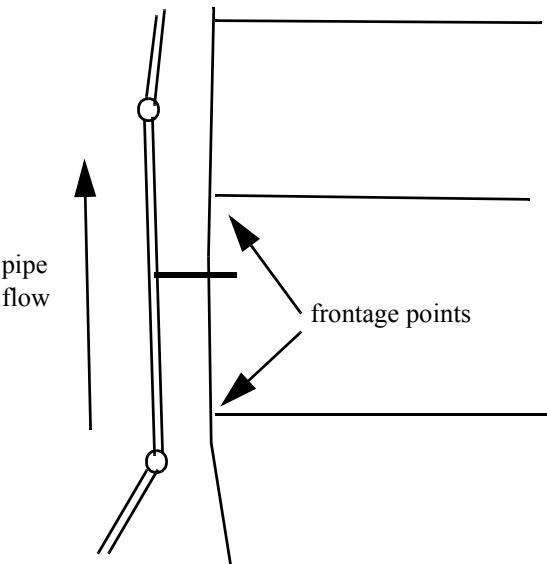
The Create/edit option is used to create a new house connection or modify an existing house connection.

After selecting the Create/edit option, the **House Connections** panel is displayed.



The process for creating a house connection will now be described in detail.

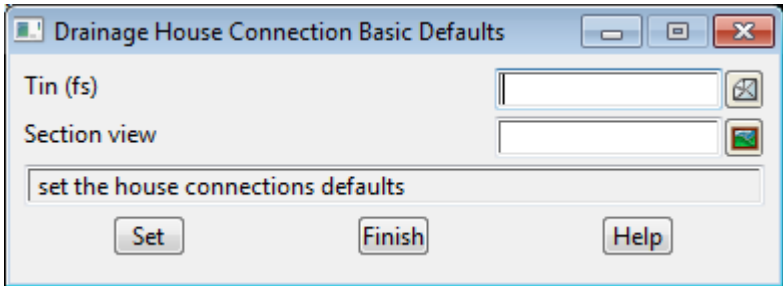
Creating A House Connection



Step 1 Select *Create*

To create a new house connection, the **Create** button is selected from the **House Connections** menu.

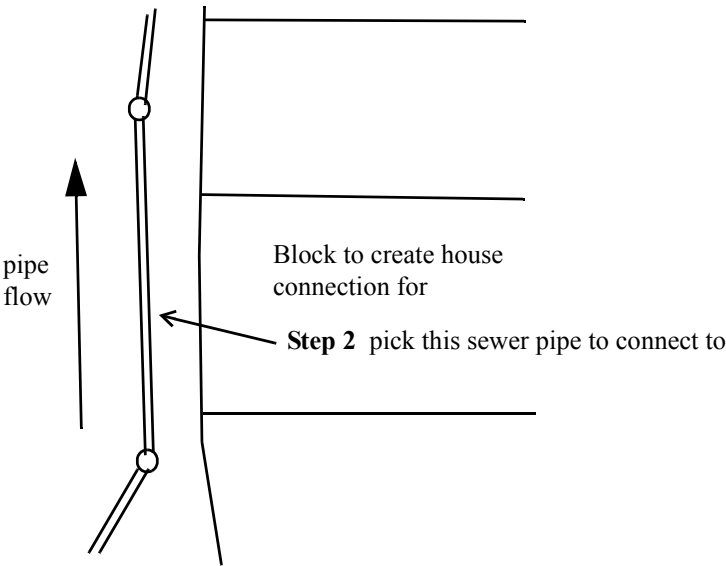
If either the default **drainage tin** or **section view** have not be defined, the **Drainage House Connection Basic Defaults** panel will be placed on the screen after the **Create** button is selected.



The missing values need to be filled in and the **Set** selected. This information is needed so that the house connections can be drawn up in a section view as soon as they are created.

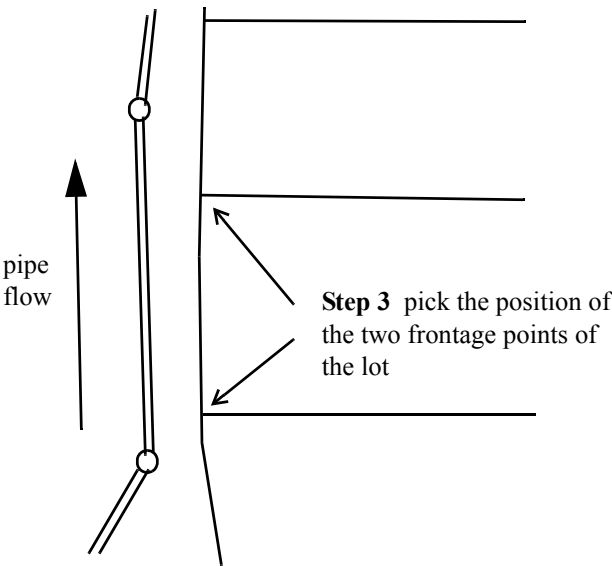
Step 2 Selecting the Sewer (drainage) Pipe to Connect to

The user is then asked to select the sewer pipe to connect into.



Step 3 Selecting the House Lot Frontage

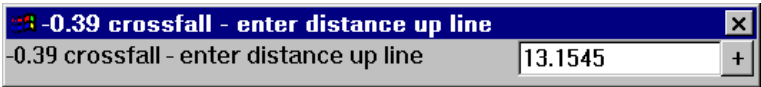
Next the user indicates the two frontage points for the house block.



Step 4 Positioning the House Connection on the Sewer Pipe

From the two frontage points and the default drainage tin, the program calculates the crossfall for the block frontage.

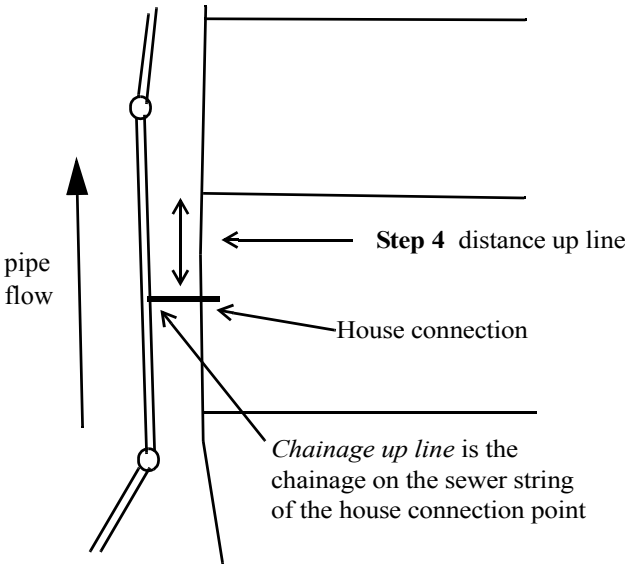
The crossfall is displayed in the name of the enter distance up line typed-input box which is now placed on the screen. The distance up line is the distance along the frontage that the house connection will be placed.



Depending on the crossfall, a default value for the distance up line is displayed. If the ground crossfall is greater than 1% the lot mid point is the suggested connection location. For crossfalls less than 1%, the connection is located 3m off the *lowest* lot boundary.

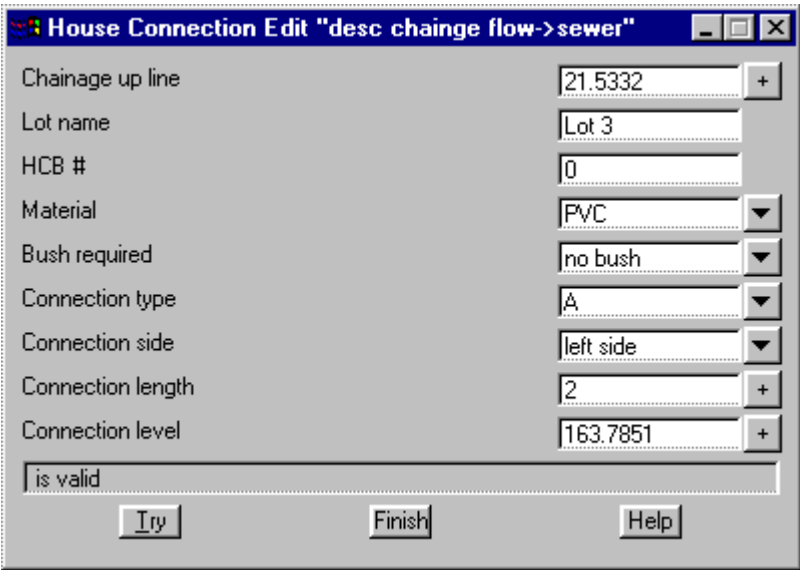
A pop-up also exists for placing the connection point at the distance 2.0, 3.0, 5.0 along the frontage, the mid point of the frontage, and the distances 2.0, 3.0 and 5.0 from the other end of the frontage.

The distance up line value is entered into the typed-input box, terminated with <enter>. The typed-input box is then removed from the screen.



Step 5 Defining the House Connection Type

Next the **House Connection Edit** panel is placed on the screen.



Most of the values in the field come from the drainage house connection defaults.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Chainage up line <i>the chainage on the sewer string where the house connection is attached to the sewer line.</i>	input/output	chainage of connection	
Lot name <i>name of the house block</i>	input	from drainage defaults	
HCB # <i>a user supplied house connection branch (HCB) number</i>	input		
Material <i>the material used for the house connection.</i>	input	from drainage defaults	PVC, PVC X/HEAVY, VC
Bush required <i>the type of bush used</i>	input	no bush	no bush, PVC to VC
Connection type <i>the type of connection used. Go to the section House Connection Types for a description of each connection type</i>	input	from drainage defaults	A, A Special, B, C, OB, Special jump up
Connection side <i>the side of the line to make the connection</i>	input	right side	right side, left side
Connection length <i>length of pipe for the house connection</i>	input	from drainage defaults	
Connection level <i>height of the house connection. When this is first displayed, it is calculated using the invert level of the sewer pipe where the house connection is attached, the house connection type and connection length (if required by the house connection type), the default house connection grade, the default house connection cover and the surface level at the end of the house connection.</i>	input	calculated	
Try <i>using the parameters in the panel fields, create the house connection. Also calculate a section along the house connection and draw it in the drainage default section view.</i>	button		
Finish <i>end the option, remove the panel.</i>	button		

Step 5 Continued

After entering the appropriate values in the **House Connection Edit** panel and then selecting the **Try** button, the house connection will created.

To help check the house connection parameters, a section along the house connection will automatically be calculated and displayed in the section view given in the drainage defaults panel. Any tins or models on the section view will be included in the section.

Step 6 Modifying the Connection

If any of the fields in the **House Connection Edit** panel are changed, selecting the **Try** button will modify the house connection and redraw the section in the default drainage section view.

Editing A House Connection

To edit an existing house connection, the **Edit** button is selected from the **House Connections** menu and then the appropriate house connection selected.

The **House Connection Edit** panel will then be placed on the screen with the details of the selected house connection.

If any of the fields in the **House Connection Edit** panel are changed, the **Try** is used button to modify the house connection and redraw the section in the default drainage section view.

Delete

The **Delete** option is used to delete a connection.

After selecting the option, the mouse is used to pick the house connection to be deleted.

Once a house connection has been selected and accepted, it is deleted and removed from the screen.

The **Delete** option is terminated by selecting **Cancel** from the **Pick Ops** menu, by selecting a new option from the **Drainage Edit** menu.

Delete all

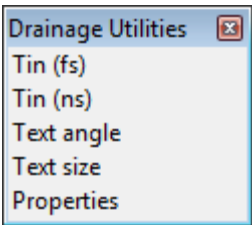
The **Delete all** option is used to delete all connections.

After selecting the option, all the connections are deleted and the option terminates.

Utilities

The options in the **Utilities** menu are used to modify default drainage tin, the name, colour, style and start chainage of the drainage string, and the size, angle, and offsets used when displaying the text for the names of all the manholes.

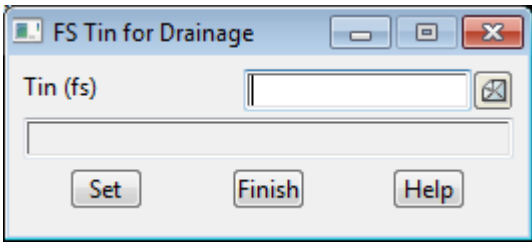
The **Drainage Utilities** walk-right menu is



Tin (fs)

The **Tin (fs)** option changes the default finished surface tin (tin (fs)) for the drainage string.

After selecting the option, the **FS Tin for Drainage** panel is displayed.

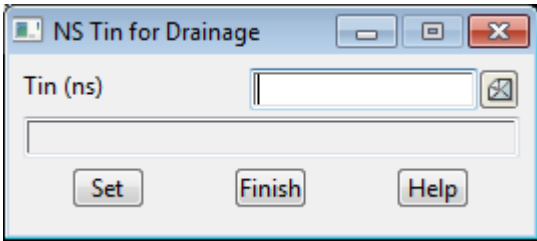


The existing default tin is displayed in the tin panel field. If a new tin is required, simply enter the new tin name into the tin (fs) field and select the **Set** button.

Tin (ns)

The **Tin (ns)** option changes the default natural surface tin (tin (ns)) for the drainage string.

After selecting the option, the **NS Tin for Drainage** panel is displayed.



The existing default tin is displayed in the tin (ns) panel field. If a new tin is required, simply enter the new tin name into the tin field and select the **Set** button.

Angle

The **Angle** option changes the angle of the text for manhole labels.

After selecting the option, an enter angle typed-input box is displayed on the screen containing the current text angle.

The new angle is entered into the typed-input box, terminated with <enter>. The typed-input box then disappears.

The **Angle** option then terminates.

Size

The **Size** option is used to change the size of the text for manhole labels.

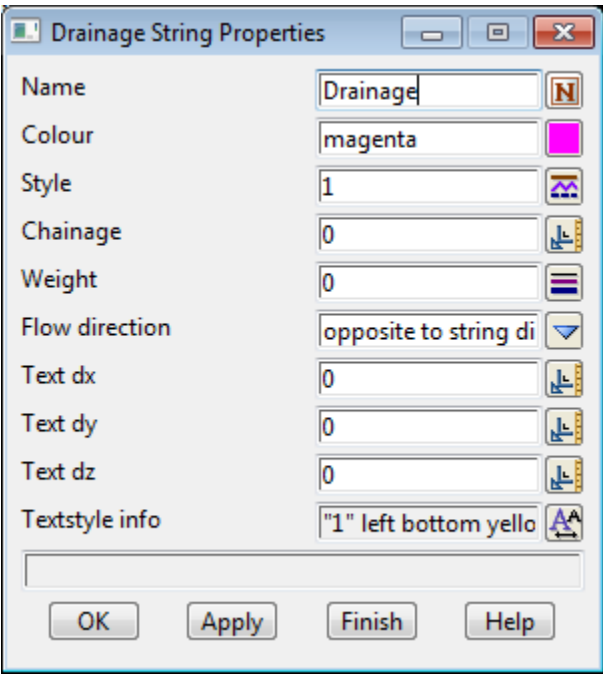
After selecting the option, an enter value typed-input box is displayed on the screen containing the current text size.

The new size is entered into the typed-input box, terminated with <enter>. The typed-input box then disappears.

The **Size** option then terminates.

Properties

The **Properties** option brings up the **Drainage String Properties** panel for the current drainage string.



Any of the data in the panel fields can be modified and then set for the drainage string by selecting the **OK** or **Apply** button.

Z Float

The status of **Z Float** is used each time a new manhole is created.

If **Z Float** is set to tick, then the top of the manhole is set to z float which means that automatically sits on the default drainage tin.

If **Z Float** is not set to tick, then the top of the manhole is given a set z value when it is created.

The z float status of the manhole can be changed after it has been created by using the **Drainage Edit=>Manhole=>Z Float** option.

Utility String Editor

Position of option on menu: **Design =>Drainage-Sewer =>Utility String Editor**

This editor is used to edit properties of the strings used by the DNE. Properties always change at an existing vertex.

Cross Section Strings (Manning’s n) - set the left and right bank n values. the centre n value is assigned by the DNE.

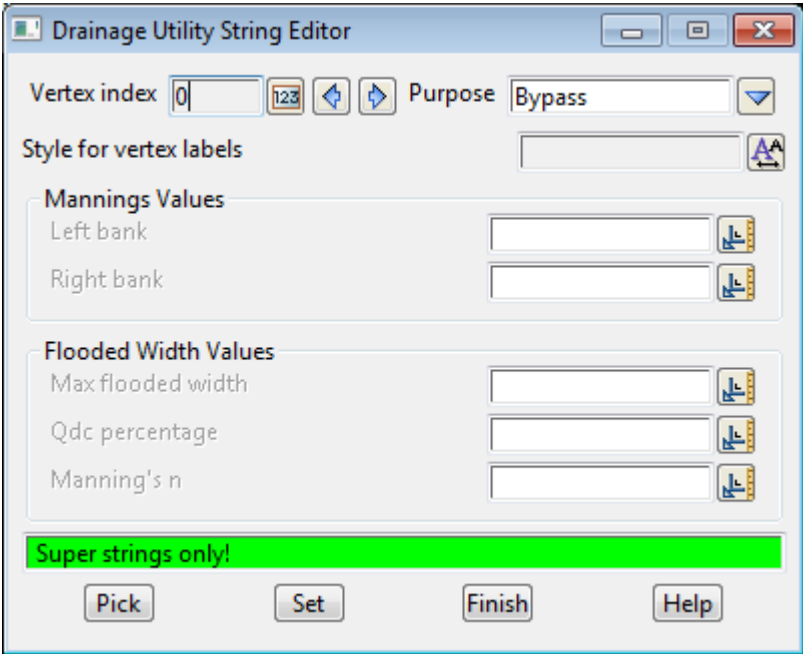
Flooded Width Values on Bypass Flow Strings - the default setting of the bypass flow strings when used to calculate flooded widths in the Drainage Analysis.Changes are in effect until the end of the string or it has been re specified at vertex at a higher chainage.

Vertex labels are created whenever properties are set (Textstyle is required).

Usage

First the string is selected at the vertex where the values are to be assigned. Next select the purpose of the string (cross section or bypass) to unlock the appropriate fields. A textstyle favourite is required as the vertex is labelled with the assigned values. Enter the values into the fields and then select Set to set the values as vertex attributes and create the label as a vertex annotation.

On selecting the Utility String Editor option, the **Drainage Utility String Editor** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Vertex index	vertex	selected vertex	
<i>Once the string is selected use this to move between vertices</i>			
Style for Vertex Labels	textstyle favourite	textstyles	
<i>A label is created on the vertex using this textstyle favourite</i>			
Left bank	Input		
<i>mannings n value, to delete clear and select set</i>			
Right bank	Input		
<i>mannings n value, to delete clear and select set</i>			

Max Flooded with Input

This changes the threshold where warning bars are created during flooded width calculations. It remains in effect till the next change or the end of the bypass flow string.

Qdc percentage Input

This changes the percentage of the $Q_{direct} + Q_{catchment}$ that is used to interpolate the discharges during flooded width calculations. It is generally set on the first vertex past upstream pit and remains in effect till the next change or the end of the bypass flow string. The flow changes from the bypass flow at the upstream pit to this value/100($Q_{direct} + Q_{catchment}$).*

Manning's n Input

This changes the Manning's n value used for during flooded width calculations. It remains in effect till the next change or the end of the bypass flow string.

Pick button

Use this button to select the string. Select near the vertex you want assign the values to.

Set button

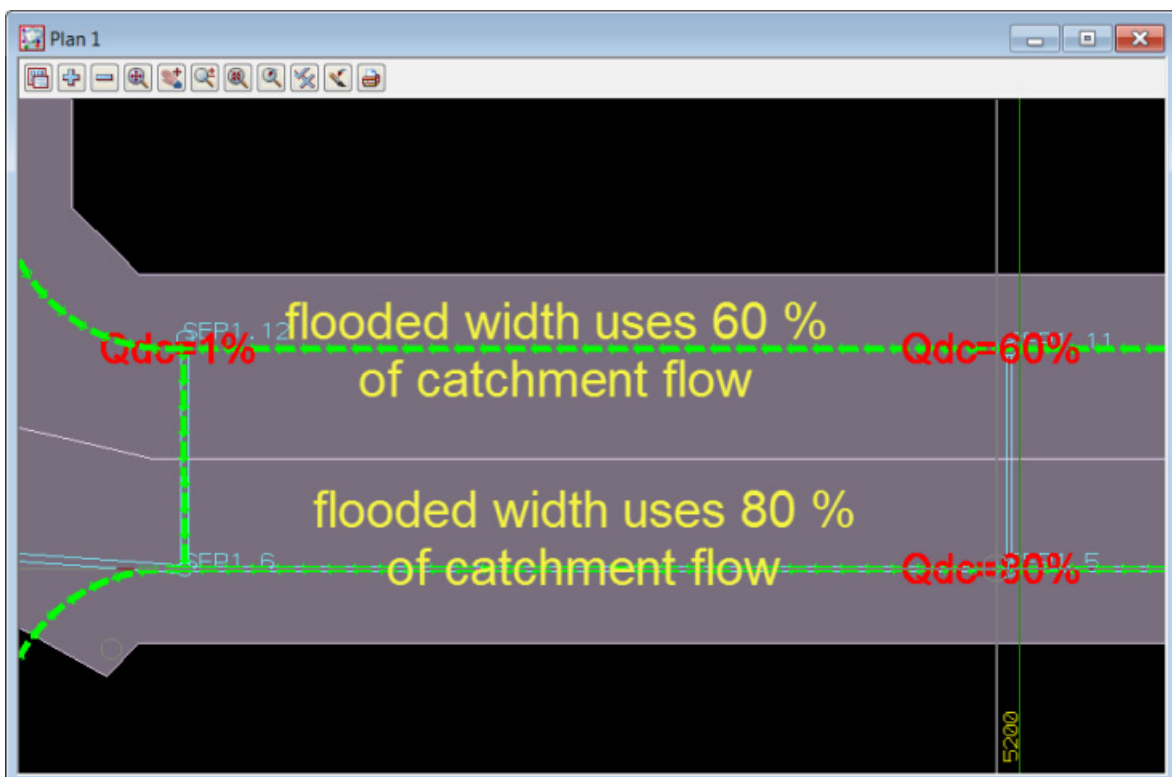
Creates the attributes and the label on the vertex.

Finish button

Removes the panel from the screen.

Help button

Launches the 12d help



In the example above, The Qdc is set to 80% at the eastern end of the catchment. The Qdc is set to 2% for the water overtopping the road. The 18% of the area is not considered large enough to do the flooded width calculation for. If desired, another bypass flow string approaching from the east could be drawn but the final bypass string to the west (direction during bypass should

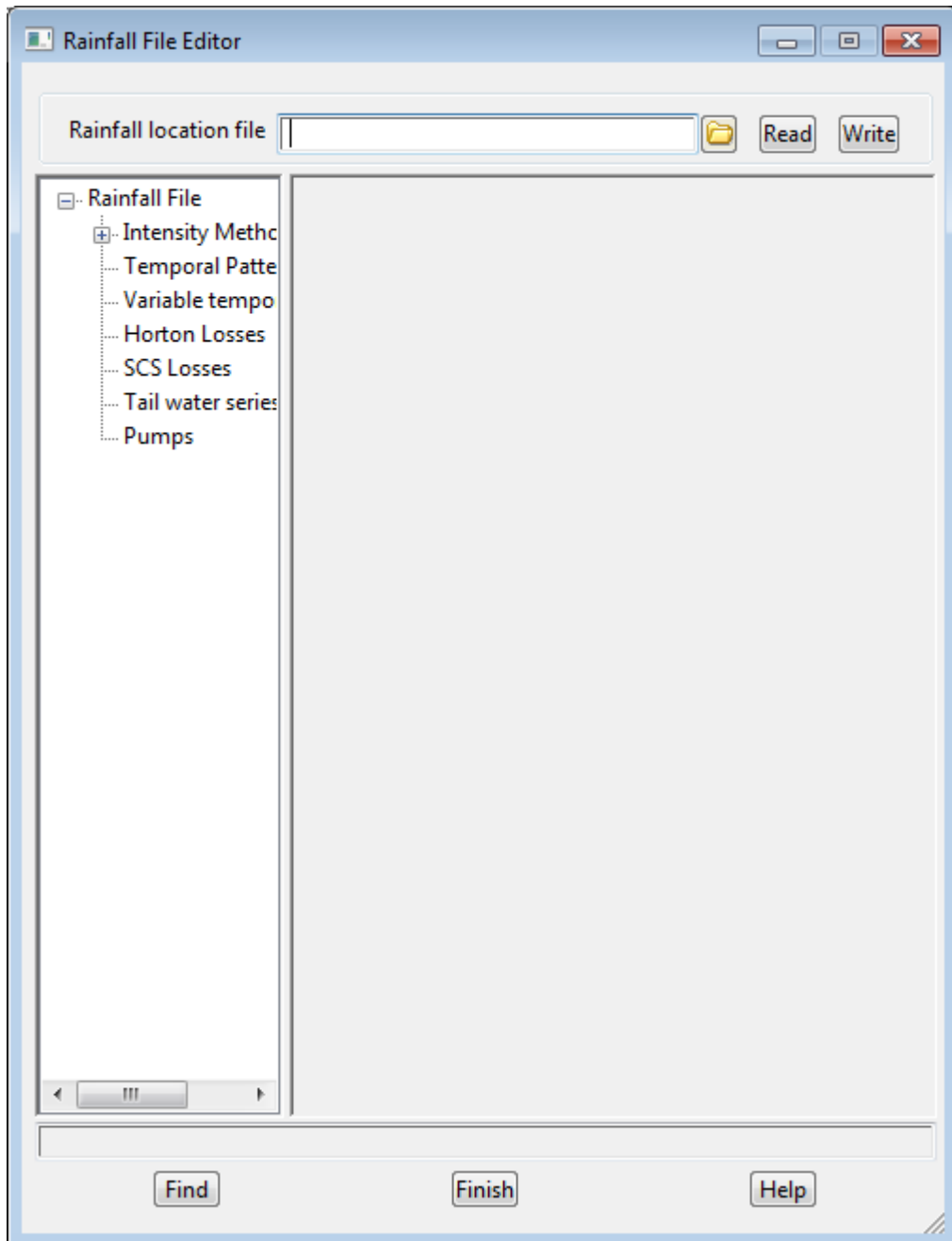
remain).

Rainfall File ppf Editor

Position of option on menu: **Design =>Drainage-Sewer =>Rainfall editor**

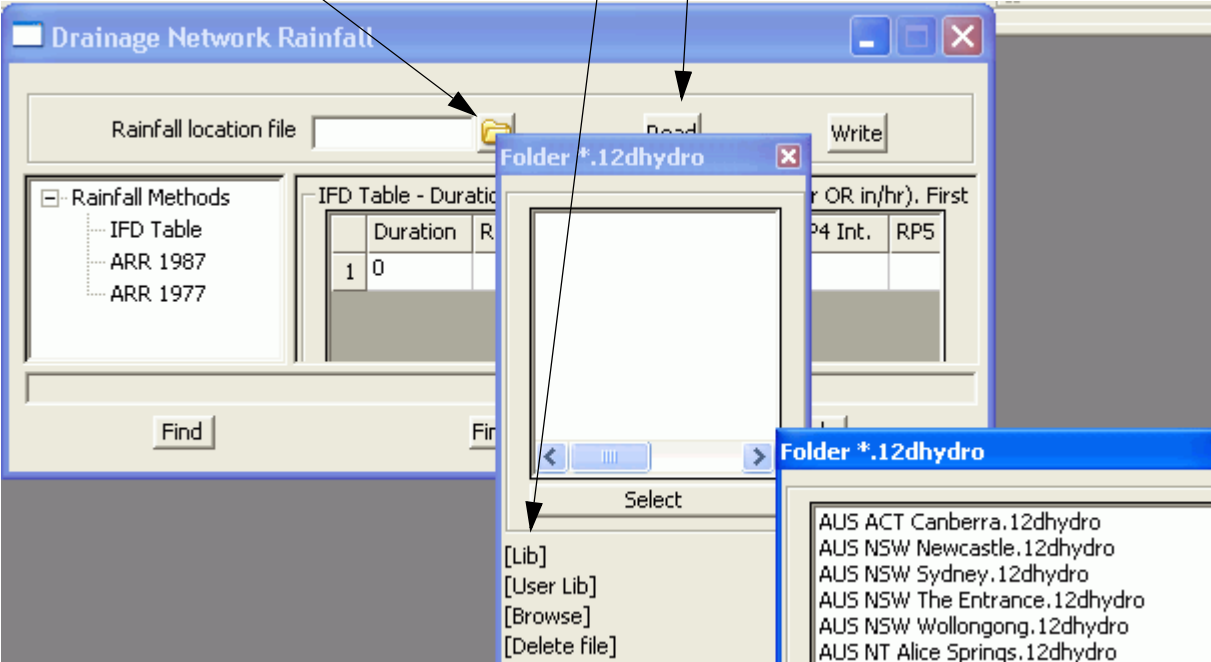
The rainfall file editor

On selecting the **Rainfall editor** option, the **Rainfall File Editor** panel is displayed.



Data is entered using one (or more if desired) input methods and then saved by entering a **Meteorology file** name and selecting **Write**. The standard 12d system file search paths are used (project folder, user library folder and then library folder).

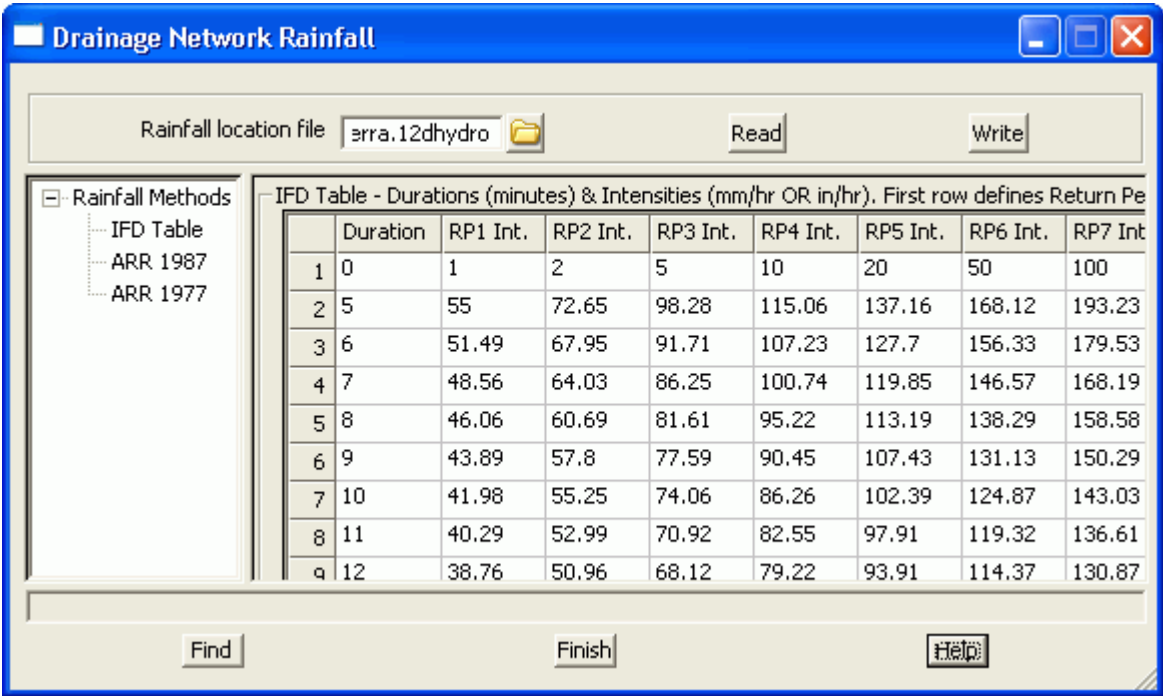
Select the folder icon and then walk right on the **Lib** item to display a list of sample files. Select a file the select **Read**. **YOU MUST SELECT THE READ BUTTON!**



IFD Tables

IFD tables are often available from meteorological services. The table input format follows. The first row is used to define up to 9 return periods and the following rows list the rainfall intensities for the duration entered in the first column.

Hint: to increase the size of the grid control select another method, ARR 1987 for example, and then select IFD table again.



Australian Rainfall and Runoff 1987 Method

The rainfall intensities and other factors from Volume 2 of ARR 1987 are entered in this table.

Drainage Network Rainfall

Rainfall location file

arra.12dhydro

Read

Write

Rainfall Methods

IFD Table

ARR 1987

ARR 1977

ARR 1987

Intensities (mm/hr)

2yr - 1hr [Map 1]

22

2yr - 12hr [Map 2]

4.3

2yr - 72hr [Map 3]

1.14

50yr - 1hr [Map 4]

43

50yr - 12hr [Map 5]

8

50yr - 72hr [Map 6]

2.25

Other factors

Skewness G [Map 7]

0.24

Geographical factor F2 [Map 8]

4.28

Geographical factor F50 [Map 9]

15.5

Lat of location (deg S)

35°18'

Long of location (deg E)

149°06'

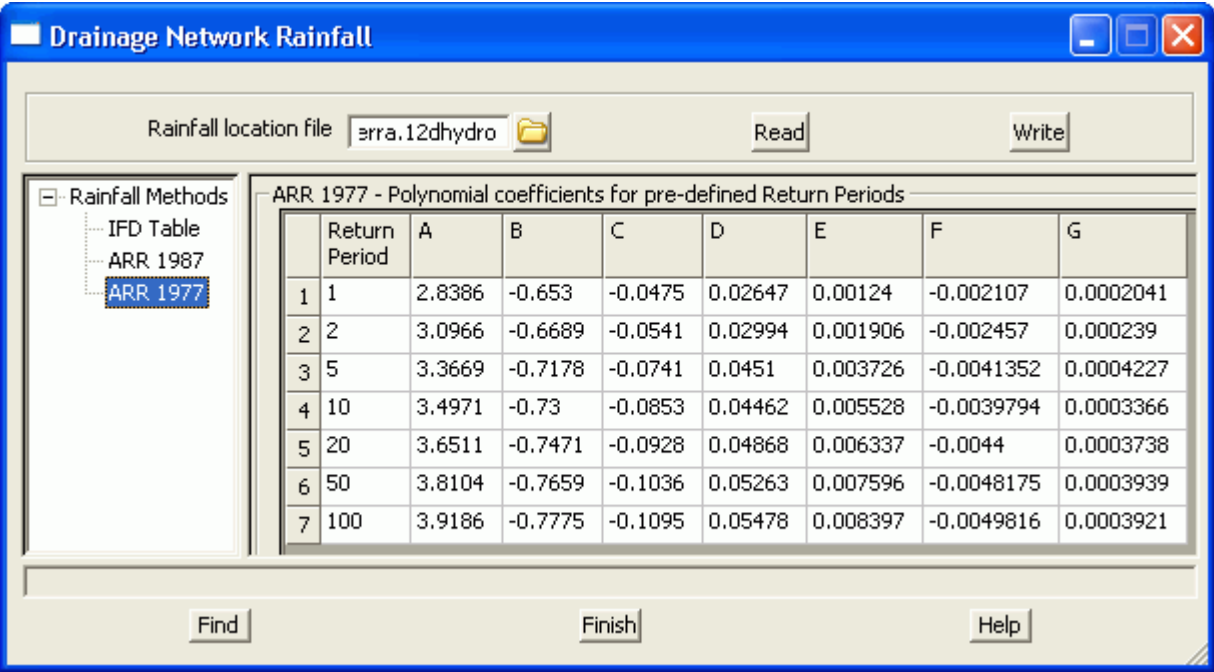
Find

Finish

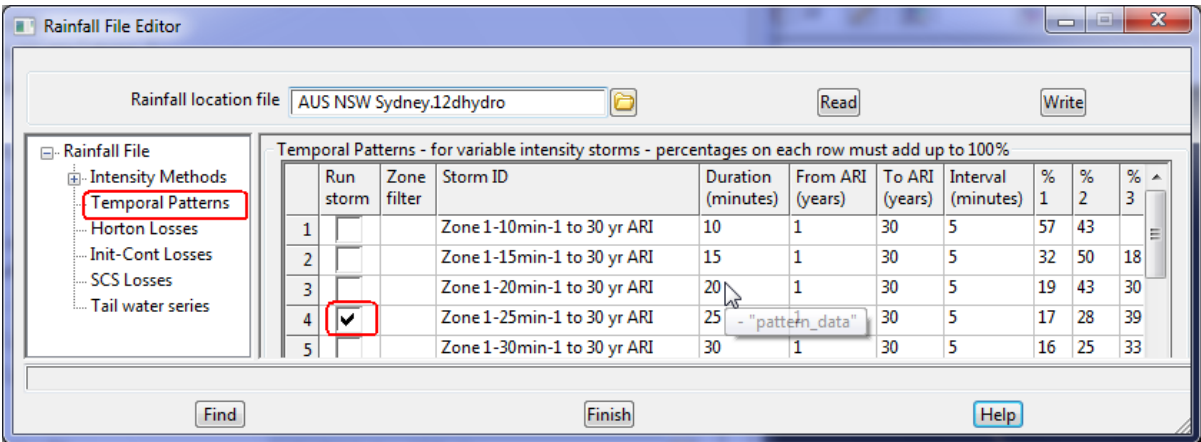
Help

Australian Rainfall and Runoff 1977 Method

The seven coefficients for each return period from ARR 1977 are entered in this table.



Rainfall Temporal Patterns



Temporal patterns are referred to as storms in dynamic drainage. Several example hydro files are included in the 12d library. These examples have the temporal patterns for the minor and major storms in the 8 zones of Australia.

Temporal patterns are not required for the SCS NZ method as the standard 24 hour temporal pattern from TP108 is built into the 12d analysis engine.

The **Run storm**, **Zone filter**, **From ARI** and **To ARI** columns are used determine which storms are analysed (run). The **Run storm** column must be checked for that temporal pattern to be analysed. Many storms may be selected.

The **Zone filter** is optional. Entering a value here will allow the selected storms to be further filtered. A **Zone filter** field (accepts wild card characters) is found on the DNE Global tab that is used to determine which of the selected storms (paragraph above) are analysed.

The **ARI** field on the Run panel is used with the **From ARI** and **To ARI** columns. The value on the run panel must be within the From-To range for the storm to be analysed.

The **Duration** column determines the total length of the storm. This value divided by the **Interval** must be a whole number and this number determines the number of % values to be entered to the right of the **Interval column**. The total of the percentage must equal 100.

Horton Losses

The pervious portion of the catchments used in the **ILSAX 2** analysis will have a loss type defined describing the soil type. The loss type is defined in the DNE Default->catchment and catchment tabs.

Rainfall File Editor

Rainfall location file: AUS NSW Sydney.12dhydro

Read Write

Rainfall File

- Intensity Methods
- Temporal Patterns
- Horton Losses**
- Init-Cont Losses
- SCS Losses
- Tail water series

Horton Losses Data

Name	Number	Initial Loss mm/hr(inch/hr)	Final Loss mm/hr(inch/hr)	Decay Rate	AMC 1 (mm)	AMC 2 (mm)	AMC 3 (mm)	AMC 4 (mm)
1 A-High infil-Sand gravel	1	250	25	2	0	50	100	150
2 B-Mod well drained	2	200	13	2	0	38	75	100
3 C-Slow infiltration	3	125	6	2	0	25	50	75
4 D-Very slow-clays	4	75	3	2	0	18	38	50
5 Mod to slow	2.5							
6 Slow to very slow	3.5							

Find Finish Help

These soil types use the classifications of Terstriep and Stall (1974), based on the system developed by the U.S. Department of Agriculture. The default values entered from the library represent the soil types of

- 1.Type A - low runoff potential, high infiltration rates (consists of sand and gravel)
- 2.Type B - moderate infiltration rates and moderately well-drained
- 3.Type C - slow infiltration rates (may have layers that impede downward movement of water)
- 4.Type D - high runoff potential, very slow infiltration rates (consists of clays with a permanent high water table and a high swelling potential)

Numbers are assigned to each soil type to allow interpolation between the defined soil types. When interpolated values are used they must be included in the list (2.5 and 3.5 for example). Interpolated values do not need loss data entered. If loss data is entered for the interpolated names then this data will be used rather than an interpolation occurring. If any loss data is entered then all of the values must be entered.

Four preset AMC points are defined in the rainfall file to mark AMC conditions ranging from dry (AMC1) to saturated (AMC4). The required data for each line is the **Initial loss rate**, **Final loss rate**, **decay rate** and 4 antecedent moisture conditions (**AMCs**). The AMC values are entered in depth of rainfall (mm) they represent the total rainfall prior to the start of the temporal pattern.

The AMC point numbers are set once for all catchments on the DNE Global tab. Value between 1 and 4 (decimal value are permitted) are entered for the minor and major events.

SCS NZ Losses (Initial Abstraction and Curve Numbers)

The SCS NZ method uses Initial abstraction (Ia) and the curve number (CN) to determine the losses for the catchments. Names are given to the SCS curve numbers in the rainfall file. These names and Ia (entered as storage values) and selected in the DNE catchment data.

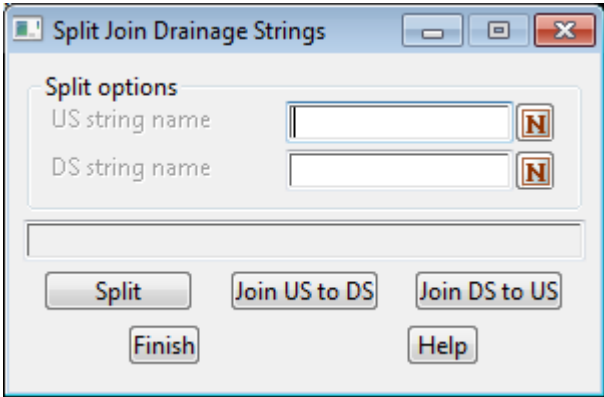
A curve number of 0 results in zero runoff while a CN=100 results in 100% runoff. TP 108 recommends the selection of the curve number by identifying 1) the soil type and 2) the land use. A CN=98 an Ia=0 are recommended for impervious areas.

String split/join

Position of option on menu: **Design =>Drainage-Sewer =>String split/join**

This option must be used on drainage strings instead of the standard split or join commands.

On selecting the **String split/join** option, the **String split/join** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
US string name	input		
<i>The upstream section of the split string is assigned this name.</i>			
DS string name	input		
<i>The downstream section of the split string is assigned this name.</i>			
Split	button		
<i>The split may only occur at a manhole. The upstream and downstream sections are renamed if names are provided above.</i>			
Join US to DS	button		
<i>The upstream segment must be selected first and then the downstream. The properties from the upstream string are used for the new string created. If there is a gap in between the joined strings, a pipe will be inserted with the default pipe properties. The attributes of the upstream pit on the downstream string will be discarded.</i>			
Join DS to US	button		
<i>The downstream segment must be selected first and then the upstream. The properties from the downstream string are used for the new string created. If there is a gap in between the joined strings, a pipe will be inserted with the default pipe properties. The attributes of the downstream pit on the upstream string will be discarded.</i>			
Finish	button		
<i>remove the panel from the screen</i>			
Help	button		
<i>displayed the help for this panel</i>			

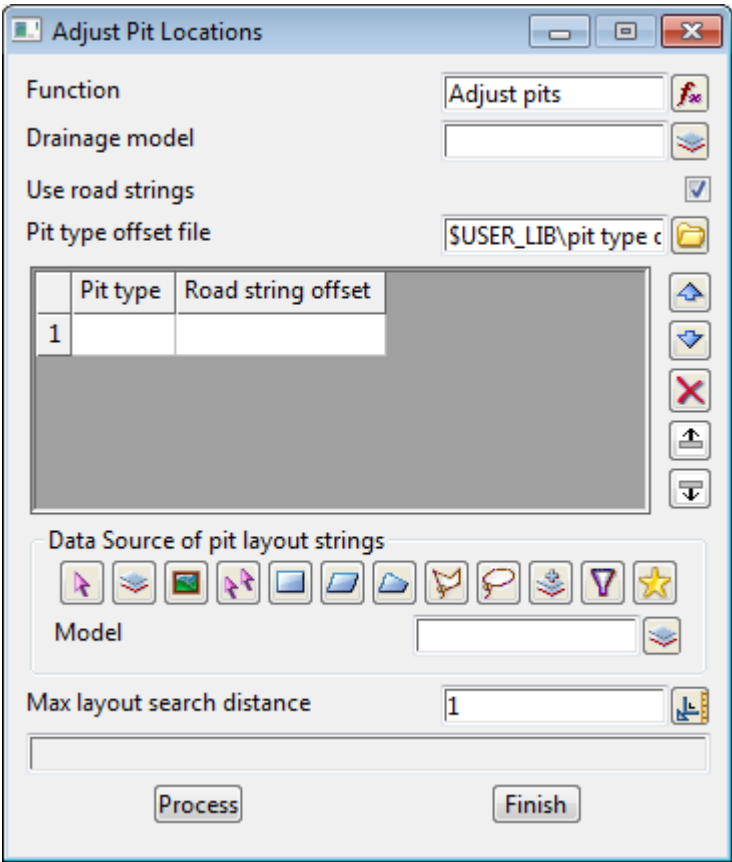
Adjust Pit Locations

Position of option on menu: Design =>Drainage-Sewer =>Adjust Pit Locations

Key Points

- 1. Pits are moved perpendicular to the road string.
- 2. The string to be moved to must be closer than the **search distance** or it will not be moved.

On selecting the **Adjust pit locations** option, the **Adjust Pit Locations** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Function	function		
<i>This function will re adjust the drainage pits</i>			

Drainage model	model		
<i>The drainage model to have the pits moved.</i>			

Use road strings	tick		
<i>When selected, a DNE road string is checked for each pit. When found, the pit will be moved perpendicular to this string at the Road string offset distance. If the road string is not found, the layout string will be searched for using the Max layout search distance. If not selected the only the layout strings with an offset of zero will be used.</i>			

Pit type offset file	file		
<i>The grid data below is stored in this file when the Process button is selected.</i>			

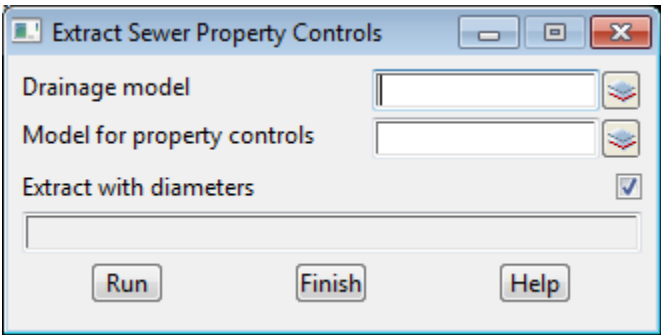
Pit type	input	
<i>Only used when Use road strings is selected. Each pit scans for its pit type in the Pit type column. When found, the pit is placed at the Road string offset distance from the road string.</i>		
Road string offset	input	
<i>Only used when Use road strings is selected. The pit is placed at the Road string offset distance from the road string. Positive is away from the road centreline and negative is towards the centreline. When no Road string offset is set via the pit type, the offset value is zero.</i>		
Data Source of Pit Layout Strings	source model	
<i>Used when Use road strings is NOT selected or when no road string is found. As road strings are often in several models, so the filter option is usually the best. Select a view with the road string models and then use the string info tab and name field (* wild card can be used) to select the strings to move to.</i>		
Max Layout Search Distance	real	1.0
<i>Only used for layout strings. Road strings do not have a search distance. If the closest string in the pit layout strings is farther than this distance the pit will not be moved.</i>		
Run	button	
<i>This moves the pits horizontally. Undo is available</i>		
Finish	button	
<i>Removes the panel from the screen.</i>		

Extract Sewer Property Controls

Position of option on menu: **Design =>Drainage-Sewer =>Extract Sewer Property Controls**

The sewer property control strings are a sub string of the drainage string and therefore may only be profiled using a right mouse click of the profile button. To include these control strings on plots or export to other packages they need to be converted to super strings.

On selecting the **Extract Sewer Property Controls** option, the **Extract Sewer Property Controls** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Drainage model	mode box		
<i>All drainage strings in this model will have their property controls strings duplicated as super strings.</i>			
Model for property controls	model box		

The super strings for the property controls are placed in this model.

Extract with diameters tick box on

The super strings will have the constant pipe dimension set to the control diameter.

Run button

Create the super strings representing the property controls.

Finish button

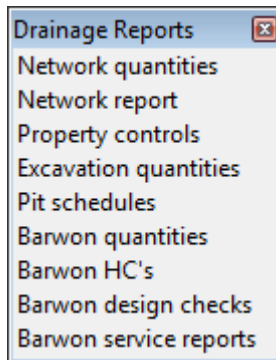
remove the panel from the screen

Reports

Position of menu: Design =>Drainage-Sewer=>Reports

Reports menu contains an option to report on the property controls for the drainage strings and an option produce network quantities.

The Reports walk-right menu is



For the option *Network quantities*, please continue to the section [Network Quantities](#).

Network report, please continue to the section [Network Report](#).

Property control, please continue to the section [Property Controls](#).

Excavation quantities, please continue to the section [Excavation Quantities](#).

Pit schedules, please continue to the section [Pit Schedules](#).

Barwon quantities, please continue to the section [Barwon Quantities](#).

Barwon HC's, please continue to the section [Barwon House Connections](#).

Barwon design checks, please continue to the section [Barwon Design Checks](#).

Barwon services reports, please continue to the section [Barwon Services Report](#)

Network Quantities

The **Network quantities** report contains information about the manholes and pipes that make up the selected drainage strings. Configuration files allow the user to specify the depth ranges and sizes of pipes to report on

On selecting **Network quantities**, the **drainage quantities** panel is displayed.

Drainage Network Quantities

Position of option on menu: **Design => Drainage => Reports=> Network Quantities**
This option creates quantity tables for manholes, pipes and house connections.
The manholes/pipes/house connections are summarised by user defined depths and types.

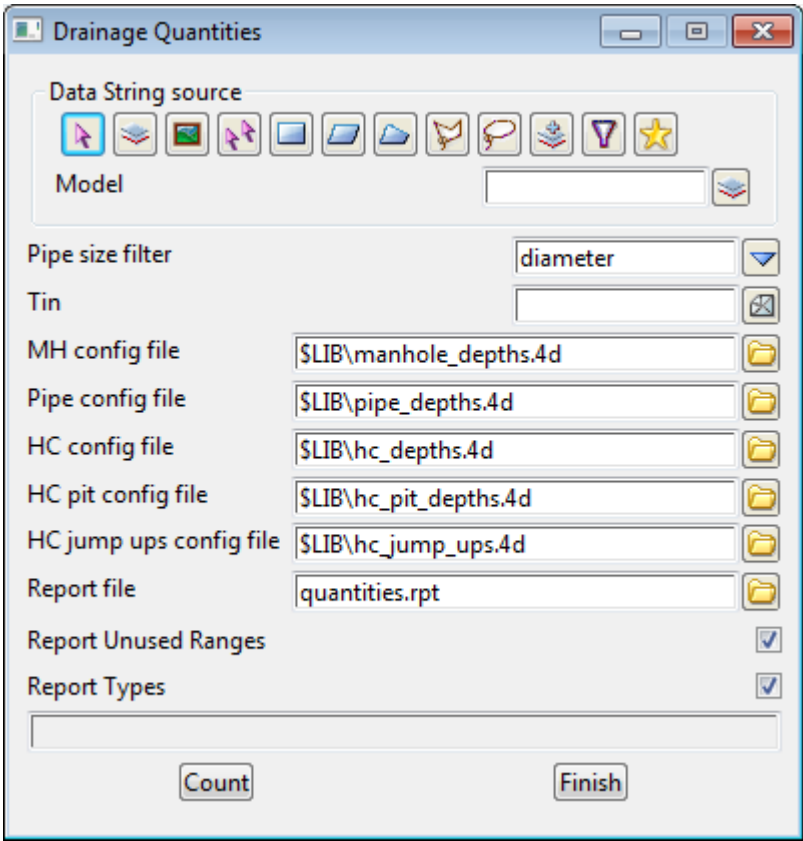
See Also

[Drainage overview](#)

Key points

- 1. Items are counted/totalled by depth and optionally type.
- 2. The routine will not "double count" items even if the ranges overlap.
- 3. Types are case sensitive, types with spaces in the name must be enclosed in quotes and the wild card * may be used.
- 4. Use vertically offset tins and "banded" depth ranges to get quantities under roads, foot paths etc. This is discussed later in detail.
- 5. Erase count file fields if the items are not to be counted.

On selecting the **Network quantities** option, the **Drainage quantities** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data String Source	Choice
---------------------------	--------

usually the entire model is selected but view is also available for combining models

Pipe size filter	Choice	diameter or pipe size attribute
<i>The second item in a count line is used to filter by diameter (in meters/ft) or the pipe size attribute. The diameter can only be used when no box culverts or trapezoidal channels are used. The pipe size attribute is the label generally used in the plan plots. This is the pipe size in mm/inches (375), for box culverts width x height (750x375) and for trapezoidal channels TopwidthBottomwidthxHeight (T5000B1000x500).</i>		
Tin	tin box	
<i>This tin will be used for the pipe and pit depths.</i>		
MH config file	file box	
<i>This file specifies the types and depth ranges for the pits. Details of this file are contained below.</i>		
Pipe config file	file box	
<i>This file specifies the types and depth ranges for the pipes. Details of this file are contained below.</i>		
HC config file	file box	
<i>This file specifies the types and depth ranges for the house connections. Details of this file are contained below.</i>		
HC pit config file	file box	
<i>This file specifies the types and depth ranges for the HC pits. Details of this file are contained below.</i>		
HC jump ups file	file box	
<i>This file specifies the types and depth ranges for the house connections jump ups. Details of this file are contained below.</i>		
Report file	file box	
<i>a sample report file is given below.</i>		
Report unused ranges	tick box	
<i>the depth ranges for the pit/pipe/house connections are defined in the *.4d files. Selecting this option will cause the depth ranges in the file to be printed even if there are no pit/pipe/house connections in these depth ranges (zero quantity values will be shown).</i>		
Report types	tick box	
<i>Selecting this option will cause the pit/pipe/house connection types used in the model types to be listed (even if quantities are not requested in the *.4d files). Since this is a complete of the type used in the model, the list informs the user what types have not been included in the quantity calculation.</i>		
Count	button	
<i>executes the option.</i>		
Finish	button	
<i>removes the dialogue from the screen</i>		

The *.4d files listed above are contained in the 12d **library** directory. Each line is the file performs a count (count lines). No items are counted twice. Therefore, if an item is counted its type and then a count line is found the wild card is used for the type, the type already counted will not be included in the count.

The format for a count line is three or four values (space delimited) per line. Size is optional.

```
<type (from drainage.4d)> <size> <starting depth> <ending depth>
```

Notes:

All **types** with spaces in the name must be enclosed in quotes The wild card * may be used.

The **size** is optional and if omitted the all sizes will be counted in this group (do not use the * for a wild card).

The **starting depth** and **ending depth** are required for all count lines.

Quantities Under Roads and Footpaths

By creating super tins with vertically offset sections, quantities under roads, footpaths etc. can be determined. for example.

Offset your road design tin up by 1000m (**Tins->Utility->Translate/Copy**) and then use the depth range 1000-1999 for pipes under roads.

Create a tin from the footpaths only, null by angle length with a small length to remove the road and then offset it vertically by 2000m. the depth range 2000-2999 is not the quantities under the footpath.

Sample count lines

```
// sum concrete cover manholes is various ranges

"CONC COVER" 0.0 1.6
"CONC COVER" 1.5 3.0
"CONC COVER" 3.0 999.9 // this is expected to be zero
"CONC COVER" -999.0 0.0 // trap errors

// any that are not Concrete cover will be counted here

* 0.0 1.6
* 1.6 3.0
* 3.0 999.9
```

Manhole Quantities
=====

CONC COVER	0.00	1.60	13	16.506
CONC COVER	1.60	3.00	1	1.510
CONC COVER	3.00	999.9	0	0.000
CONC COVER	-999.0	0.0	0	0.000
*	0.00	1.60	0	0.000
*	1.60	3.00	0	0.000
*	3.00	999.9	0	0.000

total length = 18.016

Types Used

CONC COVER

Diameters Used

1.100

Since the **Report unused ranges** tick box was selected, these lines were printed even though there were no pits in the data ranges.

This data results from selecting the **Report types** tick box.

Sample count lines for pipes follow.

```
// sum class 2 pipes by diameter and for various ranges

// count 375

2 0.375 0.0 2.0
2 0.375 2.0 5.0
2 0.375 5.0 999.

// count 450

2 0.450 0.0 2.0
2 0.450 2.0 5.0
2 0.450 5.0 999.

// count 525

2 0.525 0.0 2.0
2 0.525 2.0 5.0
2 0.525 5.0 999.

// count pipe sizes that were missed

2 * 0.0 2.0
2 * 2.0 5.0
2 * 5.0 999.

// count all other missed pipes

* 0.0 999.
```

Network Report

After selecting the **Network report** option, the **Report on Selected Items** panel is displayed.

This is the same as the option **Reports =>Co-ord/ Brd-dst** on the main menu.

For the given model, it prints out the string information for each string in the model.

If a sewer network model is given, each sewer string in the network model is reported on.

For further information, go to [Coordinates or Bearing-Distance Report](#).

Excavation Quantities

Position of option on menu: **Design =>Drainage-Sewer =>Reports=>Excavation quantities**

This routine uses 12d templates to calculate the excavation volume for all of the drainage strings in a model. An option to create section for a tin on top of the pipe is also available so that the drainage long sections can include hatching between the obvert of the pipe and the design tin under roads. Templates with names set to the pipe diameters (times 1000) are used for the calculations, thus trench shapes can be customised and over excavation for bedding materials can be included. Net area calculations to exclude pipe area are not supported.

Key points

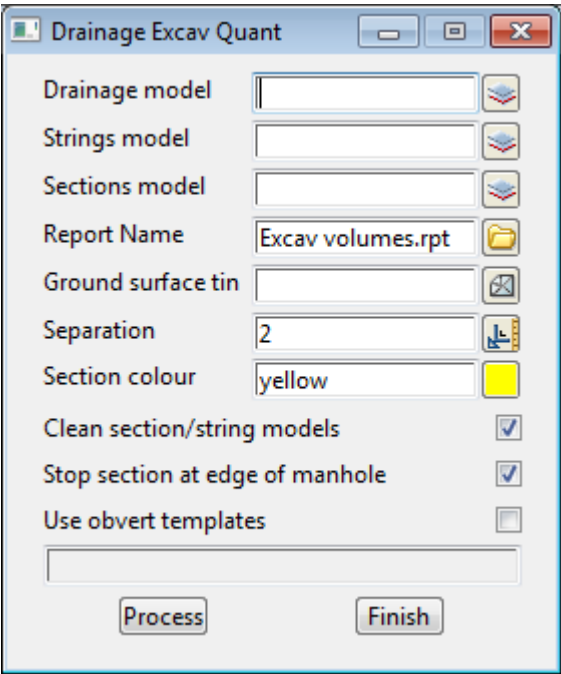
- 1. One template for each pipe size (mm)
- 2. If obvert templates are used, add the prefix “obvert “ to the pipe size
- 3. Carefully consider the tin selected.

A template must exist for each pipe size in the model (pipe size x 1000). For example a 0.3m pipe will require a template to exist named 300. A 0.5ft pipe would require a template named 500. A sample template library is included in the 12d library in the file **pipe_template.tpl**. The templates are run along the strings and the total volumes are reported. Volumes for each strings are given in the report file.

If a tin is created from these strings then volumes by depth can be determined using

Design=>Volumes=>Exact=>Tin to tin

On selecting the **Excavation quantities** option, the **Drainage Excavation Quantities** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Drainage model	input box		
<i>Model to contain all of the pit and pipe network to be worked on.</i>			
Strings model	model box		
<i>Strings generated from the templates will be stored in this model</i>			

- Sections model

model box

Sections generated from the templates will be stored in this model
- Report name

input box

cut and fill volumes will ne sent to this report
- Ground Surface Tin

tin box

tins from which the volumes will be calculated
- Separation

real box

distance between the sections
- Sections colour

colour box

Sections generated from the templates will be assigned this colour (strings colours are defined in the templates)
- Clean section/strings model

tick box

Delete the strings in these models before processing.
- Stop section at edge of pit

tick box

Template are run from pit centre to centre if this is not selected. The templates stop at the edge of the pit if selected. This is often selected with the following option **Use obvert templates**.
- Use obvert templates

tick box

Templates must be named with the prefix “obvert”. i.e. **obvert 300**. The template is still run along the invert of the pipe but the user now has a section “set” of templates that can be used to create a tin on top of the pipe as well as below.

An example report file follows.

```
----- BEGIN APPLY TEMPLATE REPORT -----

apply template to string report -

string      E
tin         design
separation  10.000
left template 375
right template 375
cut volumes and areas are negative
fill volumes and areas are positive

chainage- -----sectional  information-----  -----intermediate  information----  -----accumulative
information-----
-----cut area --fill area -----cut vol ---fill vol  -cut volume-- -fill volume- -
--balance---
```

0.000	-1.434	0.000			0.000	0.000	0.000
0.550	-1.367	0.000	-0.771	0.000	-0.771	0.000	-0.771
10.000	-1.642	0.000	-14.222	0.000	-14.992	0.000	-14.992
20.000	-1.416	0.000	-15.293	0.000	-30.286	0.000	-30.286
21.313	-1.393	0.000	-1.845	0.000	-32.130	0.000	-32.130
21.863	-1.493	0.000	-0.794	0.000	-32.924	0.000	-32.924
total cut		-32.924					
total fill		0.000					
balance		-32.924					
ie excess of cut over fill		32.924					

Pit Schedules

See Also

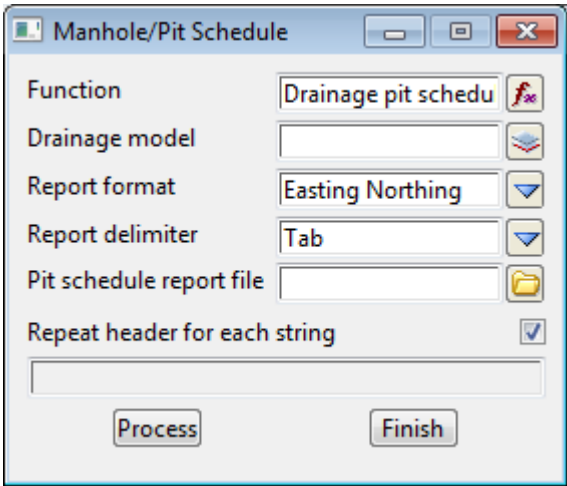
Selecting design string or tin?
Drainage overview

Usage

Position of option on menu: **Design => Drainage => Reports => Pit schedule**

This routine prints the calculations from the last time Set Pit Details was selected in the [Drainage Network Editor](#).

On selecting the Pit schedule option, the **Manhole/Pit Schedule** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Drainage model name <i>model containing the drainage strings</i>	input box	drainage network	
Pit schedule file name <i>file to be created</i>	input box	pit report	
Report Format <i>file format</i>	choice box	Road chainge.,Easting...	
Data delimiter <i>tab delimiters are best for spreadsheets and space for some text editors</i>	choice box	Tab, Space	
Repeat header for each line <i>when selected, the column headings will be printed each drainage line</i>	tick box	selected	
Process <i>Create the pit report</i>	button		
Finish <i>remove the panel from the screen</i>	button		

Notes:

The columns of data may be separated by spaces or a tab. (tab is used for spreadsheet transfers). The internal width and length data are retrieved from the **drainage.4d** file for the pit type specified. If you want a longer description for the pit then the type used inside 12d this can also be entered in the drainage.4d file. The remarks for each pit are entered as user defined pit attribute named **remarks** and may be set using the attribute editor (on the drainage menu) or via a spreadsheet.

Easting Northing Sample

.PIT SCHEDULE										
Pit		INTERNAL				INLET		OUT-		
LET		PIT								
No	TYPE	EASTING	NORTHING	WD	LEN	DIA	INV	LEV	DIA	INV
RL	DEPTH	REMARKS								FIN
B1	SA2	5302.458	7336.936	450.000	900.000				375	28.210
29.387	1.177									
A2	SA2	5264.372	7322.036	450.000	900.000	375	27.470			
28.646	1.226									
C1	SA2	5224.155	7336.936	450.000	900.000				375	26.690
27.863	1.173									
A3	SA2	5187.910	7322.036	450.000	900.000	375	25.930			
27.158	3.628									
A1	SA2	5309.458	7321.100	450.000	900.000				225	28.550
29.577	1.027									
A2	SA2	5264.372	7322.036	450.000	900.000	225	27.470	375	27.420	
28.646	1.226									
A3	SA2	5187.910	7322.036	450.000	900.000	375	25.930	375	23.530	
27.158	3.628									
A4	SA2	5157.411	7321.332	450.000	900.000	375	23.090			26.714
3.624 outlet to existing system										
NOTE:										
1. ALL SETOUT POINTS QUOTED TO CENTRE OF PIT										

Road Chainage Offset Example

DRAINAGE LINE A

PIT	PIT LOCATION		LOCATION OFFSETS	
No.	EASTING	NORTHING	STATION	CTRLOFFSTYPEREMARKS
A/1	5354.629	7336.936	231.171	d002-7.450
A/2	5340.691	7320.911	217.233	d0028.575
A/3	5293.458	7320.886	170.000	d0028.600
A/4	5250.131	7320.886	126.673	d0028.600
A/5	5217.194	7322.036	93.736	d0027.450
A/6	5183.458	7322.036	60.000	d0027.450
A/7	5152.699	7322.036	29.241	d0027.450

Notes

The Set pit details must be run at least once to before printing the report. If the pits are moved or the designed strings changed then this option must re run.

The easting northing data obtained for the **road design string** option is obtained by dropping the pit centre

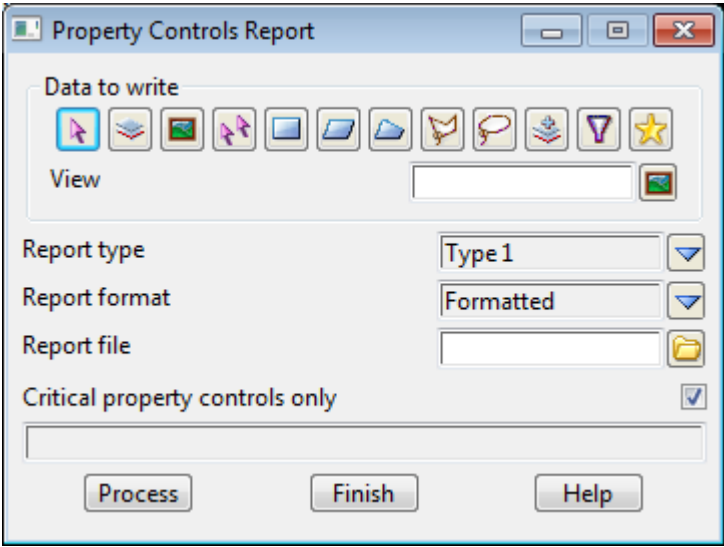
perpendicular onto the selected road design string. This data is stored as pit attributes **setout x** and **setout y**. It is calculated when the **Set Pit Detail** is selected in the [Drainage Network Editor](#).

Property Controls

Position of menu: **Design =>Drainage-Sewer=>Reports=>Property Controls**

The property controls report contains information about all the property controls for the selected drainage strings, and if required, denote the critical property control for a lot.

On selecting **Property controls**, the **Property Controls Report** panel is displayed.



The fields and buttons used in this panel have the following functions.

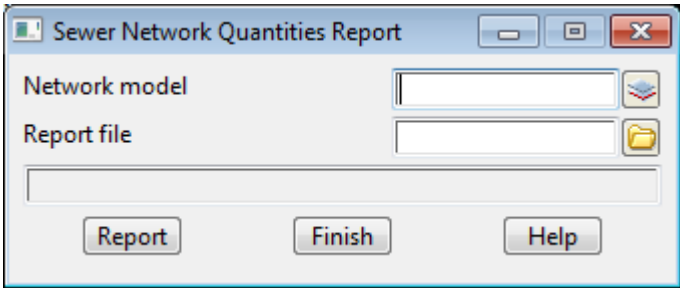
Field Description	Type	Defaults	Pop-Up
Data source type <i>data source type.</i>			
Data source <i>data source for the drainage strings to process.</i>			
Format <i>format for the property control report.</i>	choice box	ascii	ascii, excel spread sheet
Report file <i>name of the file for the report.</i>	file box		
Critical property controls only <i>if tick, only the critical property controls are reported.</i>	tick box	tick	
Process <i>run the option.</i>	button		

Barwon Quantities

The report generated from this option includes

- s the lengths of each pipe type for each line and the total length for each pipe type for all pipes in the network.
- s the quantity of concrete used for the manholes in the network.
- s the number and type of house connections in the network, including caps, bends and bushes.

After selecting the **Barwon quantities** option, the **Sewer Network Quantities Report** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Network model <i>model containing the sewer strings.</i>			available models
Report file <i>name of the file for the report.</i>	file box		
Report <i>run the option.</i>	button		

Barwon House Connections

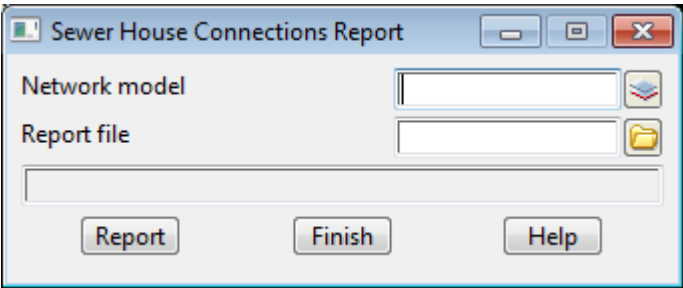
Position of menu: Design =>Drainage-Sewer=>Reports=>House connections

The house connections report contains information about all the house connections for the selected drainage (sewer) strings.

The house connection report includes for each house connection (branch) the

- s name of the sewer line
- s downstream manhole for the house connection
- s lot name
- s house connection number and type
- s chainage of the house connection
- s the invert level at the end of the house connection (IL branch)
- s the invert level of the house connection at the sewer pipe (IL sewer)
- s the drop over the house connection (branch depth)

On selecting **House connections**, the **Sewer House Connections Report** panel is displayed.



The fields and buttons used in this panel have the following functions.

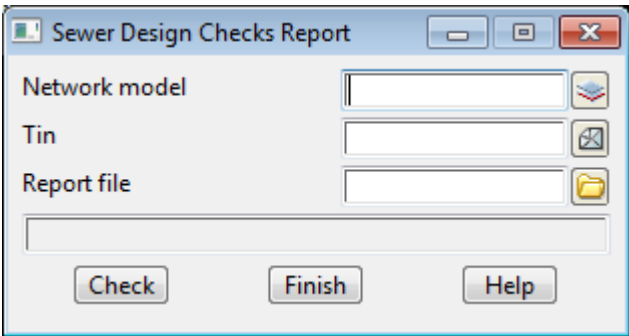
Field Description	Type	Defaults	Pop-Up
Network model <i>model containing the sewer strings.</i>			available models
Report file <i>name of the file for the report.</i>	file box		
Report <i>run the option.</i>	button		

Barwon Design Checks

The report generated from this option includes the design checks

- s network validations (checks that there are strings, no closed loops)
- s manholes don't have negative drops
- s other sewer lines connecting in don't have negative drops
- s sewers flows downhill with a minimum grade
- s manholes are not too close together (i.e. on top of each other)
- s a minimum cover for each sewer line
- s block controls are above the pipe invert level

After selecting the **Design checks** option, the **Sewer Design Checks Report** panel is displayed



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Network model <i>model containing the sewer strings.</i>			available models

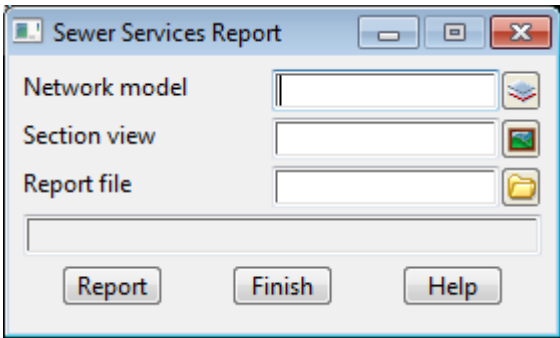
Tin	available tins
<i>tin used for checking minimum cover against.</i>	
Report file	file box
<i>name of the file for the report.</i>	
Report	button
<i>run the option.</i>	

Barwon Services Report

For each sewer string in the network, this option generates a report which includes the

- s section through any tins on the section view
- s name and model of any services in the corridor defined by the section view
- s co-ordinates and chainages of the parts of the service in the corridor, and the chainage and offset for each of the point of the parts projected onto the sewer centre-line.
- s clearance at the point where any service goes under or over the sewer string.

After selecting the **Services report** option, the **Sewer Services Report** panel is displayed



The fields and buttons used in this panel have the following functions.

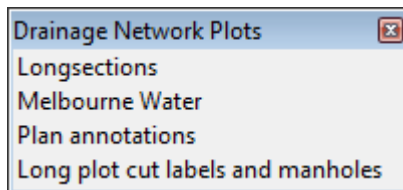
Field	Description	Type	Defaults	Pop-Up
Network model	<i>model containing the sewer strings.</i>			available models
Section view	<i>section view defining the corridor and service models.</i>			available section views
Report file	<i>name of the file for the report.</i>	file box		
Report	<i>run the option.</i>	button		

Drainage Plots

Position of menu: Design =>Drainage-Sewer=>Plots

Currently the **Plots** menu contains an option to produce a long section including any HGL values, flows and user defined attributes read in from other sources, and a second option to output the network to Melbourne Water's sewer format.

The **Plots** walk-right menu is



The options **Longsections** and **Melbourne Water** will now be described in more detail.

For the option *Long sections*, please continue to the section [Drainage Longsections](#).

Melbourne Water, please continue to the section [Melbourne Water](#).

Plan annotations, please continue to the section

Long plot cut labels and manholes, please continue to the section

Drainage Longsections

Position of menu: Design =>Drainage-Sewer=>Plots=>Longsections

The **Longsections** option is used to generate the longsection plots for all lines in a drainage network.

Given the plot sheet size and the horizontal and vertical scales, the longsections for the drainage lines are plotted starting at the top of the sheet and moving across the sheet. Once one row is full, if there is room the plot moves down the page and begins a new row. When a plot sheet is full, a new plot sheet is automatically begun.

Hence the drainage lines are plotted one after another on one or more plotter sheets.

The drainage lines are plotted in string name alphabetical order.

The drainage longsection plot includes

- s the manholes, drainage pipe and any house connections
- s the height of the finished surface at the manhole
- s manhole names and cover types
- s distances between manholes
- s the invert depth of the pipe on either side of a manhole
- s the grades and types of the pipes
- s any services in the corridor - including their name, invert level and distance from the nearest downstream manhole
- s if the information exists, the velocity, flow, HGL values and diagram

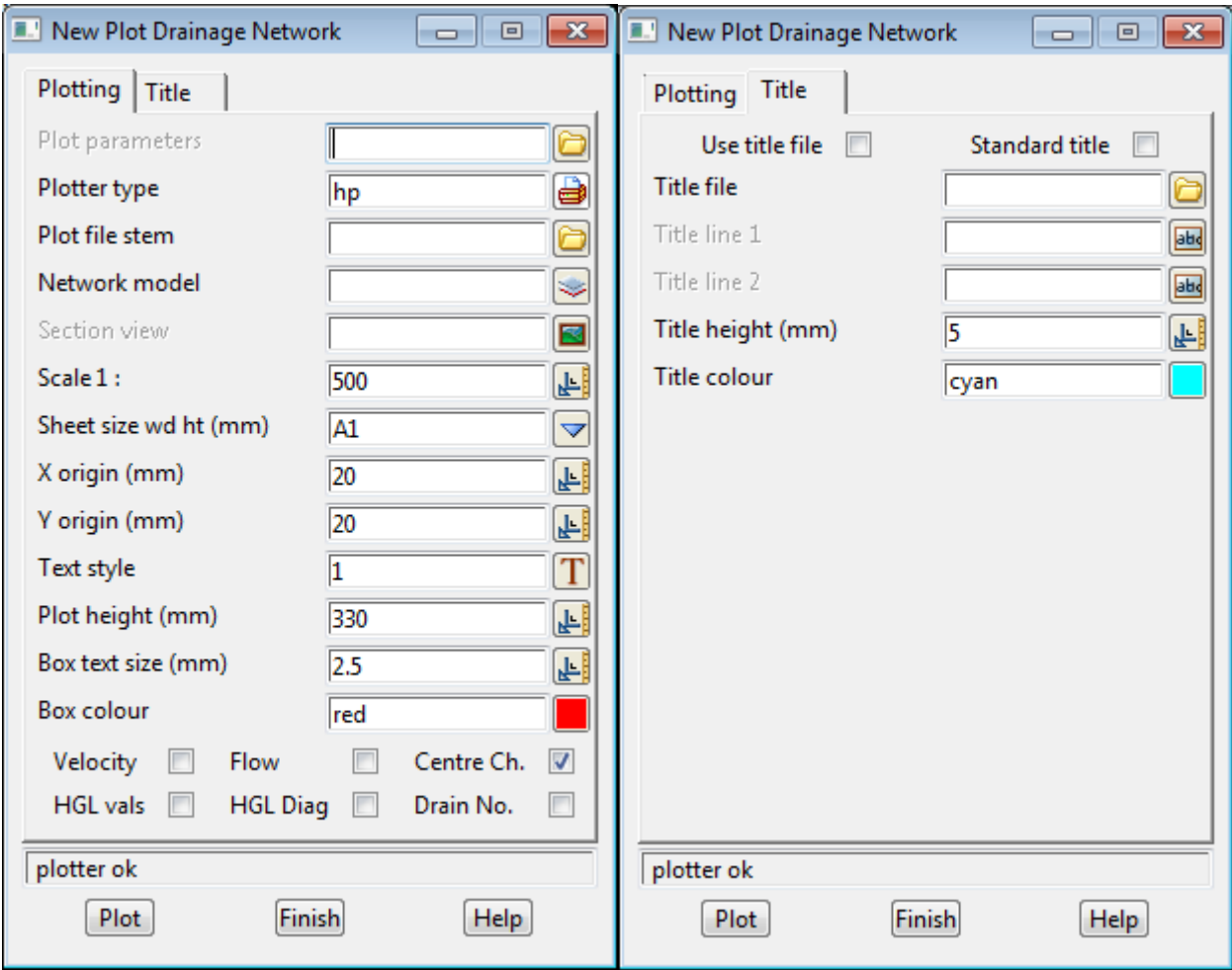
After selecting the **Longsections** option, the **New Plot Drainage Network** panel is displayed.

The drainage long section plot is tailored by using the plot parameter file (.ppf file) given in the plot parameters field. A default .ppf file is set by pointing to it with the environment variable

DRAINAGE_PPF_4D path name of default .ppf file

In the path name to the default .ppf file, \$LIB is used to stand for the library folder set by LIB_4D. For example, "\$LIB/drainage.ppf" is the file drainage.ppf in the library area.

The **title** button on the bottom of this panel controls the use of a title block file and the plotting of a border and two lines of title. If the **Title** button is selected, the **drainage plot title** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Plot parameters	input		*.ppf
<i>file of plot parameters used for extra control of the long section plot.</i>			
Plotter type	input	hp	model, windows, hp, dxf, postscript etc.
<i>format for the plot output.</i>			
Network model	input		
<i>the model containing all the drainage lines for the network.</i>			
Section view	input		
<i>the section view to be used to define the vertical exaggeration, corridor widths, tins to section through, services models to section etc.</i>			

Plot file stem	input		
<i>since more than one plot page may be produced, the plot file names are constructed from the stem plus a plot page sequence number, followed by the appropriate plotter type ending.</i>			
Scale 1:	input		
<i>horizontal scale for plotting the drainage long section. The vertical exaggeration is taken from the section view given in the section view field.</i>			
Sheet size wd ht (mm)	input		available sheet sizes
<i>the width and height values (separated by space) or the name of a user defined sheet size.</i>			
X origin (mm)	input		
<i>the x position on the plot sheet for the bottom left hand corner of the longsection plots. Same as left_margin in the plot parameter file.</i>			
Y origin (mm)	input		
<i>the y position on the plot sheet for the bottom left hand corner of the longsection plots. Same as bottom_margin in the plot parameter file.</i>			
Text style	input	1	available text styles
<i>the default text style to use in the longsection plot.</i>			
Plot ht (mm)	input		
<i>the maximum allowable height for a longsection plot for a drainage line. Datum breaks are applied to any part of the longsection that will not fit into the plot ht</i>			
Box text size (mm)	input	3	
<i>size (in millimetres) to plot the chainages, heights etc. in the boxes in the plots of the drainage longsections</i>			
Box colour	input	cyan	available colours
<i>colour used for the text and the boxes.</i>			
Velocity	tick box	tick	
<i>if tick, the velocity values for the pipes are drawn on the longsection plot.</i>			
Flow	tick box	tick	
<i>if tick, the flow values for the pipes are drawn on the longsection plot.</i>			
Centre CH.	tick box	tick	
<i>if tick, the road centre line chainages are drawn on the longsection plot.</i>			
HGL vals	tick box	tick	
<i>if tick, the HGL values for the pipes are drawn on the longsection plot.</i>			
HGL diag	tick box	tick	
<i>if tick, lines joining the HGL values for the pipes are drawn on the longsection plot.</i>			
Drain No.	tick box	tick	
<i>if tick, the drainage line names are drawn on the longsection plot.</i>			
Plot	button		
<i>plot the drainage longsections for the drainage lines in the model given in the network model field.</i>			
The fields and buttons in the <i>title</i> tab are			
Use title file	tick box		

if **tick**, a user defined title block file is used.

Standard Title	tick box	tick	
if tick , the standard 12d Model border and two lines of title are placed on the bottom of the plot			
Title file	input	*.tf	
if non-blank and use title file is set to tick , then the file given in this field is used to generate a user defined title block for the plot.			
Title line 1/2	input		
first/second line of title information			
Title height (mm)	input	5	
height (in millimetres) to draw the characters in the two lines of title information.			
Title colour	input	cyan	available colours
colour used for the border and the title information.			

Please continue to the next section [Drainage Longsection Plot Parameter File](#).

Drainage Longsection Plot Parameter File

The **Longsections plot** option is used to make special long section plots for a **network** of drainage strings.

Some of the look of the drainage long section plot can be controlled from the **plot drainage network** panel itself, however a wider selection of control parameters is available by using a drainage long plot, plot parameter file.

The drainage long section plot parameters are placed in a file with ending **.ppf**.

Each parameter consists of a parameter name followed by one or more spaces and then the parameter value. There is only one parameter per line.

Anything on a line after a double forward slash **//** is considered to be a comment.

The set of all parameters for the drainage long section plot is enclosed within a set of curly brackets **{ }** with the header

```
drainage_long_plot "plot set name"
```

before the curly brackets.

That is,

```
drainage_long_plot "plot set name" {
    plot parameters
    one per line
}
```

If there is more than one *drainage_long_plot* parameter set in the file, only the first set is used.

There may also be parameter sets for other plot types such as *section_x_plot* in the same file. The other sets will be ignored when doing a drainage long section plot.

The plot parameters are documented in following groups:

For the *Plot Sheet layout*, please continue to the section [Plot Sheet Layout](#).

Labelling the drainage string name, please continue to the section [Labelling the Drainage String Name on the Plot](#).

Boxes area, please continue to the section [Boxes Area](#).

Chainages and uprights, please continue to the section [Chainages and Uprights](#).

Staggering, please continue to the section [Staggering of Chainages and Uprights](#).

Below datum area, please continue to the section [Below Datum Area](#).

Arrows area, please continue to the section [Arrow Areas](#).

Grade arrows parameters, please continue to the section [Parameters for the Arrows for Grades of the Pipes](#).

Pipe diameter arrows parameters, please continue to the section [Parameters for the Arrows for Diameters of the Pipes](#).

Pipe velocity arrows parameters, please continue to the section [Parameters for the Arrows for Velocity in the Pipes](#).

Pipe flow arrows parameters, please continue to the section [Parameters for the Arrows for Flow in the Pipes](#).

Drainage line name arrows parameters, please continue to the section [Parameters for the Arrows giving the Drainage Line Name](#).

User defined pipe arrows parameters, please continue to the section [Parameters for the Arrows for User Defined Pipe Attributes](#).

Graph area parameters, please continue to the section [Graph Area](#).

Top area parameters, please continue to the section [Top Area](#).

Bubbles area parameters, please continue to the section [Manhole name, Manhole Types and Surrounding Bubbles](#).

Change of direction parameters, please continue to the section [Change of Direction Through Pits and Junctions](#).

Symbols at manhole parameters, please continue to the section [Symbols at Manholes](#).

House connection parameters, please continue to the section [Labelling House Connections](#)

Symbols at Property controls parameters, please continue to the section [Symbols at Property Controls](#).

Property controls parameters, please continue to the section [Labelling Property Controls](#).

Hatching cut and fill parameters, please continue to the section [Hatching Cut and Fill Areas](#).

Labelling cuts parameters, please continue to the section [Labelling Cuts of Drainage Through Strings in a Model](#).

Title block parameters, please continue to the section [Title Block Information](#).

Panel modifying parameters, please continue to the section [Parameters that Modify Fields In the Plot Drainage Network Panel](#).

Plot Sheet Layout

The plot sheet is considered to have only positive co-ordinates with the origin (0,0) in the left hand corner. The units for the plot are millimetres.

The overall size of the plot sheet is given by either a defined sheet size, or by the width and height of the plot given in millimetres and separated by one or more spaces.

```
sheet_size          text          // sheet name, or
                    "mm   mm"      // sheet size: width  height
```

The sheet size name and width and heights can be specified by the user in a file named sheets.4d which is in the normal set up areas, or is pointed to by the environment variable

```
SHEET_SIZES_4D      file          // file of plotter sheets sizes
```

The plotting area is restricted to within the plot sheet by giving the margins

```
left_margin         mm
right_margin        mm
top_margin          mm
bottom_margin       mm
```

The drainage long section plot will break an individual plot up if it doesn't fit across the sheet. There can be one or more rows of plot on the same sheet.

When a sheet is full, a follow on sheet is created.

The position of the left hand bottom corner of the first plot in the bottom row is given by the parameters, `x_origin` and `y_origin` which are the same as `left_margin` and `bottom_margin` respectively.

network_model	<i>text</i>	// model of drainage strings
x_origin	<i>mm</i>	// Position of the left hand bottom, // same as <i>left_margin</i> .
y_origin	<i>mm</i>	// corner of first plot in the bottom row, // same as <i>bottom_margin</i> .
only_one_line	<i>0</i>	// more than one row on a sheet
	<i>1</i>	// only one row of plot on a sheet
plot_height	<i>mm</i>	// total height of a plot row. // It includes the vertical_plot_gap.
horizontal_plot_gap	<i>mm</i>	// gap between plots on same row
vertical_plot_gap	<i>mm</i>	// gap between rows of plots, // also the size of the top area



drainage string name, boxes, below datum, arrow 1, bottom stagger, arrow 2, graph, arrow 3, top stagger, arrow 4, top.

The **drainage string name area** is where the name of the drainage string can be plotted.

The **boxes area** is where the chainages and various values for the drainage strings are labelled.

The **below datum area** is a region between the boxes area and the datum line.

The **arrow 1 area** is for drawing arrows where the arrows go between the staggered uprights and below the graph area. The datum line is at the bottom of the arrow 1 area.

The **bottom stagger area** is where the upright line staggers occur before going up from the boxes area to the graph area.

The **arrow 2 area** is for drawing arrows below the graph but where the arrows go between non-staggered uprights.

The **graph area** is the area where the actual plots of the strings are drawn.

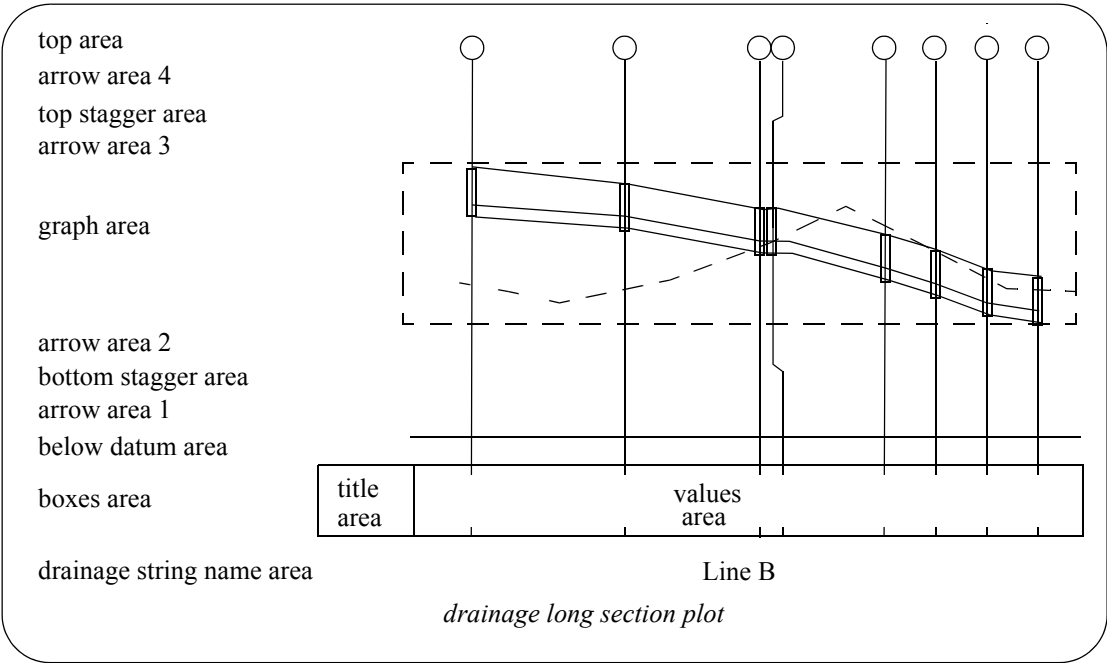
The **arrow 3 area** is for drawing arrows above the graph area and where the arrows go between non-staggered uprights.

The **top stagger area** is where the upright line staggers occur above the graph area.

The **arrow 4 area** is for drawing arrows where the arrows go between the staggered uprights and above the graph area.

The **top area** is an annotation area above the arrow 4 area and is used for bubbles, manhole names (pit names), junctions, deflection angles etc.

The areas and the information in them will now be described in more detail.



Labelling the Drainage String Name on the Plot

The plot can be labelled with the name of the drainage string under the boxes area.

The name is made up of concatenation the text strings:

plot_name_pre_text drainage-string-name plot_name_post_text

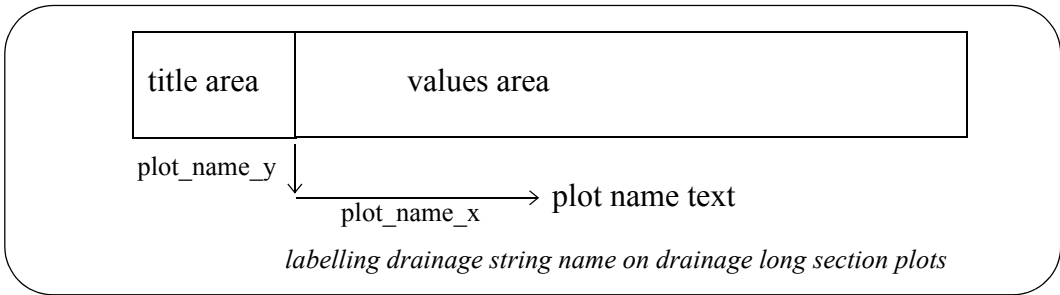
The plot name is positioned under the boxes.

plot_name_mode	0	// don't use the drainage string name
	1	// use the drainage string name in the
		// label
plot_name_pre_text	text	
plot_name_post_text	text	
plot_name_textstyle	textstyle	
plot_name_text_size	mm	
plot_name_text_colour	colour	
plot_name_x	mm	
plot_name_y	mm	

The *plot_name_x* is measured from the beginning of the height boxes.

The default for *plot_name_x* is centred on the values area.

The *plot_name_y* is measured from the bottom of the box area with positive being **down**.



Example of Labelling Drainage String Name

plot_name_pre_text	"Drainage Long Section Plot for String"
plot_name_mode	1
plot_name_post_text	""
plot_name_text_size	15
plot_name_text_colour	red
plot_name_textstyle	ISO
plot_name_y	30

Boxes Area

Many of the drainage string values (invert levels and depth, hgl values, natural and finished surface etc.) can be labelled in the boxes area at the bottom of the drainage long section plot.

Each type of information is plotted in a row made up of a title, and the actual values given at the chainage of each pit in the drainage string.

Each row of information is surrounded by lines to form a box, and the stacked boxes form the boxes area at the bottom of the drainage plot.

The **title** for the information, is drawn in the **title area** of the **boxes area** and the values are drawn in the **values area** of the **boxes area**.

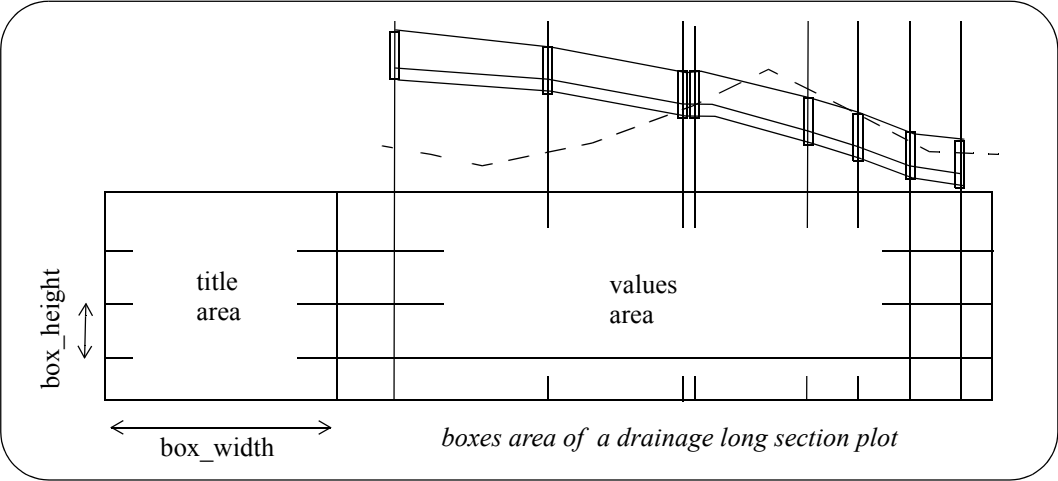
Consequently the boxes area is made up of rows of text consisting of:

title followed by the **values** along the drainage string.

The **titles area** for the left plot in the bottom row starts at the co-ordinate (*x_origin,y_origin*) and each row is begun by adding the distance *plot_height* to the *y_origin* (see previous section).

The width of the **title area** is given by the **box_width** parameter and the height of each box is given by **box_height**.

box_width	mm	// width of the label boxes.
box_height	mm	// height of each box



The colour of the box line work is given by:

box_colour	colour	// colour of the lines in the boxes
------------	--------	-------------------------------------

A default text size and colour can be specified for the title text and the values, or sizes, colours and text styles can be given for each individual box (given later in this section).

title_box_text_size	mm	// size of title text in boxes
title_box_text_colour	colour	// colour of title text in boxes
box_text_size	mm	// size of value text in boxes
box_text_colour	colour	// colour of values in boxes

The values text is written at right angles to the bottom of the boxes. It can be either top or bottom justified with respect to the box (*box_text_left_justify*).

The values text can be on the left, right or centred on the uprights and is given by the parameter *box_text_side*.

The width of the values area is determined by the number of chainages to be labelled and whether the values are staggered to prevent over writing (see next section).

box_text_left_justify	0	// top justify text in values area
	1	// bottom justify text in values area
box_text_side	0	// left (default)
	1	// right
	2	// centre

The default order of the boxes from the bottom up is

- 0. drainage string chainages
- 1. road centre line chainages - user choice
- 2. natural surface heights - user choice
- 3. finished surface heights - user choice
- 4. before pit and after pit invert levels
- 5. before pit and after pit hgl values - user choice
- 6. before pit and after pit depth to inverts - user choice

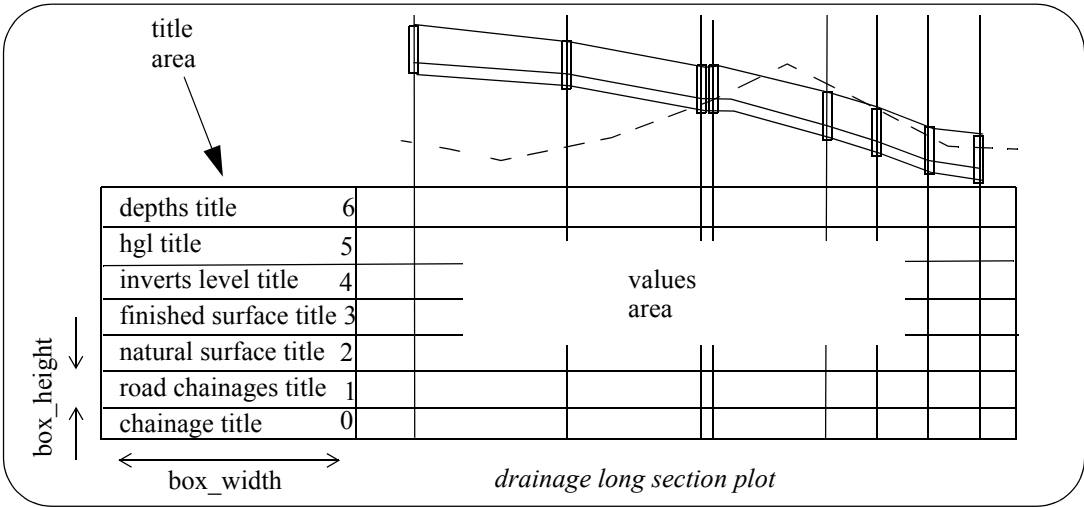
There are parameters to change the order for 1-6.

Drainage string chainages is fixed at the bottom (box 0) but what is in the boxes above box 0 is can be set by the box_n parameters:

box_n	number_from_list	// the n'th box above the drainage string
		// chainages will contain given item number
		// form the list.

For example, to have *finished surface heights* in the first box the drainage string chainages, use:

box_1	3	// the (1) will be replaced by (3)
-------	---	------------------------------------



chainage_box_size	mm	// box height for chainage box
centre_chainage_box_size	mm	// box height for centre chainage box
surface_box_size	mm)	// box height for surface box
f_surface_box_size	mm	// box height for finished surface box
invert_height_box_size	mm	// box height for invert height box
hgl_box_size	mm	// box height for hgl box
invert_depth_box_size	mm	// box height for invert depth box

The default for each box size is *box_height*

The boxes (1), (2), (3) and (5) can be suppressed by the parameters

draw_centre_chainage	0/1	// 0 = don't have centre line chainages
----------------------	-----	-----------------------------------------

		// box
draw_ns_text	0/1	// 0 = don't draw ns values from // ns tin for drainage string
draw_fs_text	0/1	// 0 = don't draw fs values from // fs tin or top of manhole // for drainage string
draw_fs_mode	0	// 0 = fs_text is from fs tin
	1	// 1 = fs_text is top of manhole
draw_hgl_value	0/1	// 0 = don't have hgl value boxes

The definition of depth to invert and whether box (6) is suppressed or not, are given by the parameter *depth_mode*:

depth_mode	0	// don't draw depth to invert values
	1	// draw depth to invert values to fs tin // for drainage string
	2	// draw depth to invert values to top of // manhole for drainage string
	3	// draw depth to invert values to ns tin // for drainage string

The default for the number of decimal places used in the values in the boxes is:

number_of_decimals	<i>integer</i>	// default number of decimal places
--------------------	----------------	-------------------------------------

The text, size, colour and textstyle for the title text and values text for each box can be set by

(0) drainage string chainages

plot_title_chainage_name	<i>text</i>	// first line of title for chainages box
plot_title_chainage_name_2	<i>text</i>	// second line of title for chainages box
chainage_title_colour	<i>colour</i>	// colour of text
chainage_title_text_size	<i>mm</i>	// size of title in chainage box
chainage_title_textstyle	<i>textstyle</i>	// textstyle for title in chainage box
chainage_text_colour	<i>colour</i>	// colour of chainage values
chainage_text_size	<i>mm</i>	// size of values
chainage_textstyle	<i>textstyle</i>	// textstyle of values
chainage_decimals	<i>integer</i>	// number of decimal places in chainage

(1) road centreline chainages

plot_title_centre_chainage_name	<i>text</i>	// title for road centre // line chainages box
plot_title_centre_chainage_name_2	<i>text</i>	// second line of title for road // centre line chainages box
chainage_title_colour_cl	<i>colour</i>	// colour of text
chainage_title_text_size_cl	<i>mm</i>	// size of title in cl box
chainage_title_textstyle_cl	<i>textstyle</i>	// textstyle for title
chainage_text_colour_cl	<i>colour</i>	// colour of cl values
chainage_text_size_cl	<i>mm</i>	// size of values
chainage_textstyle_cl	<i>textstyle</i>	// textstyle of values
chainage_cl_decimals	<i>integer</i>	// number of decimal places in chainage cl

(2) natural surface values

plot_title_surface_name	<i>text</i>	// title for the drainage ns values box
plot_title_surface_name_2	<i>text</i>	// second line of title for drainage ns values
ns_title_colour	<i>colour</i>	// colour of text
ns_title_text_size	<i>mm</i>	// size of title in ns box
ns_title_textstyle	<i>textstyle</i>	// textstyle for title
ns_text_colour	<i>colour</i>	// colour of ns values
ns_text_size	<i>mm</i>	// size of values

ns_textstyle	<i>textstyle</i>	// textstyle of values
ns_decimals	<i>integer</i>	// number of decimal places in ns

(3) finished surface values

plot_title_finished_name	<i>text</i>	// title for the drainage fs values box
plot_title_finished_name_2	<i>text</i>	// second line of title for drainage fs values
fs_title_colour	<i>colour</i>	// colour of text
fs_title_text_size	<i>mm</i>	// size of title in fs box
fs_title_textstyle	<i>textstyle</i>	// textstyle for title
fs_text_colour	<i>colour</i>	// colour of ns values
fs_text_size	<i>mm</i>	// size of values
fs_textstyle	<i>textstyle</i>	// textstyle of values
fs_decimals	<i>integer</i>	// number of decimal place in fs

(4) invert levels

plot_title_invert_name	<i>text</i>	// title for the invert levels box
plot_title_invert_name_2	<i>text</i>	// second line of title for the invert levels box
il_title_colour	<i>colour</i>	// colour of text
il_title_text_size	<i>mm</i>	// size of title in il box
il_title_textstyle	<i>textstyle</i>	// textstyle for title
il_text_colour	<i>colour</i>	// colour of il values
il_text_size	<i>mm</i>	// size of values
il_textstyle	<i>textstyle</i>	// textstyle of values
il_decimals	<i>integer</i>	// number of decimal places in il

(5) hgl values

plot_title_hgl_name	<i>text</i>	// title for hgl values box
plot_title_hgl_name_2	<i>text</i>	// second line of title for hgl values box
hgl_title_colour	<i>colour</i>	// colour of text
hgl_title_text_size	<i>mm</i>	// size of title in hgl box
hgl_title_textstyle	<i>textstyle</i>	// textstyle for title
hgl_text_colour	<i>colour</i>	// colour of hgl values
hgl_text_size	<i>mm</i>	// size of values
hgl_textstyle	<i>textstyle</i>	// textstyle of values
hgl_decimals	<i>integer</i>	// number of decimal places in hgl

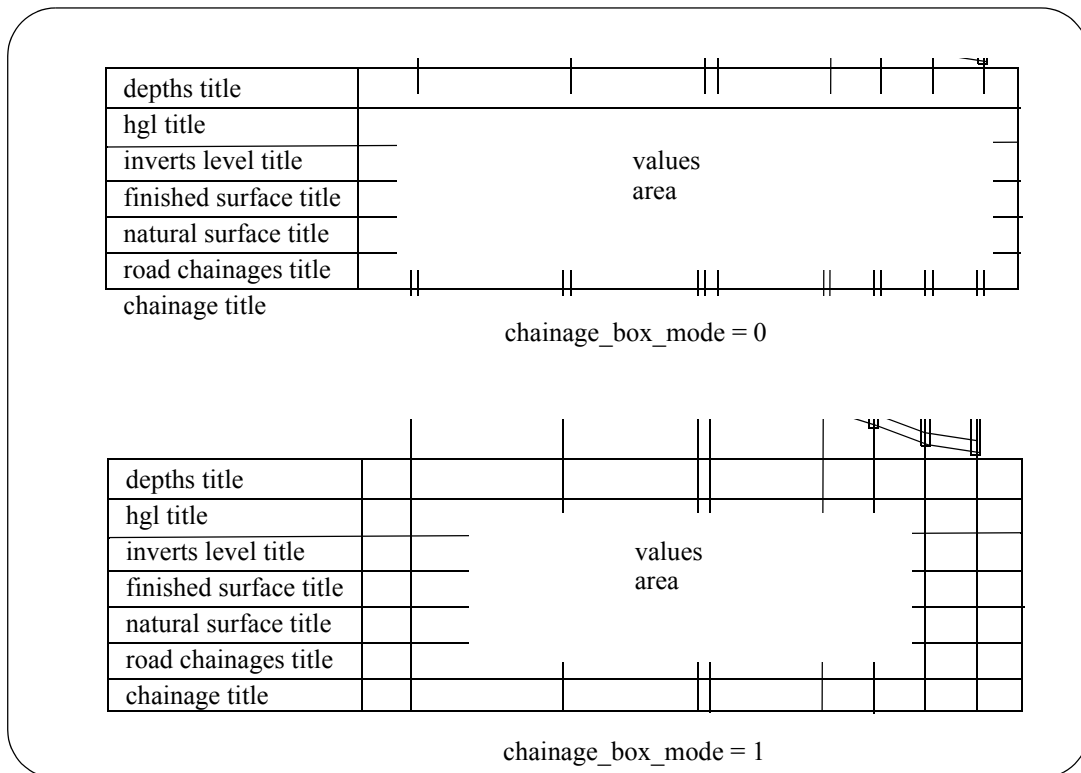
(6) depths

plot_title_depth_name	<i>text</i>	// title for depth of inverts box
plot_title_depth_name_2	<i>text</i>	// second line of title for depth of inverts box
depth_title_colour	<i>colour</i>	// colour of text
depth_title_text_size	<i>mm</i>	// size of title in depth box
depth_title_textstyle	<i>textstyle</i>	// textstyle for title
depth_text_colour	<i>colour</i>	// colour of depth values
depth_text_size	<i>mm</i>	// size of values
depth_textstyle	<i>textstyle</i>	// textstyle of values
depth_decimals	<i>integer</i>	// number of decimal places in depth

Drawing the Boxes

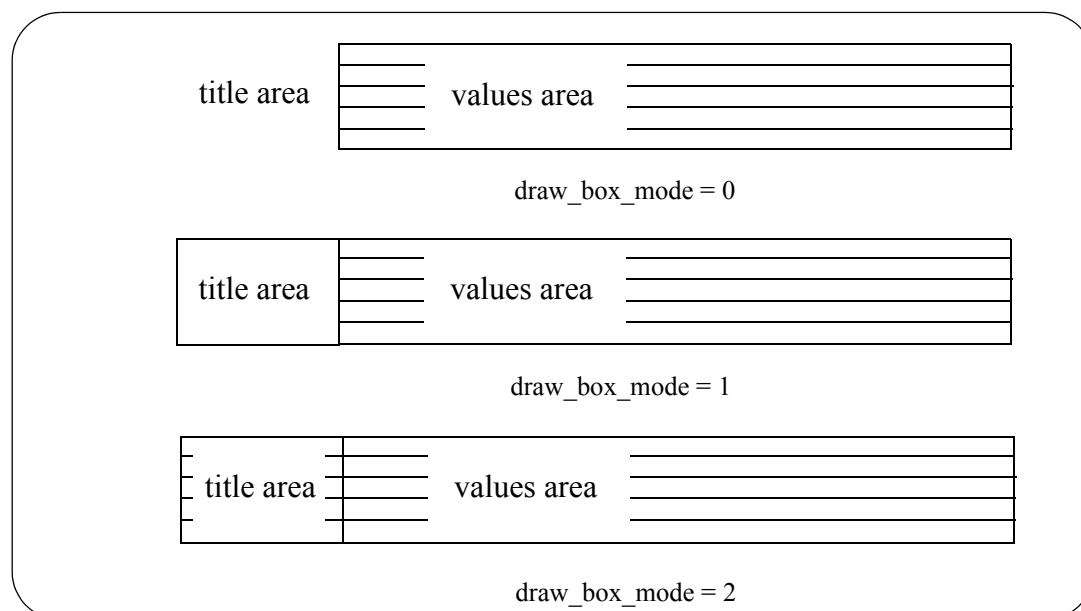
The bottom line from the boxes can be drawn or not drawn:

```
chainage_box_mode      0                // don't draw the bottom line
                      1                // draw all the box line work - default
```



A box can be drawn/not drawn around the title area of the boxes area.

draw_box_mode	0	// don't draw the title area box
	1	// draw the title area box, no lines - default
	2	// draw title box area with lines



Chainages and Uprights

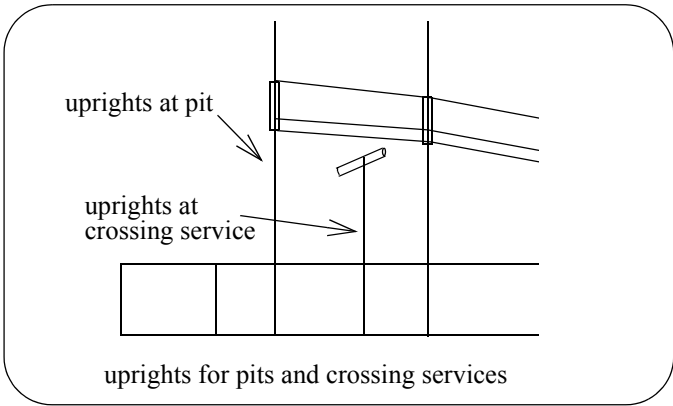
The chainage box contains drainage string chainages for

- (a) the chainages of each pit in the drainage string
- (b) the chainages on the drainage string where any strings in models on the section view are cut by the drainage string (crossing services)

For a **pit**, the invert levels, depths, finished and natural surface levels, and hgl of pipes at a pit can all labelled at the chainage of the pit.

For a **crossing service**, the level of the crossing service and the chainage on the drainage string where the crossing occurs are labelled.

Note - crossing services can also be labelled using cuts of drainage line through strings. However, this does not create a chainage in the chainage box.

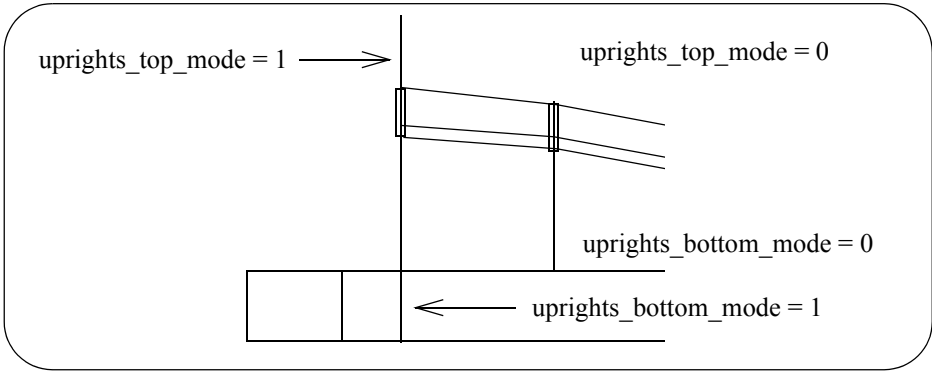


Uprights, or leader lines, can be drawn from the chainage values at the bottom of the boxes to the pit in the graph area, and from the top of the pit to the top area.

Using the parameters *uprights_top_mode* and *uprights_bottom_mode*, it is possible to suppress the drawing from the top of the pit to the top area, and also from the top of the boxes to the bottom of the boxes.

<code>uprights_top_mode</code>	<code>0</code>	// stop at top of pit
	<code>1</code>	// go to top area (default)
<code>uprights_bottom_mode</code>	<code>0</code>	// stop at top of boxes
	<code>1</code>	// go to bottom of boxes (default)

Also uprights can be drawn from the chainage values bottom of the boxes to the crossing service in the graph area.



The chainage values at the uprights for the pits can be running chainage along the drainage string, pipe length chainages (i.e. the chainage starts at zero for each pipe) or both.

chainage_mode	0	//pipe length chainage
	1	// running chainage
	2	// both pipe length and running

If the *chainage_mode* includes "pipe length chainage" (modes 0 and 2), the pipe length can either be labelled with a 0.0 chainage at the start pit for the pipe and the pipe length at the end pit, or just have the length centred between the two pits.

centre_pipe_length	0	// default - 0 at start pit, length at end pit
	1	// centre pipe length

The chainage values for the crossing services can be running chainage along the drainage string, chainage length from the previous pit (i.e. the chainage starts at zero at the previous pit) or both.

service_chainage_mode	0	//pipe length chainage
	1	// running chainage
	2	// both pipe length and running

The colour of the uprights for the pits and crossing services are given by:

manhole_line_colour	<i>colour</i>	// colour of uprights to the pits
service_line_colour	<i>colour</i>	// colour of upright to the crossing
		// services

The crossing services are labelled with the drainage string chainage of the crossing point, the invert level of the service at the crossing and the name of the service which is made up of:

service diameter name of service invert level at the service at the crossing.

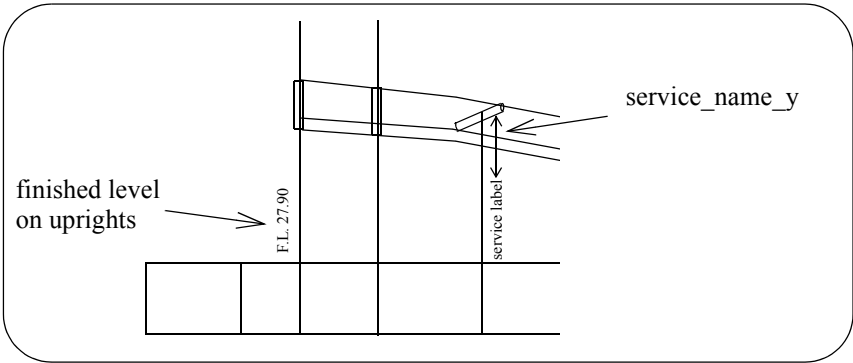
The service label is drawn the distance *service_name_y* below the crossing point:

service_name_y	<i>mm</i>	// def 1, distance of label below crossing point
----------------	-----------	--------------------------------------------------

The colours, text styles and sizes of the service information is specified by:

service_ch_text_colour	<i>colour</i>	// colour of services ch text
service_ch_text_size	<i>mm</i>	// size of services ch text
service_ch_textstyle	<i>mm</i>	// textstyle of services ch text
service_il_text_colour	<i>colour</i>	// colour of services il text
service_il_text_size	<i>mm</i>	// size of services il text
service_il_textstyle	<i>mm</i>	// textstyle of services il text
service_name_text_colour	<i>colour</i>	// colour of services name
service_name_text_size	<i>mm</i>	// size of services name
service_name_textstyle	<i>mm</i>	// textstyle of services name
service_name_decimals	<i>integer</i>	// number of decimal is il in name

A **finished surface** value or **top of manhole** value can also be written vertically along the uprights.



Whether the value is finished surface level or top of manhole level, the values position, size, colour etc. is controlled by the parameters:

```
draw_fs_vertical      0          // don't draw fs vertical values
                      1          // always draw values
                      2          // only draw values when different -see
                              // draw_fs_vertical_mode

draw_fs_vertical_mode 0          // the fs value is the value from the fs tin
                              // for the drainage string.
                              // When draw_fs_vertical is 1,
                              //  always draw the fs value.
                              // When draw_fs_vertical is 2,
                              //  only draw fs_value when it is
                              //  different from the top of manhole value
                      1          // the fs value is the top of manhole
                              // for the drainage string.
                              // When draw_fs_vertical is 1,
                              //  always draw the fs value.
                              // When draw_fs_vertical is 2,
                              //  only draw fs_value when it is
                              //  different from the value of the fs tin.
```

		draw_fs_vertical_mode	
		0	1
draw_fs_vertical	0	nothing	nothing
	1	fs tin	top of manhole
	2	fs tin when different from top of manhole	top of manhole when different from fs tin

```
fs_vertical_pre_text  text          // text before the vertical fs value
fs_vertical_post_text text          // text after the vertical fs value
fs_vertical_decimals  integer       // number of decimals in vertical fs
fs_vertical_colour    colour        // colour of the vertical fs text
fs_vertical_size      mm            // size of the vertical fs text
fs_vertical_textstyle textstyle     // textstyle of the vertical fs
fs_vertical_x         mm            // x adjustment to position of text
fs_vertical_y         mm            // y adjustment to position of text
```

Staggering of Chainages and Uprights

If the text values are placed at the real chainage positions at the bottom of the plot, text over writing can easily occur if the chainages are very close together.

To prevent such over writing, the text can be **staggered**.

That is, if the text is going to over write a previous text value, the next text value is actually moved along until there is no over writing.

Since the text is no longer at the correct chainage position, the uprights to the pits and services start at the text position and then bend back to the correct chainage position on the plot. The region where the bending occurs is called the stagger area.

For the drainage plot, there is an area below the graph where the uprights bend backwards from the staggered text position to the real chainage position (bottom stagger area).

And there is a second area above the graph where the uprights bend forwards from the real chainage position to the staggered text position (top stagger area).

Hence annotation above the top stagger area will line up with the staggered values below the bottom stagger area.

The stagger area below the graph area is defined by

stagger_height_1	mm	// distance from the top of arrow_area_1 // to the start of the staggers
stagger_height_2	mm	// distance over which stagger occurs
stagger_gap_bottom	mm	// distance from end of staggers to the // bottom of arrow_area_2

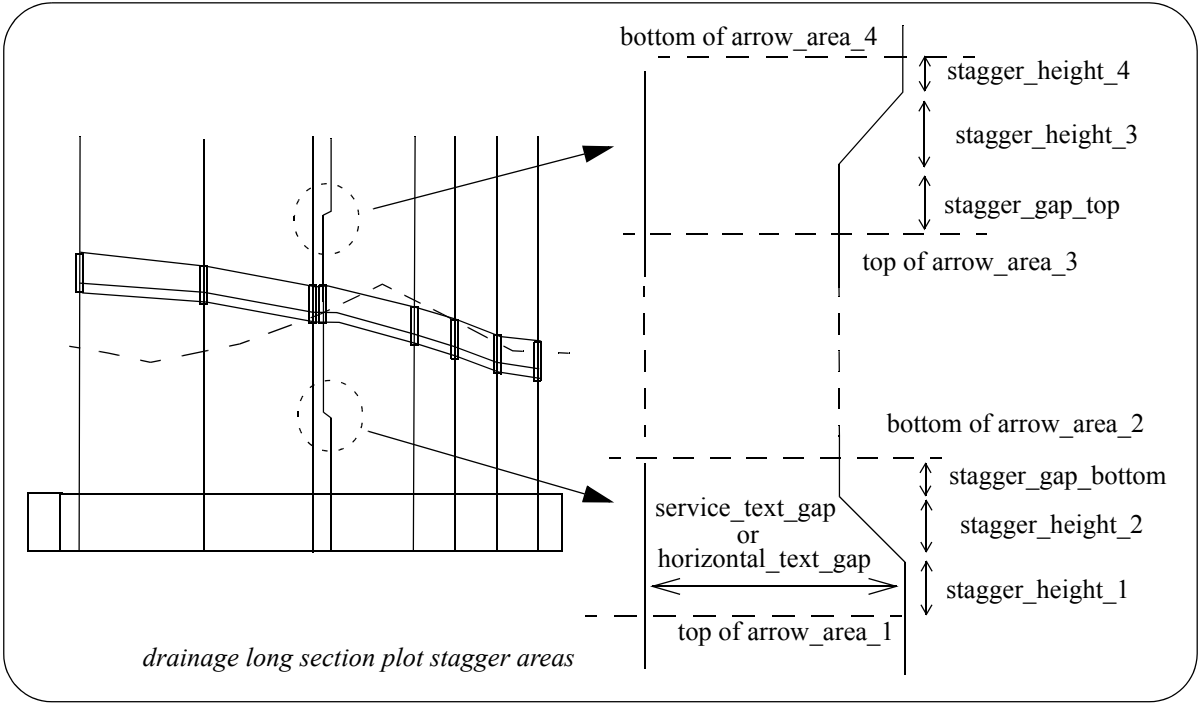
The stagger area above the graph area is defined

stagger_gap_top	mm	// distance from the top of arrow_area_3 // to the start of the staggers
stagger_height_3	mm	// distance over which stagger occurs
stagger_height_4	mm	// distance from end of staggers to the // bottom of arrow_area_4

The distance to be left for text to avoid over writing is:

horizontal_text_gap	mm	// minimum distance to leave for text // after pit values
service_text_gap	mm	// minimum distance to leave for text // after service values

When staggering occurs, it is possible for the values area to be longer than the graph area.



Arrow Areas

Apart from information labelled in the boxes and top areas, the drainage long section plot can place arrows between pits for other information such as

- (a) pipe grade or slope
- (b) pipe diameter
- (c) velocity
- (d) flow
- (e) drainage line name
- (f) user defined pipe attributes

A specific arrow area is defined for each set of arrows.

The **arrow areas** are designed for drawing and labelling arrows between pits.

All the values refer to pipes connecting adjacent pits and the relevant pipe is indicated by drawing an arrow between the uprights from the chainage text to the pits.

Because staggering of the chainage text can occur, the position of the uprights to draw the arrows between can vary depending on whether the arrow is above or below a stagger area.

Hence, there are four arrow areas:

arrow area 1 which is below the graph and the bottom stagger area. The arrows go between the *staggered* chainage positions of the pits.

The datum line is at the bottom of arrow 1 area.

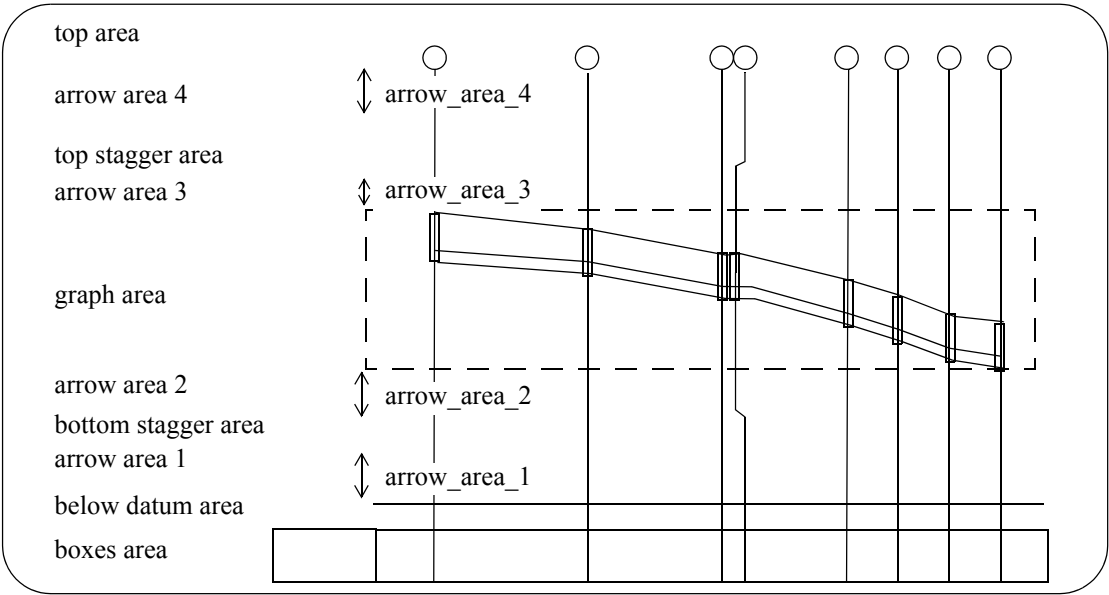
arrow area 2 which below the graph but above the bottom stagger area. Hence the arrows go between the *non-staggered* chainage positions of the pits.

arrow area 3 which is above the graph but below the top stagger area. The arrows go between the *non-staggered* chainage positions of the pits.

arrow area 4 is above the graph and the top stagger area. The arrows go between the *staggered* chainage positions of the pits.

The heights of the four areas (which can be zero) are defined by:

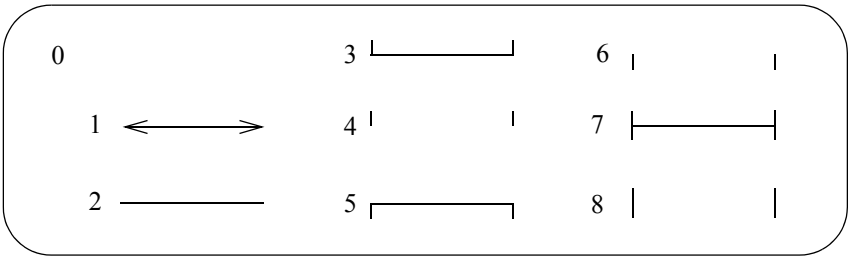
arrow_area_1	mm	// height of arrow_1 area
arrow_area_2	mm	// height of arrow_2 area
arrow_area_3	mm	// height of arrow_3 area
arrow_area_4	mm	// height of arrow_4 area



The parameters for controlling the arrows between manholes and associated text for the values of pipe slope, pipe diameter, flow, velocity, drainage line name and user defined pipe attributes are now given.

Each set of parameters has an arrow_mode with the following values:

..._arrow_mode	0	// no arrow
	1	// arrow
	2	// line
	3	// line with uprights at ends
	4	// uprights, no line
	5	// line with downrights
	6	// downrights, no line
	7	// line with up and downrights at ends
	8	// up and downrights, no line



Parameters for the Arrows for Grades of the Pipes

Parameters specifying the arrow area used and the position of the arrows.

draw_pipe_grade	0	// don't draw pipe grade
	1	// draw pipe grade
pipe_grade_arrow_area	m	// the arrow area for the arrows
		// m = 1,2,3 or 4
pipe_grade_y	mm	// distance that the arrow is above the
		// bottom of the arrow area.

For the arrow, the value of the grade can be specified as either **1 in** or **percent** grade:

percentage_grade	0	// the value is a "1 in" grade
	1	// the value is a percent grade

Parameters for the title text on the left hand side of the plot:

pipe_grade_title	text	//title on the left hand side of the arrow
pipe_grade_title_textstyle	textstyle	// textstyle of the title
pipe_grade_title_text_size	mm	// size of the title
pipe_grade_title_text_colour	colour	// colour of the title
pipe_grade_title_offset	mm	//distance to raise or lower the text
		// from the arrow position
pipe_grade_title_x	mm	// distance from the left hand side of the
		// plot

Parameters for the arrow type:

pipe_grade_arrow_mode	0	// no arrow
	1	// arrow
	2	// line
	3	// line with uprights at ends
	4	// uprights, no line
	5	// line with downrights
	6	// downrights, no line
	7	// line with up and downrights at ends
	8	// up and downrights, no line
pipe_grade_arrow_colour	colour	// colour of the arrow
pipe_grade_arrow_size	mm	// height of the arrow
pipe_grade_arrow_gap	0	// no gap in arrow
	1	// leave gap in arrow for text

Parameters for the text on the arrow:

pipe_grade_arrow_pre_text	text	// text before the arrows text
pipe_grade_arrow_post_text	text	// text after the arrows text
pipe_grade_arrow_decimals	integer	// The number of decimal places used
		// when writing out the pipe grade
		// If > 0, all trailing zeros after the
		// decimal place are removed.
		// If < 0, the absolute value is taken as
		// the number of decimal places and no
		// trailing zeros are removed after the
		//decimal point.
pipe_grade_arrow_textstyle	textstyle	// textstyle of arrow text
pipe_grade_arrow_text_size	mm	// size of the text
pipe_grade_arrow_text_colour	colour	// colour of the text
pipe_grade_arrow_text_offset	mm	// distance to raise or lower the text
		// from the arrow position

Parameters for the Arrows for Diameters of the Pipes

The diameter of the drainage pipes can be plotted between each pit.

Inside 12d Model, the pipe diameter is given a world units (usually metres), but on the diameter arrow, the diameter is multiplied by 1000 and written out as an integer value. This is normally millimetres.

For diameters entered in feet and the plot diameter to be in inches, the following parameter should be set

pipe_diameter_scale_factor 12. // default is 1000.

Parameters specifying the arrow area used and the position of the pipe diameter arrows.

draw_pipe_diameter	0	// don't draw pipe diameter
	1	// draw pipe diameter
pipe_diameter_arrow_area	m	// the arrow area for the arrows
		// m = 1,2,3 or 4
pipe_diameter_y	mm	// distance that the arrow is above the
		// bottom of the arrow area.

Parameters for the title text on the left hand side of the plot:

pipe_diameter_title	text	// title on the left hand side of the arrow
pipe_diameter_title_textstyle	textstyle	// textstyle of the title
pipe_diameter_title_text_size	mm	// size of the title
pipe_diameter_title_text_colour	colour	// colour of the title
pipe_diameter_title_offset	mm	// distance to raise or lower the text
		// from the arrow position
pipe_diameter_title_x	mm	// distance from the left hand side of the
		// plot

Parameters for the arrow type:

pipe_diameter_arrow_mode	0	// no arrow
	1	// arrow
	2	// line
	3	// line with uprights at ends
	4	// uprights, no line
	5	// line with downrights
	6	// downrights, no line
	7	// line with up and downrights at ends
	8	// up and downrights, no line
pipe_diameter_arrow_colour	colour	// colour of the arrow
pipe_diameter_arrow_size	mm	// height of the arrow
pipe_diameter_arrow_gap	0	// no gap in arrow
	1	// leave gap in arrow for text

Parameters for the text on the arrow:

pipe_diameter_arrow_pre_text	text	// text before the arrows text
pipe_diameter_arrow_post_text	text	// text after the arrows text

On the arrow, the pipe type can be also plotted after the pipe_diameter_arrow_post_text:

pipe_type_mode	0	// don't include the pipe type
	1	// include the pipe type after the
		// post_text
pipe_diameter_arrow_textstyle	textstyle	// textstyle of arrow text
pipe_diameter_arrow_text_size	mm	// size of the text
pipe_diameter_arrow_text_colour	colour	// colour of the text
pipe_diameter_arrow_text_offset	mm	// distance to raise or lower the text
		// from the arrow position

Parameters for the Arrows for Velocity in the Pipes

Parameters specifying the arrow area used and the position of the arrows.

draw_pipe_velocity	0	// don't draw pipe velocity
	1	// draw pipe velocity
pipe_velocity_arrow_area	m	// the arrow area for the arrows
		// m = 1,2,3 or 4
pipe_velocity_y	mm	// distance that the arrow is above the
		// bottom of the arrow area.

Parameters for the title text on the left hand side of the plot:

pipe_velocity_title	text	//title on the left hand side of the arrow
pipe_velocity_title_textstyle	textstyle	// textstyle of the title
pipe_velocity_title_text_size	mm	// size of the title
pipe_velocity_title_text_colour	colour	// colour of the title
pipe_velocity_title_offset	mm	//distance to raise or lower the text
		// from the arrow position
pipe_velocity_title_x	mm	// distance from the left hand side of
		// the plot

Parameters for the arrow type:

pipe_velocity_arrow_mode	0	// no arrow
	1	// arrow
	2	// line
	3	// line with uprights at ends
	4	// uprights, no line
	5	// line with downrights
	6	// downrights, no line
	7	// line with up and downrights at ends
	8	// up and downrights, no line
pipe_velocity_arrow_colour	colour	// colour of the arrow
pipe_velocity_arrow_size	mm	// height of the arrow
pipe_velocity_arrow_gap	0	// no gap in arrow
	1	// leave gap in arrow for text

Parameters for the text on the arrow:

pipe_velocity_arrow_pre_text	text	// text before the arrows text
pipe_velocity_arrow_post_text	text	// text after the arrows text
pipe_velocity_arrow_decimals	integer	// The number of decimal places used
		// when writing out the pipe velocity
		// If > 0, all trailing zeros after the
		// decimal place are removed.
		// If < 0, the absolute value is taken as
		// the number of decimal places and no
		// trailing zeros are removed after the
		// decimal point.
pipe_velocity_arrow_textstyle	textstyle	// textstyle of arrow text
pipe_velocity_arrow_text_size	mm	// size of the text
pipe_velocity_arrow_text_colour	colour	// colour of the text
pipe_velocity_arrow_text_offset	mm	// distance to raise or lower the text
		// from the arrow position

Parameters for the Arrows for Flow in the Pipes

Parameters specifying the arrow area used and the position of the arrows.

draw_pipe_flow	0	// don't draw pipe flow
	1	// draw pipe flow
pipe_flow_arrow_area	m	// the arrow area for the arrows // m = 1,2,3 or 4
pipe_flow_y	mm	// distance that the arrow is above the // bottom of the arrow area.

Parameters for the title text on the left hand side of the plot:

pipe_flow_title	text	// title on the left hand side of the arrow
pipe_flow_title_textstyle	textstyle	// textstyle of the title
pipe_flow_title_text_size	mm	// size of the title
pipe_flow_title_text_colour	colour	// colour of the title
pipe_flow_title_offset	mm	// distance to raise or lower the text // from the arrow position
pipe_flow_title_x	mm	// distance from the left hand side of // the plot

Parameters for the arrow type:

pipe_flow_arrow_mode	0	// no arrow
	1	// arrow
	2	// line
	3	// line with uprights at ends
	4	// uprights, no line
	5	// line with downrights
	6	// downrights, no line
	7	// line with up and downrights at ends
	8	// up and downrights, no line
pipe_flow_arrow_colour	colour	// colour of the arrow
pipe_flow_arrow_size	mm	// height of the arrow
pipe_flow_arrow_gap	0	// no gap in arrow
	1	// leave gap in arrow for text

Parameters for the text on the arrow:

pipe_flow_arrow_pre_text	text	// text before the arrows text
pipe_flow_arrow_post_text	text	// text after the arrows text
pipe_flow_arrow_decimals	integer	// The number of decimal places used // when writing out the pipe flow // If > 0, all trailing zeros after the // decimal place are removed. // If < 0, the absolute value is taken as // the number of decimal places and no // trailing zeros are removed after the // decimal point.
pipe_flow_arrow_textstyle	textstyle	// textstyle of arrow text
pipe_flow_arrow_text_size	mm	// size of the text
pipe_flow_arrow_text_colour	colour	// colour of the text
pipe_flow_arrow_text_offset	mm	// distance to raise or lower the text // from the arrow position

Parameters for the Arrows giving the Drainage Line Name

Parameters specifying the arrow area used and the position of the arrows.

draw_drainage_line	0	// don't draw drainage line arrow
	1	// draw drainage line arrow
drainage_line_arrow_area	m	// the arrow area for the arrows
		// m = 1,2,3 or 4
drainage_line_y	mm	// distance that the arrow is above the
		// bottom of the arrow area.

Parameters for the title text on the left hand side of the plot:

drainage_line_title	text	// title on the left hand side of the arrow
drainage_line_title_textstyle	textstyle	// textstyle of the title
drainage_line_title_text_size	mm	// size of the title
drainage_line_title_text_colour	colour	// colour of the title
drainage_line_title_offset	mm	// distance to raise or lower the text
		// from the arrow position
drainage_line_title_x	mm	// distance from the left hand side of
		// the plot

Parameters for the arrow type:

drainage_line_arrow_mode	0	// no arrow
	1	// arrow
	2	// line
	3	// line with uprights at ends
	4	// uprights, no line
	5	// line with downrights
	6	// downrights, no line
	7	// line with up and downrights at ends
	8	// up and downrights, no line
drainage_line_arrow_colour	colour	// colour of the arrow
drainage_line_arrow_size	mm	// height of the arrow
drainage_line_arrow_gap	0	// no gap in arrow
	1	// leave gap in arrow for text

Parameters for the text on the arrow:

drainage_line_arrow_pre_text	text	// text before the arrows text
drainage_line_arrow_post_text	text	// text after the arrows text
drainage_line_arrow_textstyle	textstyle	// textstyle of arrow text
drainage_line_arrow_text_size	mm	// size of the text
drainage_line_arrow_text_colour	colour	// colour of the text
drainage_line_arrow_text_offset	mm	// distance to raise or lower the text
		// from the arrow position

Parameters for the Arrows for User Defined Pipe Attributes

There can be up to twenty sets of parameters which are used to define arrows for *user defined attributes* on the pipes.

Each *user defined attribute* is referred to by a given *user name* and it is this *user name* that is specified by a parameter and links the set of parameters to the information in the drainage string.

Note: *user defined attributes* on drainage pipes are usually set by special macros.

The parameters for the n'th set (n=1,2, ... 20) are:

Parameters specifying the pipe attribute used for this set of arrows and the arrow area used.

draw_pipe_attr_n	0	// don't draw nth set of arrows
	1	// draw the nth set of arrows
pipe_attr_n_name	text	// the name of the attribute to be labelled
		// on the n'th set of arrows
pipe_attr_n_arrow_area	m	// the arrow area for the arrows
		// m = 1,2,3 or 4
pipe_attr_n_y	mm	// distance that the arrow is above the
		// bottom of the arrow area.

Parameters for the title text on the left hand side of the plot:

pipe_attr_n_title	text	//title on the left hand side of the arrow
pipe_attr_n_title_textstyle	textstyle	// textstyle of the nth attribute's title
pipe_attr_n_title_text_size	mm	// size of the nth attribute's title
pipe_attr_n_title_text_colour	colour	// colour of the nth attribute's title
pipe_attr_n_title_offset	mm	//distance to raise or lower the text
		// from the nth arrow position
pipe_attr_n_title_x	mm	// distance from the left hand side of the
		// plot

Parameters for the arrow type:

pipe_attr_n_arrow_mode	0	// no arrow
	1	// arrow
	2	// line
	3	// line with uprights at ends
	4	// uprights, no line
	5	// line with downrights
	6	// downrights, no line
	7	// line with up and downrights at ends
	8	// up and downrights, no line
pipe_attr_n_arrow_colour	colour	// colour of the nth arrow
pipe_attr_n_arrow_size	mm	// height of the nth arrow
pipe_attr_n_arrow_gap	0	// no gap in arrow
	1	// leave gap in arrow for text

Parameters for the text on the arrow:

pipe_attr_n_arrow_pre_text	text	// text before the arrows text
pipe_attr_n_arrow_post_text	text	// text after the arrows text
pipe_attr_n_arrow_decimals	integer	// Only if the attribute is a real number.
		// The number of decimal places used
		// when writing out the value of the
		// attribute.
		// If > 0, all trailing zeros after the
		// decimal place are removed.
		// If < 0, the absolute value is taken as
		// the number of decimal places and no
		// trailing zeros are removed after the
		// decimal point.

pipe_attr_n_arrow_textstyle	<i>textstyle</i>	// textstyle of arrow text
pipe_attr_n_arrow_text_size	<i>mm</i>	// size of the text
pipe_attr_n_arrow_text_colour	<i>colour</i>	// colour of the text
pipe_attr_n_arrow_text_offset	<i>mm</i>	// distance to raise or lower the text
		// form the nth attribute's arrow position



Graph Area

The **graph area** is the area where the actual plots of the drainage strings are drawn.

The length of the graph area is determined by the length of the drainage string to be plotted, the horizontal scale (given by scale) of the plot and the sheet width.

```
scale          value          // 1:value - horizontal scale
                                   // The vertical scale is determined by the
                                   // horizontal scale and the vertical
                                   // exaggeration for the section view.
```

The vertical exaggeration is taken from the section view specified for the plot by the parameter:

```
view_name      text
```

The tins to be sectioned through by the drainage strings and any service models and corridor settings for the graph area are also taken from the specified section view.

The height of the graph is **calculated** by subtracting the height of the other nine boxes from the plot height.

If the plot will not fit horizontally into a row on the sheet, then the plot will be broken at an appropriate pit and the plot continued on another row.

Datum breaks at pits are used to try and fit the plot vertically into the graph area but if the plot still cannot fit, then it will be truncated at the bottom.

The types of strings that can be drawn in the graph area of the drainage long section plot are:

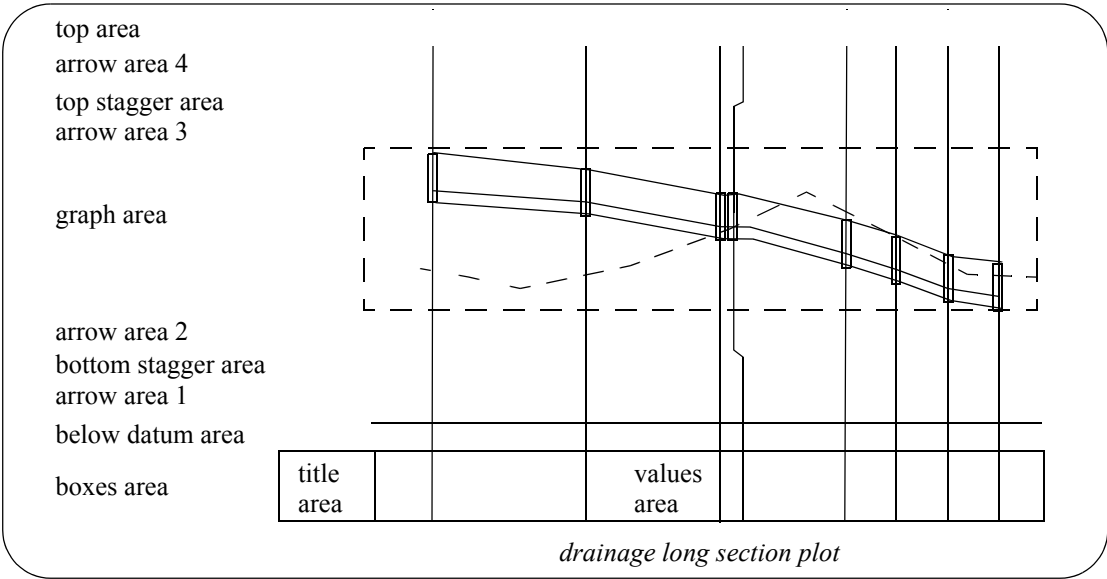
- (a) drainage string the strings from the network model
- (b) tins sections of the drainage string through any tins on the section view.
- (c) hgl hydraulic grade line values from the drainage string
- (d) services parts of strings from any models on the section view that cut the corridor for the section view.

Whether to draw the hydraulic grade line is controlled by:

```
draw_hgl_diag      0/1          // 1 = draw hydraulic grade line
```

The **colour** of the strings in the plot is the actual string colour for case (a) and (d), the colour of the tin used for the section in case (b) and user specified colour for (c).

```
hgl_colour          colour
```



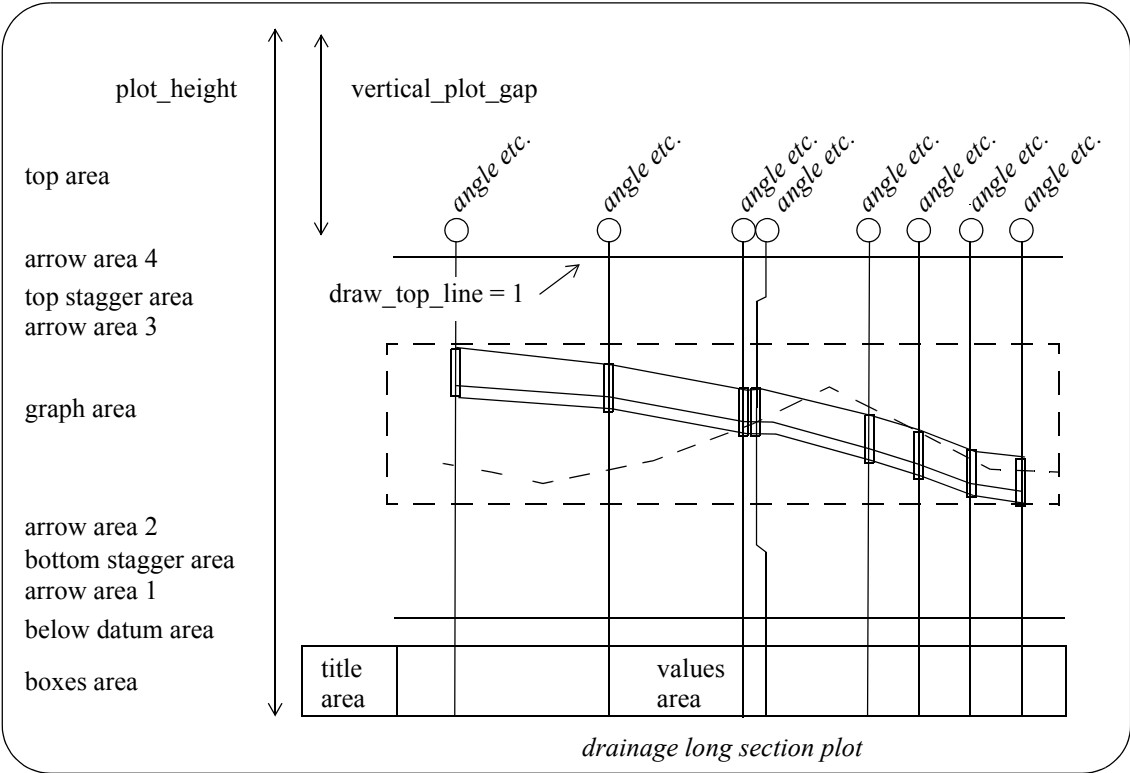
Top Area

The **top area** is an annotation area above the arrow_4_area at the top of the plot.
It can be used for pit names, pit types, line names, junctions and deflection angles through pits.
The height of the top area is given by

vertical_plot_gapmm// size of the top area. If it is not large
// enough, the text will over write the
// plot in the row above.

A line can be drawn at the bottom of the top area:

draw_top_line0/1// 1= draw line at bottom of top area
// (i.e. top of arrow_4_area)



Manhole name, Manhole Types and Surrounding Bubbles

The drainage string name, the manhole name (pit number) and manhole type (pit type) can be drawn on the drainage long section plot, with or without a bubble around it.

The bubble text is made up of

line_name / pit_name pit_type

where the bits actually used are controlled by

draw_line_name	0/1	// 1 = include line name. The "/" is only // included if the line_name is drawn.
draw_pit_name	0/1	// 1 = include pit_name
draw_pit_type	0/1	// 1 = include pit type

The size, colour and text style of the bubble text is given by:

bubble_text_size	mm	// size of text in bubble def angled_text_size
bubble_text_colour	colour	// colour of text def angled_text_colour
bubble_textstyle	textstyle	// textstyle for text def angled_text_textstyle
bubble_text_x	mm	// horizontal distance from the default // position (at the pit or in top area)
bubble_text_y	mm	// vertical distance from the default // position (at the pit or in top area)
bubble_pre_text	text	// default ""
bubble_post_text	text	// default ""
bubble_text_angle	value	// default 0
bubble_text_justify	value	// the default is centre justified

A bubble is drawn of radius **bubble_radius** is drawn around the bubble text.

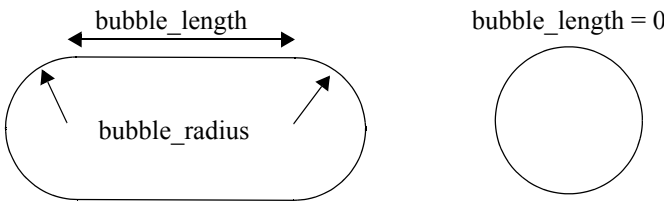
If **bubble_radius** is zero, then no bubble is drawn.

If the *bubble_radius* is zero, the bubble text is still drawn but without the enclosing bubble.

bubble_radius	mm	// if non-zero a bubble of this radius is // drawn around the text
bubble_colour	colour	// colour of bubbles

The "bubble" can be drawn as two semi-circles and two straight lines

bubble_length	mm	// length of the straight line in between // the semi-circles
---------------	----	------------------------------------------------------------------



The bubble text (and bubble) can be positioned at the bottom of the **top area**, or can be placed a fixed distance above the top of the corresponding manhole.

If the bubble text is drawn at the bottom of the top area, the upright is automatically drawn up to the bubble text.

If the bubble text is drawn above the pit, it is positioned by the *distance_above_pit* parameter **plus** the top stagger distances, *stagger_gap_top*, *stagger_height_3* and *stagger_height_4*.

This is necessary because the bubble text may need to be staggered.

draw_text_at_pit	0	// draw bubble and/or text in the top
------------------	---	---------------------------------------

	<i>l</i>	// area. // draw it above the pit
distance_above_pit	<i>mm</i>	// distance to add to the top stagger area // heights to draw the bubble above the // pit.
uprights_top_mode	<i>0/1</i>	// 1 = draw line from pit to bubble. Used to be // draw_line_to_text



Change of Direction Through Pits and Junctions

If there is a change of direction of the pipes of the plotted drainage string going through the pit, the deflection angle (in degrees, minutes and seconds) is drawn above the bubble text.

The deflection angle text is made up:

angled_pre_text deflection angle angled_post_text

Also any junctions at a pit in the plotted drainage string can be labelled with the name of the drainage strings coming into the pit, and the angle of the pipes at the junction.

Hence the junction text is made up of **two** lines:

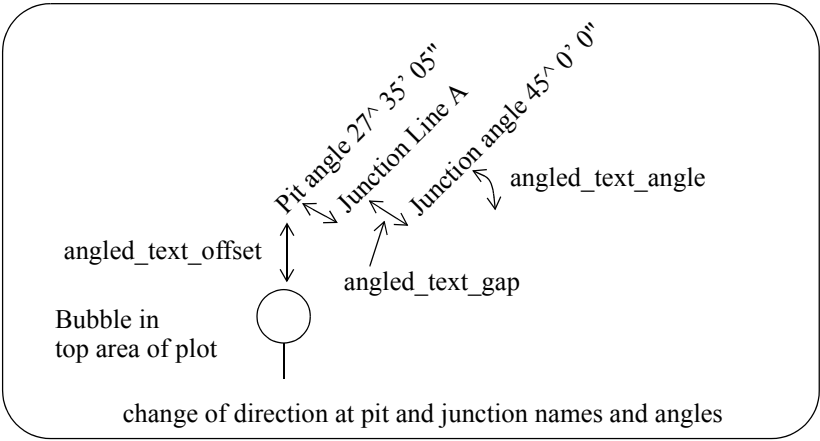
junction_pre_text line_name junction_post_text
junction_angle_pre_text junction angle junction_angle_post_text

If bubbles are drawn, the deflection angle and junction name and angle are drawn at the distance **angled_text_offset** above the bubble and with the distance **angled_text_gap** between the lines of information.

If bubbles are not drawn, the bubble text and the deflection angle and junction name and angle is placed the distance **angled_text_offset** above bottom of the top area. Each line of text is separated by the distance **angled_text_gap**.

The deflection angle and junction name and angle are drawn at an angle of **angled_text_angle**.

angled_text_offset	mm	// distance of text above bubble text // or above bottom of top area
angled_text_gap	mm	// distance between text to the right // of bubble text.
angled_text_angle	value	// angle of text



The pre and post text, colour, size and text style for the deflection angle of the drainage string pipes going through the pit are controlled by:

angled_pre_text	text	// default " "
angled_post_text	text	// default " "
angled_text_colour	colour	// colour of deflection angle text
angled_text_size	mm	// size of deflection angle text
angled_textstyle	textstyle	// textstyle of deflection angle text

The junction drainage string name can be included/not included in the first line of junction information:

junction_name_mode	0	// don't include the junction string name
	1	// default - use junction string name

The pre and post text, colour, size and text style for the junction name and the angle that the junction makes at the pit are controlled by:

junction_pre_text	text	// default "JUNCTION "
junction_post_text	text	// default " "
junction_text_colour	colour	// colour of junction name text
junction_text_size	mm	// size of junction name text
junction_textstyle	textstyle	// textstyle for junction name text
junction_angle_pre_text	text	// default " "
junction_angle_post_text	text	// default " "
junction_angle_text_colour	colour	// colour of junction angle text
junction_angle_text_size	mm	// size of junction angle text
junction_angle_textstyle	textstyle	// textstyle for junction angle text

Symbols at Manholes

Manholes can be labelled with symbols which depend on the manhole type. There can be up to twenty (20) sets of manhole symbols.

manhole_symbol_n_type	<i>mh_type</i>	// manhole type to have symbols
manhole_symbol_n_mode	0	// cross
	1	// up from centre of box
	2	// up and down from centre of box
	3	// square
	4	// triangle, base at bottom
	5	// circle
	6	// use a 12d symbol

0 + 1 | 2 | 3 □ 4 △ 5 ○

predefined symbols for manhole_symbol_n_modes

manhole_symbol_n_position	1	// at top of manhole - default
	3	// above top of boxes
	4	// above highest point
	100	// to primary string
	101	// to first found tin
manhole_symbol_n_size	<i>mm</i>	// size
manhole_symbol_n_x	<i>mm</i>	// x adjustment to position - default 0
manhole_symbol_n_y	<i>mm</i>	// y adjustment to position - default is 0
manhole_symbol_n_style	<i>text</i>	// the name of the linestyle (symbol)
manhole_symbol_n_angle	<i>value</i>	// default value is 0
manhole_symbol_n_colour	<i>colour</i>	//

For example:

manhole_symbol_1_type	"CONC COVER"	// manhole type to use
manhole_symbol_1_position	1	// on top of manhole
manhole_symbol_1_mode	6	// use 12d symbol
manhole_symbol_1_style	"shrub"	// name of 12d symbol
manhole_symbol_1_size	1	
manhole_symbol_1_x	0	
manhole_symbol_1_y	0	

Labelling House Connections

NOTE - house connections are only accessible by the **Sewer module**.

The house connections can be drawn from the pipe to the house connection level, with a line across the top (a T). The full width the T can be specified by the user.

draw_house_connections	yes/no
house_connection_width	value

The lot name for the house connection and the connection type can be labelled above the house connection. The house connection label is made up as:

connection_pre_text lot_name *connection_mid_text* connection_type *connection_post_text*

where lot_name and connection_type are stored with the house connection on the drainage string.

The parameters controlling the drawing of the house connection label are

house_connection_mode	0	// don't label the house connection
	1	// label the house connection with name
		// and type(default)
	2	// label the house connection with name only
connection_pre_text	text	// default " "
connection_mid_text	text	// default " "
connection_post_text	text	// default " "
connection_text_colour	colour	// colour of connection label
connection_text_size	mm	// size of connection label
connection_textstyle	textstyle	// textstyle connection label
connection_text_x	mm	// x adjustment to position of text - def 0
connection_text_y	mm	// y adjustment to position of text - def 0
connection_text_justify	text	// default is Bottom_left
connection_text_angle	value	// default vertical 90
connection_text_position	1	// above point height value
	3	// above top of boxes
	4	// above highest point
	100	// to primary string
	101	// to first found tin

Label connection type:

(this is used when the house_connection_mode is turned off, only the connection type is labelled)

house_connection_type_mode	0	// default, don't label connection type
	1	// label connection type
connection_type_text_x	mm	// x adjustment to position of text - def 0
connection_type_text_y	mm	// y adjustment to position of text - def 0
connection_type_pre_text	text	// text before type - def " "
connection_type_post_text	text	// text after type - def " "
connection_type_text_size	mm	// def box_text_size
connection_type_text_colour	colour	// def box_text_colour
connection_type_textstyle	text	//
connection_type_text_justify	text	//
connection_type_text_angle	value	// def vertical 90
connection_type_text_position	1	// above point height value - default
	3	// above top of boxes
	4	// above highest point
	100	// to primary string
	101	// to first found tin

Label the distance from the down stream pit to the house connection

house_connection_ds_pit_mode	0	// default, don't label chainage
	1	// label from down stream
	2	// label from up stream
	3	// label from left
	4	// label from right
connection_ds_pit_text_x	mm	// x adjustment to position of text
connection_ds_pit_text_y	mm	// y adjustment to position of text
connection_ds_pit_pre_text	text	// (") text before type
connection_ds_pit_post_text	text	// (") text after type
connection_ds_pit_text_size	mm	// def box_text_size
connection_ds_pit_text_colour	colour	//def (box_text_colour
connection_ds_pit_textstyle	text	//
connection_ds_pit_text_justify	text	// default Bottom_Left
connection_ds_pit_text_angle	value	// default is vertical (90)
connection_ds_pit_text_position	1	// above point height value - default

	3	// above top of boxes
	4	// above highest point
	100	// to primary string
	101	// to first found tin
connection_ds_pit_decimals	value	// def number_of_decimals

Label the connection depth from the finished surface

house_connection_depth_mode	1	//default, label house connection depth
	0	// don't label house connection depth
connection_depth_text_x	mm	// x adjustment to position of text - def 0
connection_depth_text_y	mm	// y adjustment to position of text - def 0
connection_depth_pre_text	text	// text before type - def " "
connection_depth_post_text	text	// text after type - def " "
connection_depth_text_size	mm	// default box_text_size
connection_depth_text_colour	colour	// default box_text_colour
connection_depth_textstyle	text	//
connection_depth_text_justify	text	// default Bottom_left
connection_depth_text_angle	value	// default is vertical (90)
connection_depth_text_position	1	// above point height value - default
	3	// above top of boxes
	4	// above highest point
	100	// to primary string
	101	// to first found tin
connection_depth_decimals	value	// default number_of_decimals

Label the finished surface:

house_connection_fs_mode	1	//default, label house connection finished
		// surface
	0	// don't label house con finished surface
connection_fs_text_x	mm	// x adjustment to position of text - def 0
connection_fs_text_y	mm	// y adjustment to position of text - def 0
connection_fs_pre_text	text	// text before type -def " "
connection_fs_post_text	text	// text after type - def " "
connection_fs_text_size	mm	// default box_text_size
connection_fs_text_colour	colour	// default box_text_colour
connection_fs_textstyle	text	//
connection_fs_text_justify	text	// default Bottom_left
connection_fs_text_angle	value	// default (vertical 90)
connection_fs_text_position	1	// above point height value - default
	3	// above top of boxes
	4	// above highest point
	100	// to primary string
	101	// to first found tin
connection_fs_decimals	integer	// default number_of_decimals
		// If > 0, all trailing zeros after the
		// decimal place are removed.
		// If < 0, the absolute value is taken as
		// the number of decimal places and no
		// trailing zeros are removed after the
		// decimal point.

The invert level of the house connection can also be plotted. The house connection invert level label is made up as:

connection_il_pre_text connection_invert_level *connection_il_post_text*

The parameters controlling the drawing of the house connection invert level label are:

2	// up and down from centre of box
3	// square
4	// triangle, base at bottom
5	// circle
6	// use a 12d symbol

0 + 1 | 2 | 3 □ 4 △ 5 ○

predefined symbols for property_control_symbol_n_modes 0

property_control_symbol_n_position	0	// at bottom (invert) of property control
	1	// at top (obvert) of property control
	2	// at centre (axis) of property control
property_control_symbol_n_size	mm	// size
property_control_symbol_n_x	mm	// x adjustment to position - default 0
property_control_symbol_n_y	mm	// y adjustment to position - default is 0
property_control_symbol_n_style	text	// the name of the 12d symbol
property_control_symbol_n_angle	value	// default value is 0
property_control_symbol_n_colour	colour	//colour of the symbol

For example:

property_control_symbol_1_position	0	// at bottom of prop control
property_control_symbol_1_mode	6	// use 12d symbol
property_control_symbol_1_style	"shrub"	// name of 12d symbol
property_control_symbol_1_size	1	
property_control_symbol_1_x	0	
property_control_symbol_1_y	0	

Labelling Property Controls

NOTE - property controls and house connections are only accessible by the **Sewer module**.

The property control can be labelled with its name where the property control is at the drainage string. The property control name label is made up as:

property_control_pre_text *property_control_name* *property_control_pre_post_text*

where *property_control_name* is the stored with the property control on the drainage string.

The parameters controlling the labelling the property control are

property_control_mode	0	// don't label the property control with name
	1	// label the property control with name
property_control_pre_text	text	// default " "
property_control_post_text	text	// default " "
property_control_text_colour	colour	// colour of label
property_control_text_size	mm	// size of label
property_control_textstyle	textstyle	// textstyle label
property_control_text_x	mm	// x adjustment to position of text - def 0
property_control_text_y	mm	// y adjustment to position of text - def 0
property_control_text_justify	text	// default is Bottom_left
property_control_text_angle	value	// default vertical 90
property_control_text_position	1	// above pc centre height value
	3	// above top of boxes
	4	// above highest point

100 // to primary string
 101 // to first found tin

Label the distance from the down stream pit to the property control

```
property_control_ds_pit_mode    0           // default, don't label chainage
                                1           // label from down stream
                                2           // label from up stream
                                3           // label from left
                                4           // label from right
property_control_ds_pit_text_x  mm          // x adjustment to position of text
property_control_ds_pit_text_y  mm          // y adjustment to position of text
property_control_ds_pit_pre_text text       // ("" ) text before type
property_control_ds_pit_post_text text      // ("" ) text after type
property_control_ds_pit_text_size mm        // def box_text_size
property_control_ds_pit_text_colour colour  //def (box_text_colour
property_control_ds_pit_textstyle text      //
property_control_ds_pit_text_justify text   // default Bottom_Left
property_control_ds_pit_text_angle value    // default is vertical (90)
property_control_ds_pit_text_position 1     // above pc centre height value - default
                                3           // above top of boxes
                                4           // above highest point
                                100         // to primary string
                                101         // to first found tin
property_control_ds_pit_decimals value      // def number_of_decimals
```

Label the depth from the finished surface to the invert level of the property control:

```
property_control_depth_mode    1           //default, label property control depth
                                0           // don't label pc depth
property_control_depth_text_x  mm          // x adjustment to position of text - def 0
property_control_depth_text_y  mm          // y adjustment to position of text - def 0
property_control_depth_pre_text text       // text before type - def " "
property_control_depth_post_text text      // text after type - def " "
property_control_depth_text_size mm        // default box_text_size
property_control_depth_text_colour colour  // default box_text_colour
property_control_textstyle text           //
property_control_depth_text_justify text   // default Bottom_left
property_control_depth_text_angle value    // default is vertical (90)
property_control_depth_text_position 1     // above pc centre height value - default
                                3           // above top of boxes
                                4           // above highest point
                                100         // to primary string
                                101         // to first found tin
property_control_depth_decimals value      // default number_of_decimals
```

Label the finished surface:

```
property_control_fs_mode    1           //default, label pc finished surface
                                0           // don't label pc finished surface
property_control_fs_text_x  mm          // x adjustment to position of text - def 0
property_control_fs_text_y  mm          // y adjustment to position of text - def 0
property_control_fs_pre_text text       // text before type -def " "
property_control_fs_post_text text      // text after type - def " "
property_control_fs_text_size mm        // default box_text_size
property_control_fs_text_colour colour  // default box_text_colour
property_control_fs_textstyle text      //
property_control_fs_text_justify text   // default Bottom_left
property_control_fs_text_angle value    // default (vertical 90)
property_control_fs_text_position 1     // above pc centre height value - default
```

	3	// above top of boxes
	4	// above highest point
	100	// to primary string
	101	// to first found tin
property_control_fs_decimals	<i>integer</i>	// default number_of_decimals
		// If > 0, all trailing zeros after the
		// decimal place are removed.
		// If < 0, the absolute value is taken as
		// the number of decimal places and no
		// trailing zeros are removed after the
		// decimal point.

The invert level of the property control at the drainage string can also be plotted. The property control invert level label is made up as:

property_control_il_pre_text *property_control_invert_level* *property_control_il_post_text*

The parameters controlling the drawing of the property control invert level label are:

property_control_il_mode	1	// default, label the pc il
	0	// don't label the pc il
property_control_il_text_position	1	// above pc centre height value - default
	3	// above top of boxes
	4	// above highest point
	100	// to primary string
	101	// to first found tin
property_control_il_text_x	<i>mm</i>	// x adjustment to position of text - def 0
property_control_il_text_y	<i>mm</i>	// y adjustment to position of text - def 0
property_control_text_gap	<i>mm</i>	// distance from pc name label and il label
property_control_il_decimals	<i>integer</i>	// def -3, number of decimal places in il value
		// >0 drop trailing zeros after decimal point
		// < 0 keep trailing zeros
property_control_il_pre_text	<i>text</i>	// default " ", text before type
property_control_il_post_text	<i>text</i>	// default " ", text after type
property_control_il_text_colour	<i>colour</i>	// colour of pc il -def box_text_colour
property_control_il_text_size	<i>mm</i>	// size of pc il - def box_text_size
property_control_il_textstyle	<i>textstyle</i>	// textstyle pc il
property_control_il_text_justify	<i>text</i>	//
property_control_il_text_angle	<i>value</i>	// (vertical 90)

Hatching Cut and Fill Areas

This option is used to hatch cut and/or fill areas between sets of tins.

For each set, the name of the two tins, the hatch linestyle, colour and separation and whether cut and/or fill regions are required are all user definable.

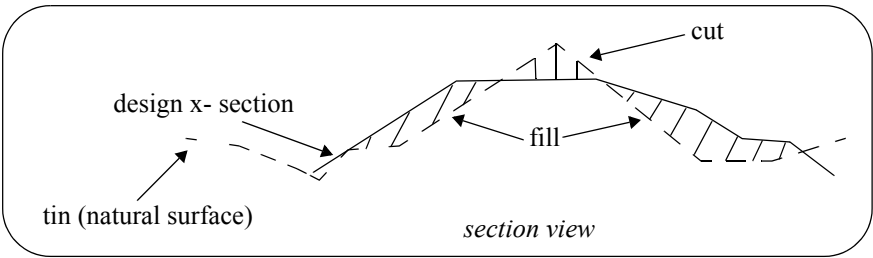
Up to twenty (20) separate sets of tins be hatched.

The parameters for labelling cuts and/or fill regions between tins are given by:

hatch_original_tin_n	tin_name	// tin_name for original surface
hatch_new_tin_n	tin_name	// tin_name for final surface
hatch_cut_separation_n	mm	// distance between cut hatch lines
	0	// don't do cut hatching
hatch_cut_angle_n	degrees	// angle in degrees of cut hatching
hatch_cut_colour_n	colour	// colour of the cut hatching
hatch_cut_linestyle_n	linestyle	// linestyle for cut hatching
hatch_cut_draw_sides_n	1/0	// 1 = draw sides of cut regions
hatch_cut_draw_original_n	1/0	// 1 = draw original tin in cut regions
hatch_cut_draw_new_n	1/0	// 1 = draw new tin in cut regions
hatch_fill_separation_n	mm	// distance between fill hatch line
	0	// don't do fill hatching
hatch_fill_angle_n	degrees	// angle in degrees of fill hatching
hatch_fill_colour_n	colour	// colour of the fill hatching
hatch_fill_linestyle_n	linestyle	// linestyle for fill hatching
hatch_fill_draw_sides_n	1/0	// 1 = draw sides of fill regions
hatch_fill_draw_original_n	1/0	// 1 = draw original tin in fill regions
hatch_fill_draw_new_n	1/0	// 1 = draw new tin in fill regions

Notes

- (a) cut is when the new tin is below the original tin.
fill is when the new tin is above the original tin.
- (b) cut hatching is turned off by setting hatch_cut_separation_n to 0.0.
fill hatching is turned off by setting hatch_fill_separation_n to 0.0.



Labelling Cuts of Drainage Through Strings in a Model

The cuts that the drainage string makes through any strings in user given models can be automatically labelled on the long section plots.

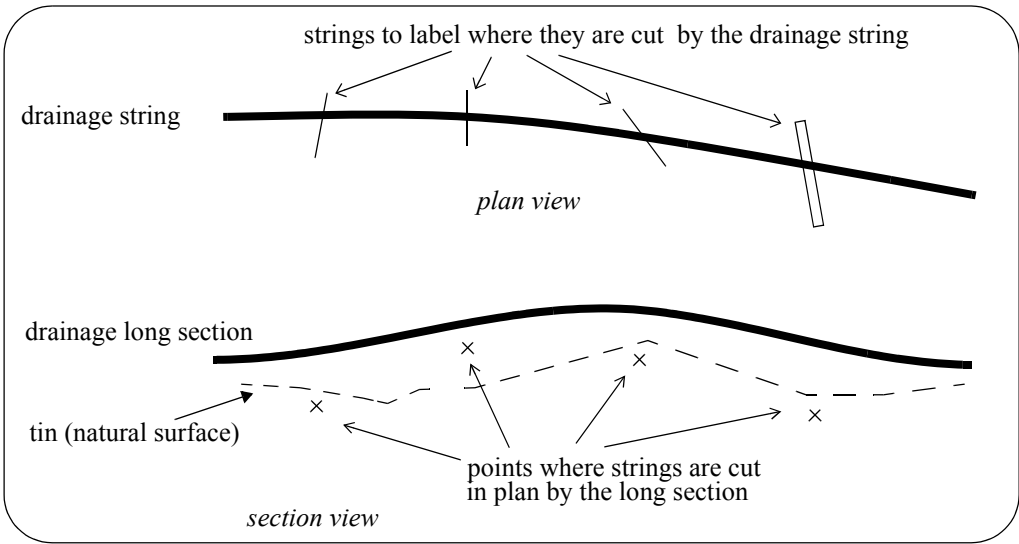
The **height**, **chainage** and **name** of the cut string can be labelled as well as a **symbol** drawn. The height of tins at the same offset value can also be labelled.

The chainage position for the labelling is the chainage of the cut string.

The height position for the labelling can be specified as the

- (a) top of the boxes on the long section
- (b) height value of the cut string
- (c) height of the primary string
- (d) height of a tin.

The actual position of the label is defined relative to the above point.



Note:

Only case (b) involves the actual height of the cut string. For all other cases, only the chainage of the cut string is used. Hence for all cases except (b), the string does need to have a sensible height to be used for cuts through strings.

For example, a boundary string may have null heights but only the chainage is required and the height of the tin at that chainage can be used as the height (case (d)).

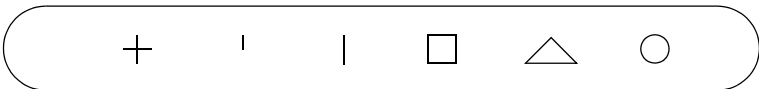
Text justification refers to the actual position and is given by

“top-left”	“top-centre”	“top-right”
“middle-left”	“middle-centre”	“middle-right”
“bottom-left”	“bottom-centre”	“bottom-right”

A choice of six special symbols and/or or any 12d symbols can be drawn at the cut point.

The special 12d Model symbols of size one millimetre are drawn in a square box centred on (0,0) with sides of length two millimetres. That is, the box co-ordinates are (-1,-1), (1,1), (1,-1), (-1,-1).

The six special shapes are



Up to twenty five (25) separate models of strings can be cut and labelled.

The method for specifying which strings are to be checked for cuts is by first specifying the **model** which contains the strings, and then a **name mask** which is used to restrict the strings in the model to only those whose name matches the name mask.

Up to twenty five different sets of models and name masks can be used so that different cut sets can be labelled in different ways.

cuts_n_model	<i>model_name</i>	// model of strings to be cut
--------------	-------------------	-------------------------------

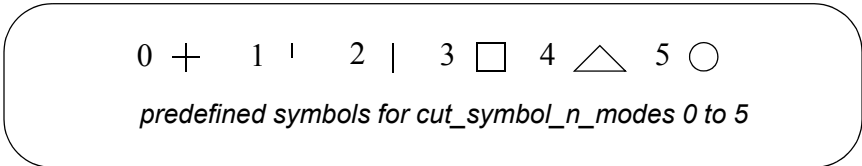
```
cuts_n_mask      name_mask      // strings to check for cuts
                                     // and if a cut occurs,
                                     // parameters show how to
                                     // label the cut
```

For example

	cuts_1_mask	"ke"
or	cuts_1_mask	"?bank"
or, if both masks are required,		
	cuts_1_mask	"ke* ?bank"

All strings in the model *cuts_n_model* whose name satisfy the name mask *cuts_n_mask* are then checked for cuts with the drainage strings, and if a cut occurs, the cut point will be labelled according to the rest of the parameters in the n'th set.

cuts_symbol_n_mode	0	// cross
	1	// up from centre of box
	2	// up and down from centre of box
	3	// square
	4	// triangle, base at bottom
	5	// circle
	6	// use a 12d symbol

[illegible]

The plot symbol of name *plotsymbol* is defined in the file given by:

- Drainage Plots* *Page 3925*

- plot_symbols filename
- or if plot_symbols is not defined**, then
- (b) in the file pointed to by the environment variable PLOT_SYMBOLS_4D
 PLOT_SYMBOLS_4D filename // default plotsym.4d
- or if PLOT_SYMBOLS_4D is not defined**, then
- (c) in the file *plotsym.4d*
 which is searched for in the standard set up file sequence
- If none of the above files are defined**, or if the symbol does not exist in the above files, then it will be searched for in the standard 12d symbols file which is:
- (d) either pointed to by the environment variable SYMBOLS_4D
 SYMBOLS_4D filename // default symbols.4d
 or if the environment variable SYMBOLS_4D does not exist, in the file, *symbols.4d*

The position of the symbol or plot symbol is given by:

cuts_symbol_n_position	1	// above point height value
	3	// above top of boxes
	100	// to primary string
	101-500	// to tin1 or tin2 etc.

The symbol can be adjusted by the parameters:

cuts_symbol_n_x	mm	// offset adjustment to position
cuts_symbol_n_y	mm	// height adjustment to position
cuts_symbol_n_angle	degrees	// rotation about point
cuts_symbol_n_colour	colour	// colour of symbol

and for all values of *cuts_symbol_n_mode* **other** than 6:

cuts_symbol_n_size	mm	// size of symbol, 0 don't draw
--------------------	----	---------------------------------

The value of the **chainage** of the cut string can be labelled using the parameters

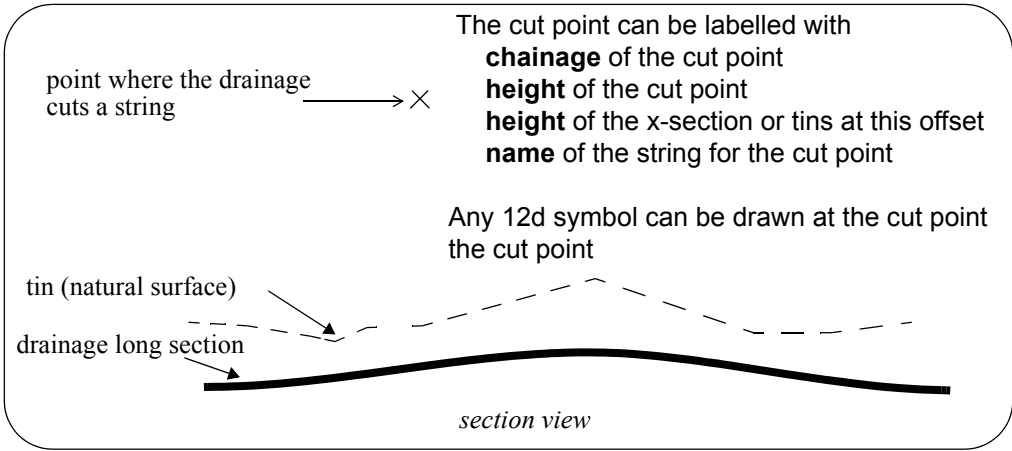
cuts_chainage_n_position	1	// above cut strings height value
	3	// above top of boxes
	100	// to primary string
	101-500	// to tin1 or tin2 etc.
cuts_chainage_n_x	mm	// chainage adjustment to position
cuts_chainage_n_y	mm	// height adjustment to position
cuts_chainage_n_angle	degrees	// rotation about point
cuts_chainage_n_size	mm	// size of text, 0 don't label
cuts_chainage_n_colour	colour	// colour of text
cuts_chainage_n_textstyle	text	// textstyle of text chainage
cuts_chainage_n_pre_text	text	// text before the chainage value
cuts_chainage_n_post_text	text	// text after the chainage value
cuts_chainage_n_justification	justification	// justification of the text
cuts_chainage_n_no_decimals	integer	// number of decimals in chainage

The value of a **height** at the chainage of the point can be calculated and labelled using the parameters

cuts_height_n_mode	1	// use height of cut point itself
	3	// use real world height of position
		// above boxes
	100	// height of primary string
cuts_height_n_position	101-500	// use height of to tin1 or tin2 etc.
	1	// at points position
	3	// above top of boxes
	100	// to primary string
cuts_height_n_x	101-500	// to tin1 or tin2 etc.
	mm	// chainage adjustment to position
	mm	// height adjustment to position
	degrees	// rotation about point
cuts_height_n_size	mm	// size of text, 0 don't label
	colour	// colour of text
	text	// textstyle of text height
	text	// text before the height value
cuts_height_n_pre_text	text	// text after the height value
	justification	// justification of the text
	integer	// number of decimals in height

A **label** which can include the **name** of the cut string is drawn by using the parameters

cuts_label_n_position	1	// above cut strings height value
	3	// above top of boxes
	100	// to primary string
	101-500	// to tin1 or tin2 etc.
cuts_label_n_mode	0	// don't include cut string name
	1	// include cut string name in label
	mm	// chainage adjustment to position
	mm	// height adjustment to position
cuts_label_n_size	degrees	// rotation about point
	mm	// size of text, 0 don't label
	colour	// colour of text
	text	// textstyle of text label
cuts_label_n_pre_text	text	// text before the string name
	text	// text after the string name
	justification	// justification of the text



Title Block Information

The plot can have a standard 12d Model title block or a user defined title block.

The standard title block consists of a simple border around the plot and two lines of text in a box underneath the plot. For a user defined title block, all the line work and text is defined by the user.

Standard Title Block

For the standard 12d Model title block, there are extra parameters for two lines of text and text size and colour. The standard title block is turned on or off by the parameter *plot_border*.

<i>plot_border</i>	<i>yes/no</i>	<i>// yes plots a standard title block</i> <i>// default yes</i>
<i>title_1</i>	<i>text</i>	
<i>title_2</i>	<i>text</i>	
<i>title_text_size</i>	<i>value</i>	
<i>title_colour</i>	<i>colour</i>	

User Title Block

For the user defined title block, the title block drawing commands are kept in a file whose name is supplied by the user. The title block drawing commands are almost identical to the *linestyle* drawing commands and is given at the beginning of chapter Advanced Plotting.

Hence for a user defined title block, there are just two parameters - one to say a title block file is being used and the other to give the name of the title block file. The *plot_border* parameter should also be set to *no* so that the standard title block is not also drawn.

<i>use_title_file</i>	<i>yes/no</i>	<i>// yes draws the title block given in title_file</i> <i>// default no</i>
<i>title_file</i>	<i>filename</i>	
<i>plot_border</i>	<i>no</i>	<i>// turn off standard title block</i>

Some special plot parameters are used to pass information down to variables in a user defined title block

For example, inside the title block file it is possible to have runtime user defined text variables. The actual text values for these text variables are passed down to the title block file from the plot parameter file via the parameters *user_text_n* (n = 1,2,... 1000)

<i>user_text_n</i>	<i>text</i>
--------------------	-------------

The special plot parameters are:

<i>time_format</i>	<i>text</i>	<i>// format for \$time</i>
<i>user_text_n</i>	<i>text</i>	<i>// where n = 1,2,... 1000</i> <i>// passed down to \$user_text_n</i>
<i>title_1</i>	<i>text</i>	<i>// passed down to \$title_1</i>
<i>title_2</i>	<i>text</i>	<i>// passed down to \$title_2</i>
<i>start_page_number</i>	<i>integer</i>	<i>// used as the starting value for</i> <i>// \$page_number. If missing,</i> <i>// \$page_number starts at 1.</i>
<i>start_drawing_number</i>	<i>integer</i>	<i>// added to \$drawing_number in title</i> <i>// block file. If missing,</i> <i>// \$drawing_number starts at 1.</i>
<i>drawing_number_prefix</i>	<i>text</i>	<i>// passed down to</i> <i>// \$drawing_number_prefix</i>
<i>drawing_number_postfix</i>	<i>text</i>	<i>// passed down to</i> <i>// \$drawing_number_postfix</i>

Parameters that Modify Fields In the Plot Drainage Network Panel

A number of parameters match those in the **plot drainage network** panel.

When the plot parameter file is first read, any parameters in the panel will be replaced by the values of any corresponding parameters from the parameter file.

However, if the parameter is subsequently modified in the panel, the panel value will be the value used for the parameter.

The plot parameters that also occur in the **plot drainage network** panel are:

network_model	text
scale	value
plotter_type	text
plot_stem	text
view_name	text
sheet_size	text or "width height"
plot_height	mm
x_origin	mm
y_origin	mm
global_textstyle	textstyle
box_text_size	mm
box_colour	colour
plot_border	yes/no
title_1	text
title_2	text
title_text_size	value
title_text_colour	colour
use_title_file	yes/no
title_file	filename

Melbourne Water

Position of menu: Design =>Drainage-Sewer=>Plots=>Melbourne Water

The **Melbourne Water** option is used to generate the longsection plots for all lines in a drainage network to the Melbourne Water sewer standards.

Given the plot sheet size and the horizontal and vertical scales, the longsections for the drainage lines are plotted starting at the top of the sheet and moving across the sheet. Once one row is full, if there is room the plot moves down the page and begins a new row. When a plot sheet is full, a new plot sheet is automatically begun.

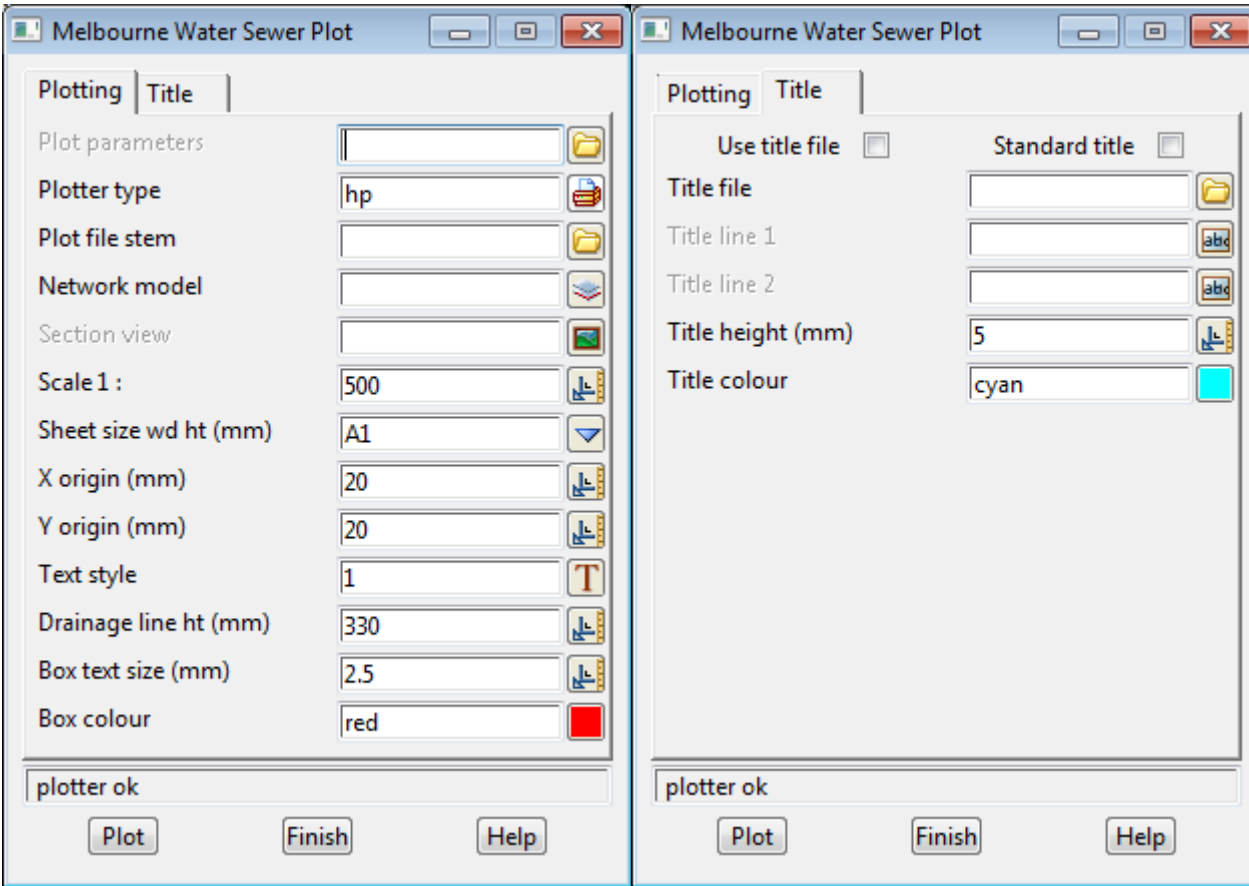
Hence the drainage lines are plotted one after another on one or more plotter sheets.

The drainage lines are plotted in string name alphabetical order.

The drainage longsection plot includes

- s the manholes, drainage pipe and any house connections
- s the height of the natural surface at the manhole
- s manhole names and cover types
- s distances between manholes
- s the invert depth of the pipe on either side of a manhole
- s the grades and types of the pipes
- s any services in the corridor - including their name, invert level and distance from the nearest downstream manhole

After selecting the **Melbourne Water** option, the **Melb plot drainage network** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Plot parameters <i>file of plot parameters used for extra control of the long section plot.</i>	input		*.ppf
Plotter type <i>format for the plot output.</i>	input	hp	hp, dxf, postscript etc.
Network model <i>the model containing all the drainage lines for the network.</i>	input		
Section view <i>the section view to be used to define the vertical exaggeration, corridor widths, tins to section through, services models to section etc.</i>	input		
Plot file stem <i>since more than one plot page may be produced, the plot file names are constructed from the stem plus a plot page sequence number, followed by the appropriate plotter type ending.</i>	input		
Scale 1: <i>horizontal scale for plotting the drainage long section. The vertical exaggeration is taken from the section view given in the section view field.</i>	input		
Sheet size wd ht (mm) <i>the width and height values (separated by space) or the name of a user defined sheet size.</i>	input		available sheet sizes
X origin (mm)	input		

the x position on the plot sheet for the bottom left hand corner of the longsection plots.

Y origin (mm)	input		
<i>the y position on the plot sheet for the bottom left hand corner of the longsection plots.</i>			
Drainage line ht (mm)	input	boxes	boxes, centreline
<i>the maximum allowable height for a longsection plot for a drainage line. Datum breaks are applied to any part of the longsection that will not fit into the drainage line ht.</i>			
Box text size (mm)	input	3	
<i>size (in millimetres) to plot the chainages, heights etc. in the boxes in the plots of the drainage longsections</i>			
Box colour	input	cyan	available colours
<i>colour used for the text and the boxes.</i>			
Plot	button		
<i>plot the drainage longsections for the drainage lines in the model given in the network model field.</i>			
The fields and buttons in title tab are:			
Use title file	tick box		
<i>if tick, a user defined title block file is used.</i>			
Standard Title	tick box	tick	
<i>if tick, the standard 12d Model border and two lines of title are placed on the bottom of the plot</i>			
Title file	input		*.tf
<i>if non-blank and use title file is set to tick, then the file given in this field is used to generate a user defined title block for the plot.</i>			
Title line 1/2	input		
<i>first/second line of title information</i>			
Title height (mm)	input	5	
<i>height (in millimetres) to draw the characters in the two lines of title information.</i>			
Title colour	input	cyan	available colours
<i>colour used for the border and the title information.</i>			

Please continue to the next section [Melbourne Water Plot Parameter File](#).

Melbourne Water Plot Parameter File

The **Melbourne Water plot** option is used to make special long section plots for a **network** of new drainage strings to Melbourne Water sewer standards.

Some of the look of the long section plot can be controlled from the **Melb plot drainage network** panel itself, however a wider selection of control parameters is available by using a Melbourne Water long plot, plot parameter file.

Because the Melbourne Water format is so fixed, most of the parameter have sensible default values and can be left out. However, for completeness, all the parameters are given.

The Melbourne Water Sewer (MWS) long section plot parameters are placed in a file with ending **.ppf**. Each parameter consists of a parameter name followed by one or more spaces and then the parameter value. There is only one parameter per line.

Anything on a line after a double forward slash `//` is considered to be a comment.

The set of all parameters for the Melbourne Water sewer long section plot is enclosed within a set of curly brackets `{ }` with the header

```
melb_water_sewer_long_plot    "plot set name"
```

before the curly brackets.

That is,

```
melb_water_sewer_long_plot  "plot set name" {
    plot parameters
    one per line
}
```

If there is more than one `melb_water_sewer_long_plot` parameter set in the file, only the first set is used.

There may also be parameter sets for other plot types such as `section_x_plot` in the same file. The other sets will be ignored when doing a Melbourne Water long section plot.

The plot parameters are documented in following groups:

For the *Plot Sheet layout*, please continue to the section [Plot Sheet Layout](#).

Chainages, staggering and uprights, please continue to the section [Chainages, Staggering and Uprights](#).

Boxes area, please continue to the section [Boxes Area](#).

Datum area, please continue to the section [Datum Value](#).

Arrows area, please continue to the section [Arrow Areas](#).

Graph area parameters, please continue to the section [Graph Area](#).

Top area parameters, please continue to the section [Top Area](#).

Manhole parameters, please continue to the section [Manholes](#).

Junctions parameters, please continue to the section [Junctions](#).

Services parameters, please continue to the section [Services](#).

Property controls and house connection parameters, please continue to the section [Property Controls and House Connections](#).

Symbols at manhole parameters, please continue to the section [Symbols at Manholes](#).

Hatching cut and fill parameters, please continue to the section [Hatching Cut and Fill Areas](#).

Labelling cuts parameters, please continue to the section [Labelling Cuts of Drainage Through Strings in a Model](#).

Title block parameters, please continue to the section [Title Block Information](#).

Panel modifying parameters, please continue to the section [Parameters that Modify Fields In the Melbourne Water Network Panel](#).

Plot Sheet Layout

The plot sheet is considered to have only positive co-ordinates with the origin (0,0) in the left hand corner. The units for the plot are millimetres.

The overall size of the plot sheet is given by either a defined sheet size, or by the width and height of the plot given in millimetres and separated by one or more spaces.

```
sheet_size          text          // sheet name, or
                    "mm    mm"    // sheet size:  width  height
```

The sheet size name and width and heights can be specified by the user in a file named `sheets.4d` which is in the normal set up areas, or is pointed to by the environment variable

```
SHEET_SIZES_4D      file          // file of plotter sheets sizes
```

The Melbourne Water long section plot will break an individual plot up if it doesn't fit across the sheet. There can be one or more rows of plot on the same sheet.

The top row is done first, followed by the second top row, then the third and so on until the bottom row. If there is only one row, it is considered to be the bottom row.

When a sheet is full, a follow on sheet is created.

As soon as one drainage string is completed, the next drainage string in the network model is plotted beginning on the same row as the previous drainage string and with a horizontal gap of size `horizontal_plot_gap` between the plots. If there is not enough room on the row to start the next plot, it will begin on a new row.

The position of the left hand bottom corner of the first plot in the bottom row is given by the parameters, `x_origin` and `y_origin`.

If there are two or more rows of plots, the position of the first plot in each row is given by adding multiples of the `plot_height` to the `y_origin`.

<code>network_model</code>	text	// model of sewer strings
<code>x_origin</code>	mm	// Position of the left hand bottom
<code>y_origin</code>	mm	// corner of first plot in the bottom row.
<code>only_one_line</code>	0	// more than one row on a sheet
	1	// only one row of plot on a sheet
<code>plot_height</code>	mm	// total height of a plot row.
		// It includes the <code>vertical_plot_gap</code> .
<code>horizontal_plot_gap</code>	mm	// gap between plots on same row
<code>vertical_plot_gap</code>	mm	// gap between rows of plots

A `textstyle` can be specified which is used for all the text in the plot.

<code>global_textstyle</code>	textstyle	//used for all plot text
-------------------------------	-----------	--------------------------

The Melbourne Water long plot itself consists of nine areas. From the bottom up, they are boxes, arrow 1, bottom stagger, arrow 2, graph, arrow 3, top stagger, arrow 4, top.

The **boxes area** is where the chainages and various values for the drainage strings are labelled.

The **arrow 1 area** is for drawing arrows where the arrows go between the staggered uprights and below the graph area. The datum line is at the bottom of the arrow 1 area.

The **bottom stagger area** is where the upright line staggers occur before going up from the boxes area to the graph area.

The **arrow 2 area** is for drawing arrows below the graph but where the arrows go between non-staggered uprights.

The **graph area** is the area where the actual plots of the strings are drawn.

The **arrow 3 area** is for drawing arrows above the graph area and where the arrows go between non-staggered uprights.

The **top stagger area** is where the upright line staggers occur above the graph area.

The **arrow 4 area** is for drawing arrows where the arrows go between the staggered uprights and above the graph area.

The **top area** is an annotation area above the arrow 4 area and is used for manhole names, junctions, deflection angles etc.

Although the arrow areas exist, the Melbourne Water plot does not have any arrows in them.

Chainages, Staggering and Uprights

All of the labelling of the Melbourne Water sewer plot is done at the chainages of the manholes on the drainage line. For example, the invert levels, depths and natural surface of pipes at a manhole are all labelled at the chainage of the manhole.

The labels for these values are done at an angle of zero degrees rather than ninety degrees for the sewer plots.

Uprights, or leader lines, are drawn from the values at the bottom of the plot to the manhole in the graph area.

If the text values are placed at the real chainage positions at the bottom of the plot, text over writing can easily occur if the chainages are very close together.

To prevent such over writing, the text can be **staggered**. That is, if the text is going to over write a previous text value, the next text value is actually moved along until there is no over writing.

Since the text is no longer at the correct chainage position, the uprights to the manholes and services start at the text position and then bend back to the correct chainage position on the plot. The region where the bending occurs is called the stagger area.

For the Melbourne Water plot, there is an area below the graph where the uprights bend backwards from the staggered text position to the real chainage position (bottom stagger area).

And there is a second area above the graph where the uprights bend forwards from the real chainage position to the staggered text position (top stagger area).

Hence annotation above the top stagger area will line up with the staggered values below the bottom stagger area.

The stagger area below the graph area is defined by

stagger_height_1	mm	// distance from the top of arrow_area_1 // to the start of the staggers
stagger_height_2	mm	// distance over which stagger occurs
stagger_gap_bottom	mm	// distance from end of staggers to the // bottom of arrow_area_2

The stagger area above the graph area is defined

stagger_gap_top	mm	// distance from the top of arrow_area_3 // to the start of the staggers
stagger_height_3	mm	// distance over which stagger occurs
stagger_height_4	mm	// distance from end of staggers to the // bottom of arrow_area_4

The distance to be left for text to avoid over writing is:

horizontal_text_gap	mm	// minimum distance to leave for text // after manhole values
services_text_gap	mm	// minimum distance to leave for text // after service values

When staggering occurs, it is possible for the values area to be longer than the graph area.

The **colour** of the uprights that are drawn from the text to the manholes is given by:

manhole_line_colour	colour	// colour of uprights to the manholes
---------------------	--------	---------------------------------------

Boxes Area

The drainage string values invert level, depth to invert and surface level can be labelled in the Melbourne Water plot with one line of title, and the actual values given at the chainage of each manhole in the drainage string.

The title or **label** for the strings, is drawn in the **labels area** of the **boxes area** and the values are drawn in the **values area** of the **boxes area**.

Consequently the boxes area is made up of rows of text consisting of:

labels followed by the **values** along the string.

Thus the boxes area is built up as a series of individual boxes and the **boxes area** is made up of two areas side by side - the **labels area** and the **values area**.

The order of the boxes from the bottom up is

- (a) chainage values
- (b) upstream and downstream depth to inverts
- (c) upstream and downstream invert levels
- (d) natural surface heights

The label text size and colour are specified by

plot_title_text_size mm // size of label text in boxes
plot_title_text_colour colour // colour of label text in boxes

The width of the label box is given by the **box_width** parameter and the height of each box is given by **box_height**.

box_width mm // width of the label boxes.
box_height mm // height of each box

The label text for each box can be set by

plot_title_chainage_name text // label for chainages box
plot_title_surface_name text // label for the sewer ns values
plot_title_invert_name text // label for the invert levels
plot_title_depth_name text // label for depth of inverts

For the Melbourne Water plots, there are also additional parameters for special Melbourne Water labels. They are

plot_title_item_name text // label for item line
plot_title_d_and_g_name text // label for diameter and grade
plot_title_detail_name text // label for detail line at top of plot

The pipe type can also be included with the diameter and grade values

label_pipe_type yes/no

The **labels area** for the left plot in the bottom row starts at the co-ordinate (x_origin,y_origin) and each row is begun by adding the distance plot_height to the y_origin.

x_origin mm // x coord of bottom lh corner of bot row
y_origin mm // y coord of bottom lh corner of bot row

The **values area** starts at the end of the label area.

As for the label boxes, the height of each individual box area is given by the box_height parameter.

The width of the heights area is determined by the number of chainages to be labelled and whether the values are staggered to prevent over writing.

box_text_size mm // size of value text
box_text_colour colour // colour of values in boxes

The colour of the box line work is given by:

box_colour colour // colour of the lines in the boxes

The total height of the boxes area is simply given by number of boxes drawn multiplied by the height of one box).

The total width of the boxes area is the width of the labels area plus the width of the values area which depends on the amount of staggering that occurs.

Datum Value

The datum value is placed above the top of the natural surface heights box.

Since the datum value is automatically calculated to try and fit the plot vertically into the graph area, the datum value can change along the plot. When a datum change occurs, the new datum value is written on the datum line at the relevant chainage position.

The datum name, text size and colour are controlled by:

datum_name	<i>text</i>	// text to write before the datum value
datum_text_size	<i>mm</i>	// size of datum text and value
datum_colour	<i>colour</i>	// colour of the datum text and line
datum_value_pre_text	<i>text</i>	// text before the datum value
datum_value_post_text	<i>text</i>	// text after the datum value
		// (default " m")
datum_value_decimals	<i>integer</i>	// number of decimal places in the
		// datum value.
		// If > 0, trailing zeros are removed.
		// If < 0, the absolute value is taken as
		// the number of decimal places and no
		// trailing zeros are removed.

Arrow Areas

The **arrow areas** were designed for drawing arrows between manholes and labelling them with values such as pipe slope, pipe diameter, flow, velocity and drainage line name.

These are not required for the Melbourne Water sewer plot.

However, values can still be given to defined the sizes of the arrow areas.

There are four arrow areas:

arrow_1_area which is below the graph and the bottom stagger area. The arrows go between the staggered positions of the manhole chainages.

The datum line is at the bottom of the arrow 1 area.

arrow_2_area which below the graph but above the bottom stagger area. Hence the arrows go between the non-staggered chainage positions of the manholes.

arrow_3_area which is above the graph but below the top stagger area. The arrows go between the non-staggered chainage positions of the manholes.

arrow_4_area is above the graph and the top stagger area. The arrows go between the staggered chainage positions of the manholes.

The heights of the four areas (which can be zero) are defined by:

arrow_area_1	<i>mm</i>	// height of arrow_1 area
arrow_area_2	<i>mm</i>	// height of arrow_2 area
arrow_area_3	<i>mm</i>	// height of arrow_3 area
arrow_area_4	<i>mm</i>	// height of arrow_4 area

Graph Area

The **graph area** is the area where the actual plots of the drainage strings are drawn.

The length of the graph area is determined by the length of the drainage string to be plotted, the horizontal scale (given by scale) of the plot and the sheet width.

```
scale                value                // 1:value - horizontal scale
// The vertical scale is determined by the
// horizontal scale and the vertical
// exaggeration for the section view.
```

The vertical exaggeration is taken from the section view specified for the plot by the parameter:

```
view_name            text
```

The tins to be sectioned through by the sewer strings and any service models and corridor settings for the graph area are also taken from the specified section view.

The height of the graph is **calculated** by subtracting the height of the other nine boxes from the plot height.

If the plot will not fit horizontally into a row on the sheet, then the plot will be broken at an appropriate manhole and the plot continued on another row.

Datum breaks at manholes are used to try and fit the plot vertically into the graph area but if the plot still cannot fit, then it will be truncated at the bottom.

The types of strings that can be drawn in the graph area of the sewer long section plot are:

- (a) drainage string the strings from the network model
- (b) tins sections of the drainage string through any tins on the section view.
- (c) services parts of strings from any models on the section view that cut the corridor for the section view.

The **colour** of the strings in the plot is the actual string colour for cases (a) and (c), and the colour of the tin used for the section in case (b).

Top Area

The **top area** is an annotation area above the arrow_4_area at the top of the plot.

It can be used for manhole names, manhole types, pegs, junctions and deflection angles through manholes.

The height of the top area is given by

```
vertical_plot_gap    mm                // size of the top area. If it is not large
// enough the text will over write the
// plot in the row above.
```


Manholes

The manhole name, manhole type, special manhole symbol and the change of direction of the pipes going through the manhole can all be displayed at the top of the plot.

The manhole name and type are drawn first, followed by the angle of any change of direction of the pipes going through the manhole (the angle is in degrees, minutes and seconds) and finally any junction information.

The text is drawn at the distance **angled_text_y_offset** above the top of the plot, **angled_text_x_offset** to the right of the manhole position and each piece of information is spaced horizontally by the distance **angled_text_gap** to the right of the manhole name if the **angled_text_angle** is zero, or the distance **angled_text_gap** below the previous text if **angled_text_angle** is non-zero.

The size of the manhole names and type is given by **angle_text_size** and the size of the change of direction angle is given by **manhole_angle_text_size**.

The colour of the manhole names, type and change of direction angle is given by **angle_text_colour**.

label_manhole_type		<i>yes/no</i>	// include manhole type
angled_text_size		<i>mm</i>	// size of manhole name text
manhole_angle_text_size		<i>mm</i>	// size of text for change of // angle through manhole
angled_text_x_offset	<i>mm</i>		// distance of text above top of the plot
angled_text_y_offset	<i>mm</i>		// distance of text to the right of manhole
angled_text_gap	<i>mm</i>		// distance of text to the right of previous // text
angled_text_angle	<i>value</i>		// angle of text
angled_text_colour	<i>colour</i>		// colour of text

The symbol at the manhole is controlled by the manhole name.

manhole_symbol_n_size	<i>mm</i>		
manhole_symbol_n_colour	<i>colour</i>		
manhole_symbol_n_y	<i>mm</i>		// distance above top line
manhole_symbol_n_repeats	<i>integer</i>		// draw the symbol this // many times with a // decreasing size)
manhole_line_colour	<i>colour</i>		// colour of line through // manhole

Junctions

Any junctions at the manhole are also labelled with the name of the lines coming into the manhole.

The junction text is made up of two lines:

JUNCTION LINE line_name
angle of the junction

The junction text is at the same height as the manhole and angle text and at a distance **angled_text_gap** to the right of the manhole and angle text, or a previous junction label. The size of the text is given by

junction_angle_text_size	<i>mm</i>
--------------------------	-----------

When a junction does occur, the incoming pipe is drawn at the correct position on the manhole of the main line.

Services

Any services in the corridor are drawn on the plot and if the service actually cuts the drainage string, then a line is drawn to the cut point and the line labelled with the service name. The name is drawn below the cut point and is right justified.

service_text_size	<i>mm</i>	// size of the text for the service name
service_text_x_offset	<i>mm</i>	// adjustment to the drawing position
service_text_y_offset	<i>mm</i>	// for the service name
service_text_colour	<i>colour</i>	// colour of the service name
service_line_colour	<i>colour</i>	// colour of the line to the cut point

Property Controls and House Connections

The position of the property controls can be drawn on the plot and can have a user specified diameter.

draw_property_controls	<i>yes/no</i>
property_control_diameter	<i>value</i>

The house connections can be drawn from the pipe to the house connection level, with a line across the top (a T). The full width the T can be specified by the user.

draw_house_connections	<i>yes/no</i>
house_connection_width	<i>value</i>

Symbols at Manholes

Manholes can be labelled with symbols which depend on the manhole type. There can be up to twenty (20) sets of manhole symbols.

manhole_symbol_n_type	<i>mh_type</i>	// manhole type to have symbols
manhole_symbol_n_mode	0	// cross
	1	// up from centre of box
	2	// up and down from centre of box
	3	// square
	4	// triangle, base at bottom
	5	// circle
	6	// use a 12d symbol

0 + 1 | 2 | 3 □ 4 △ 5 ○

predefined symbols for manhole_symbol_n_modes

manhole_symbol_n_position	1	// at top of manhole - default
	3	// above top of boxes
	4	// above highest point
	100	// to primary string
	101	// to first found tin
manhole_symbol_n_size	<i>mm</i>	// size
manhole_symbol_n_x	<i>mm</i>	// x adjustment to position - default 0
manhole_symbol_n_y	<i>mm</i>	// y adjustment to position - default is 0
manhole_symbol_n_style	<i>text</i>	// the name of the 12d symbol
manhole_symbol_n_angle	<i>value</i>	// default value is 0
manhole_symbol_n_colour	<i>colour</i>	//

For example:

manhole_symbol_1_type	"CONC COVER"	// manhole type to use
manhole_symbol_1_position	1	// on top of manhole
manhole_symbol_1_mode	6	// use 12d symbol
manhole_symbol_1_style	"shrub"	// name of 12d symbol
manhole_symbol_1_size	1	
manhole_symbol_1_x	0	
manhole_symbol_1_y	0	

Hatching Cut and Fill Areas

This option is used to hatch cut and/or fill areas between sets of tins.

For each set, the name of the two tins, the hatch linestyle, colour and separation and whether cut and/or fill regions are required are all user definable.

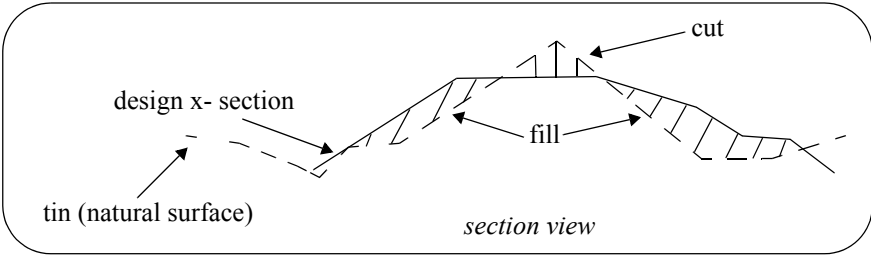
Up to twenty (20) separate sets of tins be hatched.

The parameters for labelling cuts and/or fill regions between tins are given by:

hatch_original_tin_n	tin_name	// tin_name for original surface
hatch_new_tin_n	tin_name	// tin_name for final surface
hatch_cut_separation_n	mm	// distance between cut hatch lines
	0	// don't do cut hatching
hatch_cut_angle_n	degrees	// angle in degrees of cut hatching
hatch_cut_colour_n	colour	// colour of the cut hatching
hatch_cut_linestyle_n	linestyle	// linestyle for cut hatching
hatch_cut_draw_sides_n	1/0	// 1 = draw sides of cut regions
hatch_cut_draw_original_n	1/0	// 1 = draw original tin in cut regions
hatch_cut_draw_new_n	1/0	// 1 = draw new tin in cut regions
hatch_fill_separation_n	mm	// distance between fill hatch line
	0	// don't do fill hatching
hatch_fill_angle_n	degrees	// angle in degrees of fill hatching
hatch_fill_colour_n	colour	// colour of the fill hatching
hatch_fill_linestyle_n	linestyle	// linestyle for fill hatching
hatch_fill_draw_sides_n	1/0	// 1 = draw sides of fill regions
hatch_fill_draw_original_n	1/0	// 1 = draw original tin in fill regions
hatch_fill_draw_new_n	1/0	// 1 = draw new tin in fill regions

Notes

- (a) cut is when the new tin is below the original tin.
fill is when the new tin is above the original tin.
- (b) cut hatching is turned off by setting hatch_cut_separation_n to 0.0.
fill hatching is turned off by setting hatch_fill_separation_n to 0.0.



Labelling Cuts of Drainage Through Strings in a Model

The cuts that the drainage string makes through any strings in user given models can be automatically labelled on the long section plots.

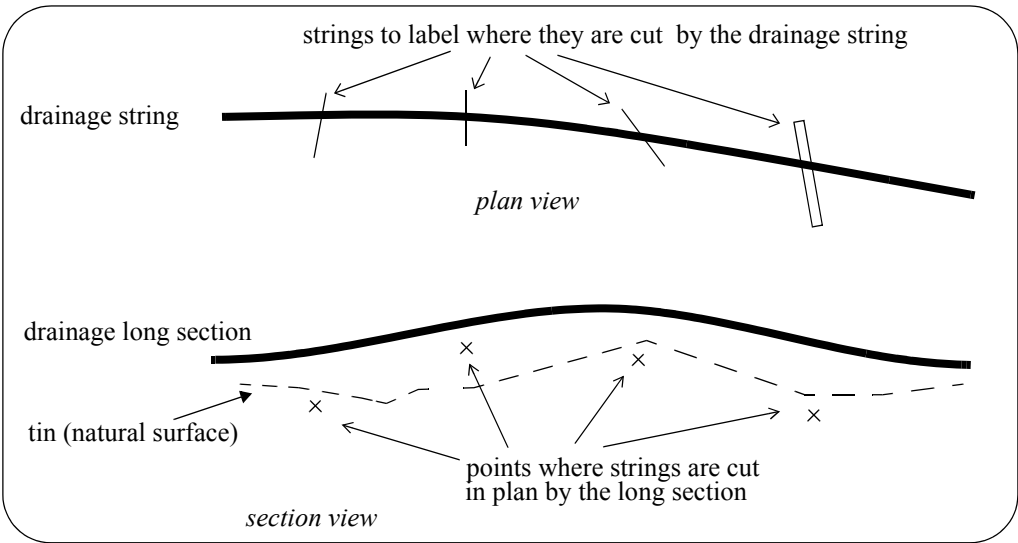
The **height**, **chainage** and **name** of the cut string can be labelled as well as a **symbol** drawn. The height of tins at the same offset value can also be labelled.

The chainage position for the labelling is the chainage of the cut string.

The height position for the labelling can be specified as the

- (a) top of the boxes on the long section
- (b) height value of the cut string
- (c) height of the primary string
- (d) height of a tin.

The actual position of the label is defined relative to the above point.



Note:

Only case (b) involves the actual height of the cut string. For all other cases, only the chainage of the cut string is used. Hence for all cases except (b), the string does need to have a sensible height to be used for cuts through strings.

For example, a boundary string may have null heights but only the chainage is required and the height of the tin at that chainage can be used as the height (case (d)).

Text justification refers to the actual position and is given by

“top-left”	“top-centre”	“top-right”
“middle-left”	“middle-centre”	“middle-right”
“bottom-left”	“bottom-centre”	“bottom-right”

A choice of six special symbols and/or or any 12d symbols can be drawn at the cut point.

The special 12d Model symbols of size one millimetre are drawn in a square box centred on (0,0) with sides of length two millimetres. That is, the box co-ordinates are (-1,-1), (1,1), (1,-1), (-1,-1).

The six special shapes are



Up to twenty five (25) separate models of strings can be cut and labelled.

(a) the parameter *plot_symbols* in the ppf file

or if `plot_symbols` is not defined, then

PLOT_SYMBOLS_4D	<i>filename</i>	<i>// default plotsym.4d</i>
-----------------	-----------------	------------------------------

(c) in the file *plotsym.4d*

(d) either pointed to by the environment variable `SYMBOLS_4D`

or if the environment variable SYMBOLS_4D does not exist, in the file, *symbols.4d*

cuts_symbol_n_position	1	// above point height value
	3	// above top of boxes
	100	// to primary string
	101-500	// to tin1 or tin2 etc.

cuts_symbol_n_x	<i>mm</i>	// offset adjustment to position
cuts_symbol_n_y	<i>mm</i>	// height adjustment to position
cuts_symbol_n_angle	<i>degrees</i>	// rotation about point
cuts_symbol_n_colour	<i>colour</i>	// colour of symbol

```
cuts_symbol_n_size      mm           // size of symbol, 0 don't draw
```

cuts_chainage_n_position	1	// above cut strings height value
	3	// above top of boxes
	100	// to primary string
	101-500	// to tin1 or tin2 etc.

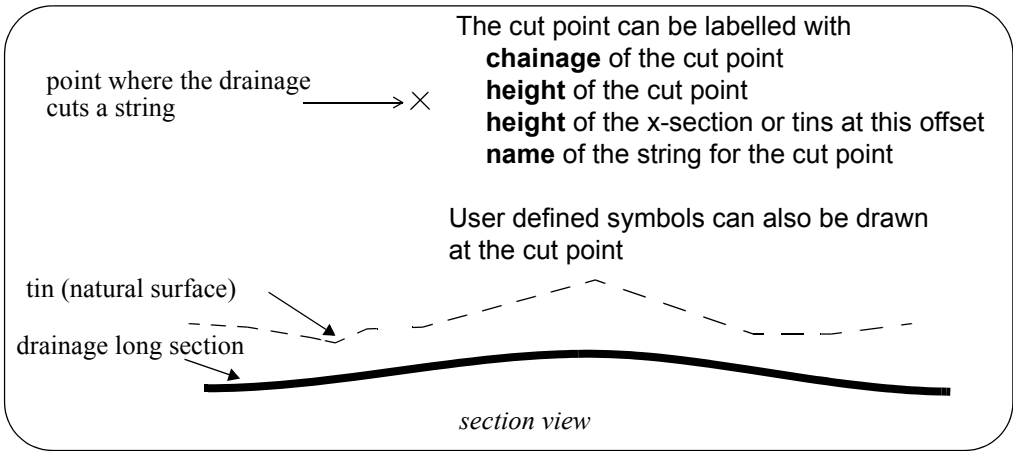
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The value of a **height** at the chainage of the point can be calculated and labelled using the parameters

cuts_height_n_mode	1	// use height of cut point itself
	3	// use real world height of position
		// above boxes
cuts_height_n_position	100	// height of primary string
	101-500	// use height of to tin1 or tin2 etc.
	1	// at points position
	3	// above top of boxes
	100	// to primary string
	101-500	// to tin1 or tin2 etc.
cuts_height_n_x	mm	// chainage adjustment to position
cuts_height_n_y	mm	// height adjustment to position
cuts_height_n_angle	degrees	// rotation about point
cuts_height_n_size	mm	// size of text, 0 don't label
cuts_height_n_colour	colour	// colour of text
cuts_height_n_textstyle	text	// textstyle of text height
cuts_height_n_pre_text	text	// text before the height value
cuts_height_n_post_text	text	// text after the height value
cuts_height_n_justification	justification	// justification of the text
cuts_height_n_no_decimals	integer	// number of decimals in height

A **label** which can include the **name** of the cut string is drawn by using the parameters

cuts_label_n_position	1	// above cut strings height value
	3	// above top of boxes
	100	// to primary string
	101-500	// to tin1 or tin2 etc.
cuts_label_n_mode	0	// don't include cut string name
	1	// include cut string name in label
cuts_label_n_x	mm	// chainage adjustment to position
cuts_label_n_y	mm	// height adjustment to position
cuts_label_n_angle	degrees	// rotation about point
cuts_label_n_size	mm	// size of text, 0 don't label
cuts_label_n_colour	colour	// colour of text
cuts_label_n_textstyle	text	// textstyle of text label
cuts_label_n_pre_text	text	// text before the string name
cuts_label_n_post_text	text	// text after the string name
cuts_label_n_justification	justification	// justification of the text



Title Block Information

The plot can have a standard 12d Model title block or a user defined title block.

The standard title block consists of a simple border around the plot and two lines of text in a box underneath the plot. For a user defined title block, all the line work and text is defined by the user.

Standard Title Block

For the standard 12d Model title block, there are extra parameters for two lines of text and text size and colour. The standard title block is turned on or off by the parameter *plot_border*.

<i>plot_border</i>	<i>yes/no</i>	<i>// yes plots a standard title block</i> <i>// default yes</i>
<i>title_1</i>	<i>text</i>	
<i>title_2</i>	<i>text</i>	
<i>title_text_size</i>	<i>value</i>	
<i>title_colour</i>	<i>colour</i>	

User Title Block

For the user defined title block, the title block drawing commands are kept in a file whose name is supplied by the user. The title block drawing commands are almost identical to the linestyle drawing commands and is given at the beginning of chapter Advanced Plotting.

Hence for a user defined title block, there are just two parameters - one to say a title block file is being used and the other to give the name of the title block file. The *plot_border* parameter should also be set to *no* so that the standard title block is not also drawn.

<i>use_title_file</i>	<i>yes/no</i>	<i>// yes draws the title block given in title_file</i> <i>// default no</i>
<i>title_file</i>	<i>filename</i>	
<i>plot_border</i>	<i>no</i>	<i>// turn off standard title block</i>

Some special plot parameters are used to pass information down to variables in a user defined title block

For example, inside the title block file it is possible to have runtime user defined text variables. The actual text values for these text variables are passed down to the title block file from the plot parameter file via the parameters *user_text_n* (n = 1,2,... 1000)

<i>user_text_n</i>	<i>text</i>
--------------------	-------------

The special plot parameters are:

<i>time_format</i>	<i>text</i>	<i>// format for \$time</i>
<i>user_text_n</i>	<i>text</i>	<i>// where n = 1,2,... 1000</i> <i>// passed down to \$user_text_n</i>
<i>title_1</i>	<i>text</i>	<i>// passed down to \$title_1</i>
<i>title_2</i>	<i>text</i>	<i>// passed down to \$title_2</i>
<i>start_page_number</i>	<i>integer</i>	<i>// used as the starting value for</i> <i>// \$page_number. If missing,</i> <i>// \$page_number starts at 1.</i>
<i>start_drawing_number</i>	<i>integer</i>	<i>// added to \$drawing_number in title</i> <i>// block file. If missing,</i> <i>// \$drawing_number starts at 1.</i>
<i>drawing_number_prefix</i>	<i>text</i>	<i>// passed down to</i> <i>// \$drawing_number_prefix</i>
<i>drawing_number_postfix</i>	<i>text</i>	<i>// passed down to</i> <i>// \$drawing_number_postfix</i>

Parameters that Modify Fields In the Melbourne Water Network Panel

A number of parameters match those in the **New Melb Plot Drainage Network** panel.

When the plot parameter file is first read, any parameters in the panel will be replaced by the values of any corresponding parameters from the parameter file.

However, if the parameter is subsequently modified in the panel, the panel value will be the value used for the parameter.

The plot parameters that also occur in the **Melb plot drainage network** panel are:

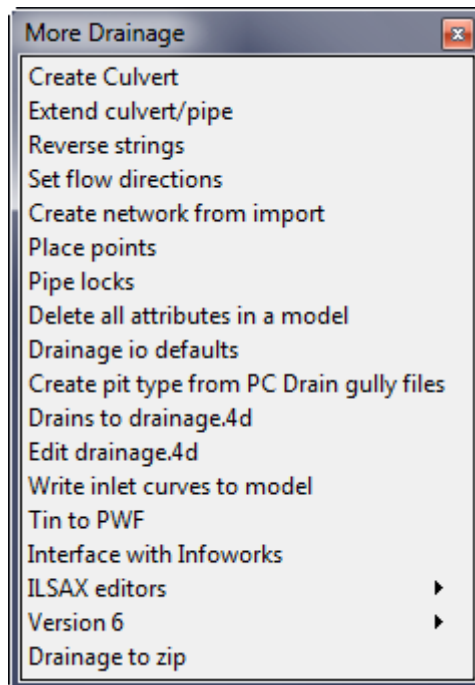
network_model	<i>text</i>
scale	<i>value</i>
plotter_type	<i>text</i>
plot_stem	<i>text</i>
view_name	<i>text</i>
sheet_size	<i>text</i> or "width height"
plot_height	<i>mm</i>
x_origin	<i>mm</i>
y_origin	<i>mm</i>
global_textstyle	<i>textstyle</i>
box_text_size	<i>mm</i>
box_colour	<i>colour</i>
plot_border	<i>yes/no</i>
title_1	<i>text</i>
title_2	<i>text</i>
title_text_size	<i>value</i>
title_text_colour	<i>colour</i>
use_title_file	<i>yes/no</i>
title_file	<i>filename</i>

More Drainage

Position of menu: Design =>Drainage-Sewer=>More

The More Drainage menu items contain the drainage import export routines and tools that enhance the basic drainage functions on the Drainage Sewer menu.

The **More Drainage** walk-right menu is:



[Frequently Asked Questions \(FAQ\)](#)

Drainage Overview

The following are the basic steps from creating a urban drainage network to producing your plan/ drainage longsection drawings and pit layout table. The optional catchment area models and bypass flow model will be discussed afterwards.

[Set drainage defaults](#)

[Draw the drainage strings](#)

[Set zero chainage to downstream end of the pipe string \(Reverse drainage strings\) \(optional\)](#)

[Automatically assign pit names](#)

[Define catchment areas \(optional\)](#)

[Define Pit/manhole Inlet Capacities via Overland flow strings \(optional\)](#)

[Hydraulic/hydrology calcs via spreadsheets, Drains, RAT2000, PCdrain, XP SWMM or ILSAX](#)

[Drainage longsection plots](#)

[Pit layout/construction schedules](#)

[Manhole and Pipe Table of Quantities \(summarise by type, depth and size\)](#)

[Drainage line excavation volume calculations](#)

[Roadway flooded width calculations](#)

Drainage Export and Import to Design Software

[Copy/Paste from spreadsheets](#)

[Running Drains](#)

[Running PCdrain \(Windows\)](#)

[Running Micro Drainage - Win DES](#)

[Running XPSWMM](#)

[Running RAT2000](#)

Training Course Notes

Stormwater Part 1, Stormwater Part 2 and Dynamic Stormwater Design training course notes (Adobe PDF format for printing) and sample 12d data sets are available on the installation CD and the 12d users forum. The training course moves through a worked example in detail. The course notes are also included below for your reference.

[Stormwater Part 1](#)

[Stormwater Part 2](#)

[Dynamic Stormwater Design](#)

Drainage FAQ

What is **pipe capacity**?

Pipe capacity is full pipe flow with no pressurisation. The capacity figure should be used to help designers know if the friction loss in the pipe is greater or less than the pipe slope.

Case 1: Flow less than capacity....friction slope is less than pipe slope. except for maybe for pit losses, surcharging is not a problem

Case 2: Flow greater than capacity....friction slope is MORE than pipe slope. You can do this for a short length of pipe but watch out for surcharging because you cannot keep it up for too long without flooding occurring!

Why do the **obvert/invert levels not change** when I import data via the "pit/pipe interface"?

On the interface panel there is an **Options** button that displays a panel with the "**hold obverts on import**" option. The default is off but if it is selected the pipe obverts will not change even if import data has new levels. Note that the invert levels will change if the pipe diameters change.

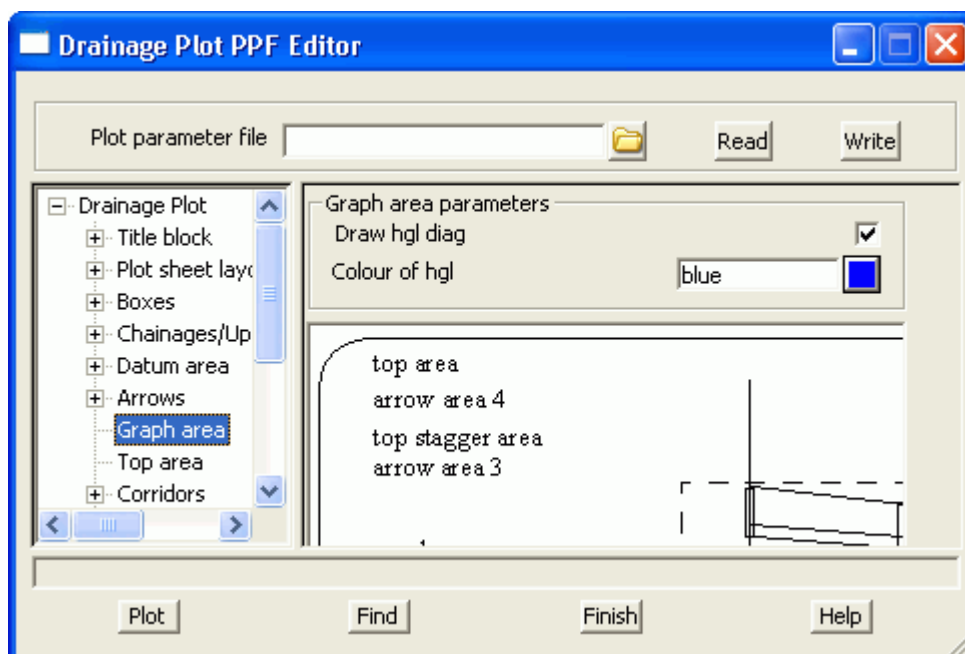
Can I **manually enter catchment areas** in the drainage design programs?

Yes. The catchment strings are optional in 12d. If no catchment string has been linked to a manhole and there has been no manhole "area" attribute a default area of 0.0001 will be sent. When results are imported back into 12d the total areas from the design package will be saved in the manhole "area" attribute.

How do I include/exclude the **hydraulic grade line** on drainage longsections..

First, there must be HGL results. These may come from the 12d rational drainage design, imported from another design package (including spreadsheets) or manually entered as manhole/pipe attributes. If HGL results exist then they may be viewed in the section view of the drainage line.

Second, the HGL results may be added to the drainage longsection drawings by editing the plot parameter file (ppf) as shown below.



Creating Drainage Strings

Drainage strings may be created in 12d in a number of ways.

1. [Import 2d strings](#) from other drawing packages and convert them to drainage string inside 12d.
2. [draw the string in 12d](#) using a design tin to the manhole cover levels and pipe inverts.
3. Enter the details in a [spreadsheet format](#) and paste the spreadsheet into 12d.

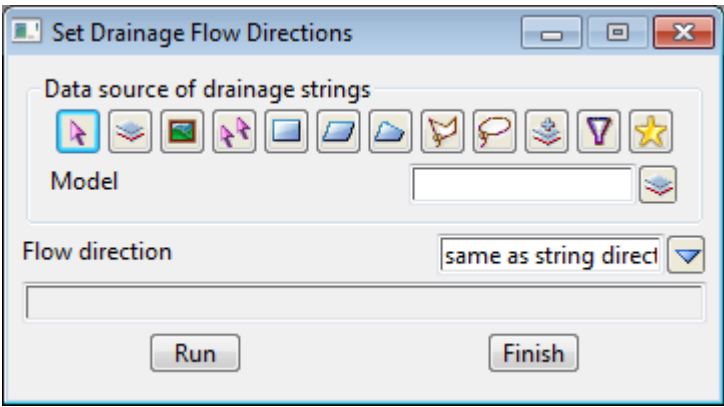
Regardless of the method, take the time to [set your defaults](#) before you start. You can always change the data later.

Set Drainage Flow Direction

Position of option on menu: **Design =>Drainage-Sewer =>More=>Set flow directions**

The routine changes the strings drainage flow direction to either **same as string direction** or **opposite to string direction**. This setting affects the pipe grading, network connectivity and hydraulic calculations.

On selecting the **Set flow directions** option, the **Set Drainage Flow Directions** panel is displayed.



The fields and buttons used in this panel have the following functions.

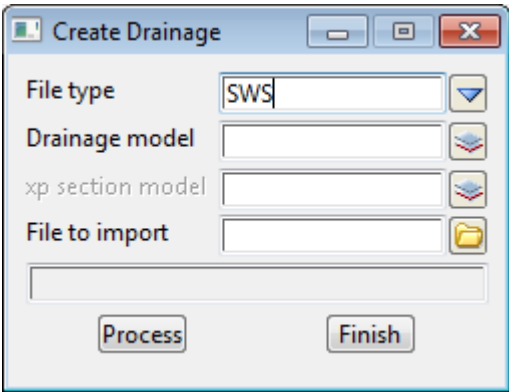
Field Description	Type	Defaults	Pop-Up
Source of drainage strings	source box		
<i>Select the desired drainage strings</i>			
Flow direction	choice box	same as string directions	same as string direction, opposite to string direction
<i>all drainage strings will have this flow direction set</i>			
Run	button		
<i>set flow directions</i>			
Finish	button		
<i>remove the panel from the screen</i>			

Create Network from Import

Position of option on menu: **Design =>Drainage-Sewer =>More=>Create network from import**

This routine creates drainage strings from existing MicroDrainage WinDes (sws and fws) and xpsoftware xpswmm (xpx) files.

On selecting the **Create network from import** option, the **Create Network from Import** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
File type	choice box	SWS	SWS,xpswmm
<i>SWS (or FWS) for WinDes files, xpstorm files are the xpsoftware xpx files</i>			
Drainage model	model box		
<i>the drainage strings created will be stored in this model.</i>			
File to import	file box		
<i>select sws, fws or xpx file types</i>			
Process	button		
<i>create import file and create strings</i>			
Finish	button		
<i>remove the panel from the screen</i>			

Place Points

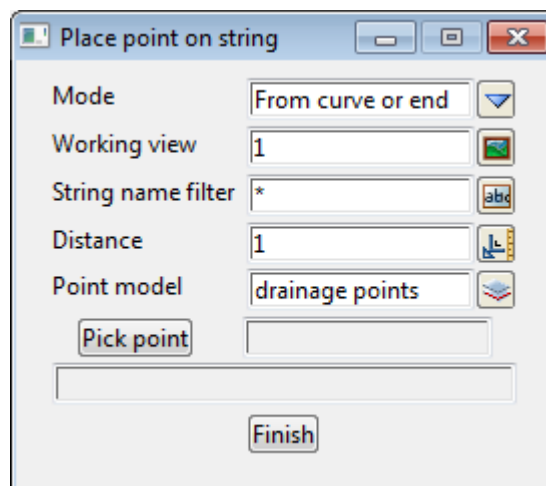
Position of option on menu: **Design =>Drainage-Sewer =>More=>Place points**

This routine creates points along a string so that drainage pits can be placed at a fixed offset from an intersection. As this is a very common task it combines several standard 12d options into one step.

The user selects a point near where the pit it to be located. The routine finds the closest string on the **working view** that matches the **String name filter** and creates a temporary point on the string.

The **Mode** determines a reference point located on the string and a marker of length, **distance**, is created from the reference point towards the temporary point.

On selecting the **Place points** option, the **Place point on string** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Mode	choice box	From curve or end	From curve or end, From end, Nearest point
<i>if From curve or end, the reference point is closest (by chainage) end of curve or end of string</i> <i>if From end, the reference point is the closest (by chainage) end of the string is located</i> <i>if Nearest point, the reference point is the closest vertex to the temporary point is located</i>			
Working view	view box	1	
<i>strings on this view will be searched using the string name filter. The point model will also be added to this view.</i>			
String name filter	input	*	
<i>the closest string on the working view matching this filter will be selected</i>			
Distance	input	1	
<i>the chainage distance from the reference point to the end of the marker (note that the marker is drawn as a straight line but the distance uses the chainage value).</i>			
Point Model	model box	drainage points	
<i>the marker points are placed in this model using the FLOW LINE linestyle</i>			

Pick point button

select a point near where the point marker is to be created. Only the x,y value is used from the selected point

Finish button

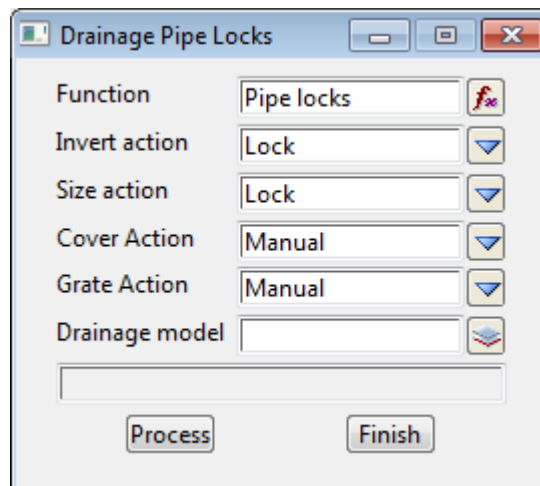
remove the panel from the screen

Drainage Pit and Pipe Locks

Position of option on menu: **Design =>Drainage-Sewer =>More=>Pipe locks**

The routine locks/unlocks (sets to manual) the pit and pipe levels in a drainage network model. A function is created so that the locks can easily be applied or removed. This is often used for existing networks or by designers wishing to set all levels manually.

On selecting the **Pipe locks** option, the **Pit and pipe locks** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Function	function box	Pipe locks	
<i>A function can be created to lock and unlock the drainage string properties (via attributes)</i>			
Invert action	choice box	Lock	Lock,Unlock,None,Default
<i>Sets the pipe invert lock flags for the DNE if Lock, the flag is enabled if Unlock, the flags are cleared if None, the flags are left unchanged if Default, the flags are cleared (same as unlock)</i>			
Size action	choice box	Lock	Lock,Unlock,None,Default
<i>Sets the pipe diameter, width and top width lock flags for the DNE if Lock, the flag is enabled if Unlock, the flags are cleared if None, the flags are left unchanged if Default, the flags are cleared (same as unlock)</i>			
Cover action	choice box	Manual	Manual,None,Default
<i>Sets the mode for the cover levels (manual is the equivalent of locked) if Manual, the mode is set to manual, if None, the mode if left unchanged, if Default, the field is cleared and the default setting becomes active</i>			
Grate action	choice box	Manual	Manual,None,Default
<i>Sets the mode for the grate levels (manual is the equivalent of locked) if Manual, the mode is set to manual,</i>			

*if None, the mode if left unchanged,
if Default, the field is cleared and the default setting becomes active*

Drainage model model box
existing strings in this model are processed

Process button
Applies and removes the locks as indicated

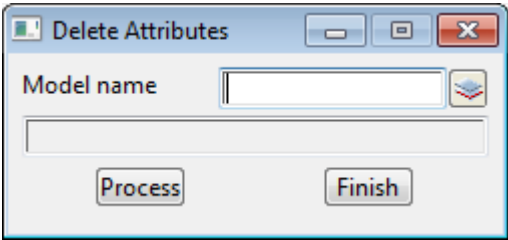
Finish button
remove the panel from the screen

Delete All Attributes in a Model

Position of option on menu: **Design =>Drainage-Sewer =>More=> Delete All Attributes in a Model**

This routine deletes all of the model, string, pit and pipe attributes in the selected model.

On selecting the **Delete All Attributes in a Model** option, the **Delete Attributes** panel is displayed.



The fields and buttons used in this panel have the following functions.

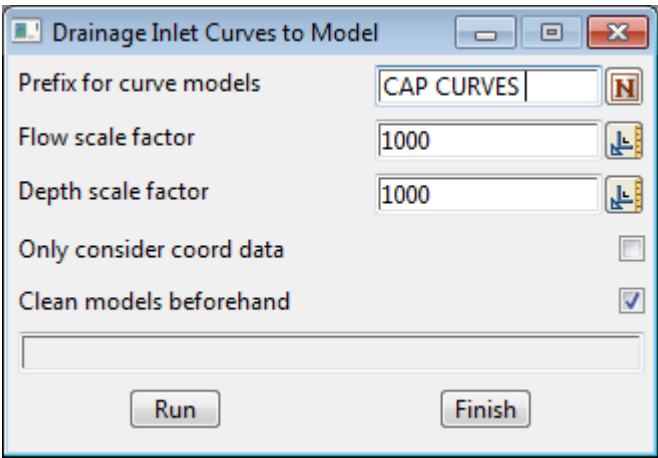
Field Description	Type	Defaults	Pop-Up
Model name <i>existing model</i>	model box		
Process <i>model, string, pit and pipe attributes will be deleted</i>	button		
Finish <i>remove the panel from the screen</i>	button		

Write Inlet Curves to Model

Position of option on menu: **Design =>Drainage-Sewer =>More=>Write inlet curves to model**

This routines reads the inlet capacity curves from the drainage.4d file and creates plot strings.
This tool is an efficient way to review the inlet capacity data in the file.

On selecting the **Write inlet curves to model**, the **Drainage Inlet Curves to Model** panel is displayed.



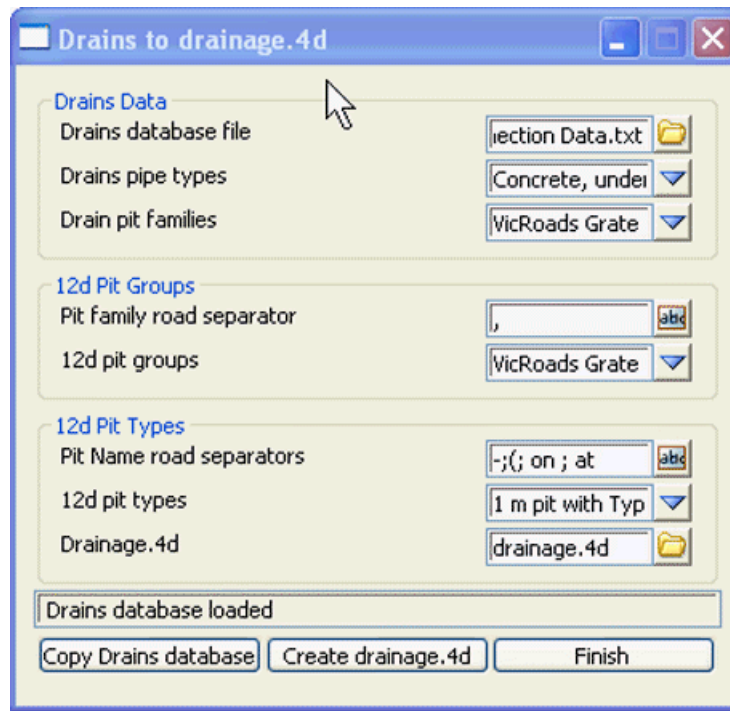
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Prefix for curves models	model box	CAP CURVES	
<i>All inlet curves for a manhole type will be placed in a model named with this prefix and the manhole type.</i>			
Flow scale factor	input	1000	
<i>Inlet and bypass flow values will be multiplied by this value before creating the strings.</i>			
Depth scale factor	input	1000	
<i>Depth values for sag curves will be multiplied by this value before creating the strings.</i>			
Only consider coord data	tick box	off	
<i>Inlet capacity curves may be expressed as formulas, curve coordinate or both. Selecting this box stops curves with only formulas from being plotted as strings.</i>			
Clean models before hand	tick box	on	
<i>The curve models are cleaned before the new strings are created</i>			
Run	button		
<i>Models and strings are created from the drainage.4d file</i>			
Finish	button		
<i>remove the panel from the screen</i>			

Creating a drainage.4d file from the Drains database dump

Position of option on menu: **Design =>Drainage-Sewer =>More=>Drains to drainage.4d**

On selecting the **Drains to drainage.4d** option, the **Drains to drainage.4d** panel is displayed.



Key Points

When you are finished, open the drainage.4d file and check the road grade and crossfall values for the ongrade curves!

1. If Drains is used to selected the pit sizes then the 12d pit type must be the prefix of the Drains pit size (**Pit Name road separators** are used).

If 12d is used to select the pit sizes to export to Drains, the Drains **Pit Size** and 12d **Pit types** have to match, exactly! The pit databases supplied by Drains often have road grade and/or crossfall attached to the end of the pit size. If pit sizes are to be sent from 12d, **this must be removed!** Find **Prepare the Drains Pit Database** for more details.

2. Select **Copy Drains database** (12d will search the usual locations for the Drains database).
3. Review the **Drains pipe types** and **Drains pit families** lists to ensure you have the correct database.
4. 12d pit groups are not used in Version 8.
5. **Pit Name road separators** can only be used if **Drains** is selecting the pit types. If 12d pit types are to be exported to Drains, this field should be left blank. If you change these entries you must press the enter key to update the **12d pit types** list below.
6. Check the **12d pit types** and if they are acceptable select **Create drainage.4d**.

The Details

YOU MUST RESTART 12D FOR THE NEW DRAINAGE.4D FILE TO BECOME ACTIVE!

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Drains database file file box Drains Connection Data.txt

You must update this file from Drains before each use of this panel. Inside Drains select Project=>Overflow Route database. Then select OK and then YES. This will cause Drains to export the database to the file "Drains Connection Data.txt".

*Selecting **Copy Drains database** will cause the panel to search for the database dump in the folders **C:\Program Files\Drains\Program** and **C:\Program Files\Drains\Demo\Program**. If the Drains program is installed in another folder then you must browse for the file. The file will be read and the panel updated with either selection.*

Drainage.4d file box drainage.4d

The drainage.4d will be created in the 12d working folder unless otherwise specified. It will only be used for 12d projects in this folder.

Pit families choice box Drains pit families

*These are the Drains pit families that will be exported to the drainage.4d file. These will become the names on grade inlet capacity curves for all the pit sizes that belong to the family. The pit family name will be searched for words like **grade**, **slope** etc to try to determine the values for road grade and cross-fall for the 12d capacity curves.*

Pipe type choice box Drains pipe types

These are the Drains pipe types that will be exported to the drainage.4d file.

Pit group separator input box

*Pit groups are not used in Version 8. These characters will be used to remove the road grade crossfall data from the **Pit families** above. The data before this character will become the **12d pit groups**. Press **Enter** or select **Read Drains database** to create a new list of **12d pit groups**.*

12d pit groups choice box 12d pit groups

*These are created from the Pit family list above by deleting all text after the **Pit group separator**.*

Create drainage.4d button

Create a drainage.4d file.

Editing a drainage.4d file

Position of option on menu: Design =>Drainage-Sewer =>More=>Edit drainage.4d

On selecting the Edit drainage.4d option, the Edit drainage.4d panel is displayed.



Select the **Find** button to search the 12d path for the current **drainage.4d** file. Select the **More info** button and then **Edit** to edit the file.

Drainage IO Defaults

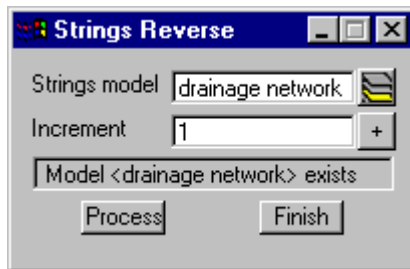
Set zero chainage to downstream end of line (Reversing the strings)

Position of options on menu: **Design =>Drainage-Sewer=>More=>Reverse all strings**

For drainage direction of flow see [Reversing the strings](#)

If desired, the reverse function may be used to move the zero chainage to the downstream end of the line. This should be done after entering all of the drainage strings and before naming the pits. From the main menu select

Design=>Drainage-sewer=>More=>Reverse all strings



This will also change the drainage flow direction attribute from **ascending chainage** to **descending chainage**.

Leave the **Increment** as 1.

Displaying the Auto Pit Names

Importing and Exporting

See Also

[Drainage overview](#)
[Drainage Misc Utilities](#)
[Spreadsheet clipboard](#)
[Running Drains](#)
[Running PCdrain \(Windows\)](#)
[Running Micro Drainage - Win DES](#)
[Running XPSWMM](#)
[Running RAT2000](#)

Spreadsheet clipboard

Spreadsheets are an effective method to manage the numerous variables urban drainage designers create in the modelling process. Spreadsheet data can be transferred to and from 12d in tab delimited files and stored within 12d as “user definable attributes”. These attributes are linked to the pit and pipes within a network. Drainage long section plots can display the pipe attributes in the “arrows” data area and pit attributes in the bubbles area. Drainage plan drawing can also show these pit and pipe attributes.

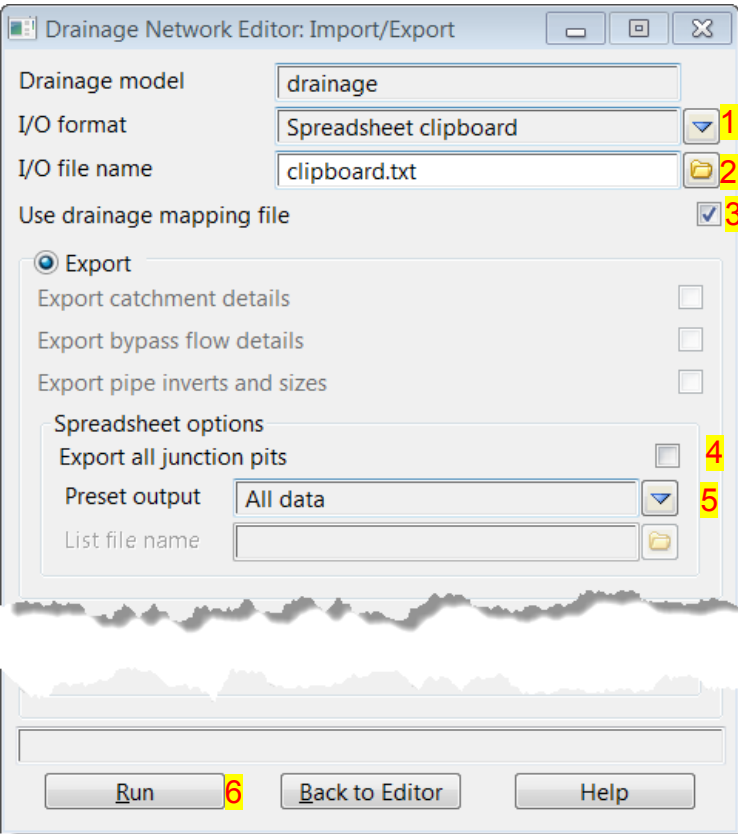
Drainage strings will be created if they do not exist in the model but pits cannot be added to existing strings.

See also

- 12d to spreadsheet transfers
- Spreadsheet to 12d update and create
- Spreadsheet options

12d to spreadsheet transfers

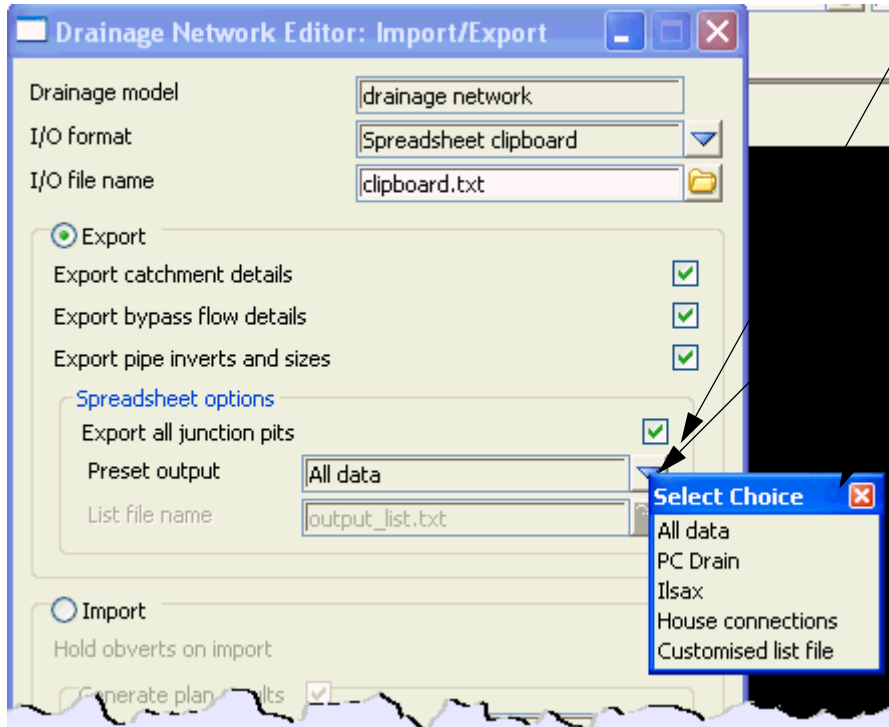
This interface is accessed the **Import/Export** button on the Drainage **Network Editor**.



1. Select Spreadsheet clipboard
 2. leave as **clipboard.txt** to send the data to the windows clipboard as well as this file.
 3. Mapping files are the most current 12d technology. Leave this selected.
- These options are not used for spreadsheet export.
4. Usually leave this off! Select to export the junction pit at the end of all drainage lines (very rarely needed).
 5. You may also select to limit the output if desired. If you like using spreadsheets for data entry, the PCdrain data and ILSAX data formats are useful for adding data for the first time for either program.
 6. Select Run to place the data on the clipboard.

Options

The **Spreadsheet Options** section allows the user to define the amount of data exported.



Export all junction pits
when selected will repeat the data for the junction pit at the end of each branch line.

Preset Output
this choice box offers the following choices:

All Data: All of the 12d drainage string data and the user defined attributes will be exported to the clipboard in a tab delimited format. The 12d data names and the user defined attribute names will

appear at the top of the spreadsheets columns.

ILSAX: For the ILSAX program, the spreadsheet column headings will change depending on the pipe and catchment indicators (P2 card) and the inlet type (P3 card). Therefore, use the ILSAX pipe editor macro to set up one pit/catchment for the type of data you wish to enter. Now when you export the pipe network data the column headings will include the names of the relevant parameters.

User defined below: The **Customised list file name** is used to define the drainage values, their order and format you desire.

The **customised list file** is a text file where each line contains a drainage variable or a spreadsheet IO command (blank lines are ignored unless preceded by the header command). The spreadsheet IO commands are all lower case and listed below:

header	to define a line of text to be exported
blank	to leave a blank column in the output
pit data	the following attributes are for the pit.
downstream pit data	the following attributes are for the downstream pit.
upstream pit data	the following attributes are for the upstream pit(s).
pipe data	the following attributes are for the pit's outlet pipe
downstream pipe data	the following attributes are for the downstream pipe(s)
upstream pipe data	the following attributes are for the upstream pipe(s)
variable name	a 12d drainage variable names
factor	the following variable is multiplied by this factor
decimals	the following variable will export with these decimal places

The simplest way to create your own customised tab delimited file is to set the **Preset Output** field to **All data** and leave the **customised list file name** field blank. Selecting **Set, Finish** and then **Copy** from the main dialogue. The data will be placed on the clipboard and a **customised list file**, named **output_list.txt** will be created containing the names of all of the drainage variables in the 12d model. Use a text editor to add/or delete the variable names, change their order and/or add spreadsheet IO commands. **Save the file with a new name!** The **output_list.txt** file is overwritten on every export.

A listing of a customised list file follows. Note the words in the header file have a "tab" between them so that they will be spaces across the spreadsheet columns.

```

header
Pipe Details
  header
  Name Length  U/S IL  D/S IL  Slope(%)  Class  Dia I.D.  Rough  Pipe Is  No. Pipes

  pit data
  *pit name

  pipe data
  *length
  low ch invert
  high ch invert

  factor
  100
  *grade

  pipe type

  factor
  1000
  diameter

```

After creating your customised list file, select **Options** again and change the **Preset Output** field

to **User Defined below** and enter the new **customised list file** name that you saved above. Select **Set** then **Finish** and finally **Copy** to put the formatted data onto the clipboard.

The data can be pasted into a spreadsheet program for checking or additional formatting.

CUSTOM FORMATED DATA MIGHT NOT BE PASTED BACK INTO 12d!

The data must be in the “12d drainage spreadsheet” format to be read into 12d.

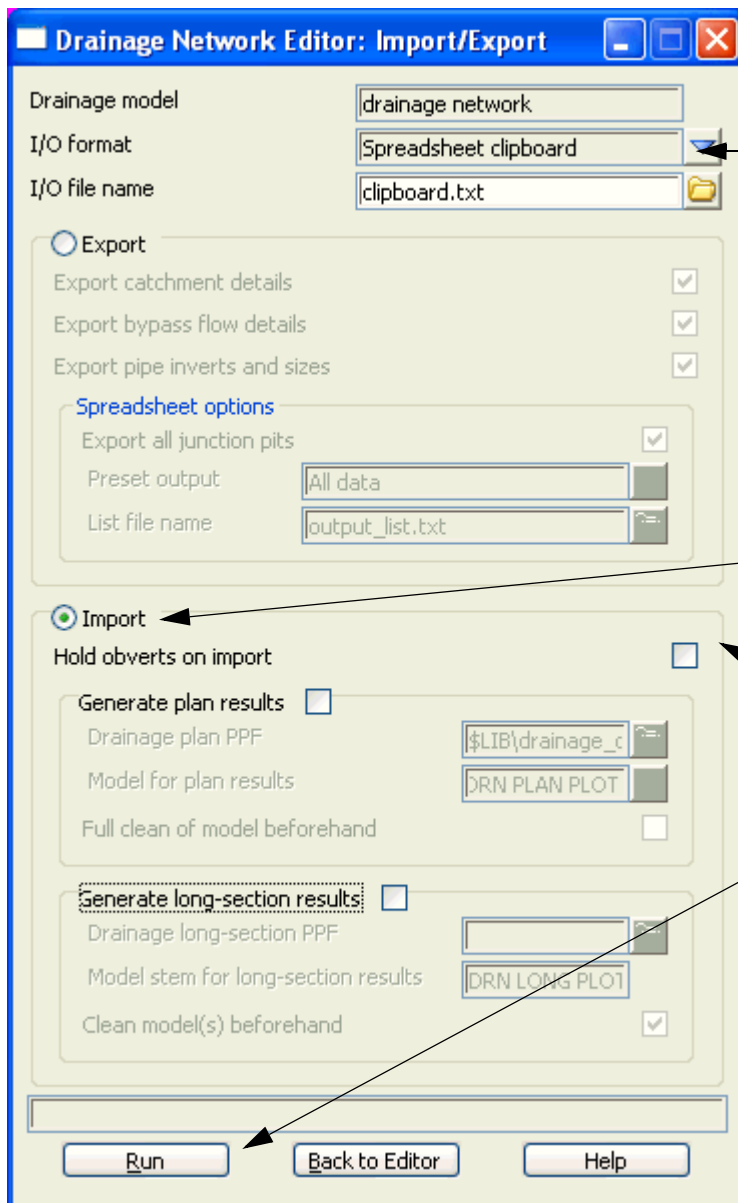
Caution with pit names in the form 1-1 or 1/1. Some spreadsheets will interpret these values as dates. If you use these formats for your pit names you will have to paste command them in once, format the columns that contain the pits names as text data and then paste the information in again.

One final word on using the copy/paste commands in the Microsoft Excel program. The Paste Special command using the “Skip Blanks” option will allow you to copy a large block of 12d data (with blanks in it) on top your data so that your data is preserved where it coincides with the blanks. To use this option paste the data into a blank spreadsheet and then select copy again. The Paste special option with “Skip Blanks” will now be available.

Spreadsheet to 12d Update and Create

This item is accessed from the **Import/Export** button on the **Drainage Network Editor**.

The following panel will appear.



Select the **Spreadsheet clipboard** format.

Select **Import**

This is ignored on spreadsheet imports.

Select **Run** to update the drainage model.

Tab delimited, “12d drainage spreadsheet” format or “from to” format data must be on the clipboard in order to update a 12d drainage model or create a new model. These format are described below.

Updating an Existing Model

The data usually is generated by 12d using the **Export** option, pasted into a spreadsheet and then copied back to the clipboard so that 12d can be updated.

When 12d exports the drainage model to a spreadsheet it includes a column for the unique string identifier and a unique pit identifier (unique to the drainage model not the 12d project). The names of the strings and pits may be changed via the spreadsheet if these columns are present at import time.

If the pit id column is not present, 12d will search the drainage model for a matching pit name. When the pit is a junction between drainage lines, only the trunk line will be the data updated.

Creating a New Model

It is possible to create a new string or an entire drainage network using this format. However, pits cannot be added to an existing string. The entire drainage string must be created at once. Two

formats are available, the “from-to pit” format and the “12d drainage spreadsheet” format.

At present the network editor must select a drainage string to become active. Therefore, if you are not adding strings to a network, you will have to create a drainage network with one “dummy” pit. Select this one “dummy” pit to activate the editor. After importing the data and the new drainage lines are created the “dummy” pit may be deleted.

12d drainage spreadsheet Format

The top left cell in the clipboard data must be the text “12d” to specify this format. The minimum amount of data required to create a new string is the string name, pit name, x and y coordinates. You can add as much additional data as you have available. This would include pipe diameters inverts etc. The pits must be listed from upstream to downstream order. If the string is to join a trunk line, the junction pit must be included for both the tributary and the trunk line.

An example file exists called **new_network.txt** is supplied in the library. Open this file in a spreadsheet or a text editor and copy it to the clipboard. Set the **I/O Action** to **Import** and select **Run**. The new drainage lines will exist in the model currently being edited.

From-to Pit Format

The top left cell in the clipboard data must be the text “from to” to specify this format. The minimum amount of data required to create a new string is the upstream pit name (*pit name), the downstream pit name (*ds pit name) and the x(x location) and y(y location) coordinates of the upstream pit. If the string is to join a trunk line, the junction pit must be included for both the tributary and the trunk line.

An optional column for the pit cover elev (cover elev) may be specified. Once the network has been created additional pipe and pit data may be added using the “12d drainage spreadsheet” format described above.

An example file exists called **new_from_to_network.txt** is supplied in the library. It is shown below. Open this file in a spreadsheet or a text editor and copy it to the clipboard. Enter a new model name in the **Drainage model** field and select paste. The new drainage model will now exist.

from to	pit	pit	pit	pit
*pit name	*ds pit name	x location	y location	cover elev
text	text	real	real	real
E/1	A/3	5309.458	7336.935993	29.2173
D/1	A/4	5277.189	7336.935989	28.5071
C/1	B/3	5251.238738	7423.99485	31.5257
A/1	A/2	5354.629222	7336.935998	30.2115
A/2	A/3	5340.019987	7322.035996	29.89
A/3	A/4	5293.458002	7322.035991	28.8652
A/4	A/5	5250.182625	7322.035986	27.9127
A/5	A/6	5217.194202	7322.035983	27.1867
A/6	A/7	5183.458002	7322.035979	26.4442
A/7		5152.698693	7322.035975	25.7672
B/1	B/2	5289.42875	7422.289079	32.7197
B/2	B/3	5264.638564	7393.947083	30.7948
B/3	B/4	5249.738564	7384.207593	30.4187
B/4	B/5	5249.738564	7351.201545	29.1444
B/5	A/5	5233.426685	7336.935984	27.544

“12d drainage spreadsheet” Format

Each column of data is used for a 12d drainage variable or a user defined attribute. Each row

represents a pit and the downstream pipe (controlled by the direction of flow variable) within the drainage network. A sample is shown below.

12d	pit	pit	pit	pit	pit	pit
*string Name	*pit name	pit type	pit low ch invert	pit high ch invert	pit id	string id
text	text	text	real	real	integer	integer
E	E/1	SA2	28.108	28.108	1	67389
E	A/3	SA2	27.7559	27.7559	2	67389
D	D/1	SA2	27.3961	27.3961	3	68100
D	A/4	SA2	26.8018	26.8018	4	68100
C	C/1	SA2	30.67	30.67	5	72072
C	B/3	SA2	29.563	29.563	6	72072
A	A/1	SA2	29.1026	29.1026	7	82469
A	A/2	SA2	28.7811	28.7311	8	82469
A	A/3	SA2	27.7652	27.7059	9	82469
A	A/4	SA2	26.8127	26.7518	10	82469
A	A/5	SA2	26.0867	26.0244	11	82469
A	A/6	SA2	25.3442	25.2942	12	82469
A	A/7	SA2	24.6672	24.6672	13	82469
B	B/1	SA2	31.2759	31.2759	14	192066
B	B/2	SA2	29.351	29.301	15	192066
B	B/3	SA2	29.123	29.073	16	192066
B	B/4	SA2	28.0444	27.8951	17	192066
B	B/5	SA2	26.3447	26.2947	18	192066
B	A/5	SA2	26.0744	26.0744	19	192066

Duplicate Definitions

Strings Variables such as “direction” are may be defined for numerous pits on the same string. Searching in a top down direction through the file, the last definition found for the string will be set.

Invert levels may be set via pipe data or pit data or combined. It is recommended that the user only use one method and not combine them. Both are exported so delete the ones you are not going to use. The variables are processed from left to right, so if duplicate definitions of an invert level or found the right most data will be set.

The format definition

- 1.Row1, column 1 must contain either “12d”, or “from to”. Therefore, the first column must be a 12d drainage variable (cannot be a user defined attribute).
- 2.Row 1. The text <pit> at the top of the column indicates the column contains a user defined pit attribute and similarly <pipe> indicates a user defined pipe attribute.
- 3.Row 2. This row contains the names of the 12d drainage variable names and the pit/pipe attributes. All names are case sensitive so be careful where you use capital letters. A list of 12d drainage variables is found below.

Names beginning with an asterix (*) will not be processed (except pit/string names when unique identifiers are present in the data). 12d drainage variables names beginning with an asterix indicate that this data was calculated at export time and cannot be read back into 12d (for example, pipe length, pipe grade and deflection angle).

Prefixing an user defined attribute name with “DELETE ” (no quotes, note the space after the DELETE) will cause the attribute to be deleted from all pits/pipes within the model.

- 4.Row 3. The text in this row define the type of attribute to be stored within 12d. The only valid choices are;
- integer
real
text
- If you want to change an attribute type you must delete the attribute and create it again. If you simply change the attribute type in the third row then that attribute will not be updated.
- 5.Blank lines may be inserted as desired.
- 6.You are not required to fill in all of the cells in the spreadsheets. Blank cells are ignored (you must use a space to remove all data from text attributes (the space will not be stored).
- 7.Pipe names are included in the data so that they can be changed but they are **not** used to identify the pipe. Pipe data will always be assigned to the pipe following the pit in the direction of **ascending** chainage. If flow directions is ascending then the pipe data will be for the downstream pipe. If the flow direction is descending then the pipe data will apply to the upstream pipe.

12d Drainage Variable Names

Manhole Variables	Pipe Variables	String Variables
*string Name	pipe name	direction
*pit name	pipe type	
pit type	low ch invert	
pit diameter	high ch invert	string id
pit low ch invert	diameter	
pit high ch invert	*length	
pit road chainage	*grade	
pit road name	low hgl	
*pit angle	high hgl	
*pit drop	pit hgl	
*pit depth	flow	
*pit chainage	velocity	
x location		
y location		
cover elev		
*fs elev		
*ns elev		
pit id		

Quick Check Lists for Drainage Design Software

The drainage design software packages each have their specific requirements regarding the manhole types, names and then method they use to model pit inlet capacities. The following section details the specific requirement for each package.

See [Drains Version 2+ Requirements and Notes](#)

See [PCdrain Requirements](#)

See [Running RATHGL/RAT2000 and XP-SWMM](#)

See [Micro Drainage - WinDes Requirements](#)

Drains Version 2+ Requirements and Notes

See also [Drainage overview](#)

Basic Check List

1. All manholes must have a unique name (Manhole names cannot begin with "O ")
2. The pipe type used in 12d must exist in the Drains pipe database

Overland flow with Inlet Capacity Check List

1. Make sure you are using Drains Version 2-5 clipboard data. Inside Drains select **Project=>Pit database**. The pit family selection should be available. (CAP1 etc. is Version 1).
2. All Overflow route shapes, pit families and pit types used in 12d must exist in the Drains pit database
3. Overland flow lines must be within 1.0 metres/feet of the manhole

Running Drains - Version 2+

Key Points

The Drains database (each project has its own) and the 12d database (drainage.4d) must be synchronised (**More**).

12d Version 8 needs you to create a new drainage.4d file to include the new inlet capacity curves (pit groups are no longer used).

For pits with a bypass pit and road grade defined (non ILLUDAS), 12d selects pit families for Drains in the following way

The user selects the pit type (Drains pit size) in 12d and 12d selects the ongrade or sag curve from the drainage.4d file (see inlet capacity calculations). The names of these curves are the Drains pit families. If there are no curves for the pit type in the drainage.4d file then the Drains pit type is exported as ILLUDAS with no family or size data.

If the 12d pit type is **Headwall** then the pit will be exported as a headwall.

Catchment lengths, slopes and roughness values are NOT exported in the Drains Rational format. The default values for these parameters are NOT exported in the Drains ILSAX format but the explicit settings from the catchment panel are exported. If used, Drains requires length, slope and roughness for both impervious (paved) and pervious (grass). Supplementary values must be entered in Drains.

Data is copied from 12d to the Windows clipboard and then pasted into Drains. 12d can not delete any objects in Drains, it can only add and update.

When updating 12d from Drains, always copy the DATA to 12d before the results. 12d will update the network but will not add or delete pits.

If a new pit is added in Drains, the user will have the option to create it in 12d. If it is created only the pit will be added and not the pipes.

Why Do I get ILLUDAS pits?

The bypass pit is blank. There must be a bypass pit for the water to go to. Bypass flow strings must pass within 1 pit diameter (beware pits with zero manhole diameters) and you can enter them manually.

The pit type selected has no capacity curves in the drainage.4d file. The curve names become the pit family for the export to Drains. No pit family means ILLUDAS.

If you are intentionally using a drainage.4d file with NO inlet capacity curves, the pit families you set in Drains will be remembered by 12d when you import back into 12d. The inlet capacity curves will not be required for your next export to Drains.

Drains Interface Overview

The Drains program performs the rational or ILSAX hydrology calculations as well as hydraulic grade line calculations that determine pipe sizes and pipe invert levels.

The data sent to Drains includes

pit names and types, easting and northing data with surface levels

finished surface profile along the centre line of the pipes

Headwalls and their levels

optional - bypass inlets, road grades/crossfalls and **SAG Inlet Calculations** (ponding volumes and depths). Pit family selection using road grade and crossfall data.

optional - composite catchment area create from three 12d areas per inlet (must alter the mapping file)

catchment characteristics, k values and overland travel times

pipe sizes, type and invert levels

Data is copied from 12d to the Windows clipboard and then pasted into Drains (**Edit=>Paste data from spreadsheet**). 12d can not delete any objects in Drains, it can only add and update.

The Drains menu selection **Run=>Design** is used to design the network. Once the drainage network has been designed in Drains the updated design data (**Edit=>Copy data to spreadsheet**) and/or the hydraulic results (**Edit=>Copy results to spreadsheet**) are sent back to 12d via the clipboard.

Always copy the DATA to 12d before the results as the results are deleted inside 12d with every update of the data!

Catchment Data

Drains has one catchment per inlet and therefore only 12d's catchment set one is used in the interface. The 12d catchment is split a pervious (grass) area and an impervious (paved) area using the percent impervious fraction. The rational and ilsax spreadsheet export formats (selected in the import/export panel) are different.

The Rational format of the Drains interface does not export Drains "more detailed data". The ilsax format does support the "more detailed data" format but the user must define the length, slope and roughness in the catchment panel. No 12d DNE default data will be exported. As 12d does not have a supplementary area this data will have to be entered into Drains. Gutter lengths and slopes are calculated from the upstream section of the longest overland flow path entering the inlet.

Supplementary data entered in Drains will be remembered in 12d for the next export. The grassed percentage for the next export is calculated as the $(100 - \% \text{ impervious} - \% \text{ supplementary})$.

Synchronising the Drains database and the drainage.4d file.

The 12d pipe types are always used to interface with Drains. Ongrade or SAG pits will be created for export to Drains if the 12d pit has a bypass pit, road grade and a pit type with inlet capacity curves. If all three are not present it will be exported as an ILLUDAS pit.

Every Drains file begins with a default database and Drains uses that database for the life of the project. This database must be synchronised with the **drainage.4d** file in 12d to ensure the Drains pit families, pit sizes, pipe types and overflow route types match. Therefore it is highly recommended that copy of the drainage.4d file be kept in the 12d working folder.

The Drains and 12d data must match as follows.

Drains database	drainage.4d
Pipe type	Pipe type entries
Only if bypass flow is required	
Drains database	drainage.4d
Pit size	Pit type
Pit family	ongrade or sag curve names
Overland route database	default in mapping file

Note: If Drains is to be used to select the pit size then an exact match in pit types is not required. For this case the 12d pit type need only be the prefix of the Drains pit size.

The following 6 steps will help ensure 12d is synchronised with Drains. More details are given in the sections below.

1) Prepare the Drains Pit Database

IF 12d is to select the Drains **Pit Size**, then the Drains **Pit Size** and 12d **Pit types** have to match, exactly! If Drains is used to determine the pit size then you may skip this step.

The pit databases supplied by Drains often have road grade and/or crossfall attached to the end of the pit size. **THIS EXTRA DATA MUST BE REMOVED!**

For example, in Drains database you may find the following

Pit family	Pit size
NSW RTA SA Inlet, 3% crossfall, 1% grade and	SA1 (Type 2) - 1% longitudinal grade
NSW RTA SA Inlet, 3% crossfall, 3% grade	SA1 (Type 2) - 3% longitudinal grade

The pit size for both is the same, **SA1**, but 12d can not tell this because of all the extra data at the end. In Drains, simply remove the extra information so that they are both **SA1**. If the network already exists in Drains, then Drains will automatically change the names of the sizes you have already selected. No time lost here.

Once you have changed the Drains pit size names, you are ready to use the **Drains to drainage.4d** routine to create a drainage.4d file that is synchronised with Drains.

2)Export the Drains database from your Drains file

Inside Drains Open your drains file or begin with a blank file. Select **Project=>Overflow Route database**. Then select **OK** and then **YES**. This will cause Drains to export the database to the file "Drains Connection Data.txt" and store it in the folder with the Drains program.

3)Create a drainage.4d file from the Drains file

From the 12d menu select **Design->Drainage-Sewer->More->Drains to drainage.4d**.

Select **Copy Drains database** to copy the file to the 12d working folder.

select **Create drainage.4d**. The Drains database dump file is copied to the 12d working folder and a drainage.4d file is created in the 12d working folder.

More details below.

4)Edit the drainage.4d file

From the 12d menu select **Design->Drainage-Sewer->More->Edit drainage.4d**. Select **Find** then edit from the file **more info** button. Set the road grade and crossfalls for the 12d pit groups.**More details below.**

5)Restart 12d

From the 12d menu select **Project->Restart**.

6)Set the Overflow shape, Update Pit and Pipe types (Optional)

If the network has already been created using pit and pipe types that no longer exist in the drainage.4d file, they will have to be updated before the export to Drains can occur. You may update them using the drainage network editor (one at a time) or you may set **all** of the pit and pipes types to **one value** using this routine.Later you may change them individually using the **Drainage network editor**

This routine will also set a default overflow route shape for export (values can be modified in the Drains program if desired).

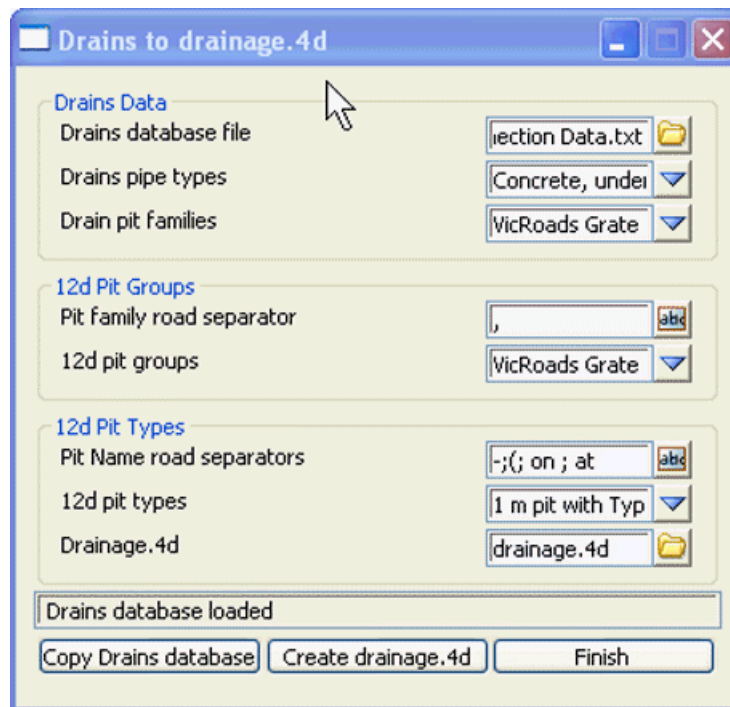
From the 12d menu select **Design->Drainage-Sewer->More->Drainage io defaults**.

More details below.

Drains to drainage.4d file

Position of option on menu: **Design =>Drainage-Sewer =>More=>Drains to drainage.4d**

On selecting the **Drains to drainage.4d** option, the **Drains to drainage.4d** panel is displayed.



Key Points

When you are finished, open the drainage.4d file and check the road grade and crossfall values for the ongrade curves!

If Drains is used to selected the pit sizes then the 12d pit type must be the prefix of the Drains pit size (**Pit Name road separators** are used).

If 12d is used to select the pit sizes to export to Drains, the Drains **Pit Size** and 12d **Pit types** have to match, exactly! The pit databases supplied by Drains often have road grade and/or crossfall attached to the end of the pit size. If pit sizes are to be sent from 12d, **this must be removed!** Find **Prepare the Drains Pit Database** for more details.

Select **Copy Drains database** (12d will search the usual locations for the Drains database).

Review the **Drains pipe types** and **Drains pit families** lists to ensure you have the correct database.

12d pit groups are not used in Version 8.

Pit Name road separators can only be used if **Drains** is selecting the pit types. If 12d pit types are to be exported to Drains, this field should be left blank. If you change these entries you must press the enter key to update the **12d pit types** list below.

Check the **12d pit types** and if they are acceptable select **Create drainage.4d**.

The Details

YOU MUST RESTART 12D FOR THE NEW DRAINAGE.4D FILE TO BECOME ACTIVE!

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Drains database file file box Drains Connection Data.txt

You must update this file from Drains before each use of this panel. Inside Drains select Project=>Overflow Route database. Then select OK and then YES. This will cause Drains to export the database to the file "Drains Connection Data.txt".

Selecting **Copy Drains database** will cause the panel to search for the database dump in the folders **C:\Program Files\Drains\Program** and **C:\Program Files\Drains\Demo\Program**. If

the Drains program is installed in another folder then you must browse for the file. The file will be read and the panel updated with either selection.

Drainage.4d file box drainage.4d

The drainage.4d will be created in the 12d working folder unless otherwise specified. It will only be used for 12d projects in this folder.

Pit families choice box Drains pit families

These are the Drains pit families that will be exported to the drainage.4d file. These will become the names on grade inlet capacity curves for all the pit sizes that belong to the family. The pit family name will be searched for words like **grade**, **slope** etc to try to determine the values for road grade and crossfall for the 12d capacity curves.

Pipe type choice box Drains pipe types

These are the Drains pipe types that will be exported to the drainage.4d file.

Pit group separator input box

Pit groups are not used in Version 8. These characters will be used to remove the road grade crossfall data from the **Pit families** above. The data before this character will become the **12d pit groups**. Press **Enter** or select **Read Drains database** to create a new list of **12d pit groups**.

12d pit groups choice box 12d pit groups

These are created from the Pit family list above by deleting all text after the **Pit group separator**.

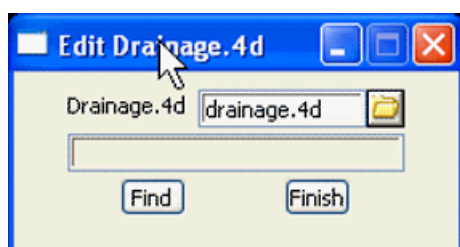
Create drainage.4d button

Create a drainage.4d file.

Editing the Drainage.4d file

Position of option on menu: Design =>Drainage-Sewer =>More=>Edit drainage.4d

On selecting the Edit drainage.4d option, the Edit drainage.4d panel is displayed.



Select the **Find** button to search the 12d path for the current **drainage.4d** file. Select the **More info** button and then **Edit** to edit the file.

The drainage.4d file contains Manhole and Pipe commands. 12d also uses the Manhole commands to specify a pit group by using the prefix "group". Details follow.

Headwalls

The pit type "Headwall" (case sensitive for Drains) is reserved for the inlet headwall for a conduit. Drains does not use this for an outlet headwall.

If the inlet type is On Grade or there is no bypass pit, the grate level is exported as the Drains surface level. If the Inlet type is marked as a SAG pit then the surface level will be calculated from the low point on the catchment string (catchment set #1). Also see **SAG Inlet Calculations**.

Pit Families

Version 2+ of the Drains clipboard interface uses a **pit family** to describe the kerb shape and optionally, the name include the road crossfall and/or grade attached as a suffix.

An example pit group is the drainage.4d file is shown below. 12d uses the road grade and/or the road crossfall to select which pit family should be sent to Drains. In this example the road crossfall would not be used in selecting the pit family.

It is up to the user to decide the grade when the next pit family should be used. In this case the threshold value for the gutter grade is set midway between the published values of the inlet curves. For example at a gutter grade of 2% 12d starts sending the **NSW RTA Pits - 3% slope**

pit family.

The pit families listed on the right must match exactly with those in the Drains pit database.

Pit Types and Pit Sizes

Each Drains **pit family** has several **pit sizes**. The Drains **pit sizes** link to the 12d pit types and therefore all Drains **pit sizes** should exist in the 12d drainage.4d file.

The **pit size** will be read back from Drains into 12d as the **pit type** so that it can be placed on the drainage long sections and pit schedules. If no matching pit type is found in 12d then a character will be dropped off the end of the Drains pit size and 12d will be searched for the new shorter pit type. This will be repeated till a match is found (or there are no more characters in the Drains pit size).

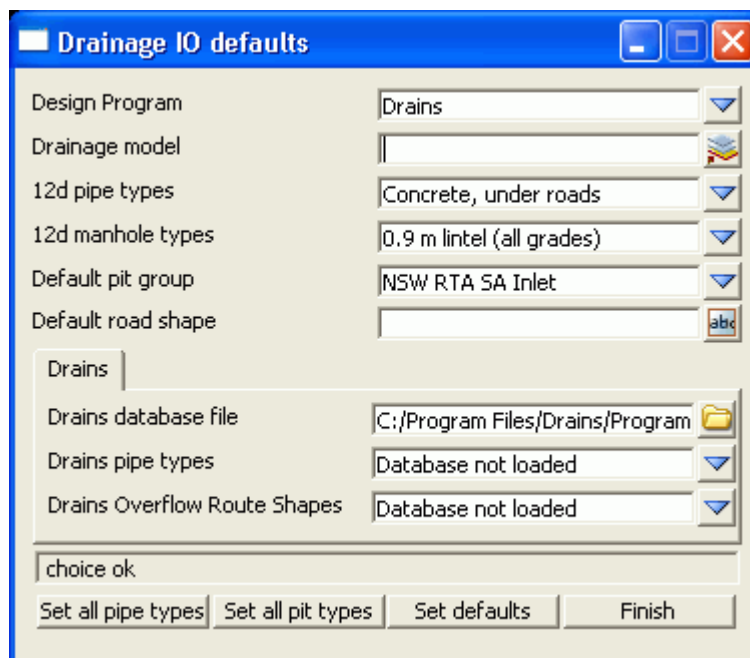
Pipe Types

The pipe type selected in 12d must exist in the pipe database inside Drains. Simple "2" for class 2 or "RCP" do not exist in Drains.

Setting the Overflow Route, the Pit and Pipe types

Position of option on menu: Design =>Drainage-Sewer =>More=>Drainage IO Defaults

On selecting the Drainage IO Defaults option, the Drainage IO Defaults panel is displayed.



The routine changes ALL of your pit and pipe types in a model to a single value. If you have changed your drainage.4d file after creating you drainage network, the pit and pipe types you originally selected may no longer be valid (i.e. in the drainage.4d file).

Field Description	Type	Defaults	Pop-Up
Design Program	choice	Drains	Drains, PCdrain

The drainage model to be updated.

Drainage model file

The drainage model to be updated.

12d pipe types choice values from drainage.4d

Set all pipe types will set all pipes in the model to this value

12d pit types choice values from drainage.4d

Set all pit types will set all pits in the model to this value

Default pit groups choice values from drainage.4d

pit definitions in the drainage.4d file that have **group** as a prefix are included.

Default road shape choice values from drainage.4d

type the desired name or if using Drains select the desired shape from the **Drains Overflow route shapes**.

Drains Tab

Drains database file file

pressing enter in this field will start a search for the Drains database dump. The search path is the specified folder, C:\Program Files\Drains\Program then C:\Program Files\Drains\Demo\Program. If the file is found the choice fields below are populated. **It is highly recommended that this file be in the 12d working folder.**

Drains pipe types choice I values from Drains file

the pipe types are retrieved from the last Drains database dump. Changing this value will update the **12 pipe types** above.

Drains Overflow Route Shapes choice values from Drains file

the overflow route shapes are retrieved from the last Drains database dump. Changing this value will update the **Default road shape** above.

Set all pipe types button

all pipe types in model are set to this value

Set all pit types button

all pit types in model are set to this value

Set defaults button

the defaults for the **Drains Overflow Route Shapes** and **12d pit group** are set

Finish button

removes the panel

Drains Version 2+ Requirements

Pit Names

The 12d pit names cannot be more than 9 characters long. 12d uses 2 additional characters to the pit name at export time create names for the pipes, overflow routes and catchments. For example pit "A-1" will have a bypass route "F A-1", a catchment "C A-1" and a downstream pipe "P A-1".

Bypass Flow (Overland Flow Routes)

There are 3 requirements for Drains bypass flow (bypass pit, pit inlet capacity curve and road grade/crossfall).

Select a **pit type** that has ongrade or sag inlet capacity curves defined in the drainage.4d file. The Drains and 12d databases must be in sync.

Bypass strings in the **Bypass route model** specified (Network editor->Global->Utility Models->Bypass flow model. For more details see **Bypass Flow**.

Road grade and crossfall calculated (Network editor->Global->Utility Models->Road design file)

The overland flow strings are not allowed to pass through the outlet pit on the network.

SAG Inlet Calculations

SAG inlets are inlets where the water ponds at the surface rather than flowing past. If a SAG inlet

has a catchment string the overflow depth and volume are calculated. The catchment string from Set #1 is draped onto the design tin and the lowest point is found on the draped string (stored as a 12d pit attribute **overflow level**). The storage volume inside the string up to this point is measured and stored as a 12d pit attribute **overflow volume from level**. and are subtracted from the to determine

The Max Ponding Depth = **overflow level- grate level**

If the **manual flag** is selected for the "sag pit pond depth", 12d will NOT calculate the value but will use the value entered by the user. 12d will check if a volume has been calculated before or imported from Drains. If the volume exists then it is exported. If it does not exist, this ponding depth will be used calculate the ponding level (depth + grate level). The ponding level will be used to calculate a ponding volume from the design tin and the catchment boundary.

If you want to manually delete this volume and force 12d to recalc to volume using the user defined level, delete the pit attribute, "overflow volume from level". To delete the attribute use Strings->Properties->Attributes, select the pit, go to the pit tab, right mouse select the row with this attribute and select delete).

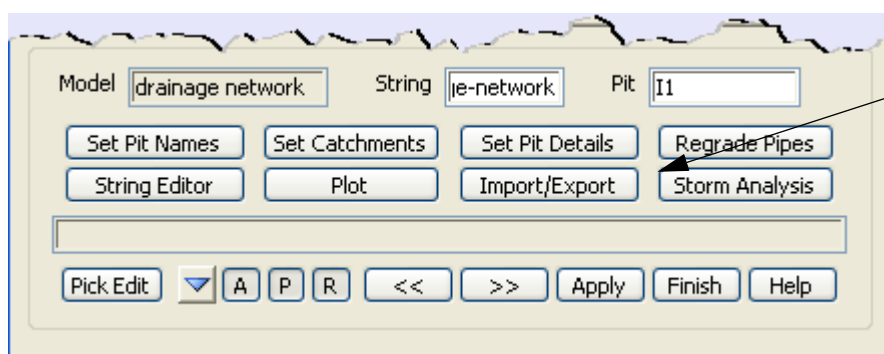
Results

Drains exports the maximum data from all of the rainfall events analysed. Therefore, ensure you analyse only the rainfall events desired before coping the results to the clipboard. To verify the data that is being sent to 12d, copy the data into a spreadsheet so you can view it there first. The pit sizes selected in Drains will be stored in 12d as the pit type. Therefore the pit sizes in Drains should exist as pit types in the drainage.4d file. If pit families are changed in Drains the pit group in 12d will be updated by search for the pit family in the drainage.4d file.

12d to Drains

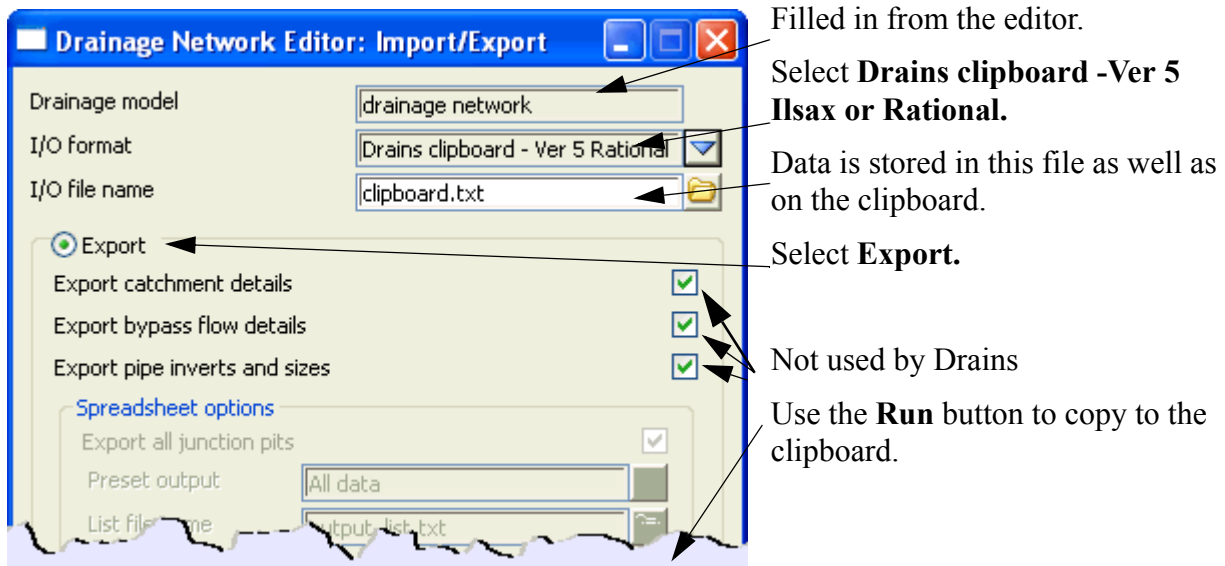
Setup your drainage network models and ensure they have been assigned pit names.

Copy the data to the clipboard



From the Drainage network editor select the **Import/Export** button.

The following interfaces dialogues will appear.



From within the Drains program select **Edit =>Paste data from spreadsheet**. If you paste the data into a Drains project that has a hydrological model and rainfall data already defined the project will be ready to run.

Use the Drains Run=>Standard design to design your pipe sizes and invert levels. The Run=>Advanced Design will select the size of the pits as well.

Drains to 12d Update

The following steps are required to update the 12d model with the Drains hydraulic results and changes to the pipe sizes and inverts.

To update the pipes and invert levels in 12d, select **Edit->Copy Data to Spreadsheet** from the Drains menu.

From within the 12d Drainage network editor select **Import/Export**.

Drainage Network Editor: Import/Export

Drainage model: drainage network

I/O format: Drains clipboard - Ver 5 Rational

I/O file name: clipboard.txt

☐ Export

Export catchment details ☒

Export bypass flow details ☒

Export pipe inverts and sizes ☒

Spreadsheet options

Export all junction pits ☒

Preset output: All data

List file name: output_list.txt

☒ Import

Hold obverts on import ☐

Generate plan results ☒

Drainage plan PPF: gn.drainplanppf

Model for plan results: DRN PLAN PLOT

Full clean of model beforehand ☐

Generate long-section results ☒

Drainage long-section PPF: ng_A1.drainppf

Model stem for long-section results: DRN LONG PLOT

Clean model(s) beforehand ☒

Run Back to Editor Help

Filled in by the editor.

Select Drains clipboard - Version 5

Leave as clipboaard.txt

Select **Import**

This will ignore the invert levels read from Drains and the current pipe obverts will remain fixed.

Plan and long section drawings may be created at the import time so that you can see the results on the drawings.

Select **Run** to update the drainage model. To see the changes in the section views you will have to select **Regen** on the section view toolbar.

To return to the network editor select **Edit**

IMPORTANT: THE DATA MUST BE PASTED BEFORE THE RESULTS!

12d erases the hydraulic and hydrology data when the physical data is updated. Therefore, always paste the data before the results.

Drains Mapping File

The rational format and the ilsax format have separate mapping files.

The Drains spreadsheet format consists of sections starting with a header, then the data area and ending with a blank line. The mapping file defines the format of the section headers and the format of the data within the sections

	A	B	C	D	E	F	G	H	I
1	PIT / NODE DETAILS			Version 9					
2	Name	Type	Family	Size	Ponding	Pressure	Surface	Max Pond	Base
3					Volume	Change	Elev (m)	Depth (m)	Inflow
4					(cu.m)	Coeff. Ku			(cu.m/s)
5	A2	Node	Sutherlan	0.85 m lin	1	1	26.451	0	
6	A3	OnGrade	Sutherlan	0.85 m lin	1	1.2	27.194	0	
7	A4	OnGrade	Sutherlan	0.85 m lin	1	1.2	27.92	0	
8	A5	OnGrade	Sutherlan	0.85 m lin	1	1.2	28.872	0	
9	D1	Sag	NSW RTA	SA1	1	2	28.492	0.068	
10									
11	DETENTION BASIN DETAILS								
12	Name	Elev	Surf. Area	Init Vol. (c	Outlet Typ	K	Dia(mm)	Centre RL	Pit Famil
13									
14	SUB-CATCHMENT DETAILS								
15	Name	Pit or	Total	Paved	Grass	Supp	Paved	Grass	Supp
16		Node	Area	Area	Area	Area	Time	Time	Time
17			(ha)	%	%	%	(min)	(min)	(min)
18	C A2	A2	0.039	80	20	0	5	10	0
19	C A3	A3	0.0408	80	20	0	5	10	
20	C A4	A4	0.0705	80	20	0	5	10	

The headers in the mapping file define the exact text to be exported in the Drains section headers. During an import the first 4 columns of the Drains header are compared to the headers in the mapping file to determine which section is being read. The data format line is then used to decode the the data.

PCdrain Requirements

See also [Drainage overview](#)

Basic Check List

1. All manholes must have a unique name
2. Only one outlet allowed in the drainage model
3. First export should have “**Export default catchment/pit/overland parameters**” selected
4. Pit types in used in 12d must exist in the PCdrain Inlet gully file selected.

Overland flow with Inlet Capacity Check List

1. A gutter profile named “4d” must exist in PCdrain before the interchange file is read. This gutter profile may be created in PCdrain from the menu selection **Data=>Gutter profiles** then **New**.
2. Overland flow lines must be within 1.0 metres/feet of the manhole

Data is exchanged to and from PCdrain via the interchange (*.int) file. Gutter profiles and inlet type must be specified in PCdrain before the interchange file is read into PCdrain.

The data sent to PCdrain includes

- s pit names and types, easting and northing data with surface levels
- s pipe deflection angles at pits
- s finished surface profile along the centre line of the pipes
- s optional - crossing services - level, size and location along the pipes
- s optional - bypass inlets, road grades and SAG inlet ponding depths
- s optional - up to 2 catchment areas per inlet
- s optional - default catchment characteristics, k values and overland travel times
- s optional - pipe sizes and invert levels

PCdrain Requirements

Pit names

The pit name from 12d is assigned to both the structure and catchment name in PCdrain. These names cannot exceed 7 characters.

Pit type

The 12d pit type is transferred to the structure type in PCdrain. These names must match those specified in the PCdrain Inlet charts selected (**Data=>Inlet charts**). Select the desired inlet charts BEFORE importing the interchange file.

12d pit types with an “S” in the name are treated by 12d and PCdrain as a SAG inlet pit. 12d will strip off all characters after the “S” before adding the ponding depth. If a catchment string in set #1 is available for the SAG pit then the ponding depth will be calculated. The 12d pit type will remain unchanged. A typical example would be a pit type “1TC” with the sag tick box on would become “1TC0.100” if a ponding depth of 0.1 was calculated.

Bypass Flow

When a catchment string is specified for the pit, the maximum depth before bypass flow commences is calculated. The lowest point on the catchment string is determined by draping it onto the drainage strings tin. The maximum depth before bypass is calculated pit setout level

less the setout to grate offset less the lowest point on the catchment string.

PCdrain differentiates between pits (no surface inflow) and gully pits via the 12d pit type. The bypass flow strings can only be drawn within 1 pit diameter of the gully pits. Keep the bypass flow strings away from the PCdrain pits.

Catchments

Again, since PCdrain differentiates between inlets and manholes (using the 12d pit type), ensure that catchments are only drawn for gully inlet and NOT manholes.

12d to PCdrain Pit Data

12d	PCdrain
Pit-Setout-Easting (northing)	Table 1- Easting (Northing)
Pit-bypass-bypass pit	Table 1 - Bypass structure
Pit-Main-grate Level	Table 5- Surface Level Overrider
Pit-Bypass-Road Grade (%)	Table 5- Road grade over rider
Pit-Setout-Chainage	Table 5- Road Chainage
Pit-Setout-Offset	Table 5- Road offset
Pipe-Main -length	Table 7 - Pipe length
Pipe-Main-diam	Table 7 - Pipe1 size
Pipe-Main-# pipes	Table 7 - Pipe1 number of conduits
Pipe-Design-Alignment Modes	Table 7 - Alignment of conduits
Pit-Main-Ku(Kw)	Table 8 - Ku (Kw)
Pipe-Main-US invert	Table 9 - Upstream level of pipe
Pipe-Main-DS invert	Table 9 - Downstream level of pipe

12d to PCdrain Catchment Data

Pervious Impervious	12d	PCdrain
Total	Area	Catchment Area
Total	Area (set 2)	Catchment Area2
Pervious	C minor and Major	Minor coef; Major coef
Pervious	C minor and Major (set 2)	Minor coef2; Major coef2
Pervious	Tc minor (Direct method only)	Time of concentration overrider
Pervious	Length	Length of overland flow
Pervious	Slope	Grade of overland flow
Impervious	Length	Length of gutter

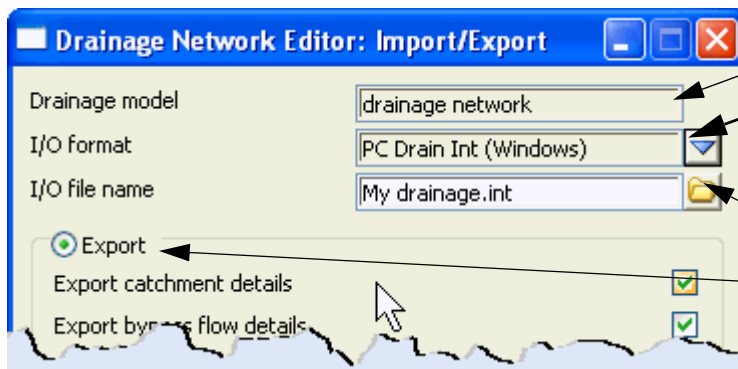
Pervious Impervious	12d	PCdrain
Impervious	Slope	Grade of Gutter

12d to PCdrain

1. Export the data to PCdrain selected via the Network editor

Design=>Drainage-Sewer=>Drainage Network Editor

After selecting the drainage network, select the **Import/Export** button and the following dialogue will appear.



The drainage model will be completed by the editor.

Select **PCdrain Int (Windows)** from the drop down list.

Enter the name of the int file to be created.

Select **Export**.

Select the **Run** button and the interface file will be created.

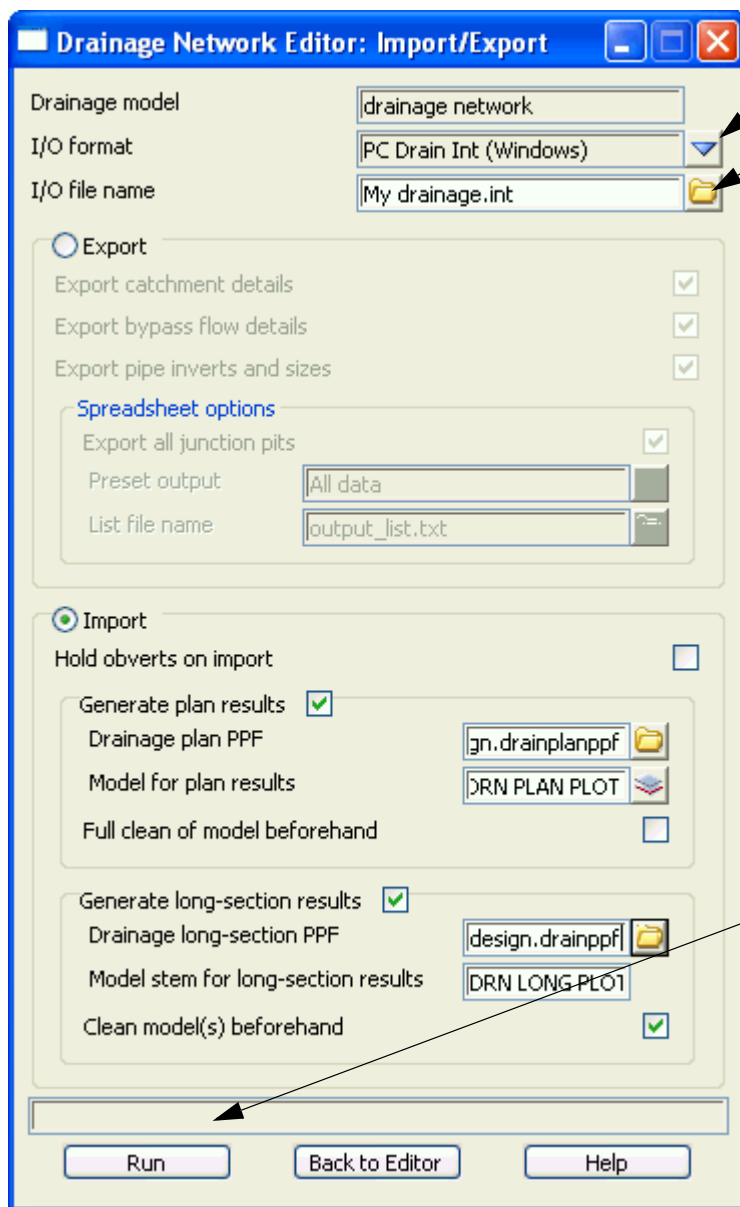
2. Launch the PCdrain for Windows program. If you have a project set up with the design parameters, rainfall data, inlet charts and gutter profiles then open it now and skip to step 8. Otherwise continue with step 5.
3. The Design Parameters can be set as desired with the menu selection **Data=>Design Parameters**.
4. Select the rainfall data using the **Data=>Rainfall** menu selection.
5. Select the inlet charts using the **Data=>Inlet Charts** menu selection. The pit types specified in 12d must be included in these settings. **More - PCdrain to 12d pit converter**
6. At least one gutter profile in PCdrain needs to be defined. These are set through the menu selection **Data=>Gutter Profiles**. The default gutter section name (**Road ID**) from 12d is **4d** and therefore it is recommended you create a profile with this name and your own description. If you have changed the profile names in 12d (through the spreadsheet interface or the Attribute editor) these new profile names will have to exist in PCdrain.
7. Save this file now so that you can retrieve it later if required. It can be used as a starting template for new jobs.
8. **File=>Import** from the menu. Select the file exported in step 1. The information from 12d may be viewed by selecting **Data=>Network** and then selecting the desired tabs.
9. The HGL level and the pipe elevation at the outlet should be set using the menu selection **Data=>Outlet**.
10. If you have not exported pipe data then the pipe size must be determined. Use the menu selection **Process=>Select Pipe Sizes**.

PCdrain to 12d

Export the results to 12d using the **File=>Export** menu selection. Note the name of the interchange file you are creating as you will need to enter it inside 12d.

Return to 12d and select **Import/Export** from the network editor and the following dialogue will

appear,



Select **PCdrain Int (Windows)** from the drop down list.

Select the output file name you created in PCdrain.

Select **Run** and the file will be read into 12d and the drainage network will be updated. To see the changes in a section view, select **Regen**.

A listing of the data imported is stored on the 12d output window.

Inlets that have been specified as SAG inlets will have the ponding depth removed from the end of the PCdrain structure type before the data is stored as the 12d pit type.

RAT2000 Requirements

See also [Drainage overview](#)

Basic Check List

1. All manholes must have a unique name (they become nodes in RAT2000)
2. Only one outlet allowed in the drainage model
3. First export should have “**Export default catchment/pit/overland parameters**” selected
4. First export should have “**Export pipe diameters and Inverts**” selected
5. Outlet conditions must be set in RAT2000.
6. Start-up data may be specified in the file **drainage startup.xpx** (the standard 12d system file path will

be searched).

Overland flow with Inlet Capacity Check List

1. Overland flow lines must be within 1.0 metres/feet of the manhole
2. If inlet capacity curves are to be used then the curve name must match the 12d pit type with the road grade/crossfall data added.

22.0 Running RAT2000

Data is exchanged to and from RAT2000 via the interchange (*.xpx) file. The data exported from the 12d drainage model is appended to the xpx startup data specified in the file **drainage startup.xpx** (the standard 12d system file path will be searched). This file may be edited using a text editor or you may create your own default file by exporting your RAT2000 global data this file.

RAT2000 Requirements

Manhole names

All manholes will become nodes in RAT2000 and therefore they must have a unique name inside 12d.

Manhole Types

The manhole types are used to determine the pit inlet capacities if overland flow routes are selected. Fixed inlet capacities values may be set in the drainage.4d file while inlet capacities curves must be included in the drainage_startup.xpx file. The range of available curves for 12d to choose from are set in the drainage.4d file and the curves are determined using the pit type, road grade and road crossfall.

Pipe Types

Pipe types are not transferred to RAT2000.

Overland Flow

When an overland flow model is selected the pit inlet capacities and bypass routes are calculated.

22.1 12d to RAT2000

1. Export the data to RAT2000 by selecting

Design=>Drainage-Sewer=>More=>Pit/Pipe Design Interface

The following dialogue will appear.

Select RAT2000 from the drop down list.

Enter the name of the xpx file to be created.

Optional.

Not supported in RAT2000.

See notes below on **Updating an existing RAT2000 file**

Select the **Run** button and several checks will be made on the drainage network at this time. The interface file will be created.

22.2 Updating an existing RAT2000 file

Adding new Nodes and Pipes

If new manholes and pipes have been added to 12d then these new entities will now be included in the xpx file and imported into the RAT2000 project. 12d identifies the nodes in XP by the node names. Therefore if nodes names are changed in either program then they must be manually changed in both programs.

If a manhole is to be inserted in an existing link then the existing link must be deleted in RAT2000 so that the new links and manholes may be created in the void.

WARNING! If the tick box **Export catchment/pit/overland flow default data** is selected for the update then any changes to these defaults in RAT2000 will be lost. Two options are available to the user.

Option 1 - Preferred method if updating pipe lengths, invert levels for your design.

De select the tick box and export the data. The new node and links created in RAT2000 will not have all the defaults set but the existing nodes and links will not have revisions to defaults over-written.

Option 2 - Preferred method if you have created numerous new links and nodes.

Leave the tick box selected but export the RAT2000 to a temporary xpx file first. This will save the existing setting. After RAT2000 is launched and loaded with the new data, import your temporary xpx file you just created to restore the original data.

Deleting Nodes and Pipes

If a node or link is to be deleted then delete the entity from both 12d and RAT2000.

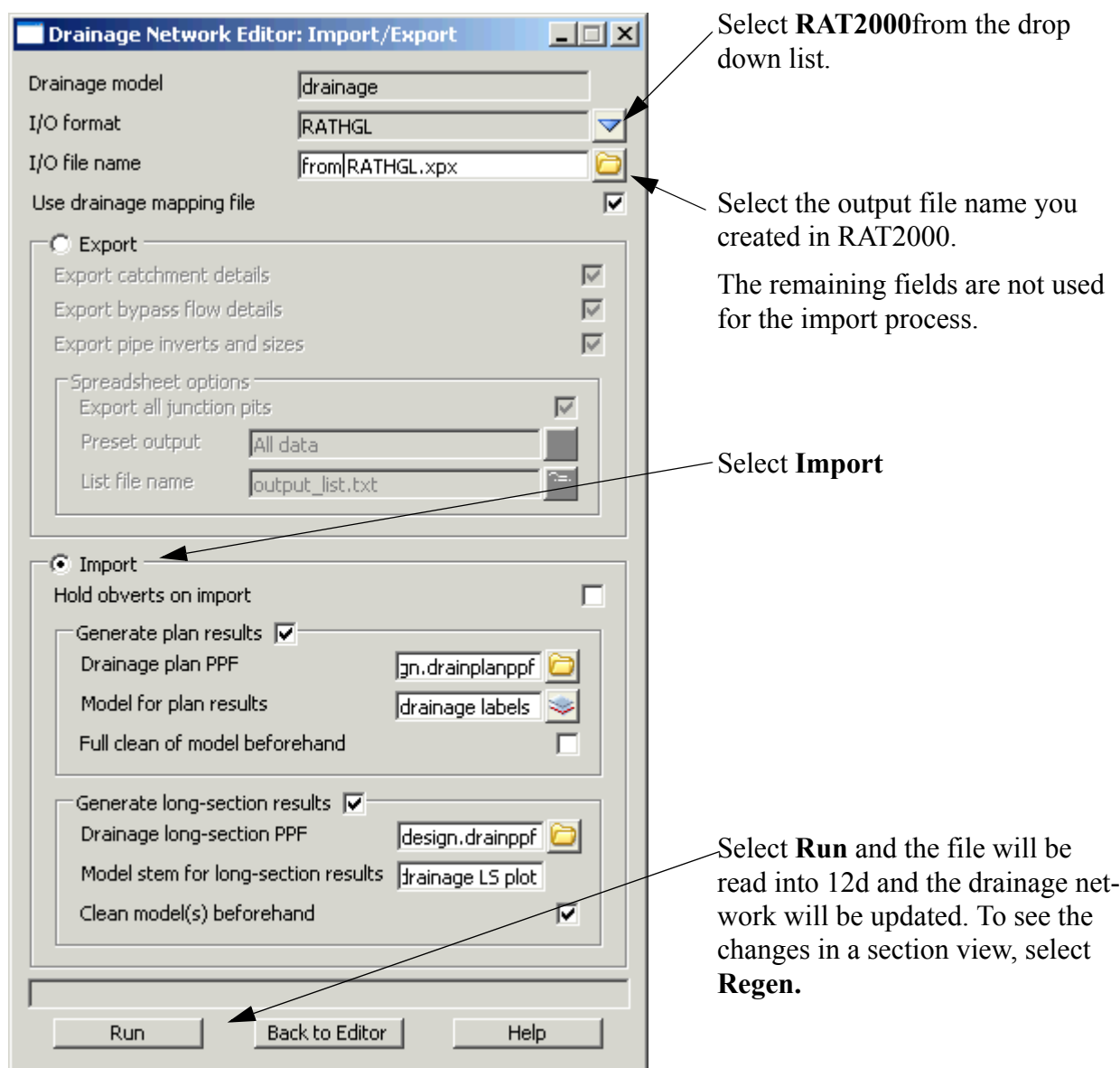
22.3 RAT2000 Results to update 12d

If RAT2000 is launched automatically using option 1 above then as soon as RAT2000 is exited an interface file is automatically created (using the same name as the import xpx file). This file will now be read back into 12d to update the pipe network and import hydraulic results for drainage longsection plots.

Return to 12d and select

Design=>Drainage-Sewer=>More=>Pit/Pipe Design Interface

The following dialogue will appear,



XP SWMM Program Requirements

See also [Drainage overview](#)

Basic Check List

1. All manholes must have a unique name (they become nodes in XP SWMM)
2. Only one outlet allowed in the drainage model
3. First export should have “**Export default catchment/pit/overland parameters**” selected
4. First export should have “**Export pipe diameters and Inverts**” selected
5. Outlet conditions must be set in XP SWMM.
6. Start-up data (run times and hydrology data) may be specified in the file **master_drainage.xp** (the standard 12d system file path will be searched).

Running RATHGL/RAT2000 and XP-SWMM

The drainage design with all three of the XP software programs follows the same methodology. The process is substantially automated with the XP-SWMM program so that the XPX file is automatically read by XP-SWMM and automatically created when leaving XP-SWMM.

Drainage design with XP programs includes the following steps.

1. 12d creates an XPX file that is read by the XP programs.
2. The XP program is then run in the design mode to determine the pipe sizes and invert levels.
3. If bypass and overland flows are to be modelled then the inlet capacities need to be defined and then run the XP program in the Full Analysis Model.
4. The XP program creates an XPX file for 12d to import.

22.4 xpstorm and xpswmm bypass requirements

12d will select the inlet capacity curves for the xp programs when the following bypass settings are complete

Drainage Network Editor

Catchment | Pit | Pipe | DEFAULTS | GLOBAL

Current pit
Pit name: E1 Pit type: OG KGR (1)

Main | Setout | Bypass | Notes

Bypass flow / Inlet capacity factors

Bypass pit: D1 (2)

On-grade pit (3)

Manual ☐ Road grade (%) 2.2009 (4)

Manual ☐ Road xfall (%) 3 (4)

Choke (minor) Choke (major) (5)

Sag pit (3)

Manual ☐ Max pond depth

Choke (minor) Choke (major) (5)

Main | Setout | Bypass | Notes

Cover RL mode Cover RL 29.37434

Grate RL mode Grate RL 29.22434

Pit diameter 1.1 Sump offset

Inlet data

Ku method Ku 0

Ku config On-grade Pit (3)

Kw 0

Inlet flow

1. The 12d pit type determines the inlet capacity values or curves to be selected from.

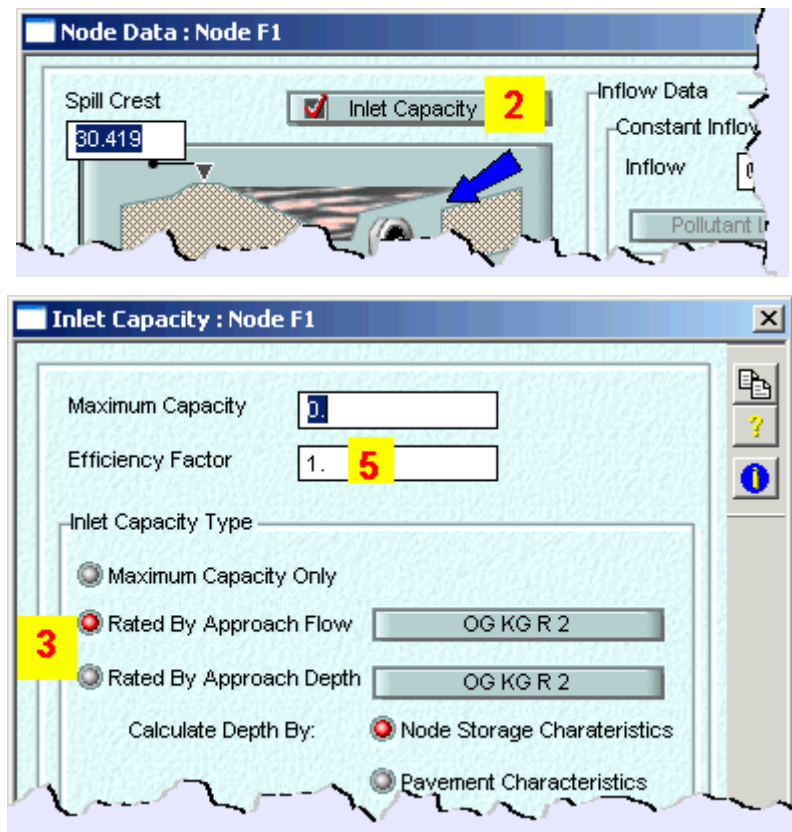
2. The bypass pit must be defined for the pit. If the bypass pit follows the pipe network a xp-multi link with a natural channel is created. Otherwise a xp single link is created. The default xp natural shape is "Road Section"

3. The Ongrade/SAG pit on the Main tab determines whether depth or approach curves are exported to (details below).

4. If ongrade is selected then the 12d inlet capacity curves may be selected by road grade, crossfall, both or neither. (details below).

5. The 12d choke factors will be exported as the xp inlet efficiency factor (1 - 12d choke)

The numbers below relate the same numbers in the 12d panels above.



- 1.
2. Inlet capacity is turned on when 12d has a bypass inlet.
3. 12d **Ongrade** inlets export as **Rated by Approach Flow** and 12d **SAG** inlets export a **Rated By Approach Depth** with depth calculated by **Node Storage Characteristics**.
- 4.
5. The minor/major selection is the 12d export panel determines the efficiency factors that are exported/
Efficiency factor = 1.0 - 12d choke.

12d Inlet Capacity Curve names

Below is an extract from the drainage.4d file for Canberra rating curves.

```

drainage.4d - Notepad
File Edit Format View Help
-----
// ACT Inlet Charts
// from Full Scale Model studies University of South Australia
//
// OG = on-grade
// LP = low point
// S = low point
//
// KG = kerb & gutter
// MLBK = modified layback kerb
// MKG = median kerb & gutter
//
// R = 'R' type kerb inlet sump
// QS = QS type inlet
//
// x = gutter slope
// Note: all the ratings are for 3 crossfall.
Manhole "OG KG R" {
cap_config G
cap curve grade "OG KG R 0.5" {
road_grade 0
coord 0 0
coord 0.005 0.005
coord 0.01 0.01
coord 0.015 0.015
coord 0.02 0.02
coord 0.025 0.025
coord 0.03 0.03
coord 0.035 0.035
coord 0.04 0.039
coord 0.045 0.0423
coord 0.05 0.0455
Ln 22, Col 1

```

1. The manhole is the inlet type selected above.
2. cap_config G forces the inlet to be used as qa 12d ongrade inlet. An S would be SAG and an M a manhole.
3. The curve name indicated here is exported as the xp inlet capacity curve.
4. The curve name will be exported starting at road grade of 0. Since one curve has a road grade value all curves must have a road grade value and the user must have a road grade calculated on the 12d bypass tab.

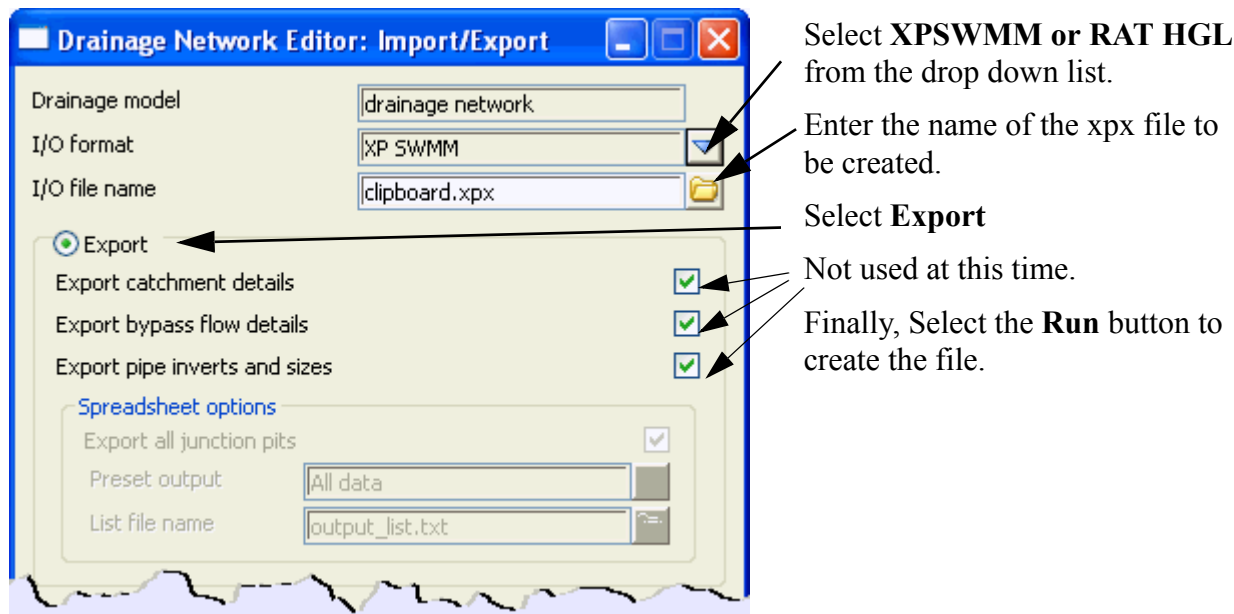
22.5 12d to the XP Programs

The x,y pit layouts and the cover/surface levels are obtained from your drainage network while the catchment and overland flow data comes from the models specified in the drainage interface dialogue.

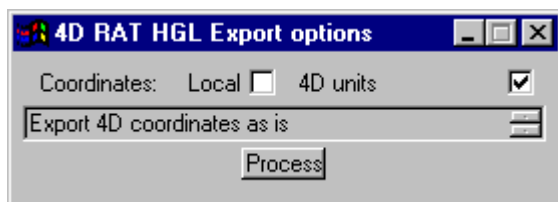
The steps required to transfer the data to the XP programs are as follows.

1. Setup your drainage network models.
2. To create the XPX file for XP programs start the Drainage Network Editor and select **Import/Export**

The following interfaces dialogues will appear.



If exporting to RAT-HGL the following dialogue will appear.



If you are using old versions of RAT-HGL (1996 or earlier) select use **Local** otherwise select **4D units** (eastings and northings).

Select process.

3. The XP SWMM program will automatically startup and load the XPX file.

From within RAT-HGL, either select **File =>New** and follow the input prompt or load a file that contains all of the pit inlet rating curves, hydrological and design data without a pipe network. Many users have such RAT-HGL files setup so as to streamline the design process.

The xpx file for RAT2000 will have the file startup.xpx added to it so that you may include all the startup global data that you require. The

Fixed inlet capacities and rating curve names indicating road grade and crossfall may be set in the **drainage.4d** file. The format for these names is pit name-crossfall-road grade (ex SA2-3-4). These curves must exist in this file.

4. To read in the pipe file created above, select **Special =>Import Data** and select the xpx data file. Warnings will be given stating that several fields are inactive. This is expected as more data is sent to RAT-HGL than is needed at this time. Select the **Close Square** on the Help title area and the pipe network and catchments should now appear on the screen.
5. If you want RAT-HGL to redesign you network, change the analysis mode to Design mode by

selecting **Special=>Job Control** and Select Design mode. Do not do this if you want to analyse the network you layed out in 12d (used for existing systems).

6. Select the rainfall events to design/analyse and the **LB** (twice) on **OK** to return to the layout. Now select the outlet and enter the starting tailwater levels.
7. Now you can run RAT-HGL (**Special =>Solve**).

22.6 XP Programs to 12d

Once you have your design finished, the following steps are required to update your 12d model. Your design may contain several return periods in the analysis (Rp1 to Rp7) but 12d reads only the results from Rp1. The following table is taken from the RATHGL output file (*.out extension) and the results indicated are read back into 12d via the xpx file.

HGL PIPE NETWORK ANALYSIS SUMMARY RETURN PERIOD 5 YEARS
PROJECT:12d DRAINAGE LAYOUT

|ITEM DIM| RESULT

RN	-	1	2	3	4	5	6	
NN	-	1-1	2-1	1-2	3-1	1-3	1-4	
DN	-	1-2	1-2	1-3	1-3	1-4	1-4	
MT	-	99	99	99	99	99	0	
DHGL	M	29.258	29.258	28.139	28.139	27.269	.000	DS HGL
DD	M	.225	.375	.375	.300	.450	.000	Diameter
DCTL		HGL	HGL	HGL	HGL	HGL		
DO	M	.225	.375	.375	.300	.450	.450	
QO	M3/S	.033	.181	.237	.075	.334	.353	Flow
VELD	M/S	.826	1.639	2.148	1.065	2.100	.000	
NORM	M	.106	.264	.271	.153	.289	.000	
CRIT	M	.152	.314	.345	.215	.396	.000	
KP	-	.00	.00	.00	.00	.00	.00	
SF	M/M	.0040	.0082	.0140	.0046	.0107	.0000	
LEN	M	45.93	18.44	54.65	31.31	49.91	.00	
HGLP	M	29.444	29.409	28.905	28.284	27.802	.000	US HGL
DU	M	.225	.375	.375	.300	.450	.000	
VELU	M/S	.826	1.639	2.148	1.065	2.100	.000	Velocity
UCTL		HGL	HGL	HGL	HGL	HGL		
KU	-	1.50	1.50	1.50	1.50	1.50	.00	Ku
KL	-	1.50	1.50	1.50	1.50	1.50	.00	
KR	-	1.50	1.50	1.50	1.50	1.50	.00	
KW	-	1.50	1.50	1.50	1.50	1.50	.00	Kw
UHGL	M	29.496	29.615	29.258	28.370	28.139	27.269	
LHGL	M	29.496	29.615	29.258	28.370	28.139	27.269	
RHGL	M	29.496	29.615	29.258	28.370	28.139	27.269	
UWSL	M	29.496	29.615	29.258	28.370	28.139	27.269	HGL PIT
MWSL	M	30.297	29.615	29.403	28.875	28.340	27.369	
AF	M3/S	.033	.207	.023	.094	.040	.000	
IF	M3/S	.033	.181	.023	.076	.023	.023	
IC	M3/S	.036	.227	.026	.076	.023	.023	
BF	M3/S	.000	.026	.000	.019	.017	.000	
ID	M	.000	.000	.000	.000	.000	.000	
ITW	M	.000	.000	.000	.000	.000	.000	
IVEL	M/S	.000	.000	.000	.000	.000	.000	
IVD	M2/S	.000	.000	.000	.000	.000	.000	
FC	-		*		#	#	#	

In addition to the results, the following input data is read back into the 12d model so that it may be exported back to RATHGL in the future (if required). 100% of your RATHGL data is not included in the XPX formats and the contents of the XPX file will depend upon your design mode. Therefore, use caution if you read an XPX file into an existing RATHGL model and check your data once inside RATHGL.

1. From within RAT-HGL, produce an XPX file for 12d to read by selecting **Special=>Export Data** and following the default prompts.
2. From within 12d, select the **Import/Export** button on the Drainage Network Editor. The fol-

lowing panel will appear.

Drainage Network Editor: Import/Export

Drainage model: drainage network

I/O format: XP SWMM

I/O file name: clipboard.xpx

☐ Export

Export catchment details ☒

Export bypass flow details ☒

Export pipe inverts and sizes ☒

Spreadsheet options

Export all junction pits ☒

Preset output: All data

List file name: output_list.txt

☒ Import

Hold inverts on import ☐

Generate plan results ☒

Drainage plan PPF: gn.drainplanppf

Model for plan results: DRN PLAN PLOT

Full clean of model beforehand ☐

Generate long-section results ☒

Drainage long-section PPF: ng_A1.drainppf

Model stem for long-section results: DRN LONG PLOT

Clean model(s) beforehand ☒

Run Back to Editor Help

Select to select **RATHGL** or **XP-SWMM**.

Select the file name specified in step 1

Select **Import**.

Select **Run** to update the drainage model and import hydraulic/hydrological results.

Running Micro Drainage - WinDes

See also [Drainage overview](#)

Basic Check List

1. All manholes must have a unique name (they become nodes)
2. Only one outlet allowed in the drainage model
3. First export should have “**Export default catchment/pit/overland parameters**” selected
4. First export should have “**Export pipe diameters and Inverts**” selected
5. Outlet conditions must be set in Win DES.

22.7 Micro Drainage - WinDes Requirements

Pit - Pipe names

The pipe names are used in the WinDes interface NOT the pit names. Therefore the pipes are often named separately to follow the WinDES required naming convention.

12d string names

The trunk line drainage string must be named “1” and then moving from upstream to down stream the branch line strings increase 2,3,4 etc. If the branch lines have sub branches then they are named in a similar upstream to downstream sequence. The sub branch string are named before moving downstream on the trunk line. If this string numbering system is not followed 12d will renumber the strings and request the user to run the drainage misc utilities to rename the pipes and pits.

12d pipe names

The trunk line pipe segments start at the upstream end at 1.000 and increase downstream (1.001, 1.002 etc). The assign pit names will automatically name the pits for you if you have followed the string naming convention discussed above. “Number of digits” must be set to 3 to ensure the leading zeros are used.

The panel below shows the naming convention.

12d pit names

The pit names may be set to any desired naming convention. Using the same names as the pipes makes the pit/pipe identification easier for the user but it is not required. As of April 2007 the maximum length is 8 characters but Windes is planning to remove this restriction.

The *.sws or *.fws files may be open directly inside WinDes.

22.8 Global /default variable mapping

The default 12d drainage mapping file maps the following Windes data

Windes	12d attribute name	pit, pipe or model	default value
Return period		model	
Time of entry		model	
UK region		model	
min grade		model	
min cover		model	
Outfall manhole name		pit	
Roughness method		model	
pipe file		model	blank. standard.pip
manhole file		model	blank. standard.mhs

22.9 Additional Notes

Pipe Resizing

Pipes are automatically resized when opened in Windes and the sizes used are from the specified *.pip file (standard.pip by default)

When locked pipe sizes are sent to Windes the pipe sizes can be increased but not made smaller.

Pit Resizing

Pit diameters are automatically updated by Windes depending on the size of the attached pipes. This resizing is determined by the Windes file, standard.mhs.

22.10 Open channel drainage design.

Win Des can (hydraulically) model any shape of conduit. The conduits are given numbers between 1 and 100. 12d selects these conduits by setting the **pipe type** to **WINDES** (case sensitive) and pipe diameter to the WinDes conduit number divided by 1000. (examples 0.032 indicates WinDes conduit 32).

12d can create the conduit shape by applying a template to the drainage string. The user must create a template with the same name as the WinDes shape number (32 for example). The templates are created from the main menu

Design->Template->Create Edit

For more information about template design please refer to the 12d training manual.

Once the template has been created it is applied to the drainage string to create the cross sections and strings to represent the conduit shape.

From the main menu **Design=>Drainage-Sewer=>User=>Drainage Volume Calculations**

For more information see **Drainage line excavation volume calculations.**

Drainage Excavation Quantities

Position of option on menu: Design => Drainage => Reports => Excavation Quantities

See Also

[Drainage overview](#)

This routine uses 12d templates to calculate the excavation volume for all of the drainage strings in a model. An option to create section for a tin on top of the pipe is also available so that the drainage long sections can include hatching between the obvert of the pipe and the design tin under roads.

Templates with names set to the pipe diameters (times 1000) are used for the calculations, thus trench shapes can be customised and over excavation for bedding materials can be included. Net area calculations to exclude pipe area are not supported.

Key points

1. One template for each pipe size (mm)
2. If obvert templates are used, add the prefix “obvert “ to the pipe size
3. Carefully consider the tin selected.

A template must exist for each pipe size in the model (pipe size x 1000). For example a 0.3m pipe will require a template to exist named 300. A 0.5ft pipe would require a template named 500. A sample template library is included in the 12d library in the file **pipe_template.tpl**.

The templates are run along the strings and the total volumes are reported. Volumes for each strings are given in the report file.

If a tin is created from these strings then volumes by depth can be determined using **Design=>Volumes=>Exact=>Tin to tin**

On selecting the **Excavation quantities** option, the **Drainage Excavation Quantities** panel is displayed.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Drainage model <i>Model to contain all of the pit and pipe network to be worked on.</i>	input box		
Strings model <i>Strings generated from the templates will be stored in this model</i>	model box		
Sections model <i>Sections generated from the templates will be stored in this model</i>	model box		
Report name <i>cut and fill volumes will ne sent to this report</i>	input box		
Ground Surface Tin <i>tins from which the volumes will be calculated</i>	tin box		
Separation <i>distance between the sections</i>	real box		
Sections colour <i>Sections generated from the templates will be assigned this colour (strings colours are defined in the templates)</i>	colour box		
Clean section/strings model <i>Delete the strings in these models before processing.</i>	tick box		
Stop section at edge of pit <i>Template are run from pit centre to centre if this is not selected. The templates stop at the edge of the pit if selected. This is often selected with the following option Use obvert templates.</i>	tick box		
Use obvert templates <i>Templates must be named with the prefix “obvert”. i.e. obvert 300. The template is still run along the invert of the pipe but the user now has a section “set” of templates that can be used to create a tin on top of the pipe as well as below.</i>	tick box		

An example report file follows.

```
----- BEGIN APPLY TEMPLATE REPORT -----

apply template to string report -

string      E
tin         design
separation  10.000
left template 375
right template 375
cut volumes and areas are negative
fill volumes and areas are positive

chainage- -----sectional information----- -----intermediate information--- -----accumulative information-----
          -----cut area --fill area -----cut vol --fill vol -cut volume-- -fill volume- ---balance---

0.000      -1.434      0.000              -0.771      0.000              0.000      0.000      0.000
0.550      -1.367      0.000              -14.222     0.000              -0.771      0.000     -0.771
10.000     -1.642      0.000              -15.293     0.000             -14.992      0.000    -14.992
20.000     -1.416      0.000              -1.845      0.000             -30.286      0.000    -30.286
21.313     -1.393      0.000              -0.794      0.000             -32.130      0.000    -32.130
21.863     -1.493      0.000              -32.924      0.000             -32.924      0.000    -32.924

total cut              -32.924
total fill              0.000
balance                -32.924
ie excess of cut over fill      32.924

----- END APPLY TEMPLATE REPORT -----
```

Attribute Editor

Position of option on menu: Design => Drainage => More => Top Ten attributes editor

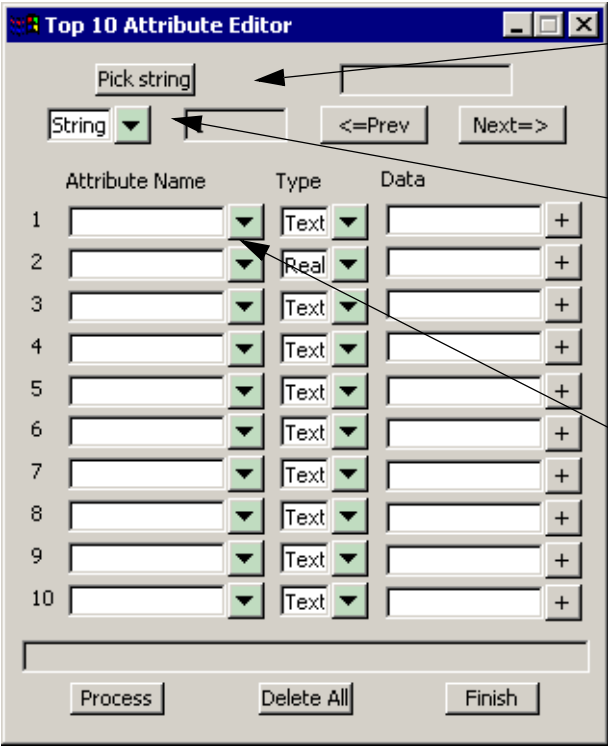
Most of the detailed catchment data is stored within 12d as user defined attributes. These attributes are automatically created by 12d when required but you are free to change them or add more as desired. The attributes may be exported to a spreadsheet and edited and then imported back into 12d or edited inside 12d using this panel.

See Also

[Drainage overview](#)

Usage

From the menu select **Design => Drainage => More => Top ten attribute editor**



First Select **Pick** to select the string that contains the user attributes (the drainage string). The strings will be highlighted in white when they are selected.

All catchment data is store with the pits in drainage strings. To access the pit attributes, select the drop down icon and then select **Pit**. A circle will be drawn around the pit selected. **Next** and **Prev** will now move you from pit to pit.

Select the drop down icon and then select the **Attribute Name** from the list of existing user defined attributes. These attributes include all of the attributes in the model that the string exists in.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

pick string	button		
<i>used to pick the initial string in a model</i>			

string-pit-pipe	choice box	string,pit,pipe	
<i>select the type of attribute to be displayed. Pit and pipe attributes are only available for drainage strings.</i>			

attribute name	input box		
<i>3 top 10 attributes lists are maintained (pit, pipe and string). The attributes that you can select from are all of the attributes that exist on all of the strings in the model. If the attribute does not exist for the</i>			

string/pit/pipe that you are displaying the **data** field will display **Not found**.

type choice box **Text, Real, Integer**

for existing attributes this will display Text, Real or Integer.

When defining a new attribute select the type of data to be stored in the attribute

data input box

the data stored in the attribute is displayed/edited/created in this field.

<= prev button

*move to next string in the model
pit on the string
pipe on the string*

next => button

*move to next string in the model
pit on the string
pipe on the string*

process button

updates the attributes displayed in the dialogue.

Notes:

First LB select Pick to select the string that contains the user attributes. All catchment data is stored with the pits in drainage strings. The strings will be highlighted in white when they are selected.

To access the pit attributes **LB** this field then select **Pit**. A circle will be drawn around the pit selected.

LB the **Attribute Name** field and then select from the list of existing user defined attributes.

These attributes include all of the attributes in the model that the string exists in. They may not be defined for the string you are editing. If the string does not have that attribute defined **not found** will be displayed in the **Data** field.

To change the value for the attribute enter the new value in the **data** field. If the attribute does not exist, deleting the **not found** text and adding data will create it. The following message will be displayed whenever you are creating a new attribute.

Delete All Attributes in a Model

Position of option on menu: Design => Drainage => More => Delete all attributes in a model

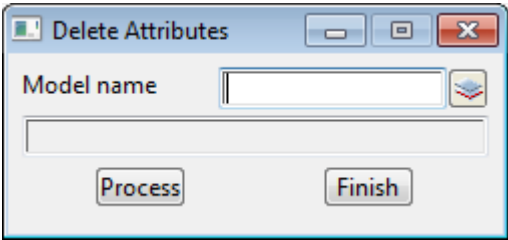
See Also

[Drainage overview](#)

This option deletes all model, string, pit and pipe attributes in the model specified. This option allows the user to "start from scratch" while maintaining the drainage, catchment and bypass flow strings.

Usage

From the menu select **Design => Drainage => More => delete all attributes in a model**



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
model name	input box		
<i>the model specified will have all of its attributes and all of the strings attributes deleted</i>			
process	button		
<i>Deletes all of the attributes</i>			

Notes: **THERE IS NO UNDO!**

Flooded Width Flow Analysis and HEC-RAS

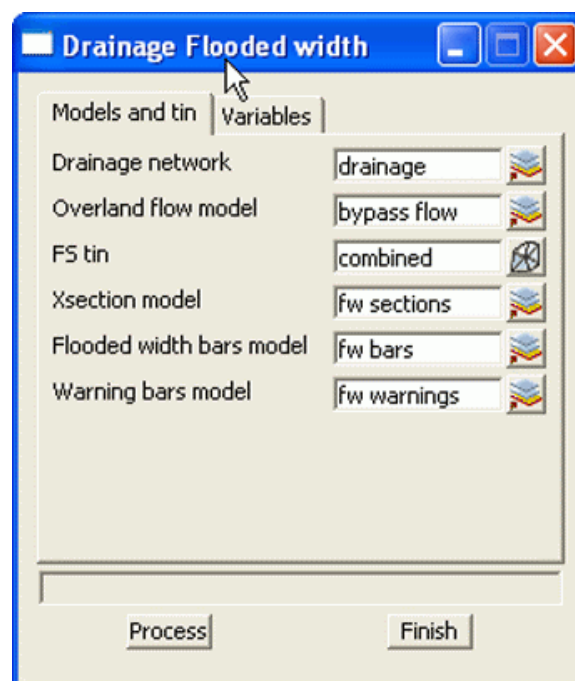
Position of option on menu: **Design =>Drainage-Sewer =>Calc flooded widths**

The Calculate Flooded width procedure creates cross sections along the **bypass flow** paths and then calculates the flooded width at each section using Manning's normal depth calculations. A HEC-RAS project (same name as the bypass flow string) is also created for each line. The flooded width is indicated on each section as a blue line if it is less than a user defined width and a red line if the flooded width exceeds the limit. Details of the calculations such as the velocity, depth, wetted perimeter and slope can be exported to a spreadsheet for further analyse (velocity times depth calculations for example). The discharges imports from the urban stormwater design packages are shown in the following table.

Design Program	Discharge Event
PCdrain	Minor ARI
Drains	Maximum flow event analysed
ILSAX	Maximum flow event analysed
RAT HGL	First return period analysed

The user defines the length of these sections and the interval at which they are to be spaced. 12d calculates the normal flow depth interpolating the pit approach and bypass flows from the hydrology models (ILSAX, Drains, PC Drains or RAT HGL). The cross sections are taken perpendicular to the flow line and the slope is for the normal depth calculations is determined using the distance along the flow line and the change in elevation between the two lowest points in the primary flow channel. The flow line need not intersect the low points on the section but the flow line does mark the primary flow channel. If the depth of the flow exceeds the banks of the primary channel, then all adjacent flow channels will be considered as active flow area.

On selecting the **Calc flooded widths**, the **Drainage flooded width** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Models and tin

Drainage network	model box	drainage	
<i>Existing drainage strings must have approach and bypass flow pit attributes. See doco below</i>			
Overland flow model	model box	bypass	
<i>Cross sections are cut perpendicular to these existing strings</i>			
FS tin	tin box	design	
<i>This tin is used to cut the cross sections and to determine the slope for normal depth calcs</i>			
Xsection model	model box	fwsections	
<i>Model is cleaned before processing. Calculated values such as velocity and slope are stored with these strings.</i>			
Flooded width bars model	model box	fw bars	
<i>Model is cleaned before processing. Blue or yellowstrings with levels indicate normal depth flooded widths.</i>			
Warning bars model	model box	fw warnings	
<i>Model is cleaned before processing. Strings created when vel x depth exceeds limit.</i>			

Variables

Max flooded width	input	2	
<i>the limit where the blue flooded width bars turn red</i>			
Manning's n	input	0.014	
<i>The n value to be used in the normal depth calculations.</i>			
Flow correction factor	input	0.8	
<i>The is the factor described in ARR 1987 for calculating depths of flow in gutter channels.</i>			
Distance between sections	input	5	
<i>The interval at which cross sections and therefore flooded width will be calculated along the flow path.</i>			
Section Length	input	5	
<i>The length of each cross section. The cross section will be centred on the overland flow path.</i>			
Trim sections at levee	tick box	off	
<i>Trims the cross section at the crest on either side of the flow channel. A levee point is the crest in the cross section found as you move away from the flow line location.</i>			
Levee tolerance	input	0.1	

The amount the cross section needs to drop as you move away from the centre line in order to identify a levee.

VxD warning limit input 0.6

The velocity times depth limit that when exceeded will cause a flooded width bar to be generated in the warning bars model.

VxD warning colour colour box orange

Colour of the velocity x depth bars

Process button

Clean output models, calculate flooded width and create HEC-RAS projects named from the string names.

Finish button

remove the panel from the screen

22.11 Limitations where overland flow lines join

Where overland flow lines converge at an inlet, 12d does not know the flow split between the 2 approaching paths. Therefore, 12d uses the total flow from all lines as the flow at the inlet for each line. This may overestimate the flooded width along the flow lines at these points.

22.12 Limitations at SAG pits

The flow width are not shown adjacent the sag inlets. The depth of flow due to ponding and the approach flow coming from several directions may overestimated flooded width in these areas. Therefore not flood depths are calculated approaching SAG inlets.

Summary Tables

The hydraulic calculations and warning messages are stored as string attributes on the flooded width bars. If these attributes are exported to a spreadsheet via the clipboard a summary table may be created. To copy these attributes to the clipboard select

File IO->User->String attributes-properties to/from clipboard



The **string model** may be either the flooded width bars or the warning bars. Both models of strings contain attributes on the strings.

The prefix selection and prefix exclusion are filters for reducing the number attributes that are exported to the clipboard.

22.13 Cross Sections, Discharges and Warnings

The analyse flooded width will proceed along each flow path and identify every pit on the line. Cross sections will be constructed in the model with the length and interval entered in the input dialogue. These cross sections may be plotted using the main menu selection

Plot=>X plot=>X plot. The **Sort Sections** must **not** be selected for these sections to be plotted.

Discharges will be determined for each cross section by linearly interpolating the discharge using distance between the pits. The bypass discharge (pit attribute - calculated bypass flow) will be taken from the upstream pit and the approach discharge (pit attribute - calculated approach flow) from the downstream pit.

The slope is calculated by subtracting the lowest points nearest to the centre line and dividing the cross section separation. The levee tolerance is NOT used for locating this point thus any rise in section moving away from the centre line marks the end of the low point search in that direction.

12d will give warning messages in the output window when it encounters the following conditions and these messages will be stored as string attributes on the flooded width strings. Descriptions of these messages follow.

Inverts do not go downhill

12d locates the lowest point (adjacent to the flow line without moving over a local crest) on each cross section to calculate the slope between the cross sections. This message indicates that the downstream minimum elevation is higher than the upstream minimum elevation.

Sometimes flow lines will go uphill. If you have specified an overflow from a SAG location then the flow line will go uphill until it crosses the overflow crest.

If the flow line is not supposed to be going uphill at this section, check to see where the flow line intersects the cross section located upstream of the one identified in the warning message. If it is in a local sag point that is not the lowest point on the section, move the flow line.

The program will use a slope of 0.5% to calculate a width at this location. This results in very wide flooded width sections to draw the user's attention to the problem area.

Vertical Walls Assumed at the Ends of the Cross Sections

If the depth of flow exceeds the ground surface elevation at the ends of the cross section a warning message the warning message shown above is shown. The cross sections causing the warning follows.

The vertical wall is placed at cross section chainage -20. Note that the flow line is always at chainage 0

Convert Drainage String to Polyline

Position of option on menu: Design => Drainage => More=> Convert drainage string to polyline

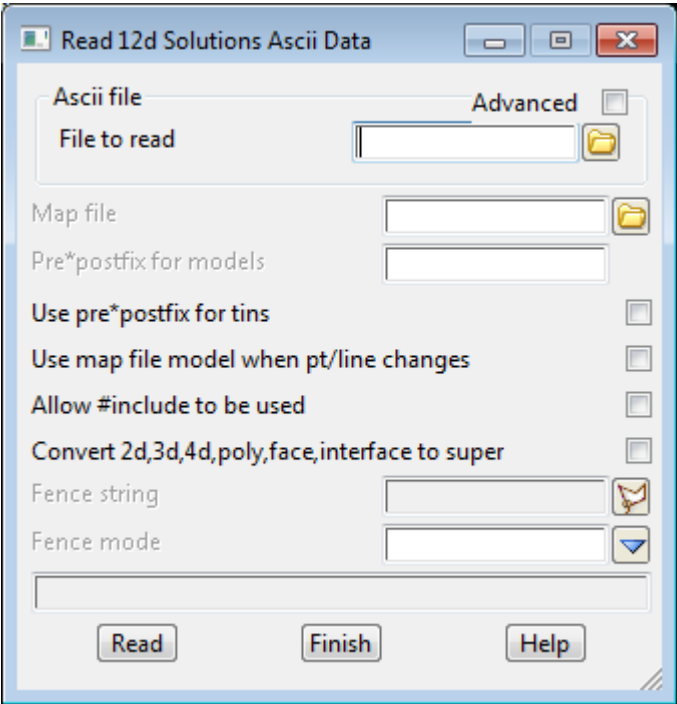
See Also

[Drainage overview](#)

All drainage strings in the specified model are exported to a 4d ascii file. When this ascii file is imported back into 12d model the strings will be converted to polylines. Import the strings using

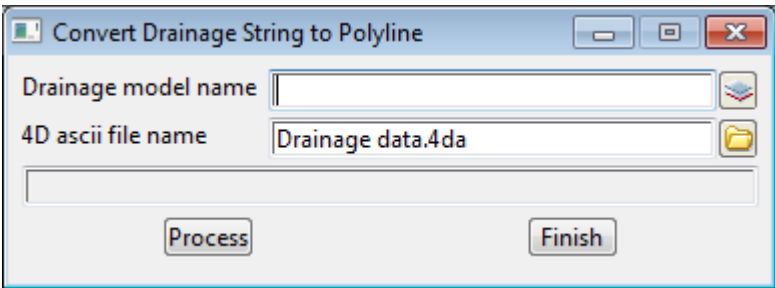
File_io=>Data Input=>12da/4da data

Specify a prefix for the model when it is read back in. Otherwise the strings will be placed in the same model as the originals.



Usage

From the menu select **Design => Drainage => More=> Version 6=> Convert drainage string to polyline**



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Drainage model name	input box	
	<i>Drainage model containing the drainage strings</i>	
4D ascii file name	input box	drainage data.4da
	<i>A temporary file that will hold the converted string data.</i>	
Process	button	
	<i>Exports the drainage strings and converts the file to polylines.</i>	



Drainage.4d file

A sample pit entry in the drainage.4d file is as follows:

Enhancements have been made if exporting to the Drains program. See [Pit Families and Pit Groups](#). The drainage.4d file controls many of the settings for the pit and pipes types inside 12d. This section details the format of the drainage.4d file. Changes to this file take effect only after 12dmodel has been restarted. If there are any errors in the drainage.4d file they will be listed in the output window at startup (just after the shp file listing). The error in the drainage.4d file is generally located just above the line indicated in the output window.

All text to the right of the // is ignored by 12d (comments). There are pit and pipe type definitions. Because of historic reasons the pit types are defined using a **Manhole** command.

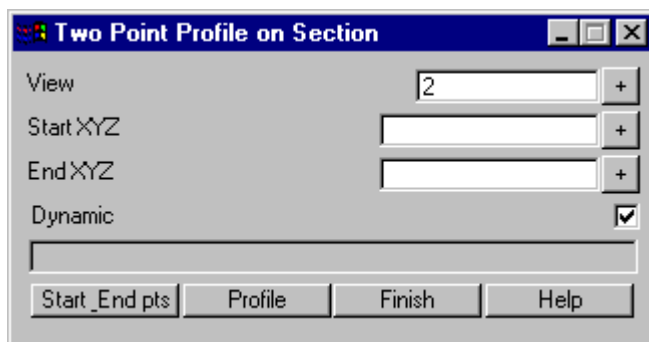
Many of the settings in the drainage network editor (DNE) can be controlled by the pit types and the pipe types defined in the drainage.4d file. The **special manhole attributes** defined below control these fields.

The original **drainage.4d** file is found in the "program files\12d\12dmodel\10.00\set_ups" directory. **Do NOT** change this file. Copy it into your user folder "\12d\10.00\User" and edit it there. Files in the user directory are used by preference and they are never over written by a 12d update.

Two Point Dynamic Profiles

If at any time you want to obtain a temporary section view, 12d has a dynamic profiling capability (2 point profile). First, add your tin design model to the section view.

Next RB on the section view title area and then LB select 2 points. The following panel will appear.



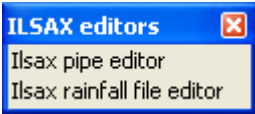
Select **Start_End pts** to begin and then pick/accept a point on a Plan View Now as you move your cursor the section view will be dynamically updated (the dynamic box should be checked on and a surface tin model added to the section view). When you obtain the cross section you want LB select then accept (MB) the second point.

LB select Finish when done.

ILSAX Editors

Position of menu: **Design => Drainage => More => ILSAX Editors**

The ILSAX editors walk-right menu is



See [ILSAX Pipe/Catchment Editor](#)

See [ILSAX Rainfall File Editor](#)

ILSAX Pipe/Catchment Editor

Position of option on menu: **Design => Drainage => More=> ILSAX editor=>ILSAX pipe editor**

See Also

[ILSAX Rainfall File Editor](#)

[Drainage overview](#)

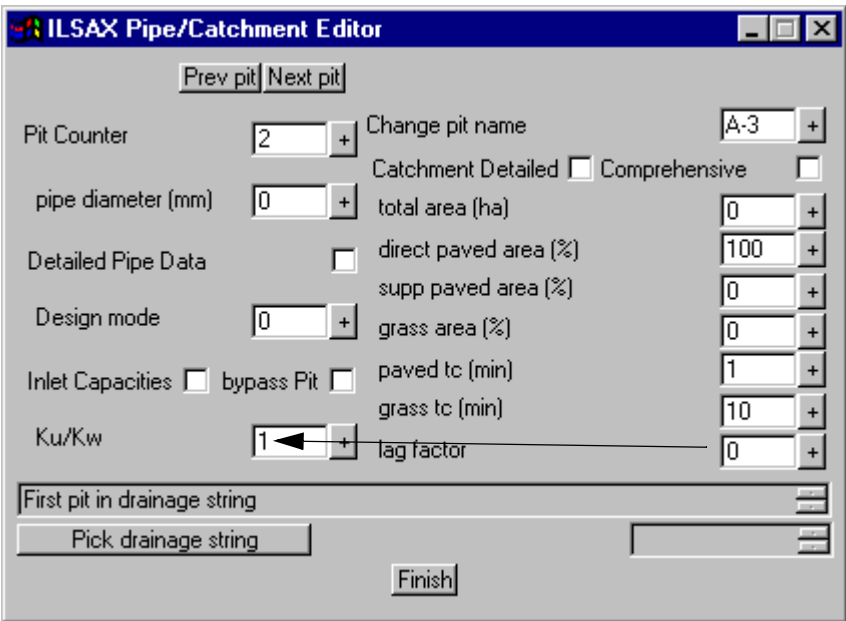
The ILSAX pipe data editor allows the user to edit pipe and catchment parameters. Most commonly used functions are supported but some of the less used functions are not included at this time. The same names have been used as those in the ILSAX drainage manual for easy reference.

Unlike the rainfall editor, all of the data in the pipe data editor is stored with the drainage string as user attributes. These user attributes can be changed using the editor (recommended for the novice user) or they may be output to a spreadsheet, changed and then read back into 12d.

CAUTION: If the drainage string is deleted then all of the attributes are deleted at the same time.

Usage

The ILSAX pipe data editor is accessed by selecting **Design=>Drainage-Sewer=>More=>ILSAX Editors=>ILSAX Pipe file editor**. The following dialogue will appear.



The panel to the left is only an example of what the editor panel may look like. This dialogue will change in size and complexity depending on the check boxes selected. The left side of the dialogue is reserved for pipe and pit data while the right side contains catchment data. The first step is to select the drainage string to be edited. Click on **Pick drainage string** and then select the drainage string from one of the views.

There are two ways to move between pits. The **Prev pit** and **Next pit** will move the user between the pits with the current pit name been shown in the **Change pit name** field. Do not use the **Change pit name**

field to move between pits. It will not work! This field is used to manually change the pit name. Entering the **pit number** and pressing **Enter** is the second method for selecting pits. This is a good way to move between pits on long drainage lines (from pit 20 to pit 1 for example).

The **pipe diameter** will change the diameter of the pipe leaving the pit in the direction of increasing chainage. Note that the invert level of the pipe will remain fixed as the obvert level changes.

The most common **Design mode** is 1 for design. This ignores the present pipe size and resizes the pipe as required.

When the **Inlet capacity** and **Bypass pit** tick boxes are checked, additional fields are added to the dialogue. These will be discussed in the section 5.0 above

The **Catchment Detailed** and **Comprehensive** tick boxes also add additional fields to the dialogue. Again, the ILSAX drainage manual contains detailed descriptions of these parameters.

ILSAX Rainfall File Editor

Position of option on menu: Design => Drainage => More => ILSAX Editor=>ILSAX rainfall file editor

The ILSAX rainfall file editor assists in the creation and editing of the ILSAX rainfall files. It is truly a file editor and no data is stored inside the 12d model. Most common features of the ILSAX rainfall file are included but some have been omitted as they have been rarely used. The files can be created using the editor and then manually edited using a word processor if required.

See Also

[ILSAX pipe editor](#)
[Drainage overview](#)

Usage

This panel is accessed from the menu selection **Design => Drainage => More=> ILSAX editors => Ilsax rainfall file editor**

The **Rainfall file name** must be specified before the **Read** or **Write** buttons will operate. If you want to create a file, fill in the **Rainfall file name** field and then **LB** select **Write** to save the data.

Intermediate Files and **Separate Rain/pipe files** must be ticked to have ILSAX run within 12d.

The minimum value for **Num Rainfall Events** is 1.

The remaining data in the left column is the data for the ILSAX R3 and R4 cards and the data in the right column is the data for the ILSAX R2,R6, R6B and R8 cards. Please refer to the ILSAX manual for a description of these values. The fields are not in the same order as the ILSAX files but instead the fields at the top of the column are those changed most frequently between rainfall events.

The **Prev Rainfall** and **Next Rainfall** buttons select the rainfall events up to the number specified

in **Num rainfall events**. If you wish to add or decrease the number of events analysed change the **Num rainfall events** value.

CAUTION: the **Finish** button does not perform a save so make sure you click **Write** before **Finish**.

The fields and buttons used in this panel are described in the ILSAX users manual.

PCdrain to 12d pit converter

Position of option on menu: Design => Drainage Sewer => More=>Create Pit type from PC Drain gully files

This option is used to read a PCdrain gully file and create the same pit type in the 12d drainage.4d file. The sag pits in the gully file have an "S" added as a suffix as they are imported.

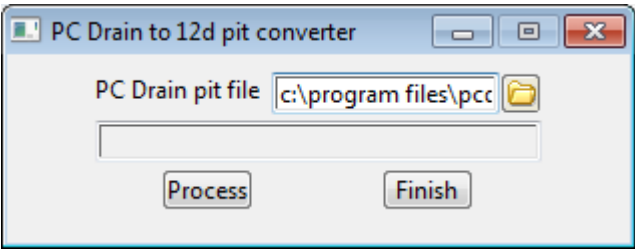
Important: 12d must be restarted to see the new pit types.

See Also

[Drainage overview](#)

Usage

This panel is accessed from the menu selection **Design => Drainage Sewer => More=>Create Pit type from PC Drain gully files**



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
PCdrain pit file <i>the PCdrain gully file to be imported into 12d</i>	file box		
Process <i>import the data file</i>	button		
Finish <i>removes the dialogue from the screen</i>	button		

Calc pit overflow areas

Position of option on menu: Design => Drainage Sewer => More=>Calc pit overflow areas

This option is used to graphically display the overflow storage volume at a sag pit. The following pit attributes must exist for the flood extents to be calculated.

overflow volume	value greater than zero required.
sag pit	must be equal to 1.
catchment model id	set by labelling catchments
catchment string id	set by labelling catchments

The maximum storage volume is read from the drainage pit attribute "overflow volume". This may be entered manually using the **Attribute Editor** or it will be created when data is read from the drainage design programs Drains or XP SWMM design programs.

This routine locates the lowest point on the catchment string by draping the string on the tin specified and adds the overflow limit specified to this value. This becomes the **overflow limit**.

The volume at this level is calculated and the compared to the **overflow volume** read from the user defined attribute. If the overflow volume is less than the volume in the catchment then the routine iterates to find the flood level for the overflow volume.

If the overflow volume is greater than the volume in the catchment, the results depend on the **Use overflow limit** tick box.

If the box is selected, the **overflow limit** (calculated above) is reported at the flood level in the catchment.

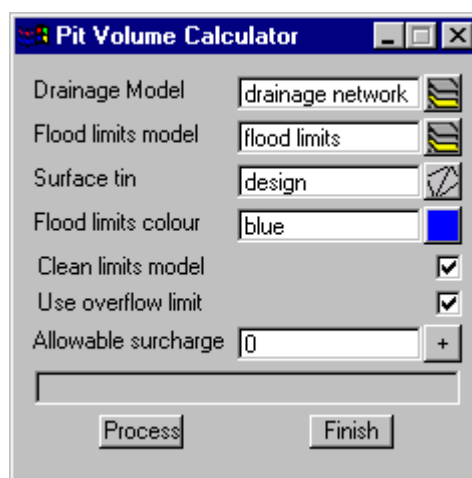
If the tick box is not selected the routine iterates to find the flood level where the storage equals the **overflow volume** read. This option allows the user to see the maximum flood level should the catchment low point become blocked.

See Also

Drainage overview

Usage

This panel is accessed from the menu selection **Design => Drainage Sewer => More=>Calc pit overflow areas**



The fields and buttons used in this panel have the following functions.

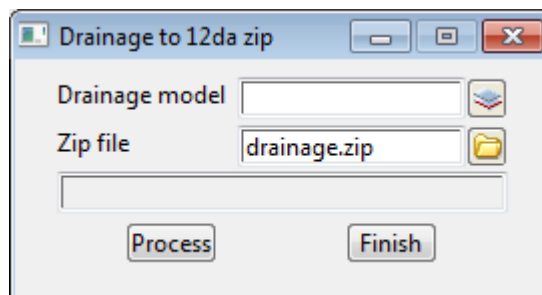
Field Description	Type	Defaults	Pop-Up
Drainage model	model box		
<i>all pits in this model that have a non zero "overflow volume" and "sag pit" set to 1 will be processed</i>			
Flood limits model	model box		
<i>flood limits strings will be created in this model</i>			
Surface Tin	tin box		
<i>ground surface tin used to calculate the volumes and flood limits</i>			
Flood limits colour	colour box		
<i>flood limits strings will be created using this colour</i>			
Clean limits model	tick box		
<i>if selected all strings in the Flood limits model will be deleted before the calculations commence.</i>			
Use overflow limit	tick box		
<i>if the elevation calculated from the storage volume is higher than the lowest point on the catchment string then the allowable surcharge value below will be added to the lowest point on the catchment string and this elevation will be used to determine the flooding limits</i>			
Allowable surcharge	real box		
<i>this value is used only if Use overflow limit is ticked. Its purpose is described in the field above.</i>			
Process	button		
<i>executes the option.</i>			
Finish	button		
<i>removes the dialogue from the screen</i>			

Drainage to Zip

Position of option on menu: **Design =>Drainage-Sewer => More=> Drainage to zip**

This zip routine is intended for support purposes only. It will save your project! This function zips up project views and only the models and files delated to the drainage model.

On selecting the **Drainage to zip** option, the **Drainage to Zip** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Drainage model	model box		
-----------------------	-----------	--	--

This model and the related models through the drainage network editor will be zipped into one file.

Zip file	file box	drainage.zip	
-----------------	----------	--------------	--

This zip file is intended to be sent to support personnel.

Process	button		
----------------	--------	--	--

Saves the project and creates the zip file

Finish	button		
---------------	--------	--	--

remove the panel from the screen

1.12d Model Drainage Modules and Work Flow

12d Model has a suite of drainage modules for stormwater design. This course covers the items listed below on this page except 24,25 and 28.



If viewing the pdf version of this manual, bookmarks on the left are hyperlinks as well as the green text. Use **Alt+left arrow** to return to where you were reading.

1.1 Drainage Module

Part A - Locate Structures and Connect the Pipe Network

1. Obtain/create [Survey data and design surfaces \(TINs\)](#) for pipe and manhole levels,
2. Identify overland flow paths and drainage inlet structure locations,
3. Set drainage default for the pits and pipes (most common settings, they may be changed later).
4. Read a drainage model template file containing you default and global settings.
5. Create the drainage strings in 12d or convert strings from CAD.
6. Assign pit names using the [DNE](#). This allows easy reference to the structures.
7. Change pit and pipe types where they are different from the default values
8. Link the drainage model to the road design models for an integrated design.
9. Check and adjust horizontal alignment of the pipes and pits.
10. Set the vertical alignment using the [DNE](#) (set pit details and regrade pipes).
11. Check for service clashes and adjust vertical as required.

Part B - Hydrology and Hydraulic Data Preparation

12. Set catchment areas, % impervious, C and tc values for hydrology,
13. Set grate levels, Ku methods (pit and culverts), pipe roughness etc for hydraulic design
14. Draw/create bypass flow paths if bypass/inlet capacity calcs are required.
15. user defined export and update interfaces with Drains, PCdrain, Micro drainage-WinDes, RAT2000 and XP SWMM/STORM.

Part C - Design Documentation

16. Print pit schedules and plan/long section drawings for construction,
17. Import and Export the network to spreadsheets,
18. Calculate network quantities (by depth ranges) for costing and system checks,
19. Calculate earthwork excavation volumes,
20. Repeat as required for design changes,
21. And of course peer review at various points of design,
22. Electronic models for survey setout.

1.2 Drainage Analysis Module

Part D - Rational Hydrology, Surface Flow Calculations and Pipe Hydraulics

23. Calculate rational hydrology peak discharges,
24. Normal depth surface flow hydraulics using channel sections cut from the ground surface. Results are shown in plan, section and 3d views (and reports) with warnings given for exceeding max widths, channel capacity and velocity x depth hazard conditions,
25. inlet capacities at sag and on grade locations determine bypass and pipe flows,

26. Hgl calculations use pipe and manhole losses (K_u/K_w) . Pipe are sized using either freeboard or flow depth methods. This includes full culvert design with backwater and inlet control calculations.
27. Review results in plan drawings, long sections and printed reports,
28. Analysis of the major flood event and checks for surface flow and hazard conditions.

1.3 Dynamic Drainage Module - Unsteady flow analysis

This module uses ILSAX and SCS hydrology together with the solution of the unsteady flow equations to analyse the network. Inlet capacity charts are used to analyse surface and subsurface hgl lines. Natural channel shapes and elevation-area curves for basin are created directly from the ground surface. User defined reports are created via the spreadsheet interface.

1.4 TUFLOW and Roadflow Modules

These modules use the TUFLOW engine (1D/2D hydrodynamic computational engine) for simulating free-surface water flow for urban waterways, rivers, floodplains, estuaries and coastlines. Using tools including 12d grid tins and the 12d TUFLOW control file editor the 12d, TUFLOW input data is created, edited and viewed all within 12d. This module may be combined with the dynamic drainage module for a coupled 1D/2D analysis to include pipes and culverts.

2.12d Model Stormwater Courses

In these documents, the generic term **pit** refers to manholes, inlets and catch basins. When the term **manhole** is used on the 12d menu system it refers to any type of pit.

2.1 Stormwater Design Part 1

These notes are for this course designed to cover creating drainage networks, rational method design and reporting.

- s create a super tin for pipe cover and pit cover levels,
- s set [Defaults](#) and layout a drainage network from CAD and in 12d,
- s use the 12d [Drainage Network Editor](#) to assign names to the pit/pipes, avoid service clashes, grade pipes, align obverts, minimise depth and many other design tools,
- s designate catchment areas and produce catchment plans,
- s run the 12d storm rational hydrology and hydraulics engine,
- s transfer data to and from electronic spreadsheets to enable the user to easily review the data and add user defined data to the 12d pipe network. This data may include such data as pipe bedding types and trench width,
- s create a drainage template containing customised default design parameters,
- s create pit setout schedules to export to spreadsheets or word processors for final formatting,
- s produce long section drainage profiles including HGL data, flows, invert levels and service crossings,
- s create plan drawings with pipe sizes, flows, pit symbols, linestyles for pipe sizes, design parameters for pit and pipes and user defined data,
- s locate pits/manholes at exact chainage and offset locations.

2.2 Stormwater Design - Part2

This course continues on with surface flow analysis, inlet capacity and bypass flow and customising the 12d drainage setup file (pit and pipe type database).

- s customising the drainage.4d file [Drainage Definitions - Manholes and Pipes](#),
- s 12d storm analysis with inlet capacity calculations and bypass flow,
- s flooded width analysis and flooding at SAG pits,
- s drainage trench excavation volume calculations,
- s pipe and pit quantity calculations/reports,
- s open channel calculations,
- s adjusting pit locations for changes in horiz road geometry
- s analysing the major flood events,
- s creating drainage symbols with grates and upstream side inlets,
- s detailed drainage plan labelling and long sections with hatching under roads.

2.3 Stormwater Basin Design Hydraulics and Hydrology

- s The course discusses unsteady flow hydraulics and their use in the design of storage basins and tanks.

3.Using the Course Notes

Areas marked in yellow (grey for black and white prints) are the exact steps required to complete the tasks. The numbers in the panels are the order to perform the tasks and they are always written to the right of the button, drop down or data field.

The additional text explains in more detail the tasks you are performing.

4. Customising 12d Model Drainage

12d Drainage has a series of files that customise your drainage components and design process. These includes

- s drainage.4d (required) manhole types and properties
pipe types and properties
- s drainage model template contains global and default settings for the drainage network. Including references to the following files.
- s cover files specify pipe cover for each pipe type
- s grade file specify pipe/channel slope by height
- s drop file specify drop across manholes by deflection angle
- s catchment file specify polygons for 3 land use types
- s road design file link manholes to strings to determine x,y z coordinates
- s services file specify clearance tolerances for models of service crossing.

The drainage.4d file has been configured for the training version. However, when you start working on your projects you may want customise the drainage module. [More - Customising the drainage module](#)

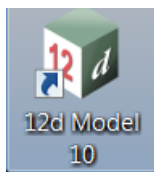
The [drainage.4d](#) file is the required drainage setup file that contains:

- s manhole and inlets with wall thickness and inlet capacity curves for ongrade and sag conditions
- s pipe types (RCP, Class 2 etc.) with nominal pipe diameters and wall thicknesses,
- s user defined attributes lists to be assigned to the network via pit and pipe types.
- s manhole and pipe type parameters are used to control settings in the [DNE](#). This allows the user to set numerous properties by selecting only the pit or pipe type. [More](#).

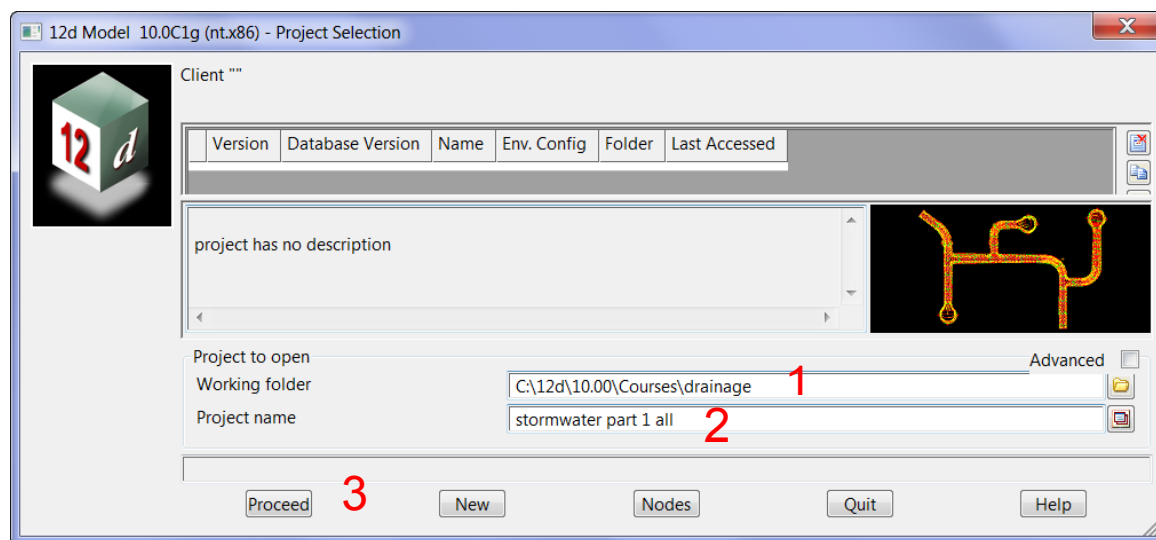
5. Survey data and design surfaces (TINs)

We will start a 12d project from the beginning by first creating the project and then reading in the survey and design data. The data can then be triangulated so that we have a final surface to measure pipe cover from and set structure cover levels to.

Start up the 12d model by selecting the 12d icon from your desktop.



The project selection panel will appear. The bottom corner of the panel is shown below



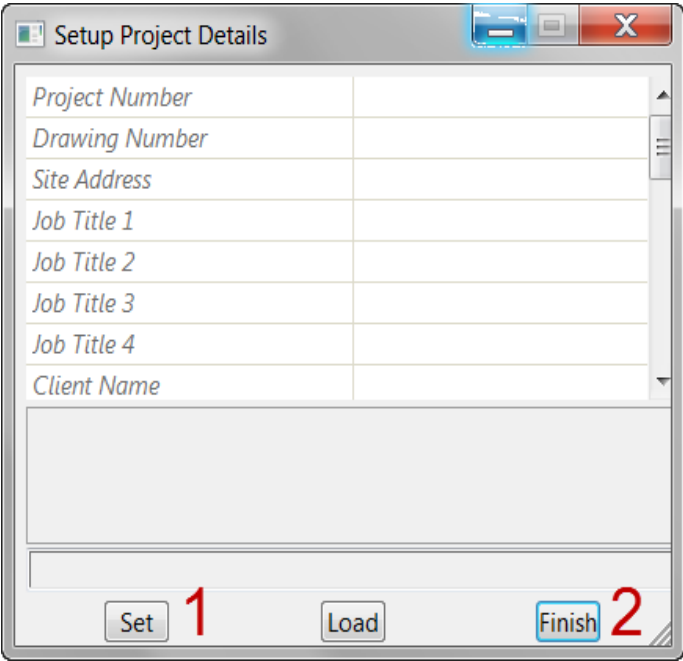
- 1) **LB** to browse to the **working folder** indicated.
- 2) Type a project name for your work **Stormwater Part 1 all** for example.
- 3) Select **Proceed**.



Alternate Step 2. If you do not want to create the tin or roadway then select the existing project Stormwater Part1 found in the courses\drainage folder. Skip to the section [Drainage Overland Flow Investigation](#) or go straight to [Read in a drainage model template](#)

12d will first look in your working folder for any input data files and output files will be created here unless you specify another folder. 12d stores it's data in a folder **not** a single file. Therefore, a folder named **Stormwater Part 1 all** will be created when you select **Proceed**.

12d model will load and you will see the following panel.



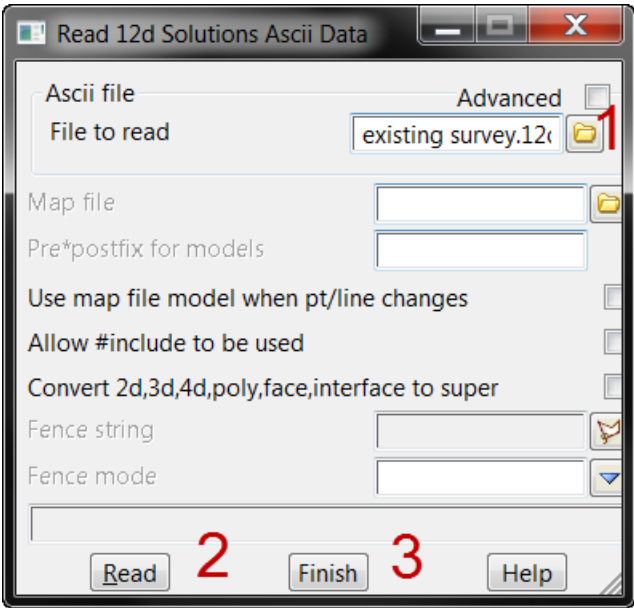
Enter data as desired. This data is both for reference and can be included on your drawings.

Later these details can be changed via Project=>Management=Details Editor

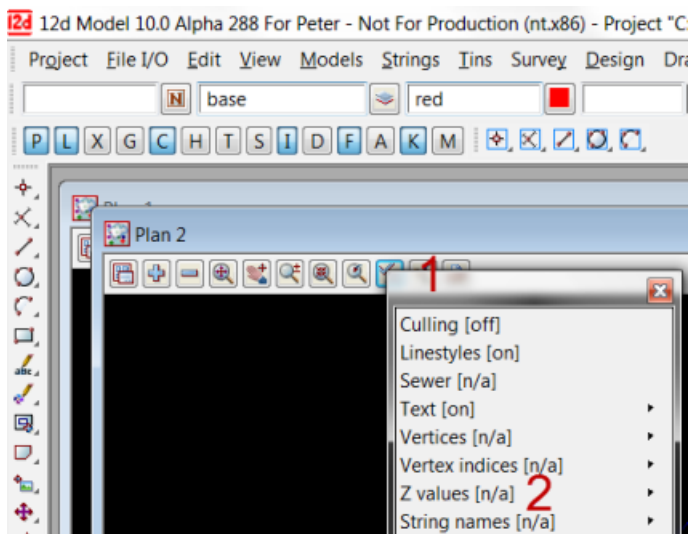
5.1 Importing the Raw Survey Data

You have created a new project into which we will import the survey data. From the main menu select.

File I/O->Data Input->12da/4da data



- 1) **LB** the folder icon to display the file list. Select the file **existing survey**.
 - 2) **LB Read** to read the data
 - 3) **LB Finish** to remove the panel
- The data will appear on a new plan view.



Now we will display the z values for the survey data.

- 1) LB the toggle button
- 2) LB **Z values**

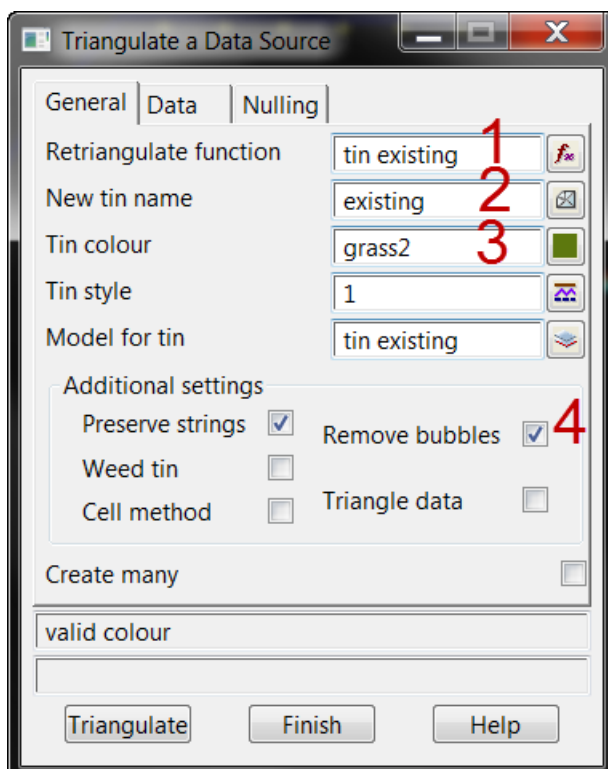


Use your mouse wheel to zoom in and read the z values.
Press Ctrl and Middle mouse drag to pan

5.2 Creating the existing Ground Surface

From the main menu select

Tins=>Create=> Triangulate data



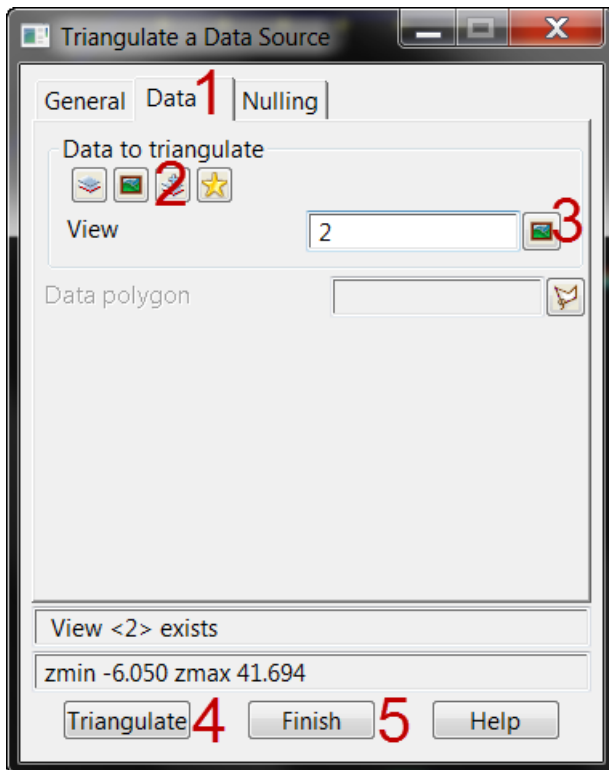
- 1) Type a name for the function to make it easy to recalculate later in new data arrives.
- 2) Type a new tin name then press **Enter**
- 3) Type grass2 instead of green. This will look better in the visualisation.
- 4) LB **Remove Bubbles** so that breaklines will attempt not to form triangles back onto themselves (if the breakline is a contour, this removes contour bubbles).

Preserve strings will make one side of a triangle follow the string thereby preserving the levels along the string.

Weed tin removes all duplicate points from the tin database.

The **Cell method** is a good speed enhancement for data that is in a grid type pattern.

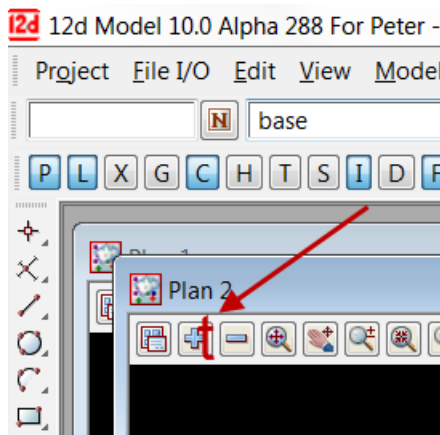
Triangle data is used for string that form triangles (tins imported from other programs).



- 1) LB the **Data** tab
- 2) LFinishB the **View** icon
- 3) Select view **2**
- 4) LB **Triangulate** to create the new tin.
- 5) **LB**

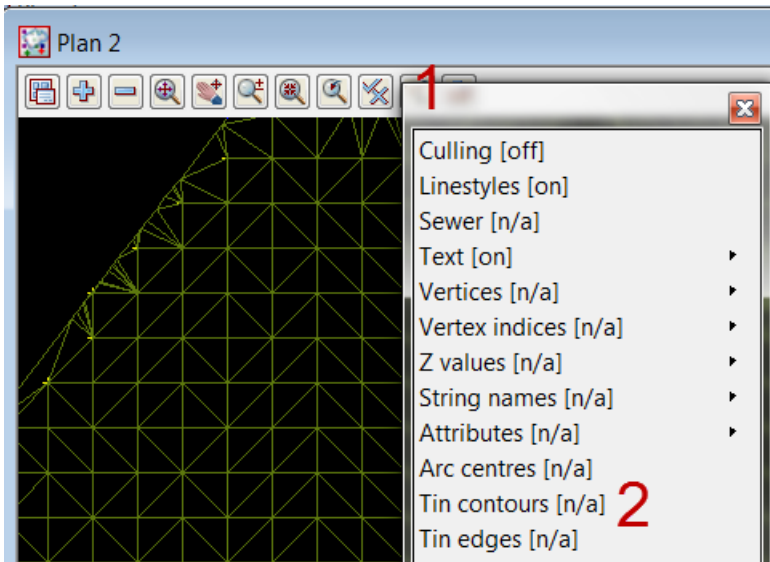
The tin will be stored in the model **tin existing**. A tin, like all 12d strings, must be stored in a model. 12d prefixes all its tins with **tin** for data management.

5.3 Viewing the Ground Surface Tin



- 1) Move your pointer over the "+" sign on the plan view 2 title toolbar
- 2) press the **t** key (all of the models beginning with lower case t will appear)
- 3) Double click on **tin existing**
- 4) **LB** Finish

The tin will be shown with the tin edges turned on. This is the default when you have all tin display modes turned off.



Display Contours

- 1) LB the toggle button
- 2) LB **Tin contours**.

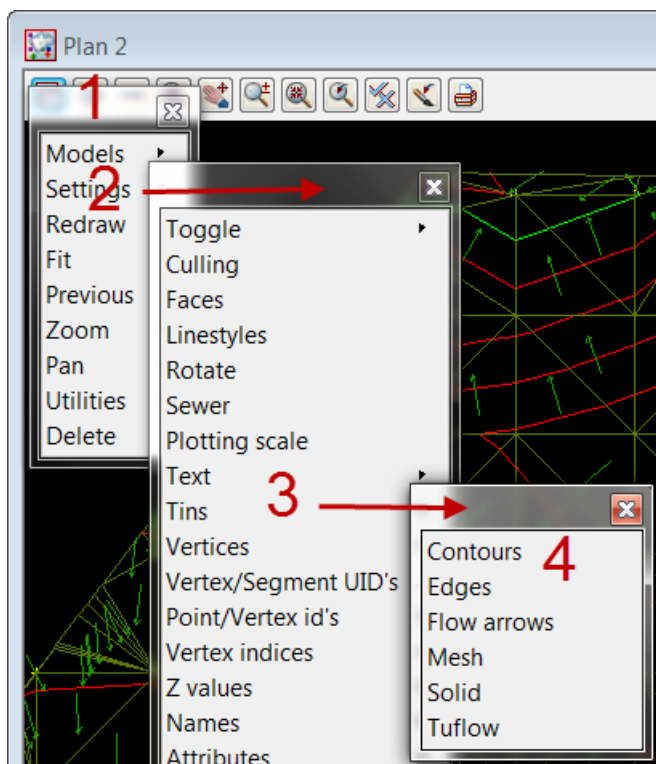
The contours are displayed with their default colours and increment (1 unit).

Display Flow

1. LB the toggle button
2. LB **Tin flow**.
Flow arrows are now visible at the centre of every triangle.



To plot flow arrows, create them in a model using **Tins->Tin analysis->Flow arrows**



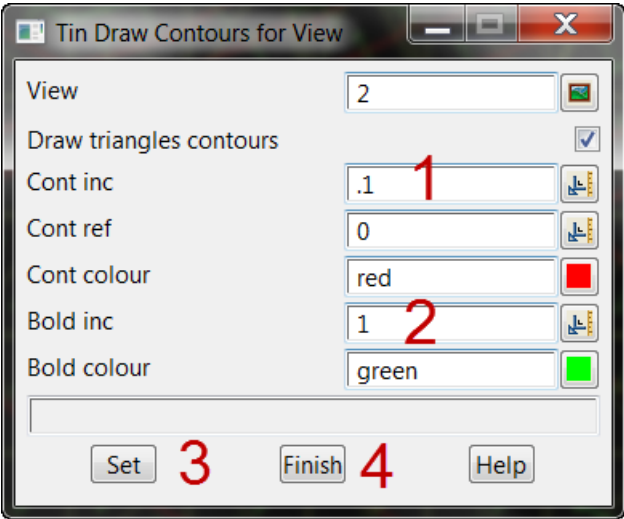
Change Contour Intervals and Colours

- 1) LB the View menu button
- 2) Walk right (do not **LB** select) on settings.
- 3) Walk right on **Tins**.
- 4) LB **Contours**

- 4) LB **Contours**



ShortCut! Press F11 to display the Menu shown in step 4

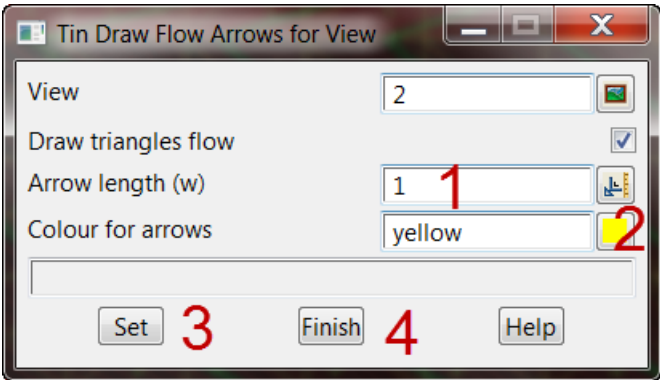


- 1) Type a new **Cont inc**
- 2) Type a new **Bold inc**.
- 3) LB **Set** to see the new contours.
- 4) LB **Finish** when done.

Change the Flow Arrow Length and Colour

Select the **Menu** button on the **plan view tool bar** and then walk right on.

Settings=>Tins=>Flow Arrows and the following dialog will appear. Remember to walk right!

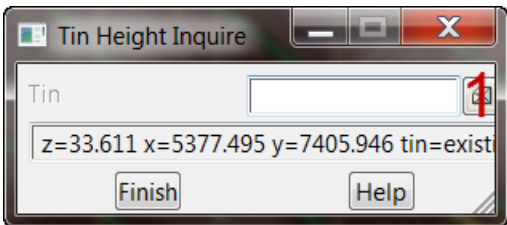


- 1) Type a new **Arrow length**
- 2) LB the colour icon to select a new **Colour for arrows**.
- 3) LB **Set** to see the new flow arrows.
- 4) LB **Finish** when done.

5.4 Inquiring about Heights on the Surface

The elevation anywhere on the tin can be obtained by simply moving the pointer over the desired spot. To obtain the tin elevations select,

Tins=>Inquire=>Height



If you do not select a tin, the last tin added to the view will have its height displayed. You will see the data

in the panel change as you move the pointer around the screen. You may explicitly select a tin if another tin is desired.

Move the panel to the bottom right corner of the screen and leave it there.

5.5 Viewing the Surface Tin in a 3d Perspective

To create a 3d perspective view select

View=>New=>Perspective Open GL

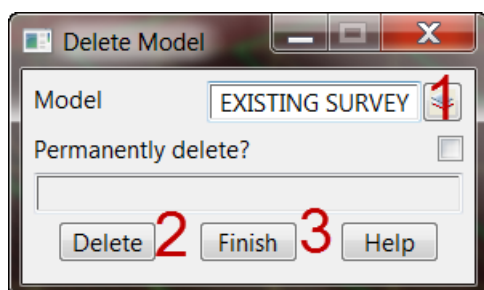
- 1) Add the model **tin existing** to the view.
- 2) **Toggle** the **contours** on.
- 3) **Toggle** the **shading** on (note that the contours are no longer seen).
- 4) Use the Orbit control (planet on the toolbar) and zoom wheel to move around the view.

5.6 Reducing the number of points for the 12d Practice Version

We can delete the survey data to save space for those using the practice version of 12d. If you have a full version of 12d this is not required. From the main menu select.

Models=>Delete=>Delete a Model

and the following dialog will appear.



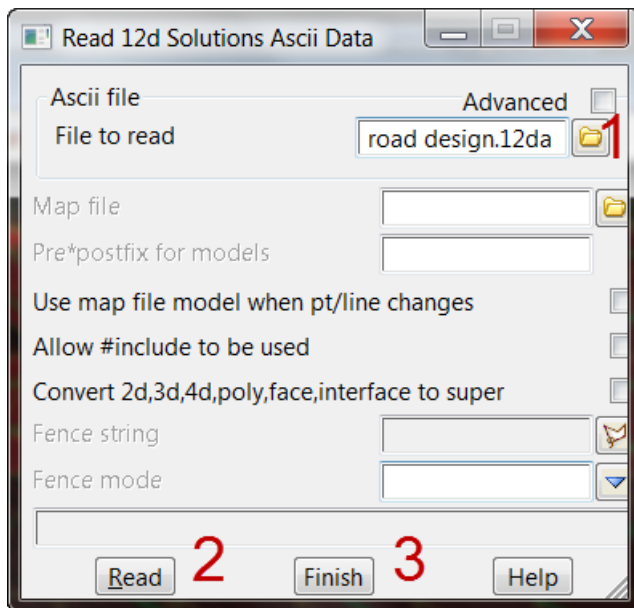
- 1) LB the model icon and select **EXISTING SURVEY**
- 2) LB **Delete** and then confirm each panel
- 3) LB **Finish**

The model is now in the 12d trash can (see bottom right corner of the 12d screen).

5.7 Importing the Road Design Centre lines

Repeat the process of importing 12da data.

File I/O->Data Input->12da/4da data

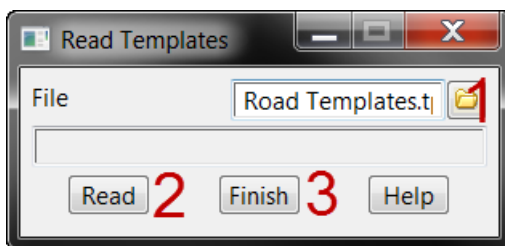


- 1) LB folder icon and select **road design**
For 12d practise users select **road design practice size use 10m spacing.12da**
- 2) LB **Read** (the data will not appear on the view yet).
- 3) LB **Finish**

5.8 Using Create Roads

We are going to create the roadways from the road centre lines (vertical grading has already been done). First we will need the road templates that we will read from a templates file.

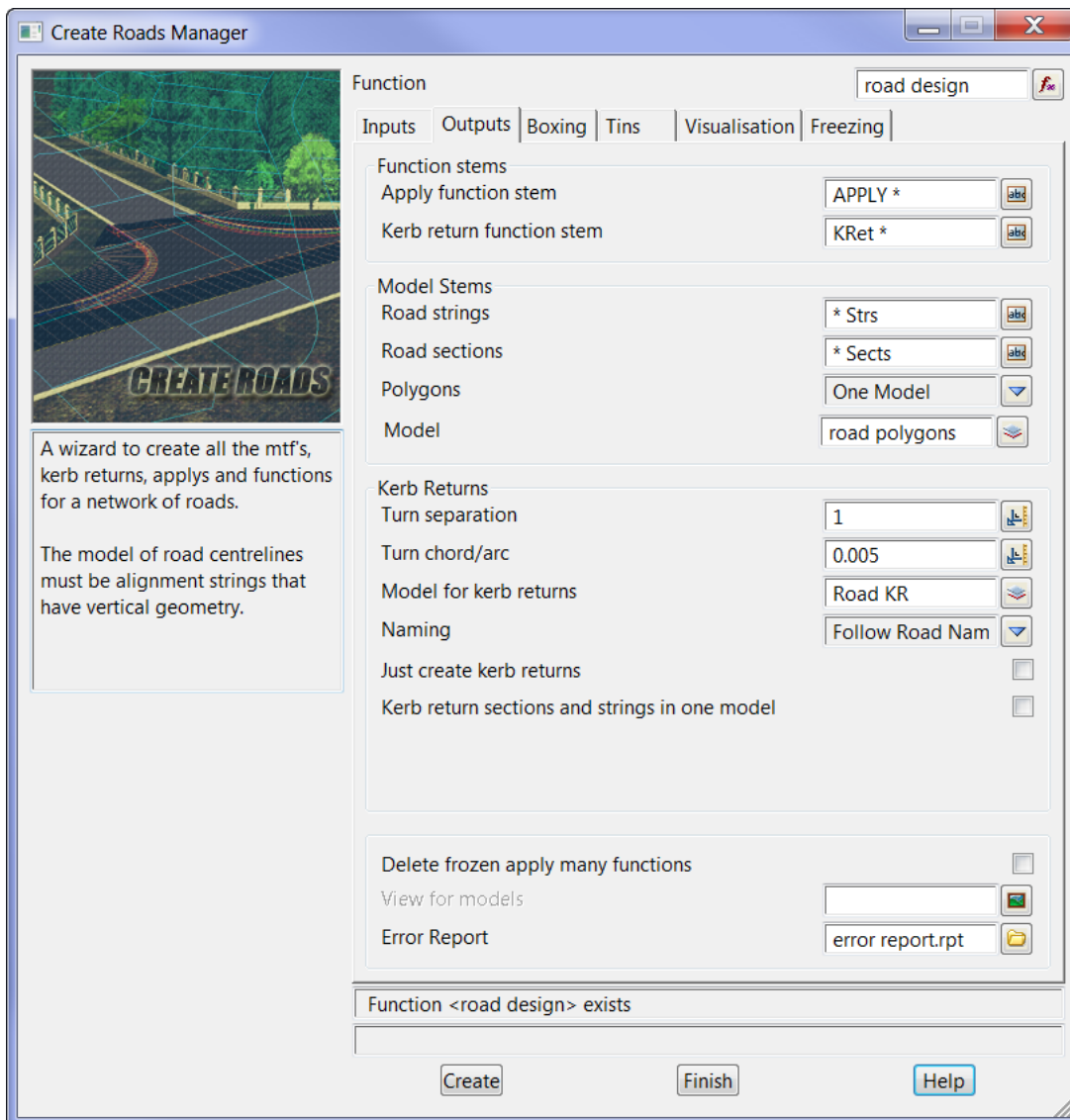
File IO=>Templates input



- 1) LB folder icon and select **lib** and select **Road templates**
- 2) LB **Read**
- 3) LB **Finish**

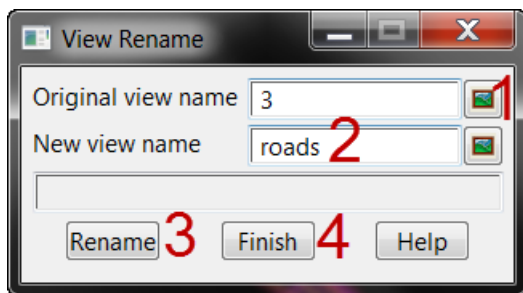
Now we are ready to create the road strings and design tin.

Design=>Roads=>Create=>Create Roads - Manager



1. LB **Function** and select the **create roads** function. This has all of the road design details included in it.
2. LB the **Create** button
3. LB the **Finish** button.
4. Add **tin design** onto the plan view.

To view the road strings, add on all of the **road *** models to view **3**. To view the tin add on the **tin design** model. You can also add the **tin design** model onto the perspective view. **Important:** On the OpenGL perspective view, 12d will show the tin data with the greatest z values (when viewed from the top side). Rename view 3 to roads to help organise your work.

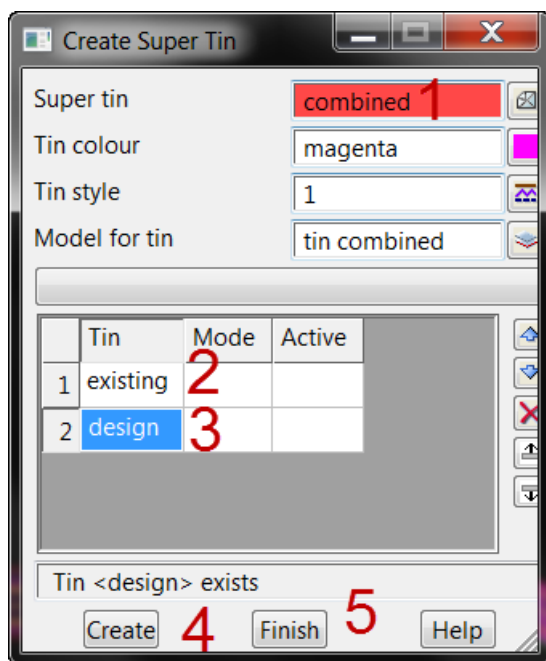


1. LB the **View** icon to select view **3**
2. Type the new name **roads**
3. LB the **Rename** button
4. LB the **Finish** button.

5.9 Creating a Super Tin from the Survey and Design Data.

The drainage fs tin may be used to set pipe inverts, pit levels, sag catchment overflow points and catchment slopes for tc strings. Therefore, the tin often needs to include several tins combined into one tin. To create a tin that is the combination of the survey data and the road design data you will need to create a 12d super tin. From the main menu

Tins=>Create=>supertin



1. Type a **New tin name** of **combined**. Press **Enter!**
2. RB in the cell and select the **existing** tin.
3. RB in the cell and select the **design** tin.
4. LB the **Create** button.
5. LB the **Finish** button.
6. Add **tin combined** onto the plan view.

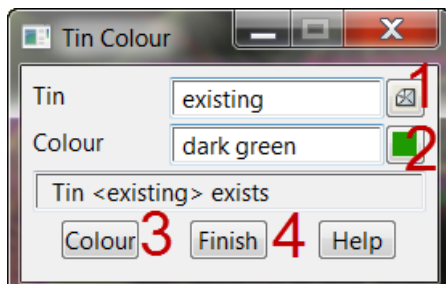
Notes about super tins:

- tin colour is only used in section views,
- the super tin is the 2 tins “glued” together,
- the super tin is Opaque so it will “cover up” other models already on the view. Use the Menu button on the View toolbar and select **Models->models to back** and select the super tin.

- **The order of the tins is very important.** Tin 1 is the first to be drawn then tin 2 is drawn. i.e. wherever tin 2 exists it will be used. If there is no tin 2 at a location then tin 1 will be used.

5.10 Changing the Colour of a Tin

To emphasise the super tin is just the tins “glued” together, we will change the colour of the **existing** tin and see how the super tin changes colour as well.



Tins=>Colour=>Colour of tin

1. LB tin icon and select the **existing** tin
2. LB colour icon and select **dark green**
3. LB **Colour**
4. LB **Finish**

Toggle the **Tin solid** on and note the colours of the super tin.

6.Drainage Overland Flow Investigation

Where a drainage designer chooses to start their design is depends a great deal on the project and the designer. Identifying overland flow routes, with the crest and sag points, is essential because it is on these routes that the inlets are to be placed. Inlet structures are then placed at the critical locations (sag points, flattening of grades, intersections, upstream of pedestrian crossings etc.). and then the spacing of additional inlets is determined by the size of the catchments. Finally, the pipe drainage system can be created linking the drainage structures.

Following is a list of 12d tools to identify surface flow routes:

[Change the Flow Arrow Length and Colour](#)

[Downhill Strings](#)

[Locating Crests and Sag Points](#)

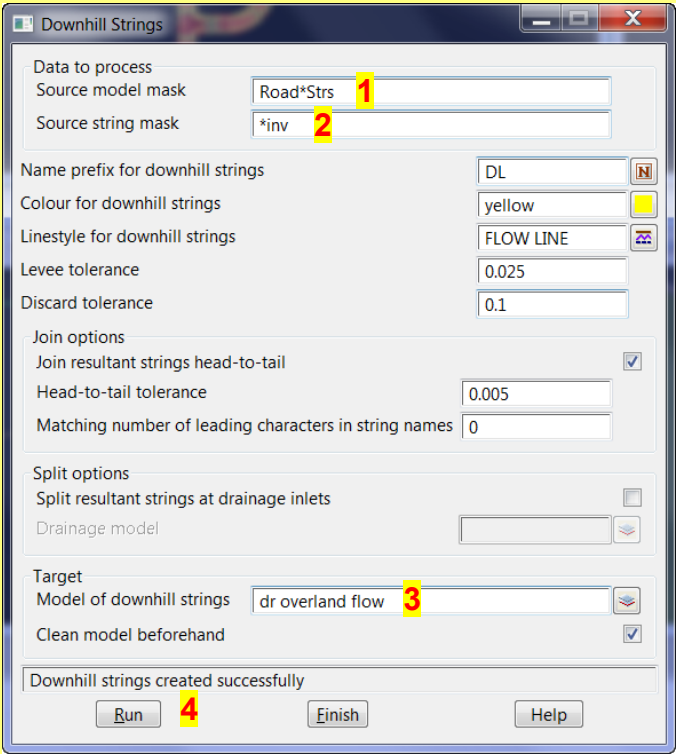
[Rain drop](#)

6.1 Downhill Strings

Roads are generally designed with a flow path in the cross section shape. In this example the roadway has a dual crossfall with kerb and gutters. We will use the downhill strings option to locate all the inverts strings, change their line style to a flow arrow, split them at their crest and sag points and ensure the chainage increases in the downhill direction.

From the main menu select

Design->Drainage-Sewer->Downhill strings

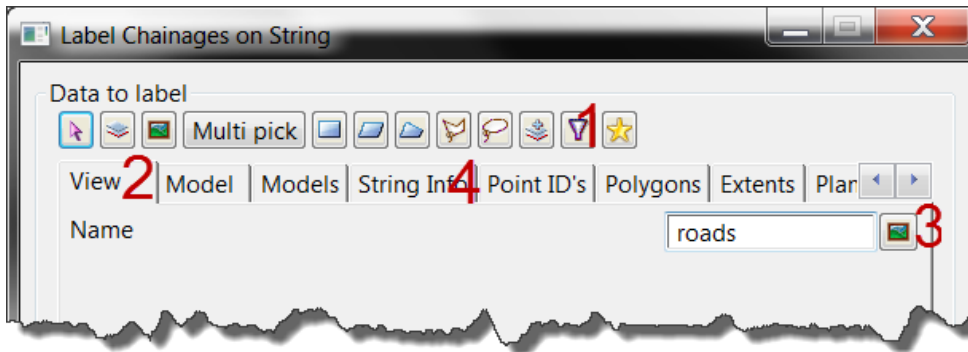


1. type **Road*Strs** (it is case sensitive). These are the models that contain all of the road strings. **Road 1 Strs** for example.
2. type ***inv**. The road string models have a **linv** and **rinv** string for the invert of the kerb and gutters.
3. type **dr overland flow** to create a model for the new strings
4. Select **Run**
5. add the model **dr overland flow** onto the **roads** view.

6.2 Locating Crests and Sag Points

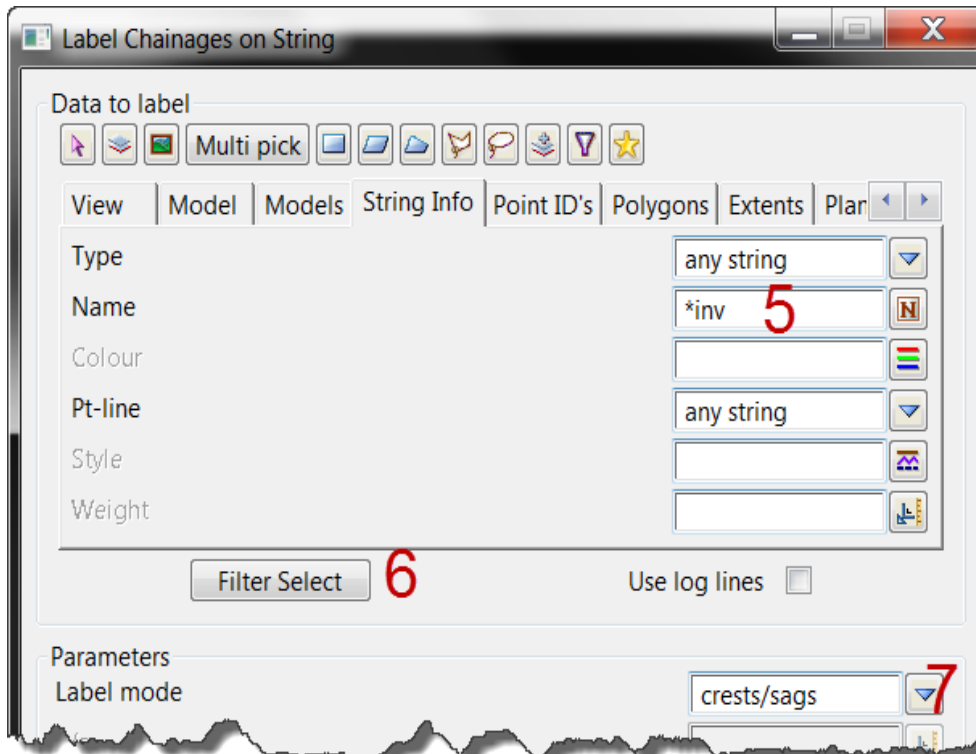
This step will place tick marks at the crest and sag points of your kerb strings and label them with the levels.

Strings =>Label => Chainages



Add all of the models beginning with Road onto plan view 1.

1. Select the filter button
2. Select the **View** tab
3. Select the **Roads** view

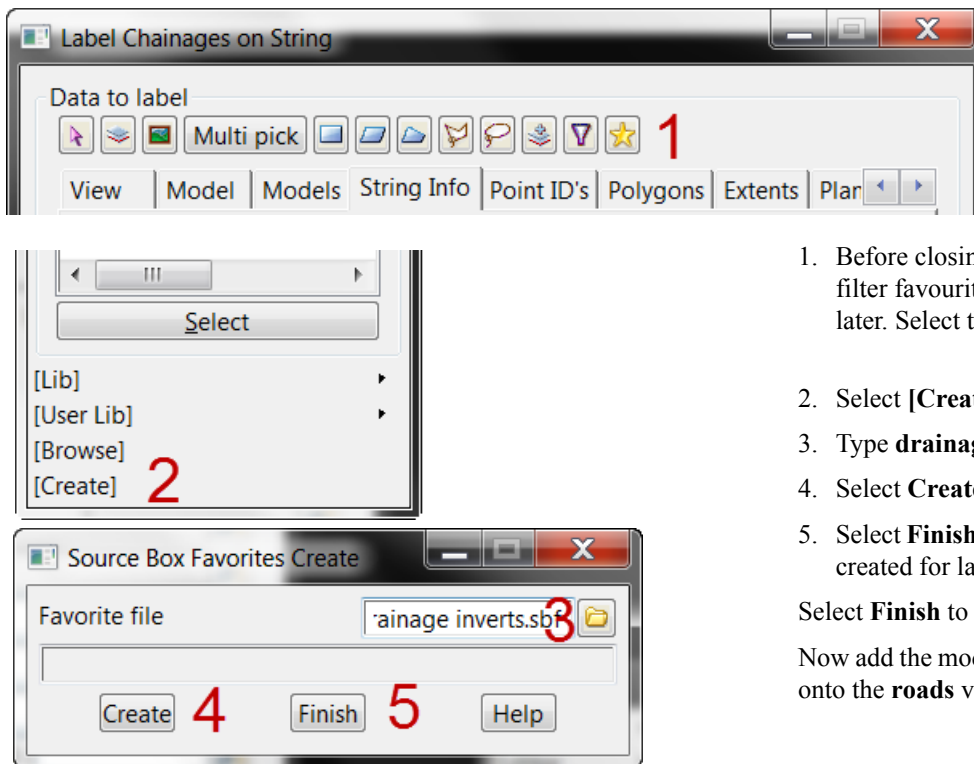


4. Select the **String Info** tab
5. Type ***inv** so that the linv and rinl strings will be selected.
6. Select **Filter Select** to select the inv strings to be labelled.
7. Select **crests/sags** from drop down list.

8. Enter a model to contain the text labels. A ,1 after the model name, requests that the model be added to view 1. This saves you adding the model to the view later to see the labels.
9. Select icon to define the text style.
10. Untick **Chainages**
11. Tick **Heights**
12. Select **Label**
13. Select **Marks** tab

14. Select the model used above for the tick marks.
15. **LB** to select **ticks centred** from the drop down list.
16. 10m marks stand out well on the screen.
17. Set colour to **yellow**
18. Select **Label** to create the labels.

6.3 Creating a Filter Favourite



1. Before closing the panels, create a filter favourite that can be used later. Select the Star button
2. Select **[Create]**
3. Type **drainage inverts**
4. Select **Create**
5. Select **Finish**. The favourite is now created for later use.

Select **Finish** to remove the panel.

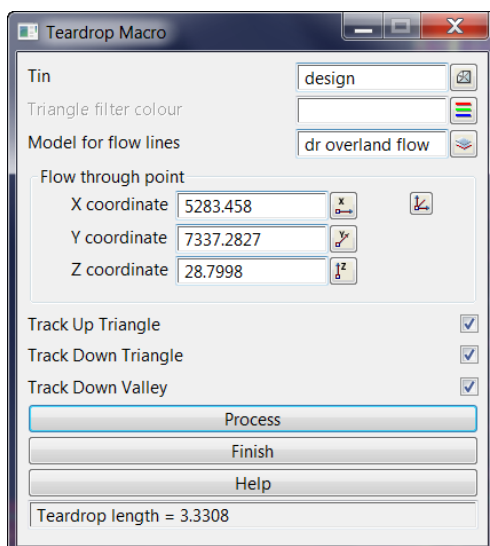
Now add the model **dr crests and sags** onto the **roads** view.

6.4 Rain drop

The raindrop routine will create a line from a selected point and follow either up or down the tin.

From the main menu select

Design->Drainage-Sewer->Rain drop



Try selecting several points on the tin to see the flow lines that are created.

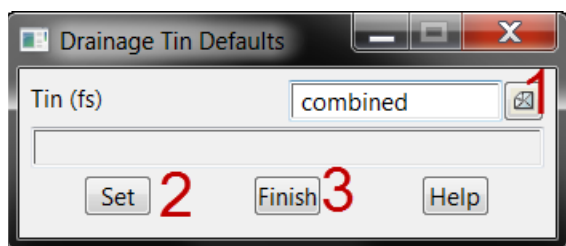
7.Setting Drainage Defaults (Initial Settings)

Before creating drainage strings in 12d we should set default values for the pit and pipes. These defaults are only used as initial settings for new manholes and pipes. This ensures that most of the pit and pipes will have the desired type, size etc and then we only need to modify the pit and pipes that are different to the default values. The defaults for the drainage network are accessed through three panels; pipe defaults, manhole defaults and Tin defaults.

7.1 Tin Default

The 12d drainage module is designed so that no levels need to be manually entered into the drainage system (although they can be and locked if desired). The primary source for these levels is a design tin but levels from design strings and polygons can be used as well.

Design =>Drainage-Sewer =>Defaults=>Tin



The default TIN is used to set the initial manhole cover level and the pipe invert levels (via pipe cover or depth settings discussed later). Super tins may be used if you want to place manholes on both the existing and the design ground surface (see [Creating a Super Tin from the Survey and Design Data.](#)).

1. LB the tin icon and select the **combined** tin.
2. LB the **Set** button
3. LB the **Finish** button.



If you place a pit outside the tin boundary:

1. then no elevation will be set for the top of the pit, (it can be set later manually or by linking it to a road design string).
2. Pipe invert levels cannot be set using the default cover. Pipe invert levels must be set manually as 12d cannot automatically determine cover levels without a TIN.
3. Finally, if you are exporting to an external drainage design program that accepts surface levels along the string, then an error message will be displayed at export time. The message will say that the surface level string is shorter than the pipe length.

7.2 Manhole (Pit) Defaults

Design =>Drainage-Sewer =>Defaults=>Manholes

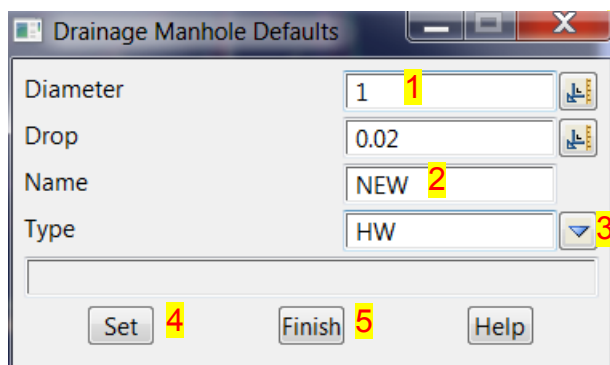
Notes on pit Diameters

The pit diameter/size is specified in metres/feet **not** mm/inches. The size of the pit is generally set in the drainage.4d file as either circular (mhdiam) or rectangular (mhsize). If both commands are specified then the mhsize command takes precedence. Plan drawings may use a symbol via the drainage plot annotations.

The **Diameter** is used for:

1. for visual service clash identification in long section drawings,

2. to clip the pipe lines drawn in the plan annotations so that symbols can be inserted in the space created,
3. maximum distance the bypass flow strings can be drawn from an inlet centre.



1. Type the desired diameter. If the manhole type below has a diameter/height defined, this setting is ignored.
2. Type the **Name** as **NEW** to remind you to assign a name latter.
3. LB the **Type** drop down and select the most common manhole type.
4. LB the **Set** button.
5. LB the **Finish** button.

The minimum **drop** will be used to set the invert level of the outlet pipe relative to the invert level of the inlet pipes. The drop should always be entered as a positive value. The DNE has many more options for aligning the pipe inverts at the pits. The drop may vary with the pipe deflection angle via the DNE->Defaults->Pipe->Drop file.

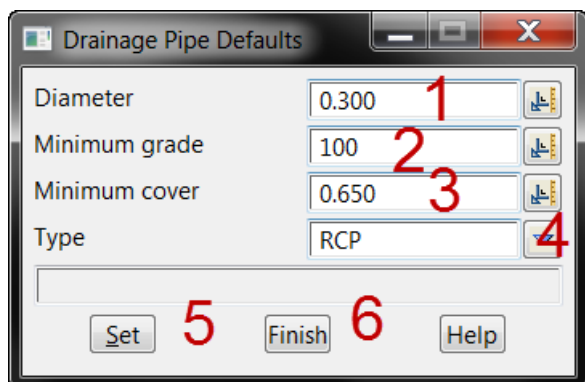
Setting the default name to **New** is a good reminder that you have not confirmed the pit type. Use the Set Pit Names function on the DNE to assign the pit names.

The **pit type** list is obtained from the drainage.4d file. Set this to the most common pit type and then later change the ones that are different using the DNE.

You **must** click the **Set** button to set the default values. Finish alone will **not** set the defaults.

7.3 Pipe Defaults

The pipe **diameter** is set in metres or feet **not** mm or inches. Set this to a common pipe diameter for your project then alter other pipes or change to box culverts in the DNE.



1. Type the common pipe diameter.
2. Type the minimum grade (1 in xxx). This value can be changed by pipe height via the **DNE->Defaults->Pipe->Grade file**
3. Type the minimum cover. This value can be changed by pipe type via the **DNE->Defaults->Pipe->Cover file**
4. LB the **Type** drop down and select the most common pipe type.
5. LB the **Set** button.
6. LB the **Finish** button.

Pipe Thickness for Pipe Cover

When 12d set the pipe inverts it checks the **minimum cover** from the top of the pipe to the finished ground surface at the ends of the pipe. Pipe thickness is changed by pipe type as defined in the drainage.4d file.

$$\text{Cover} = \text{surface level} - \text{thickness} - \text{diameter}(\text{height}) - \text{invert}$$

If the grade of the pipe is less than the **minimum** grade, the grade of the pipe is increased. The DNE has a pipe grade file where the minimum grade may be changed via the pipe diameter.

Finally, 12d checks if there is anywhere along the pipe length that has less than the **minimum cover**. If there is such a low point in the design surface, the pipe is shifted vertically downwards to achieve the cover

required. The [DNE](#) has a pipe cover file that will change the pipe cover via the pipe type. If the pipe type is not found in this file then this minimum cover will be used. Circular pipes have the cover checked along the centre line and box culverts along the centre line and edges.

When using the 12d editors to change the pipe diameters the invert levels will remain fixed and the obverts will change. The inverts may be reset using [Regrade Network](#) on the [network editor](#).

The list of available pipe types is set in the [drainage.4d](#) file.

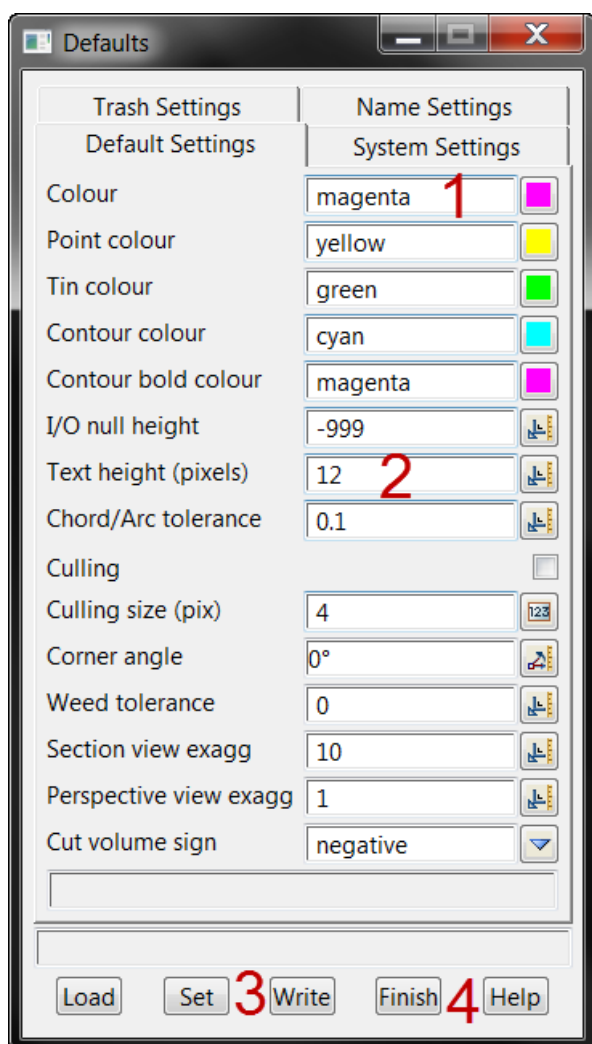
7.4 String Colour and pit Label Text Size/location (string defaults)

12d can automatically label the pits at a fixed offset from the pit using [view text](#) OR you can use the network editor [Plot](#) to create text labels that can be moved/rotated etc.

For view text, the default line colour and text size are set by selecting

Project=>Management =>Defaults

The following panel will appear.



1. LB **colour** icon to set the default colour of the drainage string and man-hole labels.
2. Type the height of the text in pixels
3. LB the **Set** button. This will set the defaults for this project only.
4. LB the **Finish** button.

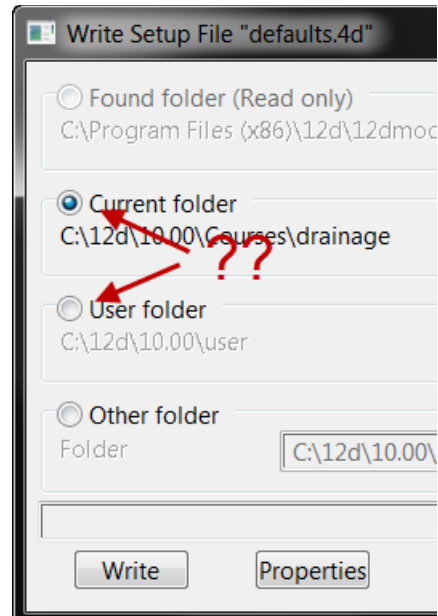


The manhole label textstyle and offset may be changed via the [DNE](#)->Global->display tab

Optionally, you may LB the **Write** button to set the defaults for other projects. The following panel will appear. Selecting **Current folder** will save ALL these defaults for projects in this working folder only. The defaults set in the **user** or **setups** directories will not be used if you select this option.

Selecting **User folder** will save your defaults so that all other 12d projects will use these defaults. This is the most common option (unless your network administrator has not given you write access to this folder (check **Properties** in windows explorer).

Select **Write** then **Finish**



8. Creating Drainage Strings

We are now going to create a culvert to cross road 3.

Key Points

1. Before creating the drainage strings, read in a drainage model template (Design->Drainage-Sewer->Create->Create/Read template) so that all of **DNE** settings will set. There is a sample one in the 12d library (drainage_template_QLD.12da). If you forget, do it later but **READ A TEMPLATE FILE**. We will create one at the end of this course.
2. You will be placing centre of the culvert headwall. The headwall centre is the selection point for the pit. Pipes can be connected this pit Use setout strings for construction setout points!
3. Drawing all drainage lines in the same direction may help you keep your drainage work organised. Either draw all string uphill to downhill (flow **same as string direction**) **OR** downhill to uphill (flow **opposite to string direction**). You can mix the flow directions if desired.
4. The Drainage Network Editor **Regrade Pipes** is the key to setting pipe invert levels! Use this after modifying the drainage plan layout as it will update all initial grading described below.

However, 12d will perform an initial grading as you draw the string. If you choose **opposite to string direction** then will need to select Pipe=>Default Grading then Grade to achieve this initial estimate. If you create branch lines before the trunk lines the initial grading will ensure the trunk line inverts remain below the branch line. Regardless, the DNE regrade pipes will sort the grading for all strings in the model.

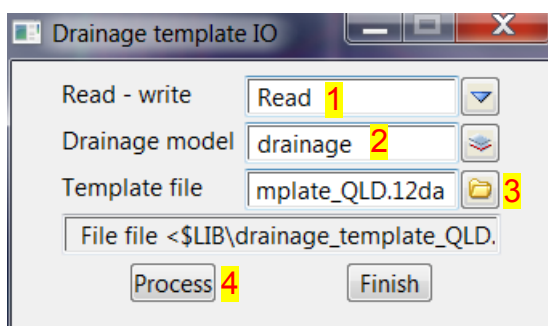
8.1 Read in a drainage model template

A drainage model template contains your favourite global and default settings for the **DNE**. These settings are stored as model attributes and the template may be read before or after the drainage strings have been created. Caution: existing default and global setting may be overridden.

You can create you own templates as well. After you have completed a drainage job and all of your global and default settings are set, create a template to save in your user library.

From the main menu select

Design =>Drainage-Sewer =>Create->Create/Read template



1. Leave as **Read**.
2. Type **drainage** to create a new model for the drainage strings
3. LB the folder icon, then lib to locate drainage_template_QLD.12da
4. LB **Process** to create tthe model and import the default and global settings.

8.2 Creating the Drainage Strings in 12d

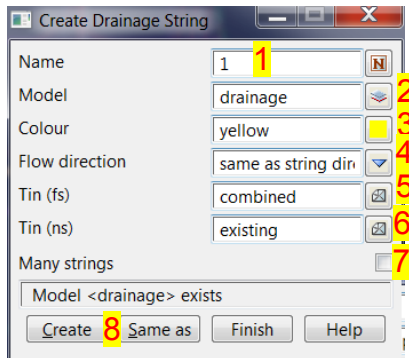


12d has a routine that creates a culvert very quickly. **Design->Drainage-Sewer->Create->Culvert**. It will also add a channel to the outlet as well! Try this, then the general method discussed below. The culvert is placed in a model **culvert** and the levels are all set to the manual mode.

A drainage string is created by selecting

Design =>Drainage-Sewer =>Create->Create

The initial manhole and pipe types will those set in [Setting Drainage Defaults \(Initial Settings\)](#).



1. Type a string name (used for pit naming later).
2. Type a new model name for the network
3. LB the **Colour** icon and select colour (optional).
4. Leave unless drawing in uphill direction.
5. From the default, leave as is.
6. Existing tin can be used for long section dwg levels
7. Select if creating more than 1 string.
8. LB the **Create** button, the menu below will appear.



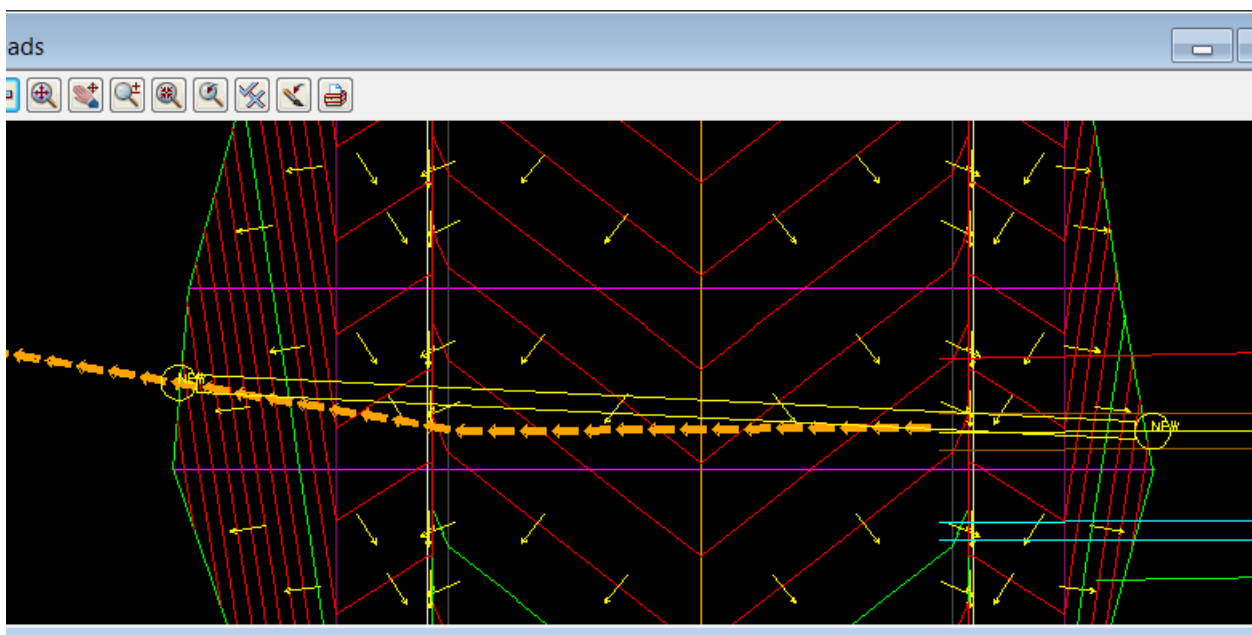
If you have already created a drainage string, click the **Same as** button and select the drainage string to obtain the panel values from that string. After selecting the string, change the string **Name**.



We are going to initially place our head walls on edge of the batters and then fine tune the location later.

To create your first manhole select

1. **Edits =>Add/Append MH**. A +MH will appear with your pointer. Refer to the plan below for the headwall locations.
2. LB and accept for the upstream (east) and downstream (west) headwalls.
3. LB the **Finish** button after the last headwall is placed.

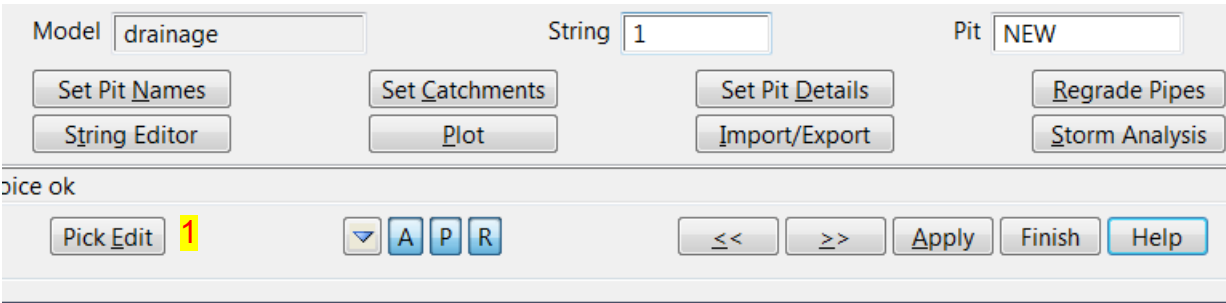


8.3 Change Pit and Pipe Types and Sizes

We will use the DNE to change the structures to inlet and outlet headwalls and the pipe to a box culvert. The drainage network editor is accessed through the main menu by selecting

Design=>Drainage-Sewer=>Network Editor

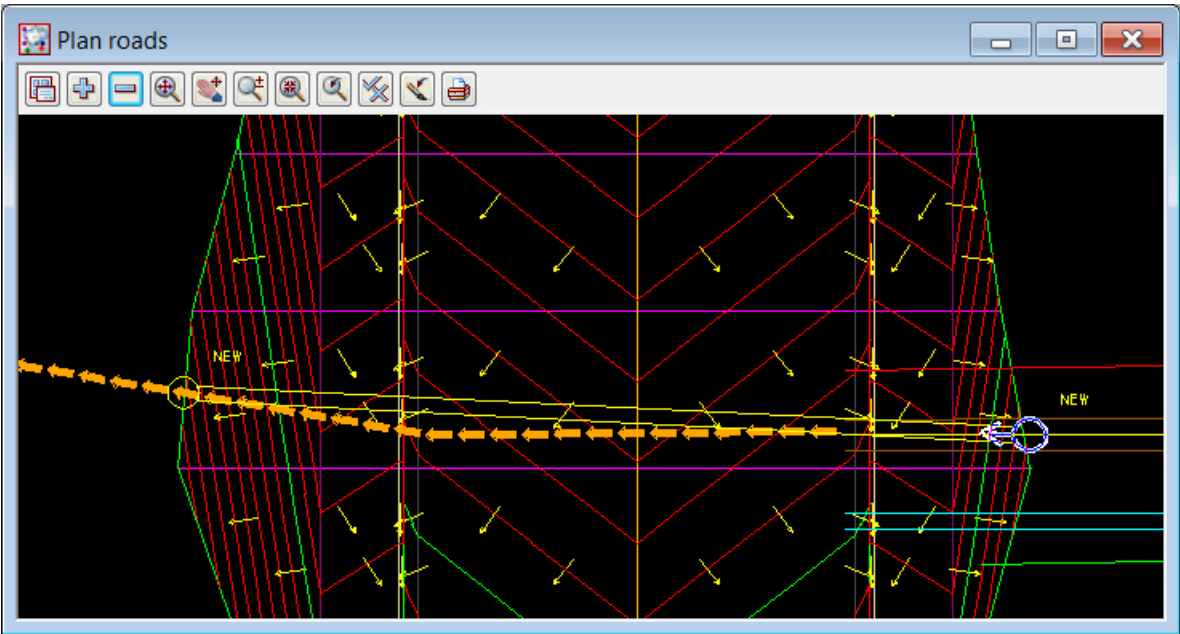
The bottom section of the network editor panel is shown below. You can change tabs but no data can be entered in the panel until a drainage pit or pipe has been selected and accepted.



1. Pick and accept the drainage string near the western headwall and the network will be loaded into the panel (only drainage strings may be picked).

The action buttons on the drainage editor now become active.

The pit closest to the point selected is highlighted with a circle and an arrow shows the direction of flow and the pipe being edited (see image below). When the outlet is selected there is no arrow. If the arrow is in the wrong direction or the outlet is at the upstream end of the string see [Flow in the Wrong Direction](#) to correct this.



The screenshot shows the 'Drainage Network Editor' window with the 'Pit' tab selected. The 'Current pit' section shows 'Pit name' as 'NEW' and 'Pit type' as 'HW'. Below this are tabs for 'Main', 'Setout', 'Bypass', 'Bypass Shape', 'Basin', 'Inflow', and 'Notes'. The 'Main' tab is active, displaying fields for 'Cover RL mode', 'Grate RL mode', and 'Sump RL mode' (set to 'floating'). It also shows 'Cover RL' and 'Grate RL' values of 29.751663, and 'Sump RL' of 28.8017. A red circle highlights the 'Diameter/length' field (1.85) and the 'Width' field (1). A yellow '3' is next to the 'Diameter/length' value.

1. Select the **Pit** Tab
2. Note the **Pit type** is already **HW** as we set this as the default. The type may be used to set pit properties. See [Drainage Definitions - Manhole Types](#) in 12d help. If you did not set this as your default ([Manhole \(Pit\) Defaults](#)) then change it now.
3. Diameter/length is in the direction of the road once it is linked otherwise it is east-west. Width is 90 degrees to this, If width is blank the pit is circular.
4. Select **Apply** to see the changes.

The screenshot shows the 'Drainage Network Editor' window with the 'Pipe' tab selected. The 'Pipe downstream of current pit' section shows 'Pipe ID' as 'NEW to NEW' and 'Pipe type' as 'BC'. Below this are tabs for 'Main', 'Design', 'Channels', and 'Notes'. The 'Main' tab is active, displaying 'Invert levels' with 'US Invert' at 28.801663 and 'DS Invert' at 28.079386. A red circle highlights the 'Diam/Height' field (0.375) and the 'Width' field (.6). A yellow '3' is next to the 'Diam/Height' value. Another red circle highlights the 'Pipe type' field 'BC' with a yellow '2' next to it.

1. Select the **Pipe** Tab
2. Change the **Pipe type** to **BC** (for box culvert). This may be used to set some of the pipe properties. See [Drainage Definitions - Pipe Types](#) in 12d help.
3. Change **Diam/height** to 0.375 and width to 0.600. If width is blank the pipe is circular.

Model	drainage	String	1	Pit	NEW
Set Pit Names		Set Catchments		Set Pit Details	
String Editor		Plot		Regrade Pipes	
		Import/Export		Storm Analysis	

choice ok

Pick Edit [v] [A] [P] [R] << >> Apply Finish Help

1. Now move to the outlet using the **Pick Edit**, << or >> buttons. << and >> are left and right in section view and NOT east west.
2. Enter the pit length and width for the outlet headwall.

A popup will appear indicating that the pipe thickness will be changed because the pipe type has a different thickness setting in the drainage.4d. Select **Stop asking for this session** and then click **Update**.



Note: A P R. The **A (auto apply)** is active by default. Changes are saved and displayed when you press any button on the DNE except **Finish** or the red **X** in the top right corner. If you turn **auto apply** off, it will be back on the next time you start the DNE.

8.4 Flow in the Wrong Direction

The direction of flow is used by 12d to determine which end of the string is the outlet and therefore the direction of decreasing invert elevations when regrading the string.

The direction of flow will be indicated with the arrow on the pit when using the **DNE**. No arrow will appear if the outlet is selected. If you find the arrow is pointing in the wrong direction there are 2 methods to access the flow directions.

Method 1: Use the **DNE** to select the string with the flow in the wrong direction and then select the **String Editor** button. From the menu select **Utility->Properties**. Change the **Flow direction** value to the other value. Select **OK** then **Save & Finish**. Now use the **Pick** button to select the drainage network again.

Method 2: Use the **Strings->Properties->String** option from the main menu. Select the string and then change the **Flow direction** value to the other value.

9.Drainage Strings Levels

The [DNE](#) quickly sets the levels for your drainage network. All the levels can be calculated by the [DNE](#) or locked with user specified values.

9.1 Pit Levels

Pits have 4 levels:

1. the cover level is used in plotting and pit depth calculations. This is also the maximum obvert level drawn for all connecting pipes.
2. the grate level is used for the freeboard measurements, the surcharge to bypass level and the reference level for pond flooding depths.
3. the setout level is used for survey setout to construct the pit.
4. the sump level (bottom of the pit) is used in plotting and for depth calculations. If set to floating mode, it is calculated from the lowest pipe invert connected to the pit plus the sump offset.



The grate level is the most important level in 12d hydraulics and will be discussed more in those sections.

9.2 Pipe Levels

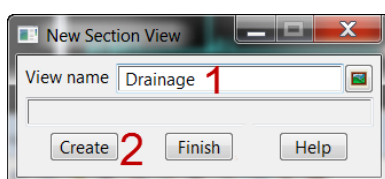
Pipes have the upstream and downstream invert levels that can set by the minimum grade and cover criteria (see [Vertical Alignment - Pipes](#)). The invert drop across a pit can also be fixed or change with the deflection angle. At this time we are only concerned with the pipe cover and grade.

9.3 Section View of a Drainage String

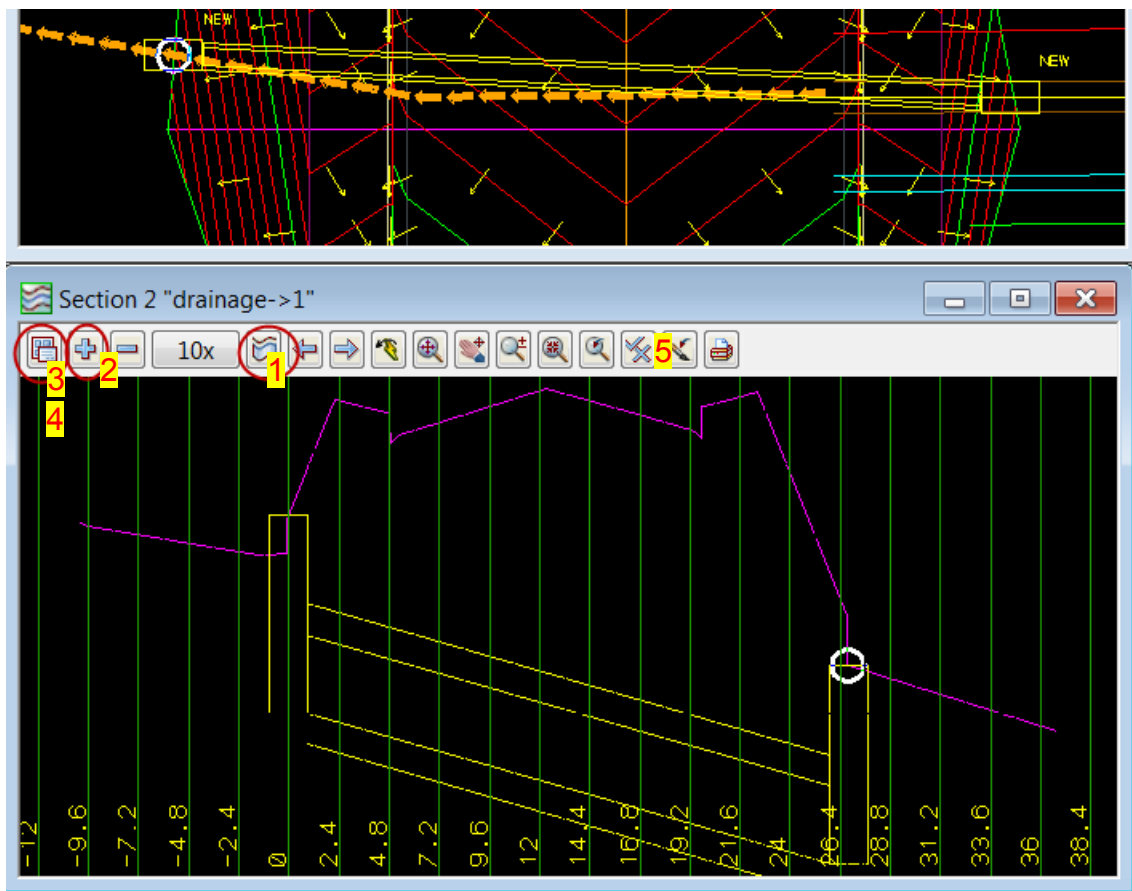
Create a section view to profile the drainage string.

From the main menu select

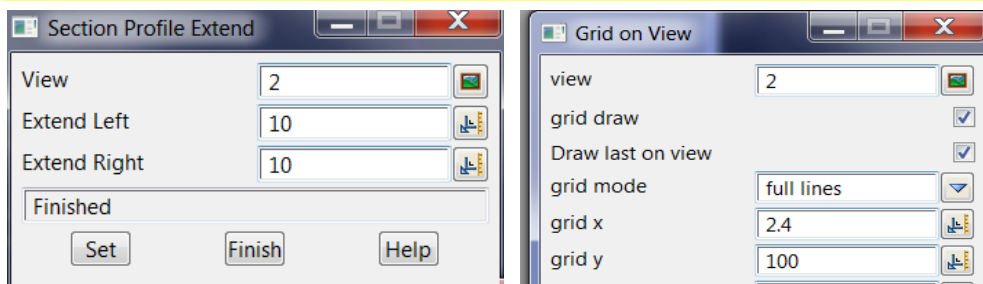
View->Create->Section view



1. Type **Drainage**
2. Select the **Create** button



1. LB the **profile** button then pick and accept the drainage string.
2. LB the + button and add the **tin combined** to the view.
3. LB the view menu button and select **Settings->Extend** to view 10m past the ends of the culvert.
4. LB the view menu button and select **Settings->Grid** to set the horizontal grid to 2.4m (a standard culvert length)
5. Toggles **Grades** on to see the pipe length and grade



LB the view menu button and select **Settings->Grade annot** to set **Draw grades as 1 in.**

9.4 Set Pit Details

Selecting **Set Pit Details** will set the pit levels and setout coordinates for all of the pits in the network using either the default settings for the model or the explicit settings for the pit (if used). Other attributes are set as well but they will be discussed later. A prompt box appears asking you to confirm. Select **Yes**.



To toggle off/on the confirm request, RB **Set Pit Details**. The same works for **Regrade pipes** and **Set Catchments**

9.5 Regrade Pipes

Selecting the **Regrade Pipes** button sets the pipe inverts for all of the pipe in the network using either the default settings for the model or the explicit settings for the pipe (if used). A prompt box appears asking you to confirm. Select **Yes**. To toggle off/on the confirm request RB **Regrade Pipes**.

Minimum grade and cover are checked and trunk lines are lowered to accept incoming branch lines. Grade is calculated using either the pit centre to centre distance or the end of pipe to end of pipe distance (**DNE->Global Use end to end pipe length**). Default pipe cover and grade are set on the **DNE Defaults-Pipe** tab and if not found there the **Drainage->Defaults-Pipe** settings are used.

Invert alignment is based on the pipe cover, the pipe minimum grade and the drop across the pit (see **Pipe Grade Modes**). The tin specified in the **Global-Main Finished Surface Tin** box is used for these calculations. Since every pipe that enters the pit may have a different drop mode, the drop mode is set on the downstream end of the pipe, NOT the pit.

If the inverts are locked on the **Pipe** tab then some the design criteria may not be able to be achieved. Messages in the output window will indicate these problems.

Now we will regrade the culvert checking the cover only under the roadway. First select the upstream (east) headwall.

Drainage Network Editor

Catchment | Pit | **Pipe 1** | DEFAULTS | GLOBAL | Results

Pipe downstream of current pit

Pipe ID: NEW to NEW Pipe type: BC

Main | **Design 2** | Channels | Notes

Invert design

Lock US Invert ☐ Lock DS Invert ☐

Grade mode Cover limit

DS vert defl Min grade (%)

DS align mode Align drop

Skip cover dist US Skip cover dist DS

1. Select the **Pipe** tab
2. Select the **Design** tab
3. Type **0.6** to over ride the default cover we set earlier (this is the minimum distance measured from the top of the pipe).
4. Type **2.5** for the Skip cover distances (US and DS). These distances are measured from the ends of the pipe. This will stop 12d from checking the cover in these areas.
5. Select **Regrade Pipe** to reset the inverts.

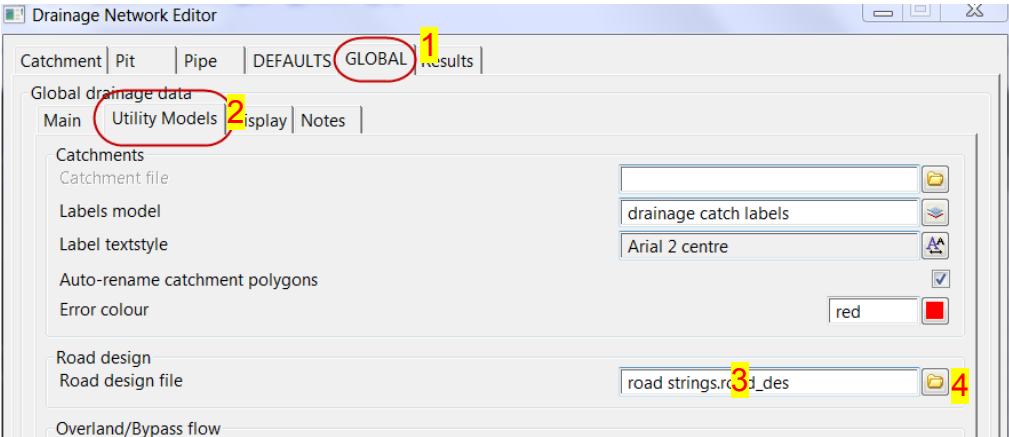
For circular pipes, the cover is checked along the centre line of the pipe. For box culverts the cover is also measured along the sides. The wall thickness is set via the pipe type and diameter from the drainage.4d file.



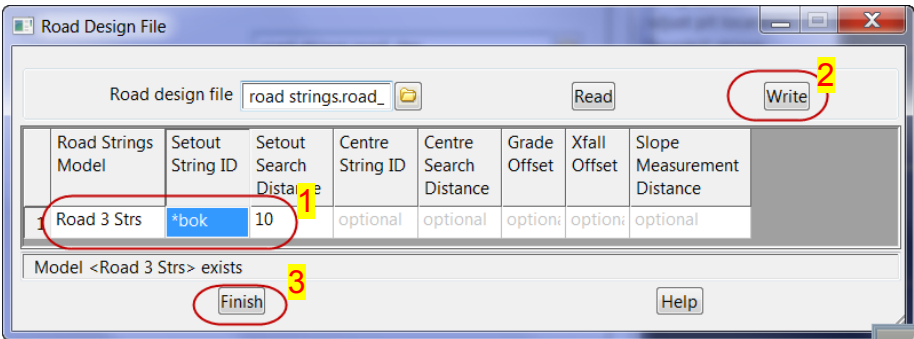
Note: The obvert of the pipe will never be drawn above the grate levels. If the cover or grate level is below the pipe invert you will get an X pipe. **Set pit details** will recalculate the pit levels and Regrade pipe to set the inverts..

9.6 Setout Strings to Align the Headwalls with the Roadway

Now link the headwalls to the roadway so they are perpendicular to the batter slope.

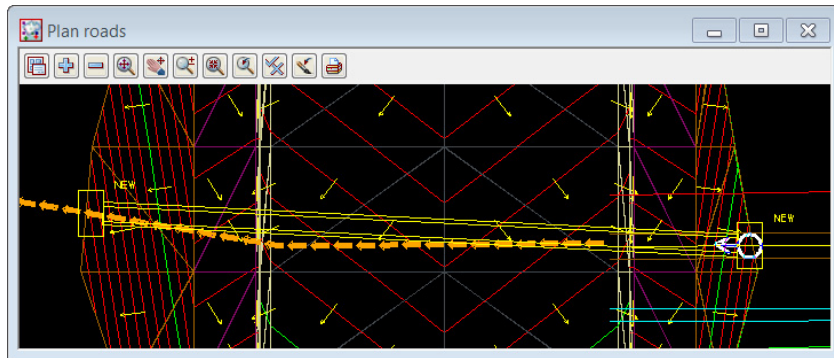


1. Select **Global**
2. Select **Utility Models**
3. Type **road strings**
4. Select the **folder icon** then **Open**

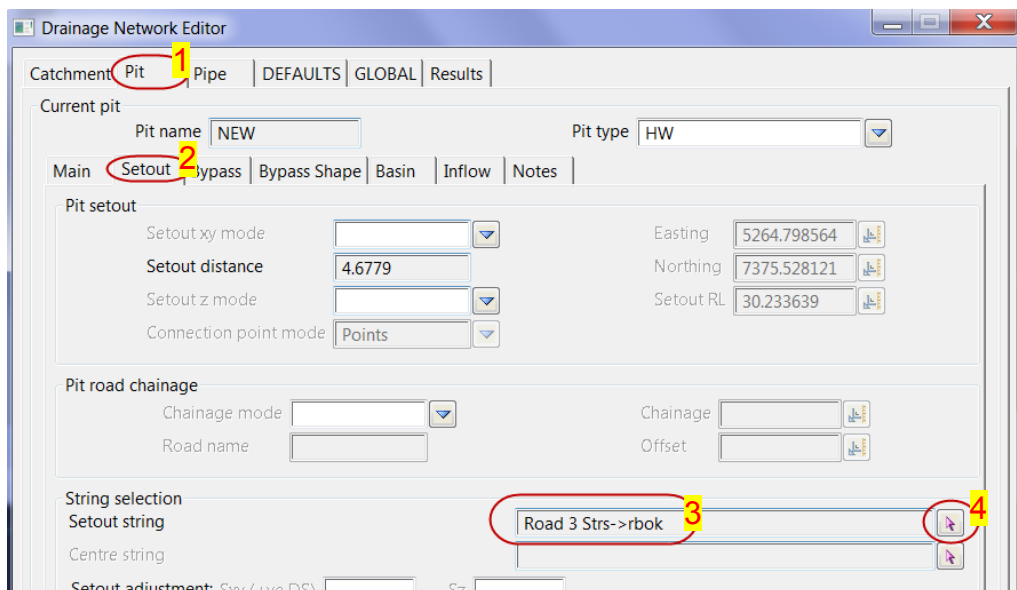


1. RB in the **Road Strings Model** cell and select **Road 3 Strs** model
type ***bok** so that the headwall will be linked to the closest lbok or rbok string.
type **10** as the max distance to search for a string
2. LB **Write** to save the file
3. Select **Finish**
4. Select **Set Pit Details** to create the links to the road strings.

The culvert headwalls now align with the roadway instead of east-west.



Now confirm the manhole link to the road strings (setout strings).



1. LB Pit
2. LB Setout
3. Note: selected string
4. Note: manual pick/clear button



DNE string links exist until you manually clear them or you delete the string.
 OR you clear the link by RB on the manual pick and select **Clear**,
 OR you clear all road string links via **Global->Utility Models->Clear Road Links**.
 We have a good link so do not do this at this time.

9.7 Adjust Pipe Length

Now adjust the culvert length to an even number of pipe lengths.

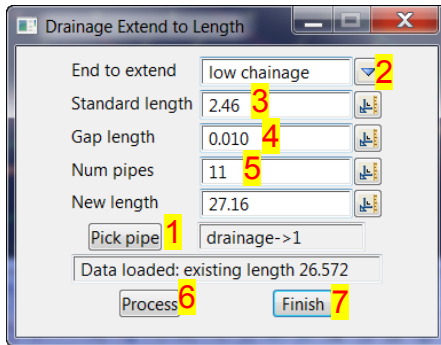


Only one editor at a time can access the strings. The DNE locks all of the strings in the model. Close the DNE now, before we start the next editor.

From the main menu select

Design->Drainage-Sewer->More->Extend pipe/culvert

As the culvert appears to be too long we will shorten it to 10 standard lengths (half on both ends).



1. Pick and accept the culvert
2. Change **End to extend** to **high chainage**
3. Change **Standard length** to 2.46
4. Change **Gap length** to 0.010
5. Change **Num pipes** to 11 and press enter. the new length is displayed
6. Select **Process**
7. Select **Finish**

After selecting process, the section view will need updating. Also the pit cover levels are set to the pipe invert level. The next time you press **Set pit details** in the DNE they will be reset using the selected method.

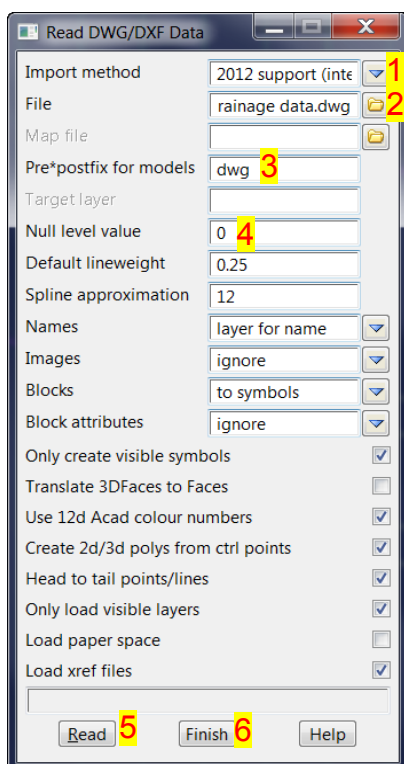
10.Importing Drainage Layouts from AutoCAD

We are now going to import a pipe layout that was drawn in CAD along with the overland flow routes and catchment areas (These could have been created in 12d as well). When these were drawn the following rules were followed:

- 1.Strings are drawn where the pipes are NOT to setout x,y locations,
- 2.Polylines are used in AutoCAD,
- 3.lines drawn from upstream to downstream (direction of flow),
- 4.a vertex was placed at every pit location.

To import the AutoCAD drawing, from the main menu select

File IO->Data Input=>DWG/DXF/DXB



1. Select 2012 support
2. LB the folder icon and select the **drainage data.dwg** file
3. Type a **prefix** for the models. It will help organise the layers from AutoCAD as every layer goes into a separate model in 12d. Specifying a prefix causes all of the layer names to be prefixed with this text and therefore kept together in the model list. The prefix used is dwg<space>.
4. Enter the null value **0** (no level in CAD value)
5. LB **Read** button. If you select the **Read** button more than once the data will be imported again and you will get duplicate, triplicate...etc data.
6. LB **Finish**

The models that have been created are,

dwg Catches Future
dwg Catch Lots
dwg Catch Reserve
dwg Catch Roads
dwg network

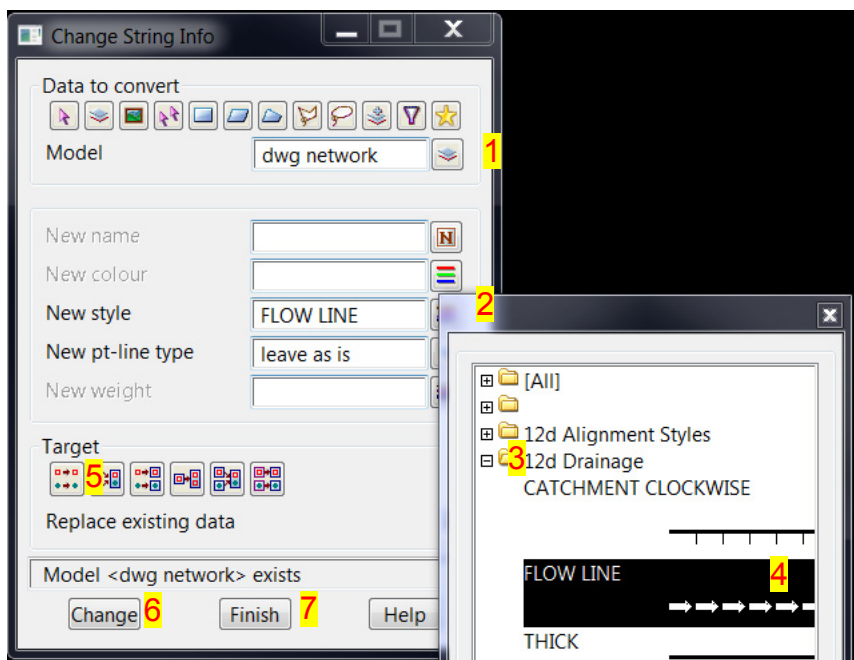
dwg network is a drainage layout that we will use to locate the pits in our drainage design.

10.1 Checking the String Direction of CAD Network Strings

A quick way to check the direction of the strings imported from CAD is to change the linestyle to a style that indicates the direction.

From the main menu select,

Utilities->A-G->Change



1. Select the dwg network model that contains the drainage network.
2. Select the **New Style** icon
3. Select + on the **Drainage 12d** group
4. Select **FLOW LINE** from the style list
5. Select the **Replace** option from the **Target** buttons
6. Select **Change**
7. Select Finish

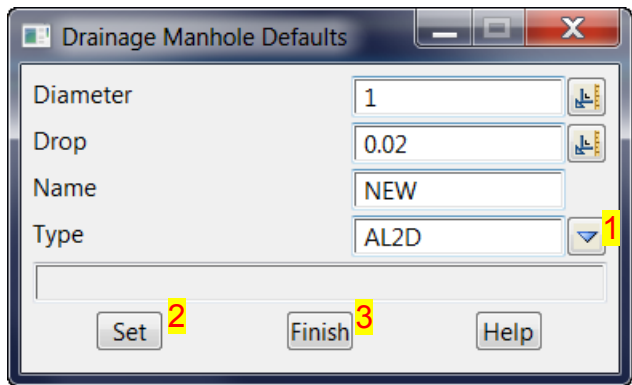
10.2 Create the drainage strings from the CAD strings

Before creating the drainage strings, [Read in a drainage model template](#) so that all of **DNE** settings will be set. If you forget, do it later but **READ A TEMPLATE FILE**. If the drainage strings are going to be added to a model that already has the global and default settings set, these strings will use those model settings.

12d will convert the import strings into 12d drainage strings. The default pipe, pit and tin data will be used to set the levels for the network. Do not use the other string convert commands found on the menu system.

Most of the pits will be grated roadway side entry pits (AL2D). Set this pit type as the default.

Design =>Drainage-Sewer =>Defaults=>Manholes

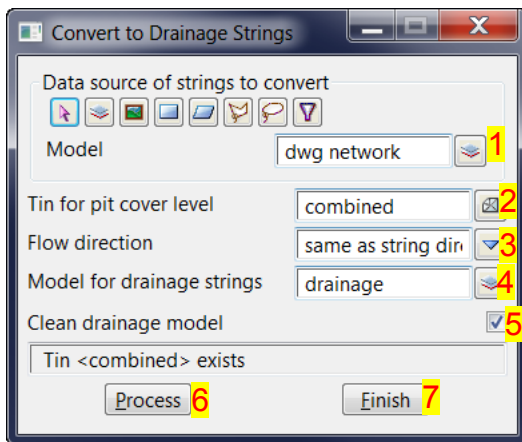


1. LB the **Type** drop down and select **AL2D**.
2. LB the **Set** button.
3. LB the **Finish** button.

Next from the menu select

Design=>Drainage-Sewer=>Create=>Create from strings

The following panel will appear.



1. Select the existing **dwg network** model
2. Select the **combined** tin. The cover level for the manholes will be obtained at the manhole centres from this tin.
3. Leave as **same as string direction**. The strings were drawn in the same direct as the flow in th CAD program.
4. Select the existing **drainage** model. If this model was not created from the read drainage model template function then you could type the name now and the model would be created.
5. **Clean drainage model** when selected will delete all strings in the model before the new drainage strings are created.
6. **Process** create the drainage strings
7. **Finish** closes the panel



The imported strings must all be drawn in the same direction. Either all in the direction the water flows or all opposite the direction of flow.

Pits are created at all vertices on the strings.

Trunk lines must have a vertex where the branch lines join.

Delete the new plan that was created and observe the new drainage strings created (road view).

11.Horizontal Alignment and Drainage String Edits

11.1 Road design strings (centre line) for Adjust Pit Locations

During the design process, roadways are often moved slightly, requiring the pit location to be adjusted. Linking the inlets to the road design strings enables 12d to quickly adjust these locations and create a report of the pit requiring adjustment.

The [Adjust Pit Locations](#) routine will move the centre of the pit perpendicularly to a **layout string** or offset from a **road setout** string.

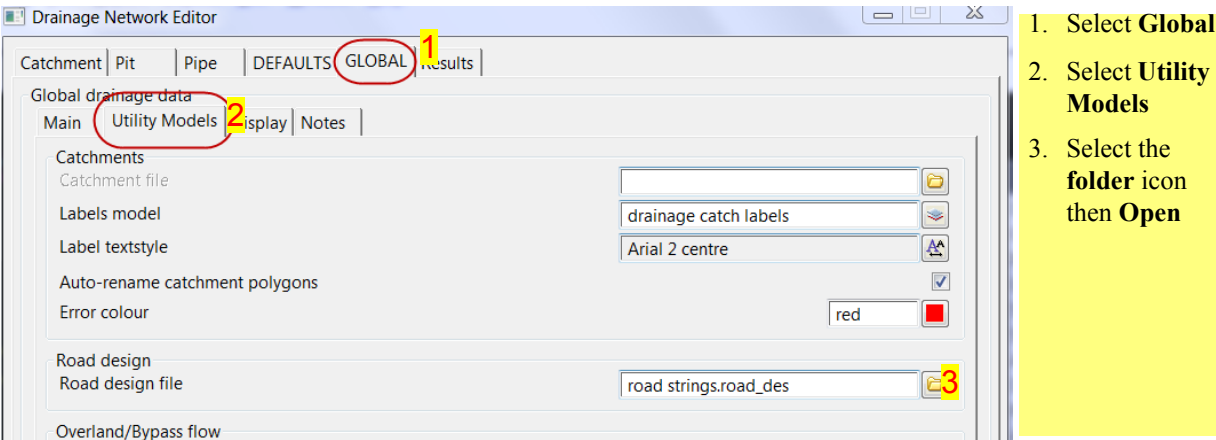
Layout strings do not need to be set up in advance but they do not allow for an offset.

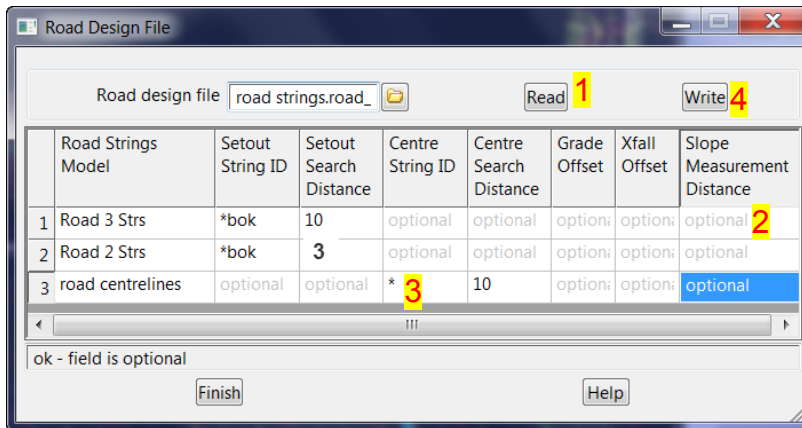
Road design strings need to be setup in the DNE but they allow an offset from the setout string that can vary with the pit type. Often large pits will be offset more into the footpath or roadway.

Road and layout strings can be used at the same time. If no road string is found, a layout string will be searched for.

In this example we are going to use the road setout strings not layout strings. We have already linked the culvert headwalls to the road design strings on Road 3. We will now do the same for the roadway inlets so they will align with the roadway and we can offset the centre of the pit a fixed distance from the setout string. This will require a link to the road centre line as well. A positive offset is away from the centre line and negative towards the centre line.

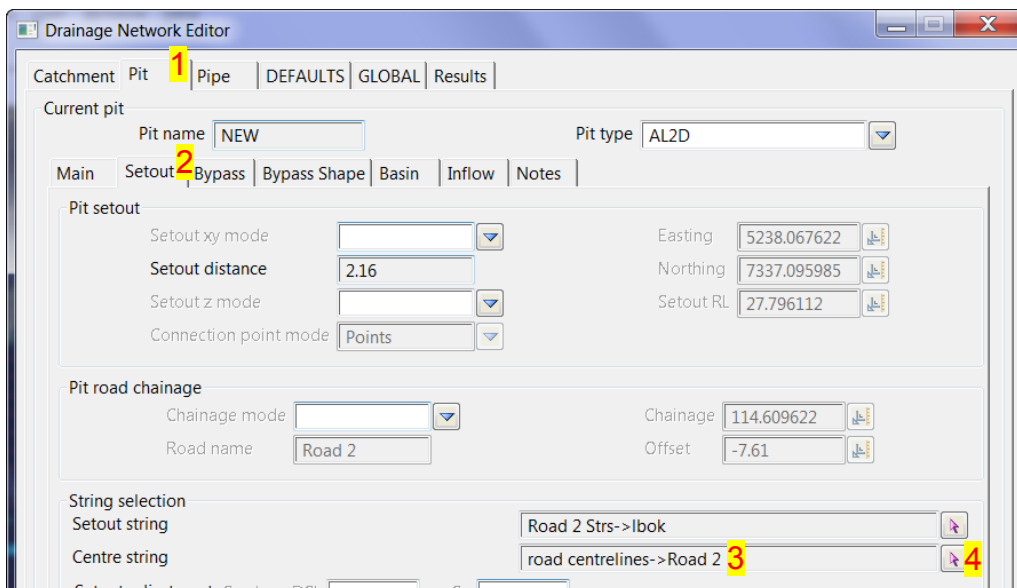
Start the DNE and select the network.





1. RB in the **Road Strings Model** cell and select **Road 2 Strs** model
type ***bok** so that the inlets will be linked to the closest lbok or rbok string.
type **3** as the max distance to search for a string
2. press enter until row 3 is added
3. type * for **Centre String ID**. This wild card will allow a string with any name (blank will not work).
type **10** as the max distance to search for a string
4. LB **Write**, then **Replace** to save the file
5. Select **Finish** then **Set Pit Details** to create the links to the road strings.
6. Regrade pipe to set the inverts.

To confirm that the inlets were linked to setout (*bok) and centre line strings,



1. LB **Pit**
2. LB **Setout**
3. Note: selected string
4. Note: manual pick/clear button

11.2 Log Lines with the Drainage Network Editor

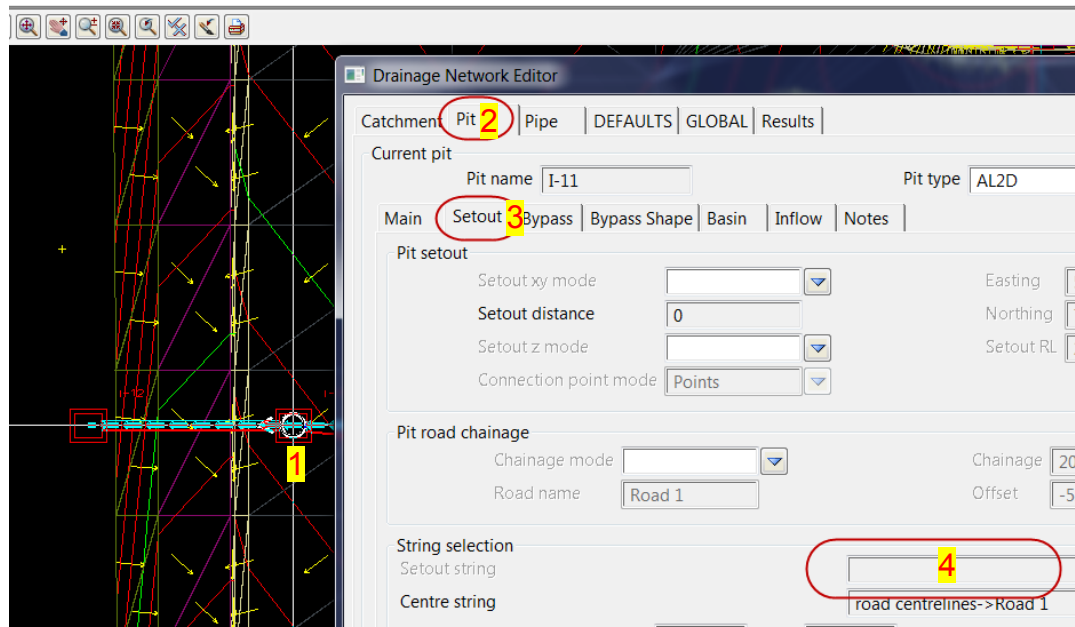


Double clicking on a log line in the Output window will take the DNE directly to the pit the message refers to!

Selecting **Set Pit Details** and messages are created in the **Output Window** for information and error checking. If the line of text begins with an exclamation mark it is a log line.

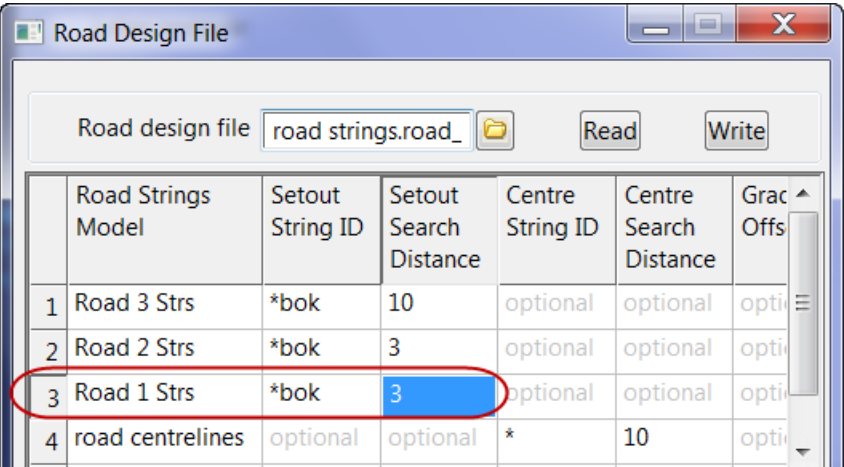
```
!INFO: Pit "NEW" Setout distance is:      0.450
!PROBLEM: Pit "NEW" Setout string not found
... needed for pit grate rl
... needed for pit z setout
... needed for pit xy setout
... needed for pit symbol angle
```

- 1. Double click on the word **PROBLEM**.



- 1. Note: the DNE (if open) moves to inlet NEW.
- 2. Select the **Pit** tab
- 3. Select the **Setout** tab.
- 4. Note that the **Setout string** field is blank

No road setout string has been found because we have not included the model **Road 1 Strs** in the **Road strings** file found on the **Global->Utility Models** tab of the DNE. The *bok strings in the **Road 2 Strs** and **Road 3 Strs** were more than the search distance away.



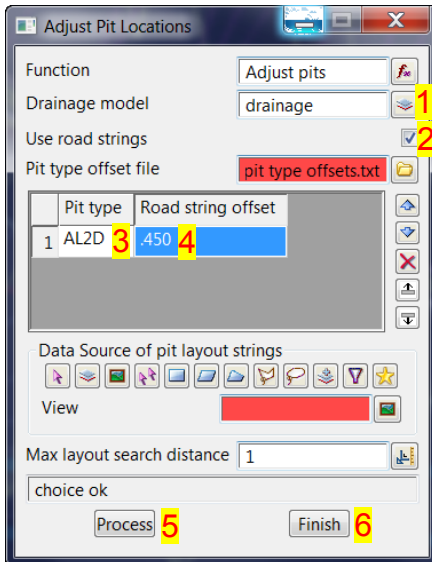
- 1. Add the new row and complete with the data as you have done before.
- 2. After **Writing** the file select **Set Pit details**.
- 3. Confirm that I-11 now has a setout string.

11.3 Adjust Pit Locations

Now we can offset the inlets from the bok setout strings.

Close the DNE and then from the main menu select,

Design->Drainage-Sewer->Adjust pit locations



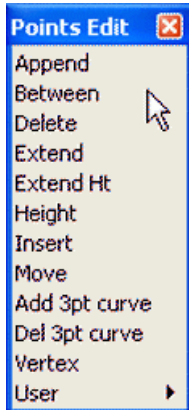
1. Select the model **drainage**.
2. ensure **Use road strings** is selected.
3. RB and select **AL2D** pit type
4. type **0.450** for the offset away from the road centre line
5. Layout strings and layout search distance are not being used at this time.
6. Select **Process** and redraw the plan view to see the new pit locations.
7. Select **Finish**

The message box indicates that 13 of the 18 pits were adjusted. Check the output window for a list of the pits that were adjusted. If no road string is found then the layout string is searched for. Since we did not use layout strings we get the warning messages for 3 of the pits. Note: You will not have pit names assigned yet ([Set Pit names \(and pipes\)](#)) so your names will be just NEW.

```
WARNING: Adjust Pit Locations - pit "I-07" found no perpendicular layout string within
the specified search distance.
INFO: Adjust Pit Locations - pit "I-04" adjusted by 2.610 units.
WARNING: Adjust Pit Locations - pit "I-08" found no perpendicular layout string within
the specified search distance.
INFO: Adjust Pit Locations - pit "I-05" adjusted by 2.610 units.
INFO: Adjust Pit Locations - pit "I-06" adjusted by 2.610 units.
INFO: Adjust Pit Locations - pit "I-07" adjusted by 2.610 units.
INFO: Adjust Pit Locations - pit "I-08" adjusted by 2.610 units.
WARNING: Adjust Pit Locations - pit "I-10" found no perpendicular layout string within
the specified search distance.
INFO: Adjust Pit Locations - pit "I-09" adjusted by 2.610 units.
INFO: Adjust Pit Locations - pit "I-10" adjusted by 2.610 units.
WARNING: Adjust Pit Locations - pit "I-11" found no perpendicular layout string within
the specified search distance.
WARNING: Adjust Pit Locations - pit "I-12" found no perpendicular layout string within
the specified search distance.
```

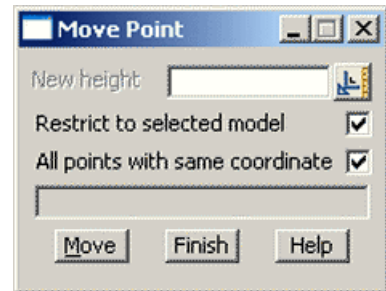
11.4 Manual Horizontal Alignment - Moving, Adding and Deleting Pits

The most common functions for adjusting the horizontal alignment of manholes and pipes are found on the Strings->Points Edit menu.



The **Append, Between, Delete, Insert and Move** commands are the most common.

The **Move** command has extra options for moving junction pits. Selecting **All points with the same coordinate** will move all points on the view that are at the same x,y coordinate. The point selected will move first and the others will follow **after** the new location has been accepted. **Restrict to selected model** will stop data from other models at the same location from being moved.



The second option

Strings->Edit

gives you all the same commands and more but requires you to select a string first and the edit commands will be restricted to the selected string.

12.Completing the Intersection Drainage Design

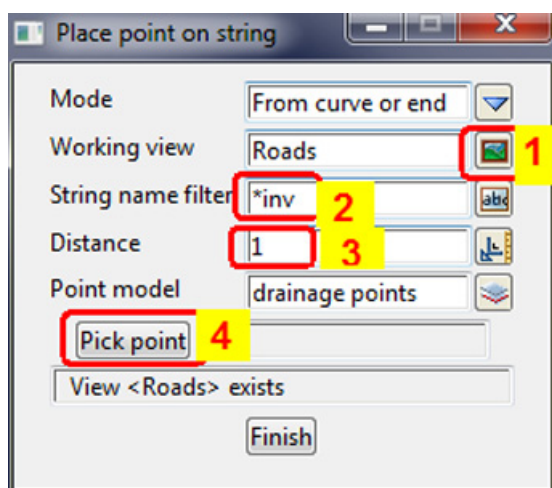
When placing inlets around an intersection, it is often required to place the centre of the inlet a specified distance from the curve so that the grate and/or the side inlet will be located on the straight section of kerb. If there is a pedestrian crossing, the inlet should be placed at a specified distance upstream to be clear of the crossing.

12.1 Placing Marker Points around the Intersection

The place points routine is a fast way to place inlet location markers at a specified location from the curved section of the kerb.

From the main menu select

Design->Drainage-Sewer->More->Place points

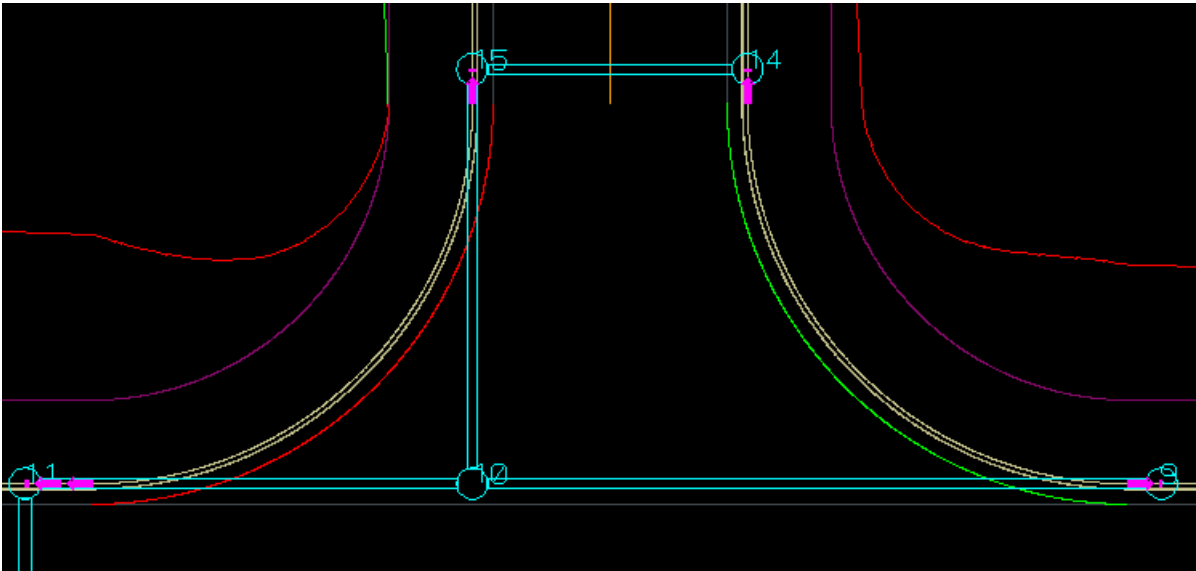


1. Select the **Roads** view as it contains the inv strings where we want the pipes.
2. Type ***inv** so the linv and rinv strings can be selected.
3. Type the distance from the end of the string or the start of curve where the pit is to be placed.
4. Select **Pick point** and then snap near where the pit is to be placed. The routine will find the closest *inv string and then search for the closest end or curve. It will then measure from the point towards your initial snap to create the marker (see magenta arrows below).
5. repeat for the remaining 3 ends of the kerb returns.



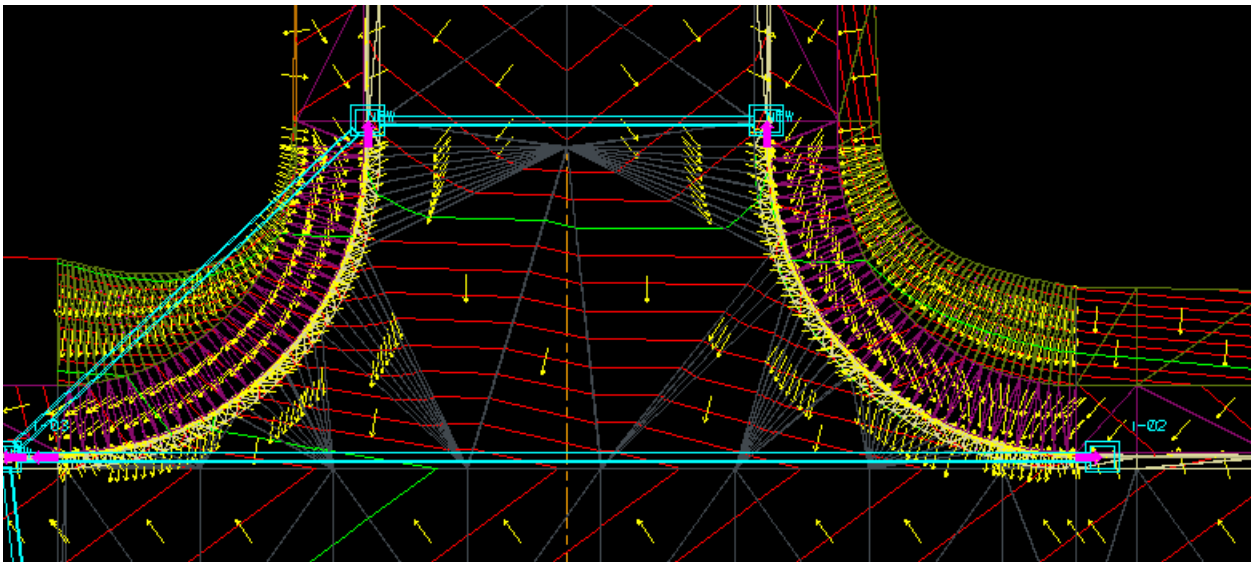
12.2 Option 1 (Connection at Manhole in the Road)

The option below has been selected for you to complete so that it has 2 inlets and a manhole. Use the tools you have learnt thus far to create the drainage string and assign the pit names. Special care is required when creating a junction pit (10) shown below. There must be a pit on the trunk line where the branch line connects and there branch line must point snap onto the centre of the trunk line pit (see [Junction Pits](#)).



12.3 Option 2(Connection pipe under the footpath)

Some road authorities prefer not to have a manhole in the intersection. Move the connection pit to the inlet to the west and delete the manhole.



A check list is on the following page once you have completed the layout.

12.4 Intersection Check List

1. Did you place the pipes in the correct location so that the correct cover could be measured?
2. When placing the manhole did you use the RB and **Perpendicular** to place the manhole?
3. Did you use **Strings->Points Edit->Insert** to add a pit to the trunk line at the junction location?
4. Did you assign a unique string number to the new string so that the set pit names routine would run?
5. Did you select **Set Pit Details** in the **DNE** to ensure the cover, grate and setout data was correctly calculated?
6. Did you check the output window for problem messages? Did you fix them?

7. Did you recalc the function **Adjust pits** so that the inlets are 0.450 behind the bok string.

Below are 2 other methods for placing pits that you may find useful.

12.5 Offsets from strings

As an alternative to the place points above you can use the snaps CAD to place the pits “on the fly”. Once the points move has been started use the **RB** and select

Snaps Cad=>Points=>Locate Offset. Follow the prompts given in the message area (bottom left corner of the screen). You will need experience with the 12d “directional pick” to use this capability.

12.6 Placing pits at specific Easting Northing Locations

For locating pits at specific x, y coordinates, simply start typing the x coordinate instead of clicking onto a location. An input panel will appear for you to enter the x and y coordinate separated by a space.

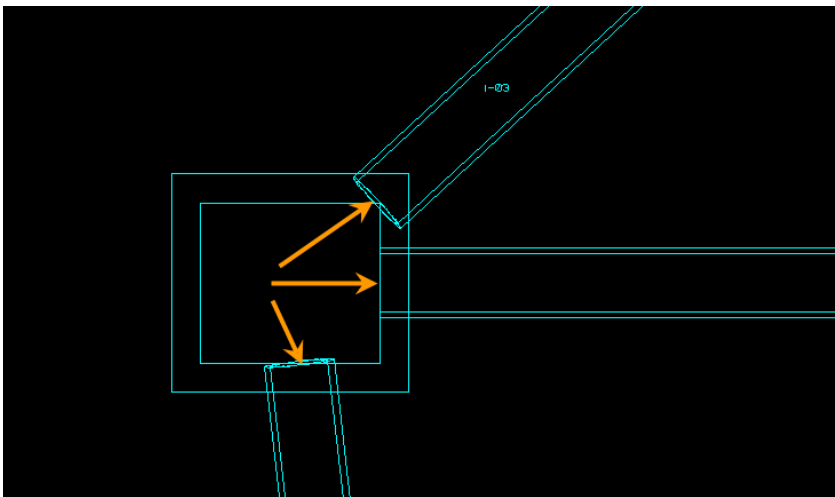


13.Manholes - A Closer Look

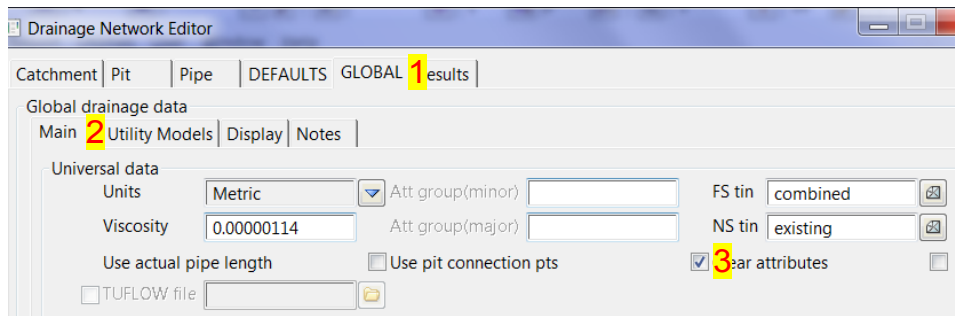
A manhole is made up of 3 points; the centre of the manhole and the pit-pipe connection points. The pipe exists as the connection between two manholes. The pipe may have a horizontal radius but not vertical.

13.1 Pit-Pipe Connection Points

The default mode has the pipes align between the centres of the manholes. The pit-pipe connection points are at the intersection of the manhole interior wall and the centre of the pipe (see below).

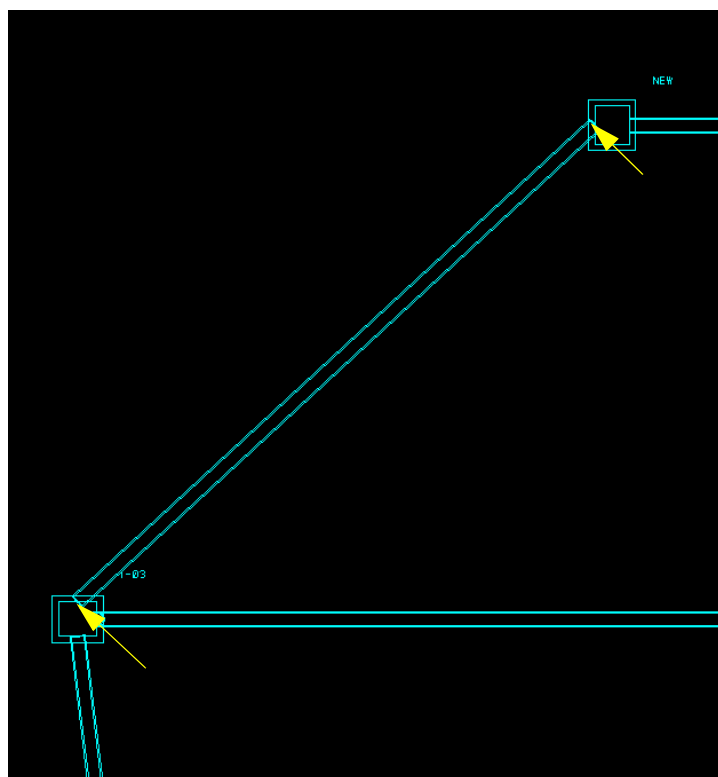


These connection points may be moved by enabling **Use pit connection points** on the **DNE->Global->Main** tab. All pits have their connection point initially set to **Points**. This setting is found on the **DNE->Pits->Setout** tab.



1. Select the **Global** tab.
2. Select the **Main** tab
3. tick the **Use pit connection pts** tick box
4. Select **Apply**

Pit connection points may be moved via **Strings->Points Edit->Move** (except for **Centre** mode described below). If a pipe is manually moved to a new connection point, it will be locked to the connection point and will not move if the pit or neighbouring pit is moved.



1. Close the DNE to unlock the drainage strings.
2. Use **Strings->Points Edit->Move** to move the junction pit you added to complete the intersection westward to the inlet.
3. Use **Strings->Points Edit->Move** to move the ends of the pipes as shown. Note that the pipes snap to the centre of the edges.

13.1.1 Pit Connection Point Modes

Centre (rectangle and circular) - This mode is the same as having the **Use connection points** turned off. The connection points will be located on the inside perimeter of the pit wall with the centre line of the pipe intersecting the centre of the pit. In this mode, the connection points may not be adjusted.

Points (rectangle) - A connection point is created at the mid point of each internal side of the pit. This may be changed for a **Pit type** by using the **con_points** command in the drainage.4d file. In this mode, the pipe ends will snap to the connection points. It is possible to place more than one pipe on the same connection point (the elevation of the pipes is not checked for clashes).

Points (circular) - The connection point may be moved anywhere around the pit internal wall as there are no connection points on the circular pits. Again, it is possible to place more than one pipe on the same connection location (the elevation of the pipes are not checked for clashes). If the manhole centre is moved the connection point locks are removed.

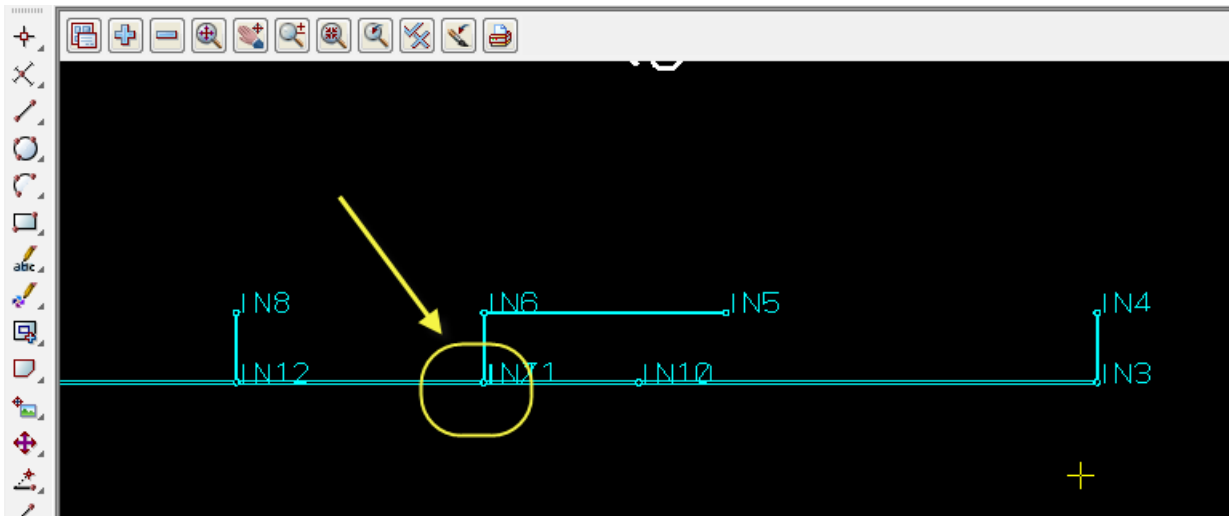
Perimeter (rectangular and circular) - Same as **Points** (circular) above.

Unrestricted (rectangular and circular) - There are no constraints on the location of the pit connection points. This mode is intended for irregular shapes such as GPT structures and stormwater basins.

13.2 Junction Pits

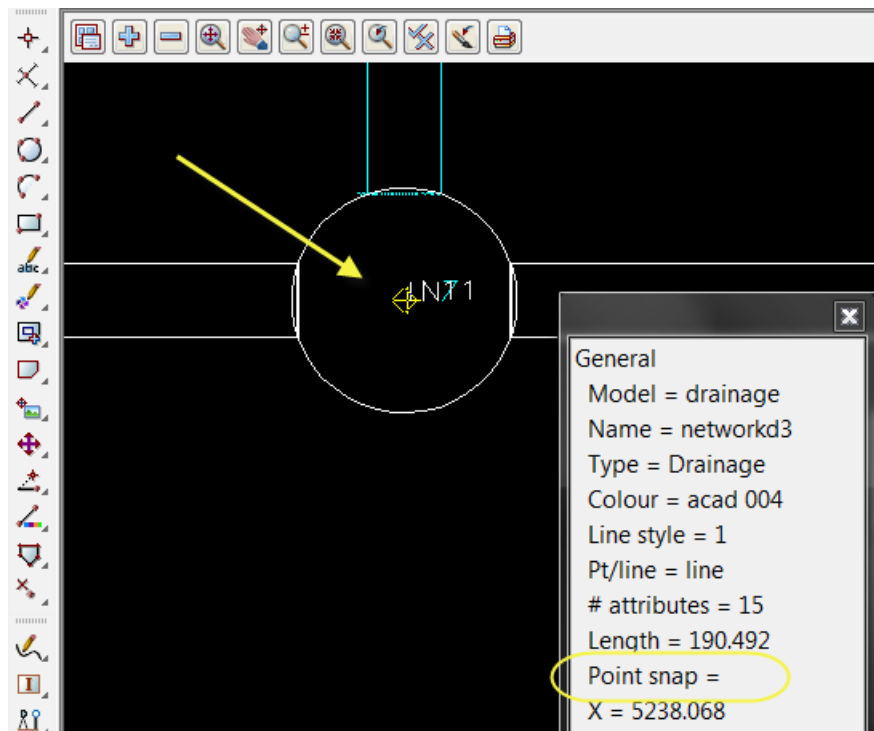
Key Points

1. The branch line must **Point Snap** onto the centre of a pit on the trunk line.
2. Both strings must be in the same model.
3. The downstream end of the string (depends on flow direction) must join onto the trunk line.



When creating a junction, pit turn the point snap on and the line snap off (the F3 and F4 keys are convenient for this). Zoom into the pit so that you can snap the being moved onto the centre of the stationary pit.

Recall a pit contains three points; one at each pit pipe connection points and one at the pit centre. You want to snap onto at the pit centre for a junction pit. In the figure below, the blue line is being placed to join the white line. Note that the diamond indicates that there is a point snap as well as the information panel.



If you cannot see your branch lines joining in the section view, check the following:

1. The centre of the pits did not align, Use **Strings=>Points Edit=>Move** to move the branch string pit the “downstream end” of the branch line must be the junction pit.
2. The branch string and the trunk string have not been created in the same drainage model. From the main menu select **Strings->Inquire (F2)** and select the strings to check their models. If this is the problem, use **Strings=>Edit=>Change** and specify the correct drainage model (enter the model BEFORE picking the string) or **Strings=>Edit=>Duplicate** to duplicate one of the strings into the correct model.

13.3 Drainage Section Views (downhill left to right OR right to left)

The long section views and the profile plots are running downhill from left to right. If you want them downhill from right to left use the **reverse** function.

To reverse only one string, from the main menu select

Strings =>Strings Edit =>Reverse

and pick the drainage strings to reverse. This will also change the drainage flow direction attribute from **same as string direction** to **opposite to string direction**.

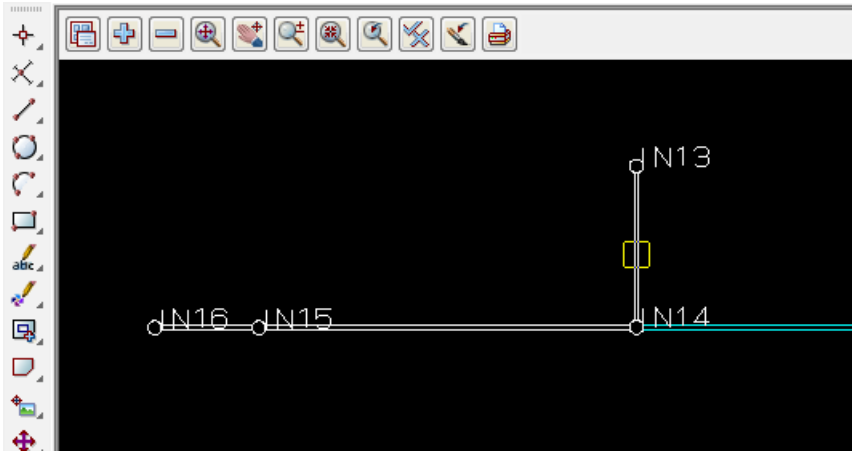
To reverse all of the strings in a model select the Reverse all strings option,

Design =>Drainage-Sewer =>More=>Reverse all strings

13.4 Drainage Split and Join

In this example, we are going to **split** the string shown in white below at IN14 (your pit are still NEW) so that we can **join** the west end (IN14 to IN16) to the trunk line on the southern side of the road (cyan). This will allow us to produce a long section that will extend the full length of the road 2 to the headwall outlet.

Use the **String split/join** from the Drainage menu not the one on the **Strings->Strings edit**.



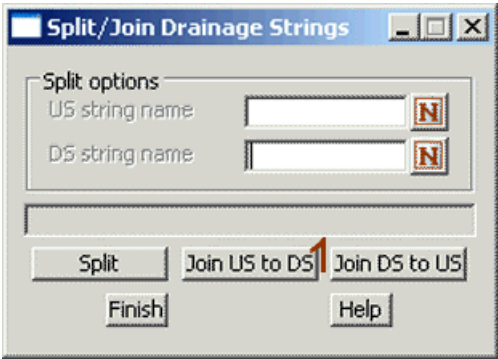
Split Option



- The split must be done at a pit.
1. A new name for the upstream string (optional). Leave it blank
 2. A new name for the downstream string (optional) Leave it blank.
 3. LB the **Split** button and then select the pit where the split is to occur. (IN14).

Join Option

This routine will add a new pipe between the 2 strings if required. When **Join US to DS** is selected, the properties and attributes of the upstream string and pit at the join will transfer to the new joined string.m string. **Join DS to US** will cause the properties and attributes to come from the ds string. Upstream and downstream is determined by the flow direction



1. Select the **Join US to DS** button.
2. Pick and accept the cyan drainage string, then the IN14 to IN16 string (follow the messages in the 12d message area).

14.Drainage Network Editor (DNE)

We have had a brief introduction to the DNE when we worked with the culvert. We will now look at many more of the DNE capabilities.

[Read in a drainage model template!](#) There is no need to set all of your global and default settings each time you start a new job. If we had not already read in a template we would do it now. Templates are a way to store all of your [Network Editor - Global, Default Settings and Explicit Settings](#)

The drainage network editor is used to automatically or manually change the properties of your drainage network. These abilities include:

[Vertical Alignment - Manholes](#)

[Set Pit names \(and pipes\)](#)

[Service and Utility Clashes](#)

Hydrology

[Catchment Areas](#)

[Catchment Areas and Percent Impervious](#)

[Coefficients of Runoff](#)

[Times of Concentration](#)

[Tc Path Strings](#)

Bypass flow routes

Hydraulics

[Cover RL, Grate RL, Setout RL and Sump RL modes.](#)

[Culvert Hydraulics and Tailwater](#)

[Pit Losses Ku, and Direct Flow](#)

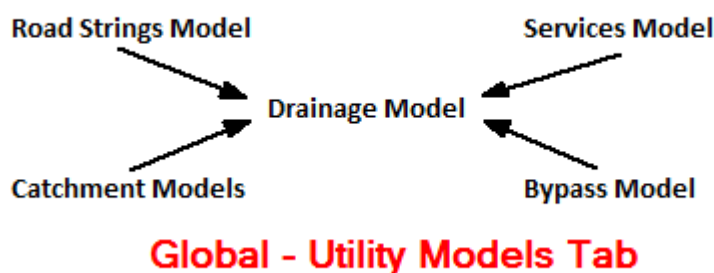
[Pipe Friction Method, Roughness Values and Direct pipe flow](#)

[Design mode, Freeboard Limit and Flow-depth limit](#)

[Pipe Size Design](#)

[Pipe Design Parameters - Sizes, Invert alignment, Min Cover, Max Height](#)

The DNE also links your drainage model to your 12d design models.



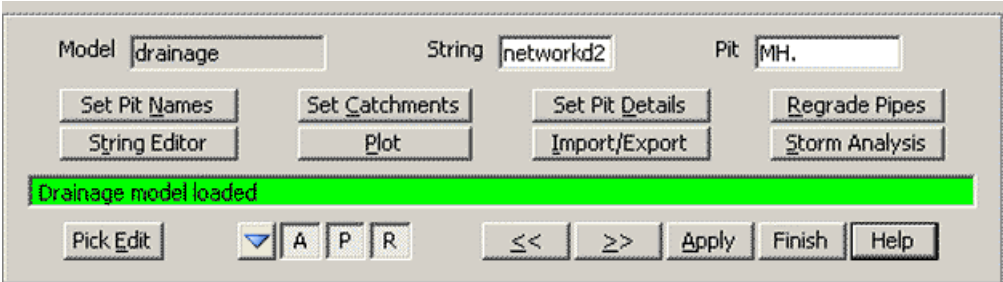
The drainage network editor is accessed through the main menu by selecting

Design=>Drainage-Sewer=>Network Editor



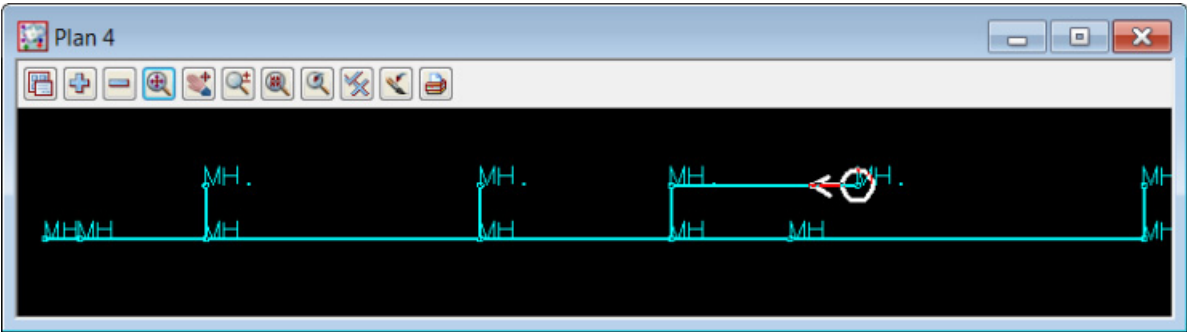
There is no need to fill in all the fields. On the **Catchment**, **pit** and **pipe** tabs, blank fields will use default values from the **Defaults** tab. Check the tool tip for the default value being used.

The bottom section of the network editor panel is shown below. You can change tabs but no data can be entered in the panel until a drainage pit or pipe has been selected.



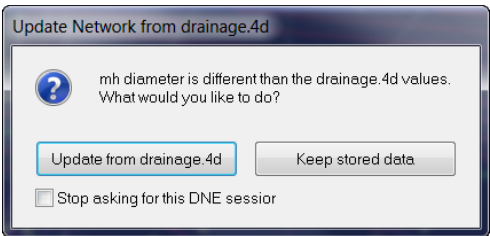
1. Pick and accept a drainage string and the network will be loaded into the panel (only drainage strings may be picked).

The pit closest to the point selected is highlighted with a circle and an arrow shows the direction of flow and the pipe being edited (see image below). When the outlet is selected there is no arrow. The option buttons on the drainage editor now become active.



14.1 Update from drainage.4d

We have set our default diameter as 1m and default manhole as AL2D. In the drainage.4d file the AL2D manhole is defined having a diameter/length of 0.93m and a width of 0.85m. When you select one of the manholes the DNE finds the difference and asks you if you want to update the manhole diameter.



1. Select **Update from drainage.4d**. The manhole diameter will now be changed to 0.93 for this manhole.
2. If you select **Stop asking for this DNE session** first, you will not be prompted before the DNE updates the manhole data.
3. Selecting **Set Pit details** will update all manhole diameters in the network.

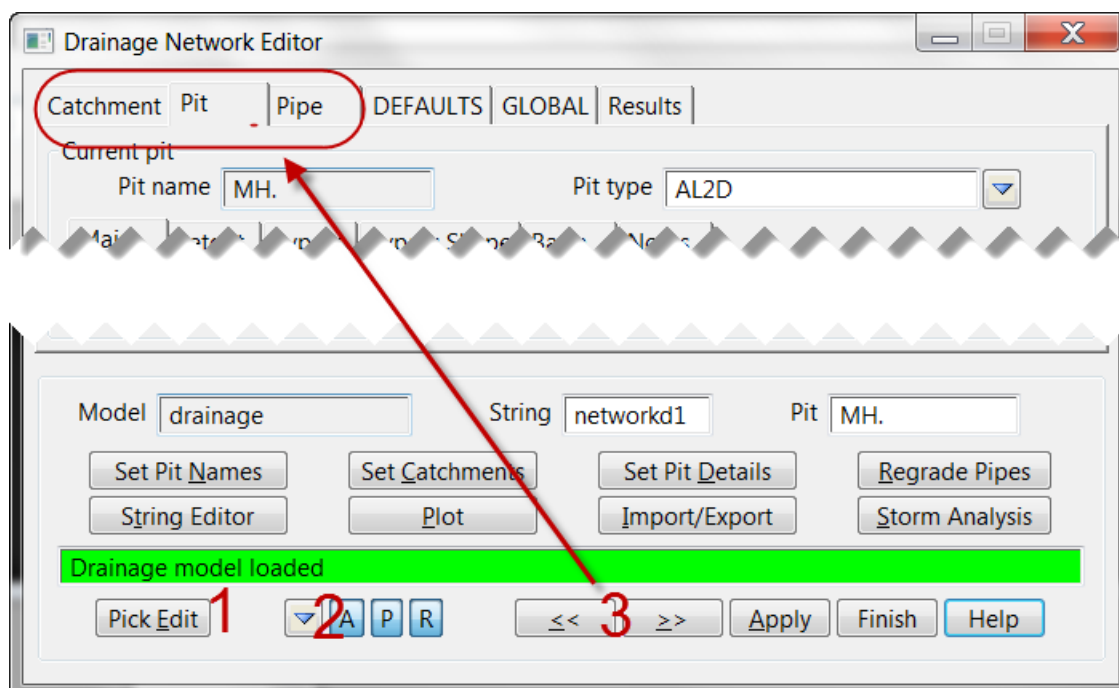


A surveyor who received a 12da file of the drainage network without the drainage.4d file would select **Keep stored data**.

14.2 Moving through the Drainage Network

There are 3 ways to change pits in the network editor. The Next-Previous (chainage NOT flow direction or east west) buttons will work if you are on the **Defaults**, **Global** or **Results** tabs. If the editor finds an error on a pit, it will take you to the error and you must correct the error before moving to the next pit.

Try all 3. The **GoTo List** will be interesting as we have not assigned pit names yet.



1. Pick Edit Button - Pick and pit or pipe in section or plan view
2. GoTo List - Select the pit from a list of pit name
3. Next and Previous (chainage) buttons - loop through all of the pits in the network



The most important button on the DNE is the **Set Pit Details** button. This button calculates the all of the manhole levels and data required for the drainage calculations.

14.3 Auto-Apply, Auto-Pan, Auto-Profile and Auto-Redraw

To tell if these buttons are on or off you need to know your computer display settings. For Windows 7, the default is Blue for on.

With **Auto-Apply (A)** enabled, data is saved when any of the 15 lower buttons are pressed **except Finish** and **Help**.

Auto-Pan is always active and any plan view showing the active drainage network selected will always auto pan if the selected pit is not in the view.

With the Auto-Profile (**P**) enabled, the same will happen for the section view.


With **Auto-Redraw (R)** enabled, the editor will regenerate the section view when changes are made in the vertical. This saves selecting **Regen** on the section views.

14.4 Set Pit names (and pipes)

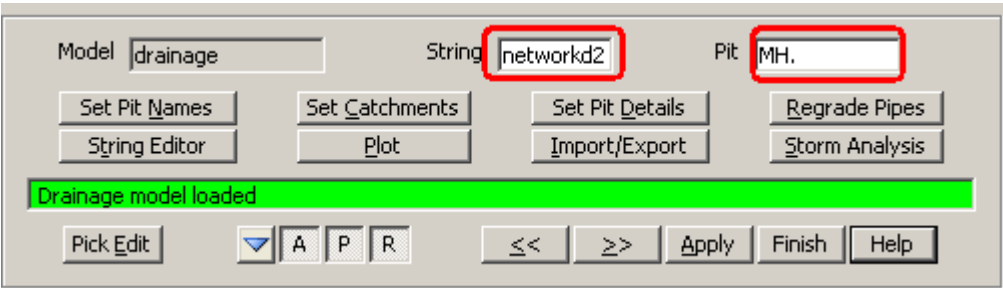
Pit names are used to identify and label the pits for access. The DNE Goto drop down and outlout window loglines (warning/problem messages) become much more meaningful. **Storm analysis** requires that unique pit names be set.

Use the DNE to manually change single pit names (in the **Pit** field) or quickly change all the names using the **Set Pit Names**, button.

The **Set Pit Names** button requires unique string names. To view string names on the plan view, go to the Plan View tool bar and select **Toggle=>Names**. If they do not appear see Displaying View Text.

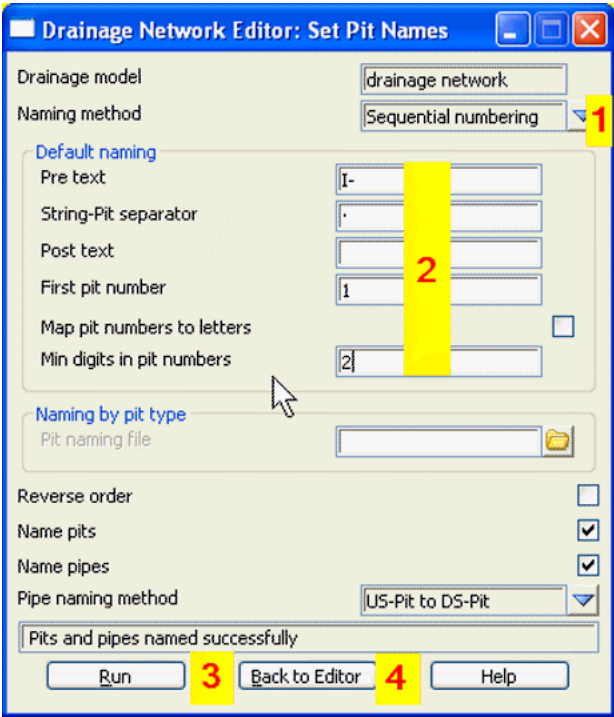


Models->String Info table is a fast way to view all the string names in the model. Double clicking on the lines will launch an editor to change the string names. The DNE also sorts the strings based on these names and this controls the plotting order.



The string names may be changed in the **String** field when the **Catchment**, **Pit** or **Pipe** tabs are selected at the top of the **DNE**. The string names must be unique.

1. Select **Set Pit Names** and the following panel will appear.



1. Select **Sequential Numbering** to number the manholes starting at First Pit Number.

2. Change the **Default naming** parameters.
Map pit numbers to letters causes the first pit to be A instead of 1.
Min digits in pit numbers set to 2 causes 1 to be 01.

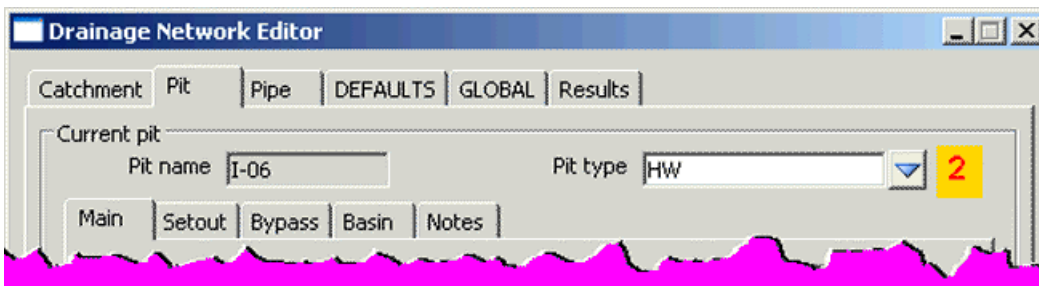
3. **Run** will update the quick text pit names on the plan view.
Try other settings!
You may find you want to change some of the string names back in the network editor.

4. **Back to the Editor** return to the main editor panel.

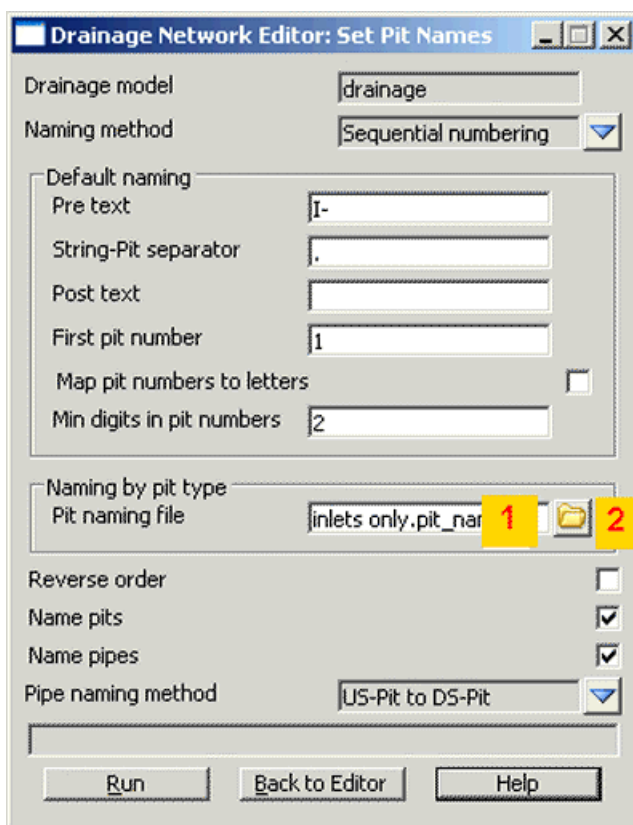
Reverse order starting numbering at the high chainage end of the string instead of the low chainage.

14.5 Set Pit Names using Pit Type

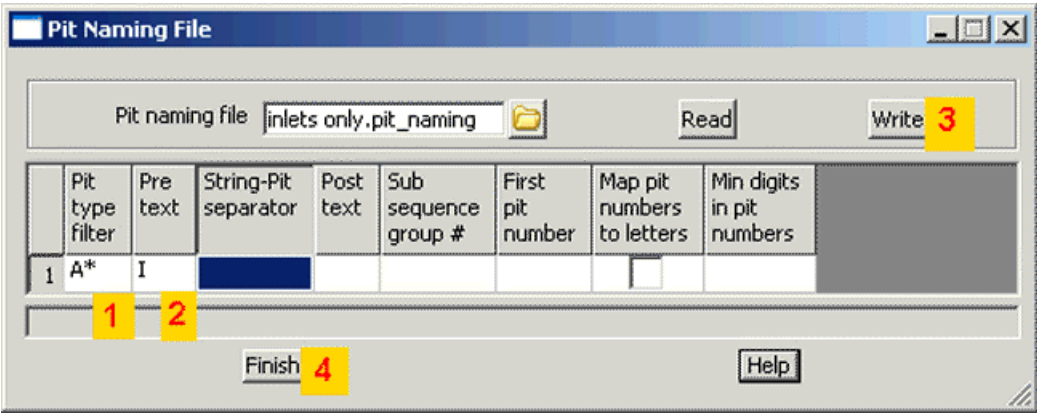
We can customise the pit name prefix, suffix, numbering sequence etc for each pit type. Currently all of the pits have the default pit type. We will now change the outlet pit type to HW and then rename the pits.



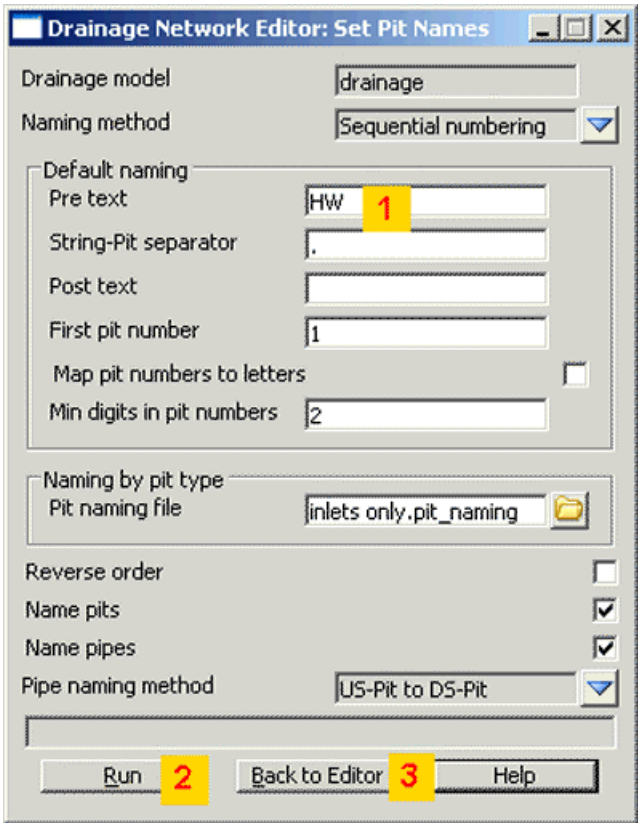
1. Move to the outlet using any of the 3 methods.
2. Change the **Pit type** to HW
3. LB Select **Pit Names**



1. Type the file name for the pit naming scheme. An example may be found in the library if desired.
2. LB the folder icon and select **Open**.



1. RB to select the **Pit type** or type text with wild card characters as shown
2. Type the **Pre text**
3. LB **Write** to save the settings to the file.
4. LB **Finish** to return to the panel.

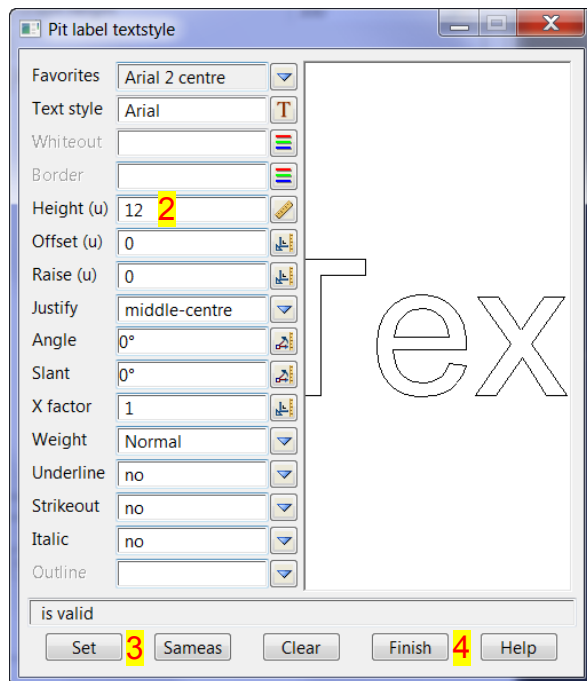
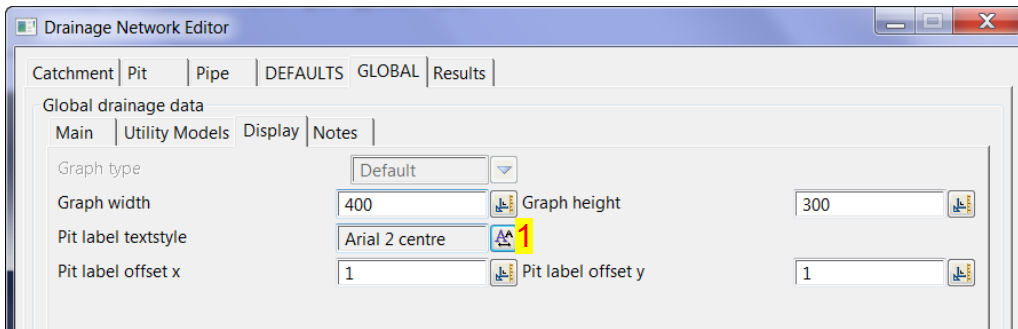


1. Type **Pre text** for those not included in the pit naming file.
2. LB **Run** to name the pits
3. LB **Back to Editor** to return to the main panel.

Note that the headwall still get the sequential numbering continued from the last numbering method. To start at a new number the **Sub sequence group number** would have to be included in the file.

14.6 Change Pit Name Textstyle and Offset

The textstyle and offset for the pit name is set on the **Global->Display** tab of the DNE. It is always shown as pixel text size and cannot be changed to world.



1. Select the **Pit label textstyle** icon and then the **Arial 2 centre** favourite.

2. Type the new **Height (u)** as 12 pixels.

3. Select **Set**.

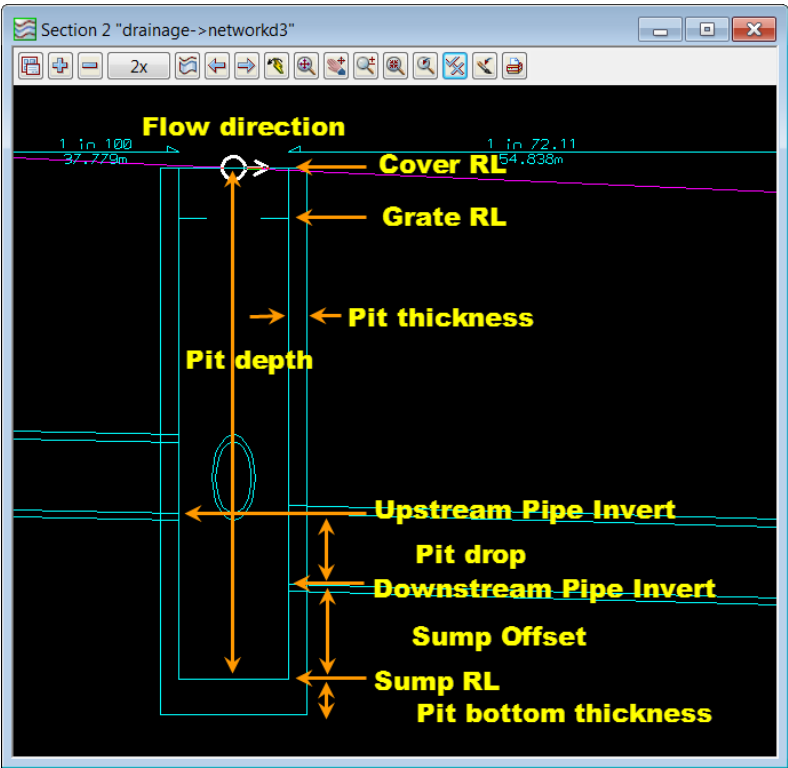
4. Select **Finish**.

5. Select **Apply** from the bottom of the DNE to see the new textstyles.

15.Vertical Alignment - Manholes

The diagram below shows the properties of a manhole. The RL levels may be set manually or calculated via the their associated mode and the **Set Pit Details** button. The **Grate RL** is used by 12d hydraulics when determining the freeboard level, bypass flows, inlet capacity values at sag inlets and depth of flooding at sag inlets.

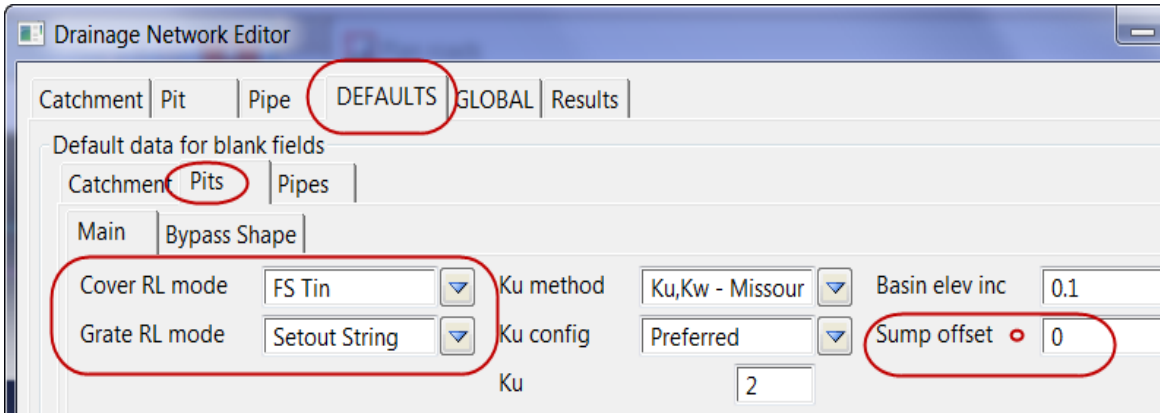
The **Setout RL** is the level used by surveyors to setout the pit.



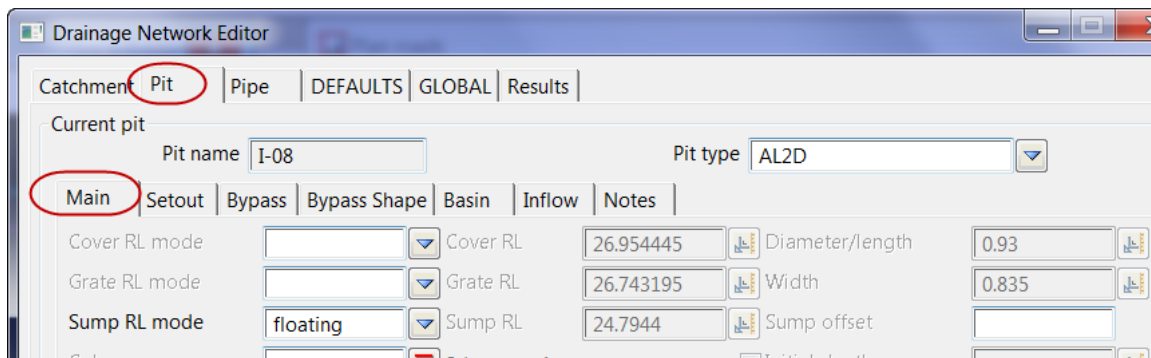
Flow direction	string property
Cover RL	DNE->Pit->Main
Grate RL	DNE->Pit->Main
Setout RL	DNE->Pit->Setout (not shown)
Pit thickness	drainage.4d via type
Pit depth	calculated value
Upstream pipe invert	DNE->pipe->design
Pit drop	Defaults(manhole) or DNE->Default->Pipes Drop file
Downstream pipe invert	DNE->pipe->design
Sump offset	DNE->Pit->Main
Sump RL	DNE->Pit->Main
Pit bottom thickness	drainge.4d via type

15.1 Cover RL, Grate RL, Setout RL and Sump RL modes

The default values for the RL modes are set on the **DNE->Defaults->Pits** tab.



These may be explicitly for an individual pit on the **DNE->Pit->Main** and Setout tabs



RL Modes

Cover RL Only available for Grade and Setout RL modes. z value will be the same as the cover RL.

FS Tin z value from the pit centre x,y location on the DNE->Global->Main->FS tin.

NS Tin z value from the pit centre x,y location on the DNE->Global->Main->NS tin.

Setout String z value from the string found by dropping the pit centre x,y location perpendicularly onto the setout string (DNE->Pit->Setout->Setout string) and then moving the distance DNE->Pit->Setout->Setout adjustment Sxy.

Sz+Setout String z value as for the **Setout String** plus the value DNE->Pit->Setout->Setout adjustment Sz.

Max Obvert z value of the maximum pipe obvert of all the connecting pipes.

DS Invert z value

Sump Invert Only available for Setout RL. z value from DNE->Global->Main->Sump RL

Manual z value is entered in the RL field to the right of the mode (field becomes active when this is selected).

floating Only available for Sump RL mode. z value is of the minimum pipe invert of all connecting pipes plus the value DNE->Pit->Main->Sump offset



RL modes for the entire model may be set via
Design->Drainage-Sewer->More->Pipe Locks

This routine has lock modes for pipes as well.

16.Vertical Alignment - Pipes

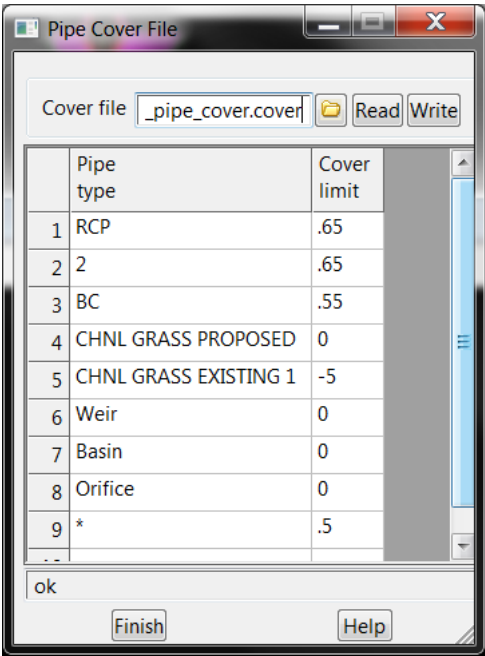
The pipe invert levels may be set manually or calculated using the DNE->Regrade Pipes button.



Pipe invert mode may be set to locked for the entire model via **Design->Drainage-Sewer->More->Pipe Locks**

There are many controls to guide 12d in the setting of the pipe inverts and the user may over constrain the network so that no solution is possible. If the minimum cover, grade or drop criteria cannot meet the criteria you have set, a problem message will be in the output window.

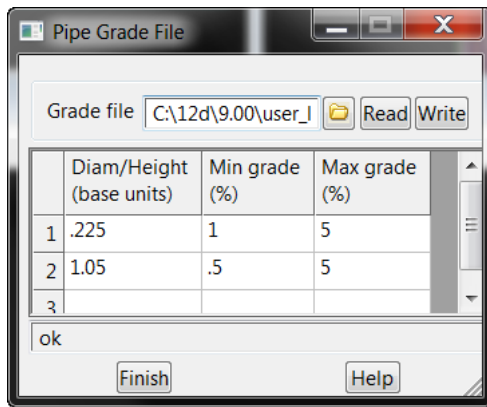
16.1 Minimum Cover



The minimum cover can be set via the pipe type and the pipe cover file (optional). If the pipe type is not found in the pipe cover file then the Defaults-Pipes-Cover for the project is used.

16.2 Minimum Grade

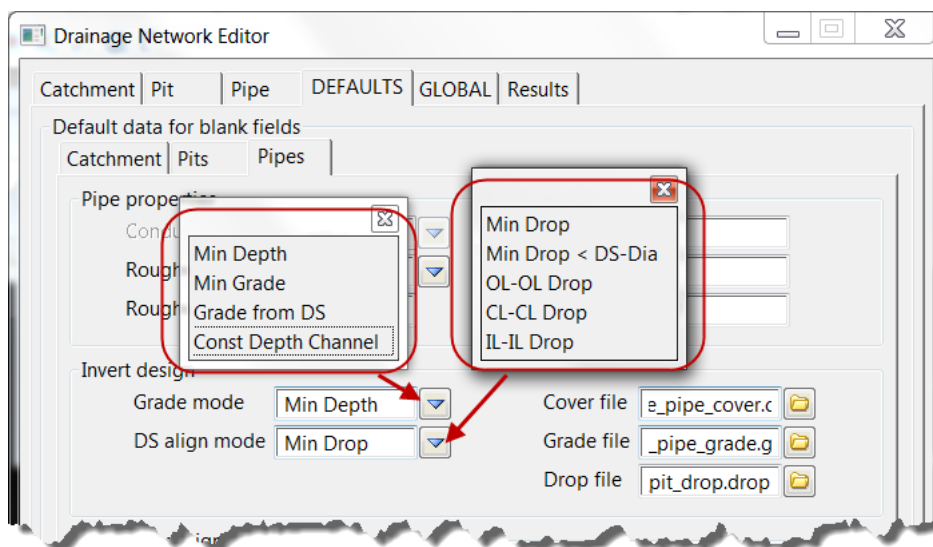
Pipe grade has been traditionally measured based on the horizontal distance from pit centre to pit centre. However, this causes issues with surveyors when they use electronic models to set out the drainage pipes. All drainage pipes lengths can now be calculated from the horizontal distance between inside pit edges (or pit connection point for the unrestricted pit connection mode). The alternate pipe length results in a different pipe grade to be calculated in 12d. This option is set one the **DNE->Global->Main Use Actual Pipe Lengths**.



The minimum grade can be set via the pipe diameter and the pipe grade file (optional). The diameter is the maximum diameter that this grade will be used for. If the diameter exceeds the greatest diameter in the grid, the last grade will be used.

If the pipe grade file is not used then the grade from the Defaults-Pipes-Min grade for the project is used.

16.3 Pipe Grade Modes



Minimum Depth The cover sets the inverts at each end of the pipe and then the downstream invert is lowered if the minimum grade is not achieved.

Minimum grade The pipe is set to the min grade and then lowered to meet the cover requirements.

Grade from DS Warning! Minimum cover may not be maintained in this mode. Each pipe has its downstream (ds) invert level set via its **DS pipe alignment** mode. If the downstream pit is the outlet then the cover is used to set the invert level. The upstream invert is set using the minimum grade.

Const Depth Channel Warning! Minimum cover, minimum grade and pit alignments are not used in this mode. The obvert of the pipe is set to the finished tin level at the pit centre.

16.4 Downstream Alignment Modes

The amount of the drop is determined first from the **Drop file** and then if required from the manhole default settings for the project. How the drop value is applied is set via the **DS align mode**.

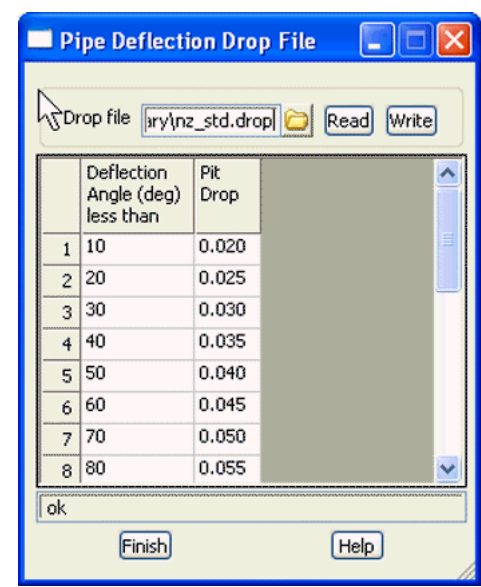
Inverts are moved down, if required, according to the setting in **DS align mode**.

Min drop ensures that the inverts drop a minimum of the drop but may be more.

Min drop<DS-Dia ensures that the inverts drop a minimum of the drop but may not be more than the downstream pipe diameter. This restricts the max drop so that the water jet will not completely impact the opposite wall of the pit.

OL-OL Drop uses the drop value for the obverts. If the downstream pipe is a smaller, then the drop will be applied to the inverts so that water will not be trapped in the pit. If the downstream pipe is larger then the obverts will be aligned as long as the min drop is maintained on the inverts.

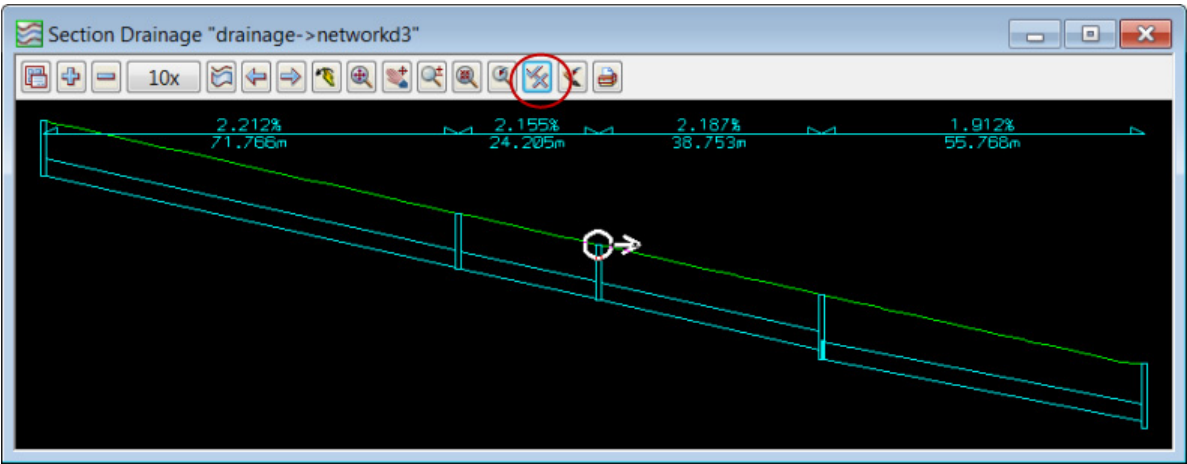
IL-IL Drop uses the drop value for the inverts.



The **Drop file** contains the drops that change with the pipe deflection angle. A sample file is included in the library.

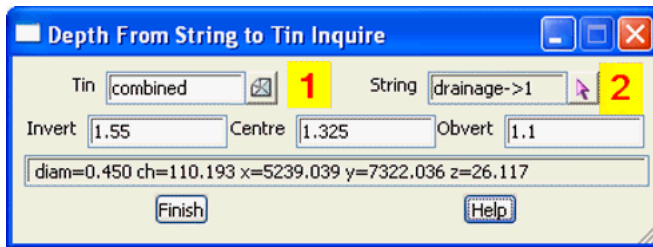
If only one drop value is to be used set the deflection angle to 180 degrees.

After setting the pit and pipe levels, add the model **tin combined** to the **Drainage** section view. The trunk profile will be similar to the following. Select the toggle button, to toggle on the grades (and pipe lengths).



To inquire about the cover on a pipe use the following option.

Tins->Inquire->Depth from string



1. LB to select the tin
2. LB to select the string.
3. Move the pointer in plan or section to monitor the data.

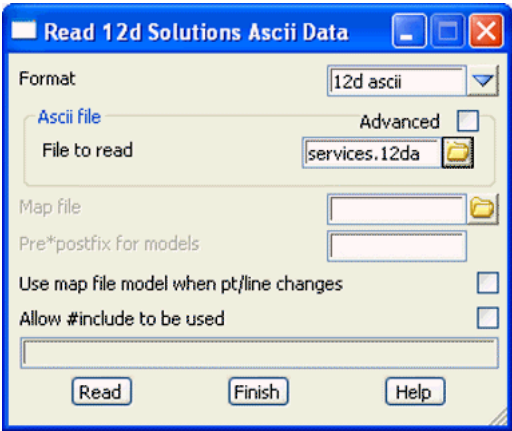


The DNE calculates cover from the top of the pipe NOT the obvert so cover may appear incorrect. Also for box culverts, cover is measured at the edges as well as the centre of the pipe. Finally for multiple pipes, each pipe is checked for cover.

17.Service and Utility Clashes

We will import some services from a 12da file. From the main menu select,

File I/O->Data Input->12da/4da data

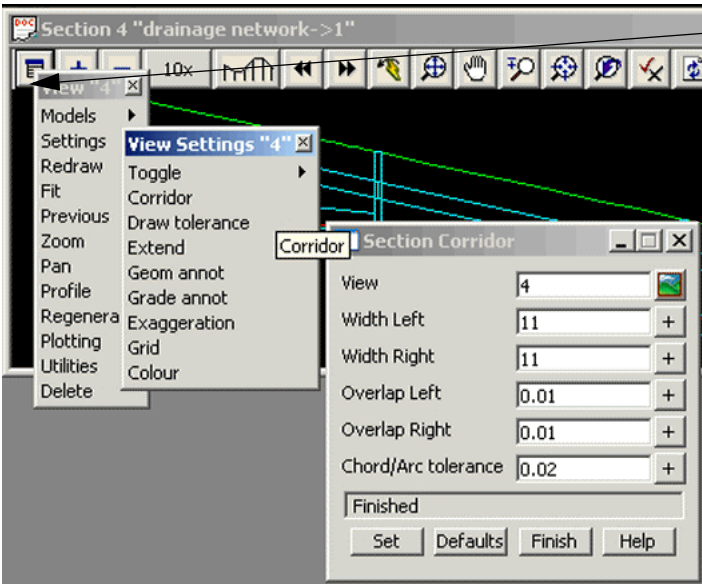


- 1. LB the **F**older icon
- 2. Select the service file
- 3. LB the **R**ead button.
- 4. LB the **F**inish button.
- 5. Add the model **s**ervices onto the plan and section views.

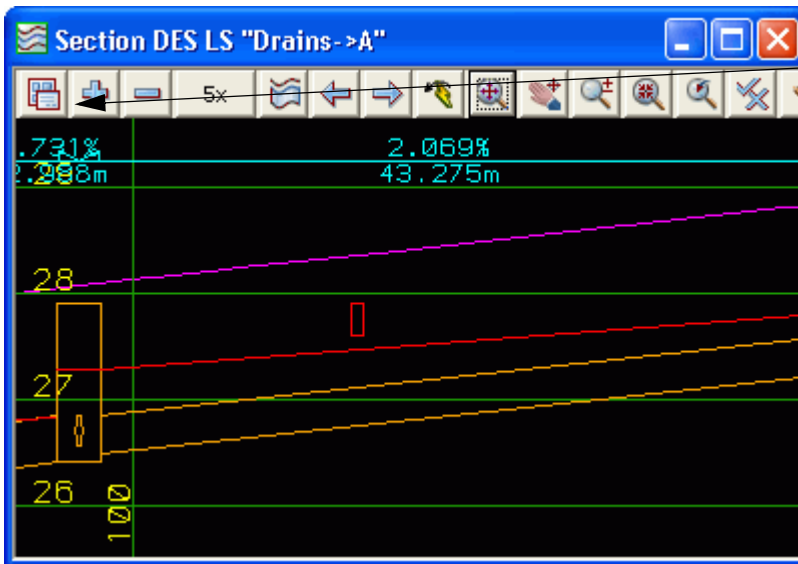


12d service clash routines notify the user of crossing services but not parallel services that are close to each other. The clearance values are vertical distances at the centre line of the drainage and service strings. The minimum clearance may be less than the vertical clearance if the drainage or services are on very steep slopes.

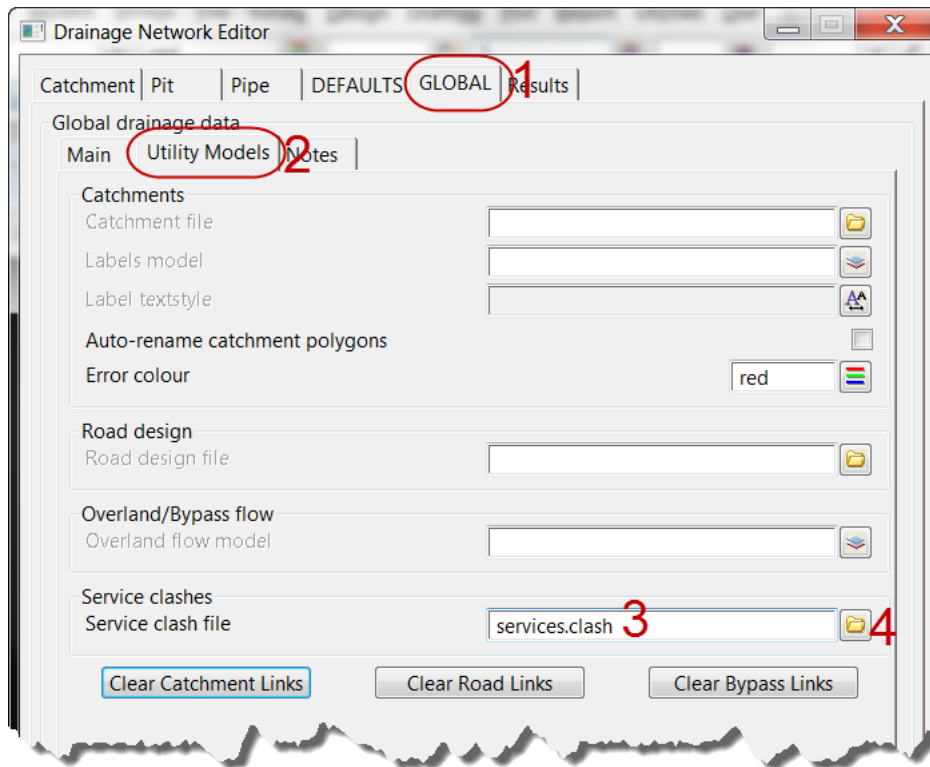
To view parallel services, add the services model onto a section view, profile a drainage string and then set the corridor value for the section view.



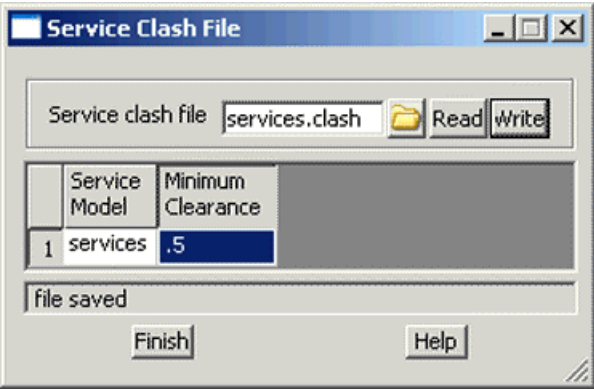
Settings->**C**orridor and then set the **W**idth **l**eft and **W**idth **R**ight to the desired clearance. If the service can be seen then it is within the tolerance. 11 is used in this example only so that you can see the service on the other side of the road.
Use the **N**ext and **P**rev button to switch drainage strings.



To obtain a report of all strings inside or crossing the drainage string profiled, select the **View menu** button then **Utilities->Report**

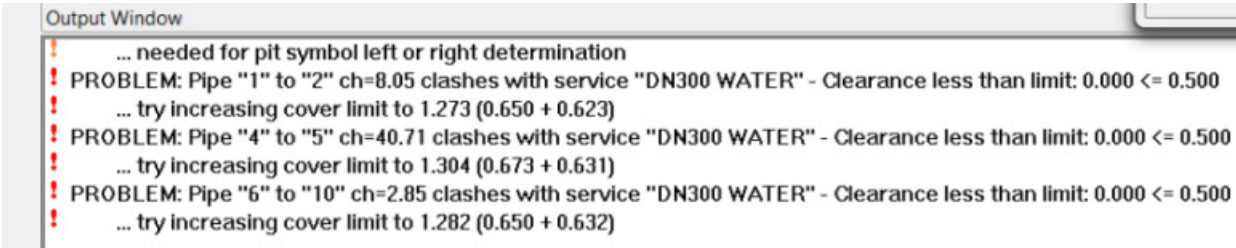


1. Select the **Global** tab
2. Select **Utilities Model** tab
3. Type **services** to create a new services file.
4. Select **Open** from the icon list.

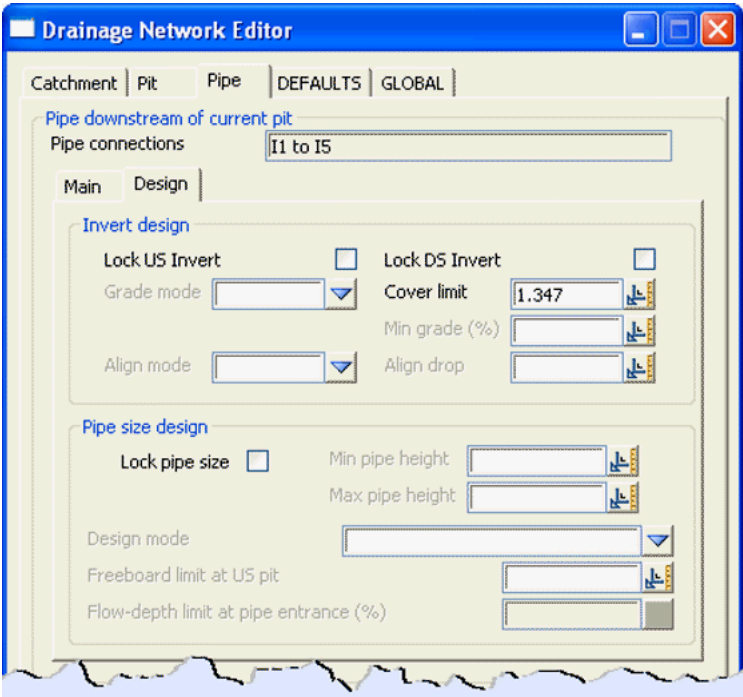


In the **Service model** column **RB** to select the model. Enter **Minimum Clearance** for the services in this model. Include an extra amount for the thickness of the drainage pipe. If the service model contains other drainage/sewer strings you must add the thickness of these pipes as well.

If different clearances are required for different services then place the services in different models. Warnings will be issued when you **Regrade Pipes**, **Set Pit details**, **Import** or **Storm Analysis**. Cover levels or fixed inverts can be used to avoid the services.



To quickly move to the section view of the string, Double click on the message in the output window (note the red! mark). The **DNE** will move to the pipe and with auto profile button enables the section view will update to this string.



The most common method to avoid the clash is to increase the **Pipe cover limit** for this pipe segment so that the pipe is pushed down.

If the clash problem is above the pipe then the **Max pipe height** may be used and multiple pipes are selected.

This method is preferred over locking the inverts as this leaves more flexibility for aligning the inverts.



Often changing the **Grade mode** to **Min grade** on a branch line will raise the downstream invert. This may allow the entire trunk line to rise and thus reduce excavation costs. This is especially true if the service clash is near the upstream end of the pipe.

Once the invert levels have been reset by selecting **Regrade pipes**, the output window will indicate the final clearance.

After a pipe design run in **Storm Analysis**, details of the service clash data will again be listed in the output window.

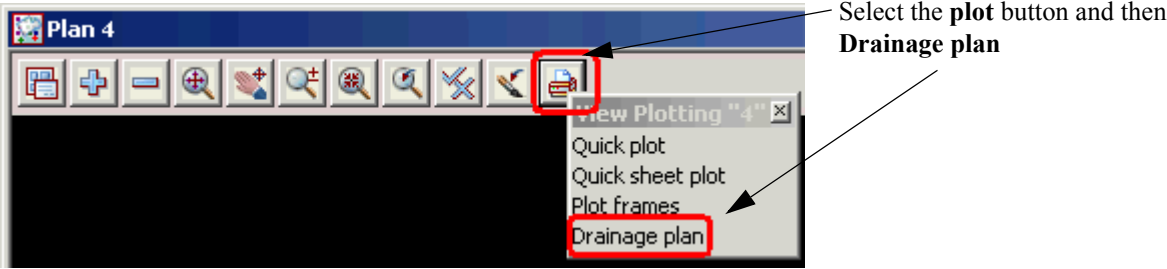
18.Drainage Plan Plots

The drainage plan plots create detailed drawings with symbols for the pits, linestyles for the pipes and string names ready to export to the desired layers in CAD. Pipes levels are 3d and setout points ready for downloading to survey total stations are prepared.

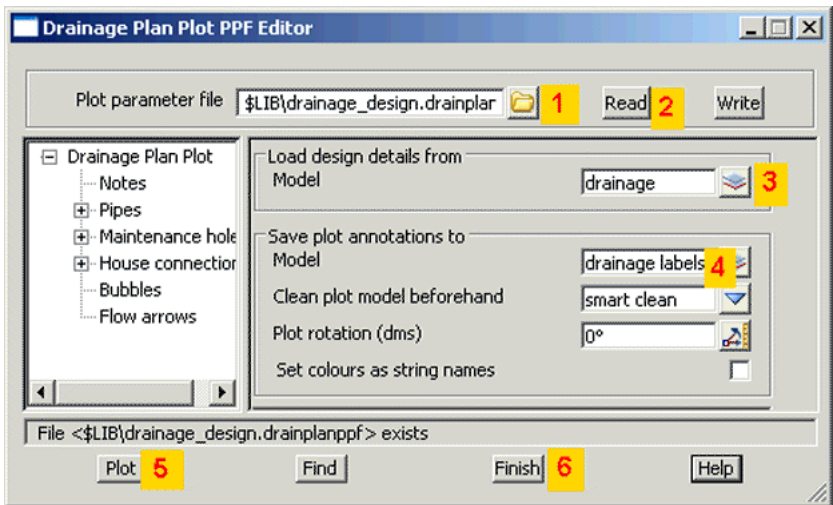
18.1 Labelling the Pits and Pipes

Plan plots are used to label the pits and the pipes. Drainage Plan Annotations may be accessed from one of three locations. The third is the most common.

Location 1: From the plan toolbar



Note (The following panel has been reduced in size).

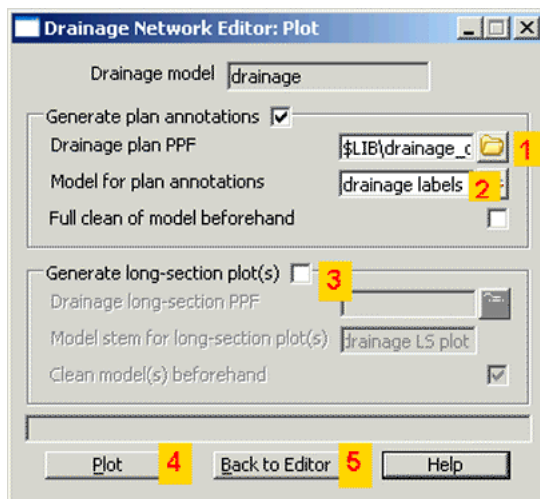


1. Select a ppf file from the library
2. LB **Read**
3. Select your drainage model
4. Type a model name for the new labels.
5. Select **Plot**
6. Select **Finish**

Now add the drainage labels model onto the plan view.

Location 2: The **Plot Button** on the **Drainage Network Editor**

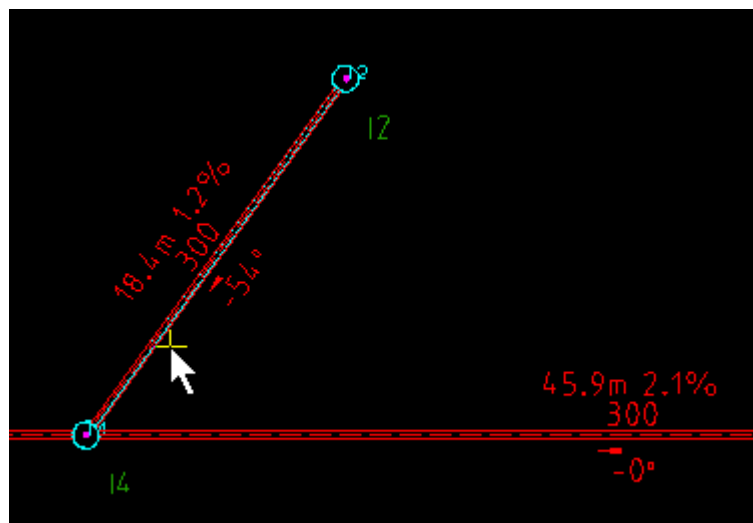
The following panel will be displayed. This option can plot both the long section and plan at the same time. Select a ppf file from the library (drainage_design).



1. Enter a model for the plan annotations.
2. Select **Full clean model beforehand** if you have not manually moved any of your man-hole labels.
3. Turn off the long section plot for now.
4. Select **Plot**.
5. Select **Back to Editor**
6. Now add the **Model for plan annotations** onto the plan view.
7. Note: if you rename the manholes you will need to replot these labels!



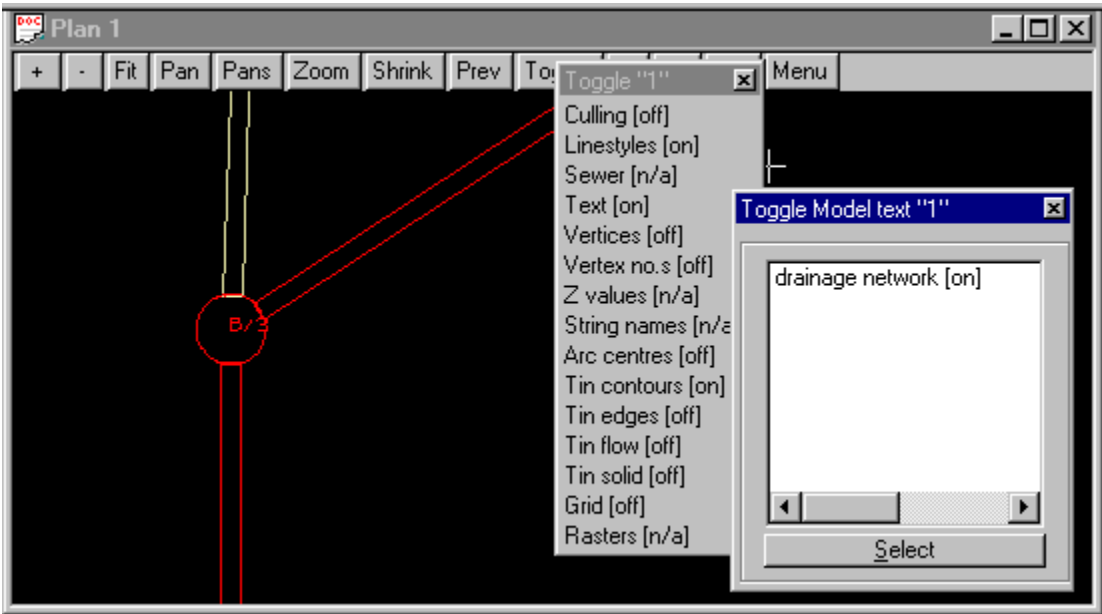
Note that **Full clean of model beforehand** was not selected. The drainage plan plot does a smart clean where it deletes and reprints text that has not been manually moved and updates text that has been moved.



The text properties can all be customised using the plot parameter file but this will be discussed later in the plotting section. These labels are **not** automatically updated when you change the names or pipe diameters. You must rerun the plot routine to update the labels.

18.1.1 Turn off View Text Pit Labels

To turn off the automatic view text pit labels for this view select Toggle=>Text and then walk right to select the drainage model. Do not click on **Text**, rather walk right. If you click **Text** you will toggle on/off all of your text on the view, not just the drainage model.



18.1.2 Moving Text

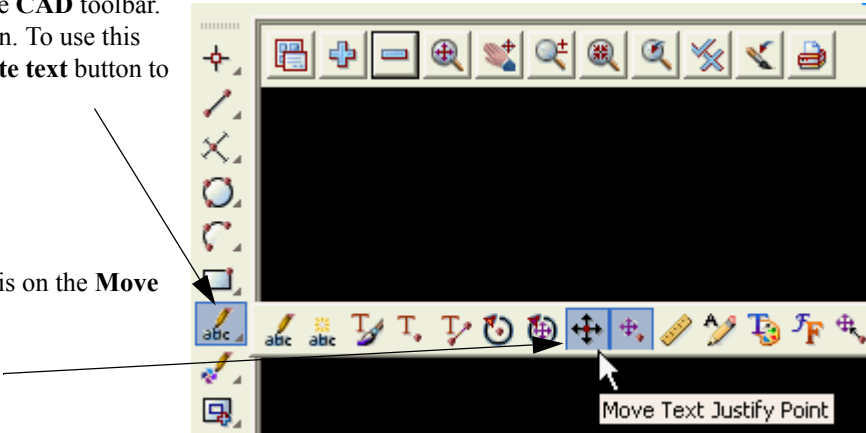
The labels created may be manually moved using the **CAD toolbar** but if the model is relabelled the text will return to its original location! Text moved via the **Drafting->Multi string translate** will remain in the moved position when **Smart Clean** is selected in the Plan Annotation panel.

Before selecting text turn on your **teXt snap**.



To move a single line a text use the **CAD toolbar**. Select the **Move text justify** button. To use this toolbar you must **DRAG** the **Create text** button to the right

and then release when the pointer is on the **Move Text Justify Point**.



To move a pre-defined **Group** of text select

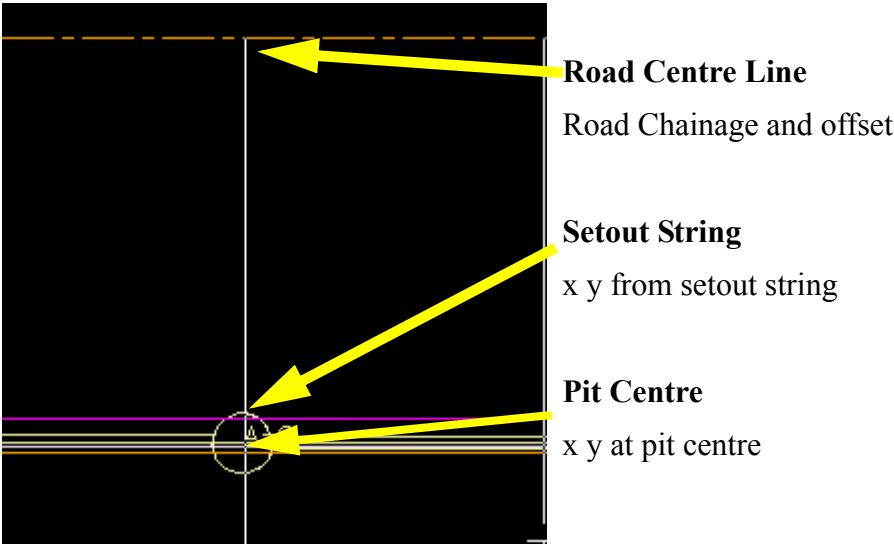
Drafting->Multi string translate



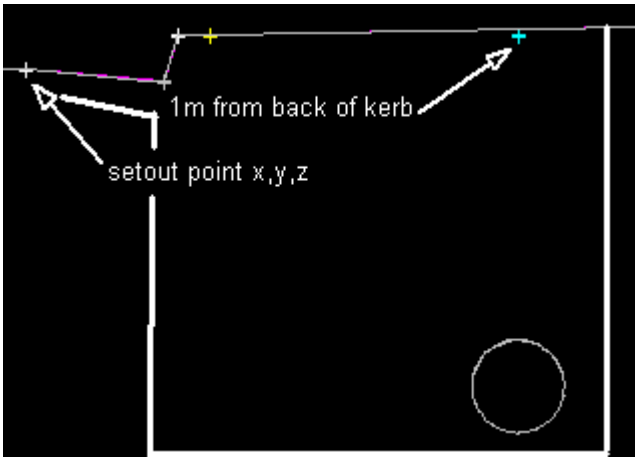
Select **Group** and then pick and accept one of the text items in the group. Move it to its new location and accept.

19.Construction Setout

Pits are setout on the construction site using a variety of techniques. The DNE creates a construction setout point (x,y,z) that can either be located at the pit centre or the pit centre can be dropped perpendicularly onto a design string for the xy location. The z value for the setout point has a number of modes as described below. Road centre line chainage may also be calculated



In the diagram below the setout point is lip of kerb. The setout x,y location level z will be obtained from the setout string and the pipe will be shown at its proper position so that the pipe cover is calculated correctly.



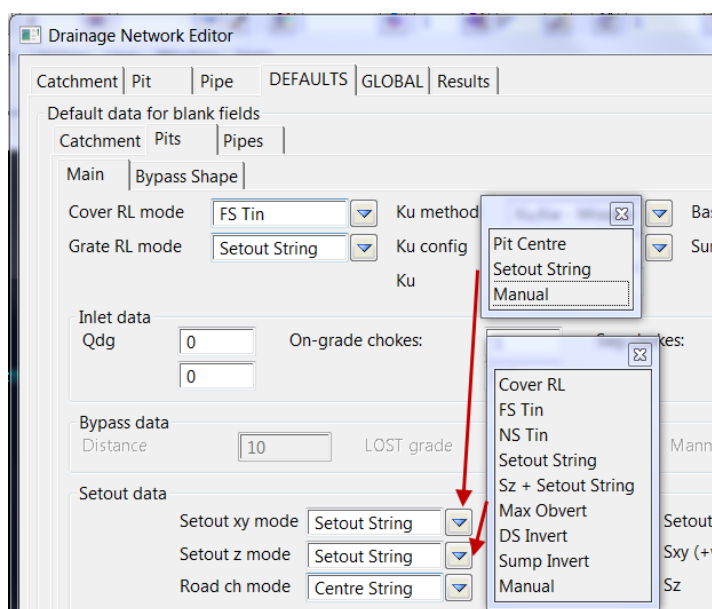
Pipes are setout using the pit connection points and the invert levels.



Design->Drainage-Sewer->Convert to Pts and Lines will create 12d super strings with the pipe attributes on them.

Setout reports can be created and the drainage plan plot generates strings for the surveyor to download to the instruments.

19.1 Pit Setout (xy)



Setout xy mode - Pit centre is the centre point of the manhole (the intersection of the joining pipes). Often the setout point for a manhole or catch basin is not the centre of the manhole but rather a point on the kerb or back on the foot path. The **setout string** option will drop the centre point of the manhole onto the closest string in the **Road design** model list specified on the **Global->Utility models** tab.

Setout z mode options are listed in the panel. This levels are used in the pit schedules.

There are currently 9 modes for determining the pit setout levels.

Cover RL - this ensures the level is the same as the Cover RL (not available for Cover level).

FS tin -The level is obtained from the finished surface tin at the pit centre.

NS tin -The level is obtained from the existing surface tin at the pit centre.

Setout String - The pit centre is dropped perpendicular onto the setout string and the level is obtained from the elevation on the string.

Sz + Setout String an offset is added to the level from Setout string described above.

Max Obvert- all connecting pipes, usually open channels, are checked for the highest obvert.

DS Invert - the invert of the outlet pipe (there is only one).

Sump Invert - the lowest pipe invert plus the **Sump offset**.

Manual - The user must manually type in the cover levels (rarely used as a default).

[Explicit settings](#) for the setout strings and the auto calculated values are found on the **Pit-Setout** tab. If the **manual** mode is selected the Easting and Northing locations may be picked in plan view or typed into the input boxes.

19.2 Pit Setout (z) Level

The setout level defines the level to be printed in the pit setout tables and in the drainage longsection plots. The **FS Tin** selection obtains the level from the FS tin, specified on the **Global-Main** tab, at the centre point of the pit. The **Setout String** location obtains the z level from the setout string as described in the section above. [Explicit settings](#) and the auto calculated value are found on the **Pit-Setout** tab.

19.3 Road Centre Line Chainage

If **Road chainage mode** is set to **Centre string**, then the **Centre String ID** in the **Road design file** (shown above) is used to select the road string to measure the chainage and offset from. The values and [explicit settings](#) for the road chainage and offset are found on the **Pit->Setout** ta

19.4 Pipe Setout

Pipe setout is along the centre line of pipes.

19.5 Plan Plots for Surveyors

Use the drainage plan plot routine to create survey setout point for each pit and strings for each pipe with the invert levels. If **drainage_setout** is not in your library, start with **drainage_inverts**.

The first screenshot shows the 'Drainage Plan Plot PPF Editor' window. Step 1: The 'Plot parameter file' is set to '\$LIB\drainage_setout.drainplanppf'. Step 2: The 'Read' button is highlighted. Step 3: The 'Drainage Plan Plot' branch is selected in the left tree. Step 4: The 'Load design details from Model' dropdown is set to 'drainage'. Step 5: The 'Set colours as string names' checkbox is checked. The second screenshot shows the 'Pipes' branch selected in the left tree (Step 6). The 'Trim mode' dropdown is set to 'trim linestyles' (Step 7). The third screenshot shows the 'MH setout points' branch selected in the left tree (Step 8). The 'Draw setout points' checkbox is checked (Step 9). The 'Plot' button is highlighted (Step 10). The final step (Step 11) is to add the 'drainage_setout' model onto a plan view.

1. Select **drainage_setout** ppf from the library
2. LB Read
3. LB **Drainage Plan Plot** branch
4. Select the existing **drainage** model
5. ensure NOT selected
6. Select **Pipes** branch and note **Trim mode**
7. Select **Maintenance holes->MH setout points** branch
8. Note:**Draw setout points** is selected.
9. String names are sent to the survey instruments so select this.
10. Select Plot
11. Add **drainage_setout** model onto a plan view

19.6 Construction Manhole/Pit Schedules

Manhole/pit schedules or construction tables are generated in tab or space delimited formats.



This routine does not recalculate the setout locations. Similar to plotting, it prints the results of the last time the calculation were done (DNE->Set Pit Details).

Position of option on menu: **Design ==> Drainage ==> Reports ==> Pit schedule**

This routine prints the calculations from the last time Set Pit Details was selected in the Drainage Network Editor.

On selecting the **Pit schedule** option, the **Manhole/Pit Schedule** panel is displayed.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Drainage model name model containing the drainage strings	input box	drainage network	
Pit schedule file name file to be created	input box	pit report	
Report Format file format	choice box	Road chainge.,Easting...	
Data delimiter tab delimiters are best for spreadsheets and space for some text editors	choice box	Tab, Space	
Repeat header for each linetick box when selected, the column headings will be printed each drainage line	checkbox	selected	
Process Create the pit report	button		
Finish remove the panel from the screen	button		

Notes:

The columns of data may be separated by spaces or a tab. (tab is used for spreadsheet transfers). The internal width and length data are retrieved from the **drainage.4d** file for the pit type specified. If you want a longer description for the pit then the type used inside 12d this can also be entered in the drainage.4d file. The remarks for each pit are entered as user defined pit attribute named **remarks** and may be set using the attribute editor (on the drainage menu) or via a spreadsheet.

Easting Northing Sample

```
.PIT SCHEDULE
Pit
No  TYPE  EASTING NORTHING  WD  LEN  DIA  INV LEV  DIA  INV LEV  FIN RL  DEPTH  REMARKS
B1  SA2   5302.458 7336.936  450.000  900.000  375  27.470  375  28.210  29.387  1.177
A2  SA2   5264.372 7322.036  450.000  900.000  375  27.470  375  28.646  28.646  1.226
C1  SA2   5224.155 7336.936  450.000  900.000  375  26.690  375  27.863  27.863  1.173
A3  SA2   5187.910 7322.036  450.000  900.000  375  25.930  375  27.158  27.158  3.628
A1  SA2   5309.458 7321.100  450.000  900.000  225  27.470  225  28.550  29.577  1.027
A2  SA2   5264.372 7322.036  450.000  900.000  225  27.470  375  27.420  28.646  1.226
A3  SA2   5187.910 7322.036  450.000  900.000  375  25.930  375  23.530  27.158  3.628
A4  SA2   5157.411 7321.332  450.000  900.000  375  23.090  375  26.714  26.714  3.624 outlet to existing
```

system
NOTE:
1. ALL SETOUT POINTS QUOTED TO CENTRE OF PIT

Road Chainage Offset Example

DRAINAGE LINE A					
PIT NO.	PIT LOCATION		LOCATION OFFSETS		
	EASTING	NORTHING	STATION	CTRLOFFSTYPER	REMARKS
A/1	5354.629	7336.936	231.171	d002-7.450	
A/2	5340.691	7320.911	217.233	d0028.575	
A/3	5293.458	7320.886	170.000	d0028.600	
A/4	5250.131	7320.886	126.673	d0028.600	
A/5	5217.194	7322.036	93.736	d0027.450	
A/6	5183.458	7322.036	60.000	d0027.450	
A/7	5152.699	7322.036	29.241	d0027.450	

Notes

The Set pit details must be run at least once to before printing the report. If the pits are moved or the designed strings changed then this option must re rerun.

The easting northing data obtained for the **road design string** option is obtained by dropping the pit centre perpendicular onto the selected road design string. This data is stored as pit attributes **setout x** and **setout y**. It is calculated when the **Set Pit Details** is selected in the Drainage Network editor.

20.DNE and Rational Hydrology

The rational methods uses the formula $Q = CIA/360$ where

A =	catchment area (hectares)
C =	runoff coefficient
I =	rainfall intensity (mm/hr)
360	conversion factor to m^3/s for area (ha) and rainfall (mm/hr)

The rainfall intensity requires the input/calculation of the time of concentration (t_c) for the catchment and then a return period to be used in the IFD table (see [12d Rational Method Hydrology - Drainage Rainfall Editor](#)).

The total area entered/measured may be split into impervious and pervious and analysed separately.



If you use a single composite C value for your catchments, enter a %impervious of zero and ignore the impervious settings.

Many authorities increase the C values for major storms. If you do not then enter the same C for minor and major. Similarly T_c values are sometimes reduced for major storms so you have the option to enter a minor and major C value. An example is provided below.

Total Area = 0.1	%imp=80	Cminor	Cmajor	Tc minor	Tc major
Impervious	Area*%imp	0.9	0.92	5 min	5 min
Pervious	Area-Imp area	0.3	0.31	10 min	10 min

20.1 Network Editor - Global, Default Settings and Explicit Settings

This section will discuss the **Global, Defaults** and [explicit setting](#) for the hydrology parameters. Design values for the hydrology and hydraulics calculations are set

s either globally (one value for the entire network)

s or via defaults.

Defaults values may be overridden by explicit settings found on the top level **catchment, pits** or **pipes** tabs. Explicit over ride catchment settings need only be specified if the default value is not desired. Only fill them in if you want to use a value different than the default. The tool tip will indicate the default values.

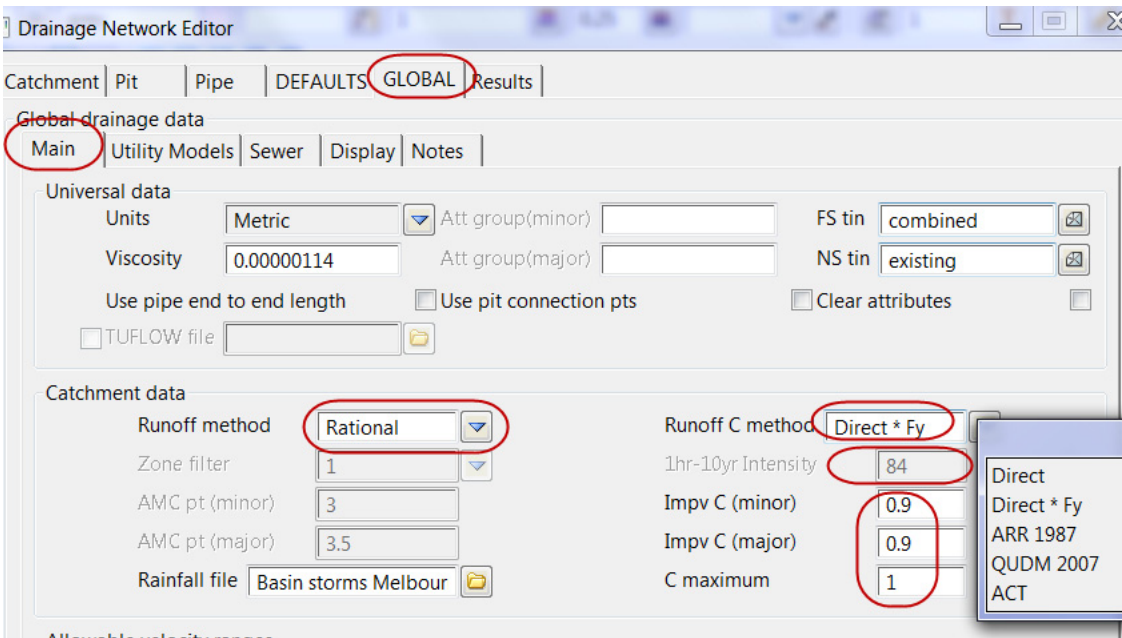
Default values must be entered for all of the fields for Set 1. Set 2 and Set 3 blank default values will use the defaults you have used in Set 1.

20.1.1 Catchment Areas and Percent Impervious

There is no default catchment area to apply to all catchments. You may type in the catchment area or create a string where 12d will measure the plan area ([Drawing Catchment Strings in 12d](#)).

The percent impervious will split the catchment area into the pervious and impervious sub catchments. Separate C and t_c values are used for the pervious and impervious areas. The default percent impervious for the various sets are entered on the **Defaults->Catchment Defaults** tab and the [explicit settings](#) are on the **Catchment** tab. The percent impervious is used also used to determine the composite C value if using the **ARR 1987** method for calculating runoff coefficients.

20.1.2 Coefficients of Runoff
Global Settings



Runoff C methods include **Direct**, **Direct * Fy**, **ARR 1987**, **QUDM 2007** and **ACT**.

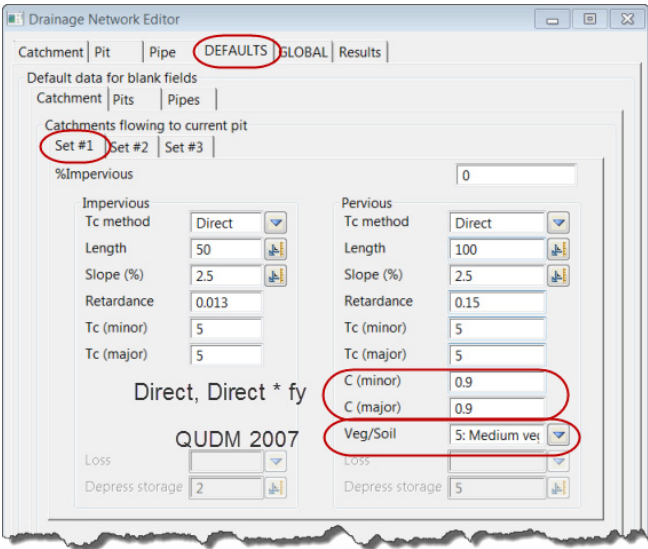
Direct: There is a global impervious C value for minor and major storms. This can only be set once. The C values for the pervious areas may be changed for every catchment in your model.

Direct * Fy: For urban areas in Australia the flood frequency factors (fy) are constant for urban hydrology. You are required to enter the f10 values, the same value for minor and major. For rural areas the direct method is required.

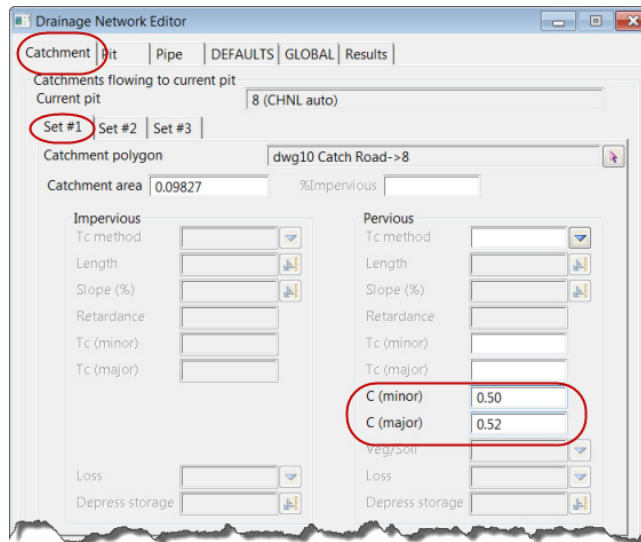
ARR 1987: The composite C value is calculated using the **1hr-10yr intensity**, the percent impervious, ARR frequency factors and the return period specified when hydrology runs are made. **You must enter the 1hr-10yr intensity value. No C values are entered if this method is used!**

QUDM 2007: Similar to the ARR 1987 method (except when the %impervious for the catchment = 0.0). The **Veg/Soil** type must be entered for the catchment via the default catchment tab.

Default Settings

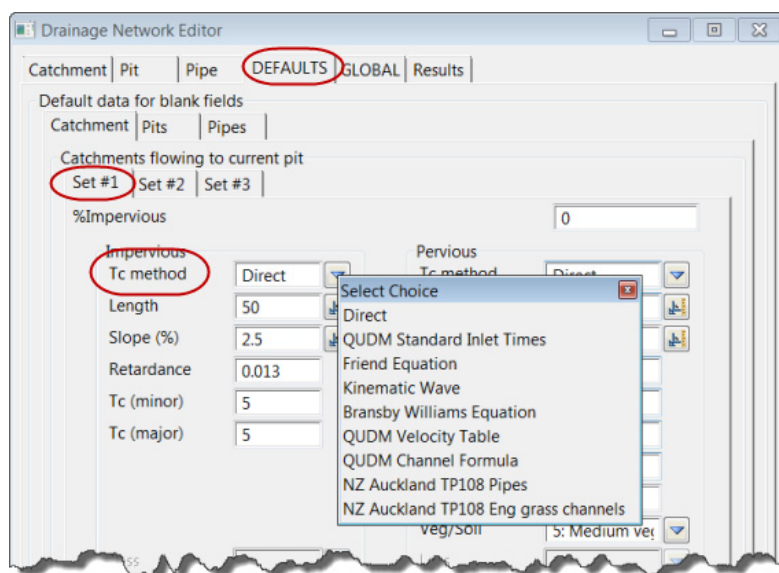


Explicit Settings



20.1.3 Times of Concentration

There are several methods for entering times of concentration for the catchment areas (see list below). Since each catchment may use a different tc method, all of the tc parameter fields on the defaults tab are active and required. They must be filled in even if you do not plan on using that value.



1. **Direct method** requires minor and major tc values.
2. **Friend, Kinematic Wave, Bransby Williams and QDUM** methods require the retardance, length and slope of the catchments to be entered. Default values must be entered but the optional [explicit settings](#) for slope and length can be entered on the catchment tabs or a catchment characteristic strings may be drawn (see [Catchment Tc path strings](#)). The length of this string is used for the length parameter and the design tin is used with the string to calculate the slope using the equal area method.
3. Data for the remaining methods is entered in a similar fashion.

20.2 Catchment Areas

Key Points

1. You do not have to draw catchment strings. You can enter the catchment areas manually (ha or acres).

2. When drawing catchment polygons, start near the inlet for auto linking.
3. 3 catchment sets are available and all catchment polygons must be in these models.
4. Specify catchment models via Network Editor->Global->Utility Models **Catchment file**.
5. Network Editor **Set Catchment** button links the polygons and calculates the areas
6. Once a string has been linked to an inlet, it will remain linked until it is deleted or the link has been cleared (**Clear Catchment Links** on the Globals->Utility Models tab).
7. Manual linking available via DNE->Catchments->Set x->Pick button (RB for a manual clear).
8. Manholes (set via cap_config in drainage.4d or **Inlet config** on the **Pit->Main** tab cannot have linked catchments.
9. Use the CAD polygon tool for drawing catchments OR close the string for sag pits
10. You can disable the auto selection of a string via Right mouse on the pick button then select **Clear**.

The catchment strings may be drawn in a CAD package and then imported into 12d or drawn inside 12d. The strings may be easily drawn in 12d with the tin contours and/or flow arrows displayed in the plan view.

When a catchment string is created to define the area for an inlet then all other data entry types will be ignored and the area from the string will be used.

There are 3 sets of catchments and it is up to the user to decide how they are to be used. Each set has its own percent impervious. The most common is to use the sets as land use types (roads, lots and park land for example). Another frequently used option is to use set 1 for all the impervious areas and set 2 the pervious and set 3 for special areas. The 3 catchment sets are drawn in three different models.

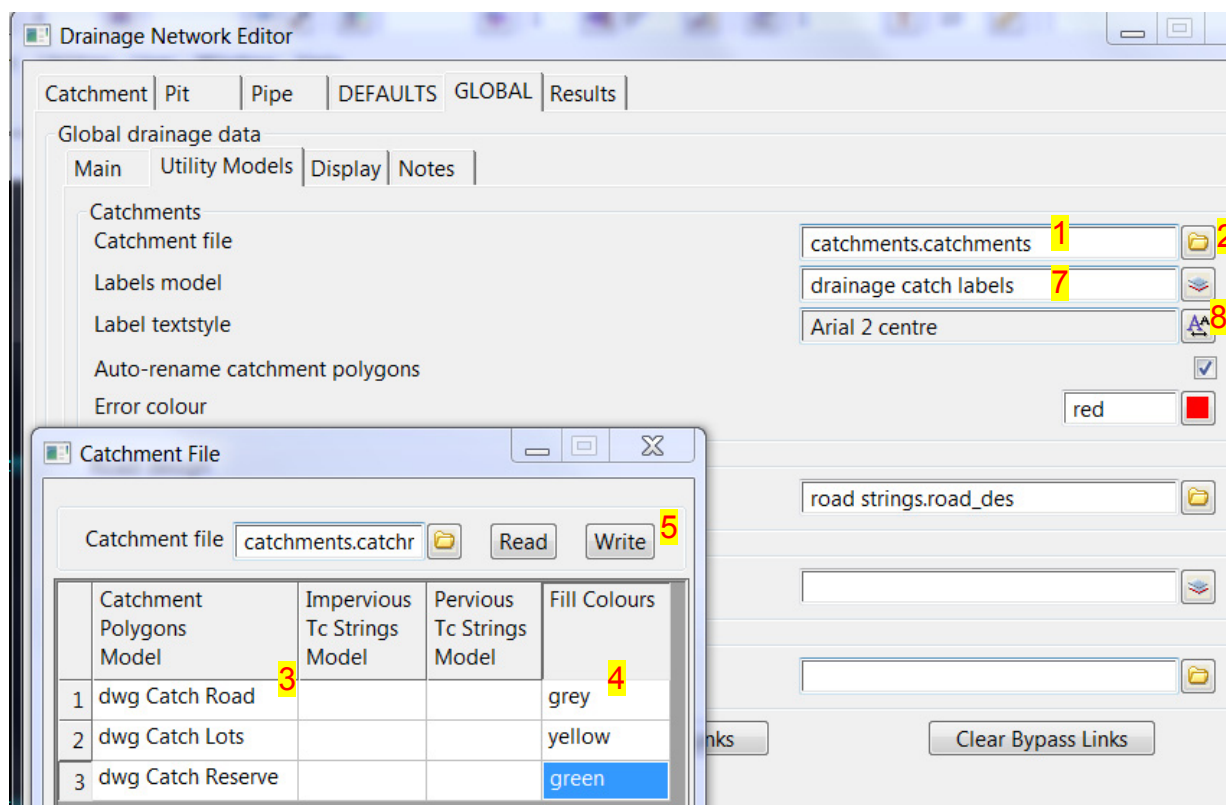
If exporting to external drainage design programs, the package may not accept all three sets so check the interface notes before defining the catchments.

Set Catchments - Auto Linking

In each set/model, 12d will automatically link the catchment string to the inlet that is closest to vertex 1 on your catchment string. This is the preferred method. If this is not possible, then an inlet may be manually linked to a catchment string using the [Catchment manual link](#). More on catchment links may be found in [Catchment string links](#).

Also see [Checking the Automatic Catchment Linking](#)

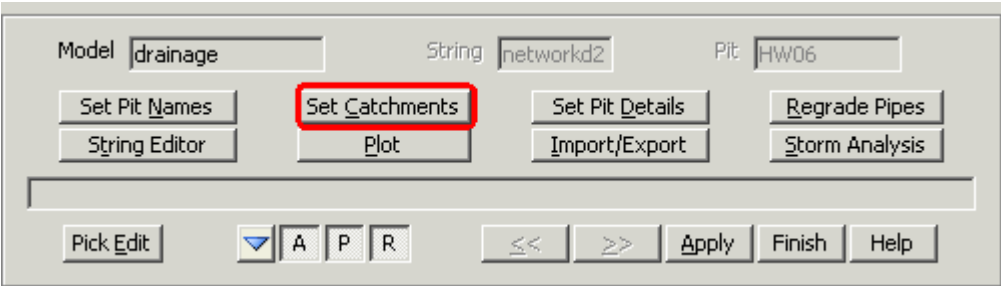
Start the **Drainage network editor** and move to the **Global** Tab and then the **Utility Models** sub tab.



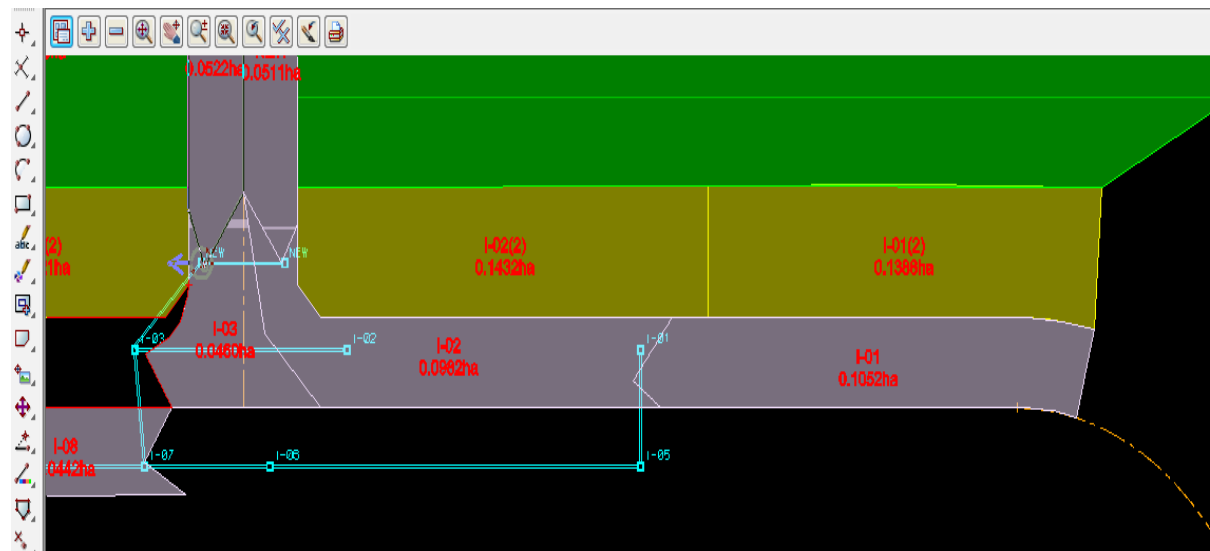
1. Type a filename for the catchment file
2. LB **More info** button and then select **Open**
3. RB to select the catchment model for set 1 (used in the **CAD control bar** above). Every inlet can have up to 3 catchments, row 1 is catchment set 1, row 2 for catchment set 2 and row 3 for catchment set 3. Often the sets are used as catchment types. for example
Set 1 - Roads, Set 2 Lots and Set 3 Parks
4. .Optional - RB to select a fill colour for the catchments
5. LB **Write** to save the file
6. LB **Finish**
7. Type a new model name for the catchment labels (optional)
8. LB **More info** button to select textstyle (required if **Labels model** is used)

The **Auto-rename catchment polygons** will set the name of the catchment string to the pit name that it is linked to. If it is not linked to any inlet it will be named "**not used**". The model can be checked for **not used** strings by selecting **Models->String Info Table**. The catchment will also be filled with the **Error colour** if a catchment string is not linked.

Label Catchments



Finally select **Set catchments**. This will link the catchments to the inlets and label the catchments. Now add the model **labels** onto the plan view.



Adding the edges to the fills

To view the edges go to the View Menu button and select **Settings->Faces**

1. LB Draw Edges
2. LB Set
3. LB Finish

There are some cases where linking the closest inlet to vertex 1 is not feasible. In these cases you may manually link the inlet to a catchment.

20.3 Drawing Catchment Strings in 12d

There are 2 catchments on the south east side of the road that have not be drawn. Use the CAD polygon tool to draw the catchments

Before creating the catchment string set the **CAD control bar** data.

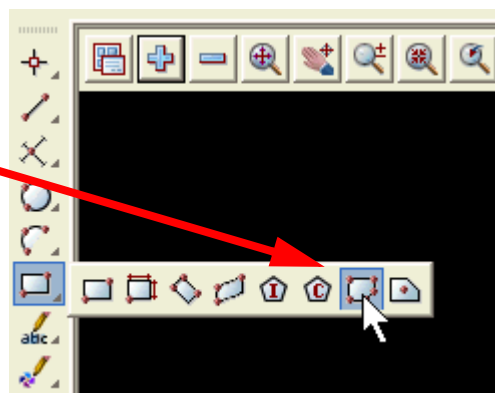
Type the name of a model for the catchment strings



Now to create the catchment string use the **Create line string** button on the CAD toolbar.

DRAG the **Create line** button and release at the **Create Line String** button.

The first point should always be placed near the inlet. 12d will assume that the catchment will drain to the inlet closest to this first point.



Draw the catchment strings with the accuracy you feel appropriate. Catchment strings for sag pit or drawn along a crest lines so take extra care near the crest low points where the water may overflow and bypass. Continue selecting and accepting the points on the catchment string and the press **ESC** to finish creating this string. You are now ready to create the next catchment string.



Sag inlet catchments: DO NOT START AT THE INLET, just start nearer to this inlet than any other! If you start at the inlet then move out to the crest of the catchment, the catchment overflow level cannot be determined from the catchment string.



CAD tips

Use the CAD toolbar eye dropper to load the properties from an existing catchment polygon.

Try CAD trace instead of CAD polygon to trace around edges of existing catchment areas. It is at the end of the CAD string fly out. Follow the directions in the 12d message area (bottom left of window).

Trace begins as normal string draw,
select **t** to start the trace, pick the start point on a string then
pick the end point of the trace, (if the trace is going the wrong way select **f** or **b**).

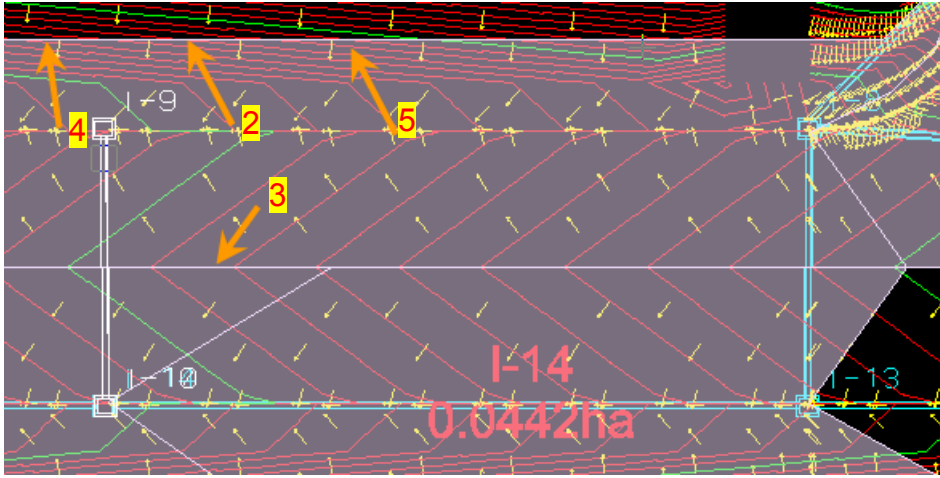
Now you can select another string to trace or
select **p** to return to pick mode.
select **c** to close and finish
and you are off creating another catchment string.

Once the catchments are drawn they become linked to the drainage network in the **Drainage network editor**. We will label the catchment with the inlet name and area at the same time.

20.4 Splitting Catchment Strings to Insert an Inlet

The catchment for the northwest sag pit needs to be split into 2 catchments for the inlet labelled I-9.

We will use mostly CAD tools except for Strings->Strings edit->Split. The trick is to roll the mouse roller ball once whenever you need to redraw the screen.

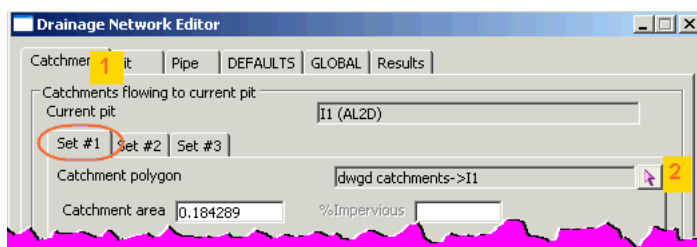


1. Cad String->Close to close the string. (roller ball!)
2. Strings->Strings Edit->Split, select string at split point (string area will go solid white - accept) roller ball!
3. repeat for south side
4. CAD vertex->Append select the string away from the split point, roller ball and draw the new catchment boundary. Single ESC to finish this string.
5. CAD vertex->Append select the string away from the split point, roller ball and trace the new catchment boundary. Double ESC to finish this string and end appending

Catchment manual link

The manual links are used when the first point on the catchment string is closest to the wrong inlet. Note that the following restrictions still apply.

1. The string selected for catchment 1 must be in the model for set 1. To check if you have selected a valid string select the **Set Catchments** button.
2. If the catchment string has already been linked to another inlet (automatic or manual) then the new link will be created and the old link erased.
3. If you change the catchment model for one of the sets on the **Network Editor->Global->Utility Models->catchments** than all of the manual links in that set will be erased.



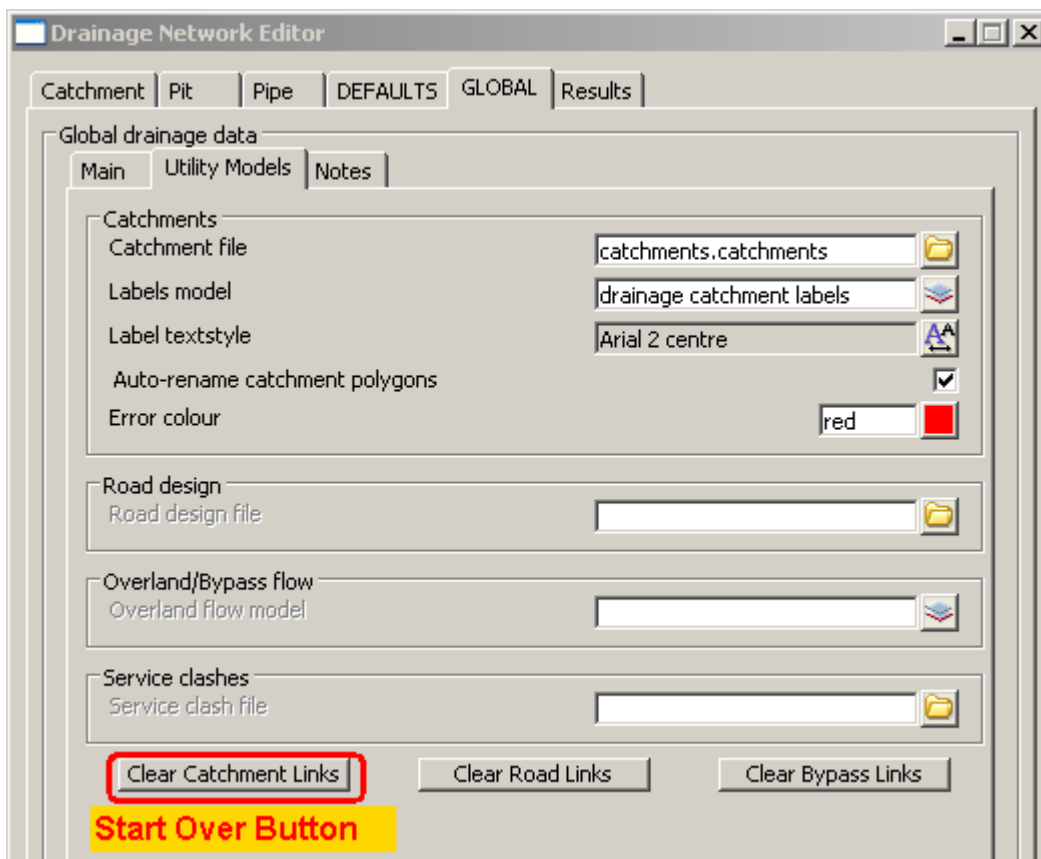
1. Change to the **Catchment** tab. Move to the desired inlet. I-9 in the plan above. The inlet will be circled in the plan view and its name shown in the **Current Pit** field.
2. LB Set 1 then LB the **Catchment polygon** button and pick the desired catchment string.
NOTE! If you decide to enter a value and NOT use the selected string **RB** on the button and select **Clear**.
If the **Auto apply** tick box is not selected then you will have to select the **Apply** button for the manual link to become active.
3. LB **Set Catchments** button. A prompt box appears asking you to confirm. Select **Yes**. To toggle off/on the confirm request **RB Set Catchments**. The measured catchment area will be shown in the **Catchment area** field using the units specified in the **Global-Utility models-Units** field.
4. Repeat these steps for the sag pit to the west.

Verifying the Automatic Catchment Linking

The automatic inlet-catchment linking is easily checked by after selecting the **Set Catchments** button on the network editor by any or all of the following:

1. Specifying a **Catchment labels model** with **Labels textstyle** on the **Global->Utility models** tab and . The catchment is indicated when the inlet is selected using the network editor. Since there may be three catchments per inlet the catchment data last viewed in the editor is the catchment that is highlighted.
2. Selecting the **Auto-rename catchment polygons** on the **Global->Utility Models** tab will set the name of the catchment string to the pit name that it is linked to. If it is not linked to any inlet, it will be named **"not used"**. The model can be checked for **not used** strings by selecting **Models->String Info Table**.
3. The unlinked catchment strings will be filled with the **Error colour** on the **Global->Utility models** tab.

Reseting All Catchment links to Start Over



There may be occasions where you will want to clear all of the catchment links and begin with a fresh start. Select **Clear Catchment Links** on Network Editor->Global->Utility Models.

20.5 Tc Path Strings

These strings are used to calculate the time of concentration for the impervious and pervious areas. For each catchment set, they are drawn in two models; one for the impervious paths and one for pervious paths. The models are specified using the **Catchment file** field on the [network editor](#) (Global->Utility model tab). The 3 rows in the **catchment file** correspond to the 3 catchments available for each inlet. Therefore it is possible to have a maximum of 6 Tc paths models!

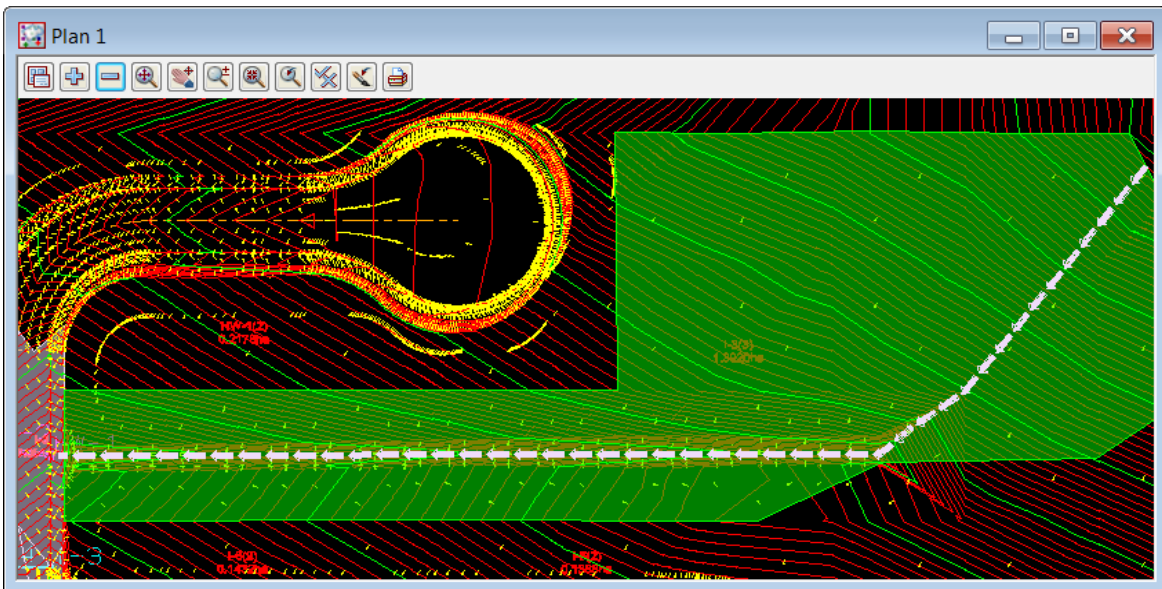
Key Points

1. Each Catchment set may have 2 Tc paths models. Pervious and impervious paths are kept in separate models.
2. End the Tc path string near the inlet that it is to be linked to.
3. Enter the paths models via **Catchment file** field on the (Global->Utility model tab)
4. You must select a Tc method (explicit or implicit) via the **Defaults->Catchments tab** or the **Catchments Tabs**. Just specifying the models is NOT enough!
5. Select **Set Catchments** to perform the calculations of length and slope.

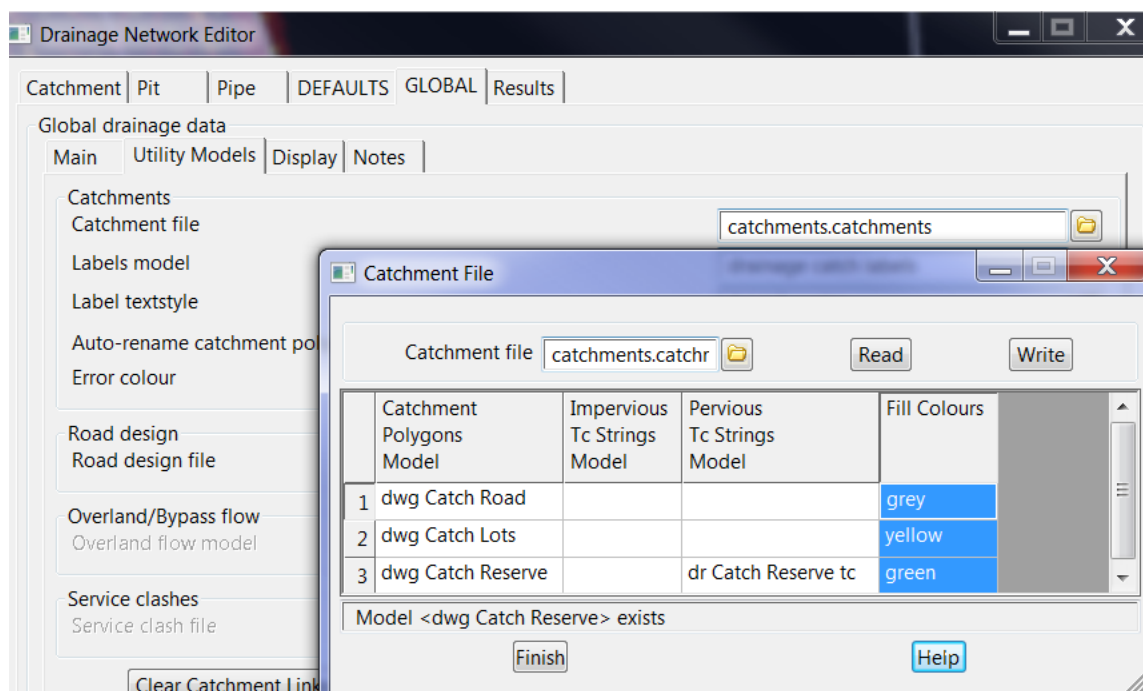
The tc strings can be drawn in the same way as the catchment strings but make sure that you change the model name first! The tc string model is then entered in either the impervious or pervious paths model columns (You could have up to 6 tc string models!).

20.5.1 Catchment slope (equal area)

The length of this string is used for the length parameter and the design tin is used with the string to calculate the slope using the equal area method. These strings are drawn from upstream to downstream, finishing nearest to the inlet they are to be linked to.

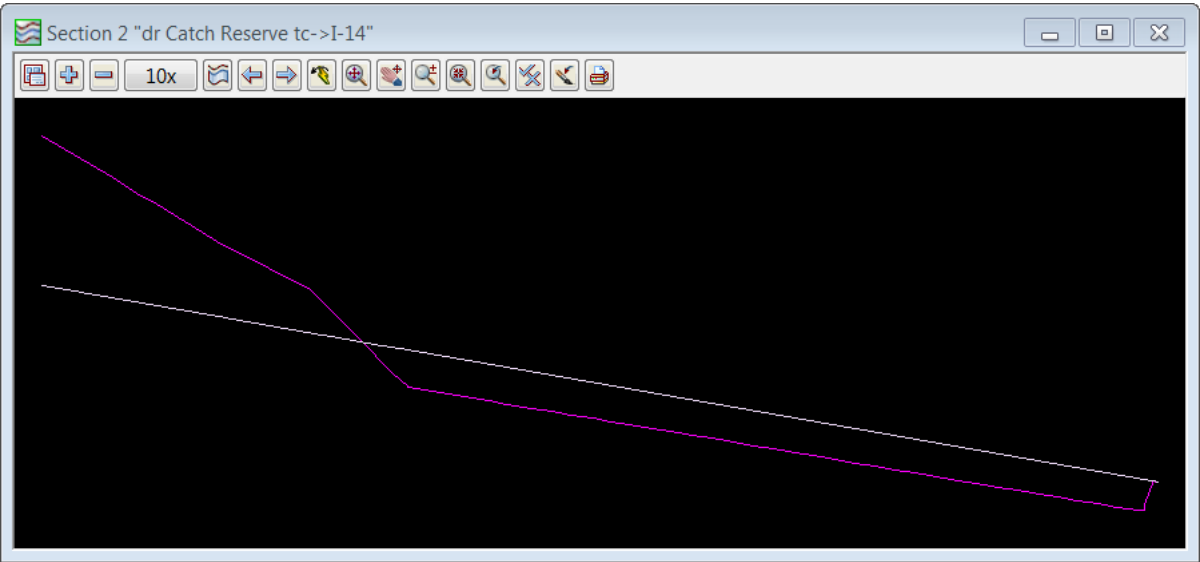


1. Change the Cad toolbar model to **dr Catch Reserve tc** and the line type to **FLOW LINE**
2. Use Cad line->Cad line to draw the flow path from the culvert inlet up to the top of the catchment.
3. Use Cad string->Reverse to that the string is in the same direction as the flow.



1. Change the Cad toolbar model to **dr Catch Reserve tc** and the line type to **FLOW LINE**
2. Use Cad line->Cad line to draw the flow path from the culvert inlet up to the top of the catchment.

The equal area slope is calculated when **Set Catchments** is selected. The slope string be profiled, with tin combined added to the view, to see the slope and the equal areas (see below) above and belong the tin.



21. Network Editor - Hydraulics

This section will discuss the hydraulic **Global**, **Defaults** and [explicit settings](#) for the hydraulic parameters. The [explicit settings](#) for the parameters described on the **defaults** tab will also be found on the **Pit** or **Pipe** tabs.

21.1 Grate Levels



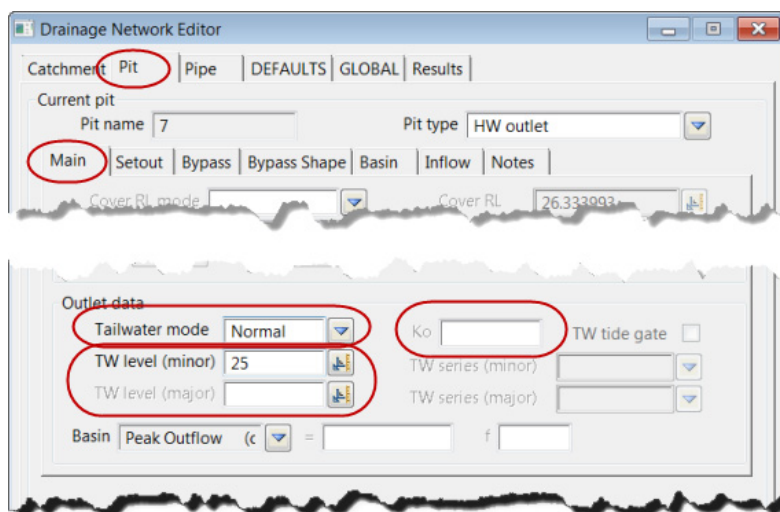
Important! Get the Grate level correct! The freeboard is measured from this level and if you do bypass cales the water will bypass if the hgl reaches this level. If the grate level is at or below the obvert of the pipe then the pit cannot surcharge and the pipe cannot flow full (it is an open channel). The grate level should not exceed the cover level except for pressurised, bolt down manholes and culvert headwalls.

Special Structures

- s **Bolt down manholes** will have the grate level above the cover level. The height above the cover will determine the hydraulic head required to "pop" the cover off and begin surcharging.
- s **Headwalls** cover levels are often the top of the headwall structure and the grate level is set to the highest point of the channel before bypass begins.

21.2 Outlet and Tailwater Conditions

The most downstream pit on each network requires tailwater conditions. Often the invert level on the downstream end of the last pipe also needs to have the invert level locked to either discharge into a waterway or join into an existing drainage system. When the most downstream pit is selected the following fields will become active on the DNE **Pit-Main** tab. If these field are not active and you think you are at the outlet see [Flow in the Wrong Direction](#).



Minimum will use the least of the **Critical** or **Normal** depths. If a fixed level is available for the minor and/or major storms, these value may be entered here.

The **Ko** is the loss coefficient for the exit losses into the downstream system. A value of 1 is typical for discharging into a pond or creek, or a Ku value for the pipe configuration in the pit the network is joining.

21.3 Culvert Hydraulics and Tailwater

To set the tailwater conditions for the culvert we created at the beginning of the course, select the outlet

1. Select **HW outlet**.
2. Select **Max Obvert** so the top of the headwall is at the obvert
3. Select **Manual** so that the grate level can be set above the max twl+ko losses.
4. Type **30.2** as the road overtopping level
5. Type **0.150** for the HW thickness.
6. Set the tailwater mode to normal and enter the expected twl.
7. Type the minor and major tailwater levels. These

In part 2 of the course we add an open channel to calculate a realistic tailwater for the culvert.

21.4 Pit Losses Ku, and Direct Flow

The **Qdg** (direct flow) (cms/cfs) is water flowing into the manhole. It is added to the approach flow and is subject to pit inlet capacity. This field will be disabled on the pit tab if the inlet type is set to a manhole.

The **Pit loss Ku** is used to model the energy losses through the pits and inlet control on culvert inlets. Three Ku methods are available, **Direct** (user entered), **Ku,Kw via charts** (may be negative), or **Ku,Kw >0 via charts** where all negative values are changed to zero. The remaining methods specify various headwall types for culverts. These will use inlet control curves and backwater energy loss coefficients.

Ku config has 4 options: **Preferred, Good, Fair** and **Poor**. The settings have no effect for 100% grate flow, straight through and 90° bends. For pipes with bends they determine the charts to use. The following are guidelines in selecting the Ku config.

Preferred	water impacts the opposite wall where it exits
Good	water impacts the side wall where it exits
Fair	water impacts the side wall and exits on the end
Poor	water impacts the opposite wall of the pit and exits on the side wall.

21.5 Introduction to 12d Ku/Kw Calculations

The following description is a very general overview of the Ku calculations in 12d. For a detailed description please see the 12d forum site <http://forums.12dmodel.com/>.

When 12d uses the Ku and Kw Charts, the values of upstream pipe angle, (Qgrate/Qoutlet), (Upstream diameter/outlet diameter) and (pit depth/outlet diameter) are calculated and used in the Ku/Kw charts. Three cases exist which determine which chart is used.

Case 1 - Pits with 100% Grate Flow

The angle between the ground approach flow and the exit pipe is measured. Charts, compiled from Sangster et al (1958) are used; G1 is used for angles less than 15 degrees (rare) and G2 for angles > 15 degrees. 12d's names G1 and G2 can be referenced to other publications in the table below.

Case 2 - Pits with More than 50% Through Flow

12d has 10 charts (T1-T10) compiled from the Hare (1981) and cross referenced to the QUDM and ACTDS Charts. In general T10 charts have greater losses than T1 charts.

Ku Config	0°	22.5°	45°	67.5°	90°
Preferred	T1	T2	T4	T8	T10
Good	T1	T2	T5	T8	T10
Fair	T1	T3	T6	T9	T10
Poor	T1	T3	T7	T9	T10

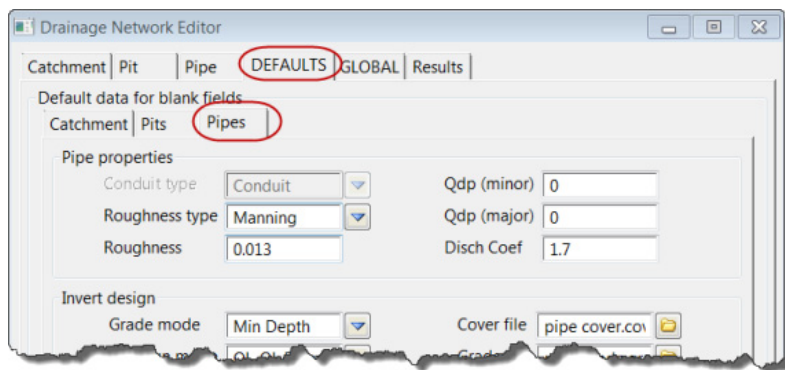
12d Chart Cross References

12d Pit Config	G1	G2	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10
QUDM Ku Chart #	32	32	33	34	35	37	37	38	40	42	44	46
QUDM Kw Chart #	32	32	33	34	36	37	37	39	41	43	45	47
ACTDS Ku Chart #	1	1	2	13	14	10	9	16	18	20	22	7
ACTDS Kw Chart #	1	1	2	13	15	10	9	17	19	21	23	8
ACTDS Pit Type #	1	2	3	11	12	8	7	13	14	15	16	6

Case 3 - Pits with between 0 and 50% Through Flow

With the flow condition between grate flow and through flow, a K value interpolation is performed based on the percentage through flow.

21.6 Pipe Friction Method, Roughness Values and Direct pipe flow

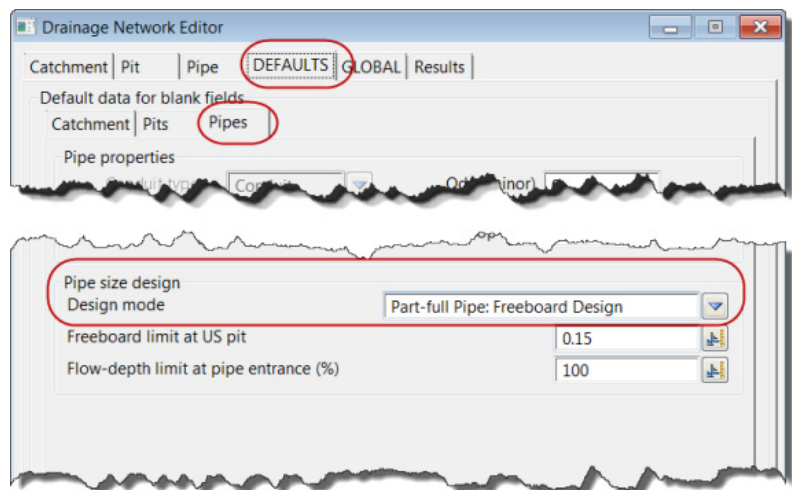


The **default** roughness and pipe roughness method are set here (**Colebrook (mm)** or **Manning**).

Qdp (direct pipe flow is flow) at the upstream end of the pipe that is included in the pipe flow calculations but is not included in the upstream pit losses nor restricted by the pits inlet capacity.

The ranges for pipe peak velocities are used for checking purposes only. If the velocities are outside this range, warning messages will be given in the output window.

21.7 Design mode, Freeboard Limit and Flow-depth limit



The **Design mode** has 4 options.

Pressurised Pipe: Freeboard Design does not use partial depths in the pipes and pipe sizes selected by checking the pit freeboard.

Part-full Pipe: Freeboard Design is similar to option 1 except gradual varied flow and hydraulic jumps are calculated in the pipes. Critical depth is the minimum depth at the upstream end of the pipe.

Part-full Pipe: Flow-depth Design is the similar to option 2 except the pipe sizes are selected by checking the normal depth in the pipe against the **Flow-depth limit**. Freeboard is also checked in this mode and if required the pipe will increase in size.

Open Channel: Freeboard Design is similar to option 2 except depths at the upstream end of the pipe may be less than critical depth for steep pipes (supercritical flow at the entrance).

The **Freeboard limit** is used for all **Design modes**. The freeboard is measured down from the grate level (**Cover RL plus Grate offset**).

The **Flow-depth limit at pipe entrance (%)** is used in **Design mode 3**. If the flow depth in the pipe is

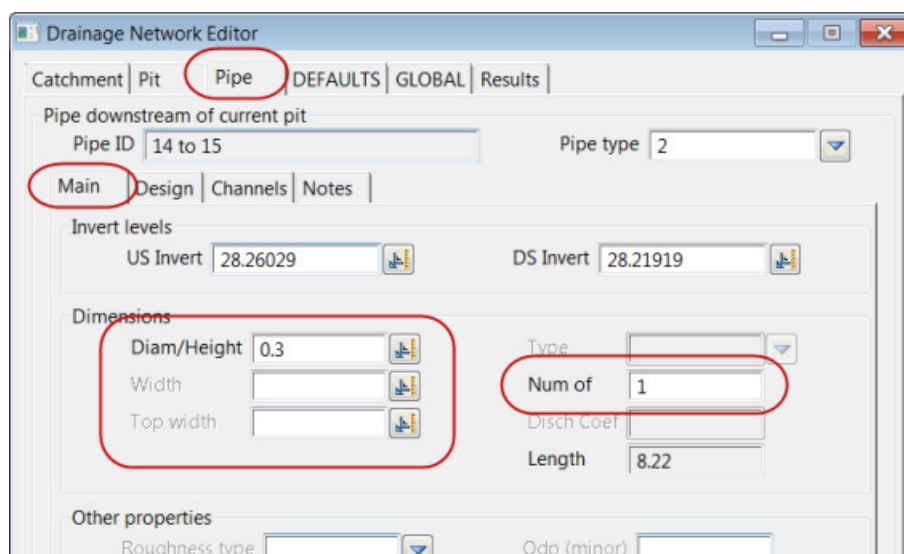
greater than this value the pipe size is increased.

21.8 Pipe Design Parameters - Sizes, Invert alignment, Min Cover, Max Height

The invert levels during design are controlled by the [pipe sizes](#), [max pipe height](#), min pipe cover and [invert alignment](#) mode.

21.9 Pipe sizes, Max pipe height and Multiple Pipes and Box Culverts

The 12d design engine will select pipe sizes from the file specified on the **Drainage Network Design** panel, **Preferred pipes file** field list. See [selecting pipe sizes](#). However, the maximum pipe height allowed before multiple pipes are used and the selection of box culverts is set on the **pipe->main** and **pipe >design** tabs respectively.



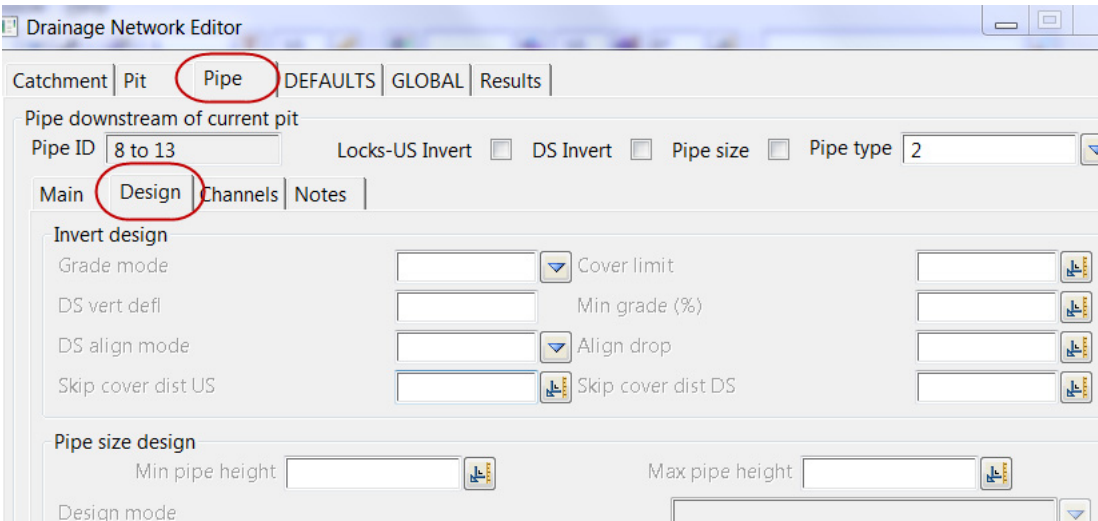
Num of specifies the number of identical pipes. The pipe flow is divided by this value when calculating losses.

To specify a box section in your network, select the pipe and enter a **width** for the pipe.

A **Top width** is used for trapezoidal channels. Note that if the hgl exceeds the top of the channel it will have friction on the soffit just as a box culvert.

For box culverts, the design engine increases the widths and maintains the height through the available sizes. Once the maximum height has been reached, the next culvert height and minimum width is checked.

21.10 Pipe Size Design



On the **Pipe** tab the **Lock Pipe size** prevents the 12d design engine from resizing the pipe.
Min pipe height can be set for each pipe segment (there is no default for this value).



Specifying a minimum pipe size may speed up 12d design. The starting value for pipe sizing will not be less than this value. That includes all downstream pipes as well. So if you know that the pipe needs to be this size or bigger, enter it here.

Max pipe height can be set for each pipe segment (there is no default for this value). If the 12d design engine requires a larger pipe, then multiple pipes will be selected.

21.11 Calculate Bypass flow routes

This option is required for pit inlet capacity calculations and is covered in the Stormwater Part 2 training.
As an introduction, the bypass strings determine the downstream bypass inlet for each inlet. Inlet capacity is determined from commands in the drainage.4d file. Road grade and crossfall measurements require the inlet to be linked to a setout string and pond depth measurements require a link to catchment string.

22.Drainage Design in 12d Drainage Design

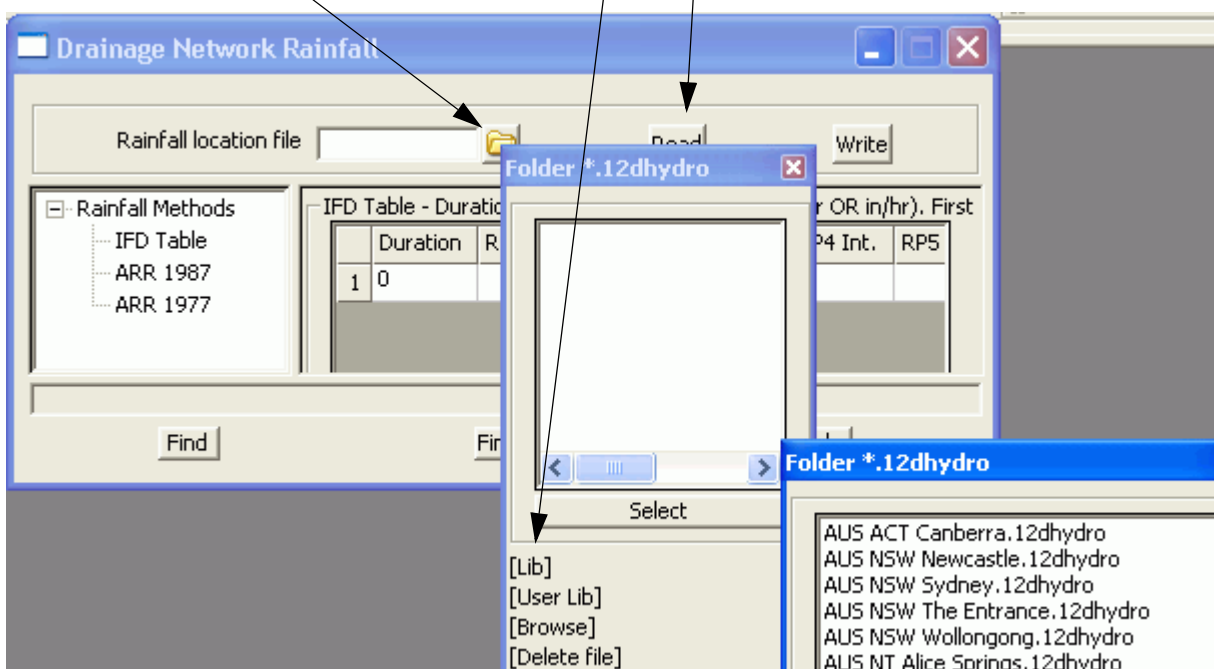
12d has a sophisticated rational method hydrology and hydraulic grade line pipe design engine. In addition it has the capability to export this data to several other popular drainage packages. Regardless of the design method selected, the drainage network in 12d is updated from the design so that drainage plans, long sections and pit schedules can be quickly produced.

22.1 12d Rational Method Hydrology - Drainage Rainfall Editor

The **Drainage Rainfall Editor** is used to input rainfall IFD data using several methods. The data is stored in hydro files (each file is for a specific location) that can be shared between 12d projects. The data is edited using an editor similar to those used for the plot parameter files (ppf). Seven methods for entering/calculating the rainfall intensities are shown in the panel below. From the main menu select,

Design->Drainage-Sewer->Rainfall Editor Data is entered using one (or more if desired) input methods and then saved by entering a **Meteorology file** name and selecting **Write**. The standard 12d system file search paths are used (project folder, user library folder and then library folder).

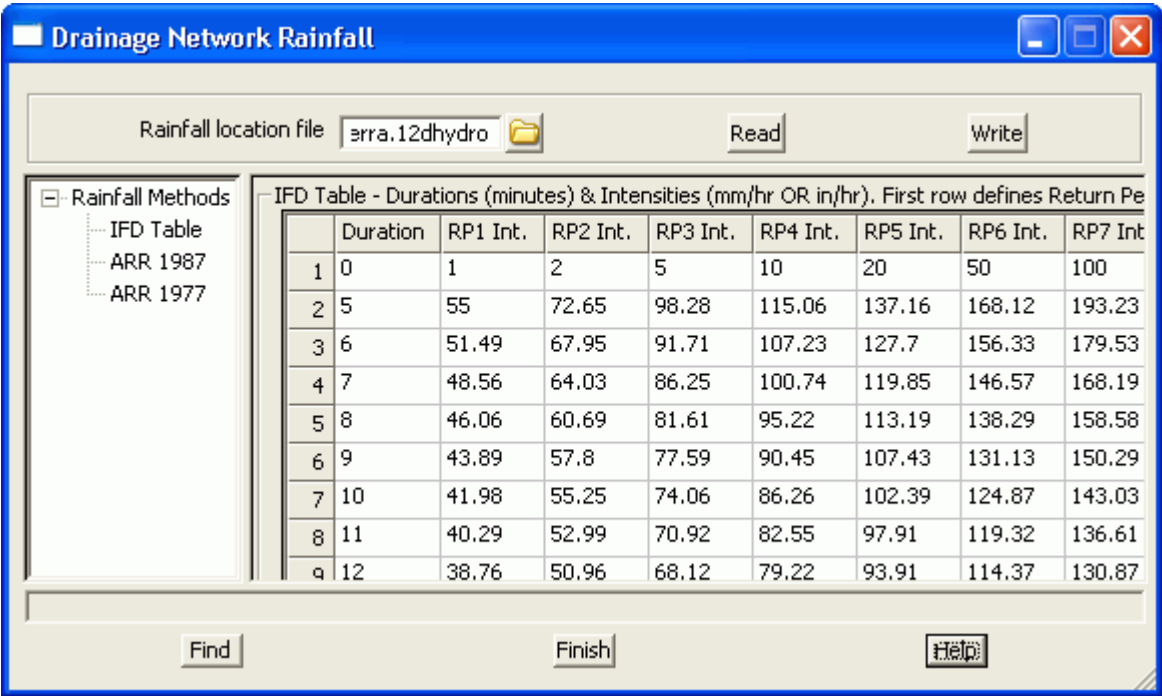
Select the folder icon and then walk right on the **Lib** item to display a list of sample files. Select a file the select **Read**. **YOU MUST SELECT THE READ BUTTON!**



22.1.1 IFD Tables

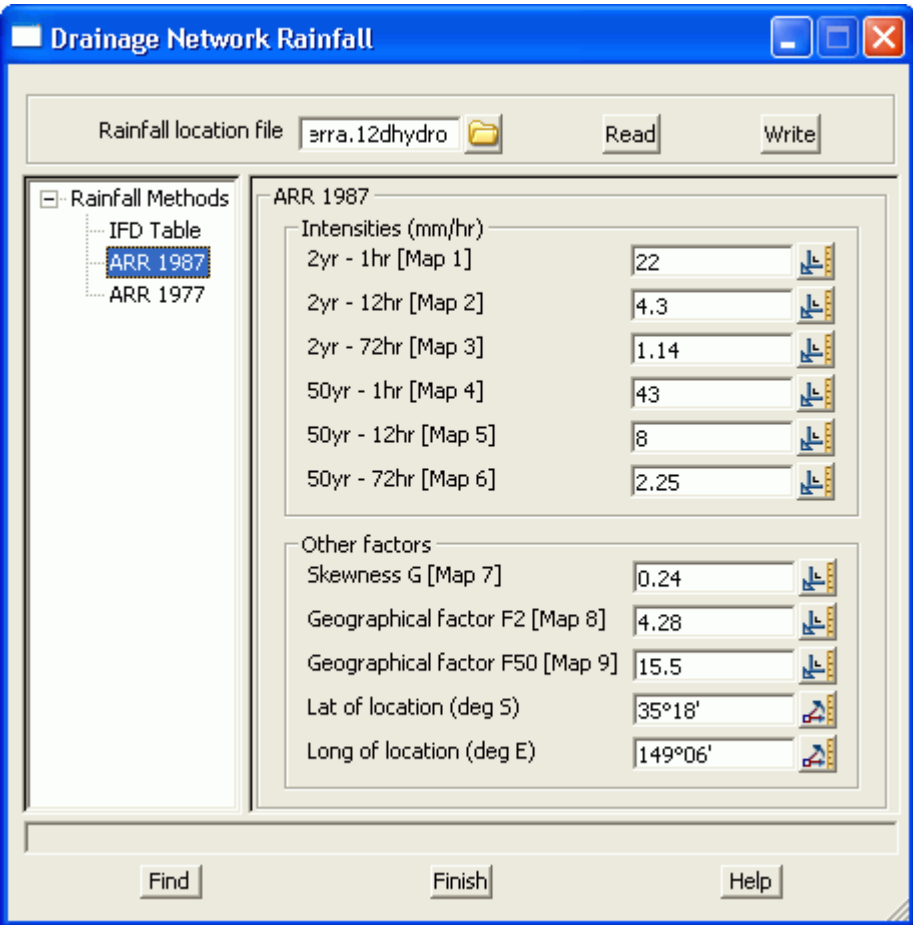
IFD tables are often available from meteorological services. The table input format follows. The first row is used to define up to 9 return periods and the following rows list the rainfall intensities for the duration entered in the first column.

Hint: to increase the size of the grid control select another method, ARR 1987 for example, and then select IFD table again.



22.1.2 Australian Rainfall and Runoff 1987 Method

The rainfall intensities and other factors from Volume 2 of ARR 1987 are entered in this table.



22.1.3 Australian Rainfall and Runoff 1977 Method

The seven coefficients for each return period from ARR 1977 are entered in this table.

Drainage Network Rainfall

Rainfall location file:

Rainfall Methods

- IFD Table
- ARR 1987
- ARR 1977**

ARR 1977 - Polynomial coefficients for pre-defined Return Periods

	Return Period	A	B	C	D	E	F	G
1	1	2.8386	-0.653	-0.0475	0.02647	0.00124	-0.002107	0.0002041
2	2	3.0966	-0.6689	-0.0541	0.02994	0.001906	-0.002457	0.000239
3	5	3.3669	-0.7178	-0.0741	0.0451	0.003726	-0.0041352	0.0004227
4	10	3.4971	-0.73	-0.0853	0.04462	0.005528	-0.0039794	0.0003366
5	20	3.6511	-0.7471	-0.0928	0.04868	0.006337	-0.0044	0.0003738
6	50	3.8104	-0.7659	-0.1036	0.05263	0.007596	-0.0048175	0.0003939
7	100	3.9186	-0.7775	-0.1095	0.05478	0.008397	-0.0049816	0.0003921

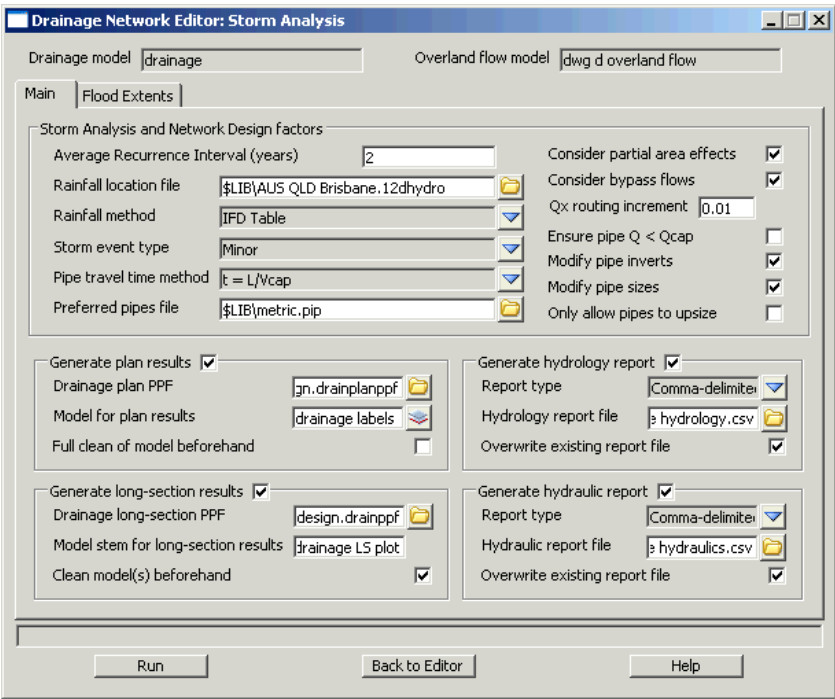
22.2 Drainage Network Design

The **Storm Analysis** button on the **Network Editor** executes the 12d drainage design, plots the drainage long section and plan annotation and prepares the hydrology and hydraulic design tables.

Model: String: Pit:

Invert levels reset ... see problems in Output Window

From the **Drainage Network Editor** select **Storm Analysis**. The following design panel will appear.



Storm Analysis Factors

The valid **ARI** will depend of the method selected but you cannot extrapolate beyond your data. Select the folder icon on the **Rainfall location file** and then walk right on the **Lib** line to select one of the rainfall files in the 12d library. If the file has only one type of rainfall definition then the **Rainfall method** field will be completed. Otherwise select the **Rainfall method** desired.

Storm event type determines which set of design values (**minor or major**) will be used for this run. **Pipe travel time method** should be set to the authorities requirements.

Enable the 12d rational method engine partial area calculations by selecting the **Partial area effects** box.

Network Design Factors

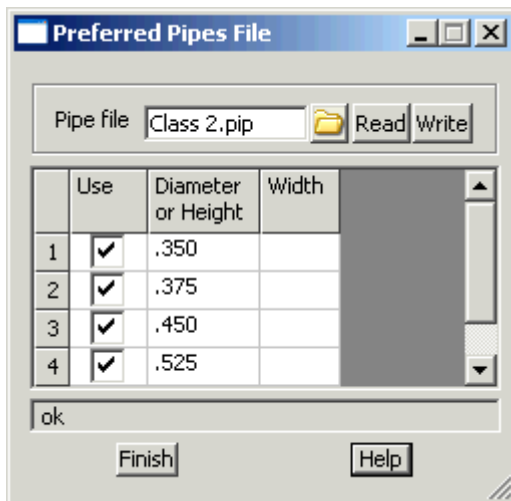
Modify Pipe Sizes

These values control the values to be designed in the run. **Consider bypass flows** causes the engine to use the bypass flow routes and inlet capacity data from the drainage.4d file.

Ensure Pipe Q < Qcap will increase the pipe size if this criteria is violated.

Modify pipe inverts will allow the design engine to shift the inverts if required (usually pipe size changes).

If **Modify pipe sizes** is selected then a files containing the available pipe sizes must be supplied. The pipe sizes in this file are in the **Units** specified in the drainage network editor. To create a new file, enter the file name and then select the folder icon followed by the **Edit** line. The following panel will appear.



The diameters/heights are required and the width is optional to specify a box culvert.

YOU MUST SELECT THE WRITE BUTTON!

The **Upsize only** selection will stop pipes in the system from being reduced in the design. Regardless of this selection, the 12d design engine will not allow a smaller pipe to be selected in the downstream direction.

22.3 Pipe Sizes too Large?



Your hydraulic settings can change you pipe sizes. Check Grate levels, freeboard, pipe design criteria and read the notes below!

A few comments on why you may have large pipes in your design.

If one pipe is sized large then 12d will not allow a smaller pipe downstream. So when pipes seem large, check the most upstream large pipe. HGL restraints will require you to look downstream of the large pipe.

Check List

1. High roughness values, accidentally setting roughness to Manning with a 0.6 roughness value (Colebrook)!
2. Grate levels not set correctly. Freeboard is measured from these levels.
3. Pipe min pipe cover set very close to freeboard.
4. Selecting **Ensure Q<Qcap** in the storm analysis dialogue. This is required by some authorities but can cause larger pipes in flat areas.
5. NOT selecting **Modify pipe sizes** in the storm analysis dialogue. 12d will not change the pipe size.
6. Selecting **Only allow pipes to upsize** in the storm analysis dialogue. 12d will not check if a smaller pipe will do.

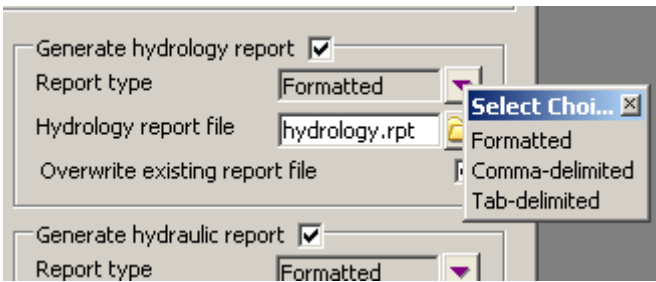
Generate Results in Plan

This selection automatically runs the drainage plot annotation function. A **Drainage plan ppf** must be entered and samples are supplied in the 12d library. A **Model for plan results** is required if this option is selected. The **Full clean model before hand** tick box forces the model to be cleaned before the labels are created. When not selected a “Smart clean” is performed.

Generate Results in Long Section

This selection automatically runs the drainage long section plotter. A **Drainage long section ppf** is required and examples are found in the 12d library. A **Model stem for long section results** is required if this option is selected. In almost all cases the **Clean model before hand** tick box should be selected.

Generate hydrology report

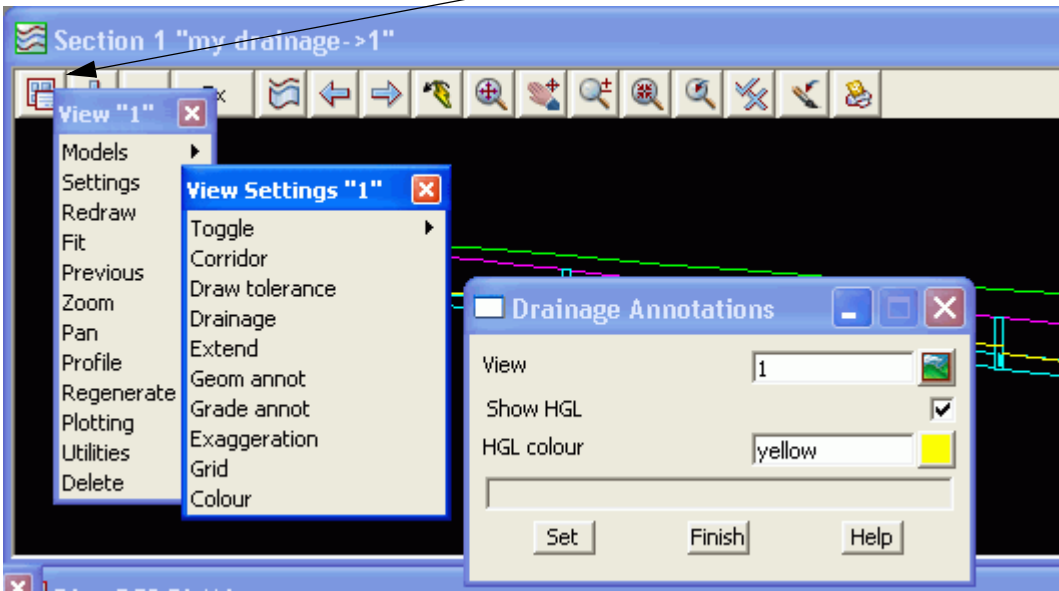


The **hydrology report** may be formatted for inserting into a 12d model/text editor (formatted) or spreadsheet (comma or tab delimited). In almost all cases **Overwrite existing report file** will be selected.

22.4 The Run Button and HGL data on the Section View

When the **Run** button is selected the discharges are calculated, the HGL check is performed and the pipes sizes and inverts are designed (if selected). The plan and long section drawings will also be updated with the new data (if selected).

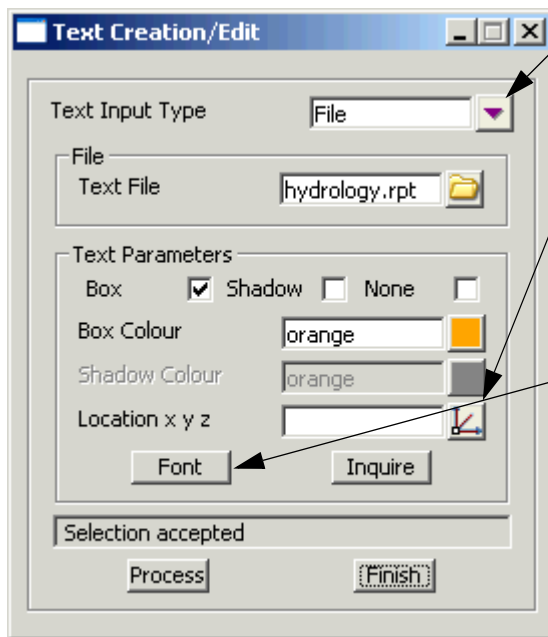
The HGL values will also be available on the 12d section views when profiling the drainage strings. The colour of the HGL line may be changed via the view's menu button then **Settings->Drainage**.



22.5 Importing Text into a 12d model

Formatted text may be inserted into a 12d model by selecting

Drafting->Text and Tables->Create edit paragraph text



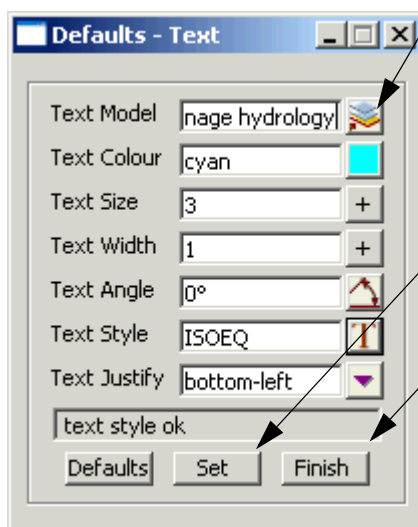
Change to **File**.

Select the folder icon and then pick the formatted text file. It will be displayed then select **Set**.

Next select the location in plan for the text.

The font selected must be a fixed space font or the data will not align properly.

Select the **Font** to display the following panel.



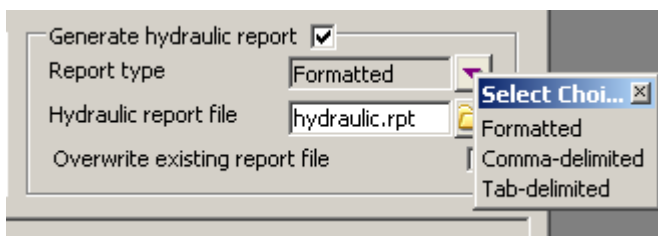
Enter a **Text Model** for the report.

The **Text Style** must be a fixed space font.

Select **Set** then **Finish**.

Now add the **Text Model** onto the

Generate hydraulic report



The **hydraulic report** may be formatted for inserting into a 12d model/text editor (formatted) or spreadsheet (comma or tab delimited). In almost all cases **Overwrite existing report file** will be selected.

If you want both the hydrology and hydraulic report in the same file, enter the same file name in both file fields but turn of the **Overwrite existing report file** for the hydraulic report.

22.5.1 Design Results

Results from the design runs are shown in several forms:

1. Hydrology and hydraulic reports
 2. [Drainage plan annotations](#)
 3. [Drainage long sections](#)
 4. Hydraulic Grade line on the Section view
 5. Output window data - Service/utility clashes
- Samples of the hydrology and hydraulics report are shown below.

12D MODEL - HYDROLOGICAL DESIGN SHEET

Project: Storm water Part 1
 Drainage Model: drainage
 Location File: \$LIB\AUS QLD Cairns.12dhydro
 Tc Method: Direct
 Rainfall Method: IFD Table
 Runoff C Method: Direct

Minor 5 Year Storm Event

Pit Name	Pit Type	Setout Easting	Setout Northing	Setout Level	Catch ID	Time Tc	Intensity I	Runoff C	Area A	Full CA	Full Sum CA	Full Qc=CIA	Partial CA	Partial Sum CA	Partial Qc=CIA	Approach Flow Qa
(-)	(-)	(m)	(m)	(m)	(-)	(min)	(mm/hr)	(-)	(ha)	(ha)	(ha)	(L/s)	(ha)	(ha)	(L/s)	(L/s)
1	A2	5349.23	7322.04	30.09	1P	10.00	163.00	0.75	0.0083	0.0062	0.0732	33.1	0.0031	0.0701	39.7	39.7
2	A2	5303.31	7322.04	29.08	1P	5.00	204.00	0.90	0.0745	0.0670	0.0522	23.7	0.0670	0.0500	28.4	28.4
3	A2	5248.65	7322.04	27.88	1P	10.00	163.00	0.75	0.0059	0.0044	0.0478	21.3	0.0022	0.0451	25.5	25.5
4	A2	5198.75	7322.04	26.78	1P	5.00	204.00	0.90	0.0531	0.0478	0.0470	21.3	0.0478	0.0451	25.5	25.5
5	A2	5314.17	7336.94	29.32	1P	10.00	163.00	0.75	0.0053	0.0040	0.0431	207.6	0.0020	0.4392	248.9	248.9
6	A2	5276.19	7336.94	28.49	1P	5.00	204.00	0.90	0.0518	0.0389	0.4586	73.8	0.4197	0.1562	88.5	88.5
					1P	5.00	204.00	0.90	0.4664	0.4197	0.1631	73.8	0.0069	0.1493	88.5	88.5

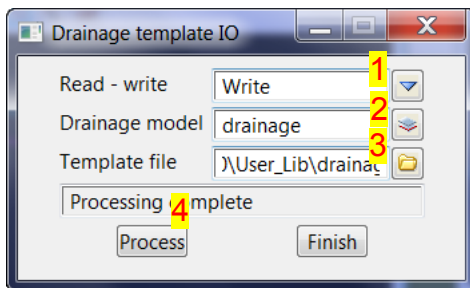
23. Create a Drainage Model Template (Saving Defaults and Globals)

A drainage model template contains your favourite global and default settings for the **DNE**. These settings are stored as model attributes and the template may be read before or after the drainage strings have been created. Caution: existing default and global setting may be overridden.

You can create you own templates as well. Now that you have completed a drainage job and all of your global and default settings are set, create a template to save in your user library.

From the main menu select

Design =>Drainage-Sewer =>Create->Create/Read template



1. Change to **Write**.
2. Select **drainage** for you existing network
3. LB the folder icon, then user_lib, type a name for the template the select **Open**
4. LB **Process** to create the drainage model template for your next project.

24.Drainage Data Input and Output to Spreadsheets

Spreadsheets are an effective method to manage the numerous variables urban drainage designers create in the modelling process. Spreadsheet data can be transferred to and from 12d in tab delimited files and stored within 12d as “user definable attributes”. These attributes are linked to the pit and pipes within a network. Drainage long section plots can display the pipe attributes in the “arrows” data area and pit attributes in the bubbles area. Drainage plan drawing can also show these pit and pipe attributes.

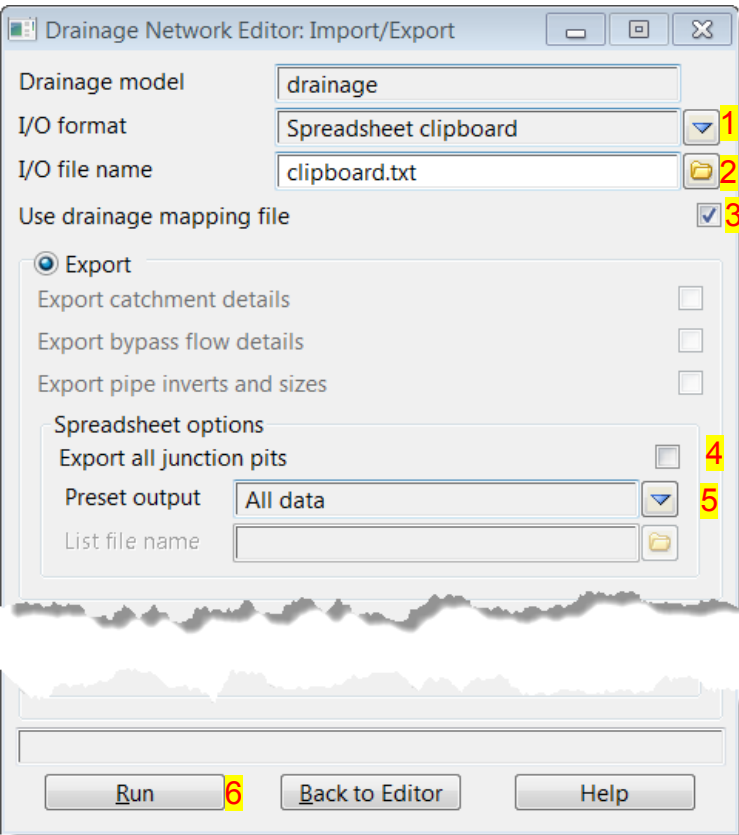
Drainage strings will be created if they do not exist in the model but pits cannot be added to existing strings.

See also

- 12d to spreadsheet transfers
- Spreadsheet to 12d update and create
- Spreadsheet options

24.1 12d to spreadsheet transfers

This interface is accessed the **Import/Export** button on the Drainage **Network Editor**.



1. Select Spreadsheet clipboard
2. leave as **clipboard.txt** to send the data to the windows clipboard as well as this file.
3. Mapping files are the most current 12d technology. Leave this selected.
- These options are not used for spreadsheet export.
4. Usually leave this off! Select to export the junction pit at the end of all drainage lines (very rarely needed).
5. You may also select to limit the output if desired. If you like using spreadsheets for data entry, the PCdrain data and ILSAX data formats are useful for adding data for the first time for either program.
6. Select Run to place the data on the clipboard.

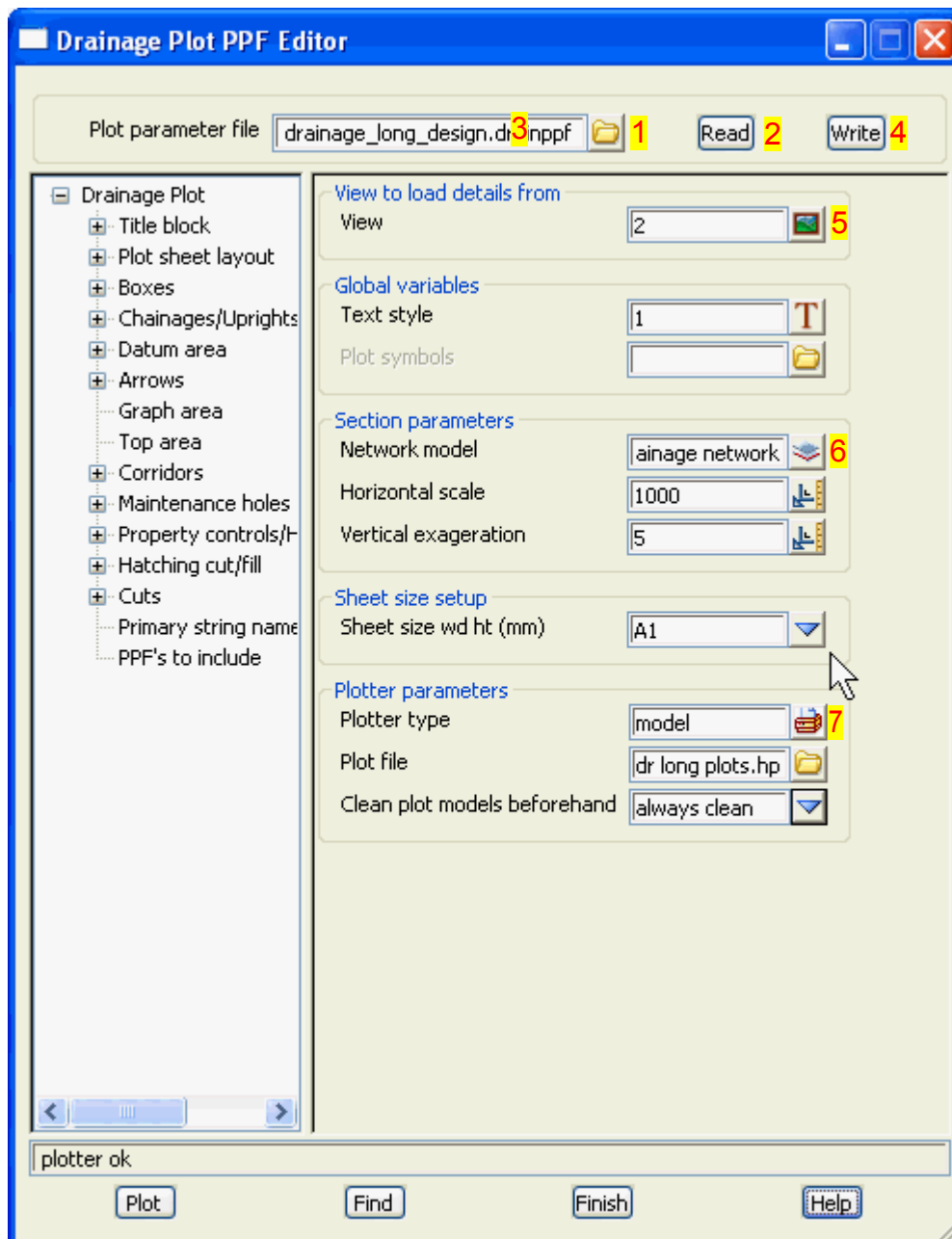
25. Long Section Plotting

Detailed description of the 12d drainage long section plotting may be found in the 12d Reference manual. The long section plots are customised using the drainage plot parameter files (drainppf). Title blocks, user defined text may be added and then plotted directly or to various file formats (dwg, dgn etc.). From the main menu

Design=>Drainage-Sewer=>Plots=>Longsections

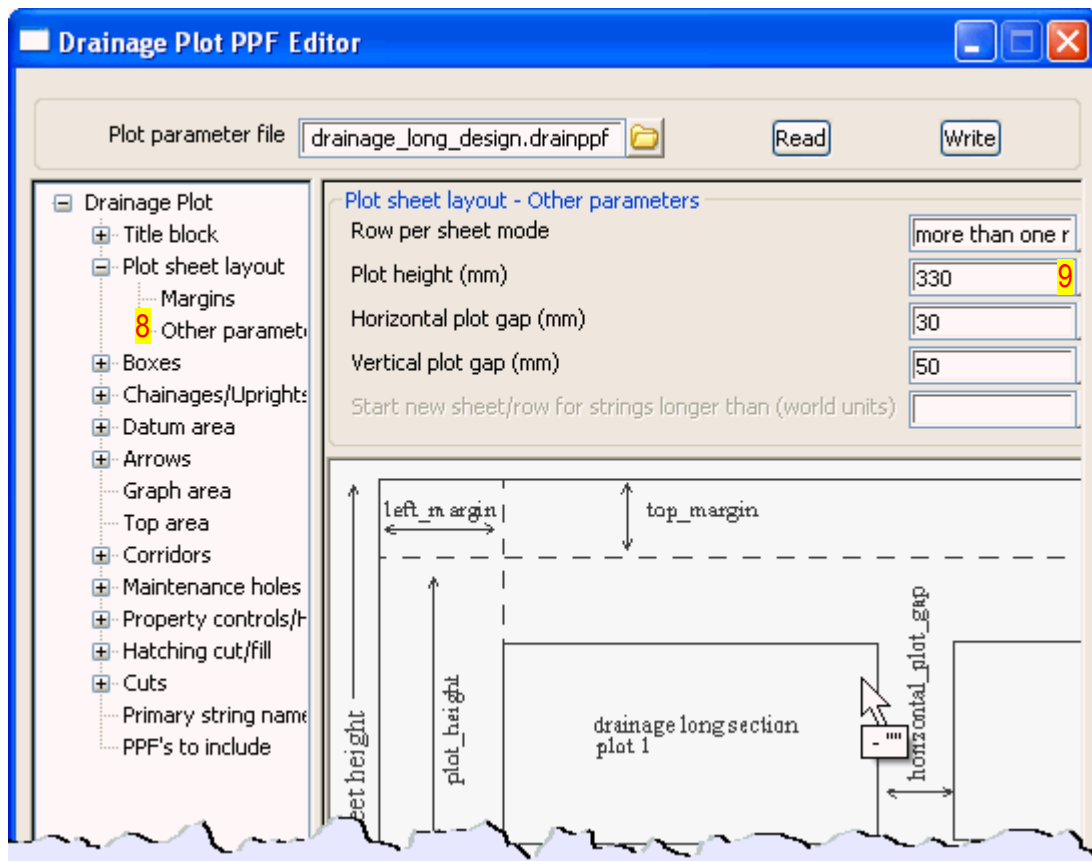
See Also

Set Pit Details to set road chainage and name data



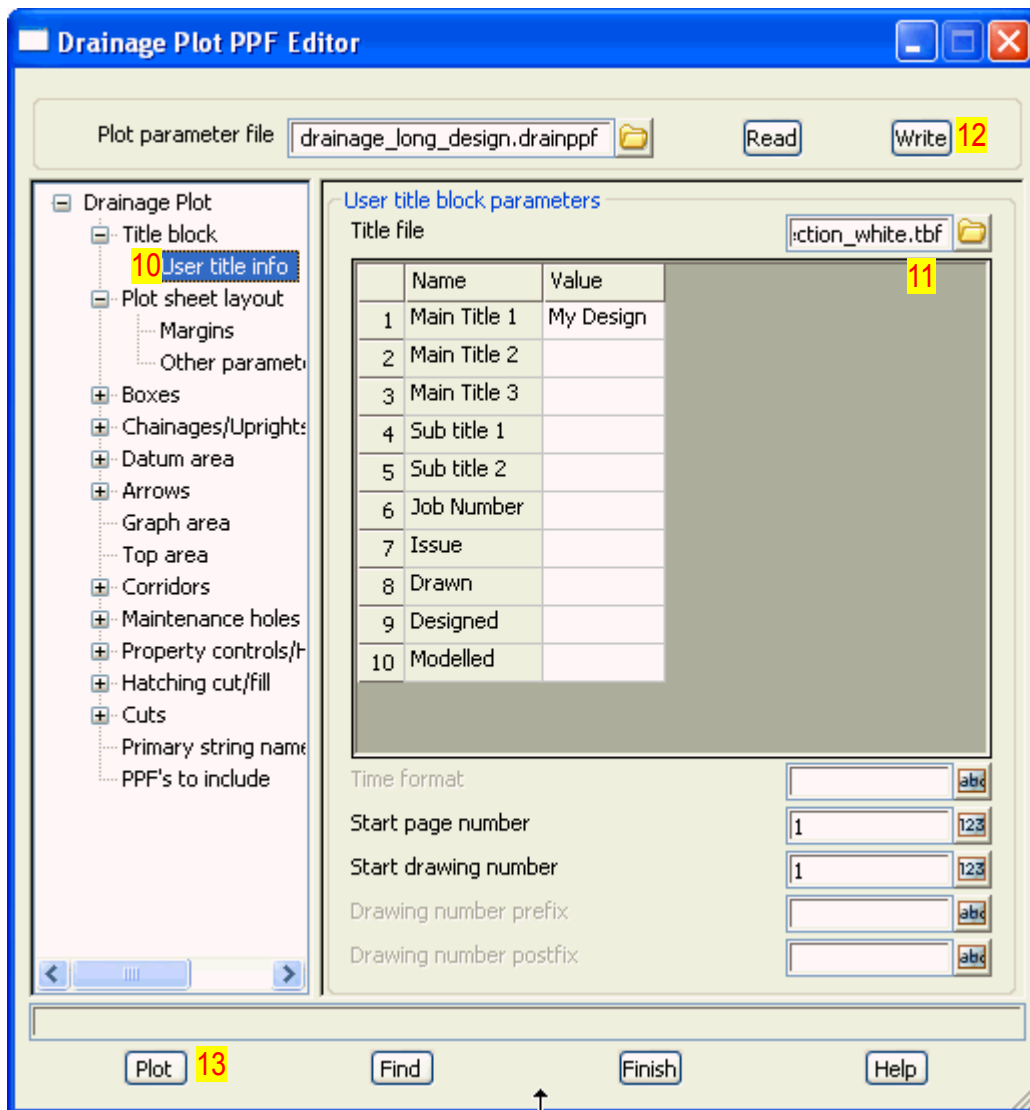
1. To access the drainppf files supplied select the icon and then walk right on **Lib** to select this drainppf file.
2. Select **Read**
3. Enter a new name for this drawing
4. select **Write**. This will save the setting we are about to make should you want to replot this long section.
5. This section view determines the additional models (such as services) to show plot. These are referred to as corridor models. The vertical exaggeration is also obtained from this view.

6. The **network model** field will be completed with the model of the string being profiled. If this is not your drainage network model then select it now.
7. When **Plotter Type** is set to model then **plot file stem** is the model name prefix for plots that will be created. The first sheet of plots will be in model **plot1**, the second in **plot2** etc.



8. Select + on the **Plot sheet layout branch** and then select **Other parameters**.
9. The **plot height** determines how much room is left vertically for the actual plot. This specifies the total height of the plot. 12d then constructs the box area and arrow area on the bottom and then arrow area on the top. The amount left over is used for the long section itself.

To stop datum breaks from occurring increase this height, increase your plot scale or decrease your vertical exaggeration. If there is too much white space in the graph area then reduce this value.



10. The **+Drainage plot+title block+User title info** allow you to enter the text for the title block.
11. The list displayed is retrieve from the **title file** selected above. Enter the data for the plot
12. Select **Write** to save the changed to the local drainppf file you entered earlier.
13. Select **Plot** and the plots will be send to the **plot file stem** entered. These models may be added (one at a time) to a plan view to inspect them before plotting to paper or exporting to other drawing packages.

26. More Information

This section provides detailed description of items introduced previously in the training notes.

26.1 Linking to Strings in General

Many pit properties may be calculated from strings linked to the pit. The following rules apply to all strings linked via the DNE.

1. The selection of strings is limited to the models specified on the DNE->Utility Model tab.
2. When no link exists for the pit, the closest string matching the selection criteria will be chosen. If a link exists, then no new string will be searched for. Even if the search criteria changes or a closer string is created. The link must be deleted before new links are searched for.
3. The link will not be broken unless
another string is manually selected
the link is manually Cleared with the RB on the manual string select
the string is deleted (manually or when a recalc is done on template applies),
the model links are reset on the DNE->Utility Model tab,
the model is removed from the DNE->Utility Model tab.
4. Once link is broken the calculated values will be kept unchanged, with the exception of bypass pits.

26.2 Catchment string links

Each catchment set has its own model of catchment strings and the sets are linked independently.

If the area (in ha) is present in the area field, no new string link be searched for.

Vertex number 1 on the catchment string determines which pit the string will link to. If vertex 1 of several catchment strings are closest to the same pit. Only the closest string will link and the remaining will not be used for any other pit.

After the catchment string link is created, the vertices are re arranged so that the vertex closest to the pit becomes vertex.

26.3 Road string links

Road strings have a name and maximum search distance criteria and there is no limit to how many pits link to a single road string. The closest string matching the string name criteria (in the road string file) and within the search distance will be selected. Note that once the string link is established, changing the criteria will NOT break the link.

26.4 Bypass string links

Pits marked with an Inlet type of Manhole on the DNE->Pit->Main tab ignore the bypass strings. Bypass strings must pass within 1 manhole diameter to be linked..

27. Training Check List

Network plan	<ul style="list-style-type: none">- convert from strings- insert, append, delete and move pits
Network Vertical	<ul style="list-style-type: none">- Set Pit Details and Regrade pipes- Pipe alignment modes
Set Pit Names	
Catchments	<ul style="list-style-type: none">- draw, label, link and check- tc strings
Hydrology	<ul style="list-style-type: none">- Area, Tc, C values with defaults
Hydraulics	<ul style="list-style-type: none">- setout to grate- method (pipe full or HGL)- available pipe sizes and box culverts
Services	<ul style="list-style-type: none">- over and under drainage pipes
Road strings	<ul style="list-style-type: none">- rotate symbols- x,y and/or z for setout- road grade and crossfall for inlet capacity- road chainage from centre line
12d design engine	understanding the reports
Setout pit schedules	<ul style="list-style-type: none">- easting, northing and road centre line
Drawings	Long Section plotting Plan drawings
Kerb Strings	<ul style="list-style-type: none">- select by name- crests and sags

THE END

1.0

1.0 Stormwater Design Part 2- Introduction

The **Stormwater Design Course Part 1** and this manual, the **Stormwater Design Part 2**, describe the functions and processes of the 12d drainage module. In these documents, the generic term **pit** refers manholes inlets, catch basin and manholes.

The **Stormwater Design Course - Part 1 Notes** contain:

- s create a super tin for pipe cover and pit cover levels,
- s set [Defaults](#) and layout a drainage network from CAD and in 12d,
- s use the 12d [Drainage Network Editor](#) to assign names to the pit/pipes, avoid service clashes, grade pipes, align obverts, minimise depth and many other design tools,
- s designate catchment areas and produce catchment plans,
- s run the 12d storm rational hydrology and hydraulics engine,
- s transfer data to and from electronic spreadsheets to enable the user to easily review the data and add user defined data to the 12d pipe network. This data may include such data as pipe bedding types and trench width,
- s create a drainage template containing customised default design parameters,
- s create pit setout schedules to export to spreadsheets or word processors for final formatting,
- s produce long section drainage profiles including HGL data, flows, invert levels and service crossings,
- s create plan drawings with pipe sizes, flows, pit symbols, linestyles for pipe sizes, design parameters for pit and pipes and user defined data,
- s locate pits/manholes at exact chainage and offset locations.

This manual, the **Stormwater Design Course - Part 2**, is intended to describe the additional features of **12d Model** drainage and discuss the customisation of the package. This will include

- s customising the drainage.4d file [Drainage Definitions - Manholes and Pipes](#),
- s 12d storm analysis with inlet capacity calculations and bypass flow,
- s flooded width analysis and flooding at SAG pits,
- s drainage trench excavation volume calculations,
- s pipe and pit quantity calculations/reports,
- s open channel calculations,
- s adjusting pit locations for changes in horiz road geometry
- s analysing the major flood events,
- s creating drainage symbols with grates and upstream side inlets,
- s detailed drainage plan labelling and long sections with hatching under roads.
- s

2.0 Starting with a Basic Drainage Network

In this document, the generic term **pit** refers to manholes, inlets, catch basin and manholes. When the term **manhole** is used on the 12d menu system it refers to any type of pit. Pit types, dimensions and inlet capacities of the pits are set in the [Drainage.4d setup file/database](#).

These course notes assume that you have completed the Stormwater Design Course and that you have experience creating 12d Model drainage networks with catchments areas. You may continue this project or begin with a completed drainage design found in the folder

\12d\10.00\Courses\Drainage_Analysis

The project name is Local Road Complete.

3.0 Setup Files and Their Locations

The [drainage.4d](#) setup/database file contains the pit and pipe types (RCP, Class 2 etc.). The drainage.4d setup/database file can also control many of the settings in the drainage network editor (DNE). Changing the pit/pipe type in the DNE will result in your favourite settings being applied thus minimising user input errors.

The pit types may optionally include:

- s DNE field controls, including internal pit dimensions (diameter or length and width)
- s pit wall thicknesses that vary with depth,
- s pit connection points (locations where the pipes joint the pit),
- s inlet capacities for sag and on grade inlet pits.
- s detailed pit type descriptions to be inserted into your pit schedules
- s user defined attributes.

The pipe types may optionally include:

- s DNE field controls, including internal nominal and actual pipe sizes with wall thickness,
- s user defined attributes.

For PCdrain and Drains users there are routines to read your gully pit/database files and create the [Drainage.4d setup file/database](#).



The [Drainage.4d setup file/database](#) may be customised for any additional inlet capacity data you may have.**REVIEW THIS DATA CAREFULLY!**

4.0 Bypass Flow

Bypass flow strings are used to trigger the bypass calculations in the network editor and are used as a centre line for flooded width calculations.

The 12d storm analysis, and many of the design programs 12d exports to, allow for bypass flow. Bypass flow involves the calculation of pit inlet capacity for on-grade or sag inlets. These capacities are based on the pit type and may use either ponding depths (sag inlets) or on the road grade and/or crossfall upstream of the inlet (on grade inlets).

4.1 Key Points

1. Draw an bypass flow string in the direction of flow so that it passes within 1 pit diameter of an inlet. At sag locations the string should show the direction of flow during bypass conditions. When bypass flow strings join they must join within 1 pit diameter of an inlet (pits with **inlet config** set to **Manhole** are not considered inlets). If flooded with calculations are to be calculated the string should be located in the flow channel.
Enter the model name in the **Bypass flow model** field on the **Global->Utility Models** tab.

Note: if there is no bypass flow string within 1 pit diameter then 100% of the approach flow will enter into the pit.

2. Many bypass strings may join at an inlet but only one bypass string should leave each inlet.
3. Set the pit type. (**Pit Type** on the **Pit** tab). With a bypass string within 1 pit diameter of the pit centre, no water will enter the pit unless the pit type has inlet capacity data defined in the [Drainage.4d setup file/database](#).
4. Set the **Inlet config** on the **Pit->Main** tab (Manhole, On-grade or Sag pit). This selection will be disabled if cap_config parameter sets the inlet type in the [Drainage.4d setup file/database](#). Manholes have no inlet capacity and are not considered inlets, on-grade inlets capture the water as it passes the inlet while SAG inlets trap the water flowing in from all directions (until the pond depth overflows at the low point of the catchment string).
5. On grade pits may require road grade and/or crossfall data for inlet capacity. They may be entered manually or calculated using the road strings. A setout string link is required to measure road grade. If road crossfall measurement is needed then the centre string is also required. These strings are specified using the [Road design file](#) on the **Global->Utility Models** tab (see Stormwater Part 1 manual).
6. Sag inlets require a pond depth either manually entered or calculated by 12d. Pond depth calculations require a link to a catchment string to locate the overflow point and correct grate level ([Grate rl mode](#)).
7. Press the **Set Pit Details** button. Road grades, crossfalls, pond depths and bypass pits will now be found on the **Pit->Bypass** tab of the **Network Editor**. Measurement markers are created in the **construction drainage data** model.
8. Bypass pits may be cleared using **Clear Bypass Links** on the **Globals->Utility Models** tab
9. **Storm Analysis** must have **Consider Bypass Flows** selected on the **Main** tab.
10. **Calculate overland flood extents** is optional on the **Flood Extents** tab of **Storm Analysis**.

4.2 Creating Overland Flow Strings using Downhill Strings

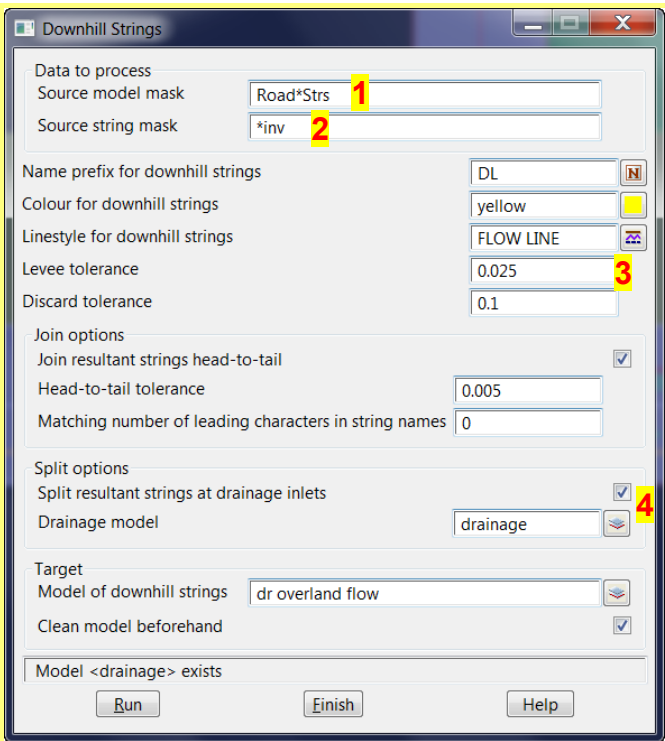
The bypass flow string must be within 1. pit diameter of the drainage pit in be considered on the bypass flow path. If the bypass flow string is to be used for flooded width calculations in the future, the string must also be drawn in the main flow area of the cross section. At sag locations the bypass flow strings indicate the direction the water flows when it overtops the overflow point. This string usually goes uphill to this overflow point.

The downhill string function quickly creates bypass flow strings from road design strings. The remaining tasks will be the bypass flow at intersections and areas off the roadways.

This routine copies strings to a single model using a string name mask to select the strings from a collection of models (using a model name mask). These strings will have their name, line style and colour changed. The line style is usually FLOW LINE so that you may see the direction of the string (downhill). The strings are split at crests (identified using a levee tolerance). They may also optionally be split at drainage string inlet location to allow easy modification using the drainage utility string editor.

From the main menu select

Design->Drainage-Sewer->Downhill strings



1. type **Road*Strs** (it is case sensitive). These are the models that contain all of the road strings. **Road 1 Strs** for example.
2. type ***inv**. The road string models have a **linv** and **rinv** string for the invert of the kerb and gutters.
3. If the crest height on one side is less than this amount it will not be split.
4. Tick the box and select the **drainage** model. This will help with the drainage utility editor later.
5. type **dr overland flow** to create a model for the new strings
6. Select **Run**
7. add the model **dr overland flow** onto the **roads** view.

4.3 Creating Overland Flow Strings at Intersection and Sag Locations

Use the **CAD toolbar** to create the overland/bypass flow paths the flow crosses the road.

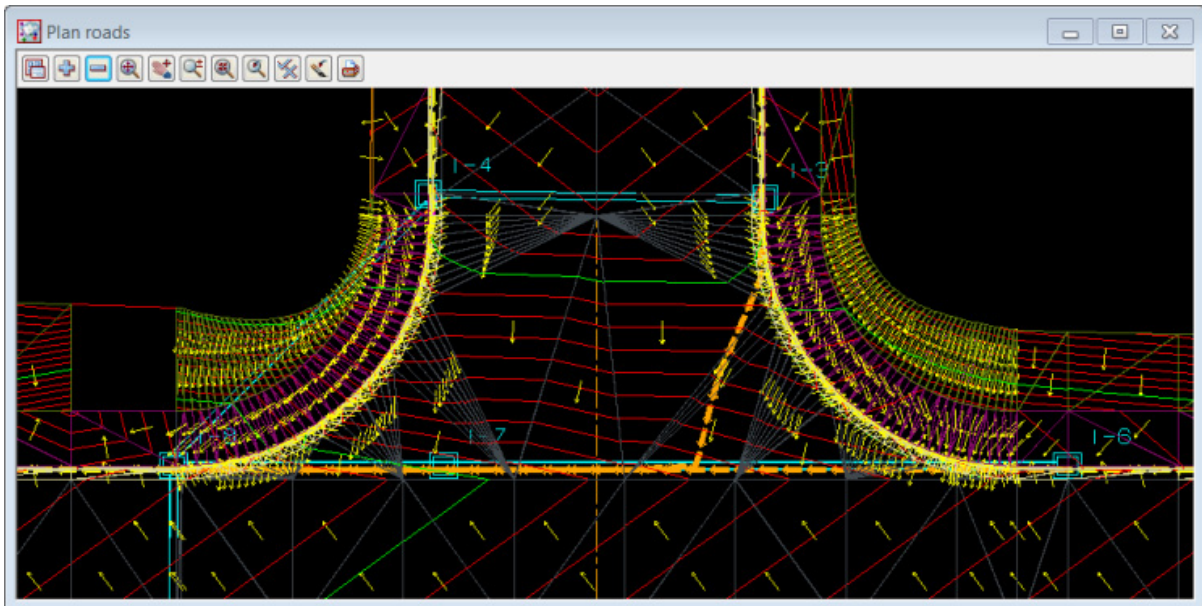
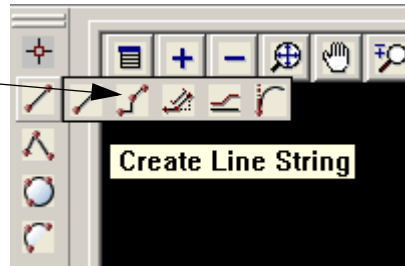
To use the **CAD toolbar** go to the **CAD data bar** and enter a string name and model name. Select the line style (optional).



Use the CAD bar eye dropper on the right (same as) and select an existing overland/bypass string. The properties of the selected string will fill the CAD bar fields.

DRAG the **Create line** button and release at the **Create Line String** button.

When finished drawing the string press **ESC**.



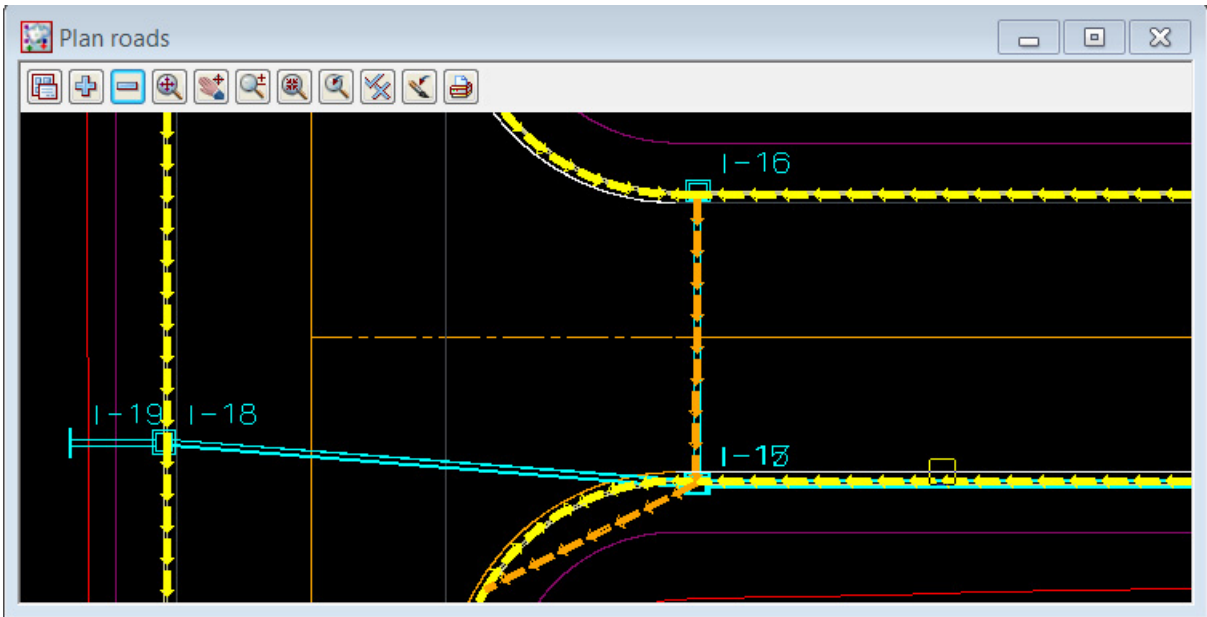
Starting at the upstream end. LB select an insertion point and MB or press return to accept the selection (the line style is shown after the point is accepted).



Do not stop drawing until you reach another sag or ongrade inlet (not a manhole). Overland flow lines often overlap as you see in the drawing above. If you stop short of the inlet, the bypass pit for the upstream inlet will be LOST.

Continue drawing until you reach the end of the flow path. Press **ESC** to finish drawing the string.

Frequently you will draw an overland flow path uphill and away from a sag inlet. It will usually go through the low point on the catchment crest and then downhill to the next inlet. No do this where road 2 intersects road 1 (see below).




4.4 Creating Overland Flow Strings for Culverts

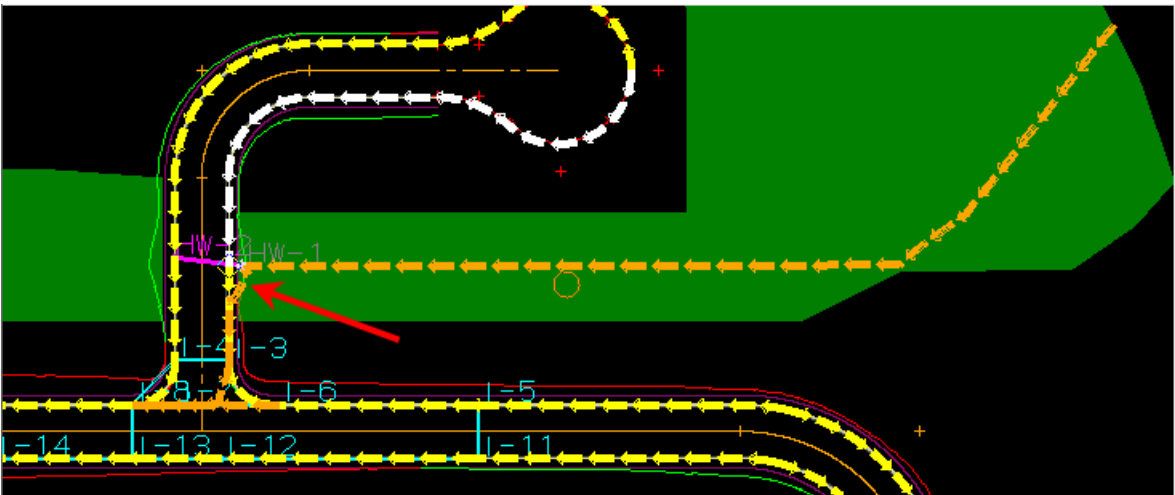
Culverts placed at sag location in the road will generally how the overflow across the crown of the the road and the upstream headwall grate level will be set the sag low point elevation of the road crown. For headwalls, there usually is not grate so this becomes the reference elevation for bypass.

The culvert in our example is not at a sag in the roadways so the water will overflow the southern side of the channel, cross the footpath, and flow down the roadway. We need to set the grate level to the bypass level along this path.

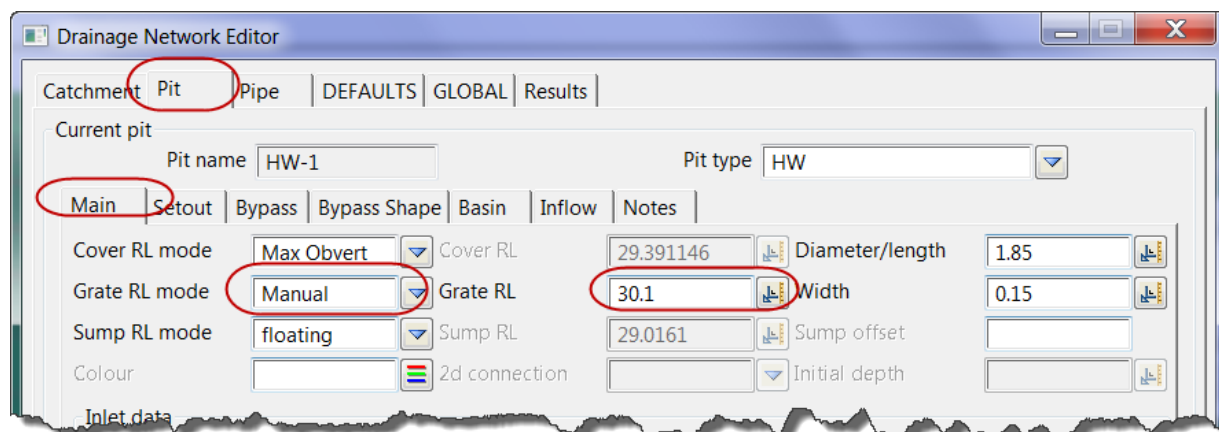
To draw the string, start at the top of the catchment so that the *flooded width calculations* in the approach channel will use the correct flows. Finish at I-3!



You could use the **CAD string->Copy** option to copy the tc string that was drawn in the model **dr Catch Reserve tc** and then **CAD vertex->Append** to add onto the downstream end of the new string and then **CAD vertex->Move** to adjust where need.



There is a low point where the south side of the channel joins the road (see red arrow). This overflow area will need to have erosion protection and detailed grading. Lets assume that the overflow area is regraded with a crest RL30.1. The grate level needs to be set to this value.



4.5 Set Inlet type to Sag or On grade

12d supports Manhole, on-grade and SAG configurations. The **inlet configuration** is set on the **Pit->Main**. This setting can be locked to the **Pit type** in the [Drainage.4d setup file/database](#) using the cap_config command. The remaining bypass data is found on the **Pit->Bypass** tab.

Pits **Inlet config** setting:

- s **Manholes** will not receive bypass flow and cannot have catchments assigned to them.
- s **On-grade** pits are pits where the water will flow past the pit if not captured (velocity and momentum are important for these inlets). Approach flow, road grade and road crossfall generally determine the inlet capacity equations/curves.
- s **Sag pits** are located at sag locations where the water will pond around the pit if there is not enough inlet capacity (generally the water will stop at these locations and flow into the inlet). There is only one inlet capacity curve/equation per inlet and the ponding depth is used to determine the inlet capacity.

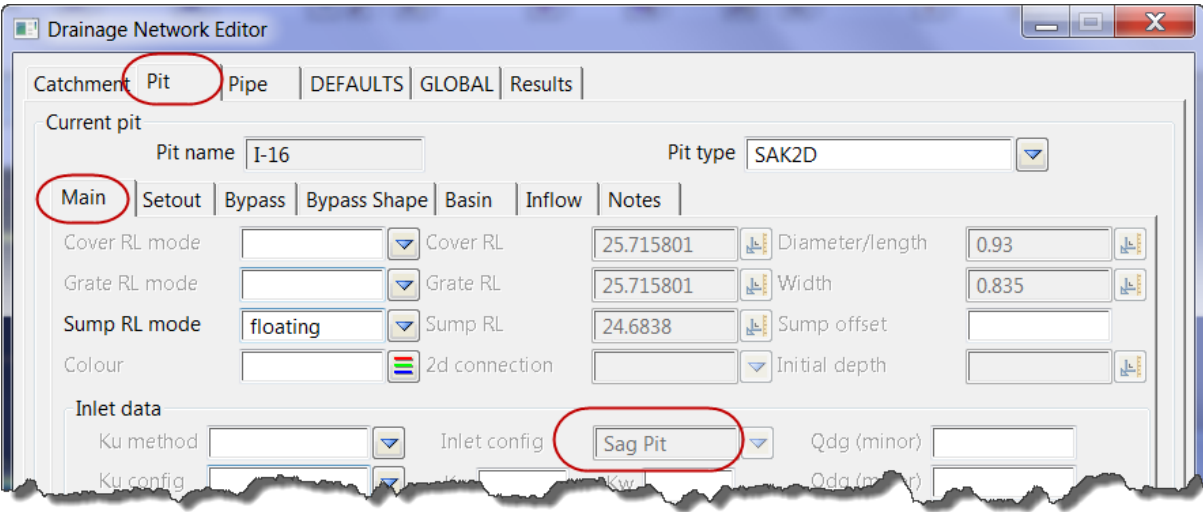


To view the inlet capacity curves used in this project, try [Viewing Inlet Capacity Curves](#).

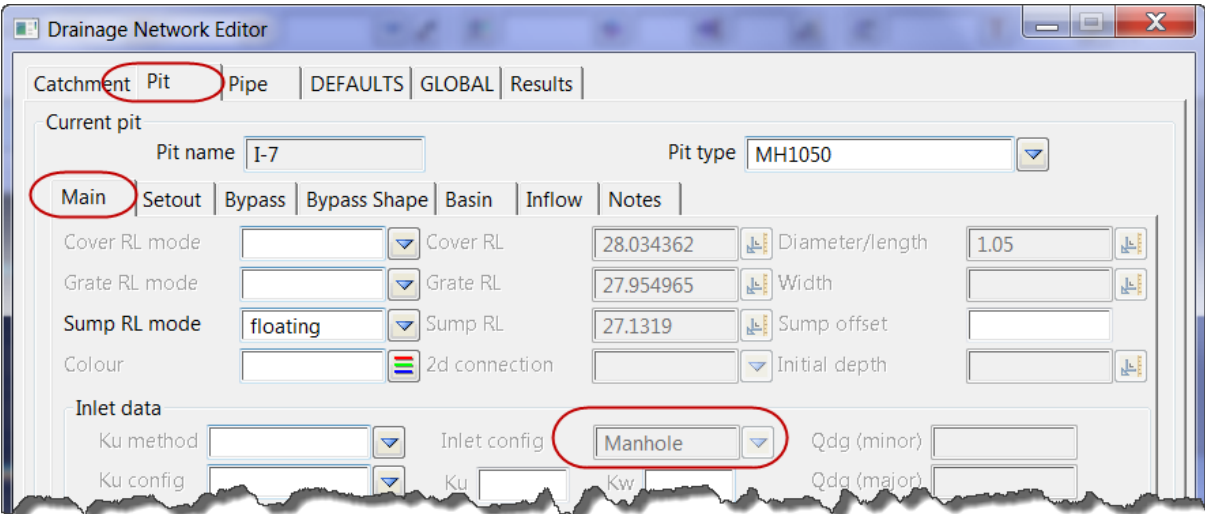
In this example the pit types have been set to an on grade grated, side entry inlet. We will now change the pit types for the manhole and the sag inlets.



Not all sag locations on a roadway behave hydraulically like a sag inlet. In general the flow should approach the inlet and not bypass over it. Sometimes the inlet acts as a sag inlet at low flows but like an on grade at design flows.



1. Move to inlet marked I-16 above and select **SAK2D** for the pit type (you may be asked to confirm the changes from the drainage.4d file).
2. Note the **Inlet config** has been changed to **Sag pit** and it cannot be changed. This has been set in the drainage.4d file.



1. Select **MH1050** for the Wipit type (you may be asked to confirm the changes from the drainage.4d file).
2. Note the **Inlet config** has been changed to **Manhole**, the **Diameter/length** to 1.05 and the **Width** has been cleared. These changes are set in the drainage.4d file.

4.6 Set Pit Details - Calculate the Bypass Flow Data

Once the first **Key Points** of bypass flow are complete, you are ready to calculate the bypass flow data. Select **Set Pit Details** and then select a pit on a bypass flow string. The bypass data is found on the **Pit Main** and **Pit->Bypass** tabs.

The downstream pit will now show in the **Bypass pit** field. If the bypass string does not go to another inlet (the network outlet is never an inlet) then the **Bypass pit** will be marked as **LOST**.

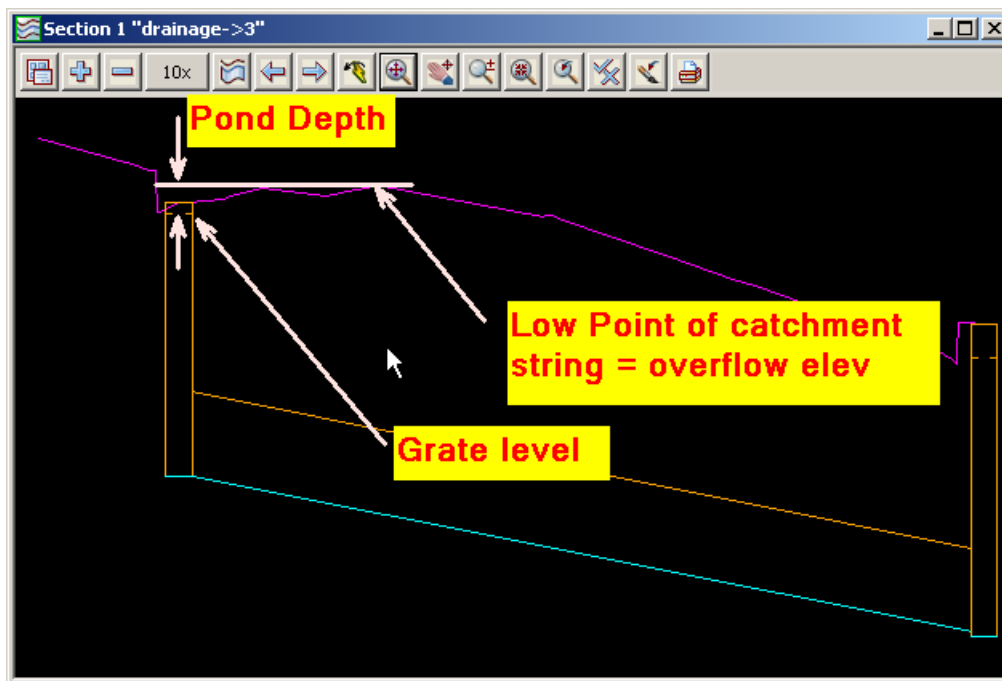


Always confirm bypass pits set to **LOST** are correct. An incorrect bypass to LOST would mean water is leaving your system when it should be included in the calculations.

If a setout string was found (see **Pit->Setout** tab), the **Road grade** will appear in grey. You may override this value by selecting the **Manual** tick box beside the value and entering your own value. If a road centre string was selected, the **Road xfall** field will also have a value.

If **Sag pit** was selected and a catchment string was selected, the **Max pond depth** will be displayed. The catchment strings from all 3 sets are draped onto the finish surface tin and the low point located. The **Max pond depth** is calculated as

Max pond depth = catchment string low point - Grate RL.



Negative Pond Depths

Negative pond depths are usually caused by one of two errors in input. The first may be that the grate level is too high. Often this happens when the Grate RL mode on the **Pit->Main** tab has not been set correctly or if **Sz + setout string** option is used the **Sz** value on the **Pit->Setout** tab has been entered correctly.

The second common error is that the catchment string has not been drawn around the crest of the catchment. The lowest section of the catchment string must be drawn carefully because it is the lowest point on the string that determines the overflow elevation. If in doubt, profile the catchment string with the design tin shown in the section view. Double check where the low point is.

4.7 Checking locations for measuring road grade, crossfall and max ponding depth

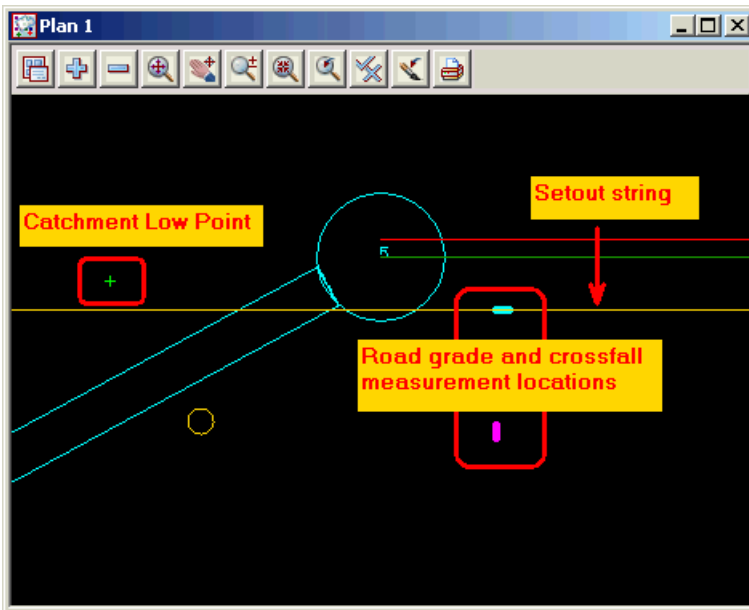
Strings indicating the location of inlet capacity parameters are generating in the **construction drainage data** model when **Set Pit Details** is selected.

The location of the low point, from all 3 catchment set polygons, is shown as a green vertex (plus sign).



Trouble finding the small green +? Select **Models->String info table** and select the sag marker line in the table. A large cross hair will show you the location in plan views.

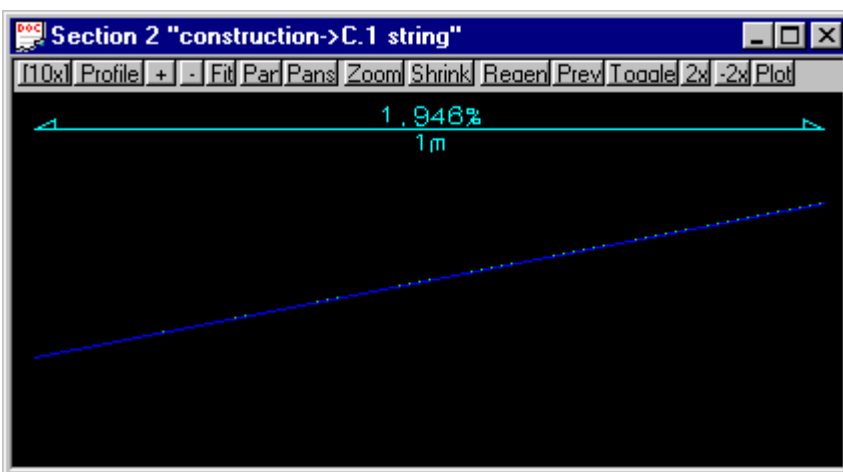
Verification strings in the same model confirm the locations where the road grade and crossfall have been measured. To check these strings add the **construction drainage data** model to the plan view. The following image shows a close up of the verification strings at a pit.



The green line indicates where road grade was measured and the magenta line indicates where the road cross fall was measured.

The default location of the road grade measurement is one pit diameter upstream of the setout point, along the setout string. The road crossfall is measure one pit diameter away from the setout point towards the road centreline. These are 3d super strings and therefore you may profile them in the section view. With the grades toggled on (check under **Toggle**) you can verify the slopes.

The location of the road grade and crossfall measurements can be changed in the **road design file**. The distance upstream to measure the road grade is controlled by the **Grade offset** column one the rows where the setout strings are defined. The road crossfall is controlled by the **Xfall offset** column on the rows where the road centre lines are defined. The distance the measurements are taken is controlled by the **Slope measurement distance**.





No flow into the pipe?

Pits with a bypass pit entered but no inlet capacity defined in the drainage.4d file will have a zero inlet capacity.

With Inlet config set to Manhole, the pit has no inlet capacity.

Important Notes

- 1. If no bypass flow string is supplied for a pit, the inlet capacity is set to 100%.
- 2. If you have a problem with the inlet capacity calculations, check the **Storm Analysis** hydrology report for details.

4.8 Viewing Inlet Capacity Curves

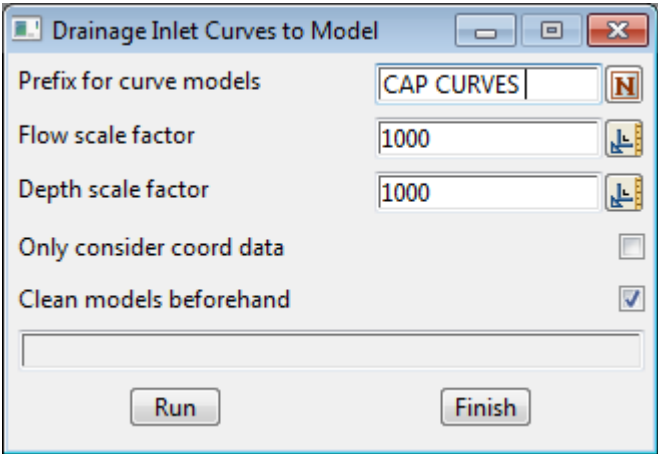
The inlet capacity information is stored in the drainage.4d file. We will now plot the inlet capacity curves in 12d. This will confirm what is in the drianage.4d but changing these plots will not change the inlet capacity calculations.



Put a **z** before **CAP CURVES** in the panel below. This will generally put these files at the end of your model list so they are not in the way when you are working.

From the main menu select

Design->Drainage-Sewer->More->Write inlet curves to model



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Prefix for curves models	model box	CAP CURVES	
<i>All inlet curves for a manhole type will be placed in a model named with this prefix and the manhole type.</i>			
Flow scale factor	input	1000	

Inlet and bypass flow values will be multiplied by this value before creating the strings.

Depth scale factor input 1000

Depth values for sag curves will be multiplied by this value before creating the strings.

Only consider coord data tick box off

Inlet capacity curves may be expressed as formulas, curve coordinate or both. Selecting this box stops curves with only formulas from being plotted as strings.

Clean models before hand tick box on

The curve models are cleaned before the new strings are created

Run button

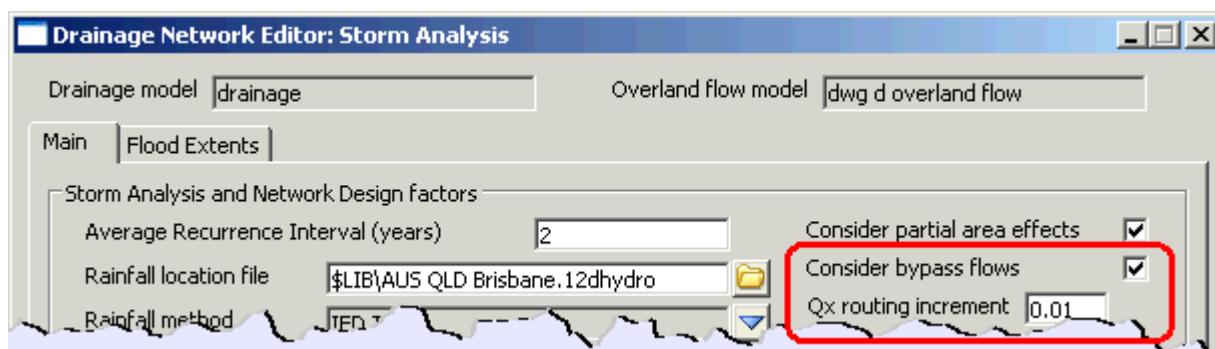
Models and strings are created from the drainage.4d file

Finish button

remove the panel from the screen

5.0 12d Storm Analysis Bypass and Flooded Width Calculations

Once the bypass pits are selected and the [Drainage.4d setup file/database](#) has been setup for bypass flow the storm analysis engine must have this feature enabled. Select **Consider bypass flow**.



Excess Flow

The **Q_x** value controls how excess flow is handled in the bypass flow calculations. If the hgl at the pit reaches the grate level then no more water can enter the pit even if there is inlet capacity. The flow that will not enter the pit is considered excess flow. When a value greater than zero is entered here, the inlet will initially have its inlet capacity restricted by this value. Upstream inlets are done first as this may reduce the hgl in the downstream system. The system is automatically rerun adjusting the flows by this amount each time.

If the inlet capacity is reduced to zero and the hgl is still above the pit then water is removed from the pit and considered as **Q_s** (surcharge flow). In the hydraulic reports this value is found as a negative **Inlet Flow Q_i**.

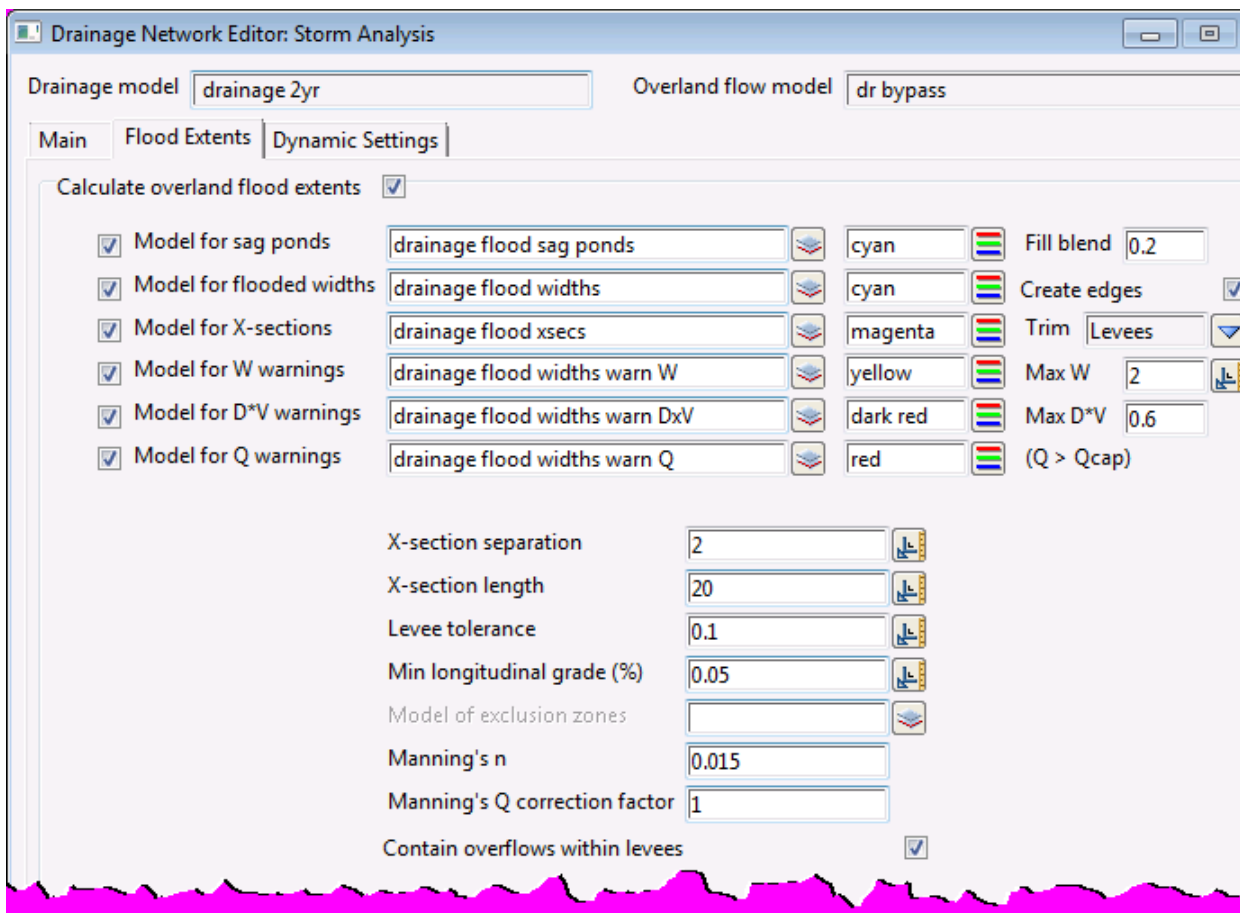
Overland Flow Calculations

The storm analysis engine will calculate flooded widths from normal depths along the flow path and ponding extents at SAG inlets. A bypass flow model (**Global-Utility Models** tab) is required for these calculations.

The **Utility String Editor** should be used where bypass flow strings combine at a pit. Without using this editor it is assumed that 100% of the catchment flow flows down each bypass flow string thereby overestimating the flooded widths.

The **Utility String Editor** could be used to change the Manning's along the string (approach channels to culvert for example) or the maximum flooded width warning limit (before a pedestrian crossing or a highway off-ramp).

The models and the default input data for these calculations are entered on the **Flood Extents** tab.

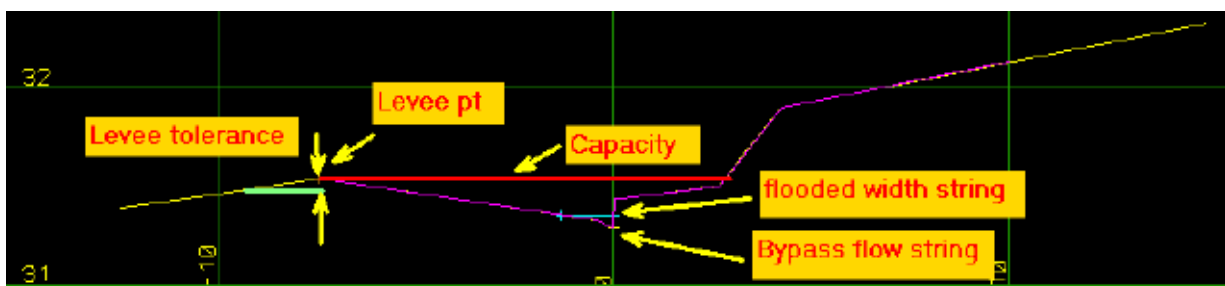


Select **Calculate overland flooded extents** to active the fields on the panel.

Model for sag ponds is used to hold strings that indicate the extent of flooding at the pits marked as SAG inlets. The total approach flow is used with the cap_curve_sag in the [Drainage.4d setup file/database](#) to determine the depth of flooding above the grate level. A closed contour at this flood elevation is then selected near the centre of the inlet. A super string is then created at this level with the colour and **fill blend** transparency selected (1.0 is solid).

Model for flooded width holds the strings indicating the normal depth - flooded width calculation results. These strings are created with a fixed elevation of the flood level. The strings will have string attributes with all of the calculations details.

Calculations



1. Cross sections are cut perpendicular to the overland flow string at the interval **X-section** sepa-

ration with a length of **X-section length**. No calculations are done for sect of the bypass flow string with in **Model of exclusion zones** polygon.

2. The x-section string is then trimmed using the **Trim** settings. The section above had a x-section length of 20 and was trimmed at the levee. The **levees** setting has the routine search for levee (high points) on either side of the low point near the bypass flow string. The levee points are found if sections drops more than the **Levee tolerance** value after the high point is found.
3. The flow for the section is calculated using the bypass flow string chainage to interpolate between the upstream bypass flow and the downstream approach flow. The percentage of catchment flow used in the calculation of the approach flow for this bypass string may be changed using the **Utility String Editor**.
4. The slope of the surface near the bypass flow line is measured for each section. If the slope is less than **Min longitudinal grade (%)** then this cross section is skipped in the calculations.
5. **Manning n** value is the default roughness used in the calculations. This value may be changed at any vertex along the bypass flow string using the **Utility String Editor**.
6. The flow's calculated at the indicated level are multiplied by the **Manning's Q correction factor**. A factor of 0.8 would cause the flooded widths to increase and the road capacity to decrease.
7. The maximum depth calculated will be at the point where water overflows the edges of the section (**Road capacity**) unless **Contain overflow within levees** is selected. This will cause frictionless vertical walls to be placed at the ends of the section so that higher water level may be calculated when the flow is greater that the road capacity.

Warning Models

Model for W warnings will contain copies of the flooded width strings with the colour selected if the flooded width is greater than the default **Max W** value.

Model for D*V warnings will contain copies of the flooded width strings with the colour selected if the depth * velocity is greater than the **Max D*V** value.

Model for Q warnings will contain copies of the flooded width strings with the colour selected if the flow is greater than the capacity of the section. The capacity is the flow where the water over tops one of the sides of the section.

6.0 Utility String Editor

Position of option on menu: **Design =>Drainage-Sewer =>Utility String Editor**

This editor is used to edit properties of the strings used by the DNE. Properties always change at an existing vertex.

Cross Section Strings (Manning's n) - set the left and right bank n values. the centre n value is assigned by the DNE.

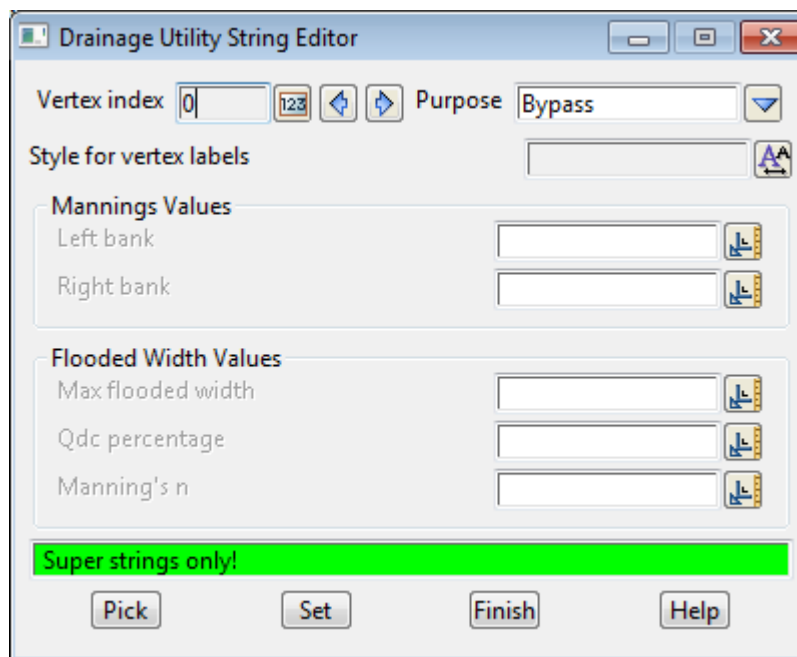
Flooded Width Values on Bypass Flow Strings - the default setting of the bypass flow strings when used to calculate flooded widths in the Drainage Analysis. Changes are in effect until the end of the string or it has been re specified at vertex at a higher chainage.

Vertex labels are created whenever properties are set (Textstyle is required).

Usage

First the string is selected at the vertex where the values are to be assigned. Next select the purpose of the string (cross section or bypass) to unlock the appropriate fields. A textstyle favourite is required as the vertex is labelled with the assigned values. Enter the values into the fields and then select Set to set the values as vertex attributes and create the label as a vertex annotation.

On selecting the **Utility String Editor** option, the **Drainage Utility String Editor** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Vertex index	vertex	selected vertex	

Once the string is selected use this to move between vertices

Style for Vertex Labels textstyle favourite textstyles

A label is created on the vertex using this textstyle favourite

Left bank Input

mannings n value, to delete clear and select set

Right bank Input

mannings n value, to delete clear and select set

Max Flooded withInput

This changes the threshold were warning bars are created during flooded width calculations. It remains in effect till the next change or the end of the bypass flow string.

Qdc percentage Input

This changes the percentage of the $Q_{direct}+Q_{catchment}$ that is used to interpolate the discharges during flooded width calculations. It is generally set on the first vertex past upstream pit and remains in effect till the next change or the end of the bypass flow string. The flow changes from the bypass flow at the upstream pit to this value/100($Q_{direct}+Q_{catchment}$).*

Manning's n Input

This changes the Manning's n value used for during flooded width calculations. It remains in effect till the next change or the end of the bypass flow string.

Pick button

Use this button to select the string. Select near the vertex you want assign the values to.

Set button

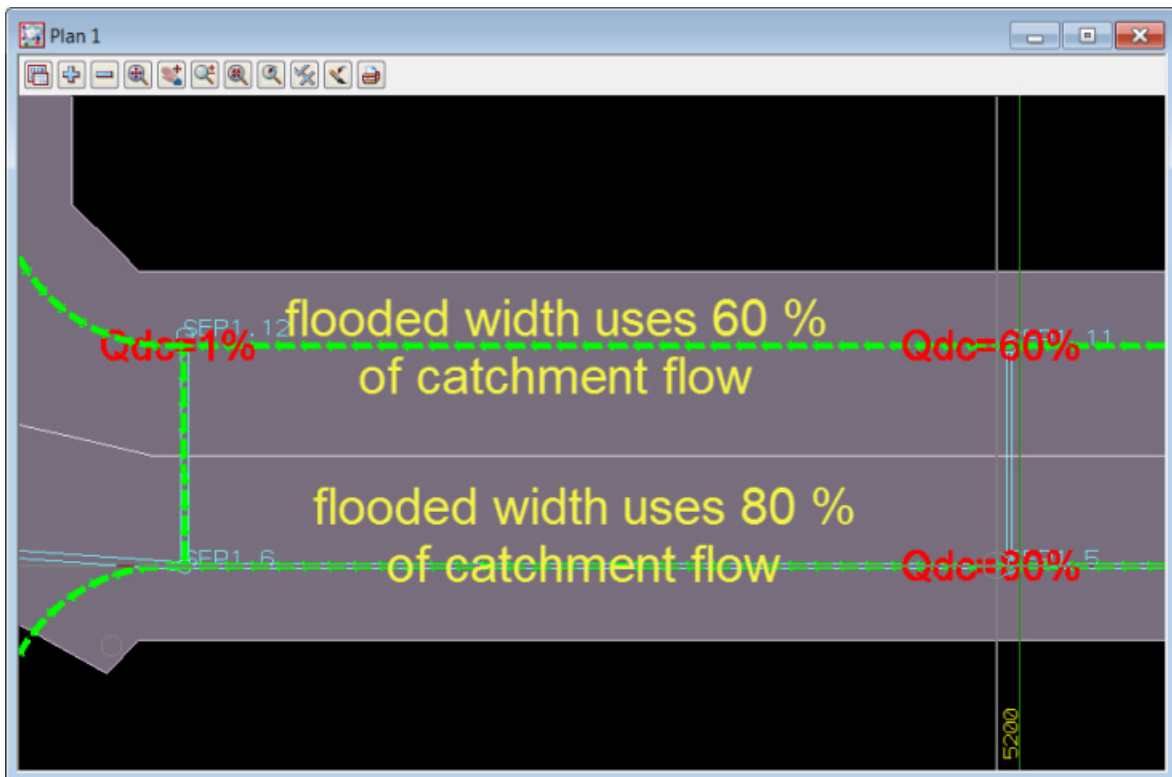
Creates the attributes and the label on the vertex.

Finish button

Removes the panel from the screen.

Help button

Launches the 12d help



In the example above, The Q_{dc} is set to 80% at the eastern end of the catchment. The Q_{dc} is set to 2% for the water overtopping the road. The 18% of the area is not considered large enough to do the flooded width calculation for. If desired, another bypass flow string approaching from the east could be drawn but the final bypass string to the west (direction during bypass should remain).

7.0 Drainage.4d setup file/database

The drainage.4d file controls many of the settings for the pit and pipes types inside 12d. This section details the format and features of the drainage.4d file. Changes to this file take effect only after 12dmodel has been restarted.



Press the **F1** button for 12d help. Select the **index** tab and type **drainage.4d** and select **drainage.4d** from the list. Full documentation of the drainage.4d file is found here.

7.1 Editing the drainage.4d file

When 12d Model starts up, it checks to see if an environment variable called DRAINAGE_4D exists and if it does, then the file it points to is used to provide the available types of manholes (maintenance holes) and pits. If the environment variable is not set, then 12d Model searches for a file called **drainage.4d** in the standard 12d Model search sequence for set up files.

12d model ships a **drainage.4d** file in the “program files\12d\12dmodel\10.00\set_ups” folder. **Do NOT** change this file. Copy it into your user folder “\12d\10.00\User” and edit it there. Files in the user folder are used by preference and they are never over written by a 12d update.

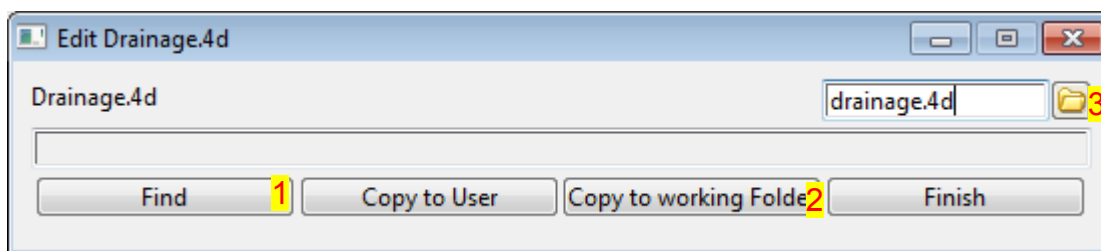
File Format

1. spaces in text - any text string that includes spaces or only numbers, must be enclosed in double quotes ”.
2. comments - anything after // until the end of the line is ignored.
3. blank lines - blank lines are ignored

Duplicate definitions are not allowed. ie. you cannot have 2 manhole types with the same name.

From the main menu select

Design->Drainage-Sewer->More->Edit drainage.4d



1. Select the **Find** button to search the 12d path for the current drainage.4d file.
2. If the file is found in the setups folder, select **Copy to working folder** and then **Find** again.
3. Now that the file is found in the working folder, select the More info button (the folder) and then **Open** to edit the file.

You must restart 12d for these changes to become active. Select Project->Restart!

At startup, refer to the output window for any error messages. 12d will print the line number where it gave up. When looking in the long list of files, the drainage.4d file is loaded after the shp files. Sometimes one error will result in many other errors to follow so fix the first one, save your changes and restart again.

7.2 Creating and Modifying Manhole Types

We will now create a new manhole type for an enlarged grated inlet. For training purposes we will do it in steps restarting 12d model between each step.

1. Create a new manhole type
2. Add manhole commands to set the size and manhole thickness
3. Add manhole commands to create pit connection points where 2 pipes may be connected on the long side.
4. Add manhole commands to set the manhole level modes
5. Add a manhole command to create a user defined attribute.

7.2.1 Create a new manhole type

The order the manhole commands appear in the file is the order they appear in the type drop down list in the DNE.

1. Go to the bottom of the file and type the following.

```
Manhole "AK2D enlarged" {
}
```
2. Save the file
3. In 12d model close the Edit drainage.4d panel.
4. From the 12d model main menu select **Project=>Restart**
5. Check the output window for errors (just below the shp files.. there are easy to find as there are so many of them. You should see the message
File found <C:\12d\10.00\Courses\drainage\drainage.4d>
6. With the DNE, change inlet I-5 to the new manhole type **AK2D enlarged**. Note that you are free to change the diameter/length, width and many of the other DNE Pit fields



Manhole must be capitalised.

Use “ (double quotes) not the single ‘ OR 2 single side by side ‘’.

Use {} NOT () or []

7.2.2 Add manhole commands to set the size and manhole thickness

The **mhsize** command sets the DNE length and width fields (rectangular manhole) and locks them from been changed.

mhdiam is used to set the diameter (circular manhole) and clear sthe width,

The **mhthickness** command block sets the mnahole wall thickness. The **diam_thickness** command has the manhole depth followed by the wall thickness. The line **diam_thickness** may be repeated if you want the pit wall thickness to change if the depth becomes greater than the specified value. Depth is measured from the cover level to the sump level.

The indenting is not required but makes the commands easier to read.

1. add a few blank lines between the braces in your new manhole definition and type the new commands shown in bold.
Manhole "AK2D enlarged" {
 mhsize 1.86 0.835
 mhthickness {
 diam_thickness 0.000 0.150
 }
}
2. Save the file
3. From the 12d model main menu select **Project=>Restart**
4. Check the output window for errors.

7.2.3 Add manhole commands to create extra connection points

With connection points enables on the DNE->Global tab, a connection point is created at the mid points of the internal sides of the manhole. Additional connection points may be added with their offsets from the manhole centre.

1. add a few blank lines before the last brace in your new manhole definition and type the new commands shown in bold.
Manhole "AK2D enlarged" {
 mhsize 1.86 0.835
 mhthickness {
 diam_thickness 0.000 0.150
 }

 con_points "AL2D" {
 con_point 0.930 0.000
 con_point -.465 0.4175
 con_point .465 0.4175
 con_point -0.930 0.000
 con_point -.465 -0.4175
 con_point .465 -0.4175
 }
}
2. Save the file
3. From the 12d model main menu select **Project=>Restart**
4. Check the output window for errors.
5. Use **Strings->Points Edit->Move** to move the end of the pipe that connects to I-5. You will see that it will snap to 2 points on the long side and 1 point on the short sides.

7.2.4 Add manhole commands to set the manhole level modes

We will now set the construction setout point and grate level to be obtained from the road setout string, the cover level to be 0.150 higher than the grate and a sump depth of 200mm.

1. add a few blank lines before the last brace in your new manhole definition and type the new commands shown in bold.

```
Manhole "AK2D enlarged" {
    mhsize 1.86 0.835
    mhthickness {
        diam_thickness 0.000 0.150
    }

    con_points "AL2D" {
        con_point 0.930 0.000
        con_point -.465 0.4175
        con_point .465 0.4175
        con_point -0.930 0.000
        con_point -.465 -0.4175
        con_point .465 -0.4175
    }
attribute_integer "cover rl mode"      8
attribute_real   "setout adjustment z"  0.150
attribute_integer "grate rl mode"      1
attribute_real   "sump offset"         -0.200

attribute_integer "setout xy mode"     1
attribute_integer "setout z mode"      1
}
```

2. Save the file
3. From the 12d model main menu select **Project=>Restart**
4. Check the output window for errors.
5. Use the DNE to select the i-5 inlet. You will be prompted to verify that you want the design parameters to change for each attribute you have added.

7.2.5 Add manhole commands to create a user defined attribute

We will now create a manhole text attribute called “reference dwg” that we can add our drainage plan plot.

1. add a few blank lines before the last brace in your new manhole definition and type the new commands shown in bold.

```
Manhole "AK2D enlarged" {
    mhsize 1.86 0.835
    mhthickness {
        diam_thickness 0.000 0.150
    }

    con_points "AL2D" {
        con_point 0.930 0.000
        con_point -.465 0.4175
        con_point .465 0.4175
        con_point -0.930 0.000
        con_point -.465 -0.4175
        con_point .465 -0.4175
    }
    attribute_integer "cover rl mode"      8
    attribute_real    "setout adjustment z" 0.150
    attribute_integer "grate rl mode"      1
    attribute_real    "sump offset"        -0.200

    attribute_integer "setout xy mode"      1
    attribute_integer "setout z mode"       1

    attribute_text "reference dwg" "Dwg 47.1 Rev A"

}
```

2. Save the file
3. From the 12d model main menu select **Project=>Restart**
4. Check the output window for errors.
5. Use the **DNE** to select the pit. This will set the attribute for this manhole. The **Set Pit details** would do this for all manholes in the model.
6. Select **Apply** or more to another pit.
7. Use **Strings->Properties->Attributes** to select the manhole and on the pit table you will find the new attributes “reference dwg”.

7.3 Pit Inlet Capacities

The pit inlet capacity tables contained within the [Drainage.4d setup file/database](#) are used by the 12d drainage modules and exported to other design packages in different ways but with a common philosophy.

These tables may be plotted in 12d Model using [Viewing Inlet Capacity Curves](#).

7.3.1 On grade pits

The grade and crossfall values for the tables are threshold values, i.e. the next set of capacity factors/curves will not be used until the measured crossfall and grade are equal to or exceed the

threshold values for the curves. Curves with the same crossfall threshold are grouped together and the correct group is selected first. The road grade is then used to select the curve within the cross-fall group.



Each inlet selects one road grade curve from the drainage.4d file. **12d** Model does not interpolate between the curves.

Some simple sample pit definitions follow to demonstrate how the pit inlet capacities are calculated. The drainage.4d file supplied in the library has extensive curve data from model testing.

```
Manhole "SEP 25" {

    mhsize    1.200 0.900
    mhdesc    "SEP with 25 l/s"
    mhnotes   ""
    mhgroup   "SA"

    cap_multi 1.0
    cap_fixed 0.025

}

Manhole "SEP 50 percent" {

    mhsize    1.200 0.900
    mhdesc    "SEP with 50%"
    mhnotes   ""
    mhgroup   "SA"

    cap_multi 1.0
    cap_percent 50.

}

Manhole "SEP Grade x 10" {

    mhsize    1.200 0.900
    mhdesc    "SEP with 25 l/s"
    mhnotes   ""
    mhgroup   "SA"

    cap_curve_grade "curve 1" {
        road_grade 0.0
        cap_multi 1.0
        cap_fixed 0.010
    }

    cap_curve_grade "curve 2" {
        road_grade 2.0
        cap_multi 1.0
        cap_fixed 0.020
    }
}
```

```
}

cap_curve_grade "curve 3" {
    road_grade    3.0
    cap_multi     1.0
    cap_fixed     0.030
}

cap_curve_sag "curve sag" {
    cap_multi     1.0
    coord 0.0    0.000
    coord 0.1    0.010
}
}
```

7.3.2 Exporting Inlet Capacity to External Programs
Drains Version 1 and ILSAX

The cap1, cap2, cap3 and cap4 values are used to describe the inlet capacity of the pit as described in their user manuals.

Drains Version +

The 12d inlet curve names are exported to Drains as the pit family.

xpswmm, xpstorm and RAT-HGL

If cap2, cap3 and cap4 are all equal to zero then a fixed inlet capacity equal to cap1 will be exported to RAT-HGL. If the sum of these three values is greater than zero then a pit type will be created in the format of **pit_type-crossfall-roadgrade**. For example SA2-3-2 for a SA2 pit with a road crossfall of 3% and a road grade of 2%. A rating curve with this name will have to exist inside RAT-HGL. 12d has no way of transferring the rating curve itself into RAT-HGL.

PC Drain

Similar to RAT-HGL, PC Drain has it own rating curves defined internally. The road grade is sent as a separate piece of data to PC Drain so that the pit inlet capacity may be determined.

PC Drain places a suffix code in the pit type to specify that the pit is a SAG pit. For example an 9S.03 indicates that pit type 9 is a sag pit and the maximum depth before bypassing is 30mm. 12d model does this automatically when exporting.

7.3.3 Add manhole commands for inlet capacity

Manhole inlet configuration and bypass pit entries determine if these inlet capacity commands are used. Both may be set in the [Drainage Network Editor](#).

cap_config

The inlet configuration may be set via the following command

cap_config	x	
	Mode	x
	Manhole	m
	Ongrade	g
	Sag	s

Inlet Capacity Equation

The inlet capacity equation is built up with 3 optional components (**single polynomial + curve polynomial + curve coordinates**). Generally, only one of the 3 components is used for each manhole type but they may all be used if desired.

inlet capacity = inlet efficiency * inlet multiplier *
[**single polynomial** + curve multiplier (**curve polynomial** + **curve coordinates**)]

An inlet efficiency (choke factor) is specified in the [Drainage Network Editor](#). An inlet efficiency (choke factor) of 0 would stop all water from entering the inlet.

Curve Coordinates (On grade and SAG)

For on-grade and sag inlets, the inlet capacity may be determined by entering coordinates along the inlet capacity curve. These coordinates are usually obtained from hydraulic model studies or analytical methods such as HEC-22.

For on grade inlets, the coordinates are Qapproach and Qin, and the curves may change with road grade and cross fall threshold values. The inlet capacity curves are never extrapolated.

Example

```
Manhole "Ongrade Inlet A" {
    cap_config G
    cap_curve_grade "0.5G" {
        road_grade 0
        coord 0.000 0.000
        coord 0.060 0.060
        coord 0.140 0.112
        coord 0.260 0.174
        coord 0.430 0.244
        coord 0.500 0.270
    }
    cap_curve_grade "1G" {
        road_grade 0.75
        coord 0.000 0.000
        coord 0.060 0.060
        coord 0.140 0.108
        coord 0.260 0.164
        coord 0.430 0.227
        coord 0.500 0.248
    }
}
```

For sag inlets, the coordinates are Depth (base units) and Qin, and there is only one curve. Each curve has a curve multiplier specified with a cap_multi parameter (discussed below).

Example

```
Manhole "SAG Inlet A" {  
    cap_config S  
    cap_curve_sag "SAG" {  
        coord 0.000 0.040  
        coord 0.045 0.101  
        coord 0.070 0.151  
        coord 0.095 0.245  
        coord 0.120 0.302  
        coord 0.170 0.347  
        coord 0.220 0.371  
        coord 0.270 0.391  
    }  
}
```

Inlet Curve Block Commands

Inlet curve blocks may be specified for both on-grade or sag inlets. Inside the curve block you may include the [Polynomial Inlet Capacity Commands](#) and [Coordinate Inlet Capacity Commands](#).

```
cap_curve_grade "unique name for the pit type" {  
    road_grade x.xx  
    road_xfall x.xx  
}
```

Inside the cap_curve_grade block the road grade and road crossfall threshold values (percent) may be set. The road grade and crossfall are calculated by the [Drainage Network Editor](#). When the 12d analysis engine selects the inlet curve, all curves with the same road_xfall are grouped together and then within the crossfall group the road_grade curves is selected. The inlet curve with the maximum grade threshold that is less than or equal to the road grade is selected.

Rules for 'cap_curve_grade' entries:

- Only applicable to on-grade pits.
- All cap_curve_grade names must be unique within a Manhole block
- If both 'road_grade' and 'road_xfall' entries are omitted, only one cap_curve_grade entry is allowed within a pit.
- The cap_curve_grade 'coord' entries (if used) must be in order of increasing Qa.

```
cap_curve_sag "unique name for the pit type" {  
}
```

Rules for 'cap_curve_sag' entries:

- Only applicable to sag pits.
- Only one cap_curve_sag entry is allowed within a pit, and it must have a valid name.

Coordinate Inlet Capacity Commands

The coord command must be used inside the cap_curve_grade or cap_curve_sag grouping
coord x.xx y.yy

x.xx must be in increasing order.

For cap_curve_grade group, the coord command has the parameters Qapproach and Qin

For cap_curve_sag group, the coord command has the parameters Depth and Qin

Please continue to the next section [Drainage Definitions - Pipe Types](#).

7.4 Drainage Definitions - Pipe Types

Pipe types may be used to set the following pipe properties via the DNE.

- s pipe nominal/actual diameters and thickness
- s roughness method and value
- s rational method design mode and design percent depth
- s minimum pipe height for the rational design engine
- s user defined pipe attributes

Each definition (pipe block) in the file begins with the key word **Pipe**, followed by the pipe type and then curly braces { }. The order that the definitions appear in the file determines the order they appear in the drop down lists inside **12d Model**.

The minimum requirement for a pipe type definition is

```
Pipe "name" {  
}
```

7.4.1 Pipe Thickness

```
pipethickness {
    diam_thickness x.xxx y.yyy a.aaa b.bbb c.ccc d.ddd
}
```

x.xxx nominal diameter choices will appear in the DNE->Pipe->Diameter drop down
y.yyy internal diameter (base units) will be entered into the DNE->Pipe->Diameter field
a.aaa optional top thickness (base units) 0.000 if omitted
b.bbb optional bottom thickness (base units) top thickness if omitted
c.ccc optional left thickness in direction of chainage (base units) top thickness if omitted
d.ddd optional right thickness in direction of chainage (base units) top thickness if omitted

An example pipe definition follows.

```
Pipe "2" {
    // HUMES class 2 rubber ring joint pipe thicknesses
    pipethickness {
        // nominal_diam internal_diam top [bottom] [left] [right] (looking in the direction of chainage)
        diam_thickness 0.225 0.229 0.025
        diam_thickness 0.300 0.300 0.031
        diam_thickness 0.375 0.375 0.035
        diam_thickness 0.450 0.450 0.042
        diam_thickness 0.525 0.534 0.041
        diam_thickness 0.600 0.610 0.044
        diam_thickness 0.675 0.685 0.048
        diam_thickness 0.750 0.760 0.052
        diam_thickness 0.825 0.838 0.054
        diam_thickness 0.900 0.910 0.066
        diam_thickness 1.050 1.070 0.075
        diam_thickness 1.200 1.220 0.076
        diam_thickness 1.350 1.370 0.077
        diam_thickness 1.500 1.524 0.095
        diam_thickness 1.650 1.676 0.095
        diam_thickness 1.800 1.828 0.102
    }
}
```

7.4.2 Pipe Attributes

attribute_integer	"attribute name1" x	x is an integer value (no decimal, stored exactly by computers
attribute_real	"attribute name2" x.xxx very large or very small numbers	x is a real value (used to store numbers with decimals or
attribute_text	"attribute name3" "text"	text is a series of words or numbers not intended for calculations

The following special attribute commands create/modify an attribute as described above but these attributes also control calculations performed by the set pit details button on the [Drainage Network Editor](#). The DNE fields will be locked when these attributes are defined for the selected pipe type. If these attribute are not defined for the selected pipe type the DNE field will not be locked and remain unchanged.

```
roughness_n      x.xx>      DNE field ->Pipe=>Main=>Roughness
                                 DNE field ->Pipe=>Main=>Roughness type (set to Manning)
```

roughness_k	x.xx	DNE field ->Pipe=>Main=>Roughness Colebrook k roughness value in millimetres DNE field ->Pipe=>Main=>Roughness type (set to Colebrook)
attribute_real	x.xx	DNE field ->Pipe=>Design=>Min pipe height min height in base units
attribute_integer	"design size mode" x	DNE field ->Pipe=>Design=>Design mode
	Mode	x
	<u>Pressurised Pipe: Freeboard design</u>	0
	<u>Part-full Pipe: Freeboard design</u>	1
	<u>Part-full Pipe: Flow depth design</u>	2
	<u>Open Channel: Freeboard design</u>	3
attribute_real	"design percent depth" x.xx	DNE field Pipe=>Design=>Flow-depth at pipe entrance

An example of these setting follows:

```
Pipe "CHNL GRASS EXISTING 1" { //Open Channel 1
  roughness_n 0.040
  attribute_integer "design size mode"    3 // open channel mode
}
```

8.0 Open Channel Flow

12d can model flow in open channels a trapezoidal sections. Suggestions for drainage network editor settings are listed below.

Generally, simple channels leading into a pipe network are often not modelled as open channels. The flooded width calculations can perform flooded width calcs (normal depth however) along the channel and the depth at the headwall is calculated using the headwall ku method.

If gradually varied depth/backwater calculations are desired then the channel will need to be modelled as a drainage string. Also if the pipes discharge into a channel then this channel will also need to be modelled as a drainage string.

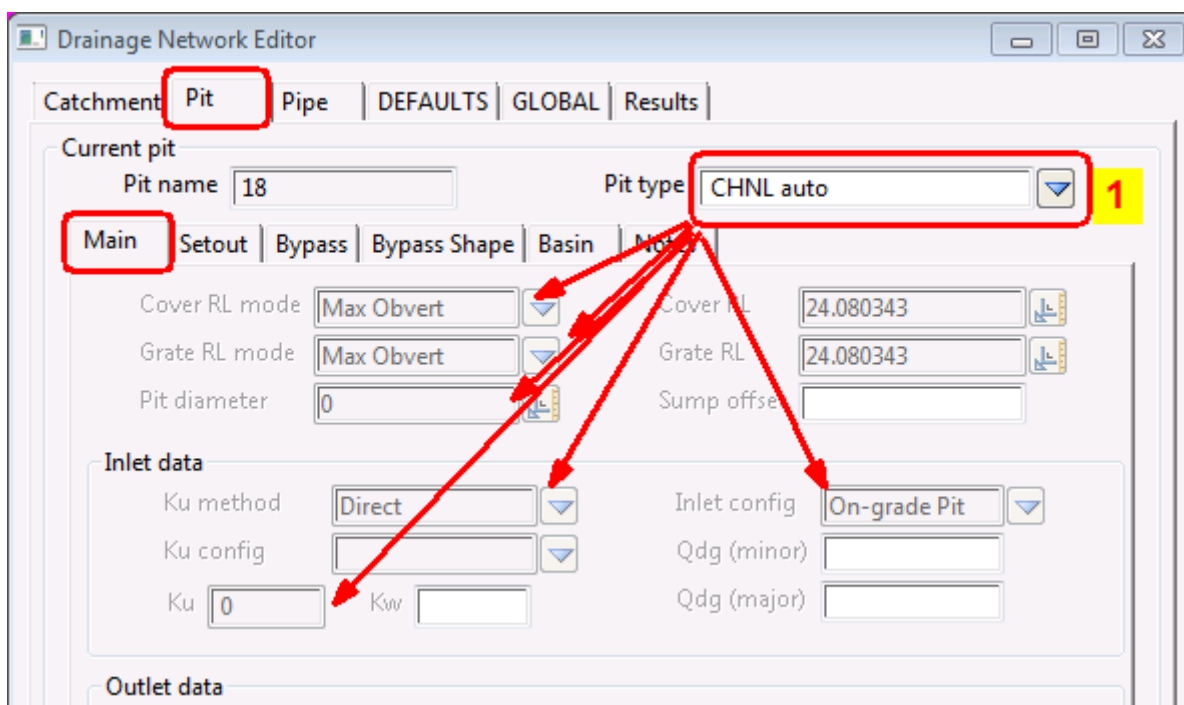
Key points

The pit grate level must always be at or above the top of the open channel conduit.

Changes in vertical grade and horizontal alignment require a pit in the drainage string. The pit diameter is usually set to zero.

Channels may exist in the tin or you may be proposing a channel to be cut into the tin. The grading and grate level modes will be different for each case. These channel type will be referred to as "Existing" or "Proposed"

Pit-Main Tab



1. Selecting the **CHNL auto** pit type changes many settings in the DNE.

Cover RL mode is changed to **Max obvert**.

Grate RL mode is changed to **Max obvert**.

Pit diameter of diameter of zero. This will result in a single line on the drainage long sections instead of a pit.

Ku method is set to **Direct** and a **Ku** of 0 for the channel change of grade points (pits).

Inlet config - On-grade pit - it has a 200% inlet capacity. The 200% inlet capacity is in case a

choke factor is accidentally applied.

2. Select the Pit Setout tab

Pit-Setout Tab

Drainage Network Editor

Catchment **Pit** Pipe DEFAULTS GLOBAL Results

Current pit
Pit name 18 Pit type CHNL auto

Main **Setout** 2 ss Bypass Shape Basin Notes

Pit setout
Setout xy mode Pit Centre
Setout distance 0
Setout z mode Sump Invert
Easting 5003.841157
Northing 7312.32155
Setout RL 23.080343

Pit road chainage
Chainage mode No Road 3
Road name
Chainage
Offset

Setout xy mode is set to **Pit centre**

Setout z mode is set to **Sump Invert** which is the lowest of the channel inverts if **Sump offset** = 0(Main tab).

3. The **Chainage mode** may be changed to **No Road** if the channel centre line is not to be used for setout.If the default was **Centre string** this will stop the Problem message saying the centreline string is not found.

Pipe-Main Tab

Drainage Network Editor

Catchment | Pit | **Pipe** | FAULTS | GLOBAL | Results

Pipe downstream of current pit

Pipe ID: 18 to 17

Pipe type: CHNL GRASS PROF

Main | Design | Channels | Notes

Invert levels

US Invert: 23.080343

DS Invert: 22.813673

Dimensions

Diam/Height: 0.5

Width: 1

Top width: 5

Section location:

Other properties

Roughness type: Manning

Roughness: 0.04

US defl.: -11°48'20"

Qdp (minor):

Qdp (major):

DS defl.: -45°06'25"

Length: 53.334

4. Change to the **Pipe->Main** tab
5. Change the **Pipe type** to **CHNL GRASS PROPOSED**. This changes the following:
the **Roughness type** to **Manning**
the **roughness** for the open channel to 0.040
6. Set the **Height**, **Top width** and **Bottom width** of the channel.

Note: The pipe type can now be changed back to channel if you needed to alter any of the locked settings. Selecting the **CHNL GRASS PROPOSED** first set most of the setting correctly as a good starting point.

Pipe-Design Tab

Drainage Network Editor

Catchment | Pit | **Pipe** | DEFAULTS | GLOBAL | Results

Pipe downstream of current pit

Pipe ID: 18 to 17

Pipe type: CHNL GRASS PROF

Main | **Design** | 7 | Channels | Notes

Invert design

Lock US Invert ☐

Grade mode

DS vert defl

DS align mode: **IL-IL Drop** (8)

Lock DS Invert ☐

Cover limit

Min grade (%): 10 (10)

Align drop: 0 (9)

Pipe size design

Lock pipe size ☐

Min pipe height

Max pipe height

Design mode: **Open Channel: Freeboard Design**

Freeboard limit at US pit

Flow-depth limit at pipe entrance (%)

7. Change to the **Pipe->Design** tab

8. Set the **Align mode** to “IL-IL drop”

9. Set the **Align drop** value to 0 (unless you are designing drop structures for your channel).

10. **Min Grade %** for open channels is usually much less than pipes.

Note: The **Design mode** has been changed to “**Open Channel: Freeboard Design**”. This will allow supercritical flow to continue through the channel junctions. Often the Freeboard limit will be different for a channel than the pipe system.

9.0 Major Flood Events

To keep the results file from the minor event copy the drainage models using



Save your project. The following routine copies the models that are saved on disk!

Models->Utilities->Copy Project Models

	Copy	Original Model Name	New Model Name	Status
7	<input checked="" type="checkbox"/>	drainage	drainage minor	ma
8	<input checked="" type="checkbox"/>	drainage flood sag ponds	drainage minor flood sag ponds	ma
9	<input checked="" type="checkbox"/>	drainage flood widths	drainage minor flood widths	ma
10	<input checked="" type="checkbox"/>	drainage flood widths warn DxV	drainage minor flood widths warn DxV	ma
11	<input checked="" type="checkbox"/>	drainage flood widths warn Q	drainage minor flood widths warn Q	ma
12	<input checked="" type="checkbox"/>	drainage flood widths warn W	drainage minor flood widths warn W	ma
13	<input checked="" type="checkbox"/>	drainage flood xsecs	drainage minor flood xsecs	ma
14	<input type="checkbox"/>	drainage labels	drainage minor labels	ma
15	<input type="checkbox"/>	drainage points	drainage minor points	ma

1. Select your current project
2. **Type** the name of your drainage model followed by the wildcard*
3. **Type** the new name for your minor results followed by the wildcard*
4. Tick the models that you want to copy
5. Select **Copy**
6. Select **Finish**

Now that the minor results are safely stored away, edit the drainage model using the DNE.

For major flood events the user may desire to use an alternative set of values for

Catchment to,
 Catchment C,
 Pit direct inflow (Qdi),
 Pipe direct inflow (Qpi),
 Pit choke factor for ongrade inlets,
 Pit choke factor for SAG inlets,
 Outlet tailwater levels.

These controls are found on the Storm Analysis Panel, **Main** tab.

1. Ensure you have selected the **drainage** model and then go to **Storm analysis**.

2. Type the new return period.

3. Select the **major** storm setting.

4. turn off the **Modify pipe inverts** and **Modify pipe sizes**.

5. Change the name of your report files by adding **100** after drainage.

You are now ready to analyse the major event and check the surface flooding conditions.

10.0 Excavation Quantities

Sample templates are included in the 12d library (pipe template.tpl). The templates from this template library may be added to your project using

Design=>Templates=>Utilities=>Input.

Usage

Access this report from the menu selection

Design => Drainage => Reports => Excavation Quantities

This routine uses 12d templates to calculate the excavation volume for all of the drainage strings in a model. An option to create section for a tin on top of the pipe is also available so that the drainage long sections can include hatching between the obvert of the pipe and the design tin under roads.

Templates with names set to the pipe diameters (times 1000) are used for the calculations, thus trench shapes can be customised and over excavation for bedding materials can be included. Net area calculations to exclude pipe area are not supported.

Key points

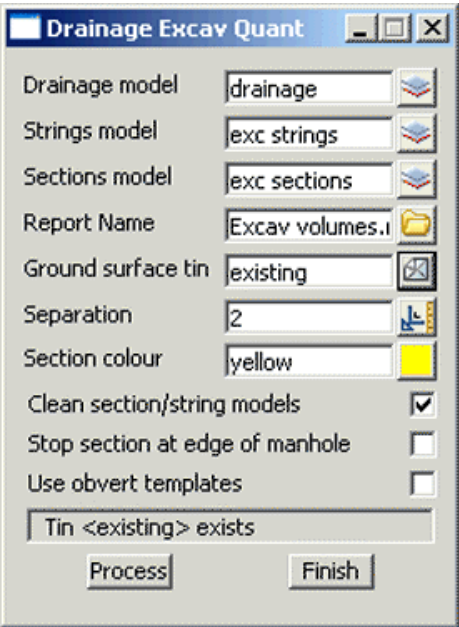
1. One template for each pipe size (mm)
2. If obvert templates are used, add the prefix “obvert “ to the pipe size
3. Carefully consider the tin selected.

A template must exist for each pipe size in the model (pipe size x 1000). For example a 0.3m pipe will require a template to exist named 300. A 0.5ft pipe would require a template named 500. A sample template library is included in the 12d library in the file **pipe_template.tpl**.

The templates are run along the strings and the total volumes are reported. Volumes for each strings are given in the report file.

If a tin is created from these strings then volumes by depth can be determined using **Design=>Volumes=>Exact=>Tin to tin**

On selecting the **Excavation quantities** option, the **Drainage Excavation Quantities** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Drainage model	input box		
<i>Model to contain all of the pit and pipe network to be worked on.</i>			

Strings model	model box		
<i>Strings generated from the templates will be stored in this model</i>			

Sections model	model box		
<i>Sections generated from the templates will be stored in this model</i>			

Report name	input box		
<i>cut and fill volumes will ne sent to this report</i>			

Ground Surface Tin	tin box		
<i>tins from which the volumes will be calculated</i>			

Separation	real box		
<i>distance between the sections</i>			

Sections colour	colour box		
<i>Sections generated from the templates will be assigned this colour (strings colours are defined in the templates)</i>			

Clean section/strings model	tick box		
<i>Delete the strings in these models before processing.</i>			

Stop section at edge of pit	tick box		
------------------------------------	----------	--	--

Template are run from pit centre to centre if this is not selected. The templates stop at the edge of the pit if selected. This is often selected with the following option **Use obvert templates.**

Use obvert templates tick box

Templates must be named with the prefix “obvert”. i.e. **obvert 300**. The template is still run along the invert of the pipe but the user now has a section “set” of templates that can be used to create a tin on top of the pipe as well as below.

An example report file follows.

```
----- BEGIN APPLY TEMPLATE REPORT -----

apply template to string report -

string      E
tin         design
separation  10.000
left template 375
right template 375
cut volumes and areas are negative
fill volumes and areas are positive

chainage- ----sectional information----- ----intermediate information---- ----accumulative information-----
          ---cut area --fill area -----cut vol --fill vol  -cut volume-- -fill volume- ---balance---

0.000      -1.434    0.000                -0.771    0.000          0.000    0.000    0.000
0.550      -1.367    0.000                -14.222    0.000         -0.771    0.000   -0.771
10.000     -1.642    0.000                -15.293    0.000        -14.992    0.000  -14.992
20.000     -1.416    0.000                -1.845     0.000        -30.286    0.000  -30.286
21.313     -1.393    0.000                -0.794     0.000        -32.130    0.000  -32.130
21.863     -1.493    0.000                0.000     0.000        -32.924    0.000  -32.924

total cut              -32.924
total fill              0.000
balance                -32.924
ie excess of cut over fill  32.924

----- END APPLY TEMPLATE REPORT -----
```


11.0 Network Quantities Report

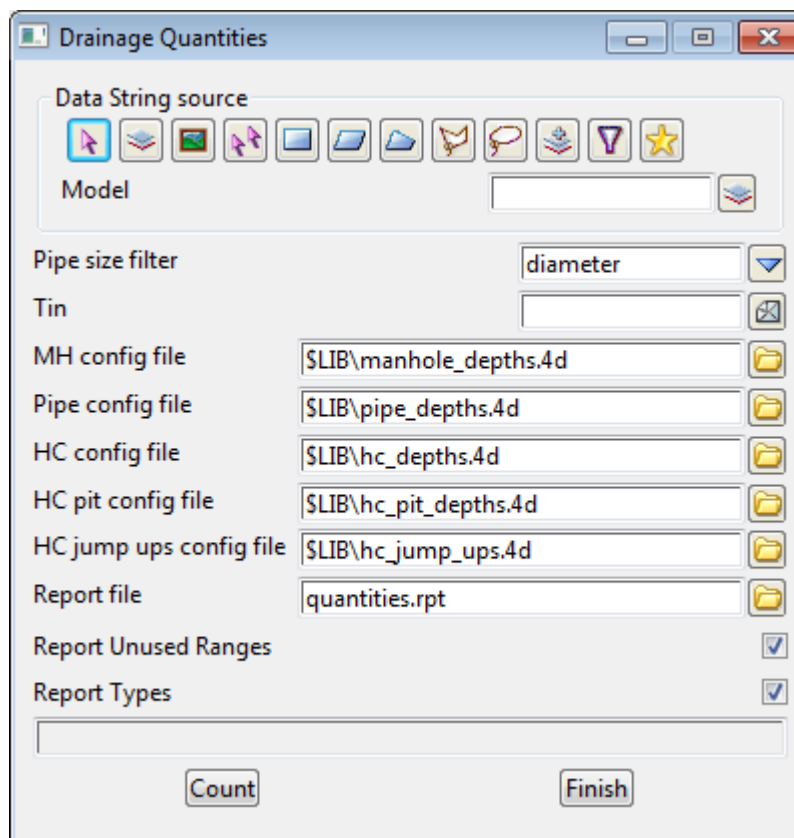
This panel is accessed from the menu selection

Design => Drainage Sewer => Reports=> Network Quantities

Key points

1. Items are counted/totalled by depth and optionally type.
2. The routine will not "double count" items even if the ranges overlap.
3. Types are case sensitive, types with spaces in the name must be enclosed in quotes and the wild card * may be used.
4. Use vertically offset tins and "banded" depth ranges to get quantities under roads, foot paths etc. This is discussed later in detail.
5. Erase count file fields if the items are not to be counted.

On selecting the **Network quantities** option, the **Drainage quantities** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data String Source	Choice		
---------------------------	--------	--	--

usually the entire model is selected but view is also available for combining models

Pipe size filter	Choice		diameter or pipe size attribute
-------------------------	--------	--	---------------------------------

*The second item in a count line is used to filter by **diameter** (in meters/ft) or the **pipe size attribute**. The*

diameter can only be used when no box culverts or trapezoidal channels are used. The **pipe size attribute** is the label generally used in the plan plots. This is the pipe size in mm/inches (375), for box culverts width x height (750x375) and for trapezoidal channels TopwidthBottomwidthxHeight (T5000B1000x500).

Tin tin box
This tin will be used for the pipe and pit depths.

MH config file file box
This file specifies the types and depth ranges for the pits. Details of this file are contained below.

Pipe config file file box
This file specifies the types and depth ranges for the pipes. Details of this file are contained below.

HC config file file box
This file specifies the types and depth ranges for the house connections. Details of this file are contained below.

HC pit config file file box
This file specifies the types and depth ranges for the HC pits. Details of this file are contained below.

HC jump ups file file box
This file specifies the types and depth ranges for the house connections jump ups. Details of this file are contained below.

Report file file box
a sample report file is given below.

Report unused ranges tick box
*the depth ranges for the pit/pipe/house connections are defined in the *.4d files. Selecting this option will cause the depth ranges in the file to be printed even if there are no pit/pipe/house connections in these depth ranges (zero quantity values will be shown).*

Report types tick box
*Selecting this option will cause the pit/pipe/house connection types used in the model types to be listed (even if quantities are not requested in the *.4d files). Since this is a complete of the type used in the model, the list informs the user what types have not been included in the quantity calculation.*

Count button
executes the option.

Finish button
removes the dialogue from the screen

The *.4d files listed above are contained in the 12d **library** directory. Each line is the file performs a count (count lines). No items are counted twice. Therefore, if an item is counted its type and then a count line is found the wild card is used for the type, the type already counted will not be included in the count.

The format for a count line is three or four values (space delimited) per line. Size is optional.

```
<type (from drainage.4d)> <size> <starting depth> <ending depth>
```

Notes:

All **types** with spaces in the name must be enclosed in quotes The wild card * may be used.

The **size** is optional and if omitted the all sizes will be counted in this group (do not use the * for a wild card).

The **starting depth** and **ending depth** are required for all count lines.

Quantities Under Roads and Footpaths

By creating super tins with vertically offset sections, quantities under roads, footpaths etc. can be determined. for example.

Offset your road design tin up by 1000m (**Tins->Utility->Translate/Copy**) and then use the depth range 1000-1999 for pipes under roads.

Create a tin from the footpaths only, null by angle length with a small length to remove the road and then offset it vertically by 2000m. the depth range 2000-2999 is not the quantities under the footpath.

Sample count lines

```
// sum concrete cover manholes is various ranges

"CONC COVER" 0.0 1.6
"CONC COVER" 1.5 3.0
"CONC COVER" 3.0 999.9 // this is expected to be zero
"CONC COVER" -999.0 0.0 // trap errors

// any that are not Concrete cover will be counted here

* 0.0 1.6
* 1.6 3.0
* 3.0 999.9
```

Manhole Quantities
=====

CONC COVER	0.00	1.60	13	16.506
CONC COVER	1.60	3.00	1	1.510
CONC COVER	3.00	999.9	0	0.000
CONC COVER	-999.0	0.0	0	0.000
*	0.00	1.60	0	0.000
*	1.60	3.00	0	0.000
*	3.00	999.9	0	0.000

total length = 18.016

Types Used

CONC COVER

Diameters Used

1.100

Since the **Report unused ranges** tick box was selected, these lines were printed even though there were no pits in the data ranges.

This data results from selecting the **Report types** tick box.

Sample count lines for pipes follow.

```
// sum class 2 pipes by diameter and for various ranges

// count 375

2 0.375 0.0 2.0
2 0.375 2.0 5.0
2 0.375 5.0 999.

// count 450

2 0.450 0.0 2.0
2 0.450 2.0 5.0
2 0.450 5.0 999.

// count 525

2 0.525 0.0 2.0
2 0.525 2.0 5.0
2 0.525 5.0 999.

// count pipe sizes that were missed

2 * 0.0 2.0
2 * 2.0 5.0
2 * 5.0 999.

// count all other missed pipes

* 0.0 999.
```

12.0 Exporting to Drainage Design Software Packages

12d contains most of the data required for your drainage design packages. However, each package has specific design variables that 12d does not have access too. The design process is intended to export your data from 12d to the design package, design the drainage system and then read the results back into 12d for your long sections.

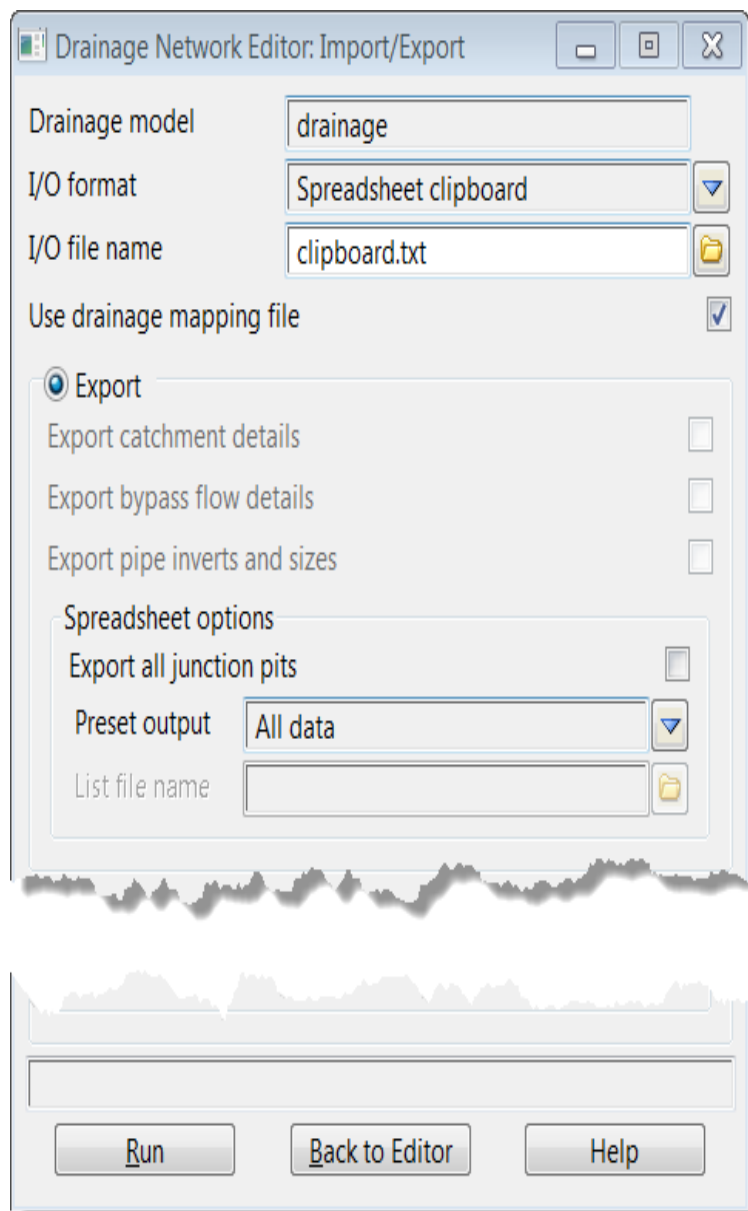
If pits/pipes are to be added/deleted from your network during the design process you are safest to add/delete the pit/pipe to 12d and to your design package separately.

Not recommended and as a poor alternative, you have the option of reading the results back into 12d, adding/deleting the pits/pipes and then exporting the data to a new drainage project in your drainage design software. **As 12d does not have access to all of the data in the design packages this method is not recommended!**

Some of the drainage design programs offer a third option that allows you to import data “on top of” an existing project thereby merging and over writing the existing data. Be sure to contact the drainage software supplier to obtain exact details of how the merging process is performed.

The interface is run by selecting **Import/Export** from the **Drainage [Network Editor](#)**

Design->Drainage-Sewer->Network Editor



The **Drainage model** is the model currently being edited.

The **I/O format** selects which external program the 12d is interfacing with. Some programs use the windows clipboard and others use files. If the clipboard is used the data will also be written to a file by 12d in case you need to take the data to another computer.

Export enables the export fields below and exports when **Run** is selected.

The **Export options** have slightly different effects depending on the **I/O format** (program) selected above. Therefore they will be discussed later with the various formats.

Export pipe diameters and inverts is generally select for existing systems only. If your design program will set invert levels and pipe sizes then turn this tick box off for new systems. Some design programs will require initial inverts and pipe sizes. In this case this box should be selected on the first export.

Export default catchment/pit parameters is generally selected for the first export. For subsequent exports turn this selection off and then only the catchment areas (if the model is supplied above) will be exported.

13.0 Drainage Data Input and Output to Spreadsheets

Spreadsheets are an effective method to manage the numerous variables urban drainage designers create in the modelling process. Spreadsheet data can be transferred to and from 12d in tab delimited files and stored within 12d as “user definable attributes”. These attributes are linked to the pit and pipes within a network. Drainage long section plots can display the pipe attributes in the “arrows” data area and pit attributes in the bubbles area. Drainage plan drawing can also show these pit and pipe attributes.

Drainage strings will be created if they do not exist in the model but pits cannot be added to existing strings.

See also

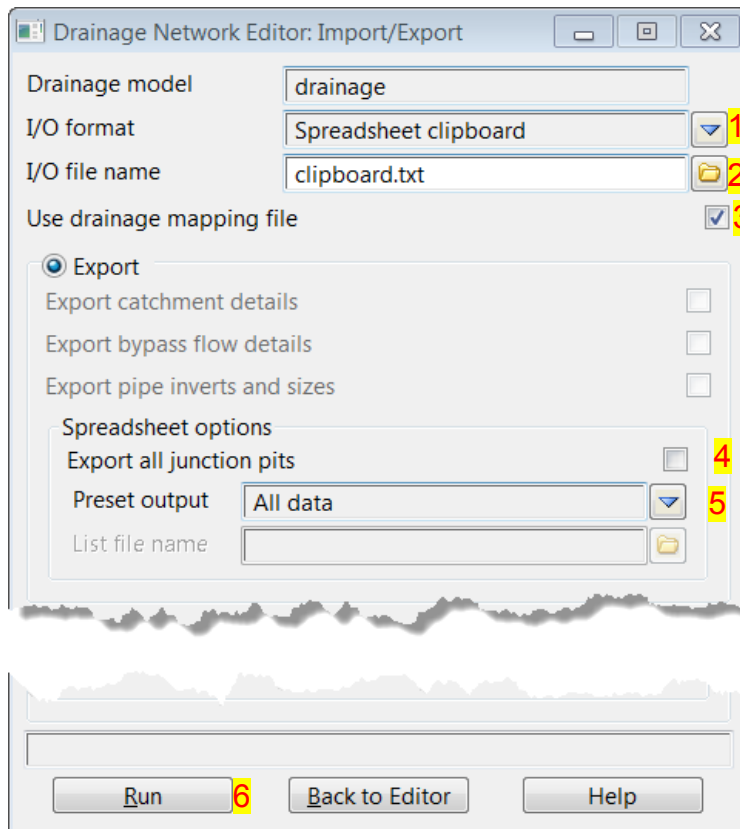
12d to spreadsheet transfers

Spreadsheet to 12d update and create

Spreadsheet options

13.1 12d to spreadsheet transfers

This interface is accessed the **Import/Export** button on the Drainage **Network Editor**.



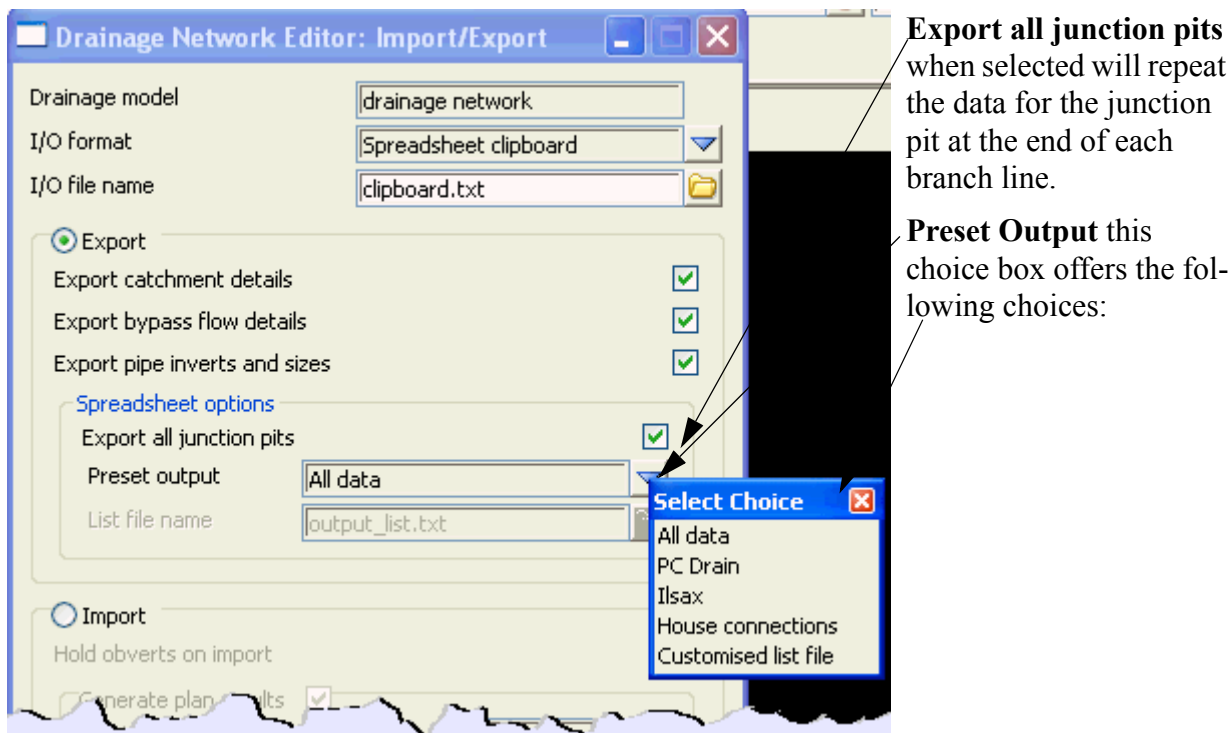
1. Select Spreadsheet clipboard
2. leave as **clipboard.txt** to send the data to the windows clipboard as well as this file.
3. Mapping files are the most current 12d technology. Leave this selected.

These options are not used for spreadsheet export.

4. Usually leave this off! Select to export the junction pit at the end of all drainage lines (very rarely needed).
5. You may also select to limit the output if desired. If you like using spreadsheets for data entry, the PCdrain data and ILSAX data formats are useful for adding data for the first time for either program.
6. Select Run to place the data on the clipboard.

13.1.1 Options

The **Spreadsheet Options** section allows the user to define the amount of data exported.



All Data: All of the 12d drainage string data and the user defined attributes will be exported to the clipboard in a tab delimited format. The 12d data names and the user defined attribute names will appear at the top of the spreadsheets columns.

ILSAX: For the ILSAX program, the spreadsheet column headings will change depending on the pipe and catchment indicators (P2 card) and the inlet type (P3 card). Therefore, use the ILSAX pipe editor macro to set up one pit/catchment for the type of data you wish to enter. Now when you export the pipe network data the column headings will include the names of the relevant parameters.

User defined below: The **Customised list file name** is used to define the drainage values, their order and format you desire.

The **customised list file** is a text file where each line contains a drainage variable or a spreadsheet IO command (blank lines are ignored unless preceded by the header command). The spreadsheet IO commands are all lower case and listed below:

header	to define a line of text to be exported
blank	to leave a blank column in the output
pit data	the following attributes are for the pit.
downstream pit data	the following attributes are for the downstream pit.
upstream pit data	the following attributes are for the upstream pit(s).
pipe data	the following attributes are for the pit's outlet pipe
downstream pipe data	the following attributes are for the downstream pipe(s)
upstream pipe data	the following attributes are for the upstream pipe(s)
variable name	a 12d drainage variable names
factor	the following variable is multiplied by this factor
decimals	the following variable will export with these decimal places

The simplest way to create your own customised tab delimited file is to set the **Preset Output**

field to **All data** and leave the **customised list file name** field blank. Selecting **Set**, **Finish** and then **Copy** from the main dialogue. The data will be placed on the clipboard and a **customised list file**, named **output_list.txt** will be created containing the names of all of the drainage variables in the 12d model. Use a text editor to add/or delete the variable names, change their order and/or add spreadsheet IO commands. **Save the file with a new name!** The **output_list.txt** file is overwritten on every export.

A listing of a customised list file follows. Note the words in the header file have a “tab” between them so that they will be spaces across the spreadsheet columns.

```

header
Pipe Details
    header
    Name Length  U/S IL  D/S IL  Slope(%)  Class  Dia I.D.  Rough  Pipe Is  No. Pipes

    pit data
    *pit name

    pipe data
    *length
    low ch invert
    high ch invert

    factor
    100
    *grade

    pipe type

    factor
    1000
    diameter
  
```

After creating your customised list file, select **Options** again and change the **Preset Output** field to **User Defined below** and enter the new **customised list file** name that you saved above. Select **Set** then **Finish** and finally **Copy** to put the formatted data onto the clipboard.

The data can be pasted into a spreadsheet program for checking or additional formatting.

CUSTOM FORMATED DATA MIGHT NOT BE PASTED BACK INTO 12d!

The data must be in the “12d drainage spreadsheet” format to be read into 12d.

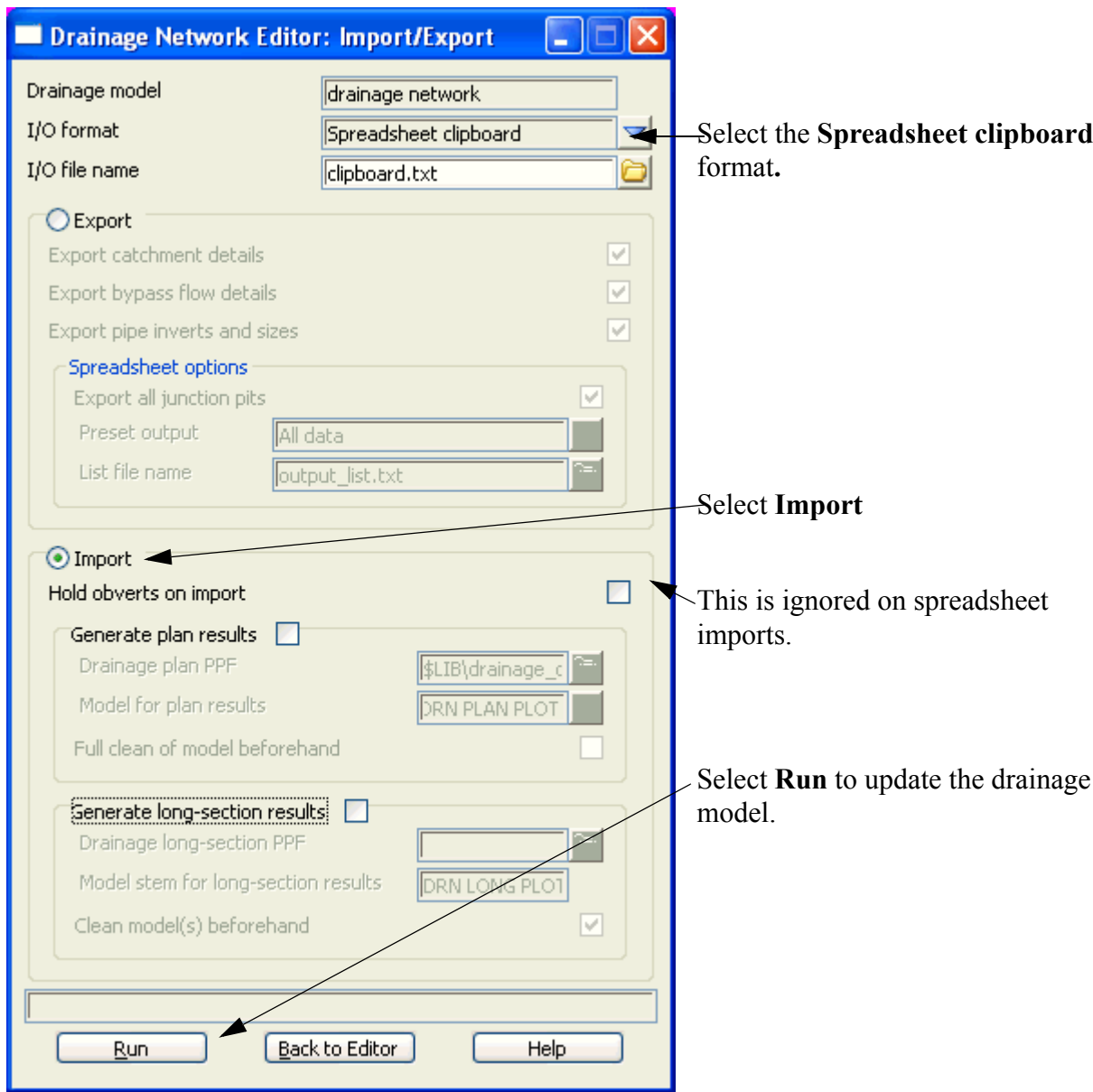
Caution with pit names in the form 1-1 or 1/1. Some spreadsheets will interpret these values as dates. If you use these formats for your pit names you will have to paste command them in once, format the columns that contain the pits names as text data and then paste the information in again.

One final word on using the copy/paste commands in the Microsoft Excel program. The Paste Special command using the “Skip Blanks” option will allow you to copy a large block of 12d data (with blanks in it) on top your data so that your data is preserved where it coincides with the blanks. To use this option paste the data into a blank spreadsheet and then select copy again. The Paste special option with “Skip Blanks” will now be available.

13.1.2 Spreadsheet to 12d transfers

This item is accessed from the **Import/Export** button on the **Drainage Network Editor**.

The following panel will appear.



Tab delimited, “12d drainage spreadsheet” format or “from to” format data must be on the clipboard in order to update a 12d drainage model or create a new model. These format are described below.

13.1.3 Updating an Existing Model

The data usually is generated by 12d using the **Export** option, pasted into a spreadsheet and then copied back to the clipboard so that 12d can be updated.

When 12d exports the drainage model to a spreadsheet it includes a column for the unique string identifier and a unique pit identifier (unique to the drainage model not the 12d project). The names of the strings and pits may be changed via the spreadsheet if these columns are present at import time.

If the pit id column is not present, 12d will search the drainage model for a matching pit name. When the pit is a junction between drainage lines, only the trunk line will be the data updated.

13.1.4 Creating a New Model

It is possible to create a new string or an entire drainage network using this format. However, pits cannot be added to an existing string. The entire drainage string must be created at once. Two formats are available, the “from-to pit” format and the “12d drainage spreadsheet” format.

At present the network editor must select a drainage string to become active. Therefore, if you are not adding strings to a network, you will have to create a drainage network with one “dummy” pit. Select this one “dummy” pit to activate the editor. After importing the data and the new drainage lines are created the “dummy” pit may be deleted.

12d drainage spreadsheet Format

The top left cell in the clipboard data must be the text “12d” to specify this format. The minimum amount of data required to create a new string is the string name, pit name, x and y coordinates. You can add as much additional data as you have available. This would include pipe diameters inverts etc. The pits must be listed from upstream to downstream order. If the string is to join a trunk line, the junction pit must be included for both the tributary and the trunk line.

An example file exists called **new_network.txt** is supplied in the library. Open this file in a spreadsheet or a text editor and copy it to the clipboard. Set the **I/O Action** to **Import** and select **Run**. The new drainage lines will exist in the model currently being edited.

From-to Pit Format

The top left cell in the clipboard data must be the text “from to” to specify this format. The minimum amount of data required to create a new string is the upstream pit name (*pit name), the downstream pit name (*ds pit name) and the x(x location) and y(y location) coordinates of the upstream pit. If the string is to join a trunk line, the junction pit must be included for both the tributary and the trunk line.

An optional column for the pit cover elev (cover elev) may be specified. Once the network has been created additional pipe and pit data may be added using the “12d drainage spreadsheet” format described above.

An example file exists called **new_from_to_network.txt** is supplied in the library. It is shown below. Open this file in a spreadsheet or a text editor and copy it to the clipboard. Enter a new model name in the **Drainage model** field and select paste. The new drainage model will now exist.

from to	pit	pit	pit	pit
*pit name	*ds pit name	x location	y location	cover elev
text	text	real	real	real
E/1	A/3	5309.458	7336.935993	29.2173
D/1	A/4	5277.189	7336.935989	28.5071
C/1	B/3	5251.238738	7423.99485	31.5257
A/1	A/2	5354.629222	7336.935998	30.2115
A/2	A/3	5340.019987	7322.035996	29.89
A/3	A/4	5293.458002	7322.035991	28.8652
A/4	A/5	5250.182625	7322.035986	27.9127
A/5	A/6	5217.194202	7322.035983	27.1867
A/6	A/7	5183.458002	7322.035979	26.4442
A/7		5152.698693	7322.035975	25.7672
B/1	B/2	5289.42875	7422.289079	32.7197
B/2	B/3	5264.638564	7393.947083	30.7948
B/3	B/4	5249.738564	7384.207593	30.4187
B/4	B/5	5249.738564	7351.201545	29.1444
B/5	A/5	5233.426685	7336.935984	27.544

13.2 “12d drainage spreadsheet” Format

Each column of data is used for a 12d drainage variable or a user defined attribute. Each row represents a pit and the downstream pipe (controlled by the direction of flow variable) within the drainage network. A sample is shown below.

12d	pit	pit	pit	pit	pit	pit
*string Name	*pit name	pit type	pit low ch invert	pit high ch invert	pit id	string id
text	text	text	real	real	integer	integer
E	E/1	SA2	28.108	28.108	1	67389
E	A/3	SA2	27.7559	27.7559	2	67389
D	D/1	SA2	27.3961	27.3961	3	68100
D	A/4	SA2	26.8018	26.8018	4	68100
C	C/1	SA2	30.67	30.67	5	72072
C	B/3	SA2	29.563	29.563	6	72072
A	A/1	SA2	29.1026	29.1026	7	82469
A	A/2	SA2	28.7811	28.7311	8	82469
A	A/3	SA2	27.7652	27.7059	9	82469
A	A/4	SA2	26.8127	26.7518	10	82469
A	A/5	SA2	26.0867	26.0244	11	82469
A	A/6	SA2	25.3442	25.2942	12	82469
A	A/7	SA2	24.6672	24.6672	13	82469
B	B/1	SA2	31.2759	31.2759	14	192066
B	B/2	SA2	29.351	29.301	15	192066
B	B/3	SA2	29.123	29.073	16	192066
B	B/4	SA2	28.0444	27.8951	17	192066
B	B/5	SA2	26.3447	26.2947	18	192066
B	A/5	SA2	26.0744	26.0744	19	192066

Duplicate Definitions

Strings Variables such as “direction” are may be defined for numerous pits on the same string. Searching in a top down direction through the file, the last definition found for the string will be set.

Invert levels may be set via pipe data or pit data or combined. It is recommended that the user only use one method and not combine them. Both are exported so delete the ones you are not going to use. The variables are processed from left to right, so if duplicate definitions of an invert level or found the right most data will be set.

The format definition

1. Row1, column 1 must contain either “12d”, or “from to”. Therefore, the first column must be a 12d drainage variable (cannot be a user defined attribute).
2. Row 1. The text <pit> at the top of the column indicates the column contains a user defined pit attribute and similarly <pipe> indicates a user defined pipe attribute.
3. Row 2. This row contains the names of the 12d drainage variable names and the pit/pipe attributes. All names are case sensitive so be careful where you use capital letters. A list of 12d drainage variables is found below.

Names beginning with an asterix (*) will not be processed (except pit/string names when unique identifiers are present in the data). 12d drainage variables names beginning with an asterix indicate that this data was calculated at export time and cannot be read back into 12d (for example, pipe length, pipe grade and deflection angle).

Prefixing an user defined attribute name with “DELETE ” (no quotes, note the space after the DELETE) will cause the attribute to be deleted from all pits/pipes within the model.

4. Row 3. The text in this row define the type of attribute to be stored within 12d. The only valid choices are;

integer
real
text

If you want to change an attribute type you must delete the attribute and create it again. If you simply change the attribute type in the third row then that attribute will not be updated.

5. Blank lines may be inserted as desired.
6. You are not required to fill in all of the cells in the spreadsheets. Blank cells are ignored (you must use a space to remove all data from text attributes (the space will not be stored).
7. Pipe names are included in the data so that they can be changed but they are **not** used to identify the pipe. Pipe data will always be assigned to the pipe following the pit in the direction of **ascending** chainage. If flow directions is ascending then the pipe data will be for the downstream pipe. If the flow direction is descending then the pipe data will apply to the upstream pipe.

13.3 12d Drainage Variable Names

Manhole Variables	Pipe Variables	String Variables
*string Name	pipe name	direction
*pit name	pipe type	<div></div>
pit type	low ch invert	<div></div>
pit diameter	high ch invert	string id
pit low ch invert	diameter	
pit high ch invert	*length	
pit road chainage	*grade	
pit road name	low hgl	
*pit angle	high hgl	
*pit drop	pit hgl	
*pit depth	flow	
*pit chainage	velocity	
x location		
y location		
cover elev		
*fs elev		
*ns elev		
pit id		

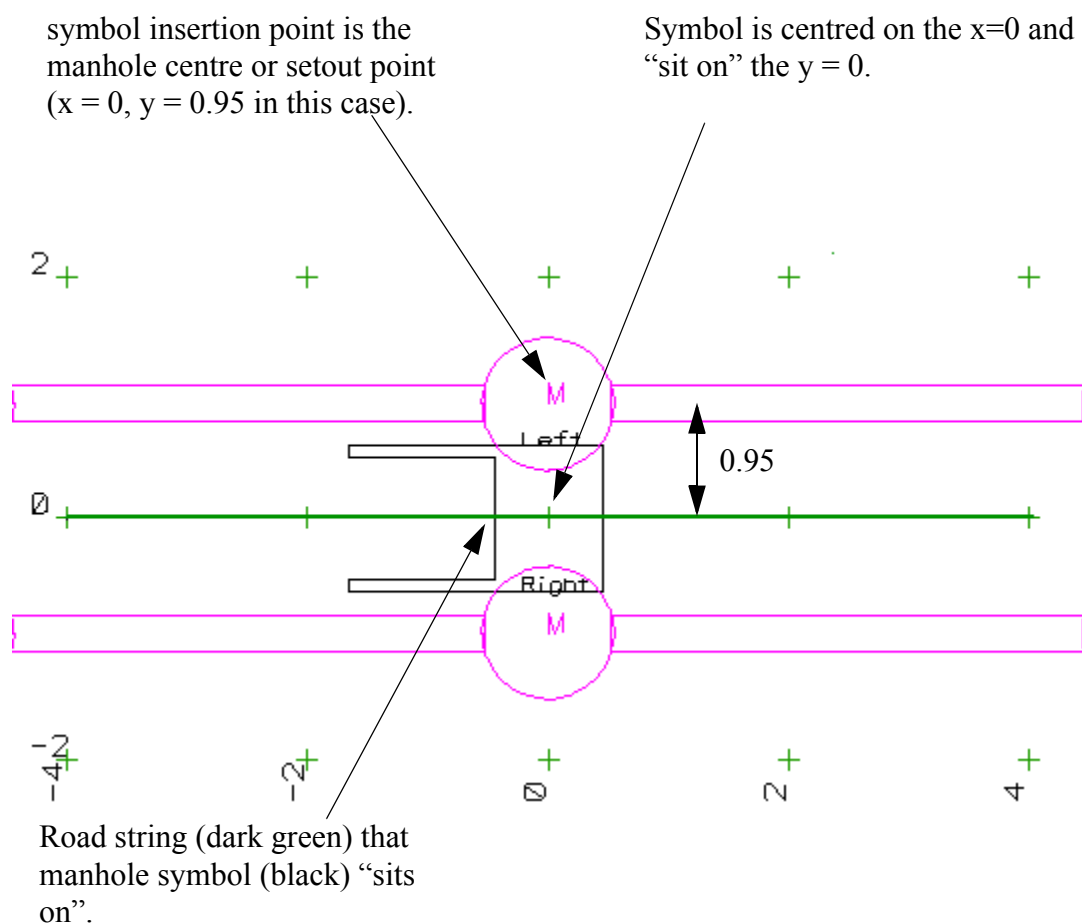


14.0 Detailed Drainage Plan Drawing - Creating MH Symbols

There are many methods to create the drainage symbols and one is presented here. The pit symbol is drawn so that the symbol “sits on” the road string that it aligns with (the road string is the y reference). For drawing lintels and grates, assume the road is downhill to the right. See diagram below.

Two symbols are required, one for the left side of the road and one for the right side (referred to as the mirror symbol in the plan ppf). 12d checks the downhill direction of the road strings when using these symbols to determine which is the left and right side of the road.

Either draw your own symbol or import the symbols using **File IO->Data Input->4ds/12da data** and selecting the file **inlet symbols.12da**

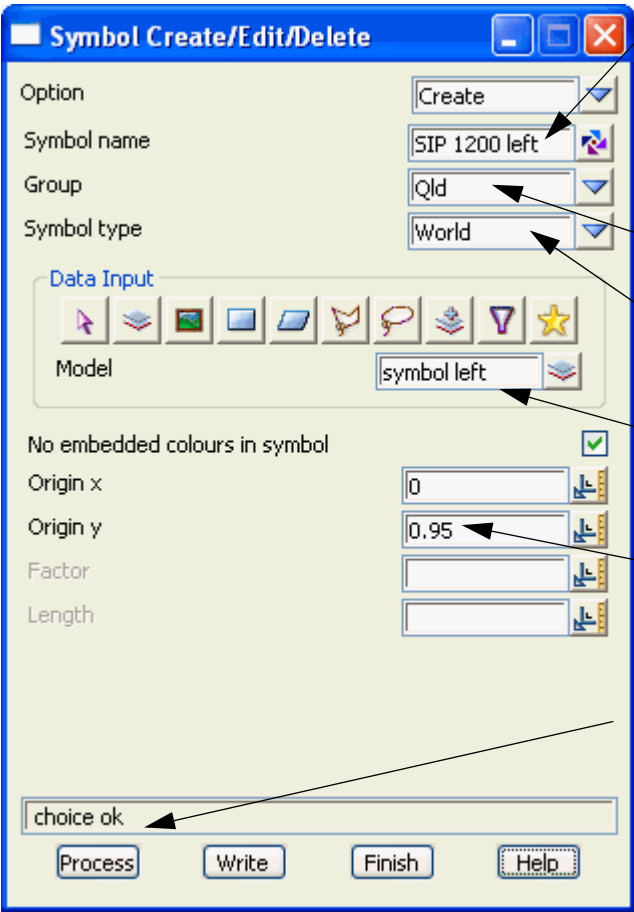


To create the symbol in 12d draw the left pit symbol in a model by itself. The pit should “sit on” the zero “y” grid line. A 900 wide by 600 long inlet with a 1.2m lintel is shown above.

From the main menu, select

Project->Tree

Expand **Project** then expand **Symbols** and finally select **Create Symbol**.



Enter the **Symbol Name**. Usually the name includes the size.

Select the **Group** the symbol is to appear in the symbol drop down menu and select **World** as the symbol type.

Select the **model** that contains the manhole drawing.

Enter the x,y location of the manhole centre in your drawing (0 is different then blank!).

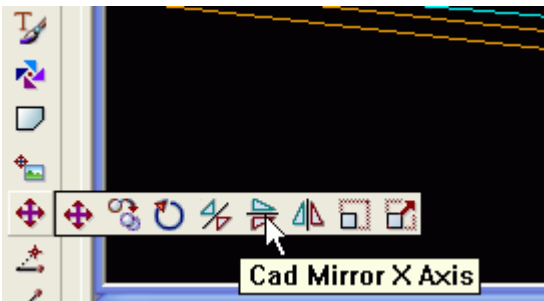
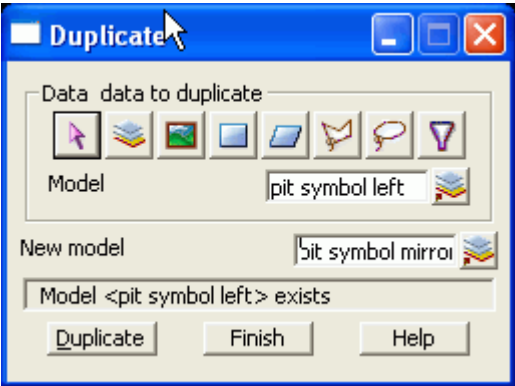
Process will create the symbol in the project.

Change the **symbol name**, **origin y** and press **Process** for each offset required.

Write will add the new symbols to the symbols.4d file so that they will be available to other projects.

Leave this panel open as we will need it after we create the mirror image of the pit.

To create the mirror image of the symbol about the x axis use the CAD mirror about X axis command. 12d will require you do this one string at a time. Version 7 does not mirror into a new model so you will want to duplicate the pit symbol model first using **Utilities->A-G->Duplicate**.



Now repeat the process of creating the right side mirrored symbol. Note that the location of the pit centre is now **negative** and add the suffix **mirrored** to the symbol name.

Do not forget to select **Write** again to save the symbols to the symbols.4d file.

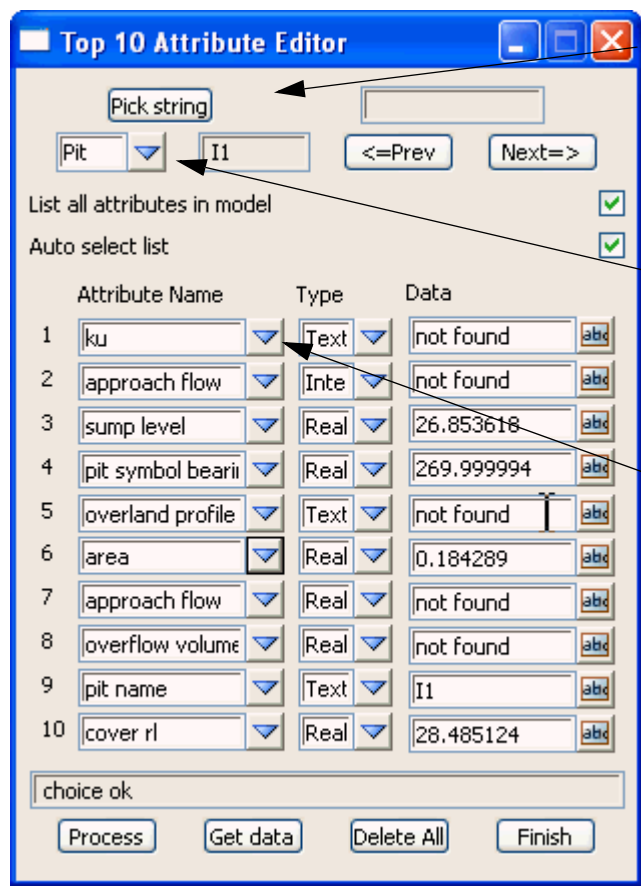
These symbols can now be used in the **Maintenance hole** tab of the Drainage Plan Plot ppf editor. If your version of 12d supports, **native-size symbol**, in the ppf editor then use this mode. If not, select scalable symbol and enter the size equal to the full width of the symbol (height if it is greater).

15.0 User Defined Attributes

These drainage attributes are automatically created by 12d when required but you are free to change them or add more as desired. The attributes may be exported to a spreadsheet and edited and then imported back into 12d. To edit/add the user defined attributes within 12d select either

Strings=>Properties=>Attributes or

Strings=>User=>Attribute Editor. This second editor is described below.



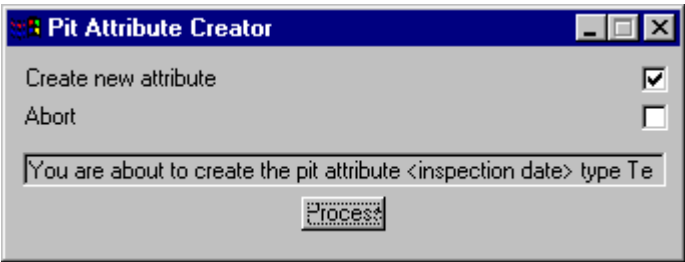
First Select **Pick** to select the string that contains the user attributes (the drainage string). The strings will be highlighted in white when they are selected.

All catchment data is store with the pits in drainage strings. To access the pit attributes, select the drop down icon and then select **pit**. A circle will be drawn around the pit selected. **Next** and **Prev** will now move you from pit to pit.

Select the drop down icon and then select the **Attribute Name** from the list of existing user defined attributes. These attributes include all of the attributes in the model that the string exists in.

They may not be defined for the pit you are editing. **Not found** will be displayed in the **Data** field if the pit does not have that attribute defined.

To change the value for the attribute enter the new value in the **data** field. If the attribute does not exist, deleting the **not found** text and adding data will create it. The message on the right will be displayed whenever you are creating a new attribute.



15.1 Drainage Pit attributes2010

Pit attributes are created and/or updated when the user selects **Set Pit Details**.

pit length	real	0	mhsiz (first value) from drainage.4d file
pit width	real	0	mhsiz (second value) from drainage.4d file
pit group	text		mhgroup from drainage.4d file
cover rl	real	446.685248	
grate level	real	446.685248	
setout z	real	446.685248	
setout x	real	299643.648	
setout y	real	6563620.716	
setout distance	real	0	
pit name	text	1-3	
pit type	text	SA2	
pit diameter	real	1.1	
pit chainage	real	118.61441375	
pit centre x	real	299643.648	
pit centre y	real	6563620.716	
pit centre fs level	real	446.685248	
pit centre ns level	real	446.685248	
ds invert	real	445.307	upstream invert level of exit pipe
ds pit	text	1-2	ds pit along the pipe network
sump level	real	445.307	
pit depth	real	1.378	

Extra Attributes from Pit - Main Tab

cover rl mode	integer	1
design freeboard	real	0.4
direct flow	real	0.02
grate rl mode	integer	1
inlet type	integer	0
ku	real	0.2
ku config	integer	1
ku method	integer	1
kw	real	0.22
sump offset	real	-0.2

Extra Attributes from Pit-Setout Tab

road chainage	real	10
road chainage mode	integer	2
road name	text	My Road
road offset	real	12
setout adjustment	real	-1
setout adjustment z	real	0.045

setout xy mode	integer	0
setout z mode	integer	8

Extra Attributes from Pit-Bypass Tab

bypass pit	text	12.4P
choke major	real	0.8
choke minor	real	0.7
choke pog major	real	0.8
choke pog minor	real	0.7
inlet capacity	curvetext	Sutherland - 3% crossfall
manual pit grade	integer	1
manual pit xfall	integer	1
pit grade	real	1
pit xfall	real	3

Extra Attributes from Pit-Notes Tab

reamrks	text	constructed by others
---------	------	-----------------------

Setout string selected

design model id	uid	52	
design string id	uid	61	
pit symbol angle	real	81.48609728	
pit symbol bearing	real	8.51390272	
pit symbol bearing	dmstext	8°30'50"	
pit grade	real	4.00	if bypass pit present

Centre line string selected (with bypass and setout)

pit xfall	real	3.00	if bypass pit present
centre model id	uid	52	
centre string id	uid	92	
mirror pit	integer	1	mirror symbol required for plotting

Bypass Pit entered

bypass pit	text	1-2	next pit along bypass string
inlet type	integer	1	
choke major	real	0.8	ongrade or sag choke (see sag setting)
choke minor	real	1	ongrade or sag choke (see sag setting)
inlet capacity	curvetext	SA2 3% Grade	
			calculate if pit grade and/or pit xfall present (pit type - inlet cap curves determines which are required)
pit grade	real	4.00	if setout string selected
pit xfall	real	3.00	if centre line string selected

The following require the bypass string (manual entry of bypass pit is not enough).

bypass distance	real	33.995	distance to bypass pit
gutter length	real	99.79	dist. up the bypass string to next pit or end of string (longest bypass route if multiple)
gutter grade	real	2.70	(us pit fs levels - ds pit fs levels) / gutter length)

Catchment Tab data

area	real	0.1
percent impervious	real	60

Pervious Area only

c major pervious	real	0.9
c minor pervious	real	0.8

For both pervious and impervious (change pervious to impervious)

catchment grade	pervious	real	1
catchment length	pervious	real	900
catchment roughness	pervious	real	0.1
tc major	pervious	real	5
tc method	pervious	text	Kinematic Wave
tc method	pervious	text	Direct
tc minor	pervious	real	5

Export Pit Attributes (calculated when Export selected on Import/Export button))

inlet type	integer	updated to include 5 for headwalls
ds pit string id	uid	drainage string id for the ds pit
ds pit index	integer	index number of the ds pit (counter along the string)
area impervious	real	%impervious * area for set 1
area pervious	real	%pervious * area for set 1
area impervious2	real	%impervious * area for set 2
area pervious2	real	%pervious * area for set 2
area impervious3	real	%impervious * area for set 3
area pervious3	real	%pervious * area for set 3
pcdrain pit type	type	pit type with the pcdrain suffix (S + pond depth)

Export Pipe Attributes (calculated when Export selected on Import/Export button))

locked diameter	real	pipe diameter (exists only if pipe locked)
locked invert us	real	pipe us invert (exists only if us invert locked)
locked invert ds	real	pipe ds invert (exists only if ds invert locked)
windes diameter	real	if pipe type is WINDES, value is neg diameter
roughness n	real	if "roughness type" is Manning then roughness value otherwise it is 0

roughness k	real	if “roughness type” is Colebrook then roughness value otherwise it is 0
-------------	------	----------------------------------------------------------------------------

15.2 Drainage Pipe attributes

Set Pit Details

invert us	real	28.47
invert ds	real	28.422
diameter	real	0.225
pipe size	text	225
pipe type	text	2
roughness text	text	n=0.010
calculated pipe length	real	9.58175349
calculated pipe grade	real	0.50095215
calculated pipe grade 1 in	real	199.6198644
calculated us deflection	real	71.75414547
calculated ds deflection	real	-36.3032794
pipe name	text	12.5P to 12.4P
minimum cover	real	1.04113728
calculated drop	real	0.03

Additional Pipe Attributes created via Pipe Tab setting

design alignment mode	integer	0
design cover	real	0.4
design cover mode	integer	0
design drop	real	0.03
design grade	real	0.1
design size mode	integer	0
diameter	real	0.225
direct pipe flow	real	0.01
lock ds il	integer	1
lock size	integer	1
lock us il	integer	1
max height	real	0.6
min height	real	0.3
remarks	text	extra pipe notes
roughness	real	0.012
roughness type	text	Manning
width	real	0.225
width top	real	6

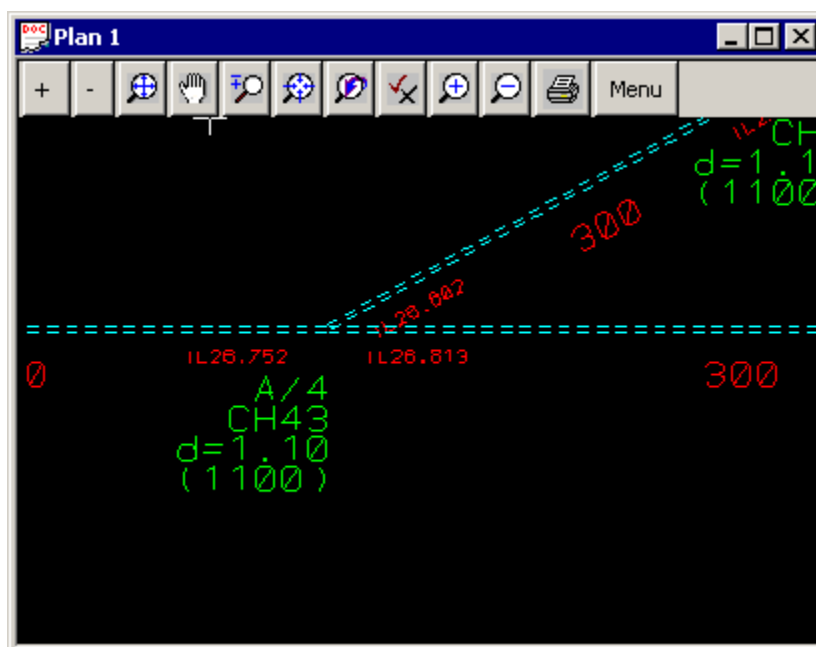
15.3

16.0 Detailed Drainage Plan Drawing

12d drainage has the capability to create detailed drainage plan drawings with the following features:

- create symbols at the inlets and the type of symbol is controlled by the inlet type (given when you create the inlet).
- create text labels for inlet types and user defined pit attributes
- draw lines with line styles and colours to represent pipe sizes
- create text labels for pipe diameters, inverts and user defined pipe attributes
- create text labels for house connection types, invert levels and chainages
- indicate direction of flow on pipes.

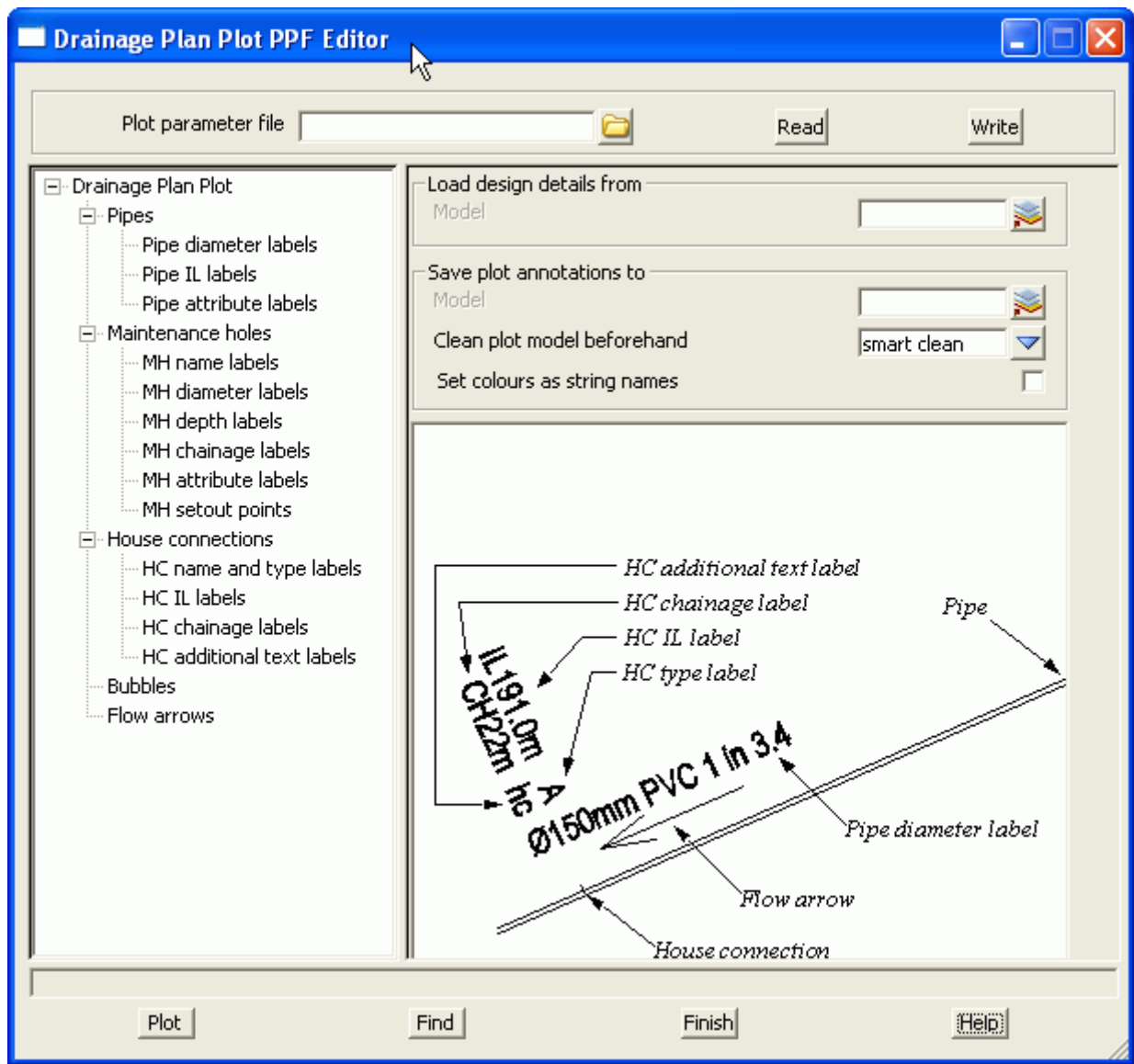
An example is shown below



Usage

This option is accessed from the menu selection

Design => Drainage-Sewer => Plots => Plan Annotations



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Plot parameter file	file box		
----------------------------	----------	--	--

Optional - no dpf is required. The default settings will create a schematic drainage drawing. A custom dpf may be selected if desired.

Load design details from	model box		
---------------------------------	-----------	--	--

data source for drainage strings to be labelled

Save plot annotations to model	model box		
---------------------------------------	-----------	--	--

labels to be created are stored here, Undo will remove the labels created

Clean plot model before hand	choice box		
-------------------------------------	------------	--	--

smart clean will update text that has been moved and clean the rest. Full clean will all text from the plan annotations model.

Set colour as string name tick box

when selected the string colour will be used for the string name (to be used for DWG/DXF export using map files)

Plot button

Creates the labels in the model specified

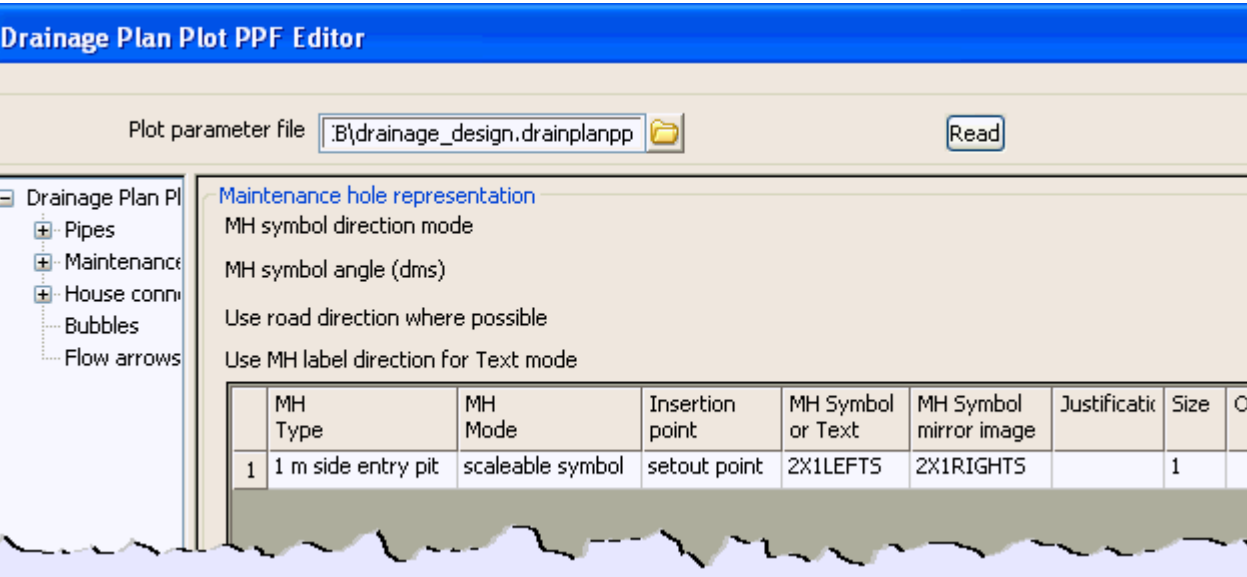
Find button

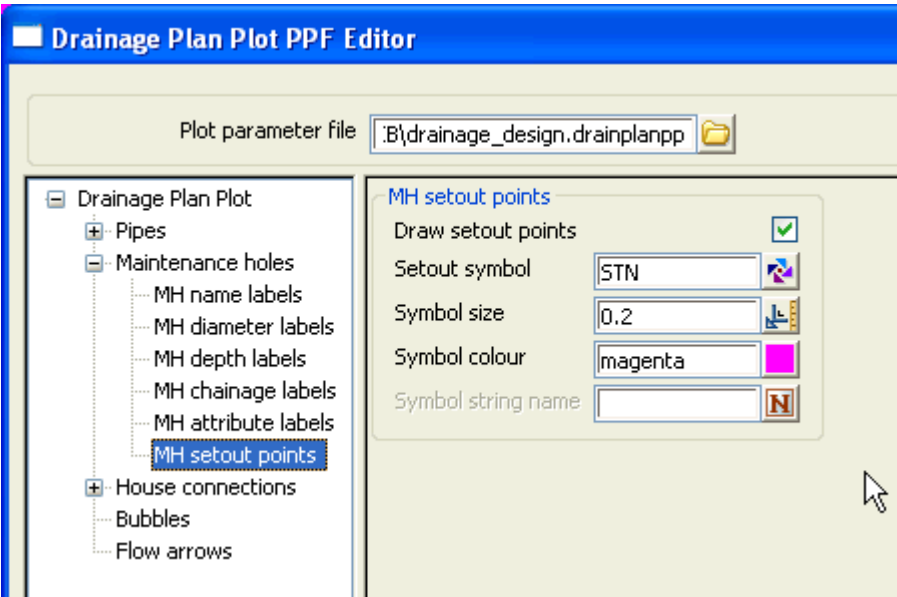
used to locate plot parameter input boxes using Version 5 plot parameter names

IMPORTANT! to turn off any data change the text height to zero.

Select **Maintenance holes** from the tree to set the symbols to be used for the various pit types.

Select the MH type as desired and use **scalable symbol** and **setout point**. For the symbols enter the names that you used when you created the symbols.





Plotting a symbol at the pit setout point is a good confirmation of the data printed in the setout reports. The settings to create this symbol are shown on the left.

17.0 Drainage Long Section Plotting - Hatching Under Roads

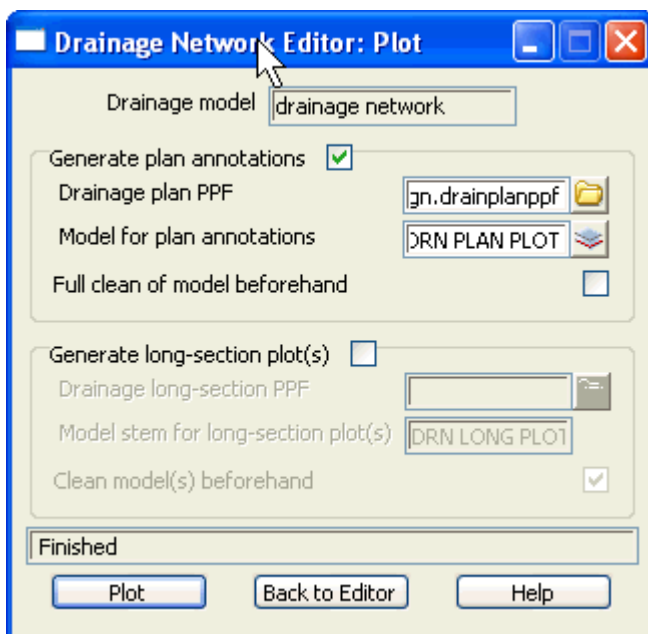
The drainage long section plotting has been discussed in the Intro Drainage Course. Here we will discuss the technique for hatching under roads and/or footpaths.

The following steps are required.

1. Run the Excavation volumes routine using the obvert templates to create sections and strings for a tin on top of the pipe (obvert tin). Select **Stop section at end of manhole** to prevent the pits from being hatched
2. Create the obvert tin from the strings and sections then and null by angle length with a small length value so that the tin is nulled near the pits.
3. Create a design tin that extends to the limit of the roads.
4. Use the hatching section of the drainage long section plot to select the hatching style.

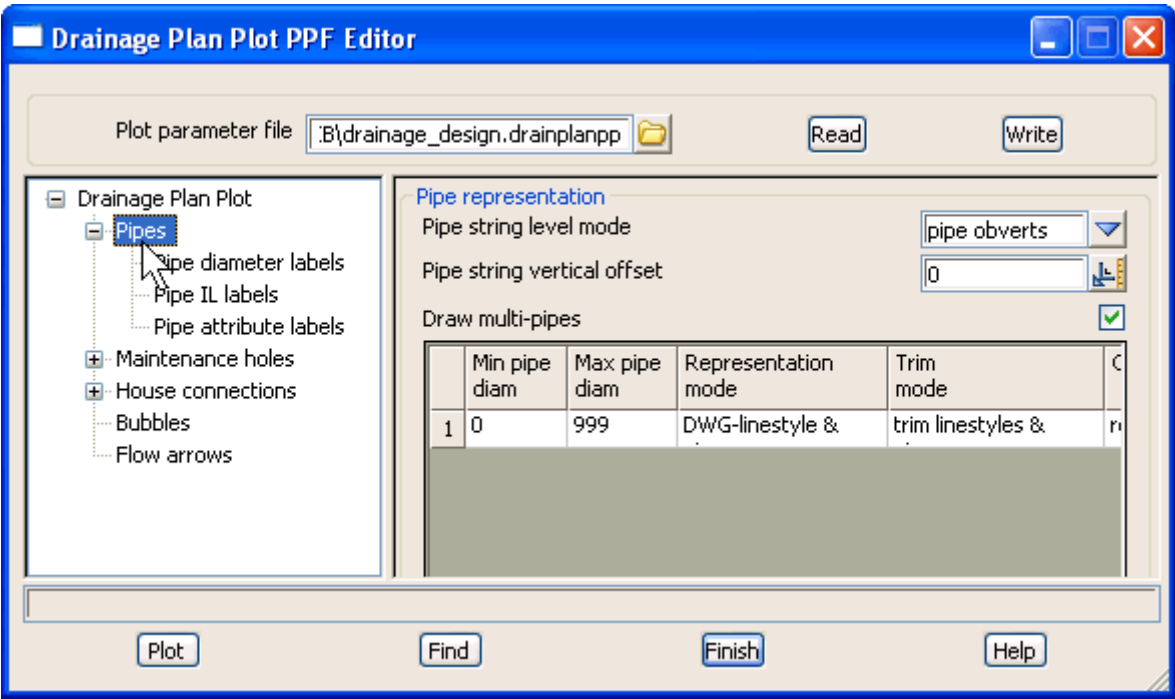
17.1 Creating the Obvert strings.

Run the Drainage Plan Plot by selecting Plot from the Drainage Network Editor.



Select the drainage_design ppf file from the library.

Select the folder icon then **Open** the ppf.

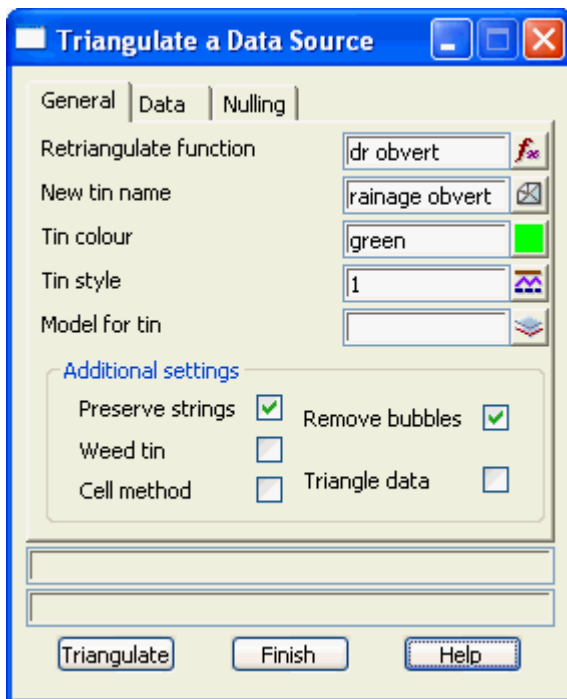


Confirm that the **Pipe string level mode** is set to **pipe obverts** and that all symbols with elevations are not used. This include:

- s MH setout points,
- s Flow arrows,
- s pit symbols

Now plot the drawing and we will use the pipe strings at the obvert level to create a tin.

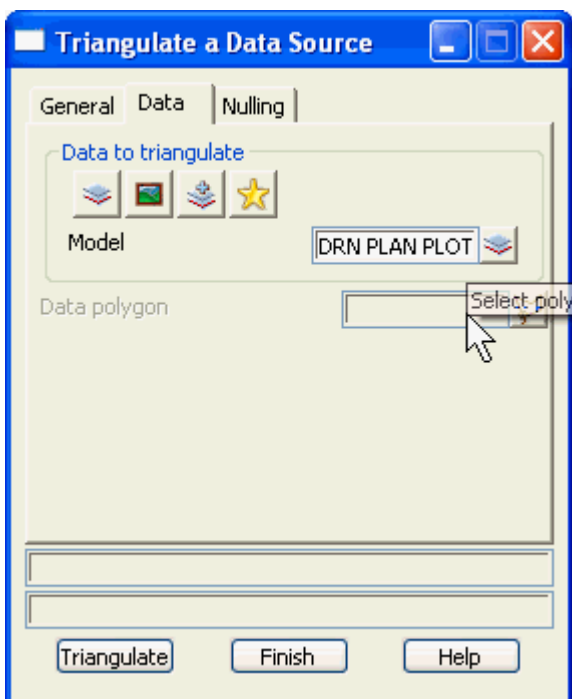
17.2 Create and Null the Obvert tin



To create the obvert tin select.

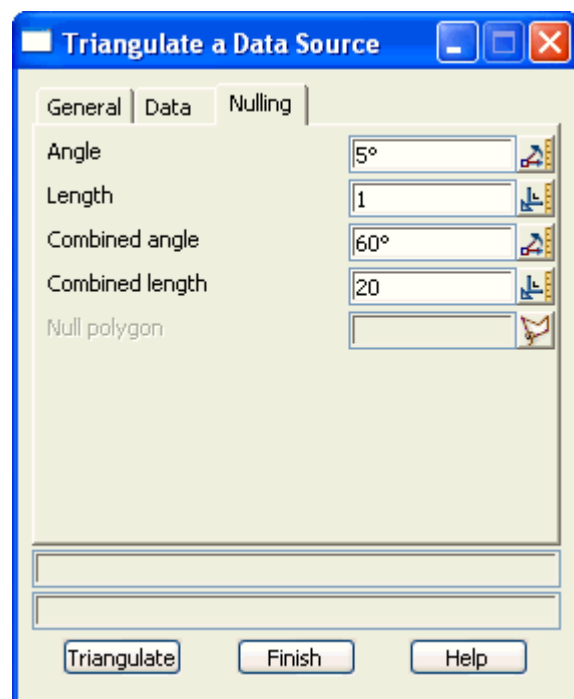
Tins->Create->Triangulate Data

Enter a **New tin name** as desired.



Select the **Data** tab.

Select the plot model created above.



Select the Nulling tab

Enter a **Length** that is less than the pit diameter and greater than the largest pipe.

Select **Triangulate**

The tin will now only exist on top of the pipe and it is ready to use for hatching.

17.3 Create a Roads Only Tin

The design tin is already nulled to remove the long triangles. If the footpaths were to be excluded from the tin then they should be removed from the road design strings. You could run a template that did not include the footpath and has a **Final Maximum slope width** of zero or just copy the desired road strings to one model and remove unwanted strings. We will use the later techniques.

Add all of the road string and kerb return models onto one view and then select

Utilities->A-G->Change



View select the view that contains all of the road strings

Copy to model type the name of a model for all of the road strings.

Select **Change** copy the strings.



Select the **Filter** icon at the end of the selection strip. Now select the **Model** tab and select the **Name** of the model that holds all of your road and kerb strings **road strings only** (tab not shown here).

Select the **String Info** tab and enter the name of the strings that you want to remove from the road only model. In this case it is **path**.

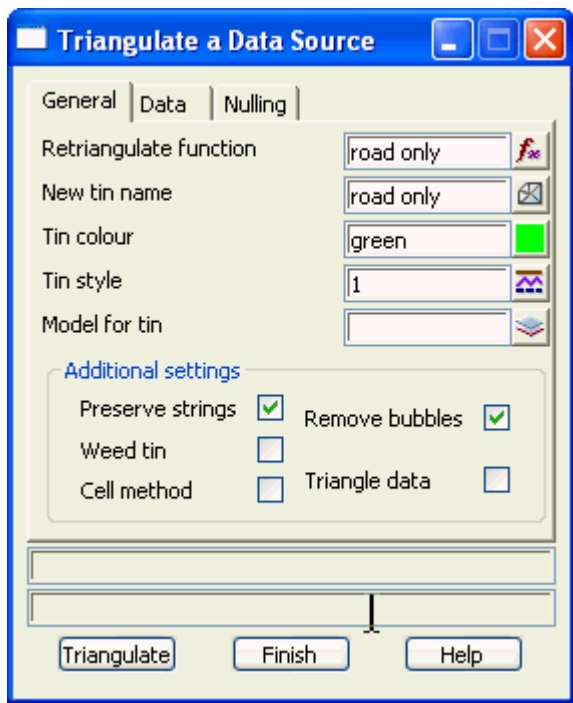
Select **Filter Select** to select these strings.

Select the second **Target** button **Move to model** and select the model **trash** and then select **Change**.

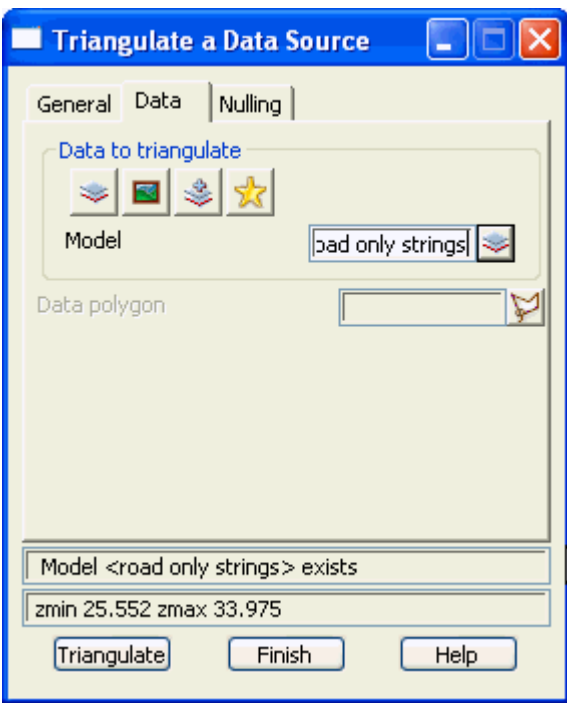
Repeat this for string names **int**.

We are now ready to triangulate the road only tin.

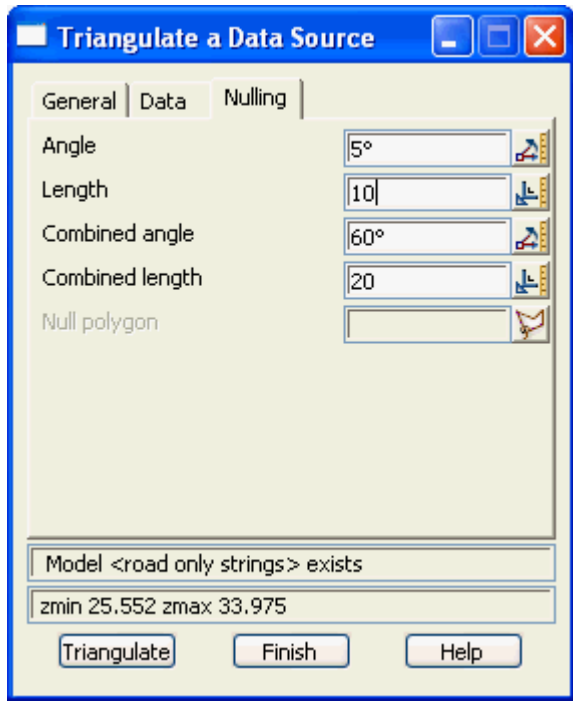
Now to create the tin select **Tins->Create->Triangulate data**



Enter a function name (optional) and **New tin name** and then select the **Data** tab.



Model - Select the model containing the road only strings.



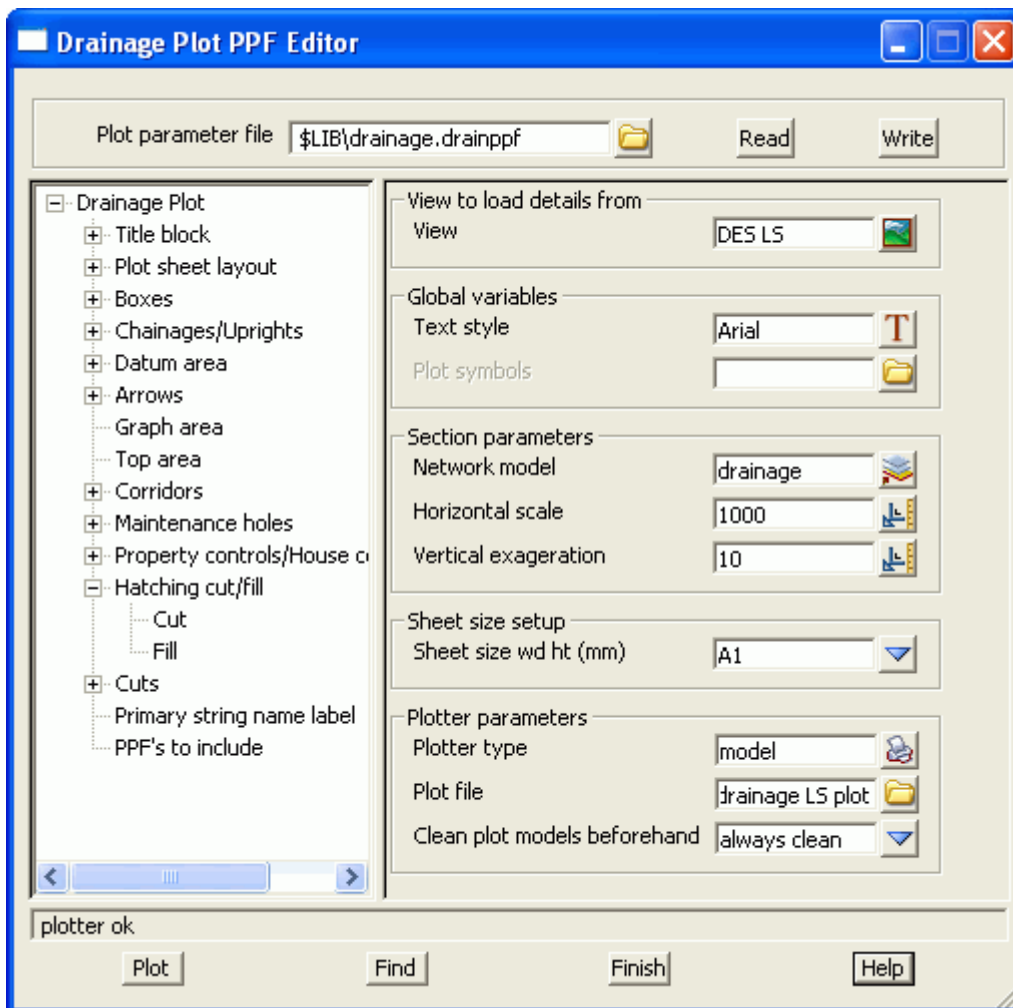
Length - Select a length just greater than the width of half the road so that the tin will not be nulled from the end of the roads.

Select **Triangulate**..

17.4 Use the Hatching Feature in Drainage Longsections

We are now ready to create the drainage longsection plots. Set up a section view with the a string in the drainage model profiled, the vertical exaggeration set, the desired tins displayed and the service models added. From the main menu select,

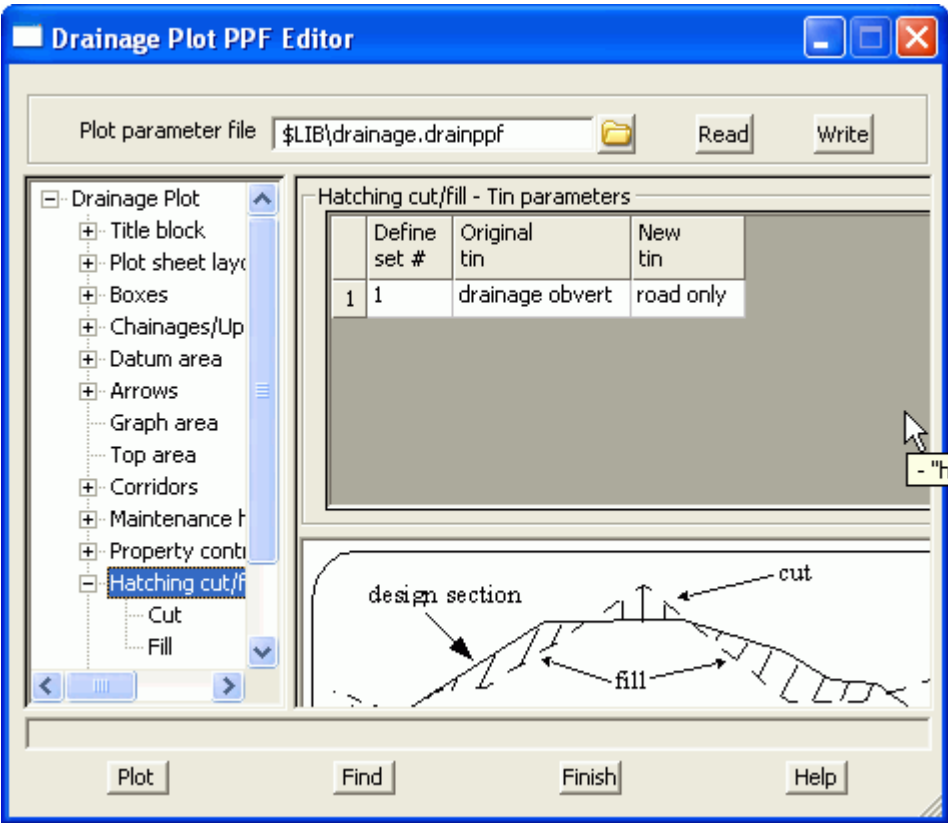
Design->Drainage-Sewer->Plots->Longsections



From the **Plot parameter file** field select a drainage longsection ppf from the library and then select **Read**.

In the **View to load details from** field select the section view you have setup for the drainage long section.

Now select **Hatching cut/fill**

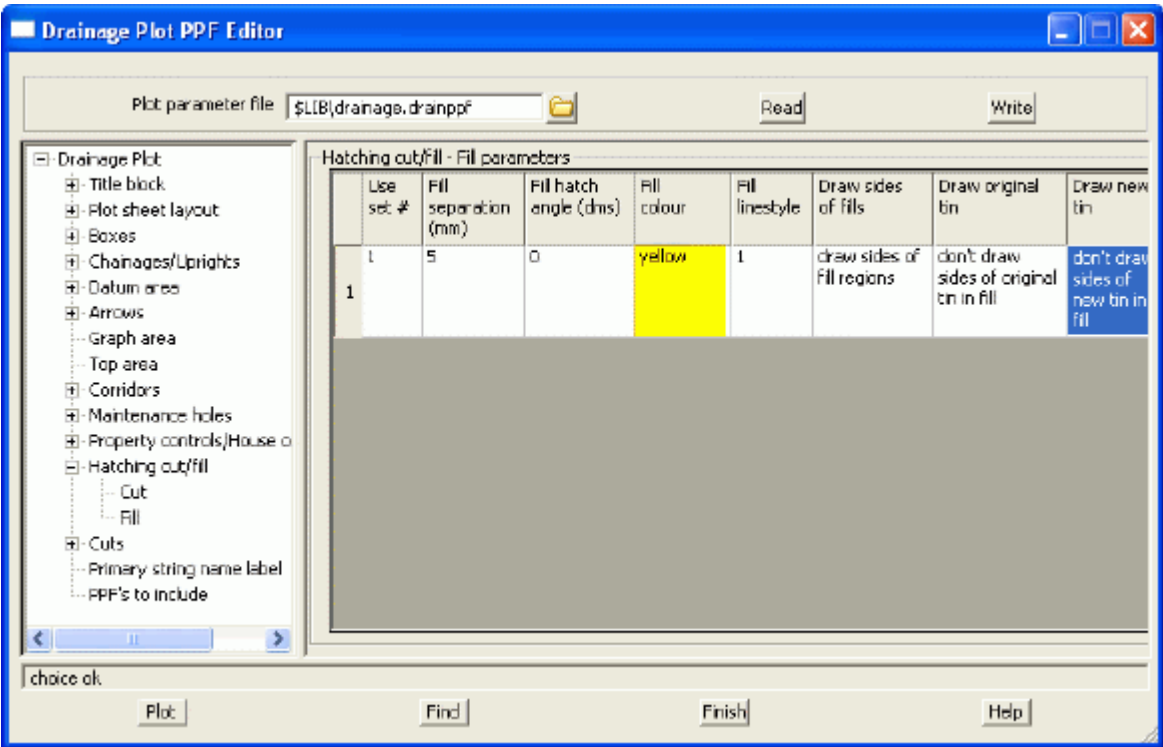


Define set is set to 1.

Original tin is set to the obvert tin.

New tin is set to the road only tin.

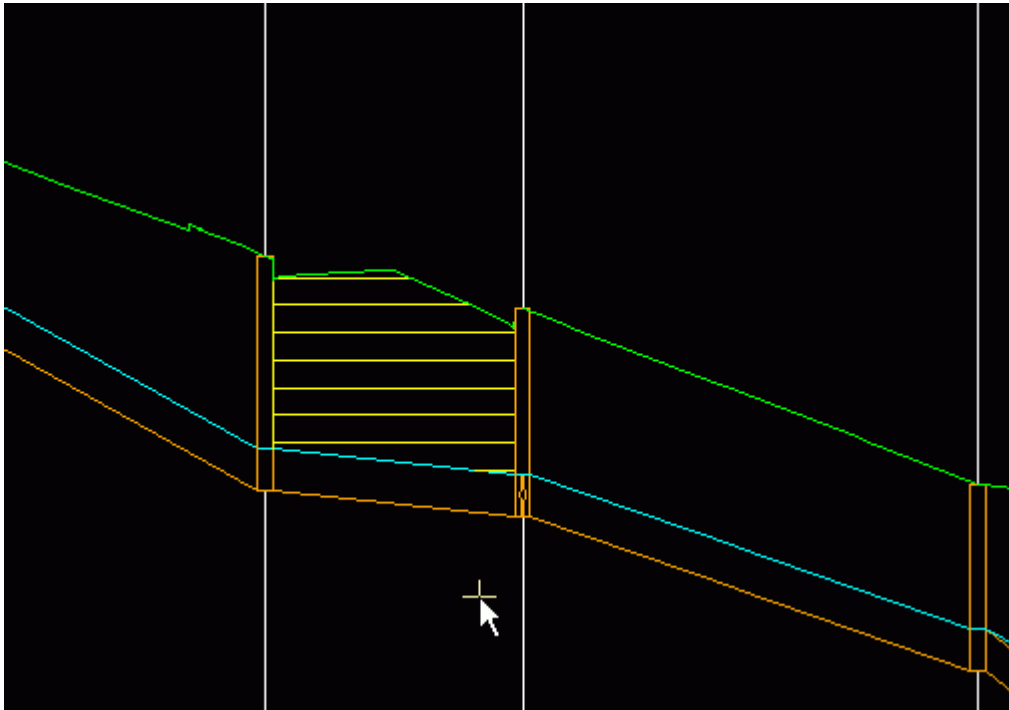
Now select the + beside the **Hatching cut/fill** and then select **fill**.



Use set # is entered as 1. Fill separation, hatch angle, colour and linestyle selected as desired. Draw sides of tin, Draw original tin and Draw new tin are not required unless you want these

extra line in the drawing.

Select **Plot** and add the plot model **drainage LS plot1** onto a PLAN view to preview the drawing.



The hatching is shown to the left at a 2mm spacing with the tins and sides not drawn.

18.0 Flooded Width Analysis and HEC RAS

There are 2 flooded width methods in the drainage module. The first can be used with any of the external drainage packages and the second is part of the 12d storm analysis. The first is found on the main menu

Design->Drainage-Sewer->Calc flooded widths

The name of the overland flow string becomes the name of the HECRAS project.

1.0

1.0 Dynamic Stormwater Design

This manual, the **Dynamic Stormwater Design**, describes how to use 12d model to calculate catchment hydrographs and perform unsteady flow hydraulic computations on drainage networks.

The rainfall runoff and loss methods supported include the time area unit hydrograph (ILSAX) with Horton infiltration (from runoff), and the New Zealand SCS hydrology method.

The starting point for this manual is a 12d drainage network already constructed with catchment areas assigned, inlet and manhole properties set and vertical grading applied. These tasks are described in detail in the **Stormwater Part 1 Design Course**. The network will have open channels, bypass flow routes and pits with inlet capacity settings as described in **Stormwater Part 2 Design Course**

This manual, **Dynamic Stormwater Design Course** contains:

- s review and modifying the 12d hydro file with respect to IFD data, rainfall temporal patterns, infiltration loss methods (horton and SCS curve numbers),
- s selecting the hydrological runoff method (Ilsax2 or NZ SCS) and the infiltration loss method,
- s using cross section shapes cut from the tin for bypass flow paths and open channels
- s running the analysis and reviewing the graphical output, plan and long section plots and the custom spreadsheet reports.
- s create parallel pipes with different sizes and invert levels,
- s adding and initial sizing of storage basin with fixed discharge,
- s discuss graphical basin links,
- s create outlet structures including, culverts, weir spillways, orifice controls, bubble up pits,
- s underground storage tanks,
- s bypass over road crown
- s

2.0 Starting with a Basic Drainage Network

In this document, the generic terms **pit** or **manhole** refer to inlets, catch basins and manholes. The exception to this is when referring to inlet types in the Drainage Network Editor (DNE). The term **manhole** specifically refers to an inlet with zero inlet capacity. Pit types, dimensions and inlet capacities are set in the drainage.4d file.

These course notes assume that you have completed the Stormwater Design Course and that you have experience creating 12d model drainage networks with catchments areas. This course will begin with a completed drainage design found in the directory

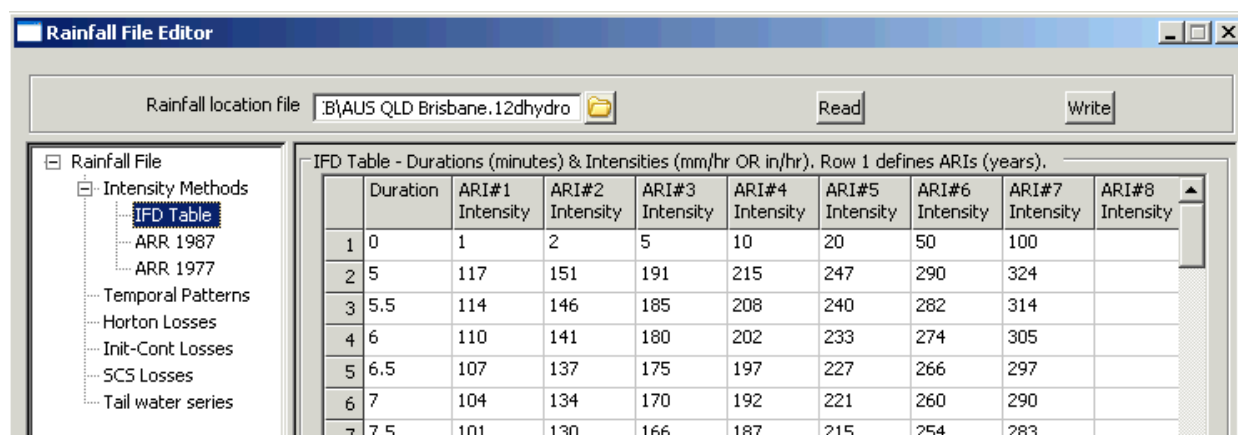
\12d\9.00\Courses\drainage\basins

The project name is basins.

3.0 Hydro-Rainfall File with Infiltration

Access the rainfall editor from the main menu

Design->Drainage-Sewer->Rainfall Editor



Key Points

1. Several rainfall files are shipped in the 12d library as examples.
2. One of the 3 Intensity method **MUST** be entered. Do not leave blank rows in the IFD Table.
3. All dynamic drainage runs require temporal patterns.
4. Dynamic drainage (ILSAX 2) requires Horton losses
5. Dynamic drainage (NZ SCS) requires SCS losses
6. Rainfall data is in mm/hr NOT mm (important for NZ)
7. Tailwater series are time versus elevation data for outlets.
8. Initial and continuing losses are not supported in release V9c1e

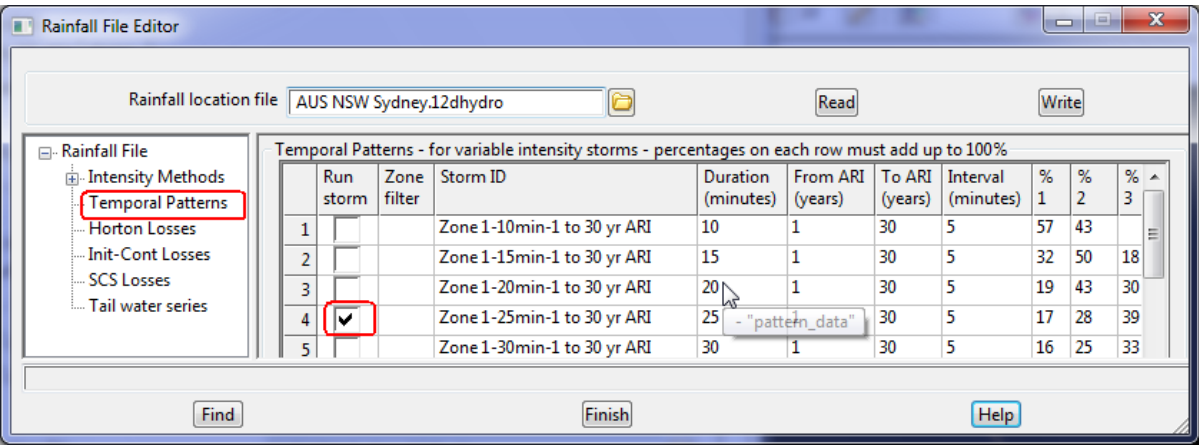
3.1 Intensity Frequency Duration (IFD) Data

The **IFD table** method is the most common (refer to figure above). The rainfall intensity is entered in mm/hr for metric data and in/hr for US units. The top row is the return period in years and the first column is the rainfall duration in minutes. The top left corner cell is always zero.

When using the TP 108 method for the Auckland region, the 24hr rainfall depth is extracted from the Appendix A and then converted to mm/hr before entering it into the IFD table. Thus only 2 lines may exist in the 12d grid.

Note that areal reduction factors must be accounted for by the user as they are not included in the 12d rational hydrology engine.

3.2 Rainfall Temporal Patterns



Temporal patterns are referred to as storms in dynamic drainage. Several example hydro files are included in the 12d library. These examples have the temporal patterns for the minor and major storms in the 8 zones of Australia.

Temporal patterns are not required for the SCS NZ method as the standard 24 hour temporal pattern from TP108 is built into the 12d analysis engine.

The **Run storm**, **Zone filter**, **From ARI** and **To ARI** columns are used determine which storms are analysed (run). The **Run storm** column must be checked for that temporal pattern to be analysed. Many storms may be selected.

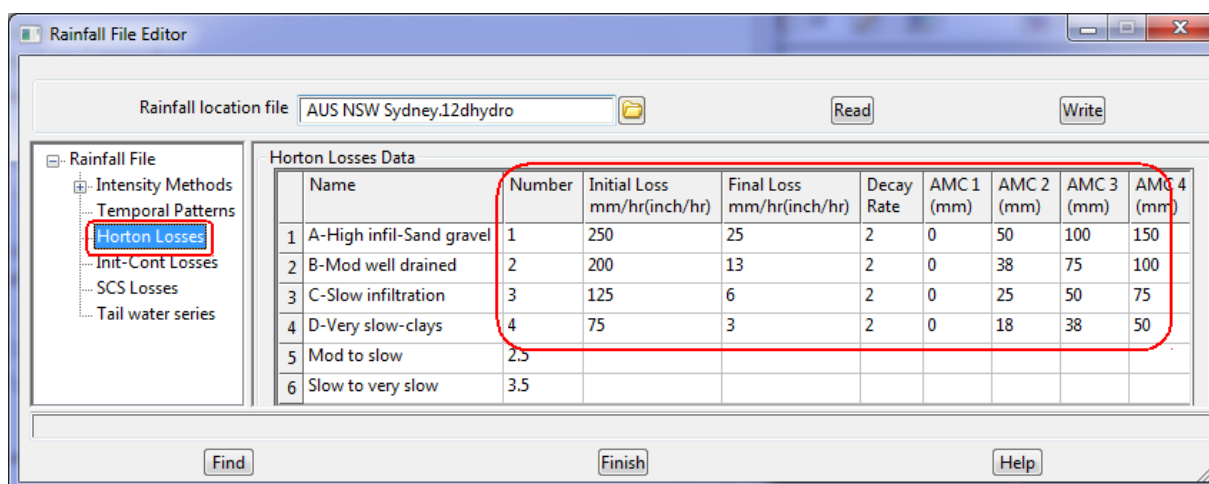
The **Zone filter** is optional. Entering a value here will allow the selected storms to be further filtered. A **Zone filter** field (accepts wild card characters) is found on the DNE Global tab that is used to determine which of the selected storms (paragraph above) are analysed.

The **ARI** field on the Run panel is used with the **From ARI** and **To ARI** columns. The value on the run panel must be within the From-To range for the storm to be analysed.

The **Duration** column determines the total length of the storm. This value divided by the **Interval** must be a whole number and this number determines the number of **%** values to be entered to the right of the **Interval column**. The total of the percentage must equal 100.

3.3 Horton Losses

The pervious portion of the catchments used in the **ILSAX 2** analysis will have a loss type defined describing the soil type. The loss type is defined in the DNE Default->catchment and catchment tabs.



These soil types use the classifications of Terstriep and Stall (1974), based on the system developed by the U.S. Department of Agriculture. The default values entered from the library represent the soil types of

- 1.Type A - low runoff potential, high infiltration rates (consists of sand and gravel)
- 2.Type B - moderate infiltration rates and moderately well-drained
- 3.Type C - slow infiltration rates (may have layers that impede downward movement of water)
- 4.Type D - high runoff potential, very slow infiltration rates (consists of clays with a permanent high water table and a high swelling potential)

Numbers are assigned to each soil type to allow interpolation between the defined soil types. When interpolated values are used they must be included in the list (2.5 and 3.5 for example). Interpolated values do not need loss data entered. If loss data is entered for the interpolated names then this data will be used rather than an interpolation occurring. If any loss data is entered then all of the values must be entered.

Four preset AMC points are defined in the rainfall file to mark AMC conditions ranging from dry (AMC1) to saturated (AMC4). The required data for each line is the **Initial loss rate, Final loss rate, decay rate** and 4 antecedent moisture conditions (AMCs). The AMC values are entered in depth of rainfall (mm) they represent the total rainfall prior to the start of the temporal pattern.

The AMC point numbers are set once for all catchments on the DNE Global tab. Value between 1 and 4 (decimal value are permitted) are entered for the minor and major events.

3.4 SCS NZ Losses (Initial Abstraction and Curve Numbers)

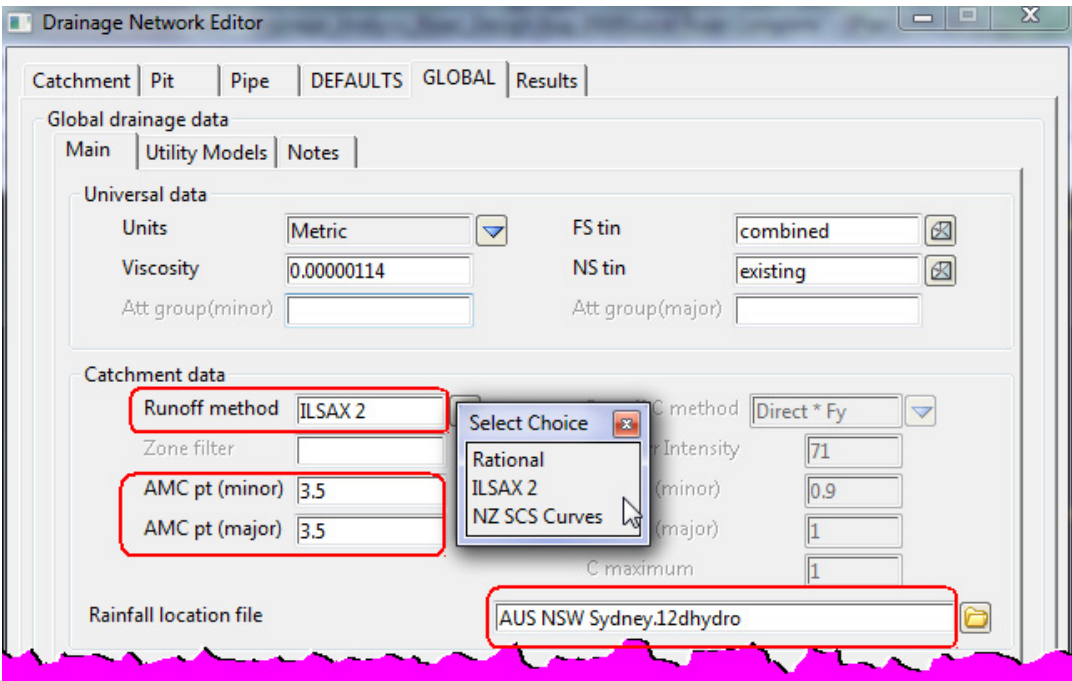
The SCS NZ method uses Initial abstraction (Ia) and the curve number (CN) to determine the losses for the catchments. Names are given to the SCS curve numbers in the rainfall file. These names and Ia (entered as storage values) and selected in the DNE catchment data.

A curve number of 0 results in zero runoff while a CN=100 results in 100% runoff. TP 108 recommends the selection of the curve number by identifying 1) the soil type and 2) the land use. A CN=98 an Ia=0 are recommended for impervious areas.

4.0 Rational to Dynamic ILSAX2 in the DNE

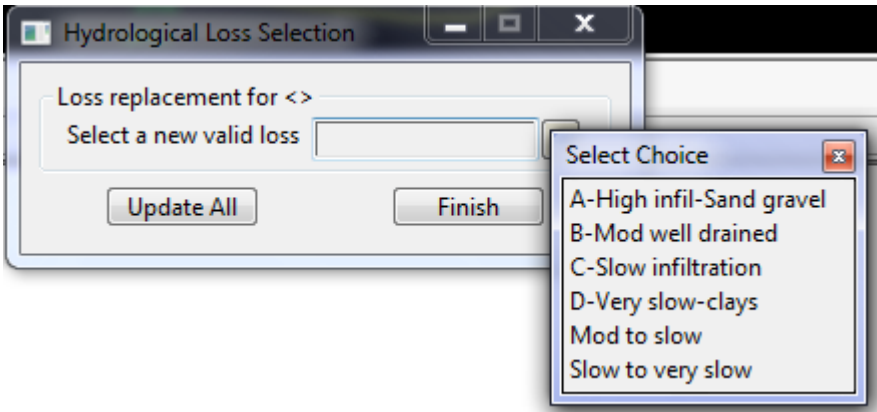
The user does not have to start with the rational hydrology method but since this method has a pipe sizing algorithm it is often run first. The following steps will prepare a drainage network for dynamic hydrology.

Changing to ILSAX 2 is done on the DNE Global->Main tab.



4.1 Infiltration Losses

If this is the first time in this project you have switched to ILSAX2 you will be prompted for the default infiltration loss. These loss types are retrieved from the rainfall location file (Horton losses) specified above. Select one of these and then select **Update All**. These losses are only applied to the previous percentage of the catchment.



4.2 Storage Losses

Both the impervious and pervious portions of the catchments have storage losses. This amount of rainfall depth (in mm) is removed from the start of the rainfall pattern. The default values are entered on the **Defaults Catchments** Tab.

Catchment | Pit | Pipe | **DEFAULTS** | GLOBAL | Results

Default data for blank fields

Catchment | Pits | Pipes

Catchments flowing to current pit

Set #1 | Set #2 | Set #3

%Impervious 90

Impervious		Pervious	
Tc method	QUDM Standard	Tc method	QUDM Standard
Length	50	Length	100
Slope (%)	2.5	Slope (%)	2
Retardance	0.013	Retardance	0.15
Tc (minor)	5	Tc (minor)	10
Tc (major)	5	Tc (major)	10
		C (minor)	0.75
		C (major)	0.75
		Veg/Soil	5: Medium vege
		Loss	C-Slow infiltrati
Depress storage	0	Depress storage	10

5.0 Rainfall Runoff Calculations

12d currently supports 2 rainfall runoff methods.

See [ILSAX 2](#)

See [SCS NZ](#)

5.1 ILSAX 2

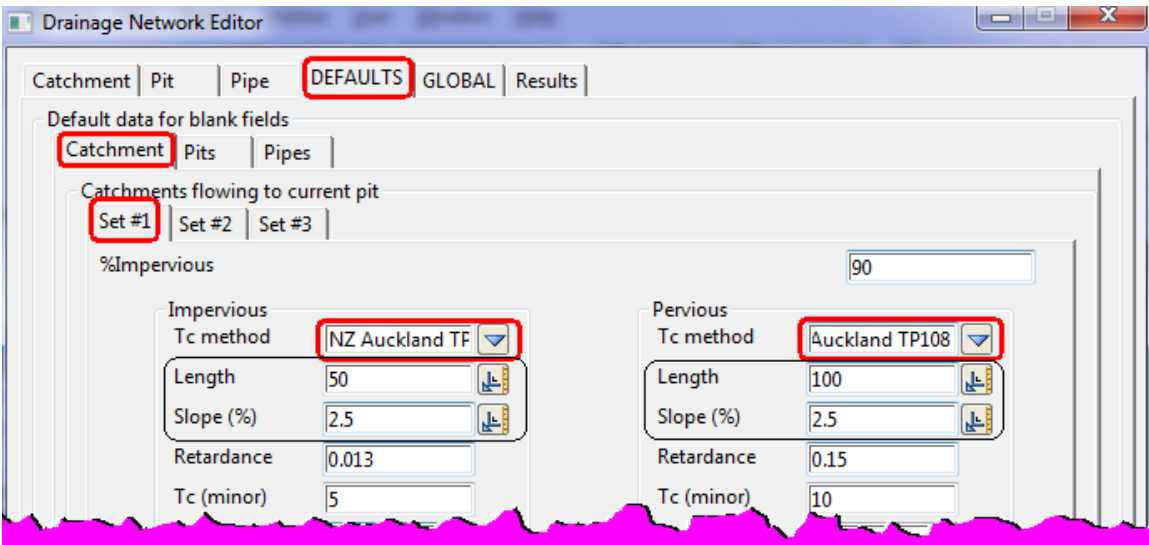
The ILSAX mode 2 uses a triangular shaped unit hydrograph with the time to peak equal to the recession time. The time to peak equals the tc value throughout the 12d DNE.

5.2 SCS NZ

The SCS NZ uses a unit hydrograph as described in TP 108 Table 4.1 (hydrograph number of 3/4). 12d calculates the time to peak value (tp) = 2/3 the time of concentration (tc).

The %impervious value is used to create a composite CN and a composite initial abstraction Ia

One of the optional tc methods uses the equation derived from a regression analysis of Auckland catchments (BCHF, 1999c). On the **Defaults->Catchments->Set 1** tab set the Impervious and Pervious Tc methods to **NZ Auckland TP108**. The default length and slope values will be used unless they are specified for each catchment.



6.0 Dynamic Hydraulics

As with the rational method hgl calculations it is essential that the pit grate levels are entered correctly. With no bypass specified, water is lost from the analysis when the hgl exceeds the grate level. When bypass is specified the water will not be lost until the level exceeds the highest bank of the bypass section shape (see below).

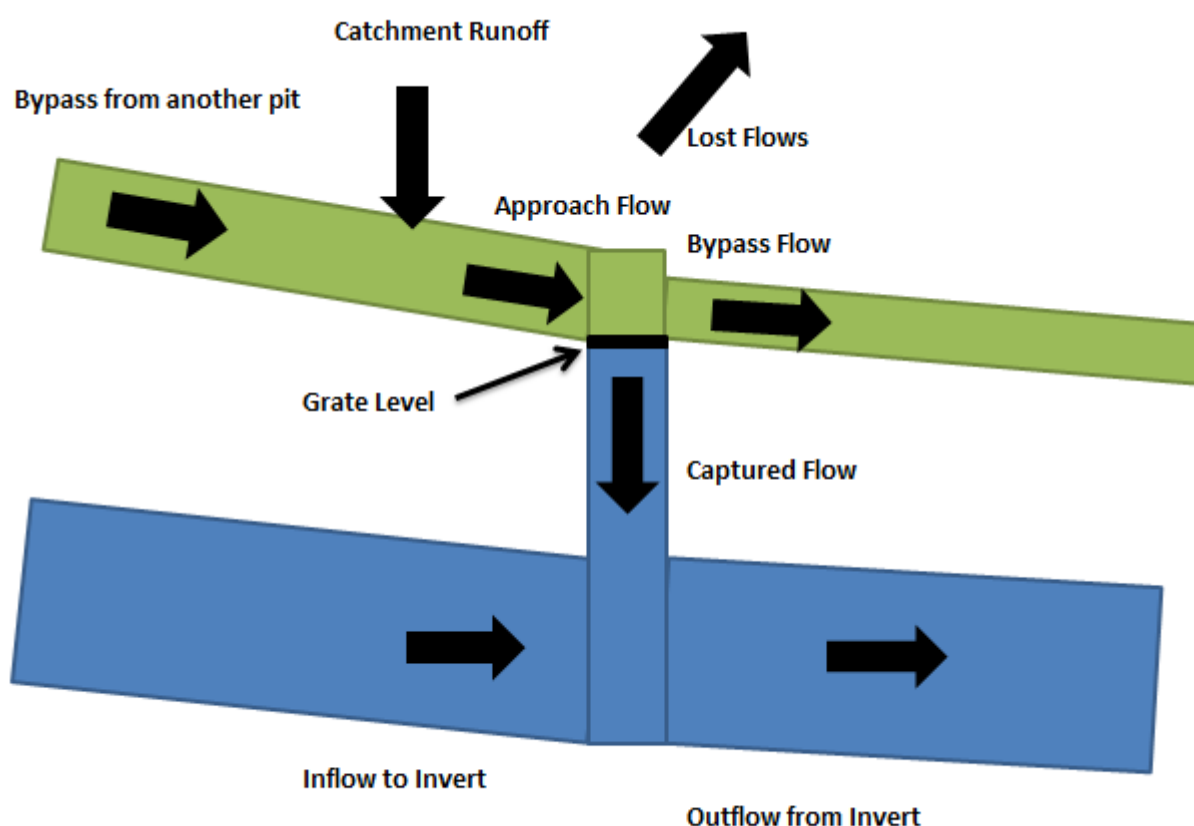
12d uses the St Venant unsteady flow and continuity equations to solve for the flows in the pipe network. With these equations it is the water level in the pits that determines how much flow travels through the conduits. The hgl is not calculated from the flows. Viewing the results from this perspective will help immensely.

6.1 Flows in and out of the Pits

The diagram below shows the possible flows through a pit. When bypass is used, there are 2 hgl levels; one level for all of the conduits with inverts at or above the grate level and another for conduits with inverts below the grate level.

The pit inlet capacity and choke factors determine the amount of approach flow that is captured. If the HGL of the subsurface reaches the grate level, the captured flow becomes zero and only the surface hgl is used to determine the flows in all conduits. When the hgl drops below the grate level again, 2 hgl levels will again be used.

The continuity balance is monitored during analysis and the results of this check are stored as a model attribute “dynamic/xx/calculated hydraulic continuity error percent” where xx is the duration of the storm. A detailed output file is also created for each storm analysed. The file name begins with the name of the drainage model and ends with the storm duration (plus the extension rpt).



6.2 Default Bypass Section Shapes and Slopes

In the rational method, bypass flows (water that could not enter the inlet because of either inlet constrictions or hgl levels) were bypassed to the **Bypass pit**. With the dynamic analysis, a channel

shape is required so that the hgl levels and the storage effects can be modelled. If all of the bypass routes have the same shape then you need only cut one default shape and it will be used for all routes. However you can enter a shape string for every bypass route if desired.

The bypass **distance** is determined from the length of the bypass flow string and the channel has a constant grade. If a changing grade or channel shape is required then the bypass should be to a drainage line modelled as a natural channel (see section further in the notes).

The invert elevations of the bypass channel are set by the grate elevation of the upstream and downstream pits. However, when the bypass is to the pit LOST then there is no downstream grate level so the slope of the bypass channel will be defined. The **Lost grade** value is specified here as 1%. 12d needs this to determine the water forces try to hold the water into the bypass channel.

The **Manning's n** value is the default for the entire section. If left and right bank n values are desired they are entered on the **Bypass Shape** tab.

Drainage Network Editor

Catchment | Pit | Pipe | **DEFAULTS** | GLOBAL | Results

Default data for blank fields

Catchment | **Pits** | Pipes

Main | Bypass Shape

Cover RL mode: FS Tin | Basin elev inc: 0.1

Grate RL mode: Setout String | Sump offset: 0

Ku method: Ku,Kw - Missouri | Ku config: Preferred

Ku: 2

Inlet data

Qdg: 0 | On-grade chokes: 1 | Sag chokes: 1 (minor)

0 | 0.8 | 0.5 (major)

Bypass data

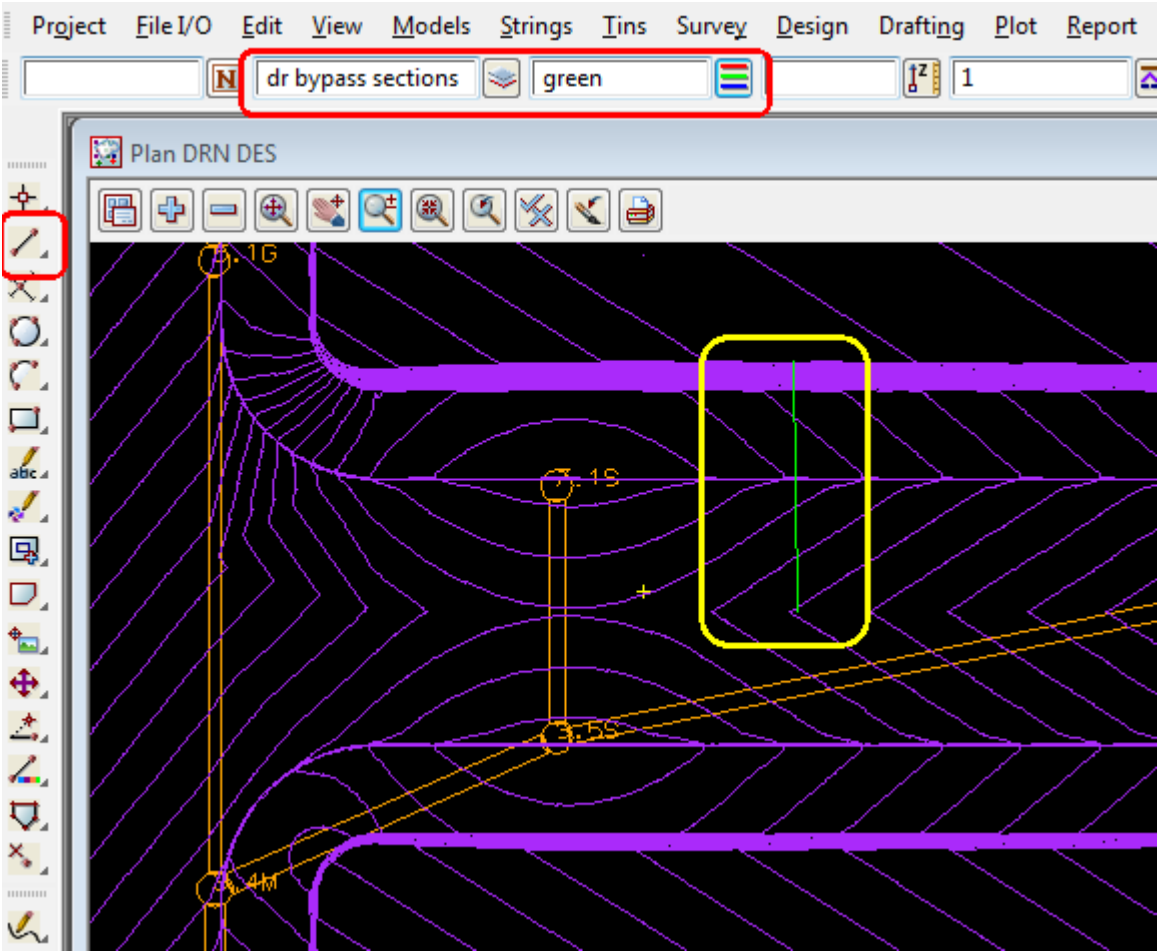
Distance: 10 | LOST grade: 1

Mannings n: 0.015

Setout data

6.3 Create and Editing Channel Shapes

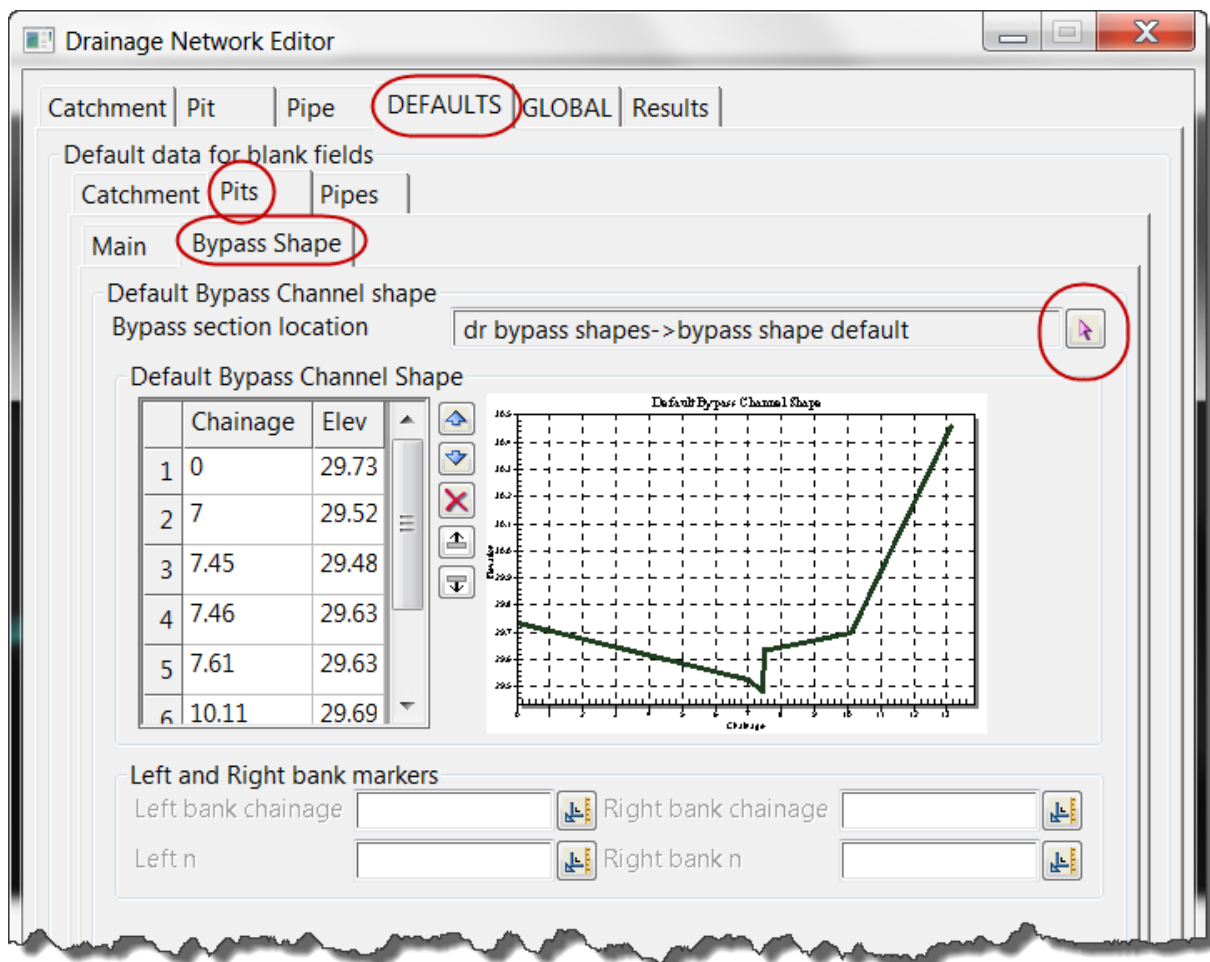
The channel shape may be entered manually or created by drawing a string perpendicular to the flow path and 12d will cut section from the finished surface tin. It is recommended that you keep you section shape strings in one model for data management purposes. The strings are drawn from left to right looking in the direction the bypass string (the direction of flow). To create this string enter the new **model name** in the **CAD Control Bar**. Entering a name for the string is optional. If only 2 points are to be used for the shape string then use the **Create Line** button from the **CAD** tool bar.



After drawing the string it needs to be selected via the **Bypass section location** pick button (see below). Once picked and accepted, select **Set Pit Details** to have the bypass shape cut from the finished surface tin specified on the Global tab. This shape may be seen on the **Bypass Shape** tab and the chainage elevation data displayed.

The elevations on this graph are not used. The data is relative to the lowest elevation on the section. This becomes level 0.0 for the shape and the channel inverts added to determine the final elevation.

Left and right bank n values may also be entered if desired. They **Left n** is used to the left of the **Left bank chainage** and the **Right n** is used to the right of the **Right bank chainage**. The centre chainage is entered on the **Default->Pits->Main** tab.

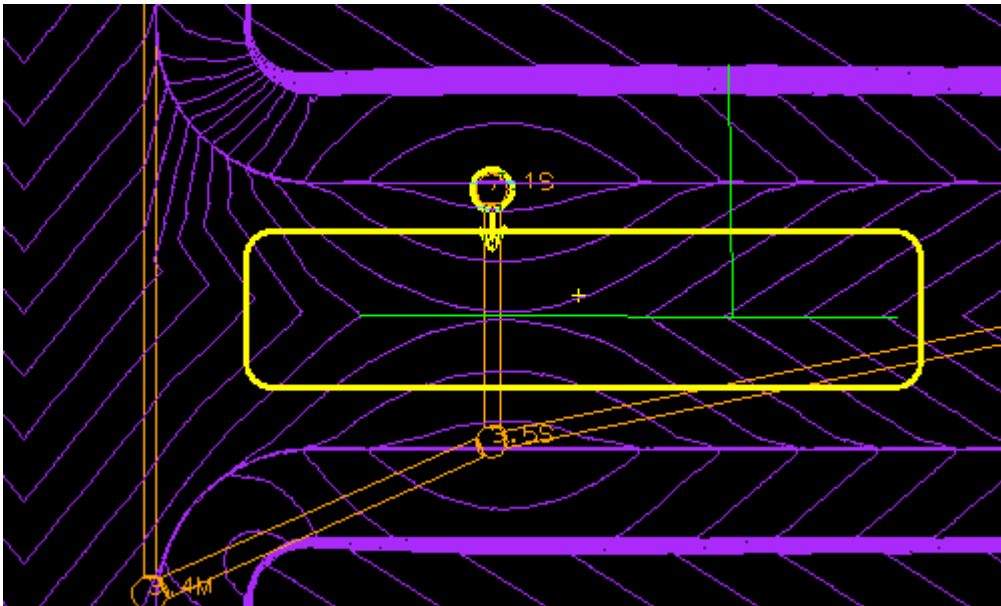


If you manually change any of the chainages and elevations they will be lost the next time you select **Set Pit Details**. To prevent this RB select the **Bypass section location** and select **Clear**. Now there is no string so the data cannot be recalculated.

6.4 Explicit Bypass Section Shapes and Slopes

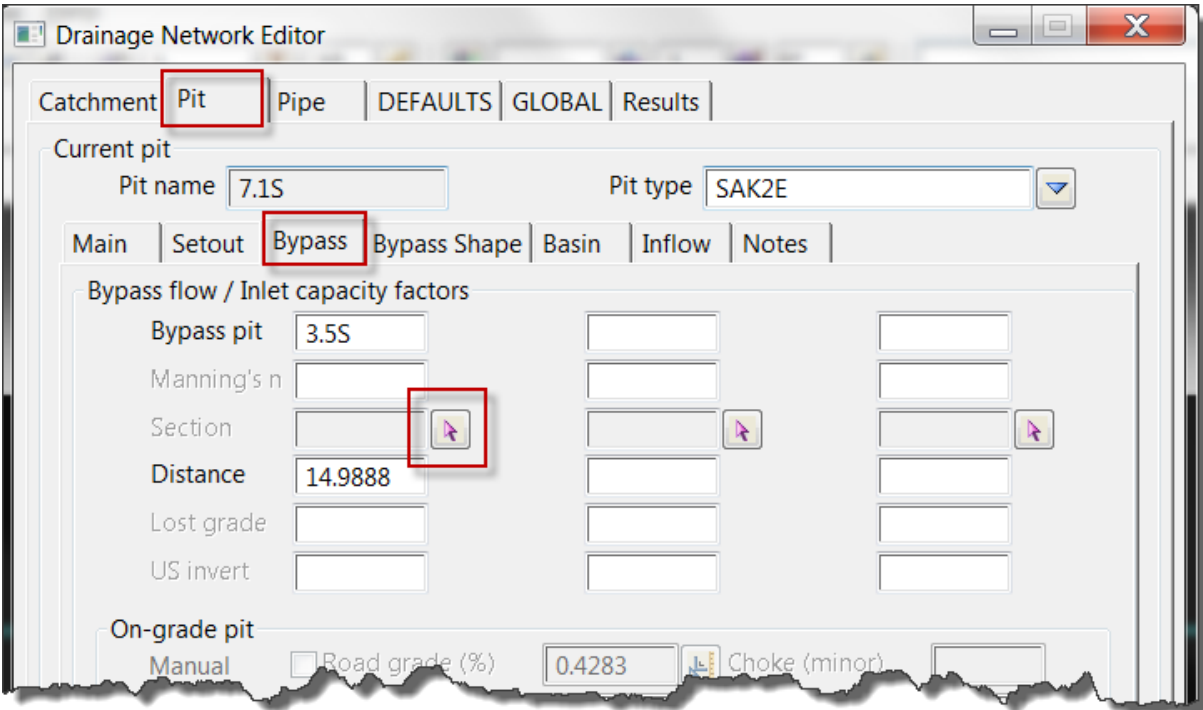
We will now explicitly define a bypass flow shape for bypass link. Water flow across the crown of the road should not use a kerb and gutter shape. Instead we need the shape and invert elevation for the road crown that the water will overtop.

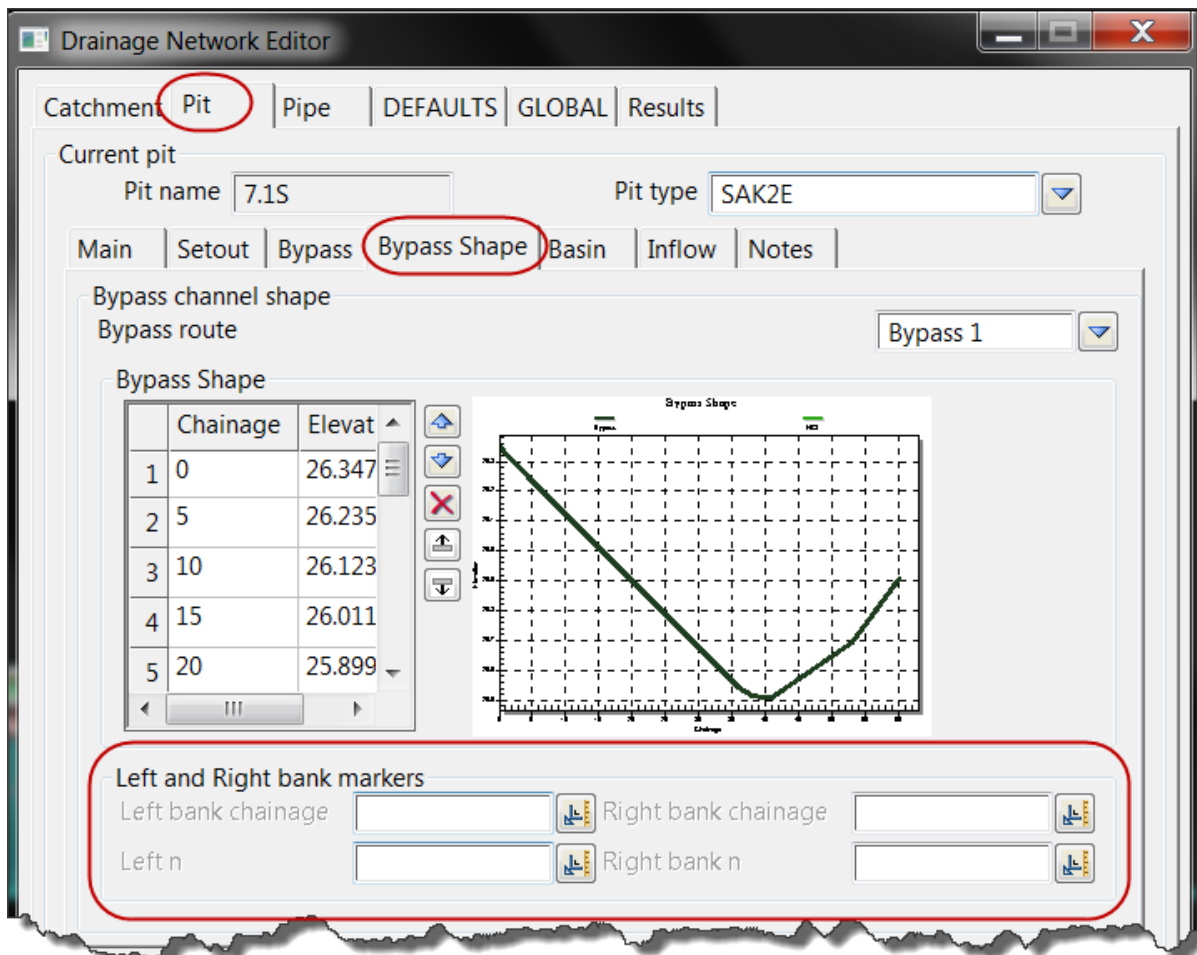
To create a shape string for the bypass across road 2, draw the string from east to west (left to right looking in the direction of flow).



Now select the bypass shape for crossing the crown of the road. Select the **Set Pit Details** button to have 12d calculate the bypass shape from the finished surface tin. Change to the Bypass Shape tab to see the shape. Note the **bypass pit** and **Distance** fields will already be completed from the bypass flow string calculations. Entering a manning's n value is optional.

You will also note that there are 2 other bypass flow routes that can be used. To use these the bypass pit and distances will need to be manually set. The hgl above the grate determines the head that will drive the water down the various channels.





The enlarge the plot RB select inside the graph area and select **Maximise** from the menu. Note the lowest level on the section shape is approximately 25.5. This is the grate level of the pit. Press **Esc** or select the title area to close the graph. Left and right channel n values with their chainages may be entered in the fields below the graph. If these values are left blank the n value from the centre of the channel will be used, NOT the n values from the default bypass channel shape.

If this bypass shapes was to be used in the model now, the bypass channel would go from one grate level to the other without any reference to the crown of the road level. To model the flow path from the crown of the road to the pit 3.5S we will raise the upstream invert level to the road crest level (25.790).

Drainage Network Editor

Catchment **Pit** Pipe DEFAULTS GLOBAL Results

Current pit

Pit name 7.1S Pit type SAK2E

Main Setout **Bypass** Bypass Shape Basin Inflow Notes

Bypass flow / Inlet capacity factors

Bypass pit	3.5S		
Manning's n			
Section	1S to 3.5S		
Distance	14.9888		
Lost grade			
US invert	25.79		

Select the **Apply** button to store the changes and note that the lowest point of the bypass shape graph is now raise the 25.79.

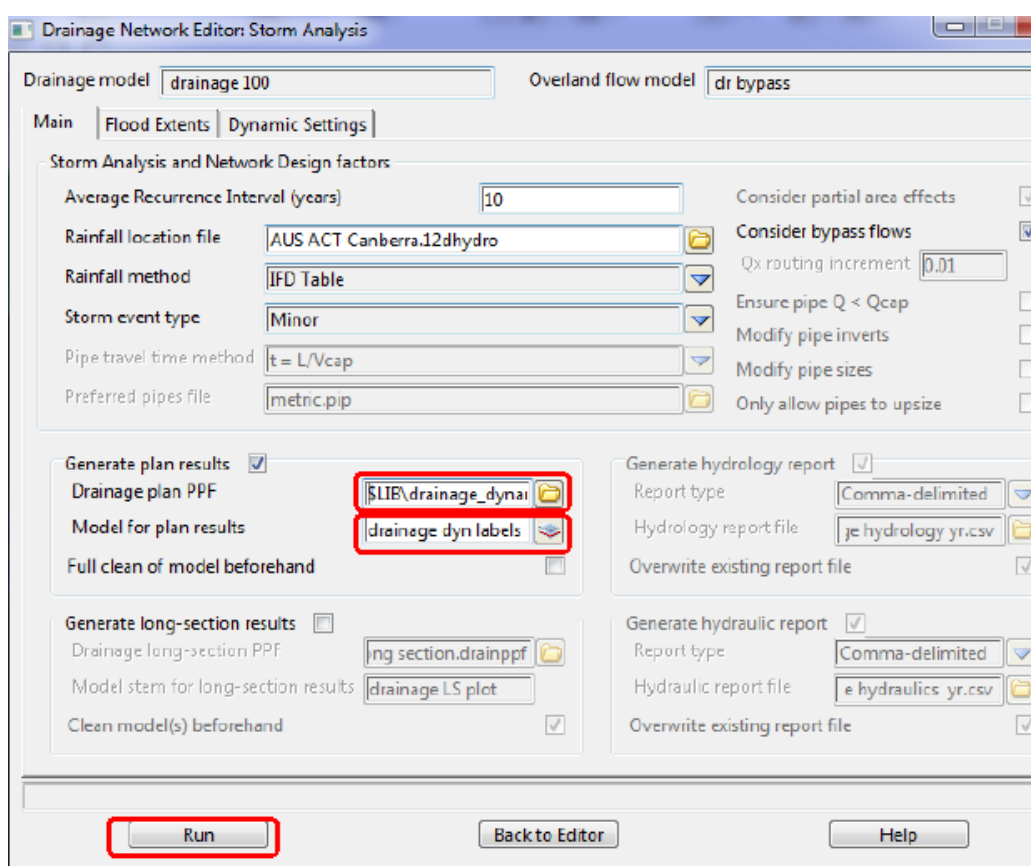
See [Create and Editing Channel Shapes](#) for details about manually entering data or changing the shape.

7.0 Running Dynamic Drainage

The dynamic engine analyses the network but does not design the components. Multiple storm patterns may be run simultaneously and the results from individual storms as well as the worst case from all currently analysed storms is saved. The results may be viewed graphically or in user defined reports. If your computer has a multiple core processor each storm will be processed by different processors and 12d will accumulate the results as the storms finish analysing.

7.1 Storm Analysis

Select the **Storm Analysis** button. To generate plan labels for the worst case dynamic results select the **drainage_dynamic_design** ppf file from the library. Also change the name of the **Model for plan results** so that you can keep the results from previous rational hydrology runs. Select the **Run** button.



A process window will be launched for each storm analysed and the status will be printed in the output window. **Always watch this window for messages.** Below are message from a sample run,

```
==> Checking Storm: 1
==> Storm: 1   OK
==> Updating Catchment Attributes
==> Updating Node Attributes
==> Updating Link Attributes
```

==> Updating Model Attributes
Elapsed Time: 6.67 secs
Run finished normally.

A run with errors would have a message like the following:

Dynamic Drainage Analysis (Build 5.1.026)
Dynamic Runoff Method: ILSAX 2
ari0.0
zone: 0
1 TP_Durations: 25.00
==> Solving Storm: 1
ERROR: Bypass section not defined for conduit: 7/A-SEP_to_6/A-SEP(S)
Model failed to solve.

7.2 Reviewing Results - Plan Labels

As with the rational method, the plan plots indicate the peak values. If multiple storms are run then this ppf file will print the max from all storms run.

So that the dynamic results are not mixed with the rational results, the worst case results are stored with the prefix **dynamic**. Results from individual storms have the prefix dynamic/xx where xx is the max time of the rainfall event.

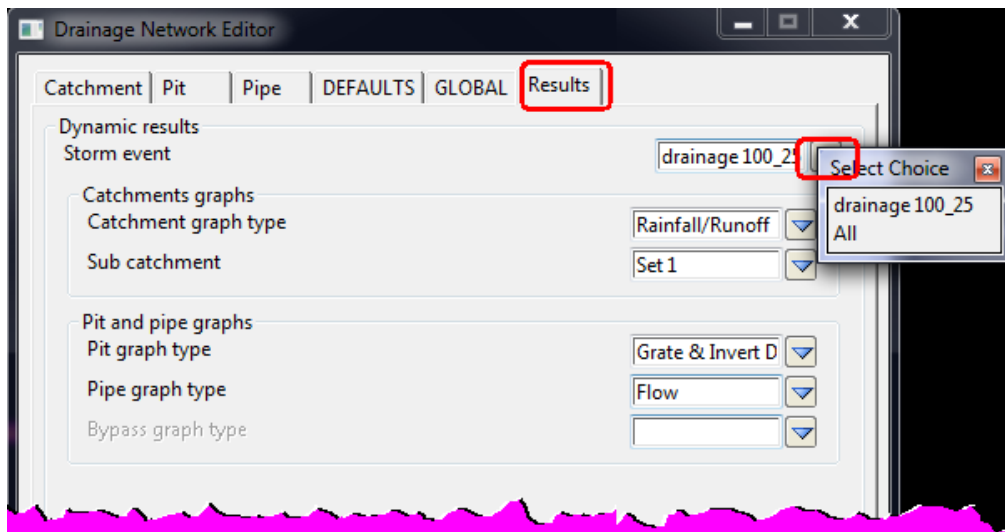
For example the pipe attribute for the maximum pipe flow

calculated pipe max flow	rational hydrology result
dynamic/calculated pipe max flow	worst case dynamic result
dynamic/calculated pipe max flow critical storm	storm where above results occurred
dynamic/25/calculated pipe max flow	25 min storm dynamic result
dynamic/calculated pipe max flow	worst case dynamic result

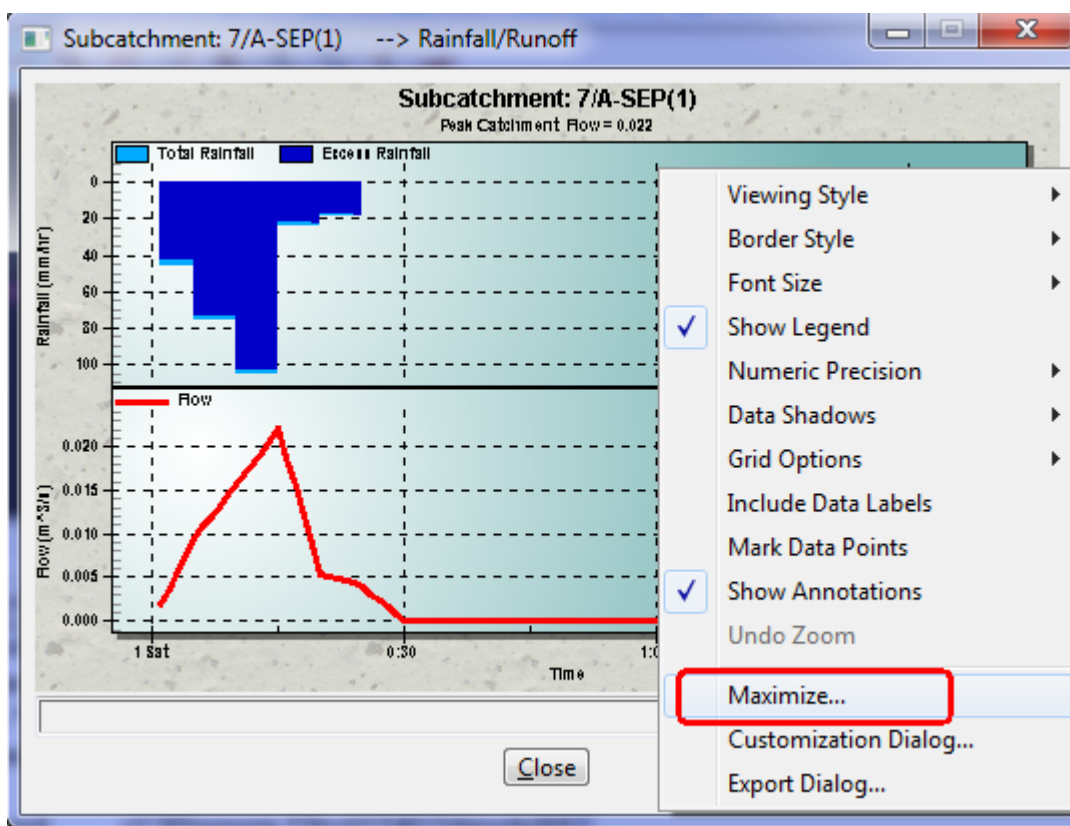
7.3 Reviewing Results - Graphs

Graphs indicating the results are created on the **Graphs** tab of the **DNE**. These graphs are a sampling of the time step results and usually does not include all time steps. Therefore, if the peak indicated in the attributes occurs between 2 plot points the peak may not be on the graph.

Select the **Storm event** to view. Nothing is displayed yet. When **All** is selected, the results from all the storms analysed in the last run are displayed. Graphs types that display more than one line will not be displayed when all is selected. There will be far too many lines on the plot to properly identify them.



Now select the data to view using the drop down boxes or by selecting the below and pressing enter. For example the **Rainfall/Runoff**.



The panel cannot be resized but it can be maximised via the right mouse menu. ESC returns to smaller view. The peak from the plot data (not the attribute) is indicated at the top of the graph.

You can zoom into the graph areas by dragging a rectangle inside the graph area. You must right mouse select and choose **Undo Zoom** to return to the full plot.

The available graphs are:

Catchment graph types (used in conjunction with **Sub catchment** selection)

Rainfall/runoff

The **Total rainfall** is the rainfall intensity calculated from the IFD data, the return period and the temporal patterns.

Excess rainfall (ILSAX 2) is the water that is left over after the rainfall losses infiltrate into the soil.

For the impervious area, excess rainfall = total rainfall - storage

For the pervious area, excess rainfall = total rainfall - storage - infiltration

Runoff starts when the excess rainfall depth exceeds the storage depth and the intensity is greater than the infiltration. Most frequently runoff starts from the impervious area first, (no infiltration, small storage and short tc) and then from the pervious area.

Runoff The runoff component of the **Rainfall/runoff** graph (good for all storms).

Rainfall The rainfall component of the **Rainfall/runoff** graph (good for all storms).

Losses These are the horton infiltration losses that are subtracted from the pervious component of the catchment (good for all storms).

Pit graph types

12d analysis has 2 systems for conveying flow. The **surface system** created with bypass flow strings (open channels with their inverts at the pit grate levels) and the **link system** created with the 12d drainage strings.

Grate & Invert Depths:

The top is the **Grate depth** showing the depth of flow in the surface channel measured from the grate level. The bottom is the **Invert depth** showing the depth in the link system above the pit invert.

Grate & Invert Elevations:

Shows both the bypass and link system water elevations. Good to see when the link elevation reaches the grate level to stop the inflow of water through the grate.

All Inflows & Outflows: (Inflows are + and outflows are - (S means surface))

Flows for each link and bypass are listed separately.

Local is the total **Catchment** flow from all 3 catchment sets plus direct flow,

In: Links and surfaces flows entering the pit.

Out: Links and surfaces flows leaving the pit.

Total Inflows and Outflows:

Local: the total **Catchment** flow from all 3 catchment sets plus direct flow,

Inflow to Invert: the sum of **In:** (links) + **Captured flow** This is the total inflow into the pit for the link system.

Outflow from Invert: the sum of **Out:** (links) This is the total outflow from the pit for the link system.

Approach Flow: the sum of the **Local** + **In:** (surface)

Captured Flow: determined from the **Approach Flow** (on grade pits) or **Grate Depth** (sag pits)

Bypass Flow: Approach flow - Captured Flow

Depth above Invert see invert depth above

Depth above Grate see grate depth above

Elevation - see Invert elevation above

Elevation Bypass Flow - see Grate elevation above

Basin volume - only available on pits with basin curve data.

Catchment Flow - Total of **Runoff** for Sets 1, 2 and 3.

Link Inflow and Captured Inflow: surface and link pit elevations, **Link Inflow** (see **Inflow to invert** above) and **Captured Inflow** (see **Captured Flow** above)

Link Outflow: see **Outflow from Invert** above

Approach Flow: see above

Bypass flow: see above

Inflow: see **Link Inflow** above

Overflow - the flow that is lost from the drainage system when the hgl exceeds the maximum level at the pit.

The maximum level at the pit is largest of

1) the cover level,

- 2) the grate level + depth of bypass channel
- 3) the maximum storage level in the basin storage data.

Ku - the link flow, upstream velocity, Ku and head loss of the primary outgoing link.

Pipe graph types (link system)

Dynamic Section: a section view of the entire string showing the hgl in the links and surface channels. The lower dashed line connect the grate levels and the upper shows the top of the surface channels. If the hgl goes above the top of the surface channel water will be lost from the system.

All Link Results 3 charts: The colour of the right axis label is the same as the graph line it represents.

HGL US, HGL DS (left axis)

Depth (right axis) depth at the mid point of the link

Capacity (left axis) the ratio of the current pipe flow / (pipe full, HGL at grade capacity)

Froude Number (right axis) - Froude number at the mid point of the link

Flow (left axis) flow in the link

Velocity (right axis) - velocity at the mid point of the link

Bypass graph types (bypass system)

same results graphs as for the **pipe graph types** above

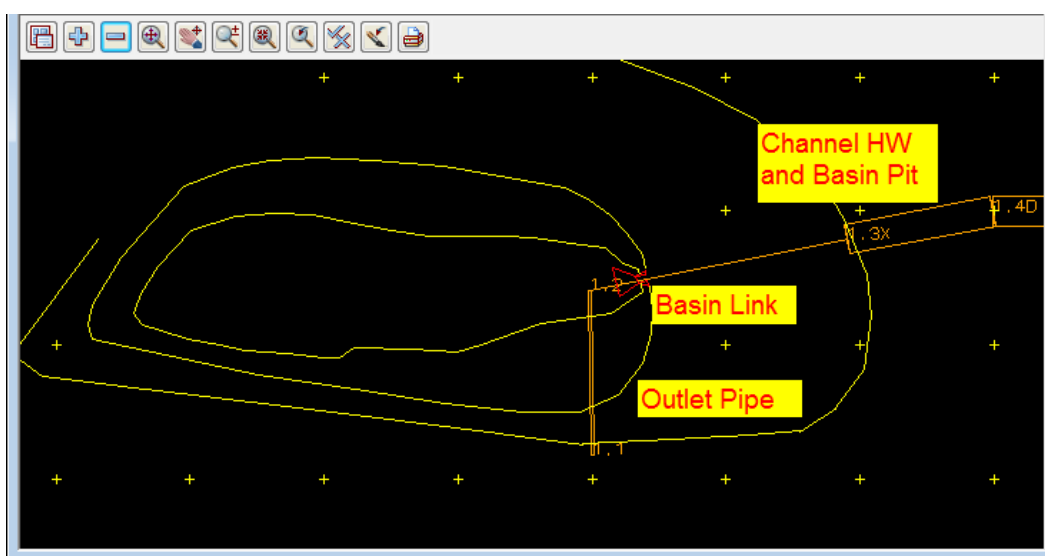
8.0 Adding Storage Basins

Storage basins are created by adding an elevation versus area curve at a pit. Without the area curve the default area of a pit is defined by the diameter or the length, width settings in the drainage.4d file.

The elevation area curve may be entered manually for initial estimates or measured from the finished surface tin (inside a string defining the extent of the basin).

The outlet structure is the link exiting the basin pit. This is often a weir, orifice or discharge limiting pipe.

An optional basin link may be used to separate the outflow structure from the basin pit. This allows the user to place the outlet structures in their correct position. The basin link is only a graphical link and often has its diameter set to zero to help indicate that it is not a hydraulic component of the system.

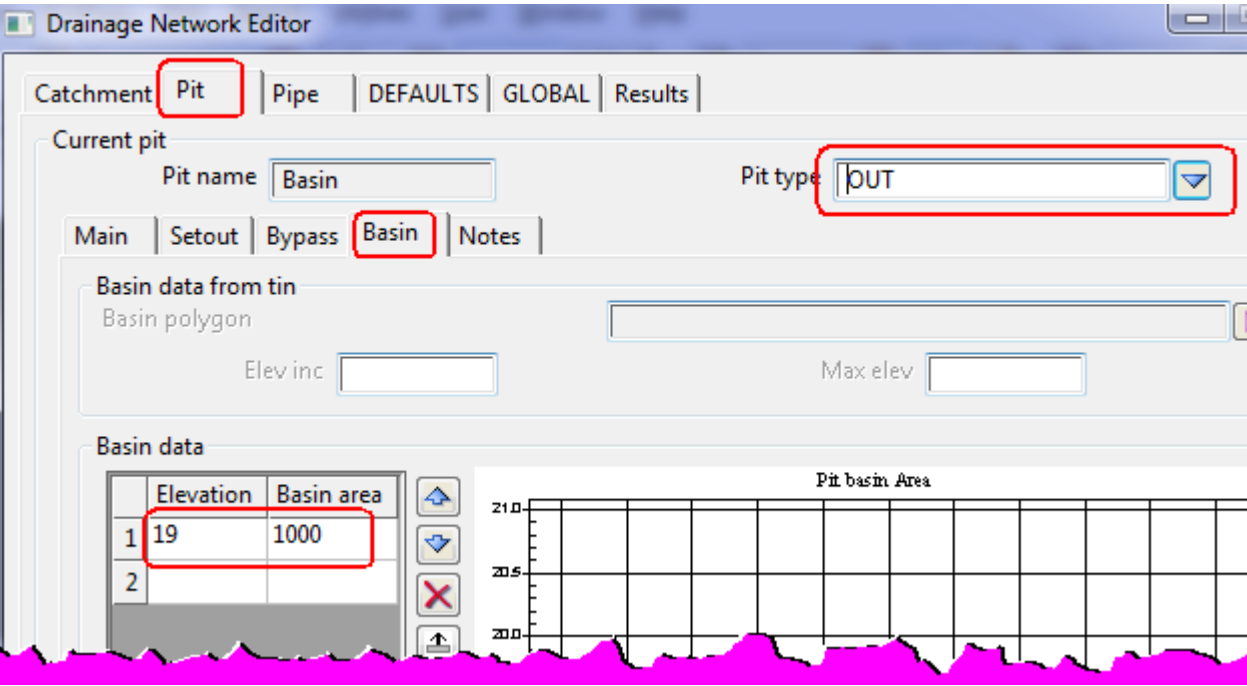


8.1 Selecting the Basin Location

The node modelling the basin is the outlet of the pipe or channel discharging into the basin. The pit becomes a basin when the user enters elevation versus area curve for the basin or selects a polygon around the top of the basin. With the polygon method, 12d will create the elevation versus area curve from the finished surface tin. We will use an existing string from the survey data but you may easily create your own polygon around the top of the basin.

For an initial sizing you only need to enter the basin invert elevation and area into the grid.

If the outlet pipe has an upstream invert level below the lowest basin curve entry, this lower section of the pit will use the default pit area.



8.2 The Outlet Structure and the Basin Link

The basin outlet generally includes more than one structure. Typical arrangements include a low flow pipe that restricts the outflow from the basin and a high flow spillway used in larger events. Every outlet structure is linked to the basin pit with a basin link. Often the outlet structure is a fair distance from the basin pit and we want the outlet structures drawn in their correct location. IF the diameter of the basin link is set to zero it joins the basin pit to the outlet structure but preforms no hydraulic function in the model.

The minimum elevation in the elevation data becomes bottom of the basin and the outlet inverts cannot be below this level. If there is a drop pit for the outlet then ensure that the base of the drop pit is first elevation in the basin data. The area will be the area of the pit. The second entry will be the top of pit level with the same pit area.

8.3 Creating the Basin link

The pipe downstream of a basin pit is a basin link. When the diameter is set to zero, the data set on this link is for graphical presentation and has no hydraulic function.

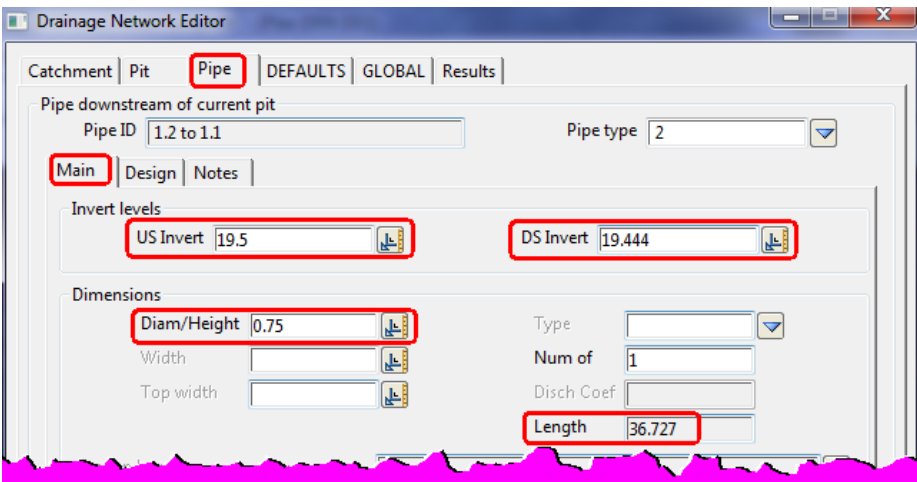
The screenshot shows the 'Pipe' tab in the Drainage Network Editor. The 'Pipe ID' is '1.3X to 1.2' and the 'Pipe type' is 'CHNL'. The 'Main' sub-tab is selected. Under 'Invert levels', 'US Invert' is '19.5' and 'DS Invert' is '19.5'. The 'Dimensions' section is highlighted with a red box and includes: 'Diam/Height' (0), 'Type' (Basin), 'Width', 'Top width', 'Num of' (1), 'Disch Coef', 'Length' (58.729), and 'Section location'. The 'Other properties' section includes 'Roughness type' (Manning), 'Roughness' (0.04), 'US defl.' (0°29'45"), and 'DS defl.' (79°35'49").

For clarity in the section view we will set the levels to the bottom elevation of the basin and set a zero pipe diameter to make the link as unobtrusive as possible.

The screenshot shows the 'Pipe' tab in the Drainage Network Editor, with the 'Design' sub-tab selected. Under 'Invert design', 'Lock US Invert' and 'Lock DS Invert' are both checked. 'Grade mode' is set to 'IL-IL Drop'. 'Cover limit' is '0'. 'DS vert defl' and 'Align drop' are both '0'. The 'Pipe size design' section includes 'Lock pipe size' (unchecked), 'Min pipe height', 'Max pipe height', 'Design mode' (Open Channel: Freeboard Design), 'Freeboard limit at US pit', and 'Flow-depth limit at pipe entrance (%)'.

Locking the link inverts will ensure the invert elevations are not changed with a regrade pipe selection. Remember this is a graphical link and the values do not affect the hydraulic calculations.

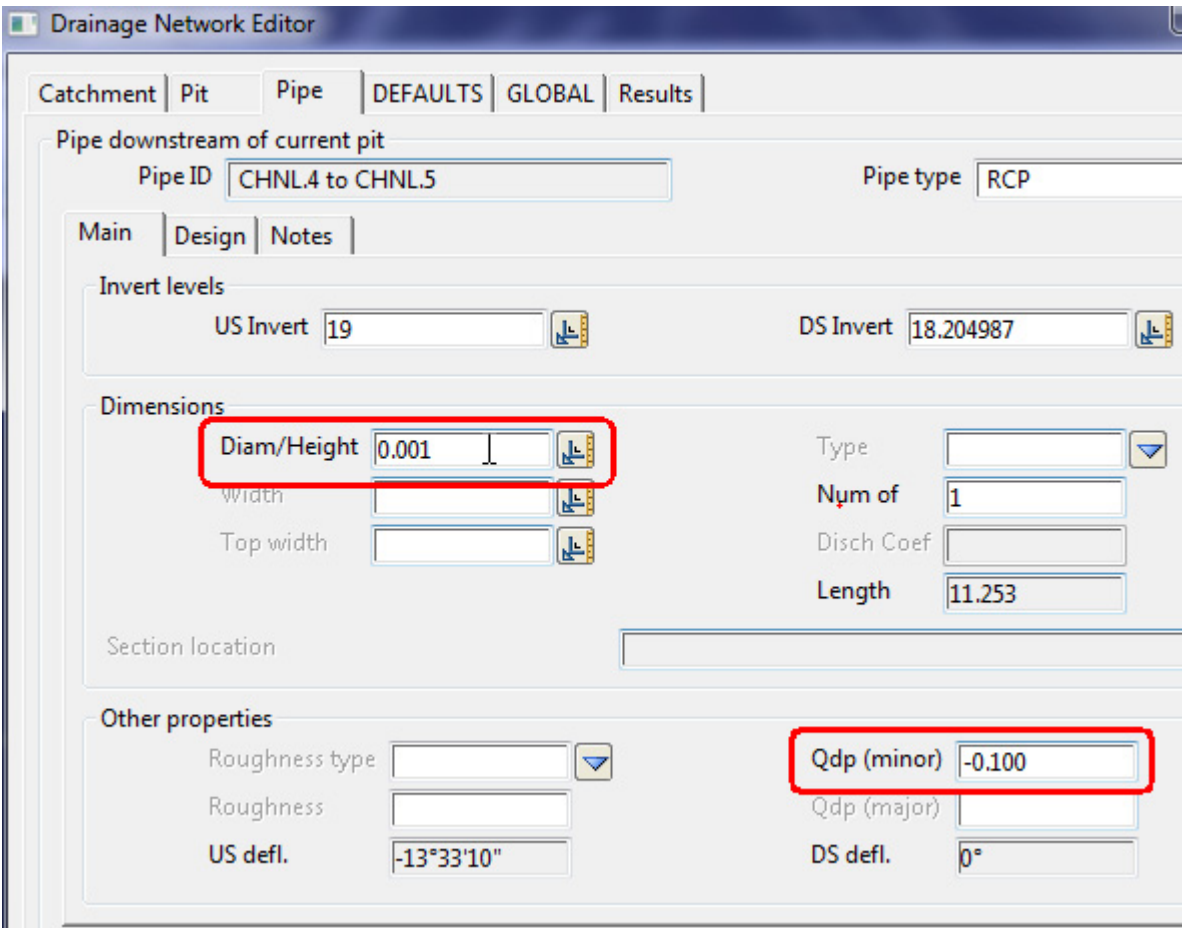
8.4 Data for the Outlet Control Pipe



The upstream invert is being set to the bottom of the basin and then we will lock this invert. We will leave the engine to set the DS invert level.

The length will depend of your drawing.

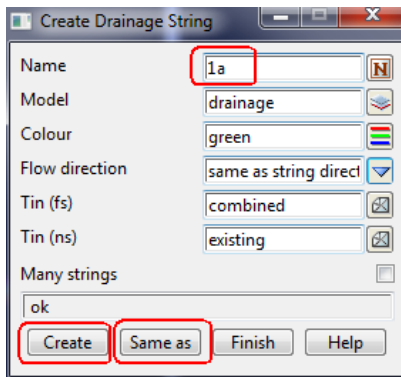
For initial sizing of the basin you can set the diameter of the pipe to 0.001m so that no flow goes through it. Now enter a negative pipe direct flow and this will become the constant outflow from the basin (usually set to your pre-development peak discharge). Once you size the basin, return here, remove the negative flow and select a pipe size to yield similar results.



8.5 Adding a Second Outlet Structure (Spillway Weir)

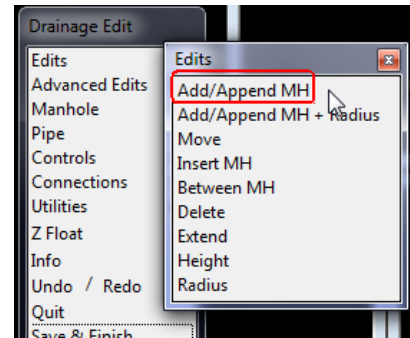
A second drainage string will be needed for the spillway. Again it will start with a basin link and then have a weir section. From the main menu select

Design->Drainage-Sewer->Create

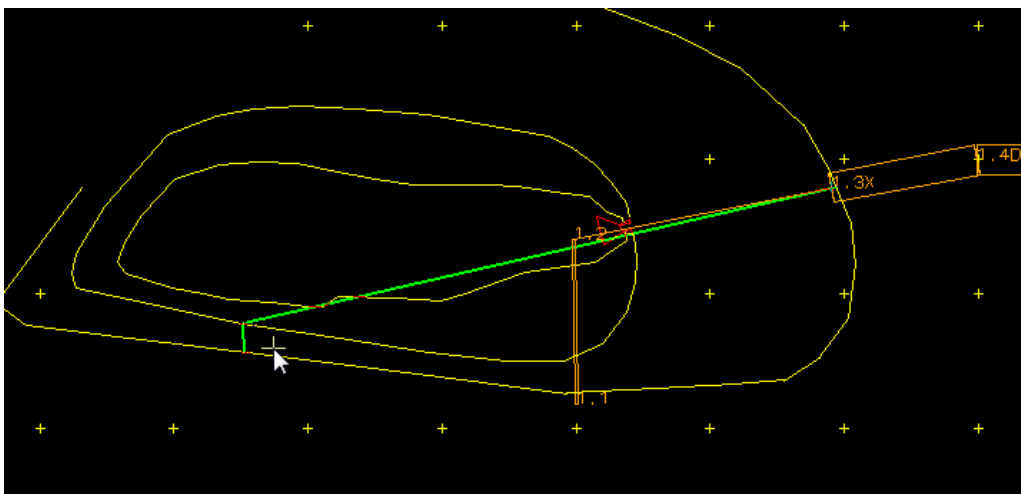


Select the Same as button and pick a drainage string in the model. This will fill in all of fields. Name must be unique so change this data. Finally select Create.

Then select Add/Append MH from the menu.



The plan view below shows the basin link and the spillway weir location. Draw the string in the



direction of flow and ensure you start with a point snap on end of the channel.

Once the string has been created the pit data at the upstream side of the weir need to be set.

Drainage Network Editor

Catchment **Pit** Pipe DEFAULTS GLOBAL Results

Current pit
Pit name Pit type

Main Setout Bypass Basin Notes

Cover RL mode Cover RL
Grate RL mode Grate RL
Pit diameter Sump offset

Inlet data
Ku method Inlet config
Ku config Qdg (minor)
Ku Kw Qdg (major)

Outlet data
Tailwater mode TW level (minor)
Ko TW level (major)
Basin = f

Model String Pit

On the Pit->Main tab we are going to set the cover level at the highest expected water level in the basin. The grate level will have the same level as the cover level.

The **Pit type** does not affect the calculations for the weir.

We have also assigned a name to this pit.

Drainage Network Editor

Catchment Pit **Pipe** DEFAULTS GLOBAL Results

Pipe downstream of current pit
Pipe ID Pipe type

Main Design Notes

Invert levels
US Invert DS Invert

Dimensions
Diam/Height Type
Width Num of
Top width Disch Coef
Length

Section location

On the pipe-main tab we will see the **US invert** level to weir crest level (20.0). The **DS Invert** is set the same but will have no affect on the calculations. The **Diam/Height** determines when the weir will start acting as an orifice. Generally used in underground storage tanks. In this case we will set it to a value higher than the expect flow depth (1.0 m). The **Width** is the dimension of the weir perpendicular to the flow. The Disch Coef is optional as the default will be used if it is blank.

The tailwater levels are now set to the expected levels for the minor and major events.

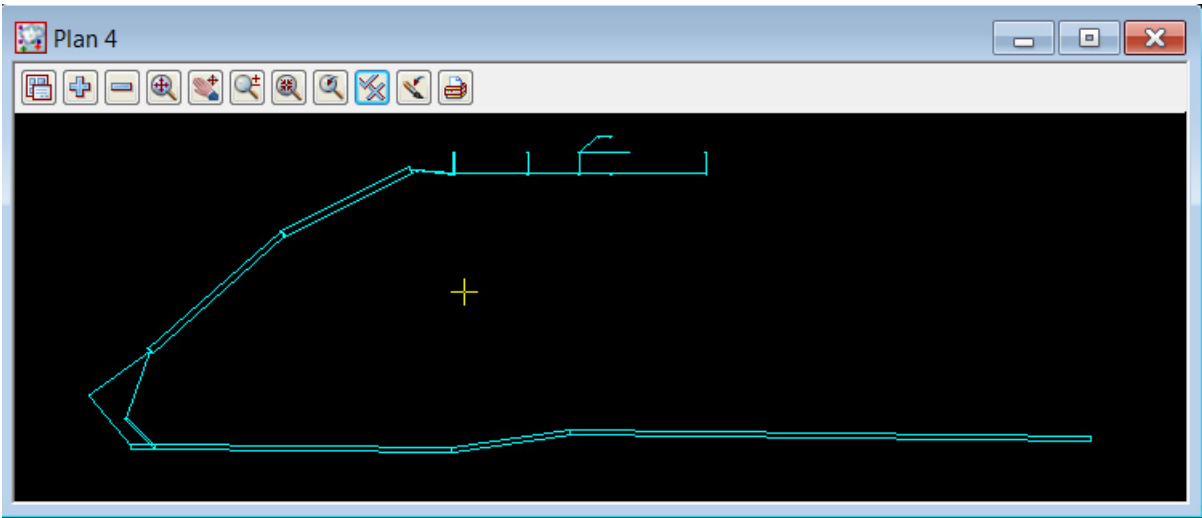
Enter a name for the outlet.

9.0 Natural Section Shapes

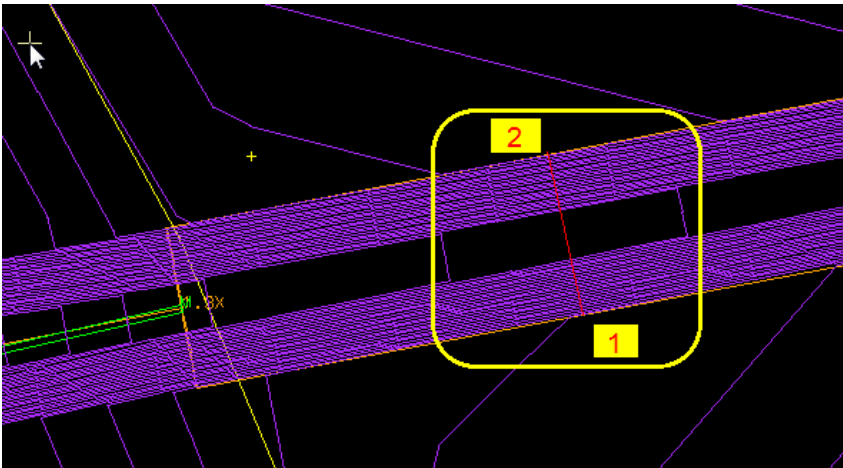
The channel shape may be cut from the design tin by drawing a string at the desired location. It is a standard convention to draw it from left to right looking in the direction of flow.

In this example we are going to connect the end of the culvert to a channel down to the spillway and then eastward to the end of the project. Set the Defaults, **Pit Type** to **chnl auto** and **Pipe Type** to **CHNL GRASS EXISTING 1** with a **height** of 4.0. This height will not affect the calculations but will show the approximate channel top in the section view. This will mean you no not have to change them later.

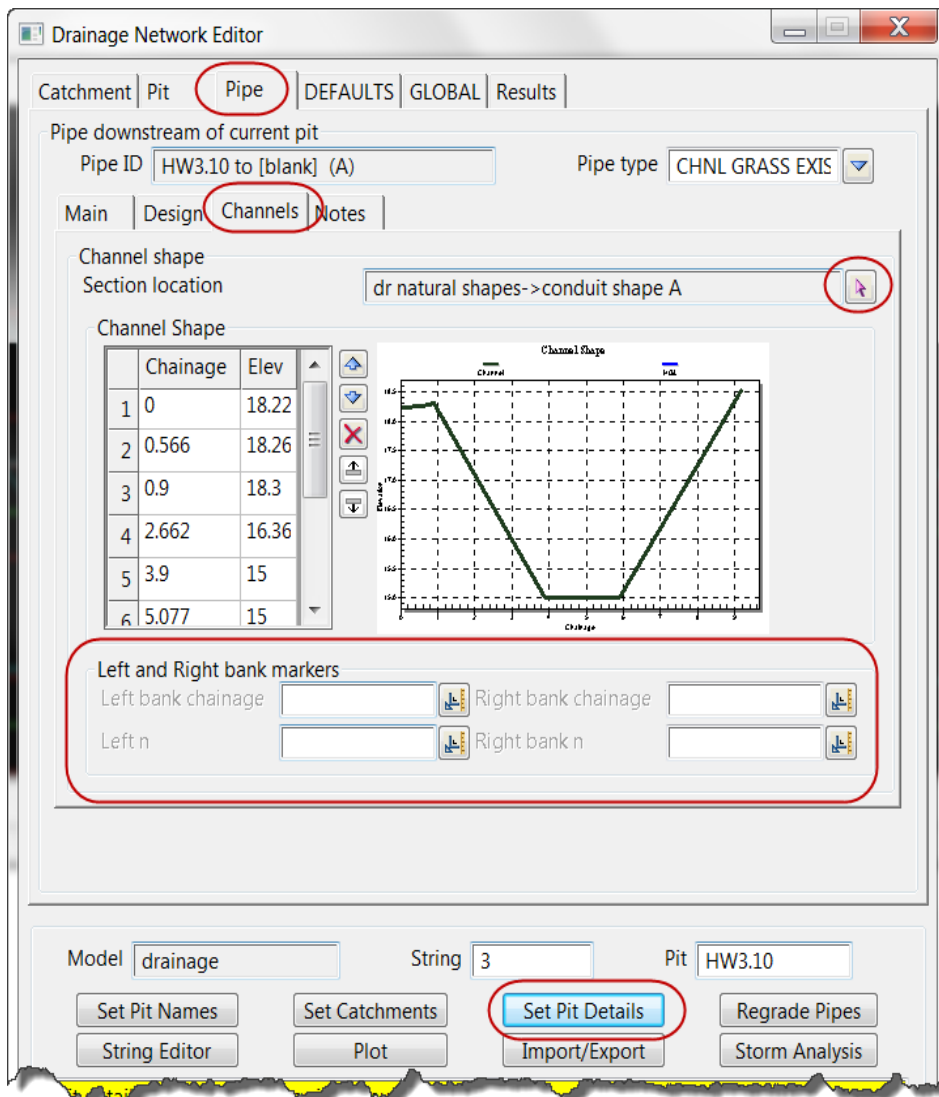
Use the **Points Edit->Append** to add the extra links as shown below. Ensure that the centre of the drainage string is in the lowest part of the channel. Finally, extent the spillway to the channel.



Enter the model name **dr natural shapes** into the CAD toolbar model field before drawing this string.



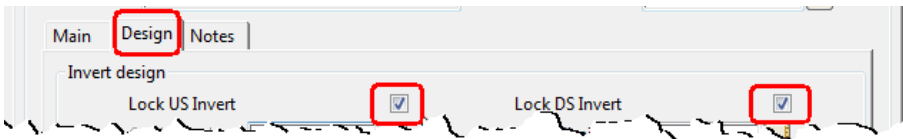
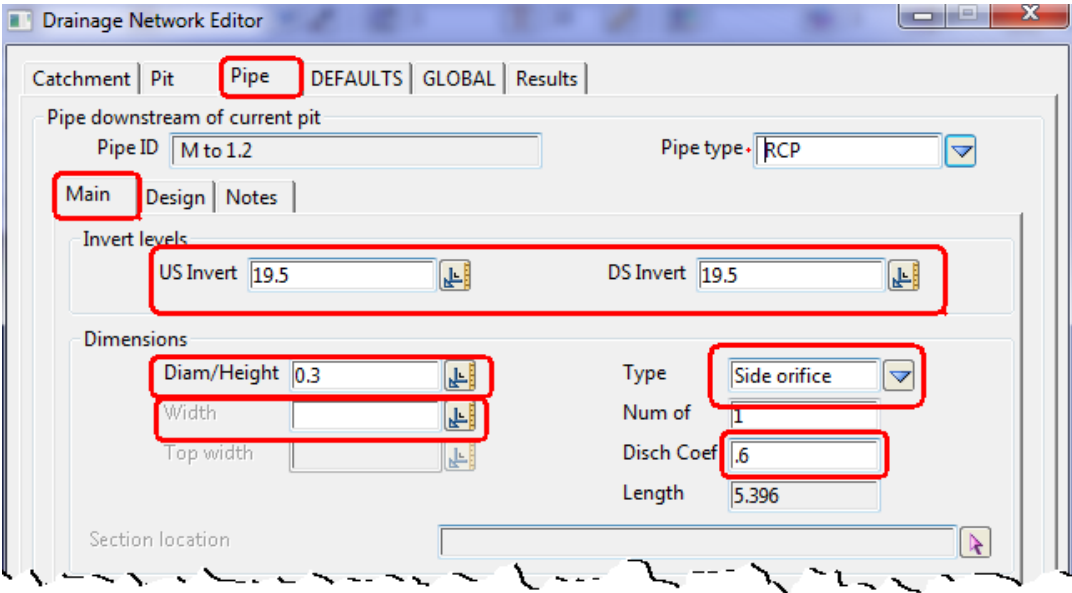
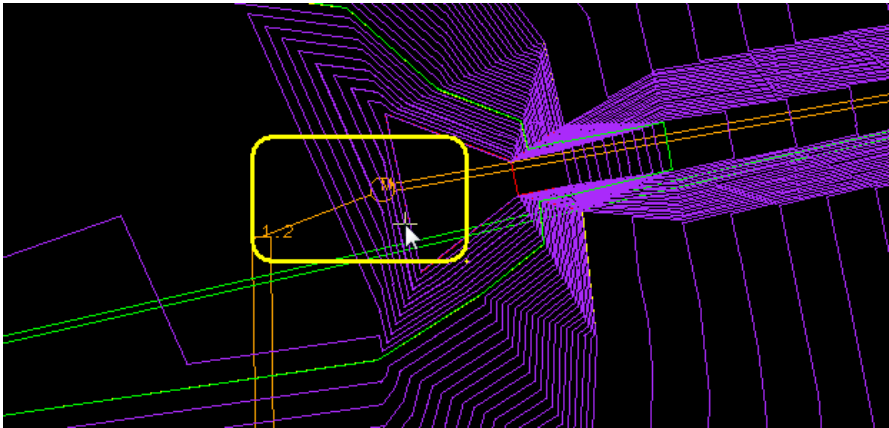
Once you have drawn the string you can select it from the **Pipe->Channels** tab. Selecting **Set Pit Details** will have the shape cut from the design tin and displayed in the grid and graph area. If you do not want the shape cut from the tin you can just enter the shape in the grid area. Once again the shape obtains its elevation by setting the lowest point onto the invert elevations.



Left and **right bank chainages** and n values may be entered if desired. If blank the link's n value will be used. There is no default left and right bank n values.

10.0 Orifice Control on a Pipe

Use the Strings->Points Edit->Insert command to add a pit upstream of the outlet pipe. This new pipe will be set to an orifice to control the flow entering the pipe.



Lock the invert levels so that the orifice will not move in elevation,

11.0 Storage Tanks as Basin or Pipe

A storage tank may be modelled as a box culvert or as a basin but do not do both as this will double count the storage. To model the tank using basin areas Set conduit type to a Basin link and set the pipe diameter to a value that is meaningful for the long section appearance. Once it is marked as a basin link it will not affect the calculations.

Drainage Utility Program

Position of option on menu: Design => Drainage-Sewer =>More => Misc. utilities

The Drainage utility program contains functions to significantly reduce the time required to perform drainage tasks. These tasks include

Assign Pit names

To use the export routines, every pit in 12d must have a pit name. This selection automatically creates the pit names for the entire model or selected strings. Examples of pit names are 1,2,3... A1,A2,A3....Pit 3-A, Pit 3-B.

Reset pit cover levels

This selection sets the cover levels for the manholes to the design tin or design strings. The user will be prompted for each manhole to select a tin level, a string level (if a design string model is supplied) or keep a manually set level. The tin/string/manual selection will be stored and the levels reset now and whenever the pit/pipe interfaces exports the data (unless this last option has been manually turned off).

Regrade pipe levels

The selection applies the default grading rules (cover level) to reset the pipe invert levels for the entire network. Manhole cover levels are not changed during this function

Label Catchments and Label drainage network

This selection quickly creates labels for a drainage and catchment plan. The pits are labelled with their name, the pipes with their diameters and the catchments with their area and the pit they drain to. These labels must be updated using this selection whenever the catchment or network is changed. To turn off the automatically drawn pit names in the current view select

Menu=>Settings=>Text=>Toggle and select the drainage model.

Analyse Flooded Width

This is the only hydraulic calculation that takes place in 12d. The normal depth along the bypass flow paths is calculated using discharges imported from hydrology/hydraulic packages including spreadsheets. This flooded width is drawn to scale at intervals along the bypass flow path and colour coded (blue if less than a specified limit and red if greater than the limit).

See Also

Drainage overview

Usage

This panel is accessed from the menu selection

Design => Drainage-Sewer => More => Misc. utilities

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

drainage model	input box		
-----------------------	-----------	--	--

Model to contain all of the pit and pipe network to be worked on.

catchment area model	input box		
-----------------------------	-----------	--	--

*Model to contain the catchments strings for the **Drainage Model** above*

<u>Assign pit names</u>	button		
-------------------------	--------	--	--

This button launches a dialogue for setting the names for the pit and pipes in the network model.

design tin	tin box		
-------------------	---------	--	--

*This optional field allows the user to specify a new tin for the surface levels of the pits. If you are using road grade and cross fall for pit inlet capacity it is preferable leave this blank and to link the pits to a string using the **design model** field below. If some or all of the pits are linked to strings in the design model below, they will still use the strings selected. [more about design strings](#)*

design model	model box		
---------------------	-----------	--	--

This model contains the strings for the pit cover levels (the string directions are also used for road grade and cross fall). If this model is changed you will be prompted to select new strings to link the pits to. [more about design strings](#)

Reset pit cover levels

button

*This button will reset the pit levels to the design strings in **design model** or to the tin specified in **design tin** above. The first time this is selected you will be prompted to choose whether to set the pit cover level to the design tin or the a string in the design model. [more about design strings](#)*

Regrade pipe levels

button

The selection applies the default grading rules (cover level) to reset the pipe invert levels.

network labels model

model box

drainage labels network

*Model to contain the network labels for the **Drainage Model** above. This model is cleaned out each time **Label drainage network** is selected.*

catchment labels model

model box

drainage labels catchment

*Model to contain the catchment labels for the **Catchment Area Model** above. This model is cleaned out each time **Label catchments** is selected*

catchment units

choice box

ha, acres

Conversion factors of 10,000 will be used for ha and 43560 for acres. Not that not all design packages support both units.

text parameters

input box

*Select the + to access the text parameters (colour, size, alignment etc.) for the text created with **Label Catchment** or **Label drainage network***

label catchments

button

This selection creates labels indicating the catchment name and area in the units specified above.

CAUTION: *If you change you catchment strings or rename you pits you must run this routine to update the labels.*

label drainage network

button

This selection creates labels indicating the pipe size and pit name for the network model.

CAUTION: *If you change you change the pipe sizes or rename you pits you must run this routine to update the labels.*

analyse flooded width

button

This selection launches the dialogue for analysing the flood along bypass flow paths. The bypass flows must be imported from your design package/spreadsheet before running this selection.

Set Pit Names

The **Set pit name** selection names the pits and pipes for the drainage model (both pits and pipes can be named). Three numbering schemes are available:

- 1) drainage strings names are used as the prefix followed by the pit number (ex A-
- A) drainage strings names are used as the suffix followed by the pit number (ex 1/
- the pits are sequentially numbered. (ex 1,2,3....)

The names can have pre-text added to the beginning of the pit name and a separator between the string name and the pit number (/ etc.) if desired.

Design Program Notes:

PCdrain users: Since catchments contain only 3 characters do not use separators. Using the letters A-Z for strings and numbers 1-99 will give you 26 strings and up to 99 pits on each string. Using the numbered stem works very well in PC Drain.

Micro Drainage users: Pits and pipes are numbered separately in Micro drainage. The pipes must use the numbered sequence with the most upstream pipes numbered with the smallest numbers. Number of digits must be set to 3.

ILSAX users: You must use alphabetic characters for your string names and no more than 3 characters

See Also

Labelling a drainage network
 Displaying the Auto Pit Names
 Drainage overview

Usage

The selection is found on the drainage **network editor** and is accessed through the main menu by selecting

Design=>Drainage-Sewer=>Drainage Network=>Drainage=>Network editor

Select the **Set Pit Names** button and the following panel will appear.

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Model	Model box		drainage model from main dialogue
Naming Method	Choice box		
		<i>Pit num - String name</i> for string A pit 1 the name is 1A <i>String name - Pit num</i> for string A pit 1 the name is A1 <i>Sequential numbering</i> the strings names are sorted alpha-numerically and the pits are numbered starting at First pit number	
Pre text	input box		
		this text will precede the pit name (ex Pit A01)	
String/pit separator	input box		
		the character that separates the string name from the pit number. For example if <u>pit names</u> A/01, A/02 etc. where desired a "/" would be entered. You may omit the separator if none is desired.	
First Pit Number	integer box		
		the starting pit number on the drainage lines. For drainage strings with the flow direction set as descending chainage the first pit is the junction pit.	
Min digits in pit numbers	integer box		
		a non zero value will pad the pit numbers with leading zeros. (ex if 2 is entered, pit 1 is not A/1 but rather A/01)	
Reverse numbering order	tick box		
		Unselected, pit First pit number is at the low chainage end of the line. Selected, pit First pit number is the second pit from the high chainage end of the line.	
Number pits	tick box		
		the pits are assigned names. This allows the pit and pipes to be names differently.	
Number pipes	tick box		
		the pipes are assigned names. This allows the pit and pipes to be names differently.	
Run	button		
		name the pits/pipes. The pit at the high chainage of the string is not labelled. The only time you will need to name this pit is when it is the outlet from the system.	
Back to Editor	button		
		return to the network editor.	
Help	button		
		display this page.	

Drainage Input/Output Interface

Position of option on menu: Design => Drainage => More=> pit/pipe design interface

See Also

[Drainage overview](#)
[Drainage Misc Utilities](#)
[Spreadsheet clipboard](#)
[Running Drains](#)
[Running PCdrain \(Windows\)](#)
[Running Micro Drainage - Win DES](#)
[Running XPSWMM](#)
[Running RAT2000](#)

Usage

This panel is accessed from the menu selection **Design => Drainage => More=>Version 6=>Pit/pipe design interface**

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
import/export format <c>	input box	XP SWMM	Spreadsheet clipboard,

Drains clipboard
PCdrain Int (windows)
RAT2000
XP SWMM
Micro Drainage
Drains
PC Drain (DOS)
RAT HGL
ILSAX

select the drainage design program to export/import to.

drainage model input box

***Required** Model to contain all of the pit and pipe network to be exported/imported. Also see [Drawing the Drainage Network](#)*

file name input box

***Required** file to be read or written to. If a clipboard format is chosen for **import/export format** above then the data will also be written to this file on a **Copy** selection*

catchment area model input box

***Optional** model to contain the catchments strings for the **Drainage Model** above. Also see [Designating Catchment Areas](#)*

catchment units <c> input box ha, acres

Conversion factors of 10,000 will be used for ha and 43560 for acres. Not that not all design packages support both units.

catchment characteristics model input box

***Optional** strings in this model will be used to define the catchment slope and width (XP SWMM only)*

bypass flow model input box

***Optional** model to contain the bypass flow strings for the **Drainage Model** above. Also see [Creating Bypass Flow Strings](#)*

road design string model input box

***Required** if **bypass flow model** is specified above. Also see [Pit Inlet Capacity, road grade/crossfall and Bypass routes](#)*

services model input box

***Optional** if the strings in this model cross the drainage network the crossing data (drainage chainage, invert elevation and thickness) will be sent to the design package*

additional services model list (file) input box

***Optional** if your services lie in more than one model then enter a text file name here and then select edit from the fields file icons. Type the names of all of the service models and then save the file.*

project description input box

***Optional** this description will be sent to the design program*

export pipe diameters and invert stick box

Select this tick box to export the pipe diameters and inverts. see also [Quick Check Lists for Drainage Design Software](#)

export default catchment/pit parameter tick box tick

selected all default catchment parameters are exported

*not selected only catchment area is exported if **catchment area model** is specified above. see also [Quick Check Lists for Drainage Design Software](#)*

Options

button

several calculations are performed before all exports. Advanced users may turn some off for large models (100's of pits). The option to re-link your pits to new design strings is also included here. [More options](#)

Write/Copy

button

*This will create/over write the file specified above in **file name**. If **Copy** button is present the data will also be placed on the windows clipboard as Tab delimited text.*

Read/Paste

button

***Read** will read the file specified above in **file name**. **Paste** read the data from the windows clipboard. Both selections will update the drainage strings in the model specified above in **drainage model**. If the **Spreadsheet clipboard** import is selected and the strings are not present in the model they will be created.*

Options

Drainage calculation options Spreadsheet clipboard

Catchment areas

Catchment areas characteristics

Calculate overland flow routes pit inlet capacities

Recalc pit levels

Hold obverts on import

auto help

Catchment and Overland Flow Defaults

Catchment Percent Impervious

75

+

Catchment Percent Pervious

25

+

Catchment Tc Impervious

1

+

Catchment Tc Pervious

10

+

Bypass flow travel time

1

+

Pit Ku,Kw

1.5

+

C minor

1

+

C major

1

+

Spreadsheet Export Options

Export all junction pits

☐

Preset Output <c>

All Data

Customised list file name

Calculate now

Set

Finish

Selecting the Options button brings up the dialogue to the left. Additional choices may be present at the bottom of the dialogue depending on the **Import/Export Format** that you selected on the main dialogue.:

Catchment areas when selected the catchment areas are linked to the drainage pits and the areas recalculated. See also [Designating Catchment Areas](#)

Re-link pits to road strings-tin when selected a dialogue for each pit will be presented asking which design string or tin to link the pit to. See also [Selecting design string or tin](#)

Calculate bypass flow routes when selected will calculate the downstream bypass pit, road grade and crossfall and inlet capacities. See also [Pit Inlet Capacity, road grade/](#)

[crossfall and Bypass routes](#)

Calculate now will calculate the selected option immediately and return the user to the main dialogue.

Set will set the options but no calculations will be performed until a **Write** or **Copy** is selected from the main dialogue.

Finish removes the panel from the screen.

20 Rivers

Position of menu: Design=>Rivers

The **Rivers** option is used to prepare data for analysis packages and examine the results from the analysis.

The **Rivers** walk-right menu is:



See Also

[Frequently Asked Questions \(Rivers\)](#)

[River Interface Models](#)

[HEC-RAS Interface](#)

[XP-SWMM Interface](#)

[XP SWMM Culverts](#)

[MIKE11 Interface](#)

[UNET Interface](#)

[ISIS Interface](#)

[River Mapper](#)

[Presenting Water Level Results](#)

[How to for Rivers](#)

[Rivers beta menu](#)

River Interface Models

The River interface strings are split into different models depending on the strings function. Also the string names are used to define names of entities such as cross sections and reservoirs when they are exported. Following is a list of the river interface string types:

[River strings](#)

[Source strings](#)

[Reservoir Strings](#)

[Spill Strings](#)

River Strings

The river centre line and bank are defined by the strings in the **River strings** model.

The centre line string is used to

- s measure the centre line distance between the sections,
- s mark to zero chainage (or starting chainage) on the cross section, and
- s if automatic source strings are created they will be perpendicular to this string
- s **define culvert locations** and sizes (XP SWMM only)

The left and right bank strings are used to

- s measure the bank distances between the sections and
- s mark the cross section chainage where the conveyance (usually roughness) changes

The names of the strings must be **left bank**, **right bank** and **centre line** *river name, reach name* (centre may be spelled center).

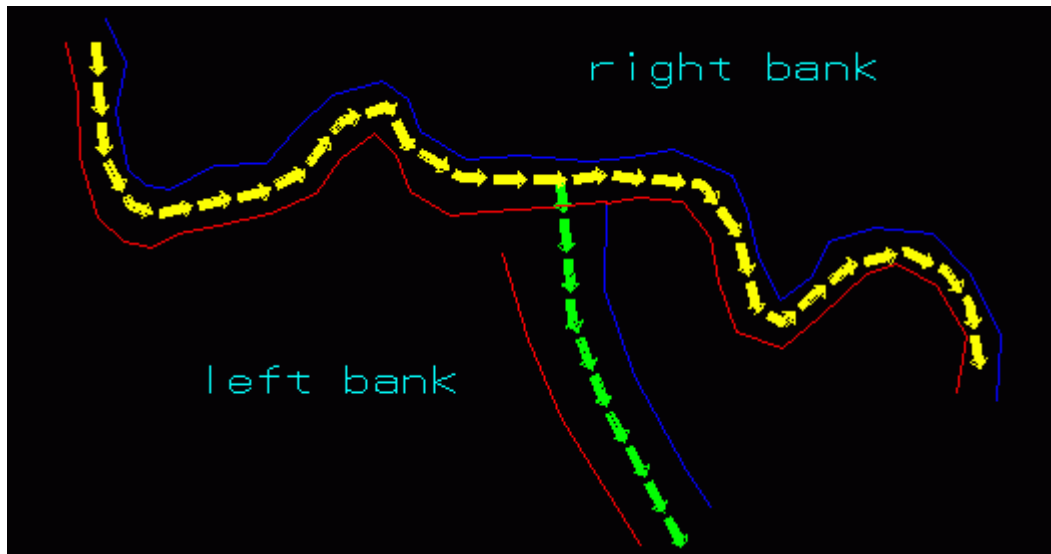
The left bank is on the left side of the river looking downstream and the right bank is on the right (looking down stream). These strings need not touch each other and may extend from one river reach to another.

HEC RAS and UNET

The centre line string must begin at the downstream end of the river. The modelling convention for these programs is to have the low chainage at the downstream end. You may use super, 2D,3D or alignment strings in this model. If you put other strings in this model you will receive warning messages saying that these strings will not be used.

Each reach of the river **MUST** have its own centre line string and they must "touch" each other to create a river confluence.

A sample of a river strings model for **HEC RAS** with one confluence is shown below. The line style for the centre line is not required. It is used only to show the direction of the centre line string.



Notes:

left bank strings are shown in red, right bank in blue and centre line strings in yellow and green. The line style for the centre line strings is *Drainage_4D->Flow line*. This is not required but shows the direction of the string. The string labels were created with Strings->Label->User->Label strings with names.

Centre line string direction is very important!

HEC RAS, UNET, XP SWMM

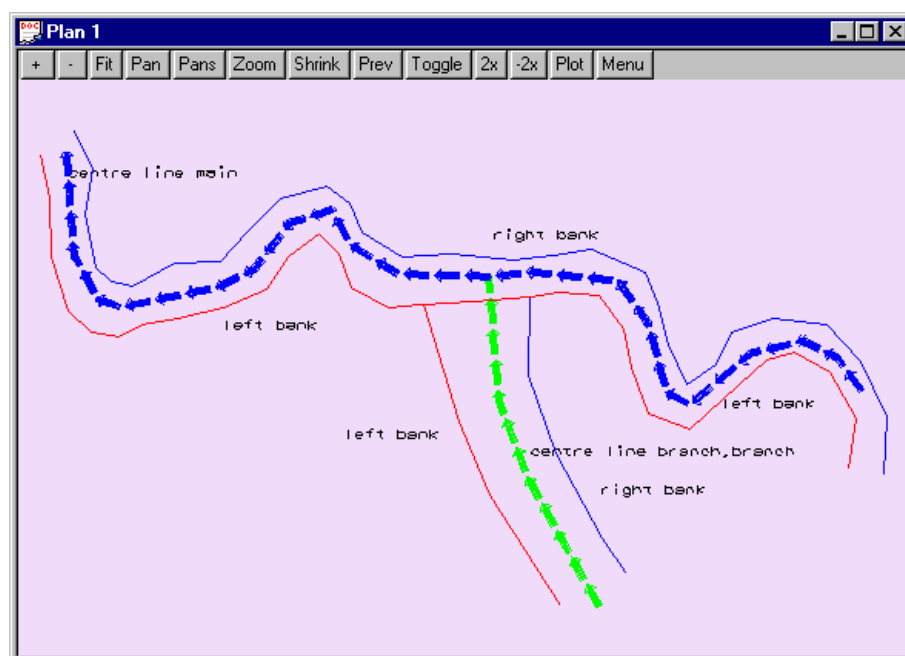
start at the **DOWN**stream end of the river

ISIS and Mike 11

start at the **UP**stream end of the river

ISIS and MIKE11

The centre line strings are drawn starting **upstream** for the ISIS and Mike 11 programs.



Source Strings

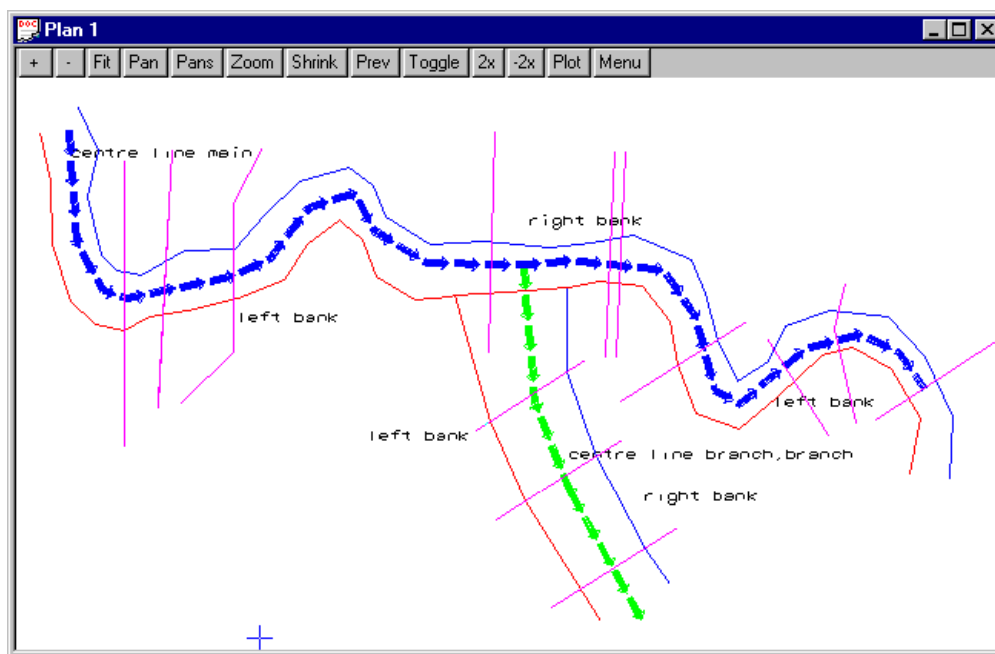
Cross sections are created at the location of the **source strings**. These source strings are initially created at a user defined spacing and section length using any one of the river interfaces writers. The user may alter these sections as desired. These may be shortened if they intersect at sharp bends in the river; they may be extended at extremely wide river sections or extra points may be added so that the section is no longer a straight line.

Source strings can be deleted and additional sections can be added by creating new source strings. The **Create source strings** tick box on the interface panel must **NOT** be selected to use the customised strings.



A quick way to manually create 2 point string is via the CAD tool bar.

A sample of source strings (shown in magenta) is presented below. The source strings may run in any direction except for Mike11. In Mike11, the cross sections will be created in the same direction as the source strings. For all other interfaces the low chainage will be used for the left bank (section viewed looking downstream).



Reservoir Strings

The **reservoir strings** may define inline reservoirs or offline storage. The elevation of the first point on the string sets the maximum level to be used in the stage storage curve. 12d will determine the minimum level inside the reservoir string and then calculate the volumes at a 1m (2 foot for imperial units) increment. The default increment may be changed by creating a string attribute "stage increment" (see **stage increment**).

Inline reservoirs are "touched" by centre line strings both upstream and downstream. Offline storage areas

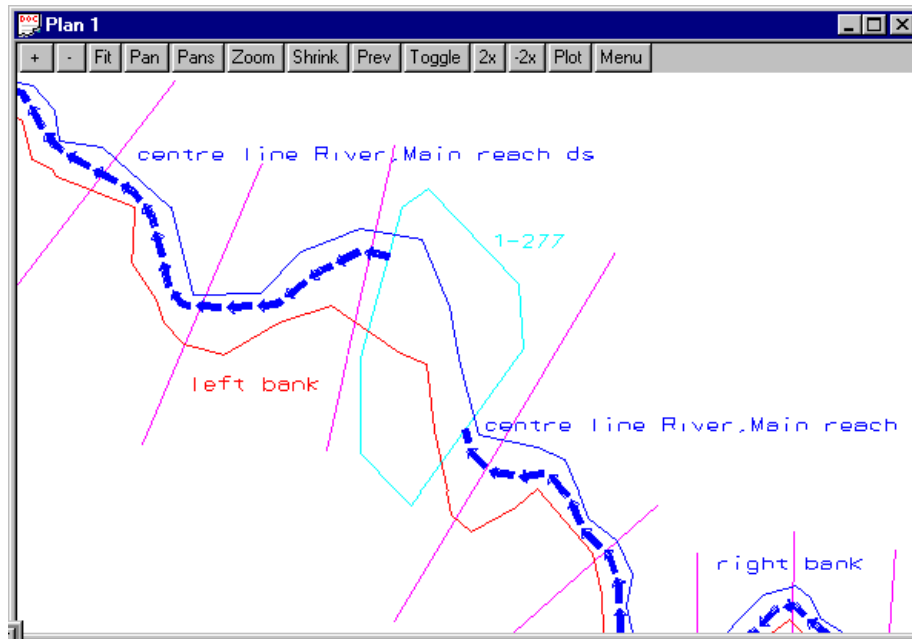
are linked to the cross sections via **Spill strings**.

Other features of the reservoir strings are

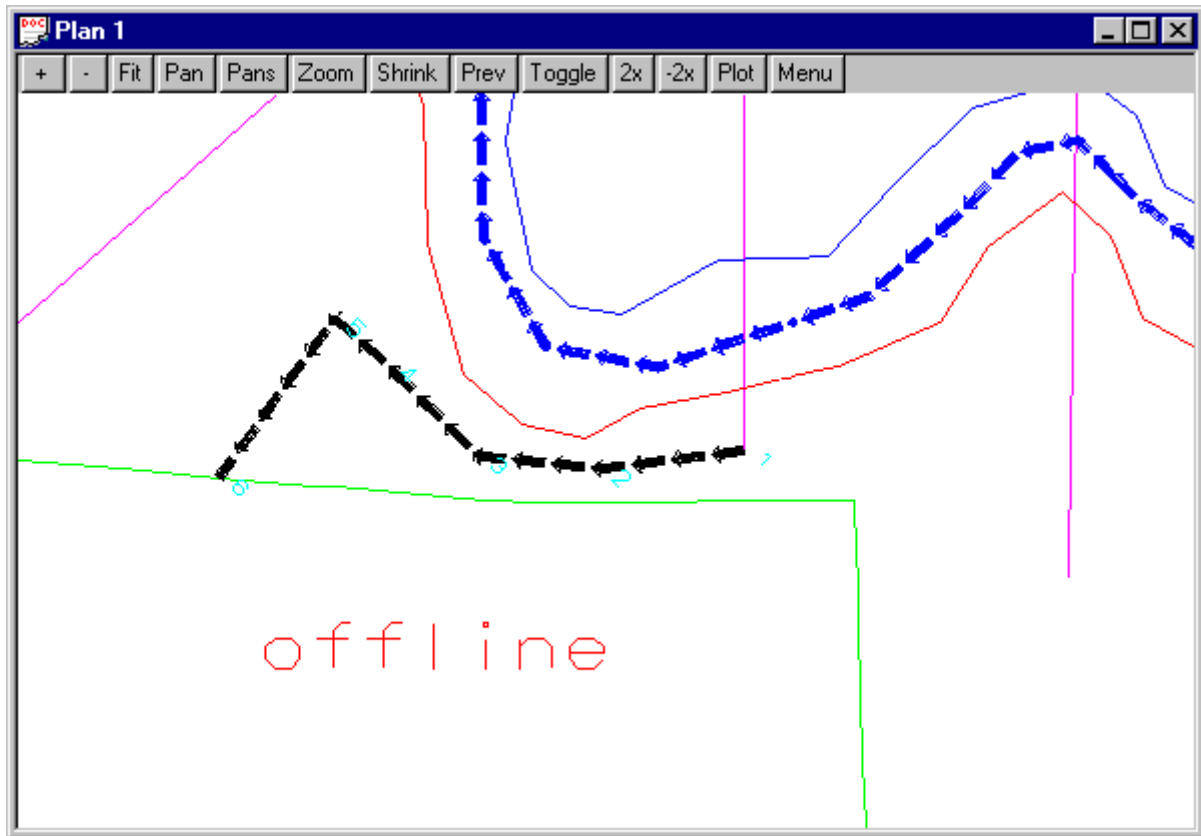
Auto height

XP SWMM catchment parameters

A sample drawing showing an inline reservoir in cyan (1-277) follows. Note that the river centre line touches the reservoir string both upstream and downstream. The left and right bank strings may continue straight through the reservoir.



A sample drawing of an offline reservoir follows (the reservoir string is shown in green). Note that the spill string (black) starts at the source string (point 1), then follows the section line to be cut and exported (points 2 to 5) and ends by touching the off line reservoir string at point 6. The rivers strings do not touch the offline storage strings.



Spill strings

Spill strings are strings that link offline storage areas to a cross section (see drawing above). The string must begin by "touching" the source string and then proceed to the first point on the spill section. During the export the first point will NOT be exported as part of the spill section. After defining the end of the spill section the last point on the string must "touch" the reservoir string. Again this last point will NOT be exported as part of the spill section.

The default roughness for the spill section is the "left n" from the main export panel, the default slope is 0.5% and the default length is 100. See the manual setting table for **manual override settings**.

XPSWMM Only. 2 point culvert strings (6 max) may be drawn across the spill string to create a multi conduit. The culvert strings should be drawn in the same direction as the spill string so that the upstream and downstream inverts follow in the same direction.

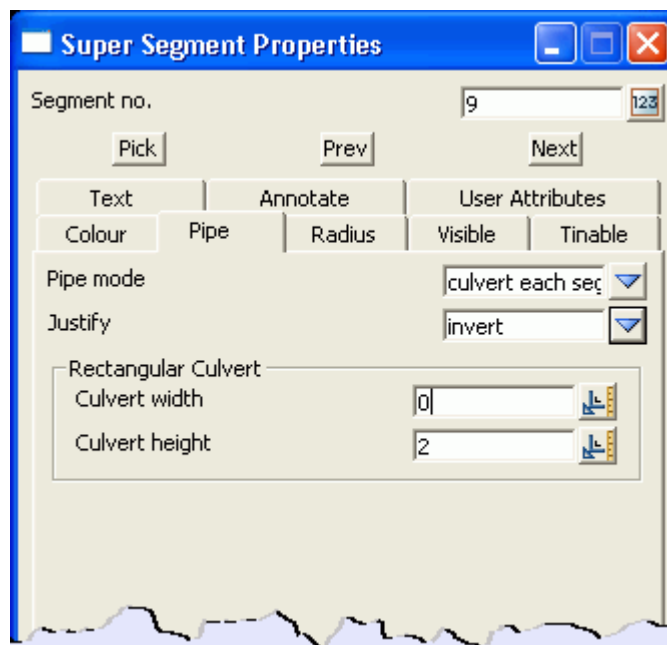
Define Culvert Locations

12d allows culverts to be included as a segment of a super string. The **XP SWMM** rivers interface allows culverts in 2 models. In the spill string model, multiple two point superstring may cross a spill string to indicate a culvert through the embankment. In the river string model a segment of the river centre line may be marked as a culvert. For parallel culverts, segment attributes must be used. If a source string crosses the same segment than a multi-link with both the culvert and the natural section will be exported.

Important note: Version 10.0 of xpswmm (at the time of writing) will only use inlet control curves on culverts with positive slopes.

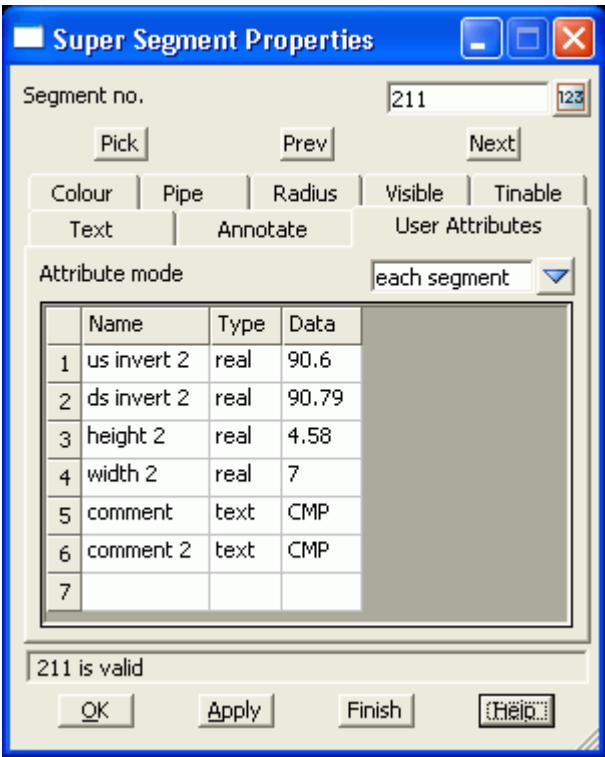
Adding a Culvert to a super string

1. **Super strings only!**
Convert string to a super string (if required)
Strings->Convert
2. **Mark the ends of the culvert.**
Add a vertex at the upstream and downstream end of the culvert (Toggle vertices on if desired)
String->Points Edit->Insert
3. **Mark the segment as a culvert or pipe**
Use the super string segment editor to set the culvert data.
Strings->Properties->Segments (all) and change Segment properties to use **culvert each segment** (box) or **pipe each segment** (round). Note that if there is one box culvert on the centre line then all must be box culverts. If you need pipes and box culverts combined, set the width to zero for pipes. Also set the Justify mode to indicate the type culvert levels you wish to specify.

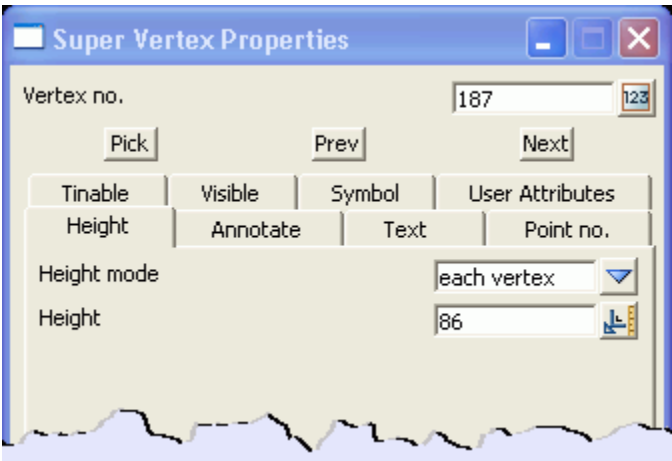


If there are two (max is 7) culverts at this location that have different inverts or sizes add the following user defined attributes to the segment. The comment attributes are printed by the Culvert Table routine and are used to label the culvert as well. If there are a number of identical culverts, the attributes "number of pipes" (integer) can be set to a value greater than 0. Additional attributes to customise the culvert are listed at the end of this section. Default manning's n are 0.024 for pipes (corrugated metal) and 0.012 for box (concrete).

4. Conduit Factors are automatically set. Circular pipes are set to "Headwall (circular corrugated metal)" and box culverts are set to "45 deg Wingwall Flares (Rect, Conc)". Expansion and contraction energy loss coefficients have default values of 1.0 and 0.5 respectively but these may be changed using the attributes indicated below.



5. **Set the upstream and downstream levels**
 Select a vertex at the end of segment, ensure the **height mode** is **each vertex** and set the height. Use the **Next** or **Prev** button to move to the other end of the culvert and set its height as well.



Additional Culvert Segment Attributes (Spill and River strings)

Purpose	Attribute Name	Type	Typical Data Value
Culvert entrance loss	entrance loss	Real	0.5
Culvert exit loss	exit loss	Real	1.0

Purpose	Attribute Name	Type	Typical Data Value
Mannings n	roughness	Real	0.014
Multiple identical culverts	number of pipes	Integer	2

Centre Line Culvert Segment Attributes (River strings)

The attribute name has the culvert number as a suffix. i.e. (height 2)

Purpose	Attribute Name	Type	Typical Data Value
Diameter/height	height n	Real	0.5
Box culvert width	width n	Real	1.0
Upstream invert	us invert n	Real	20.2
Downstream invert	ds invert n	Real	20.1
Culvert length	length n	Real	10.2

Culvert Table

Position of option on menu: **Design=>Rivers=>XP SWMM interface=>Culvert table**

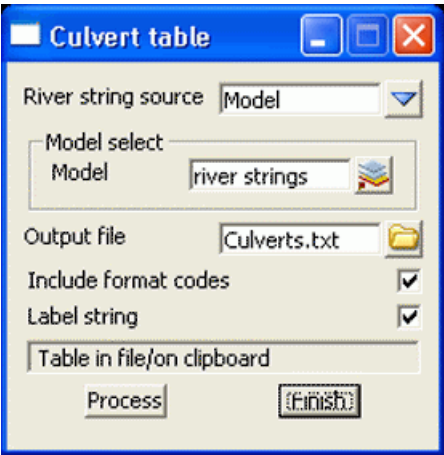
This option is used to create a table of the culverts created along the centre line of the river and to label the invert levels and comment for the first culvert on each segment (some segments may include attributes for more than on culvert). A sample is shown below.

Culvert Listing										
chainage	Number	US Invert	DS Invert	Height	Width	Quantity	X location	Y location	Comment	Segment
Centre line center line 1										
88444	1	125.28	124.95	11	7	1	683236	1389459		705
87269	1	127.58	127.24	6		1	683059	1390605	72/c mp	695
85983	1	123.13	123.72	6		1	682871	1391834	inv -72/c m	682
84317	1	124.15	123.47	6		1	681757	1392779		666
84317	2	124.59	125.15	6	0	1	681757	1392779	6ft c mp	666
83854	1	123.07	123.28	5		1	681319	1392820	60 inch c c	659
83854	2	123.54	123.42	5		1	681319	1392820	60 inch c c	659

See Also

Defining culvert locations

Usage



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
River string source <i>the imported cross section strings will be stored in this model</i>	input	view	string,model,view
String,Model,View <i>centre line string selection</i>	various		
Output file <i>text file to contain the table</i>	File box		
Include format codes	tick box		

format codes are used to format tables in 12d...not desired for other programs

Label string tick box

The invert labels and the pipe size will be added as vertex and segment text

Process button

executes the option.

Finish button

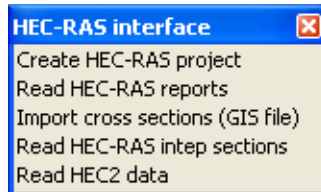
removes the dialogue from the screen

HEC-RAS Interface

Position of menu: Design=>Rivers=>HEC-RAS interface

The HEC-RAS interface creates the HEC-RAS project files ready to open and run. This includes the project, plan, flow and geometry files. Water levels are read back into 12d where they may be viewed in a 3D perspective view to easily identify extents of flooding.

The HEC-RAS walk right menu is,



See also

[River and Source Strings](#)

[Create HEC-RAS files](#)

[Read HEC-RAS results](#)

[Presenting Water Level Results](#)

[Import cross sections \(GIS file\)](#)

[Read HECRAS Interp sections](#)

[Read HEC2 Data](#)

[How to for Rivers](#)

[Frequently Asked Questions \(Rivers\)](#)

Exporting to HEC-RAS

The HEC-RAS project is created from a surface tin (representing the river bed and overbanks) and a model containing strings identified by their names "left bank", "right bank and the name prefix, "centre line". Any additional strings in the specified model will be ignored (warning messages will be given when you run the macro that any additional strings are being ignored). The low chainage (often zero) of the centre line strings must be at the downstream end of the reaches.

Cross sections are created at the location of the **source strings**. These source strings are initially created using the HEC-RAS option at a user defined spacing and section length. The user may alter these sections as desired. These may be shortened if they intersect at sharp bends in the river; they may be extended at extremely wide river sections or extra points may be added so that the section is no longer a straight line.

Source strings can be deleted and additional sections can be added by creating new source strings. The **Create source strings** tick box on the interface panel must **NOT** be selected to use the customised strings.

Presenting HEC-RAS Results in 12d

After the HEC-RAS analysis is complete the water level results are read back into 12d. Water level strings are created with the plan shape of the cross sections at the elevation retrieved from the HEC-RAS results. These strings are then triangulated to create a water surface tin from which the water level boundaries are determined. These results can then be shown in plan, long section, cross section and in 3D perspectives.

[More details](#)

HEC-RAS Write Panel

Position of option on menu: Design=> Rivers=>HEC-RAS interface=>Create HEC-RAS project

The HEC-RAS interface creates the HEC-RAS project files ready to open and run. This includes the project, plan, flow and geometry files. Water levels are read back into 12d where they may be viewed in a three dimension perspective view to easily identify extents of flooding.

See also

[River and Source Strings](#)

[HEC-RAS Interface overview](#)

[Read HEC-RAS results](#)

[Presenting Water Level Results](#)

[How to for Rivers](#)

[Frequently Asked Questions \(Rivers\)](#)

Usage

The HEC-RAS panel for creating the HEC-RAS project follows.

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

INPUT MODELS

River strings model

Model box

Model containing the centre line, left bank and right bank strings. **The centre line strings must begin downstream and proceed upstream.** The name of the river may follow the words "Centre line " (note the ending space). For example the centre line string may be named "Centre line Parramatta River, downstream reach". The comma separates the river name from the reach name. If no comma is included then the river name is repeated for the reach name.

Confluences are modelled by using a separate string for all reaches. Thus a system with a branch is modelled with three strings. The branch will be one string and the main reach will have a downstream string and an upstream string. The reaches must touch at the confluence.

The distance from the start of the upstream strings to the first cross section is used to model the confluence length.

The left and right bank strings need not be separate strings (see figure below).

Source string model

Model box

New source strings will be created in this model or existing source strings are contained in the model. See **Create source strings** tick box below.

Rename Source Strings

Tick box

not selected

If selected the source strings will be a name using the chainage along the river centre line. The **number of decimals** and the **Centre line chainage factor** (ft to miles or m to km) are specified below.

Centre Line Chainage Factor

Real box

The cross section names are created by dividing the chainage on the centre line by this factor. Typically 1000 is used to convert metres to kilometres and 5280 to convert feet to miles.

Number of decimals

Real box

When **Rename source strings** is selected, the source strings name will have the specified number of decimals.

CREATE SOURCE STRNGS OPTIONS**Create Source Strings**

Tick box

not selected

When selected existing source strings are deleted and new ones created perpendicular to the centre line at the specified spacing and length. Once you have created the sources strings they can be easily modified. On the **Strings->Points Edit** menu you will find the selections **Move** (to move the end points), **Insert** (to insert additional points).

Distance between sections

Real box

The distance between the cross sections. At present no check is made for overlapping cross sections around river bends.

Section Length

Real box

The length of the cross section with zero chainage at the mid point.

CROSS SECTION DATA**Cross section model**

Model box

The cross sections created and exported are stored in this model.

Surface Tin (not the model) Tin box

Tin or super tin to create the cross sections from (remember a tin is like a string. It is placed in a model.).

Levee Tolerance

Real box

If the surface level drops more than this amount while moving away from the channel centre line then the crest is marked as a levee. A value of zero means that no levees are marked.

Delta Y tolerance

Real box

*This value filters out points on the cross section. Imagine a tube of this diameter passing over the cross section. The tube is elongated until one point lies outside the tube. The tube is shortened to the previous point and then all points inside the tube are deleted from the cross section. The tube then moves on to the next point. The filtered (smoothed) and original sections are kept for comparison. **The final water tin is created from the ground tin and therefore the boundary string is located using the unfiltered section.***

STARTUP DATA**Manning's n**

Real box

Manning's n values for the left, right and centre channel sections.

Discharge

Real box

This discharge is used at the upstream end of all reaches. If you have multiple river branches, you can set the flow for each branch inside HEC-RAS or inside 12d. This can be changed at each section [See manual settings](#)

Units

Choice box

This selection will set the default units for the project being created.

Project file name

Input box

The HEC-RAS project name. Remember HEC-RAS (2.0 or earlier) is limited to 8 characters only. If the total path name is too long HEC-RAS will not analyse the project.

HEC-RAS Read Panel

Position of option on menu: Design=>Rivers=>HEC-RAS interface=>Read HEC-RAS reports

After the HEC-RAS analysis is complete the water level results are read back into 12d. Water level strings are created with the plan shape of the cross sections at the elevation retrieved from the HEC-RAS results. These strings are then triangulated to create a water surface tin.

See also

[HEC-RAS Interface overview](#)

[Create HEC-RAS files](#)

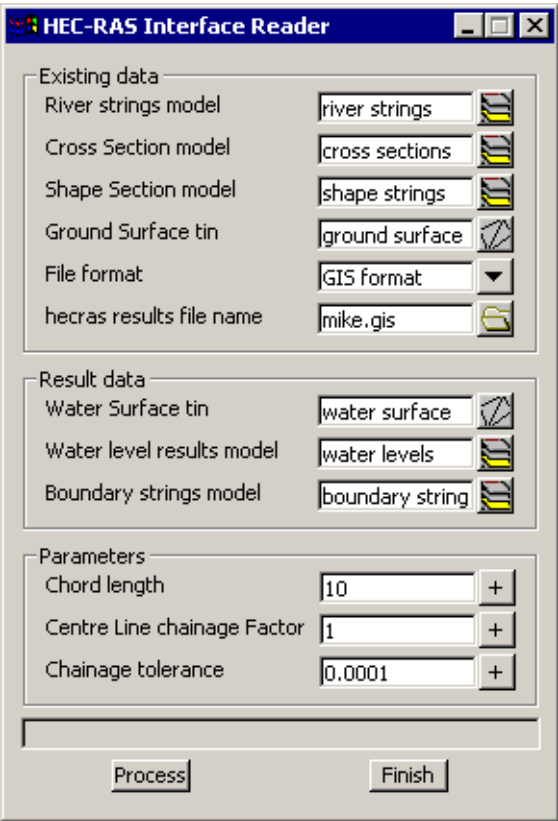
[Presenting Water Level Results](#)

[How to for Rivers](#)

[Frequently Asked Questions \(Rivers\)](#)

Usage

The HEC-RAS read panel follows.



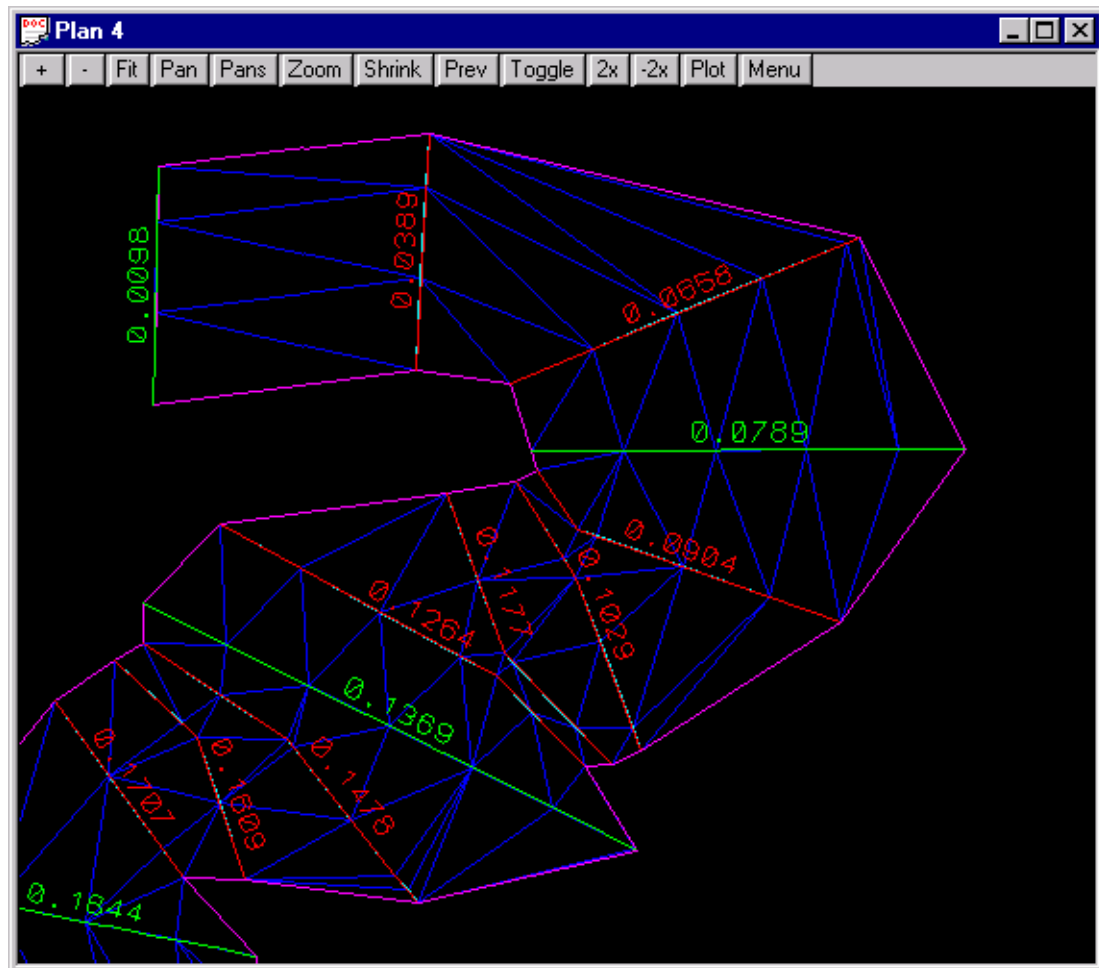
EXISTNG DATA

River strings model Model box

The river strings model specified in the write panel.

Cross Section model Model box

*The cross section model specified in the write panel. This must be specified but is only used when reading the *.rep file types (see **File format** below). The interface will search the string names in this model for the cross sections specified in the HEC-RAS report. A match is successful if the HEC-RAS cross section chainage and the string name are within the tolerance specified below in **Chainage tolerance**.*

**Shape string model**

Model box

For meandering rivers, the cross sections (shown in green above) may not be at a close enough spacing to create a water surface that follows the river. 2D shape strings (shown in red above) can be created to create a water surface (shown in blue above) to follow the river. Note that water levels are extended when the shape strings are in a junction area or past the end of a reach.

Ground surface tin

Tin box

If a **boundary string model** is specified below, the intersection of this ground surface and the water surface will be determined. The strings will be stored in the model from the **boundary string model** field.

File format

Choice box

The GIS format should be used in most cases. The rep format is used for reading the HECRAS report files with the "Standard Table 1" selected in HECRAS.

HEC-RAS report file name File box

The HEC-RAS report file (GIS format) is created using the HEC-RAS menu selection

File=>Export GIS data

The HEC-RAS report file (REP format) created using the HEC-RAS menu selection

File=>Generate Report

The report must include the Standard Table 1.

RESULTS DATA

Water surface tin model Model box

The model to contain the new water surface tin.

Water surface tin Tin box

The name of the water surface tin to be created.

Water level results model Model box

The model where the water surface strings will be created at each cross section and shape string.

Boundary string model Model box

The model to contain the intersection strings between the water and ground surfaces specified above. If left blank no intersection strings will be calculated.

PARAMETERS

Chord Length Model box

This value set the spacing for the points on the water level strings (both cross section and shape strings). It is recommended that you use a length of no more than half of your average cross section and shape string lengths. A large value in this field may result in unexpected water level profiles for meandering rivers.

Centre line chainage factor Model box

*This data is only required if the **Shape string model** is used. The shape string names are created by dividing the chainage on the centre line by this factor. Typically 1000 is used to convert metres to kilometres and 5280 to convert feet to miles.*

Chainage Tolerance Real box

This is the tolerance used when the cross section chainage from the HEC-RAS report is compared with the cross section string names. A value of 0.00001 is excellent if you have not altered the cross section names in 12d or HEC-RAS.

However, if you have altered chainage names then you may have to increase the value of the tolerance. Suppose the tolerance is set to 0.001 and the water level for section 0.056 is read from the HEC-RAS report file. The interface will search for the first string with a name between 0.055 and 0.057. If you chose to great of a tolerance then more than one water level result will match a 12d cross section and a warning message will be given.

If you have one specific cross section that you would like to have a different tolerance set for (maybe only one section is giving you troubles), use the Attribute Editor

(Strings->User->Attribute Editor), select the cross section string and create a real type attribute named tolerance set to the tolerance desired.

Import cross sections (GIS file)

Position of option on menu: Design=>Rivers=>HEC-RAS interface=>Import cross sections (gis file)

This option is used to import HEC RAS cross sections, interpolated cross sections, source strings (Cut lines), river centre lines and storage area boundaries into 12d. Note that the imported data will be given the X,Y coordinates used in the HECRAS project.

See Also

[River and Source Strings](#)

[HEC-RAS Interface](#)

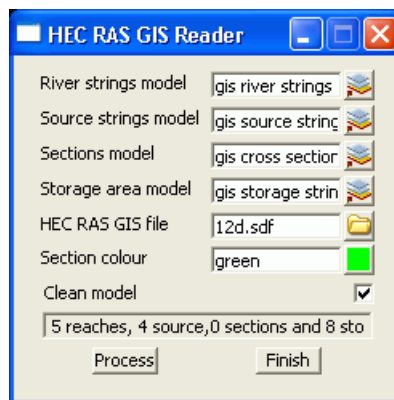
[How to for Rivers](#)

[Frequently Asked Questions \(Rivers\)](#)

Usage

This panel is accessed from the menu selection

Design => Rivers => HEC-RAS Interface=>Import cross sections (GIS file)



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
River strings model	model box		
<i>the imported centre line strings will be stored in this model (REACH:CENTERLINE: data). If blank these string will not be imported.</i>			
Source string model	model box		
<i>the imported source strings will be stored in this model (CROSS-SECTION:CUT LINE: data) If blank these string will not be imported.</i>			
Cross section model	model box		
<i>the imported cross section strings will be stored in this model (CROSS-SECTION:SURFACE LINE: data). If blank these string will not be imported.</i>			
Storage area model	model box		
<i>storage area boundaries will be stored in this model (strings not supported in 12d V7 interface). If blank these string will not be imported.</i>			
HEC RAS GIS File	File box		
<i>the GIS file generated from HEC RAS (*.RASexport.sdf)</i>			

- Section colour

colour box

Cross sections will be created using this colour unless the section name contained illegal characters
- Clean model

tick box

if selected all strings in the Cross section model will be deleted before the cross sections are imported
- Process

button

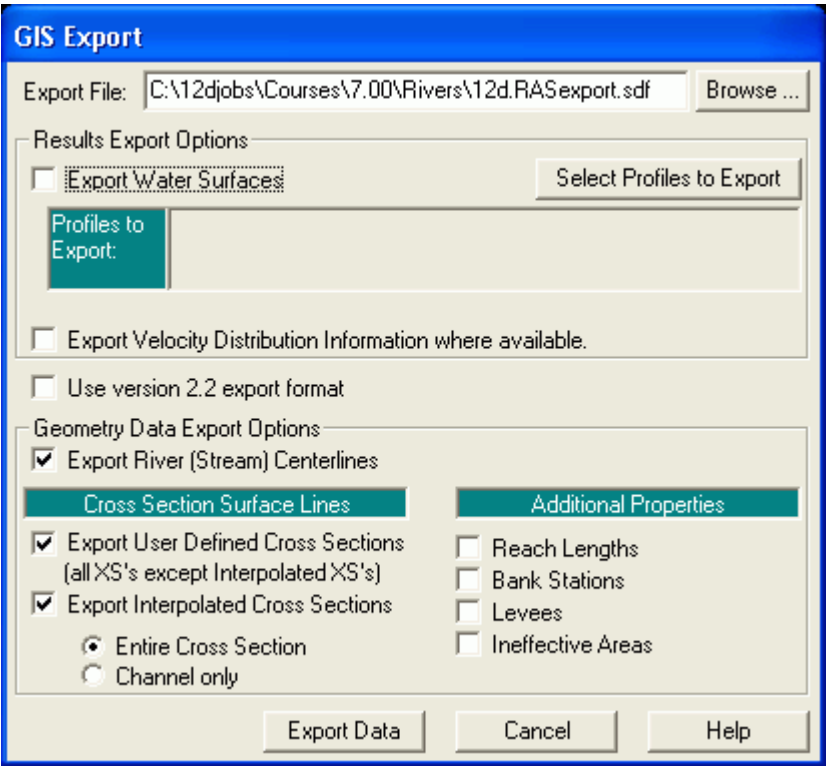
executes the option and the number of string imported will be reported in the message area.
- Finish

button

removes the dialogue from the screen

Notes:

The RASexport.sdf file is create from HEC RAS using File->Export GIS Data. From this panel the desired data to be exported may be selected. In this example all three Geometry tick boxes have been selected.



Read HEC-RAS interp sections

Position of option on menu: Design=>Rivers=>HEC-RAS interface=>Read HEC-RAS intep section

This option is used to import HEC RAS interpolated cross sections (names begin with *) based on their distance along the left and right bank strings.

The low chainage must be at the downstream end for both the "left bank" and "right bank" strings.

See Also

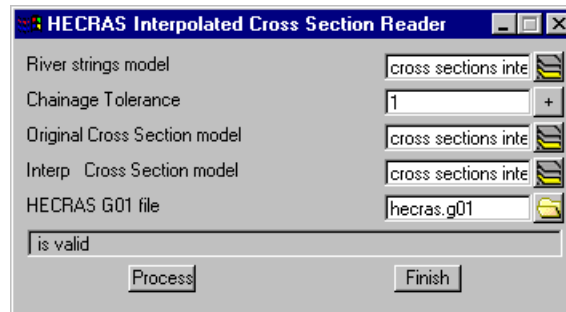
- [River and Source Strings](#)
- [HEC-RAS Interface](#)
- [How to for Rivers](#)

[Frequently Asked Questions \(Rivers\)](#)

Usage

This panel is accessed from the menu selection

Design => Rivers => HEC-RAS Interface=>Read HEC RAS Interp sections



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
River strings model	model box		
<i>the centre line, left and right bank strings must exist in this model</i>			
Chainage tolerance	Real box		
<i>existing cross sections must be located in 12d model. This value is the tolerance used when the HEC RAS cross section names are compared to the 12d string names.</i>			
Original cross section model	model box		
<i>the HEC RAS cross section names will be compared with the string names in this model</i>			
Interp cross section model	model box		
<i>the imported cross section strings will be stored in this model</i>			
HEC RAS G01 File	File box		
<i>the G01 (geometry) file used by HEC RAS to store the data in raw format. This is not the GIS format.</i>			
Process	button		
<i>executes the option.</i>			
Finish	button		
<i>removes the dialogue from the screen</i>			

Read HEC2 Data

Position of option on menu: Design=>Rivers=>HEC-RAS interface=>Read HEC2 data

This option is used to import HEC2 cross sections into 12d. Since the file does not contain any easting and northing data, the cross sections will be lined up vertically and will have to be placed manually inside 12d.

See Also

[River and Source Strings](#)

[HEC-RAS Interface](#)

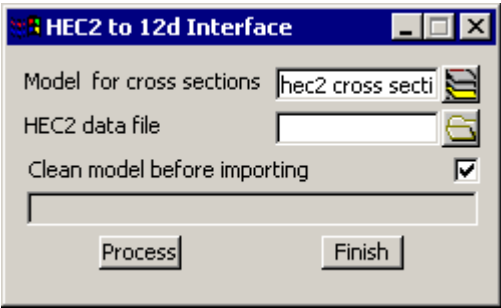
Moving Strings ragg

[How to for Rivers](#)

[Frequently Asked Questions \(Rivers\)](#)

Usage

This panel is accessed from the menu selection
Design => Rivers => HEC-RAS Interface=>Read HEC2 Data



The fields and buttons used in this panel have the following functions.

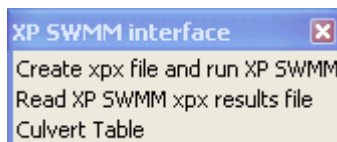
Field Description	Type	Defaults	Pop-Up
Cross section model	model box		
<i>the cross section created will be placed in this model</i>			
HEC2 cross section	File boxbox		
<i>the HEC2 cross section data file to be read</i>			
Process	button		
<i>read the data and create the cross sections.</i>			
Finish	button		
<i>removes the dialogue from the screen</i>			

XP-SWMM Interface

Position of menu: Design=>Rivers=>XP SWMM interface

The XP-SWMM interface launches your XP-SWMM program and loads either a default xp file from the set_ups path (master_rivers.xp) or your existing project. The 12d data is automatically imported in the XP-SWMM project (via a *.xpx file) to either create a new river reach or update an existing reach. Water levels are read back into 12d where they may be viewed in a 3D perspective view to easily identify extents of flooding.

The XP-SWMM walk right menu is,



See also

[River and Source Strings](#)
[Defining Centre Line Culverts](#)
[XP SWMM Culverts](#)
[Spill strings](#)
[Hydrology Data](#)
[Create XP-SWMM files](#)
[Read XP-SWMM results](#)
[Presenting Water Level Results](#)
[How to for Rivers](#)
[Frequently Asked Questions \(Rivers\)](#)

Exporting to XP-SWMM

The XP-SWMM project is created from a surface tin (representing the river bed and overbanks) and a model containing strings identified by their names “left bank”, “right bank and the name prefix, “centre line”. Any additional strings in the specified model will be ignored (warning messages will be given when you run the macro that any additional strings are being ignored). The low chainage (often zero) of the centre line strings must be at the downstream end of the reaches.

Cross sections are created at the location of the [source strings](#). Source strings can be deleted and additional sections can be added by creating new source strings. The **Create source strings** tick box on the interface panel must **NOT** be selected to use the customised strings.

Presenting XP-SWMM Results in 12d

After the XP-SWMM analysis is complete the water level results are read back into 12d. Water level strings are created with the plan shape of the cross sections at the elevation retrieved from the XP-SWMM results (xpx file). These strings are then triangulated to create a water surface tin from which the water level boundaries are determined. These results can then be shown in plan, long section, cross section and in 3D perspectives.

[More details](#)

XP-SWMM Write Panel

Position of option on menu: Design=>Rivers=>XP SWMM interface=>Create xpx file and run XP SWMM

The XP-SWMM interface creates the XP-SWMM project files ready to open and run. This includes the

project, plan, flow and geometry files. Water levels are read back into 12d where they may be viewed in a three dimension perspective view to easily identify extents of flooding.

See also

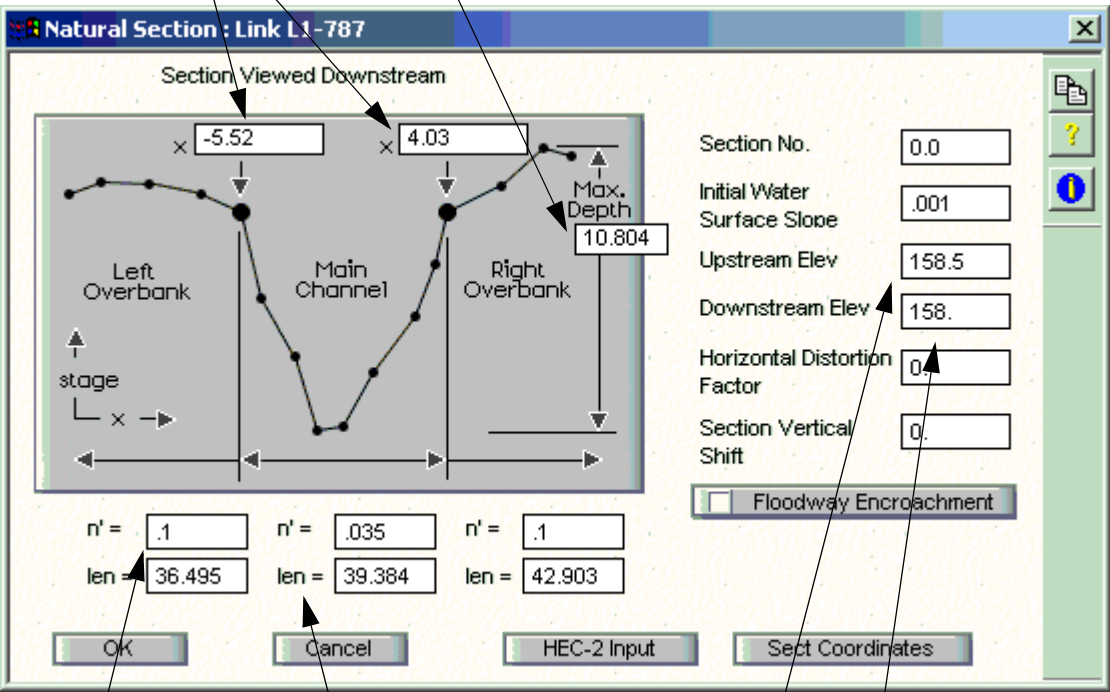
- [River and Source Strings](#)
- [Hydrology Data](#)
- [XP-SWMM Interface overview](#)
- [Read XP-SWMM results](#)
- [Presenting Water Level Results](#)
- [How to for Rivers](#)
- [Frequently Asked Questions \(Rivers\)](#)

The source strings define the location where cross sections are cut from the ground surface TIN. A node is created in XP-SWMM at this location and the cross section shape is used to the next downstream node (no cross section is created at the most downstream source string).

The centre line and overbank channel lengths are measured in the downstream direction. XP SWMM link and node input panels are displayed below with the relationship to the 12d model described.

XP SWMM Link Data

- cross section chainage at intersection of left and right bank strings
- max elev - min elev at upstream cross section



- n values from 12d panel
- channel lengths measured along river strings
- Minimum cross section elev from upstream node.
- Minimum cross section elev from downstream node

XP SWMM Node Data

Node Data : Node 1-787

Spill Crest

☐ Inlet Capacity

Inflow Data
Constant Inflow
 Inflow

Time Series Inflow
☐ User Inflow
☐ Gauged Inflow
☐ Dry Weather
☒ Use Interface File Flow
 %

Ponding
☒ None ☐ Allowed ☐ Sealed
 Initial Depth

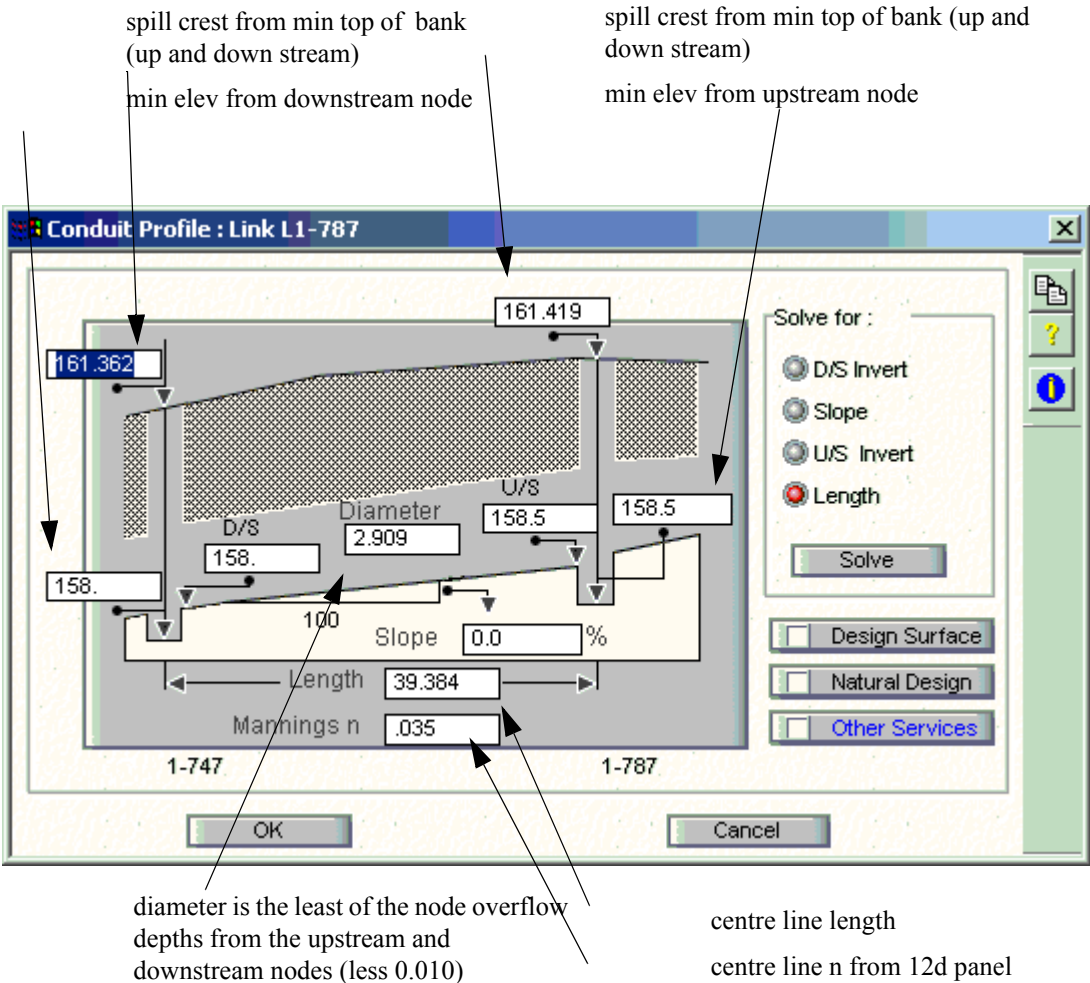
☐ Storage ☐ Outfall ☐ Detail Printout ☐ Save Overflow Results
☐ Plot Water Levels

max top of bank
from upstream
and downstream
links

minimum
elevation from
the node cross
section

XP SWMM Conduit Data

The slope of the conduit/link is calculated by assuming that its invert matches vertically with the invert of the downstream link. The overflow levels at the nodes are calculated by determining the lowest of the bank levels for the upstream and downstream links. The least of the overflow depths at the nodes is then used as the link diameter.



Usage

The XP-SWMM panel for creating the XP-SWMM project follows.

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

River strings model	Model box		
----------------------------	-----------	--	--

*Model containing the centre line, left bank and right bank strings. **The centre line strings must begin downstream and proceed upstream.** The name of the river may follow the words "Centre line " (note the ending space). For example the centre line string may be named "Centre line Parramatta River, downstream reach". The comma separates the river name from the reach name. If no comma is included then the river name is repeated for the reach name.*

The left and right bank strings need not be separate strings (see figure below).

Source string model	Model box		
----------------------------	-----------	--	--

*New source strings will be created in this model or existing source strings are contained in the model. See **Create source strings** tick box below.*

Create Source Strings	Tick box	not selected	
------------------------------	----------	--------------	--

*When selected existing source strings are deleted and new ones created perpendicular to the centre line at the specified spacing and length. Once you have created the sources strings they can be easily modified. On the **Strings->Points Edit** menu you will find the selections **Move** (to move the end points), **Insert** (to insert additional points).*

Distance between sections	Real box		
----------------------------------	----------	--	--

The distance between the cross sections. At present no check is made for overlapping cross sections

around river bends.

Section Length

Real box

The length of the cross section with zero chainage at the mid point.

Cross section model

Model box

The cross sections created and exported are stored in this model.

Centre Line Chainage Factor

Real box

The cross section names are created by dividing the chainage on the centre line by this factor. Typically 1000 is used to convert metres to kilometres and 5280 to convert feet to miles.

Number of decimals

Integer box

The cross section names are created with this many decimals. CAUTION XP SWMM only allows 10 characters for the names and each link name begins with "Lx-" That leaves 7 characters for the chainages.

Surface Tin (not the model) Tin box

Tin or super tin to create the cross sections from (remember a tin is like a string. It is placed in a model.).

Levee Tolerance

Real box

Not implemented in XP-SWMM.

Manning's n

Real box

Manning's n values for the left, right and centre channel sections.

Delta Y tolerance

Real box

*This value filters out points on the cross section. Imagine a tube of this diameter passing over the cross section. The tube is elongated until one point lies outside the tube. The tube is shortened to the previous point and then all points inside the tube are deleted from the cross section. The tube then moves on to the next point. The filtered (smoothed) and original sections are kept for comparison. **The final water tin is created from the ground tin and therefore the boundary string is located using the unfiltered section.***

Discharge

Real box

This discharge is used at the upstream end of all reaches. If you have multiple river branches, you can set the flow for each branch inside XP-SWMM or inside 12d. This can be changed at each section [See manual settings](#)

Units

Choice box

This selection will set the default units for the project being created.

Project file name

Input box

*The XP-SWMM *.xp name to be created or updated. An xpx file will also be created using this name to transfer the data.*

After selecting the **Process** button the cross section strings will be created and exported to a xpx file (using the project file name as the stem. **Never included ".xpx" in the project file name**) The xpx file will be over written without any warning. This is only used as a temporary transfer file.

12d needs to know where XPSWMM program and the XP SWMM working directory are. The system file that contains these locations is called XPSWMM.4d. (See [System file path](#) for its location). The file contents are as follows:

Line 1 the XP SWMM working directory
 Line 2 the full path to the XP SWMM program
 Line 3 the destination of the hydro.ini file when it is created

IMPORTANT: include the final "\" on lines 1 and 3.

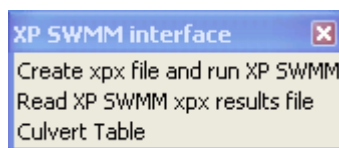
The **XPSWMM.4d** file as supplied follows;

```
c:\xps\xp-swmm\work\  

c:\xps\xp-swmm\xpswmp32.exe  

c:\xps\xp-swmm\
```

Next 12d will check for an XP project in your XP SWMM work directory (project file name + ".xp"). If it does not exist the file **Master_rivers.xp** will be copied from the [System file path](#) to your XP SWMM working directory. If a wp file already exists in your working directory you will see the following options dialogue.



The default is to update the wp file. Nodes and links in the file with the same names as in the export will be updated. If they do not exist they will be added. The import will NOT delete any nodes or links inside XP SWMM. This option is often used to merge rivers data with urban drainage data.

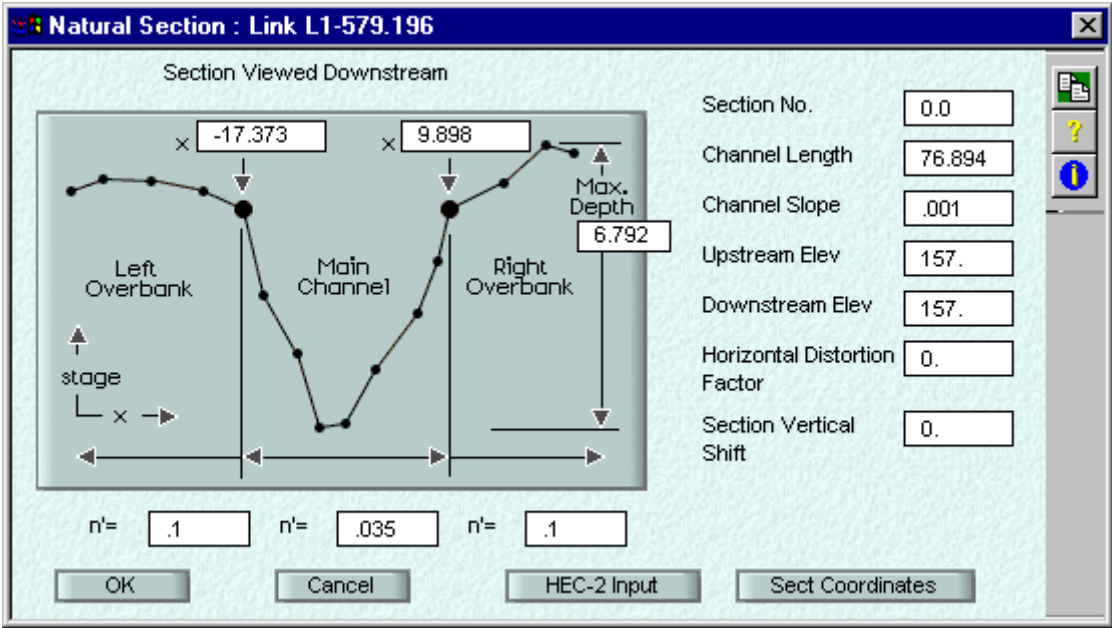
The over write option will copy the Master_river.xp file into the working directory and over write the existing file.

In either of the two cases the xpx file will be imported after XP SWMM has started. When you exit your XP SWMM session regardless of whether or not you save the XP file the XPX file will be exported over writing the original export file from 12d.

Your third option is not to run XP-SWMM at all and work with the XPX file as you see fit.

Export Details

The following diagram displays how the values from 12d are exported to XP-SWMM



At every source string location a node is created in XP-SWMM. The cross section geometry is then used for the downstream reach and is exported looking in the downstream direction.

The node name is [set manually](#) or calculated inside 12d by obtaining the centre line chainage at the intersection with section string. This value is divided by the **Centre line chainage factor** and rounded to the **Number of decimals** specified in the 12d export dialogue box. This value is then prefixed with the reach index followed by a dash. The downstream link name is set to the node name prefixed with "L". If you are planning to merge the river file with an XP SWMM drainage network then you will want to manually set the node names to the drainage pit names for the most upstream and most downstream source strings.

When selecting the **Number of decimals** in the 12d export dialogue, ensure that the total link name generated does not exceed the XP limit of 10 characters.

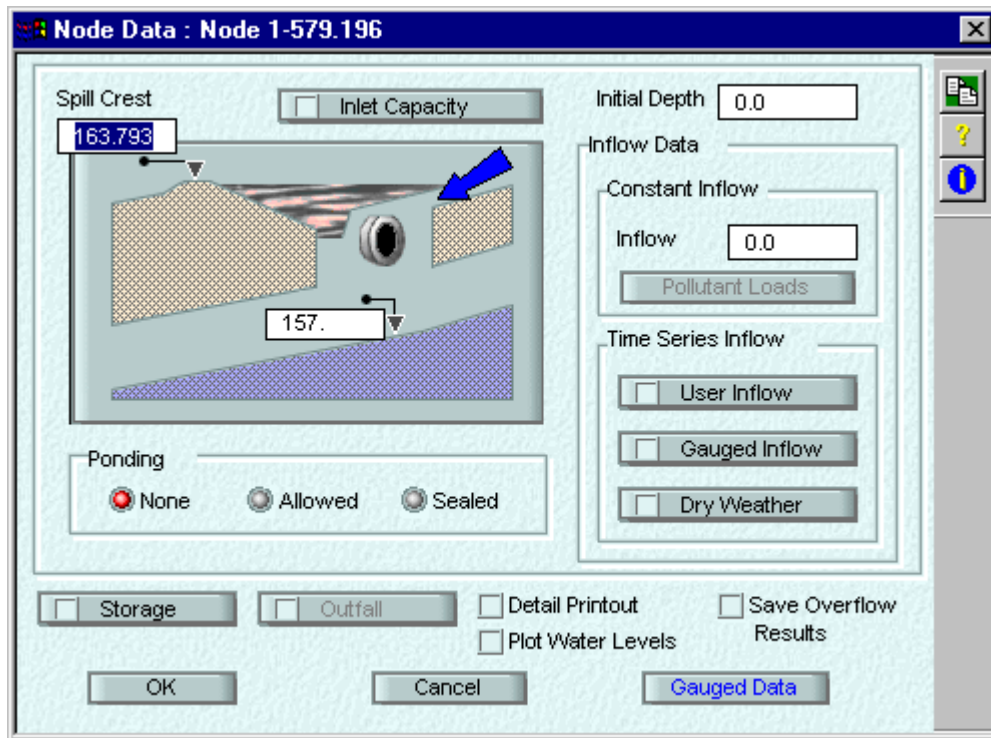
The section number variable is not exported to XP-SWMM.

Where the centre line cross the section in 12d is marked as zero chainage in XP-SWMM. The left overbank (-17.373) and the right overbank (9.898) are determined by the intersection of the left and right bank strings with the section. The n values are the values that are entered in the 12d export dialogue box. The maximum depth is calculated by subtracting the lowest elevation from the greatest elevation for both this cross section and the downstream cross section. The minimum of the two values is used.

The channel length is determined by subtracting the downstream section's centre line chainage from the current section centre line chainage. The **Centre line chainage factor** is **NOT** used in this calculation.

Upstream elevation is obtained by calculating the minimum elevation at the current section and the downstream elevation is the same value for the downstream cross section. The channel slope is calculated using these elevations and the channel length above.

The horizontal distortion factor and section vertical shift are set to zero. A section coordinate point is generated every time the source string crosses a 12d triangle edge, at the centre line and the left/right bank locations.



The spill crest level at the node is set to the maximum level on the cross section. Constant inflow is zero unless the node is the most upstream section on the reach or the flow value for the source string has been set manually [see manual settings](#).

Hydrology Data

Hydrology data may be exported to the runoff layer of XP SWMM for both the reservoir strings and the source strings. There are 2 requirements to enable the hydrology.

Key Points

1. If you plan to use storage areas, you need to draw reservoir strings (all in one model) and each should have a name (to become the XP SWMM node name).
2. You must create a file named "hydrology.txt" and store it in the project working folder. This file will contain the default xpx variable names. These defaults may be overridden using the same xpx variable name as a string attribute on the source/reservoir string (see format below).
3. The reservoir or source string must have an integer string attribute named "xpx r rfcmnt" with a value greater than 0 (max of 5). Use the Strings->Properties->Attributes or Strings->User->Attribute Editor to create/change this attribute.
4. Total area for the reservoir strings is calculated at each export time.

Hydrology.txt file format

The file is tab delimited and each line consists of three pieces of data: the XPSWMM variable name, the default value, and the type of data (integer, real or text).

You enter the xpx variable name

Any of these default values may be specified using a string attribute on the reservoir or source string. The attribute name must be of the same type as defined in the hydrology.txt file. If data for a second XP SWMM catchment is desired add a " 2" to the end of the attribute name. Up to 5 catchments are allowed in XP SWMM.

A sample hydrology.txt file follows:

```
// SCS hydrology screen

R_CN      85      real
R_TC      60      real
R_SHF     256     integer
R_SHAPE   0       integer

R_IADEPTH 0.04    real
R_IAFRACT 0.2     real
R_IA      1       integer
CNTLS     5       integer
R_FSCS    1       integer

// sub catchment screen

R_RAINSEL "SCS Type II FL Mod."text
R_INFILSEL      ""text
R_GWTAG  0      integer

// runoff node screen

R_WAREA  1.      real
R_WIMP   1.      real
R_WIDTH  1.      real
R_WSLOPE 1.      real
```

Attribute name format for string attributes.

The attribute name is the XP variable name prefixed by "xpx " with the underscore character in the xpx variable replaced by a space. For example the xpx variable "R_RAINSEL" would be set using the attribute name "xpx R RAINSEL".

Exporting River Junctions

River junctions are defined by the intersection of the centre line strings in 12d. The cross section immediately downstream of the intersection becomes the junction node. It is used as the downstream cross section for all upstream branches. The channel length for the last link on the tributary is set to the distance the centre line string extends beyond the cross section. The distance downstream along the main branch is **NOT INCLUDED!**

XP-SWMM Read Panel

Position of option on menu: **Design=>Rivers=>XP SWMM interface=>Read XP SWMM xpx results file**

After the XP-SWMM analysis is complete and the XP-SWMM program is closed the water level data is written to an xpx file that 12d will read. Water level strings are created with the plan shape of the cross sections at the elevation retrieved from the XP-SWMM results. These strings are then triangulated to create a water surface tin.

See also

- [XP-SWMM Interface overview](#)
- [Create XP-SWMM files](#)
- [Presenting Water Level Results](#)
- [How to for Rivers](#)

Frequently Asked Questions (Rivers)

Usage

The XP-SWMM read panel follows.

XP-SWMM Interface Reader

Existing data

River strings model	river strings	+
Cross Section model	cross sections	+
Shape Section model		+
Centre Line chainage Factor		+
Ground Surface tin	ground survey	+
swmm report file name	xpswmm.xpx	+

Result data

Water Surface tin	water surface	+
Water Surface tin model	tin water surface	+
Water level results model	water levels	+
Boundary strings model	boundary strings	+

Parameters

Chord length	10	+
Chainage tolerance	0.0001	+

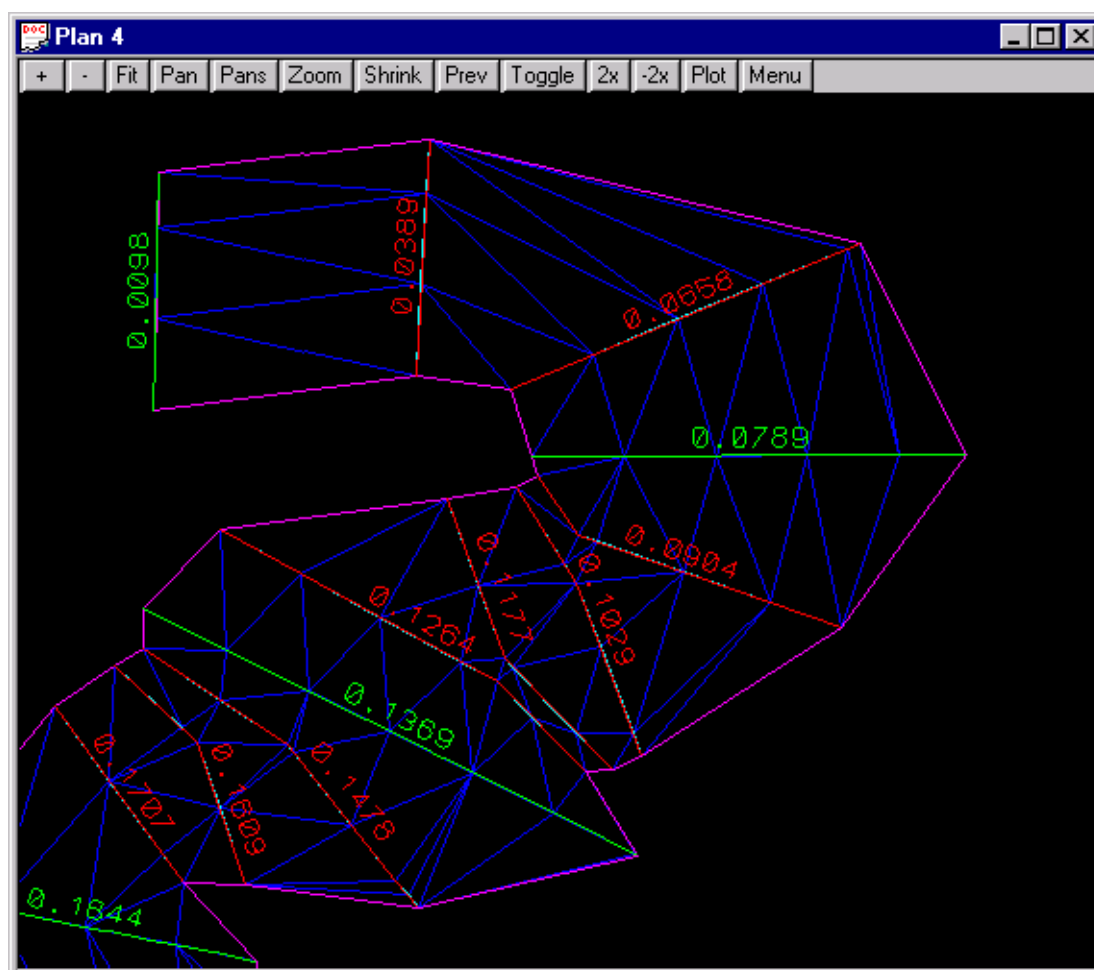
Process **Finish**

River strings model Model box

The river strings model specified in the write panel.

Cross Section model Model box

*The cross section model specified in the write panel. The interface will search the string names in this model for the cross sections specified in the XP-SWMM report. A match is successful if the XP-SWMM cross section chainage and the string name are within the tolerance specified below in **Chainage tolerance**.*

**Shape string model**

Model box

For meandering rivers, the cross sections (shown in green above) may not be at a close enough spacing to create a water surface that follows the river. 2D shape strings (shown in red above) can be created to create a water surface (shown in blue above) to follow the river. Note that water levels are extended when the shape strings are in a junction area or past the end of a reach.

Centre line chainage factor

Model box

This data is only required if the **Shape string model** is used. The shape string names are created by dividing the chainage on the centre line by this factor. Typically 1000 is used to convert metres to kilometres and 5280 to convert feet to miles.

Ground surface tin

Tin box

If a **boundary string model** is specified below, the intersection of this ground surface and the water surface will be determined. The strings will be stored in the model from the **boundary string model** field.

XP-SWMM report file name

File box

The XP-SWMM *xpx* file created automatically created when closing XP-SWMM or via the XP-SWMM menu selection

File=>Export Data

Water surface tin model Model box

The model to contain the new water surface tin.

Water surface tin Tin box

The name of the water surface tin to be created.

Water level results model Model box

The model where the water surface strings will be created at each cross section and shape string.

Boundary string model Model box

The model to contain the intersection strings between the water and ground surfaces specified above. If left blank no intersection strings will be calculated.

Chord Length Model box

This value set the spacing for the points on the water level strings (both cross section and shape strings). It is recommended that you use a length of no more than half of your average cross section and shape string lengths. A large value in this field may result in unexpected water level profiles for meandering rivers.

Chainage Tolerance Real box

This is the tolerance used when the cross section chainage from the XP-SWMM report is compared with the cross section string names. A value of 0.00001 is excellent if you have not altered the cross section names in 12d or XP-SWMM.

However, if you have altered chainage names then you may have to increase the value of the tolerance. Suppose the tolerance is set to 0.001 and the water level for section 0.056 is read from the XP-SWMM report file. The interface will search for the first string with a name between 0.055 and 0.057. If you chose to great of a tolerance then more than one water level result will match a 12d cross section and a warning message will be given.

If you have one specific cross section that you would like to have a different tolerance set for (maybe only one section is giving you troubles), use the Attribute Editor

(Strings->User->Attribute Editor), select the cross section string and create a real type attribute named tolerance set to the tolerance desired.

MIKE11 Interface

Position of menu: **Design=>Rivers=>Mike11 interface**

The MIKE 11 interface creates the MIKE 11 project files including *.bnd11, *.hd11, *.nwk11, sim11 and the cross section data text file (to be imported into *.xns11). Water levels are read back into 12d where they may be viewed in a 3D perspective view, on cross sections and on river profiles. Plan drawings easily identify extents of flooding and all data can be plotted onto engineering drawings.

The Mike11 walk right panel is,



See also

[River and Source Strings](#)

[MIKE11 Interface Overview](#)

[MIKE 11 Write Panel](#)

[MIKE 11 Read Panel](#)

[Presenting Water Level Results](#)

[How to for Rivers](#)

[Frequently Asked Questions \(Rivers\)](#)

Exporting to MIKE 11

The MIKE 11 project is created from a surface tin (representing the river bed and overbanks) and a model containing river centre line strings (identified by the name prefix, “centre line”). The low chainage (often zero) of the centre line strings must be at the upstream end of the reaches.

Cross sections are created at the location of the **source strings**. These source strings are initially created using the MIKE 11 option at a user defined spacing and section length, imported from drawing packages or manually created in 12d. The user may alter these sections as desired. They may be shortened if they intersect at sharp bends in the river; they may be extended at extremely wide river sections or extra points may be added so that the section is no longer a straight line.

Source strings can be deleted and additional sections can be added by creating new source strings. The Create source strings tick box on the interface panel must NOT be selected to use the customised strings.

Presenting MIKE 11 Results in 12D

After the MIKE 11 analysis is complete the maximum water level results are read back into 12d. Water level strings are created with the plan shape of the cross sections at the elevation retrieved from the MIKE 11 results. These strings are then triangulated to create a water surface tin.

[How the water level boundaries are determined](#)

MIKE 11 Write Panel

Position of option on menu: **Design=>Rivers=>Mike11 interface=>Create Mike11 files**

The MIKE 11 interface creates the MIKE 11 project files including *.bnd11, *.hd11, *.nwk11, *.sim11 and the cross section data text file (to be imported into *.xns11). Water levels are read back into 12d where they may be viewed in a 3D perspective view to easily identify extents of flooding.

See also

[River and Source Strings](#)

[MIKE 11 Read Panel](#)

[Presenting Water Level Results](#)

[How to for Rivers](#)

[Frequently Asked Questions \(Rivers\)](#)

Usage

12d creates most of the files necessary to run MIKE11. The exception to these are the time series files (both water level and discharge data). The simulation file created assumes that these files will have the same name as the centre line strings used in 12d. For example, if you name your centre line string *centre line Major River* then your time series files will be named *Major River-H.DFS0* for the tail water conditions and *Major River-q.dfs0* for your discharges.

The *.bnd11, *.hd11, *.nwk11 and *.sim11 files are created by appending 12d data to default data found in the following files.

cross_sections.4d

hd11-end.4d

hd11-header.4d

nwk11-header.4d

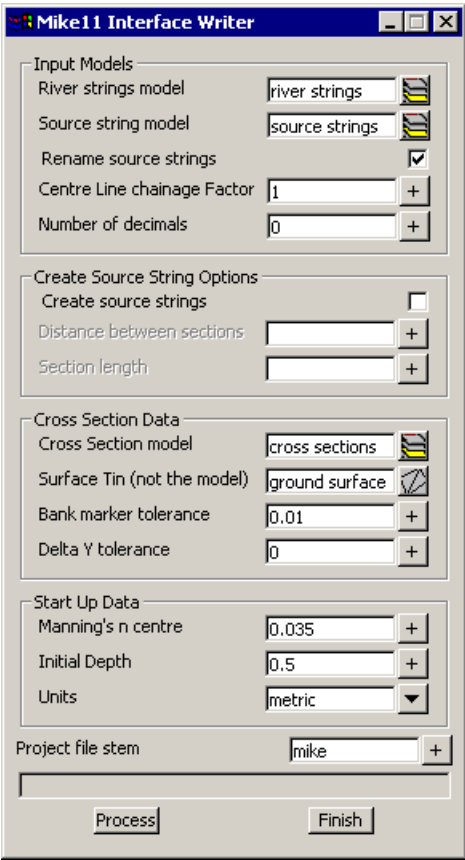
nwk11-options.4d

sim11-header.4d

sim11-period.4d

The user need not modify these files unless they would like to change the default values used when first creating the MIKE11 project. If you plan to modify these files, they are found in the 12d *setups* directory. Before modifying they should be copied to the 12d *user* directory (global defaults) or into the current project directory if they are project specific.

The MIKE 11 panel for creating the MIKE 11 project follows.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

River strings model	Model box		
----------------------------	-----------	--	--

Model containing the river centre line strings. **The centre line strings must begin upstream and proceed downstream.** The name of the river must follow the words “centre line “ (note the ending space). The name of the river may follow the words “Centre line “ (note the ending space). For example the centre line string may be named “Centre line Parramatta River, downstream reach”. The comma separates the river name from the reach name. If no comma is included then the river name is repeated for the reach name.

Confluences are modelled by a using a separate string for all reaches. Thus a system with a branch is modelled with three strings. The branch will be one string and the main reach will have a downstream string and an upstream string. The reaches must touch at the confluence.

Source string model	Model box		
----------------------------	-----------	--	--

New source strings will be created in this model or existing source strings are contained in the model. See **Create source strings** tick box below.

Create Source Strings	Tick box	not selected	
------------------------------	----------	--------------	--

When selected existing source strings are deleted and new ones created perpendicular to the centre line at the specified spacing and length. Once you have created the sources strings they can be easily modified. On the **Strings->Points Edit** menu you will find the selections **Move** (to move the end points), **Insert** (to insert additional points).

Distance between sections	Real box
<i>The distance between the cross sections. At present no check is made for overlapping cross sections around river bends.</i>	
Section Length	Real box
<i>The length of the cross section with zero chainage at the mid point.</i>	
Cross section model	Model box
<i>The cross sections created and exported are stored in this model.</i>	
Centre Line Chainage Factor	Real box
<i>The cross section names are created by dividing the chainage on the centre line by this factor. Typically 1000 is used to convert metres to kilometres and 5280 to convert feet to miles.</i>	
Surface Tin (not the model)	Tin box
<i>Tin or super tin to create the cross sections from (remember a tin is like a string. It is placed in a model.).</i>	
Bank Marker Tolerance	Real box
<i>If the surface level drops more than this amount while moving away from the channel centre line then the crest is used as a Bank Marker. A value of zero means that no bank marks are created.</i>	
Delta Y tolerance	Real box
<i>This value filters out points on the cross section. Imagine a tube of this diameter passing over the cross section. The tube is elongated until one point lies outside the tube. The tube is shortened to the previous point and then all points inside the tube are deleted from the cross section. The tube then moves on to the next point. The final water tin is created from the ground tin and therefore the boundary string is located using the unfiltered section.</i>	
Manning's n	Real box
<i>Manning's n values for the channel sections.</i>	
Initial depth	Real box
<i>This depth is added to the minimum elevation on the cross section and is used as the starting water level for the cross section.</i>	
Units	Choice box
<i>This selection will set the default units for the project being created.</i>	
Project file name	Input box
<i>The MIKE11 project name. All of the MIKE11 files will begin with this name and the appropriate extensions added.</i>	

Running MIKE11

Three steps are required to run MIKE11 with the files 12d creates.

1. Create you time series files.
2. Inside MIKE11, create a new cross sections file and import the cross sections.

3. Open the simulation file, and load the network file to have the grid points calculated.

Creating Time Series Files

Your time series files must be named with the prefix of the river string name. For example if your centre line string in 12d was named *centre line Major River* your time series files need to be named *Major River-H.DFS0* for the tail water conditions and *Major River-q.dfs0* for your discharges.

The standard time series dates are from 12:00 to 12:30 on 01 January 2000 with a one minute time step. If other periods are desired, you can either change the file *sim11-period.4d* in the 12d library before running the interface or change the dates inside MIKE11 after you read in the data. **DO NOT USE THE ORIGINAL FILES! Copy the file you are changing into the 12d user directory and modify it there. 12d will look for the file here first.**

Importing Cross Sections

From the MIKE11 main menu select **File->new** and then under Mike11 select **cross sections** from the dialogue box.

From the main menu select **File->Import->Import Raw data & Recompute**. Select the *.txt file with the **Project file stem** you specified in the 12d-Mike11 Write Panel. Now save this file with the same **Project file stem** (MIKE11 adds the .xns11 extension).

Calculating Grid Points

From the main menu select **File->Open** and select the *.sim11 file with the **Project file stem** you have specified in 12d. On the **Input** tab property sheet select **Edit** beside the **Network** file. Press **Ctrl+T** to take you into the table editing mode and then select the **Grid Points** tab property sheet. On the sheet select **Generate Grid Points** and then save the file.

You should now get the “Green lights” on the **Start** property sheet of the simulation file editor.

MIKE 11 Read Panel

Position of option on menu: **Design=>Rivers=>Mike11 interface=>Read Mike11 results (max)**

After the MIKE 11 analysis is complete the water level results are read back into 12d. Water level strings are created with the plan shape of the cross sections at the elevation retrieved from the MIKE 11 results (maximum water level).

Water levels are interpolated to create water level strings at the shape string locations. Note that water levels are extended when the shape strings are in a junction area or past the end of a reach. These strings are then triangulated to create a water surface tin.

The MIKE11 executable file, *res11read.exe* must be found in the directory *c:/mikezero/bin* so that 12d can read the Mike11 binary data files.

See also

[MIKE11 Interface Overview](#)

[Presenting Water Level Results](#)

[MIKE 11 Write Panel](#)

[How to for Rivers](#)

[Frequently Asked Questions \(Rivers\)](#)

Usage

The MIKE 11 read panel follows.

Mike 11 Interface Reader

Existing data

River strings model

river strings

+

Cross Section model

cross sections

+

Shape Section model

+

Centre Line chainage Factor

+

Ground Surface tin

ground survey

+

mike11 report file name

xpswmm.res11

+

Result data

Water Surface tin

water surface

+

Water Surface tin model

tin water surface

+

Water level results model

water levels

+

Boundary strings model

boundary strings

+

Parameters

Chord length

10

+

Chainage tolerance

0.0001

+

Process

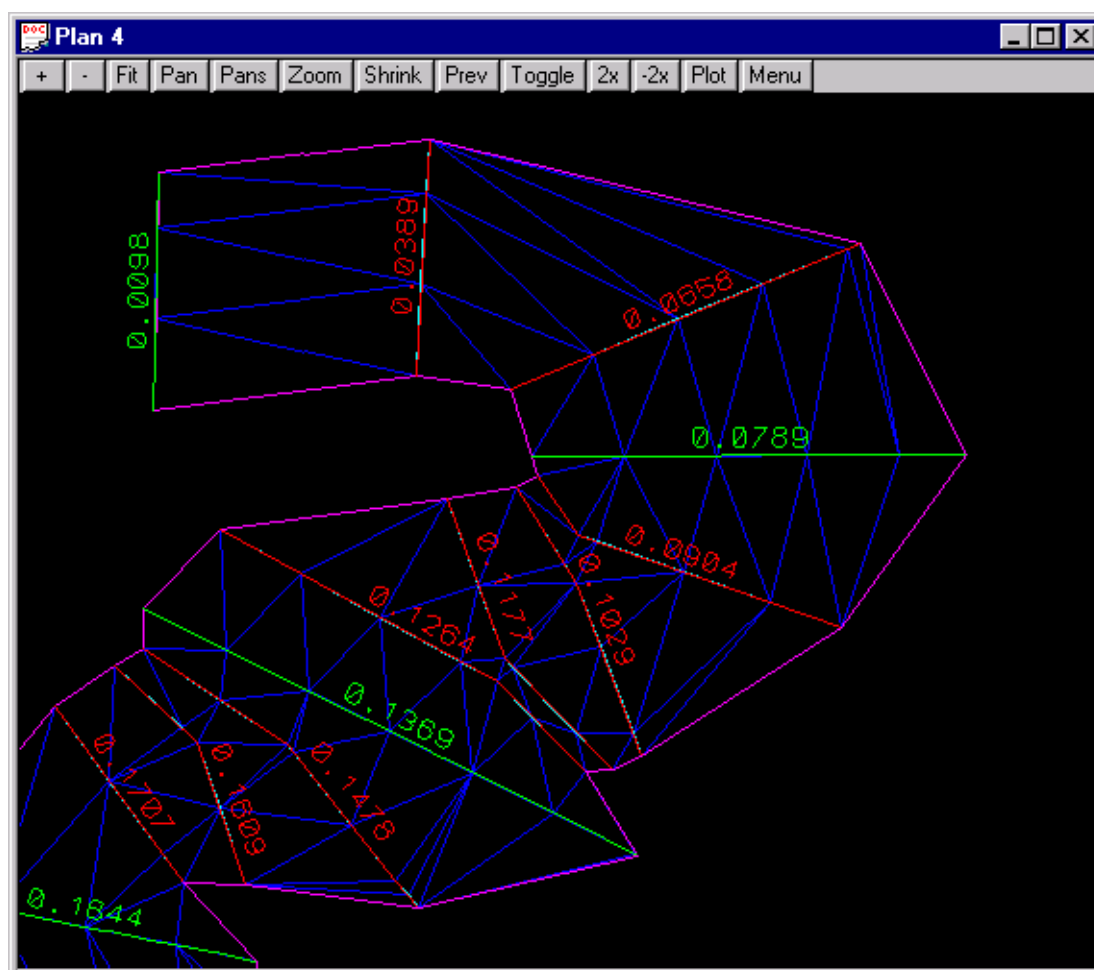
Finish

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

River strings model	Model box		
<i>The river strings model specified in the write panel.</i>			

Cross Section model	Model box		
<i>The cross section model specified in the write panel. The interface will search the string names in this model for the cross sections specified in the MIKE 11 report. A match is successful if the MIKE 11 cross section chainage and the string name are within the tolerance specified below in Chainage tolerance.</i>			

**Shape string model**

Model box

For meandering rivers, the cross sections (shown in green above) may not be at a close enough spacing to create a water surface that follows the river. 2D shape strings (shown in red above) can be created to create a water surface (shown in blue above) to follow the river. Note that water levels are extended when the shape strings are in a junction area or past the end of a reach.

Centre line chainage factor

Model box

This data is only required if the **Shape string model** is used. The shape string names are created by dividing the chainage on the centre line by this factor. Typically 1000 is used to convert metres to kilometres and 5280 to convert feet to miles.

Ground surface tin

Tin box

If a **boundary string model** is specified below, the intersection of this ground surface and the water surface will be determined. The strings will be stored in the model from the **boundary string model** field. Super tins cannot be used for this function. A composite tin is required for the tin-tin intersect.

MIKE 11 report file name

Input box

This is the binary data file that will be converted to an ASCII text file and read by 12d. The maximum water levels at each cross section will be extracted from the file.

Water surface tin

Tin box

The name of the water surface tin to be created.

Water surface tin model Model box

The model to contain the new water surface tin.

Water level results model Model box

The model where the water surface strings will be created at each cross section and shape string.

Boundary string model Model box

The model to contain the intersection strings between the water and ground surfaces specified above. If left blank no intersection strings will be calculated.

Chord Length Model box

This value set the spacing for the points on the water level strings (both cross section and shape strings). It is recommended that you use a length of no more than half of your average cross section and shape string lengths. A large value in this field may result in unexpected water level profiles for meandering rivers.

Centre Line Chainage Factor Real box

The cross section names are created by dividing the chainage on the centre line by this factor. Typically 1000 is used to convert metres to kilometres and 5280 to convert feet to miles.

Chainage Tolerance Real box

*This is the tolerance used when the cross section chainage from the MIKE 11 results file is compared with the cross section string names. If a **Centre line chainage factor** of 1 is used a value of 0.1 is appropriate. If a **Centre line chainage factor** of 1000 or 5280 is used a **Chainage** tolerance of 0.00001 is more appropriate.*

However, if you have altered chainage names then you may have to increase the value of the tolerance. Suppose the tolerance is set to 0.001 and the water level for section 0.056 is read from the MIKE 11 report file. The interface will search for the first string with a name between 0.055 and 0.057. If you chose to great of a tolerance then more than one water level result will match a 12d cross section and a warning message will be given.

If you have one specific cross section that you would like to have a different tolerance set for (maybe only one section is giving you troubles), use the Attribute Editor (Strings->User->Attribute Editor), select the cross section string and create a real type attribute named tolerance set to the tolerance desired.

Presenting River Water Level Results

Topics

[How the water level boundaries are determined](#)

[Defining the Water Surface Boundaries](#)

[Trimming the Water Surface Tin and Islands](#)

[Colouring the Ground Surface](#)

[Colour by Depth](#)

[Depth Contours](#)

[Colour the ground surface by elevation](#)

See also

[River and Source Strings](#)

[XP-SWMM Interface](#)

[HEC-RAS Interface](#)

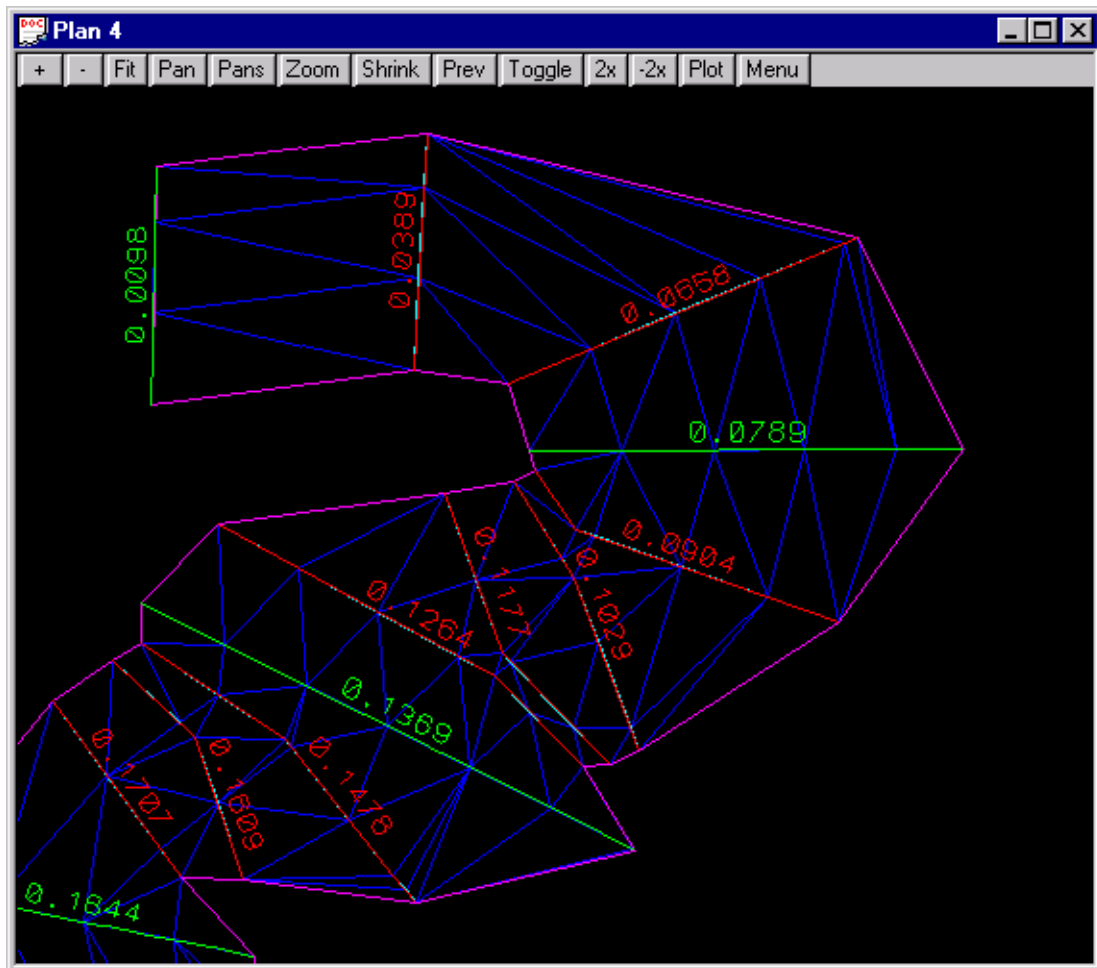
[MIKE11 Interface](#)

[ISIS Interface](#)

[How to for Rivers](#)

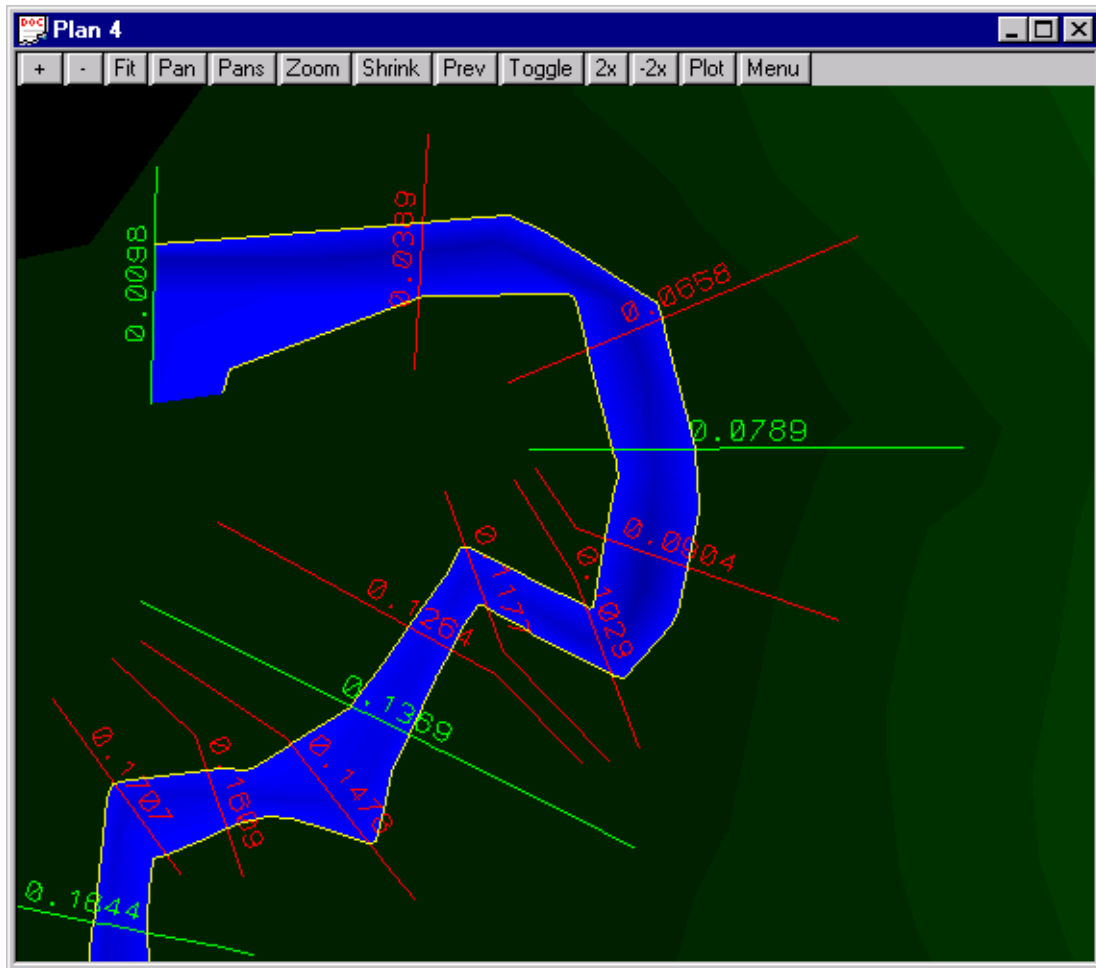
[Frequently Asked Questions \(Rivers\)](#)

How the water level boundaries are determined



For meandering rivers, the cross sections (shown in green above) may not be at a close enough spacing to create a water surface that follows the river. 2D shape strings (shown in red above). Note that water levels are extended when the shape strings are in a junction area or past the end of a reach. can be created to

create a water surface (shown in blue above) to follow the river.

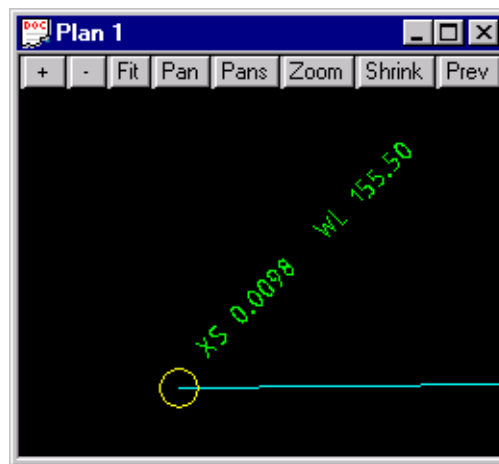


The water surface is draped over the ground surface and the boundary strings (strings defining the edges of the water surface – shown in yellow above) are created. They may be used to trim the water surface or shade your ground surface tin for flood inundation mapping. Boundary strings also include islands! Shading the river bed blue, in a 3D perspective view, is an effective way to show the water level extents and still view the shape of the river bottom (it has the effect of very clean water that you can see through!).

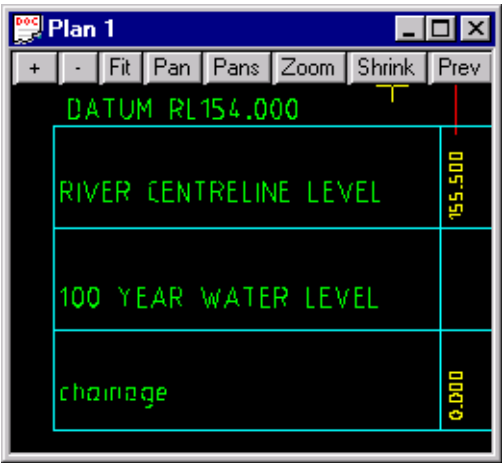
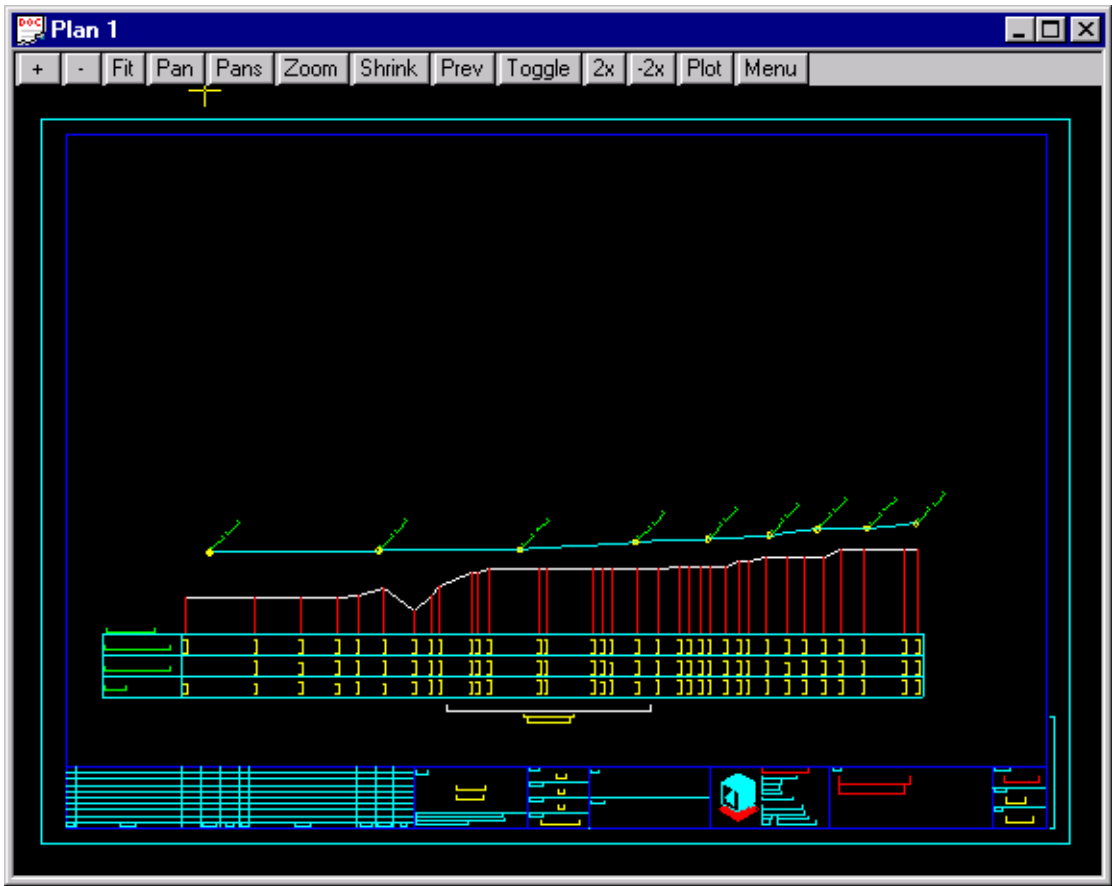
Sample Presentations and Drawings

The water surface may be

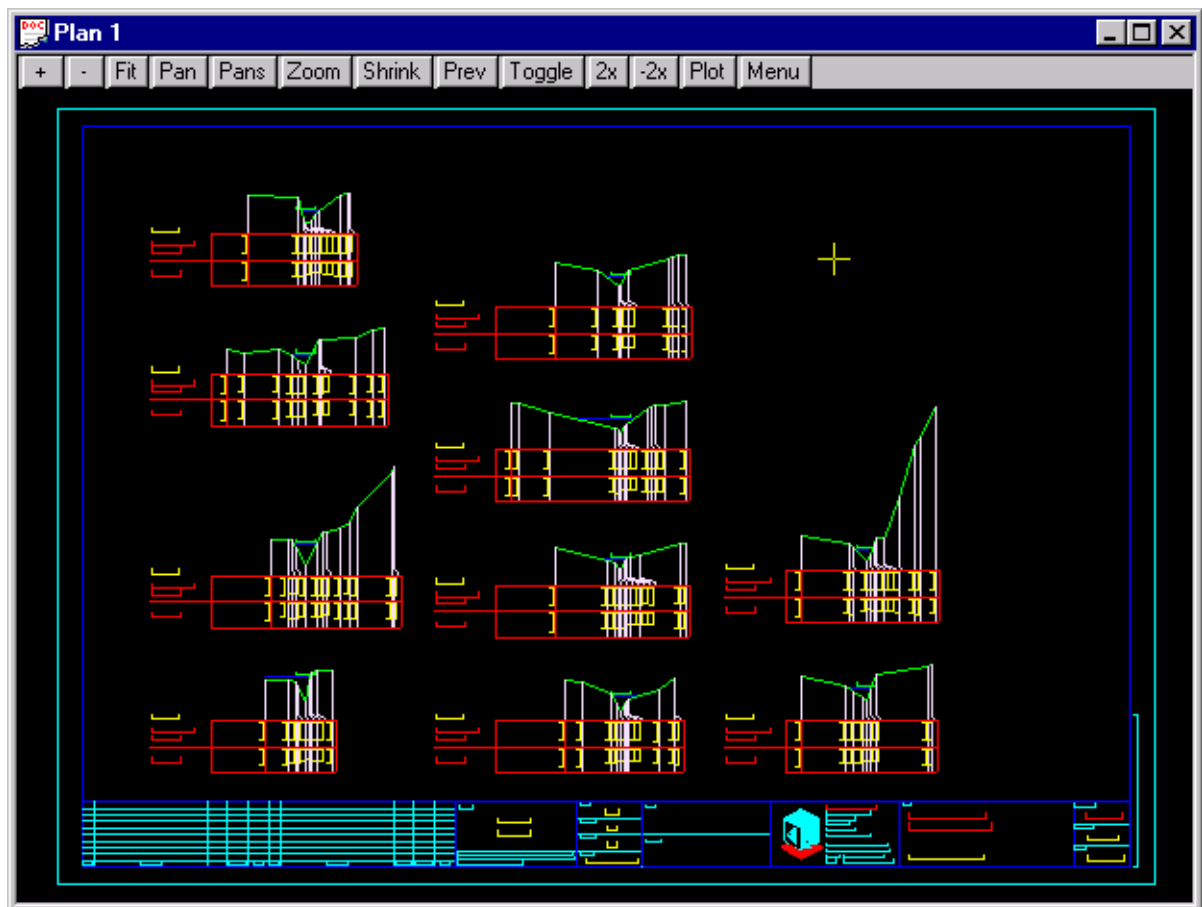
- s •contoured (elevation),
- s • depth contours created,
- s • water surface coloured by depth (shown above),
- s • cross sections plotted
- s • and longitudinal profiles drawn (shown below).
- s •All of these results can be plotted complete with your customised drawing sheets.
- s •Finally, you may walk down the water course in the perspective view (and record this to an Windows AVI file).



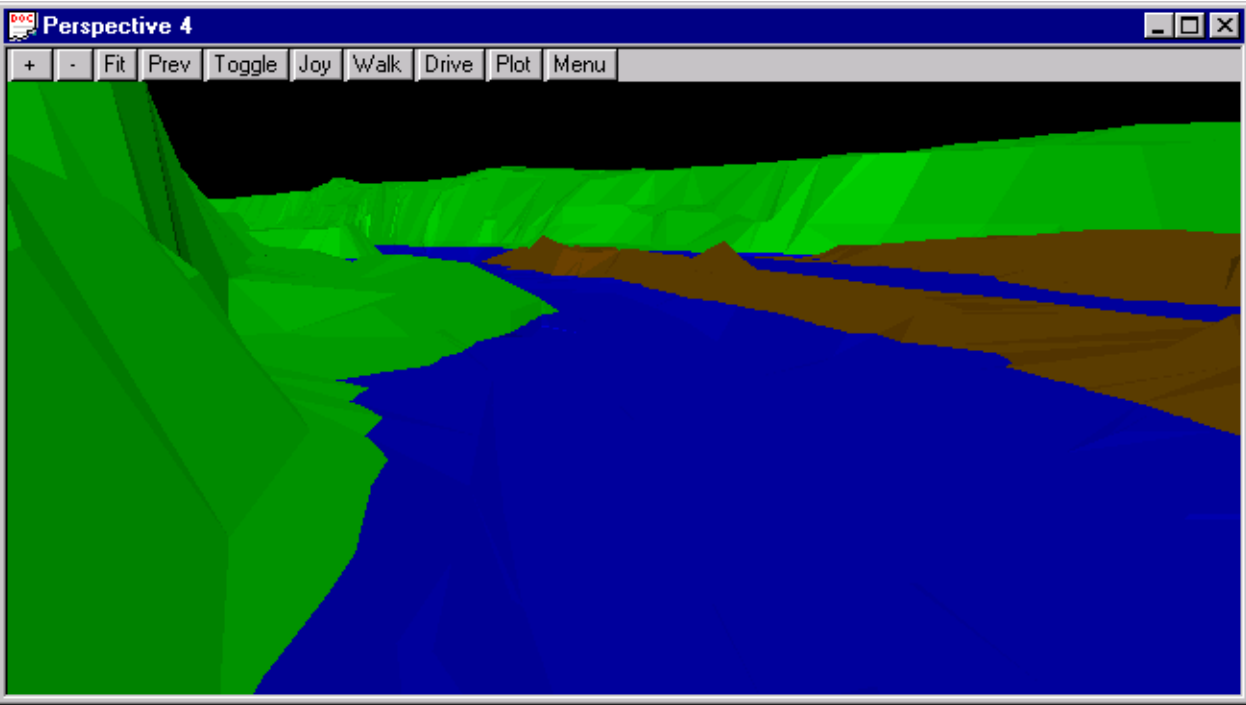
Close up view of cross section labels with water levels



Close up of text (user chooses wording, size, colour, text style etc.)



The tin created can be viewed in a perspective view and sections taken where desired. A sample perspective view follows.



Example of cross sections long sections and depth colouring see the HEC-RAS Interface topic.

Defining the Water Surface Boundaries

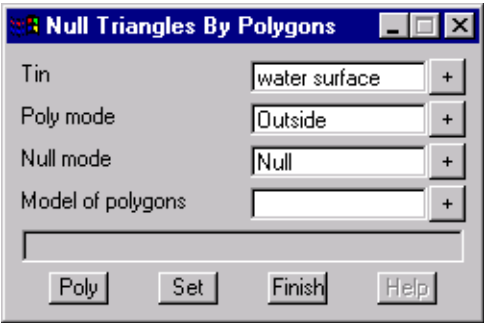
The water surface and its boundary is created by 12d. The first step is to trim the water surface back to the boundary strings. Since the water boundary does not generally form a closed polygon (the left and right river boundaries will need to be joined at one end of the river) use the **Strings=>Strings Edit=>Join** to connected strings.

If the water surface reached the edges of you cross sections then there will be numerous breaks in the boundary string. The best solution is to extend the cross sections and/or add additional shape strings. If it is not a major error in modelling then the break in the boundary can be joined using the **Strings=>Strings Edit=>Join**.

If boundary strings are created outside that water level boundaries they should not be used in this area. Boundary strings should only be used inside the area defined by your water level results.

Trimming the Water Surface Tin and Islands

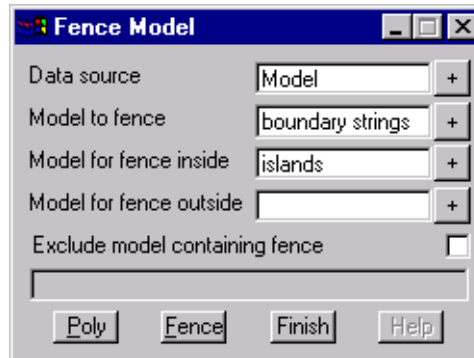
Use the **Triangle=>Null=>by polygons** selection to null triangles inside the polygon you have created above.



Select your water surface tin and change the **Poly mode** to **Outside**. Now select the **Poly** button and pick the boundary string. The triangles outside the polygon will now be nulled.

If you have some islands in the model then change the **Poly mode** to **Inside** and select the islands.

If you have numerous islands, say more than 10 it may be easier to copy all of the islands into one model using the fence command (Utilities->Fence->Fence).

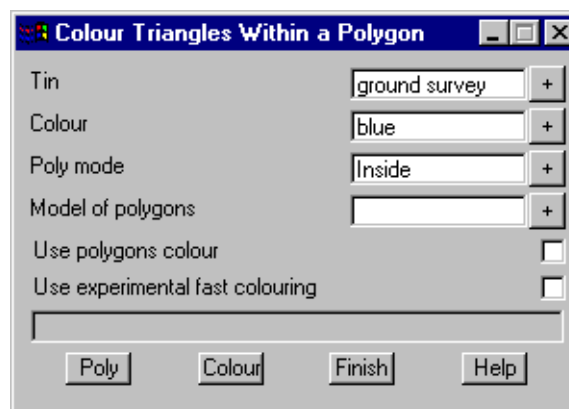


The **Model to fence** is the boundary strings model and the **Model for fence inside** is the new model to contain the islands. The **Exclude model containing fence** should not be ticked. Select **Poly** and then pick the boundary string. All of the islands inside the boundary string will not be copied to the islands model.

Colouring the Ground Surface with Flood Zones

The boundary strings can also be used to colour the ground surface. Colouring the river bed blue is an effective way to show the water level extents and still view the shape of the river bottom (the effect of very clean water that you can see through!).

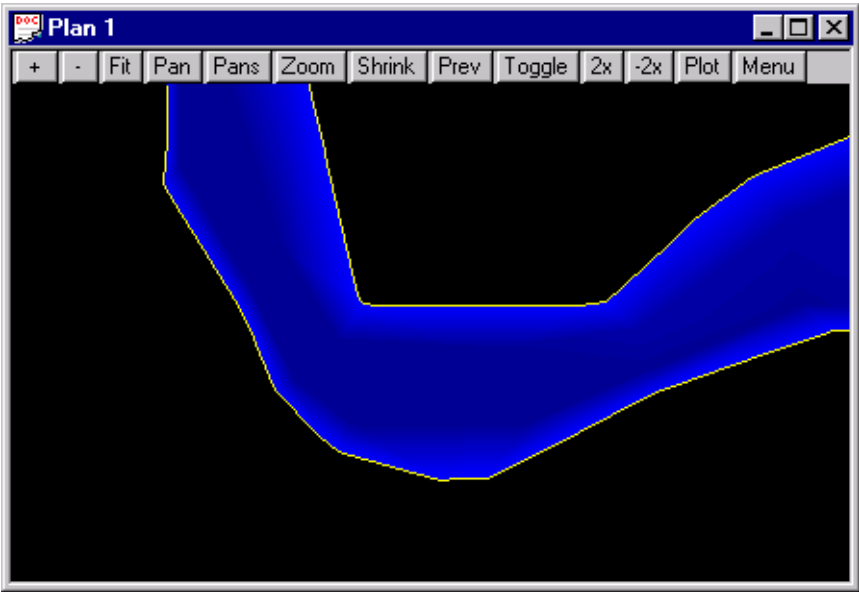
First, define the water surface boundaries (see above). Next re-triangulate the ground tin so that it includes the boundary string model (**Triangles=>Edit=>Tin**). Next select **Triangles=>Colour=>Colour within polygon**. The following panel will appear.



Select your ground tin and the desired colour. Next select the **Poly** button and pick the boundary string to be coloured inside. If islands exist change, change the colour (to a ground colour) and then select the island string.

Colour by Depth

The water surface can be coloured by depth. This function calculates the depth between the water surface and the ground surface and creates “faces” of different colours. The colours to be used are specified in a depth range file. This option requires the purchase of the Volumes Option



From the main menu select Options->Volumes->Exact->Tin to tin.

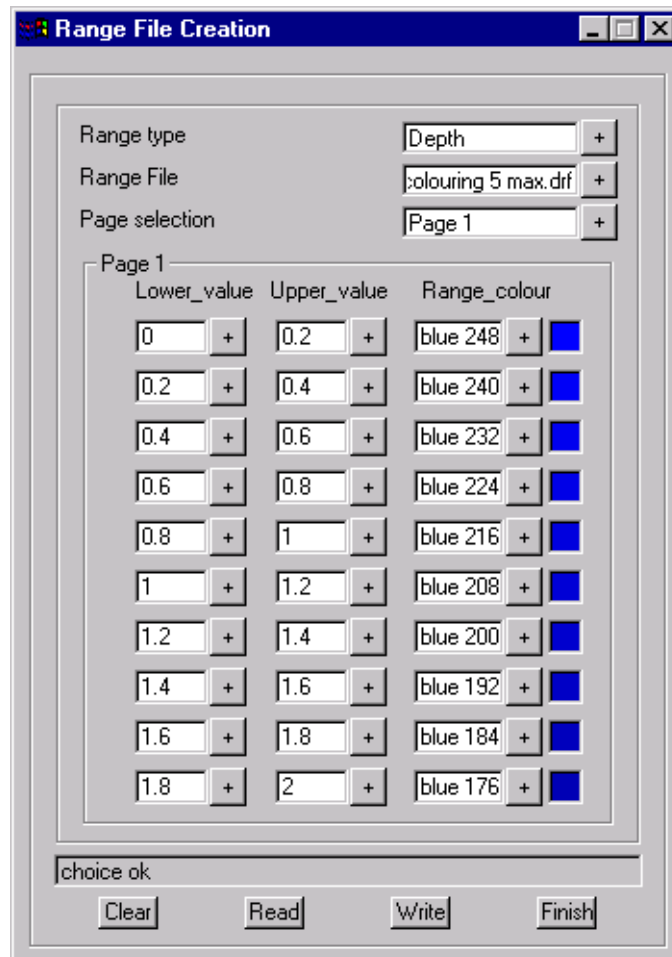
- Original tin

this is your ground survey tin
- New tin

this is your water surface tin
- Range file

two range files are supplied. One with a range from 0 to 5 and another from 0 to 50. The library contains a spreadsheet the can quickly create other range files or you may edit the using the built in range editor.

To use the built in range file editor select + beside you range file then **edit**.



You may change the range value and the colours as desired. Be sure to select **Write** to save the changes before selecting **Finish**.

See also Range File Creation

Plan View to paint you can paint a current view without saving the face data. This is a good option if you wish to take a quick look at the depth colours in one area.

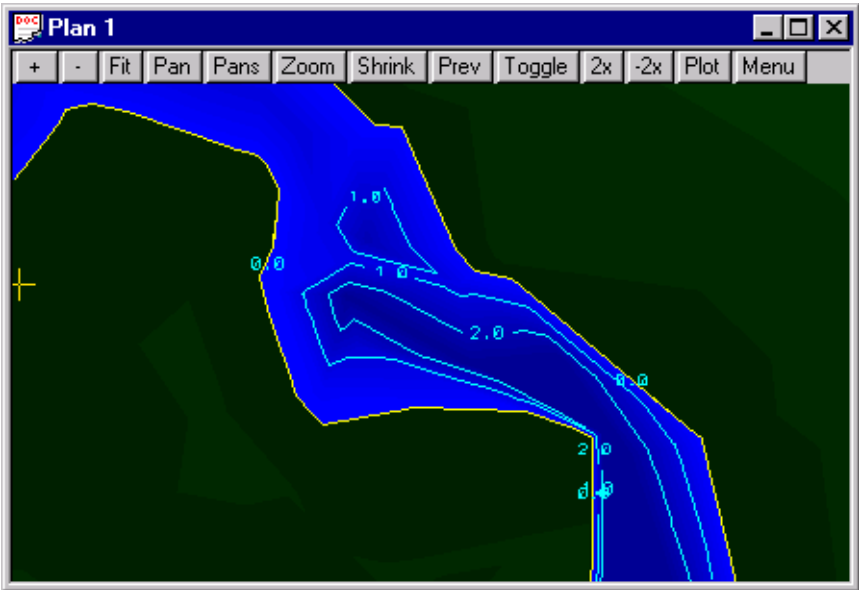
Model for faces the faces can be stored in a model. Note that faces consume a great deal of hard disk space. Therefore you may consider colouring one area at a time using the **Poly** option.

Poly If your water surface tin is very large than you may want to only colour a portion of the tin. You must create a polygon (Strings->Create->2d) and then pick this polygon. When your select **Volume** only the area inside the polygon will be coloured.

Volume select this button to colour the surface.

Depth Contours

Once you have the tin coloured by depth you might want to add depth contours. From the main menu select **Options->Tin->Analysis->Depth Contours**. This option requires the purchase of the tin Analysis module.



Depth Contours

Original tin

ground survey

+

New tin

water surface

+

Model for depth strings

depth contours

+

Colour for cut strings

red

+

Colour for zero strings

yellow

+

Colour for fill strings

cyan

+

Start level

0

+

End level

10

+

Interval

1

+

2d/3d strings

2d

+

finished

Calculate

Finish

Help

- Original tin

this is your ground survey tin
- New tin

this is your water surface tin
- Model for depth strings

this is the model for your depth contours
- Colour for cut strings

this must be selected but we will not use this colour
- Colour for zero strings

the zero string will be the same as our boundary strings
- Colour for fill strings

this is the colour for the depth contours
- Start level

enter a zero for this value
- End level

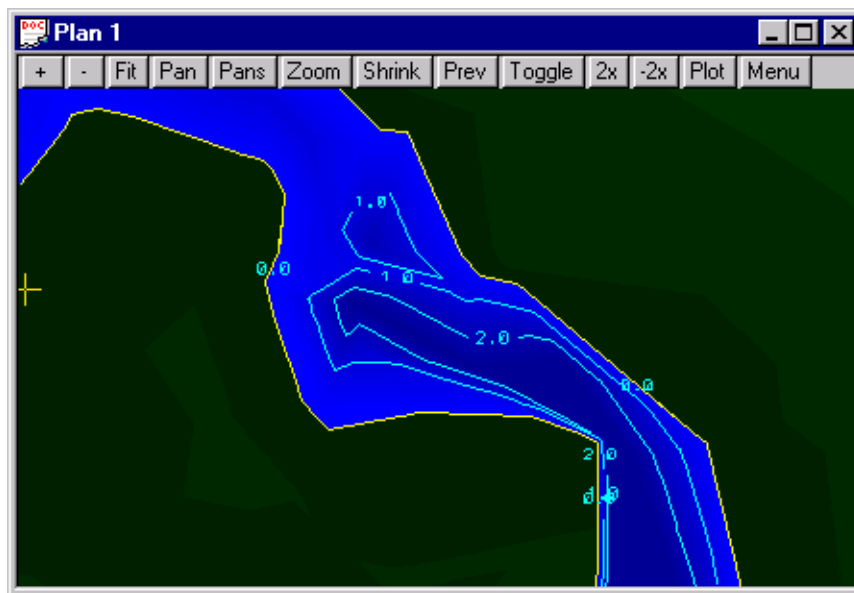
enter a level grater than the greatest depth
- Interval

enter the contour interval as desired
- 2d/3d strings

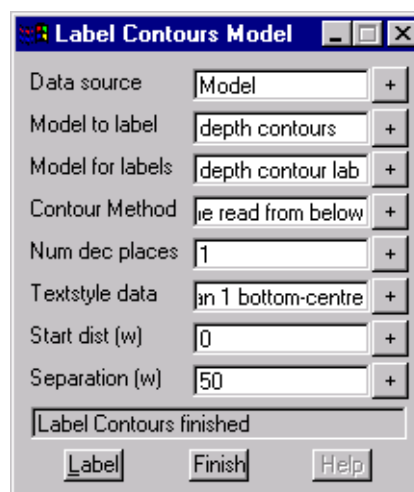
2d strings
- Calculate

this will create you contour strings

Adding Values to the Contours



Since there are numerous ways to label the contours it is performed as a separate step. From the main menu select **Strings->Label->Contours**.



Contour method the example above uses *Line removal and Centred line read from below*. This copies the contour lines themselves and inserts a break in the line.

Start distance this is usually left as zero. It changes the start point for the first label on each contour.

Separation this determines the spacing of the contour labels.

Colour the ground surface by elevation

With the water surface coloured by depth, you may want to colour the ground surface by elevation.



This colouring may be done from either From the main menu select **Options->Volumes->Exact->Tin to height** or **Triangles->Colour->Tin height colour**.

Options->Volumes->Exact->Tin to height

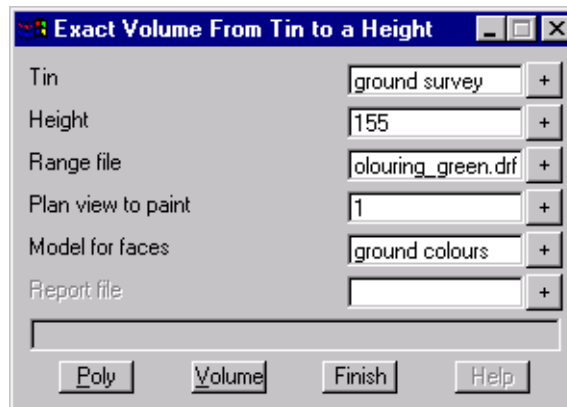
Options->Volumes->Exact->Tin to height requires the purchase of the Volumes module. First select **Triangles->Tin info** from the main menu and then select you ground surface tin. You will want to copy the minimum z level from this pane.

Tin	ground survey	+	
x min	42407.034	x max	43076.368
y min	36815.276	y max	37563.525
z min	155	z max	234.074
Points	2459	Tris	4912

information retrieved

Info Calc Extent Finish Help

Now from the main menu select **Options->Volumes->Exact->Tin to height**



Select your ground surface to colour and enter the minimum elevation (from above) into the **Height** field. The **Range file** “\$LIB/ground_colouring_green.drf” is found in the library.

Plan View to paint you can paint a current view without saving the face data. This is rarely used in this case

Model for faces the faces can be stored in a model. Note that faces consume a great deal of hard disk space. Therefore you may consider colouring one area at a time using the **Poly** option.

Poly If your ground surface tin is very large than you may want to only colour a portion of the tin. You must create a polygon (Strings->Create->2d) and then pick this polygon. When your select **Volume** only the area inside the polygon will be coloured.

Volume select this button to colour the surface.

UNET Interface

Position of menu: **Design=>Rivers=>UNET interface**

The UNET interface creates the *.cs file. Water levels are read back into 12d where they may be viewed in a 3D perspective view to easily identify extents of flooding.

The UNET walk right menu is,



See also

[River and Source Strings](#)

[Reservoir Strings](#)

[Create UNET files](#)

[Read UNET results](#)

[Presenting Water Level Results](#)

[How to for Rivers](#)

[Frequently Asked Questions \(Rivers\)](#)

UNET Write Panel

Position of option on menu: **Design=>Rivers=>UNET interface=>Create UNET CSECT file**

The UNET interface creates the UNET *.cs file. Water levels are read back into 12d where they may be viewed in a three dimension perspective view to easily identify extents of flooding.

See also

[River and Source Strings](#)

[UNET Interface Overview](#)

[Read UNET results](#)

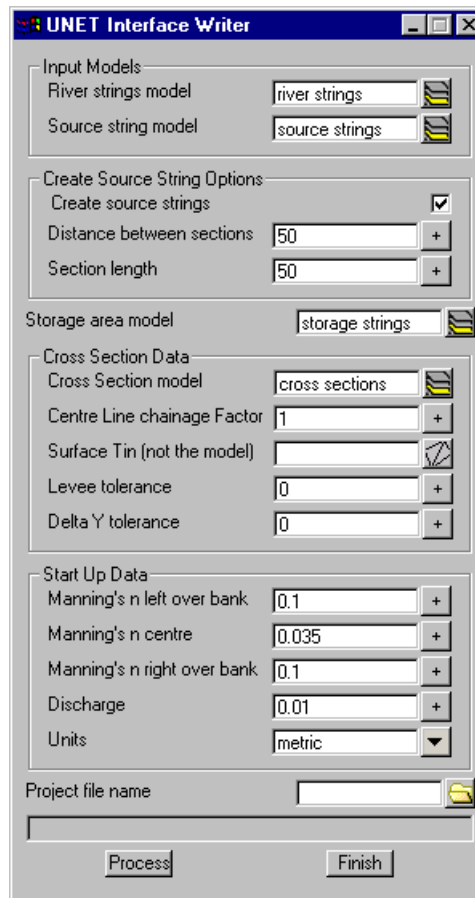
[Presenting Water Level Results](#)

[How to for Rivers](#)

[Frequently Asked Questions \(Rivers\)](#)

Usage

The UNET panel for creating the UNET project follows.



The image shows the 'UNET Interface Writer' dialog box. It contains several sections with input fields and buttons:

- Input Models:**
 - River strings model: river strings
 - Source string model: source strings
- Create Source String Options:**
 - Create source strings: ☒
 - Distance between sections: 50
 - Section length: 50
- Storage area model:** storage strings
- Cross Section Data:**
 - Cross Section model: cross sections
 - Centre Line chainage Factor: 1
 - Surface Tin (not the model): [empty]
 - Levee tolerance: 0
 - Delta Y tolerance: 0
- Start Up Data:**
 - Manning's n left over bank: 0.1
 - Manning's n centre: 0.035
 - Manning's n right over bank: 0.1
 - Discharge: 0.01
 - Units: metric
- Project file name:** [empty]
- Buttons:** Process, Finish

UNET Read Panel

Position of option on menu: **Design=>Rivers=>UNET interface=>Read UNET reports**

After the UNET analysis is complete the water level results are read back into 12d. Water level strings are created with the plan shape of the cross sections at the elevation retrieved from the UNET results. These strings are then triangulated to create a water surface tin.

See also

[UNET Interface Overview](#)

[Create UNET files](#)

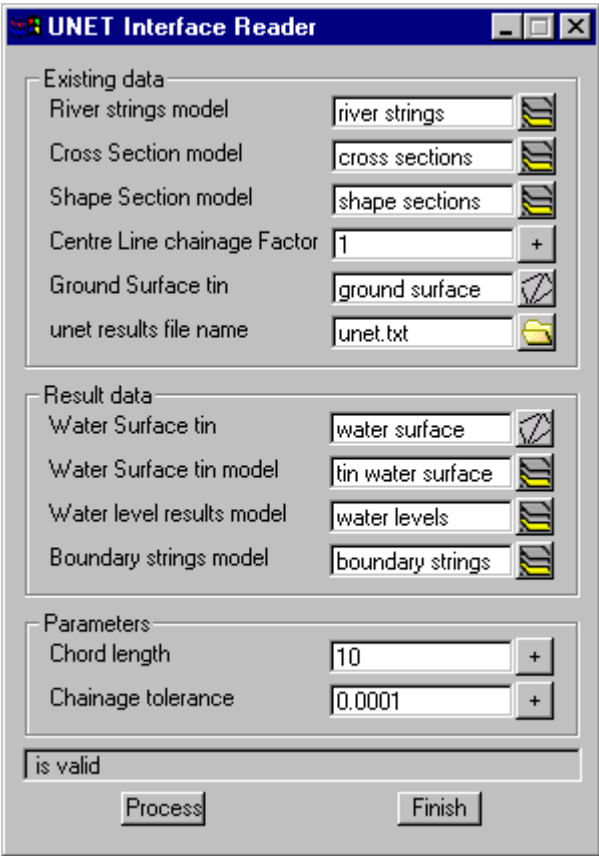
[Presenting Water Level Results](#)

[How to for Rivers](#)

[Frequently Asked Questions \(Rivers\)](#)

Usage

The UNET read panel follows.



The UNET file format consists of a line number, section name and elevation separated by at least 1 space. An example follows:

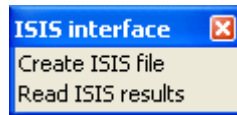
1	0.25	118.24
2	0.50	118.25
3	0.75	118.30
4	1.00	118.40

ISIS Interface

Position of menu: **Design=>Rivers=>ISIS interface**

The ISIS interface creates *.dat input file. Water levels are read back into 12d where they may be viewed in a 3D perspective view to easily identify extents of flooding.

The ISIS walk right menu is,



See also

[River and Source Strings](#)

[Reservoir Strings](#)

[Spill strings](#)

[Create ISIS files](#)

[Read ISIS results](#)

[Presenting Water Level Results](#)

[How to for Rivers](#)

[Frequently Asked Questions \(Rivers\)](#)

Exporting to ISIS

The ISIS project is created from a surface tin (representing the river bed and overbanks) and a model containing [river strings](#) identified by their names “left bank”, “right bank and the name prefix, “centre line”. Any additional strings in the specified model will be ignored (warning messages will be given when you run the macro that any additional strings are being ignored). The low chainage (often zero) of the centre line strings must be at the upstream end of the reaches.

Cross sections are created at the location of the [source strings](#). These source strings are initially created using the ISIS option at a user defined spacing and section length. The user may alter these sections as desired. These may be shortened if they intersect at sharp bends in the river; they may be extended at extremely wide river sections or extra points may be added so that the section is no longer a straight line.

Source strings can be deleted and additional sections can be added by creating new source strings. The **Create source strings** tick box on the interface panel must **NOT** be selected to use the customised strings.

[Reservoir Strings](#) are 2d strings that define the extents of the reservoir. The volume is calculated in increments of 1 or the value set in the attribute [stage increment](#) for this string. The volumes start from a level with zero volume to the level set for the 2d reservoir string.

The **reservoir strings** may define inline reservoirs or offside storage. Inline reservoirs are "touched" by centre line strings both upstream and downstream. Offline storage areas are linked to the cross sections via **spill strings**.

[Spill strings](#) are 2d strings that link offline storage areas to a cross section. The string must begin by "touching" the source string and then proceed to the first point on the spill section. During the export the first point will NOT be exported as part of the spill section. After defining the end of the spill section the last point on the string must "touch" the reservoir string. Again this last point will NOT be exported as part of the spill section.

Presenting ISIS Results in 12d

After the ISIS analysis is complete the water level results are read back into 12d. Water level strings are created with the plan shape of the cross sections at the elevation retrieved from the ISIS *.zzr file. These strings are then triangulated to create a water surface tin from which the water level boundaries are

determined. These results can then be shown in plan, long section, cross section and in 3D perspectives.

[More details](#)

ISIS Write Panel

Position of option on menu: **Design=>Rivers=>ISIS interface=>Create ISIS file**

The ISIS interface creates the ISIS project files ready to open and run. This includes the project, plan, flow and geometry files. Water levels are read back into 12d where they may be viewed in a three dimension perspective view to easily identify extents of flooding.

See also

[River and Source Strings](#)

[ISIS Interface overview](#)

[Read ISIS results](#)

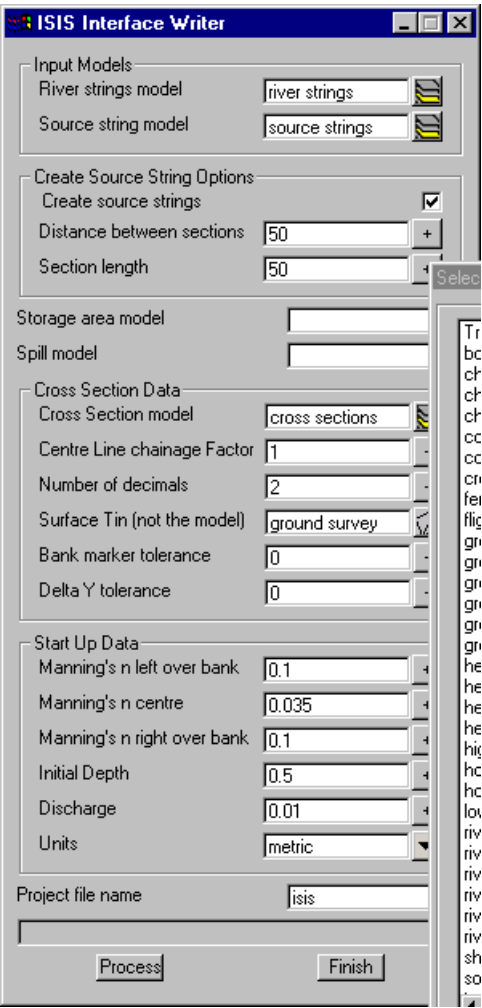
[Presenting Water Level Results](#)

[How to for Rivers](#)

[Frequently Asked Questions \(Rivers\)](#)

Usage

The ISIS panel for creating the ISIS project follows.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
River strings model	Model box		
<p><i>Model containing the centre line, left bank and right bank strings. The centre line strings must begin downstream and proceed upstream. The name of the river may follow the words “Centre line “ (note the ending space). For example the centre line string may be named “Centre line Parramatta River; downstream reach”. The comma separates the river name from the reach name. If no comma is included then the river name is repeated for the reach name.</i></p> <p><i>Confluences are modelled by using a separate string for all reaches. Thus a system with a branch is modelled with three strings. The branch will be one string and the main reach will have a downstream string and an upstream string. The reaches must touch at the confluence.</i></p> <p><i>The distance from the start of the upstream strings to the first cross section is used to model the confluence length.</i></p> <p><i>The left and right bank strings need not be separate strings (see figure below).</i></p>			
Source string model	Model box		
<p><i>New source strings will be created in this model or existing source strings are contained in the model. See Create source strings tick box below.</i></p>			
Create Source Strings	Tick box	not selected	
<p><i>When selected existing source strings are deleted and new ones created perpendicular to the centre line at the specified spacing and length. Once you have created the source strings they can be easily modified. On the Strings->Points Edit menu you will find the selections Move (to move the end points), Insert (to insert additional points).</i></p>			
Distance between sections		Real box	
<p><i>The distance between the cross sections. At present no check is made for overlapping cross sections around river bends.</i></p>			
Section Length		Real box	
<p><i>The length of the cross section with zero chainage at the mid point.</i></p>			
Storage strings		Real box	
<p><i>These 2d strings define the extents of the storage area. For more details see Reservoir strings.</i></p>			
Spill strings		Real box	
<p><i>These 2d strings define the location to cut the spill section and start end points define the cross section and reservoir, respectively. For more details see Spill strings</i></p>			
Cross section model		Model box	
<p><i>The cross sections created and exported are stored in this model.</i></p>			
Centre Line Chainage Factor		Real box	
<p><i>The cross section names are created by dividing the chainage on the centre line by this factor. Typically 1000 is used to convert metres to kilometres and 5280 to convert feet to miles.</i></p>			
Number of decimals		Integer box	

The cross section names are created with this many decimals. CAUTION XP SWMM only allows 10 characters for the names and each link name begins with "Lx-" That leaves 7 characters for the chainages.

Surface Tin (not the model) Tin box

Tin or super tin to create the cross sections from (remember a tin is like a string. It is placed in a model.).

Bank Marker

Real box

Not currently implemented in ISIS

Delta Y tolerance

Real box

This value filters out points on the cross section. Imagine a tube of this diameter passing over the cross section. The tube is elongated until one point lies outside the tube. The tube is shortened to the previous point and then all points inside the tube are deleted from the cross section. The tube then moves on to the next point. The filtered (smoothed) and original sections are kept for comparison. **The final water tin is created from the ground tin and therefore the boundary string is located using the unfiltered section.**

Manning's n

Real box

Manning's n values for the left, right and centre channel sections.

Initial depth

Real box

Not currently implemented in ISIS.

Discharge

Real box

This discharge is used at the upstream end of all reaches. If you have multiple river branches, you can set the flow for each branch inside ISIS or inside 12d. This can be changed at each section [See manual settings](#)

Units

Choice box

This selection will set the default units for the project being created.

Project file name

Input box

The ISIS project name. The extension ".dat" will automatically be added for you.

ISIS Read Panel

Position of option on menu: **Design=>Rivers=>ISIS interface=>Read ISIS results**

After the ISIS analysis is complete the water level results are read back into 12d. Water level strings are created with the plan shape of the cross sections at the elevation retrieved from the ISIS results. These strings are then triangulated to create a water surface tin.

See also

[ISIS Interface overview](#)

[Create ISIS files](#)

[Presenting Water Level Results](#)

[How to for Rivers](#)

[Frequently Asked Questions \(Rivers\)](#)

Usage

The ISIS read panel follows.

ISIS Interface Reader

Existing data

River strings model: river strings

Cross Section model: cross sections

Shape Section model: shape strings

Reservoir: reservoir strings

Centre Line chainage Factor: 1

Ground Surface tin: ground survey

isis results file name: isis.zzi

Result data

Water Surface tin: water surface

Water Surface tin model: tin water surface

Water level results model: water levels

Boundary strings model: boundary strings

Parameters

Chord length: 10

Chainage tolerance: 0.0001

Model <shape strings> exists

Process Finish

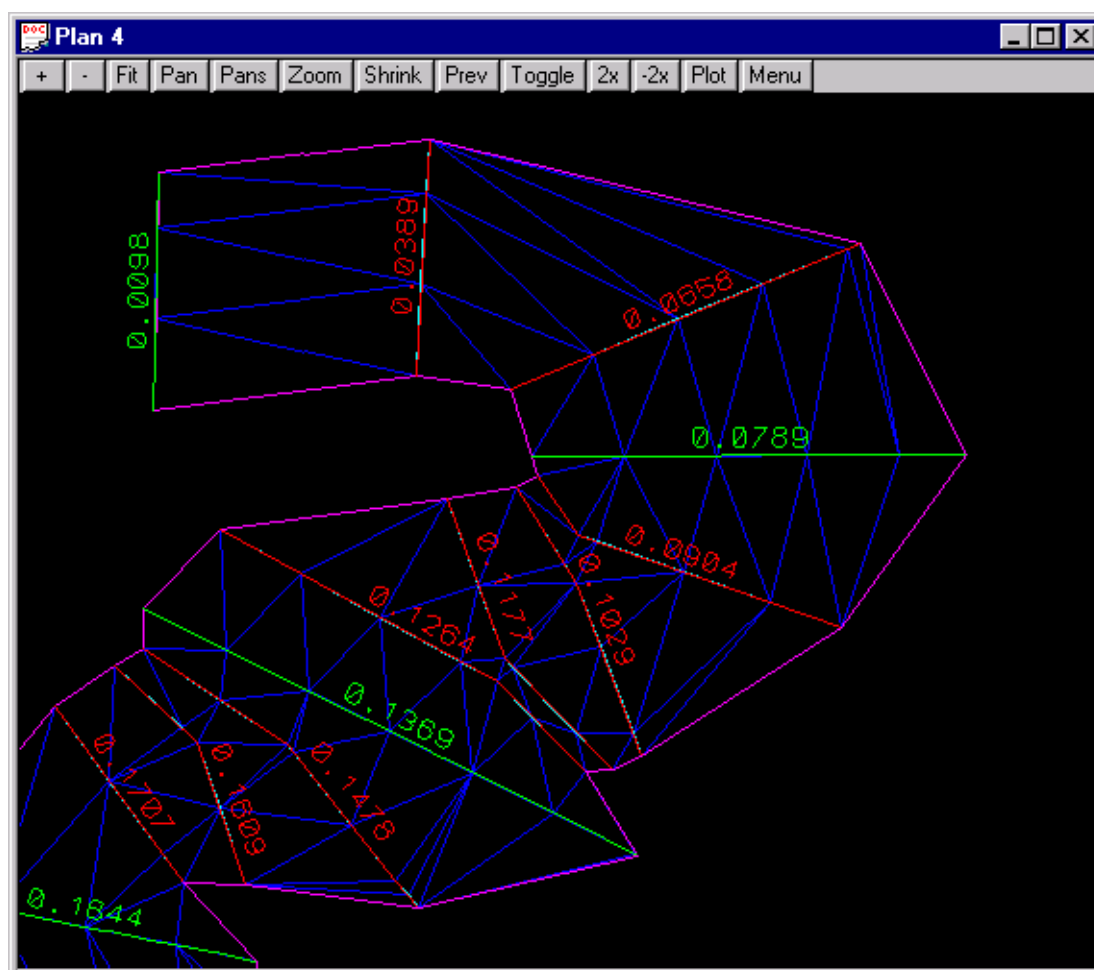
River strings model Model box

The same river strings model specified in the write panel. The river strings are used to sort the cross section and the shape strings. The left and right bank strings are used to check the direction of the strings.

Cross Section model Model box

The same cross section model specified in the write panel. The interface will match the ISIS label and the string name (without the "SECT "). If the ISIS labels were created by 12d then an exact match should result.

However, if the ISIS file was not created by 12d, the file can still be mapped by manually creating cross section strings (2d or 3d strings). See [Mapping non 12d and historical water level data](#).

**Shape string model**

Model box

For meandering rivers, the cross sections (shown in green above) may not be at a close enough spacing to create a water surface that follows the river. 2D shape strings (shown in red above) can be created to create a water surface (shown in blue above) to follow the river. Note that water levels are extended when the shape strings are in a junction area or past the end of a reach.

Reservoir

Model box

Reservoir strings are assigned elevations from the ISIS zsr file. This model is the same as the **storage area stings** specified in the write panel.

Centre line chainage factor

Model box

This data is only required if the Cross sections have been manually created and have no names yet. See [Mapping non 12d and historical water level data.](#)

ISIS results file name

File box

The ISIS zsr file is automatically generated by ISIS.

Ground surface tin

Tin box

If a **boundary string model** is specified below, the intersection of this ground surface and the water surface will be determined. The strings will be stored in the model from the **boundary string model** field.

Water surface tin model Model box

The model to contain the new water surface tin.

Water surface tin Tin box

The name of the water surface tin to be created.

Water level results model Model box

The model where the water surface strings will be created at each cross section and shape string.

Boundary string model Model box

The model to contain the intersection strings between the water and ground surfaces specified above. If left blank no intersection strings will be calculated.

Chord Length Model box

This value set the spacing for the points on the water level strings (both cross section and shape strings). It is recommended that you use a length of no more than half of your average cross section and shape string lengths. A large value in this field may result in unexpected water level profiles for meandering rivers.

Chainage Tolerance Real box

This tolerance is not used for the standard 12d cross section names. However, if the cross section names have been created manually and they can be converted to a real number then this is the tolerance used to match the cross section label from the ISIS report to the cross section string names. A value of 1.0 to 10. is common. See [Mapping non 12d and historical water level data](#) for more details.

A sample of the *.zzr file that is read by 12d follows.

A sample of the zzr file that is read follows.

Maxima and minima of all variables from

time 0.000 hours to time 30.000 hours

maxima of all variables

Label12	Flow	Stage	Froude no	Velocity	Umode	Ustate	
WY201013	y	0.470	87.305	0.033	0.076	7.916	0.000
WY202013	y	0.470	87.288	0.162	0.297	2.335	0.000
WY203013	y	0.470	87.054	0.682	0.794	4.000	0.800
WY204013	y	0.470	86.804	0.671	1.002	0.562	0.000

How to for Rivers

This section lists specific tasks for the rivers interface. Worked examples are contained in the courses directory of 12jobs and training manuals are found in the documentation directory on the 12d model distribution CD.

[Change manual override settings for river strings via attributes](#)

[Manually set a cross section name](#)

[Specify a local inflow at a cross section](#)

[Change the stage increment for reservoir strings](#)

[Boundary Strings are broken. How do I stop this?](#)

[Plot river xsections with the river sections names?](#)

Manual Override settings

Many of the automatic settings can be overridden using string attributes via the [String Attribute Editor](#). To use the editor

1. Select the river or source string to add/edit the attribute for
2. In the **Attribute Name** column use the selection list to find the attribute to change. If it is not listed then type the attribute name into one of the boxes.
3. Change the attribute **Type** to Integer/Real/Text as required
4. Type the attribute value into the **Data** field (erase the **not found** if required).
5. Select **Process**, **Next**, **Previous** or **Pick string**. Selecting **Finish** will NOT save the attribute.

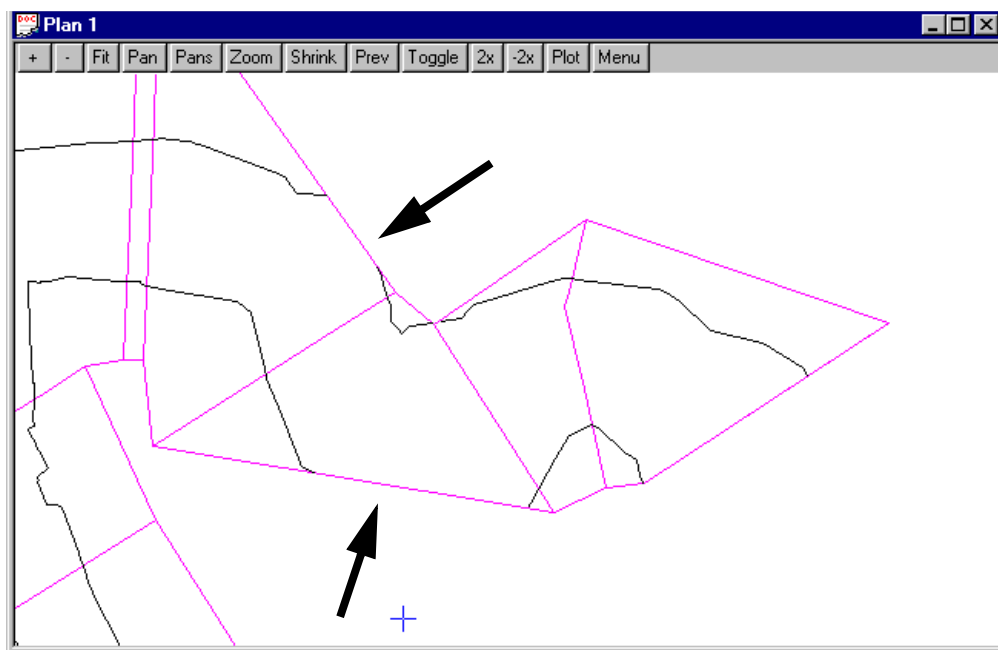
You will be prompted that you will create a new attribute if you have typed in a new attribute for that string

Purpose	String Type	Attribute Name	Type	Typical Data Value
Node/cross section name	source strings	node name	Text	A1
Set a local inflow for this section	source string	flow	Real	10.2
Storage curve increment	storage area strings	stage increment	Real	1.0
Water level string tolerance when comparing numeric string names to data file names	cross sections before importing	tolerance	Real	0.01
Custom n values	source strings	left n, right n, centre n	Real	0.03
Culvert n value	centre line and culverts in spill	roughness	Real	.013
Culvert entrance loss	centre line and culverts in spill	entrance loss	Real	0.5
Culvert exit loss	centre line and culverts in spill	exit loss	Real	1.0

Purpose	String Type	Attribute Name	Type	Typical Data Value
Culvert length	centre line and culverts in spill	length	Real	8.0
Multiple identical culverts	centre line and culverts in spill	number of pipes	Integer	2
Chanel length of a spill string	spill strings	length	Real	30
Channel roughness	spill strings	roughness	Real	0.02
Channel slope %	spill strings	slope	Real	0.5

Boundary Strings are broken. How do I stop this?

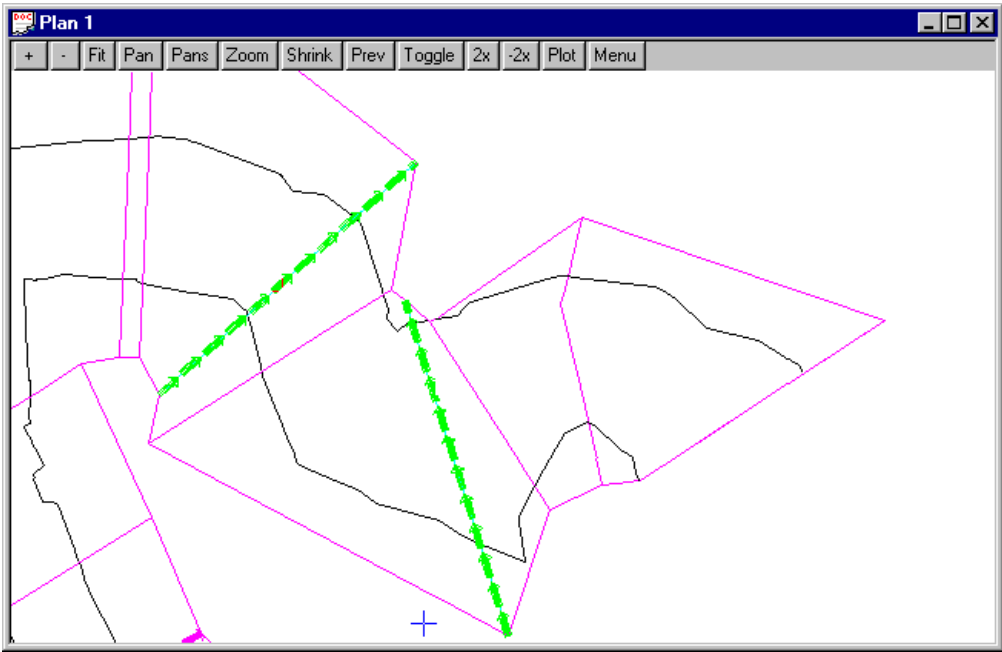
The boundary strings will be broken into sections when the boundary string goes outside the area defined by the cross sections. See below



In these two cases the water level has not exceeded the extents of the cross sections but the boundary strings (black) has gone outside the limits of the water level strings (magenta). **Shape strings** are used to expand the area of the water levels between the sections. The water level assigned to the shape string is a linear interpolation between the upstream and downstream cross section water levels. The interpolation is prorated using the distance along the centre line of the river.

Important! water levels are extended when the shape strings are in a junction area or past the end of a reach.

Shape strings are 2d strings. The direction is not important except for Mike11 models. For Mike11 they must be in the same direction as the cross section strings (usually left bank to right bank). The following drawing shows the boundary string when 2 shape strings have been added (green).



Mapping non 12d and historical water level data

12d can map water levels from river engineering models that were not created by 12d. If the water level results are in the standard HECRAS GIS, HECRAS report, ISIS zsr, UNET, XP SWMM xpx or Mikel1 binary file then the standard 12d readers can be used. If the data is historical or not in any of the standard format the **River Mapper** feature can be used.

River Mapper

Position of option on menu: **Design=>Rivers=>River Mapper**

River cross section water level data in a text file may be mapped and displayed using the 12d River Mapper interface. 2d strings are created by the user with the plan shape of the cross sections. 12d assigns water levels from a text file to these strings. These strings are then triangulated to create a water surface tin.

See also

[Presenting Water Level Results](#)

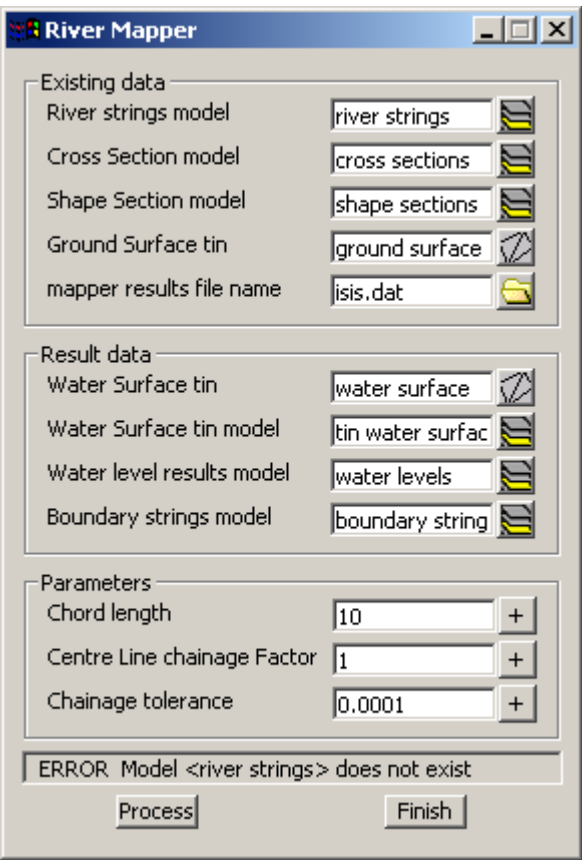
[How to for Rivers](#)

[Frequently Asked Questions \(Rivers\)](#)

Usage

The steps are as follows:

1. Create the [river strings](#) (centre line, left bank and right bank).
2. Create 2d [source strings](#). Use your name for the cross section as the string name. 12d will match the water levels in the file to this string using the name as the key. If you do not assign a name the interface will assign names to strings according to the chainage along the centreline and the value of **.Centre line chainage factor**.
3. From the **Design->Rivers** menu select **River Mapper**.
4. Fill in the fields in the dialogue for the rivers strings (step 1 above) and the cross sections (step 2 above).



River strings model Model box

The river strings model specified in the write panel.

Cross Section model Model box

*The cross section model specified in the write panel. The interface will search the string names in this model for the cross sections specified in the HEC-RAS report. A match is successful if the HEC-RAS cross section chainage and the string name are within the tolerance specified below in **Chainage tolerance**.*

Shape string model Model box

For meandering rivers, the cross sections may not be at a close enough spacing to create a water surface that follows the river. 2D shape strings can be created (automatically or manually) to create a water surface to follow the river. Note that water levels are extended when the shape strings are in a junction area or past the end of a reach.

Centre line chainage factor Model box

If you assigned the source/cross section string a name in Step 2 this field is not used. Otherwise, the centre line chainage and the Centre line chainage factor are used to name your source string/cross sections in 12d. The cross sections will be named in the same units as the 12d data if a Centre line chainage factor of 1 is specified. If your existing data uses cross section names in your data file are in kilometres and your 12d data in meters, you will want to use a Centre line chainage factor of 1000. If your existing data cross section names are in miles and your 12d data is in feet then a Centre line chainage factor of 5280 would be used.

Mapper results file name File box

The report is a tab (or space) delimited text file (usually created by a text editor or spreadsheet). The format is

cross section name <tab> water level elevation

each section name with its water level must be on a separate line. For example.

<i>Section A</i>	<i>2.31</i>
<i>Section B</i>	<i>2.32</i>

If the names contain letters (abc..) then the section name must match the 12d string names exactly (case sensitive). If the names are real numbers than a tolerance for the matching (global and string specific) can be set (see parameters).

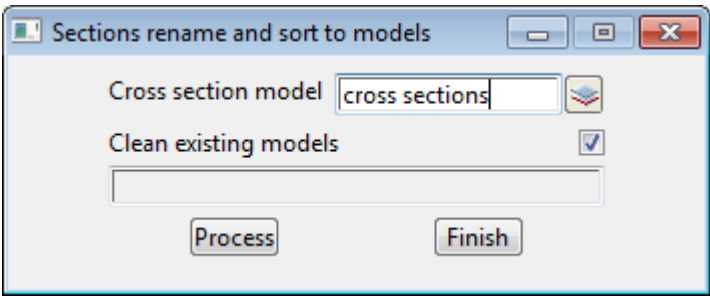
1.0 Rivers Rename and Move Cross Sections

Position of option on menu: **Design =>Rivers=>Xsections rename and move**

River cross section names begin with the river reach number followed by the cross section chainage. To plot these x sections they need to be renamed to the 12d chainage standard.

This routine gets the cross section model name moves the cross section to a model with the name as a prefix followed by the reach number. The reach number is removed from all of the cross section name.

On selecting the **Xsections rename and move** option, the panel is displayed.



These defaults are used when creating a manhole in a drainage string. The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Cross section model	model box		
<i>this model holds the cross sections created by one of the river interface routines. The name of this model will used as the prefix for the new models to hold the renamed cross sections.</i>			
Clean existing models	tick box		
<i>when selected the models that the cross sections are to be moved to will be cleaned before the supplied cross sections are moved into them.</i>			
Process	button		
<i>moves and renames the cross sections</i>			

12d System Path

When looking for system files 12d first checks your local project directory (the directory that hold the *.project folder), and then the system folders. Unless you have changed these folders in your env.4d file the path is first "program files\12d\12dmodel\5.00\user" and then "program files\12d\12dmodel\5.00\set_ups". In summary:

1. local project directory (the directory that hold the *.project folder)
2. program files\12d\12dmodel\5.00\user
3. program files\12d\12dmodel\5.00\set_ups

Never modify the files in set_ups. Copy them to the user directory and make your changes there. Here they are safe from being changed during future 12d updates. The only time you will want files in the local project directory is when you have some project specific data. Master_drainage.xp and Master_rivers.xp are good examples of such cases.

[More on System files
Attribute Editor](#)

FAQ Rivers

[XP SWMM does not start or gives errors when starting from 12d](#)



21 Pipeline

Position of menu: Design =>Pipeline

The **Pipeline** option is used to place large diameter pipelines.

The pipeline is very similar to an alignment string in that it is defined by separate horizontal and vertical geometries.

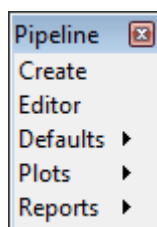
The major differences between a pipeline and an alignment is that a pipeline has a diameter and normally uses circular curves in the vertical geometry rather than the parabolic curves used for alignments.

The pipeline is entered by placing the invert (bottom) of the pipe. Hence in a plan view, the horizontal geometry places the centre of the pipeline. The vertical geometry of the pipeline is for the invert (bottom) of the pipeline.

Note

A **pipeline** string is not the same as a **pipe** string. A **pipe** string is only a 3d string with a diameter.

The **Pipeline** walk-right menu is



For the option *Create*, go to

Editor

Defaults

Plots

Reports

[Create](#)

[Editor](#)

[Defaults](#)

[Plots](#)

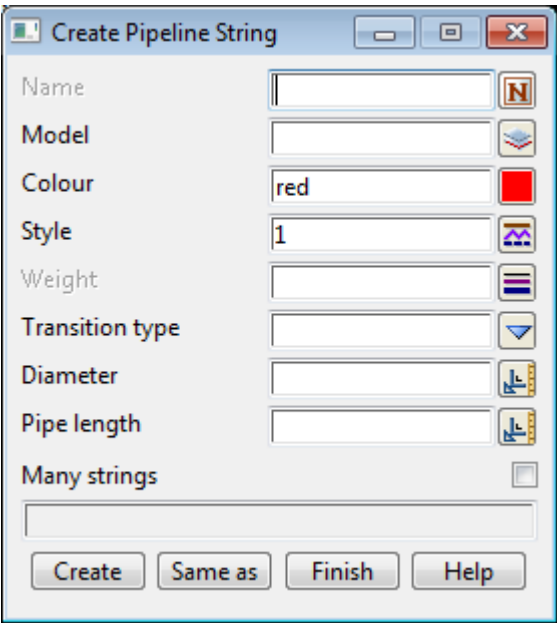
[Reports](#)

Create

Position of option on menu: Design =>Pipeline =>Create

The **Create** option is used to produce **new** pipelines. If a pipeline string already exists, the **Edit** option is used to modify it.

On selecting the **Create** option, the **Create Pipeline String** panel is displayed.



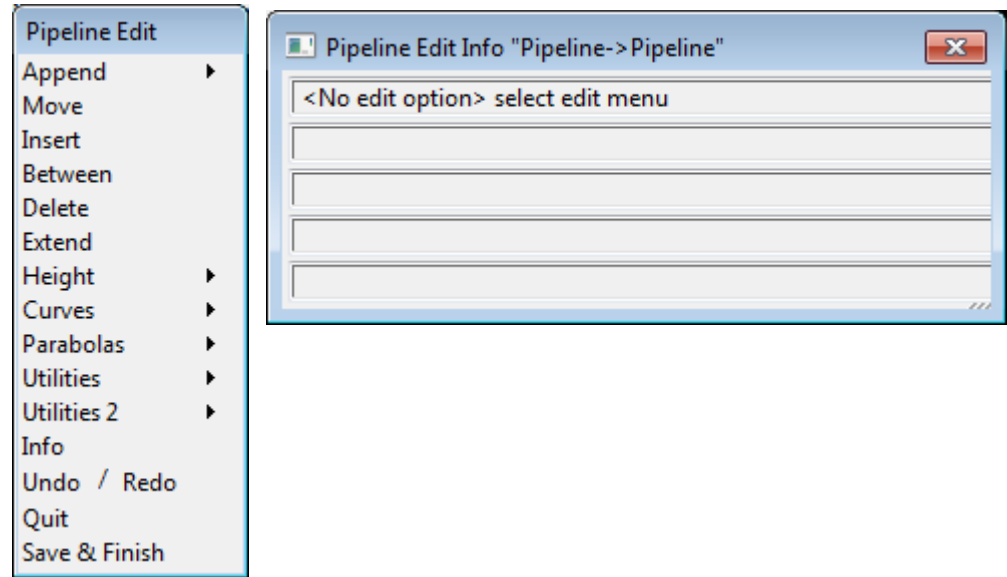
To create a new pipeline string, the pipeline's name, model, colour, style, spiral type and pipe diameter, plus the standard length of pipes used to make up the pipeline are entered into the appropriate fields and the **Create** button selected.

As for a 3d string, to create a new pipeline string with some of the **same** name, colour, model, style etc. **as** an existing string (not necessarily a pipeline), the **same as** button is chosen and the appropriate string selected.

The **Create Pipeline String** panel is then removed and the **Pipeline Edit** menu and **Pipeline Edit Info** panel fired up.

The **Pipeline Edit** menu contains all the options for creating/editing a pipeline string. The **Pipeline Edit Info** panel contains information areas.

The **Pipeline Edit** menu and **Pipeline Edit Info** panel are



As for an alignment string, to create a new pipeline string the user selects the **Append=>HIP's** option from the **Pipeline Edit** menu and start placing points in a plan view.

Since the **Pipeline Edit** menu and **Pipeline Edit Info** panel are the same as those used when editing

a pipeline string, the options will be discussed in the following sections under the pipeline **Edit** option.

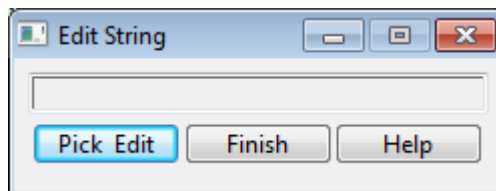
For information on pipeline editing, please continue to the section [Pipeline Editor](#).

Editor

Position of option on menu: Design =>Pipeline =>Editor

This is the same option as **Editor** from the **Strings** walk-right menu on the **12d Model** menu.

The string editor is used to modify any **12d Model** strings. After selecting the **Editor** option, the **Edit String** panel is placed on the screen to record any error messages.



The option is already in the **Pick** mode (the **Pick & Edit** button only needs to be selected if the pick was cancelled) and the user simply picks and accepts the string to be edited.

From the picked string's type, the editor is able to determine the edits that apply to the string and list them in the string's **Edit** menu.

If a pipeline string is selected, the **Pipeline Edit** menu and **Pipeline Edit Info** panel (as shown in the previous section) are placed on the screen.

The individual edit operations for a pipeline string will now be discussed in detail.

Please continue to the next section [Pipeline Editor](#).

Pipeline Editor

Position of option on menu: Design =>Pipeline =>Editor

A pipeline string is defined by specifying both the horizontal and vertical geometry of the invert (bottom of the pipeline) as separate operations.

The horizontal geometry consists of a series of (x,y) points (called horizontal intersection points) and circular curves applied to the intersection points.

Vertical geometry also consists of a series of points but they are defined with respect to the plan length of the string (chainage) and height. Hence, the vertical geometry is defined by a series of (chainage,height) points (called vertical intersection points) and circular curves applied to the vertical intersection points.

The horizontal geometry is usually defined in a plan view and the vertical geometry in a section view. Hence the pipeline string editor can edit information for the string on both plan and section views.

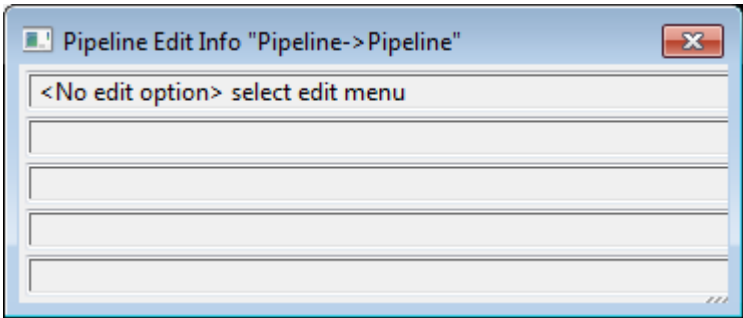
Note: the string can only be edited on a section view if the string is also profiled on the section view.

On selecting a pipeline string the **Pipeline Edit** menu and **Pipeline Edit Info** panel are placed on the screen.

The **Pipeline Edit** menu is

Pipeline Edit	
Append	▶ append or prepend an IP
Move	move an IP or TP
Insert	insert an IP
Between	insert on IP-IP line
Delete	delete an IP
Extend	extend an IP
Height	▶ modify the strings z-value
Curves	▶ circular curves, spirals
Parabolas	▶ VG only, radius or length
Utilities	▶ interval, start chainage, validate, clear etc.
Utilities 2	▶ set diameter and pipe length
Info	toggle edit info panel
Undo / Redo	undo and redo
Quit	quit the edit session
Save & Finish	finish the create

and the **pipeline edit info** panel is



To edit the selected pipeline string, simply select the required edit option from the list of all possible edits in the **pipeline edit** menu.

The edit is **cancelled** by selecting the **cancel** option. The edited string is restored to its pre-edit state and the option terminated.

The edit is **finished** and the new string placed in the given model when the **finish** option is chosen. The edit option then terminates.

When either **quit** or **finish** is selected, a **yes-no-cancel** panel is displayed and the user must confirm the selection.

The **pipeline edit info** panel is used to display information and messages during editing of the pipeline string.

The main message area indicates the purpose of the mouse buttons at each step.

Message area 1 displays the current pipeline edit option and message area 5 indicate the next step in the edit option.

Message areas 2 and 3 are used to display information about the string as the cursor is moved near the string and the string points. For example, for the closest IP, the (x,y,z) position and radius of the IP is displayed in area 2, and in area 3 the bearing-in, bearing-out and deflection angle for the adjacent IPs.

Message area 4 displays the cover above the pipeline and the vertical, horizontal and combined joint deflection.

Most of the options are identical to the edit options for an alignment string and will not be discussed in detail again. The options that are only applicable to a pipeline string will be fully described.

Append

HIPs

In a plan view, the **append=>HIPs** option is used to create the first horizontal point in a new pipeline string, to append a new horizontal intersect point to the end of the string or to prepend a new horizontal intersection point to the beginning of the string. The horizontal geometry is for the centre of the pipe in plan.

VIPs

In a section view, the **append=>VIPs** option can be used to create and edit the vertical geometry of the picked string if the string is a primary string on any section view. This can be achieved by using either the **VG edit** or the **profile** option from the section view **View ops** menu. The vertical geometry is for the invert (bottom) of the pipe.

The **append** option is the same as **append** for an alignment string and will not be described further.

Move

The **move** option can be used for moving individual horizontal and vertical intersection and tangent points.

The option acts on the horizontal geometry if the point to move is selected in a plan view, or the vertical geometry if the point to move is selected in a section view.

The **move** option is the same as **move** for an alignment string and will not be described again.

Insert

The **insert** option is designed to place a new intersection point in a string between two adjacent horizontal or vertical intersection points (note that the inserted point does not have to be on the line joining the two intersection points).

The **insert** option is the same as **insert** for an alignment string and will not be described again.

Between

The **between** option is similar to the **insert** option except the inserted point **does** have to be on the line joining the two intersection points. To accomplish this, the cursor position is automatically projected onto the IP-IP line to give the new IP point position.

The **between** option is the same as **between** for an alignment string and will not be described again.

Delete

The **delete** option is used to delete horizontal or vertical intersection points from the string.

The **delete** option is the same as **delete** for an alignment string and will not be described again.

Extend

The **extend** option is used to move an intersection point along the line joining the intersection point to its neighbouring intersection point.

The **extend** option is the same as **extend** for an alignment string and will not be described again.

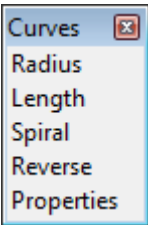
Height

The height option is used to modify the height of a vertical intersection point in the string.

The **height** option is the same as **height** for an alignment string and will not be described again.

Curves

The **curves** option allows the user to add circular curves of a given radius to a either horizontal or vertical intersection points.

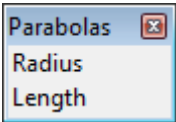


The **curve** option is the same as **curve** for an alignment string and will not be described again.

Parabolas

The **parabolas** option is for adding parabolic curves to the **vertical geometry**.

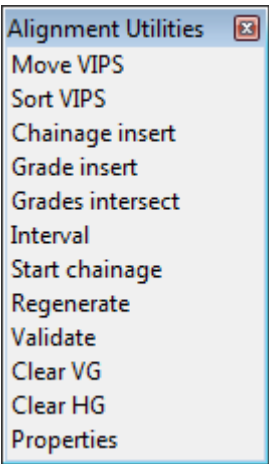
For pipelines, circular curves are normally used on vertical curves.



The **parabolas** option is the same as **parabolas** for an alignment string and will not be described again.

Utilities

The **Alignment Utilities** walk-right menu contains a number of useful miscellaneous options for the pipeline string. The menu is

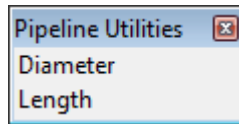


Each of these options is the same as for an alignment string and will not be discussed again.

Utilities 2

The **utilities 2** walk-right menu contains options to modify the diameter of the pipeline and to set the standard length of the pipes used to construct the pipeline.

The **utilities 2** walk-right brings up the **Pipeline Utilities** menu:



Diameter

The **Diameter** option is used to change the diameter of the pipeline string.

After selecting the option, an enter value typed-input box is displayed on the screen containing the pipeline's current diameter.

The new diameter is entered into the typed-input box, terminated with <return>.

The typed-input box then disappears and the option terminates.

Length

The **Length** option is used to change the length of the standard pipe used to construct the pipeline string.

The length of the pipes used in constructing the pipeline string is used for calculating joint deflections along the pipeline.

After selecting the option, an enter value typed-input box is displayed the pipeline's current standard pipe length.

The new length is entered into the typed-input box, terminated with <return>.

The typed-input box then disappears and the option terminates.

Info

The **pipeline edit info** panel is toggled **on/off** by the **info** option in the **pipeline edit** menu.

Quit and Finish

Even after points are created for the new string, the create process can be **aborted** by selecting the **quit** option from the **pipeline edit** menu. The option then terminates and **no** string is created.

The create process is completed and the new string created and placed in the given model when the **finish** option is chosen from the **pipeline edit** menu.

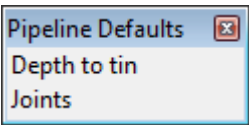
When either the **finish** or **quit** option is selected, a **yes-no-cancel** panel is displayed and the user must confirm the selection.

Defaults

Position of menu: Design =>Pipeline =>Defaults

The **defaults** menu sets default depth to tin and joint deflection angle.

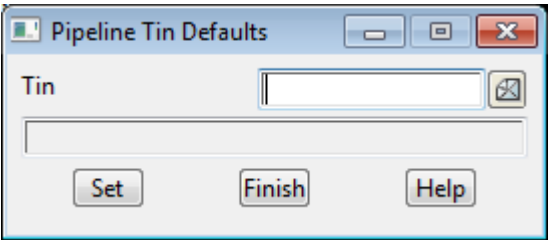
The **default** walk-right menu is



For the option Depth to tin, go to [Depth to Tin Joints](#)

Depth to Tin

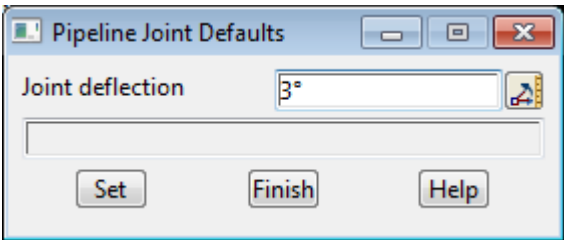
Position of option on menu: Design =>Pipeline =>Defaults =>Depth to tin
On selecting the tin option, the pipeline tin defaults panel is displayed.



This panel is for setting the default terrain tin which is used to calculated the cover above the pipeline.

Joints

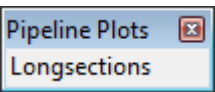
Position of option on menu: Design =>Pipeline =>Defaults =>Joints
On selecting the joints option, the pipeline joint defaults panel is displayed.



This panel is for setting the maximum joint deflection for the individual pipes that make up the pipeline.

Plots

Position of menu: Design =>Pipeline =>Plots
Currently the plots menu contains only one option and it is used for producing longsection plots of major pipelines.
The plots walk-right brings up the pipeline plots menu:



This option will now be described in more detail.

Please continue to the next section [Longsections](#).

Longsections

Position of option on menu: Design =>Pipeline =>Plots

Position of option on menu: Plot =>Pipeline Plot PPF Editor

For more information please go to the section [Pipeline Plot PPF Editor](#) in the Chapter [PPF Editors](#)

For a description of the pipeline plot parameters, please go to the section [Pipeline Plot Parameters](#).

Pipeline Plot Parameters

The **pipeline plot** option is used to make special long section plots for a **network** of pipeline strings.

Some of the look of the pipeline long section plot can be controlled from the **plot pipeline network** panel itself, however a wider selection of control parameters is available by using a pipeline long plot, plot parameter file.

The pipeline long section plot parameters are placed in a file with ending **.ppf**.

Each parameter consists of a parameter name followed by one or more spaces and then the parameter value. There is only one parameter per line.

Anything on a line after a double forward slash **//** is considered to be a comment.

The set of all parameters for the pipeline long section plot is enclosed within a set of curly brackets **{ }** with the header

```
pipeline_long_plot    "plot set name"
```

before the curly brackets.

That is,

```
pipeline_long_plot    "plot set name"  {  
                                plot parameters  
                                one per line  
                                }
```

If there is more than one `pipeline_long_plot` parameter set in the file, only the first set is used.

There may also be parameter sets for other plot types such as `section_x_plot` in the same file.

The other sets will be ignored when doing a pipeline long section plot.

Plot Sheet Layout

The plot sheet is considered to have only positive co-ordinates with the origin (0,0) in the left hand corner. The units for the plot are millimetres.

The overall size of the plot sheet is given by either a defined sheet size, or by the width and height of the plot given in millimetres and separated by one or more spaces.

```
sheet_size            text            // sheet name, or  
                      "mm    mm"      // sheet size: width  height
```

The sheet size name and width and heights can be specified by the user in a file named `sheet_sizes_definitions` which is in the normal set up areas, or is pointed to by the environment variable

```
SHEET_SIZES_4D        file            // file of plotter sheets sizes
```

The long plot is then positioned within the plot sheet by giving the margins

```
left_margin           mm  
right_margin          mm  
top_margin            mm  
bottom_margin         mm
```

The (left_margin,bottom_margin) defines the left hand corner position of the long plot on the plot sheet.

The right_margin and top_margin need not be set and if missing, will be calculated from the other plot parameters defining the plot layout.

The pipeline long section plot will break an individual plot up if it doesn't fit across the sheet. There can be one or more rows of plot on the same sheet.

The top row is done first, followed by the second top row, then the third and so on until the bottom row. If there is only one row, it is considered to be the bottom row.

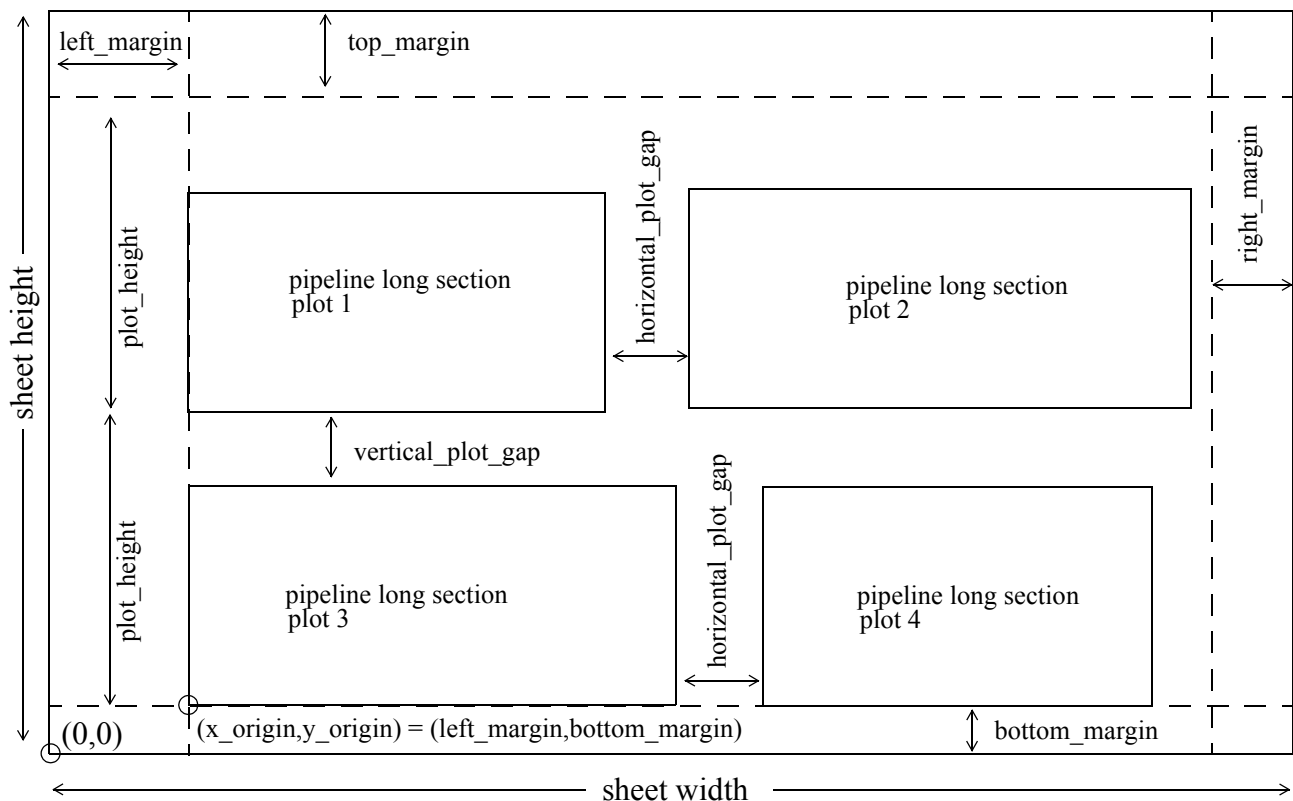
When a sheet is full, a follow on sheet is created.

As soon as one pipeline string is completed, the next pipeline string in the network model is plotted beginning on the same row as the previous pipeline string and with a horizontal gap of size horizontal_plot_gap between the plots. If there is not enough room on the row to start the next plot, it will begin on a new row.

The position of the left hand bottom corner of the first plot in the bottom row is given by the parameters, left_margin and bottom_margin.

If there are two or more rows of plots, the position of the first plot in each row is given by adding multiples of the (plot_height+vertical_plot_gap) to the bottom_margin.

network_model	text	// model of pipeline strings
left_margin	mm	// Position of the left hand bottom
bottom_margin	mm	// corner of first plot in the bottom row.
only_one_line	0	// more than one row on a sheet
	1	// only one row of plot on a sheet
plot_height	mm	// total height of a plot row. It doesn't
		// includes the vertical_plot_gap.
horizontal_plot_gap	mm	// gap between plots on same row
vertical_plot_gap	mm	// gap between rows of plots



The pipeline long plot itself consists of seven areas. From the bottom up, they are boxes, below datum, bottom stagger, graph, top stagger, arrow 4 area and top.

The **boxes area** is where the chainages and various values for the pipeline strings are labelled.

The **below datum area** is a region between the boxes area and the datum line.

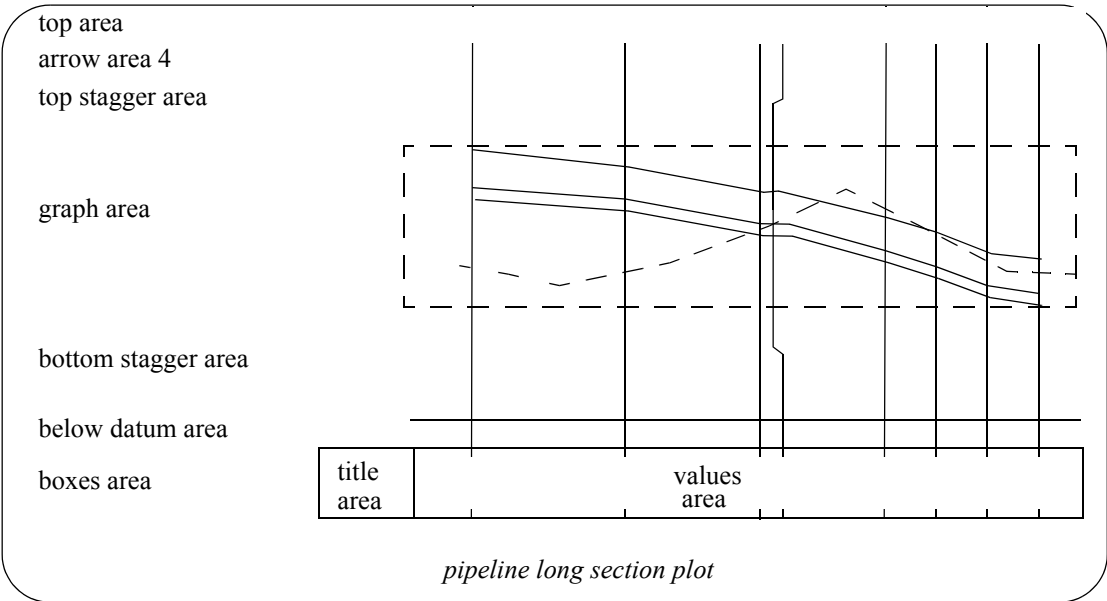
The **bottom stagger area** is where the upright line staggers occur before going up from the boxes area to the graph area.

The **graph area** is the area where the actual plots of the strings are drawn.

The **top stagger area** is where the upright line staggers occur above the graph area.

The **arrow 4 area** is an extension of the uprights above the top stagger area to allow for the drawing of arrows where the arrows go between the staggered uprights above the graph area.

The **top area** is an annotation area above the arrow 4 area (the top of the plot) and is used for pegs and deflection angles.



Apart from information labelled in the boxes and top areas, the pipeline long section plot can place arrows between ips for other information such as

- (a) pipe grade
- (b) vertical geometry
- (c) horizontal geometry

Also the chainages where services cross the pipeline line are automatically labelled.

Chainages, Staggering and Uprights

For the pipeline plot, the labelling of pipe invert levels, pipe invert, depth to invert, pipe grade and natural surface level are done at the chainages:

- (a) pegs given by the peg_interval
- (b) horizontal and vertical deflection points
- (c) points in the specials model
- (d) crossing services

The points in the specials model are projected onto the pipeline string and the chainages used for labelling. If the point is a 4d string, then the text at the point is used as a text label at the top of the plot.

The peg interval and specials model are given by the parameters

peg_interval	<i>world-units</i>	// distance between pegs
specials_model	<i>text</i>	// model name

Uprights, or leader lines, are drawn from the values at the bottom of the plot to the top of the plot for cases (a), (b) and (c), or to the crossing service in the graph area for case (d).

If the text values are placed at the real chainage positions at the bottom of the plot, text overwriting can easily occur if the chainages are very close together.

To prevent such overwriting, the text can be **staggered**.

That is, if the text is going to overwrite a previous text value, the next text value is actually moved along until there is no overwriting.

Since the text is no longer at the correct chainage position, the uprights to the pegs and services start at the text position and then bend back to the correct chainage position on the plot. The region where the bending occurs is called the stagger area.

For the pipeline plot, there is an area below the graph where the uprights bend backwards from the staggered text position to the real chainage position (bottom stagger area).

There is a second area above the graph where the uprights bend forwards from the real chainage position to the staggered text position (top stagger area).

Hence annotation above the top stagger area will line up with the staggered values below the bottom stagger area.

The stagger area below the graph area is defined by

stagger_height_1	<i>mm</i>	// distance from the top of datum to the // start of the staggers
stagger_height_2	<i>mm</i>	// distance over which stagger occurs
stagger_gap_bottom	<i>mm</i>	// distance from end of staggers to the // bottom of the graph area

The stagger area above the graph area is defined

stagger_gap_top	<i>mm</i>	// distance from top of the graph area to // the start of the staggers
stagger_height_3	<i>mm</i>	// distance over which stagger occurs
stagger_height_4	<i>mm</i>	// distance from end of staggers to the // bottom of above upper staggers area

The distance to be left for text to avoid overwriting is:

horizontal_text_gap	<i>mm</i>	// minimum distance to leave for text // after peg values
services_text_gap	<i>mm</i>	// minimum distance to leave for text // after service values

When staggering occurs, it is possible for the values area to be longer than the graph area.

For the uprights that are drawn from the text to the pegs, specials and services:

line_colour	<i>colour</i>	// colour of uprights to the pegs and // specials
service_line_colour	<i>colour</i>	// colour of upright to the crossing // services
service_text_colour	<i>colour</i>	// colour of the name of the service.
service_text_size	<i>mm</i>	// size of the service text.

service_il_text_size	<i>mm</i>	// size of the service invert level text.
----------------------	-----------	-------------------------------------------

service_il_textstyle *text* // textstyle of the service il text
service_il_text_colour *colour* // colour of the service il text

Label vertical geometry:

v_g_text_size *mm* // size of the vertical geometry text
v_g_textstyle *text* // text style of the vertical geometry text
v_g_text_colour *colour* // colour of the vertical geometry text

Label horizontal geometry:

h_g_text_size *mm* // size of the horizontal geometry text
h_g_textstyle *text* // textstyle of the horizontal geometry text
h_g_text_colour *colour* // colour of the horizontal geometry text

Label pegs:

peg_text_size *mm* // size of the peg label
peg_textstyle *text* // text style of the peg label
peg_text_colour *colour* // colour of the peg label

Label special chainage:

chainage_special_text_size *mm* // size of the special chainage text
chainage_special_textstyle *text* //textstyle of the special chainage text
chainage_special_text_colour *colour* // colour of the special chainage text

Boxes Area

The pipeline string values of chainage, invert level, depth to pipe invert or depth to top of pipe, grade and natural surface level can be labelled in the pipeline long section plot with one line of title, and the actual values given at the chainage of each peg in the pipeline string.

The **titles** for the string values, are drawn in the **titles area** of the **boxes area** and the values are drawn in the **values area** of the **boxes area**.

Consequently the boxes area is made up of rows of text consisting of:

title followed by the **values** along the string.

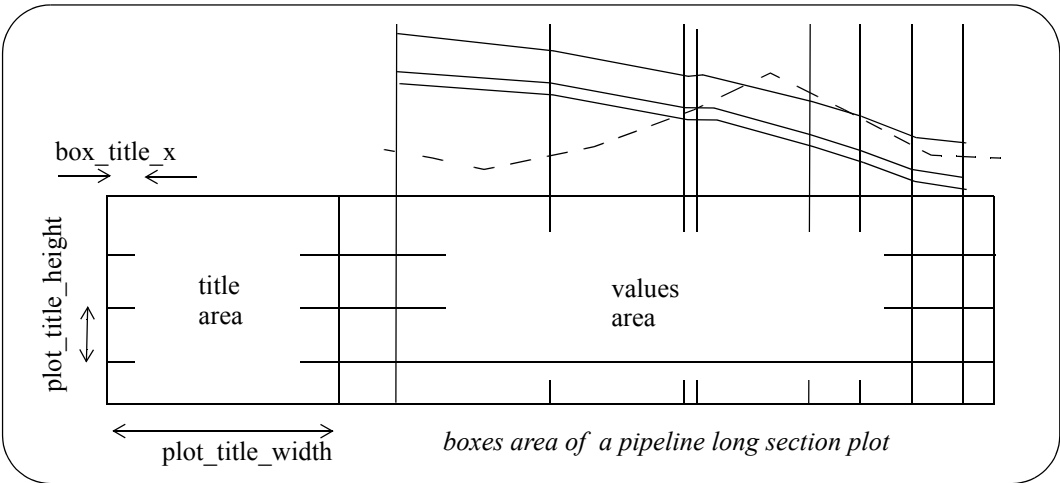
Each row is surrounded by lines to form a box.

The **titles area** for the left plot in the bottom row starts at the co-ordinate (left_margin, bottom_margin) and each row is begun by adding the distance (plot_height + vertical_plot_gap) to the bottom_margin.

The width of the title box is given by the **plot_title_width** parameter and the height of each box is given by **plot_title_height**.

plot_title_width	mm	// width of the label boxes.
plot_title_height	mm	// height of each box
box_titles_x	mm	// the distance between the left of the // title box and the title

The **values area** starts at the end of the label area and the values text is written at right angles to the bottom of the boxes.



The colour of the box line work is given by:

plot_title_line_colour	colour	// colour of the lines in the boxes
------------------------	--------	-------------------------------------

A default text size and colour can be specified for the title text, and the size and colour of the values. These can be overridden by parameters (given later in this section).

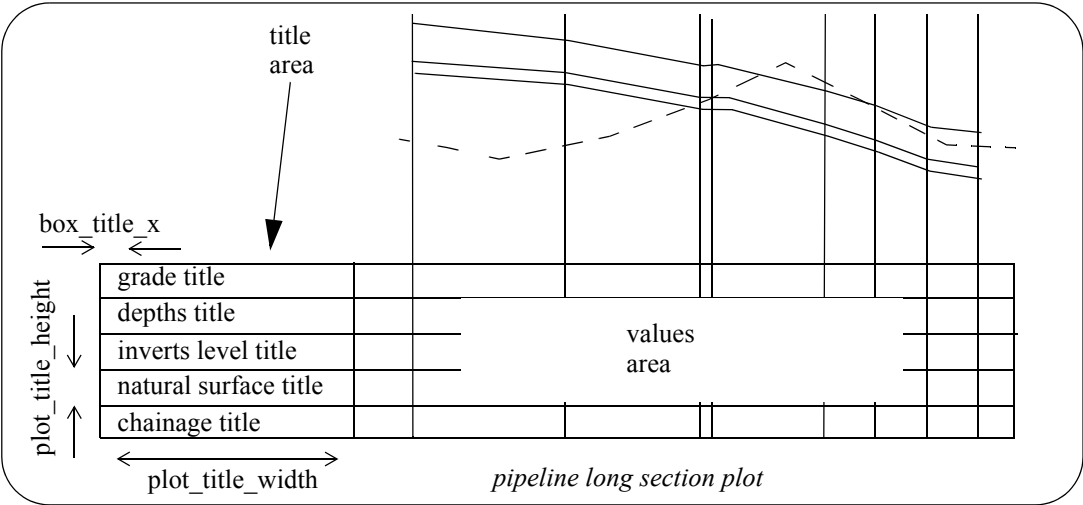
plot_title_text_size	mm	// size of label text in boxes
plot_title_text_colour	colour	// colour of label text in boxes
text_size	mm	// size of value text
text_colour	colour	// colour of values in boxes

The width of the **values** area is determined by the number of chainages to be labelled and whether the values are staggered to prevent over writing.

The total width of the boxes area is the width of the labels area plus the width of the values area which depends on the amount of staggering that occurs.

The order of drawing and labelling the boxes from the bottom up is

- (a) chainage values
- (b) natural surface heights
- (c) pipe invert levels
- (d) depth to invert or depth to top of pipe
- (e) grade of pipeline



The text, size, textstyle and colour for the title text and values text for each box can be set by:

(a) pipeline string chainages

plot_title_chainage_name	text	// label for chainages box
chainage_title_text_size	mm	// size of chainage title text in boxes
chainage_title_textstyle	text	// the textstyle of chainage title text in boxes
chainage_title_text_colour	colour	// colour of chainage title text in boxes
chainage_text_colour	colour	// colour of chainage text in boxes
chainage_text_size	mm	// size of chainage text in boxes
chainage_textstyle	text	// the textstyle of chainage text in boxes
chainage_decimals	integer	// number of decimal places
		// If > 0, trailing zeros are removed after
		// the decimal point.
		// If < 0, the absolute value is taken as the
		// number of decimal places to report
		// i.e. no trailing zeros are removed

(b) natural surface values

plot_title_surface_name	text	// label for the pipeline ns value
ns_title_text_size	mm	// size of ns title text in boxes
ns_title_textstyle	text	// the textstyle of ns title text in boxes
ns_title_text_colour	colour	// colour of ns title text in boxes
ns_text_colour	colour	// colour of ns text in boxes
ns_text_size	mm	// size of ns text in boxes
ns_textstyle	text	// the textstyle of ns text in boxes
ns_decimals	integer	// number of decimal places
		// If > 0, trailing zeros are removed after
		// the decimal point.
		// If < 0, the absolute value is taken as the

// number of decimal places to report
 // i.e. no trailing zeros are removed

(c) pipe invert values

plot_title_invert_name	<i>text</i>	// label for the invert level
il_title_text_size	<i>mm</i>	// size of il title text in boxes
il_title_textstyle	<i>text</i>	// the textstyle of il title text in boxes
il_title_text_colour	<i>colour</i>	// colour of il title text in boxes
il_text_colour	<i>colour</i>	// colour of il text in boxes
il_text_size	<i>mm</i>	// size of il text in boxes
il_textstyle	<i>text</i>	// the textstyle of il text in boxes
il_decimals	<i>integer</i>	// number of decimal places
		// If > 0, trailing zeros are removed after
		// the decimal point.
		// If < 0, the absolute value is taken as the
		// number of decimal places to report
		// i.e. no trailing zeros are removed

(c) depth to invert or depth to top of pipe

depth_mode	0	// if 0, depth to invert of pipe - default 0
	1	// if 1, depth to top of pipe (cover)
plot_title_depth_name	<i>text</i>	// label for depth of invert
depth_title_text_size	<i>mm</i>	// size of depth title text in boxes
depth_title_textstyle	<i>text</i>	// the textstyle of depth title text in boxes
depth_title_text_colour	<i>colour</i>	// colour of depth title text in boxes
depth_text_colour	<i>colour</i>	// colour of depth text in boxes
depth_text_size	<i>mm</i>	// size of depth text in boxes
depth_textstyle	<i>text</i>	// the textstyle of depth text in boxes
depth_decimals	<i>integer</i>	// number of decimal places
		// If > 0, trailing zeros are removed after
		// the decimal point.
		// If < 0, the absolute value is taken as the
		// number of decimal places to report
		// i.e. no trailing zeros are removed

(d) grade of pipeline

plot_title_grade_name	<i>text</i>	// grade of pipe at the peg
grade_title_text_size	<i>mm</i>	// size of grade title text in boxes
grade_title_textstyle	<i>text</i>	// the textstyle of grade title text in boxes
grade_title_text_colour	<i>colour</i>	// colour of grade title text in boxes
grade_text_colour	<i>colour</i>	// colour of grade text in boxes
grade_text_size	<i>mm</i>	// size of grade text in boxes
grade_textstyle	<i>text</i>	// the textstyle of grade text in boxes
grade_decimals	<i>integer</i>	// number of decimal places
		// If > 0, trailing zeros are removed after
		// the decimal point.
		// If < 0, the absolute value is taken as the
		// number of decimal places to report
		// i.e. no trailing zeros are removed

Below Datum Area

The **below datum area** is the region between the boxes area and the arrow_1 area. The datum line is drawn at the top of the below datum area.

datum_title_text_size	<i>mm</i>	// size of datum title text and value
datum_title_textstyle	<i>text</i>	// textstyle of datum title text and value
datum_title_text_colour	<i>colour</i>	// colour of the datum title text and line

The size of the below datum area is

datum_gap	<i>mm</i>	// height of the below datum area
-----------	-----------	-----------------------------------

The datum value is placed above the datum line.

Since the datum value is automatically calculated to try and fit the plot vertically into the graph area, the datum value can change along the plot. When a datum change occurs, the new datum value is written on the datum line at the relevant chainage position.

The datum name, text size and colour are controlled by:

datum_text_size	<i>mm</i>	// size of datum title text and value
datum_textstyle	<i>text</i>	// textstyle of datum title text and value
datum_text_colour	<i>colour</i>	// colour of the datum title text and line

datum_name	<i>text</i>	// text to write before the datum value
datum_text_size	<i>mm</i>	// size of datum text and value
datum_colour	<i>colour</i>	// colour of the datum text and line

Graph Area

The **graph area** is the area where the actual plots of the pipeline strings are drawn.

The length of the graph area is determined by the length of the pipelines string to be plotted (given by the start and end chainages) and the horizontal scale (given by scale) of the plot.

scale	<i>value</i>	// 1:value - horizontal scale // The vertical scale is determined by the // horizontal scale and the vertical // exaggeration for the section view.
start_chainage	<i>value</i>	// “ ” means use start of pipeline strings
end_chainage	<i>value</i>	// “ ” means use end of pipeline strings

The vertical exaggeration is taken from the section view specified for the plot by the parameter:

view_name	<i>text</i>
-----------	-------------

The tins to be sectioned through by the pipeline strings and any service models and corridor settings for the graph area are also taken from the specified section view.

The height of the graph is calculated by subtracting the height of the first five areas (i.e. don't include the top area) from the plot height.

If the plot will not fit horizontally into a row on the sheet, then the plot will be broken at an appropriate peg and the plot continued on another row.

Datum breaks at pegs are used to try and fit the plot vertically into the graph area but if the plot still cannot fit, then it will be truncated at the bottom.

The types of strings that can be drawn in the graph area of the pipeline long section plot are:

- (a) pipeline string the strings from the network model
- (b) tins sections of the pipeline string through any tins on the section view.
- (c) services parts of strings from any models on the section view that cut the

corridor for the section view.

The **colour** of the strings in the plot is the actual string colour for cases (a) and (c), the colour of the tin used for the section in case (b).

Arrow 4 Area

This is just an extension of the stagger lines before the top of the plot. It leaves an area that can be used for extra annotation after the plot is produced.

The height of the area is

plot_title_top_height mm // height of the arrow 4 area

Top Area

The **top area** is an annotation area at the top of the plot (above the arrow 4d area).

It can be used for peg names and horizontal and vertical deflection angles in the pipeline.

The height of the top area is given by

vertical_plot_gap mm // size of the top area. If it is not large
// enough, the text will overwrite the
// plot in the row above.

Change of Direction At Intersection Points

If there is a horizontal or vertical intersection point without a curve on it, the deflection angle at the intersection point is drawn in the top area.

The text is drawn at the distance **angle_text_offset** above the top of the plot and if there is more than one angle, they are spaced horizontally by the distance **angled_text_gap** to the right.

The size and colour of the deflections is given by text_size and text_colour.

angled_text_offset mm // distance of direction text above
// top of the plot
angled_text_gap mm // distance of direction text to the right
// of previous text.
angled_text_angle value // angle of direction text

Hatching Cut and Fill Areas

This option is used to hatch cut and/or fill areas between sets of tins.

For each set, the name of the two tins, the hatch linestyle, colour and separation and whether cut and/or fill regions are required are all user definable.

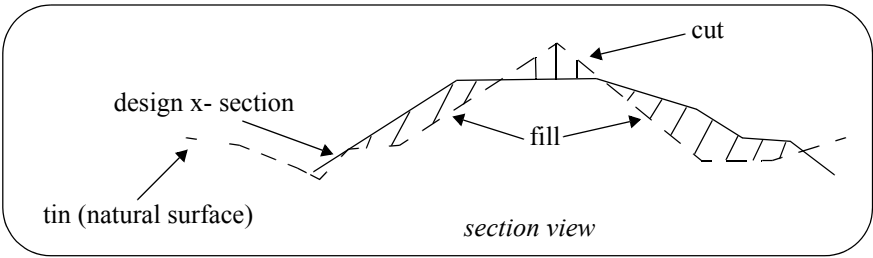
Up to twenty (20) separate sets of tins be hatched.

The parameters for labelling cuts and/or fill regions between tins are given by:

hatch_original_tin_n	tin_name	// tin_name for original surface
hatch_new_tin_n	tin_name	// tin_name for final surface
hatch_cut_separation_n	mm	// distance between cut hatch lines
	0	// don't do cut hatching
hatch_cut_angle_n	degrees	// angle in degrees of cut hatching
hatch_cut_colour_n	colour	// colour of the cut hatching
hatch_cut_linestyle_n	linestyle	// linestyle for cut hatching
hatch_cut_draw_sides_n	1/0	// 1 = draw sides of cut regions
hatch_cut_draw_original_n	1/0	// 1 = draw original tin in cut regions
hatch_cut_draw_new_n	1/0	// 1 = draw new tin in cut regions
hatch_fill_separation_n	mm	// distance between fill hatch line
	0	// don't do fill hatching
hatch_fill_angle_n	degrees	// angle in degrees of fill hatching
hatch_fill_colour_n	colour	// colour of the fill hatching
hatch_fill_linestyle_n	linestyle	// linestyle for fill hatching
hatch_fill_draw_sides_n	1/0	// 1 = draw sides of fill regions
hatch_fill_draw_original_n	1/0	// 1 = draw original tin in fill regions
hatch_fill_draw_new_n	1/0	// 1 = draw new tin in fill regions

Notes

- (a) cut is when the new tin is below the original tin.
fill is when the new tin is above the original tin.
- (b) cut hatching is turned off by setting hatch_cut_separation_n to 0.0.
fill hatching is turned off by setting hatch_fill_separation_n to 0.0.



Labelling Cuts of Pipeline Through Strings in a Model

The cuts that the pipeline string makes through any strings in user given models can be automatically labelled on the long section plots.

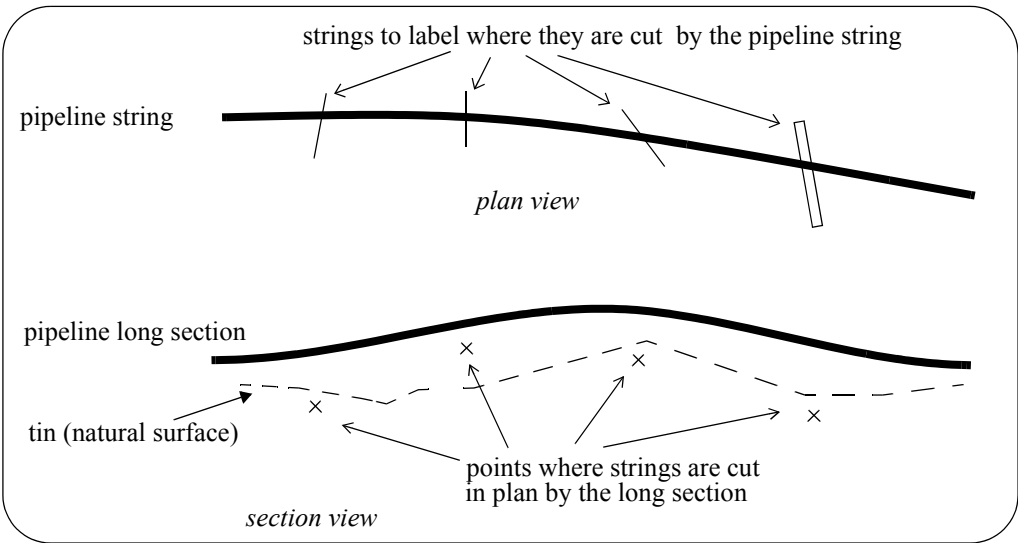
The **height**, **chainage** and **name** of the cut string can be labelled as well as a **symbol** drawn. The height of tins at the same offset value can also be labelled.

The chainage position for the labelling is the chainage of the cut string.

The height position for the labelling can be specified as the

- (a) top of the boxes on the long section
- (b) height value of the cut string
- (c) height of the primary string
- (d) height of a tin.

The actual position of the label is defined relative to the above point.



Note:

Only case (b) involves the actual height of the cut string. For all other cases, only the chainage of the cut string is used. Hence for all cases except (b), the string does need to have a sensible height to be used for cuts through strings.

For example, a boundary string may have null heights but only the chainage is required and the height of the tin at that chainage can be used as the height (case (d)).

Text justification refers to the actual position and is given by

“top-left”	“top-centre”	“top-right”
“middle-left”	“middle-centre”	“middle-right”
“bottom-left”	“bottom-centre”	“bottom-right”

A choice of six special symbols and/or any 12d symbols can be drawn at the cut point.

The special 12d Model symbols of size one millimetre are drawn in a square box centred on (0,0) with sides of length two millimetres. That is, the box co-ordinates are (-1,-1), (1,1), (1,-1), (-1,-1).

The six special shapes are



The plot symbol of name *plotsymbol* is defined in the file given by:

- (a) the parameter *plot_symbols* in the ppf file

plot_symbols *filename*

or if *plot_symbols* is not defined, then

- (b) in the file pointed to by the environment variable `PLOT_SYMBOLS_4D`

`PLOT_SYMBOLS_4D` *filename* // default *plotsym.4d*

or if `PLOT_SYMBOLS_4D` is not defined, then

- (c) in the file *plotsym.4d*

which is searched for in the standard set up file sequence

If none of the above files are defined, or if the symbol does not exist in the above files, then it will be searched for in the standard 12d symbols file which is:

- (d) either pointed to by the environment variable `SYMBOLS_4D`

`SYMBOLS_4D` *filename* // default *symbols.4d*

or if the environment variable `SYMBOLS_4D` does not exist, in the file, *symbols.4d*

The position of the symbol is given by:

<code>cuts_symbol_n_position</code>	1	// above point height value
	3	// above top of boxes
	100	// to primary string
	101-500	// to tin1 or tin2 etc.

The symbol can be adjusted by the parameters:

<code>cuts_symbol_n_x</code>	<i>mm</i>	// offset adjustment to position
<code>cuts_symbol_n_y</code>	<i>mm</i>	// height adjustment to position
<code>cuts_symbol_n_angle</code>	<i>degrees</i>	// rotation about point
<code>cuts_symbol_n_colour</code>	<i>colour</i>	// colour of symbol

and for all values of *cuts_symbol_n_mode* **other** than 6:

<code>cuts_symbol_n_size</code>	<i>mm</i>	// size of symbol, 0 don't draw
---------------------------------	-----------	---------------------------------

The value of the **chainage** of the cut string can be labelled using the parameters

<code>cuts_chainage_n_position1</code>		// above cut strings height value
	3	// above top of boxes
	100	// to primary string
	101-500	// to tin1 or tin2 etc.
<code>cuts_chainage_n_x</code>	<i>mm</i>	// chainage adjustment to position
<code>cuts_chainage_n_y</code>	<i>mm</i>	// height adjustment to position
<code>cuts_chainage_n_angle</code>	<i>degrees</i>	// rotation about point
<code>cuts_chainage_n_size</code>	<i>mm</i>	// size of text, 0 don't label
<code>cuts_chainage_n_colour</code>	<i>colour</i>	// colour of text
<code>cuts_chainage_n_textstyle</code>	<i>text</i>	// textstyle of text chainage
<code>cuts_chainage_n_pre_text</code>	<i>text</i>	// text before the chainage value
<code>cuts_chainage_n_post_text</code>	<i>text</i>	// text after the chainage value
<code>cuts_chainage_n_justification</code>	<i>justification</i>	// justification of the text
<code>cuts_chainage_n_no_decimals</code>	<i>integer</i>	// number of decimals in

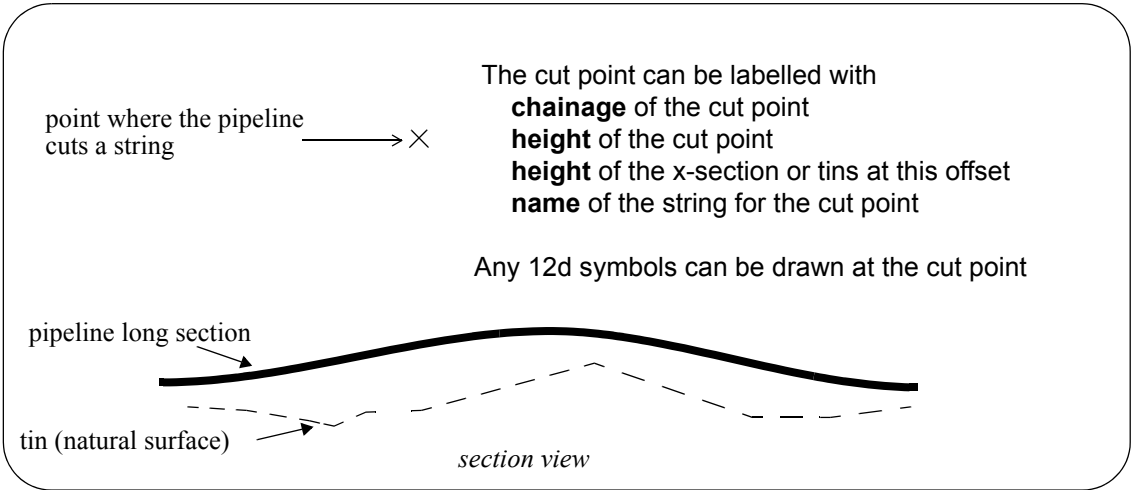
chainage

The value of a **height** at the chainage of the point can be calculated and labelled using the parameters

cuts_height_n_mode	1	// use height of cut point itself
	3	// use real world height of position
		// above boxes
	100	// height of primary string
cuts_height_n_position	101-500	// use height of to tin1 or tin2 etc.
	1	// at points position
	3	// above top of boxes
	100	// to primary string
cuts_height_n_x	101-500	// to tin1 or tin2 etc.
cuts_height_n_y	mm	// chainage adjustment to position
cuts_height_n_angle	mm	// height adjustment to position
cuts_height_n_size	degrees	// rotation about point
cuts_height_n_colour	mm	// size of text, 0 don't label
cuts_height_n_textstyle	colour	// colour of text
cuts_height_n_pre_text	text	// textstyle of text height
cuts_height_n_post_text	text	// text before the height value
cuts_height_n_justification		// text after the height value
cuts_height_n_no_decimals	justification	// justification of the text
	integer	// number of decimals in height

A **label** which can include the **name** of the cut string is drawn by using the parameters

cuts_label_n_position	1	// above cut strings height value
	3	// above top of boxes
	100	// to primary string
	101-500	// to tin1 or tin2 etc.
cuts_label_n_mode	0	// don't include cut string name
	1	// include cut string name in label
cuts_label_n_x	mm	// chainage adjustment to position
cuts_label_n_y	mm	// height adjustment to position
cuts_label_n_angle	degrees	// rotation about point
cuts_label_n_size	mm	// size of text, 0 don't label
cuts_label_n_colour	colour	// colour of text
cuts_label_n_textstyle	text	// textstyle of text label
cuts_label_n_pre_text	text	// text before the string name
cuts_label_n_post_text	text	// text after the string name
cuts_label_n_justification	justification	// justification of the text



Title Block Information

The plot can have a standard **12d Model** title block or a user defined title block.

The standard title block consists of a simple border around the plot and two lines of text in a box underneath the plot. For a user defined title block, all the line work and text is defined by the user.

Standard Title Block

For the standard **12d Model** title block, there are extra parameters for two lines of text and text size and colour. The standard title block is turned on or off by the parameter *plot_border*.

plot_border	yes/no	// yes plots a standard title block // default yes
title_1	text	
title_2	text	
title_text_size	value	
title_colour	colour	

User Title Block

For the user defined title block, the title block drawing commands are kept in a file whose name is supplied by the user. The title block drawing commands are almost identical to the linestyle drawing commands and is given at the beginning of chapter Advanced Plotting.

Hence for a user defined title block, there are just two parameters - one to say a title block file is being used and the other to give the name of the title block file. The *plot_border* parameter should also be set to *no* so that the standard title block is not also drawn.

use_title_file	yes/no	// yes draws the title block given in title_file // default no
title_file	filename	
plot_border	no	// turn off standard title block

Some special plot parameters are used to pass information down to variables in a user defined title block

For example, inside the title block file it is possible to have run time user defined text variables. The actual text values for these text variables are passed down to the title block file from the plot parameter file via the parameters *user_text_n* (n = 1,2,... 1000)

user_text_n	text
-------------	------

The special plot parameters are:

time_format	text	// format for \$time
user_text_n	text	// where n = 1,2,... 1000 // passed down to \$user_text_n
title_1	text	// passed down to \$title_1
title_2	text	// passed down to \$title_2
start_page_number	integer	// used as the starting value for // \$page_number. If missing, // \$page_number starts at 1.
start_drawing_number	integer	// added to \$drawing_number in title // block file. If missing, // \$drawing_number starts at 1.
drawing_number_prefix	text	// passed down to // \$drawing_number_prefix
drawing_number_postfix	text	// passed down to // \$drawing_number_postfix

Parameters that Modify Fields In the Plot Pipeline Network Panel

A number of parameters match those in the **plot pipeline network** panel.

When the plot parameter file is first read, any parameters in the panel will be replaced by the values of any corresponding parameters from the parameter file.

However, if the parameter is subsequently modified in the panel, the panel value will be the value used for the parameter.

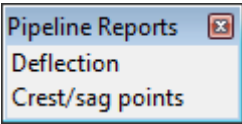
The plot parameters that also occur in the **plot pipeline network** panel are:

network_model	text	
plotter_type	text	
plot_stem	text	
view_name	text	// name of section view for tins, services, // vertical exaggeration etc.
specials_model	text	
peg_interval	world-units	
scale	value	
sheet_size	text	or "width height"
plot_height	mm	
start_chainage	world-units	
end_chainage	world-units	
left_margin	mm	
right_margin	mm	
top_margin	mm	
bottom_margin	mm	
plot_border	yes/no	
title_1	text	
title_2	text	
title_text_size	value	
title_text_colour	colour	
use_title_file	yes/no	
title_file	filename	

Reports

Position of menu: Design =>Pipeline =>Reports

The **Reports** walk-right menu contains reports for joint deflections along the pipeline and crest and sag points.



Fo the option Deflection, go to [Deflection](#)

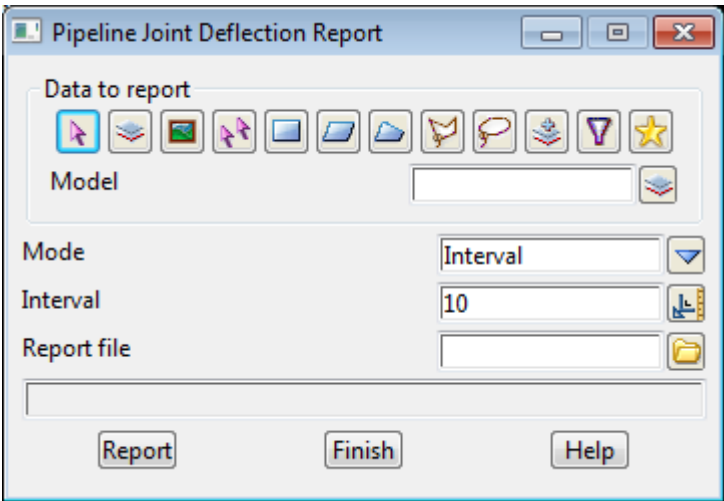
Crest/ sag points [Crest/Sag Points](#)

Deflection

Position of option on menu: Design =>Pipeline =>Reports=>Deflection

The deflection report gives the horizontal, vertical and combined joint deflections along the pipeline.

After selecting the **Deflection** option, the **Pipeline Joint Deflection Report** panel is displayed.



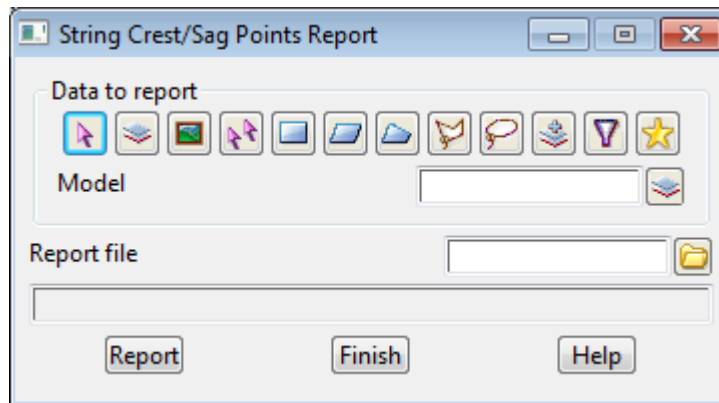
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Report file <i>name of the file for the report</i>	input		
Mode <i>if interval - reports the joint deflection at the interval given plus any horizontal or vertical intersection points without curves on them</i> <i>If critical - only reports points where the deflection is greater than the value given in the pipeline joint defaults panel.</i> <i>If summary - gives the maximum joint deflections</i>	input	interval	interval, critical, summary
Interval <i>the chainage distance between points along the pipeline where joint deflections are to be reported</i>	input	10	
Pick & Report <i>pick the pipeline string to report on.</i>	button		

Crest/Sag Points

Position of option on menu: **Design ==>Pipeline ==>Reports==>Crest/Sag Points**

After selecting the **Crest/sag points** option, the **String Crest/Sag Points Report** panel is displayed.



This is the same option as the **Reports=>Strings=>Crest/sag points**.

For more information please go to [Crest/Sag Points](#) in the chapter [Reports](#).

For each selected string, the string's crest/sag points are written to the report file given in the report file field of the panel.

22 Volumes

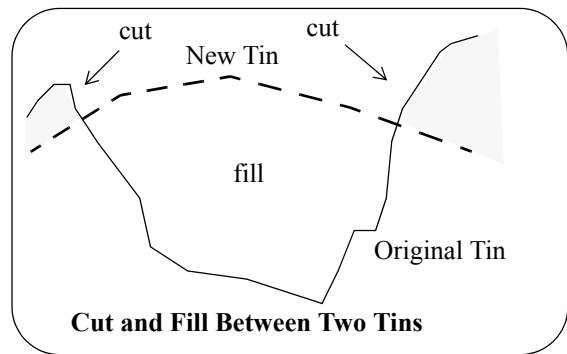
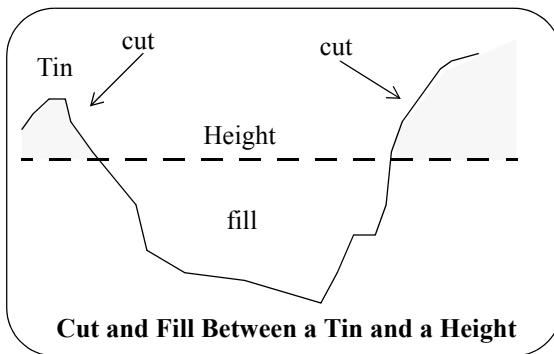
12d Model provides two distinct methodologies for calculating volumes; end area and exact.

In all cases the volumes are broken up into cut and fill volumes.

Definition of Cut and Fill

Cut is defined to be where ever the new surface or given height is **below** the original surface. That is, you have to **cut** to get from the original surface to the new surface. The sign of cut quantities is set via the **Cut volume sign** field from the **Default settings** tab of the Defaults panel (Utilities=>Defaults) and the default for *cut volume sign* is positive.

Fill is defined to be where ever the new surface or given height is **above** the original surface. That is, you have to **fill** to get from the original surface to the new surface. The sign of fill quantities is the opposite to the value for cut and cut is set via the **Cut volumes sign** field from the **Default settings** tab of the Defaults panel (Utilities=>Defaults). The default for fill is *negative*.



End Area and Exact Volumes

In the **end area** method, sections are *automatically* created through tins. From the sections, cut and fill areas for the sections and the cut and fill volumes between the sections are calculated. For more information on the end area volume calculations, go to the section [Theory of End Area Volumes](#)

For **exact** volumes, the volume between a tin and a plane or between two tin is determined by working out the exact geometrical shapes between the tins and summing their volumes. For more information on the exact volume calculations, go to the section [Theory of Exact Volumes](#)

It is often stated that exact volumes are more accurate than end area volumes. However, when the distance between sections is small in the end area volume calculations, the results are the same to any reasonable degree of accuracy.

The reason for having both methods available in **12d Model** is

- (a) to provide an independent check on the volumes produced
- (b) each method produces a different breakup of the volumes.

In the end area method, cut and fill volumes are produced on a section by section basis. This is needed for applications such as mass-haul calculations.

For the exact method, cut and fill volumes are easily calculated between different **depth** values.

This is useful for applications such as depth (isopach) analysis.

For both the end area and the exact method, 12d Model provides options to calculate the volume

(a) between a surface (tin) and a fixed height (z-value)

and

(b) the volume between two surfaces (tins) - an original surface (tin) and a new surface (tin).

NOTE: For the **end area volumes**, sections are automatically generated and used for the calculations. You do **not** need to generate the sections separately.

For more information on the end area volume calculations, go to the section [Theory of End Area Volumes](#).

For information on the end area options, please go to the section [End Area](#).

For more information on the exact volume calculations, go to the section [Theory of Exact Volumes](#).

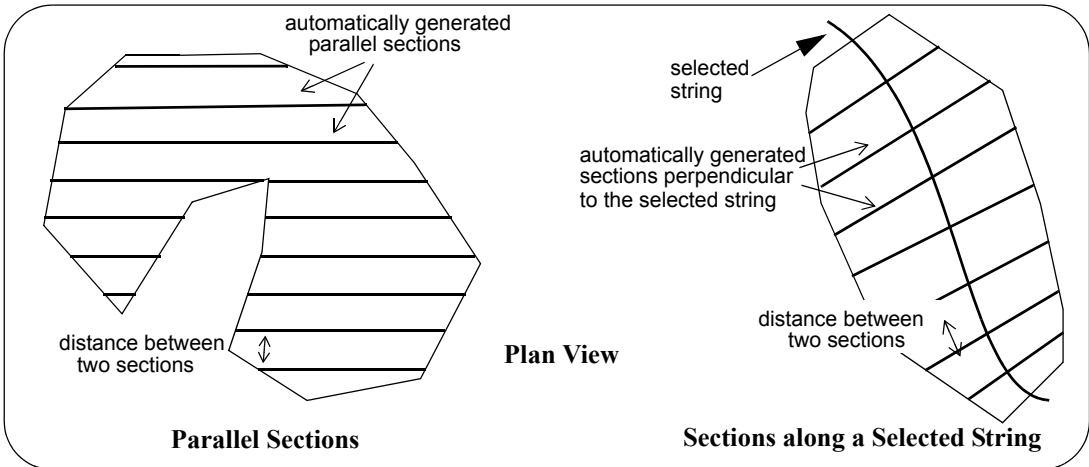
For information on the exact volume options, please go to the section [Exact](#).

Theory of End Area Volumes

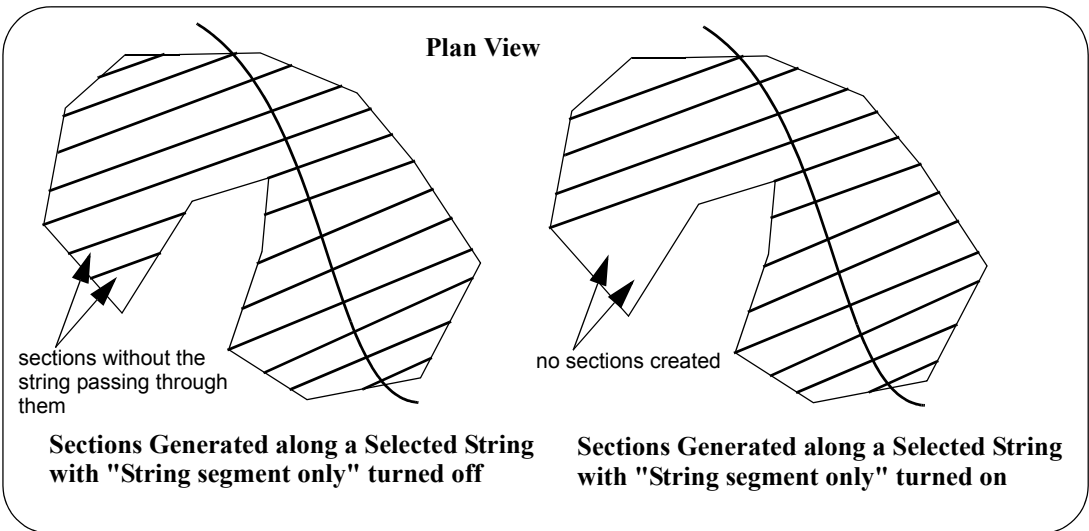
In the **end area** method of calculating volumes, sections are automatically generated through the tins. For each section, cut and fill areas are calculated and then cut and fill volumes are calculated from the cut and fill areas. For the definition of cut and fill, please go to the section [Definition of Cut and Fill](#).

For the end area method, **12d** Model provides options to calculate the volume between a surface (tin) and a fixed height (z-value) and the volume between two surfaces (tins).

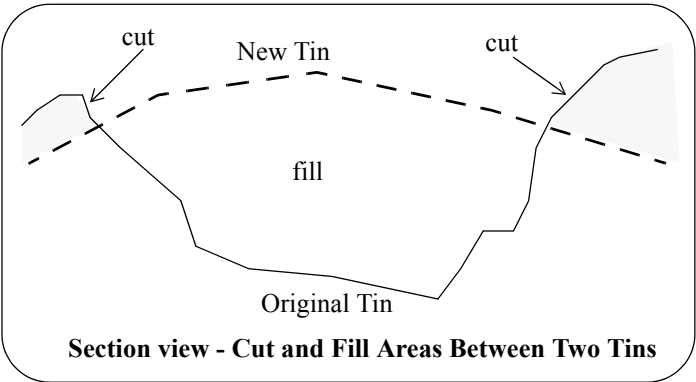
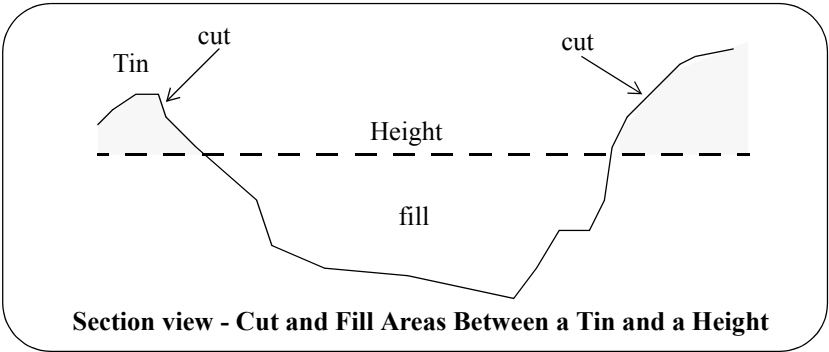
In the **end area** methods of calculating volumes, sections can be generated through a tin or tins at either a *given angle* or at right angles to a **selected** string.



When using the **sections along a string** options, it is possible for a generated section to be broken into more than one part and a parameter exists to only use those sections that contain the selected string.



For each generated section, the *cut* and *fill* areas are calculated and then the volumes between the two sections using either the **average end** (see [Average End Area Formula](#)) or the **two section prismatic** methods (see [Two Section Prismatic Formula](#)).



NOTE: For the **end area volumes**, sections are automatically generated and used for the calculations. You do **not** need to generate the sections separately.

Average End Area Formula

Using the *Average End Area* method the *volume* between two *consecutive* sections is calculated by the formula

$$\text{Volume of cut between the two sections} = D \times (C1 + C2) / 2$$

where

D = distance between the two sections

C1 = area of cut for the first section

C2 = area of cut for the second section

The **Total cut volume** is the sum of the cut volumes between each pair of sections.

Similarly

$$\text{Volume of fill between the two sections} = D \times (F1 + F2) / 2$$

where

D = distance between the two sections

F1 = area of fill for the first section

F2 = area of fill for the second section

The **Total fill volume** is the sum of the fill volumes between each pair of sections.

Two Section Prismoidal Formula

The *two section prismoidal* method, as its name suggests, is a modification of the standard prismoidal method but it uses only two sections rather than the three sections required by the standard prismoidal method.

Using the *Two Section Prismoidal* method the *volume* between two *consecutive* sections is calculated by the formula

$$\text{Volume of cut between the two sections} = D \times (C1 + C2 + \text{Sqrt}(C1 \times C2)) / 3$$

where

D = distance between the two sections

C1 = area of cut for the first section

C2 = area of cut for the second section

The **Total cut volume** is the sum of the cut volumes between each pair of sections.

Similarly

$$\text{Volume of fill between the two sections} = D \times (F1 + F2 + \text{Sqrt}(F1 \times F2)) / 3$$

where

D = distance between the two sections

F1 = area of fill for the first section

F2 = area of fill for the second section

The **Total fill volume** is the sum of the fill volumes between each pair of sections.

For the definition of cut and fill, please go to the section [Definition of Cut and Fill](#).

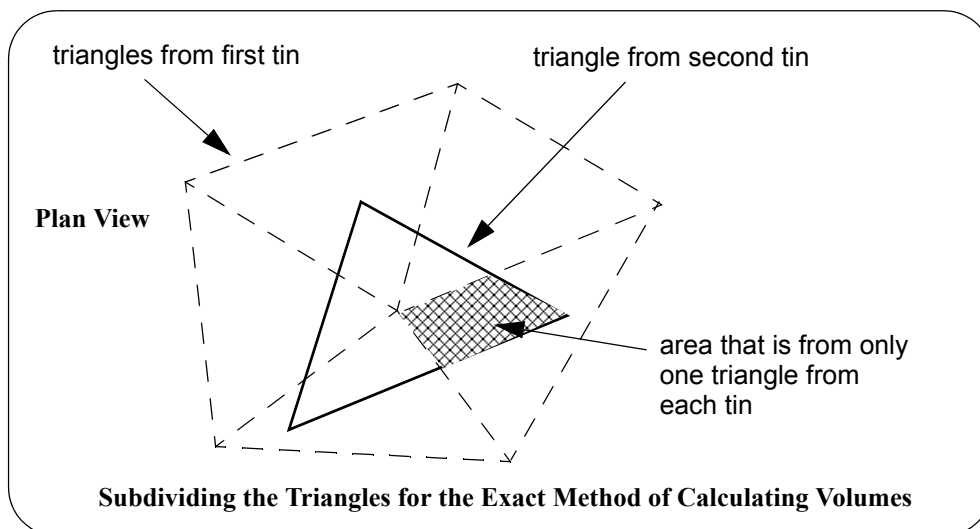
For information on the end area options, please go to the section [End Area](#).

For information on the theory for exact volumes, please continue to the section [Theory of Exact Volumes](#).

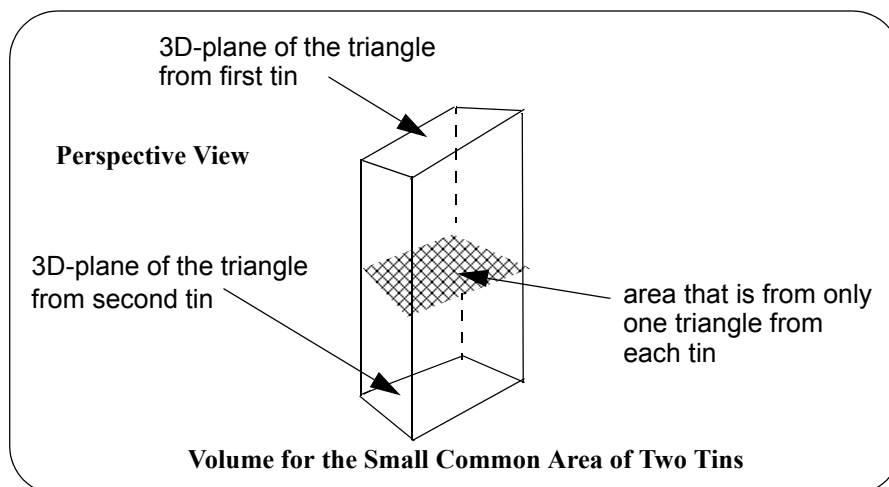
Theory of Exact Volumes

This method calculates the exact volume between two triangulated surfaces (tins), or between one triangulated surface and a plane of constant height.

The volumes are calculated by mathematically subdividing the triangles from both tins into areas that contain only one triangle from each tin.



In three dimensions, these areas represent well defined polygons with the plane of the triangle from one tin as its top and the plane of the triangle from the other tin as its bottom.



For each small area, the cut and fill volume between the two tins can be calculated exactly.

The total *cut* and *fill* volume between the two tin is simply the sum of the cut and fill volumes for each small area.

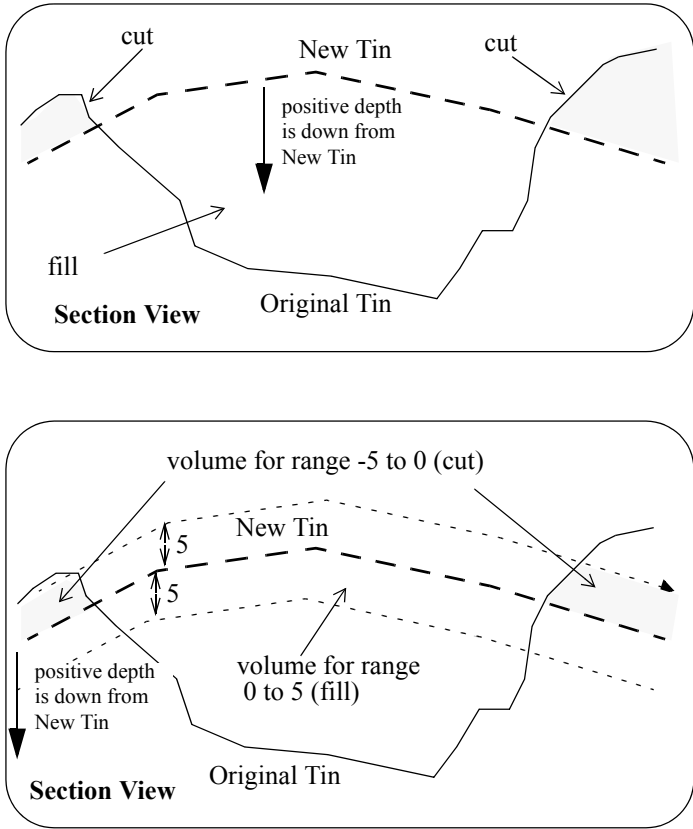
For the definition of cut and fill, please go to the section [Definition of Cut and Fill](#).

For information on the exact volume options, please go to the section [Exact](#).

The calculated volumes by the exact method can be produced and reported on over *user supplied depth ranges*. Similarly, a view can be coloured on a depth basis using the same **range** file.

IMPORTANT NOTE - the **volume totals** are **only** calculated for the **depths in the range file**. If

the depth ranges **does not cover** the entire depth difference between the tins then the totals which are the sum of the different depth ranges will **not** be the same as the volumes between the two tins.



For information on the theory for end area volumes, please go to the section [Theory of End Area Volumes](#).

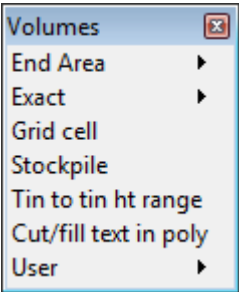
Volumes Menu

Position of menu: Design => Volumes

12d Model provides two distinct methodologies for calculating volumes; end area and exact.

For information and the theory on both these methods go to the section [Volumes](#)

The Volumes walk-right menu is



and each option in this menu will now be discussed.

For the option <i>End area</i> , go to	End Area
<i>Exact</i>	Exact
<i>Grid cell</i>	Grid Cell
<i>Stockpile</i>	Stockpile
<i>Tin to tin ht range</i>	Tin to Tin by Height Range
<i>Cut/fill text in poly</i>	Create Cut/Fill Text Within Polygon

End Area

Position of menu: Design =>Volumes =>End area

These volumes are calculated using the end area method. For more information on the end area volume calculations, go to the section [Theory of End Area Volumes](#).

The options **tin to height** and **tin to tin** use parallel sections defined at a user supplied angle and separation distance, to calculate the end areas.

The options **string tin to height** and **string tin to tin** use sections defined at right angles to a user selected string, for their end area volume calculations. The distance between sections is supplied by the user.

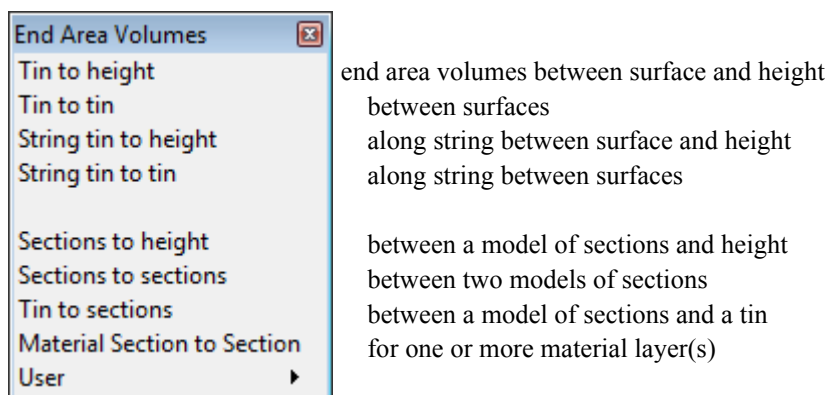
The options **sections to height** and **sections to sections** use sections already created to calculate volumes using end areas.

In all the volume options, the sections are restricted to a user defined polygon.

12d Model reports on the cut, fill and balance for each of the sections used in the calculations and also the total cut, fill and balance.

In the report, the sign for cut (negative or positive) is given by the cut volume sign from the **Defaults** panel (fill will have the opposite sign).

The **End area** walk-right menu is



Each option in this menu will now be described.

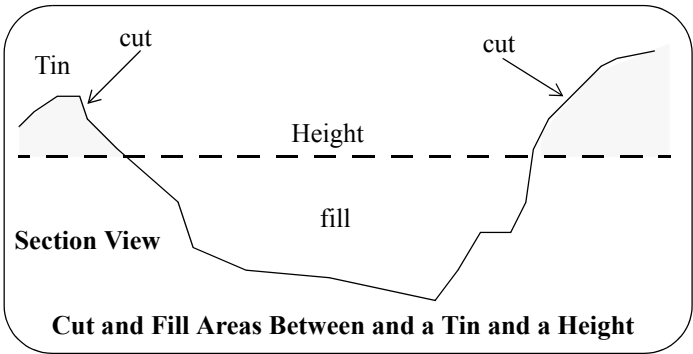
For the option <i>Tin to height</i> , go to	Tin to Height
<i>Tin to tin</i>	Tin to Tin
<i>String tin to height</i>	String Tin to Height
<i>String tin to tin</i>	String Tin to Tin
<i>Section to height</i>	Sections to Height
<i>Section to sections</i>	Sections to Sections
<i>Tin to sections</i>	Tin to Sections
<i>Material Section to Section</i>	Material Section to Section

For more information on the end area volume calculations, go to the section [Theory of End Area Volumes](#).

Tin to Height

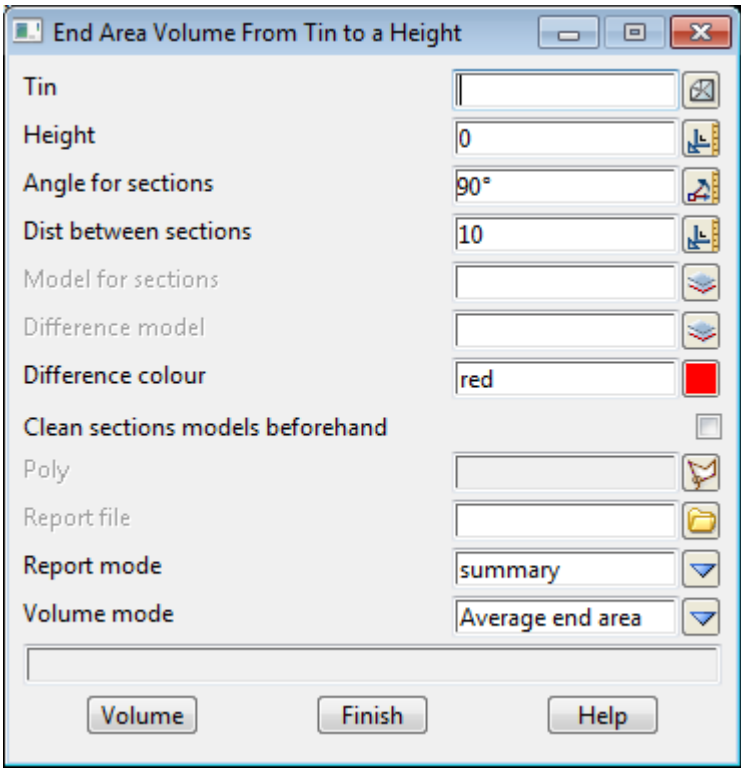
Position of option on menu: Design =>Volumes =>End Area =>Tin to height

The **Tin to height** option is used to find volumes between an existing surface and a user supplied height. The volumes can only be calculated within a user supplied polygon.



For more information on the end area volume calculations, go to the section [Theory of End Area Volumes](#).

On selecting the **Tin to height** option, the **End Area Volume From Tin to a Height** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin for which the volume between it and a height (z value) will be calculated.</i>	input		available tins
Height <i>the volume is calculated between the tin and the value in this field.</i>	input		

Angle for sections	input	90.0	0,45,90
<i>angle (in degrees) of the lines to section along.</i>			
Dist between sections	input	10.0	1,10,100
<i>distance between the lines to section along</i>			
Model for sections	input		available models
<i>if non-blank, the sections though the tin used for the end area calculations are retained and placed in the model given in this field. The sections are given the same colour as the tin. If blank, the sections are not kept.</i>			
Difference model	input		available models
<i>if non-blank, the sections which are the difference between the tin sections and the height are retained and placed in the model given in this field. If blank, the sections are not kept.</i>			
Difference colour	input		available colours
<i>colour for the difference sections strings</i>			
Clean sections models beforehand	tick box		
<i>if tick, the model of sections and difference sections are cleaned out before the option runs.</i>			
Poly	poly string-select		
<i>if selected, the string, rectangle or lasso used as the bounding polygon for the volume calculations.</i>			
Report file	input		*.rpt
<i>name of the file to contain the volume report. If the file already exists, the report will be appended to the file. If no name is given, no report is produced.</i>			
Report mode	input	summary	summary, full
<i>if full, the cut and fill details for every section are included. If summary, just the cut and fill totals are given.</i>			
Volume mode	choice box	Average end area	average end area, prismoidal - 2 sections
<i>the two methods in 12d for calculating volumes using areas of sections. For more information on each method, go to Average End Area Formula</i>			
Volume	button		
<i>The volume between the tin and the height (z-value) within the selected bounding polygon is calculated by the end area method. The sections through the polygon will be calculated along straight lines at the angle given by the angle field and at a separation given by the dist field. The sections are made against the tin given in tin field.</i>			

How to Use the Panel and Panel Messages

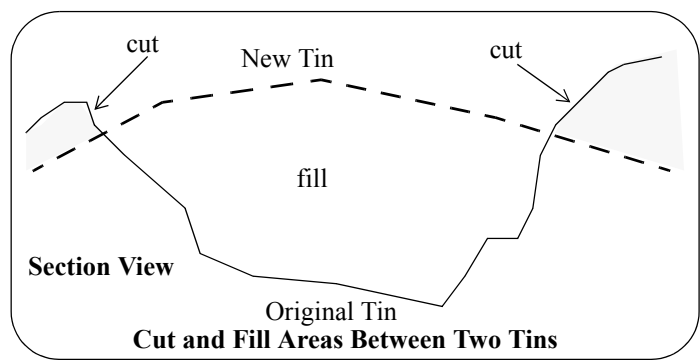
- (a) Select the bounding string by choosing **Poly** and picking the required string.
- (b) Volume processing begins on selecting the **Volume** button.
 - Progress messages - sent to the panel message area
 - calculating volumes
 - Completion message - sent to the panel message area
 - c cut volume f fill volume bal total (balance) volume

<Esc> can be used to terminate the option during volume calculations.

Tin to Tin

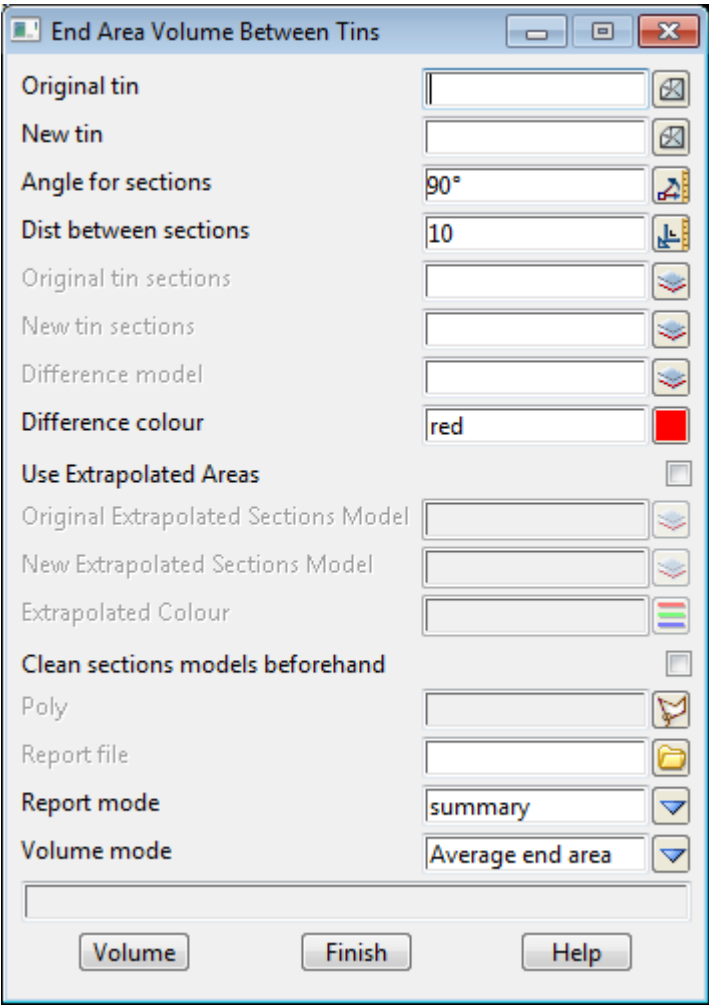
Position of option on menu: Design =>Volumes =>End Area =>Tin to tin

The **Tin to tin** option is used to find volumes between an existing and a new surface. The volumes can only be calculated within a user supplied polygon.



For more information on the end area volume calculations, go to the section [Theory of End Area Volumes](#).

On selecting the **Tin to tin** option, the **End Area Volume Between Tins** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Original tin <i>name of the original tin for determining volumes.</i>	input		available tins
New tin <i>name of the new tin for determining volumes.</i>	input		available tins
Angle for sections <i>angle (in degrees) of the lines to section along.</i>	input	90.0	0,45,90
Dist between sections <i>distance between the lines to section along</i>	input	10.0	1,10,100
Original tin sections <i>if non-blank, the sections though the original tin used for the end area calculations are retained and placed in the model given in this field. The sections are given the same colour at the original tin. If blank, the sections are not kept.</i>	input		available models
New tin sections <i>if non-blank, the sections though the new tin used for the end area calculations are retained and placed in the model given in this field. The sections are given the same colour as the new tin. If blank, the sections are not kept.</i>	input		available models
Difference model <i>if non-blank, the sections which are the difference of the original and the new sections are retained and placed in the model given in this field. If blank, the sections are not kept.</i>	input		available models
Difference colour <i>colour for the difference sections strings</i>	input		available colours
Use extrapolated areas <i>if not tick, areas (and hence volumes) are only calculated where both sections exist. Hence the sections are limited to where both occur. If tick, when the sections are not the same length, the end points of the above and below sections are connected thereby extrapolating the smaller section. This method is not recommended since data does not exist.</i>	tick box	not tick	
Original extrapolated sections model <i>if non-blank, the extrapolated sections created from the Original sections are placed in this model. If blank, the extrapolated sections for the original sections are not kept.</i>	model box		available models
New extrapolated sections model <i>if non-blank, the extrapolated sections created from the New sections are placed in this model. If blank, the extrapolated sections for the new sections are not kept.</i>	model box		available models
Extrapolated colour <i>colour for the extrapolated sections</i>	colour box		available colours
Clean sections models beforehand <i>if tick, the model of sections and difference sections are cleaned out before the option runs.</i>	tick box		
Poly <i>if selected, the string, rectangle or lasso used as the bounding polygon for the volume calculations.</i>	poly string-select		

Report file	input	*.rpt
<i>name of the file to contain the volume report. If the file already exists, the report will be appended to the file. If no name is given, no report is produced.</i>		
Report mode	input	summary summary, full
<i>if full, the cut and fill details for every section are included. If summary, just the cut and fill totals are given.</i>		
Volume mode	choice box	Average end area average end area, prismoidal - 2 sections
<i>the two methods in 12d for calculating volumes using areas of sections. For more information on each method, go to Average End Area Formula</i>		
Volume	button	
<i>The volume between the new and the original tins within the selected polygon string is calculated by the end area method. The sections through the polygon selected by poly will be calculated along straight lines at the angle given by the angle field and at a separation given by the dist field. The sections are made against the tins given by the original and the new tin fields.</i>		

How to Use the Panel and Panel Messages

- (a) Select the bounding polygon string by choosing **Poly** and picking the required string.
 - (b) Volume processing begins on selecting the **volume** button.
 - Progress messages - sent to the panel message area
calculating volumes
 - Completion message - sent to the panel message area
c cut volume f fill volume bal total (balance) volume
- <Esc> can be used to terminate the option during volume calculations.

String Tin to Height

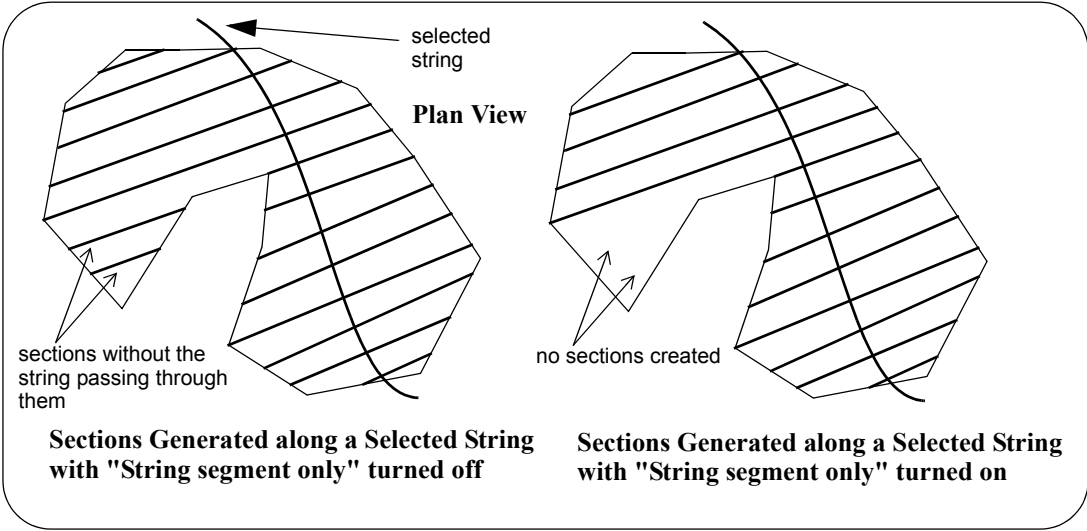
Position of option on menu: Design =>Volumes =>End Area =>String tin to height

The volume options already described calculate the volumes by forming parallel sections through the tin and then using the end area method between adjacent sections.

In many situations, the sections to be used are defined to be at right angles to a user selected string. This method is commonly used in road calculations.

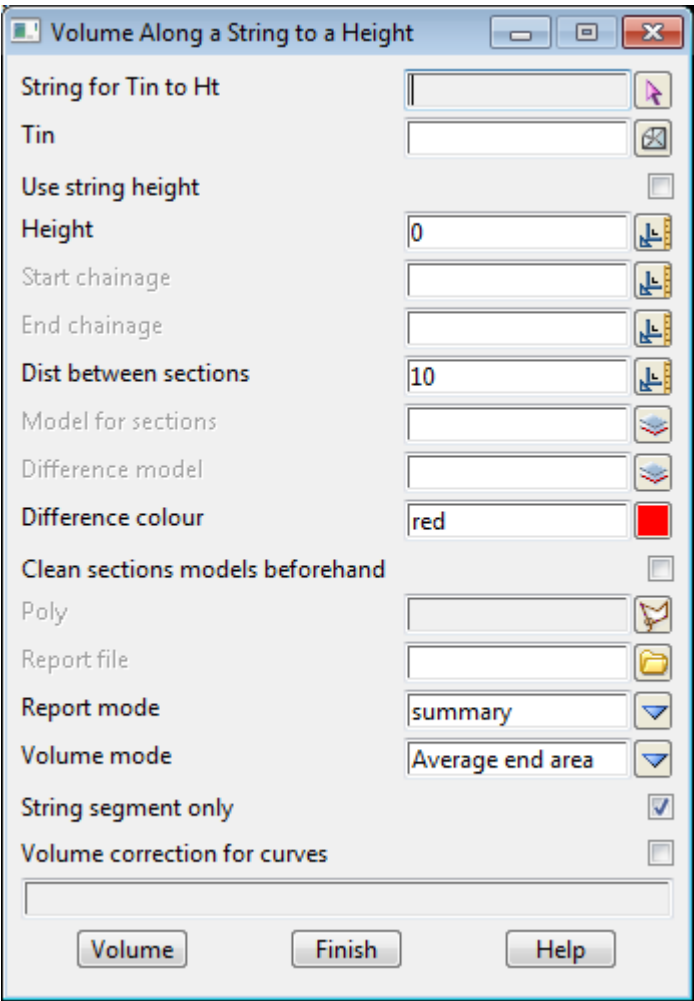
The options **String tin to height** and **String tin to tin** both use sections defined at right angles to a user selected string for the end area volume calculations. For both options, the volumes can only be calculated within a user supplied polygon.

It optionally uses the whole section within the polygon or only the part of the section that contains the string.



For more information on the end area volume calculations, go to the section [Theory of End Area Volumes](#).

On selecting the **String tin to height** option, the **Volume Along a String to a Height** panel is displayed.



The fields and buttons in this panel are used as follows.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

String for Tin to Ht	string select		
<i>a string is selected to be used to define the sections used in the end area calculations. The sections are taken at right angles to this string.</i>			

Tin	input		available tins
<i>name of the tin for which the volume between it and a height (z-value) will be calculated.</i>			

Use string height	tick box		
<i>if tick, the height used for the area calculations is taken at each section from the user selected string. If not tick, the height given in the height panel field is used in the area calculations.</i>			

Height	input	0	
<i>if Use string height is set to no tick, the volume is calculated between the tin and the value in this field.</i>			

Start chainage	input		
<i>if non blank, the chainage of the first section to use for volume calculations. If blank, start with the section with the lowest chainage.</i>			

End chainage	input		
<i>if non blank, the chainage of the last section to use for volume calculations.</i>			

If blank, end with the section with the highest chainage.

Dist between sections input 10 1,10,100

distance between the sections taken at right angles down the user selected string.

Model for sections input available models

if non-blank, the sections though the tin used for the end area calculations are retained and placed in the model given in this field. The sections are given the same colour as the tin.

If blank, the sections are not kept.

Difference model input available models

if non-blank, the sections which are the difference between the tin sections and the height are retained and placed in the model given in this field.

If blank, the sections are not kept.

Difference colour input available colours

colour for the difference sections strings

Clean sections models beforehand tick box

if tick, the model of sections and difference sections are cleaned out before the option runs.

Report file input *.rpt

name of the file to contain the volume report. If the file already exists, the report will be appended to the file. If no name is given, no report is produced.

Report mode input summary summary, full

*if **full**, the cut and fill details for every section are included.*

*If **summary**, just the cut and fill totals are given.*

Volume mode choice box Average end area average end area,
prismoidal - 2 sections

the two methods in [12d](#) for calculating volumes using areas of sections. For more information on each method, go to [Average End Area Formula](#)

String segment only tick box tick

*if **tick**, only the part of the section within the polygon that contains the selected string is used.*

*If **not tick**, the whole section within the polygon is used (see [Theory of End Area Volumes](#)).*

Volume correction for curves tick box

if tick, volume corrections are made when going around curves.

Poly poly string-select

if selected, the string, rectangle or lasso used as the bounding polygon for the volume calculations.

Volume button

The volume between the tin and the height (z-value) within the selected polygon is calculated by the end area method. The sections through the tin are calculated at right angles to the selected string at a separation given by the dist field. The section strings are placed in the model given in the model field.

How to Use the Panel and Panel Messages

- (a) Select the bounding polygon string by choosing **Poly** and picking the required string.
- (b) Select a string to define the sections string by choosing **String** button
- (c) Volume processing begins on selecting the **volume** button.

Progress messages - sent to the panel message area

calculating volumes

Completion message - sent to the panel message area

c cut volume f fill volume bal total (balance) volume

<Esc> can be used to terminate the option during volume calculations.

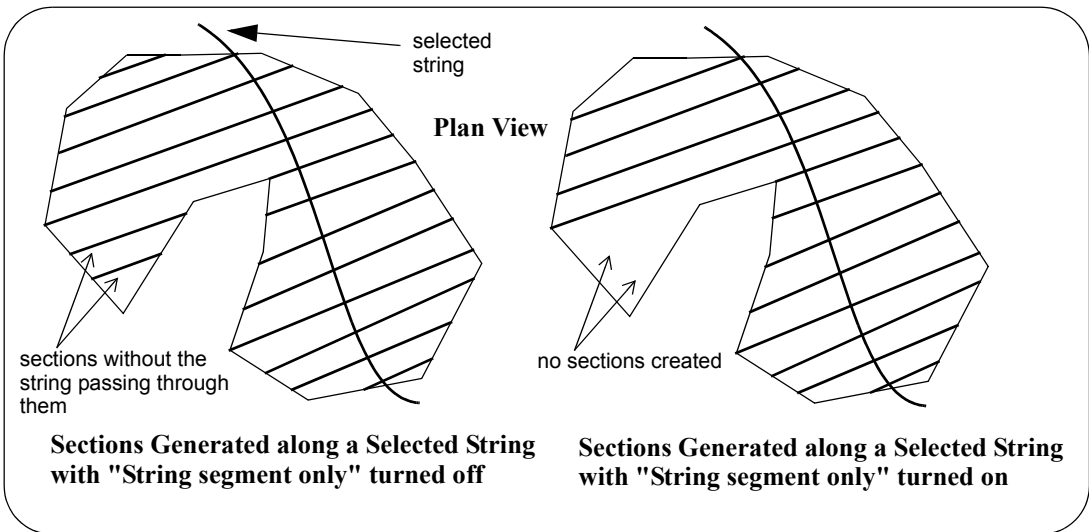
String Tin to Tin

Position of option on menu: Design =>Volumes =>End Area =>String tin to tin

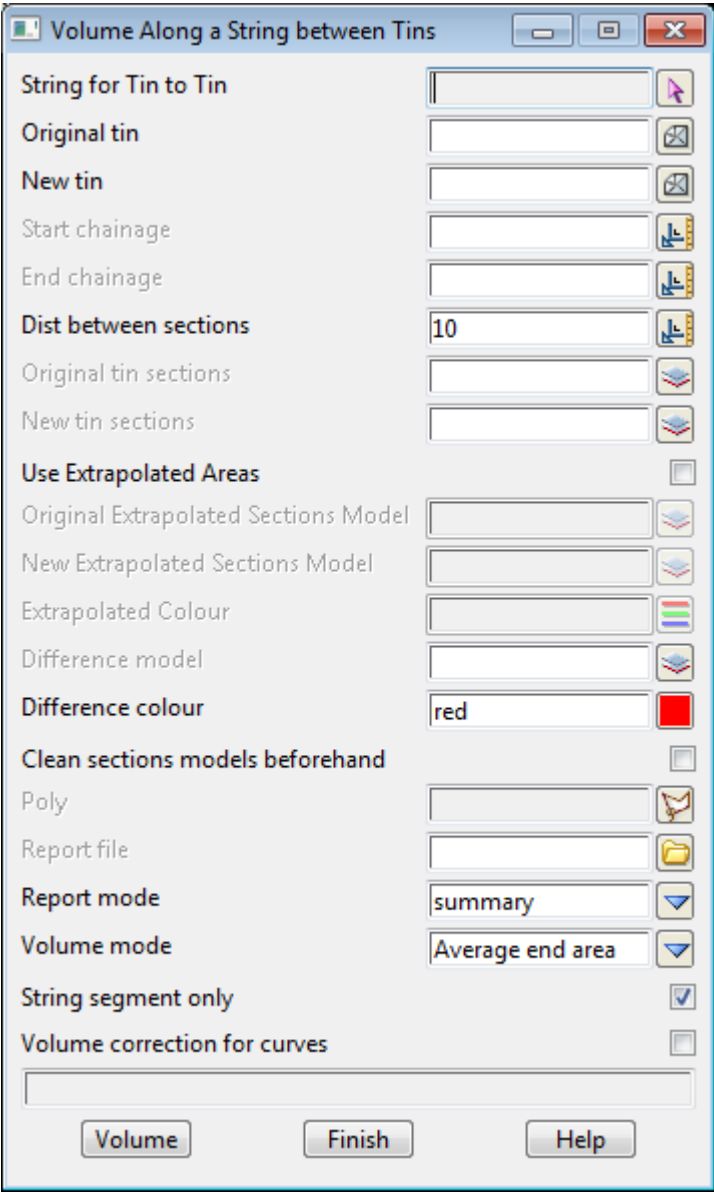
In this option, the sections generated for collating areas and volumes are defined to be at right angles to a *user selected string*. This method is commonly used in road calculations.

It optionally uses the *entire* section within the polygon or only the sections or part of sections that contain the user selected string.

For more information on the end area volume calculations, go to the section [Theory of End Area Volumes](#).



On selecting the String Tin to Tin option, the **Volume Along a String Between Tins** panel is displayed.



The fields and buttons in this panel are used as follows.

Field Description	Type	Defaults	Pop-Up
String for tin to tin	string select		
<i>the string for defining the sections used in the end area calculations. The sections are taken at right angles to this string.</i>			
Original tin	input		available tins
<i>name of the original tin for determining volumes.</i>			
New tin	input		available tins
<i>name of the new tin for determining volumes.</i>			
Start chainage	input		
<i>if non blank, the chainage of the first section to use for volume calculations. If blank, start with the section with the lowest chainage.</i>			
End chainage	input		

*if non blank, the chainage of the last section to use for volume calculations.
If blank, end with the section with the highest chainage.*

Dist between sections input 10.0 1,10,100
distance between the lines to section along

Original tin sections input available models
*if non-blank, the sections though the original tin used for the end area calculations are retained and placed in the model given in this field. The sections are given the same colour at the original tin.
If blank, the sections are not kept.*

New tin sections input available models
*if non-blank, the sections though the new tin used for the end area calculations are retained and placed in the model given in this field. The sections are given the same colour as the new tin.
If blank, the sections are not kept.*

Use extrapolated areas tick box not ticked
*if **not ticked**, areas (and hence volumes) are only calculated where **both** sections exist. Hence the sections are limited to where both occur.

If **tick**, when the sections are not the same length, the end points of the above and below sections are connected thereby extrapolating the smaller section. This method is not recommended since data does not exist.*

Original extrapolated sections model model box available models
*if non-blank, the extrapolated sections created from the Original sections are placed in this model.
If blank, the extrapolated sections for the original sections are not kept.*

New extrapolated sections model model box available models
*if non-blank, the extrapolated sections created from the New sections are placed in this model.
If blank, the extrapolated sections for the new sections are not kept.*

Extrapolated colour colour box available colours
colour for the extrapolated sections

Difference model input available models
*if non-blank, the sections which are the difference of the original and the new sections are retained and placed in the model given in this field.
If blank, the sections are not kept.*

Difference colour input available colours
colour for the difference sections strings

Clean sections models beforehand tick box
if ticked, the model of sections and difference sections are cleaned out before the option runs.

Report file input *.rpt
name of the file to contain the volume report. If the file already exists, the report will be appended to the file. If no name is given, no report is produced.

Report mode input summary summary, full
*if **full**, the cut and fill details for every section are included.
If **summary**, just the cut and fill totals are given.*

Volume mode choice box Average end area average end area,
prismoidal - 2 sections
the two methods in 12d for calculating volumes using areas of sections. For more information on each method, go to [Average End Area Formula](#)

String segment only tick box ticked

*if **ticked**, only the part of the section within the polygon that contains the selected string is used.
If **not ticked**, the whole section within the polygon is used (see [Theory of End Area Volumes](#)).*

Volume correction for curves tick box

if ticked, volume corrections are made when going around curves.

Poly poly string-select

if selected, the string, rectangle or lasso used as the bounding polygon for the volume calculations.

Volume button

The volume between the original and new tins within the selected bounding polygon is calculated by the end area method. The sections through the tins are calculated at right angles to the selected string at a separation given by the dist field.

How to Use the Panel and Panel Messages

- (a) Select the bounding polygon string by choosing **Poly** and pick the required string.
- (b) Select the string to define the sections string by choosing **String for tin to tin**
- (c) Volume processing begins on selecting the **Volume** button.

Progress messages - sent to the panel message area

calculating volumes

Completion message - sent to the panel message area

c cut volume f fill volume bal total (balance) volume

<Esc> can be used to terminate the option during volume calculations.

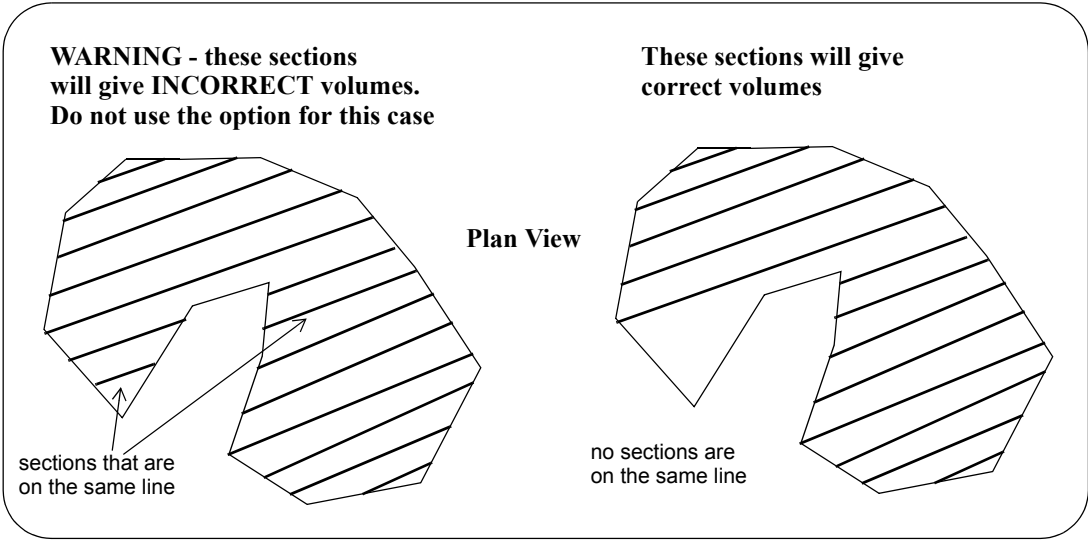
Sections to Height

Position of option on menu: Design =>Volumes =>End Area =>Sections to height

The Sections to height option is used to find volumes between sections that already exist (in a given model) and a user supplied height. The volumes can be restricted to be within a user supplied polygon.

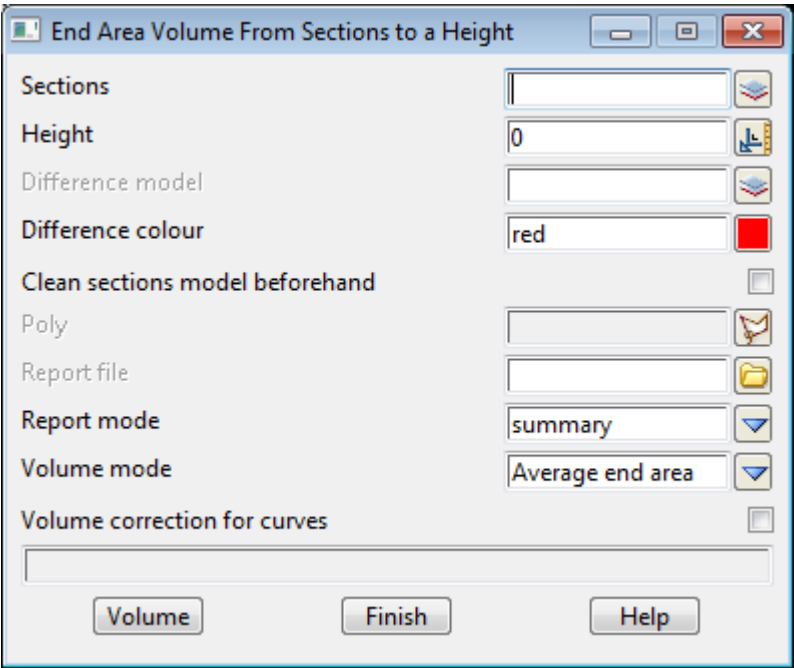
Normally the **Sections to Height** method is not used since if the tin exists, the option **Design =>Volumes =>End Area =>Tin to height** automatically generates sections through the tin at the required interval.

WARNING: The **Sections to Height** method can **not** be used when there are cases of two sections being on the same line.



For more information on the end area volume calculations, go to the section [Theory of End Area Volumes](#).

On selecting the Sections to height option, the **End Area Volume from Tin to a Height** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Sections	<i>name of the model containing the sections for which the volume between them and a height (z value) will be calculated.</i>	input		available models
Height	<i>the volume is calculated between the sections and the value in this field.</i>	input		
Difference model	<i>if non-blank, the sections which are the difference between the given sections and the height are retained and placed in the model given in this field. If blank, the sections are not kept.</i>	input		available models
Difference colour	<i>colour for the difference sections strings</i>	input		available colours
Clean sections models beforehand	<i>if ticked, the model of sections and difference sections are cleaned out before the option runs.</i>	tick box		
Poly	<i>if selected, the string, rectangle or lasso used as the bounding polygon for the volume calculations.</i>	poly string-select		
Report file	<i>name of the file to contain the volume report. If the file already exists, the report will be appended to the file. If no name is given, no report is produced.</i>	input		*.rpt
Report mode	<i>if full, the cut and fill details for every section are included. In summary, just the totals are given.</i>	input	summary	summary, full
Volume mode		choice box	Average end area	average end area, prismoidal - 2 sections

the two methods in [12d](#) for calculating volumes using areas of sections. For more information on each method, go to [Average End Area Formula](#)

Volume correction for curves tick box

if ticked, volume corrections are made when going around curves.

Volume button

the volume between the model of sections and the height (z-value) within the selected bounding polygon is calculated by the end area method.

<Esc> can be used to terminate the option during volume calculations.

Sections to Sections

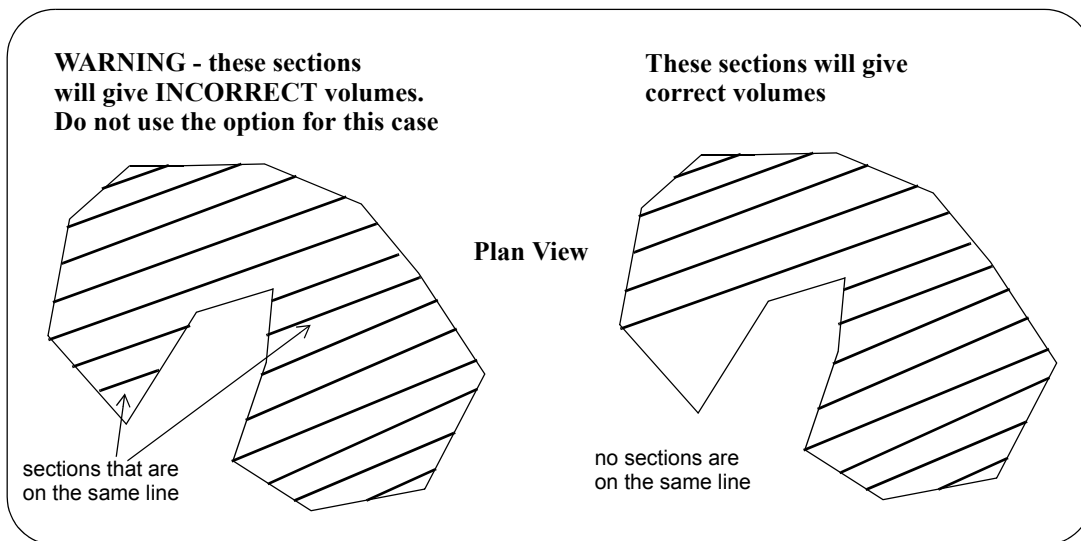
Position of option on menu: Design =>Volumes =>End Area =>Sections to sections

The **Sections to sections** option is used to find volumes between two models of sections. The volumes can be restricted to be within a user supplied polygon. Note that there needs to be matching sections in the two models of section.

Normally the ***Section to Sections*** method is not used since if the tin exists, the option

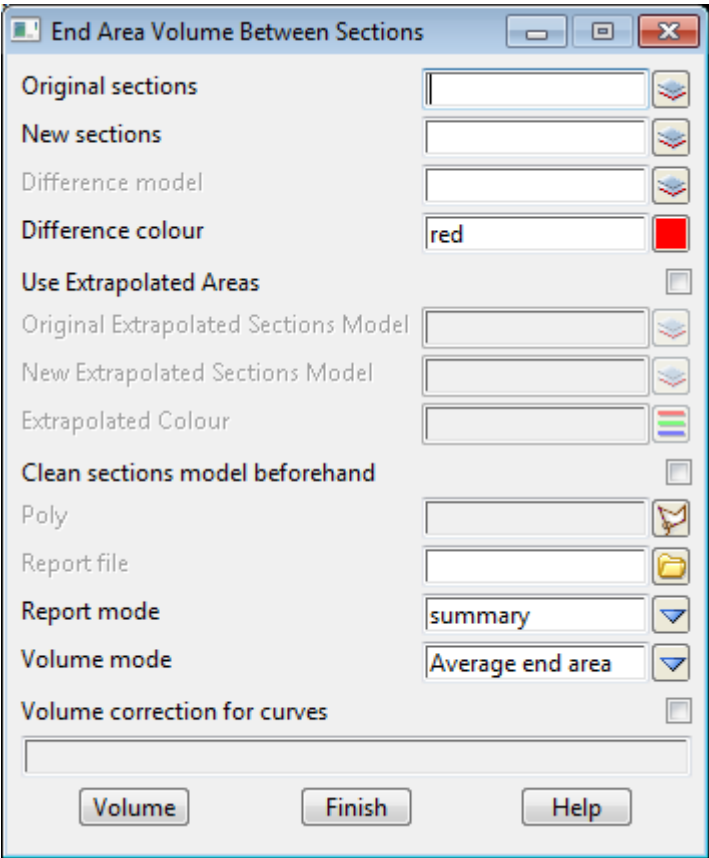
Design =>Volumes =>End Area =>Tin to tin
automatically generates sections through the two tins at the required interval.

WARNING: *The Section to Sections* method can **not** be used when there are cases of two sections being on the same line.



For more information on the end area volume calculations, go to the section [Theory of End Area Volumes](#).

On selecting the **Sections to sections** option, the **End Area Volume Between Sections** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Original sections <i>name of the original model of sections for determining volumes.</i>	input		available models
New sections <i>name of the new model of sections for determining volumes.</i>	input		available models
Difference model <i>if non-blank, the sections which are the difference of the original and the new sections are retained and placed in the model given in this field. If blank, the sections are not kept.</i>	input		available models
Difference colour <i>colour for the difference sections strings</i>	input		available colours
Use extrapolated areas <i>if not tick, areas (and hence volumes) are only calculated where both sections exist. Hence the sections are limited to where both occur.</i> <i>If tick, when the sections are not the same length, the end points of the above and below sections are connected thereby extrapolating the smaller section. This method is not recommended since data does not exist.</i>	tick box	not tick	
Original extrapolated sections model <i>if non-blank, the extrapolated sections created from the Original sections are placed in this model. If blank, the extrapolated sections for the original sections are not kept.</i>	model box		available models
New extrapolated sections model	model box		available models

*if non-blank, the extrapolated sections created from the New sections are placed in this model.
If blank, the extrapolated sections for the new sections are not kept.*

Extrapolated colour colour box available colours
colour for the extrapolated sections

Clean sections models beforehand tick box

if ticked, the model of sections and difference sections are cleaned out before the option runs.

Poly poly string-select

if selected, the string, rectangle or lasso used as the bounding polygon for the volume calculations.

Report file

name of the file to contain the volume report. If the file already exists, the report will be appended to the file. If no file name is given, the report is not produced.

Report mode	input	summary	summary, full
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if **full**, the cut and fill details for every section are included.
If **summary**, just the cut and fill totals are given.

Volume mode	choice box	Average end area	average end area, prismoidal - 2 sections

the two methods in [12d](#) for calculating volumes using areas of sections. For more information on each method, go to [Average End Area Formula](#)

Volume correction for curves tick box

if ticked, volume corrections are made when going around curves.

Volume button

The volume between the original model of sections and the new model of sections within the selected bounding polygon is calculated by the end area method.

<Esc> can be used to terminate the option during volume calculations.

Tin to Sections

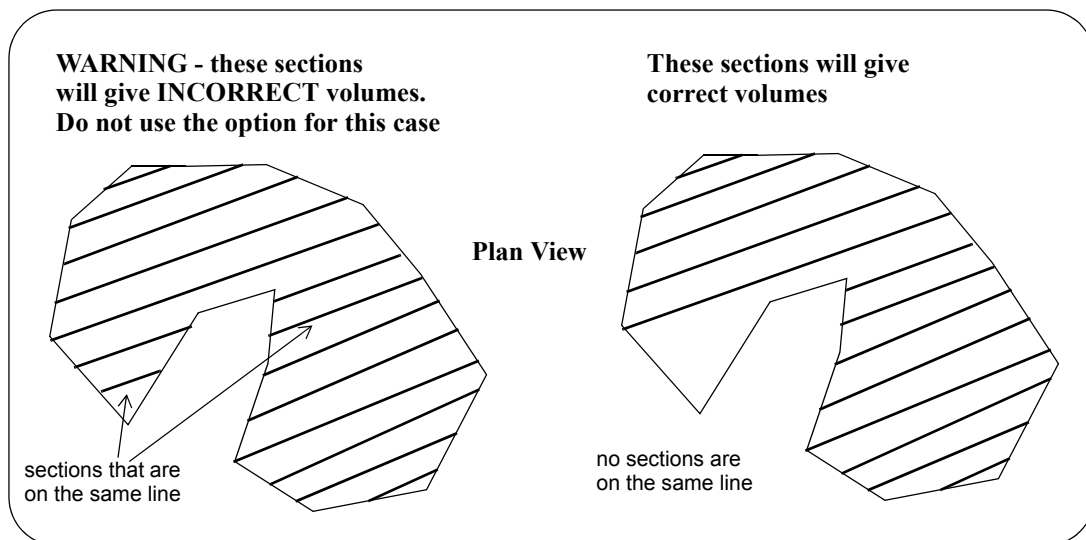
Position of option on menu: Design =>Volumes =>End Area =>Tin to sections

The **Tin to sections** option is used to find volumes between a tin and a model of sections. The volumes can be restricted to be within a user supplied polygon.

Normally the **Tin to Sections** method is not used since if the tin for the sections exists, the option

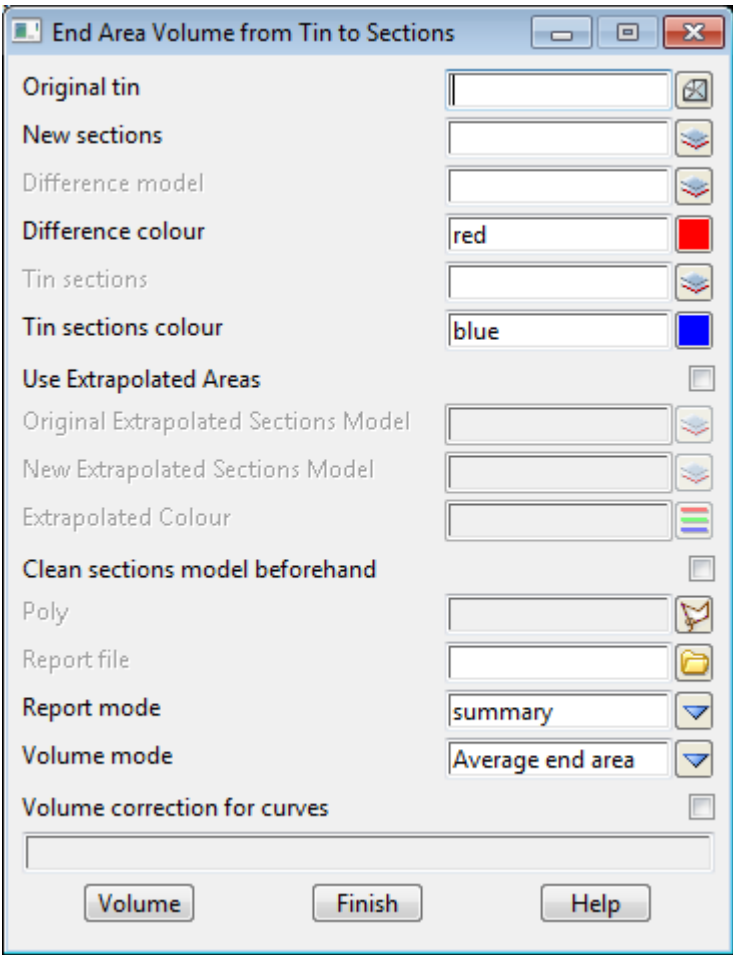
Design =>Volumes =>End Area =>Tin to tin automatically generates sections through the two tins at the required interval.

WARNING: *The Tin to Sections* method can **not** be used when there are cases of two sections being on the same line.



For more information on the end area volume calculations, go to the section [Theory of End Area Volumes](#).

Selecting **Tin to sections** brings up the **End Area Volume from Tin to Sections** panel.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Original Tin	<i>name of the original tin to use for determining volumes.</i>	tin box		available tins
New sections	<i>name of the new model of sections for determining volumes.</i>	model box		available models
Difference model	<i>if non-blank, the sections which are the difference of the original and the new sections are retained and placed in the model given in this field. If blank, the sections are not kept.</i>	model box		available models
Difference colour	<i>colour for the difference sections strings</i>	colour box		available colours
Tin sections	<i>if non-blank, the sections cut through the Original tin are placed in this model. If blank, the sections through the Original tin are not kept.</i>	model box		available models
Tin sections colour	<i>colour for the sections cut through the Original tin</i>	colour box		available colours
Use extrapolated areas	<i>if not ticked, areas (and hence volumes) are only calculated where both sections exist. Hence the</i>	tick box	not ticked	

sections are limited to where both occur.

If **ticked**, when the sections are not the same length, the end points of the above and below sections are connected thereby extrapolating the smaller section. This method is not recommended since data does not exist.

Original extrapolated sections model model box available models

if non-blank, the extrapolated sections created from the Original sections are placed in this model.
If blank, the extrapolated sections for the original sections are not kept.

New extrapolated sections model model box available models

if non-blank, the extrapolated sections created from the New sections are placed in this model.
If blank, the extrapolated sections for the new sections are not kept.

Extrapolated colour colour box available colours

colour for the extrapolated sections

Clean sections models beforehand tick box

if ticked, the model of sections and difference sections are cleaned out before the option runs.

Poly poly string-select

if selected, the string, rectangle or lasso used as the bounding polygon for the volume calculations.

Report file input

name of the file to contain the volume report. If the file already exists, the report will be appended to the file. If no file name is given, the report is not produced.

Report mode input summary summary, full

if **full**, the cut and fill details for every section are included.
If **summary**, just the cut and fill totals are given.

Volume mode choice box Average end area average end area,
prismoidal - 2 sections

the two methods in **12d** for calculating volumes using areas of sections. For more information on each method, go to [Average End Area Formula](#)

Volume correction for curves tick box

if ticked, volume corrections are made when going around curves.

Volume button

The volume between the original model of sections and the new model of sections within the selected bounding polygon is calculated by the end area method.

<Esc> can be used to terminate the option during volume calculations.

Material Section to Section

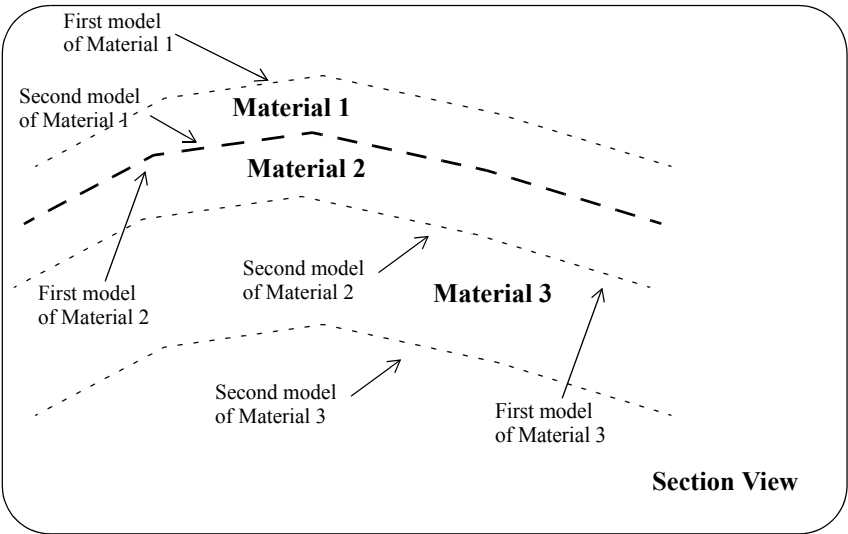
Position of option on menu: **Design =>Volumes =>End Area =>Material section to section**

The **Material section to section** option calculates the volumes for one or more material layers where a material layer is given by two models of sections representing the top (First model) and the bottom (Second model) of the material layer.

The cut and fill volumes for each material layer is written to a table on the panel, and optionally to a report.

This option uses models of sections already created by other options such as *Apply Many* or *Tins =>Sections =>X sections*

The cut and fill volumes are calculated using the **End Area** method (see [Theory of End Area Volumes](#)).



Selecting **Material section to section** brings up the **Material Volume Report (Section to Section)** panel

Material Volume Report (Section to Section)

Function name

Report File

Report Description

NOTE:

Volumes are <End Area> and a comparison is made by using the distance between ALL sections specified
Chainage limits are defined by the smallest model or by the Optional Chainage Ranges <if specified below>
First and Second models used over these limits, must have matching sections, and no large gaps in either model

	Optional Section Start Chainage	Optional Section End Chainage
1	optional	optional

	Material Description	First Model	Second Model	Cut m³	Fill m³
1					
2					
3					
4					
5					
6					
7					
8		optional	optional		

Information retrieved successfully

Write

Finish

Help

Volumes are End Area and a comparison is made by using the distance between ALL the sections specified.

The chainage limits for the volume calculations are defined by the smallest chainages on the sections in the **First** and **Second Models**, or by the **Optional Section Start Chainage** and **Optional Section End Chainage** ranges given in the panel.

The **First** and **Second Models** used over these limits, must have matching sections, and no large gaps in either model.

If the chainage limit in the smaller model falls within the limits of the chainages in the larger model and no optional chainages are used, then the chainage limit of the smaller model is used.

In this case no interpolation is done up to the start or after the end of the smaller model chainage limits, in relation to the larger model.

However, if there is a large chainage gap in the smaller model then some interpolation will be done between the first and last section in this area, in relation to the larger model.

The latter is not desirable and the optional chainage ranges should be used to take into account the chainage gap in the smaller model

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Function Name	function box		
<i>if non-blank entry used as the name of a function that can be used in chains etc</i>			
Report File	file box		available *.csv files

if non-blank entry used as the report file in a csv format

Report Description input

if non-blank entry used a descriptive heading in the report

Optional Chainages Grid

Section Start Chainage real

if non-blank entry used as the start chainage in the report

Section End Chainage real

if non-blank entry used as the end chainage in the report

Report Options Grid

Material Description input

if non-blank entry used as a description for a material, such as "Asphalt Surface" in the report

First Model model

if non-blank entry this section model is used in the volume calculations

Second Model model

if non-blank entry this section model is used in the volume calculations

Cut m³

field for display of results only, after the "Write" button is used.

If more than one <Optional Chainage Grids> are used, then the values displayed represents the accumulative cut for that material

Fill m³

field for display of results only, after the "Write" button is used.

If more than one <Optional Chainage Grids> are used, then the values displayed represents the accumulative fill for that material

Write button

the end area volumes is run for each of the Optional Chainage ranges or for the extents of the smaller model, if no optional chainages are specified

The volumes are calculated for each material using a chain from the Library. This can be verified in the output window.

Starting chain: Vol Sect to Sect.chain

Exact

Position of menu: Design => Volumes => Exact

These volumes are calculated by dividing the tins up into small prisms whose volumes can be calculated exactly. For more information on the exact volume calculations, go to the section [Theory of Exact Volumes](#)

In the exact volume options, the volumes calculations can be restricted to a user defined polygon or if no polygon is provided, the volumes will be only be calculated for the regions where both the triangulations exist.

With the exact method, volumes can easily be calculated for depth bands from

(a) the given height to the tin for "tin to height" volumes

or

(b) the new tin to the original tin for "tin to tin" volumes.

Hence for the calculations, a range file can be supplied giving depth pairs and **12d** Model will report the cut, fill and balance for each of the depth pairs and also the total of the cut, fill and balance for all the pairs.

In the report, the sign for cut (negative or positive) is given by the cut volume sign from the **default settings** panel (fill will have the opposite sign).

The range file consists of a list of depth ranges and colours, one set per line, in the format

```
lower_depth    upper_depth    depth_colour
```

This line represents all depths satisfying

```
lower_depth <= depth < upper_depth.
```

For **each range** in the file, the total cut and fill volumes for the depth range will be reported on, and the depth_colour can be used to colour all areas on a plan view satisfying the range.

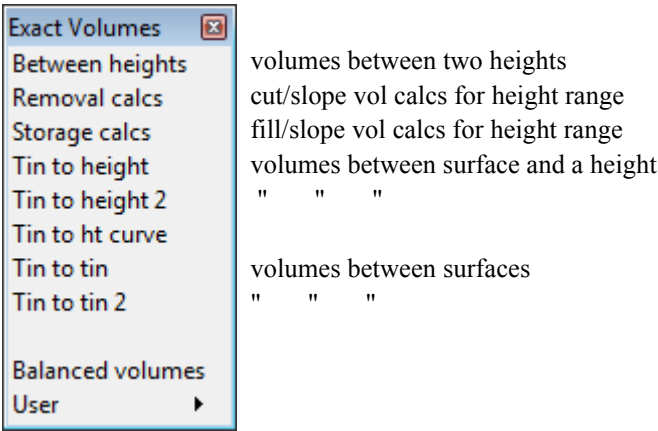
IMPORTANT NOTE - when are depth file is used, the *volume totals* are *only* calculated for the *depths in the range file*. If the depth ranges *does not cover* the entire depth difference between the tins then the totals which are the sum of the different depth ranges will *not* be the same as the volumes between the two tins or the volumes from a tin to a height.

Example of a Depth Range File

```
// depth range file
// format:  lower_depth    upper_depth    colour_for_depth_range
// depth is measured positive down and negative up.

-20  -10  red           // colour red where the depth is greater or equal to -20 and less than -10
-10   0  magenta       // colour magenta where the depth is greater or equal to -10 and less than
0
0   10  green          // colour green where the depth is greater or equal to 0 and less than 10
10   20  "dark green"   // colour dark green where depth is >=10 and less than 20
```

The Exact walk-right menu is



The options in this menu will now be described.

For the option <i>Between heights</i> , please go to	Between Heights
<i>Removal calcs</i>	Removal Calcs
<i>Storage calcs</i>	Storage Calcs
<i>Tin to height</i>	Tin to Height
<i>Tin to height 2</i>	Tin to Height 2
<i>Tin to height curve</i>	Tin to Height Curve
<i>Tin to tin</i>	Tin to Tin
<i>Tin to tin 2</i>	Tin to Tin 2
<i>Balanced volumes</i>	Balanced Volumes

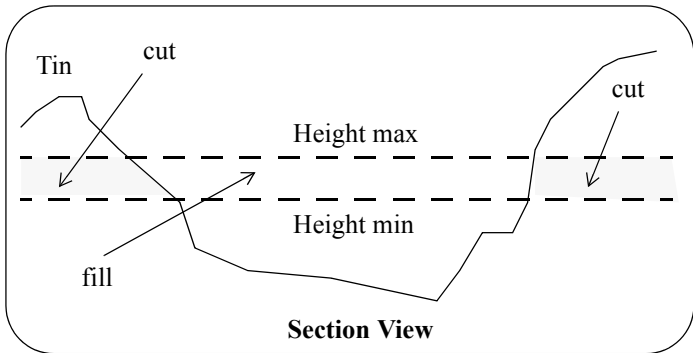
For more information on the exact volume calculations, go to the section [Theory of Exact Volumes](#)

Between Heights

Position of option on menu: Design =>Volumes =>Exact =>Between heights

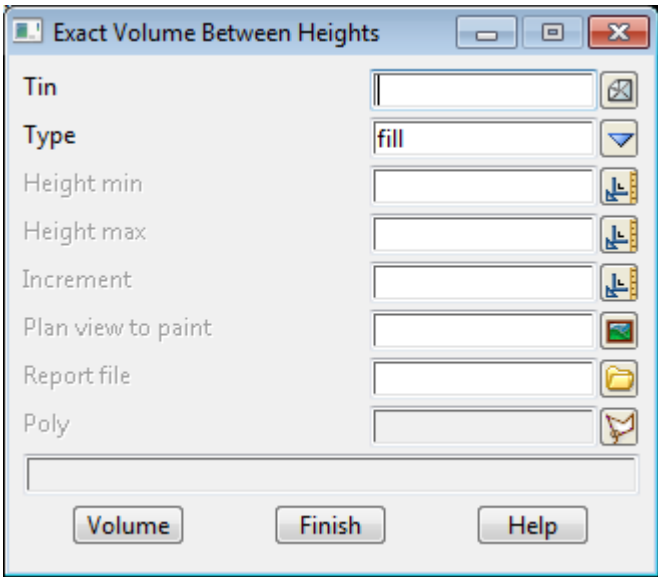
This panel is used to calculate the volume between two heights on a given tin.

The calculations can be restricted to within a polygon, or if no polygon is selected, the entire tin is used.



For more information on the exact volume calculations, go to the section [Theory of Exact Volumes](#)

On selecting the **Between heights** option, the **Exact Volume Between Heights** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin for which the volume between two heights will be calculated.</i>	input		available tins
Type <i>if fill, the fill volume between the two heights is calculated.</i> <i>If cut, the cut volume between the two heights is calculated.</i>	input	fill	cut, fill
Height min/max <i>volume is calculated between the height min and the height max values.</i>	input		
Increment	input		

the volumes between the height min and height max are reported on and is broken up into intervals given by the increment value.

Plan view to paint input available views

*if non-blank, the region used for calculations will be painted in the given plan view. The colour will be green if type is **fill**, or red if type is **cut**.*

Report file input *.rpt

name of the file to contain the volume report. If the file already exists, the report will be appended to the file. If no name is given, no report is produced.

Poly poly string-select

if selected, this string is used as the bounding polygon for the volume calculations.

Volume button

The volume between the height min and height max for the tin within the selected bounding polygon is calculated by the exact method.

<Esc> can be used to terminate the option during volume calculations.

Removal Calcs

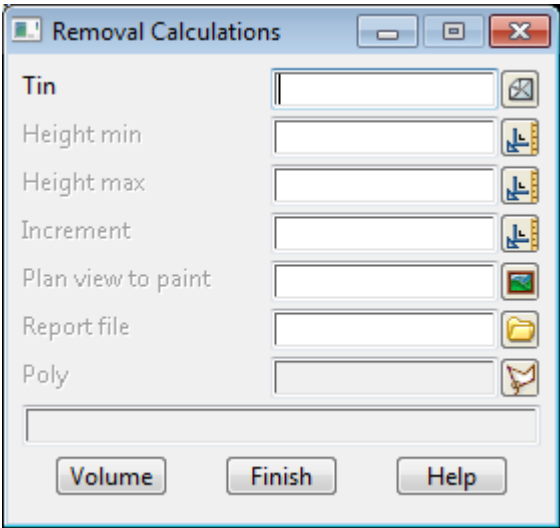
Position of option on menu: Design =>Volumes =>Exact =>Removal calcs

For a user specified range of heights, this option will calculate the cut volume from each height to a given tin, plus the plan and slope areas for the region of the tin exposed by cutting to the height.

The calculations can be restricted to within a polygon, or if no polygon is selected, the entire tin is used.

For more information on the exact volume calculations, go to the section [Theory of Exact Volumes](#)

On selecting the Removal calcs option, the **Removal Calculations** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin used in the volume calculations.</i>	input		available tins
Height min/max <i>if non-blank, the minimum/maximum value of the height range to calculate volumes to. if blank, the tin's minimum/maximum z-value is used.</i>	input		
Increment <i>increment between the heights to calculate the volumes to.</i>	input		
Plan view to paint <i>if non-blank, the region used for calculations will be painted red in the given plan view.</i>	input		available views
Report file <i>name of the file to contain the volume report. If the file already exists, the report will be appended to the file. if no name is given, no report is produced.</i>	input		*.rpt
Poly <i>if selected, this string is used as the bounding polygon for the volume calculations.</i>	poly string-select		
Volume <i>calculate the cut volumes from the tin to the height for the required heights in the height min and height</i>	button		

max *range*.

<Esc> can be used to terminate the option during volume calculations.

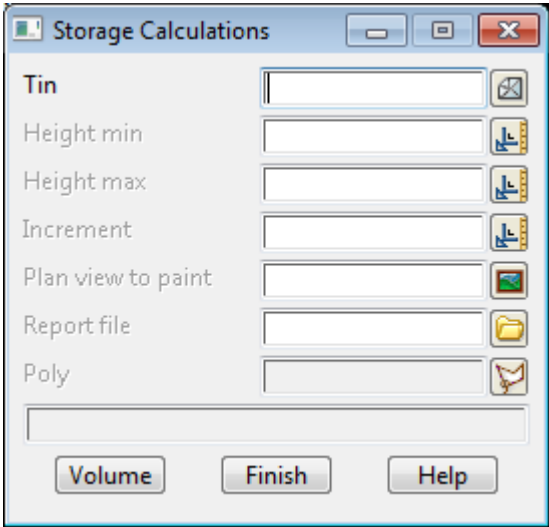
Storage Calcs

Position of option on menu: Design =>Volumes =>Exact =>Storage calcs

For a user specified range of heights, this option will calculate the fill volume from each height to a given tin, plus the plan and slope areas for the region of the tin covered by filling to the height. The calculations can be restricted to within a polygon, or if no polygon is selected, the entire tin is used.

For more information on the exact volume calculations, go to the section [Theory of Exact Volumes](#)

On selecting the Storage calcs option, the **Storage Calculations** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin used in the volume calculations.</i>	tin box		available tins
Height min/max <i>if non-blank, the minimum/maximum value of the height range to calculate volumes to. if blank, the tin's minimum/maximum z-value is used.</i>	input		
Increment <i>increment between the heights to calculate the volumes to.</i>	input	1	
Plan view to paint <i>if non-blank, the region used for calculations will be painted green in the given plan view.</i>	view box		available views
Report file <i>name of the file to contain the volume report. If the file already exists, the report will be appended to the file. If no name is given, no report is produced.</i>	file box		*.rpt
Poly <i>if selected, this string is used as the bounding polygon for the volume calculations.</i>	poly string-select		
Volume <i>calculate the fill volumes from the tin to the height for the required heights in the height min and height max range.</i>	button		

<Esc> can be used to terminate the option during volume calculations.

Tin to Height

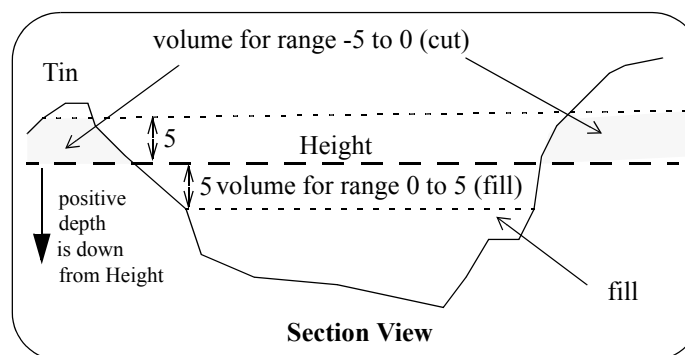
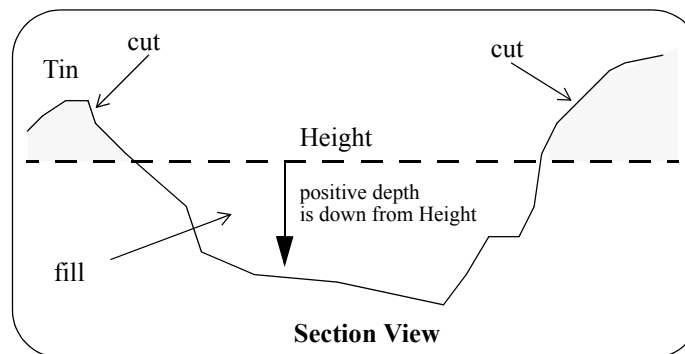
Position of option on menu: Design =>Volumes =>Exact =>Tin to height

This panel is used to calculate the volume between a tin and a given height.

The calculations can be restricted to within a polygon, or if no polygon is selected, the entire tin is used.

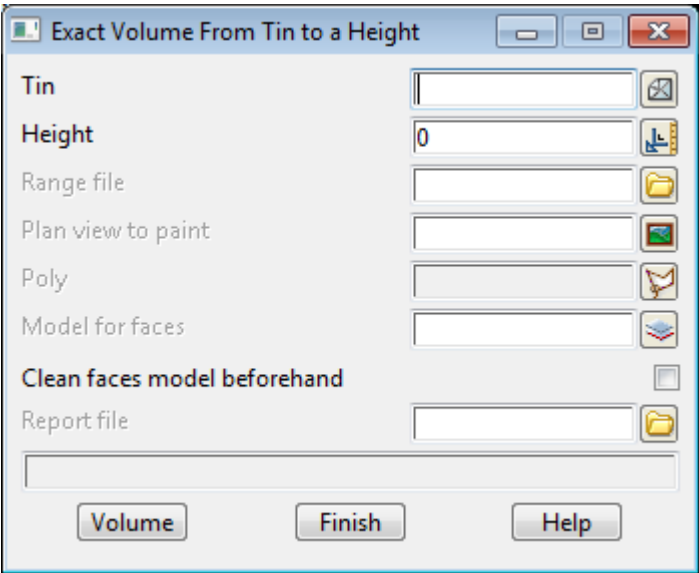
The calculated volumes can be produced and reported over user supplied depth ranges. Similarly, a view can be coloured on a depth basis using the same **range** file.

IMPORTANT NOTE - the **volume totals** are **only** calculated for the **depths in the range file**. If the depth ranges **does not cover** the entire depth difference between the tin and the height then the totals which are the sum of the different depth ranges will **not** be the same as the volume between the tin and the height.



For more information on the exact volume calculations, go to the section [Theory of Exact Volumes](#)

On selecting the **Tin to height** option, the **Exact Volume From Tin to a Height** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin for which the volume between it and a height (z value) will be calculated.</i>	input		available tins
Height <i>the volume is calculated between the tin and the value in this field.</i>	input		
Range file <i>if non-blank, the user supplied depth range file is used to split up the volumes report and define the depth colours used for painting a view.</i>	input		*.drf
Plan view to paint <i>if non-blank, the given plan view will be painted according to the depth colours given in the range file.</i>	input		available views
Poly <i>if selected, this string is used as the bounding polygon for the volume calculations.</i>	poly string-select		
Model for faces <i>if non-blank, faces will be created with colours according to the range colours given in the range file.</i>	input		available models
Clean faces models beforehand <i>if ticked, the model of faces is cleaned out before the option runs.</i>	tick box		
Report file <i>name of the file to contain the volume report. If the file already exists, the report will be appended to the file. If no name is given, no report is produced.</i>	input		*.rpt
Volume <i>The volume between the tin and the height (z-value) for the given range file within the selected bounding polygon is calculated by the exact method. If a range file does not exist, the volumes between the tin and the height is calculated.</i>	button		

<Esc> can be used to terminate the option during volume calculations.

Tin to Height 2

Position of option on menu: Design =>Volumes =>Exact =>Tin to height 2

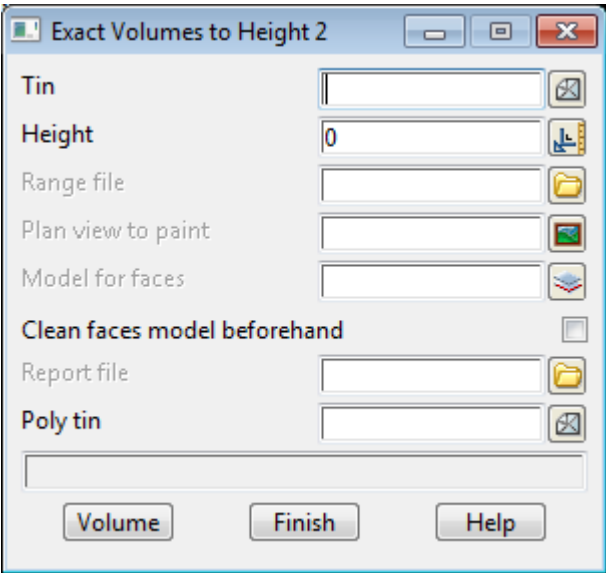
This panel is used to calculate the volume between a tin and a given height but the calculations are restricted to only the regions defined by another tin rather than to a polygon.

The calculated volumes can be produced and reported over user supplied depth ranges. Similarly, a view can be coloured on a depth basis using the same **range** file.

IMPORTANT NOTE - the **volume totals** are **only** calculated for the **depths in the range file**. If the depth ranges **does not cover** the entire depth difference between the tin and the height then the totals which are the sum of the different depth ranges will **not** be the same as the volume between the tin and the height.

For more information on the exact volume calculations, go to the section [Theory of Exact Volumes](#)

On selecting the **Tin to height 2** option, the **Exact Volumes to Height 2** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin for which the volume between it and a height (z value) will be calculated.</i>	tin box		available tins
Height <i>the volume is calculated between the tin and the value in this field.</i>	input		
Range file <i>if non-blank, the user supplied depth range file is used to split up the volumes report and define the depth colours used for painting a view.</i>	input		*.drf
Plan view to paint <i>if non-blank, the given plan view will be painted according to the depth colours given in the range file.</i>	view box		available views
Model for faces <i>if non-blank, faces will be created with colours according to the range colours given in the range file.</i>	model box		available models
Clean faces models beforehand	tick box		

if ticked, the model of faces is cleaned out before the option runs.

Report file file box *.rpt

name of the file to contain the volume report. If the file already exists, the report will be appended to the file. If no name is given, no report is produced.

Poly tin tin box available tins

name of the tin to define the regions that the volume calculations are restricted to.

Volume button

The volume between the tin and the height (z-value) for the given range file within the selected bounding polygon is calculated by the exact method. If a range file does not exist, the volumes between the tin and the height is calculated.

<Esc> can be used to terminate the option during volume calculations.



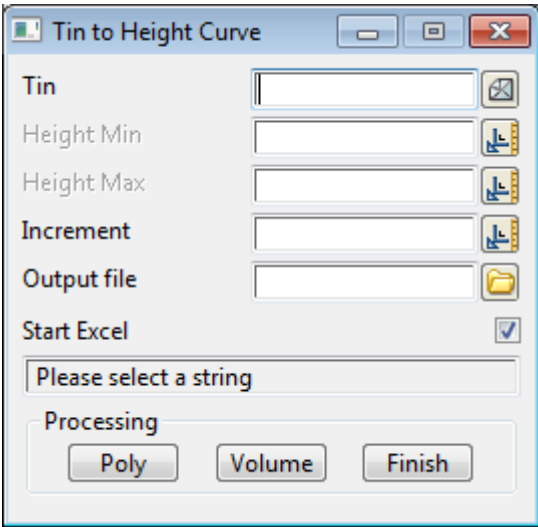
Tin to Height Curve

Position of option on menu: Design =>Volumes =>Exact =>Tin to ht curve

This panel is used to calculate the volume between a tin between heights and writes out a report on the volumes.

For more information on the exact volume calculations, go to the section [Theory of Exact Volumes](#)

On selecting the Tin to ht curve option, the **Tin to Height Curve** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin for which the volume between it and a height (z value) will be calculated.</i>	tin box		available tins
Height min <i>the start height for calculation volumes.</i>	input		
Height max <i>the end height for calculation volumes.</i>	input		
increment <i>the height increment.</i>	input		
Output file <i>the file for the volumes report.</i>	file box		
Start Excel <i>if ticked, start Excel up with the report loaded into it.</i>	tick box	tick	
Poly <i>select the polygon which is used in plan only to restrict the area for calculating volumes over.</i>	select		
Volume <i>calculate the volume between heights differing by the given increment, and write out a report.</i>	button		

Tin to Tin

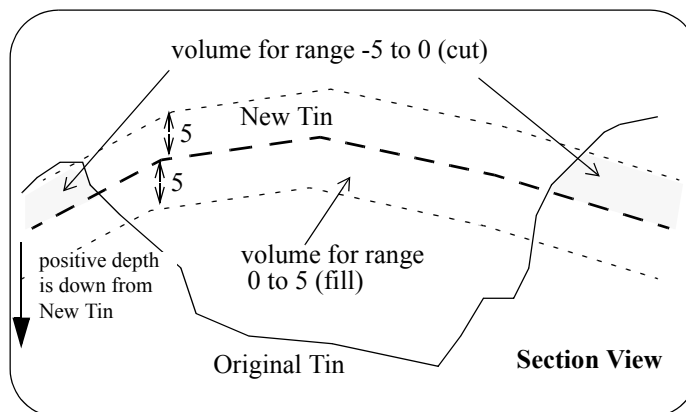
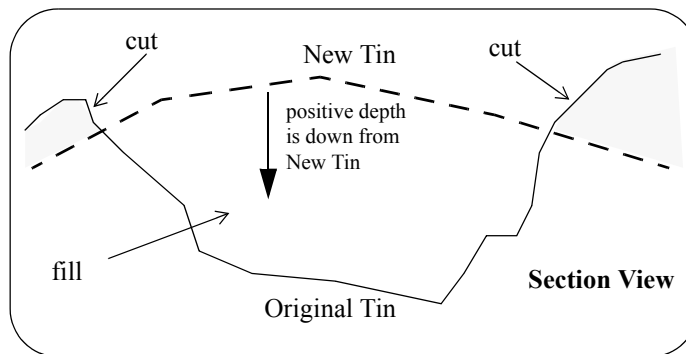
Position of option on menu: Design =>Volumes =>Exact =>Tin to tin

This panel is used to calculate the volume between two tins using the exact method.

The calculations can be restricted to within a polygon, or if no polygon is selected, the overlapping sections of the two tins is used.

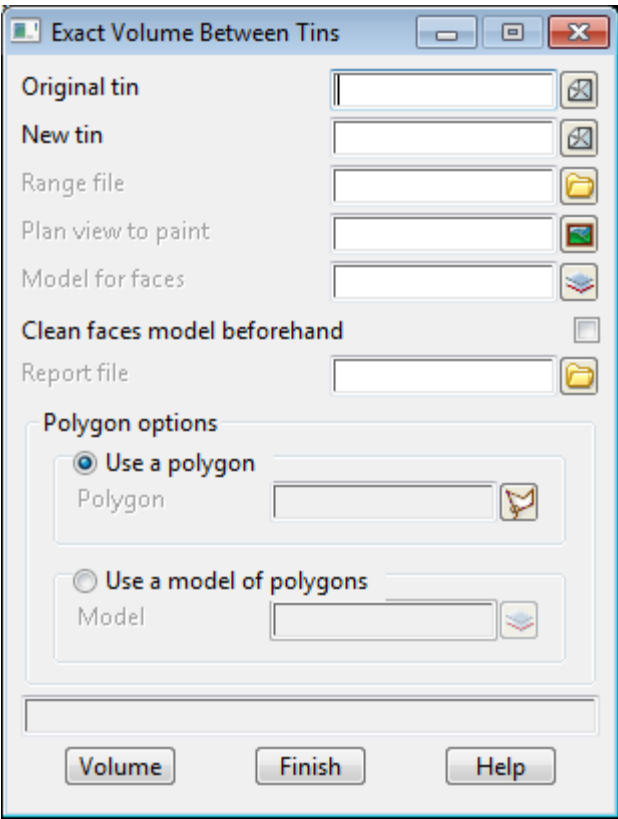
The calculated volumes can be produced and reported on over user supplied depth ranges. Similarly, a view can be coloured on a depth basis using the same **range** file.

IMPORTANT NOTE - the **volume totals** are **only** calculated for the **depths in the range file**. If the depth ranges **does not cover** the entire depth difference between the tins then the totals which are the sum of the different depth ranges will **not** be the same as the volumes between the two tins.



For more information on the exact volume calculations, go to the section [Theory of Exact Volumes](#)

On selecting the **Tin to tin** option, the **Exact Volume Between Tins** panel is displayed.



Cut is defined to be where ever the new tin is **below** the original tin. Fill is defined to be where ever the new tin is **above** the original tin.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Original/New Tin	tin box		available tins
<i>name of the original/new tin for determining volumes.</i>			
Range file	input		*.drf
<i>if non-blank, the user supplied range file is used to split up the volumes report and define the depth colours used for painting a view.</i>			
Plan view to paint	input		available views
<i>if non-blank, the given plan view will be painted according to the depth colours given in the range file.</i>			
Model for faces	input		available models
<i>if non-blank, faces will be created with colours according to the range colours given in the range file.</i>			
Clean faces model beforehand	tick box		
<i>if ticked, the model of faces is cleaned out before the option runs.</i>			
Report file	input		*.rpt
<i>name of the file to contain the volume report. If the file already exists, the report will be appended to the file. If no name is given, no report is produced.</i>			

Polygon options

Use a polygon	radio button
Polygon	poly string select

if Use a polygon is selected, then the selected string is used as the bounding polygon for the volume calculations.

Use a model of polygons ☐

Model

model box

available models

if Use a model of polygons is selected, then this model is used and each string in the model is used as a bounding polygon and the volume calculated.

Volume

button

The volume between the two tins for the given range file within the selected bounding polygon is calculated by the exact method. If a range file does not exist, the volumes between the two tins is calculated.

<Esc> can be used to terminate the option during volume calculations.

Tin to Tin 2

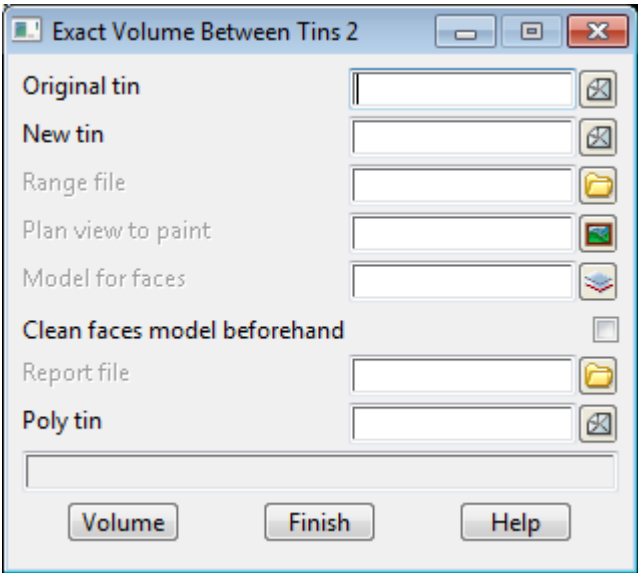
Position of option on menu: Design =>Volumes =>Exact =>Tin to tin 2

This panel is used to calculate the volume between two tins using the exact method but the calculations are restricted to only the regions defined by another tin rather than to a polygon. The calculated volumes can be produced and reported on over user supplied depth ranges. Similarly, a view can be coloured on a depth basis using the same **range** file.

IMPORTANT NOTE - the **volume totals** are **only** calculated for the **depths in the range file**. If the depth ranges **does not cover** the entire depth difference between the tins then the totals which are the sum of the different depth ranges will **not** be the same as the volumes between the two tins.

For more information on the exact volume calculations, go to the section [Theory of Exact Volumes](#)

On selecting the **Tin to tin** option, the **Exact Volume Between Tins 2** panel is displayed.



Cut is defined to be where ever the new tin is **below** the original tin. Fill is defined to be where ever the new tin is **above** the original tin.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Original/New Tin <i>name of the original/new tin for determining volumes.</i>	tin box		available tins
Range file <i>if non-blank, the user supplied range file is used to split up the volumes report and define the depth colours used for painting a view.</i>	input		*.drf
Plan view to paint <i>if non-blank, the given plan view will be painted according to the depth colours given in the range file.</i>	input		available views
Model for faces <i>if non-blank, faces will be created with colours according to the range colours given in the range file.</i>	input		available models
Clean faces model beforehand	tick box		

if ticked, the model of faces is cleaned out before the option runs.

Report file file box *.rpt
name of the file to contain the volume report. If the file already exists, the report will be appended to the file. If no name is given, no report is produced.

Poly tin tin box available tins
name of the tin to define the regions that the volume calculations are restricted to.

Volume button
The volume between the two tins for the given range file within the selected bounding polygon is calculated by the exact method. If a range file does not exist, the volumes between the two tins is calculated.

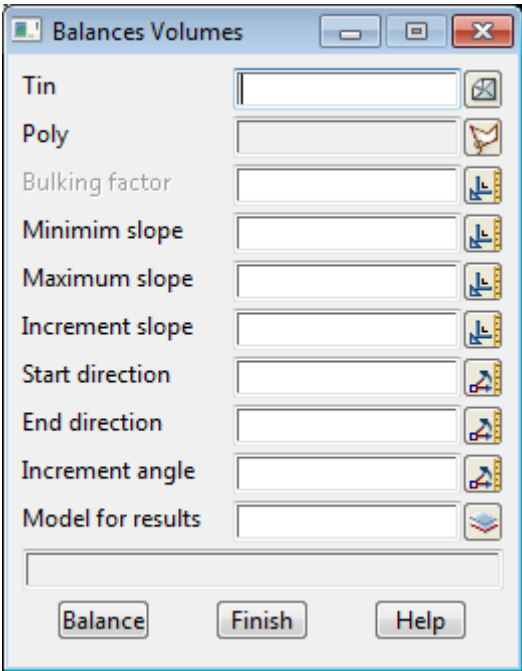
<Esc> can be used to terminate the option during volume calculations.

Balanced Volumes

Position of option on menu: Design =>Volumes =>Exact =>Balanced volumes

This option is currently under development.

On selecting the **Balanced volumes** option, the **Balances Volumes** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin	tin box		available tins
Poly	polygon box		
Bulking factor	measure box		available measures
Minimum slope	measure box		available measures
Maximum slope	measure box		available measures
Increment slope	measure box		available measures
Start direction	measure box		available measures
End direction	measure box		available measures
Increment angle	measure box		available measures
Model for results	model box		available models
Balance	button		

Grid Cell

Position of option on menu: Design =>Volumes =>Grid cell

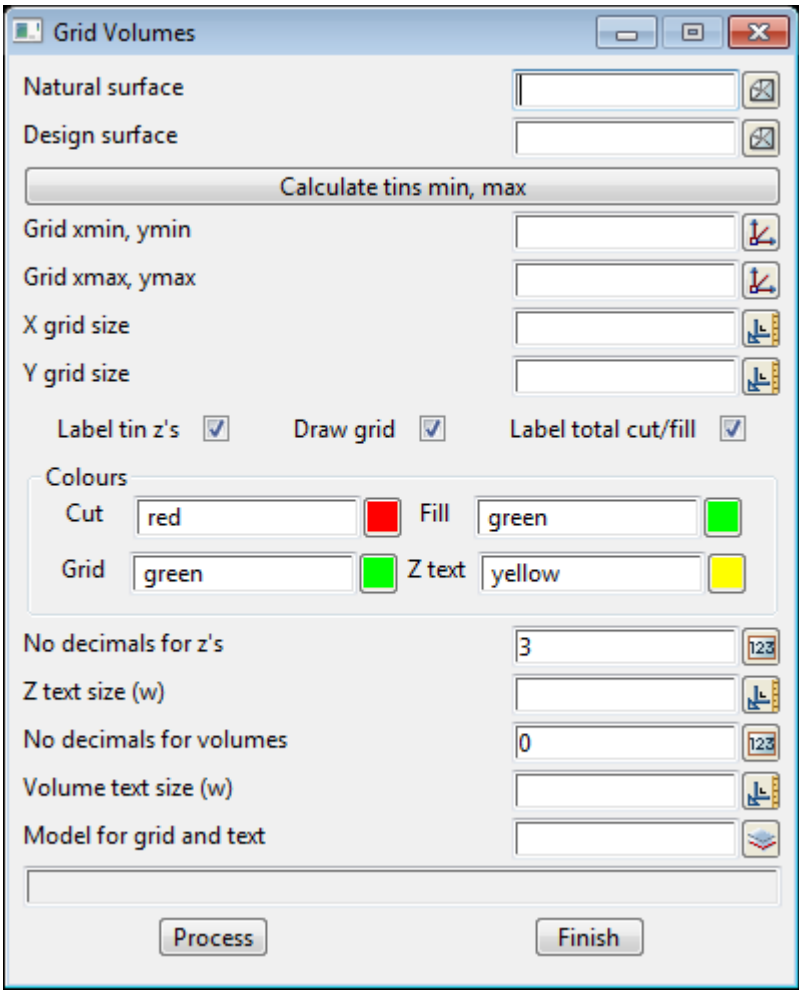
This panel is used to calculate the cut and fill volume between two tins using the exact method and then creating text for each rectangular cells of user defined sides covering the tins.

The rectangular cells (grid) can be drawn and the text of the cut and fill values for each grid cell and z-values at the cell corners. The total cut and fill can also be created at the bottom of the grid.

Cut is defined to be where ever the *design* tin is **below** the *natural surface* tin. **Fill** is defined to be where ever the *design* tin is **above** the *natural surface* tin.

For more information on the exact volume calculations, go to the section [Theory of Exact Volumes](#)

On selecting the Grid cell option, the **Grid Volumes** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Natural surface/Design surface <i>name of the original/new tin for determining volumes.</i>	tin box		available tins
Calculate tins min, max	button		

when selected, the minimum and maximum x and y values to define the grid cells are calculated and written to the grid x and y minimum and maximum panel fields.

Grid xmin xmax input

the minimum and maximum x values to define the grid cells. The two values are separated by one or more spaces.

Grid ymin ymax input

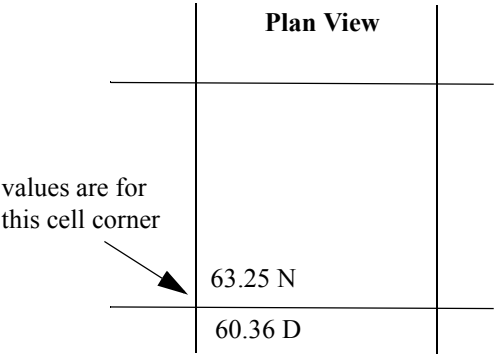
the minimum and maximum y values to define the grid cells. The two values are separated by one or more spaces.

X/Y grid size input

the X/Y size of the grid cell.

Label tin z's tick box ticked

if ticked, create text values for the z-values from the tins for each of the grid cell corners. The natural surface z value is followed by a **N** and is placed above and to the right of the corner point. The design surface z value is followed by a **D** and is placed below and to the right of the corner point.



Draw grid tick box ticked

if ticked, the grid is drawn.

Label total cut/fill tick box ticked

if ticked, label the total cut, fill and balance at the left hand bottom corner of the grid.

Cut/Fill/Grid/Z text colours colour box

colours to use for the cut, fill and z-values and the grid lines.

Num decimals for z's input 3

number of decimal places in the z values.

Z text size (w) input

size in world units for the text of the z values.

Num decimals for volumes input 0

number of decimal places in the cut and fill volumes.

Volume text size (w) input

size in world units for the text of the volumes.

Model for grid and text model box available models

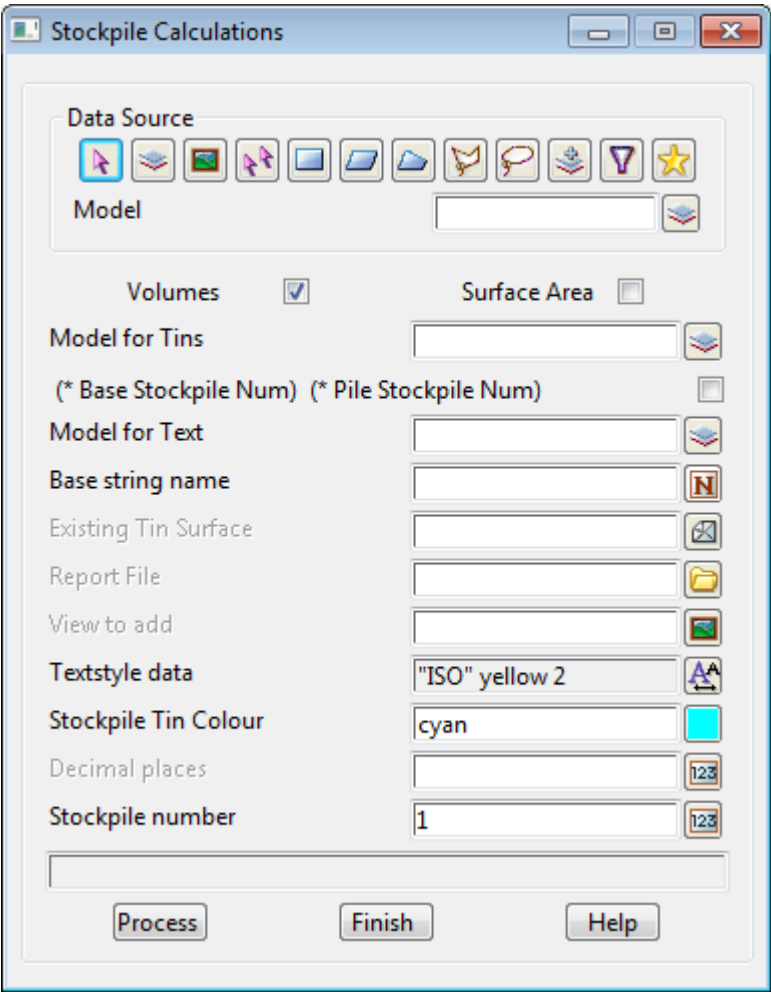
model to place all the text and grid lines in.

Report file	input	*.rpt
	<i>name of the file to contain the volume report. If the file already exists, the report will be appended to the file. If no name is given, no report is produced.</i>	
Process	button	
	<i>calculate the grid volumes and grid lines.</i>	
Undo	button	
	<i>undo the last set of text and grid lines created whilst the panel was up.</i>	

Stockpile

Position of option on menu: Design =>Volumes =>Stockpile

On selecting the Stockpile option, the **Stockpile Calculations** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source			
<i>data source for strings to create the stockpile.</i>			
Volumes	tick box	ticked	
<i>if ticked, calculate and report the volumes of the stockpiles.</i>			
Surface area	tick box		
<i>if ticked, calculate and report the surface area of the stockpiles</i>			
Model for tins	model box		available models
<i>name of the model to place the stockpile tins in.</i>			

Model for text	model box	available models
<i>name of the model to place the text in.</i>		
Base string name	name box	available names
<i>Name of the string to use as the base of the stockpile.</i>		
Report file	file box	*.rpt
<i>name of the file to contain the volume report.</i>		
View to add	view box	available views
<i>view to add the model of text to.</i>		
Textstyle data	textstyle data box	text favourites
<i>text setup - for a full description go to Textstyle Data and Textstyle Info in the chapter Tools and Concepts.</i>		
Decimal places	number box	
<i>number of decimal places for the volumes in the report.</i>		
Stockpile number	number box	
<i>number of stockpile to use in the report.</i>		
Process	button	
<i>calculate the volume and/or surface area of the stockpile.</i>		

Tin to Tin by Height Range

Position of option on menu: Design =>Volumes =>Tin to tin ht range

This option is used to calculate the cut and fill volume between two tins breaking the *cut* and *fill* volumes up by height ranges.

An approximate method is used which uses the z-value of the tin at a point as the representative of the height for a cell of user specified size "delta x" by "delta y" centred on the point. By making delta x and delta y small, the volumes become more accurate but the computation time increases.

Please note that the volume totals are **only** for the heights in the range file. If the height ranges don't cover the entire height difference, then the totals will not be the volumes between the two tins.

Cut is defined to be where ever the new tin is **below** the original tin. **Fill** is defined to be where ever the new tin is **above** the original tin.

In the volumes report, the sign for cut (negative or positive) is given by the cut volume sign from the **default settings** panel (fill will have the opposite sign).

The *height range file* consists of a list of height ranges and colours, one set per line, in the format

lower_height upper_height height_colour

This line represents all heights satisfying

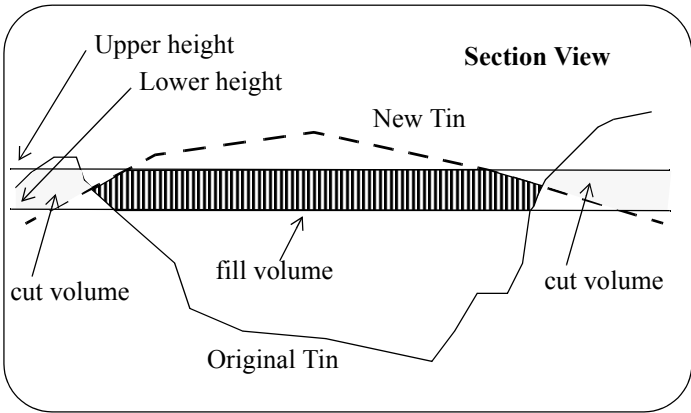
$\text{lower_height} \leq \text{height} < \text{upper_height}$.

For each range in the file, the total cut and fill volumes for the height range will be reported on. The colour is ignored in this option.

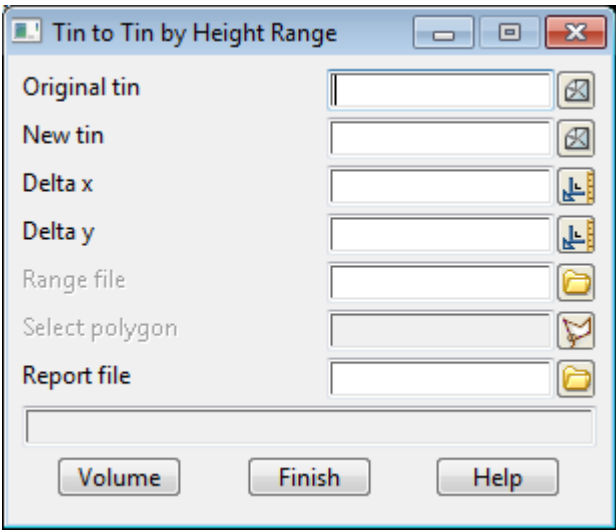
Example of a Height Range File

```
// height range file
// format:  lower_height    upper_height    colour_for_height_range

110    120    green    // colour green where the height is greater or equal to 110 and less than
120
120    220    "dark green"    // colour dark green where height is >= 120 and less than 220
```



On selecting the tin to tin ht range option, the tin to tin by height range panel is displayed.



The fields and buttons used in this panel have the following functions.

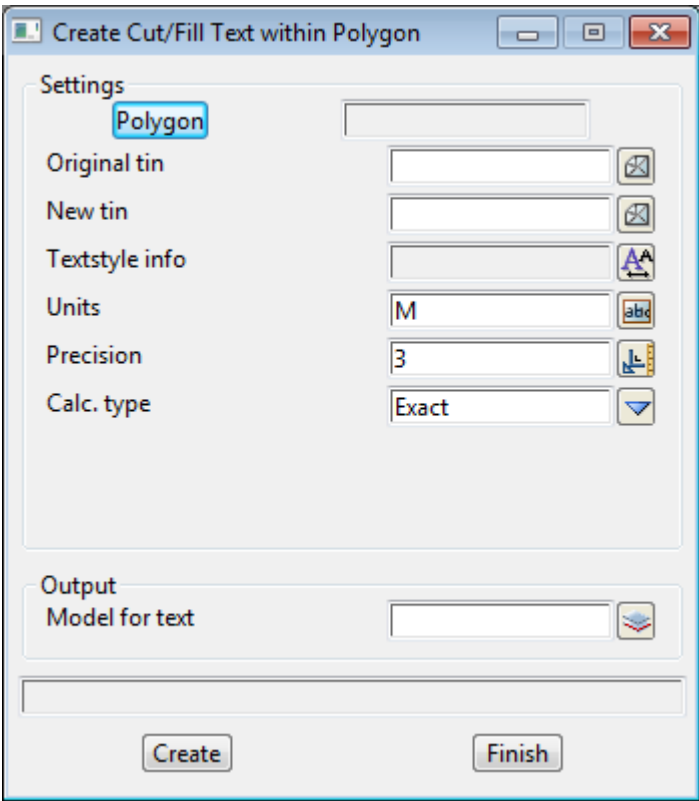
Field	Description	Type	Defaults	Pop-Up
Original/New tin	<i>name of the original/new tin for determining volumes.</i>	tin box		available tins
Delta x/Delta y	<i>x/y size of the cell to consider to be of the height.</i>	input	1	
Select polygon	<i>optional. If selected, the volumes are restricted to being inside this polygon.</i>	string select		
Range file	<i>if non-blank, the user supplied height range file is used to split up the volumes report. Note that the volume totals are only for the heights in the range file.</i>	input		*.drf
Report file	<i>if non-blank, the name of the file to contain the volume report. Note that the volume totals are only for the heights in the range file</i>	report file		*.rpt
Volume	<i>calculate the volumes.</i>	button		

Create Cut/Fill Text Within Polygon

Position of option on menu: Design =>Volumes =>Cut/fill text in poly

This option is used to calculate the cut and fill volume between two tins within a polygon and writing the cut and fill values to a model. The Exact or End Area method can be used for the volume calculations.

Selecting Cut/fill text in poly brings up the **Create Cut/Fill Text within Polygon** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Polygon <i>the volumes are restricted to being inside this polygon.</i>	poly string select		
Original/New tin <i>name of the original/new tin for determining volumes.</i>	tin box		available tins
Textstyle info <i>textstyle info to use for the cut and fill text</i>	textstyle info box		
Units <i>text to place after the cut/fill values</i>	input		
Precision <i>number of decimal places to use for the cut/fill values</i>	input	3	
Calc. type <i>use either Exact or End Area for the volume calculations</i>	choice box	Exact	Exact, End Area

Angle

angle for sections when End Area is used

Separation input

distance between sections when End Area is used

Model for text model box

available models

model to place to cut and fill text in.

Create button

calculate the volumes and text.

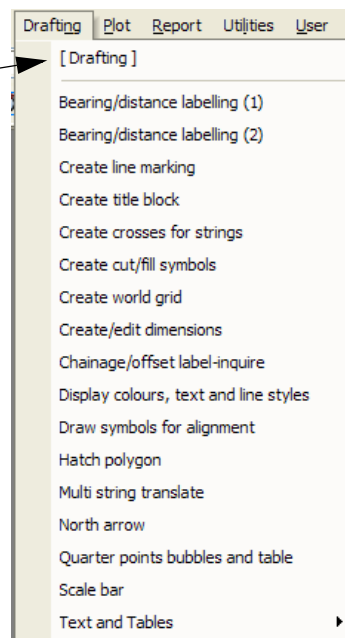
23 Drafting

The **Drafting** menu contains options to create data for plots.

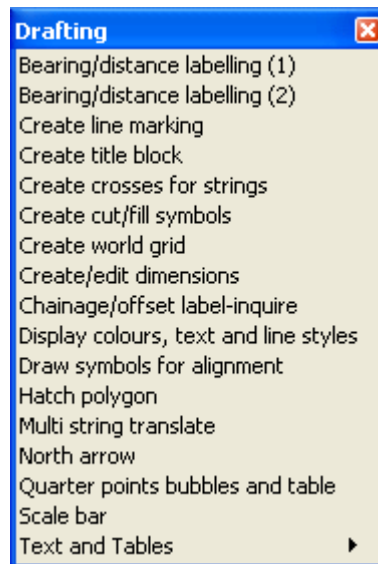
The **Drafting** menu is

on Main menu

create floating
Drafting menu



on **12d** Model menu and
floating Drafting menu



For *Bearing/distance labelling* go to

Create line marking

Create title block

Create crosses for strings

Create cut/fill symbols

Create world grid

Create/edit dimensions

Chainage/offset label inquire

Display colours, text, linestyles

Draw symbols for alignment

Hatch polygon

Multi string translate

North arrow

Quarter points bubbles and table

Scale bar

Text and tables

[Bearing/Distance Labelling](#)

[Line Marking](#) in the chapter [View](#)

[Create/Edit Title Block File](#) in the chapter [Plots](#)

[Create Crosses at String Points](#)

[Create Cut/Fill Symbols](#)

[Create World Grid](#)

[Create/Edit Dimensions](#)

[Chainage/Offset Label Inquire.](#)

[Display Colours, Textstyles and Linestyles.](#)

[Draw Symbols for Alignment String](#)

[Polygon Hatching](#)

[Text and Tables](#)

[North Point Insertion](#)

[Setout Lip Line](#) in chapter [Survey](#)

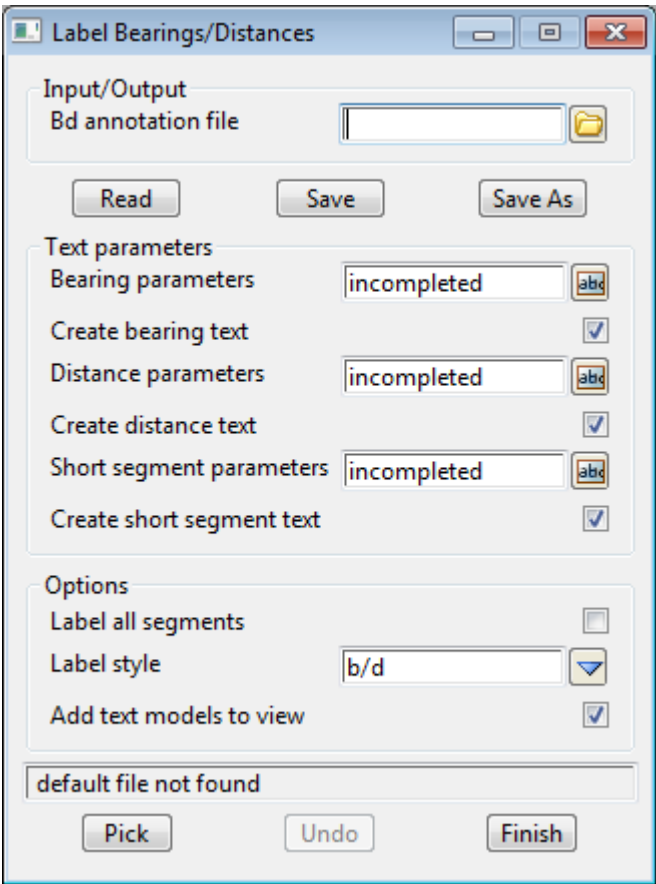
[Scalebar](#)

[Text and Tables](#)

Bearing/Distance Labelling

Position of option on menu: Drafting =>Bearing/distance labelling

This option is used to label a selected line or arc segment with bearing, distance information and arc length information. If the line or arc length is below a given value, the label information is added to a short segment table.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
bd annotation file <i>file containing values for the text parameters.</i>	file box		*.bdf files
Read <i>read the file given in the “bd annotation file” field.</i>	button		
Save <i>save the current text parameter settings to the file given in the “bd annotation file” field.</i>	button		
Save as <i>save the current text parameter settings in a file.</i>	button		
Bearing parameters	input box	none/complete	bearing parameters

incomplete

*if none, don't label bearings.
If complete, all the bearing parameters have been set.
If incomplete, not all the bearing parameters have been set so the labels can't be created.*

Create bearing text tick box tick
if tick, bearings are labelled.

Distance parameters input box none/complete bearing parameters

incomplete

*if none, don't label distances.
If complete, all the distance parameters have been set.
If incomplete, not all the distance parameters have been set so the labels can't be created.*

Create distance text tick box tick
if tick, distances are labelled.

Label all segments tick box
*if tick, all segments of the selected element are labelled.
If not-tic, only the selected segment is labelled.*

label style input box b/d, d/b, /bd b/d
 /db, bd, db
defines how to label the bearing and distances. For example, d/b means distance above the line and bearing below the line. Bearing or distance is only labelled if the appropriate flags are set.

Add text models to view tick box tick
if tick, all models containing text are added to the view containing the selected segment.

Minimum length input box 0
if non-zero, then if the length of the segment is less than this value, then it is given a short segment number and added to the short segment table.

Next short segment no. input box 1
the next number to use for short segments.

Pick button
select the segment to be labelled.

Undo button
undo the last set of created labels.

Line Marking

Position of option on menu: Drafting =>Create line marking

This option creates a title block file from a model of data. It has already been documented as

View => Visualisation => Line marking

in the section [Line Marking](#) in the chapter [View](#).

Create Titleblock

Position of option on menu: Drafting =>Create title block

This option creates a title block file from a model of data. It has already been documented as

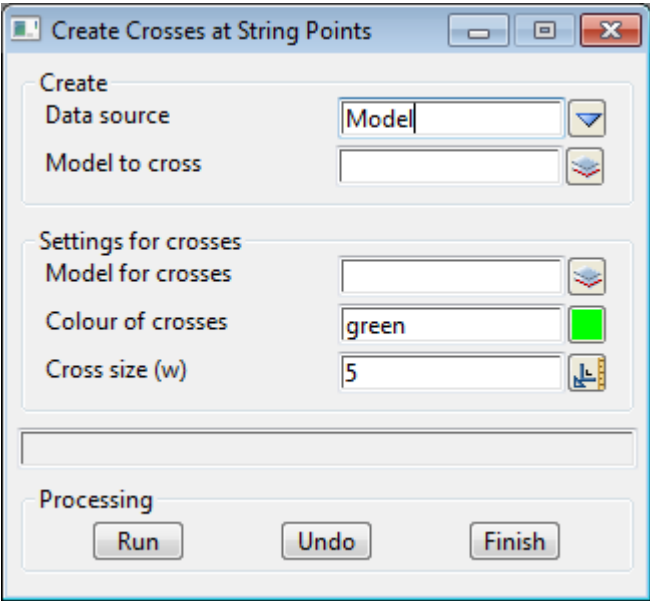
Plot => Create title block file

in the section [Create/Edit Title Block File](#) in the chapter [Plots](#).

Create Crosses at String Points

Position of option on menu: Drafting =>Create crosses for strings

This panel is used to create crosses at the points of strings. The cross is made up of two 2d strings with the intersection of the two strings being the (x,y) position of the point in the string. The option is mainly used to created crosses to send to packages that don't support a cross at a point.



The fields and buttons used in this panel have the following functions:

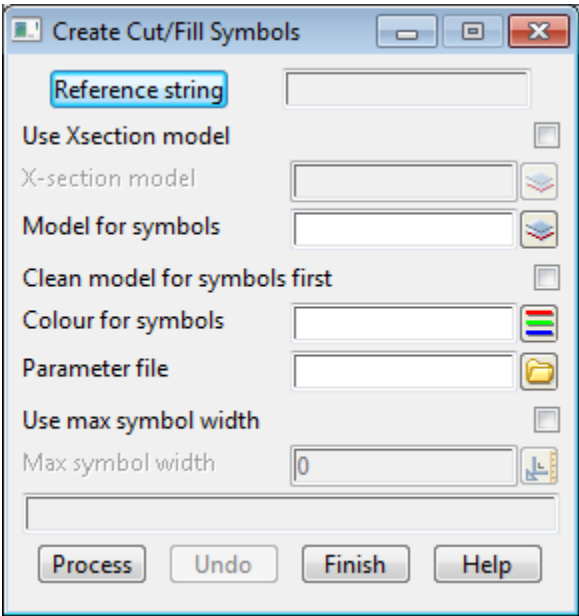
Field Description	Type	Defaults	Pop-Up
Data source <i>type of data source.</i>	data source	Model	String, Model, View
Model/View/String <i>data source to create crosses for.</i>	data source		
Model for crosses <i>model for the created crosses</i>	model box		available models
Colour for crosses <i>colour for the crosses</i>	colour box		available colours
Cross size (w) <i>size of the cross in world units.</i>	input box		5
Run <i>run the option</i>	button		
Undo	button		

undo the last set of crosses created whilst the panel has been up.

Create Cut/Fill Symbols

Position of option on menu: Drafting =>Create cut/fill symbols

This option is used to create cut and fill symbols (tadpoles) between strings or the names of the points across x-sections. The choice of symbols and the points they go between is controlled by a parameter file.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Reference string	string select		
<i>string used to define chainage and perpendicular</i>			
Use X-section model	tick box	not ticked	
<i>if ticked, the points on the cross-sections in the model are used as the names to create symbols between.</i>			
X-section model	model box		available models
<i>model of cross sections used if “Use X-section model” is ticked.</i>			
Model for symbols	input		available models
<i>model for the created cut-fill symbols</i>			
Clean model for symbols first	tick box	not ticked	
<i>if ticked, the Model for symbols will be cleaned before the new symbols are created and added.</i>			
Colour for symbols	input		available colours

colour for the created cut-fill symbols

Parameter file input

file specifying what symbols are drawn between what strings (or points on x-sections).

Use max symbol width tick box

if tick, the symbols are only stretched to the maximum size given in the "Max symbol width" field.

Max symbol width input

maximum distance in world units to stretch the symbol.

Process button

Run the option.

Undo button

undo the last set of cut-fill symbols created by running the panel. The "Undo" function is lost once the option is finished.

Notes:

```
// Sample file for plotting symbols to denote cut/fill slopes
// All lines starting with // are comments. Blank lines are ignored
//
// The file layout is:

// ch_start ch_end ch_inc side str1   str2 symbol1 %1 symbol2   %2
//
// eg 110 150 10 L "trial1->c1" "trial->c2" tadpole 100 tadpole 50
//
// ch_start defines the start chainage
// ch_end defines the end chainage
// ch_inc defines the chainage increment
// side is one of L, R or LR (left, right, both)
// str1 is the name of the string (or point on x-section) to start tadpole
// str2 is the name of the string (or point on x-section) to end tadpole

// If strings are used, the string model name must be contained in the
// string definition i.e. in the format "model->string_name"
//
// The symbols drawn between the strings (or points) alternate between
// symbol1 and symbol2 and the symbols are drawn as the
// given percentages %1 and %2 respective of the distance
// between the strings (points).

// The symbol can be one of "
// tadpole      - predefined tadpole shape
// line         - predefined batter tick
// "model=xxxxx" - where model "xxxxx" contains 3d strings
//                defining the symbol shape. This is as per
//                user-defined batter symbols in 4D.
//                NB. only 3d strings are supported in the macro

// Example

0 700 10 LR "road str->c2" "road str->c3" tadpole 100 tadpole 50
0 700 10 LR "road str->c4" "road str->c5" line 90 line 50
```

```
0 700 10 LR "road str->f2" "road str->f3" "model=symbol" 100 tadpole 50
0 700 10 LR "road str->f4" "road str->f5" line 90 line 50
```

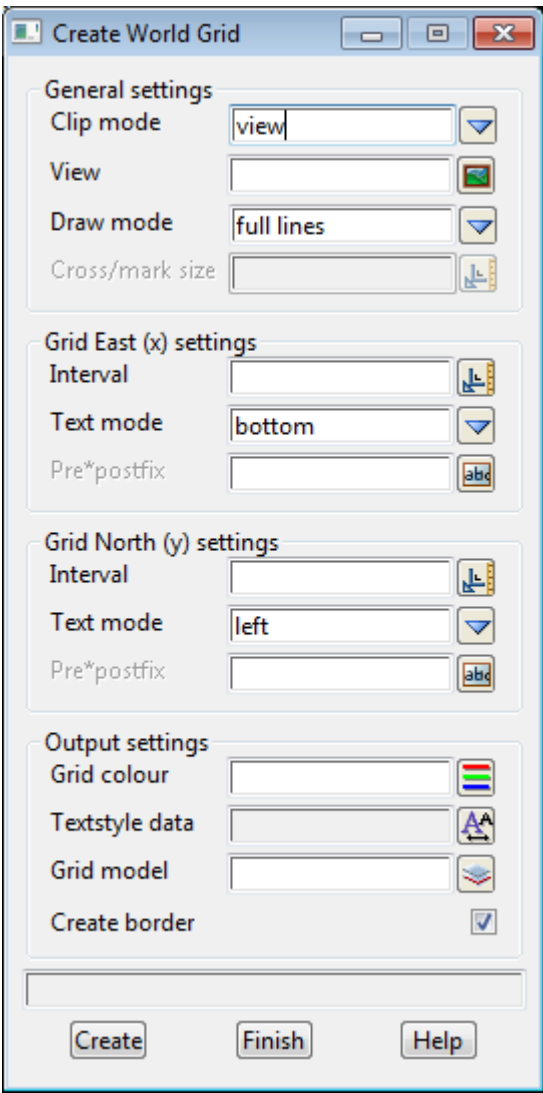


Create World Grid

Position of option on menu: Drafting =>Create world grid

This option is used to create a grid, identical to the one drawn on a plan view, but in world units. This can then be output to CAD systems that do not allow grids to be easily created.

Selecting the Create world grid option, brings up the **Create World Grid** panel:



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Clip mode	choice box		rectangle, view
<i>if rectangle, icons appear for drawing a rectangle, a rotated rectangle or selecting a plot frame. selecting the rectangle and rotated rectangle icons require the user to draw the rectangle to define the area to produce the grid for. selecting the plot frame icon requires the user to select a plot frame and the view area from the plot frame defines the area to produce the grid for.</i>			
<i>If view, a View Box appears and a view is selected to define the area to produce the grid for.</i>			

Draw mode	choice box	full lines	full lines, crosses, marks
<i>the type of the grid being drawn - full lines, crosses or marks.</i> <i>If full lines, then solid lines are drawn at the grid x and y spacing.</i> <i>If crosses, then crosses of size cross/mark size are drawn at the intersection of the grid x and y spacing.</i> <i>If marks, then solid lines size cross/mark size are drawn at the beginning/end of the grid at the x and y spacing.</i>			
Cross/mark size	input		
<i>size in world units of the grid crosses/marks.</i>			
Grid East (x)			
Interval	input		
<i>the distance between the East (x) grid lines. If this value is zero, the x grid lines will not be drawn.</i>			
Text mode	input	bottom	off, top, bottom, top and bottom
<i>the x (East) grid lines can be labelled with their x value. If the grid lines are labelled, the labels can be drawn on the top, the bottom or both ends of the x-grid lines.</i> <i>if off, no text is created for the x-grid lines.</i> <i>If bottom, text is created only at the bottom of the x-grid lines.</i> <i>If top, text is created only at the top of the x-grid lines.</i> <i>If top & bottom, text is created at the top and bottom of the x-grid lines.</i>			
Pre*postfix	input		
<i>if non blank, pre*post text to use for the labels on the x-grid lines.</i> <i>prefix/postfix (pre*post) to be applied to the value of x (East). If pretext only, just give the text. If post text is required, precede it by a *. For example E*m will place E before the x value and m after the number.</i>			
Grid North (y)			
Interval	input		
<i>the distance between the North (y) grid lines. If this value is zero, the y grid lines will not be drawn.</i>			
Text mode	input	bottom	off, top, bottom, top and bottom
<i>the y (North) grid lines can be labelled with their y value. If the grid lines are labelled, the labels can be drawn on the top, the bottom or both ends of the y-grid lines.</i> <i>if off, no text is created for the y-grid lines.</i> <i>If left, text is created only at the left of the y-grid lines.</i> <i>If right, text is created only at the right of the y-grid lines.</i> <i>If left & right, text is created at the left and right of the y-grid lines.</i>			
Pre*postfix	input		
<i>if non blank, pre*post text to use for the labels on the y-grid lines.</i> <i>prefix/postfix (pre*post) to be applied to the value of y (North). If pretext only, just give the text. If post text is required, precede it by a *.</i>			
Output settings			
Grid colour	colour box		available colours
<i>colour for the grid lines.</i>			
Textstyle data	textstyle box		
<i>textstyle data (height, angle etc) for the text for the grid labels.</i>			

Grid model model box available models
model for the grid lines and text.

Create border tick box tick
if tick, a rectangle around the area to create the grid for, is created.

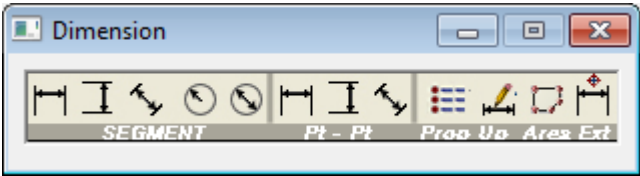
Create button
create the grid according to the values given in the panel.

Create/Edit Dimensions

Position of option on menu: Drafting =>Create/edit dimensions

This option is used to create and edit dimensions.

This option is currently under development.



The fields and buttons used in this panel have the following functions:

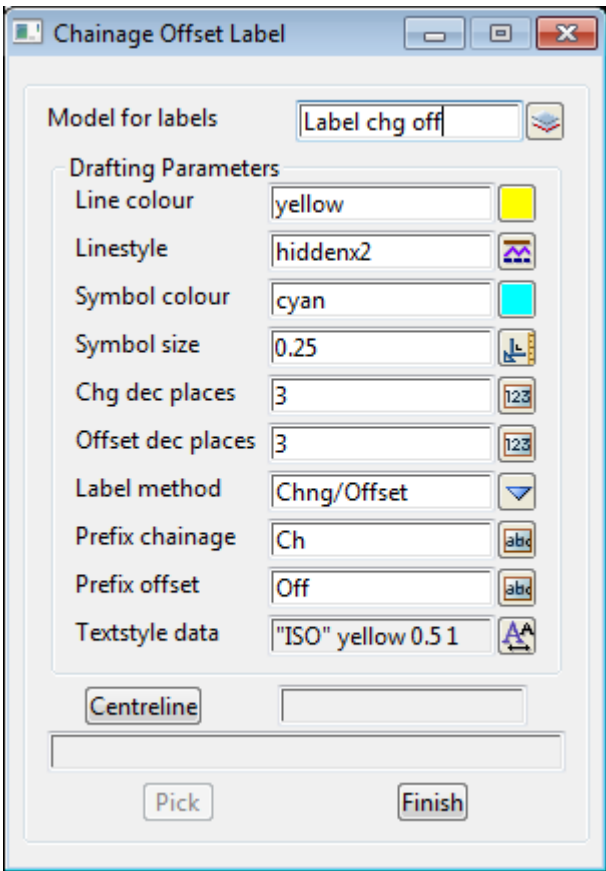
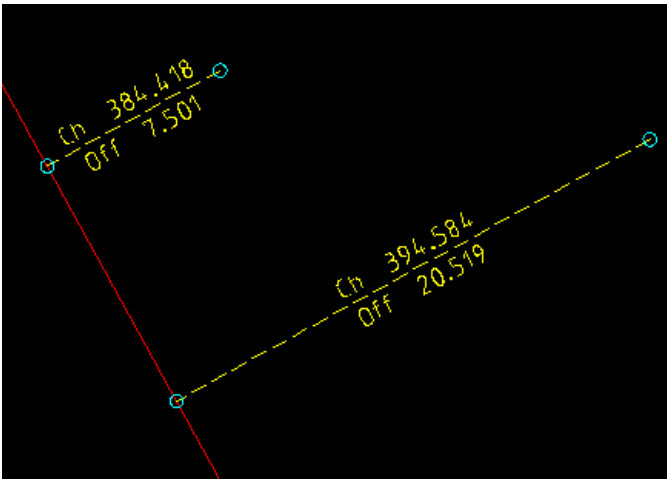
Field Description	Type	Defaults	Pop-Up
<i>read in an existing range file.</i>			

Write	button
<i>write out the data in the pages to the given range file.</i>	

Chainage/Offset Label Inquire

Position of option on menu: Drafting =>Chainage/offset label inquire

This option is used to calculate and label the perpendicular distance from a selected point to a selected centreline, and the chainage of the point dropped perpendicularly onto the centreline.



The fields and buttons used in this panel have the following functions.

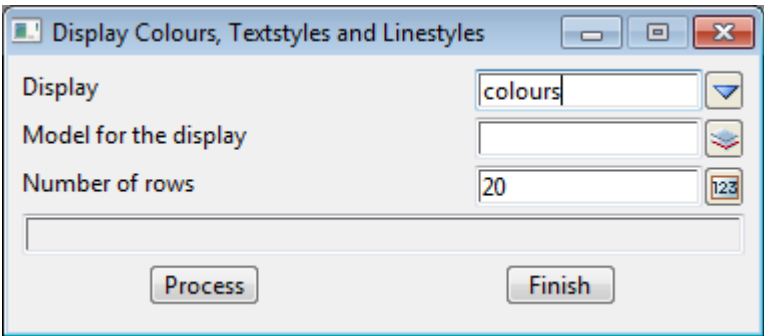
Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Model for labels <i>if non-blank, create text for the calculated offset and chainage values and place it in this model.</i>	model box	Label chg off	available models
Line colour <i>colour of the line drawn.</i>		yellow	available colours
Linestyle <i>text style for the text.</i>	linestyle box	hidden2	available linestyles
Symbol colour <i>colour of the symbol drawn at the point. text style for the text.</i>		cyan	available colours
Symbol size <i>size (in world units) of the symbol drawn at the point.</i>		0.5	
Label method <i>method of labelling the line from a selected point to the dropped point.</i>	choice box	Chng/Offset	Chng/Offset, Offset/Chng
Prefix chainage <i>prefix for the chainage value.</i>		Ch	
Prefix offset <i>prefix for the offset value.</i>		Off	
Textstyle data <i>textstyle, size, colour etc. for the text.</i>	textstyle data box		available text data
Centreline <i>select the string to use for the calculation of chainage and offset.</i>	string select		
Pick <i>pick a position and the offset from the position to the position dropped perpendicularly onto the selected Centreline is calculated, plus the chainage on the Centreline of the dropped point. The values are reported in the panel's message area and if Model for labels is non-blank, text of the values is created and place in the model.</i>	button		

Display Colours, Textstyles and Linestyles

Position of option on menu: Drafting =>Display colours, text and line styles

This option creates a model to display either all the colours, linestyles or textstyles defined for a project.



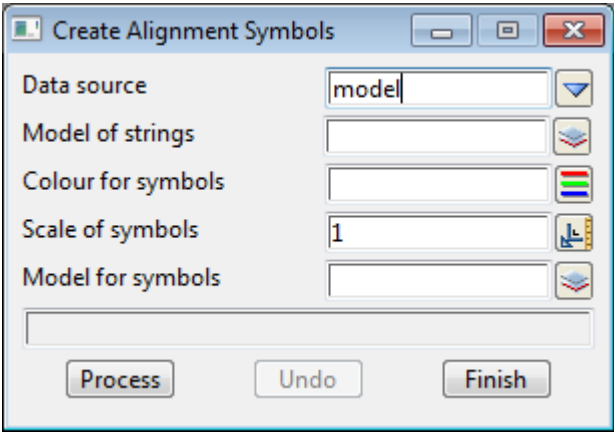
The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Display <i>type of data to display.</i>	choice	colours	colours, textstyles, linestyles
Model for the display <i>model to create the display in.</i>	model box		available modes
Number of rows <i>the display is created by first doing a column of the given "Number of rows" and then moves on to another column until all the data is drawn.</i>	input	20	
Process <i>run the option.</i>	button		

Draw Symbols for Alignment String

Position of option on menu: Drafting => Draw symbols for alignment

This panel is used to create symbols (butterflies and dumbbells) at the spiral-tangent, spiral-curve and curve tangent points.



The fields and buttons used in this panel have the following functions:

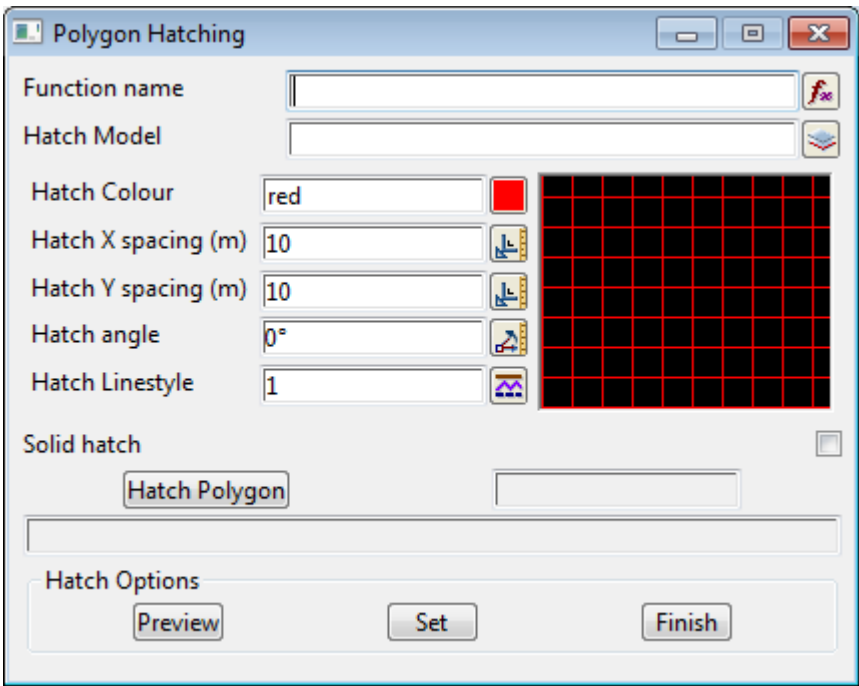
Field Description	Type	Defaults	Pop-Up
Data source <i>type of data to create symbols for.</i>	input box		
Model/View/String <i>data source to create symbols for.</i>	input box		
Colour of symbols <i>colour to use for the created symbols.</i>	input box		
Scale of symbols <i>scale of the created symbols.</i>	input box	1	
Model for symbols <i>model to put the created symbols into.</i>	input box		
Process <i>run the option.</i>	button		
Undo <i>undo the last set of symbols created whilst the panel has been up.</i>	button		

Polygon Hatching

Position of option on menu: Drafting =>Hatch polygon

This option is used to create hatching within a user selected string. A function is created so that the hatching can be recalcd if the string is modified.

Selecting **Hatch polygon** brings up the Polygon Hatching panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Function name <i>name of the hatching function.model</i>	input box		
Hatch model <i>model to place the hatching in.</i>	input box		
Hatch colour <i>colour for the hatch lines</i>	colour box	red	
Hatch x/y spacing (m) <i>distance in world units between the x/y hatching lines.</i>	input box	10	
Hatch angle <i>angle of the hatch lines.</i>	input box	0	
Hatch linestyle <i>linestyle for the hatch lines.</i>	input box	1	

Solid hatch

tick box

if ticked, a solid fill of the given hatch colour is used.

Hatch polygon

string select

select the string to hatch.

Preview

button

draw the hatching to see if it is correct - the hatching function has not been defined.

Set

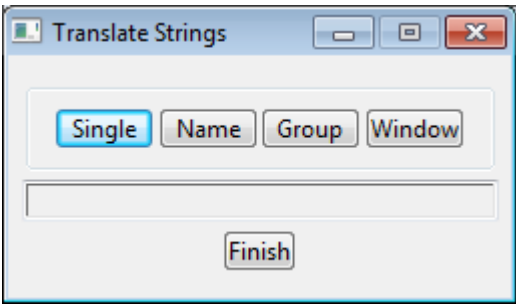
button

define the hatching function with the values given in the panel fields.



Translate Strings

Position of option on menu: Drafting =>Multi string translate
This panel is used to translate strings selected by name group of a window.
Selecting **Multi string translate** brings up the **Translate Strings** panel.



The fields and buttons used in this panel have the following functions:

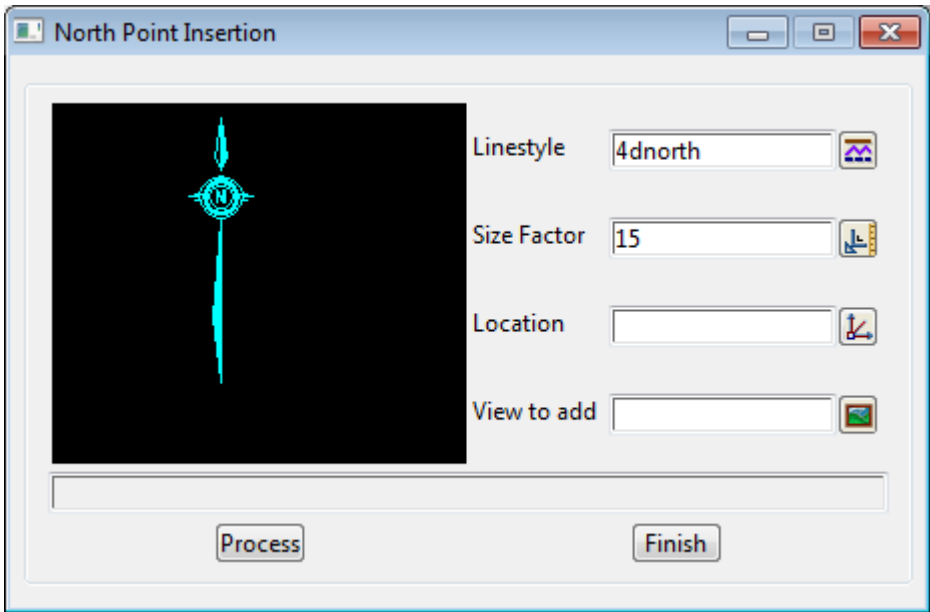
Field Description	Type	Defaults	Pop-Up
Single <i>select a single string to translate.</i>	button		
Name <i>select a string and all strings with the same name on the view will be translated.</i>	button		
Group <i>select a string and all strings with the same group on the view will be translated.</i>	button		
Window <i>click and release to define the first point of the window and then move the cursor and click and release to define the second point of the window. A position is then selected and as the cursor is moved, all strings in the view that are totally inside the window are translated and placed at the next selected position.</i>	button		
Undo <i>undo the last set of strings translated whilst the panel has been up.</i>	button		

North Point Insertion

Position of option on menu: Drafting =>North arrow

This option creates a point with a textstyle of the north point arrow.

Selecting **North arrow** brings up the North Point Insertion panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Linestyle	input box	4dnorth	
<i>Linestyle for the north point arrow - leave as 4dnorth.</i>			
Size factor	input box	15	
<i>factor the north arrow by this value.</i>			
Location	input box		
<i>either type in an x y position or click on "+" and use Pick xyz to locate the north arrow.</i>			
View to add	input box		
<i>view to add the arrow to.</i>			
Process	button		
<i>create the north point arrow in the model North Point.</i>			

Quarter Points

Position of option on menu: Drafting =>Quarter points bubbles and table

This option is used to create bubbles and/or a report for the critical horizontal and vertical points and quarter points (by chord or by chainage) for any arcs in an alignment string.

This option has already been documented as

Survey=>Setout=>Setout lip line

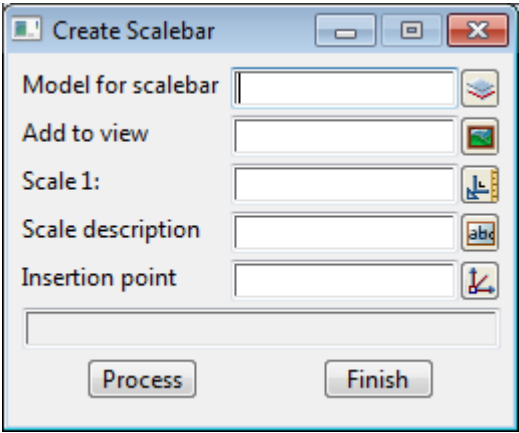
in the section [Setout Lip Line](#) in the chapter [Survey](#).

Scalebar

Position of option on menu: Drafting =>Scale bar

This option is used to create a scale bar.

Selecting Scale bar brings up the Create Scalebar panel.



The fields and buttons used in this panel have the following functions:

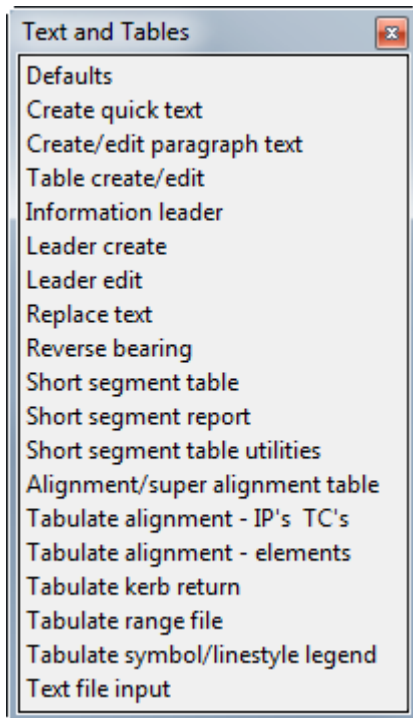
Field Description	Type	Defaults	Pop-Up
Model for scalebar <i>model to place the scalebar in.</i>	model box		available models
Add to view <i>if non-blank, the model is added to this view.</i>	input box		available views
Scale 1: <i>scale to create the scale bar at.</i>	input box		
Scale description <i>description to write under the scale bar.</i>	input box		
Insertion point <i>position to place the left hand bottom corner of the scale bar at.</i>	pick ops		pick ops
Process <i>run the option.</i>	button		

Text and Tables

Position of menu: Drafting =>Text and Tables

The Text and Tables menu contains options to create text data and tables for plots.

The Text and Tables menu is



For the option *Defaults*, go to

Create quick text
Create/edit paragraph text
Table create/edit
Information Leader
Leader create
Leader edit
Replace text
Reverse bearing
Short segment table
Short segment report
Short segment table utilities
Alignment/super alignment table
Tabulate alignment - IP's, TC's
Tabulate alignment - elements
Tabulate kerb return
Tabulate range file
Tabulate symbols/linestyle legend
Text file input

[Defaults - Text](#)

[Quick Text Input](#)

[Text Creation/Edit](#)

[Table Create/Edit](#)

[Leader Create \(Information\)](#)

[Leader Text Creation](#)

[Leader Edit](#)

[Replace Text](#)

[Reverse Bearing](#)

[Short Segments Table](#)

[Short Segment Report](#)

[Short Segments Table Utilities](#)

[Alignment & Super Alignment Table](#)

[Tabulate Alignment - IP's and CT's](#)

[Tabulate Alignment - Elements](#)

[Tabulate Kerb Return](#)

[Tabulate Range File](#)

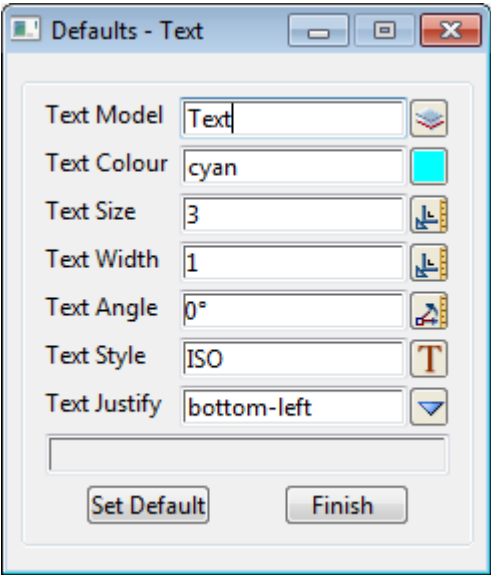
[Symbol / Linestyle Legend - Tabulation](#)

same option as [Text Creation/Edit](#)

Defaults - Text

Position of option on menu: Drafting =>Text and Tables =>Defaults

This option is used to project text defaults that are used with the "Fonts" button on many of the text options.



The fields and buttons used in this panel have the following functions:

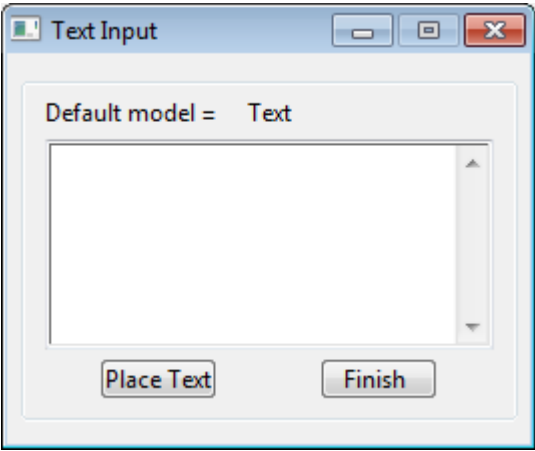
Field Description	Type	Defaults	Pop-Up
Text model <i>default model to place the text in.</i>	model box	Text	available models
Text colour <i>default colour for text.</i>	colour box	cyan	available colours
Text size <i>default size for text.</i>	input box	3	
Text width <i>default x-factor text.</i>	input box	1	
Text angle <i>default angle for text.</i>	input box	0	
Text style <i>default text style.</i>	input box	iso	
Text justify <i>default text justification.</i>	input box	bottom-left	
Set defaults	button		

set the project defaults.

Quick Text Input

Position of option on menu: Drafting =>Text and Tables =>Create quick text

The quick text option creates lines of text using the text defaults. The text can be edited and modified using the create/edit paragraph text.



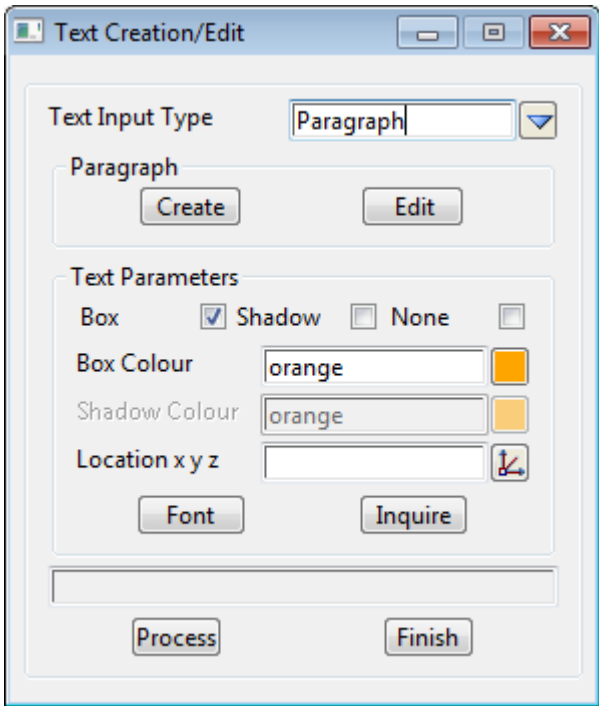
The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Text box	button		
<i>type the text to be created into the text box.</i>			
Place text	button		
<i>pick a position to become the justification point for the first line of text.</i>			

Text Creation/Edit

Position of option on menu: Drafting =>Text and Tables =>Create/edit paragraph text

The option creates and edits a paragraph of text created with this option or the quick text option.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Text input type	choice box	paragraph	paragraph, file
<i>method of creating text - type in a paragraph or read from a file</i>			
if <i>Paragraph</i> selected			
Create	button		
<i>select create to bring up the text box to type text into.</i>			
Edit	button		
<i>select edit to pick and edit existing text.</i>			
if <i>File</i> selected			
Text file	file box		
<i>name of the file to read in.</i>			
Text parameters			
Box/Shadow/None	radio button	box	
<i>if box is ticked, draw a box around the text.</i>			

*if shadow is ticked, draw shadowed box around the text.
if none is ticked, don't draw a box around the text.*

Box colour colour box orange
Colour of the box around the text

Shadow colour colour box orange
Colour of the shadow around the box around the text

Location x y z x,y,z box pick ops menu
pick the position for the text.

Font button
bring up the values for the text - e.g. model, colour, size etc.

Inquire button

Process button
create the text and place it at the given location.

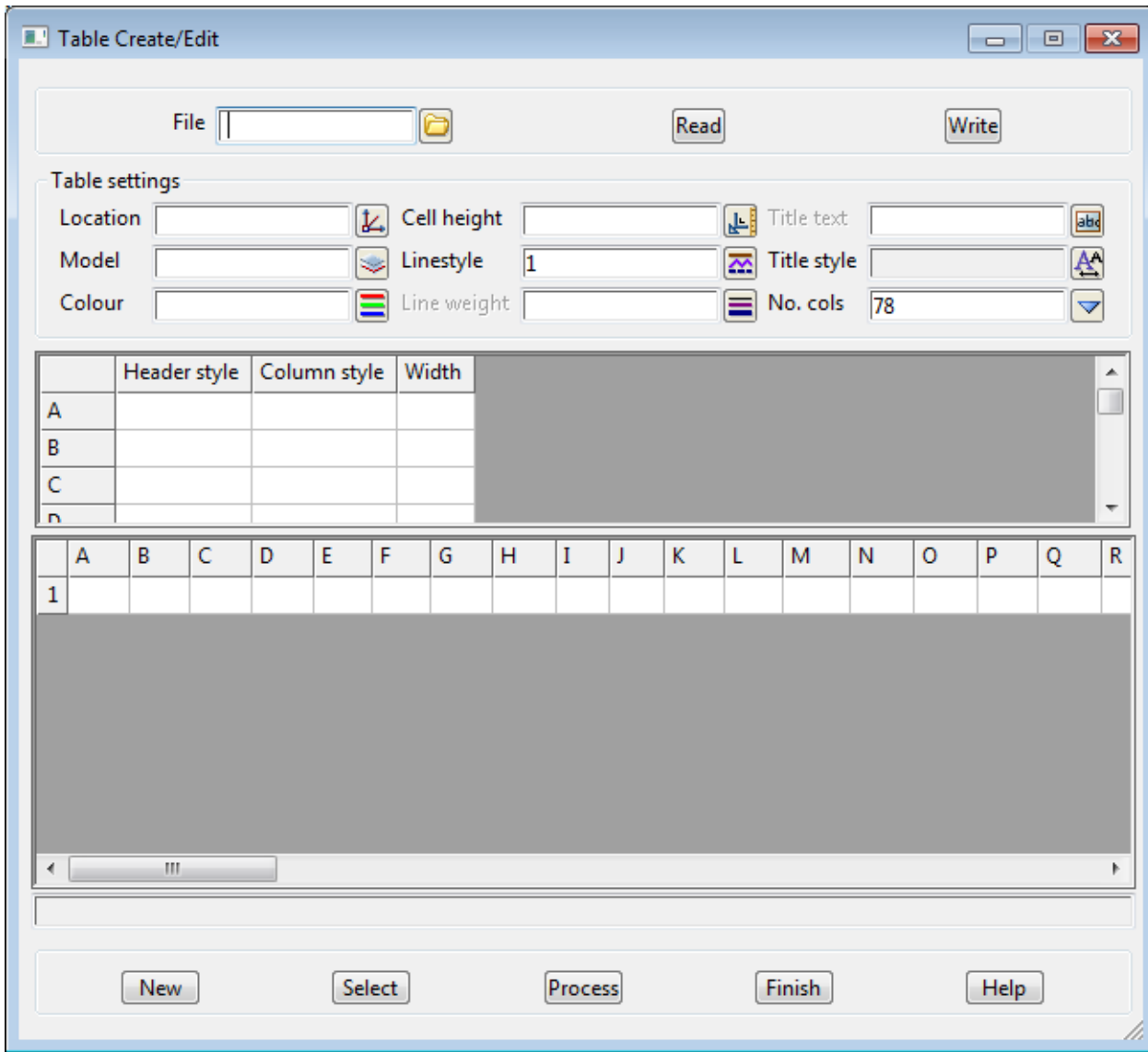
Table Create/Edit

Position of option on menu: Drafting =>Text and Tables =>Table Create/edit

This option is currently under development

This option reads in a csv file and loads the data into a grid on the panel. The data can be edited in the grid and then a table produced in a model.

An existing table in a model can also be selected and the data read into the grid on the panel. The data can then be edited and the table updated.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
File	file		
<i>file to read in and display in the grid on the panel.</i>			
Read	button		
<i>read the specified file in and display it in the grid on the panel.</i>			

Write button

write the data in the grid on the panel to the specified file.

Table settings

create the text and place it at the given location.

Leader Create (Information)

Position of option on menu: Drafting =>Text and Tables =>Information leader

This option creates a leader that can extract and list certain information about the string selected.

Information such as AREA, STRING LENGTH, SEGMENT LENGTH and GRADE can be displayed.

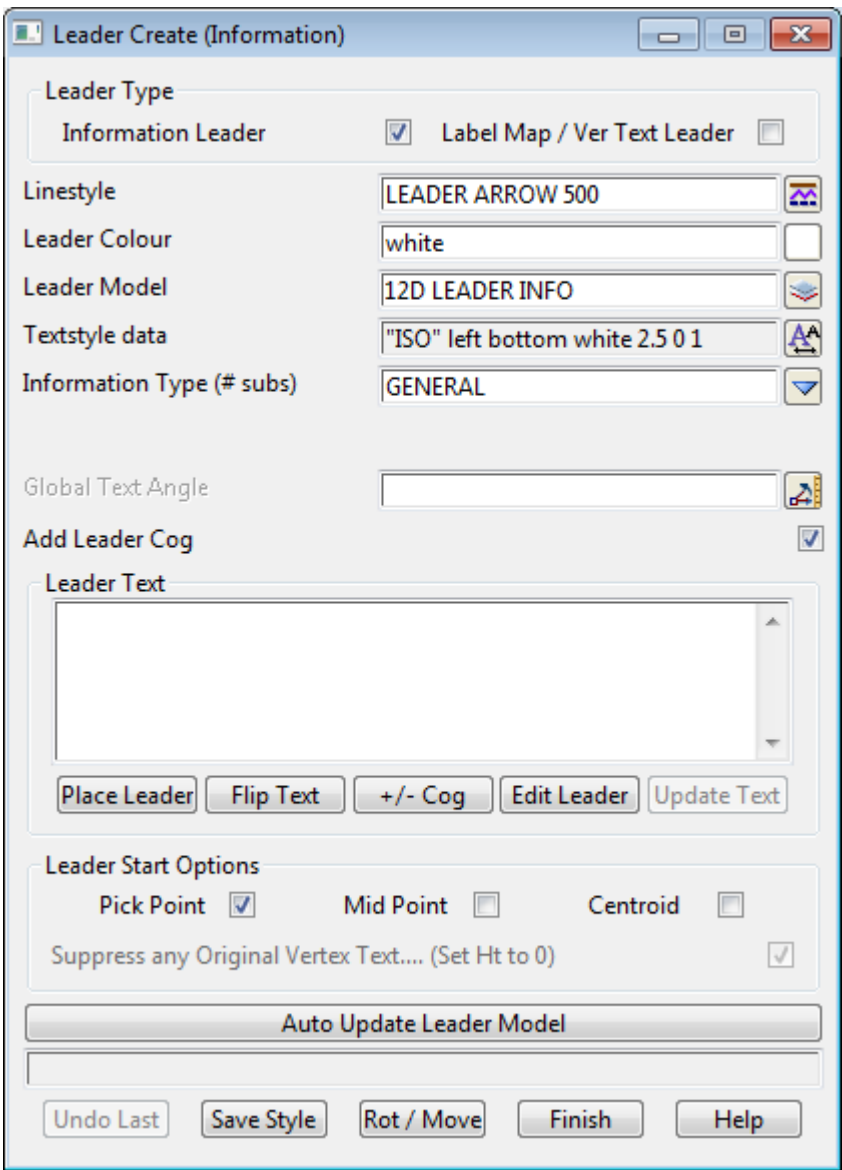
A choice list is available and can be partially user defined.

General notes can also be placed that do not extract information from any string selected.

Leaders can be moved along the string they relate to, and subsequent information values updated.

Once the timeline is written, it can be played under View =>Visualisation =>Timelines =>Play

Selecting the **Information leader** option brings up the Leader Create (Information) panel:



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Leader Type

Information Leader	tick box	ticked	
If ticked, information or general notes can be created.			
Label Map / Ver Text Leader	tick box	not ticked	
If ticked, any vertex text or text created via the Label Map File can be converted into a leader, allowing the text to be moved but still have the leader at the original location.			
Linestyle	linestyle box	LEADER ARROW 500	available linestyles
If non-blank, entry used as leader arrow scale.			
Leader Colour	colour box	white	available colours
If non-blank, entry used as leader colour.			
Leader Model	model box	12D LEADER INFO	available models
If non-blank, entry used as leader model.			
Textstyle data	input	"ISO" white 2.5	available Textdata
If non-blank, entry used as text properties.			
Information Type (# subs)	choice box	GENERAL	available choices
If non-blank, entry used as type of information leader. The list is generated from a defaults file in the library.			
Global Text Angle	real	GENERAL	
If non-blank, entry used as angle for text during placement of leader.			
Add Leader Cog	tick box	ticked	
If ticked, leader cog will be added.			

Leader Text

From the choice above, default text is placed in the Leader Text box on the panel.
Any calculated information value, such as AREA, LENGTH will be substituted for the # that may appear in the Leader Text.

Place Leader	button
Select a position along a string that suits the type of information selected from the choice box (segment for SEGMENT LENGTH, a vertex for XYZ COORDS, etc.). General notes (i.e. notes without the # in the Leader Text) may be placed using the cursor position as well. Placement of the leader is controlled by the Leader Start Options .	

Flip Text	button
Select an information leader already placed. Upon accepting the string, the text will be flipped to the opposite side of the leader.	

+/- Cog	button
Select an information leader already placed. Upon accepting the string, the cog will be added or	

The leader rotates about the arrow insertion point.

Example of Library Defaults file:

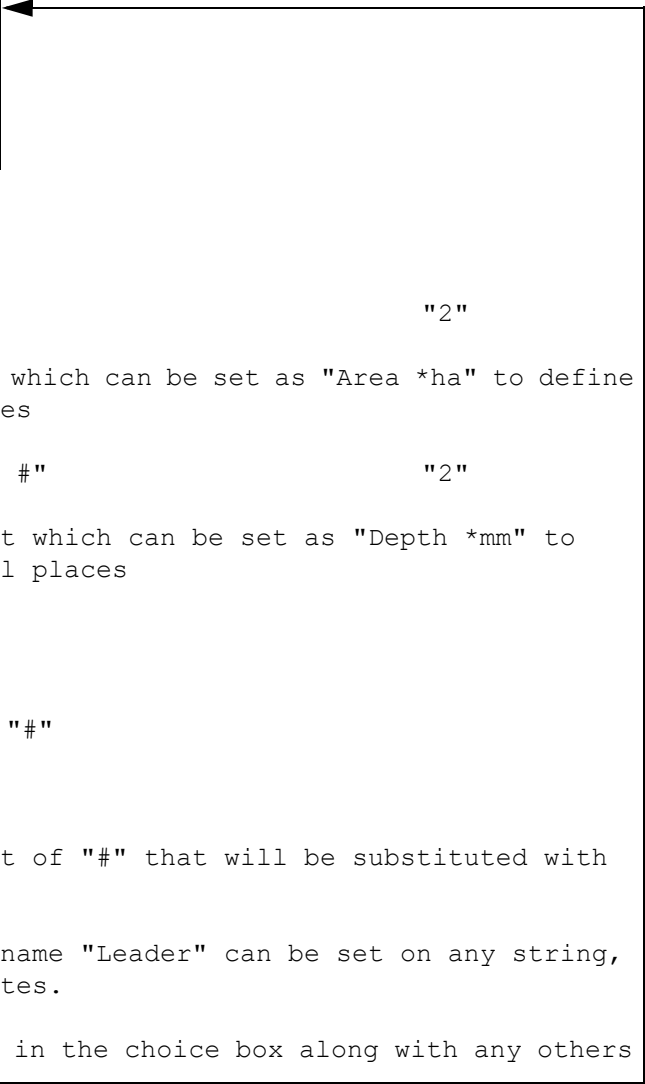
Info_Leader_Create_Panel.def

Leader_Style	"LEADER ARROW 500"	
Leader_Colour	7	
Leader_Model	"12D LEADER INFO"	
Text_Style	ISO	
Text_Colour	7	
Text_Whiteout_Colour	-1	
Text_Border_Colour	-1	
Text_Units	"Paper"	
Text_Size	"2.500"	
Text_Angle	"0"	
AREA	"Area #"	"2"
CENTROID_X_Y	"Centroid:\\n#"	"3"
CIRCLE_WITH_TEXT	"1"	
GRADE_1_IN	"Grade: 1 in #"	"2"
GRADE_PERCENT	"Grade: #"	"2"
LEVEL	"S.L. #"	"3"
SEGMENT_BEARING	"Bearing #"	
SEGMENT_LENGTH_BEARING	"#"	"2"
SEGMENT_LENGTH	"Seg Length #m"	"3"
SEGMENT_LENGTH_3D	"Seg Length 3d #m"	"3"
SEGMENT_RADIUS	"R #"	"2"
STRING_LENGTH	"Length #m"	"3"
STRING_LENGTH_3D	"Length 3d #m"	"3"
STRING_NAME	"Control Line #"	
TIN_LEVEL	"S.L. #"	"3"
TIN_DEPTH	"Depth #"	"3"
XY_COORDS	"Coords:\\n#"	"3"
XYZ_COORDS	"Coords:\\n#"	"3"
USER_STRING_ATTRIBUTE	"#"	
USER_VERTEX_ATTRIBUTE	"#"	
USER_SEGMENT_ATTRIBUTE	"#"	
USER_VERTEX_TEXT	" "	
USER_SEGMENT_TEXT	" "	
NOTE_PROP_MEDIAN	"Proposed Median"	
NOTE_PROP_ROUNDABOUT	"Proposed Roundabout"	
NOTE_PROP_ISLAND	"Proposed Traffic Island"	
NOTE_REMAIN	"Existing Kerb\\nto remain"	
NOTE_TAKE_UP	"Take up existing\\nkerb and channel"	
NOTE_REMOVE	"Remove existing\\npipes"	
NOTE_KERB_STD_SWG	"Refer to Std Dwg\\nfor Kerb Types"	
NOTE_REMOVE_PP	"Remove existing power pole"	
NOTE_PROP_CULVERT	"Proposed Culvert"	
NOTE_MATCH_EXISTING	"Match into existing"	

```
//STRING_ATTRIBUTES
Str_Att_1 <example only>

//VERTEX_ATTRIBUTES
Ver_Att_1 <example only>

//SEGMENT_ATTRIBUTES
Seg_Att_1 <example only>
```



Area syntax special:

AREA	"Area #"	"2"
------	----------	-----

Drop down Display Text which can be set as "Area *ha" to define hectares Decimal places

TIN_DEPTH	"Depth #"	"2"
-----------	-----------	-----

Drop down Display Text which can be set as "Depth *mm" to define millimetres Decimal places

Attributes syntax special:

USER_STRING_ATTRIBUTE	"#"
USER_VERTEX_ATTRIBUTE	"#"
USER_SEGMENT_ATTRIBUTE	"#"

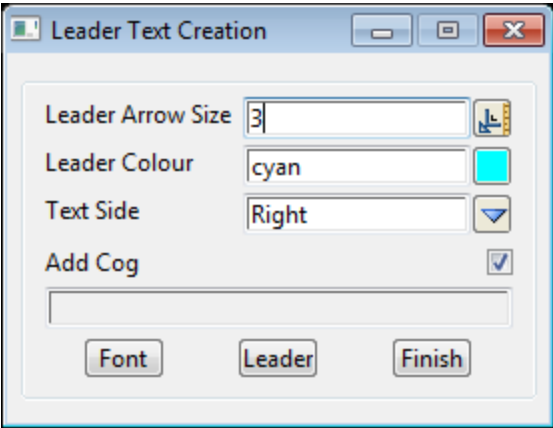
Drop down Display Text of "#" that will be substituted with attr value

Note: An attribute with the name "Leader" can be set on any string, for any of the above attributes.

It will appear automatically in the choice box along with any others set here _____

Leader Text Creation

Position of option on menu: Drafting =>Text and Tables =>Leader create
This option is used to create leader lines and text.



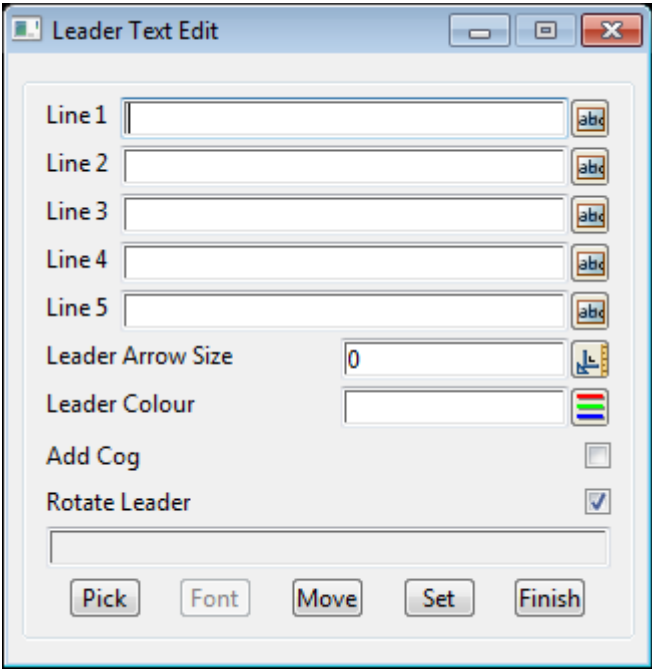
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Leader arrow size <i>length (in world units) of the head of the arrow of the leader line.</i>	input box	3	
Leader colour <i>colour of the leader line or arrow</i>	colour box	cyan	
Text side <i>side of the leader line to create the text.</i>	choice box	Right	Right, Left
Add cog <i>if tick, add a cog to the leader line.</i>	tick box	tick	
Font <i>brings up panel for defining information about the text (size, model colour etc.).</i>	button		
Leader <i>create the leader by firs picking the point for the arrow end and then the point for the opposite end.where the text goes. Once the second point is place, the "Leader Text Input" panel is displayed for entering five lines of text.</i>	button		

Leader Edit

Position of option on menu: Drafting =>Text and Tables =>Leader edit

This option is used to edit leader lines and text.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Line 1-5 <i>lines of text from the selected leader.</i>	input box		
Leader arrow size <i>length (in world units) of the head of the arrow of the leader line.</i>	input/output box		
Leader colour <i>colour of the leader line or arrow</i>	colour box	cyan	
Text side <i>side of the leader line to create the text.</i>	choice box	Right	Right, Left
Add cog <i>if tick, add a cog to the leader line.</i>	tick box	tick	
Rotate leader <i>if tick, the leader arrow remains fixed when the leader is moved. If not tick, the whole leader line and text is moved.</i>	tick box	tick	
Pick <i>select the leader to be modified.</i>	button		

Font button

brings up panel for defining information about the text (size, model colour etc.).

Move button

move the select leader and its associated text. If "rotate leader" is ticked, then the leader arrow head is left fixed.

Set button

redefine the leader line and text with the current values in the panel fields.

*if not tick, case is ignored when trying to find a match.
If tick then case is not ignored when trying to find a match.*

Regular expressions tick box

*if tick then the Find what text can contain regular expressions.
If not tick, the Find what text is not considered to contain regular expressions.*

New button

after selecting new the parameters for the find and replace can be changed.

Find button

find the search text. The text is highlighted and centred in the view.

Find Next button

find the next occurrence of the search text.

Replace button

replace the text.

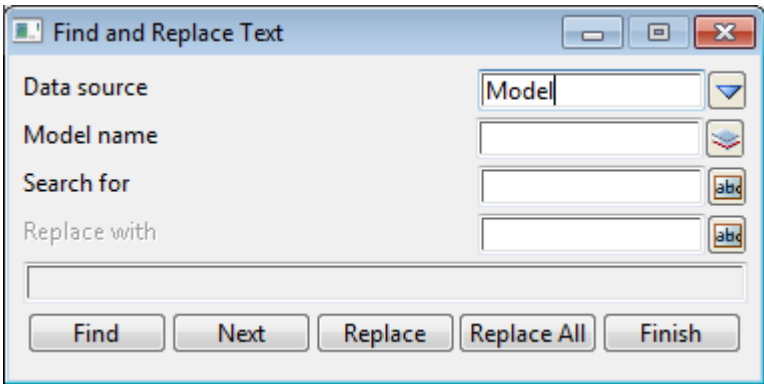
Replace all button

replace all occurrences of the text.

Find and Replace Text

Position of option on menu: Drafting =>Text and Tables =>Replace text

This option is used to find and replace text.



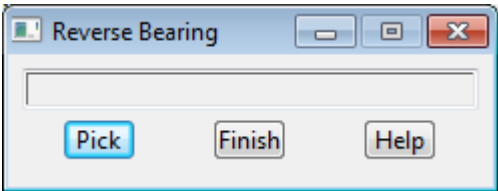
The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Data source type <i>data source type.</i>	input box		string, model, view
Data source <i>source of data to change text.</i>	input box		
Search for <i>text to search for.</i>	input box		
Replace with <i>if non-blank, text to replace the searched text with</i>	input box		
Find <i>find the search text</i>	button		
Next <i>find the next occurrence of the search text.</i>	button		
Replace <i>replace the text.</i>	button		
Replace all <i>replace all occurrences of the text.</i>	button		

Reverse Bearing

Position of option on menu: Drafting =>Text and Tables =>Reverse bearing

This section of documentation is a work in progress and will be updated in subsequent releases.

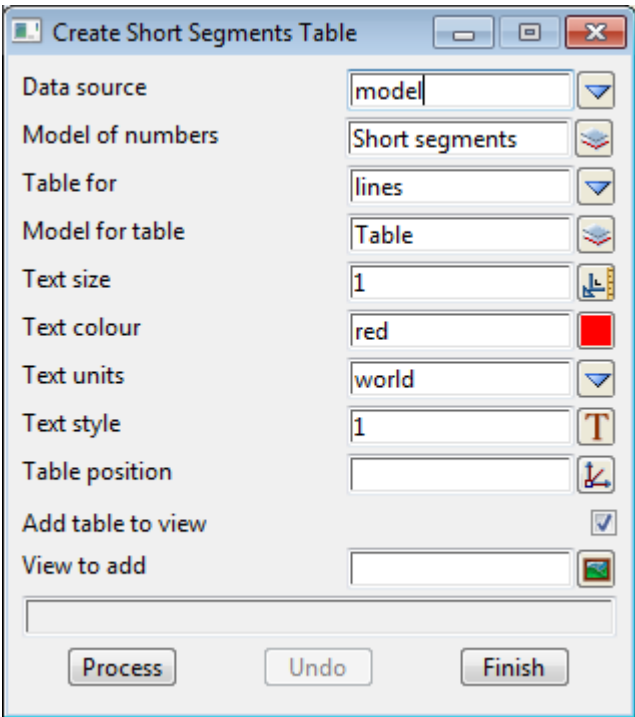


Short Segments Table

Position of option on menu: Drafting =>Text and Tables =>Short segment table

This panel is used to create a short segment table.

This option is still under development.



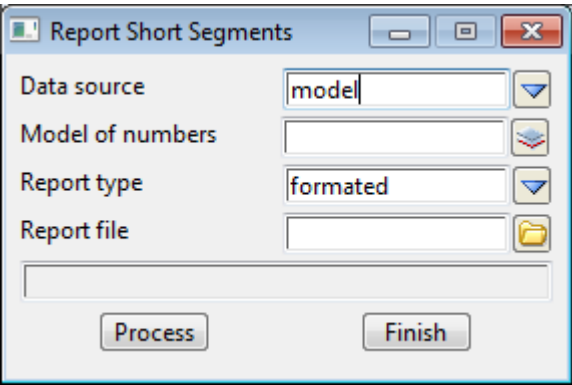
The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Data source <i>type of data to process</i>	input box	model	model, string, view
Model/string/View of numbers <i>data to process and build a short segment table for.</i>			

Table for <i>type of short elements to tabulate.</i>	choice box	lines	lines, arcs, lines and arcs
Model for table <i>model to place the short segment table in.</i>	model box	Table	
Text size <i>text size.</i>	input box	1	
Text colour <i>text colour</i>	colour box	red	
Text units <i>units for the text size - default is world units.</i>	choice box	world	world, pixels
Text style <i>textstyle for the created text.</i>	input box	1	
Table position <i>location for the top left hand corner of the table. Either type in an x y position or click on "+" and use "Pick xyz" to locate the table.</i>	input box		
Add table to view <i>if tick, add the model containing the table to the view.</i>	tick box	tick	
View to add <i>view to add the table to.</i>	input box		
Process <i>create and place the short segment table</i>	button		
Undo <i>undo the last short segment table created whilst the panel has been up.</i>	button		

Short Segment Report

Position of option on menu: Drafting =>Text and Tables =>Short segment report
This panel is used create a report on the short segments.
This option is still under development



The fields and buttons used in this panel have the following functions:

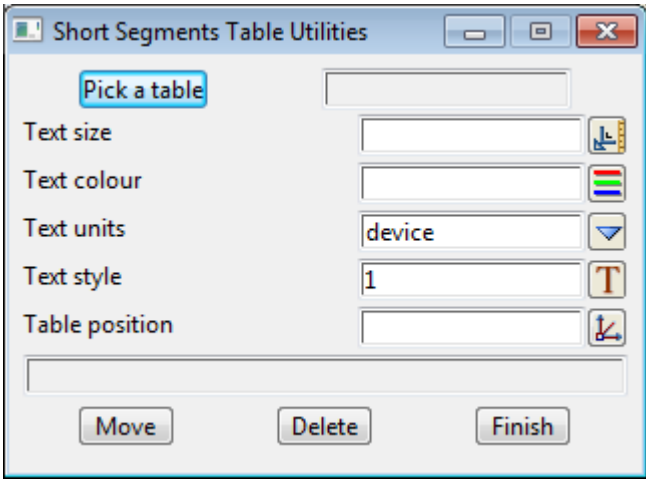
Field Description	Type	Defaults	Pop-Up
Data source <i>type of data to process</i>	input box	model	model, string, view
Model/string/View of numbers <i>data to process and report on the short segments.</i>			
Report file <i>name of the report file.</i>	report box		
Process <i>create the short segment report</i>	button		

Short Segments Table Utilities

Position of option on menu: Drafting =>Text and Tables =>Short segment table utilities

This panel is used modify an existing short segments table.

This option is still under development.



The fields and buttons used in this panel have the following functions:

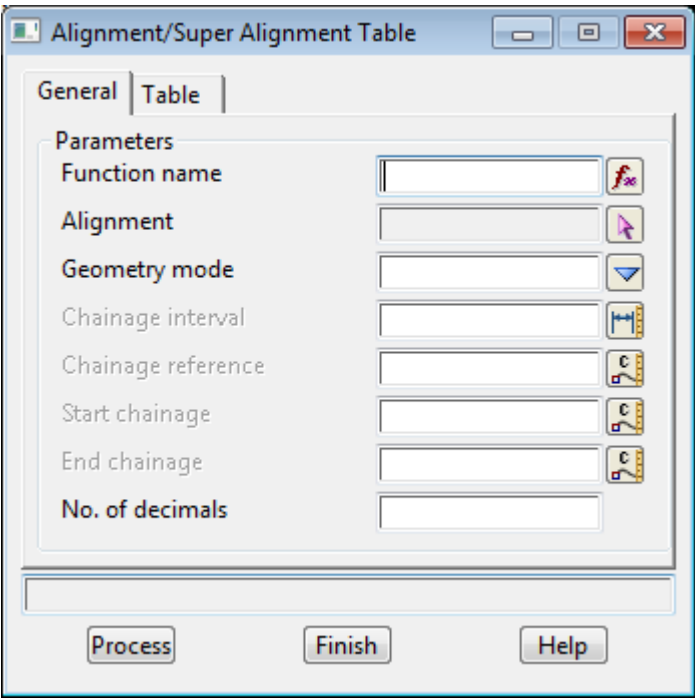
Field Description	Type	Defaults	Pop-Up
Pick a table <i>select the short segments table to modify.</i>	string select		
Text size <i>text size.</i>	input box	1	
Text colour <i>text colour</i>	colour box	red	
Text units <i>units for the text size - default is world units.</i>	choice box	world	world, pixels
Text style <i>textstyle for the created text.</i>	input box	1	
Table position <i>location for the top left hand corner of the table. Either type in an x y position or click on "+" and use "Pick xyz" to locate the table.</i>	input box		
Move <i>move the selected table to the new location.</i>	button		
Delete <i>delete the selected table.</i>	button		

Alignment & Super Alignment Table

Position of option on menu: Drafting =>Text and Tables =>Alignment/Super alignment table

This option is used to create a report and/or a table in a model for an alignment and super alignment string in an IP or element format.

This option is under development.

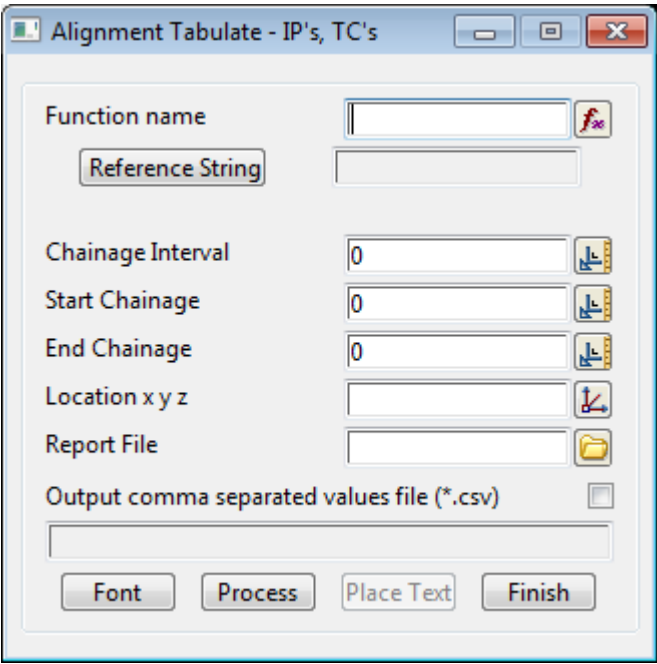


Tabulate Alignment - IP's and CT's

Position of option on menu: Drafting =>Text and Tables =>Tabulate alignment - IP's TC's

This option is used to create a report and/or a table in a model of an alignment string in an IP and tangent point format.

The table is created by a function so that if the alignment string changes, the table can be easily recalced.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Function name <i>name of the function</i>	input box		
Reference string <i>select the string to create the table and/or report for.</i>	string select		
Chainage interval <i>if zero, only information on the tangent and intersection points is given. If non-zero, the chainage interval to use to report the information about the reference string. The horizontal tangent and intersection points are included.</i>	input box	0	
Start/End chainage <i>start/end chainage to use. If 0, the start/end chainage is used.</i>	input box	0	
Location x y z <i>location for the top left hand corner of the table. Either type in an x y position or click on "+" and use "Pick xyz" to locate the table.</i>	input box		
Report file	file box		

*if non blank, name of the report file.
If blank, don't create the report.*

Font button

brings up panel for defining information about the text (size, model colour etc.).

Process button

process the reference string and create the report. The table is not yet created.

Place text button

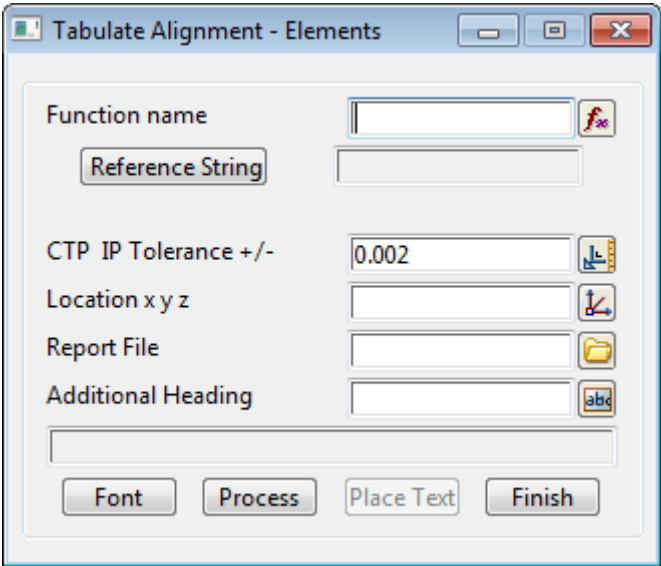
create the table and place it at the given location.

Tabulate Alignment - Elements

Position of option on menu: Drafting =>Text and Tables =>Tabulate alignment - elements

This option is used to create a report and/or a table in a model of an alignment string in an horizontal element format.

The table is created by a function so that if the alignment string changes, the table can be easily recalced.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Function name <i>name of the function</i>	input box		
Reference string <i>select the string to create the table and/or report for.</i>	string select		
CTP IP tolerance +/- <i>xxxx.</i>	input box	0.002	
Location x y z <i>location for the top left hand corner of the table. Either type in an x y position or click on "+" and use "Pick xyz" to locate the table.</i>	input box		
Report file <i>if non blank, name of the report file. If blank, don't create the report.</i>	file box		
Additional heading <i>additional information for the heading above the table.</i>	input box		
Font	button		

brings up panel for defining information about the text (size, model colour etc.).

Process button

process the reference string and create the report. The table is not yet created.

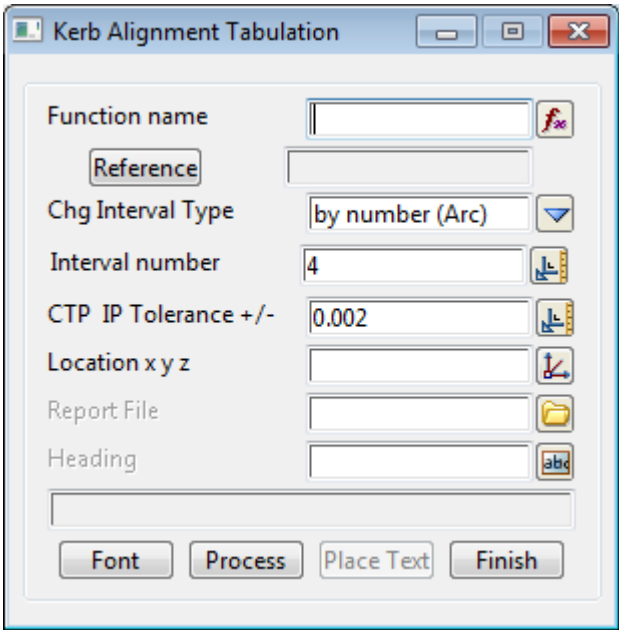
Place text button

create the table and place it at the given location.

Tabulate Kerb Return

Position of option on menu: Drafting =>Text and Tables =>Tabulate kerb return

This option creates a table for a kerb return.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Function name <i>name of the function</i>	input box		
Reference <i>select the string to create the kerb return table and/or report for.</i>	string select		
Chg interval type	choice box	by number (Arc)	by number (Arc) by distance (Arc) by special chg file by number (Chord)
Interval number <i>number of points to divide the alignment into.</i>	input box	4	
CTP IP tolerance +/- <i>xxxx.</i>	input box	0.002	
Interval number <i>xxxx.</i>	input box	4	
Location x y z <i>location for the top left hand corner of the table. Either type in an x y position or click on "+" and use "Pick xyz" to locate the table.</i>	input box		

Report file file box

*if non blank, name of the report file.
If blank, don't create the report.*

Heading input box

heading above the table.

Font button

brings up panel for defining information about the text (size, model colour etc.).

Process button

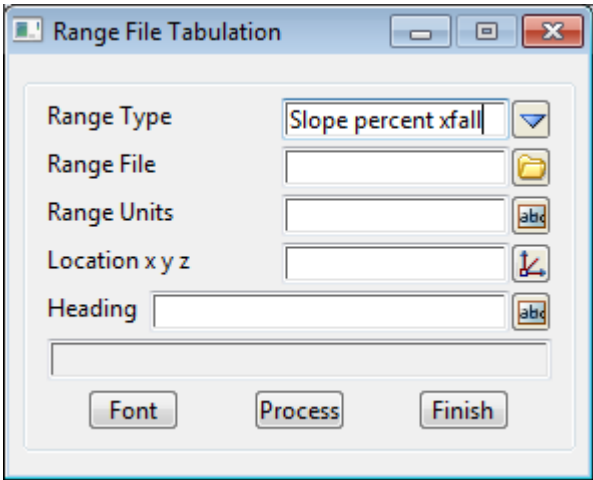
process the reference string and create the report. The table is not yet created.

Place text button

create the table and place it at the given location.

Tabulate Range File

Position of option on menu: Drafting =>Text and Tables =>Tabulate range file
This option creates a table for a range file.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Range type <i>type of range file to be created.</i>	choice box	slope percent xfall	slope percent xfall slope 1 v in, slope degrees depth, aspect, height
Range file <i>name of the range file.</i>	file box		
Range units <i>text to place beside each line of upper and lower values.</i>	input box		
Heading <i>heading to place at the top of the table.</i>	input box		
Location x y z <i>location for the top left hand corner of the table. Either type in an x y position or click on "+" and use "Pick xyz" to locate the table.</i>	input box		
Font <i>brings up panel for defining information about the text (size, model colour etc.).</i>	button		
Process <i>create and place the range table.</i>	button		

Symbol / Linestyle Legend - Tabulation

Position of option on menu: Drafting =>Text and Tables =>Tabulate symbol/linestyle legend

This option can create a legend showing features and their associated linestyle, colour, symbol *etc.*

There are 3 distinct parts to the macro. Once a data selection is chosen, the data can be analysed by either using a map file or the data features themselves.

Map File Extraction:

If specified, the 12d Map File is read and data sorted by string name (*Name* column).

If the **Extract Data** button is clicked, the **Map File Extraction** grid is populated.

The *Description* column is used in the legend and is controlled by the *Mode* selected, either *Model Name* or *Comment*.

Data only Extraction:

If no map file is specified, then the data is sorted in relation to *Name*, *Linestyle*, *Colour* and *Weight*.

If the **Extract Data** button is clicked, the **Data Only Extraction** grid is populated.

The *Description* column is used in the legend and is controlled by the *Mode* selected: *Model Name*, *String Name*, *Linestyle*, *Symbol*, *Ver attr + Name*, *Name +Ver Attr*.

Once a mode is selected, clicking the Update button will update the *Description* field.

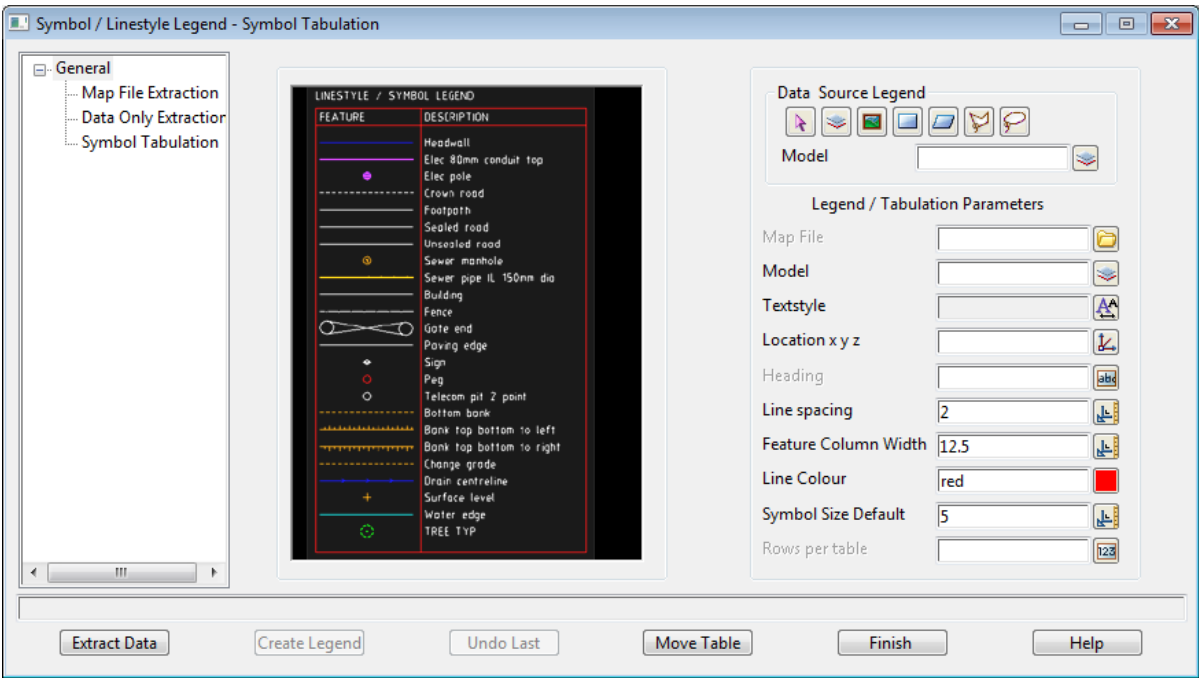
Symbol Tabulation:

This tabulation is for symbols, *e.g.* survey station points.

The table is in the format of Name, Easting, Northing & Level.

The title of the Name column can be changed.

The data to be tabulated is given by the Tabulation by choice box. It can be either tabulating the *Point ID* or the *Vertex Text*.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Legend / Tabulation Parameters			
Data Source Legend <i>selection data to extract legend information</i>	selection		model, view, string
Map File <i>if non-blank, then the map file is used with the data selection to sort and populate the < Map File Extraction > grid</i>	input		
Model <i>model name for legend tabulation</i>	input		
Textstyle <i>text parameters for all text</i>	input		
Location x y z <i>insertion point for top left corner of legend</i>	xyz box		
Heading <i>if non-blank, heading placed at top of legend</i>	input		
Line spacing <i>spacing for adjustment of lines of text</i>	real	2	
Feature Column Width <i>width for display of sample line and symbol in legend</i>	real	12.5	
Line Colour <i>the colour of separation lines in the tabulation</i>	input	red	available colours
Symbol Size Default <i>default size for symbols in table</i>	real	5	
Rows per table <i>if blank, the legend table will be created vertically if non-blank, more than one legend may be created, arrayed in either horizontal or vertical the format is: +ve number for Horizontal array -ve number for Vertical array</i>	integer		
Extract Data <i>Sorts the source data and populates either the Map File Extraction grid or Data only Extraction grid</i>	button		
Create Legend <i>Creates the tabulation using all parameters set in the general tab</i>	button		
Undo Last <i>this undo is only available while the panel is still open and only works on the last table created. Once the panel is finished all tables can be accessed via the normal 12d undo.</i>	button		T

Move Table button

Any Legend Tabulation can be moved for clarity (Esc or rmb to cancel)

Symbol Tabulation

Data Source Tabulation selection

selection data to extract tabulation information

Model model box

model name for symbol tabulation

Textstyle textstyle box

text parameters for all text

Location x y z XYZ box

insertion point for top left corner of tabulation

Heading input

if non-blank, heading placed at top of tabulation

Line colour colour box red available colours

the colour of separation lines in the tabulation

Line spacing real 2

spacing for adjustment of lines and text

Station name input STN

maximum 8 characters

Tabulation by choice box Point ID Point ID / Vertex Text

value used to define symbol e.g. Survey Station may use point number < 901 >

Process button

processes the data

Create Tab button

creates the symbol tabulation using the above parameters.

Text File Input

Position of option on menu: Drafting =>Text and Tables =>Text file input

This option has already been documented as [Text Creation/Edit](#)

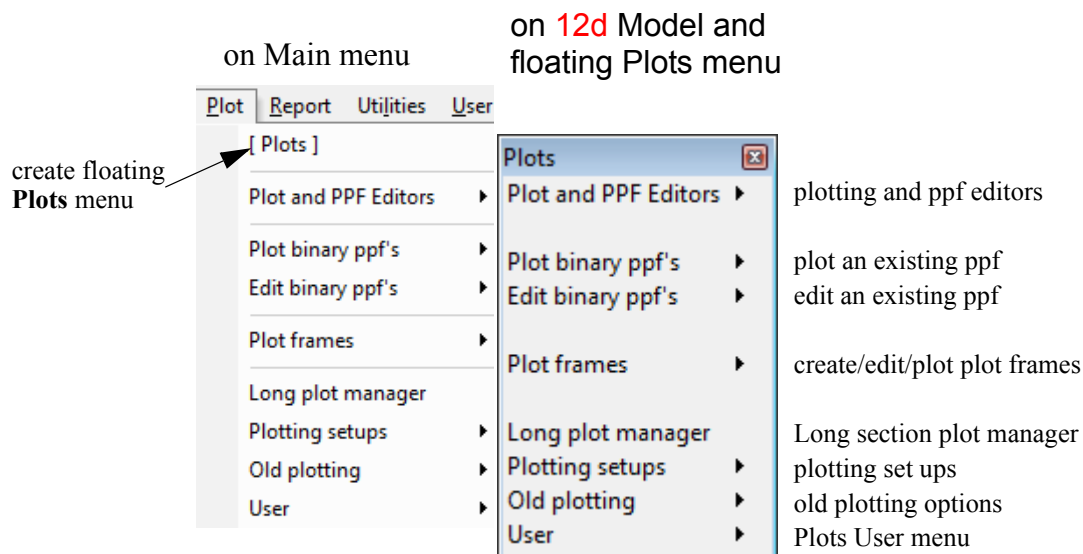
Drafting =>Text and Tables =>Create/edit paragraph text



24 Plots

Position of menu: It is on the main menu as Plot

The Plots walk-right menu is



The options [Plot Binary PPFs](#) and [Edit Binary PPFs](#) are both walk-right menus which list all the binary PPFs in the project and the when the PPF is double-clicked, it is Plotted/Edited.

For the options *Plot and PPF Editors*, go to

Plot frames

Long plot manager

Plotting setups

Old plotting

[Plot and PPF Editors](#)

[Plot Frames](#)

[Long Plot Manager](#)

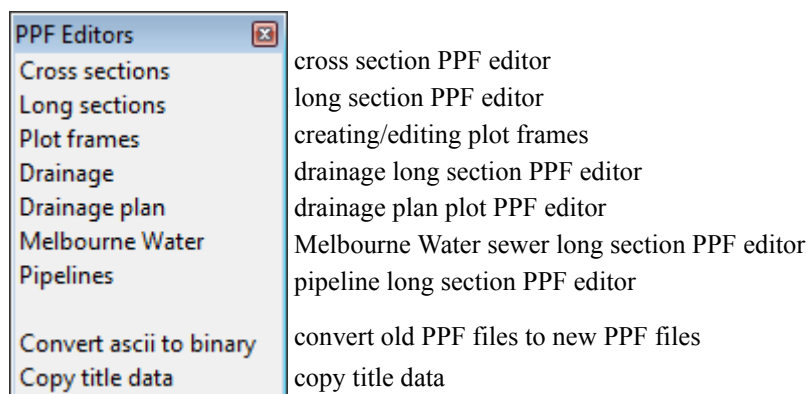
[Plotting Setups](#)

[Old Plotting](#)

Plot and PPF Editors

Position of menu: Plot =>Plot and PPF editors

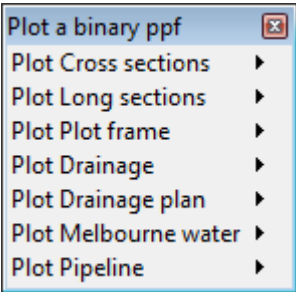
The Plot and PPF editors walk-right menu is



For the option <i>Cross sections</i> , go to	X Plot PPF Editor
<i>Long sections</i>	Long Plot PPF Editor
<i>Plot frames</i>	Plot Frame and PPF Editor
<i>Drainage</i>	Drainage Plot PPF Editor
<i>Drainage plan</i>	Drainage Plan Plot PPF Editor
<i>Melbourne Water</i>	Melbourne Water Plot PPF Editor
<i>Pipeline</i>	Pipeline Plot PPF Editor
<i>Convert ascii to binary</i>	Convert Ascii PPF to Binary
<i>Copy title data</i>	Copy Title Data

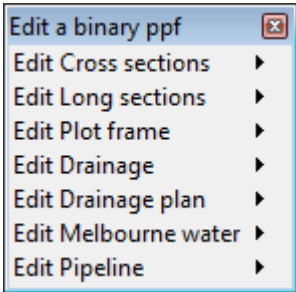
Plot Binary PPFs

This section of documentation is a work in progress and will be updated in subsequent releases.



Edit Binary PPFs

This section of documentation is a work in progress and will be updated in subsequent releases.



Plot Frames

Position of menu: Plot =>Plot frames

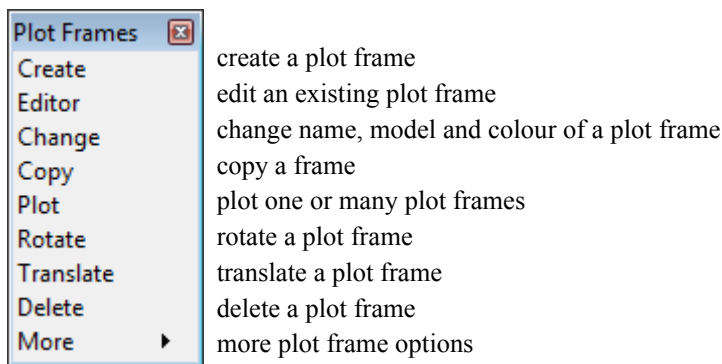
Although plan view plots can be generated in **12d Model** by plotting the contents of the plan view with the **Plot** option, the plot will only have a simple title block.

To create plan plots of an arbitrary size, rotation and scale and with complex title blocks, **12d Model** uses **plot frames**.

Basically a plot frame consists of a sheet size (in mm), margins within the sheet and a scale for the plot. This will define a plotting area in world co-ordinates (the plot frame).

The plot frame can be arbitrarily positioned and rotated on a plan view.

The **Plot frames** walk-right menu is



For the option *Create*, go to

Editor

Change

Copy

Plot

Rotate

Translate

Delete

More

[Create](#)

[Editor](#)

[Change](#)

[Change](#)

[Plot Frame and PPF Editor](#)

[Rotate](#)

[Translate](#)

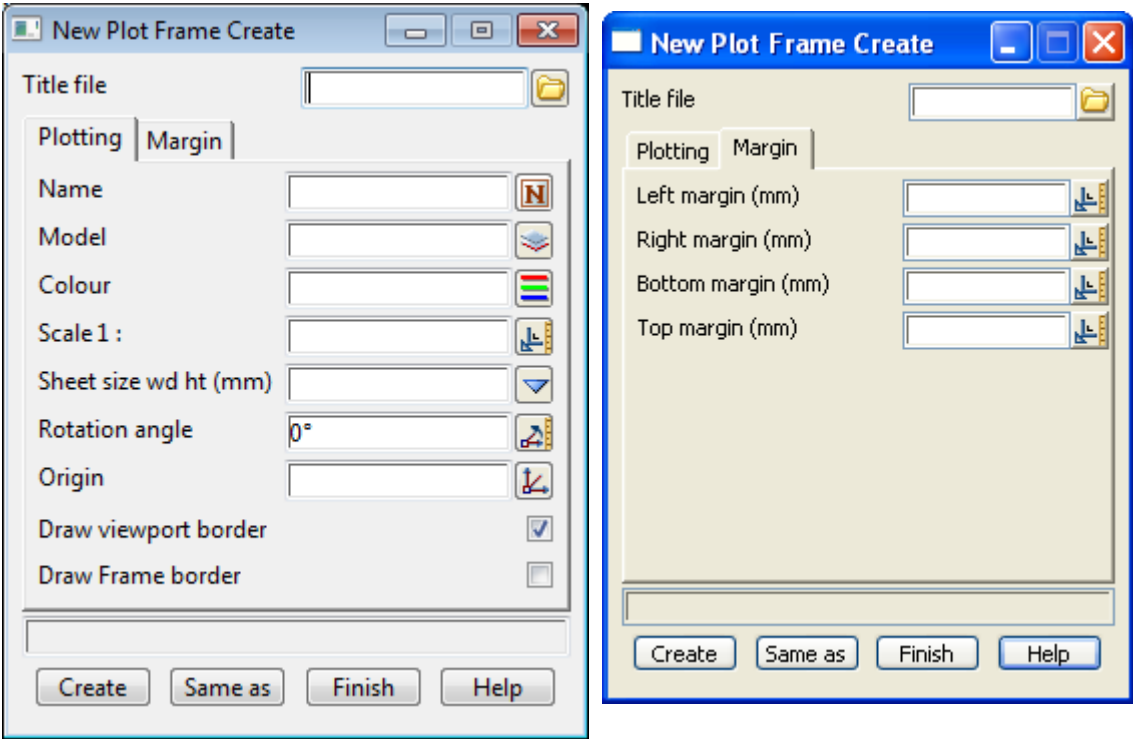
[Delete](#)

[More Plot Frames](#)

Create

Position of option on menu: Plot =>Plot frames =>Create

On selecting the Create option, the **New Plot Frame Create** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Title file <i>name for the title file to use when plotting the plot frame. The title block file can contain default information for the rest of the panel fields. See Values Used for Defaults when Creating Plot Frames in the Chapter PPF Editors</i>	title file box		all title files
Name <i>name for the plot frame.</i>	name box		available names
Model <i>the model for the plot frame.</i>	model box		available models
Colour <i>the colour for the plot frame.</i>	colour box		available colours
Scale 1: <i>scale for the plot.</i>	measure box		available measures
Sheet size wd ht (mm) <i>the width and height values (separated by spaces) or the name of a user defined sheet size.</i>	choice box		available sheet sizes
Rotation angle <i>angle of rotation for the plot frame.</i>	measure box	0 degrees	available measures
Origin	input		xyz ops menu

x_origin y_origin z_origin
origin (in world units) for the corner of the plot frame - given as three values separated by spaces. The values can either be typed in, or selected by clicking LB in the origin panel view and getting up the xyz ops menu and selecting the pick xyz option.

Draw viewport border tick box **ticked**
*if **ticked**, plot the box around the plotting area (viewport).*

Draw Frame border tick box **not ticked**
*if **ticked**, plot the box around the frame.*

Create button
create the plot frame and then put up the plot frame edit panel for the created plot frame.

Same as button
*after picking the **Same as** button, an existing plot frame is selected and its information is used to fill in the above panel fields.*

Margin tab

Left/right margin (mm) 10.0
the left/right hand side margin between the sheet and the plotting area inside the sheet.

Bottom/top margin (mm) 10.0
the bottom/top margin between the sheet and the plotting area inside the sheet.

How To Use the Option

The plot frame contains all the information required to define the physical area in real world units to be plotted, the position on the sheet of the area being plotted, the plotter type and the plot file name.

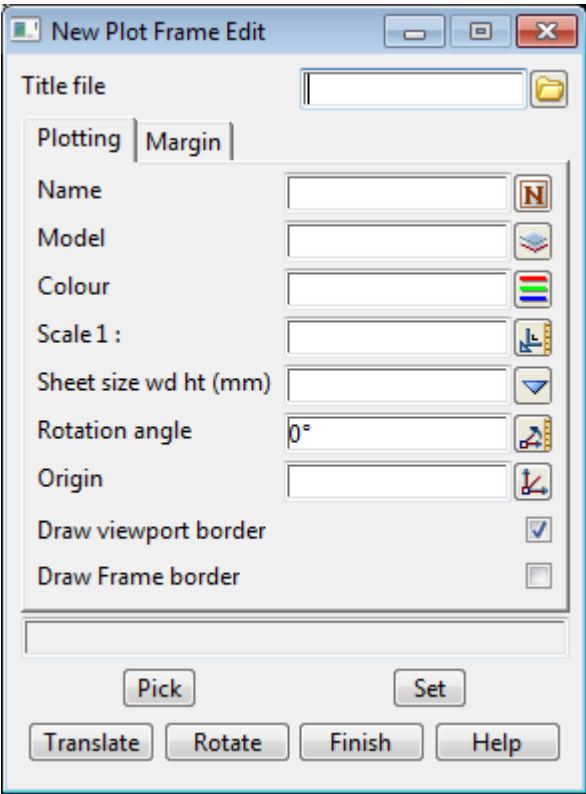
Once the frame is created, the **New Plot Frame Edit** panel for the created plot frame is automatically placed on the screen so that the frame's position can be adjusted using the **Translate** and **Rotate** buttons.

Editor

Position of option on menu: Plot =>Plot frames =>Editor

The plot frame editor is used to edit existing plot frames. It is automatically placed on the screen when a plot frame is created so that the frame's position can be adjusted using the **Translate** and **Rotate** buttons.

On selecting the **Editor** option, the **New Plot Frame Edit** panel is displayed.



Most of the fields and buttons used in this panel are the same as the **New Plot Frame Create** panel.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Title file	title file box		all title files
<i>name for the title file to use when plotting the plot frame. The title block file can contain default information for the rest of the panel fields. See Values Used for Defaults when Creating Plot Frames in the Chapter PPF Editors</i>			
Name	name box		available names
<i>name for the plot frame.</i>			
Model	model box		available models
<i>the model for the plot frame.</i>			
Colour	colour box		available colours
<i>the colour for the plot frame.</i>			
Scale 1:	measure box		available measures
<i>scale for the plot.</i>			
Sheet size wd ht (mm)	choice box		available sheet sizes

the width and height values (separated by spaces) or the name of a user defined sheet size.

Rotation angle measure box 0 degrees available measures
angle of rotation for the plot frame.

Origin input xyz ops menu
*x_origin y_origin z_origin
origin (in world units) for the corner of the plot frame - given as three values separated by spaces. The values can either be typed in, or selected by clicking LB in the origin panel view and getting up the xyz ops menu and selecting the pick xyz option.*

Draw viewport border tick box ticked
*if **ticked**, plot the box around the plotting area (viewport).*

Draw Frame border tick box not ticked
*if **ticked**, plot the box around the frame.*

Pick button
select the plot frame to be edited.

Set button
update the plot frame with the information in the above panel fields.

Translate button
*after picking the **Translate** button, the plot frame will move with the cursor until a point is selected to give the final position of the plot frame.*

Rotate button
*after picking the **Rotate** button, the plot frame is further rotated around the left hand corner of the sheet, by the angle made between the rotation point and the current cursor position. The plot frame will continue to rotate until a point is selected to fix the rotation angle.*

Margin tab

Left/right margin (mm) 10.0
the left/right hand side margin between the sheet and the plotting area inside the sheet.

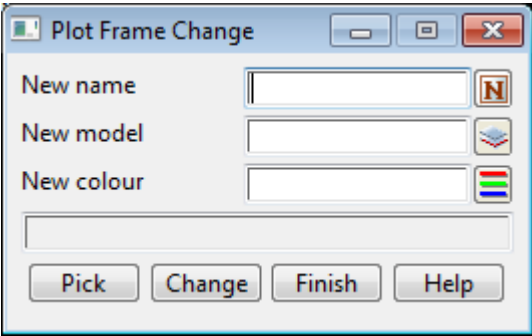
Bottom/top margin (mm) 10.0
the bottom/top margin between the sheet and the plotting area inside the sheet.

Change

Position of option on menu: Plot =>Plot frames =>Change

The **change** option is used to modify a plot frame's name, model or colour.

On selecting the **change** option, the **Plot Frame Change** panel is displayed.



The fields and buttons used in this panel have the following functions.

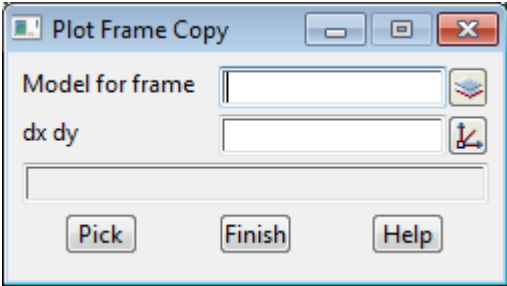
Field Description	Type	Defaults	Pop-Up
New name	name box		available names
<i>if non-blank, then the name of the selected plot frame will be changed to the name given in the new name field.</i>			
New model	model box		available models
<i>if non-blank, then the selected plot frame will be moved to the model given in the new model field.</i>			
New colour	colour box		available colours
<i>if non-blank, then the colour of the selected plot frame will be changed to the colour given in the new colour field.</i>			
Pick	button		
<i>select the plot frame to be changed.</i>			
Change	button		
<i>update the plot frame with the information in the above panel fields.</i>			

Copy

Position of option on menu: Plot =>Plot frames =>Copy

The **copy** option is used to make a copy of a plot frame.

On selecting the **Copy** option, the **Plot Frame Copy** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Model for frame <i>if blank, then the model of the copied plot frame will be the same as that of the picked frame.</i> <i>if non-blank, then the copied plot frame will be placed in the model given in the model for frame field.</i>	model box		available models
dx dy <i>dx_val dy_val</i> <i>translation in world units to apply to the copied plot frame - given as two values separated by spaces.</i>	input		xyz ops menu
Pick <i>select the plot frame to be copied - the copy will be made as soon as the selected plot frame is accepted.</i>	button		

Plot

Position of option on menu: Plot =>Plot frames =>Plot

The **Plot** option is an alternative way of bringing up the **Plot Frame PPF Editor** panel.

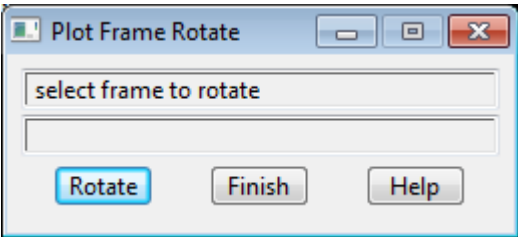
See [Plot Frame and PPF Editor](#).

Rotate

Position of option on menu: Plot =>Plot frames =>Rotate

The **Rotate** option is used to rotate a plot frame about a selected point.

On selecting the **Rotate** option, the **Plot Frame Rotate** panel is displayed.



The buttons used in this panel have the following functions.

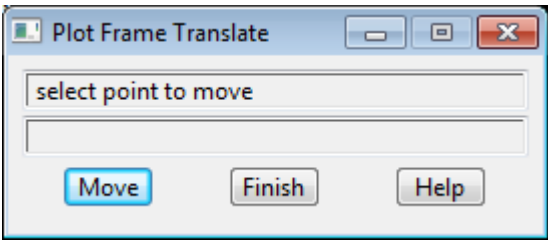
Field Description	Type	Defaults	Pop-Up
Rotate <i>after picking the Rotate button, the user is first asked to select a plot frame to rotate, and then to selected a point to rotate about. Once the rotation point has been selected, the plot frame is further rotated by the angle made between the rotation point and the current cursor position. The plot frame will continue to rotate until a point is selected to fix the rotation angle.</i> <i>The option then repeats.</i>	button		

Translate

Position of option on menu: Plot =>Plot frames =>Translate

The **Translate** option is used to translate a plot frame.

On selecting the **Translate** option, the **Plot Frame Translate** panel is displayed.



The button used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Move	button		

*after picking the **Move** button, the user is first asked to select a plot frame to translate. Once the plot frame has been selected, the plot frame will move with the cursor until a point is selected to give the final position of the plot frame.
The option then repeats.*

Delete

Position of option on menu: Plot =>Plot frames =>Delete

The **Delete** option just gets up the standard **String Delete** panel which can be used to delete plot frames as well as strings.
See [Delete](#) in the chapter [Strings](#)

More Plot Frames

Position of menu: Plot =>Plot frames =>More

This menu contains options to create plot frame seeds, insert plot frame seeds into a view and create plot frames along a string.
The **More Plot Frames** walk-right menu is

More Plot Frames

Plot frames along string

Plot frame insert

Plot frame seed create

insert a plot frame seed

create plot frames along a string

create a plot frame seed

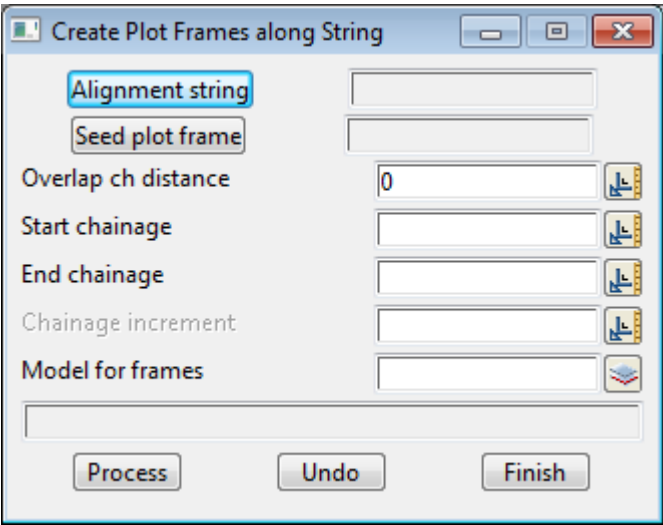
Each option in this menu will now be described.

For the option <i>Plot frames along string</i> , go to	Create Plot Frames along String
<i>Plot frame insert</i>	Insert Plot Frame
<i>Plot frame seed create</i>	Create Plot Frame Seed

Create Plot Frames along String

Position of option on menu: Plot =>Plot frames =>More =>Plot frames along string

On selecting the **plot frames along string** option, the **create plot frames along string** panel is displayed.



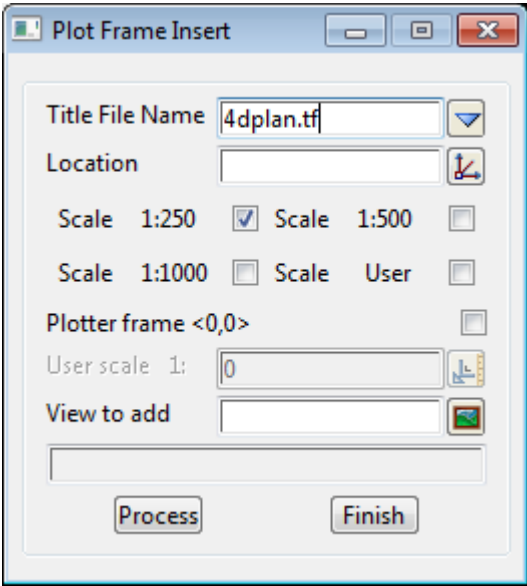
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Alignment string <i>string to create plot frame along.</i>	string select		
Seed plot frame <i>plot frame to create along the selected string.</i>	plot frame select		
Overlap chainage distance <i>if non-zero, the next plot frame is started so that it includes this chainage distance of the selected string from previous plot frame.</i>	input	0	
Start/End chainage <i>start/end chainage to restrict the amount of the selected string to place plot frames along.</i>	input	0	
Chainage increment <i>if non-blank, the start of the next plot frame is placed this chainage distance along the string from the start of the previous plot frame. Used when you want to match the plot frames with the chainage interval on a long section plot. If blank, the next plot frame is placed at the chainage point at the end of the previous plot frame (minus the overlap chainage distance).</i>	input		
Model for frames <i>model to place the created plot frames in.</i>	model box		available models
Process <i>create the plots frames along the selected string.</i>	button		
Undo <i>undo the last set of plot frames created whilst this panel is up.</i>	button		

Insert Plot Frame

Position of option on menu: Plot =>Plot frames =>More =>Plot frame insert

On selecting the Plot frame insert option, the **Plot Frame Insert** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Plot frame to insert <i>plot frame from the seed library to insert.</i>			plot frame seeds
Location <i>the bottom left hand corner of the plot frame in inserted at this location.</i>	xyz box		xyz ops menu
Scale <i>scale to use for the inserted plot frame.</i>	radio buttons	1: 250	1: 250, 1: 500, 1:1000, User
Plotter frame <0,0> <i>if ticked, the bottom left hand corner of the plot frame is placed at (0,0).</i>	tick box	not ticked	
User scale 1: <i>if User is selected for Scale, then the required scale is entered here.</i>	measure box		
View to add <i>if non-blank, add to plot frame to this view.</i>	view box		available views
Process <i>insert the selected seed plot frame at the given location at the given scale.</i>	button		

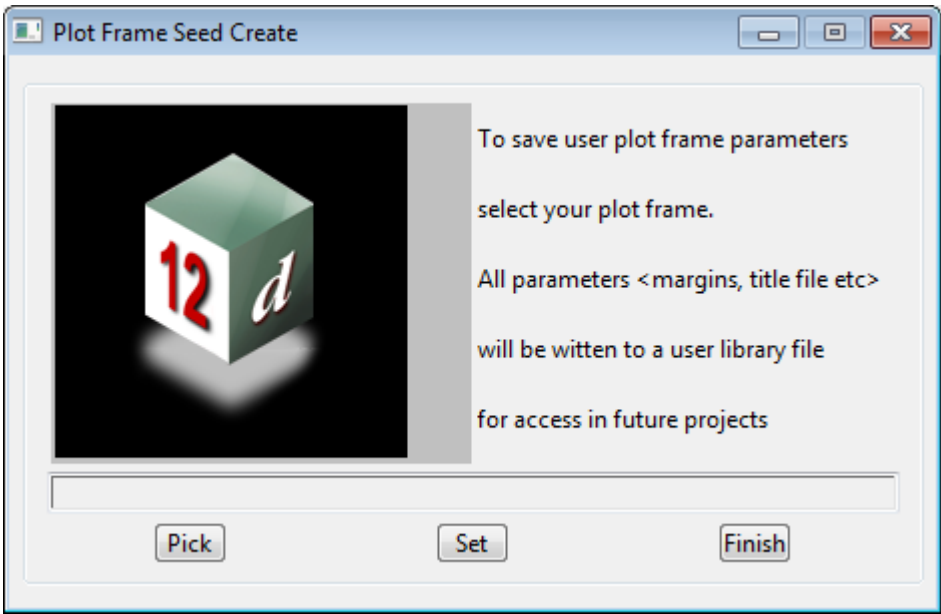
How To Use the Option

The selected plot frame is inserted at the given location with the given scale.

Create Plot Frame Seed

Position of option on menu: Plot =>Plot frames =>More =>Plot frame seed create

On selecting the **Plot frame seed create** option, the **Plot Frame Seed Create** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick	string select		
<i>pick the plot frame to add to the plot frame seed library.</i>			
Set	button		
<i>add the selected plot frame to the plot frame seed library.</i>			

How To Use the Option

The plot frame contains all the information required to define the physical area in real world units to be plotted, the position on the sheet of the area being plotted, the plotter type and the plot file name.

The **Plot Frame Seed Create** panel adds selected plot frames to a library of plot frame seeds.

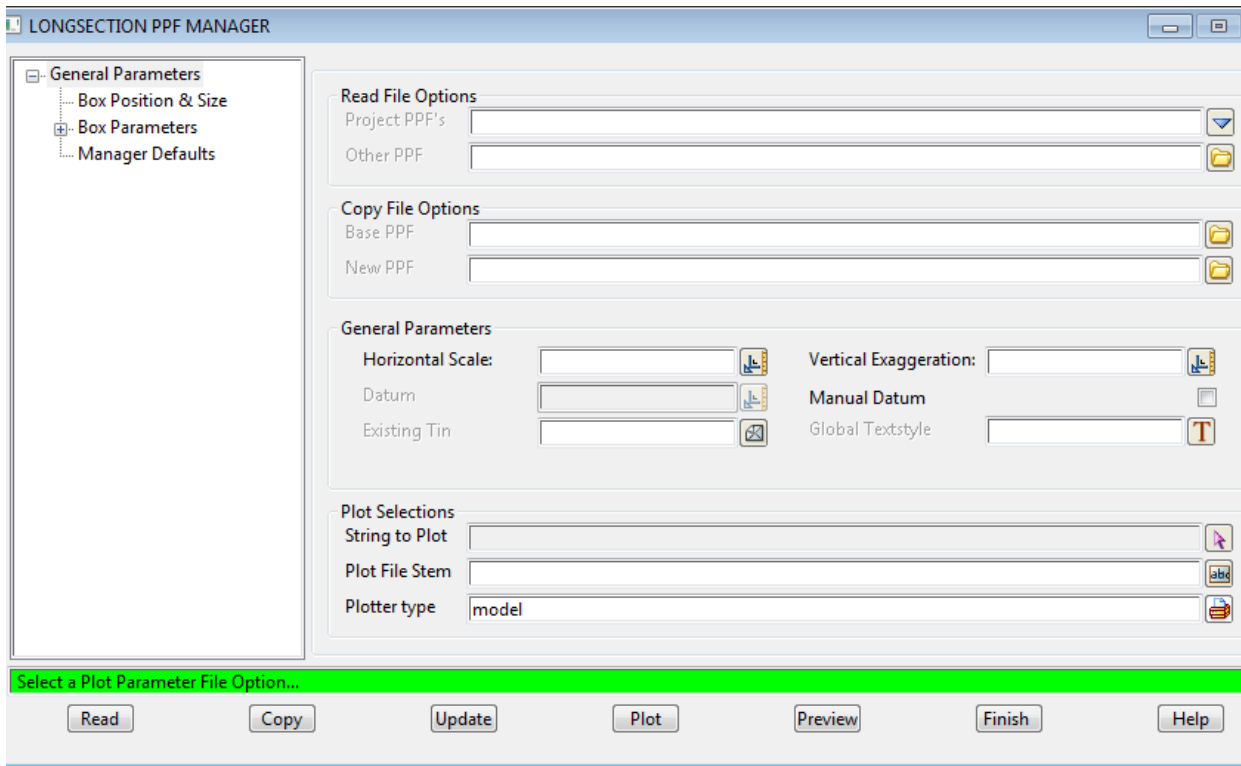
The seeds from the library can be inserted in a plan view using the **Insert plot frame seed** option.

Long Plot Manager

Position on menu: Plot =>Long plot manager

This section of documentation is a work in progress and will be updated in subsequent releases.

Selecting **Long plot manager** brings up the **Longsection PPF Manager** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
General Parameters			
Read File Options			
Project PPFs	choice box		
Other PPF	file box		
Copy File Options			
Base PPF	file box		
New PPF	file box		
General Parameters			
Horizontal Scale	measure box		
Vertical Exaggeration	measure box		
Datum	measure box		
Manual Datum	tick box	not ticked	
Existing Tin	tin box		
Global Textstyle	textstyle box		
Plot Selections			
String to Plot	select		
Plot File Stem	input		
Plotter type	plotter box		

General Parameters - Box Position & Size**Position Choice****Def Box Size****Plot Size****Active****Title 1****Title 2****Box Parameters****Global Title and Values Text Parameters****Title Text Textstyle** textstyle box**Title Text Colour** colour box**Title Text size (mm)** measure box**Values Text Textstyle** textstyle box**Values Text Colour** colour box**Values Text size (mm)** measure box**Values Decimal places****Datum/Box Parameters****Datum Name** name box**Datum Textstyle** textstyle box**Datum Colour** colour box**Datum Text size (mm)** measure box**Datum Decimal places****Box Colour** colour box**Uprights Colour** colour box**Box Parameters - Chainage & Design****Chainages - Title Parameters****Title line 1** name box**Title line 2** name box**Textstyle** textstyle box**Colour** colour box**Text size (mm)** measure box**Chainages - Value Parameters****Decimal places****Textstyle** textstyle box**Colour** colour box**Text size (mm)** measure box**Chainage Plot Interval** measure box

Design - Title parameters

Title line 1	name box
Title line 2	name box
Textstyle	textstyle box
Colour	colour box
Text size (mm)	measure box

Design - Value Parameters

Decimal places

Textstyle	textstyle box
Colour	colour box
Text size (mm)	measure box

Box Parameters - Natural Surface & Depths

Natural Surface Tin - Title parameters

Title line 1	name box
Title line 2	name box
Textstyle	textstyle box
Colour	colour box
Text size (mm)	measure box

Natural Surface Tin - Value Parameters

Decimal places

Textstyle	textstyle box
Colour	colour box
Text size (mm)	measure box

Depth Cut/Fill - Title Parameters

Title line 1	name box
Title line 2	name box
Textstyle	textstyle box
Colour	colour box
Text size (mm)	measure box

Depth Cut/Fill - Value Parameters

Decimal places

Textstyle	textstyle box
Colour	colour box
Text size (mm)	measure box

Tin Plot Colour	colour box
-----------------	------------

Box Parameters - Volumes Cut/Fill

Volume Titles - Title Parameters

Title line 1	name box
Textstyle	textstyle box
Colour	colour box
Text size (mm)	measure box

Volume Titles - Cut Title Parameters

Title line 1	name box
Textstyle	textstyle box
Colour	colour box
Text size (mm)	measure box

Volume Titles - Fill Title Parameters

Title line 1	name box
Textstyle	textstyle box
Colour	colour box
Text size (mm)	measure box

Volume Values - Cut Values Parameters

Textstyle	textstyle box
Colour	colour box
Text size (mm)	measure box

Decimal places

Volume Values - Fill Values Parameters

Textstyle	textstyle box
Colour	colour box
Text size (mm)	measure box

Decimal places

Vol Report file box

Sample Interval measure box

Box Parameters - Offset Strings**Offset String 1 - Title Parameters**

Title line 1	name box
Title line 2	name box
Textstyle	textstyle box
Colour	colour box
Text size (mm)	measure box

Offset String 1 - Value Parameters

Decimal places

Textstyle	textstyle box
Colour	colour box

Text size (mm) measure box

Offset String 2 - Title Parameters

Title line 1 name box

Title line 2 name box

Textstyle textstyle box

Colour colour box

Text size (mm) measure box

Offset String 2 - Value Parameters

Decimal places

Textstyle textstyle box

Colour colour box

Text size (mm) measure box

Offset String 1 select

Offset String 2 select

Box Parameters - X & Y Coords

X Coords - Title Parameters

Title line 1 name box

Title line 2 name box

Textstyle textstyle box

Colour colour box

Text size (mm) measure box

X Coords - Value Parameters

Decimal places

Textstyle textstyle box

Colour colour box

Text size (mm) measure box

Y Coords - Title Parameters

Title line 1 name box

Title line 2 name box

Textstyle textstyle box

Colour colour box

Text size (mm) measure box

Y Coords - Value Parameters

Decimal places

Textstyle textstyle box

Colour colour box

Text size (mm) measure box



Box Parameters - Super & Offset String Chgs**Superelevation - Title Parameters**

Title line	name box
Textstyle	textstyle box
Colour	colour box
Text size (mm)	measure box

Superelevation - Selection Parameters

Super Draw Mode
X Sect Model
Super Left Hinge
Super Left Edge
Super Right Hinge
Super Right Edge

Offset String (Shift) - Title Parameters

Title line 1	name box
Title line 2	name box
Textstyle	textstyle box
Colour	colour box
Text size (mm)	measure box

Offset String (Shift) - Value Parameters

Decimal places	
Textstyle	textstyle box
Colour	colour box
Text size (mm)	measure box

Chainage Offset String select**Manager Defaults**

Position Choice	
Def Box Size	
Title 1	
Title 2	
Read Def	button
Write Def	button

Buttons at bottom

Read	button
Copy	button
Update	button
Plot	button

Preview

button

Plotting Setups

Position of menu: Plot =>Plot and PPF editors
The Plot and PPF editor walk-right menu is

Plotting Setups	
Create/edit title block file	create/edit a title block file
Read title block file	read in a title block file
Pen mapping	map colours to pens
Plotter mapping editor	create/edit plotter mapping file
Plotter mapping	set extended pen mapping
Pixels to mm	pixel size to mm on plots
Hardware arcs	use hardware arcs
ACAD plot map file	create/edit AutoCAD map file
Interface colours	change cut/fill colours
DGN plot seed file	seed file for writing .dgn
Default DPI	default DPI for raster plots
DWT plot template file	template file for writing .dwt

For the option *Create/edit title block file*, go to
Read title block file

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ACAD plot map file
Interface colours
DGN plot seed file
Default DPI
DWT plot template file

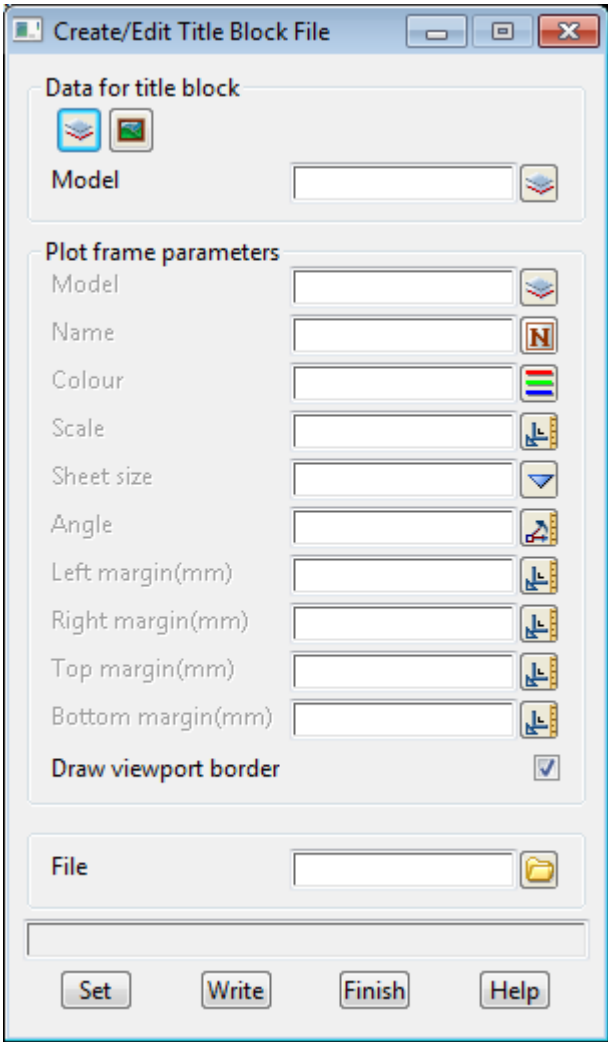
[ACAD Plot Map File](#)
[Interface Colours](#)
[DGN Plot Seed File](#)
[Default DPI](#)
[DWT Plot Template File](#)

Create/Edit Title Block File

Position of option on menu: Plot =>Plotting setups =>Create/edit title block file
Position of option on menu: Drafting => Create title block file

This option is used to create a title block file from string data in a model or a view.
If it is a model, the model attributes can also contain information that is used for creating plot frames. For example, Sheet size, left/right margins, *etc.*).

The data in the model/view should be set up with (0,0) representing the left hand bottom of the plotting sheet and the units in model/view represent **millimetres** on the paper. So text should be defined with **World** units and a metre in world units is taken to be a millimetre in the title block itself. That is, a text size 5 world units will plot as 5 mm.
For more information and the format of the title block file, go to the section [Title Blocks](#) in the chapter [PPF Editors](#).



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Data Model/View	model/view box		available models/views
<i>the data in this model/view is written to the title block file to be used as the linework and text in a title</i>			

block.
The **Set** button is used to create model attributes for the information in the Plot frame parameters section, so if the **Set** button is to be used, then only a Data Model can be used here.

Plot frame parameters

these parameters are written to an info block in the title block file and are only used when defining a plot frame using the option **Plot =>Plot frames =>Create**. The parameters can also be written as attributes in the Data Model using the **Set** button.

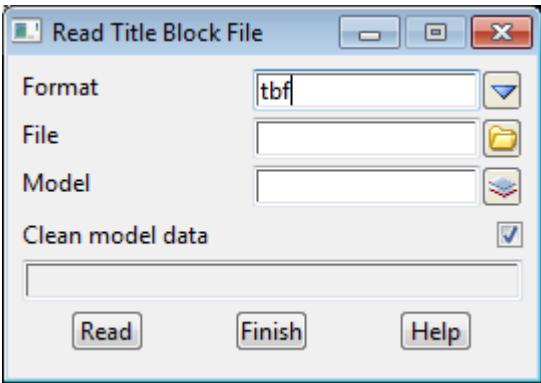
Name		
	<i>if not blank, the name to use for the plot frame.</i>	
Model	model box	available models
	<i>if not blank, model for the plot frame.</i>	
Colour	colour box	available colours
	<i>if not blank, colour for the plot frame.</i>	
Scale 1:	input	
	<i>if not blank, scale for the plot frame</i>	
Sheet size	input	available sheet sizes
	<i>if not blank, sheet size for the plot frame</i>	
Angle	angle box	
	<i>if not blank, angle of the plot frame - measured anticlockwise from the positive x-axis</i>	
Left margin, Right margin, Top margin, Bottom margin		
	<i>margins for the plot frame</i>	
Draw viewport border	tick box	tick
	<i>if ticked, a border is drawn around the view port in the colour of the plot frame.</i>	
Title block file	file box	*.tbf files
	<i>name of the file to contain the title block information.</i>	
Set	button	
	<i>save the plot frame parameters as attributes in the Data model.</i>	
Write	button	
	<i>run the option – create the title block file.</i>	

Read Title Block

Position of option on menu: Plot =>Plotting setups =>Read title block file

The **Read title block file** option is for reading in a title block file and placing the lines, arcs and text defined in the title block file into a given model.

On selecting the **Read title block file** option, the **Read Title Block File** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Format	choice box		tbf, tf
<i>specify if the format of the file is the V7 title block file (.tbf) or the older format (.tf).</i>			
File	file box		
<i>name of title block file to read in.</i>			
Model	model box		available models
<i>model to place the title block in when it is read. Any plot frame parameters in the info block of the title block file are set as attributes for this model. Hence these parameters can be written out again to a new title block file if the model is used as the Data Model when creating a title block file.</i>			
Clean model data	tick box	not ticked	
<i>if ticked, the data in the model given in the Model field will be cleaned prior to reading in the title block file.</i>			
<i>If not ticked, the data in the model given in the Model field will not be cleaned prior to reading in the title block file. The data is appended to the existing model data.</i>			
Read	button		
<i>read in the title block file and place the information in the given model.</i>			

Pen Mapping

This option brings up the **Edit Colours** panel.

For more information on this option, go to the section [Colours](#) in the Chapter [Tools and Concepts](#)

Plotter Mapping Editor

Position of option on menu: Plot =>Plotting Setups =>Plotter mapping editor

The **Plotter mapping editor** is used to create a plotter mapping file which is used when making a plot from **12d Model**. The plotter mapping file defines:

- (a) the mapping from **12d Model** colours to the plotter pens and weights of the plotter pen
- (b) the colours for the plotter pens

Different *plotter mapping files* are used for different plotter configurations.

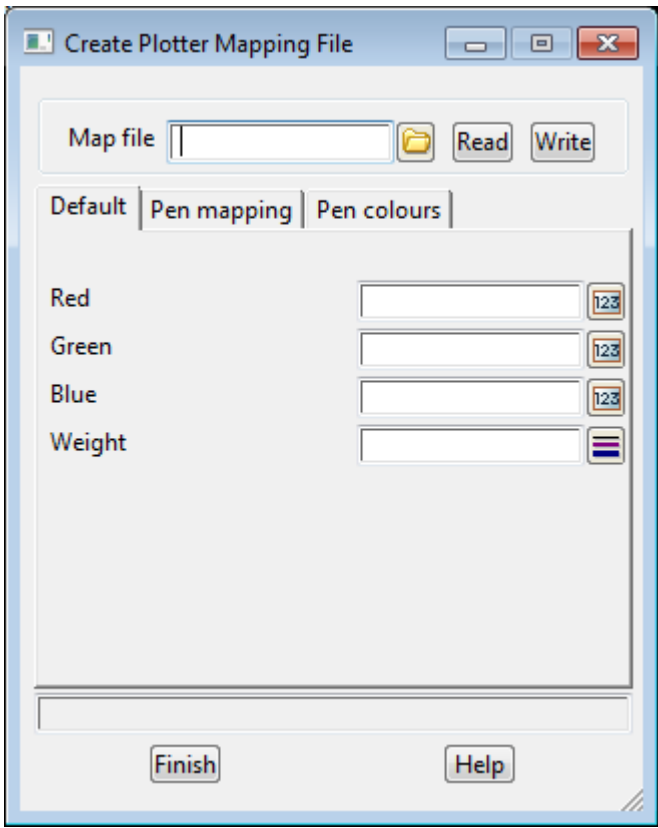
For example, different plotter mapping files would be used when plotting the same plot in **12d Model** to a mono-colour plotter or to a colour plotter.

For plotting to a mono-colour plotter, **12d Model** colours would be mapped to the one black pen but with possible different weights for different colours. So only one pen colour would be needed and its colour would be set to black (Red 0, Green 0 and Blue 0).

For plotting to a colour plotter, **12d Model** colours could be mapped to different colours and weights on the plotter.

The text definition of the plotter mapping file is given in the next section [Plotter Mapping](#).

On selecting the **Plotter mapping editor** option, the **Create Plotter Mapping File** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Map file <i>the plotter mapping file to be created/edited.</i>	file box		*.pmf file

Read button

read in the plotter mapping file given in Map file

Write button

write out to plotter mapping information in the panel to the file given in Map file.

Default tab

Red/Green/Blue input

the value between 0 and 255 of red/green/blue to be used for the default pen colour.

Weight input

the default pen weight.

12d Colour mapping tab

12d Colour colour box

the 12d colour to define the pen mapping for.

Use Pen Number integer box

the number of the pen on the plotter for the 12d colour to be mapped to.

Weight real number box

the weight to use for the plotter pen for the given 12d colour.

Define Pen Colours tab

Pen Number integer box

the number of the plotter pen to define the colour for.

Red/Green/Blue input

the value between 0 and 255 of red/green/blue to be used for the colour of the plotter pen.

Plotter Mapping

Position of option on menu: Plot =>Plotting setups =>Plotter Mapping

The **Plotter mapping file** can be used with pen plotters but is more specifically designed for electostatic and inject plotters and allows the user to

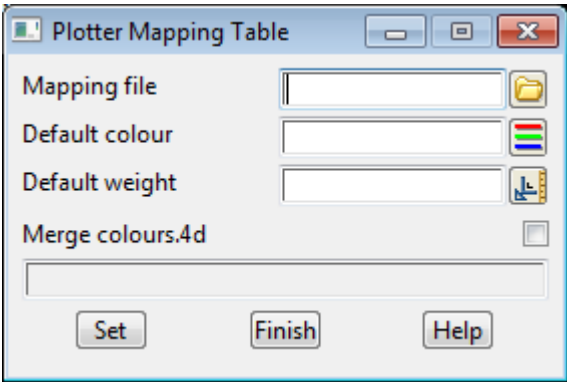
- (a) map the full 10,240 12d Model colours to particular plotter pens and also specify a width (or weight) to be used forPCL5, HPGL2 and postscript plotters.
- (b) specify the red, green and blue mix for pens on HPGL2 and colour postscript plotters

There are also two special formats of the plotter mapping file which are used for plotting to Autocad dxf/dwg and Intergraph dgn. The special mapping files use the 12d Model colour as a key to tables which control how the information is passed to DXF/DWG and DGN.

- (c) .tbl file used with plotting to Intergraph dgn
- (d) .amf used with plotting to Autocad dxf and dwg

The .tbl and .amf files are documented in the [Definition and Example of a .tbl File](#) and [Definition and Example of a .amf File](#) sections in the Appendix [Plotters and Plotting](#).

On selecting the **plotter mapping** option, the **plotter mapping table** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Mapping file	the plotter mapping file to be used when plotting. If no plotter mapping file is given, the pen mapping table is used.	input		*.pmf file
Default colour	the rgb of this colour is used as the rgb for the default pen colour.	input		available colours
Default weight	if not blank, the default pen weight.	input		
Merge colour_map.def	If ticked, the rgb columns from the colour_map.def file are used to define the pen_colours (first row is pen 0, second row is pen 1 etc.), and the pen mapping number is used to construct the pen_mapping table.	tick box	ticked	
Set	set the information in the panel	button		

Plotter Mapping File

The Plotter mapping file (.pmf) consists of two sections and two default values:

- (a) the **pen_mapping** table which defines the plotter pens that the **12d** Model colours are mapped to, and the weights for each "12d Model colour to plotter pen" mapping.

The `pen_mapping` table consists of the key word `pen_mapping` followed by the mapping for each 12d Model colour to the appropriate plotter pen number and pen weight (one per line), all enclosed in curly braces (`{ }`).

```
pen_mapping {                                     // pen mapping and weight table
//12d Model colour number                        plotter pen number          pen weight
        0                1                    0.15
        1                2                    0.25
        3                1                    0.5
//      etc.
}
```

- (b) the **pen_colours** table which defines the red, green and blue values to be used for the pens on the plotter.

The `pen_colours` table consists of the key word *pen_colours* followed by the red, green and blue values for the plotter pens (one per line), all enclosed in curly braces ({}).

```

pen_colours {           // pen colours table
//pen      red      green      blue      values 0-255
    0      0        0        0          // pen 0 is black
    1      255      0        0          // pen 1 is red
//
    etc.
}

```

- (c) the ***default_weight*** command that goes at the top of the file (not inside the *pen_mapping* or *pen_colours* table) which is used as the weight for any 12d Model colour used in the plot but not mapped and given a weight in the *pen_mapping* table.

default	weight	<i>weight</i>
---------	--------	---------------

- (d) the ***default_colour*** command that also goes at the top of the file (not inside the *pen_mapping* or *pen_colours* table) which defines the default red, green and blue for any pens used but not set in the *pen_colours* table.

```
default colour      red      green      blue
```

Initialization of the plotter mapping file

When using the plotter mapping table panel:

When used with the **Plotter mapping table** panel, the `pen_mapping` and `pen_colours` tables are initialised before the plotter mapping file is used. This is to ensure that any colours and/or pens not mentioned in the file but used in a plot, do have valid definitions.

Hence the initialisation sequence for the plotter mapping file used with the **plotter mapping table** panel is:

Before the plotter mapping file is used, a default pen_mapping table for colours 0 to 255 is set up by:

colour n goes to pen n with the default weight from the **plotter mapping table** panel.

Before the plotter mapping file is used, a default pen colours table for pens 0 to 255 is set up by:

open n is given the red, green and blue of the default colour from the **plotter mapping table**

panel.

If the **merge colours.4d** flag is set in the **plotter mapping table** panel, the rgb columns from the colours.4d file are used to define the pen_colours (first row is pen 0, second row is pen 1 etc.), and the pen mapping number is used to construct the pen_mapping table.

The **plotter mapping file** is then processed and over writes any of the above initial mapping values.

When using user defined plotters:

A plotter mapping file can be set for a user defined plotter in the file *plotters.4d*.

In this case, the **plotter mapping table** panel is **not** used and hence the initialisation sequence is slightly different.

When used with the **plotter mapping table** panel, the pen_mapping and pen_colours tables are initialised before the plotter mapping file is used. This is to ensure that any colours and/or pens not mentioned in the file but used in a plot, do have valid definitions.

For a **user defined plotter**, the initialisation sequence for the plotter mapping file is:

Before the plotter mapping file is used, a default pen_mapping table for colours 0 to 255 is set up by:

colour n goes to pen n with the **default weight** *default_weight* from the specified plotter mapping file, or zero if the default_weight does not exist.

Before the plotter mapping file is used, a default pen_colours table for pens 0 to 255 is set up by:

pen n is given the red, green and blue of the **default colour** *default_colour* from the specified plotter mapping file, or rgb 0 0 0 if the default_colour does not exist

The **plotter mapping file** is then processed and over writes any of the above initial mapping values.

An Example of a Plotter Mapping File

An example of a plotter mapping file (.pmf) is:

```
default_colour      100      0      100
default_weight      0.1

pen_mapping {                               // pen mapping and weight table

//          colour      pen      weight

          0          1          0.15      // map colour 0 to pen 1 with weight 0.15
          1          2          0.25      // map colour 1 to pen 2 with weight 0.25
          3          1          0.5       // map colour 3 to pen 1 with weight 0.5
}
pen_colours {                               // pen colours table

//pen      red      green      blue      values 0-255
  0          0          0          0      // pen 0 is black
  1          255       0          0      // pen 1 is red
  3          0          255       0      // pen 3 is green
}
```

Pixels to mm

Position of option on menu: Plot =>Plotting Setups =>Pixels to mm

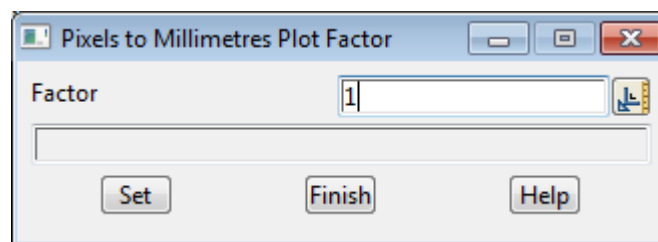
To plot an object, it must be possible to calculate the size in millimetres that the object will have in the plot.

However, in **12d Model** it is possible for text and linestyles to be defined in the screen unit pixels, and since the size of a pixel varies between screens, there is no direct millimetre equivalent for a pixel.

To allow text and linestyles with only a pixel size to be plotted, a factor to convert pixels to millimetres is used.

When plotting, all text and linestyles defined only in pixel units is **multiplied** by the pixels-to-millimetre factor to determine its size in the plot.

On selecting the **pixel to mm** option, the **pixels to millimetres plot factor** panel is displayed.



To define a new factor, simply type the value into the factor field and select **set**.

The pixel-to-millimetres value is stored for the project.

For a new project, the initial value is loaded from the **defaults** file and is defined in the file by

PIXELS TO MM PLOT FACTOR value

Hardware Arcs

Position of option on menu: Plot =>Plotting Setups =>Hardware arcs

When plotting arcs, the arc can either be broken into a series of straight lines within **12d Model**, or plotted using the arc command (if it exists) for the relevant plotter.

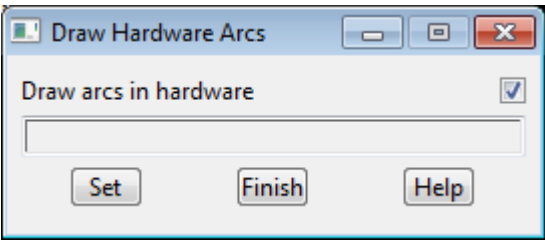
This option allows the user to choose whether

(a) the plotter arc command is used (hardware arcs)

or

(b) before plotting, the arc is broken into a series of lines.

On selecting the **hardware arcs** option, the **draw hardware arcs** panel is displayed.



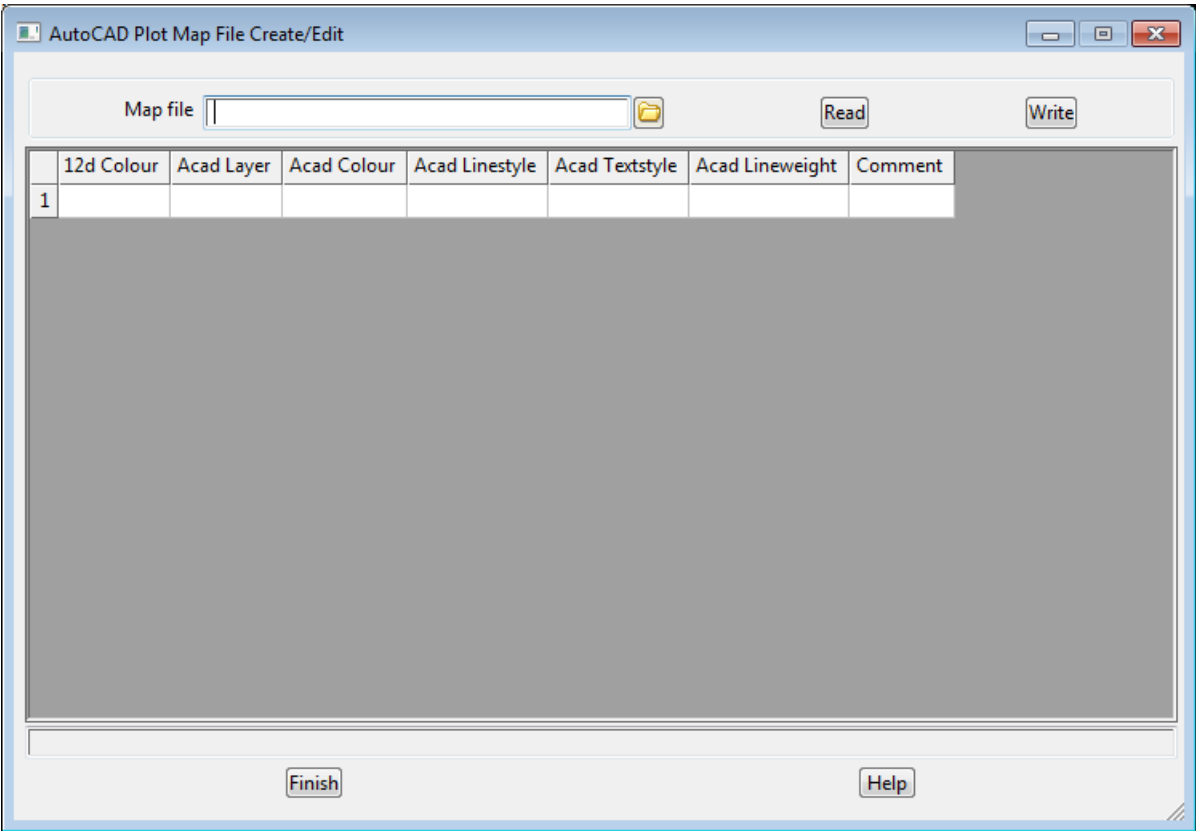
To use hardware arcs in plots, simply change the draw arcs in hardware tick box to tick and select **set**.

ACAD Plot Map File

Position of option on menu: Plot =>Plotting setups =>ACAD plot map file

When plotting to AutoCAD, an Autocad map file can be used which uses the **12d Model** colour of an entity in the plot as a key to mapping the entity into AutoCAD.

On selecting the ACAD plot map file option, the AutoCAD Map File Create/Edit panel is displayed.



Interface Colours

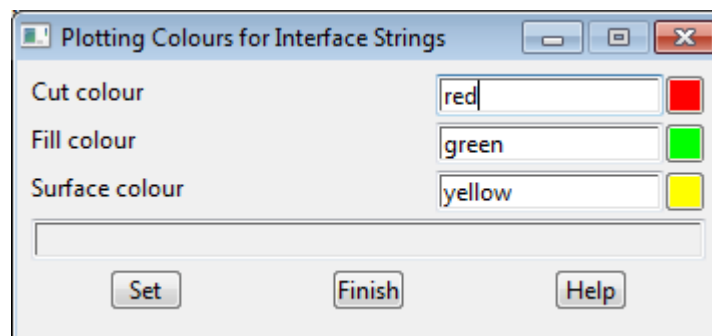
Position of option on menu: Plot =>Plotting Setups =>Interface colours

When drawing interface strings in **12d** Model, cut areas are denoted in red, fill areas in green and sections on the surface in yellow.

However, when plotting it is convenient to be able to map the interface colours to other colours.

This panel is used to define new colours for the interface colours, and the new colours are then mapped to pens using the pen mapping table or plotter mapping file.

On selecting the **interface colours** option, the **plotting colours for interface string** panel is displayed.



To define new colours, simply type the values into the appropriate panel fields and select **set**.

Note - the new interface colours are not used for displaying interface strings in **12d** Model, only for plotting.

DGN Plot Seed File

Position of option on menu: Plot =>Plotting Setups =>DGN plot seed file

When creating plot files in Intergraph DGN format, an Intergraph DGN seed file can be used.

On selecting the **DGN plot seed file** option, the **DGN plot seed file** panel is displayed.



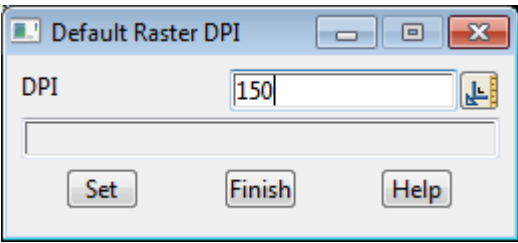
To define an Intergraph IGDS plot seed file to use for Intergraph plotting, simply type the file name into the plot seed file panel field and select **set**.

Default DPI

Position of option on menu: Plot =>Plotting setups => Default DPI

This defines the default DPI (dots per inch) when plotting rasters.

On selecting **Default DPI**, the **Default Raster DPI** panel is displayed.



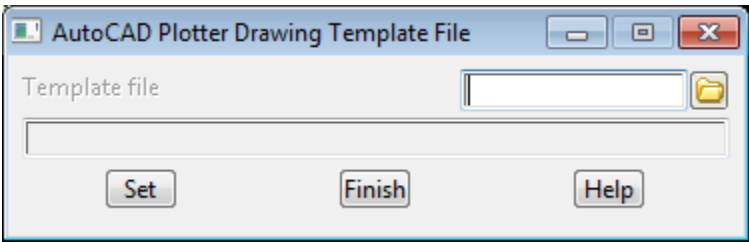
The *DPI* value give the default dots per inch that is used for plotting rasters.

DWT Plot Template File

Position of option on menu: Plot =>Plotting Setups =>DWG plot template file

When creating plot files in AutoCAD format, an AutoCAD template file can be used.

On selecting the **DWT plot template file** option, the **AutoCAD Plotter Drawing Template File** panel is displayed.

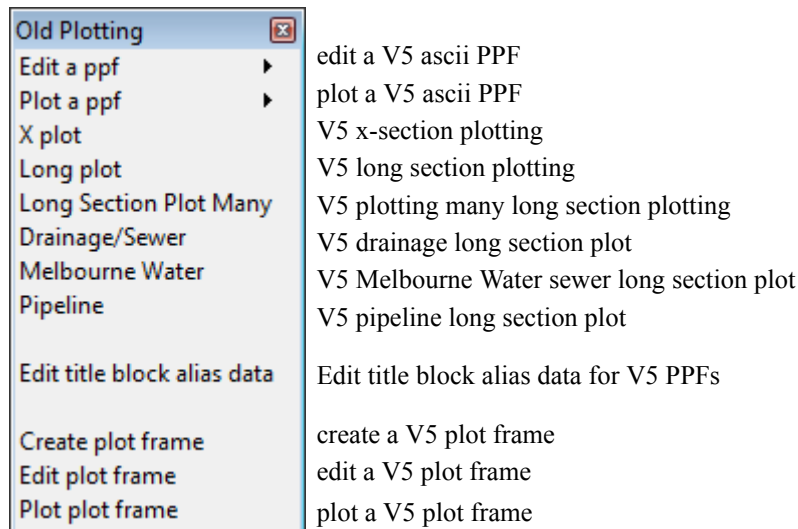


To define an AutoCAD plot seed file to use for AutoCAD plotting, simply select either *DWG* or *DXF* for the File format, type the file name into the plot seed file panel field and select **set**.

Old Plotting

Position of menu: Plot =>Plot =>Old plotting

The Old plotting walk-right menu is



For the option *Edit a ppf*, go to

Plot a ppf

X plot

Long plot

Long section plot many

Drainage/sewer

Melbourne Water

Pipeline

[Edit a ppf](#)

[Plot a ppf](#)

[X Plot](#)

[Long Plot](#)

[Plot Many Long Sections](#)

[Drainage Longsections](#) in chapter [Drainage and Sewer](#)

[Melbourne Water](#) in chapter [Drainage and Sewer](#).

[Plots](#) in chapter [Pipeline](#).

Edit title block alias data

[Title Block Data Editor](#)

Create plot frame

[Create Old Plot Frame](#)

Edit plot frame

[Editor Old Pot Frame](#)

Plot plot frames

[Plotting Old Plot Frames](#)

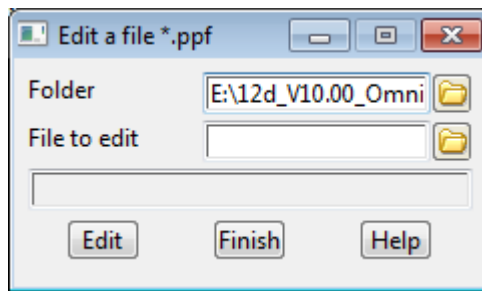
Edit a ppf

Position of option on menu: Plot =>Old plotting =>Edit a ppf

The **Edit a ppf** option is used to edit V5 ascii plot parameter files (*.ppf) with the editor pointed to by the EDITOR_4D environment variable.

The **Edit a ppf** walk-right menu provides a list all the plot parameter files (files ending in .ppf) in the current folder.

When a file is selected from the list, it is loaded into the editor pointer to by the environment variable EDITOR_4D.



Plot a ppf

Position of option on menu: Plot =>Old plotting =>Plot a ppf

The V5 ascii PPFs for long section, cross section and plot frames can have enough information in them to totally generate the plot from the ppf. The **plot a ppf** option is used to plot such a plot parameter file (*.ppf).

The **Plot a ppf** walk-right menu provides a list all the plot parameter files (files ending in .ppf) in the current folder.

When a file is selected from the list, it is then used to generate a plot.

Note - the plot parameter file is defined in the chapter **Advanced Plotting**.

X Plot

Position of option on menu: Plot =>Old plotting =>X plot

The **X plot** option is used to make the traditional pages of cross-section plots, that is, stacked x-sections, with offsets and elevations labelled for each cross section string, and elevations displayed for each of the tins on the section view.

For **12d Model V5**, each string to be plotted is assumed to be on a straight line in plan. Hence the cross section is taken as a straight line from the first point of the string to the last point of the string. The chainage of the first point of the string is used as the offset.

For **12d Model V6** and above, sections do not have to be a straight line in plan. The chainage of the first point of the string is used as the offset.

The format of the x-section plot is partially controlled by fields in the **Section X Plot** panel but more extensive control is possible using a **plot parameter file** (*.ppf). The plot parameter file is fully documented in the [Cross Section Plot Parameter File](#) section of the Appendix, [Plot Parameters](#).

The cross section plot is tailored by using the plot parameter file (.ppf file) given in the plot parameters field. A default .ppf file is set by pointing to it with the environment variable

X_SECTION_PPF_4D pathname of default .ppf file

In the pathname to the default .ppf file, \$LIB is used to stand for the library folder set by LIB_4D. For example, "\$LIB/cross.ppf" is the file cross.ppf in the library area.

Which x-sections are to be plotted is specified by giving the model containing the appropriate cross sections. Sections are also drawn through any triangulations and service items on the section view. Vertical exaggeration, services and corridor settings are taken from a plot parameter file or from the settings for the section view.

X-sections can be labelled with either the offset from the centreline and heights for each of the x-section points, or simply the position of the centre-line.

The required page size is given, plus the scale (the vertical exaggeration is taken from the view

settings) and the sections are then plotted in columns on the plotter page. Once a page is full, a new plot page is automatically begun.

The stacked x-section plots in each column can be lined up by their centre-lines.

After selecting the **X plot** option, the **Cross Section Plot** panel is displayed.

The **Title** button on the bottom of this panel controls the use of a title block file and the plotting of a border and two lines of title. If the **title** button is selected, the **Cross Section Plot Title** panel is displayed.

Cross Section Plot

Plotting | **Title**

Plot parameters [] [Folder icon]

Plot parameters write [] [Folder icon]

Section view [] [Icon]

Model of X-sections [] [Icon]

Plotter type [hp] [Icon]

Plot file stem [] [Folder icon]

Start chainage [] [Icon]

End chainage [] [Icon]

Sheet size wd ht (mm) [A1] [Icon]

Scale 1 : [100] [Icon]

Label type [boxes] [Icon]

Text style [1] [Icon]

Text ht (mm) [2.5] [Icon]

Box colour [cyan] [Icon]

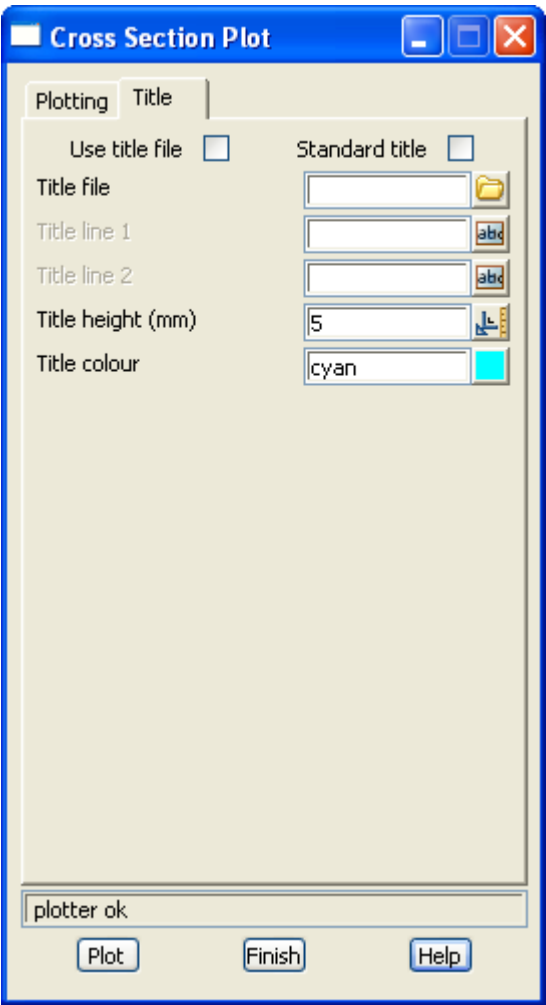
Primary string ☒ Sort sections ☐

Absolute extensions ☐ Line up CL's ☒

LHS extension [0] [Icon] RHS extension [0] [Icon]

plotter ok

[Plot] [Finish] [Help]



The fields and buttons used in the first panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Plot parameters <i>file of plot parameters used for extra control of the x section plot. The default .ppf file is pointed to by the environment variable X_SECTION_PPF_4D.</i>	file box	X_SECTION_PPF.4D	available *.ppf files
<i>For more information on the x section plot parameters, please go to the section Cross Section Plot Parameter File in the Appendix Plot Parameters</i>			
Plot parameters write <i>file to write a copy of the plot parameters necessary to regenerate the plot.</i>	file box		available *.ppf files
Section view <i>section view to use for plot definitions such as the tins to profile, the models of services, corridor width and vertical exaggeration.</i>	input/output	current view	available views
Model of X-sections <i>the model containing all the x-sections to be plotted. The x-sections are plotted in the same order as they are in the model.</i>	model box		available models
<i>Each string to be plotted is assumed to be on a straight line in plan. Hence the cross section is taken as a straight line from the first point of the string to the last point of the string. The chainage of the first point of the string is used as the offset.</i>			

Plotter type	input	hp	hp, dxf, postscript etc.
<i>file format for the plot output.</i>			
Plot file stem	input		
<i>since more than one plot page may be produced, the plot file stem plus a plot page sequence number followed by the ending for the plotter type is used as the plot file names.</i>			
Start/end chainage	input		
<i>the plots cover the chainage range for the cross sections given by the start and end chainage fields. If the start/end chainage is blank, the start/end chainage of the x-section strings are used.</i>			
Sheet size wd ht (mm)	choice box		available sheet sizes
<i>must contain the width and height values (separated by space) or the name of a user defined sheet size.</i>			
Scale 1:	input		
<i>horizontal scale for plotting the x-sections.</i>			
Label type	choice box	boxes	boxes, centreline
<i>if boxes, the offset from the centreline and heights for each point in the x-section will be plotted in the traditional offset/height boxes.</i>			
<i>if centre line, only the position of the centre-line and the height of the section at that point will be drawn.</i>			
Text style (mm)	input	1	
<i>text style to be used in the x section plot boxes or centreline labelling.</i>			
Text ht (mm)	input	3	
<i>height (in millimetres) to plot the offset and heights in the boxes in the plots of the x-sections</i>			
Offset colour	colour box	red	available colours
<i>colour used for the offset text and the boxes.</i>			
Primary string	tick box	ticked	
<i>if ticked, the string from the model of x-sections (the primary string) is plotted.</i>			
Sort sections	tick box	ticked	
<i>if ticked, the strings from the model of x-sections are sorted by chainage along the design string.</i>			
Absolute extensions	tick box	not ticked	
<i>If ticked, the sections are only drawn from the centreline out to the left and right extension distances. if not ticked, the left and right extension values are added to the section left and right widths, and the section is taken between the extended values</i>			
Line up CL's	tick box	ticked	
<i>if ticked, the centre-lines are lined up under each other for each plot in a column.</i>			
LHS extension	input	0	
<i>distance to extend the x-section to the left.</i>			
RHS extension	input	0	
<i>distance to extend the x-section to the right.</i>			
Plot	button		
<i>write out the plots for the x-sections given in the model of x-sections field.</i>			

Title tab

panel for defining information in the title block.

The fields and buttons in *Title* tab are:

Use title file	tick box	not ticked
-----------------------	----------	------------

if *ticked*, a user defined title block file is used.

Standard Title	tick box	ticked	
if <i>ticked</i> , the standard 4D Solutions border and two lines of title are placed on the bottom of the plot			
Title file	file box		available *.tf files
if <i>non-blank</i> and use title file is set to <i>tick</i> , then the file given in this field is used to generate a user defined title block for the plot.			
Title line 1/2	input		
first/second line of title information			
Title height (mm)	input	5	
height (in millimetres) to draw the characters in the two lines of title information.			
Title colour	input	cyan	available colours
colour used for the border and the title information.			

Long Plot

Position of option on menu: Plot =>Old plotting =>Long plot

The **Long plot** option is used to make traditional long section plots with string chainages and elevations labelled for the primary string and elevations and depths displayed for each of the tins on the section view.

The format of the long section plot is partially controlled by fields in the section long plot panel but more extensive control is possible using a **plot parameter file** (*.ppf). The plot parameter file is fully documented in the [Long Section Plot Parameter File](#) section in the chapter, [Plot Parameters](#).

After selecting the **Long plot**, the **Long Section Plot** panel is displayed.

The long section plot is tailored by using the plot parameter file (.ppf file) given in the plot parameters field. A default .ppf file is set by pointing to it with the environment variable

LONG_SECTION_PPF_4D pathname of default .ppf file

In the pathname to the default .ppf file, \$LIB is used to stand for the library folder set by LIB_4D. For example, "\$LIB/long.ppf" is the file long.ppf in the library area.

The **title** button on the bottom of this panel controls the use of a title block file and the plotting of a border and two lines of title. If the **title** button is selected, the **section long plot title** panel is displayed.

The **pagination** button on the bottom of this panel controls whether the long section plot is broken into pages, by a chainage length or millimetres of plot.

If the **pagination** button is selected, the **Section long plot pagination** panel is displayed.

Long Section Plot

Plotting | Title | Pagination

Plot parameters

Plot parameters write

Section view

Plotter type

Plot file

Start chainage

End chainage

Chainage increment

Sheet size wd ht (mm)

Scale 1 :

Plot primary string ☒

Use HG VG for min max ☐

Label depths ☒

Text style

Box text ht (mm)

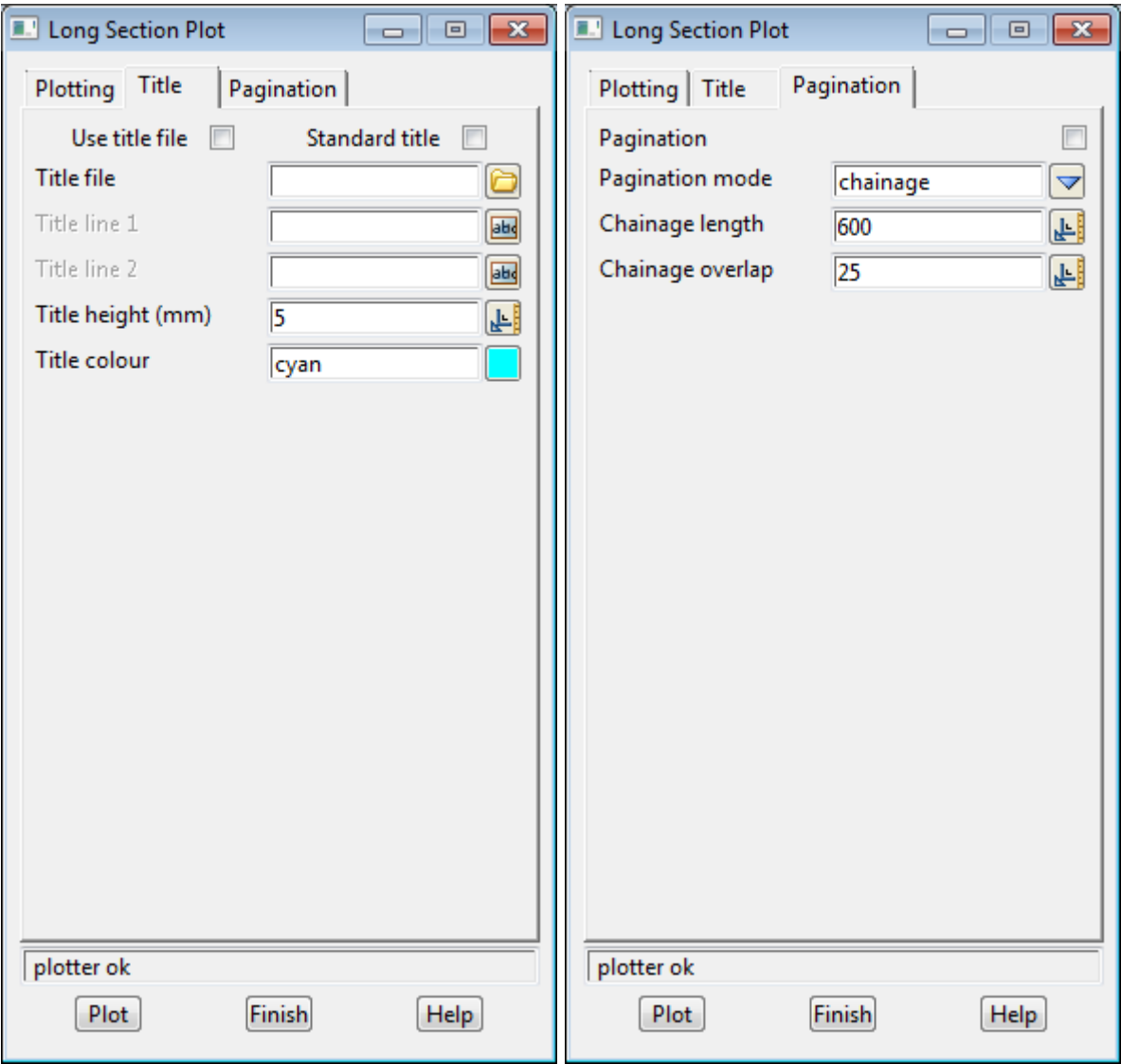
Box colour

Datum value

Offset model

plotter ok

Plot Finish Help



The fields and buttons used in the two panels have the following functions.

Field Description	Type	Defaults	Pop-Up
Plot parameters	file box	LONG_SECTION_PPF_4D*.ppf	
<i>file of plot parameters used for extra control of the long section plot. The default .ppf file is pointed to by the environment variable LONG_SECTION_PPF_4D.</i>			
<i>For more information on the long section plot parameters, please go to the section Long Section Plot Parameter File in the Appendix Plot Parameters</i>			
Plot parameters write	file box		*.ppf
<i>file to write a copy of the plot parameters necessary to regenerate the plot.</i>			
Section view	input/output	current view	available section views
<i>section view to use for plot definitions such as the tins to profile, the models of services, corridor width and vertical exaggeration.</i>			
Plotter type	input	hp	hp, dxf, postscript etc.
<i>file format for the plot information.</i>			
Plot file	file box		*.hp etc.
<i>name of the file to write out the long section plot to.</i>			

Start/end chainage	input		
<i>the plot covers the chainage range given by the start and end chainage fields. If the start/end chainage is blank, the start/end chainage of the primary string is used.</i>			
Chainage increment	input	100	
<i>chainage increment to label the long plot with chainage and height values.</i>			
Sheet size wd ht (mm)	input		available sheet sizes
<i>The width and height values (separated by space) or the name of a user defined sheet size.</i>			
Scale 1:	input		
<i>horizontal scale for the plot. The vertical scale is taken from the ppf or the section view.</i>			
Plot primary string	tick box	ticked	
<i>if ticked, the primary string is plotted along with any horizontal geometry displayed in the section view.</i>			
Use HG VG for min, max	tick box	ticked	
<i>if ticked, the chainage range available for plotting is from the minimum of the horizontal geometry (HG) and the vertical geometry (VG) to the maximum of the HG and VG. Useful for kerb returns. If not ticked, the chainage range available for plotting is from the minimum of the horizontal geometry (HG) to the maximum of the HG.</i>			
Label depths	tick box	ticked	
<i>if ticked, label in boxes at the bottom of the plot, the distance between the primary string and the tins.</i>			
Text style	input	1	
<i>text style to be used in the long section plot boxes.</i>			
Box text ht (mm)	input	3	
<i>height (in millimetres) to plot the chainage and elevations in the boxes in the long section plot.</i>			
Box colour	colour box	cyan	available colours
<i>colour used for the chainage text and the boxes.</i>			
Datum value	input		
<i>if non-blank, the value to be used as a datum. If blank, then a suitable datum value will be calculated.</i>			
Offset model	input		available models
<i>if non-blank, then all the strings in the offset model will be projected onto the primary string and drawn and labelled on the long section plot.</i>			
Title tab			
<i>brings up the section long plot title panel.</i>			
Use title file	tick box	not ticked	
<i>if ticked, a user supplied title block file is used.</i>			
Standard Title	tick box	ticked	
<i>if ticked, the standard 4D Solutions border and two lines of title are placed on the bottom of the plot</i>			
Title file	file box		available *.tf files
<i>if non-blank and use title file is set to tick, then the file given in this field is used to generate a user defined title block for the plot.</i>			
Title line 1/2	input		
<i>first/second line of title information</i>			
Title height (mm)	input	5	
<i>height (in millimetres) to draw the characters in the two lines of title information.</i>			
Title colour	colour box	cyan	available colours

colour used for the border and the title information.

Pagination tab

brings up the section long plot pagination panel.

Pagination	tick box	ticked
-------------------	----------	--------

if **ticked**, the long section plot is broken into separate plots of length given in the **length** field, from the start chainage to the end chainage. If the **overlap** field is non-zero, then each page of the long section plot also includes the **overlap** value of the end of the previous page of plot.

*The units for length and overlap can be either **chainage distance** or **millimetres on the plot page**.*

Hence apart from the first page and possibly the last page, the plot will have a total length given by the sum of the length and the overlap panel fields.

Pagination mode	input	chainage	chainage, millimetres
------------------------	-------	----------	-----------------------

*the units for length and overlap can be either **chainage distance** or **millimetres on the plot page**.*

*If pagination mode is set to **chainage**, the units are chainage distance.*

If pagination mode is set to **millimetres**, the units are millimetres on the plot.

Length	measure box	600
---------------	-------------	-----

if pagination is set to **ticked**, the length of new plot to be included in the current plot.

Overlap	measure box	25
----------------	-------------	----

*if pagination is set to **ticked**, the length of the previous plot page to be included in the current plot.*

Plot button

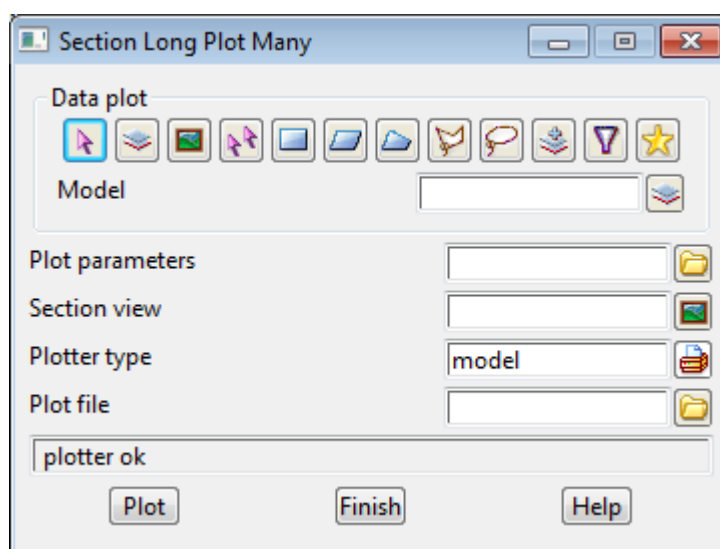
write out the plot for the long section plot between the chainages given in the start and end chainage fields. The format of the file is given by the `plotter` type

Plot Many Long Sections

Position of option on menu: Plot =>Old plotting =>Long Section Plot Many

The **Long Section Plot Many** option is used to plot individual long section plots for each string selected by the Data source.

On selecting the **Long Section Plot Many** option, the **Section Long Plot Many** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data to plot - Data source type

data source type.

Data source

*when the **plot** button is selected, long section plots are created for all the strings selected by the data source.*

Plot parameters

file box

*.ppf files

file of plot parameters to be used for the long section plots.

Section view

view box

available views

name of the section view for defining information for the long section plots. For example, tins to plot.

Plotter type

input

hp

available plotters

type of plotter to plot to.

Plot file

input

stem of the name to use for the long section plots.

Plot

button

*when the **Plot** buttons is selected, individual long section plots will be created for all the strings selected in the data source field.*

Drainage/Sewer Plot

Position of option on menu: Plot =>Old plotting =>Drainage/Sewer

The **Drainage/Sewer** option is for creating drainage and/or sewer long-section plots.

The option has already been described under **Design=>Drainage-sewer =>Plots**.

See [Drainage Longsections](#).

Melbourne Water Sewer Plot

Position of option on menu: Plot =>Old plotting =>Melbourne Water

The **Melbourne Water** option is for creating sewer long-section plots to Melbourne Water specifications.

The option has already been described under **Design =>Drainage-sewer =>Plots**.

See [Melbourne Water](#).

Pipeline Plot

Position of option on menu: Plot =>Old plotting =>Pipeline

The **Pipeline** option is for creating pipeline long-section plots.

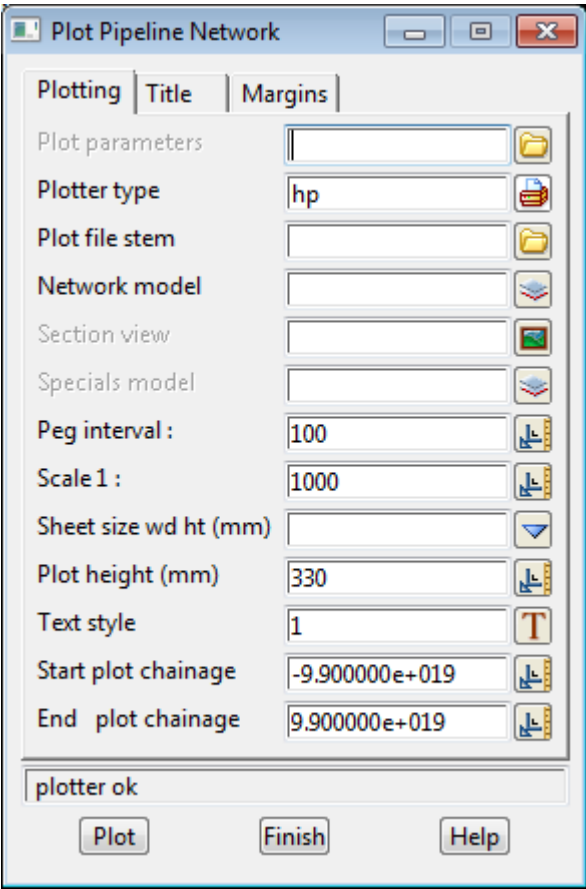
Given the plot sheet size and the horizontal and vertical scales, the longsections for the pipelines are plotted starting at the top of the sheet and moving across the sheet. Once one row is full, if there is room the plot moves down the page and begins a new row. When a plot sheet is full, a new plot sheet is automatically begun.

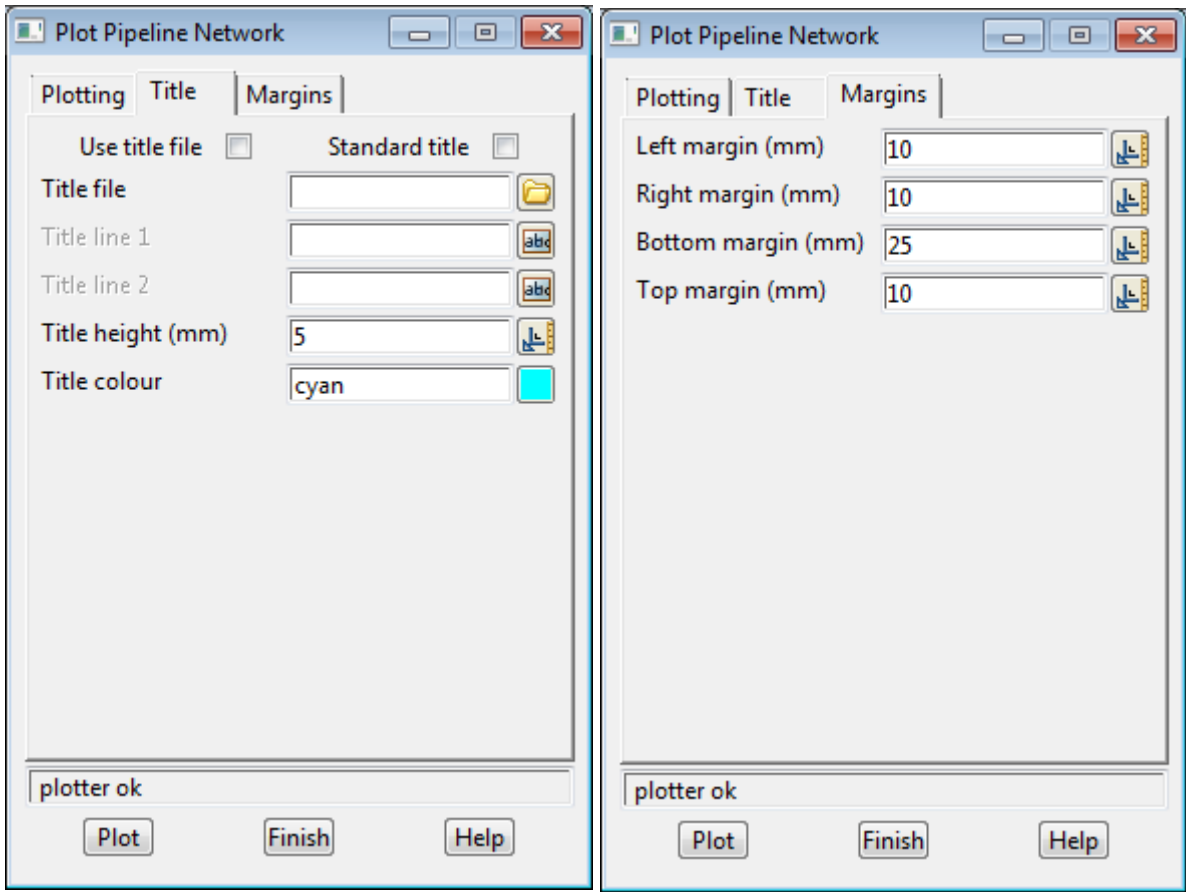
The pipeline plots include

- s the horizontal and vertical joint deflection at any vertical intersection points which have no curves on them
- s the natural surface height and chainage at any pegs or positions from the specials model, plus the invert level and depth to pipe at the position

- s for any services which cuts the pipeline, the name, diameter, invert level, the distance along the pipeline of the cut point plus the invert level and depth of the invert for the pipeline and the cut point.

After selecting the Pipeline option, the **Plot Pipeline Network** panel is displayed.





The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Plot parameters <i>file of plot parameters used for extra control of the long section plot.</i>	input		*.ppf
Plotter type <i>format for the plot output.</i>	input	hp	hp, dxf, postscript etc.
Network model <i>the model containing the pipelines to be plotted.</i>	input		
Section view <i>the section view to be used to define the vertical exaggeration, corridor widths, tins to section through, services models to section etc.</i>	input		
Plot file stem <i>since more than one plot page may be produced, the plot file stem plus a plot page sequence number followed by .plt is used as the plot file names.</i>	input		
Specials model <i>model of text strings which are used as extra labels for the plots.</i>	input		
Peg interval <i>if the specials model is blank, the pipelines are labelled with the text peg at the peg interval along the</i>	input	50	

pipeline.

- Scale 1:

input

horizontal scale for plotting the pipeline long sections. The vertical exaggeration is taken from the section view given in the section view field.
- Sheet size wd ht (mm)

input

available sheet sizes

*if **non-blank**, the width and height values in millimetres (separated by space) or the name of a user defined sheet size.*

*If **blank**, the sheets size is calculated to fit the long section plot.*
- Pipeline line ht (mm)

input

*the maximum allowable height for a longsection plot for a pipeline line. Datum breaks are applied to any part of the longsection that will not fit into the **pipeline line ht**.*
- Start plot chainage

input

If blank, the start chainage of the pipelines is used; if non blank, the plots start at this chainage for each pipeline.
- End plot chainage

input

If blank, the end chainage of the pipelines is used; if non blank, the plots finishes at this chainage for each pipeline.
- Plot

button

write out the pipeline longsection plots for the pipelines in the model given in the network model field.

The fields and buttons for *margin* tab:

Left/right margin (mm) 10.0
the left/right hand side margin between the sheet and the plotting area inside the sheet.

Bottom/top margin (mm) 10.0
the bottom/top margin between the sheet and the plotting area inside the sheet.

The fields and buttons for the *title* tab:

Use title file tick box
*if **ticked**, a user defined title block file is used.*

Use Standard title tick box tick
*if **ticked**, the standard border and two lines of title are placed on the bottom of the plot*

Title file input *.tf
*if **non-blank** and use title file is set to **tick**, then the file given in this field is used to generate a user defined title block for the plot.*

Title line 1/2 input
first/second line of title information

Title height (mm) input 5
height (in millimetres) to draw the characters in the two lines of title information.

Title colour input cyan available colours
colour used for the border and the title information.

Title Block Data Editor

Position of option on menu: Plot =>Old Plotting =>Edit title block data
NO LONGER USED IN V7

This panel is used to easily change to data in your drawing title blocks (set values for the `user_text_n` field in a title file).

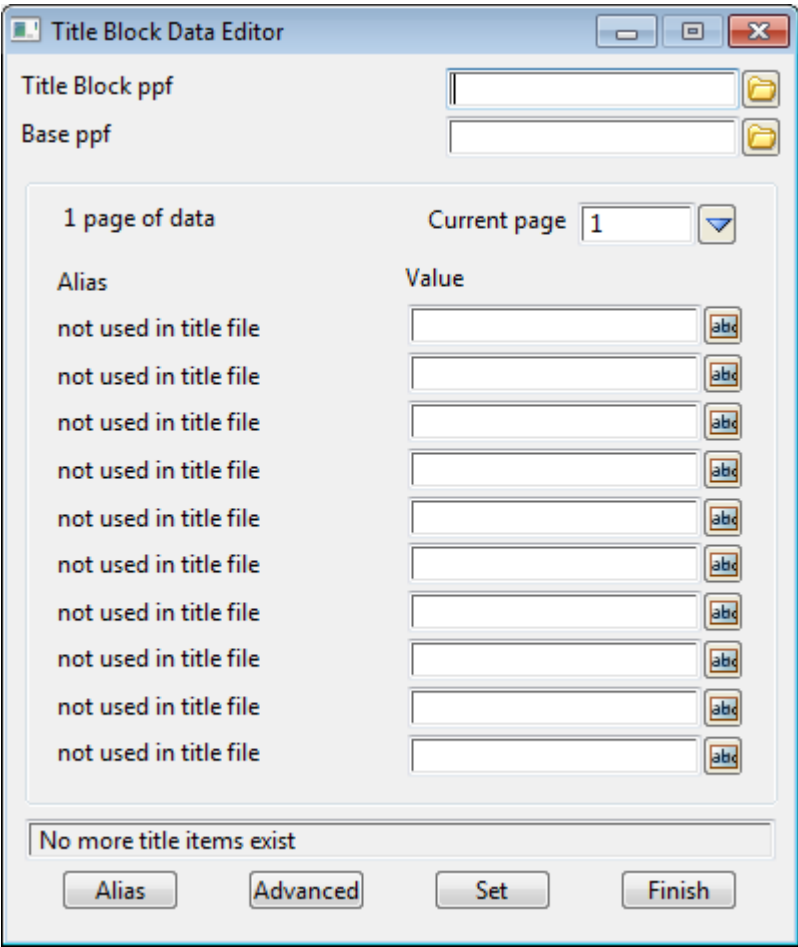
The **Title block ppf** is the ppf that is created by the panel. You may want to create a title block ppf for every drawing you create. This way you can easily re-plot a drawing with the same title block data. This is the ppf name that you will use in the future plot panels when you are ready to plot using the title block.

The **Base ppf** field is an existing ppf that includes all of your default plot parameters for creating your drawing. It must reference a title file.

12d marks the location of your title block data using the variables `user_text_1`, `user_text_2` etc. Since it is difficult to remember what `user_text_1` represents in the title block, 12d allows you to use a meaningful name reference (Main title for example) instead of `user_text_1`. The Alias button allows you to set these alias names for the title file referenced in your base ppf.

The Advanced button is only used if the same text data is to be used in another Title Block ppf (share the data between drawing).

The Set button creates/updates the title block ppf and the title file values that you entered.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Title block ppf

this is the ppf that is created by the panel. This is the ppf name that you will use in the future plot panels when you are ready to plot using the title block. The Title Block ppf is usually stored locally (in the current folder).

Base ppf

this ppf must exist (often in library or your user library). It will contain all of your default plot parameters for creating your drawing. It must reference a title file (see notes below).When you press enter, the ppf file is read to find the name of the title file you reference. Once the title file is found, the alias names are read from the title alias file if available.

To convert an existing ppf file into a Base ppf file use a text editor to delete all references to *user_text_n* variables in the file.

Current page	choice box	available pages
---------------------	------------	-----------------

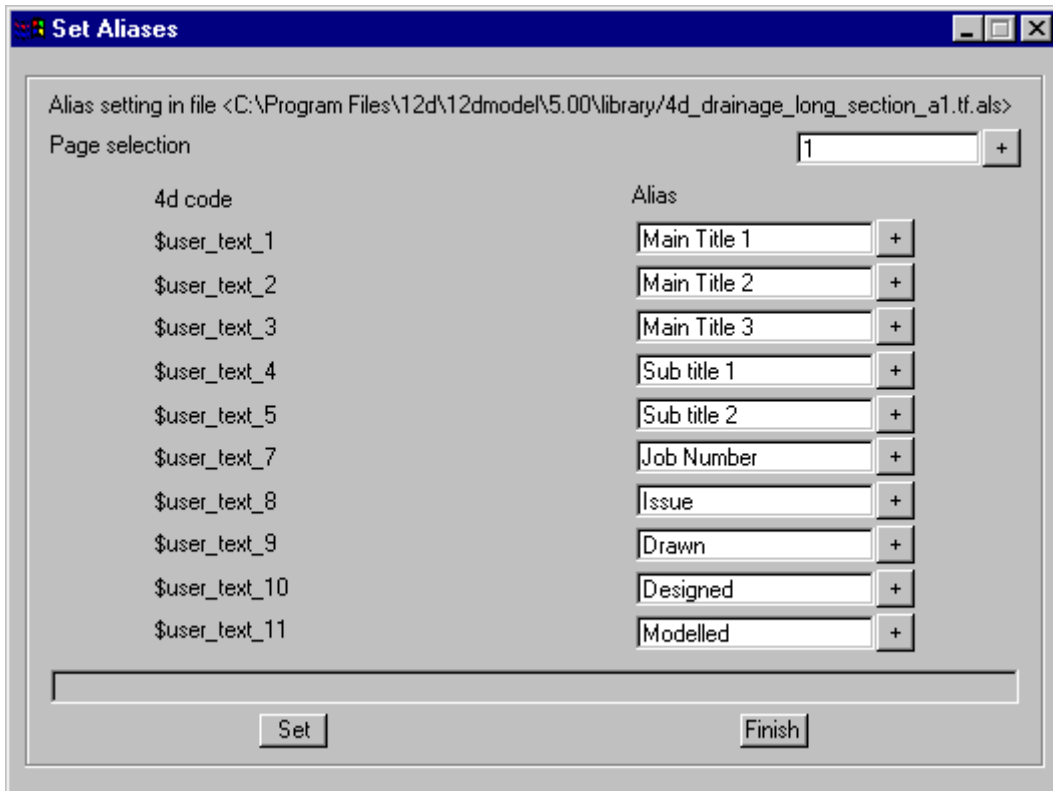
if more than one page of data (10 fields) are required additional pages will be listed here.

Value	input box
--------------	-----------

the data to be shown into your drawing title block is entered here. The description to the left is either *\$user_text_n* (Note that there may be gaps in the numbering sequence) or an alias that has been set up using the alias button below.

Alias	button
--------------	--------

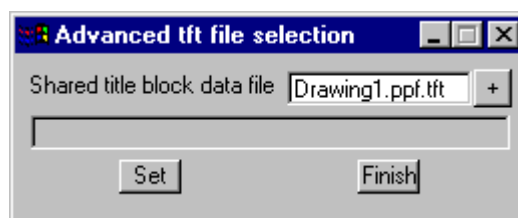
if the fields have the names *\$user_text_1*, *\$user_text_2* etc. use the button to change the names to a more meaningful description. These new names will be stored in the same folder as the with the title file specified in your base ppf file (the extension *als* will be added). The following panel will be displayed.



Note that there may be gap in the *\$user_text_n* sequence. Only the variable used in the title file will be listed.

Advanced button

this feature allows you to share text data between different *title block ppf* files. The actual text data is stored in a title file txt (*.tft) file. Selecting the button will bring up the following panel and allow you to change the *.tft file to be used. Generally you will select a *.tft file previously set up for another title block file.



Select the **Set** button to set your select. The text data will be read and the main panel updated when you select the **Finish** button.

Set button

creates/updates the Title block ppf file and *.tft file.

Notes:

Short-cuts:

*.als and *.tft files can be copied, renamed and then edited using the Title Block Edit Panel or your own text editor.

Alias files (*.als) are kept in the same folder as the your title files. Once you have one alias file set up copy the alias file and rename the copy the same name as the title file but add the additional extension .als. For example:

title file	4d_drainage_long_section_a1.tf
alias file	4d_drainage_long_section_a1.tf.als

CAUTION: The *user_text_n* variables should represent the same data in both title files. For example *user_text_1* should be the main title in both files.

Title file text files (*.tft see advanced) files are kept in the same folder as the your Title block ppf. If you choose not to share a tft between Title block ppf files you can simply copy and rename them. Once you have saved one *.tft file, copy the file and rename the copy the same name as the title block file but add the additional extension .tft

Title Block ppf file	drawing 1.ppf
title file text file	drawing 1.ppf.tft

Title Block ppf

The title block ppf file does not contain any data itself. Rather it references a *.tft file containing the text data and your base ppf file (file containing all of your default plot parameters). An example ppf file follows:

The Title Block ppf file is a ppf file with the Base ppf and user text values (in the tft file) referenced by #include statements.

```
#define ALIAS 1
section_long_plot "plot 2" {
// TITLE BLOCK PPF FILE
#include "Base_ljg.ppf"
#include "Title_block.ppf.tft"
}
```

Base ppf

The Base ppf can be anywhere including local, Library and User Library. It must contain a reference to a title file in the *use_title_file* parameter. The *user_title_file* parameter must be in the file and can't be in an #include file.

The following is an example title file reference.

use_title_file	yes
title_file	"your title file.tf "

Note: If you already have user_text variables defined in your Base ppf these values will not be used and a warning message will be issued at plot time. It is best to remove all user_text variables from your existing ppfs before attempting to use them with this new 4d facility.

The panel scans the title file reference and records all of the *user_text_n* entries that are used. **Only those used are displayed in the panel.** Next a file with the (is located. If found the alias values are used in the panel instead of *\$user_text_1*, *\$user_text_2* etc.

If an alias file (same name as the title file PLUS the extension .als) has been previously created using the Alias button, the aliases for the user_text's are used on the left hand side of the panel.

If an alias file has not been found, they can be created by simply selecting the Alias button.

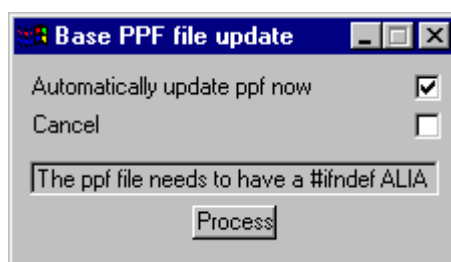
The Base ppf is also checked to see if a

```
#ifndef ALIAS
```

```
and
```

```
#endif
```

exist around the opening "xxxxxxx {" and closing "}" braces. If not, a Base PPF file update panel is displayed.



Select *Automatically update ppf now* and select the Process button. The extra lines then are added to the Base ppf.

For example, the beginning and end of the updated file will look like:

BEGINNING

```
#ifndef ALIAS
```

```
section_long_plot "plot 2" {
```

```
#endif
```

END

```
#ifndef ALIAS
```

```
}
```

```
#endif
```

Clicking on the Alias button brings up the Set Aliases panel. Simply fill in the names to use instead of the words \$user_texts_n in the Title Block - User Text Data Editor panel. Selecting Set writes out an aliases file which has the same names as the title file but with the appended ending .als.

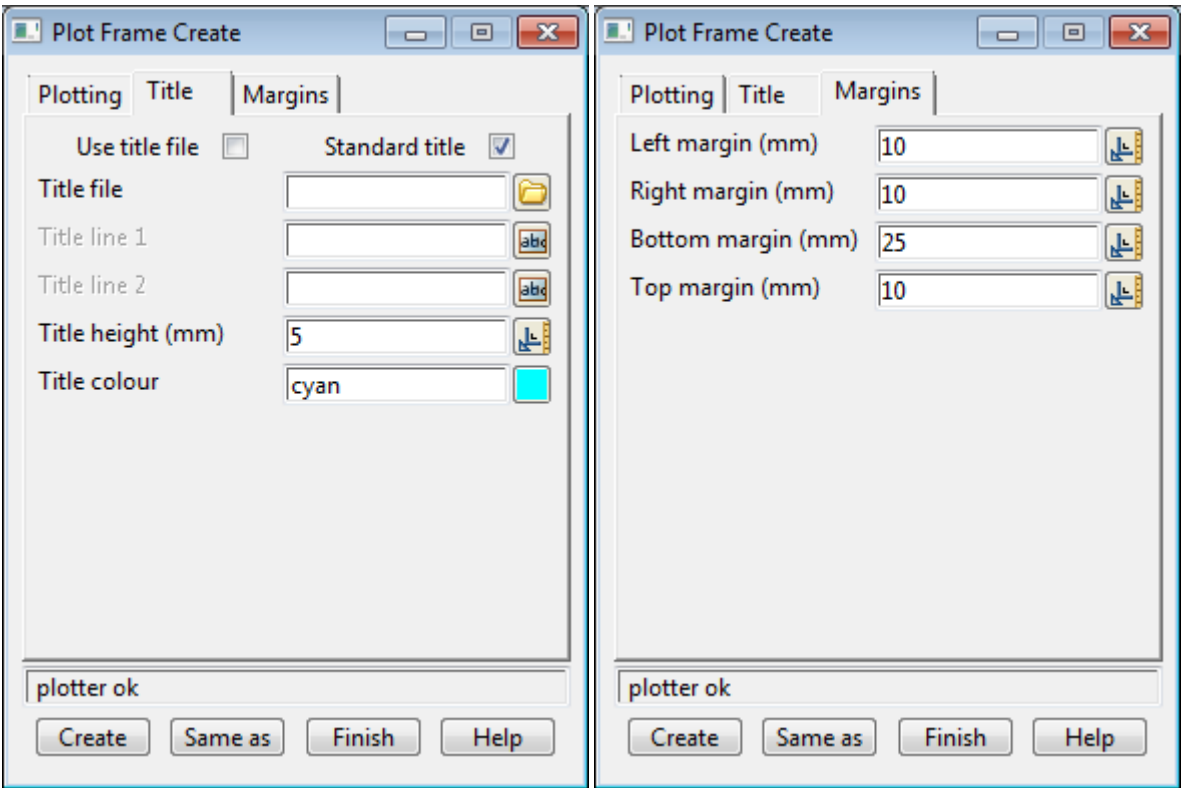
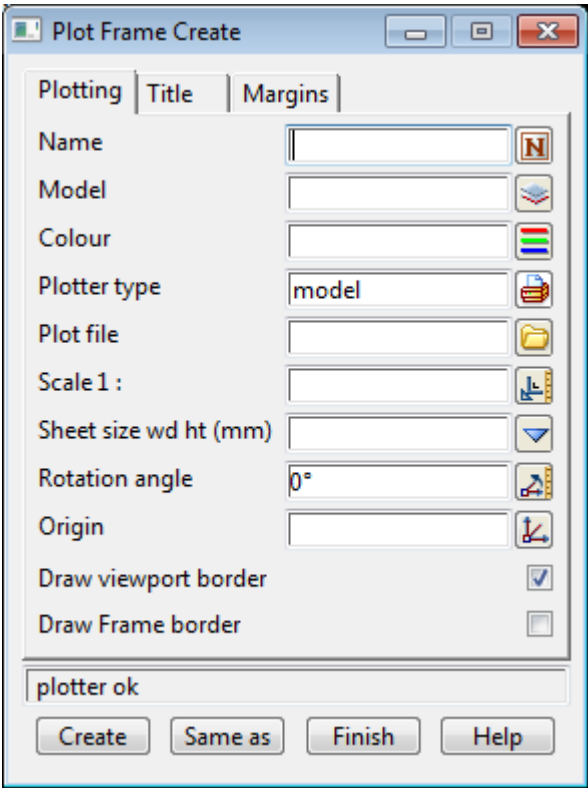
Set

After selecting Set, the values for the user_texts are written to a file specified under **Advanced** (if used) or of the same name as the Title block ppf but with .tft appended.

Create Old Plot Frame

Position of option on menu: Plot =>Old plotting =>Create plot frame

On selecting the Create old option, the **plot frame create** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name <i>name for the plot frame.</i>	input		
Model <i>the model for the plot frame.</i>	input		available model
Colour <i>the colour for the plot frame.</i>	input		available colours
Plotter type <i>format for the plot file.</i>	input	hp	hp, dxf, dwg, postscript etc.
Plot file <i>name of the file to write the plot of the plot frame to.</i>	input		*.hp etc.
Scale 1: <i>scale for the plot.</i>	input		
Sheet size wd ht (mm) <i>the width and height values (separated by spaces) or the name of a user defined sheet size.</i>	input		
Rotation angle <i>angle of rotation for the plot frame.</i>	input	0	
Origin <i>x_origin y_origin z_origin origin (in world units) for the corner of the plot frame - given as three values separated by spaces. The values can either be typed in, or selected by clicking LB in the origin panel view and getting up the xyz ops menu and selecting the pick xyz option.</i>	input		xyz ops menu
Draw viewport border <i>if ticked, plot the box around the plotting area (viewport).</i>	tick box	tick	
Create <i>create the plot frame and then put up the plot frame edit panel for the created plot frame.</i>	button		
Same as <i>after picking the same as button, an existing plot frame is selected and its information is used to fill in the above panel fields.</i>	button		

Title tab

Use title file <i>if ticked, use the file given in the title file field to generate a title block.</i>	tick box		
Standard Title <i>if ticked, plot the standard 12d Model title block with the text, height and colour given in the following panel fields.</i>	tick box	tick	
Title line 1/2 <i>first/second line of title information in the 12d titleblock or for the user defined title block.</i>	input		
Title height (mm) <i>height (in millimetres) to draw the two lines of title information in the 12d titleblock.</i>	input	10	
Title colour	input	cyan	available colours

colour used for the border and the title information in the 12d titleblock.

Title tab

Left/right margin (mm) 10.0

the left/right hand side margin between the sheet and the plotting area inside the sheet.

Bottom/top margin (mm) 10.0

the bottom/top margin between the sheet and the plotting area inside the sheet.

How To Use the Option

The plot frame contains all the information required to define the physical area in real world units to be plotted, the position on the sheet of the area being plotted, the plotter type and the plot file name.

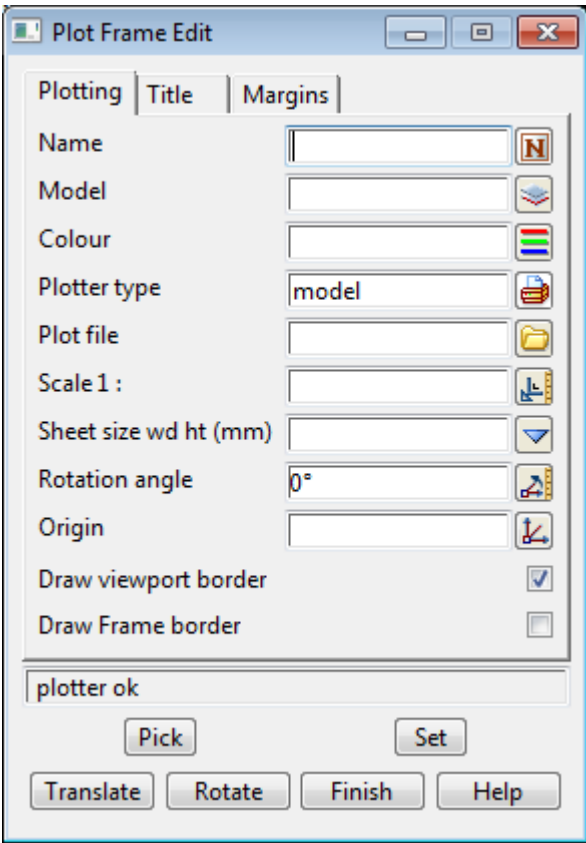
Once the frame is created, the **plot frame edit** panel for the created plot frame is automatically placed on the screen so that the frame's position can be adjusted using the **Translate** and **Rotate** buttons.

Editor Old Pot Frame

Position of option on menu: Plot =>Old plotting =>Editor plot frame

The plot frame editor is used to edit existing plot frames. It is automatically placed on the screen when a plot frame is created so that the frame's position can be adjusted using the **Translate** and **Rotate** buttons.

On selecting the **Editor old** option, the **plot frame edit** panel is displayed.



Most of the fields and buttons used in this panel are the same as the **plot frame create** panel - see the previous section [Create Old Plot Frame](#). The different ones are

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Pick	button		
-------------	--------	--	--

select the plot frame to be edited.

Set	button		
------------	--------	--	--

update the plot frame with the information in the above panel fields.

Translate	button		
------------------	--------	--	--

*after picking the **translate** button, the plot frame will move with the cursor until a point is selected to give the final position of the plot frame.*

Rotate	button		
---------------	--------	--	--

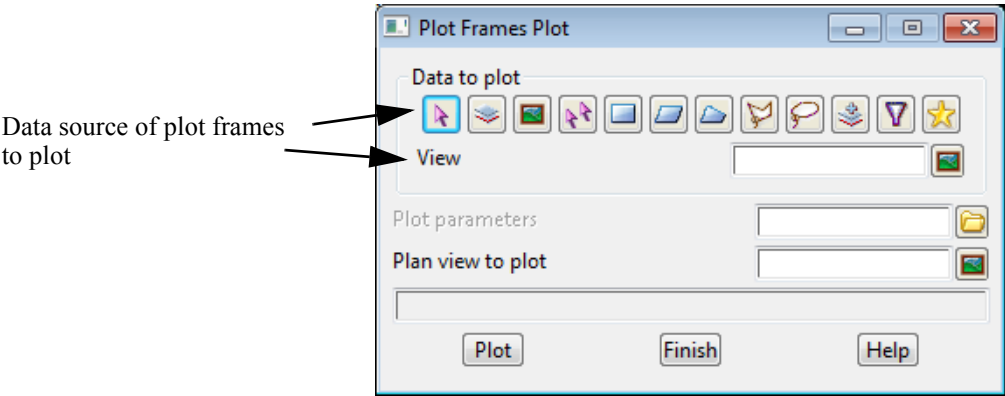
*after picking the **rotate** button, the plot frame is further rotated around the left hand corner of the sheet, by the angle made between the rotation point and the current cursor position. The plot frame will continue to rotate until a point is selected to fix the rotation angle.*

Plotting Old Plot Frames

Position of option on menu: Plot =>Old plotting =>Plot plot frame

The **plot old** option is used to make a plot of the data on a given plan view for all the selected plot frames (selected by the data source). Note that the plots are of a given plan view and the plot frames do not have to be on the plan view.

On selecting the **plot old** option, the **plot frames plot** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Data to plot	Data source type			
--------------	------------------	--	--	--

data source type.

Data source

*when the **plot** button is selected, all the plot frames in the data source will be plotted.*

Plot parameters	input			*.ppf files
-----------------	-------	--	--	-------------

file of plot parameters to be used for the plot frames.

For more information on the plot frame plot parameters, please go to the section [Plot Frame Plot Parameter File](#) in the Appendix [Plot Parameters](#)

Plan view to plot	input			available views
-------------------	-------	--	--	-----------------

*the name of the view that is plotted when the plot frames are selected for plotting. Note that the plot frames **do not** have to be on the view.*

Plot	button			
------	--------	--	--	--

*when the **plot** buttons is selected, all the plot frames in the data source field will be plotted.*

Pen Mapping Old

Position of option on menu:

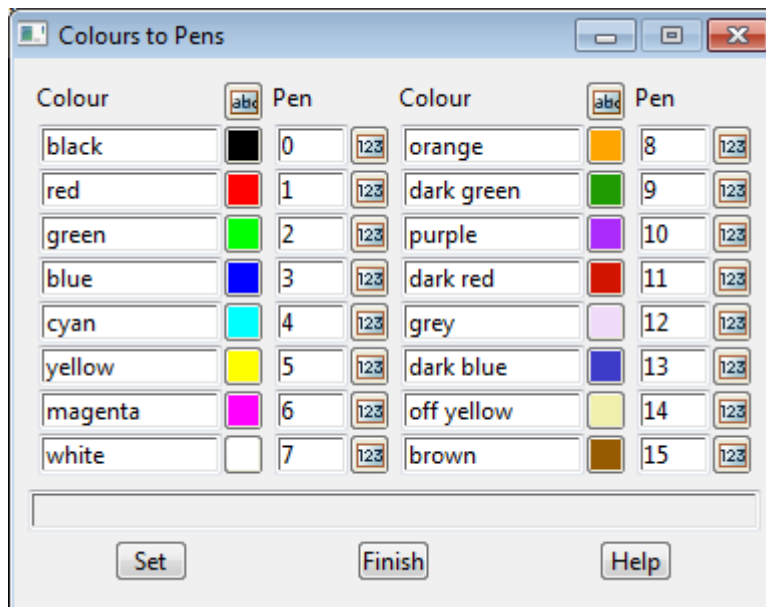
NO LONGER USED

Although **12d** Model uses up to 10,240 different colours, most plotters have a smaller number of pens. Consequently for any plot, it is necessary to define what pen number corresponds to each **12d** Model colour.

For all plotters types except Eagle, the **pen mapping** option can be used to define the correspondence between **12d** Model colours and plotter pens for the first sixteen colours. The other colours are given in the colour_map.def file. For Eagle plots, the **eagleplt.pmf** file is used to map colours to pens.

The pen mapping option is only used if a plotter mapping is not being used (see next section).

On selecting the **pen mapping** option, the current pen mapping table is displayed in the **colours to pens** panel.



When starting a new project or entering an existing project, the default pen mapping table is defined by the **colours.4d** file.

Once inside the project, any pen number in the table can be modified by changing the appropriate pen field and then selecting the **set** button. The modified table is stored until **12d** Model is quit or the user changes to another project.

The pen mappings for colours above sixteen are given in the **colours.4d** file but can not be displayed or modified by the **colour to pens** panel.

Whenever a plot is created using non-eagle plotter types, the colours are mapped to the pen numbers given in the **colours to pen** table before writing out the plot file.

For Eagle plots, the **eagleplt.pmf** file is used to map colours to pens.

Note - when **12d** Model is started up again or the user changes to a new project, the table reverts to its default settings as given in the colours.4d file.



25 PPF Editors

The **PPF Editors** chapter contains information about the items used in the binary plot parameter editors.

Go to [Title Blocks](#)
[Plot Data Model](#)
[X Plot PPF Editor](#)
[Long Plot PPF Editor](#)
[Drainage Plot PPF Editor](#)
[Melbourne Water Plot PPF Editor](#)
[Pipeline Plot PPF Editor](#)
[Drainage Plan Plot PPF Editor](#)
[Plot Frame and PPF Editor](#)
[Convert Ascii PPF to Binary](#)
[Copy Title Data](#)

The first section of the documentation is [Title Blocks](#).

Title Blocks

A sheet of paper on a plotter has (0,0) in the bottom left hand corner and the units of millimetres.

So when any plot (plan, plot frame, long section, cross section, drainage network long section, Melbourne Water longsection or pipeline longsection) is generated from **12d Model**, the data is effectively translated and scaled so that it fits onto a sheet of paper with (0,0) in the left hand corner, and with drawing units of millimetres.

When generating plots from **12d Model** (other than the simple view plots), users can select to have a Standard **12d** title block, or use their own Title blocks that have been stored in **12d Model** title block file (tbf). A user defined title block is build up from lines, circles, arcs, text etc and the title block drawing commands are placed in a file with ending **.tbf**

For **12d Model 8** and above, the format for the title block information is a subset of the **12d Ascii** format with a special header title_block.

So Inside the **tbf** file, the set of all title block drawing commands is enclosed within a set of curly brackets **{ }** with the special header

title_block

before the curly brackets.

That is,

```
title_block  {
              title block drawing commands

              }
```

The easiest way to create a **tbf** file is to create the title block information in a model, or a view of models, and then write the models out to a **tbf** file using the **Create/Edit Title Block File** panel (*Plot =>Plotting setups =>Create/edit title block file* or *Drafting => Create title block file*. See [Create/Edit Title Block File](#)).

Because the units for plots are millimetres, the units for the title block drawing commands are also in millimetres. And for the purpose of drawing up a title block in a **12d Model** model, the (0,0) for the model corresponds to the **origin** (0,0) of the plot, and the units in the model are

taken to be millimetres rather than the normal standard that the World units are metres.

So for any lines and text drawn up in a model as part of a title block, think of the World units representing millimetres rather than metres.

Title Block Variables

For title blocks, the text drawing command has been extended so that special information such as the project name, project details, current date and time, plotting scales etc. can be automatically inserted into the title block at plot time.

To achieve this, special **title block variables** have been defined and wherever these variables appear in a title block text command, they are expanded to their defined value at the time of plotting.

Hence the title block variables are simply place markers which have text values substituted for them when the title block file is used in a plot.

The title block variables all begin with a \$ and are followed by either another title block variable or a single space. For example, in the 12d Ascii string definition, the line is

```
text "user text $variable more user text"
or
text "user text $variable_1 more user text $variable_2 more user text "
```

For example

```
text "Project $project"
```

will write out the word "Project " followed by the name of the project.

Note - colour, style, xfactor, slant, offset etc. are all assigned as part of the 12d Ascii string definition.

List of Title Block Variables

Project Name

\$project // the current project

Project Details

Project details which are entered by the user for each project (and defined by the option **Project =>Details =>Details**) can be included in the title block and are specified as *title block variables* by beginning with **\$project_detail** and then including the *project detail name* as part of the \$project_detail.

\$project_detail_project_detail_name

where project_detail_name is the name of the project detail as given in the **Projects Detail Editor** (and not the **Display name** which is shown in the **Setup Projects Details** or **Edit Project Details** panels)

For example

```
text "Client: $project_detail_Client"
```

will write out the word "Client: " followed by the text in the project detail with the name "Client".

Folder Details

The full path name of the working folder

\$folder

Plot Details

The following title block variables take values which are passed down from the plot itself:

\$plot_file	// the current plot file
\$scale	// for plot frames, the current scale
\$horizontal_scale	// for section plots, the current horizontal scale
\$vertical_scale	// for section plots, the current vertical scale
\$start_chainage	// for section plots, the start chainage for the plot // sheet
\$end_chainage	// for section plots, the end chainage of the plot sheet

PPF Details

The following title block variables take values which are passed down from the **plot parameter file** for the plot (plot parameter files are described in more detail in the rest of this manual):

- \$time**
The current date and time. The format for the date and time is given by the plot parameter `time_format`. See the next section for the description of the format.
- \$title_1, \$title_2**
`$title_1` takes the value from the panel field title line 1 from the **section x plot title**, **section long plot title** or **plot frame title** panels, or from the parameter `title_1` in the plot parameter file. If `title_1` doesn't exist, then `$title_1` is blank.
Similarly for `$title_2`.
- \$user_text_n** where `n=1,2,... 1000`
`$user_text_n` takes the value of the parameter `user_text_n` in the plot parameter file. If `user_n` doesn't exist, then `$user_text_n` is blank.

Aliases can also be defined for the `$user_text_n` which are used in the PPF editors. See the next section [Aliases for \\$User Text](#) on aliases.
- \$page_number**
`$page_number` has the starting value one, or the value given by the parameter **start_page_number** from the plot parameter file, and is incremented by one, for each plot produced by the plot option (for example, for each page of a long section plot, for each page of x-section plots or each plot generated from a model of plot frames).
- \$drawing_number_prefix, \$drawing_number, \$drawing_number_postfix**
The values for `$drawing_number_prefix` and `$drawing_number_postfix` are passed down from the plot parameter file by the parameters **drawing_number_prefix** and **drawing_number_postfix** respectively.

`$drawing_number` has the starting value one, or the value given by the parameter **start_drawing_number** from the plot parameter file, and is incremented by one for each plot produced by the plot option (for example, for each page of a long section plot, for each page of x-section plots or each plot generated from a model of plot frames).

Client: \$project_detail_Client			DESCRIPTION:	
SURVEYED:	FIELD BOOK:	DATE:	\$user_1	
DRAWN:	CHECKED:	\$time		
HORIZONTAL DATUM:		LEVEL DATUM:	SCALE:	DI
			\$scale	

~

Example of Model with Title Block Variables

Notes

1. For plot frames, the horizontal_scale and vertical_scale are given the current scale, and \$start_chainage and \$end_chainage are ignored.
2. For section plots, \$scale is ignored.

Model Details - for the *Drainage Long-section Plot* only

The following title block variables take values from the model containing the drainage network.

\$model_name

The name of the drainage model

\$model_event_type

Type of event of last storm analysed ("Minor" or "Major")

\$model_return_period

ARI of last storm analysed.

Aliases for \$User Text

12d Model user defined title blocks can include up to 1,000 markers for placing *user defined text* (\$user_text_n where n can be from 1 to 1000) which is only substituted for actual text at plotting time. Because of the difficulty of knowing exactly what \$user_text_n stood for when the title block is being plotted, the concept of aliases has been introduced.

For example, instead of referring to \$user_text_4, an alias can be defined to use the "Engineers name:" instead.

The definition of \$user_text_n in a title block file has been **extended** so that it also includes any **alias** for the \$user_text_n.

To define an alias for the \$user_text_n in the title block file, simply replace the

"_n" by "<n, for the alias>"

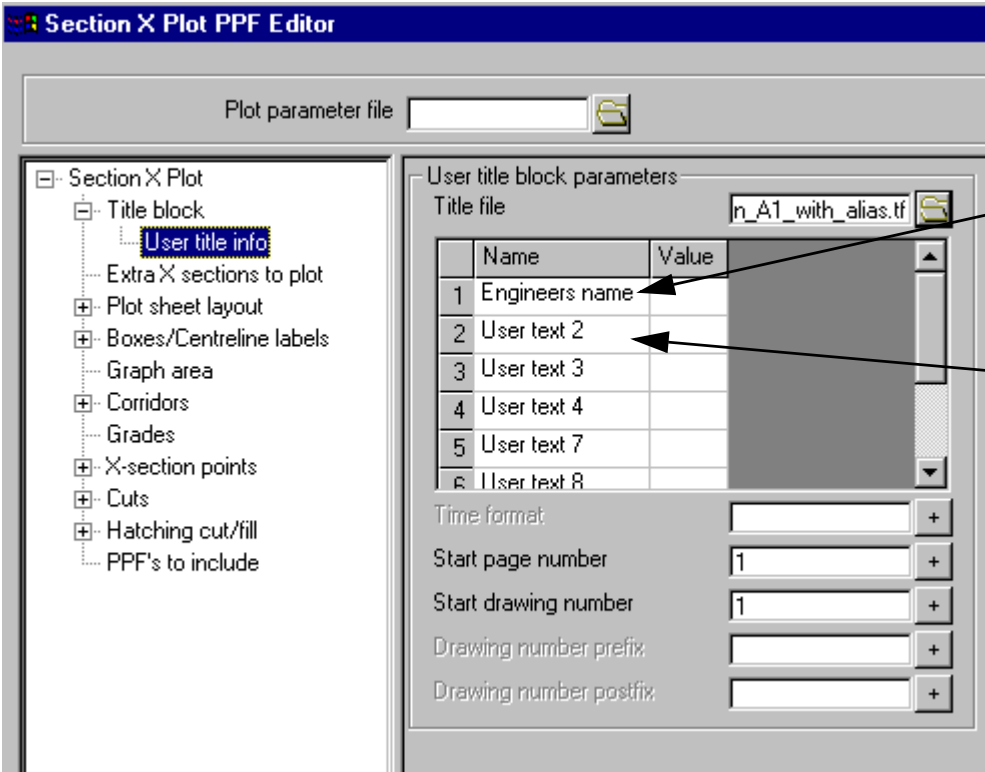
For example, if \$user_text_1 is to have the alias "Engineers name", the title block file would now contain:

```
text "$user_<1,Engineers name:>"
```

The title file and aliases work seamlessly with the interactive PPF editors and Plotters (which are described in their own sections). In the *Title block* section of the interactive PPF editors and Plotters, the user defined title block file is *scanned* for any \$user_text in it and it is presented as a grid containing all the \$user_text's in the title block with a column to fill in the values that the user wants to be plotted.

If the format \$user_text_n is in the title block file, it is displayed as "*User text n*" in the PPF editor. If an *alias* exists, then the *alias* is displayed instead of "User text n".

For example, using the \$user_text<1,Engineers name> in a title block file will give:



Values Used for Defaults when Creating Plot Frames

There are special parameters that are written in an info block at the top of title block file that are used as defaults for fields in the option **Plots=>Plot frames=>Create**.

They are

```
info {
  text "plot_frame_name"          plot_frame_name
  text "plot_frame_model"        plot_frame_model
  text "plot_frame_sheet_size"   plot_frame_model
  text "plot_frame_colour"       plot_frame_colour
  text "plot_frame_scale"        real_number
  text "plot_frame_angle"        real_number
  text "plot_frame_left_margin"  real_number
  text "plot_frame_right_margin" real_number
  text "plot_frame_top_margin"   real_number
  text "plot_frame_bottom_margin" real_number
  text "plot_frame_viewport"     0 or 1
}
```

Specifying the Format for \$time

The format for \$time is passed down by the plot parameter **time_format**.

time_format format // format for \$time

The format consists of one or more codes and the formatting codes are preceded by a percent sign (%). Characters that do not begin with a % are copied unchanged.

%a	abbreviated weekday name
%A	full weekday name
%b	abbreviated month name
%B	full month name
%c	date and time representation for locale
%d	day of month as decimal number (01 - 31)
%H	hour in 24-hour format (00 - 23)
%I	hour in 12-hour format (01 - 12)
%j	day of year as decimal number (001 - 366)
%m	month as decimal number (01 - 12)
%M	minute as decimal number (00 - 59)
%p	current locale's A.M./P.M. indicator for 12-hour clock
%S	second as decimal number (00 - 59)
%U	week of year as decimal number, with Sunday as first day of week (00 - 51)
%w	weekday as decimal number (0 - 6; Sunday is 0)
%W	week of year as decimal number, with Monday as first day of week (00 - 51)
%x	date representation for current locale
%X	time representation for current locale
%y	year without century, as decimal number (00 - 99)
%Y	year with century, as decimal number
%Z, %z	time-zone name or abbreviation; no characters if time zone is unknown
%%	percent sign

The # flag may prefix any formatting code and the meaning of the format code is changed as follows

Format Code	Meaning
%%#c	long date and time representation, appropriate for current locale. For example, "Tuesday, March 16, 1993,12:41:29"
%%#x	long date, appropriate for current locale. For example, "Tuesday, March 16"
%%#d, %%#H, %%#I, %%#, %%#m, %%#M, %%#S, %%#U, %%#W, %%#y, %%#Y	Remove leading zeros (if any).
%%#a, %%#A, %%#b, %%#B, %%#p, %%#X, %%#z, %%#Z, %%#%	# flag is ignored

Examples

The format to give the date in the form dd/mm/yy (06/09/97) is	"%d/%m/%y"
If you want to remove leading zeros from the day and month (6/9/97)	"%#d/%#m/%y"

Example Title Block File for V8 and Above

```

title_block {
  name ""
  info {      // Info block for plot frames
    text "plot_frame_name" "test 1"
    text "plot_frame_model" "test"
    text "plot_frame_colour" "blue"
    real "plot_frame_scale" 1000
    text "plot_frame_sheet_size" "A0"
    real "plot_frame_angle" 0
    real "plot_frame_left_margin" 5
    real "plot_frame_right_margin" 5
    real "plot_frame_top_margin" 5
    real "plot_frame_bottom_margin" 5
    integer "plot_frame_viewport" 1
  }
  // text and line work for title block
  data {

    string text {
      name "white"
      chainage 0
      breakline line
      colour black
      style "1"
      worldsize 1.91800944
      textstyle "ROMANS"
      angle 0
      x_factor 1
      slant 0
      offset 0
      raise 0
      text_colour black
      justify "middle-left"
      x 644.91367043
      y 54.28362874
      z -999
      text "DATE:"
    }

    string text {
      name "white"
      chainage 0
      breakline line
      colour black
      style "1"
      worldsize 3.32407138
      textstyle "ROMANS"
      angle 0
      x_factor 1
      slant 0
      offset 0
      raise 0
      text_colour black
      justify "bottom-left"
      x 689.63937012
      y 53.9997359
    }
  }
}

```

```
z      -999
text "$user_1"
}
```

```
string text {
  name      "white"
  chainage  0
  breakline line
  colour    black
  style     "1"
  worldsize 1.91800944
  textstyle "HELV"
  angle     0
  x_factor  1
  slant     0
  offset    0
  raise     0
  text_colour black
  justify   "bottom-left"
  x         504.81297445
  y         42.5174265
  z         -999
  text "WEB: www.12d.com"
}
```

```
string text {
  name      "white"
  chainage  0
  breakline line
  colour    black
  style     "1"
  worldsize 3
  textstyle "ROMANS"
  angle     0
  x_factor  1
  slant     0
  offset    0
  raise     0
  text_colour black
  justify   "middle-left"
  x         568.83213949
  y         63.44111597
  z         -999
  text "Client: $project_detail_Cient"
}
```

```
string text {
  name      "white"
  chainage  0
  breakline line
  colour    black
  style     "1"
  worldsize 3.32407138
  textstyle "ROMANS"
  angle     0
  x_factor  1
  slant     0
  offset    0
```

```
raise 0
text_colour black
justify "bottom-left"
x 648.7669706
y 46.62569771
z -999
text "$time"
}

string text {
  name "white"
  chainage 0
  breakline line
  colour black
  style "1"
  worldsize 3.32407138
  textstyle "ROMANS"
  angle 0
  x_factor 1
  slant 0
  offset 0
  raise 0
  text_colour black
  justify "bottom-left"
  x 683.00792635
  y 34.87576264
  z -999
  text "$scale"
}

string super {
  name "white"
  chainage 0
  breakline line
  colour black
  style "1"
  closed 0
  data_3d {
    801 594 0
    841 594 0
    841 554 0
  }
}
}
```

Example of a V7 Title Block File

For **12d Model 7** and earlier, the format of the commands to draw these objects in the title block file was the same as the draw_commands for user defined linestyles. However this format is now obsolete.

```
// Information used for creating plot frames with 12d Model 7
// plot_frame_name "plot 17"
// plot_frame_model "plot frames"
// plot_frame_colour "green"
// plot_frame_scale 500.000
// plot_frame_sheet_size "A1"
// plot_frame_angle 0.000
// plot_frame_left_margin 10.000
// plot_frame_right_margin 20.000
// plot_frame_top_margin 50.000
// plot_frame_bottom_margin 100.000
// plot_frame_viewport yes
//
// Drawing the title block
//
linestyle title_block {
  colour yellow
  move 0.0 100.0
  text "Page No. $page_number ..." 45.0 45.0 "bottom-left"

  move 100.0 100.0
  text "Scale 1:$scale ..." 45.0 45.0 "bottom-left"

  move 200.0 100.0
  text "Horizontal Scale 1:$horizontal_scale ..." 45.0 45.0 "bottom-left"

  move 300.0 100.0
  text "Vertical Scale 1:$vertical_scale ..." 45.0 45.0 "bottom-left"

  move 400.0 100.0
  text "Time is $time ..." 45.0 45.0 "bottom-left"

  move 500.0 100.0
  text "Plot file:$plot_file Project:$project Time:$time ..." 45.0 45.0 "bottom-left"

  move 600.0 100.0
  text "Engineer: $user_text<1,Engineers name:> ..." 45.0 45.0 "bottom-left"

  move 700.0 100.0
  text "User 2: $user_text_3 ..." 45.0 45.0 "bottom-left"

  move 800.0 100.0
  text "Drawing No:$drawing_number_prefix$drawing_number$drawing_number_postfix ..."
    45.0 45.0 "bottom-left"

  move 900.0 100.0
  text "Chainage min:$start_chainage Chainage max:$end_chainage ..." 45.0 45.0 "bottom-left"

  colour green
  move 0.0 0.0
  draw 1200.0 0.0
  draw 1200.0 1000.0
  draw 0.0 1000.0
  draw 0.0 0.0
  move 10.0 10.0
  draw 1190.0 10.0
  draw 1190.0 990.0
```

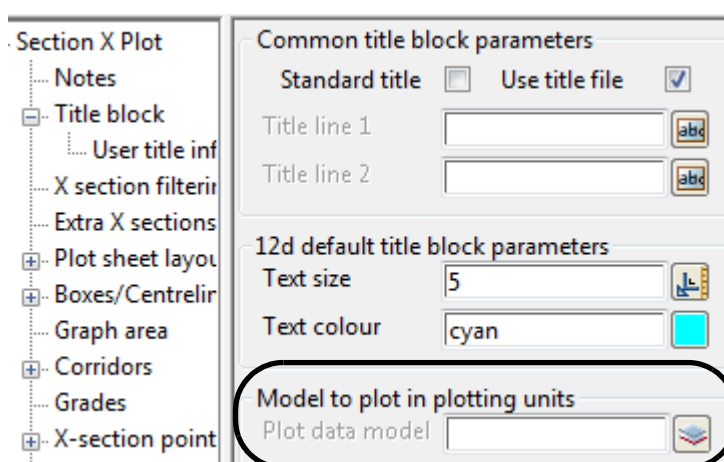
```
draw 10.0 990.0
draw 10.0 10.0
}
```

Plot Data Model

A sheet of paper on a plotter has (0,0) in the bottom left hand corner and the units of millimetres. So when any plot (plan, plot frame, long section, cross section, drainage network longsection, Melbourne Water longsection or pipeline longsection) is generated from **12d Model**, the data is effectively translated and scaled so that it fits onto a sheet of paper with (0,0) in the left hand corner, and the drawing units are millimetres.

If a title block is drawn, either using either the Standard title or taking the title drawing information from a user defined title file, the title block is also drawn onto the sheet of paper with the drawing units of millimetres.

In each of the **Title Block** nodes in the plot PPF editors, a model can be given in the **Plot data model** field. Like the Title Block, the **Plot data model** is also drawn onto the sheet of paper (that is, to the plot) with the drawing units of millimetres.



Because of the special nature of the **Plot data model**, (0,0) in the **Plot data model** matches the (0,0) of the plot and the units of the **Plot data model** are taken to be millimetres (unlike a normal model where the units are metres). This is also no clipping done when plotting the **Plot data model**.

So like the Title Block, the **Plot data model** is simply an overlay that is plotted on top of the paper plan/long section/x section plot that has just been generated.

In the **Plot data model** you can have information in World Units or Paper Units (which are millimetres on a plot). And because of the special nature of the **Plot data model**, one World unit in the **Plot data model** ends up as one millimetre on the plot. This applies to strings, text, linestyles and symbols in World units. For text, linestyles and symbols defined in Paper units (millimetres), one Paper unit in the **Plot data model** still ends up as one millimetre on the plot.

Special Notes

- If the **Plot data model** is added to a Plan View, for example when it is being created or edited, then the **Plotting scale** for the Plan view needs to be 1000 for any text, linestyles and symbols defined in Paper units to display as they would appear on a final plot.
- When **plotting to a model**, **12d Model** multiplies the millimetre size by 1000 so that lengths (distances) in the "model of the plot" represent millimetres on the plot page. Hence if you plot the "model of the plot", you need to plot with a scale of 1:1000 to get the correct size in the paper plot.
- Because the **Plot data model** is simply an overlay with no change of scale and is not clipped, then in the special case of **plotting to a model**, a copy of the **Plot data model** is simply added to the model containing the plot. So World text, linestyles and symbols stay as World text, linestyles and symbols. And text, linestyles and symbols in Paper units stay as

text, linestyles and symbols in Paper units.

- (d) Because of (c), when displaying the "model of the plot" on a Plan View, the **Plotting scale** for the Plan View needs to be 1000 so that text, linestyles and symbols defined in Paper units that have come from the **Plot data model** display as they would appear in a final paper plot.
- (e) If you plot to a model, and then plot the "model of the plot", all the linestyles and symbols will be exploded into lines and arcs.

When creating data in a **Plot data model**, the easiest thing is to create all the data, text, linestyles and symbols in World units, and to think of the World unit as being millimetres.

However many **12d Model** users only have their linestyles and symbols defined in Paper units and it is okay to use them in the **Plot data model** as long as (c) and (d) of the Special Notes are remembered when plotting to a model.

X Plot PPF Editor

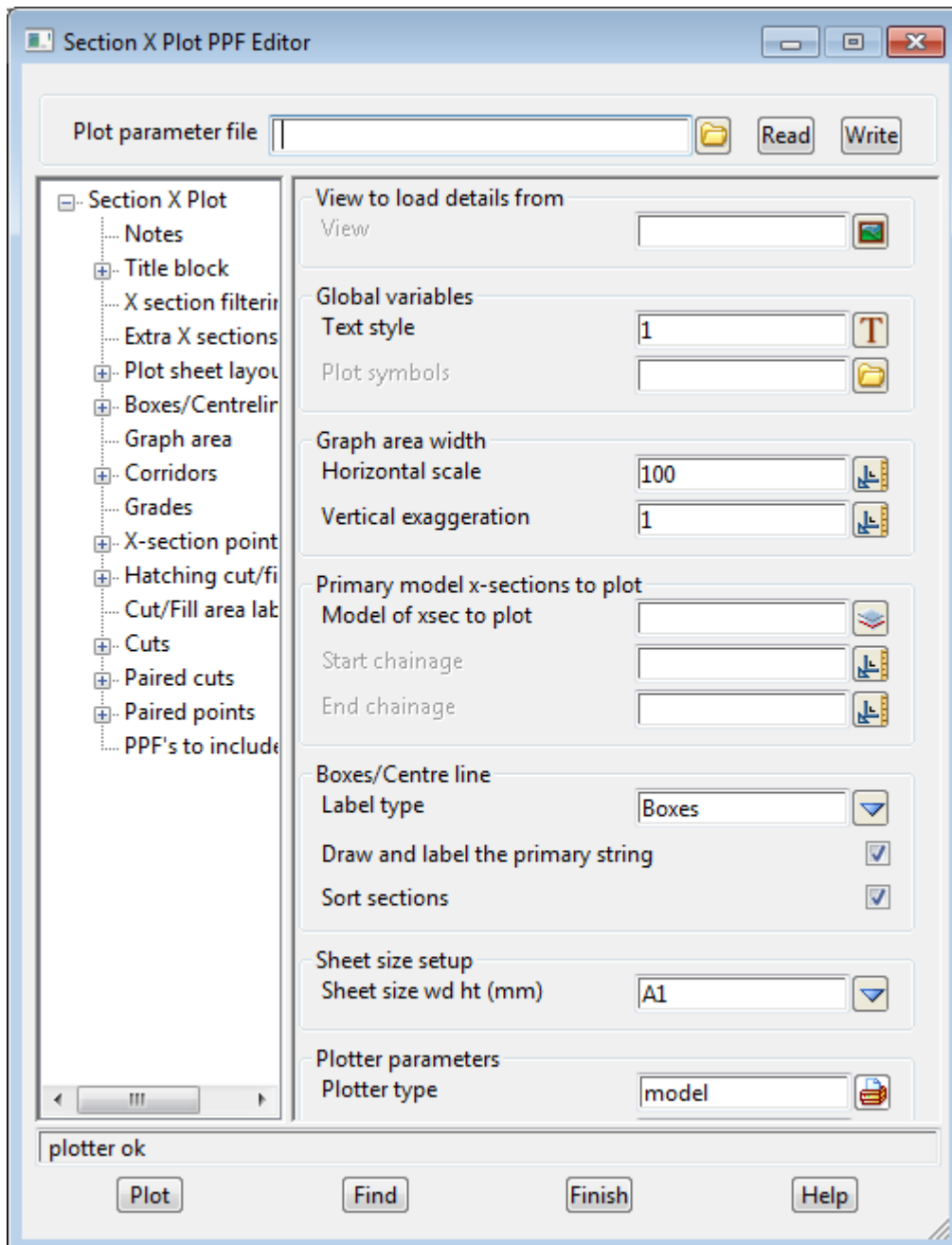
Position of option on menu: Plot =>Plot and PPF Editors =>Cross sections

The **Cross Sections PPF Editor** is for creating and/or editing a (binary) X-section PPF and for creating a cross section plot.

Note: Binary PPFs are stored *within* the project (not in the folder containing the project as the ascii PPFs were).

On selecting the **Cross sections** option, the **Section X Plot PPF Editor** panel is displayed.

The plot parameters for controlling the cross section plots are accessed by expanding the appropriate node in the **Section X Plot** tree (click on the **+** to expand to node or **-** to collapse the node) and then clicking on the required node, and the information to fill in is displayed on the right hand side of the panel.



Information on the top and bottom buttons, and all the different nodes, now follows.

See [Buttons on Top and Bottom of X-Plot Panel](#)

See [Section X Plot - Front Page](#)

See [Notes - X-Section](#)

See [Title Block](#)

See [X Section Filtering](#)

See [Extra X Sections To Plot](#)

See [Plot Sheet Layout](#)

See [Boxes/ Centreline Labels](#)

See [Graph Area](#)

- See [Corridors](#)
- See [Grades](#)
- See [X-Section Points](#)
- See [Hatching Cut/Fill](#)
- See [Cut/Fill Area Labels](#)
- See [Cuts](#)
- See [Paired Cuts - X Sections](#)
- See [Paired Points](#)
- See [PPFs To Include](#)

Buttons on Top and Bottom of X-Plot Panel

Panel field	Type
Plot parameter file	file box
<i>name for the binary plot parameter file to read in or write out.</i>	
Read	button
<i>read the given plot parameter file in.</i>	
Write	button
<i>write out the plot parameters to the given plot parameter file. An ascii ppf file is also written out.</i>	
Plot	button
<i>use the plot parameters from the panel to create the plot.</i>	
Find	button
<i>brings up a search box. If a valid parameter name is keyed in followed by the enter key, the cursor will be placed in the appropriate field on the appropriate page.</i>	

Please continue to the next section [Section X Plot - Front Page](#)

Section X Plot - Front Page

Section: View to load details from

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
View		section view box	
<i>on selection of an existing section view, the vertical exaggeration, model of x-sections to plot, corridor model and corridor settings from the section view are loaded into the ppf editor.</i>			

Section: Global variables

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Text style	global_textstyle	text box	
<i>default textstyle</i>			
Plot symbols	plot_symbols	file box	
<i>specify a plot symbol file if it exists.</i>			

Section: Global area width

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Horizontal Scale	scale	measure box	available measures
<i>horizontal scale to be used for X section plots</i>			
Vertical exaggeration	vertical_exaggeration	measure box	available measures
<i>vertical scale to be used for X section plots</i>			

Section: Primary model x-sections to plot

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Model of xsec to plot	model_to_plot	model box	
<i>model of X sections to plot</i>			
Start chainage	start_chainage	input	
<i>start chainage of X sections to plot</i>			
End chainage	end_chainage	input	
<i>start chainage of X sections to plot</i>			

Section: Boxes/Centre line

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
-------------------	----------------	------	--------

Label type	label_type	choice box	centre line boxes
------------	------------	------------	-------------------

the label type to be used for plotting.

Draw and label the primary string

primary_string	tick box
----------------	----------

if ticked, the primary string will be labelled and drawn.

Sort sections	sort_sections	tick box
----------------------	---------------	----------

if ticked, the X sections will be sorted in increasing chainage. This is important if individual cross sections are added after an apply function for example.

Section: Sheet size setup

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Sheet size wd ht (mm)	sheet_size	sheet size box	

a valid sheet size is selected.

Section: Plotter parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Plotter type	plotter_type	plotter box	

a valid plotting option is selected.

Plot file stem	plot_stem	plotter box
-----------------------	-----------	-------------

plot file name. The appropriate extension is added dependant on the plotter type selected.

Clean plot models beforehand

plot_model_clean	choice box	do not clean prompt for clean always clean
------------------	------------	--------------------------------------------------

whether to clean (delete the elements in) any resultant plot models that may already exist, before generating the plot(s). This parameter is only applicable if plotting to a model or models. Note that if the models are cleaned using this parameter, any non-plot or locked elements found in the models will not be cleaned from the models, and the plot job will be cancelled.

Please continue to the next section [Notes - X-Section](#).

Notes - X-Section

Section: Document your PPF here

type in notes for this PPF file

Please continue to the next section [Title Block](#).

Title Block

Section: Common title block parameters

Panel field	Parameter name	Type
Standard title	plot_border	tick box
<i>if ticked, a standard 12d title block will be used.</i>		
Use title file	use_title_file	tick box
<i>if ticked, a user defined title file is used.</i>		
Title line 1	title_1	text box
<i>if Standard title is ticked, Title line 1 is the first line of title text. If Use title file is ticked, Title line 1 is substituted for the title block variable \$title_1.</i>		
Title line 2	title_2	text box
<i>if Standard title is ticked, Title line 2 is the second line of title text. If Use title file is ticked, Title line 2 is substituted for the title block variable \$title_2.</i>		

Section: 12d default title block parameters

Panel field	Parameter name	Type	Pop-Up
Text size	title_text_size	measure box	
<i>text size of title text.</i>			
Text colour	title_colour	colour box	available colours
<i>colour of title text.</i>			

Section: Model to plot in plotter units

Plot data model	mm_plot_model	model box	available models
<i>the model is plotted as part of the x-section plot. The Units for the Plot data model is considered to be millimetres and the (0,0) in the Plot data model corresponds to (0,0) in the plot. For more information see Plot Data Model.</i>			

Title block - User title info

The parameters shown below are subject to the appropriate title block variables existing in the title file. For more information on these variables see the section [Title Block Variables](#).

Section: User title block parameters

Panel field	Parameter name	Type	Pop-Up
Title file	title_file	file box	available title files
<i>specifies the name of the title file to use. If a valid title file exists, the specified Name values will be filled out in the grid using the title block variable \$user_text_n.</i>			
Name		output	
<i>the alias for the nth user text specified in the title file.</i>			
Value	user_text_n	input	
<i>the alias text to be substituted in for the user text specified.</i>			
Time format	time_format	input	
<i>the time format relates to the \$time title block variable. For more information on the time formats see</i>			

the section [Specifying the Format for \\$time](#).

Start page number start_page_number input

used as the starting value for the title block variable \$page_number. If missing, \$page_number starts at 1.

Start drawing number start_drawing_number input

used as the starting value for the title block variable \$drawing_number. If missing, \$drawing_number starts at 1.

Drawing number prefix drawing_number_prefix input

the value entered is used for the title block variable \$drawing_number_prefix.

Drawing number postfix drawing_number_postfix input

the value entered is used for the title block variable \$drawing_number_postfix.

Please continue to the next section [X Section Filtering](#).

X Section Filtering

The model of cross sections usually contains all the sections required to accurately model the object.

Section: X-Section Filtering

For plotting purposes, often only a subset of all the cross sections is required to be plotted so the filtering section contains methods to select only those cross sections that are to be plotted.

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Filter cross-sections	filter_sections	tick box	
<i>if tick, the fields in this tab are used to filter cross sections in the X-sections model.</i>			
Filtered sections colour	filter_colour	colour box	available colours
<i>colour of the filtered cross sections</i>			
Created by function	filter_function	function box	available functions
<i>a model of sections can contain sections created by more than one function. If a function is given, only cross sections created by that function are selected.</i>			
Regular filtering interval	filter_interval	input	
<i>regular interval to use for filtering the cross sections</i>			
Regular culling tolerance	filter_tolerance	input0	
<i>tolerance to use when selecting a cross section</i>			
Include start section	filter_start	tick box	
<i>if tick, a section at the start chainage is included even if the start chainage is not a regular interval</i>			
Include end section	filter_end	tick box	
<i>if tick, a section at the end chainage is included even if the end chainage is not a regular interval</i>			
Include chainage equality sections	filter_equalities	tick box	
<i>if tick, include sections where there is a chainage equality</i>			
Reference string	filter_reference	string select	
<i>if tick, a string is selected to define which sections occur at H/V tangent points, crest and sags.</i>			
Include H tangent sections	filter_tangent	tick box	
<i>if tick, a sections at the horizontal tangent points of the reference string are included even if they are not a regular interval</i>			
Include V tangent sections	filter_tangent_vertical	tick box	
<i>if tick, a sections at the vertical tangent points of the reference string are included even if they are not a regular interval</i>			
Include V crest/sag sections	filter_crestsag	tick box	
<i>if tick, a sections at the crest and sag points of the reference string are included even if they are not a regular interval</i>			
Special chainage file	filter_spc_file	file box	*.spc files
<i>if non blank, a file of chainages to include sections at even if they are not a regular interval</i>			

Please continue to the next section [Extra X Sections To Plot](#).

Extra X Sections To Plot

The order and centreline chainages of the x-section subplots for the x-section plot are defined by the sections from the primary model of cross sections.

The sections through any specified triangulations and service models, and offsets for labelling are fully defined by these primary x-sections.

However it is also possible to plot extra x-sections on each of the sub-plots by supplying extra models of x-sections which are at the same plan positions as the primary x-section strings.

Only those x-sections from the extra models that are within a user specified tolerance of a primary x-section are plotted.

The extra models of x-sections and the plan tolerance for checking that the extra cross-sections are the same position as the primary x-sections are

Section: Extra models of x-sections to plot

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Model tolerance <i>user defined distance</i>	extra_model_tolerance_1	input	
Model name <i>extra models of x-sections to plot.</i>	extra_model_n	input	

Please continue to the next section [Plot Sheet Layout](#).

Plot Sheet Layout

X-sections are normally generated at chainages along a given centreline. This centreline chainage is stored with each x-section string.

The chainages of the actual x-sections are referred to as **offsets** from the centreline position rather than x-section chainages. The offsets of the x-section are set up so that the zero offset occurs where the x-section crossed the centreline string.

The x-sections along the centreline are stored in the one model (the primary model) which is then used to generate the cross section plot.

The x-sections are plotted in the order they occur in the x-section model and start being plotted at the bottom left hand corner of the sheet (left_margin,bottom_margin).

The individual x-section plots are then drawn going up the column, and when the column is full, start from the bottom of the next column.

When a sheet is full, a follow on sheet is created.

Each x-section from the primary model of x-sections generates its own sub-plot for which the x-section is the primary string. Hence the cross section plot consists of many individual plots drawn on one or more plot sheets.

Each plot sheet is considered to have only positive co-ordinates with the origin (0,0) in the left hand corner. The units for the plot are millimetres.

Section: Plot width parameters

The width of the plot can be a fixed distance left or right of the centre line (zero offset) or for the full section plus an extra left and right distance:

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Absolute extensions	absolute_extensions	tick box	
<i>if ticked, the section goes from the left_extension offset on the left to the right_extension offset on the right. If unticked the section goes for the entire section length plus the left and right extension distances.</i>			
Left extension	left_extension	input	
<i>The left_extension value in world units.</i>			
Right extension	right_extension	input	
<i>The right_extension value in world units</i>			

Section: Align section parameters

If required, all the sub-plots in a column can be automatically positioned so that the zero offsets (the centrelines) of each x-section line up.

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Line up centrelines	line_up_cl	tick box	
<i>if ticked, each sub plot will be aligned on the plot using the centreline of each x section.</i>			

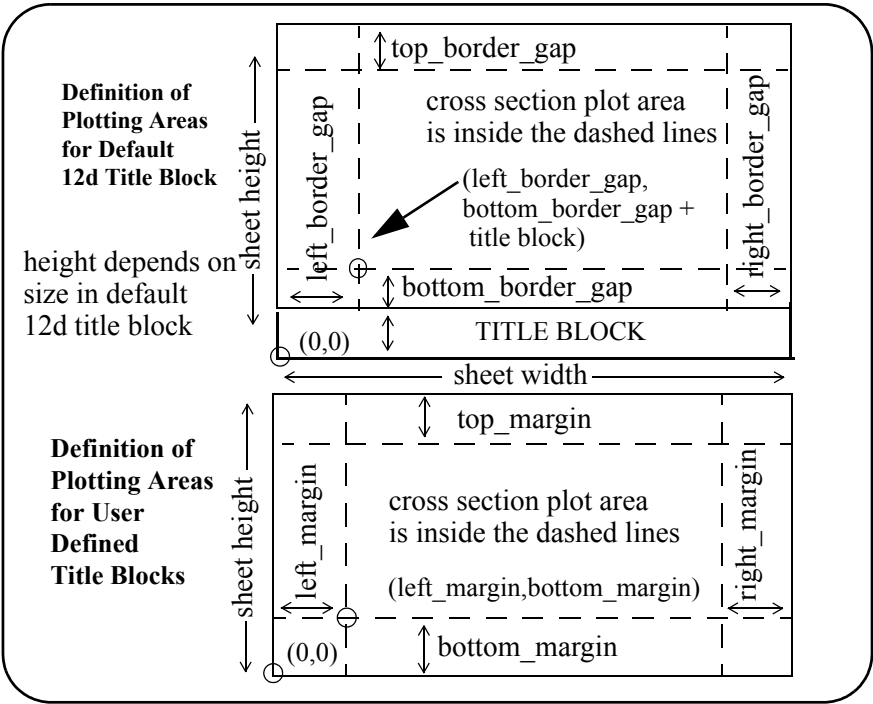
Plot Sheet Layout - Margins

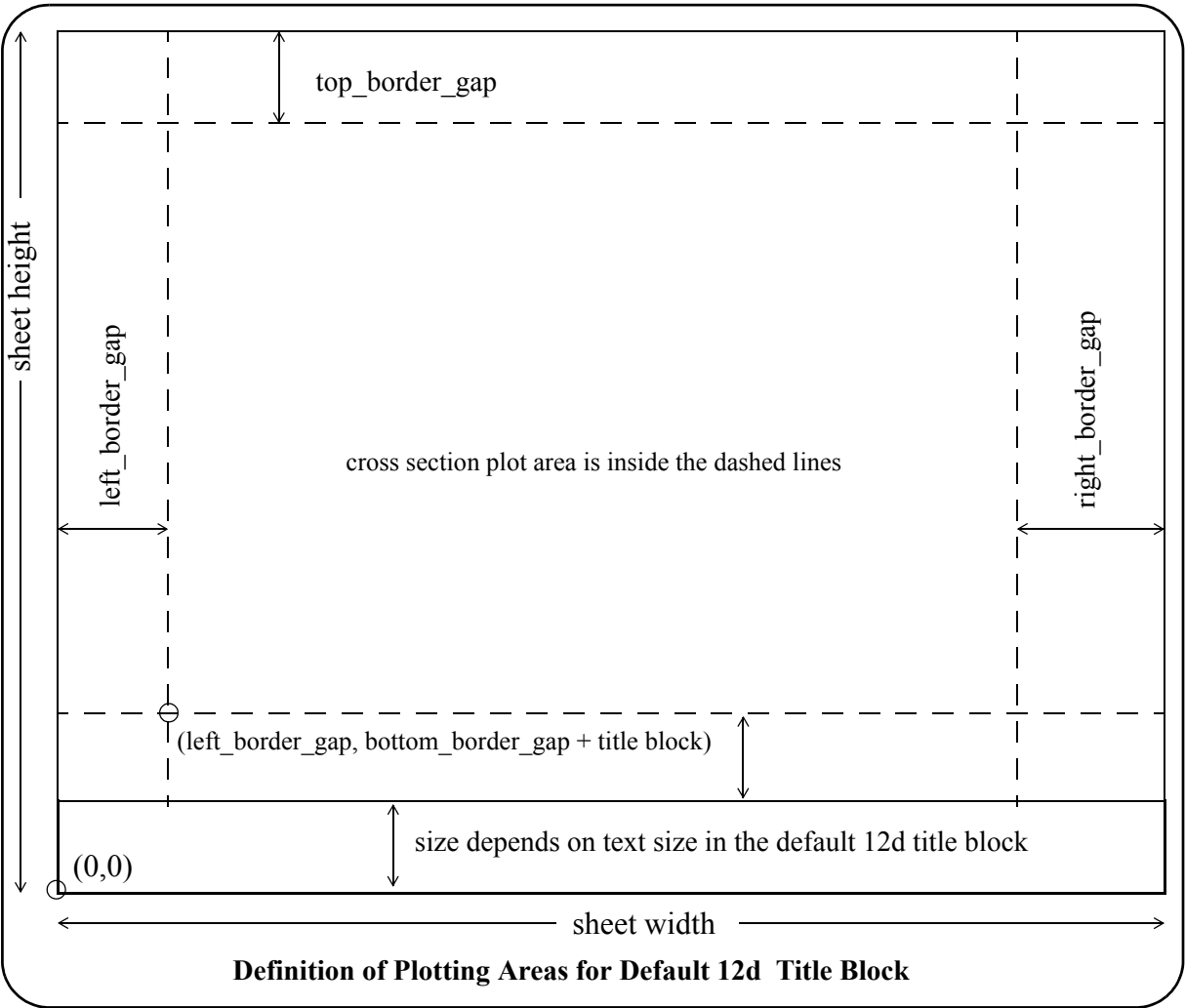
Section: Margins for standard 12d title file - Border gaps

If the *default 12d title block* is used, then the size of the bottom of title block depends on the size. The following parameters are used in the default title block case and the *bottom_border_gap* is added to the calculated height of the bottom of the title block.

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Left (mm) <i>left border gap (in millimetres).</i>	left_border_gap	input	
Right (mm) <i>right border gap (in millimetres).</i>	right_border_gap	input	
Top (mm) <i>top border gap (in millimetres).</i>	top_border_gap	input	
Bottom (mm) <i>bottom border gap (in millimetres).</i>	bottom_border_gap	input	

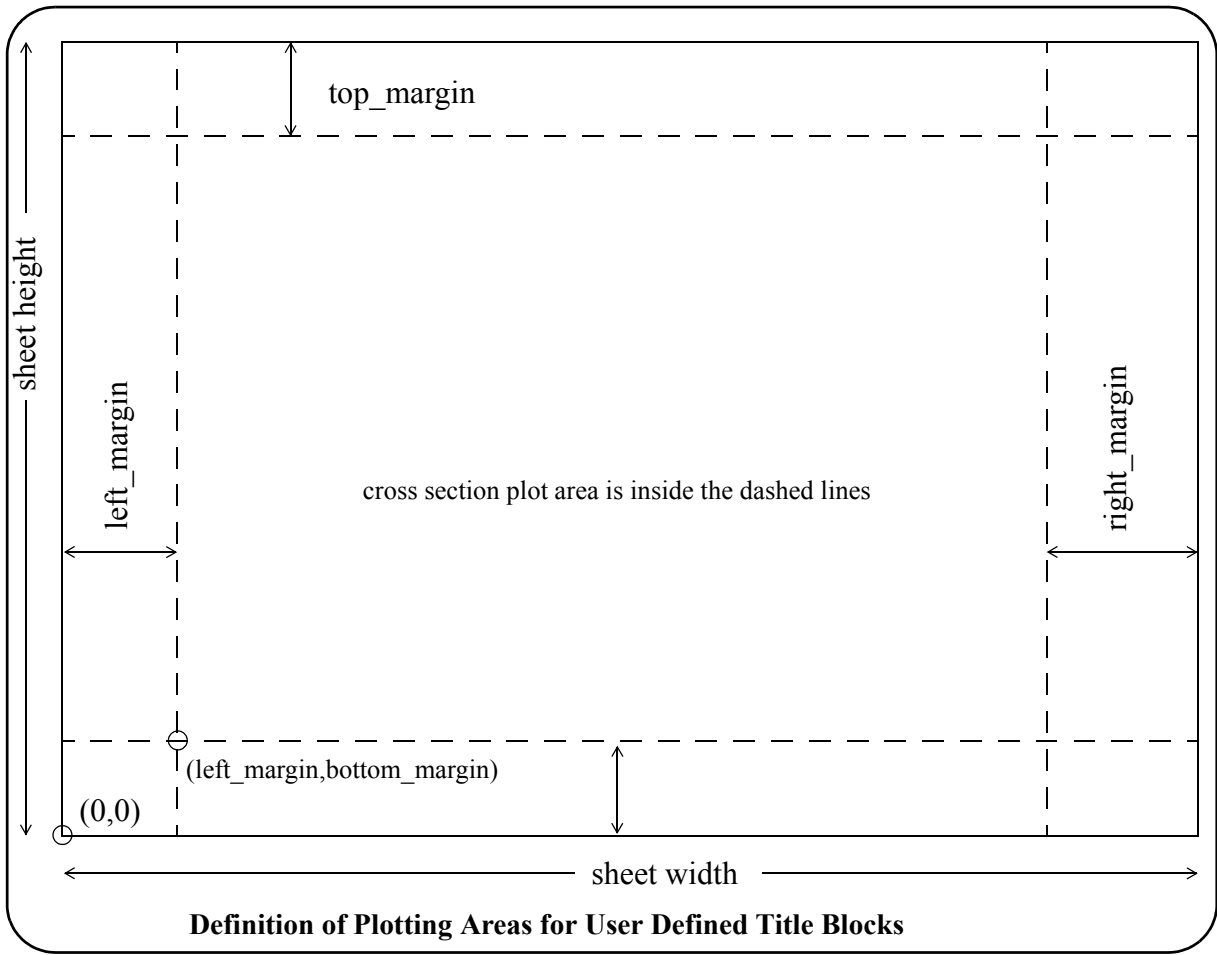




Section: Margins for user title file

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Left (mm) <i>left margin (in millimetres).</i>	left_margin	input	
Right (mm) <i>right margin (in millimetres).</i>	right_margin	input	
Top (mm) <i>top margin (in millimetres).</i>	top_margin	input	
Bottom (mm) <i>bottom margin (in millimetres).</i>	bottom_margin	input	



Because the user can easily select from the plotting panel whether a User Defined Title Block or the default 12d title block is used, both sets of margin and gap parameters can exist in the one plot parameter file.

The x-sections are plotted in the order they occur in the x-section model and start being plotted at the bottom left hand corner of the cross section plotting area.

The individual x-section plots are then drawn going up the column, and when the column is full, start from the bottom of the next column.

When a sheet is full, a follow on sheet is created.

Plot Sheet Layout - Sub Plot Gaps

The gaps between the sub plots is restricted to those specified below.

Section: Sub plot gaps parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Left (mm) <i>left margin (in millimetres).</i>	left_sub_plot_gap	input	
Right (mm) <i>right margin (in millimetres).</i>	right_sub_plot_gap	input	

Top (mm)	top_sub_plot_gap	input
-----------------	------------------	-------

top margin (in millimetres).

Bottom (mm)

bottom margin (in millimetres).

The x-section sub-plot itself consists of the three regions - boxes, datum and graph.

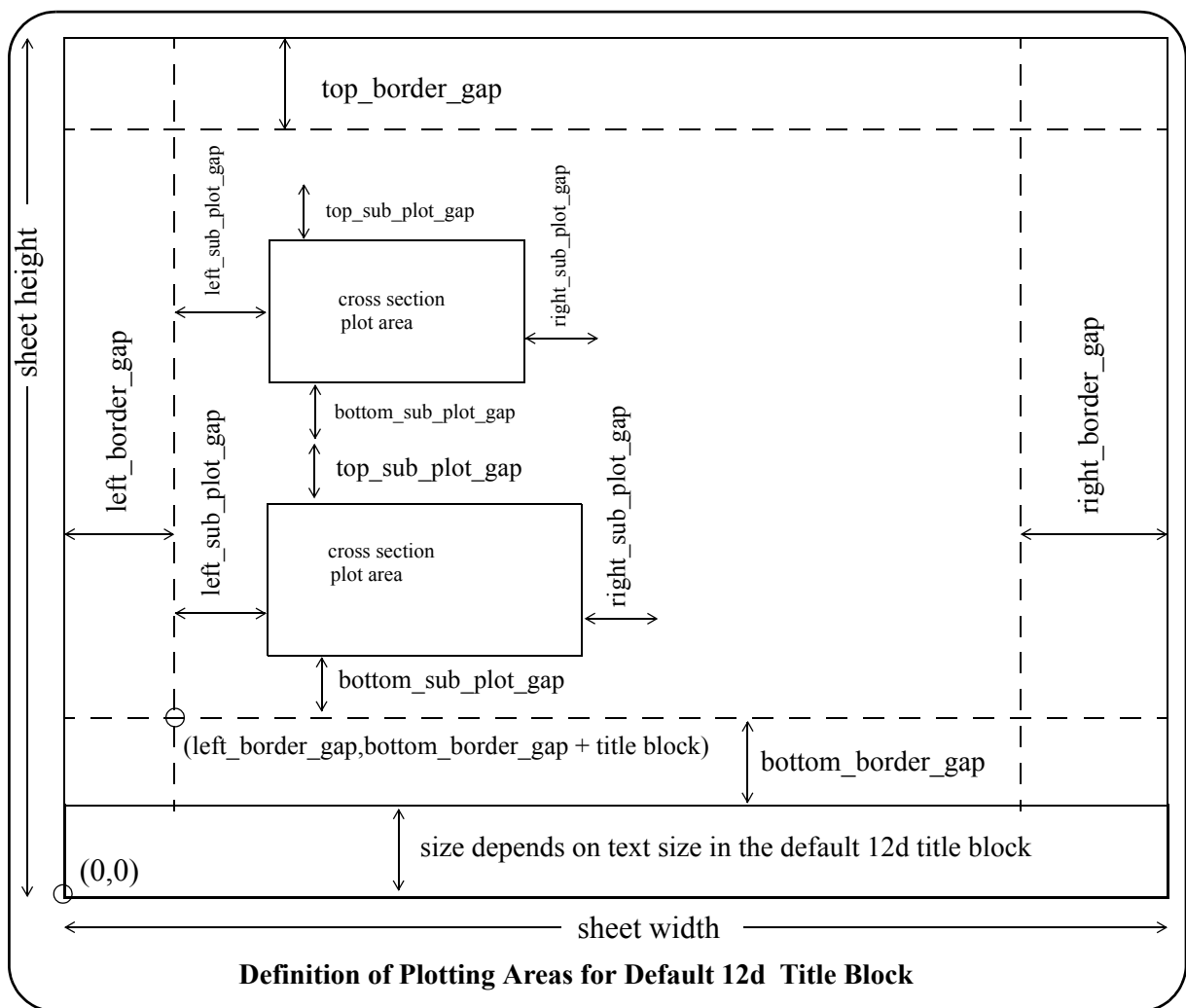
The **boxes area** is where the offset values and the heights for the strings drawn on the x-section plot are labelled.

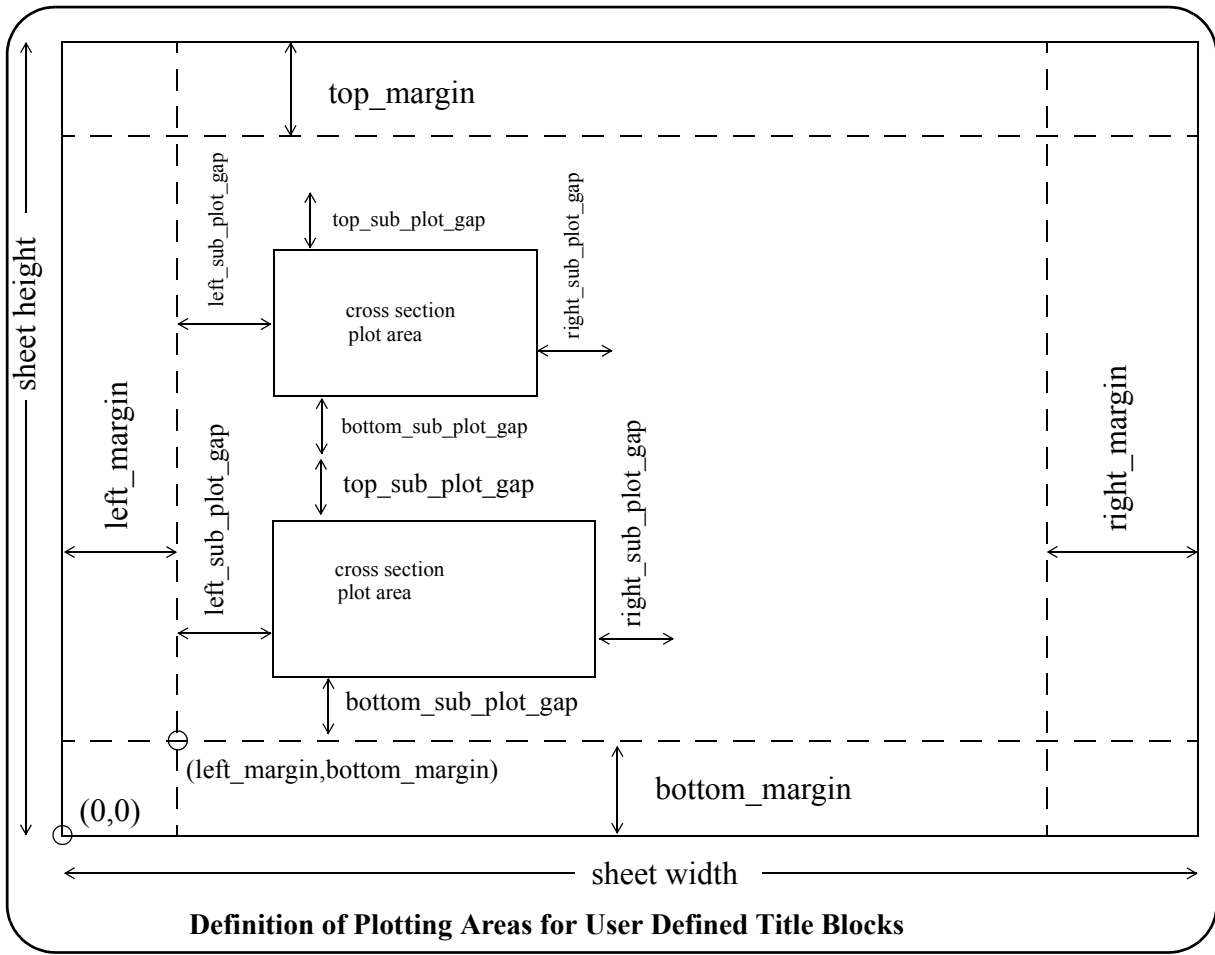
The **datum area** is the region between the boxes area and the graph area.

The **graph area** is the area where the actual plots of the strings are drawn.

Apart from information labelled in the boxes area, the x-section sub-plot can label other information such as

- (a) grades across the x-section
- (b) points across the x- section
- (c) cuts the x-section makes through strings
- (d) cut and fill areas





Please continue to the next section [Boxes/ Centreline Labels](#).

Boxes/ Centreline Labels

The x-section can be labelled with either

- (a) an upright, and the offset and height value at the zero offset (normally the centre line position) - Centre line
- (b) the heights of the x-section and the tins at all the x-section points. - Boxes

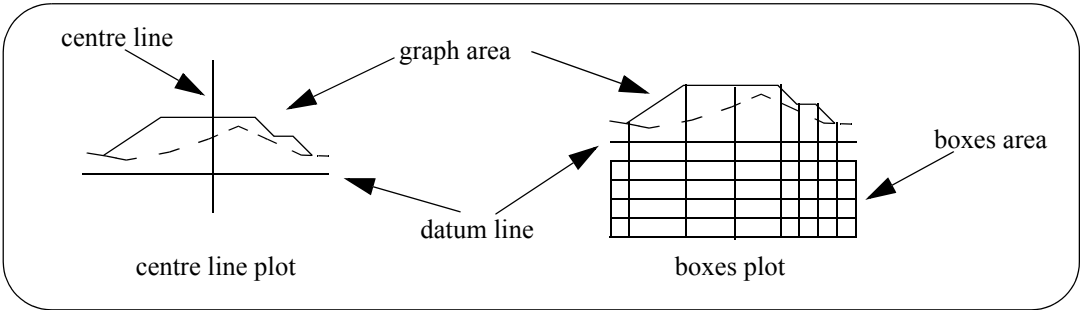
The choice is given by the parameter **label_type** defined in the section [Section: Boxes/Centre line](#).

A datum line exists for both cases.

For the boxes case, a box area for the offset and heights is created below the datum line. The available parameters for tailoring the box area will be given after describing the datum line parameters.

For the centre line case, the centre line and offset and height of the centre line are shown.

In both cases, the actual cross section plot is drawn above the datum line in the graph area.



The parameters defined below, are common to both boxes and centreline label types

Boxes/Centreline Labels - Common Parameters

Section: Common Datum Line label parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
-------------------	----------------	------	--------

Datum roundoff	datum_roundoff	input	
<i>value to roundoff the datum value to e.g. 0.5, 0.2, 1.0 (default 1.0)</i>			

The roundoff for the datum value is specified by the user (default 1.0) and the datum is automatically calculated for each sub-plot, and labelled.

Decimal places for datum	datum_decimals	input	
---------------------------------	----------------	-------	--

number of decimal places to display the datum value (default 1). If > 0, trailing zeros are removed after the decimal point. If < 0, the absolute value is taken as the number of decimal places to report i.e. no trailing zeros are removed. For example -3 means that there is always 3 figures after the decimal place.

Datum linestyle	datum_linestyle	linestyle box	
<i>datum line linestyle (default solid)</i>			

Datum name	datum_name	input	
<i>text to write before the datum value</i>			

Datum textstyle	datum_textstyle	text box	
------------------------	-----------------	----------	--

textstyle for datum information

Datum text size (mm)	datum_text_size	input
<i>size of datum text and value (mm)</i>		
Datum colour	datum_colour	colour box
<i>colour of the datum text</i>		
Datum line colour	datum_line_colour	colour box
<i>colour of the datum line</i>		

Boxes/Centreline Labels - Common Parameters - Tins To Label

Section: Common parameters for tins to label

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Define tin set #		input	
<i>where $n = 1$ to The set enables the specification of a number of parameters for a number of specified tin names.</i>			
Tin name	tin_n_name	tin box	available tins
<i>the name of the nth tin to be used for labelling.</i>			

If a tin of the name given by **tin_n_name** does not exist, then the plot is not produced and an error message is given.

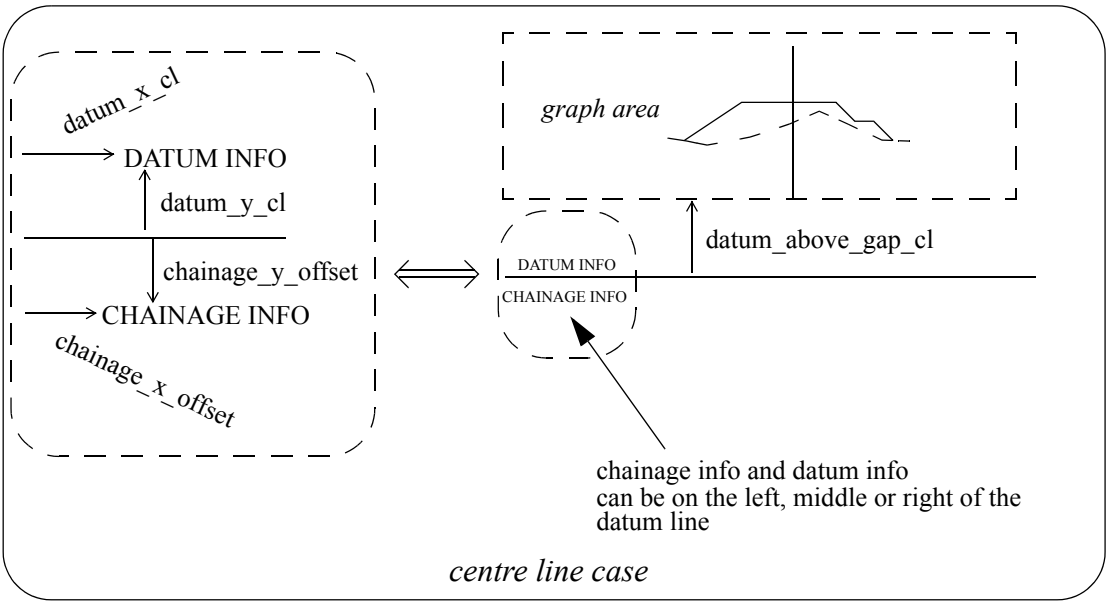
Boxes/Centreline Labels - Common Parameters - Centreline Chainage

Each x-section sub-plot can be labelled with the centreline chainage of the x-section string.

This CHAINAGE INFO label is made up of the text strings:

chainage_title followed by the *chainage-value*

and is drawn under the datum line.



Section: Common centreline chainage label parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
-------------------	----------------	------	--------

Label subplot with centreline chainage

	chainage_label	tick box	
<i>if ticked, label sub-plot with centreline</i>			

Chainage title	chainage_title	input	
<i>text before the chainage value</i>			

Chainage Decimal places	chainage_decimals	input	
<i>number of decimals in the chainage value. If <0, the absolute value is taken as the number of decimal places i.e. no trailing zeros are removed for the values in the chainage values.</i>			

Chainage colour	chainage_colour	colour box	
<i>colour of the text</i>			

Chainage text size (mm)	chainage_size	input	
<i>size of the text</i>			

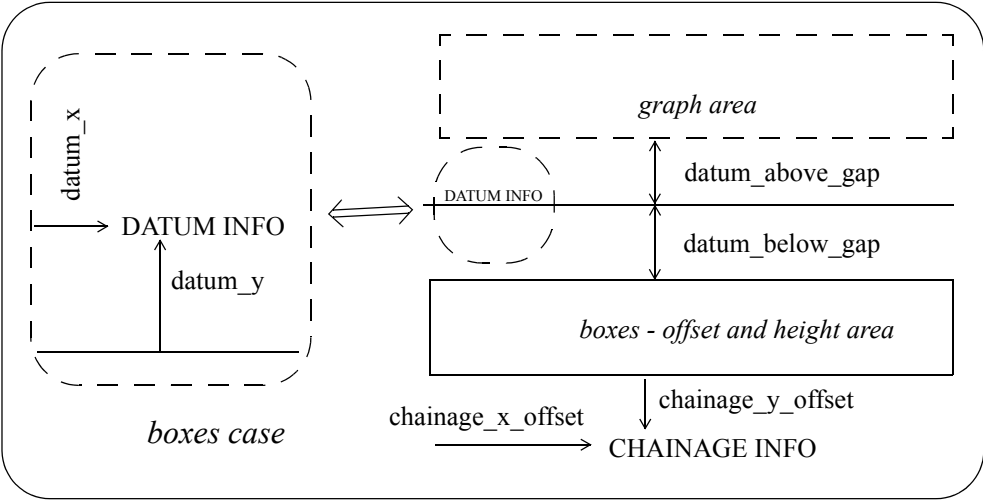
Chainage textstyle	chainage_textstyle	text box	
<i>textstyle for the chainage label</i>			

Chainage text x position (mm)	chainage_x_offset	input	
<i>x position of text (mm)</i>			

Chainage text y position (mm)	chainage_y_offset	input	
<i>y position of text (mm)</i>			

The *chainage_x_offset* is measured from the beginning of the datum line.

The *chainage_y_offset* is measured from the bottom of the datum line with positive being **down**.



The values of the height and X and Y co-ordinates of the **primary string** (usually the design cross section) at the zero offset can be labelled. Note that zero offset is normally where the alignment string cuts the cross section.

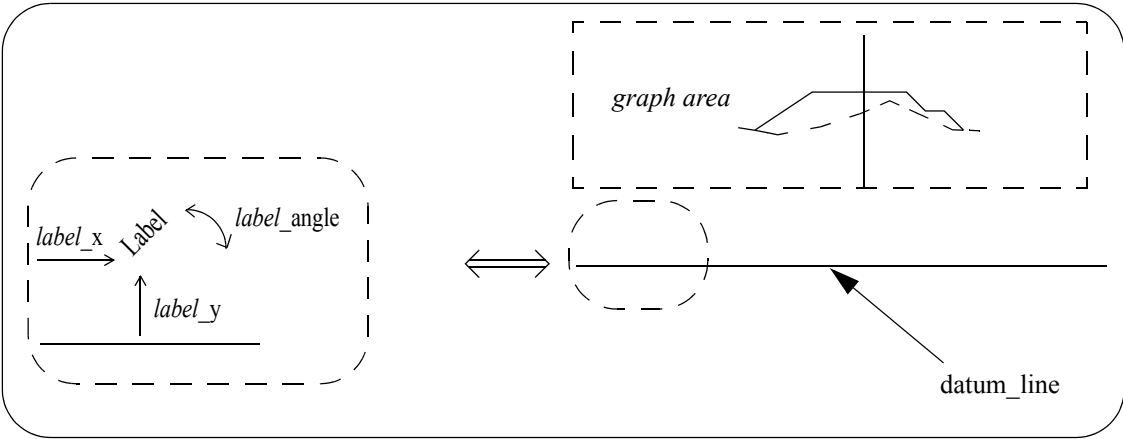
The heights of any tins (such as the natural surface) at the zero offset can also be labelled.

The labels are made up of:

pre_text value post_text

where *value* is either a height or a co-ordinate.

The label is positioned at either the left, right or middle of the datum line, with an x and y adjustment and a rotation.



Chainage text justification chainage_text_justification_cl choice box
justification of text

Boxes/Centreline Labels - Com Params - Centreline Equality Chainage

Section: Common centreline equality chainage label parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Label sub-plot with centreline equality chainage	chainage_label_eq	tick box	
Equality chainage title	chainage_title_eq	tick box	
Decimal places	chainage_decimals_eq		
1000s separator (non K-post)	chainage_thousands_separator_eq		
Zero-pack digits after 1000s separator	chainage_zero_pack_eq	tick box	
Show K-post at non-zero offset (if defined)	chainage_name_include_eq	tick box	
K-post pre text	chainage_name_pre_eq		
K-post post text	chainage_name_post_eq		
Space before offset of K-post	chainage_offset_space_eq	tick box	
Plus sign before positive offset of K-post	chainage_plus_eq	tick box	
Show equality zone (if defined)	chainage_zone_include_eq	tick box	
Space before equality zone	chainage_zone_space_eq	tick box	

Equality zone pre text	chainage_zone_pre_eq
Equality zone post text	chainage_zone_post_eq
Before/after equality separator	chainage_zone_pre_eq
Colour	chainage_colour_eq
Text size (mm)	chainage_size_eq
Textstyle	chainage_textstyle_eq
Text x position	chainage_x_offset_eq
Text y position	chainage_y_offset_eq
Text justification	chainage_text_justification_cl_eq

Boxes/Centreline Labels - Com Params - X Coordinate At 0 Offset

Section: Common labelling for X coord at 0 offset

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Draw Label <i>if ticked draw the label -default</i>	primary_x0_draw_mode	tick box	
Pre text <i>pre- text for label - def " "</i>	primary_x0_pre_text	input	
Post text <i>post-text for label - def " "</i>	primary_x0_post_text	input	
Decimal places <i>number of decimal places to display - def 1. If > 0, trailing zeros are removed after the decimal point If < 0, the absolute value is taken as the number of decimal places to report i.e. no trailing zeros are removed</i>	primary_x0_decimals	input	
X adjustment (mm) <i>x adjustment to position of label - def 0</i>	primary_x0_x	input	
Y adjustment (mm) <i>y adjustment to position of label - def 0</i>	primary_x0_y	input	
Angle (dms) <i>angle of label - def 0</i>	primary_x0_angle	angle box	
Colour <i>colour of the label</i>	primary_x0_colour	colour box	
Size (mm) <i>size (in mm) of the label</i>	primary_x0_size	input	
Textstyle <i>textstyle of the label</i>	primary_x0_textstyle	text box	
Justification <i>justification of the label</i>	primary_x0_justify	justification box	

Boxes/Centreline Labels - Com Params - Y Coordinate At 0 Offset

Section: Common labelling for Y coord at 0 offset

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Draw Label <i>if ticked draw the label -default</i>	primary_y0_draw_mode	tick box	
Pre text <i>pre-text for label - def " "</i>	primary_y0_pre_text	input	
Post text <i>post-text for label - def " "</i>	primary_y0_post_text	input	
Decimal places <i>number of decimal places to display - def 1. If > 0, trailing zeros are removed after the decimal point If < 0, the absolute value is taken as the number of decimal places to report i.e. no trailing zeros are removed</i>	primary_y0_decimals	input	
X adjustment (mm) <i>x adjustment to position of label - def 0</i>	primary_y0_x	input	
Y adjustment (mm) <i>y adjustment to position of label - def 0</i>	primary_y0_y	input	
Angle (dms) <i>angle of label - def 0</i>	primary_y0_angle	angle box	
Colour <i>colour of the label</i>	primary_y0_colour	colour box	
Size (mm) <i>size (in mm) of the label</i>	primary_y0_size	input	
Textstyle <i>textstyle of the label</i>	primary_y0_textstyle	text box	
Justification <i>justification of the label</i>	primary_y0_justify	justification box	

Boxes/CL Labels - Com Par - Height Of Primary String At 0 Offset

Section: Common labelling for height of primary string at 0 offset

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Draw Label <i>if ticked draw the label -default</i>	primary_height_draw_mode	tick box	
Pre text <i>pre-text for label - def " "</i>	primary_height_pre_text	input	
Post text	primary_height_post_text	input	

post-text for label - def " "

Decimal places	primary_height_decimals	input
<i>number of decimal places to display - def 1. If > 0, trailing zeros are removed after the decimal point If < 0, the absolute value is taken as the number of decimal places to report i.e. no trailing zeros are removed</i>		
X adjustment (mm)	primary_height_x	input
<i>x adjustment to position of label - def 0</i>		
Y adjustment (mm)	primary_height_y	input
<i>y adjustment to position of label - def 0</i>		
Angle (dms)	primary_height_angle	angle box
<i>angle of label - def 0</i>		
Colour	primary_height_colour	colour box
<i>colour of the label</i>		
Size (mm)	primary_height_size	input
<i>size (in mm) of the label</i>		
Textstyle	primary_height_textstyle	text box
<i>textstyle of the label</i>		
Justification	primary_height_justify	justification box
<i>justification of the label</i>		

Boxes/Centreline Labels - Com Params - Text Placement

Section: Common parameters for text labelling

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Draw Label	extra_text_draw_mode	tick box	
<i>if ticked draw the label -default</i>			
Text	extra_text	input	
<i>text for label - def " "</i>			
X adjustment (mm)	extra_text_x	input	
<i>x adjustment to position of label - def 0</i>			
Y adjustment (mm)	extra_text_y	input	
<i>y adjustment to position of label - def 0</i>			
Angle (dms)	extra_text_angle	angle box	
<i>angle of label - def 0</i>			
Colour	extra_text_colour	colour box	
<i>colour of the label</i>			
Size (mm)	extra__size	input	
<i>size (in mm) of the label</i>			
Textstyle	extra_text_textstyle	text box	

	<i>textstyle of the label</i>	
Justification	extra_text_justify	justification box
	<i>justification of the label</i>	

Boxes/Centreline Labels - Com Params - Position of ch,x,y,ht,text

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
<i>Section: Centreline - chainage text position</i>			
Position of chainage value	chainage_side_cl	choice box	
<i>Section: Labelling for X-coord at 0 offset</i>			
Position of text	primary_x0_position	choice box	
<i>Section: Labelling for Y-coord at 0 offset</i>			
Position of text	primary_y0_position	choice box	
<i>Section: Labelling for height of primary string at 0 offset</i>			
Position of text	primary_height_position	choice box	
<i>Section: Parameters for text labelling</i>			
Position of text	extra_text_position	choice box	

Please continue to the next section [Boxes/Centreline Labels - Boxes](#).

Boxes/Centreline Labels - Boxes

When **boxes** is selected for *label_type*, the primary string (usually the design cross section) and each tin in the x-section sub-plot can be labelled with one or two lines of title, and the height at the offset position for each point in the primary string.

The **title** for the strings, is drawn in the **title area** of the **boxes area**.

The offsets/heights are drawn in the **heights area** of the **boxes area**.

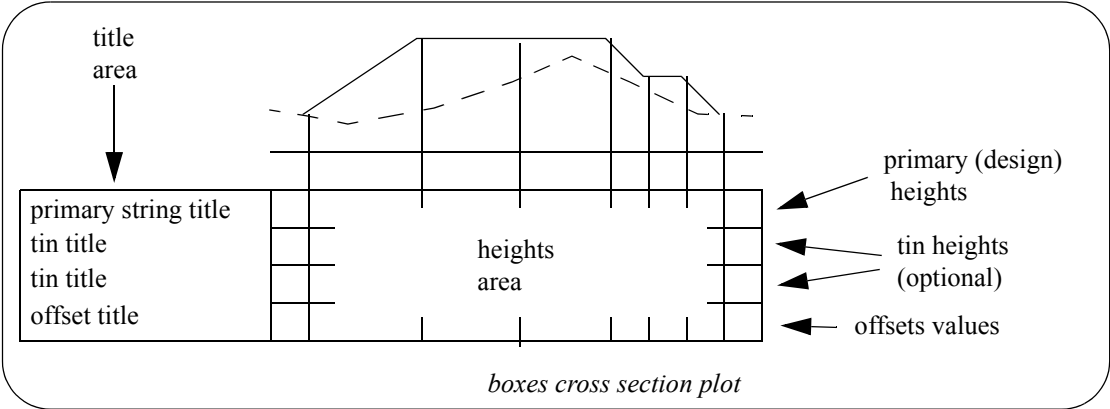
Consequently the boxes area is made up of rows of text consisting of:

string/tin titles followed by the **offset/height values** across the string/tin.

Each row is surrounded by lines to form a box.

The default order of the boxes from the bottom up is

- (a) offset title and values
- (b) tin title and heights - natural surface etc. (optional)
- (c) primary string title and heights - design x-section (optional)



The **title area** starts at the relative position (left_sub_plot_gap,bottom_sub_plot_gap).

Section: Default box parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Colour <i>the default box colour</i>	box_colour	colour box	
Insert 0 offset <i>if ticked, a zero offset will be calculated if not already defined on the x section.</i>	offset_insert_zero	tick box	
Draw box mode	draw_box_mode	choice box	Do not draw any box lines Draw box lines around height area only Draw box lines around title and height area only Use parameters defined in boxes - heights

mode for drawing the boxes for the x section plot.

Boxes/Centreline Labels - Boxes - Datum Lines

For the boxes case, the **datum line** is positioned the distance **datum_below_gap** above the top of the boxes area and the graph area is then positioned the distance **datum_above_gap** above the datum line.

Hence the graph area is distance (datum_below_gap + datum_above_gap) above the top of the boxes area.

Section: Boxes - datum line parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Graph area to datum line gap (mm) <i>dist from datum line to bottom of the</i>	datum_above_gap	input	

Datum line gap to top of boxes (mm) datum_below_gap **input**
dist from datum line to the top of the boxes

X adjustment (mm) datum_x **input**
distance to move the datum text along the datum line

Y adjustment (mm) datum_y **input**
distance to raise the datum text above the datum line (used to be called datum_offset) The datum_x and datum_y can be positive, zero or negative.

Centreline Chainage - LJG ??

Section: Boxes - Centre Line Parameters

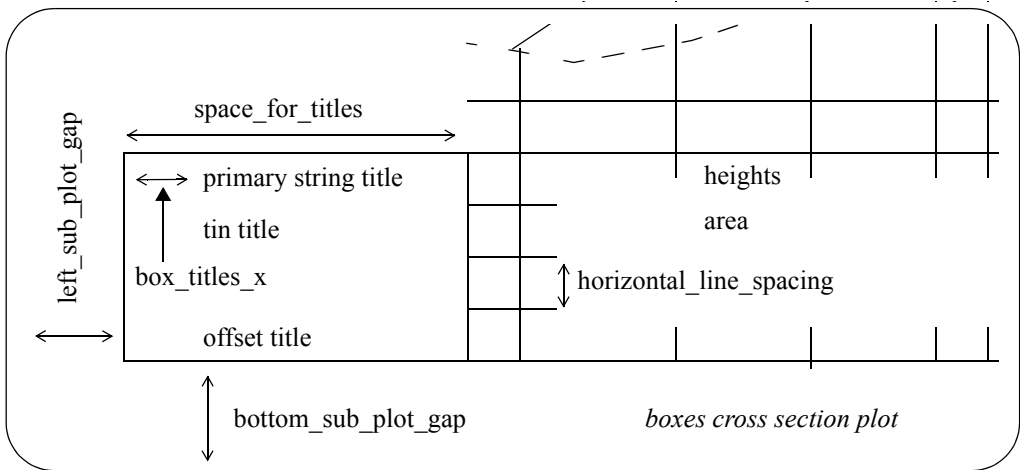
The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Justification of chainage text	chainage_text_justification	justification box	bottom-left bottom-centre bottom-right bottom-decimal middle-left middle-centre middle-right middle-decimal top-left top-centre top-right top-decimal decimal-left decimal-centre decimal-right decimal-point

justification of the chainage text.

Boxes/Centreline Labels - Boxes - Title Area

Many distance definitions in the plot parameter file are given in terms of distance above the **top** of the boxes area.



The size of the title text is given by the **title_box_text_size** parameter.

The width of the title area is either given by the **space_for_titles** parameter, or if omitted, the required width is automatically calculated.

Section: Boxes - Title area parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Size of titles (mm) <i>size of offset, height label and values</i>	title_box_text_size	input	
Space for titles (mm) <i>size of title area.</i>	space_for_titles	input	

There can be two lines of title text and the title text, textstyle and colour can be set independently for the primary string and each tin.

The x position of the title text is the same for all the lines of title text and can be set to be a fixed distance from the left hand side of the boxes.

X adjustment (mm) <i>distance to move the title text from the left hand side of the boxes</i>	box_titles_x	input
---------------------------------------------------------------------------------------------------------	--------------	-------

The text in the title area is the same for each cross section plot on the sheet so it is possible to restrict the title area to be only on the first cross section on the sheet or the first column of cross sections.

Title area mode <i>it is possible to restrict the title area to be only on the first cross section on the sheet or the first column of cross sections</i>	label_first_only	choice box	on all sections on first x-sec of page only on x-sec's in first column
---------------------------------------------------------------------------------------------------------------------------------------------------------------------	------------------	------------	------------------------------------------------------------------------------

Boxes/Centreline Labels - Boxes - Heights Area

The **heights area** starts at the end of the title area.

The height text is written at right angles to the bottom of the boxes. It can be either top or bottom justified with respect to the box (**box_text_justification**).

The number of decimal places and the size of the heights text can also be specified.

The height of each individual box area is either given by the **horizontal_line_spacing** parameter, or if omitted, the required height is automatically calculated.

Section: Boxes - Height area parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Number of decimals <i>number of decimal places in the offset height boxes. If <0, the absolute value is taken as the number of decimal places i.e. no trailing zeros are removed for the values in the offset, heights area.</i>	number_of_decimals	input	
Text size (mm) <i>text size of the height values</i>	text_size	input	

Justification

box_text_justification

choice box

bottom of individual boxes
top of individual boxes

justification of box text.

Horizontal line spacing (mm)

horizontal_line_spacinginput

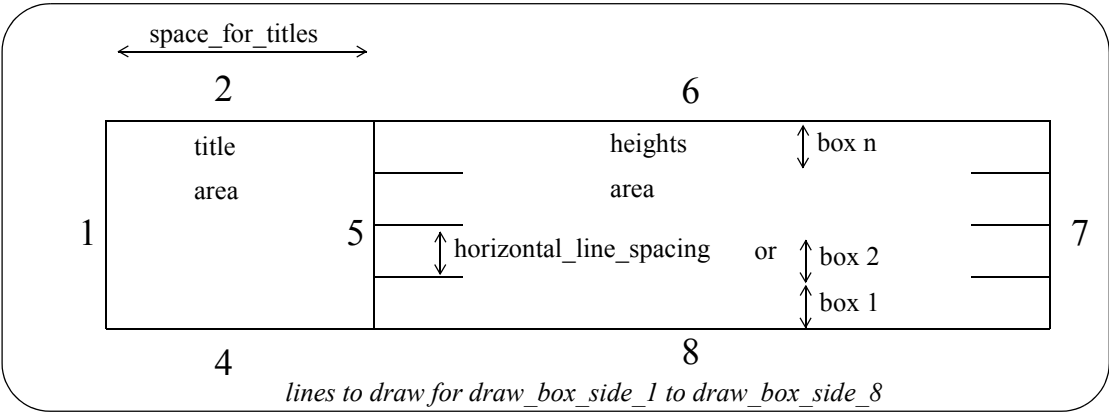
height of each individual box area of title area. Calculated if omitted

The total height of the boxes area is simply given by number of boxes drawn multiplied by the height of one box (they all have the same height).

The **width** of the heights area is determined by the number of chainages to be labelled and whether the values are staggered to prevent over writing.

Hence the total width of the boxes area is the width of the labels area plus the width of the heights area.

Boxes/Centreline Labels - Boxes - Outside Linework



Section: Boxes - Outside linework parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
-------------------	----------------	------	--------

Draw the left side of title area(1)

	draw_box_side_1	tick box	
--	-----------------	----------	--

if ticked, draw the left side of the title area (def).

Draw the top line of title area(2)

	draw_box_side_2	tick box	
--	-----------------	----------	--

if ticked, draw the top line of the title area (def).

Draw the bottom line of title area(4)

	draw_box_side_4	tick box	
--	-----------------	----------	--

if ticked, draw the bottom line of the title area (def).

Draw the left side of heights area(5)

	draw_box_side_5	tick box	
--	-----------------	----------	--

if ticked, draw the left side of the heights area (def).

Draw the top line of heights area(6)

	draw_box_side_6	tick box
if ticked, draw the top line of the heights area (def).		
Draw right side of heights area(7)		
	draw_box_side_7	tick box
if ticked, draw right side of the heights area (def).		
Draw bottom side of heights area(8)		
	draw_box_side_8	tick box
if ticked, draw bottom side of the heights area (def).		
Colour (1)	box_side_colour_1	colour box
colour to draw left side of title area		
Colour (2)	box_side_colour_2	colour box
colour to draw top of title area		
Colour (4)	box_side_colour_4	colour box
colour to draw bottom of title area		
Colour (5)	box_side_colour_5	colour box
colour to draw left side of heights area		
Colour (6)	box_side_colour_6	colour box
colour to draw top of heights area		
Colour (7)	box_side_colour_7	colour box
colour for right side of heights area		
Colour (8)	box_side_colour_8	colour box
colour for bottom of heights area		

Boxes/Centreline Labels - Boxes - Inside Linework

The lines at the top of the individual boxes inside the title area and heights area (separation lines) are controlled by the parameters *box_line_draw_mode* and *box_line_mode_n*.

The separation lines can be drawn just in the title area, just in the heights area or in both areas.

The parameter *box_line_draw_mode* can be set to control all the separation lines but there are additional parameters, *box_line_mode_n*, which override *box_line_draw_mode* for each of the individual boxes where n = 1, ... number of boxes -1.

The top of the top box is not controlled by *box_line_mode_n* but is controlled by the parameters *draw_box_side_2* and *draw_box_side_6*.

Section: Boxes - Inside linework parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Separation line mode	box_line_draw_mode	choice box	Do not draw any separation lines
			Draw the separation lines in both areas

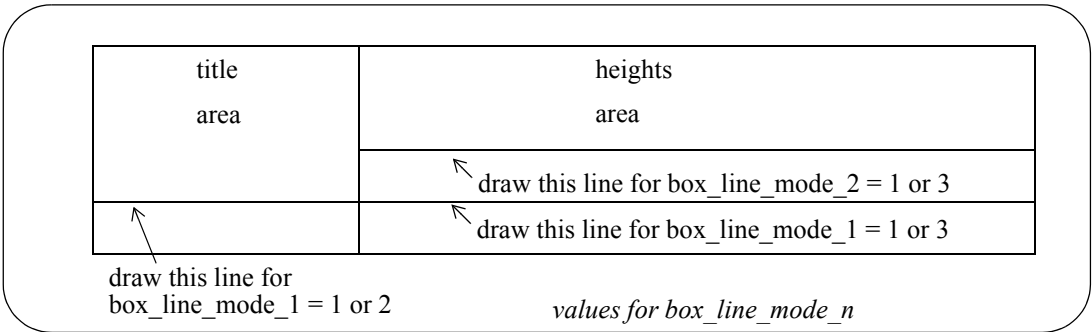
Draw the separation lines in the title area only

Draw the separation lines in the heights area only

the separation line draw mode.

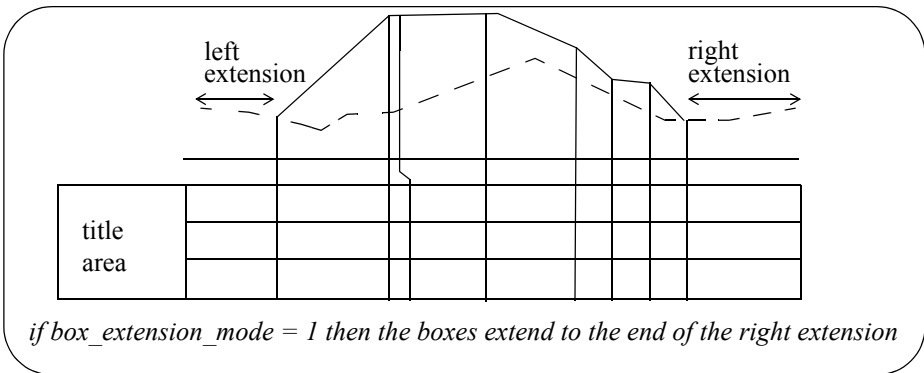
Box #	input		
<i>Where box # = 1 to number of boxes(n). Box 1 is the bottom box, increasing upwards.</i>			
Line mode	box_line_mode_n	choice box	No top line for title or height area (mode=0)
			Draw top line for title or height area (mode=1)
			Draw top line for title area only (mode=2)
			Draw top line for height area only (mode=3)

line mode for top of title and height areas for box number specified.



Boxes/Centreline Labels - Boxes - Extension Mode

The right hand end of the boxes can stop at the end of the design x-section or extend to the end of the right_extension distance.



Section: Boxes - Extension mode parameters

The fields and buttons used in this section have the following functions.

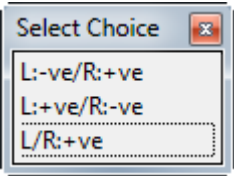
Field Description	Parameter name	Type	Pop-Up
Extension mode	box_extension_mode	choice box	extend boxes to end of design x-section (mode=0) extend boxes to end of right extension distance (mode=1)

Boxes/Centreline Labels - Boxes - Offset Titles/Values

Section: Boxes - Offset title/value parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
First line of offset title <i>first line of offset title</i>	offset_title	input	
Second line of offset title <i>second line of offset title</i>	offset_title_2	input	
Offset title textstyle <i>offset title textstyle</i>	offset_title_textstyle	text box	
Offset title colour <i>offset title colour</i>	offset_title_colour	colour box	
Offset title size (mm) <i>offset title size</i>	offset_title_size	input	
Offset value mode	offset_value_mode	choice box	



<i>offset value mode</i>			
Offset value colour <i>offset value colour</i>	offset_colour	colour box	
Offset value textstyle <i>offset value textstyle</i>	offset_textstyle	text box	
Offset value size (mm) <i>offset value size</i>	offset_size	input	

Boxes/Centreline Labels - Boxes - Primary String Titles/Values

Section: Boxes - Primary string title parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
First line <i>first line of primary string title</i>	primary_title	input	
Second line <i>second line of primary string title</i>	primary_title_2	input	
Textstyle <i>primary string title textstyle</i>	primary_title_textstyle	text box	
Colour <i>primary string title colour</i>	primary_title_colour	colour box	
Size (mm) <i>primary string title size</i>	primary_title_size	input	
Y position (mm) <i>if set, the height in mm above the bottom of all the boxes that the primary string title text is drawn. If not set, then the text is placed at a height that puts it inside the default box for the primary string title.</i>	primary_title_y_pos	input	

Section: Boxes - Primary string value parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Colour <i>primary string value colour</i>	primary_colour	colour box	
Textstyle <i>primary string value textstyle</i>	primary_textstyle	text box	
Size (mm) <i>primary string value size</i>	primary_size	input	
Y position (mm) <i>if set, the height in mm above the bottom of all the boxes that the primary string value text is drawn. If not set, then the text is placed at a height that puts it inside the default box for the primary string values.</i>	primary_y_pos	input	
Decimal places <i>number of dec places in primary string height. < 0 to keep all trailing zeros</i>	primary_decimals	input	

Boxes/Centreline Labels - Boxes - Tin Titles/Values

Section: Tin titles/values - Tin parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Use tin set # <i>set number to be used to define sets of tin parameters i.e. n value</i>		input	
Tin draw mode	tin_n_draw_mode	choice box	Draw the tin Do not draw the tin

draw tin mode for the nth tin specified by set #.

Tin colour	tin_n_draw_colour	colour box	
<i>tin colour mode for the nth tin specified by set #.</i>			
Tin label mode	tin_n_label	choice box	Label the tin
			Do not label the tin
<i>tin label mode for the nth tin specified by set #.</i>			

Boxes/Centreline Labels - Boxes - Tin Titles/Values - Tin Titles

Section: Tin title parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Use tin set #		input	
<i>set number to be used to define sets of tin parameters i.e. n value</i>			
First line of tin title	tin_n_title	input	
<i>first line of nth tin title</i>			
Second line of tin title	tin_n_title_2	input	
<i>second line of nth tin title</i>			
Tin title textstyle	tin_n_title_textstyle	text box	
<i>nth tin title textstyle</i>			
Tin title colour	tin_n_title_colour	colour box	
<i>nth tin title colour</i>			
Tin title size (mm)	tin_n_title_size	input	
<i>nth tin title size</i>			
Title Y position (mm)	tin_n_title_y_pos	input	
<i>if set, the height in mm above the bottom of all the boxes that the nth tin title text is drawn. If not set, then the text is placed at a height that puts it inside the default box for the tin heights.</i>			

Boxes/Centreline Labels - Boxes - Tin Titles/Values - Tin Heights

Section: Tin height parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Use tin set #		input	
<i>set number to be used to define sets of tin parameters i.e. n value</i>			
Decimals	tin_n_decimals	input	
<i>number of dec places in nth tin height. < 0 to keep all trailing zeros</i>			
Textstyle	tin_n_textstyle	text box	
<i>textstyle of nth tin height</i>			
Colour	tin_n_colour	colour box	
<i>nth tin height and depth colour</i>			

Size (mm)	tin_n_size	input
<i>nth tin height size</i>		

Y pos (mm)	tin_n_y_pos	input
<i>if set, the height in mm above the bottom of all the boxes that the tin height text is drawn.If not set, then the text is placed at a height that puts it inside the default box for the tin heights.</i>		

Boxes/Centreline Labels - Boxes - Tin Titles/Values - Tin Depths

Section: Tin depth parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Use tin set # <i>set number to be used to define sets of tin parameters i.e. n value</i>		input	
Depth label mode <i>depth label mode for the nth tin specified by set #.</i>	tin_n_depth_label	choice box	Label depths Do not label depths
First line of tin depth title <i>first line of nth tin depth title</i>	tin_n_depth_title	input	
Second line of tin depth title <i>second line of nth tin depth title</i>	tin_n_depth_title_2	input	
Depth title textstyle <i>nth tin depth title textstyle</i>	tin_n_depth_title_textstyle	text box	
Depth title colour <i>nth tin depth title colour</i>	tin_n_depth_title_colour	colour box	
Depth title size (mm) <i>nth tin depth title size</i>	tin_n_depth_title_size	input	
Depth title Y position (mm) <i>if set, the height in mm above the bottom of all the boxes that the tin depth title text is drawn. If not set, then the text is placed at a height that puts it inside the default box for the tin heights.</i>	tin_n_depth_title_y_pos	input	
Decimals in depth value <i>number of dec places in tin height. < 0 to keep all trailing zeros</i>	tin_n_depth_decimals	input	
Depth value textstyle <i>nth tin depth textstyle</i>	tin_n_depth_textstyle	text box	
Depth value colour <i>nth tin depth colour</i>	tin_n_depth_colour	colour box	
Depth value size (mm) <i>nth tin depth size</i>	tin_n_depth_size	input	
Depth value Y position (mm) <i>if set, the height in mm above the bottom of all the boxes that the tin depth text is drawn. If not set, then the text is placed at a height that puts it inside the default box for the tin heights.</i>	tin_n_depth_y_pos	input	
Multiplier for positive depths <i>if set, this value will be used to multiply positive depth values.</i>	depth_positive_factor	input	
Multiplier for negative depths <i>if set, this value will be used to multiply negative depth values.</i>	depth_negative_factor	input	

The depth from the primary string to a tin, at a particular offset is defined as

depth = tin height value - height of the primary string

That is, the depth that the primary string is **below** the tin.

Before plotting, the value of depth is multiplied by either the *depth_positive_factor* or *depth_negative_factor*.

```
if (depth >= 0)  plotted_depth_value = depth * depth_positive_factor
if (depth < 0)   plotted_depth_value = depth * depth_negative_factor
```

Hence the definition of depth can be modified by the parameters:

```
depth_positive_factor    value    // multiplier for positive depths
depth_negative_factor    value    // multiplier for negative depths
```

For example, if the opposite sign is required for depth, that is,

depth = height of the primary string - tin height value

simply set

```
depth_positive_factor    -1
depth_negative_factor    1
```

Boxes/CL Labels - Boxes - Upright Offset/Staggering Parameters

For each sub-plot, the offsets of the points across the x-section string (primary string) are used for positioning uprights (leader lines), and the offset and height labels for the uprights.

By default, there is an upright at each point across the primary string.

However, if the primary string is a 4d string, then the text at the points on the 4d string can be used as a key to **suppress** the labelling and upright at that point. See [Section: Exclude uprights at nominated x-sec points](#)

If the real offset position is used for the horizontal position of the offset/height text, text over writing can easily occur. To prevent over writing, the text is automatically **staggered**.

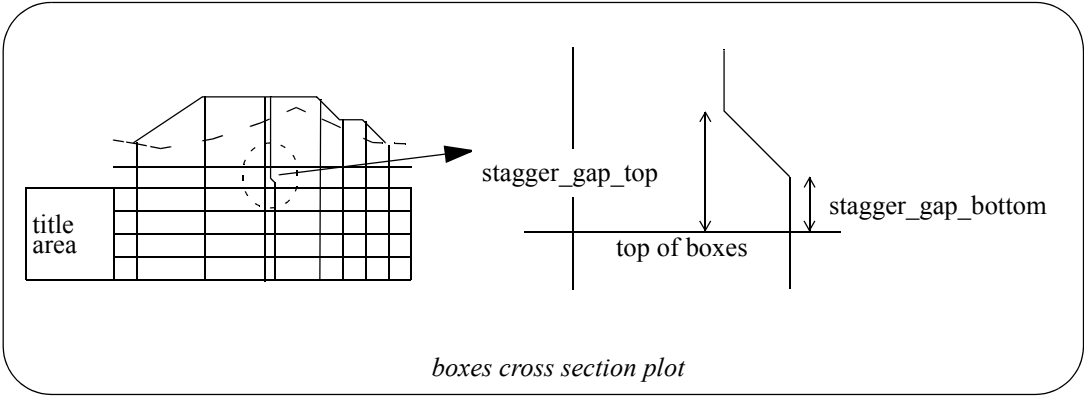
When staggering occurs, the real offset position is then indicated by the offset markers which are drawn at the top of the text boxes from the staggered text position back to the actual offset position of the upright.

The size and position of the staggers are given by:

Section: Upright offset/staggering parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	TypePop-Up
Offset label tolerance <i>weed out offset values closer together (in offset units) than this value.</i>	offset_label_tolerance	input
Top of stagger to boxes distance (mm) <i>distance from boxes to top of stagger.</i>	stagger_gap_top	input
Bottom of stagger to boxes distance (mm) <i>distance from boxes to bottom of stagger.</i>	stagger_gap_bottom	input
Stagger gap factor <i>distance between staggers is box_text_size * stagger_gap_factor</i>	stagger_gap_factor	input



Boxes/CL Lab - Boxes - Upright Off/Stag Params - Uprights To Exclude

For each sub-plot, the offsets of the points across the x-section string (primary string) are used for positioning uprights (leader lines), and the offset and height labels for the uprights.

By default, there is an upright at each point across the primary string.

However, if the primary string is a 4d string, then the text at the points on the 4d string can be used as a key to **suppress** the labelling and upright at that point.

The parameters to **stop** labelling and uprights are:

mask_name_n 4d_string_point_text where n=1,100

After any *name masks* have been applied, it is often desirable to weed out offset values that are too close together before doing any labelling.

Section: Exclude uprights at nominated x-sec points

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Set #		input	
set number to be used to define a number of uprights to suppress			
X-sec points to exclude	mask_name_n	input	
the string name to be excluded. Note: the name can include wild cards (*) and characters (?). n is the value from the Set # provided.			

Boxes/Centreline Labels - Boxes - Upright Off/Stag Params - Uprights

Section: Uprights

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Upright draw mode	uprights_draw_mode	choice box	none
ticks to stagger height			
to uprights_y above boxes			
to primary string			

- to tin 1
- to tin 2
- to tin 3
- to tin 4
- to tin 5
- to tin 6
- to tin 7
- to tin 8
- to tin 9
- to tin 10

Upright draw mode above boxes.

Uprights Y distance (mm)

uprights_y

input

distance to draw the uprights for `uprights_draw_mode = "to uprights_y above boxes"`

Uprights colour

uprights_colour

colour box

uprights colour: Default is box_colour

Uprights bottom mode

uprights_bottom_mode

choice box

stop at top of boxes

draw to bottom of boxes

draw to `uprights_bottom_y`

below top of boxes

draw to `uprights_bottom_y`

above bottom of boxes

ticks at chainage

Upright draw mode below top of boxes.

Uprights bottom Y distance (mm)

uprights_bottom_y

input

distance in mm.

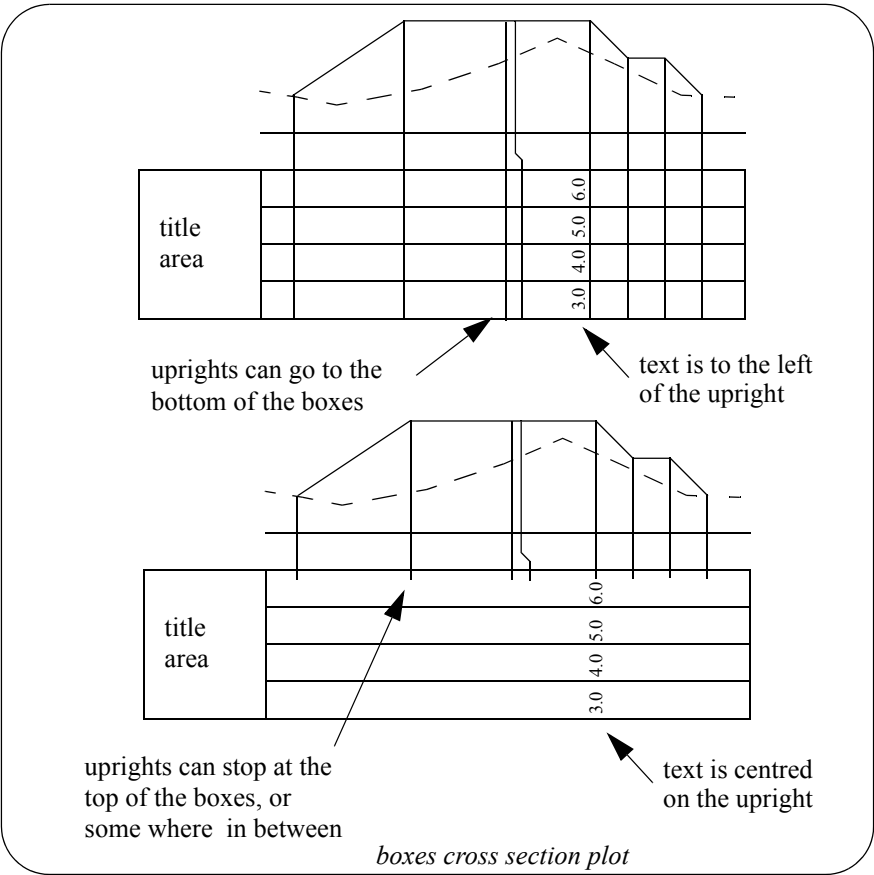
Uprights text offset factor

uprights_text_offset_factor

input

*move the text by this factor*size.*

When uprights go below the top of the boxes, the height and offset text is moved to the left so that the upright does not go through the text. The left hand side of the heights boxes also moves to the left to leave room for the height text.



Please continue to the next section [Boxes/Centreline Labels - Centreline](#).

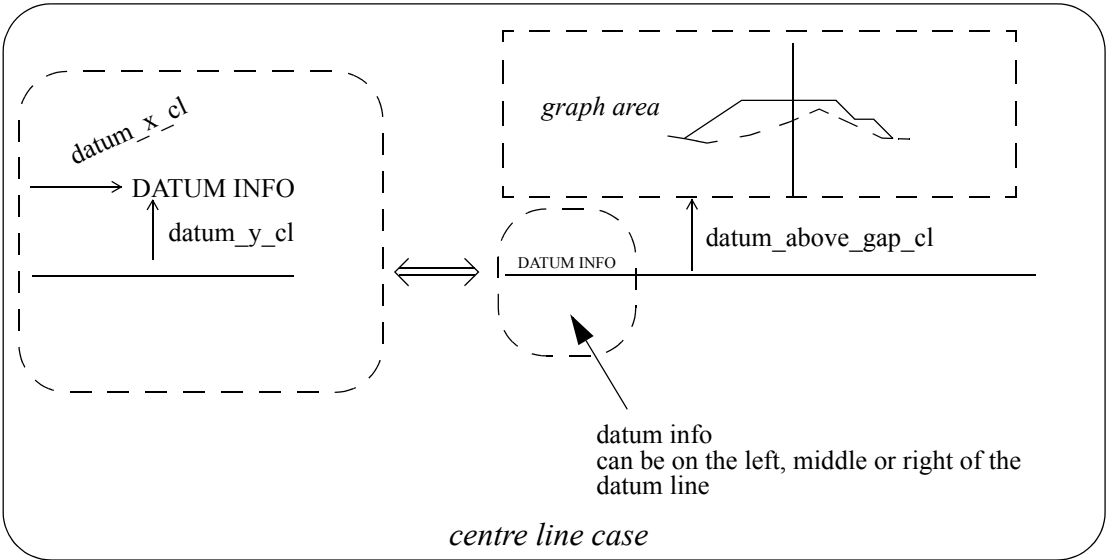
Boxes/Centreline Labels - Centreline

Section: Centreline linestyle

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Linestyle of centreline	cl_linestyle	linetype box	
<i>linestyle to be used for drawing centreline</i>			

Boxes/Centreline Labels - Centreline - Datum Lines



For the centreline case, the graph area is positioned the distance datum_above_gap_cl above the datum line.

Section: Centreline - datum line parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Graph area - datum line gap (mm)	datum_above_gap_cl	input	
dist from datum line to bottom of the graph area			
Position of text	datum_side_cl	choice box	Middle of datum line Left of datum line Right of datum line
side of centreline to position text.			
Text justification	datum_text_justification_cl	just. box	bottom-left bottom-centre bottom-right bottom-decimal middle-left middle-centre middle-right middle-decimal top-left top-centre top-right top-decimal decimal-left decimal-centre decimal-right decimal-point

justification of the datum text. **NOTE:** - this is not normally required since by default the text justification is set to match datum_side_cl.

Datum text position along datum line (mm)

datum_x_cl	input
distance to move the datum text along the datum line	

Boxes/CL Labels - Centreline - Labelling Offset/Height (Superseded)

In the centre line case, the value of the height of the **primary string** (usually the design cross section) at the zero offset can be labelled. This is normally where the alignment string cuts the cross section.

The label is made up of the texts:

primary_title offset_title offset_value height_text height_value

Note: These parameters have now been superseded. The parameters for labelling the height of the primary string at zero offset covers this case. To use the zero offset parameters instead, the *primary_height_pre_text* would include all text required for the Primary_title, offset_title, offset_value and height_text (offset_value is always 0.0).

Section: Centreline - Labelling offset/height parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
-------------------	----------------	------	--------

Include primary title in label

primary_mode_cl	Tick box
-----------------	----------

*The parameter primary_mode_cl controls whether the **primary_title** is included in the label.*

Include height in label

height_mode_cl	Tick box
----------------	----------

*The parameter height_mode_cl controls whether the **height_title** and **height_value** are included in the label.*

Include offset in label

offset_mode_cl	Tick box
----------------	----------

*The parameter offset_mode_cl controls whether the **offset_title** and **offset_value** are included in the label.*

Position of text	offset_height_side_cl	Choice	0
		Choice	1
		Choice	2

The label can be placed on the left, centre of right side of the datum line.

Justification of text	offset_height_text_justification_cl
------------------------------	-------------------------------------

*justification of the offset height text. **NOTE:** - this is not normally required since by default the text justification is set to match offset_height_side_cl*

Height text label	height_text	Input
--------------------------	-------------	-------

height text.

Distance to move text position along datum line (mm)

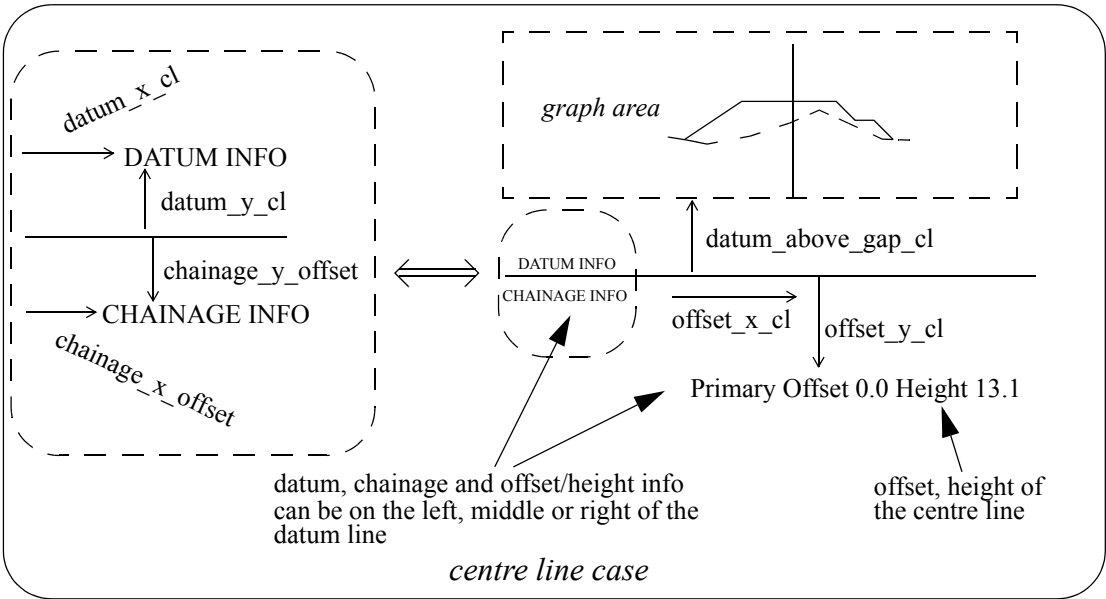
offset_x_cl	Input
-------------	-------

distance to move the text along the datum line.

Distance to move text position below datum line (mm)

offset_y_cl	Input
-------------	-------

distance to move the text below the datum line.



Boxes/CL Labels - Centreline - Position Of Ch, X, Y, Ht, Text LJG ??

Section: Centreline - Chainage Text Position

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Position of chainage value	chainage_side_cl	choice box	Middle of datum line
			Left of datum line
			Right of datum line
<i>side of centreline to position chainage text.</i>			
Justification of chainage text			
	chainage_text_justification_cl	just. box	bottom-left bottom-centre bottom-right bottom-decimal middle-left middle-centre middle-right middle-decimal top-left top-centre top-right top-decimal decimal-left decimal-centre decimal-right decimal-point

justification of the chainage text.

Section: Labelling for X Coord At 0 Offset

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Position of text	primary_x0_position	choice box	Middle of datum line Left of datum line Right of datum line

side of centreline to position x coord text.

Section: Labelling for Y Coord At 0 Offset

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Position of text	primary_y0_position	choice box	Middle of datum line Left of datum line Right of datum line

side of centreline to position y coord text.

Section: Labelling for height of primary string at 0 offset

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Position of text	primary_height_position	choice box	Middle of datum line Left of datum line Right of datum line

side of centreline to position height text.

Section: Parameters for text labelling

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Position of text	primary_height_position	choice box	Middle of datum line Left of datum line Right of datum line

side of centreline to position text.

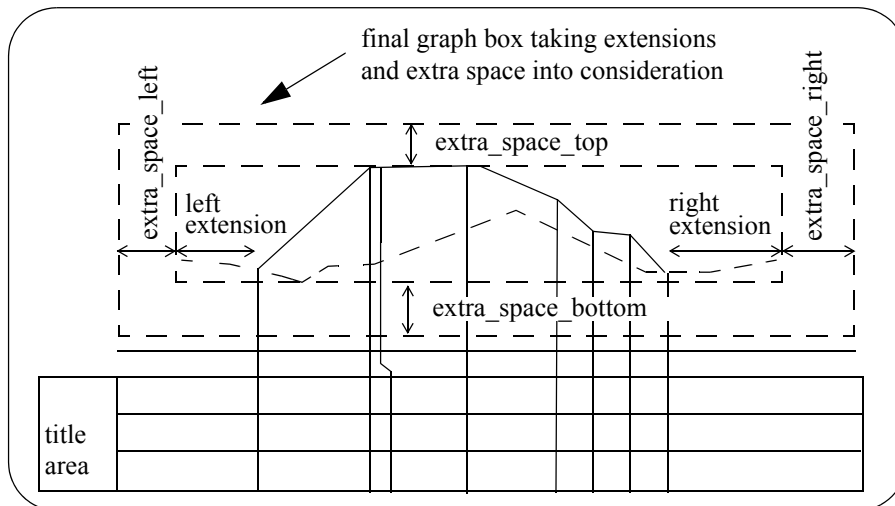
Please continue to the next section [Graph Area](#).

Graph Area

The **graph area** for each section sub-plot is the area where the actual plot of the x-section string is drawn.

The **width** of the graph area is determined by the width of the x-section string being plotted, the left and right extensions and horizontal scale (scale) given by the parameters.

The size of the graph area can be extended to allow for symbols by the following parameters:



The types of strings that are drawn in the graph area of a cross section plot are:

- (a) primary string the x-section string from the x-section model that is being drawn.
Called the primary string and is usually the design x-section.
- (b) tins sections of the primary string through any tins in models in the corridor models.
- (c) services parts of strings (from models in corridor models) that cut the defined corridor.

The **colour** of the strings in the plot is the actual string colour for cases (a) and (c), and the colour of the tin used for the section in case (b).

Although all the strings are plotted, the plot parameter file can be used to select which ones are labelled with heights.

Section: Graph area - Extra space parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Extra space units	extra_space_units	choice box	world units millimetres

units for specifying extra space.

Extra space left (units)	extra_space_left	input
<i>distance to subtract from left of plot area</i>		
Extra space right (units)	extra_space_right	input
<i>distance to add to right of plot area</i>		
Extra space top (units)	extra_space_top	input
<i>distance to add to top of plot area</i>		

Extra space bottom (units) extra_space_bottom input
distance to subtract from bottom of plot area

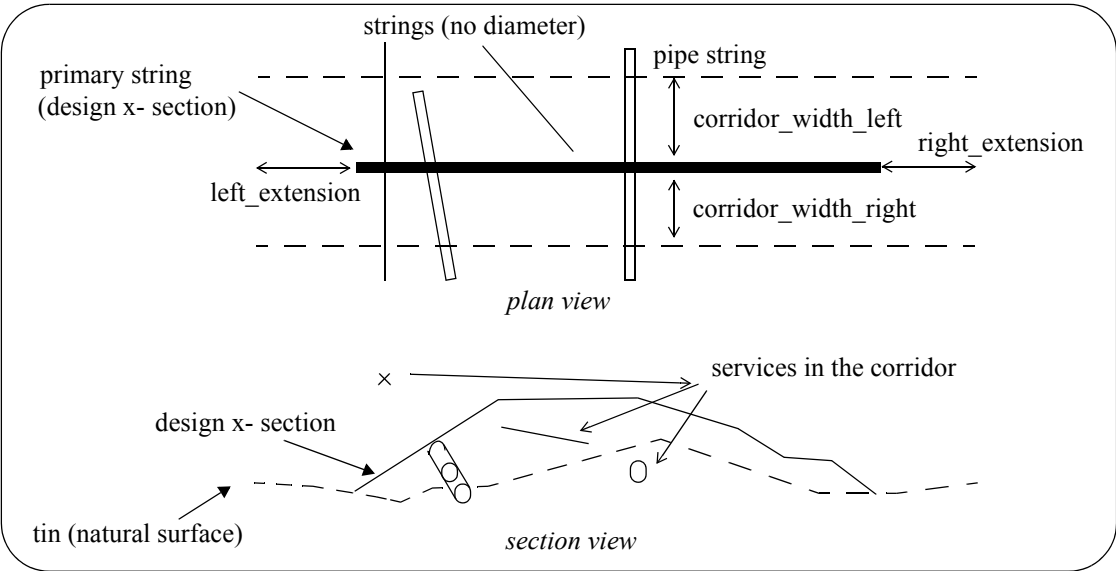
Please continue to the next section [Corridors](#).

Corridors

A corridor around the primary string is defined by giving a left and right corridor width.

Any string in a model added to the section view is checked to see if it appears in the corridor, and if it does, it is drawn on the cross-section plot.

To be drawn, strings do not have to cross the primary string, but just be in the corridor.



Section: Corridor parameters

Panel field	Parameter name	Type
Left corridor width (world units)		
	corridor_width_left	input
<i>left corridor width</i>		
Right corridor width (world units)		
	corridor_width_right	input
<i>right corridor width</i>		
Left corridor overlap (world units)		
	corridor_overlap_left	input
<i>left corridor overlap</i>		
Right corridor overlap (world units)		
	corridor_overlap_right	input
<i>right corridor overlap</i>		
Chord-arc tolerance (world units)		
	corridor_chord_arc	input
<i>chord-arc tolerance used near any bends in the corridor.</i>		

Corridors - Model Selection

Panel field	Parameter name	Type
Corridor model	corridor_model_n	model box

models containing tins and service strings to be drawn on the section. Where n = 1, 2, ... ,100 given by

line number on grid.

Please continue to the next section [Grades](#).

Grades

The plot of the x-section string is made up of straight lines joining the individual points of the x-section.

Section: Grade parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Label grades <i>if ticked, label grades.</i>	grade_label	tick box	

Either the individual lines can be used as the segments to be labelled for grade, or adjacent lines of the same grade can be considered to be just one segment and labelled only once.

Hence the segments to be labelled for grade can be the individual lines of the x-section, or the segments defined by changes of grade.

Label change of grade segments

grade_change_only	tick box
<i>if ticked, label change of grade segments. If not, label individual lines.</i>	

It is also possible to ignore segments smaller than a given minimum width on the plot.

Minimum segment 3d length	grade_minimum_width	input
<i>segments smaller than specified value (in mm) are not labelled</i>		

The grade labels are drawn parallel to the segment, centred about the segments end points, and a distance *grade_offset* above the segment. The size, colour and number of decimal places can all be set.

Minimum segment plan length	grade_minimum_width_2d	input
Minimum slope (m/m)	grade_minimum_slope	input
Maximum slope (m/m)	grade_maximum_slope	input

Decimal places for grades	grade_decimals	input
<i>number of decimal places in grade</i>		

Size for grade text (mm)	grade_size	input
<i>size of the grade label</i>		

Textstyle for grades	grade_textstyle	text box
<i>textstyle of the grade label</i>		

Colour for grades	grade_colour	colour box
<i>number of decimal places in grade</i>		

Grade offset (mm)	grade_offset	input
<i>distance above the segment for label</i>		

Show grade sign	grade_offset	tick box
<i>if ticked, the sign of the grade is labelled.</i>		

The grade can be labelled as percent cross-fall, 1 in slope, m/m or VicRoads x:1.

Also a threshold value can be set and any grades whose absolute value are below the threshold can be labelled in one way, and those above the threshold labelled a different way.

Hence, if the absolute value of the grade is less that or equal to the absolute value of *grade_threshold*, then **grade_mode** is used, otherwise **grade_upper_mode** is used.

Grade mode	grade_mode	choice box	% grade 1 in m/m VicRoads x:1
-------------------	------------	------------	----------------------------------------

type of grade value

Grade threshold	grade_threshold	input
------------------------	-----------------	-------

grade threshold for type of grade labelling

Grade threshold mode	grade_threshold_mode	choice box	% grade 1 in m/m VicRoads x:1
-----------------------------	----------------------	------------	----------------------------------------

type of grade value

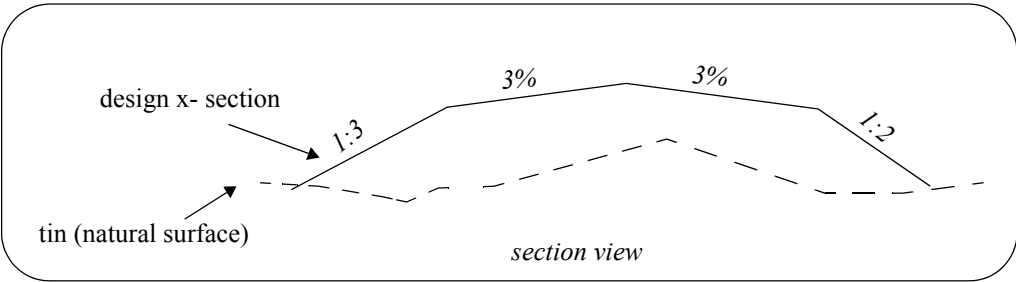
Grade upper mode	grade_upper_mode	choice box	% grade 1 in m/m VicRoads x:1
-------------------------	------------------	------------	----------------------------------------

type of grade value

Decimal places for grades above threshold value

grade_upper_decimals	input
----------------------	-------

number dec places in grades above threshold value



Please continue to the next section [X-Section Points](#).

X-Section Points

The points across each x-section can be automatically labelled on the x-section plots.

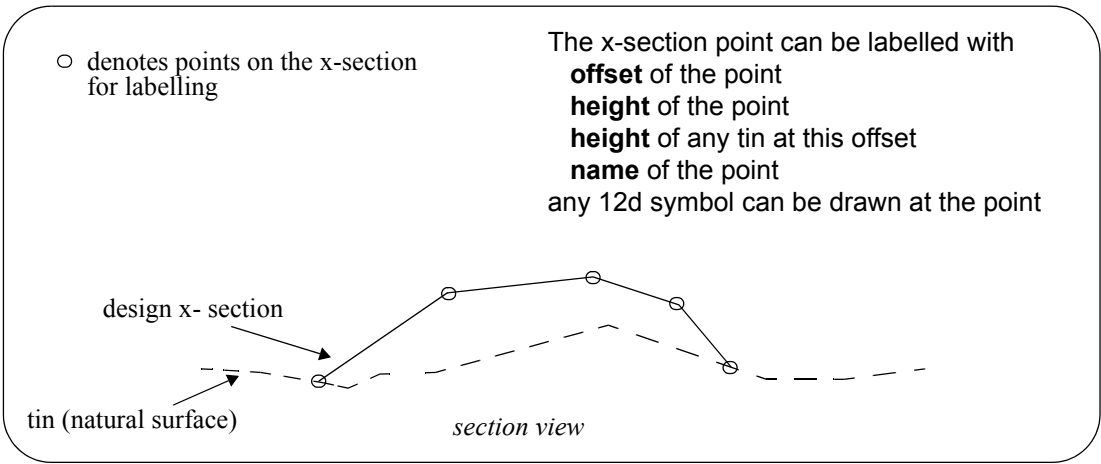
The **offset**, **height** and **name** of the point can be labelled as well as a **symbol** drawn. The height of tins at the same offset value can also be labelled.

The offset position for the labelling is the offset of the point.

The height position for the labelling can be specified as the

- (a) top of the boxes for the x-section
- (b) above the maximum height of the strings on the plot
- (c) height of the point on the x-section string (primary string)
- (d) height of a tin.

The actual position of the label is defined relative to the above point.



Note:

Only case (b) involves the actual height of the point on the cross section string. For all other cases, only the offset of the cut string is used.

Other heights, for example, the height of the tin at that offset can be used as the height (case (d)).

Section: X-section point mask parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Define Set #		input	

set number to be used to define a number of points to include

Point mask	points_n_mask	input
-------------------	---------------	-------

The points of the x-section to be labelled for the nth set of parameters is restricted to all the points whose name satisfying the points_n_mask. For example

points_1_mask = "ke"*

or

points_1_mask = "?bank"*

or, if both masks are required,

points_1_mask = "ke ?bank*"*

X Section Points - Offsets

Section: X-section - Offset parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Use Set #		input	
set number as specified in the Define set#			
Position	points_offset_n_position	choice box	above point value above top of boxes above top of graph area to primary string to tin 1 to tin 2 to tin 3 to tin 4 to tin 5 to tin 6 to tin 7 to tin 8 to tin 9 to tin 10
above point value.			
X (mm)	points_offset_n_x	input	
horizontal adjustment to position of offset text.			
Y (mm)	points_offset_n_y	input	
height adjustment to position of offset text.			
Angle (dms)	points_offset_n_angle	input	
rotation of offset text about point.			
Colour	points_offset_n_colour	colour box	
colour of offset text			
Size (mm)	points_offset_n_size	input	
size of offset text. A value of 0 = no label			
Textstyle	points_offset_n_textstyle	text box	
textstyle of offset text			
Pre-text	points_offset_n_pre_text	input	
text before offset text			
Post-text	points_offset_n_post_text	input	
text after offset text			
Justification	points_offset_n_justification		
		justification box	bottom-left bottom-centre bottom-right bottom-decimal middle-left

middle-centre
middle-right
middle-decimal
top-left
top-centre
top-right
top-decimal
decimal-left
decimal-centre

decimal-right
decimal-point

justification of the offset text.

Decimals points_offset_n_no_decimals input
number of decimals in offset text

X Section Points - Heights

Section: X-section - Height parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Use Set # <i>set number as specified in the Define set#</i>		input	
Mode	points_height_n_mode	choice box	use height of cut point use real height above boxes height of primary string use height of tin 1 use height of tin 2 use height of tin 3 use height of tin 4 use height of tin 5 use height of tin 6 use height of tin 7 use height of tin 8 use height of tin 9 use height of tin 10

height mode above point value.

Position	points_height_n_position	choice box	above point value above top of boxes above top of graph area to primary string to tin 1 to tin 2 to tin 3 to tin 4 to tin 5 to tin 6 to tin 7 to tin 8 to tin 9 to tin 10
-----------------	--------------------------	------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

above point position.

X (mm)	points_height_n_x	input	
<i>horizontal adjustment to position of height text.</i>			
Y (mm)	points_height_n_y	input	
<i>height adjustment to position of height text.</i>			
Angle (dms)	points_height_n_angle	input	
<i>rotation of height text about point.</i>			
Colour	points_height_n_colour	colour box	
<i>colour of height text</i>			
Size (mm)	points_height_n_size	input	
<i>size of height text. A value of 0 = no label</i>			
Textstyle	points_height_n_textstyle	text box	
<i>textstyle of height text</i>			
Pre-text	points_height_n_pre_text	input	
<i>text before height text</i>			
Post-text	points_height_n_post_text	input	
<i>text after height text</i>			
Justification	points_height_n_justification	just. box	bottom-left bottom-centre bottom-right bottom-decimal middle-left middle-centre middle-right middle-decimal top-left top-centre top-right top-decimal decimal-left decimal-centre decimal-right decimal-point
<i>justification of the height text.</i>			
Decimals	points_height_n_no_decimals	input	
<i>number of decimals in height text</i>			

X Section Points - Labels

Section: X-section - Label parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Use Set #		input	
<i>set number as specified in the Define set#</i>			
Position	points_label_n_position	choice box	above point value above top of boxes

			above top of graph area to primary string to tin 1 to tin 2 to tin 3 to tin 4 to tin 5 to tin 6 to tin 7 to tin 8 to tin 9 to tin 10
<i>above point position.</i>			
Mode	points_label_n_mode	choice box	don't include point name include point name in label
<i>label mode.</i>			
X (mm)	points_label_n_x	input	
<i>horizontal adjustment to position of label.</i>			
Y (mm)	points_label_n_y	input	
<i>height adjustment to position of label.</i>			
Angle (dms)	points_label_n_angle	input	
<i>rotation of label about point.</i>			
Colour	points_label_n_colour	colour box	
<i>colour of label</i>			
Size (mm)	points_label_n_size	input	
<i>size of label. A value of 0 = no label</i>			
Textstyle	points_label_n_textstyle	text box	
<i>textstyle of label</i>			
Pre-text	points_label_n_pre_text	input	
<i>text before label</i>			
Post-text	points_label_n_post_text	input	
<i>text after label</i>			
Justification	points_label_n_justification	just. box	bottom-left bottom-centre bottom-right bottom-decimal middle-left middle-centre middle-right middle-decimal top-left top-centre top-right top-decimal decimal-left decimal-centre decimal-right decimal-point

justification of the label.

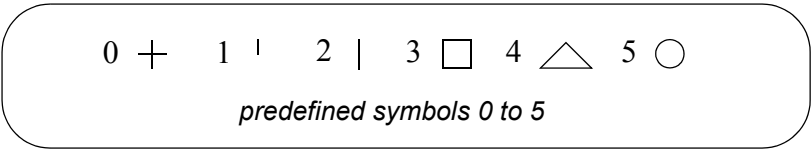
X Section Points - Symbols

Section: X-section - Symbol parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Use Set #		input	
set number as specified in the Define set#			
Mode	points_symbol_n_mode	choice box	cross (0) up from centre of box (1) up and down from centre of box (2) square (3) triangle, base at bottom (4) circle (5) use a plot symbol

symbol mode.



if a plot symbol is to be used, the points_symbol_n_style parameter must be specified.

Symbol	points_symbol_n_style	plot symbols	
a valid plot symbol can be selected.			
Position	points_symbol_n_position	choice box	above point value above top of boxes above top of graph area to primary string to tin 1 to tin 2 to tin 3 to tin 4 to tin 5 to tin 6 to tin 7 to tin 8 to tin 9 to tin 10

above point position.

X (mm)	points_symbol_n_x	input	
horizontal adjustment to position of symbol.			
Y (mm)	points_symbol_n_y	input	
height adjustment to position of symbol.			
Angle (dms)	points_symbol_n_angle	input	
rotation of symbol about point.			

Colour points_symbol_n_colour colour box
colour of symbol

Size (mm) points_symbol_n_size input
size of symbol. A value of 0 = no symbol

Please continue to the next section [Hatching Cut/Fill](#).



Hatching Cut/Fill

This option is used to hatch cut and/or fill areas between sets of tins.

For each set, the name of the two tins, the hatch linestyle, colour and separation and whether cut and/or fill regions are required are all user definable.

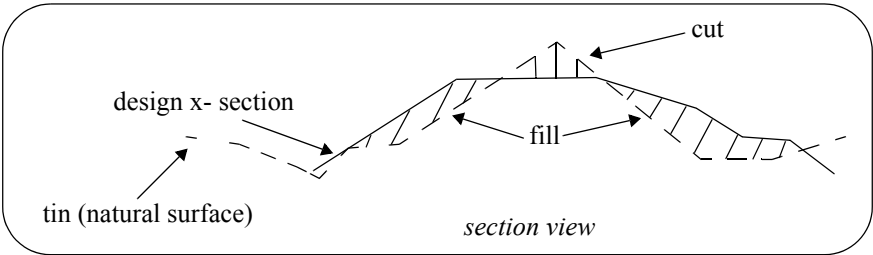
Up to twenty (20) separate sets of tins may be hatched.

Section: Hatching cut/fill - Tin parameters

Panel Field	Parameter name	Type
Define Set #		input
set number to be used to define different original/new tin sets.		
Original tin	hatch_original_tin_n	tin box
tin_name for original surface		
New tin	hatch_new_tin_n	tin box
tin_name for final surface		

Notes

- (a) cut is when the new tin is below the original tin.
fill is when the new tin is above the original tin.
- (b) cut hatching is turned off by setting hatch_cut_separation_n to 0.0.
fill hatching is turned off by setting hatch_fill_separation_n to 0.0.



Hatching Cut/Fill - Cut

Section: Hatching cut/fill - Cut parameters

Panel Field	Parameter name	Type
Use Set #		input
set number as specified in the Define set#.		
Cut separation (mm)	hatch_cut_separation_n	input
distance between cut hatch lines. If 0, no hatching.		
Cut hatch angle (dms)	hatch_cut_angle_n	input
angle of hatching.		
Cut colour	hatch_cut_colour_n	colour box
colour of the hatching.		
Cut linestyle	hatch_cut_linestyle_n	linestyle box
linestyle of the hatching.		
Draw sides of cuts	hatch_cut_draw_sides_n	choice box

draw mode for sides of cut regions.

Draw original tin	hatch_cut_draw_original_n	choice box
<i>draw mode for sides of original tin in cut.</i>		

Draw new tin	hatch_cut_draw_new_n	choice box
<i>draw mode for sides of new tin in cut.</i>		

Hatching Cut/Fill - Fill

Section: Hatching cut/fill - Fill parameters

Panel Field	Parameter name	Type
Use Set #		input
<i>set number as specified in the Define set#.</i>		
Fill separation (mm)	hatch_fill_separation_n	input
<i>distance between fill hatch lines. If 0, no hatching.</i>		
Fill hatch angle (dms)	hatch_fill_angle_n	input
<i>angle of hatching.</i>		
Fill colour	hatch_fill_colour_n	colour box
<i>colour of the hatching.</i>		
Fill linestyle	hatch_fill_linestyle_n	linestyle box
<i>linestyle of the hatching.</i>		
Draw sides of fills	hatch_fill_draw_sides_n	choice box
<i>draw mode for sides of fill regions.</i>		
Draw original tin	hatch_fill_draw_original_n	choice box
<i>draw mode for sides of original tin in fill.</i>		
Draw new tin	hatch_fill_draw_new_n	choice box
<i>draw mode for sides of new tin in fill.</i>		

Please continue to the next section [Cut/Fill Area Labels](#).

Cut/Fill Area Labels

This section of documentation is a work in progress and will be updated in subsequent releases.

Section: Cut/Fill area labels

Panel Field	Parameter name	Type
Label cut/fill	cut_fill_labels_grid	input
Label mode	cut_fill_labels_grid	input
Text size (mm)	cut_fill_labels_grid	input
Label position	cut_fill_labels_grid	input
X off (mm)	cut_fill_labels_grid	input
Y off (mm)	cut_fill_labels_grid	input
Angle (dms)	cut_fill_labels_grid	input
Pre text	cut_fill_labels_grid	input
Post text	cut_fill_labels_grid	input
Decimal places	cut_fill_labels_grid	input
Units factor	cut_fill_labels_grid	input
Colour	cut_fill_labels_grid	input
Textstyle	cut_fill_labels_grid	input
Justification	cut_fill_labels_grid	input

Please continue to the next section [Cuts](#).

Cuts

The cuts that each x-section string makes though strings in any user-specified model, can be automatically labelled on the x-section plots.

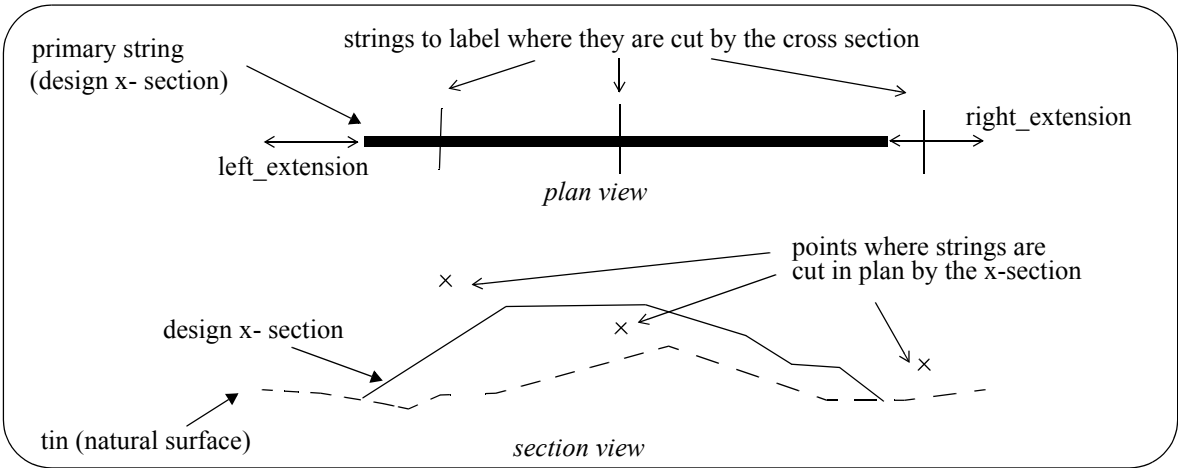
The **height**, **offset**, **name**, **attributes**, **diameter**, **x** and **y coordinates**, **3d length of CL until cut point** of the cut string can be labelled as well as a **symbol** drawn. The height of tins at the same offset value can also be labelled.

The offset position for the labelling is the offset of the cut string.

The height position for the labelling can be specified as the:

- (a) top of the boxes on the x-section,
- (b) above the maximum height of the strings on the plot,
- (c) height value of the cut string,
- (d) height of the x-section string (the primary string),
- (e) height of a tin.

The actual position of the label is defined relative to the above point.



Note: Only case (c) involves the actual height of the cut string. For all other cases, only the offset of the cut string is used. Hence, for all cases except (c), the string does need to have a sensible height to be used for cuts through strings. For example, a boundary string may have null heights but only the offset is required and the height of the tin at that offset can be used as the height (case (e)).

The method for specifying which strings are to be checked for cuts is by first specifying the **model** which contains the strings, and then a **name mask** which is used to restrict the strings in the model to only those whose names match the name mask.

Up to twenty five different sets of models and name masks can be used so that different cut sets can be labelled in different ways.

Section: Cuts - Model/Name mask parameters

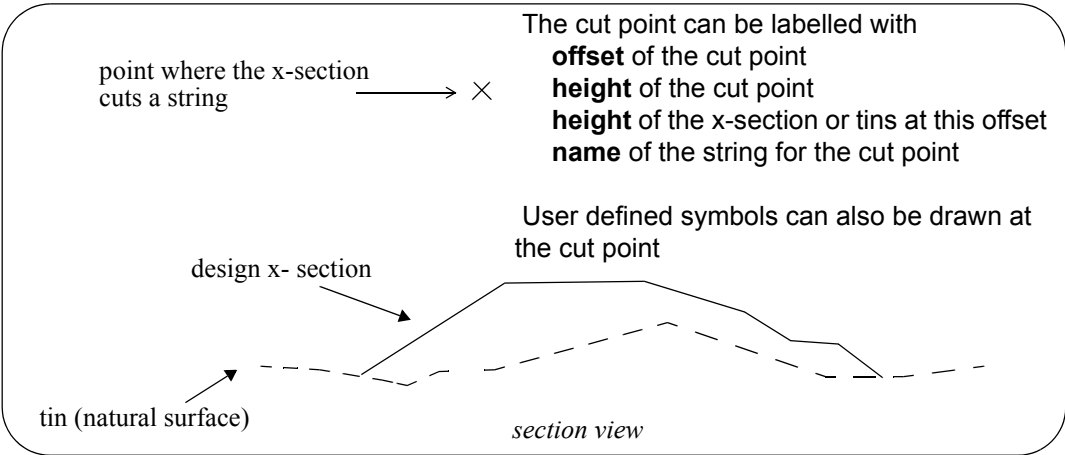
Panel Field	Parameter name	Type
Define Set #		input
<i>set number to be used to define different model/mask sets.</i>		
Model	cuts_n_model	model box
<i>model from which cut masks are derived</i>		
Name mask	cuts_n_mask	input
<i>text string containing the name masks, each separated by one or more spaces, to test the string name</i>		

against. Each mask can include wild cards and wild characters.

For example: "ke*" or,
 "?bank*" or, if both masks are required,
 "ke* ?bank*"

If cuts_n_mask is blank, then all strings in the model are used. This is equivalent to name mask being set to "*".

All strings in the model cuts_n_model whose name satisfy the name mask cuts_n_mask are then checked for cuts with the x-sections, and if a cut occurs, the cut point will be labelled according to the rest of the parameters in the nth set.



Cuts - Offsets

Section: Cuts - Offset parameters

Panel Field	Parameter name	Type	Pop-Up
Use Set #		input	
set number as specified in the Define set#.			
Position	cuts_offset_n_position	choice box	at cut string height above top of boxes above top of graph area to primary string to tin 1 to tin 2 to tin 3 to tin 4 to tin 5 to tin 6 to tin 7 to tin 8 to tin 9 to tin 10
position of offset label.			
X (mm)	cuts_offset_n_x	input	
horizontal adjustment to position of offset text.			
Y (mm)	cuts_offset_n_y	input	
vertical adjustment to position of offset text.			
Angle (dms)	cuts_offset_n_angle	input	

rotation of offset text about position.

Colour cuts_offset_n_colour colour box
colour of offset text.

Size (mm) cuts_offset_n_size input
size of offset text. A value of 0 means no label.

Textstyle cuts_offset_n_textstyle text box
textstyle of offset text.

Pre-text cuts_offset_n_pre_text input
text before offset text.

Post-text cuts_offset_n_post_text input
text after offset text.

Justification cuts_offset_n_justification justification box



justification of the offset text.

Decimals cuts_offset_n_no_decimals input
number of decimals in offset.

Cuts - Heights

Section: Cuts - Height parameters

Panel Field	Parameter name	Type	Pop-Up
Use Set #		input	
	<i>set number as specified in the Define set#.</i>		
Mode	cuts_height_n_mode	choice box	use height of cut point use real height above boxes height of primary string use height of tin 1

use height of tin 2
use height of tin 3
use height of tin 4
use height of tin 5
use height of tin 6
use height of tin 7
use height of tin 8
use height of tin 9
use height of tin 10

determines which height value is labelled.

Position	cuts_height_n_position	choice box	at cut string above top of boxes above top of graph area to primary string to tin 1 to tin 2 to tin 3 to tin 4 to tin 5 to tin 6 to tin 7 to tin 8 to tin 9 to tin 10
-----------------	------------------------	------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

position of height label.

X (mm)	cuts_height_n_x	input
---------------	-----------------	-------

horizontal adjustment to position of height text.

Y (mm)	cuts_height_n_y	input
---------------	-----------------	-------

vertical adjustment to position of height text.

Angle (dms)	cuts_height_n_angle	input
--------------------	---------------------	-------

rotation of height text about position.

Colour	cuts_height_n_colour	colour box
---------------	----------------------	------------

colour of height text.

Size (mm)	cuts_height_n_size	input
------------------	--------------------	-------

size of height text. A value of 0 means no label.

Textstyle	cuts_height_n_textstyle	text box
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textstyle of height text.

Pre-text	cuts_height_n_pre_text	input
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text before height text.

Post-text	cuts_height_n_post_text	input
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text after height text.

Justification	points_height_n_justification	justification box
left	0	
center	1	
right	2	

Select Choice

- bottom-left
- bottom-centre
- bottom-right
- bottom-decimal
- middle-left
- middle-centre
- middle-right
- middle-decimal
- top-left
- top-centre
- top-right
- top-decimal
- decimal-left
- decimal-centre
- decimal-right
- decimal-point

[Sameas]

justification of the height text.

```
Decimals          cuts_height_n_no_decimals
                  input
```

number of decimals in height.

Cuts - Diameters

Section: Cuts - Diameter parameters

Panel Field	Parameter name	Type	Pop-Up
Use Set #		input	

set number as specified in the Define set#.

Position	cuts	diam	n	position	choice box
----------	------	------	---	----------	------------

Select Choice

- at cut string height
- above top of boxes
- above top of graph area
- on primary string
- on tin 1
- on tin 2
- on tin 3
- on tin 4
- on tin 5
- on tin 6
- on tin 7
- on tin 8
- on tin 9
- on tin 10

position of diameter label.

X (mm) <i>horizontal adjustment to position of text.</i>	cuts_diam_n_x	input
Y (mm) <i>vertical adjustment to position of text.</i>	cuts_diam_n_y	input
Angle (dms) <i>rotation of diameter text about position.</i>	cuts_diam_n_angle	input
Colour <i>colour of height text.</i>	cuts_diam_n_colour	colour box
Size (mm) <i>size of diameter text. A value of 0 means no label.</i>	cuts_diam_n_size	input
Textstyle <i>textstyle of diameter text.</i>	cuts_diam_n_textstyle	text box
Pre-text <i>text before diameter text.</i>	cuts_diam_n_pre_text	input
Post-text <i>text after diameter text.</i>	cuts_diam_n_post_text	input
Justification <i>justification of the diameter text.</i>	points_diam_n_justification	justification box



Factor	cuts_diam_n_factor	input
Decimals <i>number of decimals in diameter value.</i>	cuts_diam_n_no_decimals	input

Cuts - Labels
Section: Cuts - Label parameters

Panel Field	Parameter name	Type	Pop-Up
Use Set # <i>set number as specified in the Define set#.</i>		input	
Position <i>position of label text.</i>	cuts_label_n_position	choice box	at cut string height above top of boxes above top of graph area to primary string to tin 1 to tin 2 to tin 3 to tin 4 to tin 5 to tin 6 to tin 7 to tin 8 to tin 9 to tin 10
Mode <i>determines whether the label includes the cut string name.</i>	cuts_label_n_mode	choice box	don't include string name include cut string name
X (mm) <i>horizontal adjustment to position of label.</i>	cuts_label_n_x	input	
Y (mm) <i>vertical adjustment to position of label.</i>	cuts_label_n_y	input	
Angle (dms) <i>rotation of label about position.</i>	cuts_label_n_angle	input	
Colour <i>colour of label.</i>	cuts_label_n_colour	colour box	
Size (mm) <i>size of label. A value of 0 means no label.</i>	cuts_label_n_size	input	
Textstyle <i>textstyle of label.</i>	cuts_label_n_textstyle	text box	
Pre-text <i>text before label.</i>	cuts_label_n_pre_text	input	
Post-text <i>text after label.</i>	cuts_label_n_post_text	input	

Justification

points_label_n_justification

justification box



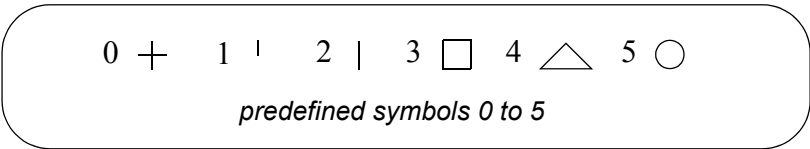
justification of the label.

Cuts - Symbols

Section: Cuts - Symbol parameters

Panel Field	Parameter name	Type	Pop-Up
Use Set #		input	
<i>set number as specified in the Define set#.</i>			
Mode	cuts_symbol_n_mode	choice box	cross (0) up from centre of box (1) up&down from box centre(2) square (3) triangle, base at bottom (4) circle (5) use a plot symbol

symbol mode.



Note: *If a plot symbol is to be used, the cuts_symbol_n_style parameter must be specified.*

Symbol	cuts_symbol_n_style	plot symbols
<i>a valid plot symbol can be selected.</i>		

Position	cuts_symbol_n_position	choice box	at cut string height above top of boxes above top of graph area to primary string to tin 1 to tin 2 to tin 3
----------	------------------------	------------	--------------------------------------------------------------------------------------------------------------------------------

to tin 4
to tin 5
to tin 6
to tin 7
to tin 8
to tin 9
to tin 10

position of symbol.

X (mm) cuts_symbol_n_x input
horizontal adjustment to position of symbol.

Y (mm) cuts_symbol_n_y input
vertical adjustment to position of symbol.

Angle (dms) cuts_symbol_n_angle input
rotation of symbol about point.

Colour cuts_symbol_n_colour colour box
colour of symbol.

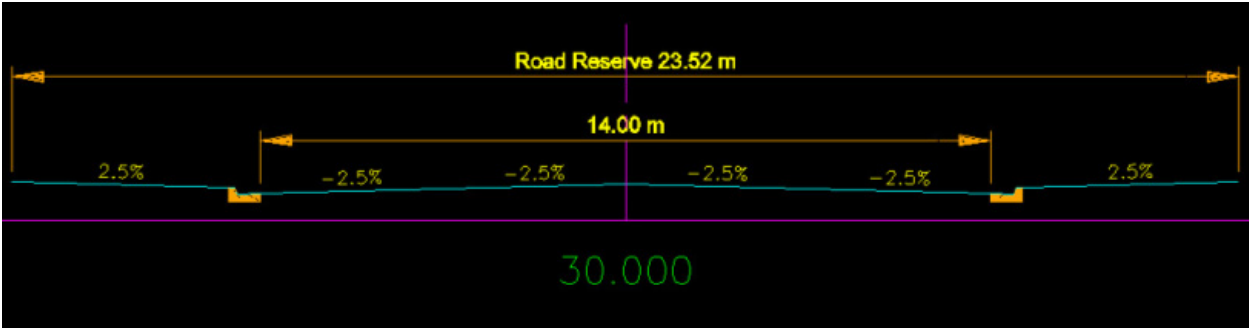
Size (mm) cuts_symbol_n_size input
size of symbol. A value of 0 means no symbol.

Please continue to the next section [Paired Cuts - X Sections](#).

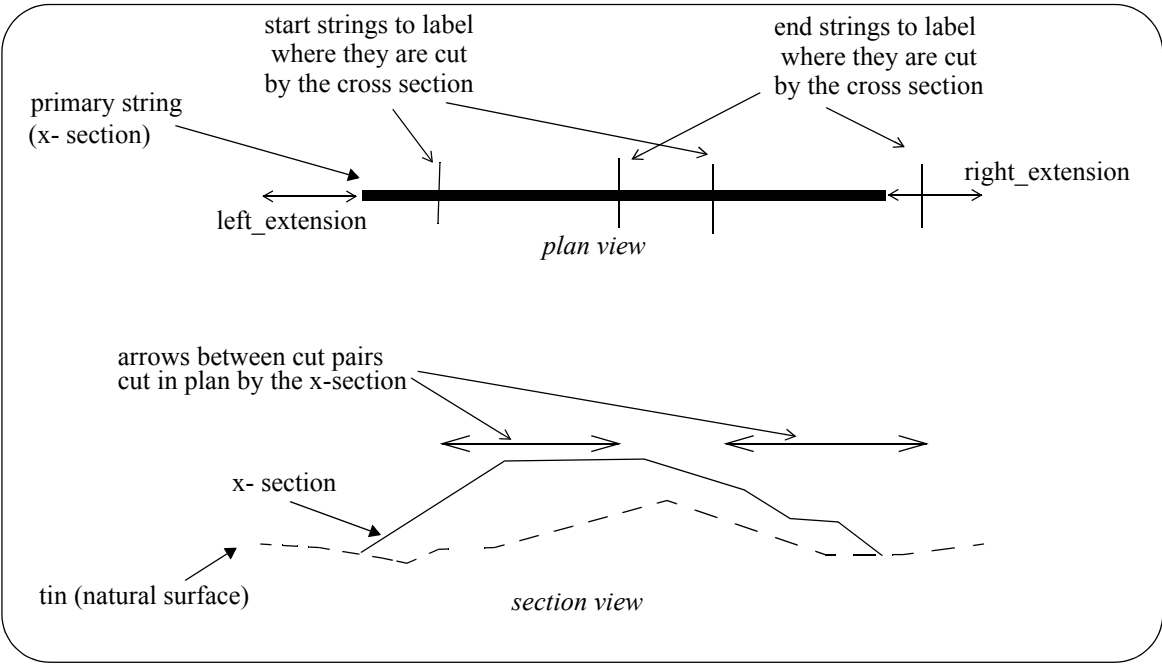
Paired Cuts - X Sections

Paired Cuts uses pairs of strings and where both strings cut each x-section, the cuts on the x-plot can be labelled with information such as

- (a) the name of the first and second cut strings
- (b) attributes from the first and second cut string
- (c) offset distance between the two cuts of the pair
- (d) 3d length between the two cuts of the pair
- (e) the offsets on the x-section of the first and second cuts of the pair



Symbols can be drawn at the offsets of the first and second cuts (at a height specified when defining the Cut sets), and a line drawn between the symbols. Using both the line and a symbol of an arrow head makes an arrow between the two cuts.



The method for specifying which strings are to be checked for paired cuts is by first specifying the **models** (using wild cards and characters) that contains the strings, and then a **start name mask** to select the all the strings that are to be the first strings in a cut pair, and an **end name mask** to select all the strings that are the second strings in a cut pair.

For a x-section, all the cuts of the selected **start** strings are found and the cuts ordered by the offset of the cut on the x-section. Then all the cuts of the selected **end** strings are found and the cuts ordered by the offset of the cut on the x-section.

Up to twenty five different sets of models and name masks can be used so that different paired cut sets can be labelled in different ways.

Panel Field	Parameter name	Type
Define Set #		input

Model	pairing_n_model	model box
<i>models (the name can include wild cards (*) and wild characters (?)) from which start and end cut masks are derived.</i>		

text string containing the name masks to select the start strings, each separated by one or more spaces, to test the string names against. If the name include spaces then it must be enclosed in the quotes " (eg "bench 2").

For example: "ke*" or,
 "?bank*" or, if both masks are required,
 "ke* ?bank*"

text string containing the name masks to select the end strings, each separated by one or more spaces, to test the string names against. If the name include spaces then it must be enclosed in the quotes " (eg "bench 2")

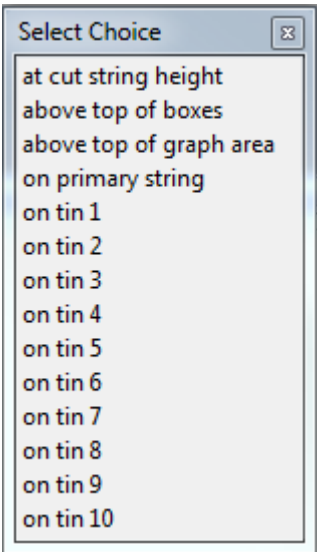
For example: "ke*" or;
 "?bank*" or, if both masks are required,
 "ke* ?bank*"

If **Start name mask** is blank and **End name mask** is not blank, then all strings in the models that are not used as end strings, are used as start string.

*If **End name mask** is blank and **Start name mask** is not blank, then all strings in the models that are not used as start strings, are used as end string.*

*This is currently not operational: If **Start name mask** and **End name mask** are both blank, then all strings in the models are used. All the strings are cut by the x-section are ordered by offset, and successive pairs of cuts taken to be the cut pairs. There could be one remaining cut point (it has the largest offset) and if so, it is taken to be orphaned start point.*

Position pairing_n_position choice box



where to get the z-values to use for the two cut positions. This is used in conjunction with the choice in the Adopted height field.

If left blank, **at cut string height** is used.

Adopted height pairing_n_height choice box lower position, higher position
start position, end position

for the choice selected in the Position field, there will be a z-value at the first cut and another z-value at the end cut. The Adopted height says which of the two z-value to use for placing symbols, lines between cuts, text from Attributes and the Offsets of the first cut and the second cut.

If lower (higher) position, the smaller (greater) of the two z-values will be used.

If start (end), the z-value of the first (second) cut of the cut point pair will be used.

If left blank, **lower position** is used.

Include orphaned start ? pairing_n_orphan_start choice box yes, no

if **Yes** and there are start cuts after the last end cut (and so can't be paired), then the last start cut (i.e. the one with the largest offset) is taken as an orphaned start and it is labelled as though there is a matching end at the end of the x-section.

if **No** and there are start cuts after the last end cut, then those start cut are ignored.

If left blank, **No** is used.

Include orphaned ends ? pairing_n_orphan_end choice box yes, no

if **Yes** and there are end cuts before the first start cut, then the first end cut (the one with the smallest offset) is taken as an orphaned end and it is labelled as though there is a matching start at the beginning of the x-section.

if **No** and there are end cuts before the first start cut, then those end cut are ignored.

If left blank, **No** is used.

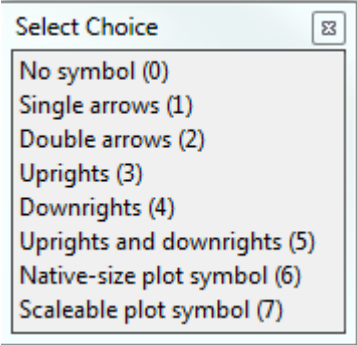
Paired Cuts - Lines and Symbols

Symbols can be placed at the start and end cut offsets (at the z-value given by the Position and Adopted height columns when defining the Sets), and a line can also be drawn between the cuts at that z-value. Having both the line and a symbol forms an arrow between the cuts pair.

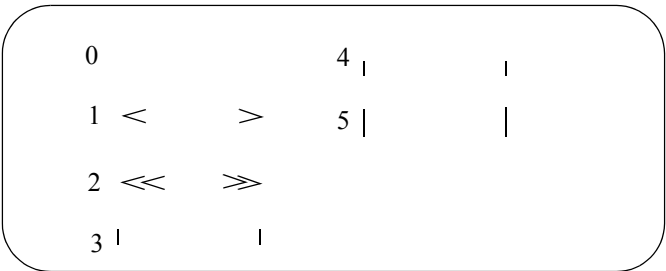
Section: Pairing - Lines and symbol parameters

Panel Field	Parameter name	Type	Pop-Up
Use Set #		input	
set number as specified in the Define set #.			

Symbol type	pairing_line_symbols_n_symbol	choice box
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type of symbol at each end of the cut pair:



for cases 6 and 7, a plot symbol is to be used and is given in the Symbol field

The height used for the symbol at both ends of the cuts pair is given by the Position and Adopted height column in the Set definition.

Symbol	pairing_line_symbols_n_user_symbol	plot symbols
--------	------------------------------------	--------------

for Symbol type 6 and 7, the plot symbol to be used at each cut point.

For Symbol type 0 to 5, this field is not used.

The height used for the symbol at both ends is given by the Position and Adopted height columns in the Set definition.

Symbol colour	pairing_line_symbols_n_symbol_colour	colour box
---------------	--------------------------------------	------------

colour of the symbol

Draw line	pairing_line_symbols_n_line	choice box	No line, Draw line
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if Draw line, draw a line between the start and end cuts for each cut pair.

If No line, no line is drawn between the start and end cuts for each cut pair.

The height used for the line at both ends is given by the Position and Adopted height columns in the Set definition.

Line colour	pairing_line_symbols_n_line_colour	colour box
-------------	------------------------------------	------------

colour of the line between the start and end cuts for each cut pair

Left symbol rotation	pairing_line_symbols_n_left_rotate	measure box
----------------------	------------------------------------	-------------

angle (measured counterclockwise from the positive x-axis with units of degrees in [HP Notation](#)) to rotate the symbol at the start cut point for the cut point pair.

If there is no value then the rotation is 0.

Right symbol rotation	pairing_line_symbols_n_right_rotate	measure box
-----------------------	-------------------------------------	-------------

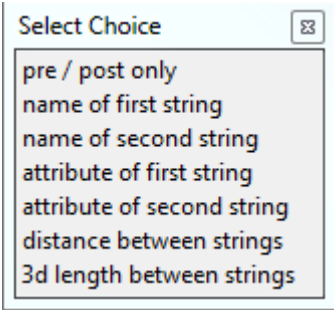
angle (measured counterclockwise from the positive x-axis with units of degrees in [HP Notation](#)) to rotate the symbol at the end cut point for the cut point pair.
If there is no value then the rotation is 0.

X (mm)	pairing_line_symbols_n_x	measure box
horizontal adjustment to the position of the symbol.		
Y (mm)	pairing_line_symbols_n_y	measure box
vertical adjustment to the position of the symbol.		
Size	pairing_line_symbols_n_size	measure box
size of symbol. A value of 0 means no symbol.		

Paired Cuts - Labels

Section: Pairing - Label parameters

Panel Field	Parameter name	Type	Pop-Up
Use Set #		input	
set number as specified in the Define set # .			
Mode	pairing_label_n_mode	choice box	



type of label to write between the start and end points of the cuts pair
The height used for the label is given by the Position and Adopted height columns in the Set definition.

Attribute name	pairing_label_n_attribute	text box
if Mode is attribute of first string or attribute of second string , this is the name of the attribute to use as the label		
Offset	pairing_label_n_offset	measure box
the text is raised by this amount above the line between the cut pair		
Colour	pairing_label_n_colour	colour box
colour of the text		
Size (mm)	pairing_label_n_size	measure box
size of the text in millimetres. A value of 0 means no text.		
Textstyle	pairing_label_n_textstyle	textstyle box
the textstyle for the text		
Pre-text	pairing_label_n_pre_text	text box
text to draw before the label. This can include spaces, including one or more spaces after the last non blank character of Pre-text.		
Post-text	pairing_label_n_post_text	text box

text to draw after the label. This can include spaces, including one or more spaces before the first non blank character of Post-text.

Decimals pairing_label_n_no_decimals number box

if the label is a number, then Decimals is the number of decimal places to write the number out to.

If > 0, trailing zeros are **removed** after the decimal point.

If <0, the absolute value is taken as the number of decimal places to report i.e. no trailing zeros are removed. For example -3 means that there is always 3 figures after the decimal place.

Leave gap for text pairing_label_n_?? tick box

if ticked then a gap in the line between the cuts pair is left large enough for the label and the pre-text and post-text.

If not ticked then no gap is left in the line between the cuts pair.

Rotate text to fit pairing_label_n_roate_text tick box

if ticked, then if the label and the pre-text and post-text will not fit between the start cut and end cut of the cut pair, the text is rotated through ninety degrees.

If not ticked, then the label text is drawn even though it will run over the ends of the cut pair.

Paired Cuts - Start Offset

The Offset (on the x-section) of the first point of the cut pair can be labelled.

The text for the label consists of pre-text followed by Offset value followed by post-text.

Section: Pairing - Start Offset parameters

Panel Field	Parameter name	Type	Pop-Up
Use Set #		input	

set number as specified in the **Define set #**.

The height used for the text is given by the Position and Adopted height columns in the Set definition. This is then adjusted by the field Y (mm).

X (mm) pairing_start_offset_n_x measure box

for placing the text: horizontal adjustment from the offset of the first cut.

Y (mm) pairing_start_offset_n_y measure box

for placing the text: the vertical adjustment to the height given by the Position and Adopted height columns in the Set definition

Angle (dms) pairing_start_offset_n_angle measure box

angle (measured counterclockwise from the positive x-axis with units of degrees in [HP Notation](#)) to rotate the text

Colour pairing_start_offset_n_colour colour box

colour of the text

Size (mm) pairing_start_offset_n_size measure box

size of the text in millimetres. A value of 0 means no text.

Textstyle pairing_start_offset_n_textstyle textstyle box

the textstyle for the text

Pre-text pairing_start_offset_n_pre_text text box

text before the Offset value. This can include spaces, including one or more spaces after the last non blank character of Pre-text.

Post-text	pairing_start_offset_n_post_text	text box
<i>text after the Offset value. This can include spaces, including one or more spaces before the first non blank character of Post-text.</i>		
Justification	pairing_start_offset_n_justification	justification box



justification of the text.

Decimals	pairing_start_offset_n_no_decimals	number box
<i>the number of decimal places for the offset value</i>		
<i>If > 0, trailing zeros are removed after the decimal point.</i>		
<i>If <0, the absolute value is taken as the number of decimal places to report i.e. no trailing zeros are removed. For example -3 means that there is always 3 figures after the decimal place.</i>		

Paired Cuts - End Offset

The Offset on the x-section of the second point of the cut pair can be labelled.
The label consists of pre-text then the Offset value followed by post-text.

Section: Pairing - End Offset parameters

Panel Field	Parameter name	Type	Pop-Up
Use Set #		input	
<i>set number as specified in the Define set #.</i>			
<i>The height used for the text is given by the Position and Adopted height columns in the Set definition. This is then adjusted by the field Y (mm).</i>			
X (mm)	pairing_end_offset_n_x	measure box	
<i>for placing the text: horizontal adjustment from the offset of the second cut.</i>			
Y (mm)	pairing_end_offset_n_y	measure box	
<i>for placing the text: the vertical adjustment to the height given by the Position and Adopted height columns in the Set definition</i>			
Angle (dms)	pairing_end_offset_n_angle	measure box	

angle (measured counterclockwise from the positive x-axis with units of degrees in [HP Notation](#)) to rotate the text

Colour pairing_end_offset_n_colour colour box
colour of the text

Size (mm) pairing_end_offset_n_size measure box
size of the text in millimetres. A value of 0 means no text.

Textstyle pairing_end_offset_n_textstyle textstyle box
the textstyle for the text

Pre-text pairing_end_offset_n_pre_text text box
text before the Offset value. This can include spaces, including one or more spaces after the last non blank character of Pre-text.

Post-text pairing_end_offset_n_post_text text box
text after the Offset value. This can include spaces, including one or more spaces before the first non blank character of Post-text.

Justification pairing_start_offset_n_justification justification box



justification of the text.

Decimals pairing_start_offset_n_no_decimals number box

the number of decimal places for the Offset value

*If > 0, trailing zeros are **removed** after the decimal point.*

If <0, the absolute value is taken as the number of decimal places to report i.e. no trailing zeros are removed. For example -3 means that there is always 3 figures after the decimal place.

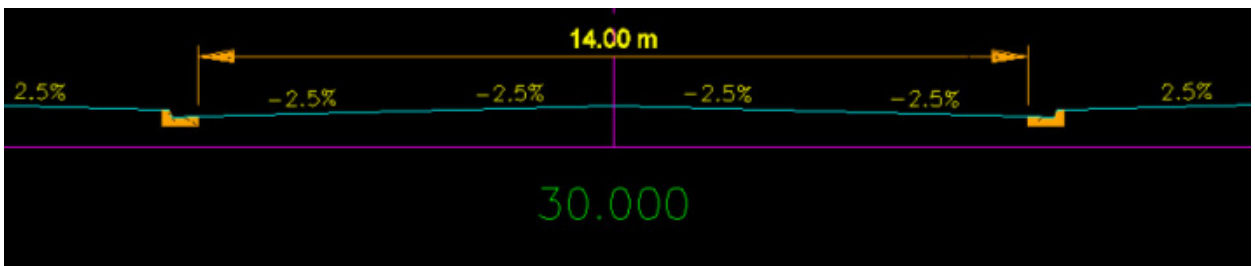
Please continue to the next section [Paired Points](#).

Paired Points

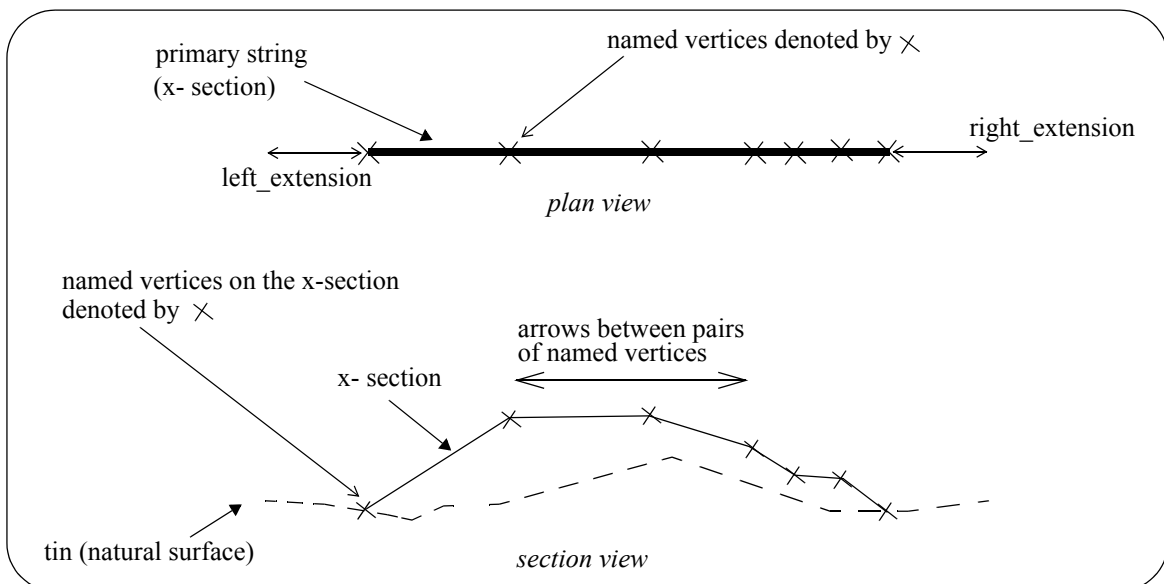
Most cross sections are created with the vertices having vertex names which correspond to the strings created by template links, or MTF modifiers, or the names of the cut strings when cross sections are created by cutting through strings.

The **Paired Points** option enables a user to link pairs of these vertex names from the cross section being plotted (to create a points pair), and the points from the pair can be labelled with information such as

- (a) the name of the first and second point of the pair
- (b) vertex attributes of the cross section from the first and second points of the pair
- (c) distance between the two points in a pair
- (d) 3d length between the two points in a pair
- (e) the offsets on the x-section of the first and second points in a pair



Symbols can be drawn at the offsets of the first and second points of a pair (at a height specified when defining the Cut sets), and a line drawn between the symbols. Using both the line and a symbol of an arrow head makes an arrow between the two cuts in a pair.



The method for specifying which named vertices are to be used for paired points is by a **start name mask** (using wild cards and characters) to select the all the vertices that are to be the first points in a pair, and an **end name mask** (using wild cards and characters) to select all the vertices that are the second points in a pair.

For a x-section, all the named vertices of the selected **start points** are found and the points ordered by the offset of the point on the x-section. Then all the named vertices of the selected **end points** are found and the points ordered by the offset of the point on the x-section.

The start points are then processed and each start point is paired with the next end point with a larger offset than the start point. It is possible that there are end points before the first start point (orphaned end points) and start points with no following end point (orphaned start points).

Up to twenty five different sets of name masks can be used so that different paired point sets can be labelled in different ways.

Section: Pairing - Model/Name mask parameters

Panel Field	Parameter name	Type
Define Set #		input

set number to be used to define different name mask sets.

Start name mask

text string containing the name masks to select the start points, each separated by one or more spaces, to test the x-section vertex names against. If the name includes spaces then it must be enclosed in the quotes " (eg "bench 2").

Each mask can include wild cards (*) and wild characters (?).

For example:

"ke*"	or,
"?bank*"	or, if both masks are required,
"ke* ?bank*"	

End name mask input

text string containing the name masks to select the end points, each separated by one or more spaces, to test the x-section vertex names against. If the name include spaces then it must be enclosed in the quotes " (eg "bench 2")

Each mask can include wild cards and wild characters.

For example: "ke*" or;
 "?bank*" or, if both masks are required,
 "ke* ?bank*"

Note

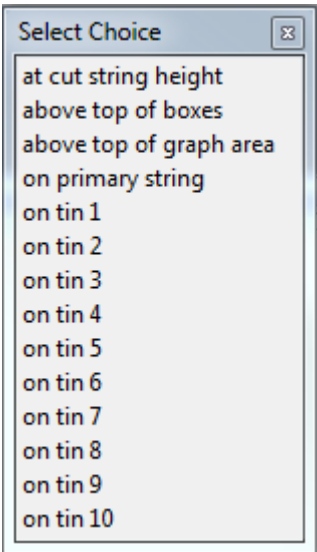
If **Start name mask** is blank and **End name mask** is not blank, then all vertices on the x-section that are not used as end points, are used as start points.

*If **End name mask** is blank and **Start name mask** is not blank, then all vertices on the x-section that are not used as start points, are used as end points.*

*If **End name mask** and **Start name mask** are both blank, then all vertices on the x-section are used. Successive pairs of vertices taken to be the point pairs. There could be one remaining point (it has the largest offset) and if so, it is taken to be orphaned start point.*

Position

choice box



where to get the z-values to use for the two paired points. This is used in conjunction with the choice in the Adopted height field.

If left blank, **at point height** is used.

Adopted height	pairing_n_height	choice box	lower position, higher position start position, end position
-----------------------	------------------	------------	-----------------------------------------------------------------

for the choice selected in the Position field, there will be a z-value at the first point and another z-value at the second point of the pair. The Adopted height says which of the two z-value to use for placing symbols, lines between paired points, text from Attributes and the Offsets of the first point and the second point of a point pair.

If lower (higher) position, the smaller (greater) of the two z-values will be used.

If start (end), the z-value of the first (second) cut of the cut point pair will be used.

If left blank, **lower position** is used.

Include orphaned start ?	pairing_n_orphan_start	choice box	yes, no
---------------------------------	------------------------	------------	---------

if **Yes** and there are start points after the last end point (and so can't be paired), then the last start point (i.e. the one with the largest offset) is taken as an orphaned start and it is labelled as though there is a matching end at the end of the x-section.

if **No** and there are start points after the last end point, then those start points are ignored.

If left blank, **No** is used.

Include orphaned ends ?	pairing_n_orphan_end	choice box	yes, no
--------------------------------	----------------------	------------	---------

if **Yes** and there are end points before the first start point, then the first end point (the one with the smallest offset) is taken as an orphaned end and it is labelled as though there is a matching start at the beginning of the x-section.

if **No** and there are end points before the first start point, then those end points are ignored.

If left blank, **No** is used.

Paired Points - Lines and Symbols

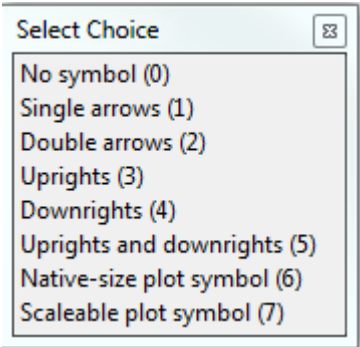
Symbols can be placed at the start and end point offsets (at the z-value given by the Position and Adopted height columns when defining the Sets), and a line can also be drawn between the paired points at that z-value. Having both the line and a symbol forms an arrow between the paired points.

Section: Pairing - Lines and symbol parameters

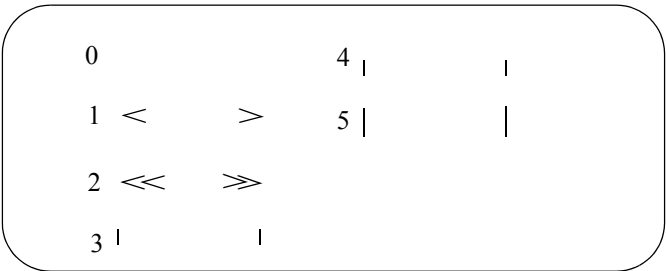
Panel Field	Parameter name	Type	Pop-Up
Use Set #		input	

set number as specified in the **Define set #**.

Symbol type	pairing_line_symbols_n_symbol	choice box
-------------	-------------------------------	------------



type of symbol at each end of the points pair:



for cases 6 and 7, a plot symbol is to be used and is given in the Symbol field

The height used for the symbol at both ends is given by the Position and Adopted height column in the Set definition.

Symbol	pairing_line_symbols_n_user_symbol	plot symbols
--------	------------------------------------	--------------

for Symbol type 6 and 7, the plot symbol to be used at each paired point.

For Symbol type 0 to 5, this field is not used.

The height used for the symbol at both ends is given by the Position and Adopted height columns in the Set definition.

Symbol colour	pairing_line_symbols_n_symbol_colour	colour box
---------------	--------------------------------------	------------

colour of the symbol

Draw line	pairing_line_symbols_n_line	choice box	No line, Draw line
-----------	-----------------------------	------------	--------------------

if Draw line, draw a line between the start and end points for each point pair.

If No line, no line is drawn between the start and end points for each point pair.

The height used for the line at both ends is given by the Position and Adopted height columns in the Set definition.

Line colour	pairing_line_symbols_n_line_colour	colour box
-------------	------------------------------------	------------

colour of the line between the start and end points for each point pair

Left symbol rotation	pairing_line_symbols_n_left_rotate	measure box
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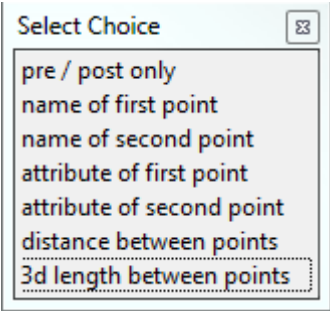
angle (measured counterclockwise from the positive x-axis with units of degrees in [HP Notation](#)) to rotate the symbol at the start point of the point pair.

If there is no value then the rotation is 0.

Right symbol rotation	pairing_line_symbols_n_right_rotate	measure box
<i>angle (measured counterclockwise from the positive x-axis with units of degrees in HP Notation) to rotate the symbol at the end point of the point pair.</i>		
<i>If there is no value then the rotation is 0.</i>		
X (mm)	pairing_line_symbols_n_x	measure box
<i>horizontal adjustment to the position of the symbol.</i>		
Y (mm)	pairing_line_symbols_n_y	measure box
<i>vertical adjustment to the position of the symbol.</i>		
Size	pairing_line_symbols_n_size	measure box
<i>size of the symbol. A value of 0 means no symbol.</i>		

Paired Points - Labels

Section: Pairing - Label parameters

Panel Field	Parameter name	Type	Pop-Up
Use Set #		input	
<i>set number as specified in the Define set #.</i>			
Mode	pairing_label_n_mode	choice box	
			
<i>type of label to write between the start and end points of the points pair</i>			
<i>The height used for the label is given by the Position and Adopted height columns in the Set definition.</i>			
Attribute name	pairing_label_n_attribute	text box	
<i>if Mode is attribute of first point or attribute of second point, this is the name of the attribute to use as the label</i>			
Offset	pairing_label_n_offset	measure box	
<i>the text is raised by this amount above the line between the point pair</i>			
Colour	pairing_label_n_colour	colour box	
<i>colour of the text</i>			
Size	pairing_label_n_size	measure box	
<i>size of the text. A value of 0 means no text.</i>			
Textstyle	pairing_label_n_textstyle	textstyle box	
<i>the textstyle for the text</i>			
Pre-text	pairing_label_n_pre_text	text box	
<i>text to draw before the label. This can include spaces, including one or more spaces after the last non blank character of the Pre-text.</i>			

Post-text	pairing_label_n_post_text	text box
<i>text to draw after the label. This can include spaces, including one or more spaces before the first non blank character of the Post-text.</i>		
Decimals	pairing_label_n_no_decimals	number box
<i>if the label is a number, then Decimals is the number of decimal places to write the number out to.</i>		
<i>If > 0, trailing zeros are removed after the decimal point.</i>		
<i>If <0, the absolute value is taken as the number of decimal places to report i.e. no trailing zeros are removed. For example -3 means that there is always 3 figures after the decimal place.</i>		
Leave gap for text	pairing_label_n_??	tick box
<i>if ticked then a gap in the line between the points pair is left large enough for the label and the pre-text and post-text.</i>		
<i>If not ticked then no gap is left in the line between the points pair.</i>		
Rotate text to fit	pairing_label_n_roate_text	tick box
<i>if ticked, then if the label and the pre-text and post-text will not fit between the start point and end point of the point pair, the text is rotated through ninety degrees.</i>		
<i>If not ticked, then the label text is drawn even though it will run over the ends of the point pair.</i>		

Paired Points - Start Offset

The offset (on the x-section) of the first point of the point pair can be labelled.
The text for the label consists of pre-text followed by Offset value followed by post-text.

Section: Pairing - Start Offset parameters

Panel Field	Parameter name	Type	Pop-Up
Use Set #		input	
<i>set number as specified in the Define set #.</i>			
<i>The height used for the text is given by the Position and Adopted height columns in the Set definition. This is then adjusted by the field Y (mm).</i>			
X (mm)	pairing_start_offset_n_x	measure box	
<i>for placing the text: horizontal adjustment from the offset of the first cut.</i>			
Y (mm)	pairing_start_offset_n_y	measure box	
<i>for placing the text: the vertical adjustment to the height given by the Position and Adopted height columns in the Set definition</i>			
Angle (dms)	pairing_start_offset_n_angle	measure box	
<i>angle (measured counterclockwise from the positive x-axis with units of degrees in HP Notation) to rotate the text</i>			
Colour	pairing_start_offset_n_colour	colour box	
<i>colour of the text</i>			
Size (mm)	pairing_start_offset_n_size	measure box	
<i>size of the text in millimetres. A value of 0 means no text.</i>			
Textstyle	pairing_start_offset_n_textstyle	textstyle box	
<i>the textstyle for the text</i>			
Pre-text	pairing_start_offset_n_pre_text	text box	
<i>text before the Offset value. This can include spaces, including one or more spaces after the last non</i>			

blank character of Pre-text.

Post-text pairing_start_offset_n_post_text text box

text after the Offset value. This can include spaces, including one or more spaces before the first non blank character of the Post-text.

Justification pairing_start_offset_n_justification justification box



justification of the text.

Decimals pairing_start_offset_n_no_decimals number box

the number of decimal places for the Offset value

*If > 0, trailing zeros are **removed** after the decimal point.*

If <0, the absolute value is taken as the number of decimal places to report i.e. no trailing zeros are removed. For example -3 means that there is always 3 figures after the decimal place.

Paired Points - End Offset

The Offset (on the x-section) of the second point of the point pair can be labelled.

The label consists of pre-text then the Offset value followed by post-text.

Section: Pairing - End Offset parameters

Panel Field	Parameter name	Type	Pop-Up
Use Set #		input	

*set number as specified in the **Define set #**.*

The height used for the text is given by the Position and Adopted height columns in the Set definition. This is then adjusted by the field Y (mm).

X (mm) pairing_end_offset_n_x measure box

for placing the text: horizontal adjustment from the Offset of the second point.

Y (mm) pairing_end_offset_n_y measure box

for placing the text: the vertical adjustment to the height given by the Position and Adopted height columns in the Set definition

Angle (dms)	pairing_end_offset_n_angle	measure box
<i>angle (measured counterclockwise from the positive x-axis with units of degrees in HP Notation) to rotate the text</i>		
Colour	pairing_end_offset_n_colour	colour box
<i>colour of the text</i>		
Size (mm)	pairing_end_offset_n_size	measure box
<i>size of the text in millimetres. A value of 0 means no text.</i>		
Textstyle	pairing_end_offset_n_textstyle	textstyle box
<i>the textstyle for the text</i>		
Pre-text	pairing_end_offset_n_pre_text	text box
<i>text before the Offset value. This can include spaces, including one or more spaces after the last non blank character of Pre-text.</i>		
Post-text	pairing_end_offset_n_post_text	text box
<i>text after the Offset value. This can include spaces, including one or more spaces before the first non blank character of Post-text.</i>		
Justification	pairing_start_offset_n_justification	justification box



justification of the text.

Decimals	pairing_start_offset_n_no_decimals	number box
<i>the number of decimal places for the Offset value</i>		
<i>If > 0, trailing zeros are removed after the decimal point.</i>		
<i>If <0, the absolute value is taken as the number of decimal places to report i.e. no trailing zeros are removed. For example -3 means that there is always 3 figures after the decimal place.</i>		

Please continue to the next section [PPFs To Include](#).

PPFs To Include

Panel Field	Parameter name	Type	Pop-Up
PPF files		input	
<i>by including pre-existing PPF files, the user can build up a modified version without having to set all the parameters.</i>			

Long Plot PPF Editor

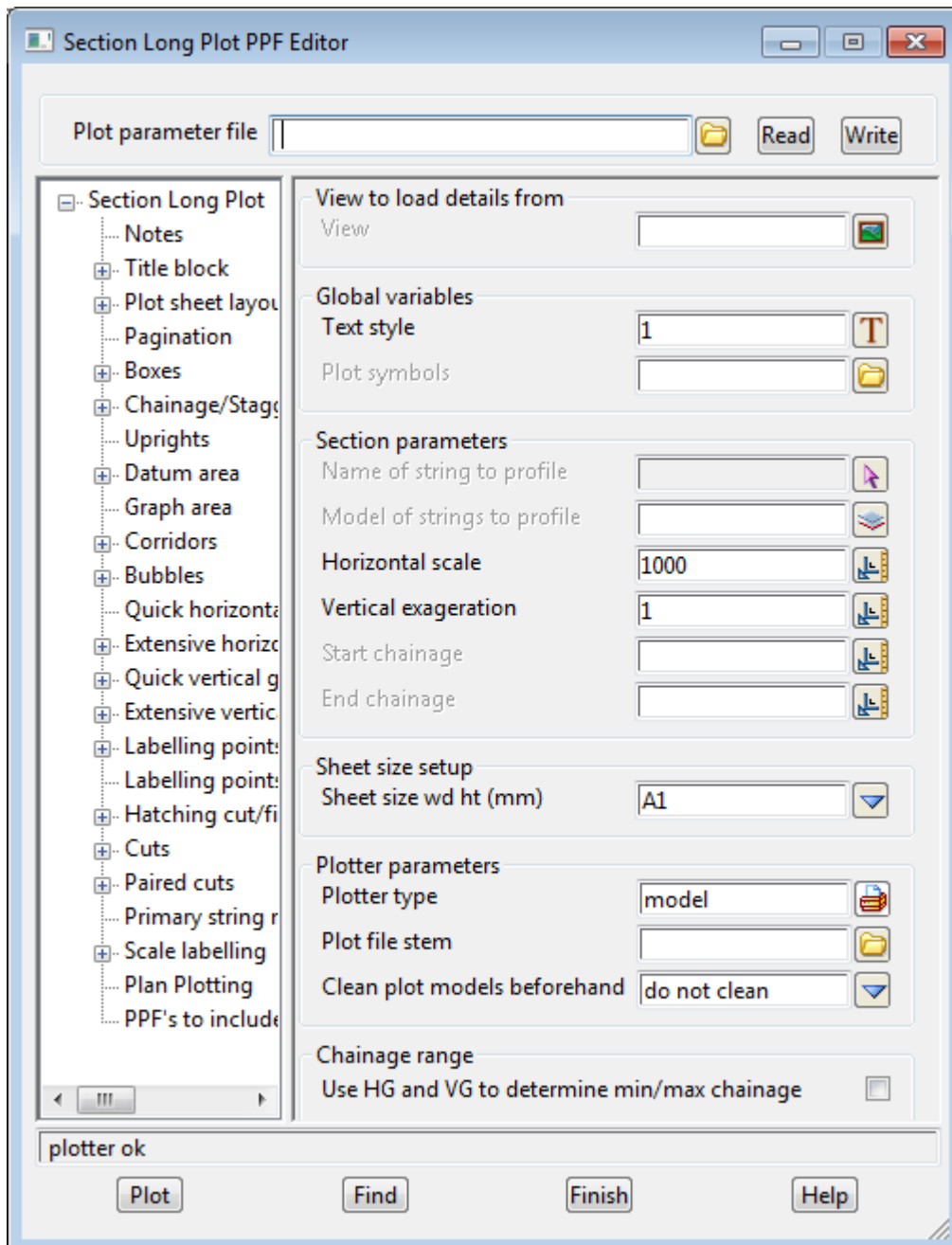
Position of option on menu: Plot =>Plot and PPF Editors =>Long sections

The **Long section PPF editor** is for creating and/or editing a (binary) long-section PPF and for creating a long section plot.

Note: Binary PPFs are stored *within* the project (not in the folder containing the project as the ascii ppf's were).

On selecting the **Long sections** option, the **Section Long Plot PPF Editor** panel is displayed.

The plot parameters for controlling the cross section plots are accessed by expanding to the appropriate node in the **Section Long Plot** tree (click on the **+** to expand to node or **-** to collapse the node) and then clicking on the required node, and the required information to fill in is displayed on the right hand side of the panel.



Information on the top and bottom buttons, and all the different nodes, now follows.

See [Buttons on Top and Bottom of Panel](#)

See [Section Long Plot - Front Page](#)

See [Notes - Long Section](#)

See [Title Block](#)

See [Plot Sheet Layout](#)

See [Pagination](#)

See [Boxes](#)

See [Chainage/Staggering](#)

See [Uprights](#)

- See [Datum Area](#)
- See [Graph Area](#)
- See [Corridors](#)
- See [Bubbles](#)
- See [Quick Horizontal Geometry](#)
- See [Extensive Horizontal Geometry](#)
- See [Quick Vertical Geometry](#)
- See [Extensive Vertical Geometry](#)
- See [Labelling Points With Chainage/Height/Grade/Deflection](#)
- See [Labelling Points With Symbols](#)
- See [Hatching Cut/Fill](#)
- See [Cuts](#)
- See [Paired Cuts - Long Section](#)
- See [Primary String Name Label](#)
- See [Scale Labelling](#)
- See [Plan Plotting](#)
- See [PPFs To Include](#)

Buttons on Top and Bottom of Panel

Panel field	Type
Plot parameter file	file box
<i>name for the binary plot parameter file to read in or write out.</i>	
Read	button
<i>read the given plot parameter file in.</i>	
Write	button
<i>write out the plot parameters to the given plot parameter file. An ascii ppf file is also written out.</i>	
Plot	button
<i>use the plot parameters from the panel to create the plot.</i>	
Find	button
<i>brings up a search box. If a valid parameter name is keyed in followed by the enter key, the cursor will be placed in the appropriate field on the appropriate page.</i>	

Please continue to the next section [Section Long Plot - Front Page](#).

Section Long Plot - Front Page

The long plot itself consists of the three regions - boxes, datum and graph areas.

The **boxes area** is where the titles and the chainage values and the heights/depths for the strings drawn on the long plot are labelled.

The **datum area** is the region between the boxes area and the graph area.

The **graph area** is the area where the actual plots of the strings are drawn.

Apart from information labelled in the boxes area, the long section plot can label other information such as

- (a) horizontal geometry
- (b) vertical geometry
- (c) chainage, heights at special points
- (d) symbols at special points
- (e) bubbles at special chainages
- (f) cuts the design string makes through strings
- (g) cut and fill areas

Section: View to load details from

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
View		section view box	
<i>on selection of an existing section view, the vertical exaggeration, string to profile, corridor model and corridor settings from the section view are loaded into the ppf editor.</i>			

Section: Global variables

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Text style	global_textstyle	text box	
<i>default textstyle</i>			
Plot Symbols	plot_symbols	file box	
<i>specify a plot symbol file if it exists.</i>			

Section: Section parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Name of string to profile	string_to_plot		string box
<i>model of long sections to plot</i>			
Model of strings to profile	model_to_plot		model box
Horizontal Scale	scale	input	
<i>horizontal scale to be used for long section plots</i>			
Vertical exaggeration	vertical_exaggeration	input	
<i>vertical scale to be used for long section plots</i>			
Start chainage	start_chainage	input	
<i>start chainage of long sections to plot</i>			

End chainage	end_chainage	input
<i>start chainage of long sections to plot</i>		

Section: Sheet size setup

The plot **page** or **sheet** is considered to have only positive co-ordinates with the origin (0,0) in the left hand corner. The units for the plot are millimetres.

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Sheet size wd ht (mm)	sheet_size	sheet size box	
<i>a valid sheet size is selected.</i>			

Section: Plotter parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Plotter type	plotter_type	plotter box	
<i>a valid plotting option is selected.</i>			

Plot file stem	plot_stem	file box	
<i>plot file name. The appropriate extension is added dependant on the plotter type selected.</i>			

Clean plot models beforehand

	plot_model_clean	choice box	do not clean prompt for clean always clean
<i>whether to clean (delete the elements in) any resultant plot models that may already exist, before generating the plot(s). This parameter is only applicable if plotting to a model or models. Note that if the models are cleaned using this parameter, any non-plot or locked elements found in the models will not be cleaned from the models, and the plot job will be cancelled.</i>			

Section: Chainage range

Use HG VG for min, max determines whether the horizontal geometry (HG) and the vertical geometry (VG) are both used to determine the minimum and maximum chainages for drawing. This allows the vertical geometry to be plotted when it is outside the horizontal geometry (e.g. kerb returns).

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Use HG and VG to determine min/max chainage	use_hg_vg_for_min_max	tick box	
<i>if ticked, the min/max chainage will be determined by the Horizontal and Vertical geometry.</i>			

Please continue to the next section [Notes - Long Section](#).

Notes - Long Section

Section: Document your PPF here

type in notes on this PPF file

Please continue to the next section [Title Block](#).

Title Block

Section: Common title block parameters

Panel field	Parameter name	Type
Standard title	plot_border	tick box
<i>if ticked, a standard 12d title block will be used.</i>		
Use title file	use_title_file	tick box
<i>if ticked, a user defined title file is used.</i>		
Title line 1	title_1	input
<i>if Standard title is ticked, Title line 1 is the first line of title text. If Use title file is ticked, Title line 1 is substituted for the title block variable \$title_1.</i>		
Title line 2	title_2	input
<i>if Standard title is ticked, Title line 2 is the second line of title text. If Use title file is ticked, Title line 2 is substituted for the title block variable \$title_2.</i>		

Section: 12d default title block parameters

Panel field	Parameter name	Type	Pop-Up
Text size	title_text_size	input	
<i>text size of title text.</i>			
Text colour	title_colour	colour	available colours
<i>colour of title text.</i>			

Section: Model to plot in plotting units

Plot data model	mm_plot_model	model box	available models
<i>the model is plotted as part of the long section plot. The Units for the Plot data model is considered to be millimetres and the (0,0) in the Plot data model corresponds to (0,0) in the plot. For more information see Plot Data Model.</i>			

Title Block - User Title Info

The parameters shown below are subject to the appropriate title block variables existing in the title file. For more information on these variables see the section [Title Block Variables](#).

Section: User title block parameters

Panel field	Parameter name	Type	Pop-Up
Title file	title_file	file box	available title files
<i>specifies the name of the title file to use. If a valid title file exists, the specified Name values will be filled out in the grid using the title block variable \$user_text_n.</i>			
Name		output	
<i>the alias for the nth user text specified in the title file.</i>			
Value	user_text_n	input	
<i>the alias text to be substituted in for the user text specified.</i>			
Time format	time_format	input	
<i>the time format relates to the \$time title block variable. For more information on the time formats see the section Specifying the Format for \$time.</i>			
Start page number	start_page_number	input	
<i>used as the starting value for the title block variable \$page_number. If missing, \$page_number starts at</i>			

1.

Start drawing number start_drawing_number input
used as the starting value for the title block variable \$drawing_number. If missing, \$drawing_number starts at 1.

Drawing number prefix drawing_number_prefix input
the value entered is used for the title block variable \$drawing_number_prefix.

Drawing number postfix drawing_number_postfix input
the value entered is used for the title block variable \$drawing_number_postfix.

Title Block - Symbols

Panel field	Parameter name	Type	Pop-Up
Symbol			
Scale mode			
Scale			
Rotate with plot			
Rotation			
Colour			
X			
Y			

Please continue to the next section [Plot Sheet Layout](#).

Plot Sheet Layout

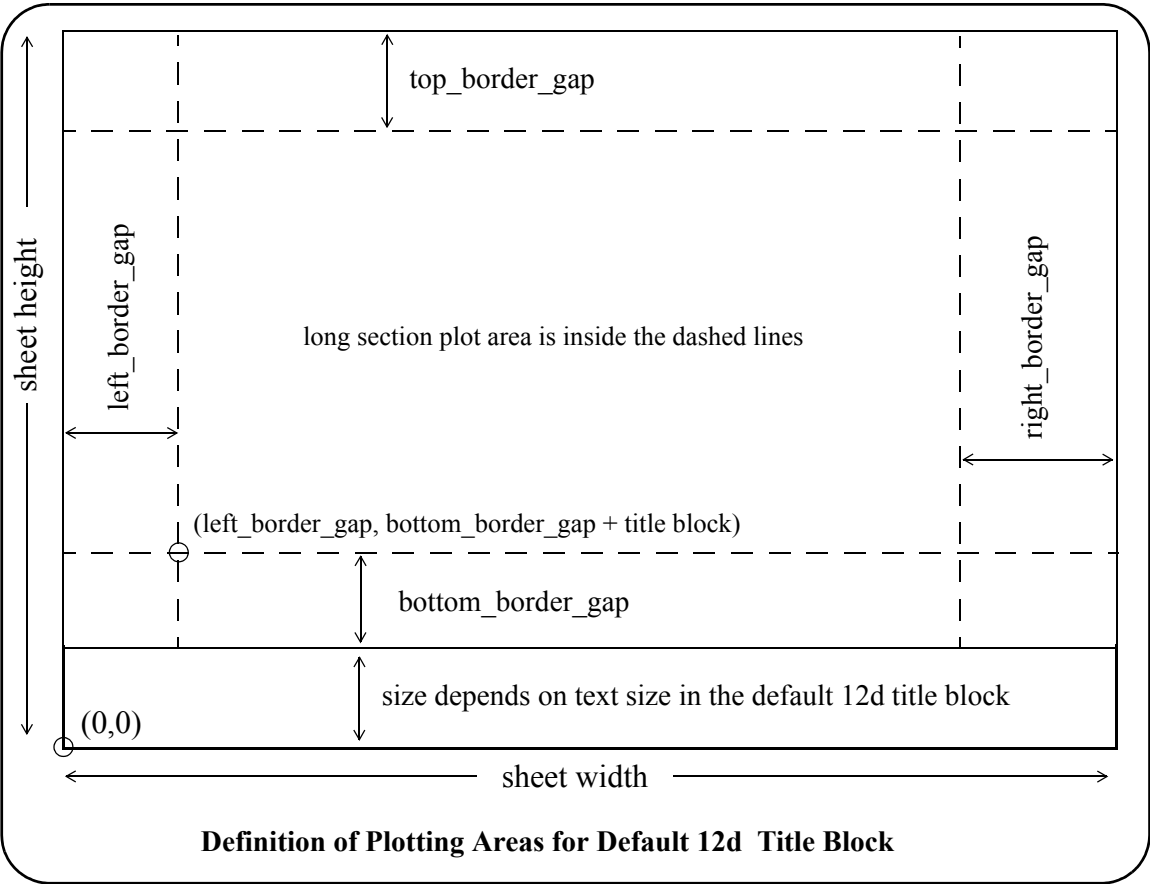
Plot Sheet Layout - Margins

Section: Margins for standard 12d title file - Border gaps

If the *default 12d title block* is used, then the size of the bottom of title block depends on the text size. The following parameters are used in the default title block case and the *bottom_border_gap* is added to the calculated height of the bottom of the title block.

The fields and buttons used in this section have the following functions.

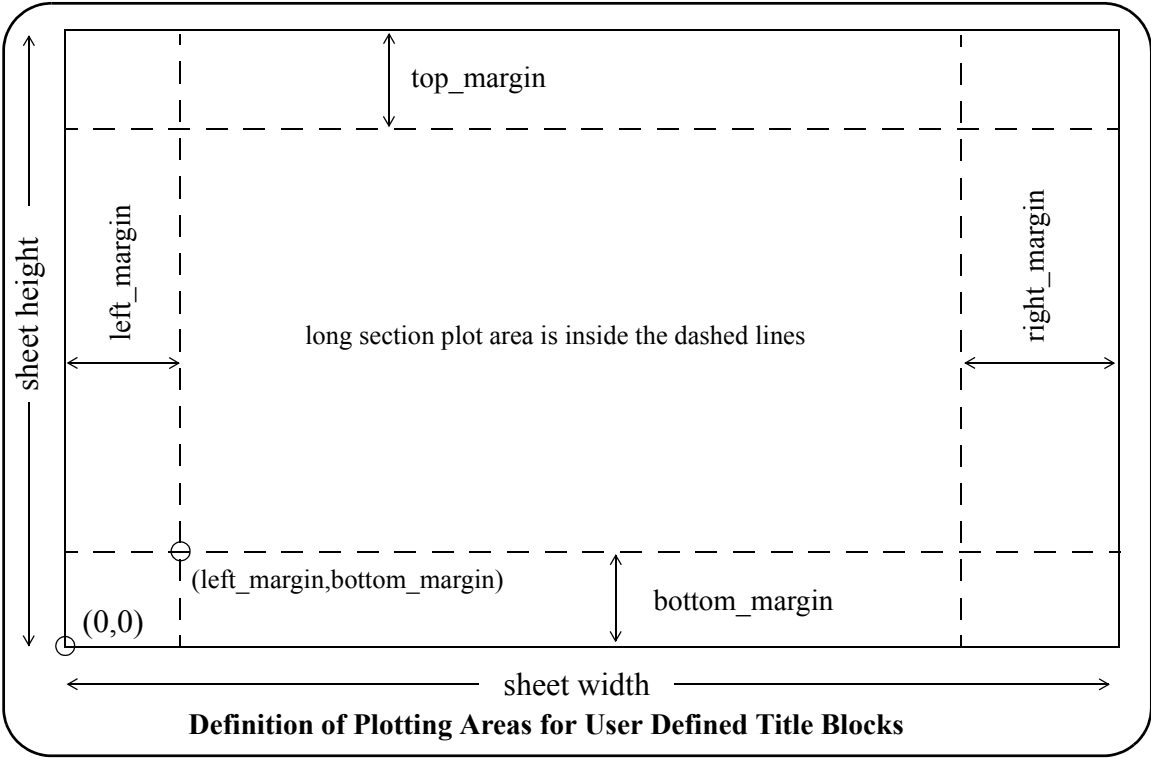
Field Description	Parameter name	Type	Pop-Up
Left (mm)	left_border_gap	input	
left border gap (in millimetres).			
Right (mm)	right_border_gap	input	
right border gap (in millimetres).			
Top (mm)	top_border_gap	input	
top border gap (in millimetres).			
Bottom (mm)	bottom_border_gap	input	
bottom border gap (in millimetres).			



Section: Margins for user title file

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Left (mm) <i>left margin (in millimetres).</i>	left_margin	input	
Right (mm) <i>right margin (in millimetres).</i>	right_margin	input	
Top (mm) <i>top margin (in millimetres).</i>	top_margin	input	
Bottom (mm) <i>bottom margin (in millimetres).</i>	bottom_margin	input	



Because the user can easily select from the plotting panel whether a User Defined Title Block or the default 12d title block is used, both sets of margin and gap parameters can exist in the one plot parameter file.

The (left_margin,bottom_margin) defines the left hand corner position of the long plot on the plot sheet.
The *right_margin* and *top_margin* need not be set and if missing, will be calculated from the other plot parameters defining the plot layout.
If the sheet sizes are missing, they will also be automatically calculated.

Please continue to the next section [Pagination](#).

Pagination

If the long section plot is too long to fit on one page, it can be broken into a number of pages (sheets).

The parameter, *pagination_length*, controls the amount of new chainage length on each plot page. Each page of the long section plot can also included a set chainage amount from the end of the **previous** plot.

Hence apart from the first page and possibly the last page, the plot will have a chainage length given by the sum of the *pagination_length* and *pagination_overlap*.

Section: *Pagination parameters*

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Use pagination <i>if ticked, then break the plot into pages.</i>	pagination	tick box	
Pagination mode <i>length and overlap units.</i>	pagination_mode	choice	chainage millimetres
Chainage length <i>new chainage range on each page.</i>	pagination_length	input	
Chainage overlap <i>overlap between pages.</i>	pagination_overlap	input	

Note:

The *pagination_length* and *pagination_overlap* are given in chainage units **or** millimetres. The user must choose values which will fit on the selected sheet size or the end of each plot will be truncated by the sheet.

Please continue to the next section [Boxes](#).

Boxes

Each string in the long section plot can be labelled with one or two lines of title, and the chainages/heights/depths at the user specified chainages for the strings.

The **title** for the strings, is drawn in the **title area** of the **boxes area**.

The **chainages/heights/depths** are drawn in the **heights area** of the **boxes area**.

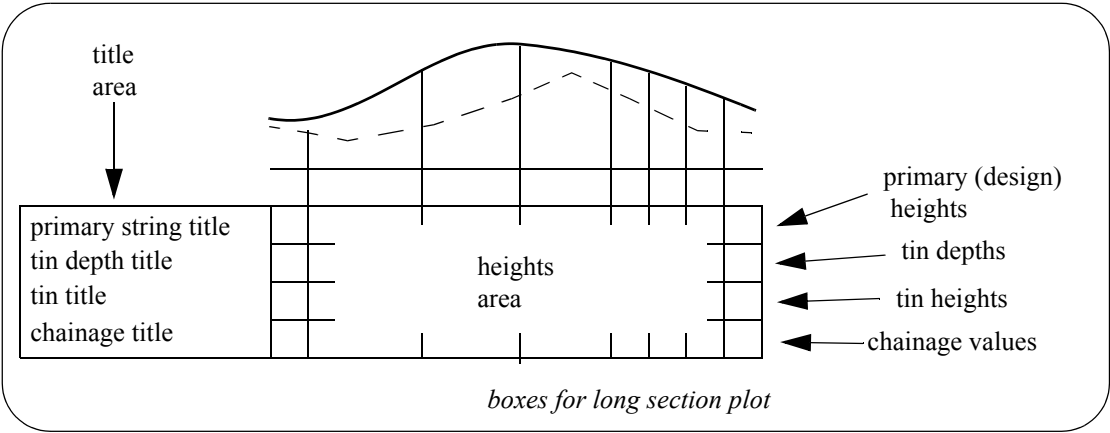
Consequently the boxes area is made up of rows of text consisting of:

string/tin titles followed by the **chainage/height/depth** values along the string.

Each row is surrounded by lines to form a box.

The default order of the boxes from the bottom up is

- (a) optional super-elevation diagram
- (b) chainage values
- (c) can be primary string heights - user choice
- (d) tin heights and depths
- (e) offset heights and depths
- (f) optional volumes or earth works
- (g) can be primary string heights - user choice
- (h) zero or more blank boxes



Section: Linework parameters

Field Description	Parameter name	Type	Pop-Up
Draw box mode	draw_box_mode	choice box	Do not draw any box lines
			Draw box lines around height area only
			Draw box lines around title and height area only
			Use parameters defined in boxes - heights

mode for drawing the boxes for the long section plot.

Default box colour	box_colour	colour box
<i>default box colour</i>		

Number of blank boxes	number_of_blank_boxes	input
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number of boxes to be left blank

The blank boxes are used to place other information in (such as horizontal or vertical geometry) or for other user supplied information.

Section: Primary string parameters

The primary string (the design string) is used to define

- (a) the design long section
- (b) the chainage positions for labelling heights and drawing uprights
- (c) the section line used for sectioning through tins
- (d) the section line for defining the corridor for services

Although the primary string is used to set up most of the information for the long section plot, it doesn't have to be drawn on the long section.

The drawing or not drawing of the primary string on each cross section plot is controlled by the parameter *primary_string*.

The **colour** of the primary string in the plot is the actual primary string colour.

Sometimes the primary string is only required to define chainages or the horizontal path for tin sections. In this case, the primary string would not be drawn on the long section plot.

If the primary string is drawn, it is automatically labelled.

Also the drawing of crosses at the vertical intersection points can be controlled from the ppf file.

Draw and label the primary string *primary_string* tick box

if ticked, the primary string will be drawn and labelled.

Draw crosses at VIPs *primary_draw_vips* tick box

if ticked, crosses will be draw at the vertical intersection points.

The position of the primary string label box can be either straight after the chainage box, or after the tin and offset boxes but before the blank boxes.

Placing the primary string label before the bank boxes or just after the chainage box in controlled by the parameter *primary_label_mode*.

Primary string location *primary_label_mode* choice box in last box before blank boxes
in first box above chainages

position of the primary string label.

Although the order of the boxes may appear to be fixed, in practice they can be in any order. This is possible because for each box, there is a parameter to set the height in millimetres from the bottom of all the boxes that the text in the box is drawn at (the *_y_pos* parameters).

The roundoff for the datum value is specified by the user (default 1.0) and the datum is automatically calculated for each sub-plot, and labelled.

Boxes - Title Area

Section: Boxes - Title area parameters

The **title area** starts at the co-ordinate (left_margin,bottom_margin).

The size of the title text is given by the **title_box_text_size** parameter.

The **width** of the title area is either given by the *space_for_titles* parameter, or if omitted, the required width is automatically calculated.

Field Description	Parameter name	Type	Pop-Up
Size of titles (mm) <i>size of offset, height label and values</i>	title_box_text_size	input	

Space for titles (mm) <i>size of title area.</i>	space_for_titles	input	
------------------------------------------------------------	------------------	-------	--

The x position of the title text is the same for all the lines of title text and can be set to be a fixed distance from the left hand side of the boxes.

X adjustment (mm) <i>distance to move the title text from the left hand side of the boxes</i>	box_titles_x	input	
---------------------------------------------------------------------------------------------------------	--------------	-------	--

The y position of the title text can be set separately for each type of title. The parameters are given later under each of the title types (e.g. chainages, primary string, tins, depths etc.).

After the title area there can be a user defined gap, followed by the heights area

Distance between title and values area (mm) <i>distance between title and values area in mm.</i>	box_gap	input	
------------------------------------------------------------------------------------------------------------	---------	-------	--

The height text is written at right angles to the bottom of the boxes. It can be either top or bottom justified with respect to the box (*box_justification*).

Boxes - Values Area

Section: Boxes - Value area parameters

The **values area** starts at the end of the title area.

The height text is written at right angles to the bottom of the boxes. It can be either top or bottom justified with respect to the box (*box_text_justification*).

The number of decimal places (*number_of_decimals*), and the size of the heights text (*box_text_size*) can be specified globally but there is a parameter for each box which overrides these defaults for each box of heights.

Field Description	Parameter name	Type	Pop-Up
Justification <i>justification of height text.</i>	box_text_justification	choice box	bottom of individual boxes top of individual boxes

Number of decimals <i>number of decimal places in the height boxes. If <0, the absolute value is taken as the number of decimal places i.e. no trailing zeros are removed for the values in the heights area.</i>	number_of_decimals	input	
--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--------------------	-------	--

Text size (mm) <i>distance to move the title text from the left hand side of the boxes</i>	box_text_size	input	
------------------------------------------------------------------------------------------------------	---------------	-------	--

Horizontal line spacing (mm) <i>height of the individual height boxes.</i>	horizontal_line_spacing	input	
--------------------------------------------------------------------------------------	-------------------------	-------	--

A global height for the individual boxes is either given by the *horizontal_line_spacing* parameter, or if omitted, a height to fit the largest height or depth value is calculated and used as the default box height.

However, the height of each box can be individually set by parameters *box_size_n* where the

boxing numbering, n. starts from the bottom box. The value of *horizontal_line_spacing* is used for any of the *box_size_n* parameters not specified.

Label tin/offset string heights by default

label_heights tick box

Label tin/offset string depths by default

label_depths tick box

Box #

input

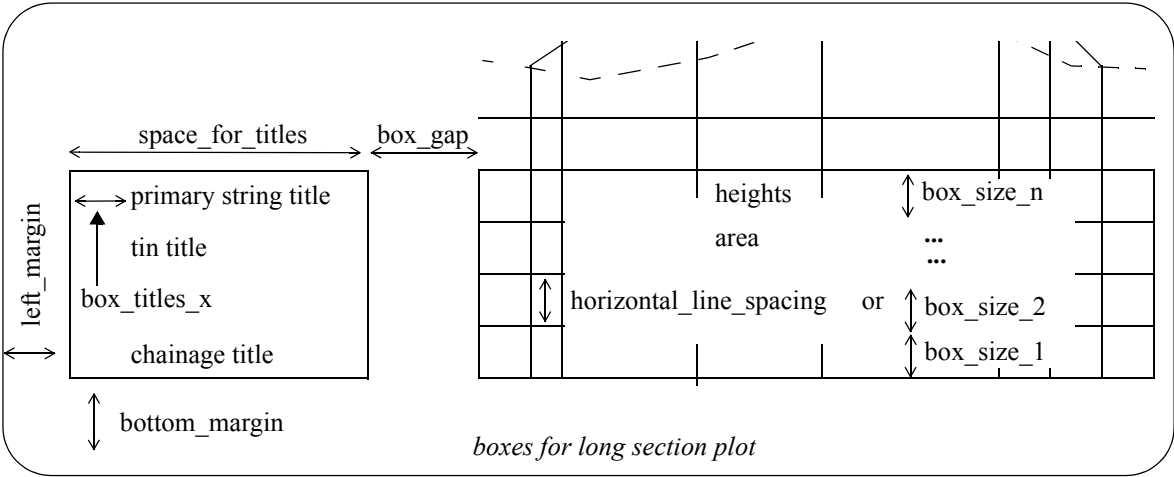
specifying the nth value

Size (mm)

box_size_n input

height of the nth box, numbered from bottom up.

The total height of the boxes area is simply given by the sum of the heights of each box.



The **width** of the **heights area** is determined by the number of chainages to be labelled and whether the values are staggered to prevent over writing.

Hence the total width of the boxes area is the width of the **title area** plus *box_gap*, plus the width of the **heights area**.

Many distance definitions in the plot parameter file are given in terms of distance above the **top** of the boxes area so that the distances are independent of the number of boxes and box sizes.

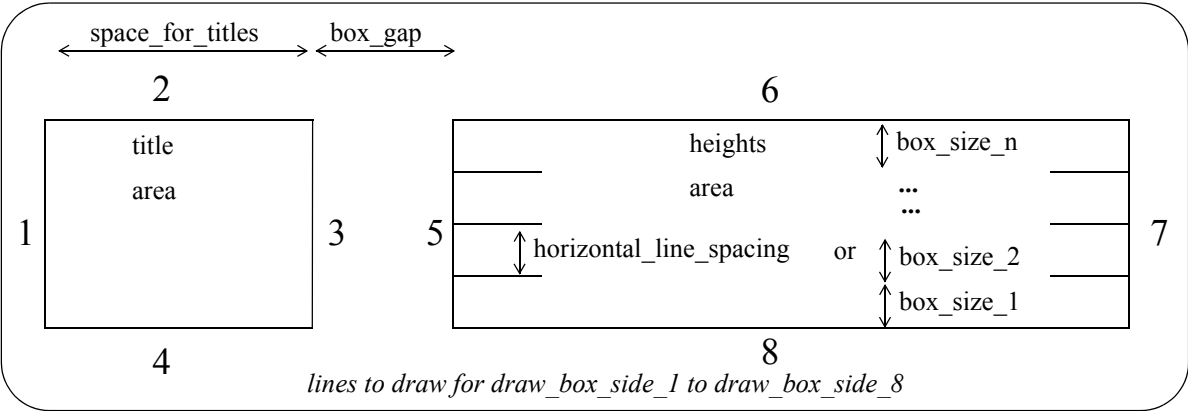
Boxes - Outside Linework

The drawing of the box line work, the box colour, the position of the primary string labels and the number of blank boxes are all set by parameters.

Section: Boxes - Outside linework parameters

Field Description	Parameter name	Type	Pop-Up
Draw the left side of title area(1)			
	draw_box_side_1	tick box	
<i>if ticked, draw the left side of the title area (def).</i>			
Draw the top line of title area(2)			
	draw_box_side_2	tick box	
<i>if ticked, draw the top line of the title area (def).</i>			

Draw the top line of title area(3)		
	draw_box_side_3	tick box
<i>if ticked, draw right side of the title area (def).</i>		
Draw the bottom line of title area(4)		
	draw_box_side_4	tick box
<i>if ticked, draw the bottom line of the title area (def).</i>		
Draw the left side of heights area(5)		
	draw_box_side_5	tick box
<i>if ticked, draw the left side of the heights area (def).</i>		
Draw the top line of heights area(6)		
	draw_box_side_6	tick box
<i>if ticked, draw the top line of the heights area (def).</i>		
Draw right side of heights area(7)		
	draw_box_side_7	tick box
<i>if ticked, draw right side of the heights area (def).</i>		
Draw bottom side of heights area(8)		
	draw_box_side_8	tick box
<i>if ticked, draw bottom side of the heights area (def).</i>		
Colour (1)	box_side_colour_1	colour box
<i>colour to draw left side of title area</i>		
Colour (2)	box_side_colour_2	colour box
<i>colour to draw top of title area</i>		
Colour (3)	box_side_colour_3	colour box
<i>colour to draw right side of title area</i>		
Colour (4)	box_side_colour_4	colour box
<i>colour to draw bottom of title area</i>		
Colour (5)	box_side_colour_5	colour box
<i>colour to draw left side of heights area</i>		
Colour (6)	box_side_colour_6	colour box
<i>colour to draw top of heights area</i>		
Colour (7)	box_side_colour_7	colour box
<i>colour for right side of heights area</i>		
Colour (8)	box_side_colour_8	colour box
<i>colour for bottom of heights area</i>		



Boxes - Inside Linework

Section: Boxes - Inside linework parameters

The lines at the top of the individual boxes inside the title area and heights area (separation lines) are controlled by the parameters *box_line_draw_mode* and *box_line_mode_n*.

The separation lines can be drawn just in the title area, just in the heights area or in both areas.

The parameter *box_line_draw_mode* can be set to control all the separation lines but there are additional parameters, *box_line_mode_n*, which override *box_line_draw_mode* for each of the individual boxes where n = 1, ... number of boxes -1.

The top of the top box is not controlled by *box_line_mode_n* but is controlled by the parameters *draw_box_side_2* and *draw_box_side_6*.

The fields and buttons used in this section have the following functions.

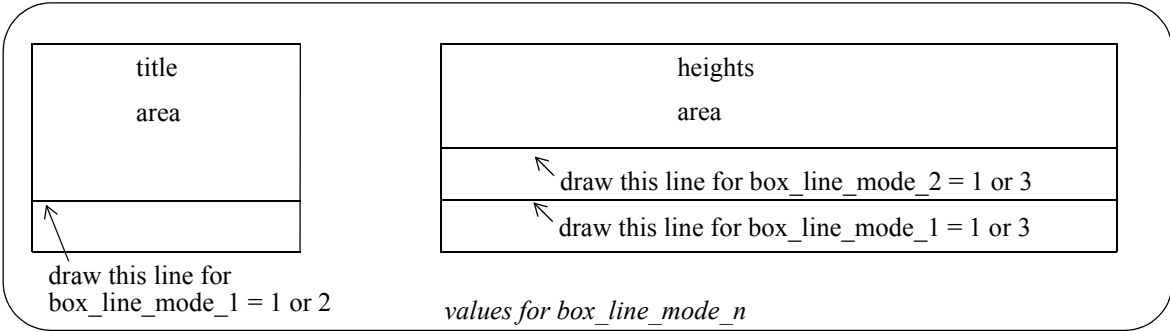
Field Description	Parameter name	Type	Pop-Up
Separation line mode	box_line_draw_mode	choice box	Do not draw any separation lines Draw the separation lines in both areas Draw the separation lines in the title area only Draw the separation lines in the heights area only

the separation line draw mode.

Box #		input	
			Where box # = 1 to number of boxes(n). Box 1 is the bottom box, increasing upwards.
Line mode	box_line_mode_n	choice box	No top line for title or height area (mode=0) Draw top line for title or height area (mode=1) Draw top line for title area only (mode=2)

Draw top line for height area only (mode=3)

line mode for top of title and height areas for box number specified.



Boxes - Chainage Titles/Values

Section: Chainage title parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Title line 1	chainage_title	input	
1st line of chainage title.			
Title line 2	chainage_title_2	input	
second line of chainage title.			
Textstyle	chainage_title_textstyle	text box	
Textstyle for the chainage title			
Colour	chainage_title_colour	colour box	
colour of the chainage title			
Text size (mm)	chainage_title_size	input	
size of the chainage title			
Text y position (mm)	chainage_title_y_pos	input	
if set, the height in mm above the bottom of all the boxes that the chainage title text is drawn. If not set, then the text is placed at a height that puts it inside the default box for the chainage.			

Section: Chainage value parameters (raw/running chainage)

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Decimal places	chainage_decimals	input	
number of decimal places for chainages			
Textstyle	chainage_textstyle	text box	
textstyle for the chainage values			
Colour	chainage_colour	colour box	

colour of the chainage values

Text size (mm) chainage_size input

size of the chainage values

Text y position (mm) chainage_y_pos input

if set, the height in mm above the bottom of all the boxes that the chainage values are drawn. If not set, then the text is placed at a height that puts it inside the default box for the chainage.

Boxes - Chainage Title/Values - Equality Chainage Values

Section: Equality chainage values

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type
Label with equality chainages	chainage_label_eq	tick box
Decimal places	chainage_decimals_eq	input
1000s separator (non K-post)	chainage_thousands_separator_eq	input
Zero-pack digits after 1000s separator	chainage_zero_pack_eq	tick box
Show K-Post at non-zero offset (if defined)	chainage_name_include_eq	tick box
K-post pre text	chainage_name_pre_eq	input
K-post post text	chainage_name_post_eq	input
Space before offset of K-post	chainage_offset_space_eq	tick box
Plus sign before positive offset of K-post	chainage_plus_eq	tick box
Show equality zone (if defined)	chainage_zone_include_eq	tick box
Space before equality zone	chainage_zone_space_eq	tick box
Equality zone pre text	chainage_zone_pre_eq	input
Equality zone post text	chainage_zone_post_eq	input
Before/after equality separator	chainage_equals_separator_eq	input
Textstyle	chainage_textstyle_eq	input
Colour	chainage_colour_eq	colour box
Text size (mm)	chainage_size_eq	input
Text y position (mm)	chainage_y_pos_eq	input

Boxes - Primary String Titles/Heights

Sometimes the primary string is only required to define chainages or the horizontal path for tin sections. In this case, the primary string would not be drawn on the long section plot.

If the primary string is drawn, it is automatically labelled.

Also the drawing of crosses at the vertical intersection points can be controlled from the ppf file.

Section: Primary string title parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Title line	primary_title	input	

1st line of string title.

Title line 2	primary_title_2	input
<i>second line of string title. Default is primary string name.</i>		
Textstyle	primary_title_textstyle	text box
<i>textstyle for the primary string title</i>		
Colour	primary_title_colour	colour box
<i>colour of the primary string title</i>		
Text size (mm)	primary_title_size	input
<i>size of the string title</i>		
Text y position (mm)	primary_title_y_pos	input
<i>if set, the height in mm above the bottom of all the boxes that the primary string title text is drawn. If not set, then the text is placed at a height that puts it inside the default box for the primary string.</i>		

Section: Primary string height parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Decimal places	primary_decimals	input	
<i>number of decimal places for height values.</i>			
Textstyle	primary_textstyle	text box	
<i>textstyle for the height values</i>			
Colour	primary_colour	colour box	
<i>colour of the height values</i>			
Text size (mm)	primary_size	input	
<i>size of the height values</i>			
Text y position (mm)	primary_y_pos	input	
<i>if set, the height in mm above the bottom of all the boxes that the primary string height values are drawn. If not set, then the text is placed at a height that puts it inside the default box for the primary string.</i>			
Search dist when no z (m)	primary_ch_tolerance	input	
<i>for a given chainage, if no z value exists, this distance is added to/subtracted from the chainage to search for a valid z value.</i>			

Boxes - Tin Titles/Heights/Depths

Section: Tin titles/heights/depths parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Label depth default	label_depths	tick box	
<i>if ticked, the depths are labelled.</i>			
Define tin set #		input	
<i>where n = 1 to.... The set enables the specification of a number of parameters for a number of specified tin names.</i>			
Tin name	tin_n_name	tin box	available tins

the name of the nth tin to be used for labelling.

If a tin of the name given by **tin_n_name** does not exist, then the plot is not produced and an error message is given.

Tin draw mode	tin_n_draw_mode	choice box	Draw the tin
			Do not draw the tin

draw tin mode for the nth tin specified by tin set #.

Tin colour	tin_n_draw_colour	colour box
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tin colour mode for the nth tin specified by tin set #.

Tin label mode	tin_n_label	choice box	Label the tin
			Do not label the tin

tin label mode for the nth tin specified by tin set #.

Boxes - Tin Titles/Heights/Depths - Titles

Section: Tin - Title parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Use tin set #		input	
<i>set number to be used to define sets of tin parameters i.e. n value</i>			
First line of tin title	tin_n_title	input	
<i>first line of nth tin title</i>			
Second line of tin title	tin_n_title_2	input	
<i>second line of nth tin title</i>			
Tin title textstyle	tin_n_title_textstyle	text box	
<i>nth tin title textstyle</i>			
Tin title colour	tin_n_title_colour	colour box	
<i>nth tin title colour</i>			
Tin title size (mm)	tin_n_title_size	input	
<i>nth tin title size</i>			
Title Y position (mm)	tin_n_title_y_pos	input	
<i>if set, the height in mm above the bottom of all the boxes that the nth tin title text is drawn. If not set, then the text is placed at a height that puts it inside the default box for the tin heights.</i>			

Boxes - Tin Titles/Heights/Depths - Heights

Section: Tin - Height parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Use tin set #		input	
<i>set number to be used to define sets of tin parameters i.e. n value</i>			
Decimals	tin_n_decimals	input	

<i>number of dec places in nth tin height. < 0 to keep all trailing zeros</i>		
Textstyle	tin_n_textstyle	text box
<i>textstyle of nth tin height</i>		
Colour	tin_n_colour	colour box
<i>nth tin height and depth colour</i>		
Size (mm)	tin_n_size	input
<i>nth tin height size</i>		
Y pos (mm)	tin_n_y_pos	input
<i>if set, the height in mm above the bottom of all the boxes that the tin height text is drawn.If not set, then the text is placed at a height that puts it inside the default box for the tin heights.</i>		

Boxes - Tin Titles/Heights/Depths - Depths

Section: Tin depth parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Use tin set #		input	
<i>set number to be used to define sets of tin parameters i.e. n value</i>			
Depth label mode	tin_n_depth_label	choice box	Label depths Do not label depths
<i>depth label mode for the nth tin specified by set #.</i>			
First line of tin depth title	tin_n_depth_title	input	
<i>first line of nth tin depth title</i>			
Second line of tin depth title	tin_n_depth_title_2	input	
<i>second line of nth tin depth title</i>			
Depth title textstyle	tin_n_depth_title_textstyle	text box	
<i>nth tin depth title textstyle</i>			
Depth title colour	tin_n_depth_title_colour	colour box	
<i>nth tin depth title colour</i>			
Depth title size (mm)	tin_n_depth_title_size	input	
<i>nth tin depth title size</i>			
Depth title Y position (mm)	tin_n_depth_title_y_pos	input	
<i>if set, the height in mm above the bottom of all the boxes that the tin depth title text is drawn. If not set, then the text is placed at a height that puts it inside the default box for the tin heights.</i>			
Decimals in depth value	tin_n_depth_decimals	input	
<i>number of dec places in tin height. < 0 to keep all trailing zeros</i>			
Depth value textstyle	tin_n_depth_textstyle	text box	
<i>nth tin depth textstyle</i>			
Depth value colour	tin_n_depth_colour	colour box	
<i>nth tin depth colour</i>			

Depth value size (mm) tin_n_depth_size input

nth tin depth size

Depth value Y position (mm) tin_n_depth_y_pos input

if set, the height in mm above the bottom of all the boxes that the tin depth text is drawn. If not set, then the text is placed at a height that puts it inside the default box for the tin heights.

Multiplier for positive depths depth_positive_factor input

if set, this value will be used to multiply positive depth values.

Multiplier for negative depths depth_negative_factor input

if set, this value will be used to multiply negative depth values.

The depth from the primary string to a tin, at a particular offset is defined as

depth = tin height value - height of the primary string

That is, the depth that the primary string is **below** the tin.

Before plotting, the value of depth is multiplied by either the *depth_positive_factor* or *depth_negative_factor*.

if (depth >= 0) plotted_depth_value = depth * depth_positive_factor

if (depth < 0) plotted_depth_value = depth * depth_negative_factor

Hence the definition of depth can be modified by the parameters:

depth_positive_factor value // multiplier for positive depths

depth_negative_factor value // multiplier for negative depths

For example, if the opposite sign is required for depth, that is,

depth = height of the primary string - tin height value

simply set

depth_positive_factor -1

depth_negative_factor - 1

Boxes - Offset String Titles/Heights/Depths

Section: Offset string titles/heights/depths parameters

Each string in the offset model given can be automatically projected onto the primary string and drawn on the long section plot.

The offset model has been modified to allow strings to be projected onto the primary string to be specified by model and name, rather than just projecting all the strings in a given model. The string can also be labelled with either the string name, its model name or both.

The string is specified by

offset_n_mask "model_name->string_name"

For each n, a set of plot parameters determine if the string's heights and/or depths from the primary string are labelled in the boxes area.

If only the *string_name* is given, then the model given in the Offset model field of the **Section Long Plot** panel.

If there is **more than one string** with the given model and name, then it will be considered to be one string and at any primary string chainage, the closest of the strings will be the part used for projecting. For example, strings of the same name on either side of a road intersection will be considered to be the one string for projecting.

If any *offset_n_mask* is used, then the Offset option expects all the strings to be specified by an

offset_n_mask. Then if no mask exists for any value of n, then that parameter set is ignored and no string projected.

If no offset masks are used (that is, no *offset_n_mask*'s are used), then the plot parameters determine whether each string in the offset model is drawn, and if the string's heights and depths from the primary string are labelled in the boxes area. The order that the strings are then plotted and labelled is the same as the order of the strings in the Offset model.

For the following sets of parameters, n takes the value 1 to 100 and specifies that the parameter set applies to the nth string given by *offset_n_mask* or, if no offset masks are given, the nth string in the *Offset model*.

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Default offset model <i>default offset model.</i>	offset_model	model box	
Define set # <i>where n = 1 to.... The set enables the specification of a number of parameters for a number of specified tin names.</i>		input	
Offset mask <i>the value specified by model_name->string_name.</i>	offset_n_mask	input	
Offset draw mode <i>draw mode for offset string.</i>	offset_n_draw_mode	choice box	Draw the offset string Do not draw the offset string
Datum difference from primary		input	
Left search distance <i>default 1000. Distance to search to the left of the primary string for the offset string. If 0, don't search to the left.</i>	offset_n_lw	input	
Right search distance <i>default 1000. Distance to search to the right of the primary string for the offset string. If 0, don't search to the right.</i>	offset_n_rw	input	
Offset colour <i>default offset string colour.</i>	offset_n_draw_colour	colour box	
Offset label mode heights <i>offset string label mode.</i>	offset_n_label	choice box	Label the strings heights Do not label the strings

Boxes - Offset String Titles/Heights/Depths - Titles

Section: Offset string - Title parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Offset string mode	offset_title_mode	choice box	Label with string name

Label with model name
Label with model->string as
name

offset string title mode.

Use set # input
set number to be used to define sets of offset parameters i.e. n value

or, for any set, the *offset_title_mode* can be replaced by two lines of user defined title:

First line of offset title offset_n_title input
first line of nth offset title

Second line of offset title offset_n_title_2 input
second line of nth offset title

Title textstyle offset_n_title_textstyle text box
nth offset title textstyle

Title colour offset_n_title_colour colour box
nth offset title colour

Title size (mm) offset_n_title_size input
nth offset title size

Title Y position (mm) offset_n_title_y_pos input
if set, the height in mm above the bottom of all the boxes that the offset title text is drawn. If not set, then the text is placed at a height that puts it inside the default box for the offset heights.

Boxes - Offset String Titles/Heights/Depths - Heights

Section: Offset string - Height parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Use set # <i>set number to be used to define sets of offset parameters i.e. n value</i>		input	
Decimals <i>number of dec places in nth offset height. < 0 to keep all trailing zeros</i>	offset_n_decimals	input	
Textstyle <i>Textstyle of nth offset height</i>	offset_n_textstyle	text box	
Colour <i>nth offset height and depth colour</i>	offset_n_colour	colour box	
Size (mm) <i>nth offset height size</i>	offset_n_size	input	
Y pos (mm) <i>if set, the height in mm above the bottom of all the boxes that the offset height text is drawn.If not set, then the text is placed at a height that puts it inside the default box for the offset heights.</i>	offset_n_y_pos	input	

Boxes - Offset String Titles/Heights/Depths - Depths

Section: Offset string - Depth parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Use set #		input	
<i>set number to be used to define sets of offset parameters i.e. n value</i>			
Depth label mode	offset_n_depth_label	choice box	Label depths Do not label depths
<i>depth label mode for the nth offset specified by set #.</i>			
First line of depth title	offset_n_depth_title	input	
<i>first line of nth offset depth title</i>			
Second line of depth title	offset_n_depth_title_2	input	
<i>second line of nth offset depth title</i>			
Depth title textstyle	offset_n_depth_title_textstyle	text box	
<i>nth offset depth title textstyle</i>			
Depth title colour	offset_n_depth_title_colour	colour box	
<i>nth offset depth title colour</i>			
Depth title size (mm)	offset_n_depth_title_size	input	
<i>nth offset depth title size</i>			
Depth title Y position (mm)	offset_n_depth_title_y_pos	input	
<i>if set, the height in mm above the bottom of all the boxes that the offset depth title text is drawn. If not set, then the text is placed at a height that puts it inside the default box for the offset heights.</i>			
Decimals in depth value	offset_n_depth_decimals	input	
<i>number of dec places in offset height. < 0 to keep all trailing zeros</i>			
Depth value textstyle	offset_n_depth_textstyle	box	
<i>nth offset depth textstyle</i>			
Depth value colour	offset_n_depth_colour	colour box	
<i>nth offset depth colour</i>			
Depth value size (mm)	offset_n_size	input	
<i>nth offset depth size</i>			
Depth value Y position (mm)	offset_n_depth_y_pos	input	
<i>if set, the height in mm above the bottom of all the boxes that the offset depth text is drawn. If not set, then the text is placed at a height that puts it inside the default box for the offset heights.</i>			

Boxes - Offset String Chainages

Section: Offset string - Chainage parameters

The fields and buttons used in this section have the following functions for the nth defined offset string.

Field Description	Parameter name	Type	Pop-Up
Use String	chainage_n_offset_mode	tick box	

if ticked, use offset string.

Offset String chainage_n_offset_string select box
the value specified by model_name->string_name.

First line of chainage title chainage_n_title input
first line of offset chainage title.

Second line of chainage title chainage_n_title_2 input
second line of offset chainage title.

Chainage title textstyle chainage_n_title_textstyle text box
textstyle for the offset chainage title

Chainage title colour chainage_n_title_colour colour box
colour of the offset chainage title

Chainage title size (mm) chainage_n_title_size input
size of the offset chainage title

Chainage title Y position (mm) chainage_n_title_y_pos input
if set, the height in mm above the bottom of all the boxes that the offset chainage title text is drawn. If not set, then the text is placed at a height that puts it inside the default box for the chainage.

Decimals in chainage value chainage_n_decimals input
number of decimal places for offset chainages

Chainage value textstyle chainage_n_textstyle text box
textstyle for the offset chainage values

Chainage value colour chainage_n_colour colour box
colour of the offset chainage values

Chainage value size (mm) chainage_n_size input
size of the offset chainage values

Chainage value Y position (mm) chainage_n_y_pos input
if set, the height in mm above the bottom of all the boxes that the offset chainage values are drawn. If not set, then the text is placed at a height that puts it inside the default box for the chainage.

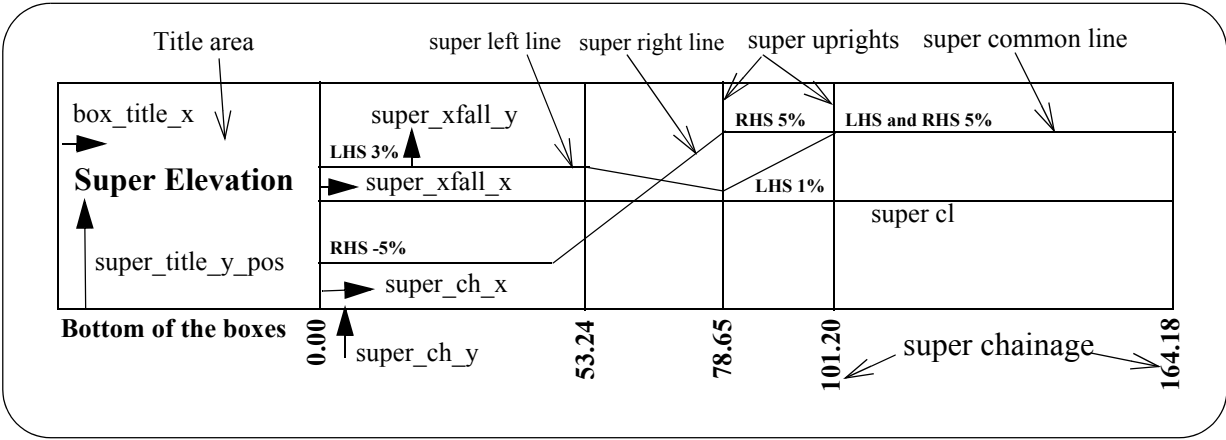
Boxes - Super Elevation Diagram

Section: Super elevation diagram parameters

The optional *super-elevation diagram* draws the values of the cross-fall (x-fall) between two strings using the primary string as the reference string. The cross-fall at a given chainage on the primary string is calculated by sectioning perpendicular to the reference string at that chainage and cutting the two strings. The cross-fall is defined as the cross-fall between the two cuts points on the strings.

The diagram has levels for the cross fall for a pair of strings on the left of the primary string, and a pair of strings on the right of the primary string. The diagram also has uprights in the super-elevation box with chainage values at the change of super values.

For the left hand side, the cross-fall is calculated at right angles to the primary string between the user given left hinge string and the left edge string.



The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Super elevation diagram draw mode			
	super_draw_mode	choice box	don't draw diagram
		mode = 1	draw diagram using super sample interval
		mode = 2	sample super using chainages of x-sec's
		mode = 3	sample super using chainages from a string

super elevation diagram draw mode.

Super sample interval super_sample_interval input

if mode = 1, Chainage distance to sample x-fall. (default 20)

Super sample name super_sample_name input

name to be used in sampling. If mode = 2, name = model_name.

If mode = 3, name = model_name->string_name

Super tolerance super_tolerance input

If super_draw_mode is 1, the change of super is greater than super_tolerance, draw uprights

Boxes - Super Elevation Diagram - Titles

Section: Super elevation diagram - Title parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
First line of super title	super_title	input	
<i>1st line of the super title</i>			
Super title textstyle	super_title_textstyle	text box	

textstyle of super title

Super title colour	super_title_colour	colour box
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colour of super title

Super title size (mm)	super_title_size	input
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size of super title

Super title Y position (mm)	super_title_y_pos	input
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if set, the height in mm above the bottom of all the boxes that the super title text is drawn. If not set, then the text is placed at a height that puts it inside the default box for the super.

Boxes - Super Elevation Diagram - X-Fall

Section: Super elevation diagram - X-fall parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
X-fall textstyle	super_xfall_textstyle	text box	

textstyle of super title

X-fall colour	super_xfall_colour	colour box
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colour of super title

X-fall size (mm)	super_xfall_size	input
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size of super title

X-fall X position (mm)	super_xfall_x	input
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the distance to the right from the super chainage uprights to the start of the x-fall text.

X-fall Y position (mm)	super_xfall_y	input
-------------------------------	---------------	-------

if set, the height in mm above the bottom of all the boxes that the super x-fall text is drawn. If not set, then the text is placed at a height that puts it inside the default box for the super.

Boxes - Super Elevation Diagram - Chainage

Section: Super elevation diagram - Chainage parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Chainage textstyle	super_ch_textstyle	text box	

textstyle of super chainage title

Chainage colour	super_ch_colour	colour box
------------------------	-----------------	------------

colour of super chainage title

Chainage size (mm)	super_ch_size	input
---------------------------	---------------	-------

size of super chainage title

Chainage X position (mm)	super_ch_x	input
---------------------------------	------------	-------

the distance to the right from the super chainage uprights to the start of the super chainage text.

Chainage Y position (mm)	super_ch_y	input
---------------------------------	------------	-------

if set, the height in mm below the bottom of all the boxes that the super chainage is finished.

Chainage decimal places `super_ch_decimals` input
number of dec places in super chainage

Boxes - Super Elevation Diagram - Left Side

Section: Super elevation diagram - Left side parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Left hinge string <i>left hinge string. (model_name->string_name)</i>	<code>super_hinge_name_left</code>	select box	
Left edge string <i>left edge string. (model_name->string_name)</i>	<code>super_edge_name_left</code>	select box	
Super left linestyle <i>linestyle of super left line.</i>	<code>super_left_linestyle</code>	linestyle box	
Super left line colour <i>colour of super left line.</i>	<code>super_left_line_colour</code>	colour box	
Super left decimal places <i>number of dec places in super left x-fall value</i>	<code>super_left_decimals</code>	input	
Text before left X-fall value <i>text before super left x-fall value.</i>	<code>super_left_pre</code>	input	
Text after left X-fall value <i>text after super left x-fall value.</i>	<code>super_left_post</code>	input	

Boxes - Super Elevation Diagram - Right Side

Section: Super elevation diagram - Right side parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Right hinge string <i>right hinge string. (model_name->string_name)</i>	<code>super_hinge_name_right</code>	select box	
Right edge string <i>right edge string. (model_name->string_name)</i>	<code>super_edge_name_right</code>	select box	
Super right linestyle <i>linestyle of super right line.</i>	<code>super_right_linestyle</code>	linestyle box	
Super right line colour <i>colour of super right line.</i>	<code>super_right_line_colour</code>	colour box	
Super right decimal places <i>number of dec places in super right x-fall value</i>	<code>super_right_decimals</code>	input	
Text before right X-fall value <i>text before super right x-fall value.</i>	<code>super_right_pre</code>	input	

Text after right X-fall value super_right_post input
text after super right x-fall value.

Boxes - Super Elevation Diagram - Centre Line

Section: Super elevation diagram - Centre line parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Super centre linestyle <i>super centre line linestyle.</i>	super_cl_linestyle	linestyle box	
Super centre line colour <i>super centre line colour.</i>	super_cl_line_colour	colour box	

Boxes - Super Elevation Diagram - Common X-Fall

Section: Super elevation diagram - Common X-fall parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Text before common X-fall value <i>text before super common x-fall value.</i>	super_common_pre	input	
Text after common X-fall value <i>text after super common x-fall value.</i>	super_common_post	input	
Super common linestyle <i>super common linestyle.</i>	super_common_linestyle	linestyle box	
Super common line colour <i>super common colour.</i>	super_common_line_colour	colour box	
Super common decimal places <i>number of decimal places in super common x-fall value</i>	super_common_decimals	input	

Boxes - Super Elevation Diagram - Uprights

Section: Super elevation diagram - Upright parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Upright mode	super_upright_mode	choice box	for left string only for right string only for both strings

upright mode for super elevation diagram.

Super uprights colour `super_upright_colour` colour box
super upright colour.

Boxes - Volume Cut/Fill

Section: Volume cut/fill parameters

The values of calculated cut and fill volumes (cut and fill earth works) can be read from a file and then interpolated to produce cut and fill volumes for a given interval along the primary string.

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Draw a volume diagram <i>if ticked, draw a volume diagram.</i>	<code>volume_draw_mode</code>	tick box	
Cut and fill text position <i>position of cut and fill text relative to the uprights.</i>	<code>volume_text_centre_mode</code>	choice box	along the uprights between the uprights
Sample interval <i>interval to display volumes.</i>	<code>volume_sample_interval</code>	input	
Report file <i>name of volumes report file.</i>	<code>volume_file_name</code>	report box	
Box Y position (mm) <i>if set, the volume box is positioned at this height from the bottom of the first box</i>	<code>volume_y_pos</code>	input	
Box size (mm) <i>if set, upright, volumes and titles box height.</i>	<code>volume_box_size</code>	input	
Horizontal cut/fill dividing line linestyle <i>linestyle of the cut/fill dividing line.</i>	<code>volume_cl_linestyle</code>	linestyle box	
Horizontal cut/fill dividing line colour <i>colour of the cut/fill dividing line.</i>	<code>volume_cl_line_colour</code>	colour box	

Boxes - Volume Cut/Fill - Titles

Section: Volumes cut/fill - Title parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
First line of volume title <i>1st line of the volume title</i>	<code>volume_title</code>	input	
Volume title textstyle <i>textstyle of volume title</i>	<code>volume_title_textstyle</code>	text box	
Volume title colour <i>colour of volume title</i>	<code>volume_title_colour</code>	colour box	

Volume title size (mm) volume_title_size input
size of volume title

Volume title Y position (mm) volume_title_y_pos input
if set, the height in mm above the bottom of all the boxes that the volume title text is drawn. If not set, then the text is placed at a height that puts it inside the default box for the volumes.

Boxes - Volume Cut/Fill - Titles - Cut

Section: Volumes cut/fill - Title cut parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
First line of volume cut title <i>1st line of the cut volume title</i>	volume_cut_title	input	
Volume cut title textstyle <i>textstyle of cut volume title</i>	volume_cut_title_textstyle	text box	
Volume cut title colour <i>colour of cut volume title</i>	volume_cut_title_colour	colour box	
Volume cut title size (mm) <i>size of cut volume title</i>	volume_cut_title_size	input	
Volume cut title Y position (mm) <i>if set, the height in mm above the default position. If not set, then the text is placed at a height that puts it inside the default box for the cut volumes.</i>	volume_cut_title_y	input	

Boxes - Volume Cut/Fill - Titles - Fill

Section: Volumes cut/fill - Title fill parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
First line of volume fill title <i>1st line of the fill volume title</i>	volume_fill_title	input	
Volume fill title textstyle <i>textstyle of fill volume title</i>	volume_fill_title_textstyle	text box	
Volume fill title colour <i>colour of fill volume title</i>	volume_fill_title_colour	colour box	
Volume fill title size (mm) <i>size of fill volume title</i>	volume_fill_title_size	input	
Volume fill title Y position (mm) <i>if set, the height in mm above the default position. If not set, then the text is placed at a height that puts it inside the default box for the fill volumes.</i>	volume_fill_title_y	input	

Boxes - Volume Cut/Fill - Values

Section: Volumes cut/fill - Cut value parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Textstyle <i>textstyle of the cut values.</i>	volume_cut_textstyle	text box	
Colour <i>colour of cut values</i>	volume_cut_text_colour	colour box	
Size (mm) <i>size of cut values</i>	volume_cut_text_size	input	
X position (mm) <i>the x distance to move the cut text from the default cut text position, def 0, it is not used if volume_text_centre_mode= between the uprights</i>	volume_cut_text_x	input	
Y position (mm) <i>the y distance to move the cut text from the default cut text position</i>	volume_cut_text_y	input	
Decimal places <i>number of dec places in cut values.</i>	volume_cut_decimals	input	

Section: Volumes cut/fill - Fill value parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Textstyle <i>textstyle of the fill values.</i>	volume_fill_textstyle	textstyle box	
Colour <i>colour of fill values</i>	volume_fill_text_colour	colour box	
Size (mm) <i>size of fill values</i>	volume_fill_text_size	input	
X position (mm) <i>the x distance to move the fill text from the default fill text position, def 0, it is not used if volume_text_centre_mode= between the uprights</i>	volume_fill_text_x	input	
Y position (mm) <i>the y distance to move the fill text from the default fill text position</i>	volume_fill_text_y	input	
Decimal places <i>number of dec places in fill values.</i>	volume_fill_decimals	input	

Boxes - Volume Cut/Fill - Uprights/Sub Uprights

Section: Volumes cut/fill - Upright parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Draw cut/fill uprights	volume_uprights_draw_mode		

choice box don't draw cut/fill uprights
draw cut/fill uprights

upright draw mode.

Colour of uprights volume_uprights_line_colour colour box
colour of uprights

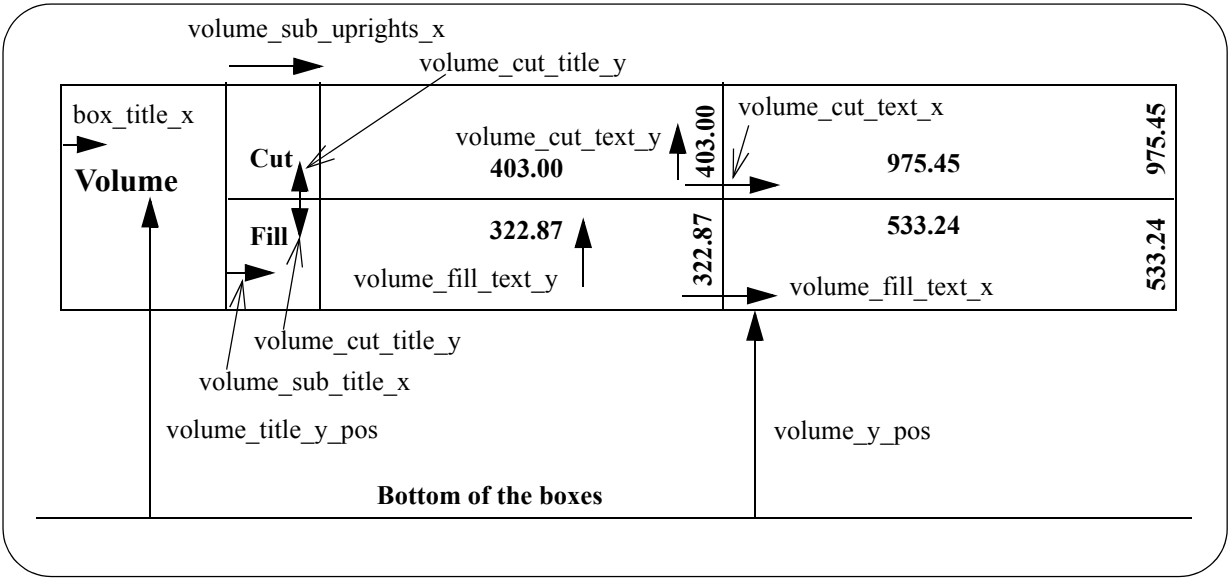
Section: Volumes cut/fill - Sub upright parameters

The fields and buttons used in this section have the following functions.

Field Description Parameter name Type Pop-Up
Colour of sub uprights volume_sub_upright_colour colour box
colour of sub uprights line

Sub upright X position (mm) volume_sub_uprights_x input
the x distance to move from the default sub uprights position.

Sub upright title X position (mm) volume_sub_title_x input
the distance to move the sub title text from the volume sub uprights



Boxes - X,Y

Section: X, Y parameters

The values of the X and Y coordinate for selected chainages can be labelled as separate boxes. The chainages specified are limited to the base set of chainages already defined in the chainage selection and staggering section. i.e. an upright must exist for the X and Y value to be labelled. Not all of the uprights have to be labelled, just those specified in this section.

There are plot parameters to control all aspects of the X and Y labelling.

Chainages are used for positioning X and Y labels.

The chainages for the long section plot relate to the primary string and are controlled by a set of parameters.

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
X, Y order	xy_order	choice box	X before Y Y before X <i>order to place X and Y boxes. X before Y indicates that the X box will appear closest to the bottom of the boxes and the Y box will be on top of it. Note: The boxes are placed from bottom to top.</i>
Chord/arc chainage mode	xy_chord_arc	choice box	Do not use chord/arc chainages Use chord/arc chainages <i>mode to include chord/arc chainages.</i>
Start chainage	xy_start_chainage	input box	<i>start chainage of chainage range to be labelled.</i>
End chainage	xy_end_chainage	input box	<i>end chainage of chainage range to be labelled.</i>
Chainage interval	xy_interval	input	<i>the regular interval (0=no regulars).</i>
Include tangents, spirals	xy_label_hcp	tick box	<i>if ticked, include the tangents and spirals.</i>
Include hip points	xy_label_hip	tick box	<i>if ticked, include horizontal intersection points.</i>
Include vip points	xy_label_vip	tick box	<i>if ticked, include vertical intersection points.</i>
Include tangent points	xy_label_vtp	tick box	<i>if ticked, include tangent points.</i>
Include crest points	xy_label_crest	tick box	<i>if ticked, include crest points.</i>
Include sag points	xy_label_sag	tick box	<i>if ticked, include sag points.</i>
Include change of vertical grade	xy_label_grade_change	tick box	<i>if ticked, include changes in vertical grade.</i>
Include chord/arc tolerance chainages	xy_chord_arc	tick box	
Chainage weeding tolerance	xy_label_tolerance	input	<i>if >0 then use as a weeding tolerance, if <=0 don't weed.</i>
Files of special chainages	xy_special_n_file	file box	<i>n = 1 to 20 - include chainages from the file (one chainage per line)</i>

Boxes - X,Y - X Parameters

Section: X parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Label X values/title	x_label	tick box	

if ticked, the X values/titles will be labelled.

Section: X title parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Title line 1	x_title	input	
<i>1st line of X title.</i>			
Title line 2	x_title_2	input	
<i>second line of X title.</i>			
Textstyle	x_title_textstyle	text box	
<i>textstyle for the X title</i>			
Colour	x_title_colour	colour box	
<i>colour of the X title</i>			
Text size (mm)	x_title_size	input	
<i>size of the X title</i>			
Text y position (mm)	x_title_y_pos	input	

if set, the height in mm above the bottom of all the boxes that the X title text is drawn. If not set, then the text is placed at a height that puts it inside the default box for the X labels.

Section: X value parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Decimal places	x_label_decimals	input	
<i>number of decimal places for X values</i>			
Textstyle	x_label_textstyle	text box	
<i>textstyle for the X values</i>			
Colour	x_label_colour	colour box	
<i>colour of the X values</i>			
Text size (mm)	x_label_size	input	
<i>size of the X values</i>			
Text y position (mm)	x_label_y_pos	input	

if set, the height in mm above the bottom of all the boxes that the X values are drawn. If not set, then the text is placed at a height that puts it inside the default box for the X labels.

Boxes - X,Y - Y Parameters

Section: Y parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Label Y values/titles	y_label	tick box	
<i>if ticked, the Y values/titles will be labelled.</i>			

Section: Y Title Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Title line 1	y_title	input	
<i>1st line of Y title.</i>			
Title line 2	y_title_2	input	
<i>second line of Y title.</i>			
Textstyle	y_title_textstyle	text box	
<i>textstyle for the Y title</i>			
Colour	y_title_colour	colour box	
<i>colour of the Y title</i>			
Text size (mm)	y_title_size	input	
<i>size of the Y title</i>			
Text y position (mm)	y_title_y_pos	input	
<i>if set, the height in mm above the bottom of all the boxes that the Y title text is drawn. If not set, then the text is placed at a height that puts it inside the default box for the Y labels.</i>			

Section: Y value parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Decimal places	y_label_decimals	input	
<i>number of decimal places for Y values</i>			
Textstyle	y_label_textstyle	text box	
<i>textstyle for the Y values</i>			
Colour	y_label_colour	colour box	
<i>colour of the Y values</i>			
Text size (mm)	y_label_size	input	
<i>size of the Y values</i>			
Text y position (mm)	y_label_y_pos	input	
<i>if set, the height in mm above the bottom of all the boxes that the Y values are drawn. If not set, then the text is placed at a height that puts it inside the default box for the Y labels.</i>			

Please continue to the next section [Chainage/Staggering](#).

Chainage/Staggering

Section: Chainage/Staggering - Chainage parameters

Chainages are used for positioning height labels, uprights (leader lines) and bubbles. The chainages for the long section plot relate to the primary string

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Chord/arc chainage mode	chord_arc	choice box	Do not use chord/arc chainages Use chord/arc chainages

mode to include chord/arc chainages.

Chainage interval	chainage_interval	input
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the regular interval (0=no regulars).

Include start and end chainages

chainage_label_ends	tick box
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if ticked, include the start and end chainages.

Include tangents, spirals	chainage_label_hcp	tick box
----------------------------------	--------------------	----------

if ticked, include the tangents and spirals.

Include horizontal intersection points	chainage_label_hip	tick box
-----------------------------------------------	--------------------	----------

if ticked, include horizontal intersection points.

Include horizontal tangent points	chainage_label_hcp	tick box
------------------------------------------	--------------------	----------

if ticked, include horizontal tangent points.

Include vertical intersection points	chainage_label_vip	tick box
---------------------------------------------	--------------------	----------

if ticked, include vertical intersection points.

Include vertical tangent points	chainage_label_vtp	tick box
----------------------------------------	--------------------	----------

if ticked, include vertical tangent points.

Include crest points	chainage_label_crest	tick box
-----------------------------	----------------------	----------

if ticked, include crest points.

Include sag points	chainage_label_sag	tick box
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if ticked, include sag points.

Include change of vertical grade	chainage_label_grade_change	tick box
-----------------------------------------	-----------------------------	----------

if ticked, include changes in vertical grade.

Include chord/arc tolerance chainages	chainage_label_grade_change	tick box
----------------------------------------------	-----------------------------	----------

Chainage weeding tolerance	chainage_label_tolerance	input
-----------------------------------	--------------------------	-------

if >0 then use as a weeding tolerance, if <=0 don't weed.

Merge in bubble chainages	chainage_merge_bubbles	tick box
----------------------------------	------------------------	----------

if ticked, merge in bubble chainages.

Weeding tolerance after bubble merge	chainage_merge_tolerance	input
---------------------------------------------	--------------------------	-------

if > 0, weed after merge using specified weeding tolerance. If <= 0, don't weed after merge.

Files of special chainages	chainage_special_n_file	file box
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n = 1 to 20 - include chainages from the file (one chainage per line)

Chainage/Staggering - Staggering

Section: Chainage/Staggering - Staggering parameters

If the real chainage position is used for the horizontal position of the chainage/height/depth text, text over writing can easily occur.

To prevent over writing, the text can be **staggered**.

If the **stagger_mode** parameter is set to 1, the text position is adjusted so that the text does not over write.

The real chainage position is then indicated by the chainage markers which are drawn at the top of the text boxes from the staggered text position back to the actual chainage position of the text.

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Stagger mode	stagger_mode	choice box	no staggering, allow over writing Stagger text

stagger mode.

Distance from boxes to top of staggers (mm)

stagger_gap_top input

distance from the top of boxes to top of staggers in mm.

Distance from boxes to bottom of staggers (mm)

stagger_gap_bottom input

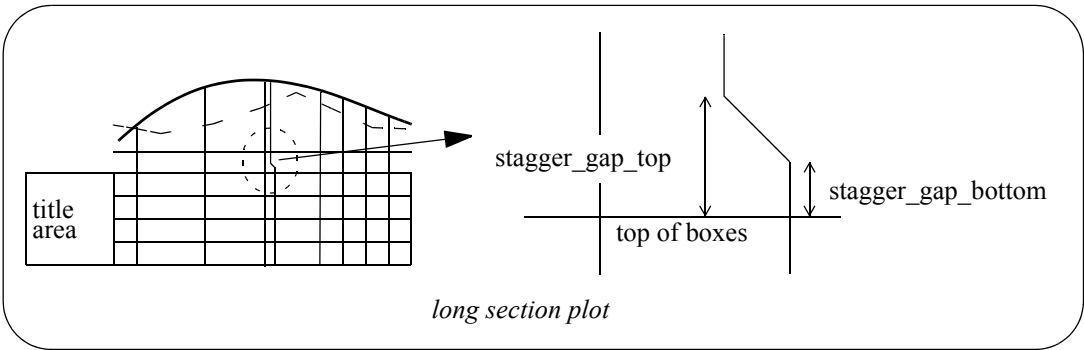
distance from the top of boxes to bottom of staggers in mm.

Stagger gap factor

stagger_gap_factor input

*distance between staggers is box_text_size * stagger_gap_factor*

When staggering occurs, it is possible for the heights area to be longer than the graph area.



Please continue to the next section [Uprights](#).

Uprights

Section: Upright parameters

Uprights, or leader lines, can be drawn from the top of the staggers to the strings drawn on the plot.

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Upright draw mode	uprights_draw_mode	choice box	<div>none</div> <div>max string height to stagger height</div> <div>uprights_y above boxes to primary string</div> <div>tin 1</div> <div>tin 2</div> <div>tin 3</div> <div>tin 4</div> <div>tin 5</div> <div>tin 6</div> <div>tin 7</div> <div>tin 8</div> <div>tin 9</div> <div>tin 10</div> <div>to offset 1</div> <div>to offset 2</div> <div>to offset 3</div> <div>to offset 4</div> <div>to offset 5</div> <div>to offset 6</div> <div>to offset 7</div> <div>to offset 8</div> <div>to offset 9</div> <div>to offset 10</div>

upright draw mode.

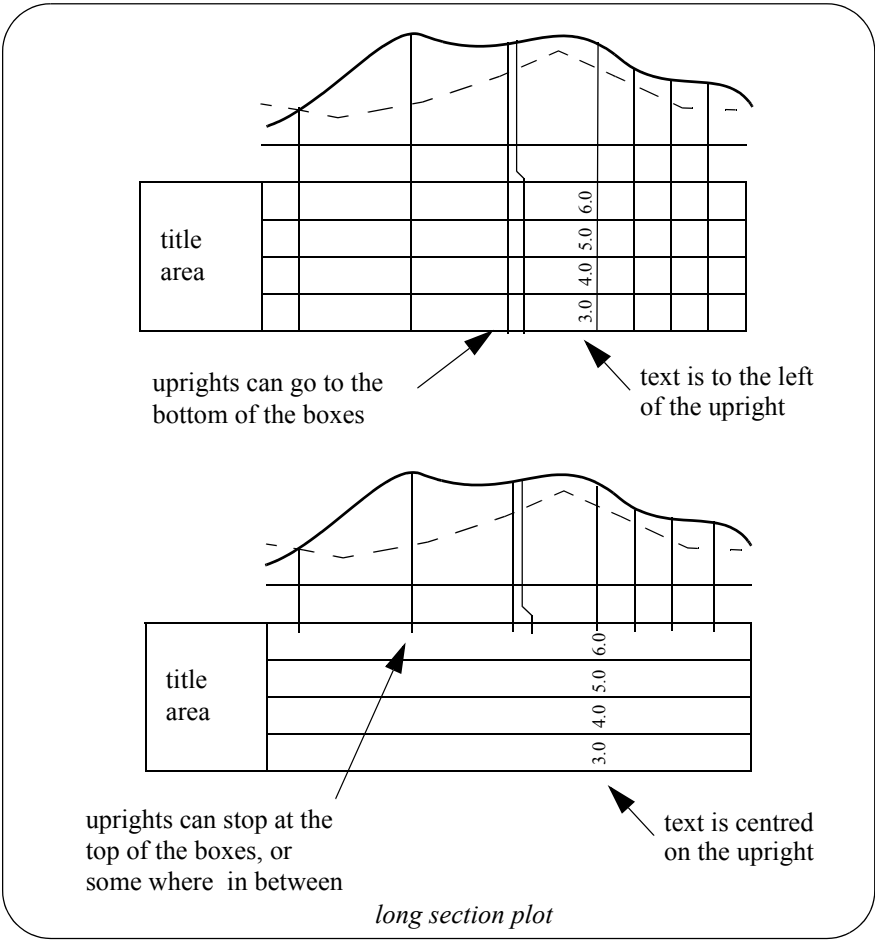
Uprights Y distance (mm)	uprights_y	input	
<i>distance to draw the uprights for <code>uprights_draw_mode</code> = "to <code>uprights_y</code> above boxes"</i>			
Uprights colour	uprights_colour	colour box	
<i>uprights colour: Default is <code>box_colour</code></i>			
Uprights bottom mode	uprights_bottom_mode	choice box	<div>stop at top of boxes</div> <div>draw to bottom of boxes</div> <div>draw to <code>uprights_bottom_y</code> below top of boxes</div> <div>draw to <code>uprights_bottom_y</code> above bottom of boxes</div> <div>ticks at chainage</div>

Upright draw mode below top of boxes.

Uprights bottom Y distance (mm)	uprights_bottom_y	input	
<i>distance in mm.</i>			
Uprights text offset factor	uprights_text_offset_factor	input	
<i>move the text by this factor*size.</i>			

When uprights go below the top of the boxes, the height and offset text is moved to the left so that the

upright does not go through the text. The left hand side of the heights boxes also moves to the left to leave room for the height text.



Please continue to the next section [Datum Area](#).

Datum Area

The **datum area** is the region between the boxes area and the graph area.

Section: Datum area - datum value mode

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Use manual datum	manual_datum	tick box	
<i>if ticked the datum will be calculated internally, else use the datum_value parameter for the datum.</i>			
Datum value	datum_value	input	
<i>the value to be used for the datum.</i>			
Datum roundoff	datum_roundoff	input	
<i>the value to roundoff the datum value.</i>			
Decimal places for datum	datum_decimals	input	
<i>If > 0, trailing zeros are removed after the decimal point. If <0, the absolute value is taken as the number of decimal places to report i.e. no trailing zeros are removed</i>			

Section: Datum area - other parameters

The fields and buttons used in this section have the following functions.

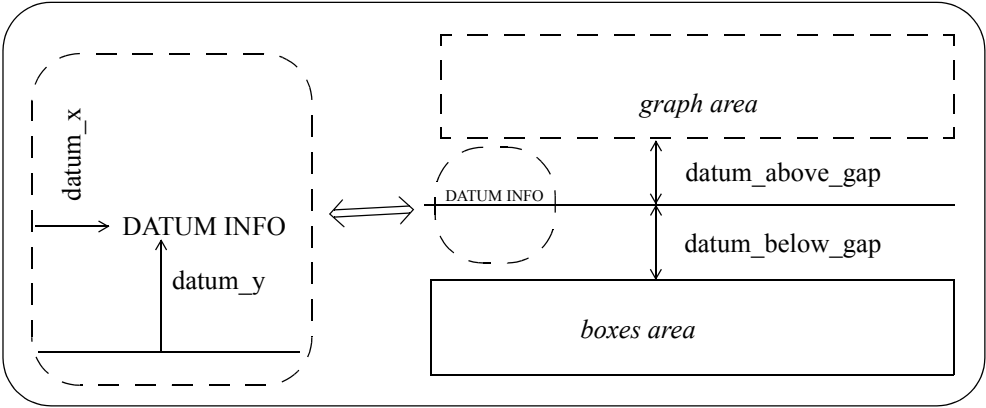
Field Description	Parameter name	Type	Pop-Up
Datum name	datum_name	input	
<i>text to write before the datum value</i>			
Graph area to datum line gap (mm)			
	datum_above_gap	input	
<i>distance from the bottom of the graph area to the datum line.</i>			
Datum line gap to top of boxes (mm)			
	datum_below_gap	input	
<i>distance from datum line to top of boxes.</i>			

The **datum line** is positioned the distance **datum_below_gap** above the top of the boxes area and the graph area is positioned the distance **datum_above_gap** above the datum line.
Hence the graph area is distance (datum_below_gap + datum_above_gap) above the top of the boxes area.

The *datum_below_gap* and *datum_above_gap* can be zero or positive.

Datum linestyle	datum_linestyle	linestyle box
<i>datum line linestyle (default solid)</i>		
Datum textstyle	datum_textstyle	text box
<i>textstyle for datum information</i>		
Datum text size (mm)	datum_text_size	input
<i>size of datum text and value (mm)</i>		
Datum colour	datum_colour	colour box
<i>colour of the datum text and line.</i>		

X adjustment (mm)	datum_x	input
<i>distance to move the datum text along the datum line</i>		
Y adjustment (mm)	datum_y	input
<i>distance to raise the datum text above the datum line</i>		



Datum Area - Offset String Datum Labels

Section: Offset string datum area label parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Offset string			
Datum name			
Datum colour			
X adjustment (mm)			
Y adjustment (mm)			

Please continue to the next section [Graph Area](#).

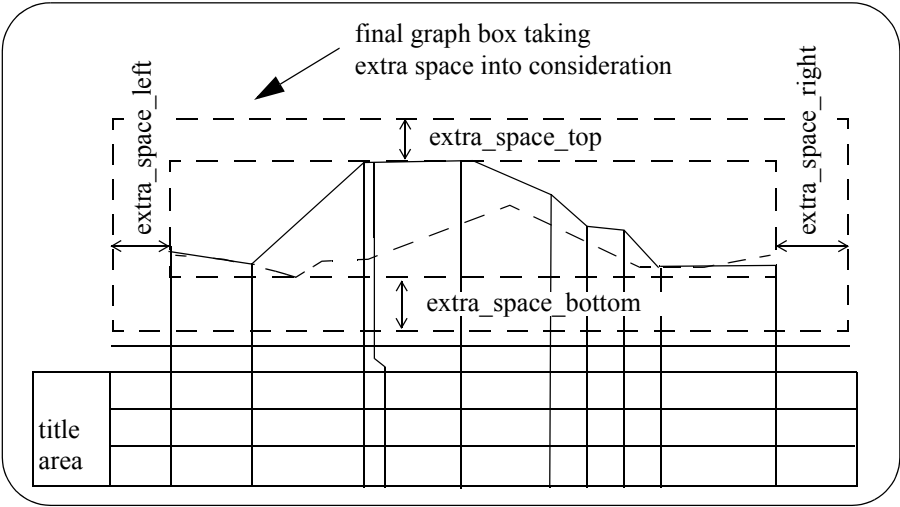
Graph Area

The graph area sits on top of the boxes and datum areas, so there may not be enough room left on the sheet for the full plot height. In this case, the plot will be truncated at the top of the allowed graph area.

Section: Graph area parameters

The fields and buttons used in this section have the following functions.

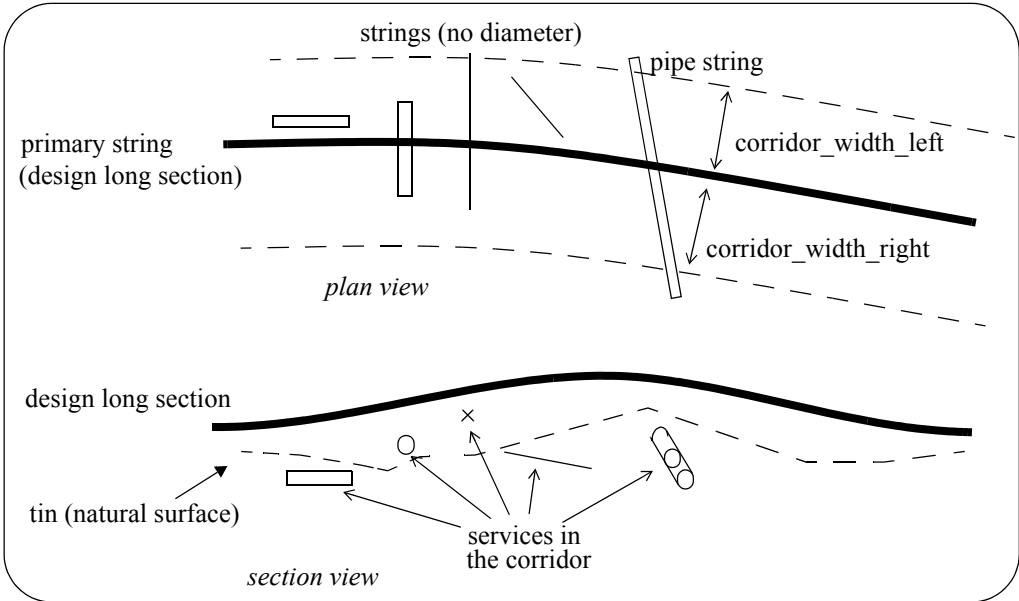
Field Description	Parameter name	Type	Pop-Up
Left/Right extensions (world units)			
Extra space units	extra_space_units	choice box	world units millimetres
<i>units for specifying extra space.</i>			
Extra space left (units)	extra_space_left	input	
<i>distance to subtract from left of plot area</i>			
Extra space right (units)	extra_space_right	input	
<i>distance to add to right of plot area</i>			
Extra space top (units)	extra_space_top	input	
<i>distance to add to top of plot area</i>			
Extra space bottom (units)	extra_space_bottom	input	
<i>distance to subtract from bottom of plot area</i>			



Please continue to the next section [Corridors](#).

Corridors

A corridor around the primary string is defined by giving a left and right corridor width. Any string in a model added to the section view is checked to see if it appears in the corridor, and if it does, it is drawn on the long section plot. To be drawn, strings do not have to cross the primary string, but just be in the corridor.



Section: Corridor parameters

The fields and buttons used in this section have the following functions.

Panel field	Parameter name	Type
Left corridor width (world units)		
	corridor_width_left	input
<i>left corridor width</i>		
Right corridor width (world units)		
	corridor_width_right	input
<i>right corridor width</i>		
Left corridor overlap (world units)		
	corridor_overlap_left	input
<i>left corridor overlap</i>		
Right corridor overlap (world units)		
	corridor_overlap_right	input
<i>right corridor overlap</i>		
Chord-arc tolerance (world units)		
	corridor_chord_arc	input
<i>chord-arc tolerance used near any bends in the corridor:</i>		

Corridors - Model Selection

Section: Corridor - Model selection

The fields and buttons used in this section have the following functions.

Panel field	Parameter name	Type
Corridor model	corridor_model_n	model box
<i>models containing tins and service strings to be drawn on the section. Where $n = 1, 2, \dots, 100$ given by line number on grid.</i>		

Please continue to the next section [Bubbles](#).

Bubbles

Section: Bubble definition parameters

Circles with the string name and a unique number (**bubbles**) can be drawn on the long section plot. Bubbles are normally used for lip profiles.

The chainages used for the bubbles are given by a set of parameters similar to the chainage parameters. The resulting set of bubbles are sequentially numbered (starting with one) in chainage order.

Although many bubbles can be defined by the bubble parameters, a bubble is only drawn on the plot if there is a labelled chainage to draw it above.

Hence not all bubbles given by the bubble chainage parameters are drawn but for the ones that are drawn, the bubble number is taken from the full bubble set.

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Bubble draw mode <i>draw bubble mode</i>	chainage_bubbles	choice box	Do not draw bubbles Draw bubbles
Bubble radius <i>radius of the bubbles</i>	bubble_radius	input	
Bubble colour <i>colour of the bubbles</i>	bubble_colour	colour box	
Bubble upright mode <i>draw bubble upright mode</i>	bubble_draw_upright	choice box	Do not draw bubble upright Draw bubble upright
Bubble start chainage <i>start chainage bubbles</i>	bubble_start_chainage	input	
Bubble end chainage <i>end chainage bubbles</i>	bubble_end_chainage	input	
Chord/arc chainage mode <i>chord/arc chainage mode</i>	bubble_chord_arc	choice box	Do not use chord/arc chainages Use chord/arc chainages
Bubble interval <i>include regular interval for bubbles</i>	bubble_interval	input	

Bubbles - Text

Section: Bubble definition - Text parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Bubble text string name mode	bubble_text_string_name_mode		

		choice box	Do not label with string name Label with string name Label with model->string name
<i>mode of bubble text string name.</i>			
Pre text <i>pre text for label</i>	bubble_pre_text	input	
Post text <i>post text for label</i>	bubble_post_text	input	
Textstyle <i>textstyle of label of label</i>	bubble_textstyle	text box	
Size (mm) <i>size of label</i>	bubble_text_size	input	
Colour <i>colour of label</i>	bubble_text_colour	colour box	
Offset (mm) <i>offset value for bubbles.</i>	bubble_text_offset	input	
Upright distance (mm) <i>distance bubbles are above boxes/uprights</i>	bubble_upright_distance	angle box	
Bubble upright distance mode <i>mode of bubble upright distance.</i>	bubble_mode	choice box	Distance is above boxes Distance is above uprights

Bubbles - Label

Section: Bubble definition - Label parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Include tangents, spirals <i>if ticked, include the tangents and spirals.</i>	bubble_label_hcp	tick box	
Include horizontal intersection points <i>if ticked, include horizontal intersection points.</i>	bubble_label_hip	tick box	
Include horizontal tangent points <i>if ticked, include horizontal tangent points.</i>	bubble_label_hcp	tick box	
Include vertical intersection points <i>if ticked, include vertical intersection points.</i>	bubble_label_vip	tick box	
Include vertical tangent points <i>if ticked, include vertical tangent points.</i>	bubble_label_vtp	tick box	
Include crest points	bubble_label_crest	tick box	

if ticked, include crest points.

Include sag points bubble_label_sag tick box

if ticked, include sag points.

Include change of vertical grade

 bubble_label_grade_change tick box

if ticked, include changes in vertical grade.

Include chord/arc tolerance chainages

 bubble_chord_arc tick box

Bubble weeding tolerance

 bubble_label_tolerance input

if >0 then use as a weeding tolerance, if <=0 don't weed.

Files of special chainages

 bubble_special_n_file file box

n = 1 to 20 - include chainages from the file (one chainage per line)

Please continue to the next section [Quick Horizontal Geometry](#).

Quick Horizontal Geometry

Section: Quick horizontal geometry

The standard horizontal geometry arrows can be drawn at a given distance above the top of the boxes area.

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Distance above boxes (mm) <i>distance above boxes for drawing of arrows</i>	horizontal_geometry_y	input	

Section: Quick horizontal geometry - Left side label parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type
Text <i>text for label</i>	horizontal_geometry_label_text	input
Textstyle <i>textstyle of label</i>	horizontal_geometry_label_textstyle	text box
Text colour <i>colour of label</i>	horizontal_geometry_label_text_colour	colour box
Text size (mm) <i>size of label</i>	horizontal_geometry_label_text_size	input

Section: Quick horizontal geometry - Arrow and text parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type
Text colour <i>colour of arrow text</i>	horizontal_geometry_arrow_text_colour	colour box
Textstyle <i>textstyle of arrow text</i>	horizontal_geometry_arrow_textstyle	text box
Text size (mm) <i>size of arrow text</i>	horizontal_geometry_arrow_text_size	input
Decimal places <i>number of decimal places in arrow text</i>	horizontal_geometry_label_decimals	input
Arrow colour <i>colour of arrow</i>	horizontal_geometry_arrow_colour	colour box
Arrow height (mm) <i>size of arrow</i>	horizontal_geometry_arrow_height	input

Please continue to the next section [Extensive Horizontal Geometry](#).

Extensive Horizontal Geometry

Section: Extensive horizontal geometry parameters

The standard horizontal geometry arrows can be drawn at a given distance above the top of the boxes area.

For complicated horizontal geometry labelling, there are sets of horizontal geometry labelling parameters which give tight control over the position and types of labels.

It is also possible to label the horizontal geometry of **alignment** strings other than the primary string. To plot such a string on the same plot, the chainage position of the horizontal geometry for the non-primary alignment strings is *projected* onto the primary string to give a primary string chainage for plotting. The values of the horizontal geometry (such as radius and spiral length) that are plotted are taken from the other string. Independently graded offset strings (such as a left and right kerbs) are the type of additional alignment strings that may need to be plotted on the same long section plot as the reference string (primary string).

For plotting horizontal geometry, the user can give up to twenty sets of these labels and they can be used to label spirals, curves and tangent information for the primary string and/or additional alignment strings.

Each label set consists of three parts:

- (a) a text label on the left hand side of the plot
- (b) an arrow
- (c) text on the arrows.

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Define set #		input	
<i>where n = 1 to....20. The set enables the specification of a number of parameters for a number of specified extensive horizontal geometry.</i>			
For the following parameters, n takes the value 1 to 20 and specifies the nth parameter set.			
Geometry to label	h_g_n_type	choice box	label spirals label horizontal curves label horizontal tangents
<i>specifies what geometry is to be labelled for the nominated set. If h_g_n_type is missing, then the set is ignored.</i>			
Value to label	h_g_n_value_mode	choice box	nothing length radius (for curve labelling) or radius*length (for spiral)
<i>specifies the value to label.</i>			
Y offset (mm)	h_g_n_label_y	input	
<i>distance of arrow line above top of the boxes.</i>			
If the set of parameters is to apply to the horizontal geometry of an alignment string <i>other</i> than the primary string, then the offset string can be specified.			
Offset string	h_g_n_offset_string	select box	
<i>the name of the non-primary string. i.e.</i>			

h_g_n_offset_string model->string_name
or
h_g_n_offset_string string_name

and the model is the *defined by offset_model*. *offset_model* has been defined in the section [Boxes - Offset String Titles/Heights/Depths](#).

If the *h_g_n_offset_string* parameter does not exist, then the set of horizontal geometry parameters is applied to the primary string.

Extensive Horizontal Geometry - Left Hand Labels

Section: Extensive horizontal geometry - Left hand label parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Use set #		input	

set #, as specified by the define set # parameter.

For the following parameters, n takes the value 1 to 20 and specifies the nth parameter set.

Label X (mm)	h_g_n_label_x	input	
distance from the left hand side of the labels area to start the left hand label text.			
Offset (mm)	h_g_n_label_offset	input	
distance to raise the left hand label text above arrow line.			
Text size (mm)	h_g_n_label_text_size	input	
size of the left hand label text.			
Text colour	h_g_n_label_text_colour	colour box	
size of the left hand label text.			
Text	h_g_n_label_text	input	
left hand label text.			
Textstyle	h_g_n_label_textstyle	text box	
textstyle for the left hand label text.			

Extensive Horizontal Geometry - Arrow Type

Section: Extensive horizontal geometry- Arrow type parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Use set #		input	

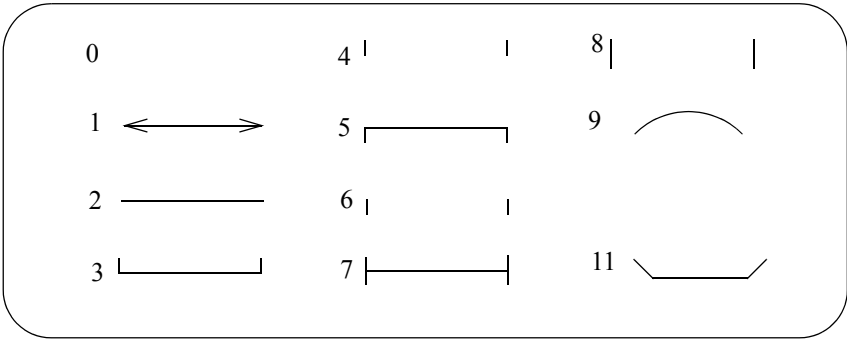
set #, as specified by the define set # parameter.

For the following parameters, n takes the value 1 to 20 and specifies the nth parameter set.

Arrow type mode	h_g_n_draw_mode	choice box	arrow (1) line (2) line with uprights at ends (3) uprights with no lines (4) line with downrights (5) downrights with no lines (6)
-----------------	-----------------	------------	---------------------------------------------------------------------------------------------------------------------------------------------------

line with up and downrights
at ends (7)
up and downrights with no
line (8)
draw curve (9)
radius*length curve (11)

specifies the arrow type to be drawn.



Left arrow gap (mm) <i>size of gap for left side of arrow.</i>	h_g_n_left_gap	input
Right arrow gap (mm) <i>size of gap for right side of arrow.</i>	h_g_n_right_gap	input
Arrow colour <i>colour of arrow text</i>	h_g_n_colour	colour box
Arrow height (mm) <i>height of arrow in mm.</i>	h_g_n_height	input
Leave gap in arrow for text <i>if ticked, a gap will be left for text.</i>	h_g_n_gap	tick box

Extensive Horizontal Geometry - Arrow Text

Section: Extensive horizontal geometry - Arrow text parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Use set # <i>set #, as specified by the define set # parameter.</i>		input	
Text colour <i>colour of arrow text</i>	h_g_n_text_colour	colour box	
Text size (mm) <i>size of arrow text</i>	h_g_n_text_size	input	
Text offset (mm) <i>distance to raise the text above the arrow line.</i>	h_g_n_text_offset	input	

Arrow text pre-text <i>text before the arrow text</i>	h_g_n_pre_text	input
Arrow text post-text <i>text after the arrow text</i>	h_g_n_post_text	input
Textstyle <i>textstyle of arrow text</i>	h_g_n_textstyle	text box
Decimal places <i>number of decimal places in arrow text. If > 0, all trailing zeros after the decimal place are removed. If < 0, the absolute value is taken as the number of decimal places and no trailing zeros are removed after the decimal point.</i>	h_g_n_no_decimals	input
Rotate text to fit <i>if ticked, the text on the arrows will be rotated to fit.</i>	h_g_n_rotate	tick box

Please continue to the next section [Quick Vertical Geometry](#).

Quick Vertical Geometry

Section: Quick vertical geometry - Grade

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Distance above boxes (mm)	vertical_geometry_grade_y	input	
distance above boxes. If 0, don't draw.			

Section: Quick vertical geometry - Length

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Distance above boxes (mm)	vertical_geometry_length_y	input	
distance above boxes. If 0, don't draw.			

Section: Quick vertical geometry - Common parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Arrow mode	vertical_geometry_arrow_mode	input	ticks arrows
arrow mode.			
Arrow colour	vertical_geometry_arrow_colour	colour box	
arrow colour.			
Arrow height (mm)	vertical_geometry_arrow_height	input	
height of arrow in mm.			

Quick Vertical Geometry - Grade Labels

Section: Quick vertical geometry - Grade left hand label parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Text	vertical_geometry_label_grade_text	input	
text for left hand grade label.			
Textstyle	vertical_geometry_label_grade_textstyle	textstyle box	

Text colour

vertical_geometry_label_grade_text_colour
colour box

Text size (mm) vertical_geometry_label_grade_text_size

input

Text colour	vertical_geometry_label_length_text_colour
	colour box
	<i>colour of left hand length label</i>
Text size (mm)	vertical_geometry_label_length_text_size
	input
	<i>size of left hand length label</i>

Section: Quick vertical geometry - Length arrow and text parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Length mode	vertical_geometry_length_mode	choice box	length radius k value mixed - length for parabolic, radius for circular
			<i>mode of length for length labels.</i>
Length decimal places	vertical_geometry_label_length_decimals	input	
			<i>number of decimal places for length arrow labels.</i>
Length arrow textstyle	vertical_geometry_arrow_length_textstyle	textstyle box	
			<i>textstyle for length arrow labels.</i>
Length arrow text colour	vertical_geometry_arrow_length_text_colour	colour box	
			<i>colour of length arrow labels.</i>
Length arrow text size (mm)	vertical_geometry_arrow_length_text_size	input	
			<i>size of length arrow labels</i>

Please continue to the next section [Extensive Vertical Geometry](#).

Extensive Vertical Geometry

Section: Extensive vertical geometry parameters

For complicated vertical geometry labelling of the *primary alignment* string, there are sets of vertical geometry labelling parameters which give tight control over the position and types of labels.

It is also possible to label the vertical geometry of **alignment** strings other than the primary string. To plot such a string on the same plot, the chainage position of the vertical geometry for the non-primary alignment strings is *projected* onto the primary string to give a primary string chainage for plotting. The values of the vertical geometry (such as grade and curve length) that are plotted are taken from the other string. Independently graded offset strings (such as a left and right kerbs) are the type of additional alignment strings that may need to be plotted on the same long section plot as the reference string (primary string).

For plotting vertical geometry, the user can give up to twenty sets of these labels and they can be used to label grades or vertical curve information for the primary string and/or additional alignment strings.

Each label set consists of three parts:

- (a) a text label on the left hand side of the plot
- (b) an arrow
- (c) text on the arrows.

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Define set #		input	
<i>where n = 1 to....20. The set enables the specification of a number of parameters for a number of specified extensive horizontal geometry.</i>			
For the following parameters, n takes the value 1 to 20 and specifies the nth parameter set.			
Geometry to label	v_g_n_type	choice box	label grades label vg curve information
<i>specifies what geometry is to be labelled for the nominated set. If v_g_n_type is missing, then the set is ignored.</i>			
Value to label	v_g_n_value_mode	choice box	nothing %grade or parabola length, arc length 1 in grade or radius mm grade or K value ch length between curve points per chord(QR) or curve constant (QR).

specifies the value to label. This will be dependant on the v_g_n_type chosen.

Vertical curve points to draw the arrows between (for grade labelling only)

Points to draw arrows between

v_g_n_between_mode	choice box	between chainages at the vips between chainages at the vtps
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specifies where to draw the arrows between (for grade labelling only).

Y offset (mm) v_g_n_label_y input
distance of arrow line above top of the boxes. This value can be negative

If the set of parameters is to apply to the vertical geometry of an alignment string *other* than the primary string, then the following parameter can define the other alignment string

Offset string v_g_n_offset_string select box
the name of the non-primary string. i.e.

 v_g_n_offset_string model->string_name
or
 v_g_n_offset_string string_name

and the model is the *defined by offset_model*. *offset_model* has been defined in the section [Boxes - Offset String Titles/Heights/Depths](#).

If the v_g_n_offset_string parameter does not exist, then the set of vertical geometry parameters is applied to the primary string.

Extensive Vertical Geometry - Left Hand Labels

Section: Extensive vertical geometry - Left hand labels parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Use set #		input	
<i>set #, as specified by the define set # parameter.</i>			

For the following parameters, n takes the value 1 to 20 and specifies the nth parameter set.

Label X (mm) v_g_n_label_x input
distance from the left hand side of the labels area to start the left hand label text.

Offset (mm) v_g_n_label_offset input
distance to raise the left hand label text above arrow line.

Text size (mm) v_g_n_label_text_size input
size of the left hand label text.

Text colour v_g_n_label_text_colour colour box
size of the left hand label text.

Text v_g_n_label_text input
left hand label text.

Textstyle v_g_n_label_textstyle text box
textstyle for the left hand label text.

Extensive Vertical Geometry - Arrow Type

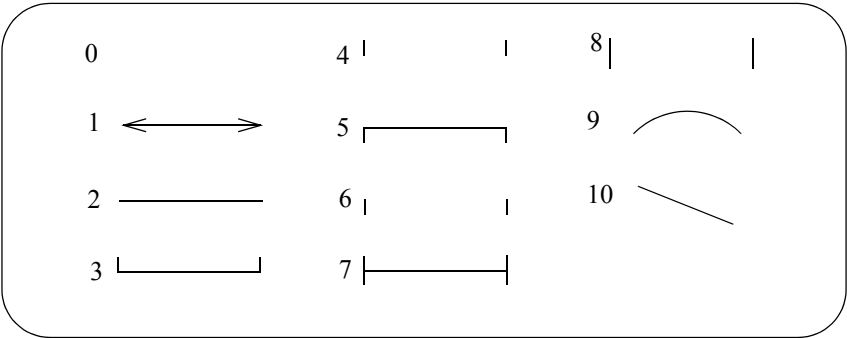
Section: Extensive vertical geometry - Arrow type parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
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Use set #		input
set #, as specified by the define set # parameter.		
For the following parameters, n takes the value 1 to 20 and specifies the nth parameter set.		
Arrow type mode	v_g_n_draw_mode	choice box
		arrow (1)
		line (2)
		line with uprights at ends (3)
		uprights with no lines (4)
		line with downrights (5)
		downrights with no lines (6)
		line with up and downrights at ends (7)
		up and downrights with no line (8)
		draw curve (9)
		draw grade (10)

specifies the arrow type to be drawn.



Left arrow gap (mm)	v_g_n_left_gap	input
size of gap for left side for arrow.		
Right arrow gap (mm)	v_g_n_right_gap	input
size of gap for right side of arrow.		
Arrow colour	v_g_n_colour	colour box
colour of arrow text		
Arrow height (mm)	v_g_n_height	input
height of arrow in mm.		
Leave gap in arrow for text	v_g_n_gap	tick box
if ticked, a gap will be left for text.		

Extensive Vertical Geometry - Arrow Text

Section: Extensive vertical geometry - Arrow text parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Use set #		input	

set #, as specified by the define set # parameter.

Text colour <i>colour of arrow text</i>	v_g_n_text_colour	colour box
Text size (mm) <i>size of arrow text</i>	v_g_n_text_size	input
Text offset (mm) <i>distance to raise the text above the arrow line.</i>	v_g_n_text_offset	input
Arrow text pre-text <i>text before the arrow text</i>	v_g_n_pre_text	input
Arrow text post-text <i>text after the arrow text</i>	v_g_n_post_text	input
Textstyle <i>textstyle of arrow text</i>	v_g_n_textstyle	text box
Decimal places <i>number of decimal places in arrow text. If > 0, all trailing zeros after the decimal place are removed. If < 0, the absolute value is taken as the number of decimal places and no trailing zeros are removed after the decimal point.</i>	v_g_n_no_decimals	input
Rotate text to fit <i>if ticked, the text on the arrows will be rotated to fit.</i>	v_g_n_rotate	tick box

Please continue to the next section [Labelling Points With Chainage/Height/Grade/Deflection](#).

Labelling Points With Chainage/Height/Grade/Deflection

Section: Labelling points with chainage/height/grade/deflection

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Define set #		input	
<i>where $n = 1$ to....20. The set enables the specification of a number of parameters for a number of specified labels.</i>			
For the following parameters, n takes the value 1 to 20 and specifies the nth parameter set.			
Label Type	label_n_type	choice box	chainage of vip, height of vip chainage of vip, height of primary crest sag vtp hcp change of grade mid-ordinate of the vertical curve

The chainage and/or height values for certain points (given by label_n_type) can be labelled.

If label_n_type is missing, then the set is ignored.

Label height mode	label_n_y_mode	choice box	height above boxes (mm) height above height value (mm) height above primary height (mm)
<i>specifies which reference point the label_n_y distance is measured from.</i>			

Labelling Points - Label Position

Section: Ch/Ht/Grade label position parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Use set #		input	
<i>set #, as specified by the Define set # parameter.</i>			
For the following parameters, n takes the value 1 to 20 and specifies the nth parameter set.			
Distance above point (mm)	label_n_y	input	
<i>distance above point.</i>			
Angle (dms)	label_n_angle	angle box	
<i>rotation about point.</i>			
Angle on grade		tick box	
Distance along from point (mm)	label_n_x	input	
<i>the distance along from the point in mm.</i>			

Text raise height (mm)	label_n_offset	input	
<i>the distance to raise the text in mm.</i>			
Justification	label_n_justification	choice box	left end middle end
<i>justification of the label.</i>			

Labelling Points - Label Text Type

Section: Ch/Ht/Grade label text type parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Use set #		input	
<i>set #, as specified by the Define set # parameter.</i>			

For the following parameters, n takes the value 1 to 20 and specifies the nth parameter set.

Size (mm)	label_n_size	input	
<i>size of the text.</i>			
Colour	label_n_colour	colour box	
<i>colour of text.</i>			
Textstyle	label_n_textstyle	text box	
<i>the textstyle of the text.</i>			

Labelling Points - Label Text

Section: Ch/Ht/Grade label text parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Use set #		input	
<i>set #, as specified by the Define set # parameter.</i>			

For the following parameters, n takes the value 1 to 20 and specifies the nth parameter set.

Label type	label_n_value_mode	choice box	no values labelled val 1 = chainage val 1 = height val 1 = chainage, val2 = height val 1 = height, val2 = chainage
<i>the value label mode.</i>			
Pre-text	label_n_pre_text	input	
<i>text before the label text</i>			
Mid-text	label_n_mid_text	input	
<i>text at mid position i.e. between val 1 and val 2.</i>			
Post-text	label_n_post_text	input	

text after the label text

Decimal places val 1	label_n_no_decimals_1	input
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number of decimal places in val 1.

Decimal places val 2 label_n_no_decimals_2 input

number of decimal places in val 2.

If the **number of decimal places is greater than zero (> 0)**, then any trailing zeros after the decimal point are removed.

If the **number of decimal places is less than zero (< 0)**, the absolute value is taken as the number of decimal places and **no** trailing zeros after the decimal point are removed.

Deflection mode input

Please continue to the next section [Labelling Points With Symbols](#).



Labelling Points With Symbols

Section: Labelling points with symbols

Symbols can be placed at certain points given by `symbol_n_type`.

The symbol is drawn in a square box centred on (0,0) with sides of length two millimetres. That is, the box co-ordinates are (-1,-1), (1,1), (1,-1), (-1,-1).

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Set #		input	
<i>where n = 1 to....20. The set enables the specification of a number of parameters for a number of specified symbols.</i>			
Symbol Type	<code>symbol_n_type</code>	choice box	chainage of vip, height of vip chainage of vip, height of primary crest sag vtp hcp change of grade mid-ordinate of the vertical curve

If `symbol_n_type` is missing, then the set is ignored.

Label height mode	<code>symbol_n_y_mode</code>	choice box	height above boxes (mm) height above height value (mm) height above primary height (mm)
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specifies which reference point the label_n_y distance is measured from.

Distance above point (mm)	<code>symbol_n_y</code>	input	
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distance above point given by mode.

Angle (dms)	<code>symbol_n_angle</code>	angle box	
--------------------	-----------------------------	-----------	--

rotation about point.

Distance along from point (mm)	<code>symbol_n_x</code>	input	
---------------------------------------	-------------------------	-------	--

the distance along from the point in mm.

Size (mm)	<code>symbol_n_size</code>	input	
------------------	----------------------------	-------	--

the symbol size in mm.

Colour	<code>symbol_n_colour</code>	colour box	
---------------	------------------------------	------------	--

the symbol size in mm.

Symbol draw mode	<code>symbol_n_draw_mode</code>	choice box	height above boxes (mm) cross (0) upright from centre of box (1) up and downright from centre of box (2) square (3) triangle, base at bottom (4) circle (5)
-------------------------	---------------------------------	------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

draw mode for symbol

0 + 1 | 2 | 3 □ 4 △ 5 ○

Symbolinput

Please continue to the next section [Hatching Cut/Fill](#).

Hatching Cut/Fill

Section: Hatching cut/fill - Tin parameters

This option is used to hatch cut and/or fill areas between sets of tins.

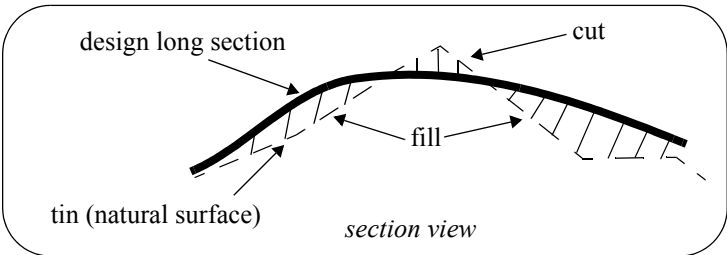
For each set, the name of the two tins, the hatch linestyle, colour and separation and whether cut and/or fill regions are required are all user definable.

Up to twenty (20) separate sets of tins may be hatched.

Panel Field	Parameter name	Type
Define Set #		input
set number to be used to define different original/new tin sets.		
Original tin	hatch_original_tin_n	tin box
tin_name for original surface		
New tin	hatch_new_tin_n	tin box
tin_name for final surface		

Notes

- (a) cut is when the new tin is below the original tin.
fill is when the new tin is above the original tin.
- (b) cut hatching is turned off by setting *hatch_cut_separation_n* to 0.0.
fill hatching is turned off by setting *hatch_fill_separation_n* to 0.0.



Hatching Cut/Fill - Cut

Section: Hatching cut/fill - Cut parameters

Panel Field	Parameter name	Type
Use Set #		input
set number as specified in the Define set# .		
Cut separation (mm)	hatch_cut_separation_n	input
distance between cut hatch lines. If 0, no hatching.		
Cut hatch angle (dms)	hatch_cut_angle_n	input

angle of hatching.

Cut colour	hatch_cut_colour_n	colour box
<i>colour of the hatching.</i>		
Cut linestyle	hatch_cut_linestyle_n	linestyle box
<i>linestyle of the hatching.</i>		
Draw sides of cuts	hatch_cut_draw_sides_n	choice box
<i>draw mode for sides of cut regions.</i>		
Draw original tin	hatch_cut_draw_original_n	choice box
<i>draw mode for sides of original tin in cut.</i>		
Draw new tin	hatch_cut_draw_new_n	choice box
<i>draw mode for sides of new tin in cut.</i>		

Hatching Cut/Fill - Fill

Section: Hatching cut/fill - Fill parameters

Panel Field	Parameter name	Type
Use Set #		input
<i>set number as specified in the Define set#.</i>		
Fill separation (mm)	hatch_fill_separation_n	input
<i>distance between fill hatch lines. If 0, no hatching.</i>		
Fill hatch angle (dms)	hatch_fill_angle_n	input
<i>angle of hatching.</i>		
Fill colour	hatch_fill_colour_n	colour box
<i>colour of the hatching.</i>		
Fill linestyle	hatch_fill_linestyle_n	linestyle box
<i>linestyle of the hatching.</i>		
Draw sides of fills	hatch_fill_draw_sides_n	choice box
<i>draw mode for sides of fill regions.</i>		
Draw original tin	hatch_fill_draw_original_n	choice box
<i>draw mode for sides of original tin in fill.</i>		
Draw new tin	hatch_fill_draw_new_n	choice box
<i>draw mode for sides of new tin in fill.</i>		

Please continue to the next section [Cuts](#).

Cuts

The cuts that the primary string (design line) makes through strings in any user-specified model can be automatically labelled on the long section plots.

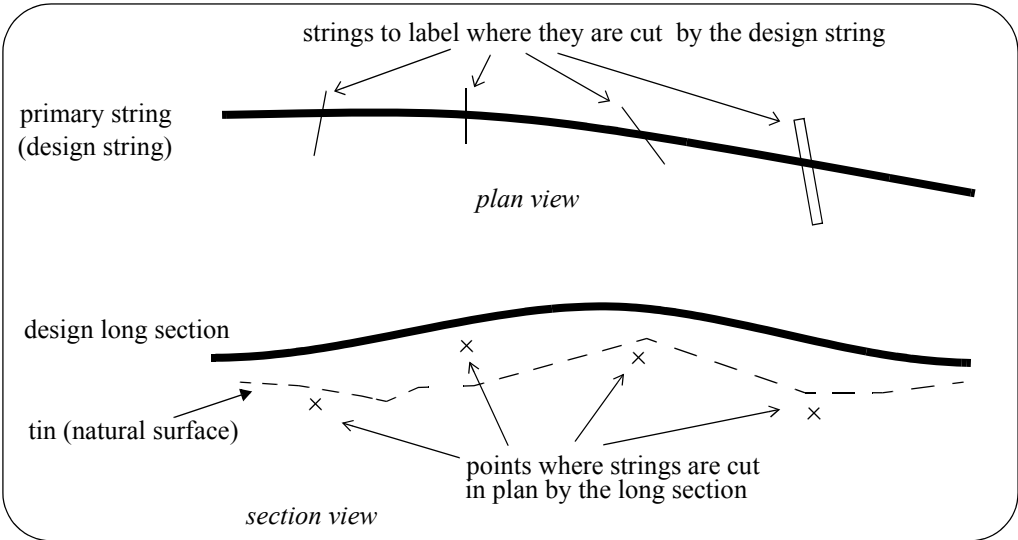
The **height**, **chainage** and **name** of the cut string can be labelled as well as a **symbol**. The height of tins at the same offset value can also be labelled.

The chainage position for the labelling is the chainage of the cut string.

The height position for the labelling can be specified as the:

- (a) top of the boxes on the long section,
- (b) height value of the cut string,
- (c) height of the primary string,
- (d) height of a tin.

The actual position of the label is defined relative to the above point.



Note: Only case (b) involves the actual height of the cut string. For all other cases, only the chainage of the cut string is used. Hence for all cases except (b), the string does need to have a sensible height to be used for cuts through strings. For example, a boundary string may have null heights but only the chainage is required and the height of the tin at that chainage can be used as the height (case (d)).

The method for specifying which strings are to be checked for cuts is by first specifying the **model** which contains the strings, and then a **name mask** which is used to restrict the strings in the model to only those whose names match the name mask.

Up to twenty five different sets of models and name masks can be used so that different cut sets can be labelled in different ways.

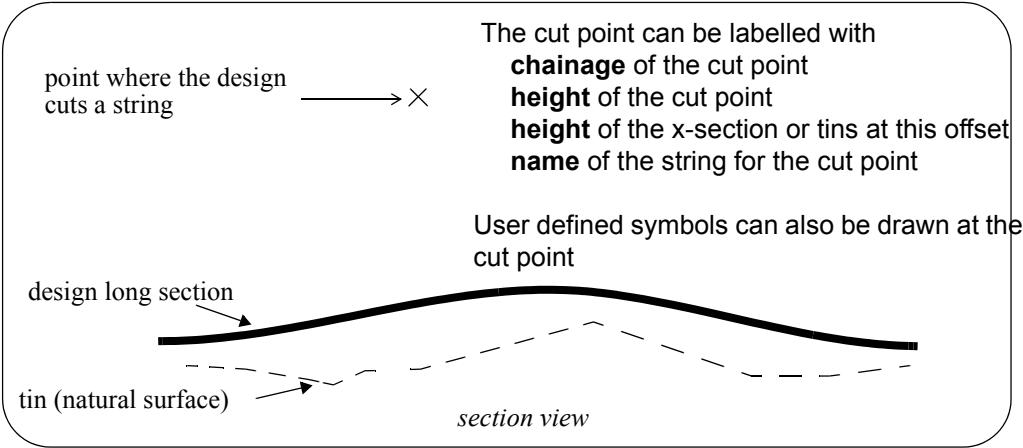
Section: Cuts - Model/Name mask parameters

Panel Field	Parameter name	Type
Define Set #		input
set number to be used to define different model/mask sets.		
Model	cuts_n_model	model box
model from which cut masks are derived		
Name mask	cuts_n_mask	input
text string containing the name masks, each separated by one or more spaces, to test the string name against. Each mask can include wild cards and wild characters.		

For example: "ke*" or,
 "?bank*" or, if both masks are required,
 "ke* ?bank*"

If cuts_n_mask is blank, then all strings in the model are used. This is equivalent to name mask being set to "*".

All strings in the model cuts_n_model whose name satisfy the name mask cuts_n_mask are then checked for cuts with the design string, and if a cut occurs, the cut point will be labelled according to the rest of the parameters in the nth set.



Cuts - Chainage

Section: Cuts - Chainage parameters

Panel Field	Parameter name	Type	Pop-Up
Use Set #		input	
set number as specified in the Define set#.			
Position	cuts_chainage_n_position	choice box	above cut string height value above top of boxes to primary string to tin 1 to tin 2 to tin 3 to tin 4 to tin 5 to tin 6 to tin 7 to tin 8 to tin 9 to tin 10
position of chainage label.			
X (mm)	cuts_chainage_n_x	input	
horizontal adjustment to position of chainage text.			
Y (mm)	cuts_chainage_n_y	input	
vertical adjustment to position of chainage text.			
Angle (dms)	cuts_chainage_n_angle	input	
rotation of chainage text about position.			

Colour	cuts_chainage_n_colour	colour box	
			<i>colour of chainage text.</i>
Size (mm)	cuts_chainage_n_size	input	
			<i>size of chainage text. A value of 0 means no label.</i>
Textstyle	cuts_chainage_n_textstyle	text box	
			<i>textstyle of chainage text.</i>
Pre-text	cuts_chainage_n_pre_text	input	
			<i>text before chainage text.</i>
Post-text	cuts_chainage_n_post_text	input	
			<i>text after chainage text.</i>
Justification	cuts_chainage_n_justification	justification box	
			bottom-left
			bottom-centre
			bottom-right
			bottom-decimal
			middle-left
			middle-centre
			middle-right
			middle-decimal
			top-left
			top-centre
			top-right
			top-decimal
			decimal-left
			decimal-centre
			decimal-right
			decimal-point
			<i>justification of the chainage text.</i>
Decimals	cuts_chainage_n_no_decimals	input	
			<i>number of decimals in chainage.</i>

Cuts - Heights

Section: Cuts - Height parameters

Panel Field	Parameter name	Type	Pop-Up
Use Set #		input	
			<i>set number as specified in the Define set#.</i>
Mode	cuts_height_n_mode	choice box	use height of cut point use real height above boxes height of primary string use height of tin 1 use height of tin 2 use height of tin 3 use height of tin 4 use height of tin 5

use height of tin 6
use height of tin 7
use height of tin 8
use height of tin 9
use height of tin 10

determines which height value is labelled.

Position	cuts_height_n_position	choice box	at cut string above top of boxes above top of graph area to primary string to tin 1 to tin 2 to tin 3 to tin 4 to tin 5 to tin 6 to tin 7 to tin 8 to tin 9 to tin 10
-----------------	------------------------	------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

position of height label.

X (mm)	cuts_height_n_x	input
---------------	-----------------	-------

horizontal adjustment to position of height text.

Y (mm)	cuts_height_n_y	input
---------------	-----------------	-------

vertical adjustment to position of height text.

Angle (dms)	cuts_height_n_angle	input
--------------------	---------------------	-------

rotation of height text about position.

Colour	cuts_height_n_colour	colour box
---------------	----------------------	------------

colour of height text.

Size (mm)	cuts_height_n_size	input
------------------	--------------------	-------

size of height text. A value of 0 means no label.

Textstyle	cuts_height_n_textstyle	text box
------------------	-------------------------	----------

textstyle of height text.

Pre-text	cuts_height_n_pre_text	input
-----------------	------------------------	-------

text before height text.

Post-text	cuts_height_n_post_text	input
------------------	-------------------------	-------

text after height text.

Justification	points_height_n_justification	justification box
----------------------	-------------------------------	-------------------

bottom-left
bottom-centre
bottom-right
bottom-decimal
middle-left
middle-centre
middle-right
middle-decimal
top-left

top-centre
top-right
top-decimal
decimal-left
decimal-centre
decimal-right
decimal-point

justification of the height text.

Decimals	cuts_height_n_no_decimals	input
-----------------	---------------------------	-------

number of decimals in height.

Cuts - Diameters

Section: Cuts - Diameter parameters

Panel Field	Parameter name	Type	Pop-Up
Use Set #		input	
Position		input	
X (mm)		input	
Y (mm)		input	
Angle (dms)		input	
Colour		input	
Size (mm)		input	
Textstyle		input	
Pre-text		input	
Post-text		input	
Justification		input	
Factor		input	
Decimals		input	

Cuts - Labels

Section: Cuts - Label parameters

Panel Field	Parameter name	Type	Pop-Up
Use Set #		input	

set number as specified in the Define set#.

Position	cuts_label_n_position	choice box	at cut string height above top of boxes above top of graph area to primary string to tin 1 to tin 2 to tin 3 to tin 4 to tin 5 to tin 6 to tin 7 to tin 8 to tin 9 to tin 10
-----------------	-----------------------	------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

position of label text.

Mode	cuts_label_n_mode	choice box	don't include string name include cut string name
-------------	-------------------	------------	------------------------------------------------------

determines whether the label includes the cut string name.

Attribute name		input
X (mm)	cuts_label_n_x	input

horizontal adjustment to position of label.

Y (mm)	cuts_label_n_y	input
---------------	----------------	-------

vertical adjustment to position of label.

Angle (dms)	cuts_label_n_angle	input
--------------------	--------------------	-------

rotation of label about position.

Colour	cuts_label_n_colour	colour box
---------------	---------------------	------------

colour of label.

Size (mm)	cuts_label_n_size	input
------------------	-------------------	-------

size of label. A value of 0 means no label.

Textstyle	cuts_label_n_textstyle	text box
------------------	------------------------	----------

textstyle of label.

Pre-text	cuts_label_n_pre_text	input
-----------------	-----------------------	-------

text before label.

Post-text	cuts_label_n_post_text	input
------------------	------------------------	-------

text after label.

Justification	cuts_label_n_justification	justification box
		bottom-left
		bottom-centre
		bottom-right
		bottom-decimal
		middle-left
		middle-centre
		middle-right
		middle-decimal
		top-left
		top-centre
		top-right
		top-decimal
		decimal-left
		decimal-centre
		decimal-right
		decimal-point

justification of the label.

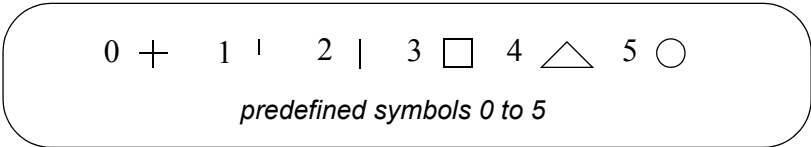
Factor		input
Decimals		input

Cuts - Symbols

Section: Cuts - Symbol parameters

Panel Field	Parameter name	Type	Pop-Up
Use Set #		input	
	set number as specified in the Define set#.		
Mode	cuts_symbol_n_mode	choice box	cross (0) up from centre of box (1) up&down from box centre(2) square (3) triangle, base at bottom (4) circle (5) use a plot symbol

symbol mode.



Note: If a plot symbol is to be used, the cuts_symbol_n_style parameter must be specified.

Symbol	cuts_symbol_n_style	plot symbols
a valid plot symbol can be selected.		
Position	cuts_symbol_n_position	choice box
		at cut string height above top of boxes above top of graph area to primary string to tin 1 to tin 2 to tin 3 to tin 4 to tin 5 to tin 6 to tin 7 to tin 8 to tin 9 to tin 10

position of symbol.

X (mm)	cuts_symbol_n_x	input
horizontal adjustment to position of symbol.		
Y (mm)	cuts_symbol_n_y	input
vertical adjustment to position of symbol.		
Angle (dms)	cuts_symbol_n_angle	input
rotation of symbol about point.		
Colour	cuts_symbol_n_colour	colour box
colour of symbol.		
Size (mm)	cuts_symbol_n_size	input
size of symbol. A value of 0 means no symbol.		

Please continue to the next section [Paired Cuts - Long Section](#).

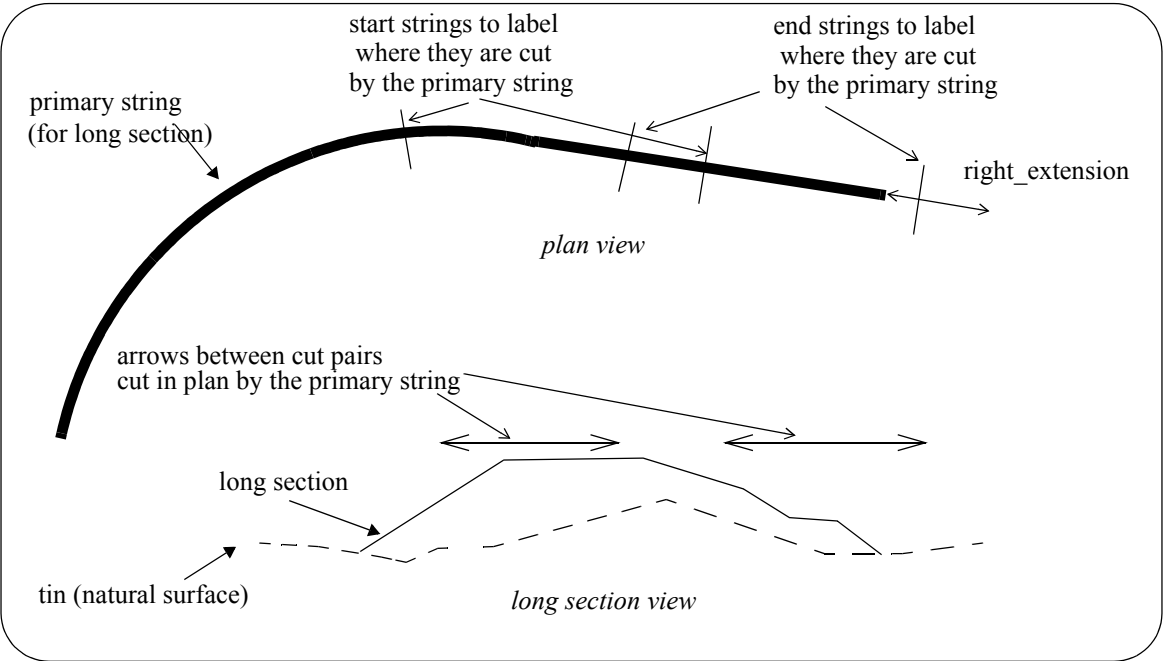
Paired Cuts - Long Section

Paired cuts uses pairs of strings and where both strings cut the primary string, the cuts on the long plot can be labelled with information such as

- (a) the name of the first and second cut strings
- (b) attributes from the first and second cut string
- (c) plan distance between the two cuts of the pair
- (d) 3d length between the two cuts of the pair
- (e) the change on the long section of the first and second cuts of the pair



Symbols can be drawn at the chainages of the first and second cuts (at a height specified when defining the Cut sets), and a line drawn between the symbols. Using both the line and a symbol of an arrow head makes an arrow between the two cuts.



The method for specifying which strings are to be checked for paired cuts is by first specifying the **models** (using wild cards and characters) that contains the strings, and then a **start name mask** to select the all the strings that are to be the first strings in a cut pair, and an **end name mask** to select all the strings that are the second strings in a cut pair.

For a long section, all the cuts of the selected **start** strings are found and the cuts ordered by the chainage of the cut with the primary string of the long section. Then all the cuts of the selected **end** strings are found and the cuts ordered by the chainage of the cut with the primary string of

The start cuts are then processed and each start cut is paired with the next end cut with a larger chainage than the start cut. It is possible that there are end cuts before the first start cut (orphaned end cuts) and start cut with no following end cut (orphaned start cuts).

Section: Pairing - Model/Name mask parameters

set number to be used to define different model/mask sets.

models (the name can include wild cards () and wild characters (?)) from which start and end cut masks are derived.*

text string containing the name masks to select the start strings, each separated by one or more spaces, to test the string names against. If the name include spaces then it must be enclosed in the quotes " (eg "bench 2").

For example: "ke*" or,
 "?bank*" or, if both masks are required,
 "ke* ?bank*"

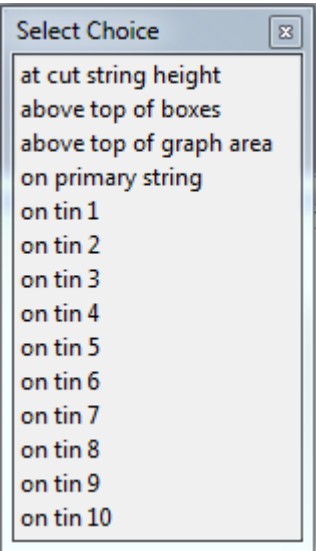
text string containing the name masks to select the end strings, each separated by one or more spaces, to test the string names against. If the name include spaces then it must be enclosed in the quotes " (eg "bench 2")

For example: `"ke"` or,
 `"?bank"` or, if both masks are required,
 `"ke* ?bank"`

If **Start name mask** is blank and **End name mask** is not blank, then all strings in the models that are not used as end strings, are used as start string.

*This is currently not operational: If **Start name mask** and **End name mask** are both blank, then all strings in the models are used. All the strings that cut the primary string of the long section are ordered by offset, and successive pairs of cuts taken to be the cut pairs. There could be one remaining cut point (it has the largest chainage) and if so, it is taken to be orphaned start point.*

Position pairing_n_position choice box



where to get the z-values to use for the two cut positions. This is used in conjunction with the choice in the Adopted height field.

If left blank, **at cut string height** is used.

Adopted height pairing_n_height choice box lower position, higher position
start position, end position

for the choice selected in the Position field, there will be a z-value at the first cut and another z-value at the end cut. The Adopted height says which of the two z-value to use for placing symbols, lines between cuts, text from Attributes and the Offsets of the first cut and the second cut.

If lower (higher) position, the smaller (greater) of the two z-values will be used.

If start (end), the z-value of the first (second) cut of the cut point pair will be used.

If left blank, **lower position** is used.

Include orphaned start ? pairing_n_orphan_start choice box yes, no

if **Yes** and there are start cuts after the last end cut (and so can't be paired), then the last start cut (i.e. the one with the largest chainage) is taken as an orphaned start and it is labelled as though there is a matching end at the end of the long section.

if **No** and there are start cuts after the last end cut, then those start cut are ignored.

If left blank, **No** is used.

Include orphaned ends ? pairing_n_orphan_end choice box yes, no

if **Yes** and there are end cuts before the first start cut, then the first end cut (the one with the smallest chainage) is taken as an orphaned end and it is labelled as though there is a matching start at the beginning of the long section.

if **No** and there are end cuts before the first start cut, then those end cut are ignored.

If left blank, **No** is used.

Paired Cuts (Long Section) - Lines and Symbols

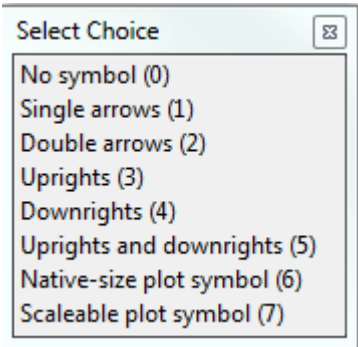
Symbols can be placed at the start and end cut chainages (at the z-value given by the Position and Adopted height columns when defining the Sets), and a line can also be drawn between the cuts at that z-value. Having both the line and a symbol forms an arrow between the cuts pair.

Section: Pairing - Lines and symbol parameters

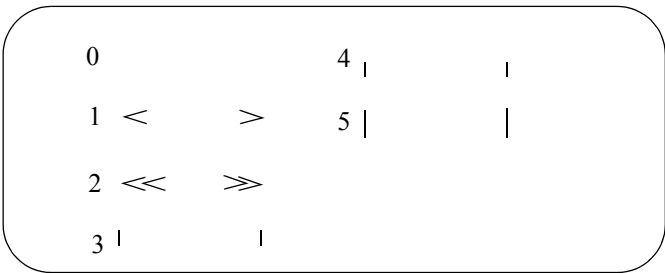
Panel Field	Parameter name	Type	Pop-Up
Use Set #		input	

set number as specified in the **Define set #**.

Symbol type	pairing_line_symbols_n_symbol	choice box
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type of symbol at each end of the cut pair.



for cases 6 and 7, a plot symbol is to be used and is given in the **Symbol** field

The height used for the symbol at both ends of the cuts pair is given by the **Position** and **Adopted height** column in the **Set** definition.

Symbol	pairing_line_symbols_n_user_symbol	plot symbols
---------------	------------------------------------	--------------

for **Symbol** type 6 and 7, the plot symbol to be used at each cut point.

For **Symbol** type 0 to 5, this field is not used.

The height used for the symbol at both ends is given by the **Position** and **Adopted height** columns in the **Set** definition.

Symbol colour	pairing_line_symbols_n_symbol_colour	colour box
----------------------	--------------------------------------	------------

colour of the symbol

Draw line	pairing_line_symbols_n_line	choice box	No line, Draw line
------------------	-----------------------------	------------	--------------------

if **Draw line**, draw a line between the start and end cuts for each cut pair.

If **No line**, no line is drawn between the start and end cuts for each cut pair.

The height used for the line at both ends is given by the **Position** and **Adopted height** columns in the **Set** definition.

Line colour	pairing_line_symbols_n_line_colour	colour box
--------------------	------------------------------------	------------

colour of the line between the start and end cuts for each cut pair

Left symbol rotation	pairing_line_symbols_n_left_rotate	measure box
-----------------------------	------------------------------------	-------------

angle (measured counterclockwise from the positive x-axis with units of degrees in [HP Notation](#)) to rotate the symbol at the start cut point for the cut point pair.

If there is no value then the rotation is 0.

Right symbol rotation	pairing_line_symbols_n_right_rotate	measure box
------------------------------	-------------------------------------	-------------

angle (measured counterclockwise from the positive x-axis with units of degrees in [HP Notation](#)) to rotate the symbol at the end cut point for the cut point pair.

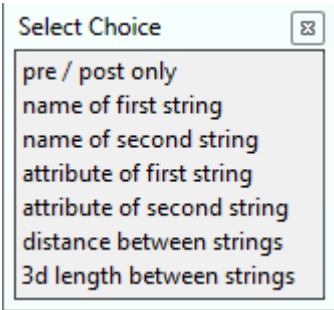
If there is no value then the rotation is 0.

X (mm)	pairing_line_symbols_n_x	measure box
horizontal adjustment to the position of the symbol.		
Y (mm)	pairing_line_symbols_n_y	measure box
vertical adjustment to the position of the symbol.		
Size	pairing_line_symbols_n_size	measure box
size of symbol. A value of 0 means no symbol.		

Paired Cuts (Long Section) - Labels

Section: Pairing - Label parameters

Panel Field	Parameter name	Type	Pop-Up
Use Set #		input	
set number as specified in the Define set #.			
Mode	pairing_label_n_mode	choice box	



type of label to write between the start and end points of the cuts pair

The height used for the label is given by the Position and Adopted height columns in the Set definition.

Attribute name	pairing_label_n_attribute	text box
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if Mode is **attribute of first string** or **attribute of second string**, this is the name of the attribute to use as the label

Offset	pairing_label_n_offset	measure box
the text is raised by this amount above the line between the cut pair		
Colour	pairing_label_n_colour	colour box
colour of the text		
Size (mm)	pairing_label_n_size	measure box
size of the text in millimetres. A value of 0 means no text.		
Textstyle	pairing_label_n_textstyle	textstyle box
the textstyle for the text		
Pre-text	pairing_label_n_pre_text	text box
text to draw before the label. This can include spaces, including one or more spaces after the last non blank character of Pre-text.		
Post-text	pairing_label_n_post_text	text box

text to draw after the label. This can include spaces, including one or more spaces before the first non blank character of Post-text.

Decimals pairing_label_n_no_decimals number box

if the label is a number, then Decimals is the number of decimal places to write the number out to.

If > 0, trailing zeros are **removed** after the decimal point.

If < 0, the absolute value is taken as the number of decimal places to report i.e. no trailing zeros are removed. For example -3 means that there is always 3 figures after the decimal place.

Leave gap for text pairing_label_n_?? tick box

if ticked then a gap in the line between the cuts pair is left large enough for the label and the pre-text and post-text.

If not ticked then no gap is left in the line between the cuts pair.

Rotate text to fit pairing_label_n_roate_text tick box

if ticked, then if the label and the pre-text and post-text will not fit between the start cut and end cut of the cut pair, the text is rotated through ninety degrees.

If not ticked, then the label text is drawn even though it will run over the ends of the cut pair.

Paired Cuts (Long Section) - Start Chainage

The Chainge (on the long section) of the first point of the cut pair can be labelled.

The text for the label consists of pre-text followed by Chainage value followed by post-text.

Section: Pairing - Start Chainage parameters

Panel Field	Parameter name	Type	Pop-Up
Use Set #		input	

set number as specified in the **Define set #**.

The height used for the text is given by the Position and Adopted height columns in the Set definition. This is then adjusted by the field Y (mm).

X (mm) pairing_start_chainage_n_x measure box

for placing the text: horizontal adjustment from the chainage of the first cut.

Y (mm) pairing_start_chainage_n_y measure box

for placing the text: the vertical adjustment to the height given by the Position and Adopted height columns in the Set definition

Angle (dms) pairing_start_chainage_n_angle measure box

angle (measured counterclockwise from the positive x-axis with units of degrees in [HP Notation](#)) to rotate the text

Colour pairing_start_chainage_n_colour colour box

colour of the text

Size (mm) pairing_start_chainage_n_size measure box

size of the text in millimetres. A value of 0 means no text.

Textstyle pairing_start_chainage_n_textstyle textstyle box

the textstyle for the text

Pre-text pairing_start_chainage_n_pre_text text box

text before the Chainage value. This can include spaces, including one or more spaces after the last non blank character of Pre-text.

Post-text	pairing_start_chainage_n_post_text	text box
<i>text after the Chainage value. This can include spaces, including one or more spaces before the first non blank character of Post-text.</i>		
Justification	pairing_start_chainage_n_justification	justification box



justification of the text.

Decimals	pairing_start_chainage_n_no_decimals	number box
<i>the number of decimal places for the offset value</i>		
<i>If > 0, trailing zeros are removed after the decimal point.</i>		
<i>If <0, the absolute value is taken as the number of decimal places to report i.e. no trailing zeros are removed. For example -3 means that there is always 3 figures after the decimal place.</i>		

Paired Cuts (Long Section) - End Chainage

The Chainage on the long section of the second point of the cut pair can be labelled.
The label consists of pre-text then the Chainage value followed by post-text.

Section: Pairing - End Chainage parameters

Panel Field	Parameter name	Type	Pop-Up
Use Set #		input	
<i>set number as specified in the Define set #.</i>			
<i>The height used for the text is given by the Position and Adopted height columns in the Set definition. This is then adjusted by the field Y (mm).</i>			
X (mm)	pairing_end_chainage_n_x	measure box	
<i>for placing the text: horizontal adjustment from the offset of the second cut.</i>			
Y (mm)	pairing_end_chainage_n_y	measure box	
<i>for placing the text: the vertical adjustment to the height given by the Position and Adopted height columns in the Set definition</i>			
Angle (dms)	pairing_end_chainage_n_angle	measure box	

angle (measured counterclockwise from the positive x-axis with units of degrees in [HP Notation](#)) to rotate the text

Colour pairing_end_chainage_n_colour colour box
colour of the text

Size (mm) pairing_end_chainage_n_size measure box
size of the text in millimetres. A value of 0 means no text.

Textstyle pairing_end_offset_n_textstyle textstyle box
the textstyle for the text

Pre-text pairing_end_chainage_n_pre_text text box
text before the Offset value. This can include spaces, including one or more spaces after the last non blank character of Pre-text.

Post-text pairing_end_chainage_n_post_text text box
text after the Offset value. This can include spaces, including one or more spaces before the first non blank character of Post-text.

Justification pairing_start_chainage_n_justification justification box



justification of the text.

Decimals pairing_start_chainage_n_no_decimals number box
the number of decimal places for the Offset value

*If > 0, trailing zeros are **removed** after the decimal point.*
If <0, the absolute value is taken as the number of decimal places to report i.e. no trailing zeros are removed. For example -3 means that there is always 3 figures after the decimal place.

Please continue to the next section [Primary String Name Label](#).

Primary String Name Label

The plot can be labelled with a name under the boxes area.
The name is made up of a concatenation of the text string names.

Section: Primary string name label parameters

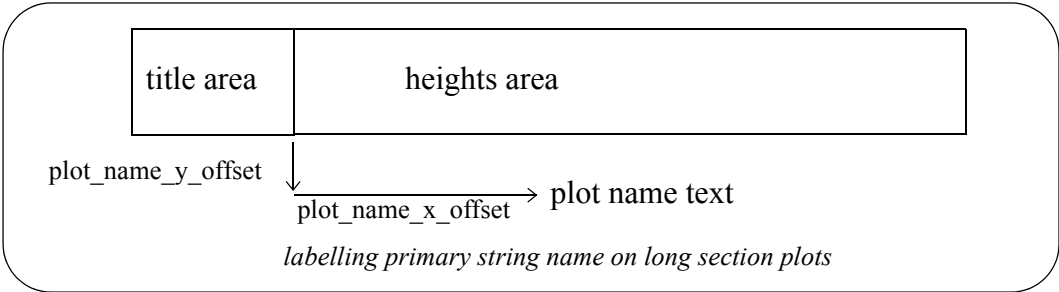
Panel Field	Parameter name	Type
Name mode <i>determines what text is placed in the name labels.</i>	plot_name_string_name	choice box
Pre-text <i>text before label.</i>	plot_name_pre_text	input
Post-text <i>text after label.</i>	plot_name_post_text	input
Textstyle <i>textstyle of label.</i>	plot_name_textstyle	text box
Size (mm) <i>size of label.</i>	plot_name_size	input
Colour <i>colour of label.</i>	plot_name_colour	colour box
X offset (mm) <i>horizontal adjustment to position of label.</i>	plot_name_x_offset	input
Y offset (mm) <i>vertical adjustment to position of label.</i>	plot_name_y_offset	input

The plot name is positioned under the boxes.

The *plot_name_x_offset* is measured from the beginning of the height boxes.

The default for *plot_name_x_offset* is centred on heights area.

The *plot_name_y_offset* is measured from the bottom of the box area with positive being down.



Please continue to the next section [Scale Labelling](#).

Scale Labelling

The plot can be labelled with the horizontal and vertical scale under the boxes area.

The scale label is made up of a concatenation of the text strings:

scale_horizontal_pre_text

horizontal scale value

scale_horizontal_post_text

and

scale_vertical_pre_text

vertical scale value

scale_vertical_post_text

The horizontal scale value is the value given by the scale parameter.

The scales are positioned under the boxes.

Scale Labelling - Horizontal

Section: Scale labelling - Horizontal parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Pre-text <i>text before label</i>	scale_horizontal_pre_text	input	
Post-text <i>text after label</i>	scale_horizontal_post_text	input	
Textstyle <i>textstyle of label</i>	scale_horizontal_textstyle	textstyle box	
Size (mm) <i>size of label</i>	scale_horizontal_size	input	
Colour <i>colour of label</i>	scale_horizontal_colour	colour box	
X offset (mm) <i>horizontal adjustment to position of label.</i>	scale_horizontal_x_offset	input	
Y offset (mm) <i>height adjustment to position of label.</i>	scale_horizontal_y_offset	input	
Decimal places <i>height adjustment to position of label.</i>	scale_horizontal_decimals	input	

Scale Labelling - Vertical

Section: Scale labelling - Vertical parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Pre-text <i>text before label</i>	scale_vertical_pre_text	input	
Post-text <i>text after label</i>	scale_vertical_post_text	input	
Textstyle	scale_vertical_textstyle	textstyle box	

textstyle of label

Size (mm) scale_vertical_size input

size of label

Colour scale_vertical_colour colour box

colour of label

X offset (mm) scale_vertical_x_offset input

horizontal adjustment to position of label.

Y offset (mm) scale_vertical_y_offset input

height adjustment to position of label.

Decimal places scale_vertical_decimals input

height adjustment to position of label.

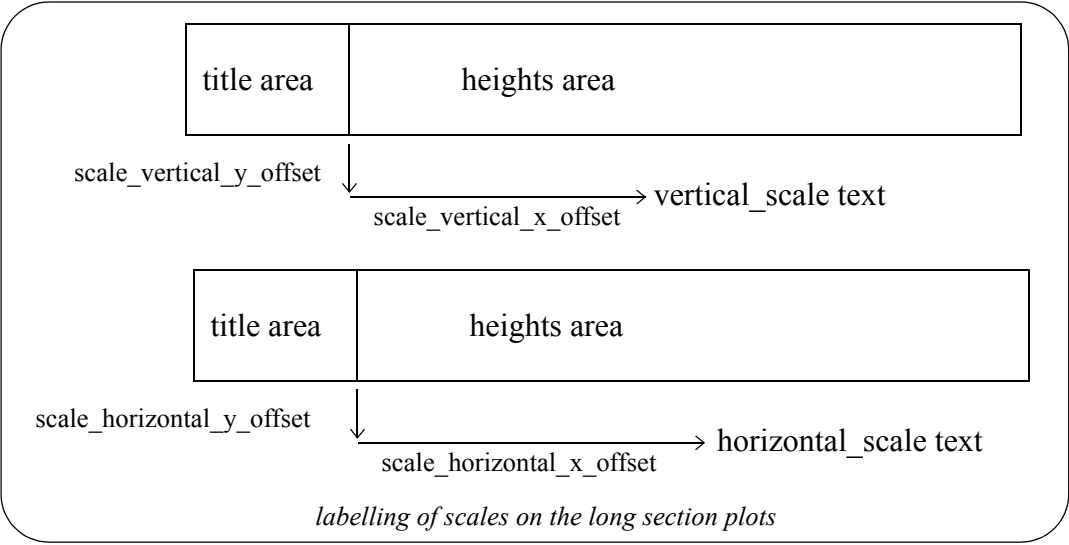
The *scale_vertical_x_offset* and *scale_horizontal_x_offset* are measured from the beginning of the heights area.

The default for *scale_vertical_x_offset* and *scale_horizontal_x_offset* are centred on the heights area.

The *scale_vertical_y_offset* and *scale_horizontal_y_offset* are measured from the bottom of the box area with positive being **down**.

If the **number of decimal places is greater than zero (> 0)**, then any trailing zeros after the decimal point are removed.

If the **number of decimal places is less than zero (< 0)**, the absolute value is taken as the number of decimal places and **no** trailing zeros after the decimal point are removed.



Please continue to the next section [Plan Plotting](#).

Plan Plotting

Section: Plan parameters

The *Plan Plotting* section is for generating a combined long section and plan plot on the one plot sheet. The chainage interval for the long section plots (as set up in the **Pagination** section [Pagination](#)) is used to define the chainage interval for the plan plot.

The total sheet size is given by the **Sheet size** parameter (see the section [Long Plot PPF Editor](#)), and the position of the long section plot on the sheet is defined in the section [Plot Sheet Layout](#). What is left to be defined is the area on the sheet for the plan plot.

Hence sheets of long sections and the associated plan plots are automatically generated.

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Use plan plotting <i>if tick, a plan plot to match the long section plot, is created on the same sheet. If not tick, no plan plot is created - only the long section.</i>	plan_plotting	tick box	
Left margin (mm) <i>left margin of the area of the plan plot</i>	plan_left_margin	input	
Right margin (mm) <i>right margin of the area of the plan plot</i>	plan_right_margin	input	
Top margin (mm) <i>top margin of the area of the plan plot</i>	plan_top_margin	input	
Bottom margin (mm) <i>bottom margin of the area of the plan plot</i>	plan_bottom_margin	input	
Gap from left margin to start chainage (mm)	plan_left_margin_gap	input	
Draw border around plan plot <i>if ticked, a border is drawn around the plan plot area</i>	plan_draw_border	tick box	
Border colour <i>colour of border</i>	plan_border_colour	colour box	
Symbol for start chainage <i>symbol to place in the plan area on the primary string at the start chainage of the long section plot</i>	plan_start_symbol	symbol box	
Symbol for end chainage <i>symbol to place in the plan area on the primary string at the end chainage of the long section plot</i>	plan_end_symbol	symbol box	
Symbol size (mm) <i>size of the symbols</i>	plan_symbol_size	input	
Symbol colour <i>colour of the symbols</i>	plan_symbol_colour	colour box	
View to plot <i>view containing the information to be plotted in the plan area</i>	plan_view_name	view box	

Please continue to the next section [PPFs To Include](#).

PPFs To Include

Panel Field	Parameter name	Type	Pop-Up
PPF files		input	
<i>by including pre existing PPF files, the user can build up a modified version without having to set all the parameters.</i>			

Drainage Plot PPF Editor

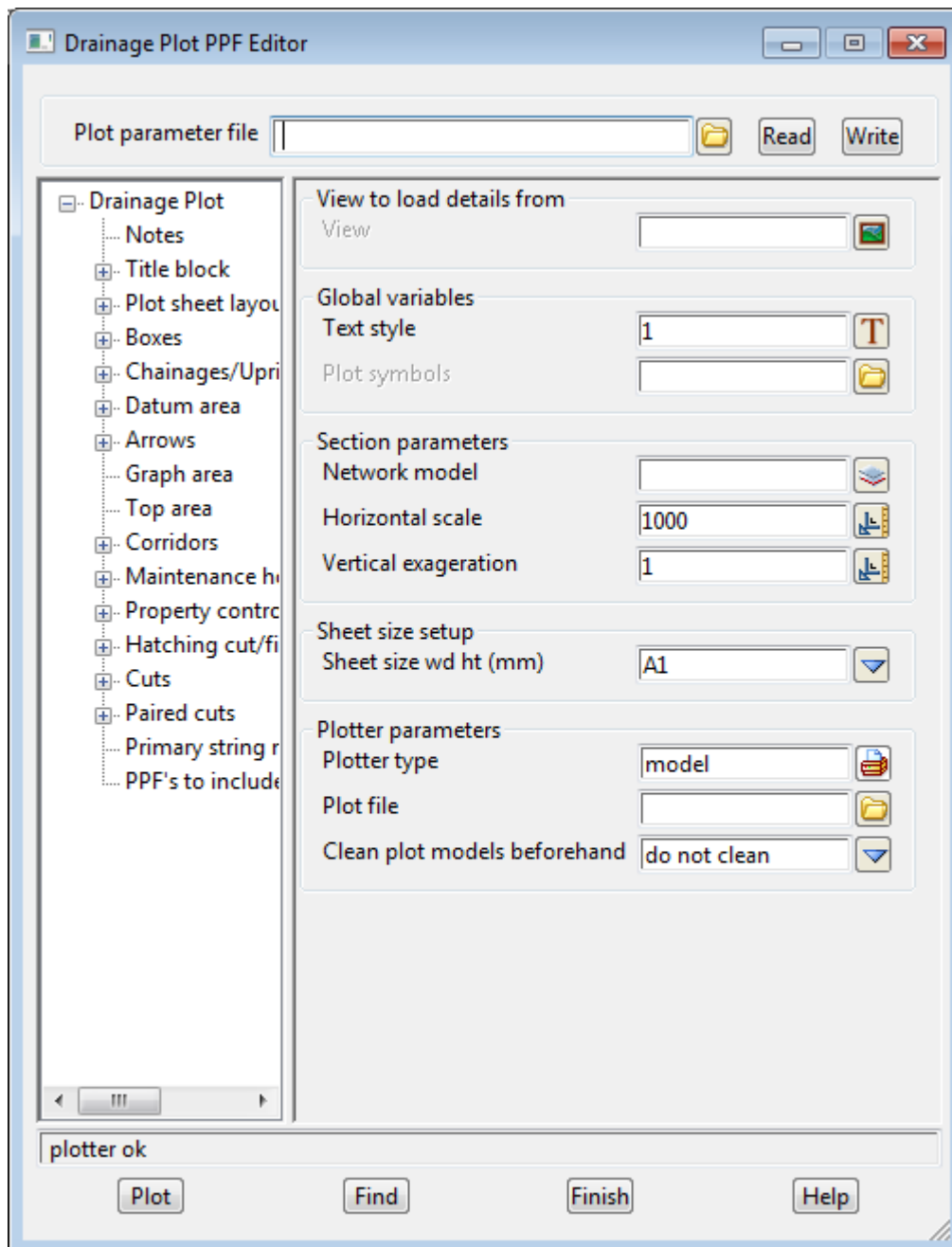
Position of option on menu: Plot =>Plot and PPF Editors => Drainage

The **Drainage Plot PPF Editor** is for creating and/or editing a (binary) drainage and sewer long section ppf file and for creating a drainage and/or sewer long section plot. An ascii version of the file is also produced.

Note: Binary and ascii PPFs are stored *within* the project (not in the folder containing the project).

On selecting the Drainage option, the **Drainage Plot PPF Editor** panel is displayed.

The plot parameters for controlling the cross section plots are accessed by expanding to the appropriate node in the **Drainage Plot** tree (click on the **+** to expand to node or **-** to collapse the node) and then clicking on the required node, and the required information to fill in is displayed on the right hand side of the panel.



Information on the top and bottom buttons, and all the different nodes, now follows.

See [Buttons on Top and Bottom of Panel](#)

See [Drainage Plot - Front Page](#)

See [Notes - Drainage Long Plot](#)

See [Title Block](#)

See [Plot Sheet Layout](#)

See [Boxes](#)

See [Chainages/Uprights](#)

See [Datum Area](#)

See [Arrows](#)

See [Drainage Graph Area](#)

See [Top Area](#)

- See [Corridors](#)
- See [Maintenance Holes](#)
- See [Property Controls/House Connections](#)
- See [Hatching Cut/Fill](#)
- See [Cuts](#)
- See [Paired Cuts - Drainage](#)
- See [Primary String Name Label](#)
- See [PPFs to include](#)

Buttons on Top and Bottom of Panel

Panel field	Type
Plot parameter file	file box
<i>name for the binary plot parameter file to read in or write out.</i>	
Read	button
<i>read the given plot parameter file in.</i>	
Write	button
<i>write out the plot parameters to the given plot parameter file. An ascii ppf file is also written out.</i>	
Plot	button
<i>use the plot parameters from the panel to create the plot.</i>	
Find	button
<i>brings up a search box. If a valid parameter name is keyed in followed by the enter key, the cursor will be placed in the appropriate field on the appropriate page.</i>	

Please continue to the next section [Drainage Plot - Front Page](#).

Drainage Plot - Front Page

Section: View to load details from

Panel field	Type	Pop-Up
View	view box	existing section views
<i>on selection of an existing section view, the vertical exaggeration, network model to profile, corridor models and corridor settings from that section view are loaded into the ppf editor. The section view itself is not stored as a parameter in the ppf editor. It is only for convenience, in order to populate certain other parameters easily in the ppf editor, based on a particular section view that may currently exist.</i>		

Section: Global variables

Panel field	Parameter name	Type	Pop-Up
Textstyle	global_textstyle	textstyle	available fonts
<i>default textstyle.</i>			
Plot Symbols	plot_symbols	file box	available symbol files
<i>specify a plot symbol file if it exists.</i>			

Section: Section parameters

Panel field	Parameter name	Type	Pop-Up
Network model	network_model	model box	available models
<i>model containing the drainage strings to plot.</i>			
Horizontal scale	scale	input	
<i>horizontal scale to be used for the plot.</i>			
Vertical exaggeration	vertical_exaggeration	input	
<i>vertical exaggeration to be used for the plot.</i>			

Section: Sheet size setup

The plot **page** or **sheet** is considered to have only positive co-ordinates with the origin (0,0) in the left hand corner. The units for the plot are millimetres.

Panel field	Parameter name	Type	Pop-Up
Sheet size wd ht (mm)	sheet_size	sheet size	available sheet sizes
<i>sheet size to plot on.</i>			

Section: Plotter parameters

Panel field	Parameter name	Type	Pop-Up
Plotter type	plotter_type	plotter box	available plotter types
<i>plotter type to plot to.</i>			
Plot file stem	plot_stem	input	
<i>plot file name stem. A number is appended to the stem for each sheet plotted. The appropriate file extension is added dependant on the plotter type selected.</i>			

Clean plot models beforehand

plot_model_clean	choice box	do not clean prompt for clean always clean
<i>whether to clean (delete the elements in) any resultant plot models that may already exist, before generating the plot(s). This parameter is only applicable if plotting to a model or models. Note that if the models are cleaned using this parameter, any non-plot or locked elements found in the models will not be cleaned from the models, and the plot job will be cancelled.</i>		

Please continue to the next section [Notes - Drainage Long Plot](#).

Notes - Drainage Long Plot

Section: Document your PPF here

type in notes on this PPF file

Please continue to the next section [Title Block](#).

Title Block

Section: Common title block parameters

Panel field	Parameter name	Type
Standard title	plot_border	tick box
<i>if ticked, a standard 12d title block will be used.</i>		
Use title file	use_title_file	tick box
<i>if ticked, a user defined title file is used.</i>		
Title line 1	title_1	input
<i>if Standard title is ticked, Title line 1 is the first line of title text. If Use title file is ticked, Title line 1 is substituted for the title block variable \$title_1.</i>		
Title line 2	title_2	input
<i>if Standard title is ticked, Title line 2 is the second line of title text. If Use title file is ticked, Title line 2 is substituted for the title block variable \$title_2.</i>		

Section: 12d default title block parameters

Panel field	Parameter name	Type	Pop-Up
Text size	title_text_size	input	
<i>text size of title text.</i>			
Text colour	title_colour	colour	available colours
<i>colour of title text.</i>			

Section: Model to plot in plotting units

Panel field	Parameter name	Type	Pop-Up
Plot data model	mm_plot_model	model box	available models
<i>if not blank, the model is plotted as part of the drainage network long section plot. The Units for the Plot data model is considered to be millimetres and the (0,0) in the Plot data model corresponds to (0,0) in the plot. For more information see Plot Data Model.</i>			

Title Block - User Title Info

The parameters shown below are subject to the appropriate title block variables existing in the title file. For more information on these variables see the section [Title Block Variables](#).

Section: User title block parameters

Panel field	Parameter name	Type	Pop-Up
Title file	title_file	file box	available title files
<i>specifies the name of the title file to use. If a valid title file exists, the specified Name values will be filled out in the grid using the title block variable \$user_text_n.</i>			
Name		output	
<i>the alias for the nth user text specified in the title file.</i>			
Value	user_text_n	input	
<i>the alias text to be substituted in for the user text specified.</i>			
Time format	time_format	input	
<i>the time format relates to the \$time title block variable. For more information on the time formats see the section Specifying the Format for \$time.</i>			
Start page number	start_page_number	input	

used as the starting value for the title block variable \$page_number. If missing, \$page_number starts at 1.

Start drawing number start_drawing_number input

used as the starting value for the title block variable \$drawing_number. If missing, \$drawing_number starts at 1.

Drawing number prefix drawing_number_prefix input

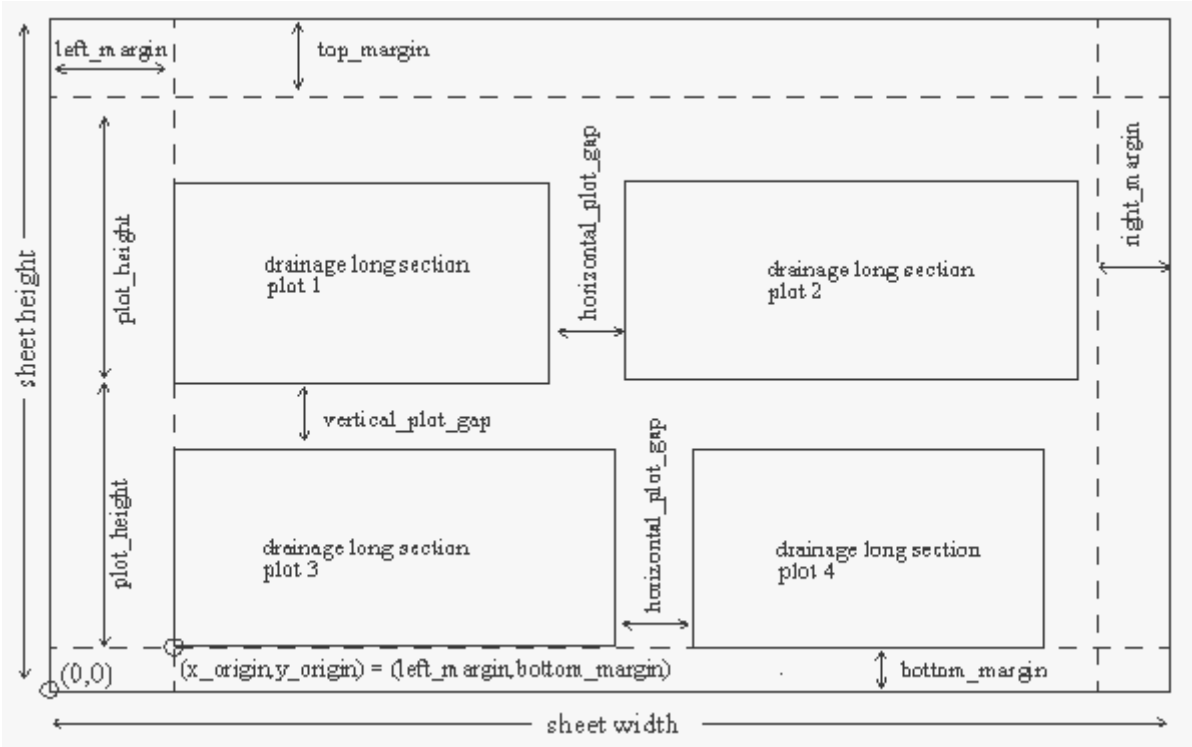
the value entered is used for the title block variable \$drawing_number_prefix.

Drawing number postfix drawing_number_postfix input

the value entered is used for the title block variable \$drawing_number_postfix.

Please continue to the next section [Plot Sheet Layout](#).

Plot Sheet Layout



Plot Sheet Layout - Margins

Section: Plot sheet layout - Margins

Panel field	Parameter name	Type
Left (mm)	left_border_gap	input
<i>left border gap (in millimetres).</i>		
Right (mm)	right_border_gap	input
<i>right border gap (in millimetres).</i>		
Top (mm)	top_border_gap	input
<i>top border gap (in millimetres).</i>		
Bottom (mm)	bottom_border_gap	input
<i>bottom border gap (in millimetres).</i>		

Plot Sheet Layout - Other Parameters

Section: Plot sheet layout - Other parameters

Panel field	Parameter name	Type	Pop-Up
Row per sheet mode	only_one_line	choice box	more than one row on sheet only one row on sheet
<i>whether to allow multiple rows on a sheet.</i>			
Plot height (mm)	plot_height	input	
<i>height of plot row (in millimetres).</i>			
Horizontal plot gap (mm)	horizontal_plot_gap	input	

gap between plot columns (in millimetres).

Vertical plot gap (mm) vertical_plot_gap input

gap between plot rows (in millimetres).

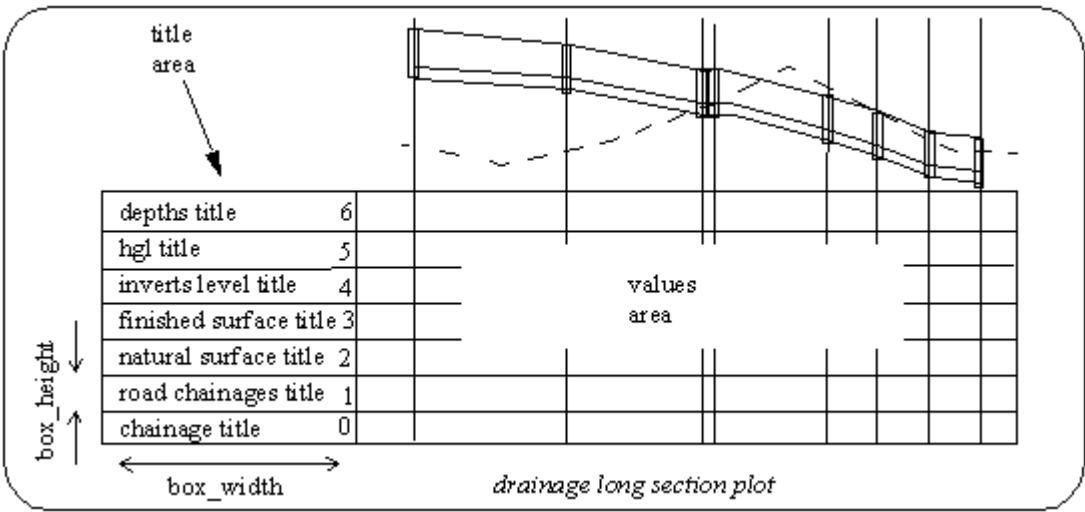
Start new sheet/row for strings longer than (world units) string_length_for_break input

Please continue to the next section [Boxes](#).

Boxes

The Boxes Area on the drainage long section plot is used to label points on the drainage strings with the following information: chainages, road centre line chainages, natural surface heights, finished surface heights, before pit and after pit invert levels, before pit and after pit hgl values, and before pit and after pit depths to inverts.

The default order of the boxes is as shown in the diagram, below.



The *chainage* box is hardwired to always appear first (at the bottom) in the order of boxes. If, you wish to change the order of any of the other boxes, or wish to omit any of the other boxes, you can do so by specifying the following box order parameters.

Panel Field	Parameter name	Type	Pop-Up
Box #	box_n_set	input	
<i>order (from 1 to 6) of the nth box type.</i>			
List #	box_n	choice box	road centre line chainages natural surface heights finished surface heights invert levels hgl values depths to inverts

box type for the nth set of box order parameters.

Boxes - Title Area

Section: Boxes - Title area parameters

Panel Field	Parameter name	Type	Pop-Up
Box width (mm)	box_width	input	
<i>width of the box title area.</i>			
Box height (mm)	box_height	input	
<i>default height of each box.</i>			
Colour of box linework	box_colour	colour box	available colours
<i>colour of box line work.</i>			
Size of titles (mm)	title_box_text_size	input	
<i>default text size of box titles.</i>			

Colour of titles	title_box_text_colour	colour box	available colours
<i>default text colour of box titles.</i>			
Suppress title left linework	suppress_title_box_line_left	tick box	
Suppress title top linework	suppress_title_box_line_top	tick box	
Draw linestyle legend beneath TIN & HGL titles	draw_linestyle_legends	tick box	
Draw linestyle legend beneath IL title	draw_linestyle_legend_il	tick box	

Boxes - Values Area

Section: Boxes - Value area parameters

Panel Field	Parameter name	Type	Pop-Up
Size of values (mm)	box_text_size	input	
<i>default text size of box values.</i>			
Colour of values	box_text_colour	colour box	available colours
<i>default text colour of box values.</i>			
Justification mode	box_text_left_justify	choice box	top justify values bottom justify values
<i>whether to justify the (vertical) value text with the top or the bottom of the box.</i>			
Text side mode	box_text_side	choice box	left right centre
<i>whether to place the (vertical) value text to the left of, to the right of, or on the chainage uprights.</i>			
Decimal places of values	number_of_decimals	input	
<i>default number of decimal places for box values.</i>			
Suppress value top linework	suppress_value_box_line_top	tick box	

Boxes - Chainage

Panel Field	Parameter name	Type	Pop-Up
Box height (mm)	chainage_box_size	input	
<i>height of chainage box (only required if different from default box_height).</i>			
Section: Title parameters			
Line 1	plot_title_chainage_name	input	
<i>first line of text for chainage box title.</i>			
Line 2	plot_title_chainage_name_2	input	
<i>optional second line of text for chainage box title.</i>			
Colour	chainage_title_colour	colour box	available colours
<i>text colour of chainage box title (required only if different from default title_box_text_colour).</i>			
Text size (mm)	chainage_title_text_size	input	
<i>text size of chainage box title (required only if different from default title_box_text_size).</i>			

Textstyle chainage_title_textstyle font box available fonts
font of chainage box title (required only if different from default global_textstyle).

Suppress title bottom linework suppress_title_box_line_ch tick box

Section: Value parameters

Colour chainage_text_colour colour box available colours
text colour of chainage box values (required only if different from default box_text_colour).

Text size (mm) chainage_text_size input
text size of chainage box values (required only if different from default box_text_size).

Textstyle chainage_textstyle font box available fonts
font of chainage box values (required only if different from default global_textstyle).

Decimal places chainage_decimals input
decimal places for chainage box values (required only if different from default number_of_decimals).

Suppress value bottom linework suppress_value_box_line_ch tick box

Boxes - Road Centre Line Chainage

Panel Field	Parameter name	Type	Pop-Up
Include centre line chainage box	draw_centre_chainage	tick box	
	<i>whether to include the road centreline chainage box in the boxes area.</i>		
Box height (mm)	centre_chainage_box_size	input	
	<i>height of road centreline chainage box (only required if different from default box_height).</i>		

Section: Title parameters

Line 1 plot_title_centre_chainage_name input
first line of text for road centreline chainage box title.

Line 2 plot_title_centre_chainage_name_2 input
optional second line of text for road centreline chainage box title.

Colour chainage_title_colour_cl colour box available colours
colour of road centreline chainage box title (required only if different from default title_box_text_colour).

Text size (mm) chainage_title_text_size_cl input
text size of road centreline chainage box title (required only if different from default title_box_text_size).

Textstyle chainage_title_textstyle_cl font box available fonts
font of road centreline chainage box title (required only if different from default global_textstyle).

Suppress title bottom linework suppress_title_box_line_rc tick box

Section: Value parameters

Colour	chainage_text_colour_cl	colour box	available colours
<i>text colour of road centreline chainage box values (required only if different from default box_text_colour).</i>			
Text size (mm)	chainage_text_size_cl	input	
<i>text size of road centreline chainage box values (required only if different from default box_text_size).</i>			
Textstyle	chainage_textstyle_cl	font box	available fonts
<i>font of road centreline chainage box values (required only if different from default global_textstyle).</i>			
Decimal places	chainage_cl_decimals	input	
<i>decimal places for road centreline chainage box values (required only if different from default number_of_decimals).</i>			
Suppress value bottom linework	suppress_value_box_line_rc	tick box	

Boxes - Natural Surface

Panel Field	Parameter name	Type	Pop-Up
Draw text mode	draw_ns_text	choice box	don't include ns box include ns box
<i>whether to include the natural surface box in the boxes area.</i>			
Box height (mm)	surface_box_size	input	
<i>height of natural surface box (only required if different from default box_height).</i>			

Section: Title parameters

Line 1	plot_title_surface_name	input	
<i>first line of text for natural surface box title.</i>			
Line 2	plot_title_surface_name_2	input	
<i>optional second line of text for natural surface box title.</i>			
Colour	ns_title_colour	colour box	available colours
<i>text colour of natural surface box title (required only if different from default title_box_text_colour).</i>			
Text size (mm)	ns_title_text_size	input	
<i>text size of natural surface box title (required only if different from default title_box_text_size).</i>			
Textstyle	ns_title_textstyle	font box	available fonts
<i>font of natural surface box title (required only if different from default global_textstyle).</i>			
Suppress title bottom linework	suppress_title_box_line_ns	tick box	

Section: Value parameters

Colour	ns_text_colour	colour box	available colours
<i>text colour of natural surface box values (required only if different from default box_text_colour).</i>			
Text size (mm)	ns_text_size	input	

text size of natural surface box values (required only if different from default box_text_size).

Textstyle	ns_textstyle	font box	available fonts
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font of natural surface box values (required only if different from default global_textstyle).

Decimal places	ns_decimals	input
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decimal places for natural surface box values (required only if different from default number_of_decimals).

Suppress value bottom linework	suppress_value_box_line_ns	tick box
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Boxes - Finished Surface

Panel Field	Parameter name	Type	Pop-Up
Draw text mode	draw_fs_text	choice box	don't include fs box include fs box

whether to include the finished surface box in the boxes area.

FS tin/Top of MH mode	draw_fs_mode	choice box	height from fs tin height from top of MH
------------------------------	--------------	------------	---------------------------------------------

whether the finished surface height values come from the finished surface tin, or from the tops of the maintenance holes.

Box height (mm)	f_surface_box_size	input
------------------------	--------------------	-------

height of finished surface box (only required if different from default box_height).

Section: Title parameters

Line 1	plot_title_finished_name	input
---------------	--------------------------	-------

first line of text for finished surface box title.

Line 2	plot_title_finished_name_2	input
---------------	----------------------------	-------

optional second line of text for finished surface box title.

Colour	fs_title_colour	colour box	available colours
---------------	-----------------	------------	-------------------

text colour of finished surface box title (required only if different from default title_box_text_colour).

Text size (mm)	fs_title_text_size	input
-----------------------	--------------------	-------

text size of finished surface box title (required only if different from default title_box_text_size).

Textstyle	fs_title_textstyle	font box	available fonts
------------------	--------------------	----------	-----------------

font of finished surface box title (required only if different from default global_textstyle).

Suppress title bottom linework	suppress_title_box_line_fs	tick box
---------------------------------------	----------------------------	----------

Section: Value parameters

Colour	fs_text_colour	colour box	available colours
---------------	----------------	------------	-------------------

text colour of finished surface box values (required only if different from default box_text_colour).

Text size (mm)	fs_text_size	input
-----------------------	--------------	-------

text size of finished surface box values (required only if different from default box_text_size).

Textstyle	fs_textstyle	font box	available fonts
------------------	--------------	----------	-----------------

font of finished surface box values (required only if different from default global_textstyle).

Decimal places	fs_decimals	input
<i>decimal places for finished surface box values (required only if different from default number_of_decimals).</i>		
Suppress value bottom linework	suppress_value_box_line_fs	tick box

Boxes - Invert Levels

Panel Field	Parameter name	Type	Pop-Up
Box height (mm)	invert_height_box_size	input	
<i>height of invert level box (only required if different from default box_height).</i>			
Section: Title parameters			
Line 1	plot_title_invert_name	input	
<i>first line of text for invert level box title.</i>			
Line 2	plot_title_invert_name_2	input	
<i>optional second line of text for invert level box title.</i>			
Colour	il_title_colour	colour box	available colours
<i>text colour of invert level box title (required only if different from default title_box_text_colour).</i>			
Text size (mm)	il_title_text_size	input	
<i>text size of invert level box title (required only if different from default title_box_text_size).</i>			
Textstyle	il_title_textstyle	font box	available fonts
<i>font of invert level box title (required only if different from default global_textstyle).</i>			
Suppress title bottom linework	suppress_title_box_line_il	tick box	

Section: Value parameters

Colour	il_text_colour	colour box	available colours
<i>text colour of invert level box values (required only if different from default box_text_colour).</i>			
Text size (mm)	il_text_size	input	
<i>text size of invert level box values (required only if different from default box_text_size).</i>			
Textstyle	il_textstyle	font box	available fonts
<i>font of invert level box values (required only if different from default global_textstyle).</i>			
Decimal places	il_decimals	input	
<i>decimal places for invert level box values (required only if different from default number_of_decimals).</i>			
Suppress value bottom linework	suppress_value_box_line_il	tick box	

Boxes - HGL

Panel Field	Parameter name	Type	Pop-Up
Draw HGL box	draw_hgl_value	tick box	
<i>whether to include the HGL box in the boxes area.</i>			
Box height (mm)	hgl_box_size	input	

height of HGL box (only required if different from default box_height).

Section: Title parameters

Line 1	plot_title_hgl_name	input	
	<i>first line of text for HGL box title.</i>		
Line 2	plot_title_hgl_name_2	input	
	<i>optional second line of text for HGL box title.</i>		
Colour	hgl_title_colour	colour box	available colours
	<i>text colour of HGL box title (required only if different from default title_box_text_colour).</i>		
Text size (mm)	hgl_title_text_size	input	
	<i>text size of HGL box title (required only if different from default title_box_text_size).</i>		
Textstyle	hgl_title_textstyle	font box	available fonts
	<i>font of HGL box title (required only if different from default global_textstyle).</i>		
Suppress title bottom linework	suppress_title_box_line_hg	tick box	

Section: Value parameters

Colour	hgl_text_colour	colour box	available colours
	<i>text colour of HGL box values (required only if different from default box_text_colour).</i>		
Text size (mm)	hgl_text_size	input	
	<i>text size of HGL box values (required only if different from default box_text_size).</i>		
Textstyle	hgl_textstyle	font box	available fonts
	<i>font of HGL box values (required only if different from default global_textstyle).</i>		
Decimal places	hgl_decimals	input	
	<i>decimal places for HGL box values (required only if different from default number_of_decimals).</i>		
Suppress value bottom linework	suppress_value_box_line_hg	tick box	

Boxes - Depths

Panel Field	Parameter name	Type	Pop-Up
Depth box mode	depth_mode	choice box	don't include depths box depths from fs tin depths from top of MH depths from ns tin
	<i>whether to include the depths (to inverts) box in the boxes area, and if so, whether the depths are measured from the finished surface tin, the tops of the maintenance holes, or the natural surface tin.</i>		
Box height (mm)	invert_depth_box_size	input	
	<i>height of depths box (only required if different from default box_height).</i>		

Section: Title parameters

Line 1	plot_title_depth_name	input
	<i>first line of text for depths box title.</i>	
Line 2	plot_title_depth_name_2	input
	<i>optional second line of text for depths box title.</i>	

Colour	depth_title_colour	colour box	available colours
<i>text colour of depths box title (required only if different from default title_box_text_colour).</i>			
Text size (mm)	depth_title_text_size	input	
<i>text size of depths box title (required only if different from default title_box_text_size).</i>			
Textstyle	depth_title_textstyle	font box	available fonts
<i>font of depths box title (required only if different from default global_textstyle).</i>			
Suppress title bottom linework	suppress_title_box_line_dp	tick box	

Section: Value parameters

Colour	depth_text_colour	colour box	available colours
<i>text colour of depths box values (required only if different from default box_text_colour).</i>			
Text size (mm)	depth_text_size	input	
<i>text size of depths box values (required only if different from default box_text_size).</i>			
Textstyle	depth_textstyle	font box	available fonts
<i>font of depths box values (required only if different from default global_textstyle).</i>			
Decimal places	depth_decimals	input	
<i>decimal places for depths box values (required only if different from default number_of_decimals).</i>			
Suppress value bottom linework	suppress_value_box_line_dp	tick box	

Boxes - Outer linework

Section: Boxes - Outer linework

Panel Field	Parameter name	Type	Pop-Up
Title area box mode	draw_box_mode	choice box	do not draw title area box draw title area box, no lines draw title area box with lines
<i>whether to draw the line work around the titles area, and if so, whether to draw lines separating each title as well.</i>			
Chainage box mode	chainage_box_mode	choice box	don't draw the chainage box draw the chainage box
<i>whether to draw the line work around the chainage box.</i>			

Please continue to the next section [Chainages/Uprights](#).

Chainages/Uprights

Uprights, or leader lines, can be drawn through the points on the drainage strings, anywhere from the top area to the bottom of the boxes area.

Section: Upright parameters

Panel Field	Parameter name	Type	Pop-Up
Top of uprights mode	uprights_top_mode	choice box	stop at top of pit go to top area

determines how high on the plot, the uprights are drawn.

Bottom of uprights mode	uprights_bottom_mode	choice box	stop at top of boxes go to bottom of boxes
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determines how low on the plot, the uprights are drawn.

Leave gap in uprights through pit	uprights_gap_mode	tick box	
Colour of uprights to pits	manhole_line_colour	colour box	available colours

colour of the uprights.

Section: Chainage parameters

Panel Field	Parameter name	Type	Pop-Up
Chainage values at uprights	chainage_mode	choice box	pipe length chainage running chainage both pipe length and running

whether the chainage values represent the individual pipe lengths, the running chainages, or both.

Pipe length label position	centre_pipe_length	choice box	0 at start pit, length at end pit centre of pipe length
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*determines how pipe length chainages are displayed. **Note:** if the centre of pipe length option is chosen, the pipe length chainage text is drawn horizontally, rather than vertically.*

Chainages/Uprights - Services

Any services crossing the drainage strings (defined by specifying *corridor service models* in the *Corridors* section) can be automatically labelled with an upright, chainage and invert level labels (of the drainage string, placed within the appropriate boxes in the Boxes area), and a name label (that includes the crossing service string name, its diameter, and its invert level at the point of crossing).

Note: crossing services may also be labelled (independently) by utilising the parameters in the *Cuts* section.

Panel Field	Parameter name	Type	Pop-Up
Service chainage values at uprights	service_chainage_mode	choice box	pipe length chainage running chainage both pipe length and running

whether the crossing service chainage values represent the chainages from the previous pits, the running chainages, or both.

Draw uprights to crossing services		tick box	
Colour of uprights to crossing services	service_line_colour	colour box	available colours

colour of the crossing service uprights.

Section: Service chainage text parameters

Panel Field	Parameter name	Type	Pop-Up
Colour	service_ch_text_colour	colour box	available colours
<i>text colour of crossing service chainage box values (required only if different from default box_text_colour).</i>			
Text size (mm)	service_ch_text_size	input	
<i>text size of crossing service chainage box values (required only if different from default box_text_size).</i>			
Textstyle	service_ch_textstyle	font box	available fonts
<i>font of crossing service chainage box values (required only if different from default global_textstyle).</i>			
Decimal places	service_ch_decimals	input	
<i>decimal places for crossing service chainage box values (required only if different from default number_of_decimals).</i>			

Section: Service invert level text parameters

Panel Field	Parameter name	Type	Pop-Up
Colour	service_il_text_colour	colour box	available colours
<i>text colour of crossing service invert level box values (required only if different from default box_text_colour).</i>			
Text size (mm)	service_il_text_size	input	
<i>text size of crossing service invert level box values (required only if different from default box_text_size).</i>			
Textstyle	service_il_textstyle	font box	available fonts
<i>font of crossing service invert level box values (required only if different from default global_textstyle).</i>			
Decimal places	service_il_decimals	input	
<i>decimal places for crossing service invert level box values (required only if different from default number_of_decimals).</i>			

Section: Service label text parameters

Panel Field	Parameter name	Type	Pop-Up
Show name	service_name_show_name	tick box	
Show size	service_name_show_size	tick box	
Show IL	service_name_show_il	tick box	
Show clearance	service_name_show_clr	tick box	
X adjustment (mm)	service_name_x	input	
Y adjustment (mm)	service_name_y	input	
Stagger	service_name_stagger	tick box	
Y position	service_name_y_mode	choice box	below crossing point above crossing point below top staggers above bottom staggers
Distance of label below crossing point (mm)	service_name_y	input	
<i>distance (in millimetres) of crossing service name labels below crossing points.</i>			

Colour	service_name_text_colour	colour box	available colours
<i>text colour of crossing service name labels (required only if different from default box_text_colour).</i>			
Text size (mm)	service_name_text_size	input	
<i>text size of crossing service name labels (required only if different from default box_text_size).</i>			
Textstyle	service_name_textstyle	font box	available fonts
<i>font of crossing service name labels (required only if different from default global_textstyle).</i>			
Decimal places	service_name_decimals	input	
<i>decimal places for the crossing service invert levels that make up part of the crossing service name labels (required only if different from default number_of_decimals).</i>			

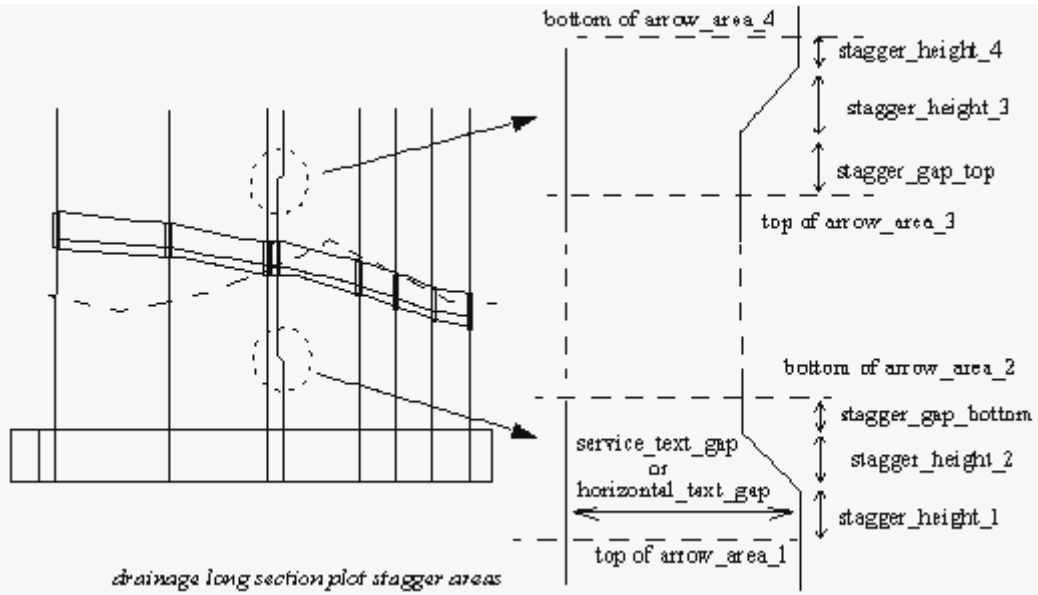
Chainages/Uprights - Finished Surface/Top of MH Values

In addition to the finished surface level labels within the Boxes area, more detailed vertical labels representing finished surface levels at the pits, can be added to accompany the pit uprights within the Graph area.

Panel Field	Parameter name	Type	Pop-Up
Finished surface draw mode	draw_fs_vertical	choice box	do not draw fs values always draw fs values only draw if different
<i>whether to label the finished surface levels within the Graph area. Additional control is provided to only draw the labels if the finished surface level is different from the level at the top of the maintenance hole.</i>			
Finished surface value mode	draw_fs_vertical_mode	choice box	value from fs tin value from top of mh
<i>whether the finished surface level label values come from the fs tin or the top of the maintenance holes.</i>			
Pre text	fs_vertical_pre_text	input	
<i>label text before the finished surface level.</i>			
Post text	fs_vertical_post_text	input	
<i>label text after the finished surface level.</i>			
Decimal places	fs_vertical_decimals	input	
<i>decimal places for finished surface level values (required only if different from default number_of_decimals).</i>			
Colour	fs_vertical_colour	colour box	available colours
<i>text colour of finished surface level labels (required only if different from default box_text_colour).</i>			
Size (mm)	fs_vertical_size	input	
<i>text size of finished surface level labels (required only if different from default box_text_size).</i>			
Textstyle	fs_vertical_textstyle	font box	available fonts
<i>font of finished surface level labels (required only if different from default global_textstyle).</i>			
X adjustment (mm)	fs_vertical_x	input	
<i>horizontal adjustment to position of finished surface level labels.</i>			
Y adjustment (mm)	fs_vertical_y	input	
<i>vertical adjustment to position of finished surface level labels.</i>			

Chainages/Uprights - Staggering

Because the pit and service uprights are sometimes too close together to fit all the desired information in the Boxes and Arrows areas, the uprights can be staggered (widened) in such a way as to provide more space in these areas, below and above the Graph area, whilst still maintaining the correct upright spacing within the Graph area itself. Specifically, the staggering of the uprights occurs below the Graph area between Arrow areas 1 and 2, and above the Graph area between Arrow areas 3 and 4. As such, it is recommended that Arrow areas 2 and 3 be used only for information requiring minimal space.



Section: Stagger area below graph area parameters

Panel Field	Parameter name	Type
Top of arrow area 1 to start of the staggers (mm)	stagger_height_1	input
<i>refer to stagger_height_1 on above diagram.</i>		

Distance over which stagger occurs (mm)	stagger_height_2	input
<i>refer to stagger_height_2 on above diagram.</i>		

End of the staggers to bottom of arrow area 2 (mm)	stagger_gap_bottom	input
<i>refer to stagger_gap_bottom on above diagram.</i>		

Section: Stagger area above graph area parameters

Panel Field	Parameter name	Type
Top of arrow area 3 to start of the staggers (mm)	stagger_gap_top	input
<i>refer to stagger_gap_top on above diagram.</i>		

Distance over which stagger occurs (mm)	stagger_height_3	input
<i>refer to stagger_height_3 on above diagram.</i>		

End of the staggers to bottom of arrow area 4 (mm)	stagger_height_4	input
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refer to stagger_height_4 on above diagram.

Section: Stagger offset parameters

Panel Field	Parameter name	Type
Minimum distance between pit uprights (mm)	horizontal_text_gap	input

refer to horizontal_text_gap on above diagram.

Minimum distance before first service upright (mm)	service_text_gap_before	input
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Minimum distance after service uprights (mm)	service_text_gap	input
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refer to service_text_gap on above diagram.

Please continue to the next section [Datum Area](#).

Datum Area

The Datum area is where each long section plot's datum value is drawn. The datum line for each long section plot is defined at the bottom of Arrow area 1.

Panel Field	Parameter name	Type
Below datum area gap (mm)	datum_gap	input
<i>distance from the top of the Boxes area to the bottom of Arrow area 1.</i>		
Extend datum line into title area	datum_extend	tick box

Datum Area - Name

The datum name (or title) is drawn at the datum line, above the Boxes title area.

Panel Field	Parameter name	Type	Pop-Up
Datum name	datum_name	input	
<i>title for the datum area.</i>			
X offset (mm)	datum_title_x	input	
<i>horizontal adjustment to position of datum name.</i>			
Y offset (mm)	datum_title_y	input	
<i>vertical adjustment to position of datum name.</i>			
Textstyle	datum_title_textstyle	font box	available fonts
<i>font of datum name (required only if different from default global_textstyle).</i>			
Text size (mm)	datum_title_text_size	input	
<i>text size of datum name (required only if different from default box_text_size).</i>			
Colour	datum_title_colour	colour box	available colours
<i>text colour of datum name (required only if different from default box_text_colour).</i>			

Datum Area - Values

The datum values are drawn at the datum lines, above the Box values areas.

Panel Field	Parameter name	Type	Pop-Up
Decimal places	datum_decimals	input	
<i>number of decimal places for datum values.</i>			
X offset (mm)	datum_x	input	
<i>horizontal adjustment to position of datum values.</i>			
Y offset (mm)	datum_y	input	
<i>vertical adjustment to position of datum values.</i>			
Textstyle	datum_textstyle	font box	available fonts
<i>font of datum values (required only if different from default global_textstyle).</i>			
Text size (mm)	datum_text_size	input	
<i>text size of datum values (required only if different from default box_text_size).</i>			
Colour	datum_text_colour	colour box	available colours
<i>text colour of datum values (required only if different from default box_text_colour).</i>			

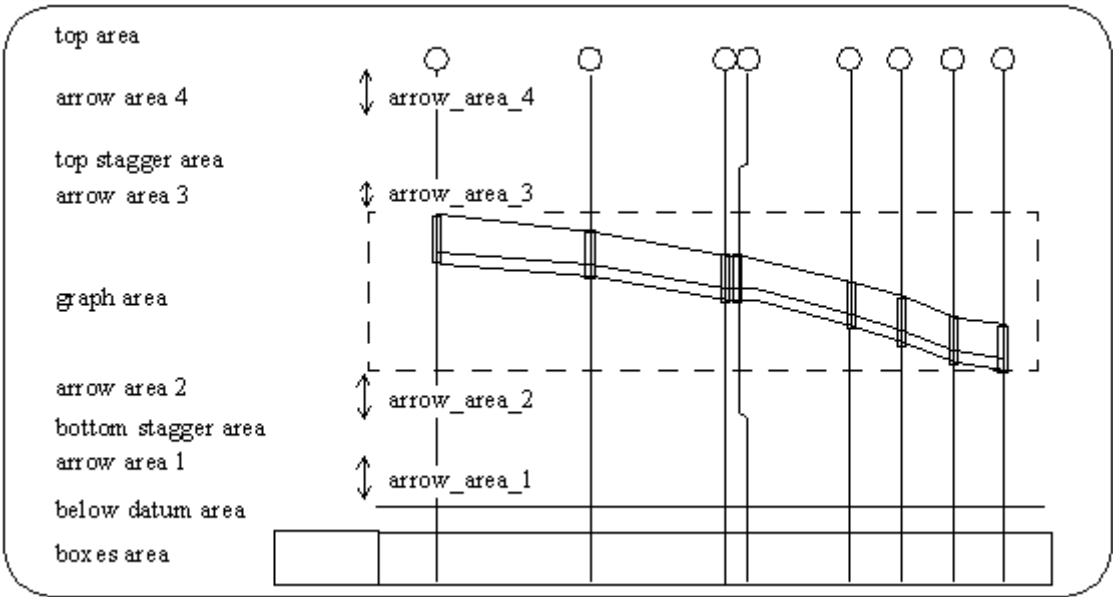
Please continue to the next section [Arrows](#).

Arrows

The Arrow areas on the drainage long section plot, are used to label segments (individual pipes) on the drainage strings with the following information: grades, diameters and types, flow velocities, flow volumes, drainage line names, and any user-defined pipe attribute values.

There are four separate Arrow areas on the plot, any of which can be used to label the above information. From plot bottom to top, the Arrow areas are:

- Arrow area 1: staggered arrows below the Graph area,
- Arrow area 2: unstaggered arrows below the Graph area,
- Arrow area 3: unstaggered arrows above the Graph area,
- Arrow area 4: staggered arrows above the Graph area.



Panel Field	Parameter name	Type
Height of arrow area 1 (mm)	arrow_area_1	input
refer to arrow_area_1 on the above diagram.		
Height of arrow area 2 (mm)	arrow_area_2	input
refer to arrow_area_2 on the above diagram.		
Height of arrow area 3 (mm)	arrow_area_3	input
refer to arrow_area_3 on the above diagram.		
Height of arrow area 4 (mm)	arrow_area_4	input
refer to arrow_area_4 on the above diagram.		

Arrows - Grades

Panel Field	Parameter name	Type	Pop-Up
Draw pipe grade	draw_pipe_grade	check box	
whether to draw the pipe grades in one of the Arrow areas.			

Arrow area for the arrow	pipe_grade_arrow_area	choice box	Area 1
			Area 2
			Area 3
			Area 4

the desired Arrow area for the pipe grade information.

Y offset (mm)	pipe_grade_y	input
<i>vertical offset of pipe grade information, measured upwards from the bottom of the selected Arrow area.</i>		

Grade mode	percentage_grade	choice box	1 in grade % grade
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determines the format of the pipe grade information.

Arrows - Grades - Title Text

Panel Field	Parameter name	Type	Pop-Up
Text	pipe_grade_title	input	
<i>title for the pipe grade information.</i>			
Textstyle	pipe_grade_title_textstyle	font box	available fonts
<i>font of pipe grade title.</i>			
Size (mm)	pipe_grade_title_text_size	input	
<i>text size of pipe grade title.</i>			
Colour	pipe_grade_title_text_colour	colour box	available colours
<i>text colour of pipe grade title.</i>			
Offset (mm)	pipe_grade_title_offset	input	
<i>vertical adjustment to position of pipe grade title.</i>			
X offset (mm)	pipe_grade_title_x	input	
<i>horizontal adjustment to position of pipe grade title.</i>			
Draw title bottom linework	pipe_grade_title_line	tick box	
Height of title left linework (mm)	pipe_grade_title_height	input	

Arrows - Grades - Arrow type

Panel Field	Parameter name	Type	Pop-Up
Arrow type	pipe_grade_arrow_mode	choice box	available arrow types
<i>arrow type (0 to 8) for the pipe grade information.</i>			
Colour	pipe_grade_arrow_colour	colour box	available colours
<i>arrow colour for pipe grade information.</i>			
Size (mm)	pipe_grade_arrow_size	input	
<i>arrow size for pipe grade information.</i>			
Arrow gap mode	pipe_grade_arrow_gap	choice box	no gap in arrow leave gap in arrow for text

whether to put text gaps in the arrows, for pipe grade information.

Arrows - Grades - Arrow Text

Panel Field	Parameter name	Type	Pop-Up
Pre text	pipe_grade_arrow_pre_text	input	
<i>label text before the pipe grade values.</i>			
Post text	pipe_grade_arrow_post_text	input	
<i>label text after the pipe grade values.</i>			
Decimal places	pipe_grade_arrow_decimals	input	
<i>decimal places for pipe grade values.</i>			
Colour	pipe_grade_arrow_text_colour	colour box	available colours
<i>text colour for pipe grade values.</i>			
Size (mm)	pipe_grade_arrow_text_size	input	
<i>text size for pipe grade values.</i>			
Textstyle	pipe_grade_arrow_textstyle	font box	available fonts
<i>font of pipe grade values.</i>			
Offset (mm)	pipe_grade_arrow_text_offset	input	
<i>vertical adjustment to position of pipe grade values.</i>			

Arrows - Diameters

Panel Field	Parameter name	Type	Pop-Up
Pipe diameter scale factor	pipe_diameter_scale_factor	input	
<i>multiplier of pipe diameter values.</i>			
Draw pipe diameter	draw_pipe_diameter	choice box	don't draw pipe diameter draw pipe diameter
<i>whether to draw the pipe diameters in one of the Arrow areas.</i>			
Arrow area for the arrow	pipe_diameter_arrow_area	choice box	Area 1 Area 2 Area 3 Area 4
<i>the desired Arrow area for the pipe diameter information.</i>			
Y offset (mm)	pipe_diameter_y	input	
<i>vertical offset of pipe diameter information, measured upwards from the bottom of the selected Arrow area.</i>			

Arrows - Diameters - Title Text

Panel Field	Parameter name	Type	Pop-Up
Text <i>title for the pipe diameter information.</i>	pipe_diameter_title	input	
Textstyle <i>font of pipe diameter title.</i>	pipe_diameter_title_textstyle	font box	available fonts
Size (mm) <i>text size of pipe diameter title.</i>	pipe_diameter_title_text_size	input	
Colour <i>text colour of pipe diameter title.</i>	pipe_diameter_title_text_colour	colour box	available colours
Offset (mm) <i>vertical adjustment to position of pipe diameter title.</i>	pipe_diameter_title_offset	input	
X offset (mm) <i>horizontal adjustment to position of pipe diameter title.</i>	pipe_diameter_title_x	input	
Draw title bottom linework	pipe_diameter_title_line	tick box	
Height of title left linework (mm)	pipe_diameter_title_height	input	

Arrows - Diameters - Arrow type

Panel Field	Parameter name	Type	Pop-Up
Arrow type <i>arrow type (0 to 8) for the pipe diameter information.</i>	pipe_diameter_arrow_mode	choice box	available arrow types
Colour <i>arrow colour for pipe diameter information.</i>	pipe_diameter_arrow_colour	colour box	available colours
Size (mm) <i>arrow size for pipe diameter information.</i>	pipe_diameter_arrow_size	input	
Arrow gap mode <i>whether to put text gaps in the arrows, for pipe diameter information.</i>	pipe_diameter_arrow_gap	choice box	no gap in arrow leave gap in arrow for text

Arrows - Diameters - Arrow Text

Panel Field	Parameter name	Type	Pop-Up
Pre text <i>label text before the pipe diameter values.</i>	pipe_diameter_arrow_pre_text	input	
Post text	pipe_diameter_arrow_post_text	input	

label text after the pipe diameter values.

Pipe type mode	pipe_type_mode	choice box	don't include the pipe type include the pipe type
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whether to include the pipe type after the post text in the pipe diameter labels.

Units factor	pipe_diameter_arrow_factor	input	
Decimal places	pipe_diameter_arrow_decimals	input	
Colour	pipe_diameter_arrow_text_colour	colour box	available colours

text colour for pipe diameter values.

Size (mm)	pipe_diameter_arrow_text_size	input
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text size for pipe diameter values.

Textstyle	pipe_diameter_arrow_textstyle	font box	available fonts
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font of pipe diameter values.

Offset (mm)	pipe_diameter_arrow_text_offset	input
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vertical adjustment to position of pipe diameter values.

Arrows - Velocities

Panel Field	Parameter name	Type	Pop-Up
Draw pipe velocity	draw_pipe_velocity	check box	
Arrow area for the arrow	pipe_velocity_arrow_area	choice box	Area 1 Area 2 Area 3 Area 4

the desired Arrow area for the flow velocity information.

Y offset (mm)	pipe_velocity_y	input
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vertical offset of flow velocity information, measured upwards from the bottom of the selected Arrow area.

Arrows - Velocities - Title Text

Panel Field	Parameter name	Type	Pop-Up
Text	pipe_velocity_title	input	
Textstyle	pipe_velocity_title_textstyle	font box	available fonts
Size (mm)	pipe_velocity_title_text_size	input	
Colour	pipe_velocity_title_text_colour	colour box	available colours

text colour of flow velocity title.

Offset (mm)	pipe_velocity_title_offset	input
<i>vertical adjustment to position of flow velocity title.</i>		
X offset (mm)	pipe_velocity_title_x	input
<i>horizontal adjustment to position of flow velocity title.</i>		
Draw title bottom linework	pipe_velocity_title_line	tick box
Height of title left linework (mm)	pipe_velocity_title_height	input

Arrows - Velocities - Arrow type

Panel Field	Parameter name	Type	Pop-Up
Arrow type	pipe_velocity_arrow_mode	choice box	available arrow types
<i>arrow type (0 to 8) for the flow velocity information.</i>			
Colour	pipe_velocity_arrow_colour	colour box	available colours
<i>arrow colour for flow velocity information.</i>			
Size (mm)	pipe_velocity_arrow_size	input	
<i>arrow size for flow velocity information.</i>			
Arrow gap mode	pipe_velocity_arrow_gap	choice box	no gap in arrow leave gap in arrow for text
<i>whether to put text gaps in the arrows, for flow velocity information.</i>			

Arrows - Velocities - Arrow Text

Panel Field	Parameter name	Type	Pop-Up
Pre text	pipe_velocity_arrow_pre_text	input	
<i>label text before the flow velocity values.</i>			
Post text	pipe_velocity_arrow_post_text	input	
<i>label text after the flow velocity values.</i>			
Units factor	pipe_velocity_arrow_factor	input	
Decimal places	pipe_velocity_arrow_decimals	input	
<i>decimal places for flow velocity values.</i>			
Colour	pipe_velocity_arrow_text_colour	colour box	available colours
<i>text colour for flow velocity values.</i>			
Size (mm)	pipe_velocity_arrow_text_size	input	
<i>text size for flow velocity values.</i>			
Textstyle	pipe_velocity_arrow_textstyle	font box	available fonts
<i>font of flow velocity values.</i>			

Offset (mm) pipe_velocity_arrow_text_offset
input

vertical adjustment to position of flow velocity values.

Arrows - Flow

Panel Field	Parameter name	Type	Pop-Up
Draw pipe flow	draw_pipe_flow	check box	

whether to draw the flow volumes in one of the Arrow areas.

Arrow area for the arrow	pipe_flow_arrow_area	choice box	Area 1 Area 2 Area 3 Area 4
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the desired Arrow area for the flow volume information.

Y offset (mm) pipe_flow_y input

vertical offset of flow volume information, measured upwards from the bottom of the selected Arrow area.

Arrows - Flow - Title Text

Panel Field	Parameter name	Type	Pop-Up
Text	pipe_flow_title	input	

title for the flow volume information.

Textstyle	pipe_flow_title_textstyle	font box	available fonts
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font of flow volume title.

Size (mm)	pipe_flow_title_text_size	input	
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text size of flow volume title.

Colour	pipe_flow_title_text_colour	colour box	available colours
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text colour of flow volume title.

Offset (mm)	pipe_flow_title_offset	input	
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vertical adjustment to position of flow volume title.

X offset (mm)	pipe_flow_title_x	input	
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horizontal adjustment to position of flow volume title.

Draw title bottom linework	pipe_flow_title_line	tick box	
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Height of title left linework (mm)	pipe_flow_title_height	input	
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Arrows - Flow - Arrow Type

Panel Field	Parameter name	Type	Pop-Up
Arrow type	pipe_flow_arrow_mode	choice box	available arrow types

arrow type (0 to 8) for the flow volume information.

Colour	pipe_flow_arrow_colour	colour box	available colours
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arrow colour for flow volume information.

Size (mm)	pipe_flow_arrow_size	input	
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arrow size for flow volume information.

Arrow gap mode pipe_flow_arrow_gap choice box no gap in arrow
leave gap in arrow for text

whether to put text gaps in the arrows, for flow volume information.

Arrows - Flow - Arrow Text

Panel Field	Parameter name	Type	Pop-Up
Pre text	pipe_flow_arrow_pre_text	input	
<i>label text before the flow volume values.</i>			
Post text	pipe_flow_arrow_post_text	input	
<i>label text after the flow volume values.</i>			
Units factor	pipe_flow_arrow_factor	input	
Decimal places	pipe_flow_arrow_decimals	input	
<i>decimal places for flow volume values.</i>			
Colour	pipe_flow_arrow_text_colour	colour box	available colours
<i>text colour for flow volume values.</i>			
Size (mm)	pipe_flow_arrow_text_size	input	
<i>text size for flow volume values.</i>			
Textstyle	pipe_flow_arrow_textstyle	font box	available fonts
<i>font of flow volume values.</i>			
Offset (mm)	pipe_flow_arrow_text_offset	input	
<i>vertical adjustment to position of flow volume values.</i>			

Arrows - Drainage Line Name

Panel Field	Parameter name	Type	Pop-Up
Draw drainage line	draw_drainage_line	check box	
<i>whether to draw the drainage line names in one of the Arrow areas.</i>			
Arrow area for the arrow	drainage_line_arrow_area	choice box	Area 1 Area 2 Area 3 Area 4
<i>the desired Arrow area for the drainage line name information.</i>			
Y offset (mm)	drainage_line_y	input	
<i>vertical offset of drainage line name information, measured upwards from the bottom of the selected Arrow area.</i>			

Arrows - Drainage Line Name - Title Text

Panel Field	Parameter name	Type	Pop-Up
Text	drainage_line_title	input	

title for the drainage line name information.

Textstyle	drainage_line_title_textstyle	font box	available fonts
	<i>font of drainage line name title.</i>		
Size (mm)	drainage_line_title_text_size	input	
	<i>text size of drainage line name title.</i>		
Colour	drainage_line_title_text_colour	colour box	available colours
	<i>text colour of drainage line name title.</i>		
Offset (mm)	drainage_line_title_offset	input	
	<i>vertical adjustment to position of drainage line name title.</i>		
X offset (mm)	drainage_line_title_x	input	
	<i>horizontal adjustment to position of drainage line name title.</i>		
Draw title bottom linework	drainage_line_title_line	tick box	
Height of title left linework (mm)	drainage_line_title_height	input	

Arrows - Drainage Line Name - Arrow Type

Panel Field	Parameter name	Type	Pop-Up
Arrow type	drainage_line_arrow_mode	choice box	available arrow types
	<i>arrow type (0 to 8) for the drainage line name information.</i>		
Colour	drainage_line_arrow_colour	colour box	available colours
	<i>arrow colour for drainage line name information.</i>		
Size (mm)	drainage_line_arrow_size	input	
	<i>arrow size for drainage line name information.</i>		
Arrow gap mode	drainage_line_arrow_gap	choice box	no gap in arrow leave gap in arrow for text
	<i>whether to put text gaps in the arrows, for drainage line name information.</i>		

Arrows - Drainage Line Name - Arrow Text

Panel Field	Parameter name	Type	Pop-Up
Pre text	drainage_line_arrow_pre_text	input	
	<i>label text before the drainage line names.</i>		
Post text	drainage_line_arrow_post_text	input	
	<i>label text after the drainage line names.</i>		
Colour	drainage_line_arrow_text_colour	colour box	available colours
	<i>text colour for drainage line names.</i>		

Size (mm)	drainage_line_arrow_text_size	input	
text size for drainage line names.			
Textstyle	drainage_line_arrow_textstyle	font box	available fonts
font of drainage line names.			
Offset (mm)	drainage_line_arrow_text_offset	input	
vertical adjustment to position of drainage line names.			

Arrows - User Defined Pipe Attributes

User defined pipe attribute data can be drawn in the Arrow areas.

The following fields are required for each desired pipe attribute (set). Each set of fields forms one row of a grid.

Panel Field	Parameter name	Type	Pop-Up
Set #		input	
a unique integer n, greater than 0, to identify the nth set of pipe attribute plot parameters.			
Draw pipe attribute mode	draw_pipe_attr_n	choice box	don't draw pipe attribute draw pipe attribute
whether to draw the nth set of pipe attribute data in one of the Arrow areas.			
Pipe attribute name	pipe_attr_n_name	input	
name of the nth pipe attribute.			
Arrow area for the arrow	pipe_attr_n_arrow_area	choice box	Area 1 Area 2 Area 3 Area 4
the desired Arrow area for the nth set of pipe attribute data.			
Y offset (mm)	pipe_attr_n_y	input	
vertical offset of the nth set of pipe attribute data, measured upwards from the bottom of the selected Arrow area.			

Arrows - User Defined Pipe Attributes - Title Text

The following fields are required for each desired pipe attribute (set). Each set of fields forms one row of a grid.

Panel Field	Parameter name	Type	Pop-Up
Set #		input	
a unique integer n, greater than 0, to identify the nth set of pipe attribute plot parameters. The Set # should match one of the Set #'s from the grid in the parent node: User defined pipe attributes .			
Text	pipe_attr_n_title	input	
title for the nth set of pipe attribute data.			
Textstyle	pipe_attr_n_title_textstyle	font box	available fonts
font of the title for the nth set of pipe attribute data.			
Size (mm)	pipe_attr_n_title_text_size	input	

<i>text size of the title for the nth set of pipe attribute data.</i>			
Colour	pipe_attr_n_title_text_colour	colour box	available colours
<i>text colour of the title for the nth set of pipe attribute data.</i>			
Offset (mm)	pipe_attr_n_title_offset	input	
<i>vertical adjustment to position of the title for the nth set of pipe attribute data.</i>			
X offset (mm)	pipe_attr_n_title_x	input	
<i>horizontal adjustment to position of the title for the nth set of pipe attribute data.</i>			
Draw title bottom linework		tick box	
Height of title left linework (mm)		input	

Arrows - User Defined Pipe Attributes - Arrow Type

The following fields are required for each desired pipe attribute (set). Each set of fields forms one row of a grid.

Panel Field	Parameter name	Type	Pop-Up
Set #		input	
<i>a unique integer n, greater than 0, to identify the nth set of pipe attribute plot parameters. The Set # should match one of the Set #s from the grid in the parent node: User defined pipe attributes.</i>			
Arrow type	pipe_attr_n_arrow_mode	choice box	available arrow types
<i>arrow type (0 to 8) for the nth set of pipe attribute data.</i>			
Colour	pipe_attr_n_arrow_colour	colour box	available colours
<i>arrow colour for the nth set of pipe attribute data.</i>			
Size (mm)	pipe_attr_n_arrow_size	input	
<i>arrow size for the nth set of pipe attribute data.</i>			
Arrow gap mode	pipe_attr_n_arrow_gap	choice box	no gap in arrow leave gap in arrow for text
<i>whether to put text gaps in the arrows, for the nth set of pipe attribute data.</i>			

Arrows - User Defined Pipe Attributes - Arrow Text

The following fields are required for each desired pipe attribute (set). Each set of fields forms one row of a grid.

Panel Field	Parameter name	Type	Pop-Up
Set #		input	
<i>a unique integer n, greater than 0, to identify the nth set of pipe attribute plot parameters. The Set # should match one of the Set #s from the grid in the parent node: User defined pipe attributes.</i>			
Pre text	pipe_attr_n_arrow_pre_text	input	
<i>label text before the values of the nth set of pipe attribute data.</i>			
Post text	pipe_attr_n_arrow_post_text	input	
<i>label text after the values of the nth set of pipe attribute data.</i>			
Units factor			

Decimal places	pipe_attr_n_arrow_decimals	input	
	<i>decimal places the values of the nth set of pipe attribute data.</i>		
Colour	pipe_attr_n_arrow_text_colour	colour box	available colours
	<i>text colour for the values of the nth set of pipe attribute data.</i>		
Size (mm)	pipe_attr_n_arrow_text_size	input	
	<i>text size for the values of the nth set of pipe attribute data.</i>		
Textstyle	pipe_attr_n_arrow_textstyle	font box	available fonts
	<i>font for the values of the nth set of pipe attribute data.</i>		
Offset (mm)	pipe_attr_n_arrow_text_offset	input	
	<i>vertical adjustment to position of values of the nth set of pipe attribute data.</i>		

Please continue to the next section [Drainage Graph Area](#).

Drainage Graph Area

The Graph area is where the diagram of the drainage line, in long-section, is drawn. In addition, if Hydraulic Grade Line (HGL) information is set, the HGL can also be drawn in the Graph area.

Panel Field	Parameter name	Type	Pop-Up
Left/Right extensions (world units)	profile_extension	input	
Drainage string colour	drainage_colour	colour box	available colours
Draw finished surface tin	draw_fs_tin	tick box	
Finished surface tin colour	fs_tin_colour	colour box	available colours
Draw natural surface tin	draw_ns_tin	tick box	
Natural surface tin colour	ns_tin_colour	colour box	available colours
Draw HGL	draw_hgl_diag	tick box	
<i>whether to draw the HGL in the Graph area.</i>			
HGL colour	hgl_colour	colour box	available colours
<i>colour of HGL.</i>			
HGL linestyle	hgl_linestyle	choice box	
<i>linestyle of HGL.</i>			

Please continue to the next section [Top Area](#).

Top Area

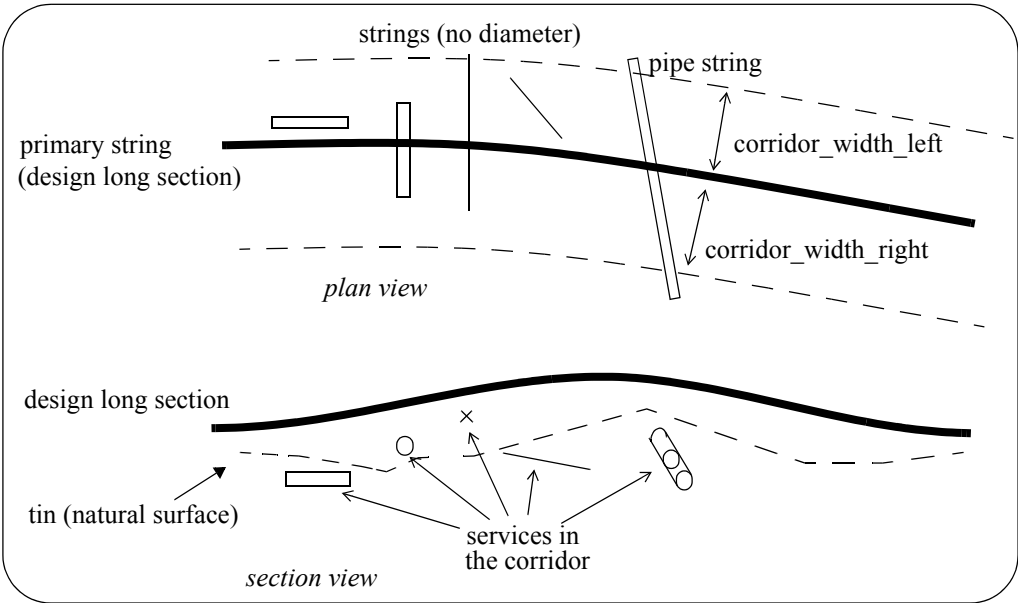
Panel Field	Parameter name	Type	Pop-Up
Line at the bottom of the top area mode	draw_top_line	choice box	don't draw line draw line

whether to draw a horizontal line at the bottom of the Top area.

Please continue to the next section [Corridors](#).

Corridors

A corridor around the primary string is defined by giving a left and right corridor width. Any string in a model added to the section view is checked to see if it appears in the corridor, and if it does, it is drawn on the long section plot. To be drawn, strings do not have to cross the primary string, but just be in the corridor.



Panel field	Parameter name	Type
Left corridor width (world units)		
	corridor_width_left	input
<i>left corridor width</i>		
Right corridor width (world units)		
	corridor_width_right	input
<i>right corridor width</i>		
Left corridor overlap (world units)		
	corridor_overlap_left	input
<i>left corridor overlap</i>		
Right corridor overlap (world units)		
	corridor_overlap_right	input
<i>right corridor overlap</i>		
Chord-arc tolerance (world units)		
	corridor_chord_arc	input
<i>chord-arc tolerance used near any bends in the corridor.</i>		

Corridors - Model Selection

Panel field	Parameter name	Type
Corridor model	corridor_model_n	model box

models containing tins and service strings to be drawn on the section. Where n = 1, 2, ... ,100 given by line number on grid.

Please continue to the next section [Maintenance Holes](#).

Maintenance Holes

Section: Maintenance hole names/types/bubbles

Panel Field	Parameter name	Type	Pop-Up
Include line name mode	draw_line_name	choice box	don't include line name include line name
<i>whether to include the drainage line name in the MH name label.</i>			
Include pit name mode	draw_pit_name	choice box	don't include pit name include pit name
<i>whether to include the MH name in the MH name label.</i>			
Include pit type mode	draw_pit_type	choice box	don't include pit type include pit type
<i>whether to include the MH type in the MH name label.</i>			
Size (mm)	bubble_text_size	input	
<i>text size of MH name label.</i>			
Colour	bubble_text_colour	colour box	available colours
<i>text colour of MH name label.</i>			
Textstyle	bubble_textstyle	font box	available fonts
<i>font of MH name label.</i>			
X adjustment (mm)	bubble_text_x	input	
<i>horizontal adjustment to position of MH name label.</i>			
Y adjustment (mm)	bubble_text_y	input	
<i>vertical adjustment to position of MH name label.</i>			
Pre text	bubble_pre_text	input	
<i>text to go before MH name label.</i>			
Post text	bubble_post_text	input	
<i>text to go after MH name label.</i>			
Text angle (dms)	bubble_text_angle	angle box	
<i>text angle of MH name label.</i>			
Text justification	bubble_text_justify	justification box	
<i>text justification of MH name label.</i>			
Bubble radius (mm)	bubble_radius	input	
<i>radius of bubble around MH name label. Zero (0) for no bubble.</i>			
Bubble colour	bubble_colour	colour box	available colours
<i>colour of bubble around MH name label.</i>			
Bubble length (mm)	bubble_length	input	
<i>length of bubble around MH name label. Zero (0) for circular bubble.</i>			
Bubble text position	draw_text_at_pit	choice box	draw bubble&text in top area draw bubble&text above pit
<i>whether to position the MH name labels and bubbles in the Top area, or directly above the pits.</i>			
Distance to add to place bubble above the pit (mm)			

distance_above_pit input

for draw_text_at_pit set to draw bubble & text above pit, distance to add between top of pit and bottom of bubble.

Maintenance Holes - Line/Junction Deflection Angles

Section: Maintenance hole line/junction deflection angles

Panel Field	Parameter name	Type	Pop-Up
Angled text x offset (mm)	angled_text_x_offset	input	
Angled text y offset (mm)	angled_text_offset	input	
Angled text horiz gap (mm)	angled_text_gap	input	
Angled text angle (dms)	angled_text_angle	input	
Angled text justification	angled_text_justification	choice box	left, right
Degrees mode	angled_text_degrees_mode	choice box	
Degrees decimals	angled_text_degrees_decimals	input	

Section: Drainage line deflection angles

Panel Field	Parameter name	Type	Pop-Up
Pre text	angled_pre_text	input	
Post text	angled_post_text	input	
Colour	angled_text_colour	colour box	available colours
Size (mm)	angled_text_size	input	
Textstyle	angled_textstyle	textstyle box	available textstyles

Maint Holes - Line/Junction Deflection Angles - Junction Names

Panel Field	Parameter name	Type	Pop-Up
Junction name mode	junction_name_mode	choice box	
Pre text	junction_pre_text	input	
Post text	junction_post_text	input	
Colour	junction_text_colour	colour box	available colours
Size (mm)	junction_text_size	input	
Textstyle	junction_textstyle	textstyle box	available textstyles

Maint Holes - Line/Junction Defl Ang - Junction Deflection Angles

Panel Field	Parameter name	Type	Pop-Up
Append mode	junction_angle_append	choice box	
Pre text	junction_angle_pre_text	input	
Post text	junction_angle_post_text	input	
Colour	junction_angle_text_colour	colour box	available colours
Size (mm)	junction_angle_text_size	input	
Textstyle	junction_angle_textstyle	textstyle box	available textstyles

Maintenance Holes - Symbols

Symbols representing the different types of maintenance holes used, can be drawn on the plots.

The following fields form one set (grid row) of controls for the placement of MH symbols on the plot. Normally, the grid will contain one row for each MH type/symbol used.

Panel Field	Parameter name	Type	Pop-Up
Set #		input	
	<i>a unique integer n, greater than 0, to identify the nth set of MH symbol plot parameters.</i>		
All MH types		input	
MH type	manhole_symbol_n_type	choice box	available MH types
	<i>the MH type to associate with the Set #, n.</i>		
MH symbol mode	manhole_symbol_n_mode	choice box	cross (0) up from centre of box (1) up&down from box centre(2) square (3) triangle, base at bottom (4) circle (5) use a symbol
	<i>for the nth MH type, whether to use one of the hard-wired symbols (1-5), or a symbol from the defined symbols list.</i>		
MH symbol position	manhole_symbol_n_position	choice box	at top of mh above top of boxes above highest point to primary string to first found tin
	<i>for the nth MH type, the desired position of the symbol.</i>		
Stagger		input	
Size (mm)	manhole_symbol_n_size	input	
	<i>for the nth MH type, the symbol size.</i>		
X (mm)	manhole_symbol_n_x	input	
	<i>for the nth MH type, the horizontal adjustment to the selected MH symbol position.</i>		
Y (mm)	manhole_symbol_n_y	input	
	<i>for the nth MH type, the vertical adjustment to the selected MH symbol position.</i>		
Symbol	manhole_symbol_n_style	choice box	available symbols
	<i>for the nth MH type, and with manhole_symbol_n_mode set to use a symbol, the symbol to use from the defined symbols list.</i>		
Angle (dms)	manhole_symbol_n_angle		

angle box

for the nth MH type, the symbol angle.

Colour	manhole_symbol_n_colour	colour box	available colours
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for the nth MH type, the symbol colour.

Maintenance Holes - Attribute Labels

Panel Field	Parameter name	Type	Pop-Up
Label MH attribute	drainage_manhole_attributes_grid	tick box	

Attribute name

From primary string at junction pits (non-standard)

Text size (mm)

Label position

Stagger	tick box
---------	----------

X off (mm)	input
------------	-------

Y off (mm)	input
------------	-------

Angle (dms)

Pre text

Post text

Decimal places

Units factor

Colour

Textstyle

Justification

Please continue to the next section [Property Controls/House Connections](#).

Property Controls/House Connections

Section: Property control parameters

Draw property control mode draw_property_controls choice box

Section: House connection parameters

Draw property control mode draw_house_connections choice box

House connection width (mm) house_connection_width measure box

Property Controls/House Connections - House Connection Labels

Property Controls/House Connections - House Connection Labels - Symbols

drainage_hc_symbols_grid

Property Controls/House Connections - House Connection Labels - House connection type

Property Controls/House Connections - House Connection Labels - Distance

Property Controls/House Connections - House Connection Labels - Depths

Property Controls/House Connections - House Connection Labels - Finished surface

Property Controls/House Connections - House Connection Labels - Invert levels

Property Controls/House Connections - Property Control Labels

Property Controls/House Connections - Property Control Labels - Symbols

Property Controls/House Connections - Property Control Labels - Distance

Property Controls/House Connections - Property Control Labels - Depths

Property Controls/House Connections - Property Control Labels - Finished Surface

Property Controls/House Connections - Property Control Labels - Invert Levels

Please continue to the next section [Hatching Cut/Fill](#).

Hatching Cut/Fill

This option is used to hatch cut and/or fill areas between sets of tins.

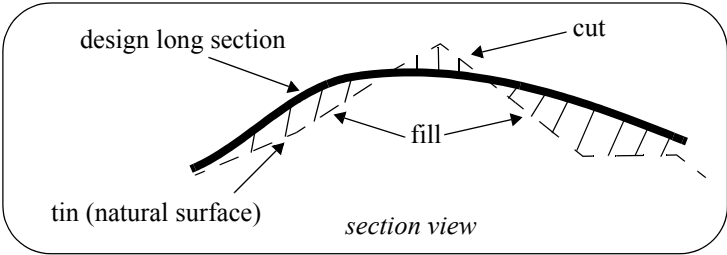
For each set, the name of the two tins, the hatch linestyle, colour and separation and whether cut and/or fill regions are required are all user definable.

Up to twenty (20) separate sets of tins may be hatched.

Panel Field	Parameter name	Type
Define Set #		input
set number to be used to define different original/new tin sets.		
Original tin	hatch_original_tin_n	tin box
tin_name for original surface		
New tin	hatch_new_tin_n	tin box
tin_name for final surface		

Notes

- (a) cut is when the new tin is below the original tin.
fill is when the new tin is above the original tin.
- (b) cut hatching is turned off by setting *hatch_cut_separation_n* to 0.0.
fill hatching is turned off by setting *hatch_fill_separation_n* to 0.0.



Hatching Cut/Fill - Cut

Panel Field	Parameter name	Type
Use Set #		input
set number as specified in the Define set# .		
Cut separation (mm)	hatch_cut_separation_n	input
distance between cut hatch lines. If 0, no hatching.		
Cut hatch angle (dms)	hatch_cut_angle_n	input
angle of hatching.		
Cut colour	hatch_cut_colour_n	colour box
colour of the hatching.		
Cut linestyle	hatch_cut_linestyle_n	linestyle box
linestyle of the hatching.		
Draw sides of cuts	hatch_cut_draw_sides_n	choice box
draw mode for sides of cut regions.		
Draw original tin	hatch_cut_draw_original_n	choice box
draw mode for sides of original tin in cut.		

Draw new tin	hatch_cut_draw_new_n	choice box
<i>draw mode for sides of new tin in cut.</i>		

Hatching Cut/Fill - Fill

Panel Field	Parameter name	Type
Use Set #		input
<i>set number as specified in the Define set#.</i>		
Fill separation (mm)	hatch_fill_separation_n	input
<i>distance between fill hatch lines. If 0, no hatching.</i>		
Fill hatch angle (dms)	hatch_fill_angle_n	input
<i>angle of hatching.</i>		
Fill colour	hatch_fill_colour_n	colour box
<i>colour of the hatching.</i>		
Fill linestyle	hatch_fill_linestyle_n	linestyle box
<i>linestyle of the hatching.</i>		
Draw sides of fills	hatch_fill_draw_sides_n	choice box
<i>draw mode for sides of fill regions.</i>		
Draw original tin	hatch_fill_draw_original_n	choice box
<i>draw mode for sides of original tin in fill.</i>		
Draw new tin	hatch_fill_draw_new_n	choice box
<i>draw mode for sides of new tin in fill.</i>		

Please continue to the next section [Cuts](#).

Cuts

The cuts that the primary string (design line) makes through strings in any user-specified model can be automatically labelled on the long section plots.

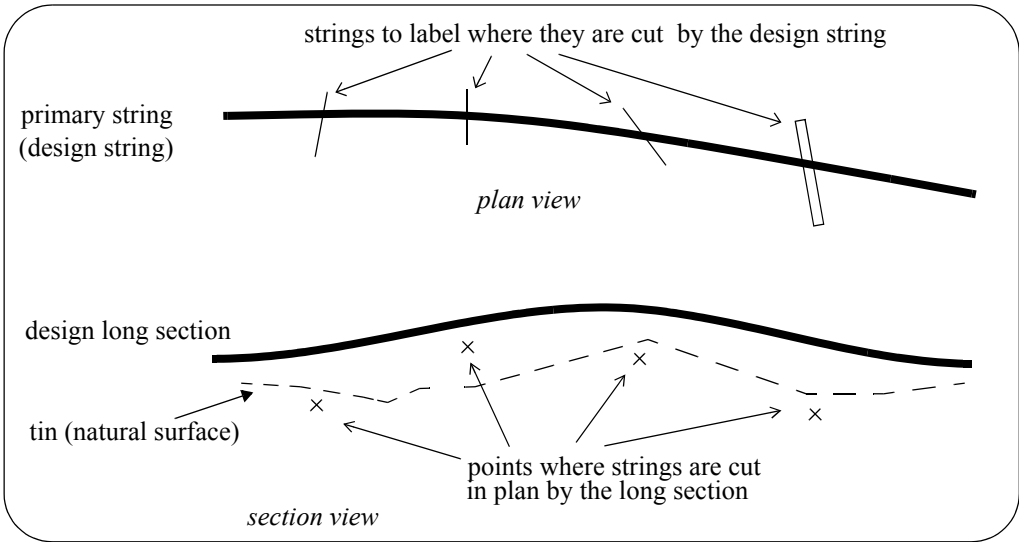
The **height**, **chainage** and **name** of the cut string can be labelled as well as a **symbol**. The height of tins at the same offset value can also be labelled.

The chainage position for the labelling is the chainage of the cut string.

The height position for the labelling can be specified as the:

- (a) top of the boxes on the long section,
- (b) height value of the cut string,
- (c) height of the primary string,
- (d) height of a tin.

The actual position of the label is defined relative to the above point.



Note: Only case (b) involves the actual height of the cut string. For all other cases, only the chainage of the cut string is used. Hence for all cases except (b), the string does need to have a sensible height to be used for cuts through strings. For example, a boundary string may have null heights but only the chainage is required and the height of the tin at that chainage can be used as the height (case (d)).

The method for specifying which strings are to be checked for cuts is by first specifying the **model** which contains the strings, and then a **name mask** which is used to restrict the strings in the model to only those whose names match the name mask.

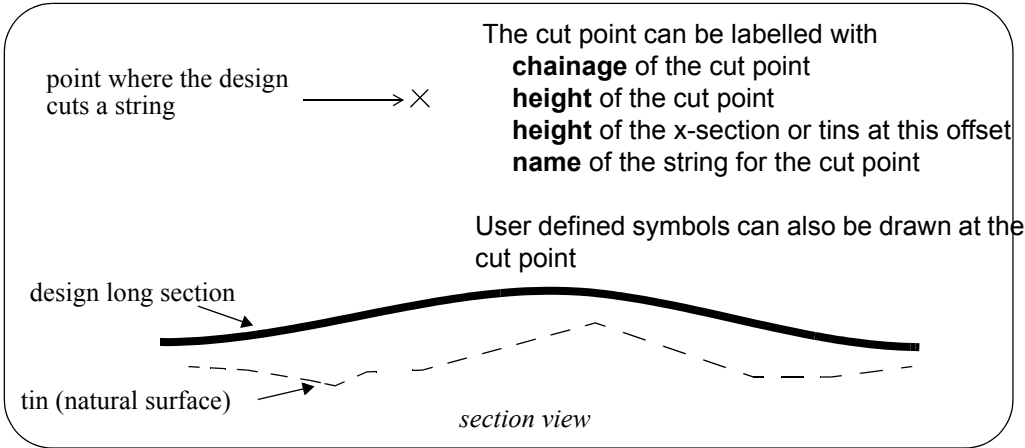
Up to twenty five different sets of models and name masks can be used so that different cut sets can be labelled in different ways.

Panel Field	Parameter name	Type
Define Set #		input
<i>set number to be used to define different model/mask sets.</i>		
Model	cuts_n_model	model box
<i>model from which cut masks are derived</i>		
Name mask	cuts_n_mask	input
<i>text string containing the name masks, each separated by one or more spaces, to test the string name against. Each mask can include wild cards and wild characters.</i>		
<i>For example: "ke*" or, "bank*" or, if both masks are required,</i>		

"ke* ?bank*"

If cuts_n_mask is blank, then all strings in the model are used. This is equivalent to name mask being set to "*".

All strings in the model cuts_n_model whose name satisfy the name mask cuts_n_mask are then checked for cuts with the design string, and if a cut occurs, the cut point will be labelled according to the rest of the parameters in the nth set.



Cuts - Chainage

Panel Field	Parameter name	Type	Pop-Up
Use Set #		input	
set number as specified in the Define set#.			
Position	cuts_chainage_n_position	choice box	above cut string height value above top of boxes to primary string to tin 1 to tin 2 to tin 3 to tin 4 to tin 5 to tin 6 to tin 7 to tin 8 to tin 9 to tin 10
position of chainage label.			
X (mm)	cuts_chainage_n_x	input	
horizontal adjustment to position of chainage text.			
Y (mm)	cuts_chainage_n_y	input	
vertical adjustment to position of chainage text.			
Angle (dms)	cuts_chainage_n_angle	input	
rotation of chainage text about position.			
Colour	cuts_chainage_n_colour	colour box	
colour of chainage text.			

Size (mm)	cuts_chainage_n_size	input	
<i>size of chainage text. A value of 0 means no label.</i>			
Textstyle	cuts_chainage_n_textstyle	text box	
<i>textstyle of chainage text.</i>			
Pre-text	cuts_chainage_n_pre_text	input	
<i>text before chainage text.</i>			
Post-text	cuts_chainage_n_post_text	input	
<i>text after chainage text.</i>			
Justification	cuts_chainage_n_justification	justification box	
			bottom-left
			bottom-centre
			bottom-right
			bottom-decimal
			middle-left
			middle-centre
			middle-right
			middle-decimal
			top-left
			top-centre
			top-right
			top-decimal
			decimal-left
			decimal-centre
			decimal-right
			decimal-point
<i>justification of the chainage text.</i>			
Decimals	cuts_chainage_n_no_decimals	input	
<i>number of decimals in chainage.</i>			

Cuts - Heights

Panel Field	Parameter name	Type	Pop-Up
Use Set #		input	
<i>set number as specified in the Define set#.</i>			
Mode	cuts_height_n_mode	choice box	use height of cut point use real height above boxes height of primary string use height of tin 1 use height of tin 2 use height of tin 3 use height of tin 4 use height of tin 5 use height of tin 6 use height of tin 7 use height of tin 8 use height of tin 9 use height of tin 10

determines which height value is labelled.

Position	cuts_height_n_position	choice box	at cut string above top of boxes above top of graph area to primary string to tin 1 to tin 2 to tin 3 to tin 4 to tin 5 to tin 6 to tin 7 to tin 8 to tin 9 to tin 10
-----------------	------------------------	------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

position of height label.

X (mm)	cuts_height_n_x	input
---------------	-----------------	-------

horizontal adjustment to position of height text.

Y (mm)	cuts_height_n_y	input
---------------	-----------------	-------

vertical adjustment to position of height text.

Angle (dms)	cuts_height_n_angle	input
--------------------	---------------------	-------

rotation of height text about position.

Colour	cuts_height_n_colour	colour box
---------------	----------------------	------------

colour of height text.

Size (mm)	cuts_height_n_size	input
------------------	--------------------	-------

size of height text. A value of 0 means no label.

Textstyle	cuts_height_n_textstyle	text box
------------------	-------------------------	----------

textstyle of height text.

Pre-text	cuts_height_n_pre_text	input
-----------------	------------------------	-------

text before height text.

Post-text	cuts_height_n_post_text	input
------------------	-------------------------	-------

text after height text.

Justification	points_height_n_justification	justification box bottom-left bottom-centre bottom-right bottom-decimal middle-left middle-centre middle-right middle-decimal top-left top-centre top-right top-decimal decimal-left decimal-centre
----------------------	-------------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

			decimal-right decimal-point
	<i>justification of the height text.</i>		
Decimals	cuts_height_n_no_decimals	input	
	<i>number of decimals in height.</i>		

Cuts - Diameters

Panel Field	Parameter name	Type	Pop-Up
Use Set #		input	
	<i>set number as specified in the Define set#.</i>		
Position			
	<i>position of diameter label.</i>		
X (mm)			
Y (mm)			
Angle (dms)			
Colour			
Size (mm)			
Textstyle			
Pre-text			
Post-text			
Justification			
Decimals		input	
	<i>number of decimals in diameter</i>		

Cuts - Labels

Panel Field	Parameter name	Type	Pop-Up
Use Set #		input	
	<i>set number as specified in the Define set#.</i>		
Position	cuts_label_n_position	choice box	at cut string height above top of boxes above top of graph area to primary string to tin 1 to tin 2 to tin 3 to tin 4 to tin 5 to tin 6 to tin 7 to tin 8 to tin 9 to tin 10
	<i>position of label text.</i>		
Mode	cuts_label_n_mode	choice box	don't include string name include cut string name

determines whether the label includes the cut string name.

Attribute name		input	
X (mm)	cuts_label_n_x	input	
	<i>horizontal adjustment to position of label.</i>		
Y (mm)	cuts_label_n_y	input	
	<i>vertical adjustment to position of label.</i>		
Angle (dms)	cuts_label_n_angle	input	
	<i>rotation of label about position.</i>		
Colour	cuts_label_n_colour	colour box	
	<i>colour of label.</i>		
Size (mm)	cuts_label_n_size	input	
	<i>size of label. A value of 0 means no label.</i>		
Textstyle	cuts_label_n_textstyle	text box	
	<i>textstyle of label.</i>		
Pre-text	cuts_label_n_pre_text	input	
	<i>text before label.</i>		
Post-text	cuts_label_n_post_text	input	
	<i>text after label.</i>		
Justification	cuts_label_n_justification	justification box	
		bottom-left	
		bottom-centre	
		bottom-right	
		bottom-decimal	
		middle-left	
		middle-centre	
		middle-right	
		middle-decimal	
		top-left	
		top-centre	
		top-right	
		top-decimal	
		decimal-left	
		decimal-centre	
		decimal-right	
		decimal-point	

justification of the label.

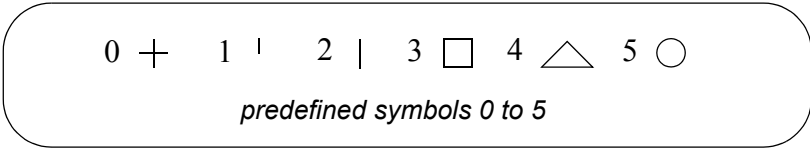
Factor	input
Decimals	input

Cuts - Symbols

Panel Field	Parameter name	Type	Pop-Up
Use Set #		input	
	<i>set number as specified in the Define set#.</i>		
Mode	cuts_symbol_n_mode	choice box	cross (0) up from centre of box (1)

up&down from box centre(2)
square (3)
triangle, base at bottom (4)
circle (5)
use a plot symbol

symbol mode.



Note: If a plot symbol is to be used, the cuts_symbol_n_style parameter must be specified.

Symbol cuts_symbol_n_style plot symbols
a valid plot symbol can be selected.

Position cuts_symbol_n_position choice box at cut string height
above top of boxes
above top of graph area
to primary string
to tin 1
to tin 2
to tin 3
to tin 4
to tin 5
to tin 6
to tin 7
to tin 8
to tin 9
to tin 10

position of symbol.

X (mm) cuts_symbol_n_x input
horizontal adjustment to position of symbol.

Y (mm) cuts_symbol_n_y input
vertical adjustment to position of symbol.

Angle (dms) cuts_symbol_n_angle input
rotation of symbol about point.

Colour cuts_symbol_n_colour colour box
colour of symbol.

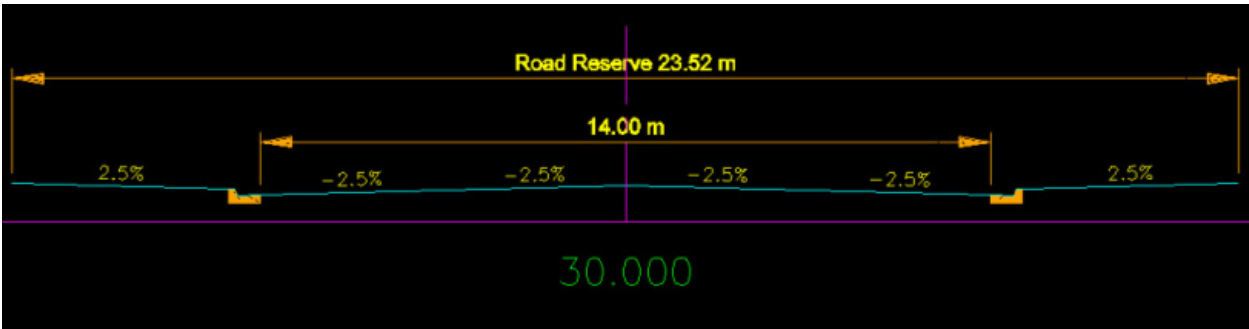
Size (mm) cuts_symbol_n_size input
size of symbol. A value of 0 means no symbol.

Please continue to the next section [Paired Cuts - Drainage](#).

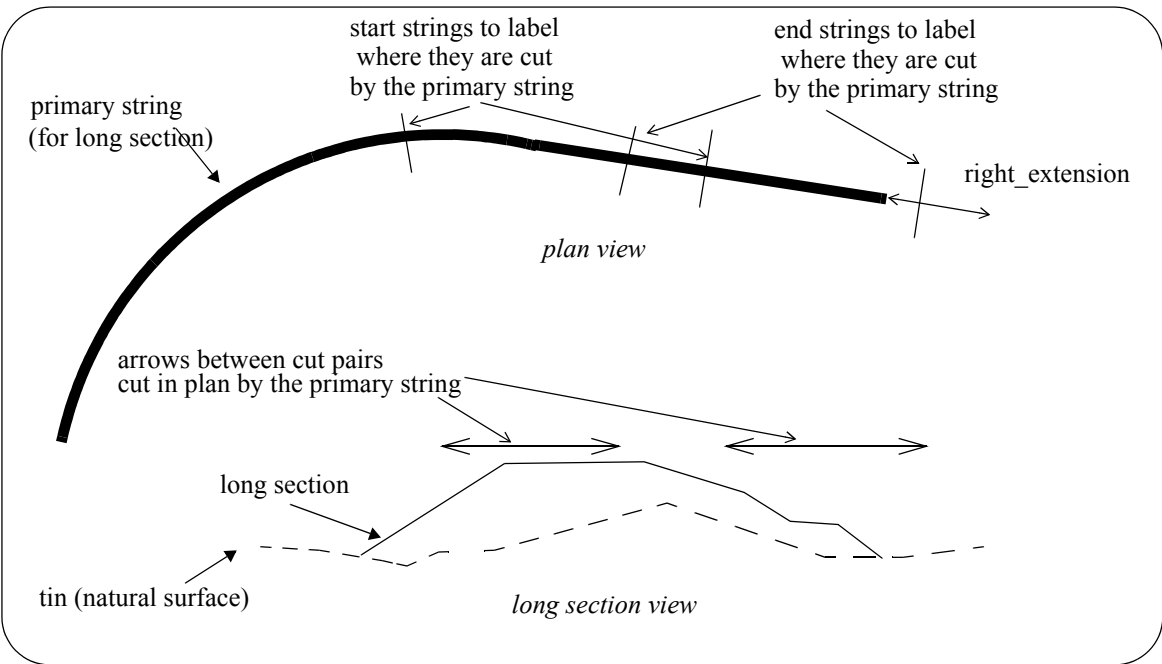
Paired Cuts - Drainage

Paired cuts uses pairs of strings and where both strings cut the primary string, the cuts on the long plot can be labelled with information such as

- (a) the name of the first and second cut strings
- (b) attributes from the first and second cut string
- (c) plan distance between the two cuts of the pair
- (d) 3d length between the two cuts of the pair
- (e) the change on the long section of the first and second cuts of the pair



Symbols can be drawn at the chainages of the first and second cuts (at a height specified when defining the Cut sets), and a line drawn between the symbols. Using both the line and a symbol of an arrow head makes an arrow between the two cuts.



The method for specifying which strings are to be checked for paired cuts is by first specifying the **models** (using wild cards and characters) that contains the strings, and then a **start name mask** to select the all the strings that are to be the first strings in a cut pair, and an **end name mask** to select all the strings that are the second strings in a cut pair.

For a long section, all the cuts of the selected **start** strings are found and the cuts ordered by the chainage of the cut with the primary string of the long section. Then all the cuts of the selected **end** strings are found and the cuts ordered by the chainage of the cut with the primary string of the long section.

The start cuts are then processed and each start cut is paired with the next end cut with a larger chainage than the start cut. It is possible that there are end cuts before the first start cut (orphaned end cuts) and start cut with no following end cut (orphaned start cuts).

Up to twenty five different sets of models and name masks can be used so that different paired cut sets can be labelled in different ways.

Paired Cuts - Front Page

The information on this section is the same as that for Long Sections, please see [Paired Cuts \(Long Section\) - Front Page](#)

Paired Cuts - Lines and Symbols

The information on this section is the same as that for Long Sections, please see [Paired Cuts \(Long Section\) - Lines and Symbols](#)

Paired Cuts - Labels

The information on this section is the same as that for Long Sections, please see [Paired Cuts \(Long Section\) - Labels](#)

Paired Cuts - Start Chainage

The information on this section is the same as that for Long Sections, please see [Paired Cuts \(Long Section\) - Start Chainage](#)

Paired Cuts - End Chainage

The information on this section is the same as that for Long Sections, please see [Paired Cuts \(Long Section\) - End Chainage](#)

Please continue to the next section [Primary String Name Label](#).

Primary String Name Label

The plot can be labelled with a name under the boxes area.

The name is made up of a concatenation of the text string names:

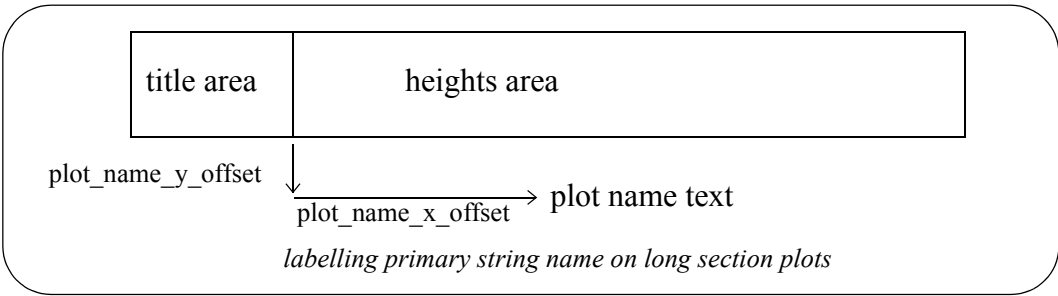
Panel Field	Parameter name	Type
Name mode	plot_name_string_name	choice box
<i>determines what text is placed in the name labels.</i>		
Pre-text	plot_name_pre_text	input
<i>text before label.</i>		
Post-text	plot_name_post_text	input
<i>text after label.</i>		
Textstyle	plot_name_textstyle	text box
<i>textstyle of label.</i>		
Size (mm)	plot_name_size	input
<i>size of label.</i>		
Colour	plot_name_colour	colour box
<i>colour of label.</i>		
X offset (mm)	plot_name_x_offset	input
<i>horizontal adjustment to position of label.</i>		
Y offset (mm)	plot_name_y_offset	input
<i>vertical adjustment to position of label.</i>		

The plot name is positioned under the boxes.

The *plot_name_x_offset* is measured from the beginning of the height boxes.

The default for *plot_name_x_offset* is centred on heights area.

The *plot_name_y_offset* is measured from the bottom of the box area with positive being down.



Please continue to the next section [PPFs to include](#).

PPFs to include

Panel Field	Parameter name	Type	Pop-Up
PPF files		input	

by including pre existing PPF files, the user can build up a modified version without having to set all the parameters.

Melbourne Water Plot PPF Editor

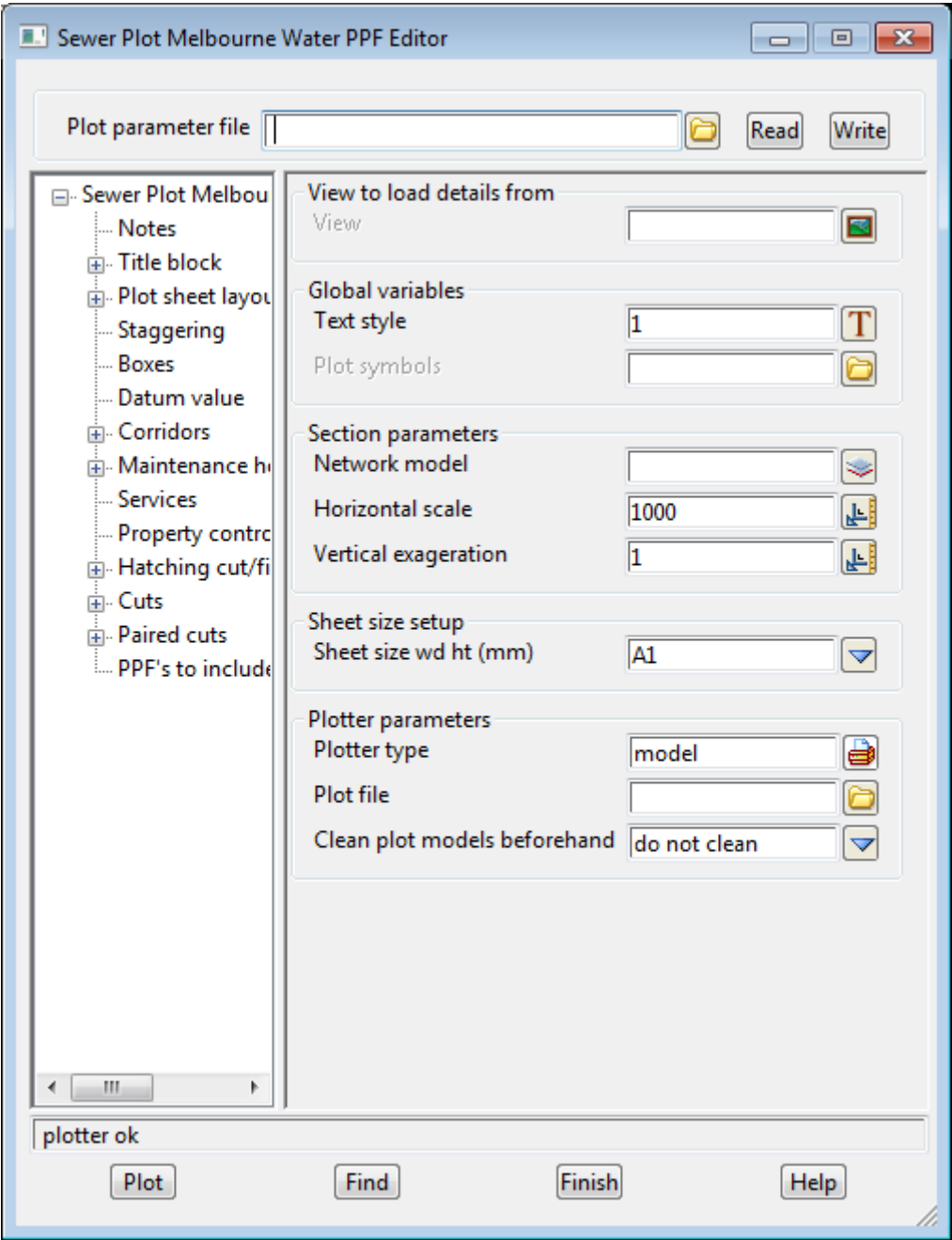
Position of option on menu: Plot =>Plot and PPF Editors =>Melbourne Water

The **Melbourne Water plot PPF editor** is for creating and/or editing a (binary) Melbourne Water sewer long section PPF and for creating a Melbourne Water sewer long section plot. An ascii version of the file is also produced.

Note: Binary and ascii PPFs are stored *within* the project (not in the folder containing the project).

On selecting the Melbourne Water option, the **Sewer Plot Melbourne Water PPF Editor** panel is displayed.

The plot parameters for controlling the cross section plots are accessed by expanding to the appropriate node in the **Sewer Plot Melbourne Water** tree (click on the **+** to expand to node or **-** to collapse the node) and then clicking on the required node, and the required information to fill in is displayed on the right hand side of the panel.



Information on the top and bottom buttons, and all the different nodes, now follows.
See [Buttons on Top and Bottom of Panel](#)
See [Paired Cuts - Melbourne Water](#)

Buttons on Top and Bottom of Panel

Panel field	Type
Plot parameter file	file box
Read	button

read the given plot parameter file in.

Write button

write out the plot parameters to the given plot parameter file. An ascii ppf file is also written out.

Plot button

use the plot parameters from the panel to create the plot.

Find button

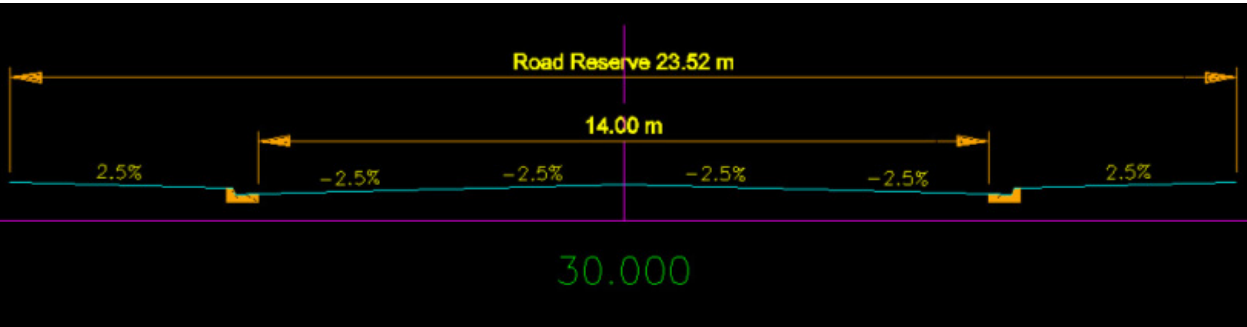
brings up a search box. If a valid parameter name is keyed in followed by the enter key, the cursor will be placed in the appropriate field on the appropriate page.

Please continue to the next section [Paired Cuts - Melbourne Water](#).

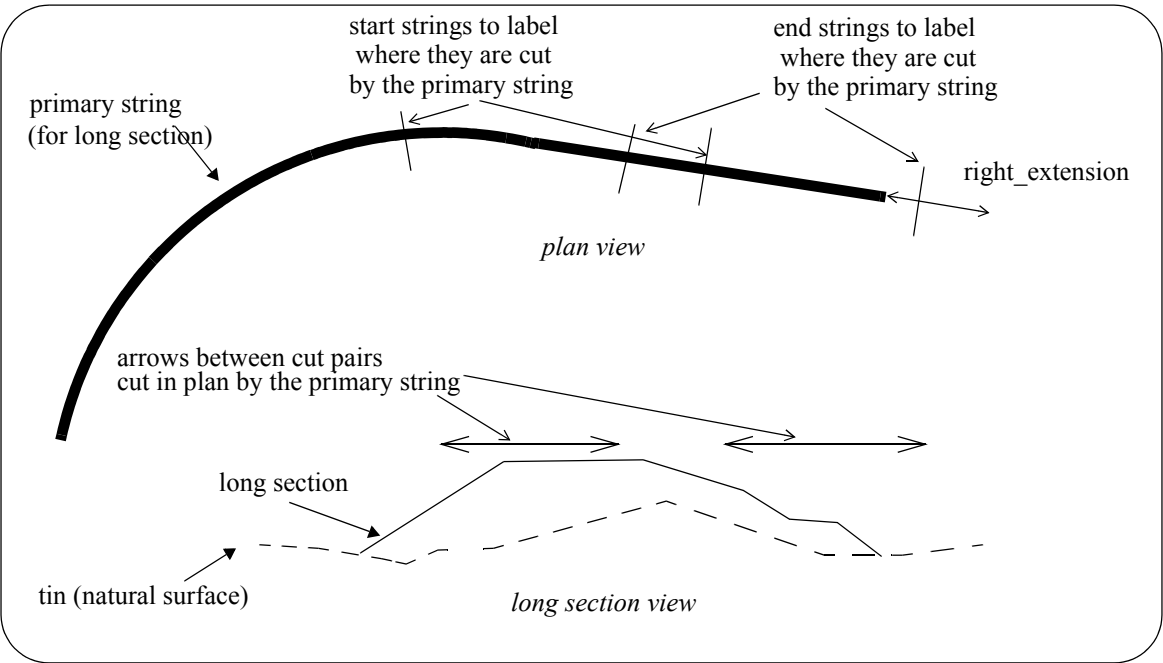
Paired Cuts - Melbourne Water

Paired cuts uses pairs of strings and where both strings cut the primary string, the cuts on the long plot can be labelled with information such as

- (a) the name of the first and second cut strings
- (b) attributes from the first and second cut string
- (c) plan distance between the two cuts of the pair
- (d) 3d length between the two cuts of the pair
- (e) the change on the long section of the first and second cuts of the pair



Symbols can be drawn at the chainages of the first and second cuts (at a height specified when defining the Cut sets), and a line drawn between the symbols. Using both the line and a symbol of an arrow head makes an arrow between the two cuts.



The method for specifying which strings are to be checked for paired cuts is by first specifying the **models** (using wild cards and characters) that contains the strings, and then a **start name mask** to select the all the strings that are to be the first strings in a cut pair, and an **end name mask** to select all the strings that are the second strings in a cut pair.

For a long section, all the cuts of the selected **start** strings are found and the cuts ordered by the chainage of the cut with the primary string of the long section. Then all the cuts of the selected **end** strings are found and the cuts ordered by the chainage of the cut with the primary string of the long section.

The start cuts are then processed and each start cut is paired with the next end cut with a larger chainage than the start cut. It is possible that there are end cuts before the first start cut (orphaned end cuts) and start cut with no following end cut (orphaned start cuts).

Up to twenty five different sets of models and name masks can be used so that different paired cut sets can be labelled in different ways.

Paired Cuts - Front Page

The information on this section is the same as that for Long Sections, please see [Paired Cuts \(Long Section\) - Front Page](#)

Paired Cuts - Lines and Symbols

The information on this section is the same as that for Long Sections, please see [Paired Cuts \(Long Section\) - Lines and Symbols](#)

Paired Cuts - Labels

The information on this section is the same as that for Long Sections, please see [Paired Cuts \(Long Section\) - Labels](#)

Paired Cuts - Start Chainage

The information on this section is the same as that for Long Sections, please see [Paired Cuts \(Long Section\) - Start Chainage](#)

Paired Cuts - End Chainage

The information on this section is the same as that for Long Sections, please see [Paired Cuts \(Long Section\) - End Chainage](#)

Pipeline Plot PPF Editor

Position of option on menu: Plot => Plot and PPF Editors => Pipelines

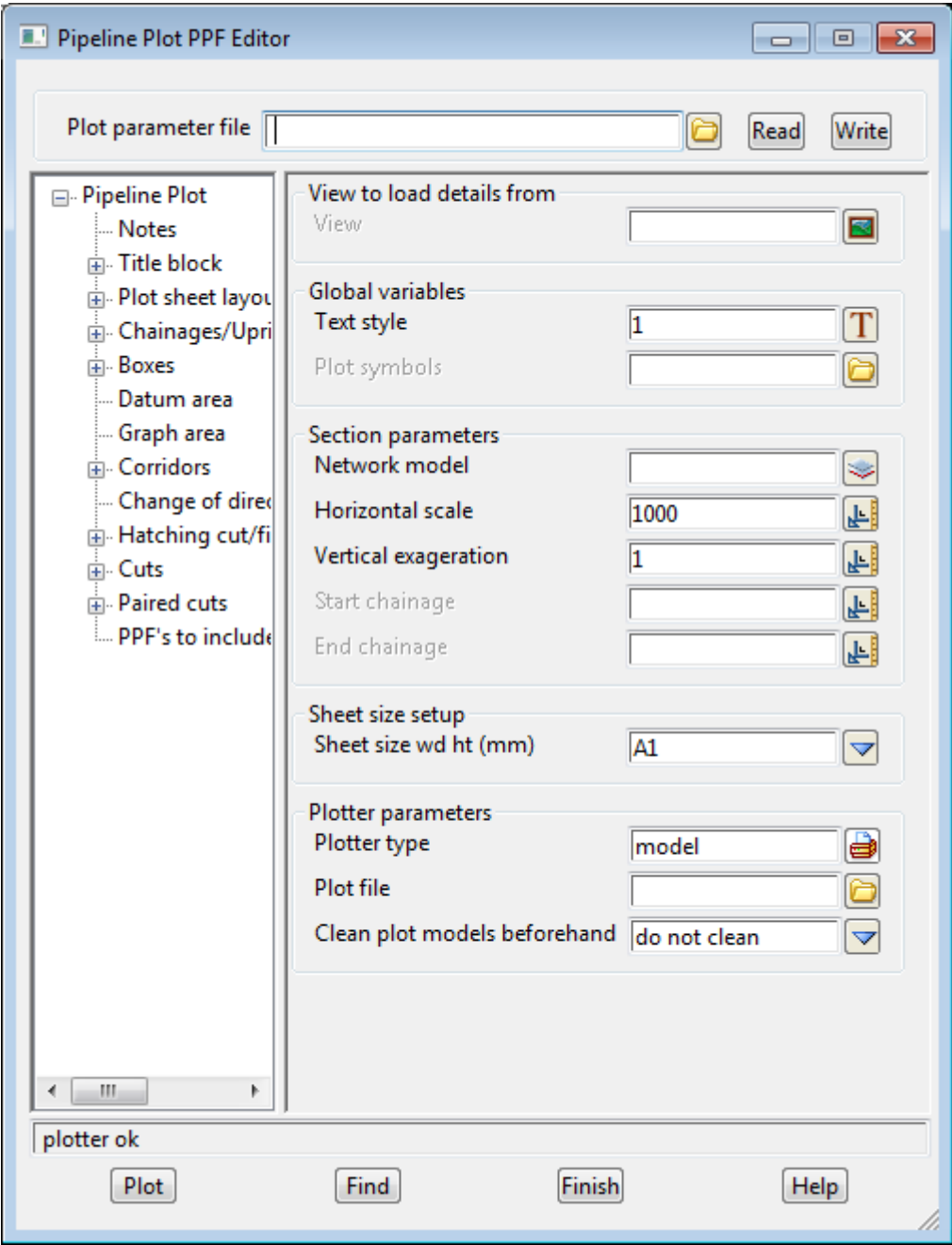
Position of option on menu: Design => Pipeline => Plots

The **Pipeline Plot PPF Editor** is for creating and/or editing a (binary) pipeline long section ppf file and for creating a pipeline long section plot.

Note: Binary PPFs are stored *within* the project (not in the folder containing the project as the ascii PPFs were).

On selecting the **Pipelines** option, the **Pipeline Plot PPF Editor** panel is displayed.

The plot parameters for controlling the cross section plots are accessed by expanding to the appropriate node in the **Pipeline Plot** tree (click on the **+** to expand to node or **-** to collapse the node) and then clicking on the required node, and the required information to fill in is displayed on the right hand side of the panel.



Information on the top and bottom buttons, and all the different nodes, now follows.

See [Buttons on Top and Bottom of Panel](#)

See [Paired Cuts - Pipeline](#)

Buttons on Top and Bottom of Panel

Panel field	Type
Plot parameter file	file box
	<i>name for the binary plot parameter file to read in or write out.</i>
Read	button

read the given plot parameter file in.

Write button

write out the plot parameters to the given plot parameter file. An ascii ppf file is also written out.

Plot button

use the plot parameters from the panel to create the plot.

Find button

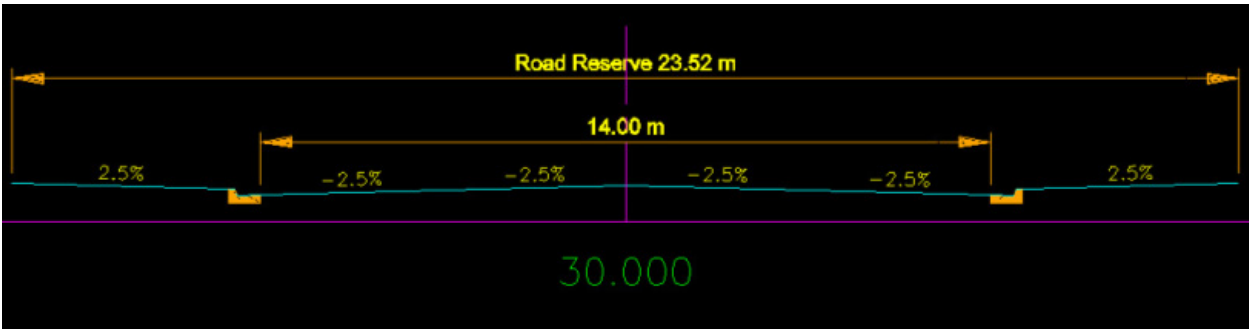
brings up a search box. If a valid parameter name is keyed in followed by the enter key, the cursor will be placed in the appropriate field on the appropriate page.

Please continue to the next section [Paired Cuts - Pipeline](#).

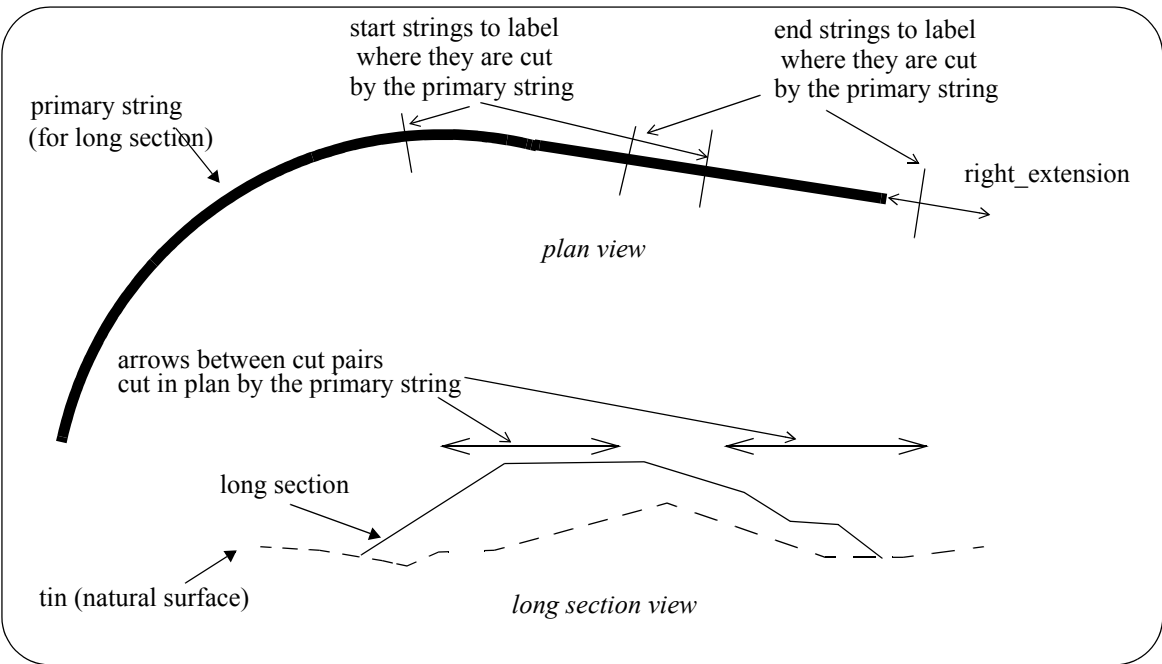
Paired Cuts - Pipeline

Paired cuts uses pairs of strings and where both strings cut the primary string, the cuts on the long plot can be labelled with information such as

- (a) the name of the first and second cut strings
- (b) attributes from the first and second cut string
- (c) plan distance between the two cuts of the pair
- (d) 3d length between the two cuts of the pair
- (e) the chainge on the long section of the first and second cuts of the pair



Symbols can be drawn at the chainages of the first and second cuts (at a height specified when defining the Cut sets), and a line drawn between the symbols. Using both the line and a symbol of an arrow head makes an arrow between the two cuts.



The method for specifying which strings are to be checked for paired cuts is by first specifying the **models** (using wild cards and characters) that contains the strings, and then a **start name mask** to select the all the strings that are to be the first strings in a cut pair, and an **end name mask** to select all the strings that are the second strings in a cut pair.

For a long section, all the cuts of the selected **start** strings are found and the cuts ordered by the chainage of the cut with the primary string of the long section. Then all the cuts of the selected **end** strings are found and the cuts ordered by the chainage of the cut with the primary string of the long section.

The start cuts are then processed and each start cut is paired with the next end cut with a larger chainage than the start cut. It is possible that there are end cuts before the first start cut (orphaned end cuts) and start cut with no following end cut (orphaned start cuts).

Up to twenty five different sets of models and name masks can be used so that different paired cut sets can be labelled in different ways.

Paired Cuts - Front Page

The information on this section is the same as that for Long Sections, please see [Paired Cuts \(Long Section\) - Front Page](#)

Paired Cuts - Lines and Symbols

The information on this section is the same as that for Long Sections, please see [Paired Cuts \(Long Section\) - Lines and Symbols](#)

Paired Cuts - Labels

The information on this section is the same as that for Long Sections, please see [Paired Cuts \(Long Section\) - Labels](#)

Paired Cuts - Start Chainage

The information on this section is the same as that for Long Sections, please see [Paired Cuts \(Long Section\) - Start Chainage](#)

Paired Cuts - End Chainage

The information on this section is the same as that for Long Sections, please see [Paired Cuts \(Long Section\) - End Chainage](#)

Drainage Plan Plot PPF Editor

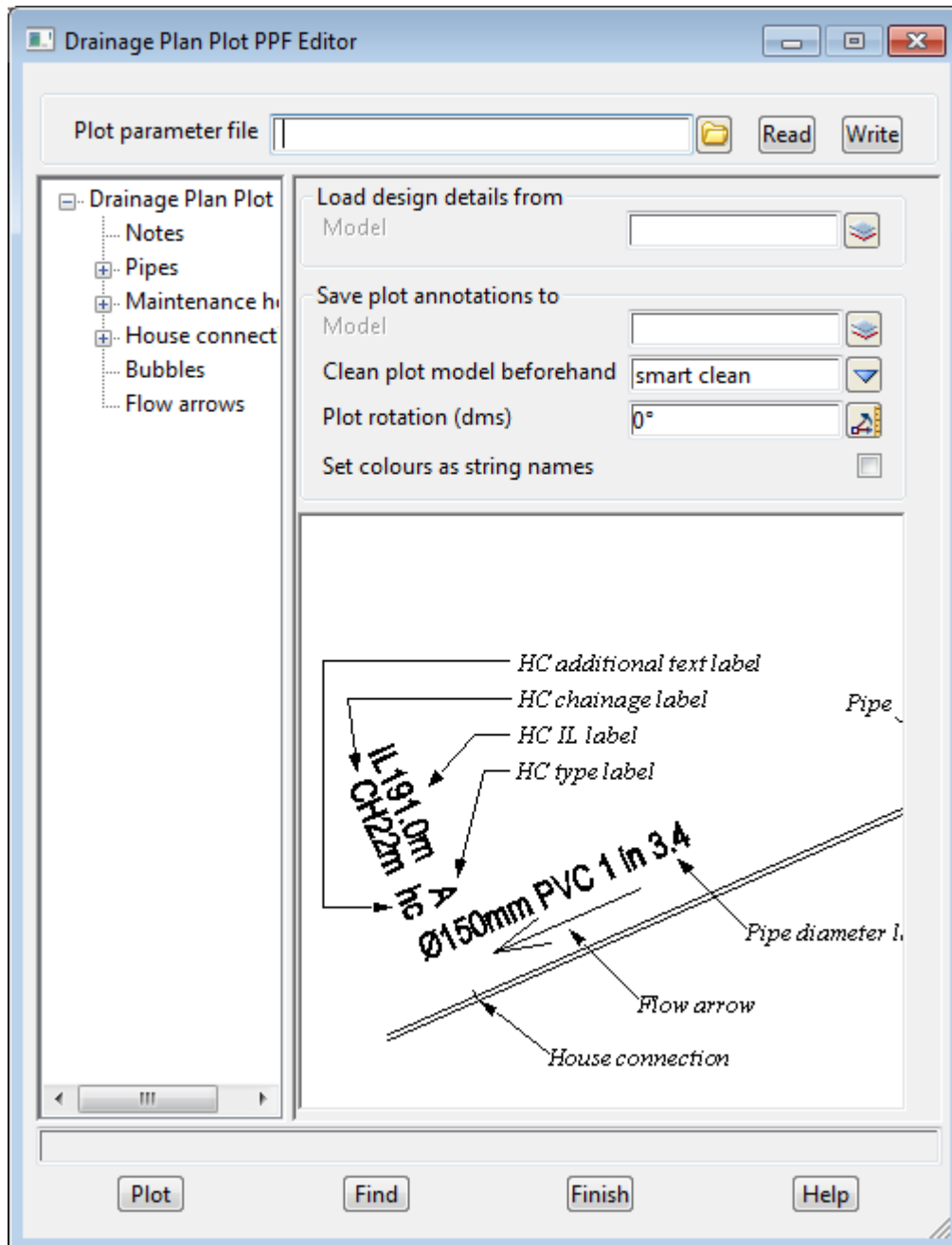
Position of option on menu: Plot => Plot and PPF Editors => Drainage Plan

The **Drainage Plan Plot PPF Editor** is for creating and/or editing a (binary) drainage and sewer plan plot ppf file and for creating a drainage and/or sewer plan annotation overlay model. An ascii version of the file is also produced.

Note: Binary and ascii PPFs are stored *within* the project (not in the folder containing the project).

On selecting the **Drainage plan** option, the **Drainage Plan Plot PPF Editor** panel is displayed.

The plot parameters for controlling the cross section plots are accessed by expanding to the appropriate node in the **Drainage Plan Plot** tree (click on the **+** to expand to node or **-** to collapse the node) and then clicking on the required node, and the required information to fill in is displayed on the right hand side of the panel.



Information on the top and bottom buttons, and all the different nodes, now follows.

See [Buttons on Top and Bottom of Panel](#)

See [Drainage Plan Plot - Front Page](#)

See [Notes - Drainage Plan Plot](#)

See [Pipes](#)

See [Maintenance Holes](#)

See [House Connections](#)

See [Bubbles](#)

See [Flow Arrows](#)

Buttons on Top and Bottom of Panel

Panel field	Type
Plot parameter file	file box
<i>name for the binary plot parameter file to read in or write out.</i>	
Read	button
<i>read the given plot parameter file in.</i>	
Write	button
<i>write out the plot parameters to the given plot parameter file. An ascii ppf file is also written out.</i>	
Plot	button
<i>use the plot parameters from the panel to create the plot.</i>	
Find	button
<i>brings up a search box. If a valid parameter name is keyed in followed by the Enter key, the cursor will be placed in the appropriate field on the appropriate page.</i>	

Please continue to the next section [Drainage Plan Plot - Front Page](#).

Drainage Plan Plot - Front Page

Note: When creating Drainage Plan Plot overlays, all distances and sizes (including text sizes, offsets, rises, etc) are specified in world units.

Section: Load design details from

Panel field	Parameter name	Type	Pop-Up
Model	input_model	model	available models
<i>input model containing the drainage design strings.</i>			

Section: Save plot annotations to

Panel field	Parameter name	Type	Pop-Up
Model	output_model	model	available models
<i>output model to which the plot annotations are saved.</i>			

Clean plot model beforehand

	plot_model_clean	choice box	smart clean full clean
<i>determines how to clean (delete the elements in) the output model, if it exists, before generating the plot annotations. In the case of a smart clean, any existing text, flow arrow and bubble annotation elements found that match the annotations about to be generated, will retain their pre-existing positions. In the case of a full clean, no information about the pre-existing plot annotation is used, and the new plot annotation is created from scratch.</i>			
Plot rotation (dms)	plot_rotation	measure boxAt Point, Point to Point, String from Point, String to Point	
Set colours as string	colour_string_	tick box	

Notes - Drainage Plan Plot

Section: Document your PPF here

type in notes on this PPF file

Please continue to the next section [Pipes](#).

Pipes

Section: Pipe representation

Panel field	Parameter name	Type	Pop-Up
Pipe string level mode	pipe_level_mode	choice box	available choices
Pipe string vertical offset	pipe_vertical_offset	measure box	available measures

Section: Draw multi-pipes

The fields in this section are grid column fields that may each have up to 20 sets (rows) defined.

Min pipe diam (m)	pipe_dia_min_n	input	
<i>minimum pipe diameter in metres for the nth set of pipe representations.</i>			
Max pipe diam (m)	pipe_dia_max_n	input	
<i>maximum pipe diameter in metres for the nth set of pipe representations. All pipes with diameters that fall between the min and max diameters of this set (row), will be represented according to the values of the other fields in this set. Pipe diameters are defined in the drainage design strings.</i>			
Pipe type mask		input	
Representation mode	pipe_dia_mode	choice box	none linestyle pipe linestyle and pipe
<i>determines whether to represent pipes as linestyles and/or solid pipes for the nth set of pipe representations.</i>			
Trim mode	trim_edge_mode	choice box	don't trim strings trim pipes trim linestyles trim pipes and linestyles
<i>determines whether to trim pipe and/or linestyle strings around maintenance holes for the nth set of pipe representations.</i>			
Multi-pipe spacing		input	
Colour	pipe_dia_colour_n	colour	available colours
<i>colour to use for the nth set of pipe representations.</i>			
Linestyle	pipe_dia_linestyle_n	linestyle	available linestyles
<i>linestyle to use for the nth set of pipe representations.</i>			
Linestyle string name	pipe_dia_name_n	input	
<i>string name of linestyles for the nth set of pipe representations.</i>			
Pipe string name	pipe_edge_name_n	input	
<i>string name of pipes for the nth set of pipe representations.</i>			

Section: Pipe labels

Panel field	Parameter name	Type	Pop-Up
Rise mode	rise_mode	choice box	rise from centre of pipe rise from edge of pipe
<i>determines where all pipe label text rise values are measured from.</i>			

Pipes - Pipe Diameter Labels

Panel field	Parameter name	Type	Pop-Up
-------------	----------------	------	--------

Draw diameter labels	pipe_label_draw	tick box	
Label mode	pipe_label_mode	choice box	none pre dia post pre dia post grade pre dia post type grade

determines what text is to be placed for the pipe diameter labels. Pipe types and grades can be included, in addition to diameters. Pipe diameters, types and grades are all defined in the drainage design strings. **Note:** if a pipe attribute of real type named **width** exists and is greater than zero, the pipe is considered to be rectangular and is labelled <width x height>, where the height takes the value of the pipe diameter.

Text size	pipe_label_size	input
-----------	-----------------	-------

text size of the pipe diameter labels. The labels will only be created if the size is greater than zero.

Text offset	pipe_label_offset	input
-------------	-------------------	-------

distance to move the pipe diameter labels along the pipe, from the mid position of the pipe segment. Positive values are to the right.

Text rise	pipe_label_rise	input
-----------	-----------------	-------

distance to move the pipe diameter labels away from the pipe centreline or edge (depending on setting of rise_mode). A negative value will place the labels on the other side of the pipes.

Text colour	pipe_label_colour	colour	available colours
-------------	-------------------	--------	-------------------

colour of the pipe diameter labels.

Text style	pipe_label_textstyle	textstyle	available fonts
------------	----------------------	-----------	-----------------

font of the pipe diameter labels.

Pre text	pipe_label_pre_text	input
----------	---------------------	-------

text to be placed before the diameter in the pipe diameter labels.

Post text	pipe_label_post_text	input
-----------	----------------------	-------

text to be placed after the diameter in the pipe diameter labels.

Units factor	pipe_label_factor	input
--------------	-------------------	-------

multiplier of diameter values. A Units factor of 1000 will result in the diameters being labelled in mm.

Decimal places	pipe_label_decimals	input
----------------	---------------------	-------

number of decimal places in labelled diameter values.

Text string name	pipe_label_name	input
------------------	-----------------	-------

string name of the pipe diameter labels.

Pipes - Pipe IL Labels

Panel field	Parameter name	Type	Pop-Up
Draw IL labels	pipe_text_draw_il	tick box	
Text size	pipe_text_size_il	input	

text size of the pipe IL (Invert Level) labels. The labels will only be created if the size is greater than zero.

Text offset	pipe_text_offset_il	input
-------------	---------------------	-------

distance to move the pipe IL labels along the pipe, from the ends of the pipe. Positive values are towards the mid position of the pipe segment.

Text rise	pipe_text_rise_il	input
-----------	-------------------	-------

distance to move the pipe IL labels away from the pipe centreline or edge (depending on setting of

rise_mode). A negative value will place the labels on the other side of the pipes.

Text colour	pipe_text_colour_il	colour	available colours
<i>colour of the pipe IL labels.</i>			
Text style	pipe_text_textstyle_il	textstyle	available fonts
<i>font of the pipe IL labels.</i>			
Pre text	pipe_text_pre_text_il	input	
<i>text to be placed before the IL in the pipe IL labels.</i>			
Post text	pipe_text_post_text_il	input	
<i>text to be placed after the IL in the pipe IL labels.</i>			
Units factor	pipe_text_factor_il	input	
<i>multiplier of IL values. A Units factor of 3.281 will result in the ILs being labelled in feet.</i>			
Decimal places	pipe_text_decimals_il	input	
<i>number of decimal places in labelled IL values.</i>			
Text string name	pipe_text_name_il	input	
<i>text string name of the pipe IL labels.</i>			

Pipes - Pipe Attribute Labels

Panel field	Parameter name	Type	Pop-Up
Label pipe attribute			
Attribute name			
Text size			
Text offset			
Text rise			
Text colour			
Text style			
Pre text			
Post text			
Units factor			
Decimal places			
Text string name			

Please continue to the next section [Maintenance Holes](#).

Maintenance Holes

Section: Maintenance hole representation

Panel field	Parameter name	Type	Pop-Up
MH symbol direction mode	mh_symbol_dir_mode	choice box	use symbol angle left right average

determines what mode of direction is used to place the MH symbols.

MH symbol angle (dms)	mh_symbol_angle	angle	
<i>angle of MH symbol placement. This is only used depending on the setting of mh_symbol_dir_mode.</i>			

Use road direction where possible	tick box
Use MH label direction for Text mode	tick box
Group symbols with text labels	tick box

The remaining fields in this section are grid column fields that may each have up to 20 sets (rows) defined.

Panel field	Parameter name	Type	Pop-Up
MH type	mh_type_n	input	
<i>MH type of the nth set of maintenance holes. All MHs of this type will be represented according to the values of the other fields in this set (row). MH types are defined in the drainage design strings.</i>			
MH mode	mh_mode_n	choice box	none text symbol circle

determines whether a text string, a symbol, or a circle is to be used to represent the nth set of maintenance holes.

Insertion point

MH Symbol or Text	mh_symbol_n	symbol	available symbols
<i>symbol or text string to use to represent the nth set of maintenance holes. If mh_mode_n is set to text, a text string can be typed in. If mh_mode_n is set to symbol, the symbol name can be chosen from the pop-up list. Ignored if mh_mode_n is set to circle.</i>			

MH Symbol mirror image

Justification	mh_symbol_justify_n	choice box	left bottom left middle left top centre bottom centre middle centre top right bottom right middle right top
---------------	---------------------	------------	-------------------------------------------------------------------------------------------------------------------------------------

*justification mode of the MH text for the nth set of maintenance holes, relative to the centres of the MHs. This will only be relevant if mh_mode_n is set to **text**.*

Size	mh_symbol_size_n	input	
<i>size of the MH symbols or text strings for the nth set of maintenance holes. The symbols, circles or text strings will only be created if the size is greater than zero. In the case of a circle, the size is determined</i>			

to match the diameter of the MH.

Offset	mh_symbol_offset_n	input	
distance to move the MH symbols, circles or text strings to the left or right of the MH centres, for the nth set of maintenance holes. Positive values are to the right. The direction of movement is parallel to the angle of the MH symbols (see mh_symbol_dir_mode and mh_symbol_angle).			
Rise	mh_symbol_rise_n	input	
distance to move the MH symbols, circles or text strings above or below of the MH centres, for the nth set of maintenance holes. Positive values are upwards. The direction of movement is perpendicular to the angle of the MH symbols (see mh_symbol_dir_mode and mh_symbol_angle).			
Colour	mh_symbol_colour_n	colour	available colours
colour of the MH symbols, circles or text strings, for the nth set maintenance holes.			
Text style	mh_symbol_textstyle_n	style	available fonts
font of the MH text for the nth set of maintenance holes. This will only be relevant if mh_mode_n is set to text .			
MH Symbol string name	mh_symbol_name_n	input	
string name of the MH symbols, circles or text strings for the nth set of maintenance holes.			

Section: Maintenance Hole Labels

Panel field	Parameter name	Type	Pop-Up
MH label direction mode	mh_text_mode	choice box	use label angle use pipe angle
determines what angle is to be used to position the maintenance hole label text.			
MH label angle	mh_text_angle	angle	
angle of MH label text. This is only used depending on the setting of mh_text_mode.			
MH label justification	mh_text_justify	choice box	left bottom left middle left top centre bottom centre middle centre top right bottom right middle right top
justification mode of all MH label text strings, relative to the MH centres.			

Maintenance Holes - MH Name Labels

Panel field	Parameter name	Type	Pop-Up
Draw name labels		tick box	
Text size	mh_text_size	input	
text size of the MH name labels. The labels will only be created if the size is greater than zero. MH names are defined in the drainage design strings.			
Text offset	mh_text_offset	input	
distance to move the MH name labels to the left or right of the MH centres. Positive values are to the right. The direction of movement is parallel to the angle of the text, specified by parameters mh_text_mode and mh_text_angle. The justification of the text is specified by parameter mh_text_justify.			
Text rise	mh_text_rise	input	

distance to move the MH name labels above or below the MH centres. Positive values are above. The direction of movement is perpendicular to the angle of the text, specified by parameters mh_text_mode and mh_text_angle. The justification of the text is specified by parameter mh_text_justify.

Text colour	mh_text_colour	colour	available colours
colour of the MH name labels.			
Text style	mh_text_textstyle	textstyle	available fonts
font of the MH name labels.			
Pre text	mh_text_pre	input	
text to be placed before the MH name in the MH name labels.			
Post text	mh_text_post	input	
text to be placed after the MH name in the MH name labels.			
Text string name	mh_text_name	input	
text string name of the MH name labels.			

Maintenance Holes - MH diameter Labels

Draw diameter labels	tick box
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Only label if diameter is outside range:

Panel field	Parameter name	Type
Min	mh_text_min_dia	input
Max	mh_text_max_dia	input

range of MH diameters for which the MH diameter labels will not be created. Both Min and Max are entered in metres.

Panel field	Parameter name	Type	Pop-Up
Text size	mh_text_size_dia	input	

text size of the MH diameter labels. The labels will only be created if the size is greater than zero. MH diameters are defined in the drainage design strings.

Text offset	mh_text_offset_dia	input
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distance to move the MH diameter labels to the left or right of the MH centres. Positive values are to the right. The direction of movement is parallel to the angle of the text, specified by parameters mh_text_mode and mh_text_angle. The justification of the text is specified by parameter mh_text_justify.

Text rise	mh_text_rise_dia	input
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distance to move the MH diameter labels above or below the MH centres. Positive values are above. The direction of movement is perpendicular to the angle of the text, specified by parameters mh_text_mode and mh_text_angle. The justification of the text is specified by parameter mh_text_justify.

Text colour	mh_text_colour_dia	colour	available colours
colour of the MH diameter labels.			

Text style	mh_text_textstyle_dia	textstyle	available fonts
font of the MH diameter labels.			

Pre text	mh_text_pre_dia	input
text to be placed before the diameter in the MH diameter labels.		

Post text	mh_text_post_dia	input
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text to be placed after the diameter in the MH diameter labels.

Units factor	mh_text_factor_dia	input	<i>multiplier of diameter values. A Units factor of 1000 will result in the diameters being labelled in mm.</i>	
Decimal places	mh_text_decimals_dia	input	<i>number of decimal places in labelled diameter values.</i>	
Text string name	mh_text_name_dia	input	<i>string name of the MH diameter labels.</i>	

Maintenance Holes - MH depth Labels

Panel field	Parameter name	Type	Pop-Up
Draw depth labels		tick box	
Text size	mh_text_size_depth	input	
<i>text size of the MH depth labels. The labels will only be created if the size is greater than zero. MH depths are defined in the drainage design strings.</i>			
Text offset	mh_text_offset_depth	input	
<i>distance to move the MH depth labels to the left or right of the MH centres. Positive values are to the right. The direction of movement is parallel to the angle of the text, specified by parameters mh_text_mode and mh_text_angle. The justification of the text is specified by parameter mh_text_justify.</i>			
Text rise	mh_text_rise_depth	input	
<i>distance to move the MH depth labels above or below the MH centres. Positive values are above. The direction of movement is perpendicular to the angle of the text, specified by parameters mh_text_mode and mh_text_angle. The justification of the text is specified by parameter mh_text_justify.</i>			
Text colour	mh_text_colour_depth	colour	available colours
<i>colour of the MH depth labels.</i>			
Text style	mh_text_textstyle_depth	textstyle	available fonts
<i>font of the MH depth labels.</i>			
Pre text	mh_text_pre_depth	input	
<i>text to be placed before the depth in the MH depth labels.</i>			
Post text	mh_text_post_depth	input	
<i>text to be placed after the depth in the MH depth labels.</i>			
Units factor	mh_text_factor_depth	input	
<i>multiplier of depth values. A Units factor of 3.281 will result in the depths being labelled in feet.</i>			
Decimal places	mh_text_decimals_depth	input	
<i>number of decimal places in labelled depth values.</i>			
Text string name	mh_text_name_depth	input	
<i>string name of the MH depth labels.</i>			

Maintenance Holes - MH Chainage Labels

Panel field	Parameter name	Type	Pop-Up
Draw chainage labels		tick box	
Chainage mode	mh_text_mode_ch	choice box	running chainage

			previous chainage next chainage
<i>determines what chainage values will be labelled at the MHs. The running chainage option refers to the start of the drainage design string. The previous chainage and next chainage options refer to the previous and next MHs respectively.</i>			
Text size	mh_text_size_ch	input	
<i>text size of the MH chainage labels. The labels will only be created if the size is greater than zero.</i>			
Text offset	mh_text_offset_ch	input	
<i>distance to move the MH chainage labels to the left or right of the MH centres. Positive values are to the right. The direction of movement is parallel to the angle of the text, specified by parameters mh_text_mode and mh_text_angle. The justification of the text is specified by parameter mh_text_justify.</i>			
Text rise	mh_text_rise_ch	input	
<i>distance to move the MH chainage labels above or below the MH centres. Positive values are above. The direction of movement is perpendicular to the angle of the text, specified by parameters mh_text_mode and mh_text_angle. The justification of the text is specified by parameter mh_text_justify.</i>			
Text colour	mh_text_colour_ch	colour	available colours
<i>colour of the MH chainage labels.</i>			
Text style	mh_text_textstyle_ch	textstyle	available fonts
<i>font of the MH chainage labels.</i>			
Pre text	mh_text_pre_ch	input	
<i>text to be placed before the chainage in the MH chainage labels.</i>			
Post text	mh_text_post_ch	input	
<i>text to be placed after the chainage in the MH chainage labels.</i>			
Units factor	mh_text_factor_ch	input	
<i>multiplier of chainage values. A Units factor of 3.281 will result in the chainages being labelled in feet.</i>			
Decimal places	mh_text_decimals_ch	input	
<i>number of decimal places in labelled chainage values.</i>			
Text string name	mh_text_name_ch	input	
<i>string name of the MH chainage labels.</i>			

Maintenance Holes - MH Attribute Labels

Panel field	Parameter name	Type	Pop-Up
Label MH attribute			
Attribute name			
Text size			
Text offset			
Text rise			
Text colour			
Text style			
Pre text			
Post text			

Units factor

Decimal places

Text string name

Maintenance Holes - MH Setout Points

Panel field	Parameter name	Type	Pop-Up
Draw setout points	mh_setout_draw_mode	tick box	
Setout symbol	mh_setout_symbol	choice box	available choices
Symbol size	mh_setout_size	measure box	available measures
Colour	mh_setout_colour	colour box	available colours
Setout point string name	mh_setout_name	name box	available names
Include MH name in string name	mh_setout_name_by_pit	tick box	

Please continue to the next section [House Connections](#).

House Connections

Panel field	Parameter name	Type	Pop-Up
Draw house connections	hc_draw_mode	tick box	
HC linestyle	hc_line_style	linestyle	available linestyles
<i>linestyle with which to represent the house connections to the pipes. The HCs will be represented as lines perpendicular to the pipe, from the pipe centreline, to the sides of the pipe that the HCs are on.</i>			
HC colour	hc_colour	colour	available colours
<i>colour of the house connection linestyles</i>			
HC string name	hc_line_name	input	
<i>string name of the HC lines.</i>			
The remaining fields in this section are grid column fields that may each have up to 6 sets (rows) defined.			
Panel field	Parameter name	Type	Pop-Up
HC Type	hc_types_n	input	
<i>HC type of the nth set of house connections. All HCs of this type will be represented according to the values of the other fields in this set (row). HC types are defined in the drainage design strings. There are only 6 different HC types used in 12d Model.</i>			
HC Type label	hc_type_text_n	input	
<i>text label to be associated with the HC type of the nth set of house connections.</i>			
Label HC Name and Type	hc_type_tp_n	tick box	
<i>label the names and types of the HCs of the nth set of house connections. Depending on the HC type, it may not be desired to label the type.</i>			
Label HC IL	hc_type_il_n	tick box	
<i>label the ILs of the HCs of the nth set of house connections. Depending on the HC type, it may not make sense to label the IL.</i>			
Label HC Chainage	hc_type_ch_n	tick box	
<i>label the chainages of the HCs of the nth set of house connections. Depending on the HC type, it may not make sense to label the chainages.</i>			
Label HC Additional Text	hc_type_at_n	tick box	
<i>label the Additional text of the HCs of the nth set of house connections. Depending on the HC type, it may not be desired to label the Additional text.</i>			

House Connections - HC Name and Type Labels

Panel field	Parameter name	Type	Pop-Up
Label mode	hc_type_mode	choice box	available choices
Text size	hc_type_size	input	
<i>text size of the HC type labels. The labels will only be created if the size is greater than zero and the parameter hc_type_tp_n is set to on for the nth set of house connections. The HC type labels are associated with the HC types are defined by the parameter set hc_type_text_n.</i>			
Text offset	hc_type_offset	input	
<i>distance to move the HC type labels away from the pipe centreline. Negative values are converted to positive. HC label text is always placed perpendicular to the pipe (or parallel to the HC line) and on the same side of the pipe as the HC. The text will be automatically left justified or right justified,</i>			

depending on the side.

Text rise	hc_type_rise	input	
<i>distance to move the HC type labels above or below the HC lines. Positive values are above. The direction of movement is parallel to the pipe (or perpendicular to the HC line). The text will be automatically bottom justified.</i>			
Text colour	hc_type_colour	colour	available colours
<i>colour of the HC type labels.</i>			
Text style	hc_type_textstyle	textstyle	available fonts
<i>font of the HC type labels.</i>			
Text string name	hc_type_name	input	
<i>string name of the HC type labels.</i>			

House Connections - HC IL Labels

Panel field	Parameter name	Type	Pop-Up
Text size	hc_il_size	input	
<i>text size of the HC IL (Invert Level) labels. The labels will only be created if the size is greater than zero and the parameter hc_type_il_n is set to on for the nth set of house connections.</i>			
Text offset	hc_il_offset	input	
<i>distance to move the HC IL labels away from the pipe centreline. Negative values are converted to positive. HC label text is always placed perpendicular to the pipe (or parallel to the HC line) and on the same side of the pipe as the HC. The text will be automatically left justified or right justified, depending on the side.</i>			
Text rise	hc_il_rise	input	
<i>distance to move the HC IL labels above or below the HC lines. Positive values are above. The direction of movement is parallel to the pipe (or perpendicular to the HC line). The text will be automatically bottom justified.</i>			
Text colour	hc_il_colour	colour	available colours
<i>colour of the HC IL labels.</i>			
Text style	hc_il_textstyle	textstyle	available fonts
<i>font of the HC IL labels.</i>			
Pre text	hc_il_pre	input	
<i>text to be placed before the IL in the HC IL labels.</i>			
Post text	hc_il_post	input	
<i>text to be placed after the IL in the HC IL labels.</i>			
Units factor	hc_il_factor	input	
<i>multiplier of IL values. A Units factor of 3.281 will result in the ILs being labelled in feet.</i>			
Decimal places	hc_il_decimals	input	
<i>number of decimal places in labelled IL values.</i>			
Text string name	hc_il_name	input	
<i>string name of the HC IL labels.</i>			

House Connections - HC Chainage Labels

Panel field	Parameter name	Type	Pop-Up
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Chainage mode	hc_chain_mode	choice box	hc lot offset running chainage previous chainage next chainage
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determines what chainage values will be labelled at the HCs. The **running chainage** option refers to the start of the drainage design string. The **previous chainage** and **next chainage** options refer to the previous and next MHs respectively. The **hc lot offset** option is a special one that looks for a user-defined attribute called "<hc_name> hc lot offset" in the house connections along the drainage design strings. If the attribute is found, its value is set as the HC chainage label. If the attribute is not found, the value of the HC chainage label is set to a default HC Lot Offset of 5.0.

Text size	hc_chain_size	input
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text size of the HC chainage labels. The labels will only be created if the size is greater than zero and the parameter hc_type_ch_n is set to **on** for the nth set of house connections.

Text offset	hc_chain_offset	input
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distance to move the HC chainage labels away from the pipe centreline. Negative values are converted to positive. HC label text is always placed perpendicular to the pipe (or parallel to the HC line) and on the same side of the pipe as the HC. The text will be automatically left justified or right justified, depending on the side.

Text rise	hc_chain_rise	input
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distance to move the HC chainage labels above or below the HC lines. Positive values are above. The direction of movement is parallel to the pipe (or perpendicular to the HC line). The text will be automatically bottom justified.

Text colour	hc_chain_colour	colour	available colours
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colour of the HC chainage labels.

Text style	hc_chain_textstyle	textstyle	available fonts
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font of the HC chainage labels.

Pre text	hc_chain_pre	input
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text to be placed before the chainage in the HC chainage labels.

Post text	hc_chain_post	input
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text to be placed after the chainage in the HC chainage labels.

Units factor	hc_chain_factor	input
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multiplier of chainage values. A Units factor of 3.281 will result in the chainages being labelled in feet.

Decimal places	hc_chain_decimals	input
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number of decimal places in labelled chainage values.

Text string name	hc_chain_name	input
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string name of the HC chainage labels.

House Connections - HC Additional Text Labels

Panel field	Parameter name	Type	Pop-Up
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Additional text	hc_text	input	
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the additional text to place near the HCs.

Text size	hc_text_size	input
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text size of the HC additional text labels. The labels will only be created if the size is greater than zero and the parameter hc_type_at_n is set to **on** for the nth set of house connections.

Text offset	hc_text_offset	input
--------------------	----------------	-------

distance to move the HC additional text labels away from the pipe centreline. Negative values are converted to positive. HC label text is always placed perpendicular to the pipe (or parallel to the HC line) and on the same side of the pipe as the HC. The text will be automatically left justified or right justified, depending on the side.

Text rise	hc_text_rise	input	
<i>distance to move the HC additional text labels above or below the HC lines. Positive values are above. The direction of movement is parallel to the pipe (or perpendicular to the HC line). The text will be automatically bottom justified.</i>			
Text colour	hc_text_colour	colour	available colours
<i>colour of the HC additional text labels.</i>			
Text style	hc_text_textstyle	textstyle	available fonts
<i>font of the HC additional text labels.</i>			
Text string name	hc_text_name	input	
<i>string name of the HC additional text labels.</i>			

Please continue to the next section [Bubbles](#).

Bubbles

Panel field	Parameter name	Type	Pop-Up
Draw bubbles <i>draw bubbles (circles) around the MH name labels.</i>	bubble_draw_mode	tick box	
Bubble colour <i>colour of the bubbles.</i>	bubble_colour	colour box	available colours
Bubble factor <i>the initial radius of the bubble is calculated as half the text length of the MH name label. The bubble factor is used to multiply the initial radius to give the final bubble radius. Factors greater than 1 will increase the bubble size.</i>	bubble_factor	input	
Bubble string name <i>string name of the bubbles.</i>	bubble_name	input	

Please continue to the next section [Flow Arrows](#).

Flow Arrows

Panel field	Parameter name	Type	Pop-Up
Draw flow arrows	flow_arrow_mode	tick box	
<i>draw flow arrows near the pipe diameter labels, showing the direction of flow in the pipes.</i>			
Arrow colour	flow_arrow_colour	colour box	
<i>colour of the flow arrows.</i>			
Solid fill arrows	flow_arrow_fill	tick box	
Arrow length	flow_arrow_length	input	
<i>length of the flow arrows. Setting the length to a negative number will place the arrow on the other side of the pipe (whilst still maintaining the correct arrow direction).</i>			
Arrow rise	flow_arrow_rise	input	
Arrow string name	flow_arrow_name	input	
<i>string name of the flow arrows.</i>			

Plot Frame and PPF Editor

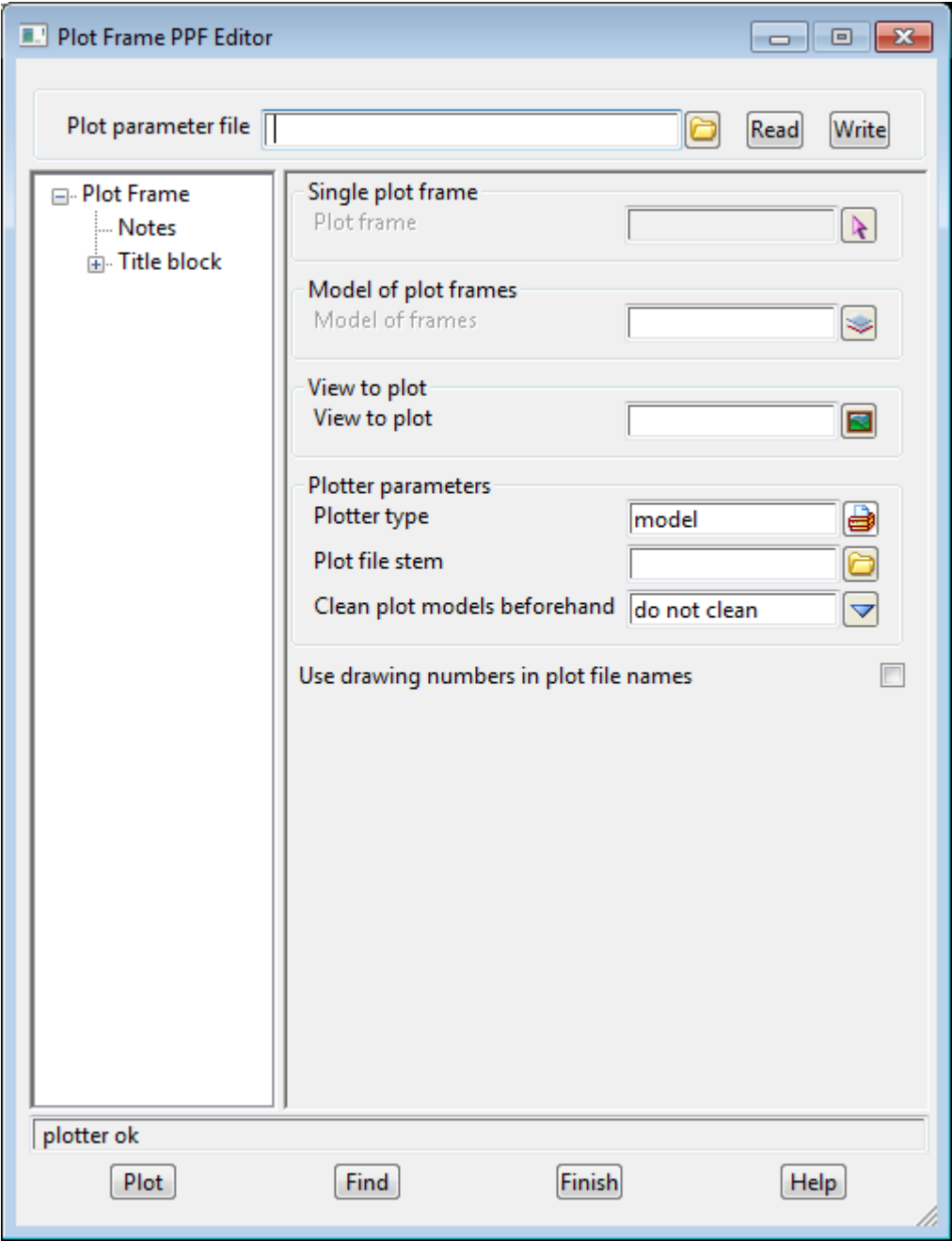
Position of option on menu: Plot =>Plot and PPF Editors =>Plot frames

The **Plot Frame PPF Editor** is for creating and/or editing a (binary) plot frame PPF file and for creating a cross section plot.

Note: Binary PPFs are stored *within* the project (not in the folder containing the project as the ascii ppf's were).

On selecting the **Plot frames** option, the **Plot Frame PPF Editor** panel is displayed.

The plot parameters for controlling the cross section plots are accessed by expanding to the appropriate node in the **Plot Frame** tree (click on the **+** to expand to node or **-** to collapse the node) and then clicking on the required node, and the required information to fill in is displayed on the right hand side of the panel.



Information on the top and bottom buttons, and all the different nodes, now follows.

See [Buttons on Top and Bottom of Plot Frame PPF Editor](#)

See [Plot Frame - Front Page](#)

See [Notes - Plot Frame](#)

See [Plot Frame Title Block](#)

Buttons on Top and Bottom of Plot Frame PPF Editor

Panel field

Type

Plot parameter file

file box

name for the binary plot parameter file to read in or write out.

Read	button
<i>read the given plot parameter file in.</i>	
Write	button
<i>write out the plot parameters to the given plot parameter file. An ascii ppf file is also written out.</i>	
Plot	button
<i>use the plot parameters from the panel to create the plot.</i>	
Find	button
<i>brings up a search box. If a valid parameter name is keyed in followed by the Enter key, the cursor will be placed in the appropriate field on the appropriate page.</i>	

Plot Frame - Front Page

Section: Single plot frame

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Plot frame	single_frame	string	select box
<i>select the plot frame to be plotted.</i>			

Section: Model of plot frames

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Model of frames	model_of_frames	model	box
<i>model of plot frames to plot.</i>			

Section: View to plot

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
View to plot	view_name	model	box
<i>view in which data to plot resides.</i>			

Section: Plotter parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Plotter type	plotter_type	plotter	box
<i>a valid plotting option is selected.</i>			
Plot file stem	plot_stem	plotter	box
<i>plot file name. The appropriate extension is added dependant on the plotter type selected.</i>			
Clean plot models beforehand	plot_model_clean	choice	box
			do not clean prompt for clean

always clean

whether to clean (delete the elements in) any resultant plot models that may already exist, before generating the plot(s). This parameter is only applicable if plotting to a model or models. Note that if the models are cleaned using this parameter, any non-plot or locked elements found in the models will not be cleaned from the models, and the plot job will be cancelled.

Use drawing numbers in plot file names use_drawing_numbers_in_filenames tick box

Please continue to the next section [Notes - Plot Frame](#).

Notes - Plot Frame

Section: Document your PPF here

type in notes on this PPF file

Please continue to the next section [Plot Frame Title Block](#).

Plot Frame Title Block

Section: Common title block parameters

Panel field	Parameter name	Type
Standard title	plot_border	tick box
if ticked, a standard 12d title block will be used.		
Use title file	use_title_file	tick box
if ticked, a user defined title file is used.		
Title line 1	title_1	input
if Standard title is ticked, Title line 1 is the first line of title text. If Use title file is ticked, Title line 1 is substituted for the title block variable \$title_1.		
Title line 2	title_2	input
if Standard title is ticked, Title line 2 is the second line of title text. If Use title file is ticked, Title line 2 is substituted for the title block variable \$title_2.		

Section: 12d default title block parameters

Panel field	Parameter name	Type	Pop-Up
Text size	title_text_size	input	
text size of title text.			
Text colour	title_colour	colour	available colours
colour of title text.			

Section: Model to plot in plotting units

Panel field	Parameter name	Type	Pop-Up
Plot data model	mm_plot_model	model box	available models
if not blank, the model is plotted as part of the plot frame plot. The Units for the Plot data model is considered to be millimetres and the (0,0) in the Plot data model corresponds to (0,0) in the plot. For more information see Plot Data Model .			

Title Block - User Title Info

The parameters shown below are subject to the appropriate title block variables existing in the title file. For more information on these variables see the section [Title Block Variables](#).

Section: User title block parameters

Panel field	Parameter name	Type	Pop-Up
Title file	title_file	file box	available title files
specifies the name of the title file to use. If a valid title file exists, the specified Name values will be filled out in the grid using the title block variable \$user_text_n.			
Name		output	
the alias for the nth user text specified in the title file.			
Value	user_text_n	input	
the alias text to be substituted in for the user text specified.			
Time format	time_format	input	
the time format relates to the \$time title block variable. For more information on the time formats see the section Specifying the Format for \$time .			

Start page number	start_page_number	input
<i>used as the starting value for the title block variable \$page_number. If missing, \$page_number starts at 1.</i>		
Start drawing number	start_drawing_number	input
<i>used as the starting value for the title block variable \$drawing_number. If missing, \$drawing_number starts at 1.</i>		
Drawing number prefix	drawing_number_prefix	input
<i>the value entered is used for the title block variable \$drawing_number_prefix.</i>		
Drawing number postfix	drawing_number_postfix	input
<i>the value entered is used for the title block variable \$drawing_number_postfix.</i>		

Title Block - Symbols

Section: Symbol parameters

Panel field	Parameter name	Type	Pop-Up
Symbol	title_block_symbol_grid	input	
Scale mode		input	
Scale		input	
Rotate with plot		input	
Rotation		input	
Colour		input	
X		input	
Y		input	

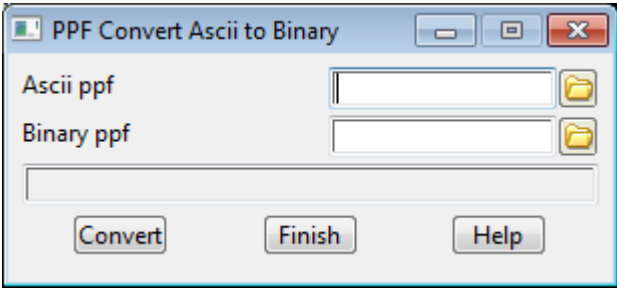
Convert Ascii PPF to Binary

Position of option on menu: Plot =>Plot and PPF Editors =>Convert Ascii to Binary

The **Convert ascii to binary** option is for converting the old ascii plot parameter files to the new binary plot parameter file format.

Note: Binary PPFs are stored *within* the project (not in the folder containing the project as the Ascii PPFs were).

On selecting the **Convert ascii to binary** option, the **PPF Convert Ascii to Binary** panel is displayed.



The fields and buttons used in this panel have the following functions.

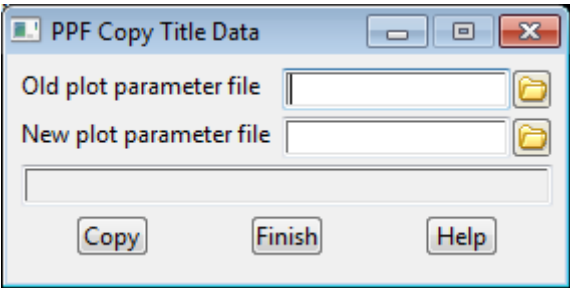
Field Description	Type	Defaults	Pop-Up
Ascii ppf	file box		
<i>name of the Ascii plot parameter file to convert.</i>			
Binary ppf	button		
<i>convert the Ascii PPF to the equivalent binary PPF. The binary PPF file will be stored in the current project.</i>			
Convert	button		
<i>convert the Ascii PPF to a binary PPF.</i>			

Copy Title Data

Position of option on menu: Plot =>Plot and PPF Editors =>Copy title data

The **Copy title data** option is for copying the title data in one binary plot parameter to another binary plot parameter file format.

On selecting the **Copy title data** option, the **PPF Copy Title Data** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Old plot parameter file	file box		
<i>name of the plot parameter file to copy the title data from.</i>			
New plot parameter file	button		
<i>name of the plot parameter file to copy the title data to.</i>			
Copy	button		
<i>copy the title data from one PPF file to another.</i>			



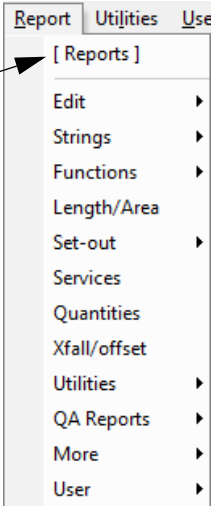
26 Reports

Position of menu: It is on the main menu as Report

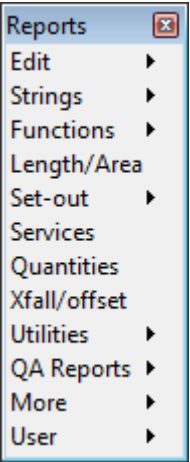
The Reports menu contains options to report on the strings in a model, polygon details (area, centroid), string set outs, string names, crest and sag points and x-falls.

The Reports menu is

on Main menu



on 12d Model menu and floating Reports menu



<ul style="list-style-type: none"> Edit ▶ Strings ▶ Functions ▶ Length/Area Set-out ▶ Services Quantities Xfall/offset Utilities ▶ QA Reports ▶ More ▶ User ▶ 	<ul style="list-style-type: none"> Edit ▶ Strings ▶ Functions ▶ Length/Area Set-out ▶ Services Quantities Xfall/offset Utilities ▶ QA Reports ▶ More ▶ User ▶ 	<ul style="list-style-type: none"> edit a .rpt file report on strings, crest/sag points, names report on functions length, area, centroid of strings point and string set-out information calculations of quantities report x-fall between two strings XML report utilities QA reports further reports Reports User menu
---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

For the option/menu *Edit*, go to

- | | |
|--------------------|-------------------------------------------------|
| <i>Strings</i> | <u>Edit</u> |
| <i>Functions</i> | <u>Strings</u> |
| <i>Length/area</i> | <u>Functions</u> |
| <i>Set-out</i> | <u>Length and Area</u> |
| <i>Services</i> | <u>Set-Out Reports</u> |
| <i>Quantities</i> | <u>Services</u> |
| <i>X-fall</i> | <u>Quantities</u> |
| <i>Utilities</i> | <u>X-Fall and Offset Report</u> |
| <i>QA reports</i> | <u>Report Utilities</u> |
| <i>More</i> | <u>QA Reports</u> |
| | <u>More Reports</u> |

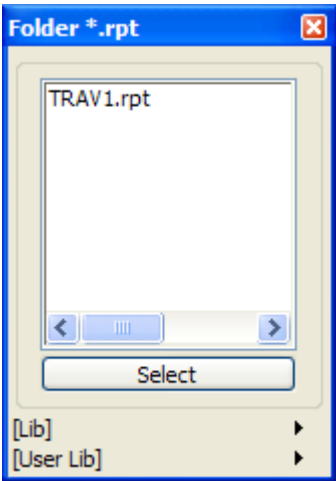
Each menu option will now be discussed.

Edit

Position on menu: Report =>Edit

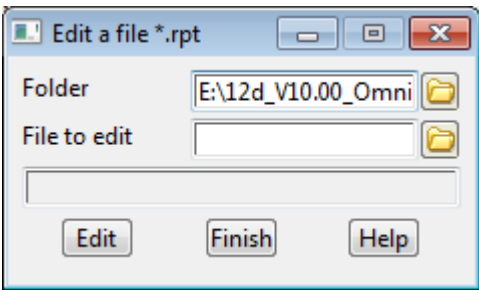
The **Edit** option is used to edit any (printer) reports ending in *.rpt.

On walking right on *Edit*, the list of files ending in *.rpt are displayed.



Double clicking on the report name will bring up the report in the system editor.

Clicking on the *Edit* at the top of the menu brings up the **Edit a file** panel.



The fields and buttons used in this panel have the following functions.

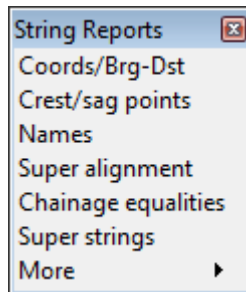
Field Description	Type	Defaults	Pop-Up
Folder <i>the folder to look for the report file.</i>	folder box	current folder	folder browser
File to edit <i>name of the file to bring up in the system editor.</i>	file box		*.rpt

Strings

Position of menu: Report =>Strings

The **Strings** menu contains options to report on selected strings, report the crest/sag points for a string and create a list of all the unique string names in a model or view.

The **Strings** walk-right menu is



For the option *Coords/Brg-Dst*, go to

Crest/sag points

Names

Super alignment

Chainage Equalities

Super strings

More

[Coordinates or Bearing-Distance Report](#)

[Crest/Sag Points Report](#)

[Names Report](#)

[Super Alignment Report](#)

[Chainage Equalities Report](#)

[Report for Super Strings](#)

[More Strings Reports.](#)

Coordinates or Bearing-Distance Report

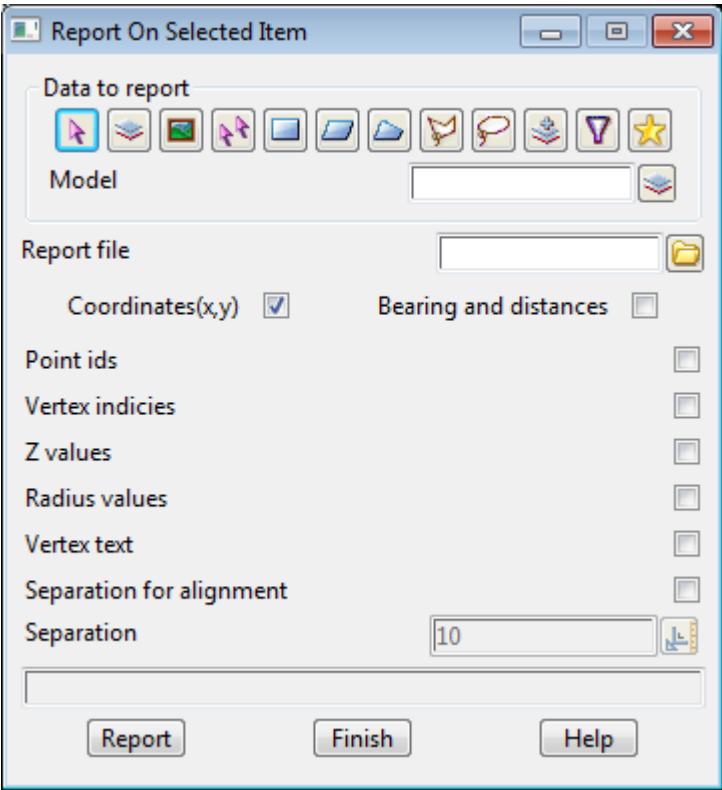
Position of option on menu: Report =>Strings =>Coords/Brg-Dst

The **Coords/Brg-Dst** option is used to generate a report on selected items defined by a source box. The report can be of the form of coordinates of each point of a string, or the co-ordinates of the first point of a string and the bearings and distances from each other point of the string to the first point of the string.

For a a Super Alignment string it will report the solved horizontal and vertical geometry (the horizontal and vertical Segments that make up the Super Alignment). If there is a non-zero separation value, then at each chainage that is a multiple of the separation value, the report also includes the chainage, x, y, z, and in and out bearings at he chainage.

For an Alignment string it will report on the HIP's and VIPS. If there is a non-zero separation value, then at each chainages that are multiples of the separation value, the report also includes the chainage, x, y, z, bearing for horizontal and chainage, height (z), grade for vertical.

On selecting the **Coords/Brg-Dst** option, the **Report on Selected Item** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source	input		
<i>source of data to be processed.</i>			
Report file	input		*.rpt
<i>name of the file to report to.</i>			
Coordinates(x,y)	tick box	tick	

if **tick**, the coordinate report parameters will be displayed which will determine what other information as well as the coordinate values will be placed in the report. **NOTE:** If an **alignment string** is part of the selection, the report will include **all** relevant details about the alignment. In this case the report will not use the coordinate report parameters as specified, for the alignment string.

Bearing and Distances tick box

if **tick**, the bearing and distance report parameters will be displayed which will determine what other information as well as the bearing and distance values will be placed in the report.

Coordinate report parameters

if the **Coordinates(x,y)** option is selected, the following parameters will be displayed

Point ids tick box

if selected, any valid point ids will be shown in the report.

Vertex indices tick box

if selected, vertex indices will be shown in the report.

Z Values tick box

if selected, any valid z values will be shown in the report.

Radius values tick box

if selected, any valid radius values will be shown in the report.

Vertex Text tick box

if selected, any valid vertex text values will be shown in the report.

Separation for Alignment tick box

if selected, the separation for alignment box will be enabled.

Separation input box 10

if enabled by ticking the previous tick box, the alignment string information will be reported at a chainage interval given by the separation value.

Report button

run the option and create the report.

For a Super Alignment, the report is the same as **Reports => Strings => Super alignment** (see [Super Alignment Report](#)).

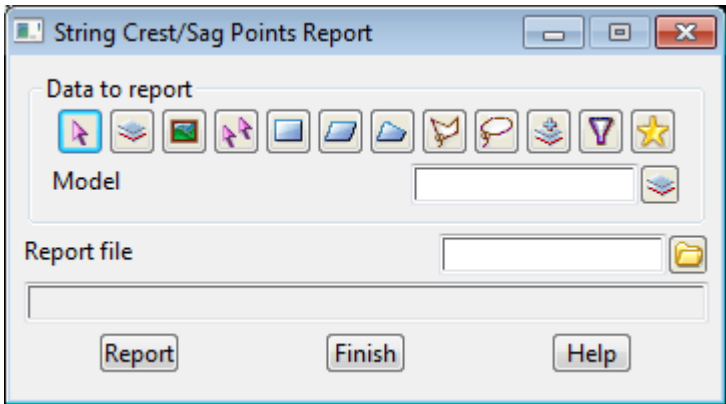
Crest/Sag Points Report

Position of option on menu: Report =>Strings =>Crest sag points

The **crest/sag points** option is used to generate a (printer) report on the crests and sags points of a string.

A number of strings can be reported on by selecting them in turn

On selecting the **crest/sag points** option, the **string crest/sag points report** panel is displayed.



The fields and buttons in this panel are used as follows

Field	Description	Type	Defaults	Pop-Up
Data source type			Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>				
Data source				
<i>type of data source.</i>				
Report file		input		*.rpt
<i>name of the file to contain the reports on the crest and sag points of strings.</i>				
Pick & Report		button		
<i>as strings are selected, the crest and sag points report is generated and appended to the report file. The cycle is terminated by clicking RB to raise the pick ops menu and selecting cancel from it.</i>				

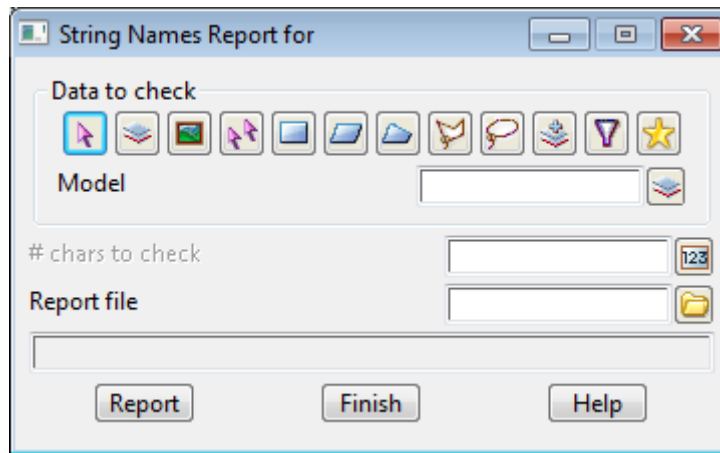
Names Report

Position of option on menu: Report =>Strings =>Names

The **names** option is used to report on all the unique strings in a model or on a view.

If the **report** button is selected, then all the strings in the model/view given by the model/view to report field will be checked and all unique names, plus a frequency count, will be written to the report file.

Selecting Names displays the **String Names Report for** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source			
<i>type of data source.</i>			
# chars to check	input		
<i>if non blank, the number of characters to be used in the string name when checking for uniqueness. If blank, then the entire string name is used.</i>			
Report file	file box		*.rpt files
<i>name of the file for the report.</i>			
Report	button		
<i>report on all the unique string names in model/view.</i>			

Super Alignment Report

Position of option on menu: Report =>Strings =>Super alignment

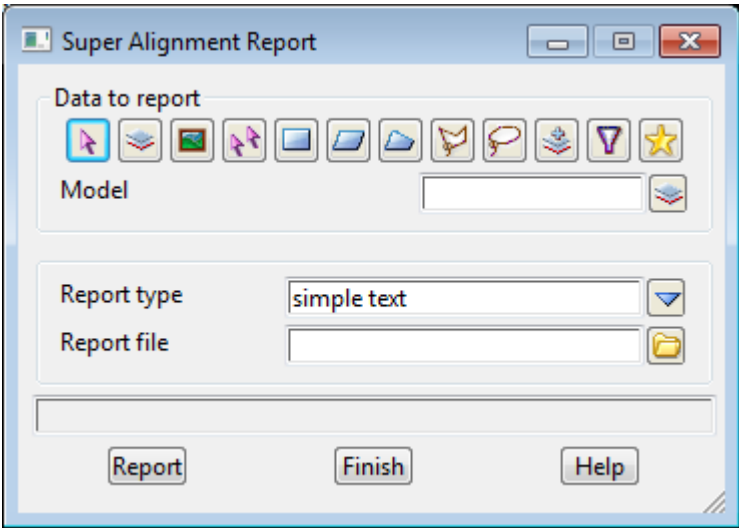
Position of option on menu: Strings =>SA tools =>Report

Report on the Super Alignment that gives information on the horizontal and vertical components.

For a Super Alignment string it will report the solved horizontal and vertical geometry (the horizontal and vertical Segments that make up the Super Alignment).

If there is a non-zero separation value, then at each chainages that are multiples of the separation value, the report also includes the chainage, x, y, z, in and out bearing for horizontal vertices, and chainage, height (z) and in and out grade for vertical vertices.

On selecting the Super alignment option, the **Super Alignment Report** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source			
<i>type of data source.</i>			
Report type	choice box	simple text	html tables, pdf tables, original xml, csv ip tables, simple text, crests and sags
<i>type of report</i>			
Report file	input		*.rpt
<i>name of the file to report to. See below for definition of the report and an example.</i>			
Report	button		
<i>run the option and create the report.</i>			

The Super Alignment report is made up of 5 parts:

- (a) General Information
- The type of transition curve.

Whether the super alignment is closed or not.

The start chainage for the string and the chainage length (2d length) of the string.

(b) Horizontal Vertex Data

The **Horizontal Vertex Data** section of the report gives information about each of the *horizontal vertices* of the underlying **horizontal segment geometry**.

Note: "Solving" a super alignment takes all the constraints and produces a string of vertices with segments of type Line, Arc or Transition between each pair of adjacent vertices.

So the **Horizontal Vertex Data** report gives the (x,y,z) coordinates of each of the vertices of the solved horizontal geometry with the type of segment going into the vertex (**In Seg**), and the type of segment going out of the vertex (**Out Seg**).

The **In Direction** is the angle at the vertex of the segment going into the vertex, and the **Out Direction** is the angle at the vertex of the segment going out of the vertex.

If the *In* and *Out Direction* are the same, then the two segments are *tangential* at the vertex and there will be a **Yes** in the **Tan** column, otherwise there will be a **No** in the **Tan** column.

In Seg

The type of the segment going into the critical point (In Segment) at the chainage - Line, Arc, Leading Spiral (LSpiral), Trailing Spiral (TSpiral)

Out Seg

The type of the segment going out of the critical point (Out Segment) at the chainage - Line, Arc, Leading Spiral (LSpiral), Trailing Spiral (TSpiral)

Tan - yes or no

yes if the In Segment and Out Segment are tangential. That is, the In Direction and Out Direction are the same.

no if the In Segment and Out Segment are not tangential. That is, the In Direction and Out Direction are different.

Chainage

chainage of the critical point

X, Y and Z Coordinates at that chainage

In Direction

the angle of the In Segment at the critical point. Measured in dms, counterclockwise from the positive x-axis.

Out Direction

the angle of the Out Segment at the critical point. Measured in dms, counterclockwise from the positive x-axis.

In Radius

the radius of the In Segment at the critical point (or blank if on a Line).

Out Radius

the radius of the Out Segment at the critical point (or blank if on a Line).

(c) Horizontal Geometry Data

How each of the horizontal parts is defined.

(d) Vertical Vertex Data

The **Vertical Vertex Data** section of the report gives information about each of the *vertical vertices* of the underlying **vertical segment geometry**.

Note: "Solving" the vertical of a super alignment takes all the constraints and produces a 2d string in the (Chainage, height) plane, of vertices with segments of type Line, Arc or Parabola between each pair of adjacent vertices.

So the **Vertical Vertex Data** report gives the (ch,z) coordinates of each of the vertices of the solved vertical geometry with the type of segment going into the vertex (**In Seg**), and the type of segment going out of the vertex (**Out Seg**).

The **In Grade** is the grade at the vertex of the segment going into the vertex, and the **Out Grade** is the grade at the vertex of the segment going out of the vertex.

If the *In* and *Out Grade* are the same, then the two segments are *tangential* at the vertex and there will be a **Yes** in the **Tan** column, otherwise there will be a **No** in the **Tan** column.

In Seg

The type of the segment going into the critical point (In Segment) at the chainage - Line, Arc, Parabola

Out Seg

The type of the segment going out of the critical point (Out Segment) at the chainage - Line, Arc, Parabola

Tan - yes or no

yes if the In Segment and Out Segment are tangential. That is, the In Grade and Out Grade are the same.

no if the In Segment and Out Segment are not tangential. That is, the In Grade and Out Grade are different.

Chainage

chainage of the critical point

Level

height (z value) at that chainage

In Grade

the grade of the In Segment at the critical point.

Out Grade

the grade of the Out Segment at the critical point.

In VCL Radius

the radius of the parabola or arc of the In Segment at the critical point (or blank if on a Line).

Out VCL Radius

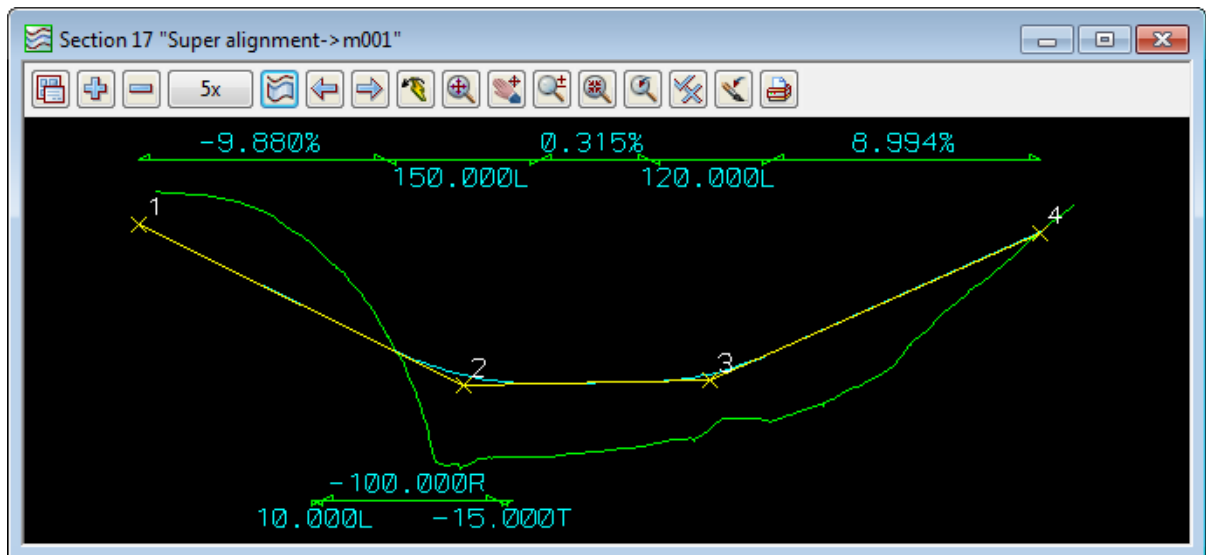
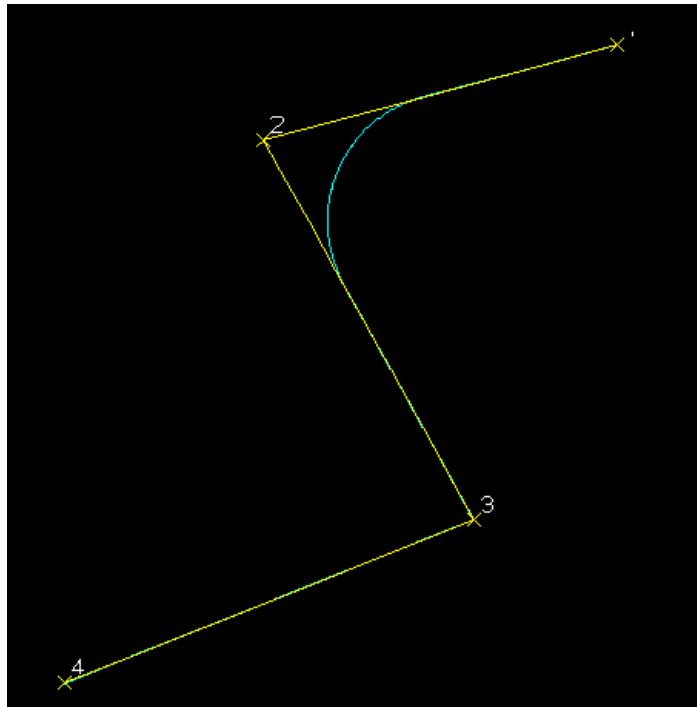
the radius of the parabola or arc of the Out Segment at the critical point (or blank if on a Line).

(e) Vertical Geometry Data

How each of the vertical parts is defined.

Super Alignment to Report

Horizontal Geometry



Vertical Geometry

Super Alignment Report

: Report for String <m001> in Model <m001>									
Information									

m : clothoid									
: opened									
: 0									
: 889.253									
a1 Alignment Report for String <m001> in Model <m001>									
a1 Vertex Data									

Out Seg	Tan	Chainage	X	Coordinates Y	Z	In Direction Deg Min Sec	Out Direction Deg Min Sec	In Rad	Out Rad
Line		0.000	42946.380	37406.792	203.514	195°01'49.59"	195°01'49.59"		
Lspiral	Yes	151.558	42800.007	37367.489	188.541	195°01'49.59"	195°01'49.59"		
Arc	Yes	161.558	42790.395	37364.735	187.553	197°53'42.83"	197°53'42.83"	-100.000	-100.000
Tspiral	Yes	330.321	42730.191	37227.962	174.830	294°35'21.86"	294°35'21.86"	-100.000	-100.000
Line	Yes	345.321	42737.105	37214.654	174.523	298°53'11.72"	298°53'11.72"		
Line	No	546.945	42834.506	37038.116	176.680	201°48'05.08"	201°48'05.08"		
		889.253	42516.681	36910.986					
a1 Geometry Data									

Alignment Report for String <m001> in Model <m001>									
Vertex Data									

Out Seg	Tan	Chainage	Level	In Grade %	Out Grade %	In VCL Radius	Out VCL Radius		
Line		-15.441	205.039	-9.90	-9.90	1471.385	1471.385		
Parabola	Yes	222.506	181.531	-9.90	-9.90	1471.385	1471.385		
Line	Yes	372.506	174.358	0.30	0.30	1382.628	1382.628		
Parabola	Yes	476.930	174.687	0.30	0.30				
Line	Yes	596.930	180.272	9.00	9.00				
		855.532	203.531		9.00				

Old Report - V9

The Super Alignment report is made up of 5 parts:

(a) General Information

- The date the report was produced and the string and model name for the string.
- The type of transition curve.
- Whether the super alignment is closed or not.
- The start chainage for the string and the chainage length (2d length) of the string.

- (b) A report for the critical points, and the horizontal chainage increment of the string giving the **Point Type** at the chainage (eg Straight, Tangent-Curve, Curve, Spiral-Curve etc) **Chainage** at that point.

X, Y and Z Coordinates at that chainage

Instantaneous **Bearing** at that chainage

Instantaneous **Radius** at that chainage (or blank if on a straight)

- (c) Horizontal Vertex Data

The **Horizontal Vertex Data** section of the report gives information about each of the *horizontal vertices* of the underlying **horizontal segment geometry**.

Note: "Solving" a super alignment takes all the constraints and produces a string of vertices with segments of type Line, Arc or Transition between each pair of adjacent vertices.

So the **Horizontal Vertex Data** report gives the (x,y,z) coordinates of each of the vertices of the solved horizontal geometry with the type of segment going into the vertex (**In Seg**), and the type of segment going out of the vertex (**Out Seg**).

The **In Bearing** is the bearing at the vertex of the segment going into the vertex, and the **Out Bearing** is the bearing at the vertex of the segment going out of the vertex.

If the *In* and *Out Bearings* are the same, then the two segments are *tangential* at the vertex and there will be a **Yes** in the **Tan** column, otherwise there will be a **No** in the **Tan** column.

- (d) Horizontal Geometry Details

How each of the horizontal parts is defined.

- (e) Vertical Vertex Data

The **Vertical Vertex Data** section of the report gives information about each of the *vertical vertices* of the underlying **vertical segment geometry**.

Note: "Solving" the vertical of a super alignment takes all the constraints and produces a 2d string in the (Chainage, height) plane, of vertices with segments of type Line, Arc or Parabola between each pair of adjacent vertices.

So the **Vertical Vertex Data** report gives the (ch,z) coordinates of each of the vertices of the solved vertical geometry with the type of segment going into the vertex (**In Seg**), and the type of segment going out of the vertex (**Out Seg**).

The **In Grade** is the grade at the vertex of the segment going into the vertex, and the **Out Grade** is the grade at the vertex of the segment going out of the vertex.

If the *In* and *Out Grade* are the same, then the two segments are *tangential* at the vertex and there will be a **Yes** in the **Tan** column, otherwise there will be a **No** in the **Tan** column.

- (f) Horizontal Geometry Details

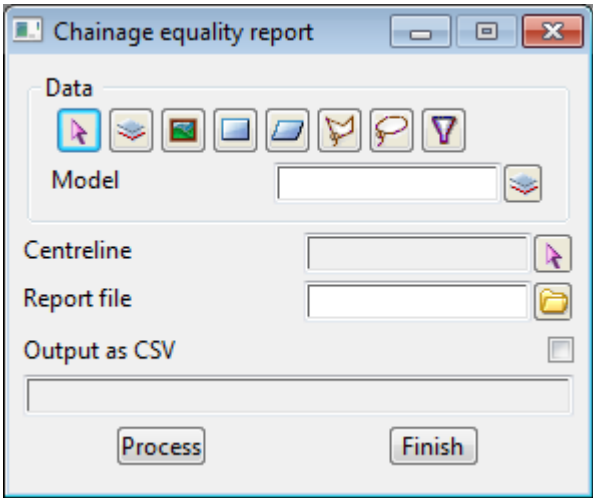
How each of the vertical parts is defined.

Chainage Equalities Report

Position of option on menu: Report =>Strings =>Chainage equalities

This option is under development.

On selecting the Chainage equalities option, the **Chainage Equality Report** panel is displayed.

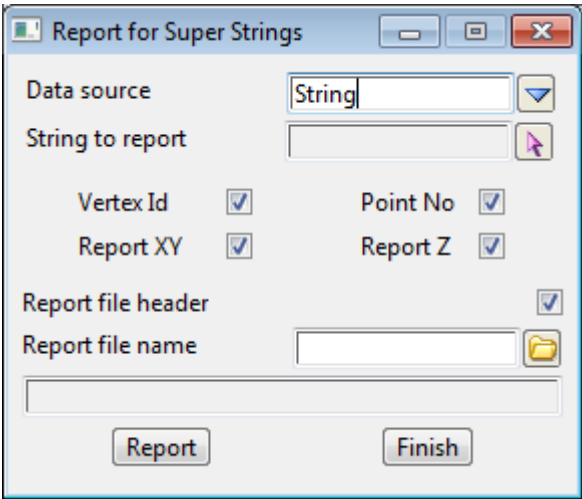


The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source			
<i>type of data source.</i>			
Centreline	string select		
<i>name of the super alignment to report on.</i>			
Report File	file select		
<i>name of the file to report to.</i>			
Output as CSV	tick box		
<i>if tick, write the report out as a CSV file</i>			
Report	button		
<i>run the option and create the report.</i>			

Report for Super Strings

Position of option on menu: Report =>Strings =>Super strings
This option reports on information in the super string.



The fields and buttons used in this panel have the following functions:

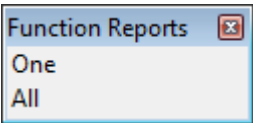
Field Description	Type	Defaults	Pop-Up
Data source type <i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>		Model	
Data source <i>type of data source.</i>			
Vertex index <i>if tick, vertex indices are reported.</i>	tick box	tick	
Point id <i>if tick, point ids are reported.</i>	tick box	tick	
Report XY <i>if tick, x and y values are reported.</i>	tick box	tick	
Report Z <i>if tick, z values are reported.</i>	tick box	tick	
Report file header <i>if tick, a header including the date and model name and string names is included.</i>	input box	tick	
Report file name <i>name of the report.</i>	input box		
Report <i>Run the option.</i>	button		

More Strings Reports

There are currently no options on this menu.

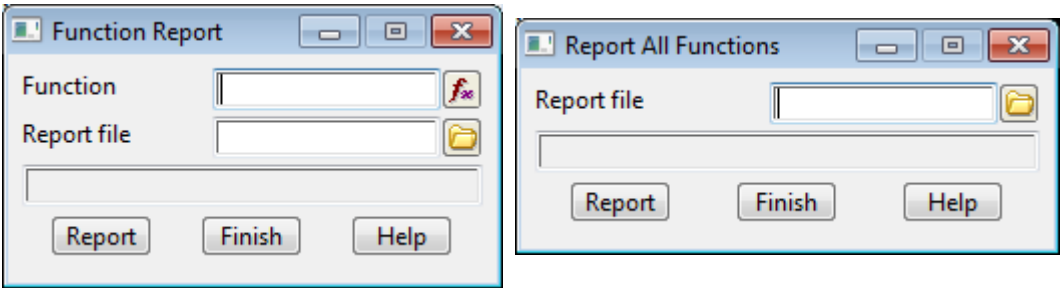
Functions

Position of menu: Report =>Functions
A report can be made on a function. The **function** walk-right menu is



Report a Function, Report all Functions

Position of option on menu: Report =>Functions =>One
Position of option on menu: Report =>Functions =>All
On selecting the **report** or **report all** option, the **function report/ report all functions** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Function <i>name of the function to be reported.</i>	function box		available functions
Report file <i>name of the file to write the report to.</i>	file box		*.rpt files
Report <i>after selecting this button, a report on the function/ all functions is produced.</i>	button		

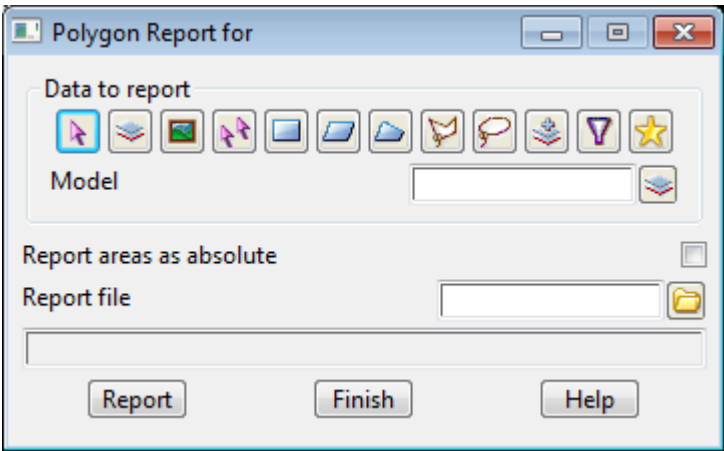
Length and Area

Position of option on menu: Report =>Length/Area

The **Length/area (Polygons)** option creates a report containing the following information for each selected string:

- s string name
- s if the string is closed or not
- s length of the string
- s area of the string (if not closed, join first and last points). A polygon area is positive if the vertices of the polygon go in a clockwise direction, or negative if the vertices go in an anti-clockwise direction.
- s centroid co-ordinates

On selecting the Length/Area option, the Polygon Report for panel is displayed.



The fields and buttons in this panel are used as follows

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source			
<i>type of data source.</i>			
Report areas as absolute	tick box		
<i>A polygon area is positive if the vertices of the polygon go in a clockwise direction, or negative if the vertices go in an anti-clockwise direction.</i>			
<i>if ticked, report all areas as positive.</i>			
Report file	input		*.rpt
<i>file for the polygon reports.</i>			
Report	button		
<i>produce a polygon report for all strings selected in the Data source.</i>			

Set-Out Reports

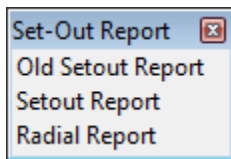
Position of menu: Report =>Set-out

The **Set out** report options are for reporting the bearing and distance from a selected instrument station to individual points, strings, models of strings or views of strings.

In the *Setout report*, a backsight stations can be selected and the bearing of the **line** from the instrument station to the backsight station reported. Individual backsight points or strings of backsight points can be selected for reporting.

In the *Radial report*, the report can be sorted by point number, bearing or distance.

The **set outs** walk-right menu is



old set out report from V5.0

set out report for strings

set out report sorted by name, distance or bearing

For the option *Old setout report*, go to

Setout report

Radial report

[Old Setout Report](#)

[Setout Report](#)

[Radial Report](#)

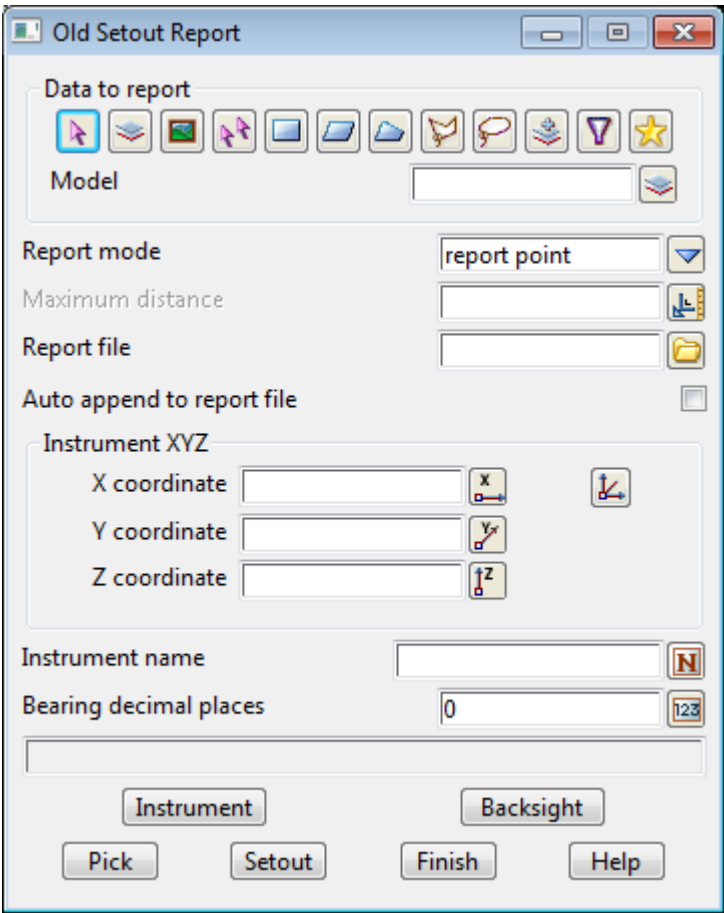
The menu options will now be discussed.

Old Setout Report

Position of option on menu: Report =>Set out =>Old setout report

The setout report from **12d Model** V5. This option has been rewritten for **12d Model** V6 and is called **Setout Report**.

On selecting the **Old setout report** option, the **Old Setout Report** panel is displayed.



The fields and buttons in this panel are used as follows

Field	Description	Type	Defaults	Pop-Up
Data source type			Model	
	<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source				
	<i>type of data source.</i>			
Report mode		input		report points, report string
	<i>if report points, report selected points. Otherwise report on all points in the selected string.</i>			
Maximum distance		input		
	<i>if non-blank, any points further that the maximum distance from the instrument station will not be reported on. If blank, all selected points will be reported on</i>			
Report file		input		
	<i>file for the backsight and setout reports</i>			

Instrument XYZ/name output

co-ordinates/name of the current instrument station

Bearing decimal places input

number of decimal places to report the bearings to

Instrument button

the required instrument station is selected and its name and position are reported in the instrument XYZ and instrument name panel fields.

Backsight button

a backsight is selected and written to the report file.

Pick button

*After pick is chosen, a set out report is written to the report file for any selected strings. If the report mode is **report point**, only the individual point is reported. If the report mode is **report string**, all the points in the string are reported.*

*The cycle is terminated by clicking RB to raise the **pick ops** menu and selecting **cancel** from it.*

Setouts button

produce a set out report for all the strings in the model/view given in the model/view field.

How to Use the Panel and Panel Messages

- (a) Enter the report file name and maximum distance.
- (b) The instrument station is chosen by activating the **station** button and selecting the required station point. It will then be reported in the file
- (c) Any backsight points to be reported can then be chosen by picking the **backsight** button and selecting the backsight point.
- (d) To report on individual strings or points, set the report mode to either point or string. The **pick** button is then activated and the individual points or strings selected. The cycle is terminated by clicking RB to raise the **pick ops** menu and selecting **cancel** from it.

To report on all the strings in a model/view, give the model/view in the model/view field, and select the **setout** button.

Note

The instrument station can be changed at any time by selecting the **station** button and picking the new station.

All backsight and set outs will then be taken from the new instrument station.

Setout Report

Position of option on menu: Report =>Set out =>Setout report

In the *Setout report*, a backsight stations can be selected and the bearing of the **line** from the instrument station to the backsight station reported. Individual backsight points or strings of back-sight points can be selected for reporting.

The instrument station can be changed at any time and new backsight and set outs reported.

The **set out** option prints the following information:

instrument station

string name, point number, x, y, z

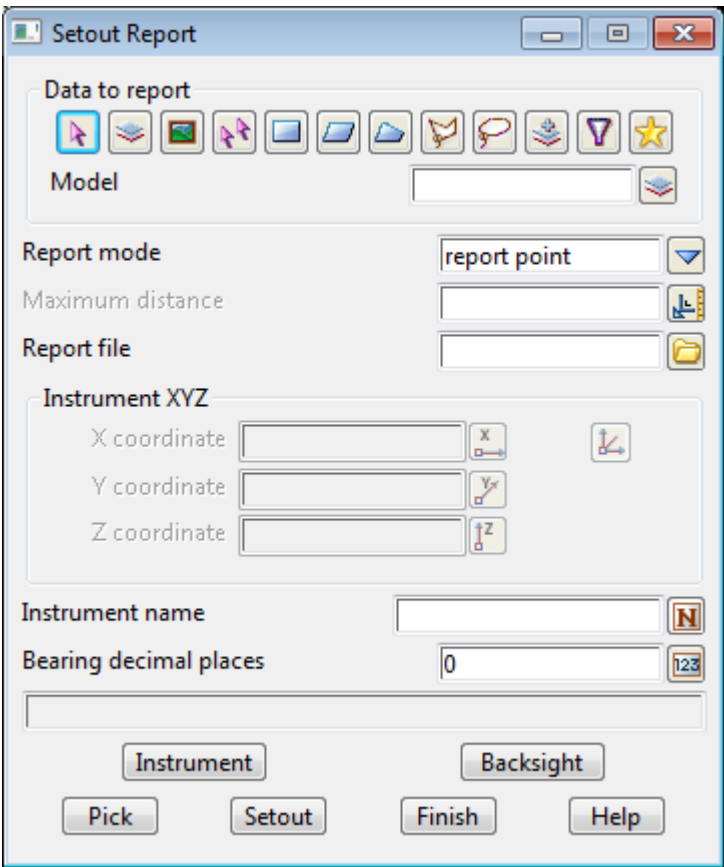
backsight point

string name, point number, x, y, z, bearing to the line joining the instrument and backsight, horizontal distance, height difference between instrument station and the backsight

point set-out point

string name, point number, x, y, z, bearing, horizontal distance, height difference between instrument station and the point

On selecting the **Setout report** option, the **Setout Report** panel is displayed.



The fields and buttons in this panel are used as follows

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type		Model	
-------------------------	--	-------	--

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data source

type of data source.

Report mode choice box report points, report string
*if **report points**, report selected points. Otherwise report on all points in the selected string.*

Maximum distance input

*if **non-blank**, any points further that the maximum distance from the instrument station will not be reported on. If **blank**, all selected points will be reported on*

Report file file box

file for the backsight and setout reports

Instrument XYZ/name output

co-ordinates/name of the current instrument station

Bearing decimal places input

number of decimal places to report the bearings to

Instrument button

the required instrument station is selected and its name and position are reported in the instrument XYZ and instrument name panel fields.

Backsight button

a backsight is selected and written to the report file.

Pick button

*After pick is chosen, a set out report is written to the report file for any selected strings. If the report mode is **report point**, only the individual point is reported. If the report mode is **report string**, all the points in the string are reported.*

*The cycle is terminated by clicking RB to raise the **Pick ops** menu and selecting **Cancel** from it.*

Setouts button

produce a set out report for all the strings in the model/view given in the model/view field.

How to Use the Panel and Panel Messages

- (a) Enter the report file name and maximum distance.
- (b) The instrument station is chosen by activating the **station** button and selecting the required station point. It will then be reported in the file
- (c) Any backsight points to be reported can then be chosen by picking the **backsight** button and selecting the backsight point.
- (d) To report on individual strings or points, set the report mode to either point or string. The **pick** button is then activated and the individual points or strings selected. The cycle is terminated by clicking RB to raise the **pick ops** menu and selecting **cancel** from it.

To report on all the strings in a model/view, give the model/view in the model/view field, and select the **setout** button.

Note

The instrument station can be changed at any time by selecting the **station** button and picking the new station.

All backsight and set outs will then be taken from the new instrument station.

Radial Report

Position of option on menu: Report =>Set out =>Radial report

The radial report reports the bearing and distance from the Instrument to selected vertices. the report can be sorted by point id, bearing or distance.

Selecting Radial report brings up the **Radial Report** panel.

Radial Report

Data to report

Model

Scaled radial

Scale factor

1

Projection radial

Projection

Instrument setup

Instrument xyz

Instrument name

Report settings

Include vertices without id

Zero padding for bearing

Sort by

point id

Number of decimals for distance

3

Number of decimals for bearing

Maximum distance

Search tolerance

Report file

Report

Finish

Help

The fields and buttons in this panel are used as follows

Field	Description	Type	Defaults	Pop-Up
Data source type			Model	

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data source

type of data source.

Scaled radial

radio button

if selected, the report uses a fixed scale factor.

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Set-Out Reports

Scale factor input 1

*if **scaled radial** is selected, the fixed scale factor to use*

Projection radial radio button

if selected, the report uses a projection for calculating distances

Projection projection box available projections

*if **projection radial** is selected, the selected projection is used when calculating distances*

Instrument setup

*when the instrument point is selected, the **Instrument co-ordinates** and **name** is displayed in the Instrument xyz and Instrument name fields.*

Report settings

Include points without id tick box

*if **tick**, vertices with a non blank point id are included in the report.*

*if **not tick**, only vertices with non blank point id are included in the report.*

Zero padding for bearing tick box

*if **tick**, include extra zeros for minutes and seconds.*

Sort by choice box point id point id, bearing, distance

*if **point id**, the report is sorted by the point id's on the vertex.*

***bearing**, the report is sorted by the bearing to the point.*

***distance**, the report is sorted by the distance to the point.*

Number of decimals input 3

number of decimal places for reporting co-ordinates

Maximum distance input

*if **non-blank**, any vertices further than the maximum distance from the instrument station will not be reported on. If **blank**, all vertices points will be reported on*

Search tolerance input

when a vertex is found, any vertices with the same point id within the search distance of the vertex are not reported. Also no vertices closer to the instrument point than this distance will be reported.

Report file file box

file for the setout reports

Report button

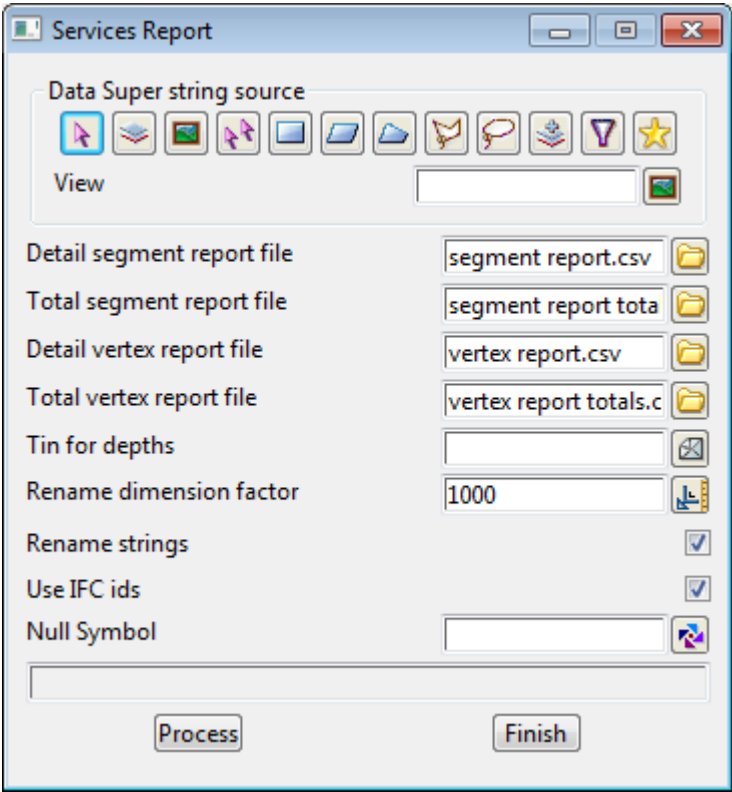
produce the report

Services

Position of option on menu: Report =>Services

Selecting Services brings up the **Services** panel.

This section of documentation is a work in progress and will be updated in subsequent releases.



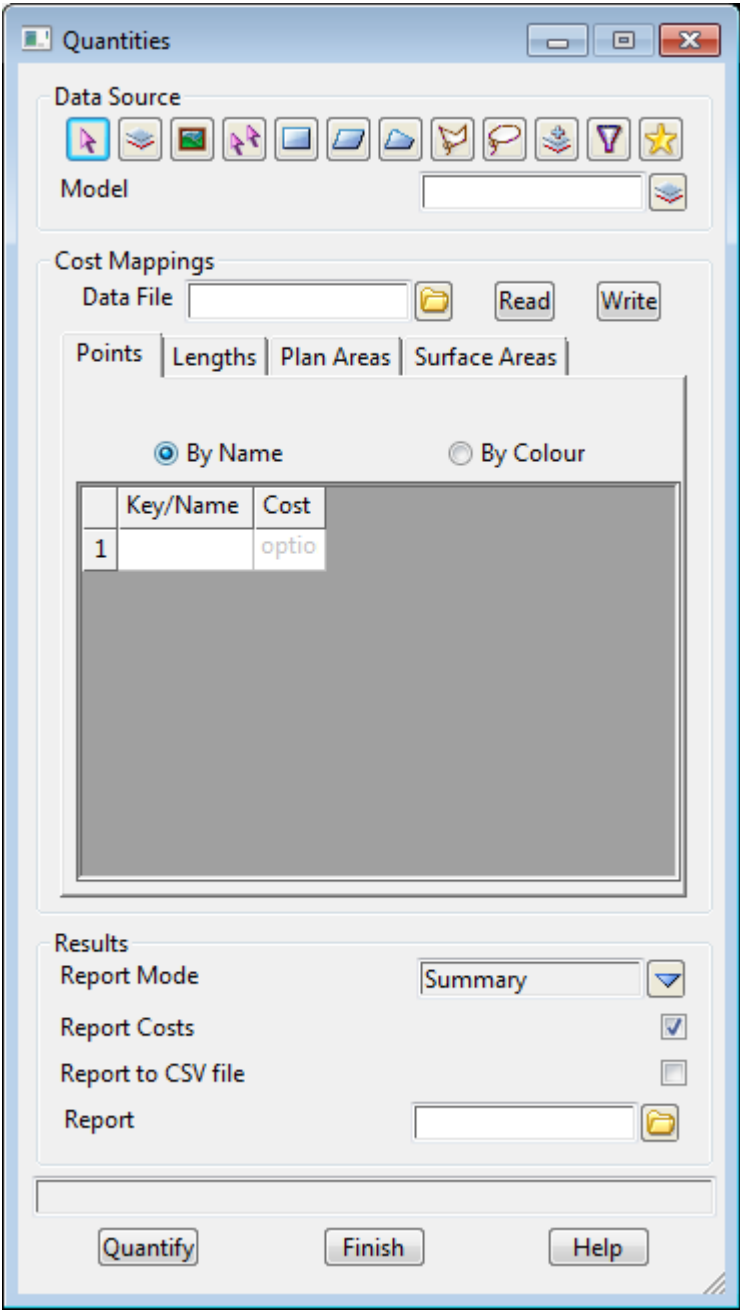
The fields and buttons in this panel are used as follows

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source			
<i>type of data source.</i>			
Data segment report file	file box	segment report.csv	available .csv files
Total segment report file	file box	segment report totals.csv	available .csv files
Detail vertex report file	file box	vertex report.csv	available .csv files
Total vertex report file	file box	vertex report totals.csv	available .csv files
Tin for depths	tin box		available tins
Rename dimension factor	measure box	1000	At Point, Point to Point, String from Point, String to Point

Rename strings	tick box	ticked	
Use IFS ids	tick box	ticked	
Null symbol	symbol box		available symbols

Quantities

Position of option on menu: Report =>Quantities
Selecting Quantities brings up the Quantities panel.



The fields and buttons in this panel are used as follows

Field Description	Type	Defaults	Pop-Up
Data source type		Model	

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data source

type of data source.

Data file file box
*set up file for the costing data - file is read/written using the **Read/Write** buttons.*

Costing tabs

Points tab and grid

By name **By colour**
for any string selected by the key/name or colour, the number of vertices in the string is multiplied by the cost and the total added to the quantities report.

Lengths tab and grid

By name **By colour**
for any string selected by the key/name or colour, the plan or 3d length of the string is multiplied by the cost and the total added to the quantities report.

Plan Areas tab and grid

By name **By colour**
for any string selected by the key/name or colour, the plan area of the string is multiplied by the cost and the total added to the quantities report.

Surface Areas tab and grid

By name **By colour**
for any string selected by the key/name or colour, the surface area of the string within the given tin is multiplied by the cost and the total added to the quantities report.

Report mode choice box Summary Summary, Full
produce the quantity report.

Report costs tick box
if tick, the cost used for each calculation is included in the report.

Report to CSV file tick box
if tick, the report is written as a CSV file

Report file box
name of the quantities report file

Quantify button
produce the quantity report.

X-Fall and Offset Report

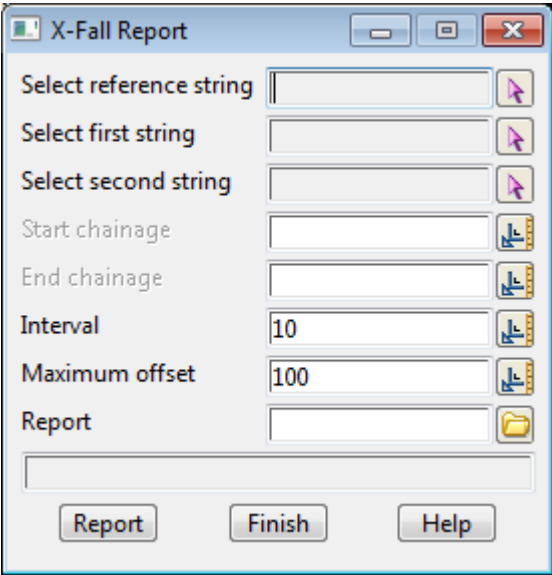
Position of option on menu: Report =>Xfall/offset

The **x-fall** report option reports on the horizontal and vertical offsets and the cross-fall between two strings.

The offsets are calculated as follows:

- (a) a reference string is selected which is used to define chainages.
- (b) lines perpendicular to the reference string are taken at regular chainages and intersected (in plan) with the first and second strings.
- (c) the horizontal and vertical offsets and the cross-fall between the two strings is calculated at the intersection points.

On selecting the **X-fall** option, the **X-Fall Report** panel is displayed.



The fields and buttons in this panel are used as follows

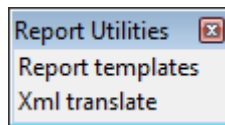
Field Description	Type	Defaults	Pop-Up
Start/End chainage <i>if blank, the start/end chainage of the reference string is used. if non-blank, the given chainage is used as the start/end chainage.</i>	input		
Interval <i>chainage interval to calculate values at.</i>	input	10	
Maximum offset <i>if non-blank, the maximum distance to search from the reference string to find the 1st and 2nd strings.</i>	input	100	
Report file <i>file for the x-fall report</i>	file box		*.rpt
Ref/1st/2nd <i>select the reference/first/second string.</i>	button		
Report <i>produce a offset and x-fall report between the first and second strings.</i>	button		

Report Utilities

Position of menu: Report =>Utilities

This section of documentation is a work in progress and will be updated in subsequent releases.

The **Utilities** walk-right menu is



For the option *Report templates*, go to
XML translate

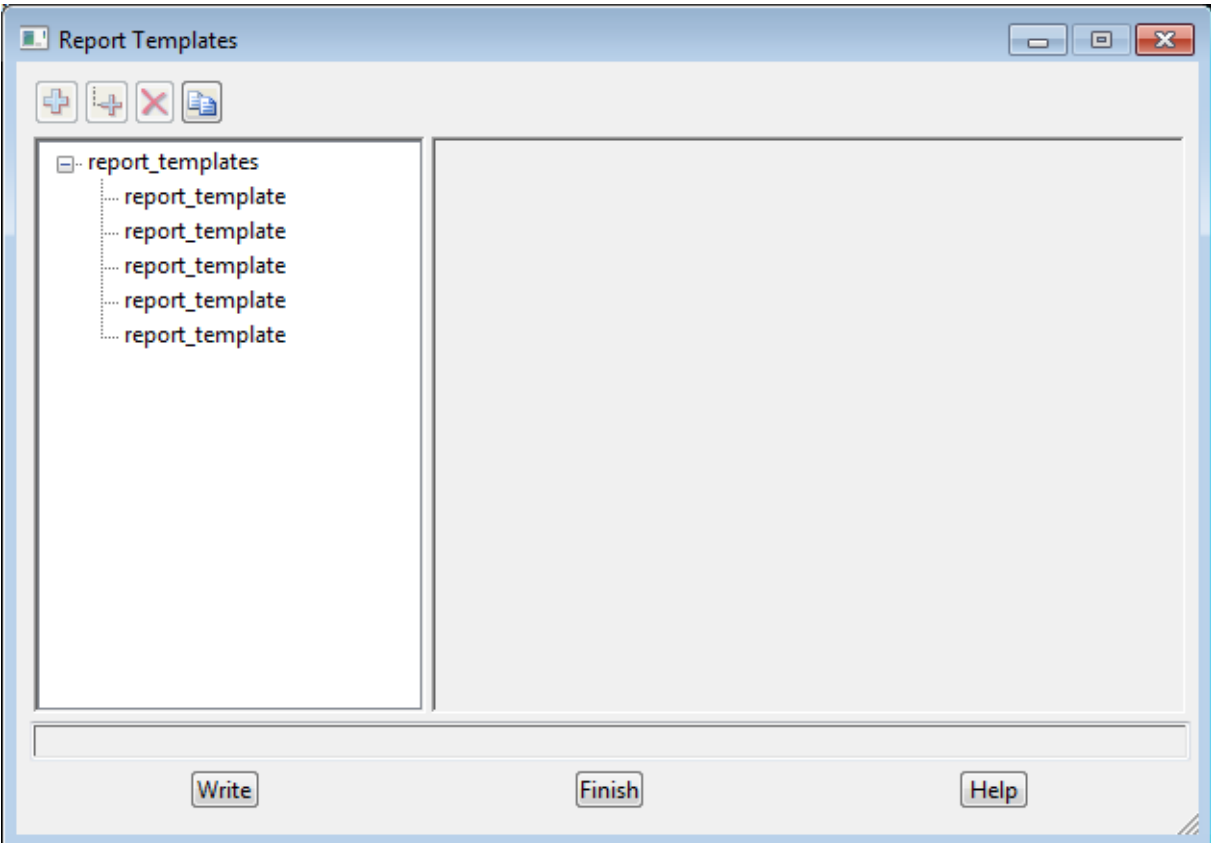
[Report Templates](#)
[XML Translate](#)

Report Templates

Position of option on menu: Report =>Utilities =>Report templates

This section of documentation is a work in progress and will be updated in subsequent releases.

On selecting **Report templates**, the **Report Templates** panel is displayed.

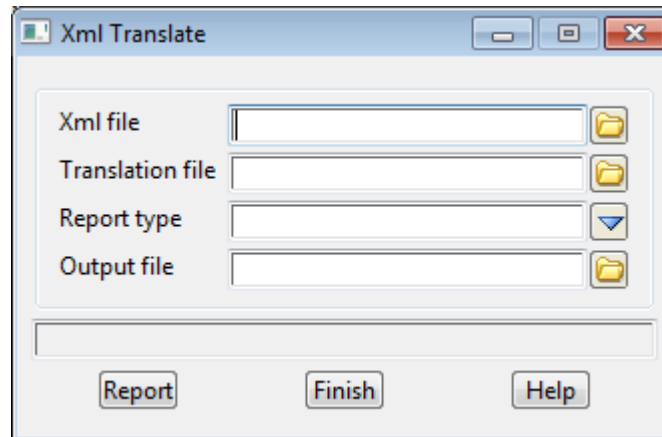


XML Translate

Position of option on menu: Report =>Utilities =>XML translate

This section of documentation is a work in progress and will be updated in subsequent releases.

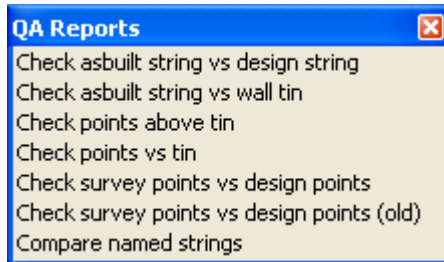
On selecting XML translate, the **XML Translate** panel is displayed.



QA Reports

Position of menu: Report => QA Reports

The QA options are for checking surveyed strings against design strings or tins.



For *Check asbuilt string vs design string*, go to

Check asbuilt string vs wall tin

Check points above tin

Check points vs tin

Check survey points vs design points

Check survey points vs design points

Compare name strings

[Check As built String vs Design String](#)

[Check Asbuilt String vs Wall Tin](#)

[Check Points Above a Tin](#)

[Check Points vs Tin](#)

[Check Survey Points vs Design Points \(3\).](#)

[Check Survey Points vs Design Points \(Old\).](#)

[Compare Named Strings](#)

Check As built String vs Design String

Position of option on menu: Report => QA Reports => Check asbuilt string vs design string

This panel is used to check the horizontal and vertical differences between two strings (usually "as built" and design). A control string is selected to provide the chainage and line to cut the two strings and calculate the difference along. The control string can be one of the two strings.

The corridors are an optional setting for where multiple cuts of the as built and design strings are possible.

E.g. If string crosses over itself or turns through more than 90° a section normal to the control string could cut it more than once.

If the user sees warning messages such as "> 1 cut" then use these settings to filter out the multiple cuts.

Selecting the Check asbuilt string vs design string brings up the **Check As Built String vs Design String** panel.

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
As built string	string select		
<i>string to compare</i>			
Design string	string select		

string to compare

Control string string select

string to use to define chainage and right angles. The line at right angles cuts the “as built” and “design” strings and is used to calculate the horizontal and vertical differences.

Report horizontal difference choice box Right +ve None, Right +ve, Right -ve

if **None** Don't report horizontal distances.

if **Right +ve** Horizontal differences are reported with differences to the right reported as +ve

if **Right -ve** Horizontal differences are reported with differences to the right reported as -ve

Report vertical difference choice box Above +ve None, Above +ve, Above -ve

if **None** Don't report horizontal distances.

if **Above +ve** Vertical differences are reported with differences above reported as +ve

if **Above -ve** Vertical differences are reported with differences above reported as -ve

Report at asbuilt string's vertices tick box tick

if tick, the differences are reported at the vertices of the as built string.

Report at regular control line interval tick box tick

if tick, the differences are reported at the chainage interval given in the “Report interval” box.

Difference units choice box Millimetres (0 dp) Millimetres (0 dp)
Millimetres (1 dp)
Metres (3 dp)
Metres (4 dp)

if **Millimetres (0 dp)** In the report, differences are printed out as Millimetres with 0 decimal places

if **Millimetres (1 dp)** In the report, differences are printed out as Millimetres with 1 decimal place

if **Metres (3 dp)** In the report, differences are printed out as Metres with 3 decimal places

if **Metres (4 dp)** In the report, differences are printed out as Metres with 4 decimal places

Report interval input box 5

chainage interval of the control string to report the differences at.

Start chainage input box

start chainage of the control string to start reporting differences.

End chainage input box

end chainage of the control string to stop reporting differences.

Offset Corridor input box

If this value is set a cut offset greater than this from the design string is ignored.

Hgt diff Corridor input box

If this value is set a cut hgt difference greater than this from the design string is ignored

Report file input box

name of the report file.

Report button

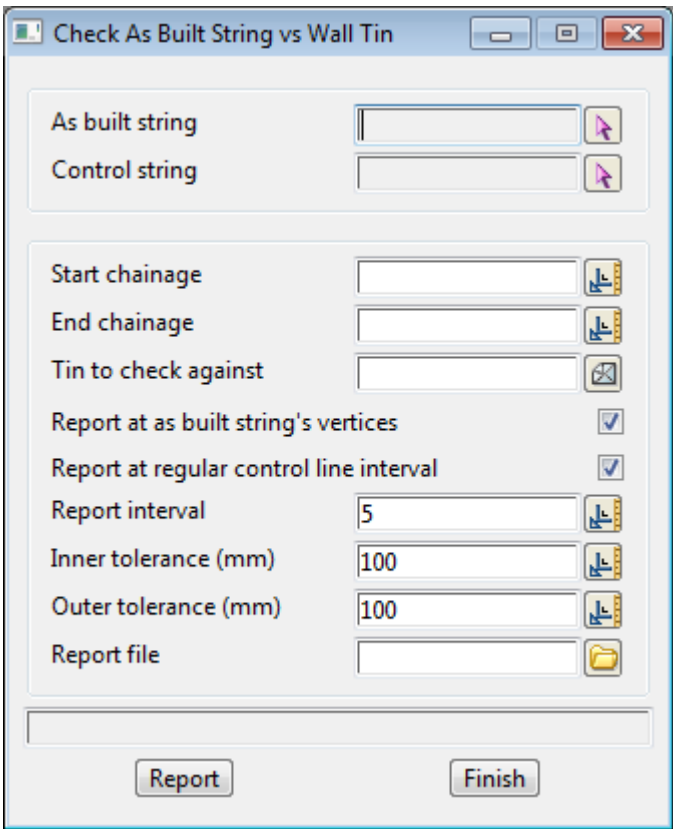
run the option.

Check Asbuilt String vs Wall Tin

Position of option on menu: Report =>QA Reports =>Check asbuilt string vs wall tin

This panel is used to check the horizontal difference between a string (usually the “as built”) and a tin (usually a wall tin). A control string is selected to provide the chainage and bearing to project a horizontal line to cut the string and the tin and calculate the horizontal difference along. The control string can be the “as built” string.

Points that are different by a given inner and outer tolerance are flagged in the report.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
As built string <i>string to compare against the wall tin.</i>	string select		
Control string <i>string to use to define chainage and right angles. The horizontal line at right angles cuts the “as built” string and “tin to check against” tin that is used to calculate the horizontal differences.</i>	string select		
Start chainage <i>start chainage of the control string to start reporting differences.</i>	input box		
End chainage <i>end chainage of the control string to stop reporting differences.</i>	input box		
Tin to check against <i>tin to compare the as built string with.</i>	input box		available tins
Report at as built string’s verticestick box <i>if tick, the differences are reported at the vertices of the as built string.</i>	tick box	tick	

Report at regular control line interval	tick box	tick
<i>if tick, the differences are reported at the chainage interval given in the “Report interval” box.</i>		
Report interval	input box	5
<i>chainage interval of the control string to report the differences at.</i>		
Inner tolerance (mm)	input box	100
<i>if the inner horizontal distance between the string and the wall is greater that this value (in units times 1000) then it is flagged in the report.</i>		
Outer tolerance (mm)	input box	100
<i>if the outer horizontal distance between the string and the wall is greater that this value (in units times 1000) then it is flagged in the report.</i>		
Report File	input box	
<i>name of the report file.</i>		
Report	button	
<i>run the option.</i>		

Check Points Above a Tin

Position of option on menu: Report => QA Reports => Check points above tin

This panel is used to check the z-value of points against the z-value of a tin at the same (x,y) locations and only report on those above the tin. To check points above and below a tin, go to the next section [Check Points vs Tin](#).

A z-tolerance above the tin is given and all points above the tin and outside the tolerance are especially flagged in the report.

Optionally the report can also include the chainage and offset of the points from a selected alignment string.

The fields and buttons used in this panel have the following functions:

Field	Description	Type	Defaults	Pop-Up
Model of shots	<i>model of points to check the z-value against the tin.</i>	model box		
Tin to check against	<i>tin to check the z-values against</i>	tin box		
Above tolerance (mm)	<i>if the z-value of the point is above the tin and the difference of the z-value of the point and the tin (times 1000), is greater than this amount then it is flagged in the report.</i>	input box	175	
Report file	<i>name of the report file.</i>	file box		
Report ch/off to centre line	<i>if tick, the chainage and offset of the points from the selected alignment string are included in the report.</i>	checkbox		
Select align	<i>select the alignment string to calculate offset and chainage from.</i>	string select		
Report		button		
Finish		button		

run the option.

Check Points vs Tin

Position of option on menu: Report => QA Reports => Check points vs tin

For Check points above tin, go to [Check Points Above a Tin](#).

This panel is used to check the z-value of points against the z-value of a tin at the same (x,y) locations, or if a **Layer depth** is given, the z-values of points are checked against the tin *minus* the layer depth.

Separate z-tolerances are supplied for **above** and **below** the tin and points outside either tolerance are especially flagged in the report.

Optionally the report can also include the chainage and offset of the points from a selected alignment string.

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Model of shots	model box		
<i>model of points to check the z-value against the tin.</i>			
Tin to check against	tin box		
<i>tin to check the z-values against</i>			
Above tolerance (mm)	input box	175	
<i>if the z-value of the point is above the tin and the difference of the z-value of the point and the tin (times 1000), is greater than this amount then it is flagged in the report.</i>			
Below tolerance (mm)	input box	175	
<i>if the z-value of the point is below the tin and the absolute value of the difference of the z-value of the point and the tin (times 1000), is greater than this amount then it is flagged in the report.</i>			
Layer depth	input box	0	
<i>this value is subtracted form the z-value of the tin before the comparison is made with the z-value of the point.</i>			
Report file	file box		
<i>name of the report file.</i>			

Report ch/off to centre line tick box

if tick, the chainage and offset of the points from the selected alignment string are included in the report.

Select align string select

select the alignment string to calculate offset and chainage from.

Report

run the option.

Check Survey Points vs Design Points (Old)

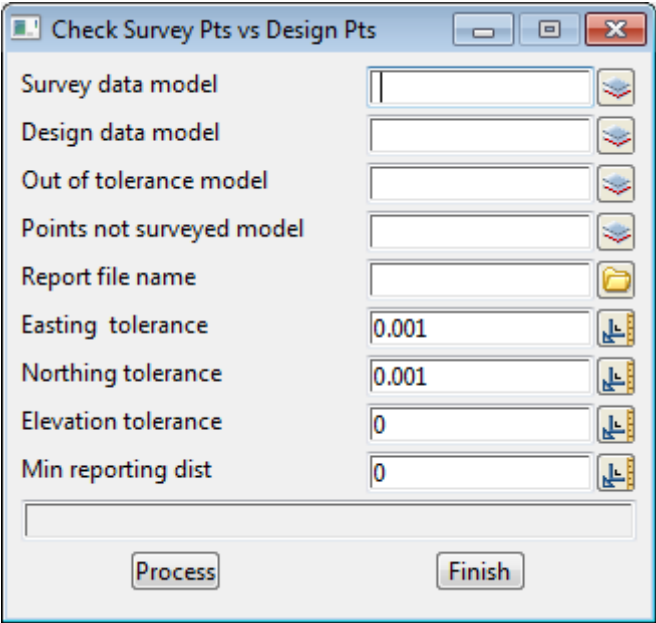
Position of option on menu: Report =>QA Reports =>Check survey points vs design points (old)

This option is used to check surveyed points against the design points.

Separate tolerances are given for Eastings (x), Northings (y) and Elevations (z).

Any design points that have not been surveyed are noted and copies of points out of tolerance and/or points not surveyed can be automatically made.

NOTE - if a **radial** search distance is required in (x,y), go to the next section [Check Survey Points vs Design Points \(3\)](#).



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Survey data model <i>model of points to be compared against the design points.</i>	model box		available models
Design data model <i>points to be compared against.</i>	model box		available models
Out of tolerance model <i>copies of any points out of tolerance are added to this model.</i>	model box		available models
Points not surveyed model <i>copies of any points from the design model that have not been surveyed.</i>	input box		
Report file name <i>name of the report.5</i>	input box		
Easting tolerance <i>tolerance in the x direction.</i>	input box	0.001	
Northing tolerance <i>tolerance in the y-direction.</i>	input box	0.001	
Elevation tolerance <i>tolerance in the z-direction.</i>	input box	0	

Min reporting dist	input box	0
Process <i>run the option.</i>	button	

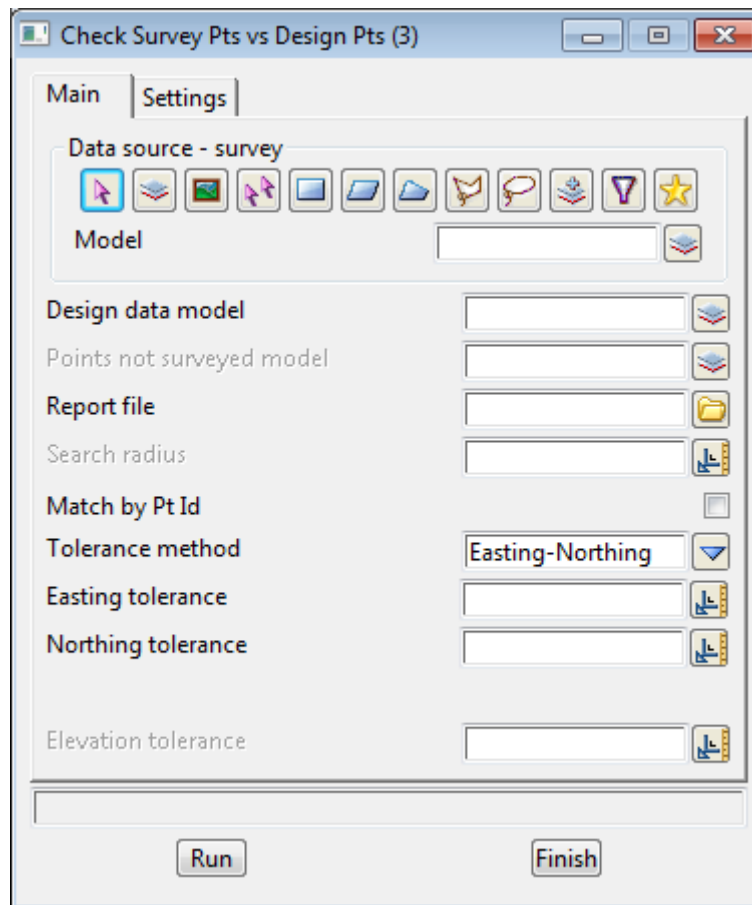
Check Survey Points vs Design Points (3)

Position of option on menu: Report => QA Reports => Check survey points vs design points

This option is used to check surveyed points against the design points.

The (x,y) search distance can be either one radial distance, a separate x and y distance or separate chainage and offset distances.

Any design points that have not been surveyed are noted and can be optionally copied to a model.



The fields and buttons used in this panel have the following functions:

Field	Description	Type	Defaults	Pop-Up
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Main Tab

Data source type - survey			Model	
----------------------------------	--	--	-------	--

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data source	input			
--------------------	-------	--	--	--

source of data to be processed.

Design data model	model box			available models
--------------------------	-----------	--	--	------------------

Model containing design points for comparison against.

Points not surveyed model	input box			
----------------------------------	-----------	--	--	--

Copies of any points from the design model that have not been surveyed.

Report file	file box			
--------------------	----------	--	--	--

Name of report file for results

Search radius	measure box	At Point, Point to Point, String from Point,String to Point
----------------------	-------------	-------------------------------------------------------------------

if set surveyed/design points are matched when less than this distance apart.

Match by Pt Id	tick box
-----------------------	----------

if ticked surveyed/design points are matched by point id.

Tolerance method	choice box	Easting-Northing	Easting-Northing, Distance,Chainage-Offset
-------------------------	------------	------------------	-----------------------------------------------

*if **Chainage-Offset**, separate chainage and offset tolerances relative to a selected string are given to check against.*
*if **Easting-Northing**, separate Easting (x) and Northing (y) tolerances are given to check against.*
*if **Distance**, the test is for a radial distance, not a separate tolerances.*

Easting tolerance	measure box	At Point, Point to Point, String from Point, String to Point
--------------------------	-------------	--------------------------------------------------------------------

The tolerance in the x-direction

Northing tolerance	measure box	At Point, Point to Point, String from Point, String to Point
---------------------------	-------------	--------------------------------------------------------------------

The tolerance in the y-direction

Elevation tolerance	measure box	At Point, Point to Point, String from Point, String to Point
----------------------------	-------------	--------------------------------------------------------------------

The tolerance in the z-direction

Settings Tab

This tab allows some settings in controlling the report.

Report Column Widths

Point Id width	input	10
-----------------------	-------	----

Width of point id column.

Code width	input	12
-------------------	-------	----

Width of code column, (0 removes column)

Model width	input	25
--------------------	-------	----

Width of model column, (0 removes column)

Easting /Chainage width	input	12
--------------------------------	-------	----

Width of easting/chainage column.

Northing /Offset width	input	12
-------------------------------	-------	----

Width of northing/offset column.

Level width	input	12
--------------------	-------	----

Width of level column.

Distance width	input	12
-----------------------	-------	----

Width of distance column.

Report design coords

if ticked design coordinates will be written to the report file

Report as CSV?

*If **Report as CSV?** is ticked then the column width settings are ignored and the report written as a comma delimited 'CSV' file suitable for exports to spreadsheets and others.*

*If **Report as CSV?** is not ticked then the reported is formatted with the column width figures in mind.*

Run

button

run the option.

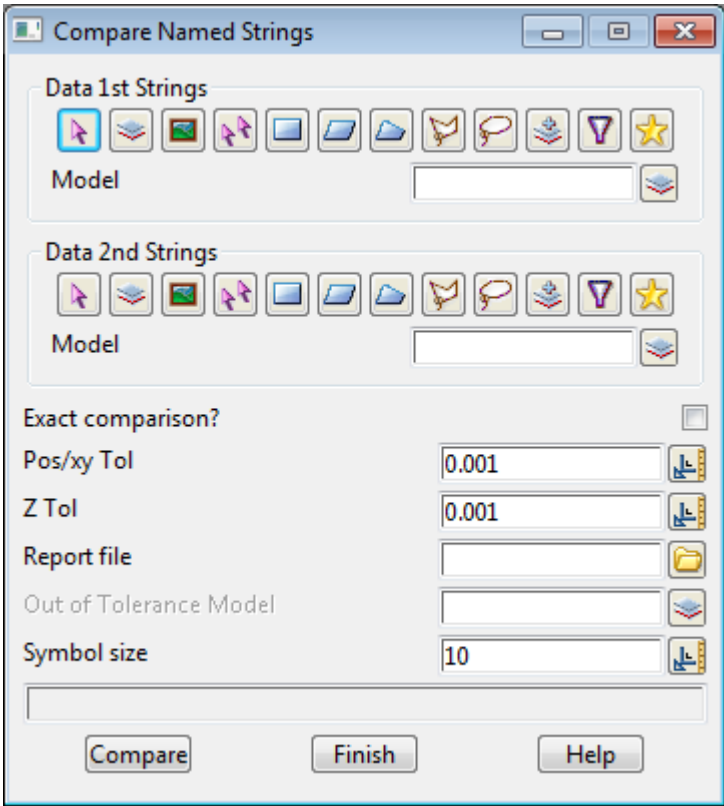
Compare Named Strings

Position of option on menu: Report =>QA Reports =>Compare named strings

The **compare named strings** panel is a utility to check for changes in a string and highlights these changes. It would typically be used when a revised design is released to highlight where the actual changes are.

Strings are matched by name, there must only be one string of the same name in each of the data sources.

Selecting **Compare named strings** brings up the **Compare Named Strings** panel.



The fields and buttons used in this panel have the following functions:

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Data 1st Strings

the data source for the 1st set of strings.
for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data 2nd Strings

the data source for the set of strings to compare to the 1st set of strings.
for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Exact comparison?	tick box
--------------------------	----------

if ticked the strings are compared vertex by vertex
if unticked the points in the 2nd string are dropped to the first string and the comparison is done by offset and height difference.

Pos/xy Tol	measure box
-------------------	-------------

The distance between vertices or the difference in offset before the point is considered different.

Z Tol	measure box
--------------	-------------

The height difference between the strings before the point is considered different.

Report file file box

The file to which the results of the comparison are written, contains the strings compared, the number of name matches if not matched or unique and the details of differing points.

Out of Tolerance Model model box

Any points outside the nominated tolerances can be written to this model.

Symbol size input

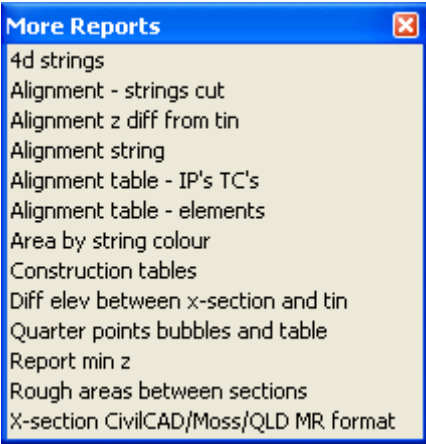
*Points in the **out of tolerance model** have a diamond of this real world size drawn around them to highlight the points.*

Compare button

Compares the two data sources

More Reports

Position of menu: Report =>More
More miscellaneous reports.



report on 4d strings
report the strings that an alignment cuts
give the differences from a tin to a string
report on an alignment string
create alignment report and/or table giving IP's and CT's
create alignment report and/or table giving elements
give plan areas summed by string colour
give the differences from the points on a section to a tin
report and/or table of quarter points for an arc
report the minimum values on a x-section
report of areas between sections

For the option/menu *4d string*, go to
Alignment - strings cut
Alignment z diff from tin
Alignment string
Alignment table - IP's TC's
Alignment table - elements
Area by string colour
Diff elev between x-sections and tin
Quarter points bubble and table
Report min z
Rough areas between sections
Super string
X-section CivilCAD/Moss/Qld MRD format

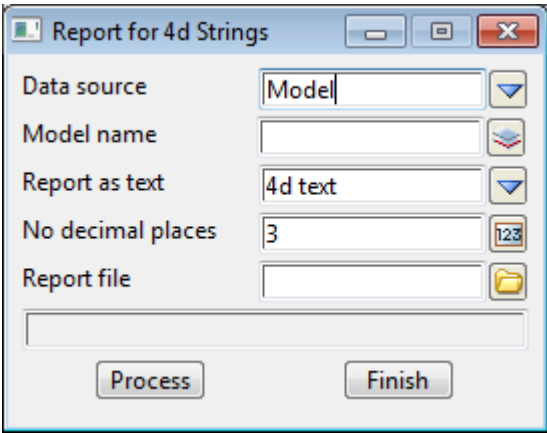
[Report for 4d Strings](#)
[Alignment - Strings Cut](#)
[Report Z Differences from Alignment to Tin](#)
[Alignment Report](#)
[Tabulate Alignment - IP's and CT's](#) in chapter [Drafting](#)
[Tabulate Alignment - Elements](#) in chapter [Drafting](#)
[Total of Plan Area by String Colour](#)
[Report Z Differences From X-Sections to a Tin](#)
[Setout Lip Line](#) in the chapter [Survey](#)
[Report Minimums Z-Value on a Cross Section](#)
[Report Rough Areas](#)
[Report for Super Strings](#)
[X-Sections Report](#)

The menu options will now be discussed.

Report for 4d Strings

Position of option on menu: Report =>More =>Report for 4d strings

This panel is used to create a report for 4d strings where the x y and z values are printed out for each point plus either the 4d text for the point or the name of the string (repeated for each point).



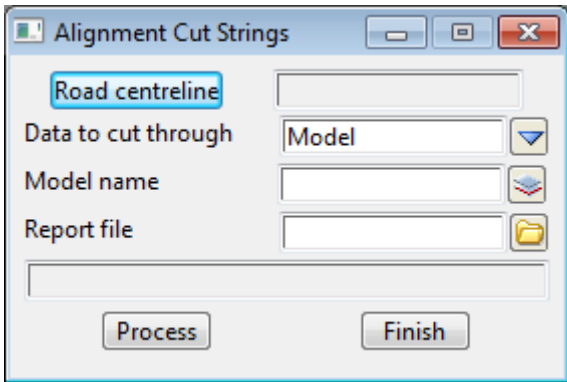
The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Data source <i>data source type.</i>	choice box	model	string, model, view
Model/View/String <i>Data source to do report of 4d strings on.</i>	data source		
Report as text <i>if 4d text, the 4d text for the point is written out after the x, y and z values. If string name, the string name is written out after the x, y and z values.</i>	file	4d text	string name 4d text
No decimal places <i>number of decimal places to use in the x, y and z values.</i>	input	3	
Report file <i>name of the report file.</i>	file		
Process <i>run the option.</i>	button		

Alignment - Strings Cut

Position of option on menu: Report =>More =>Alignment - strings cut

This option is used to create a report of the position and angle that strings make where they cut a selected alignment string.



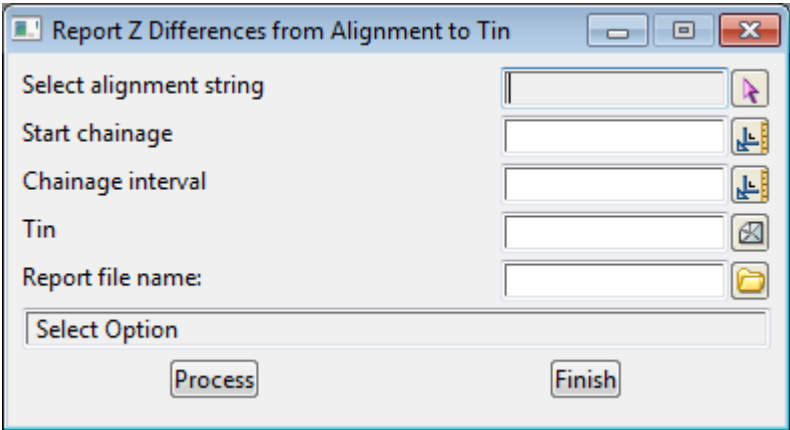
The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Road centreline <i>select the alignment string to report the cuts for.</i>	string select		Pop-Up
Data source <i>source of the data</i>	choice box	Model	String/Model/View
Data <i>method a specifying data</i>			
Report file <i>name of the report file.</i>	input box		*.rpt files
Process <i>run the option.</i>	button		

Report Z Differences from Alignment to Tin

Position of option on menu: Report =>More =>Report z differences from alignment to tin

This panel is used to create a report of the difference in z-values between an alignment string and a tin. The differences are reported at a given chainage interval along the alignment string.



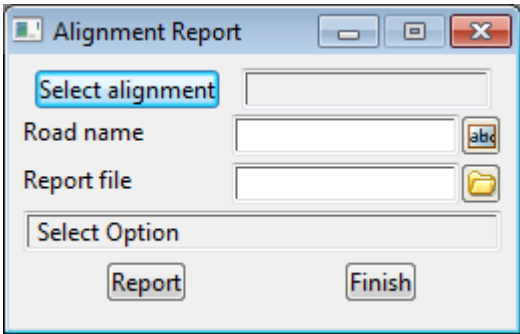
The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Select alignment string <i>select the alignment string to report z-differences for.</i>	string select		
Chainage interval <i>interval to report on.</i>	input box		
Tin <i>tin to get z-values from.</i>	input box		available tins
Report file name <i>name of the report file.</i>	input box		*.rpt files
Process <i>run the option.</i>	button		

Alignment Report

Position of option on menu: Report =>More =>Alignment string

This panel is used to report the tangent points and centres of arcs for an alignment string.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Select alignment string <i>select the alignment string to report on.</i>	string select		
Report file name <i>name of the report file.</i>	input box		
Report <i>run the option.</i>	button		

Alignment Table - IP's, TC's

Position of option on menu: Report =>More =>Alignment table - IP's and TC's

Create table of IP and CT points for an alignment string.

This panel has already been documented.

See [Tabulate Alignment - IP's and CT's](#) in chapter [Drafting](#)

Alignment Table - Elements

Position of option on menu: Report =>More =>Alignment table - elements

Create table of horizontal elements for an alignment string.

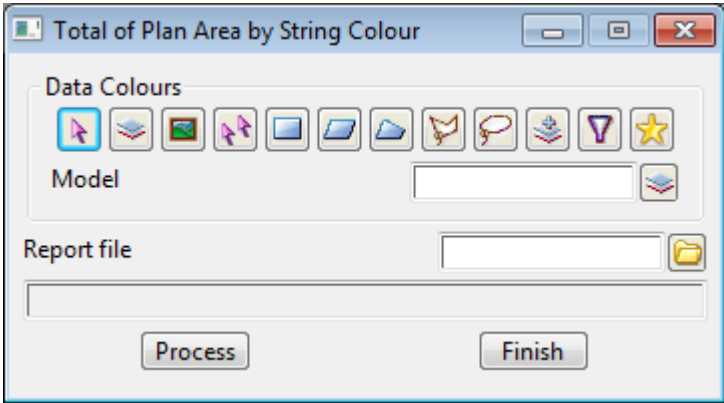
This panel has already been documented.

See [Tabulate Alignment - Elements](#) in chapter [Drafting](#)

Total of Plan Area by String Colour

Position of option on menu: Report =>More =>Area by string colour

This panel is used to calculate the sum of the plan area of all strings of the same colour. This is especially useful for calculating the plan areas of faces produced for slope areas, volumes etc.
A report giving the total plan area for each different colour is produced.



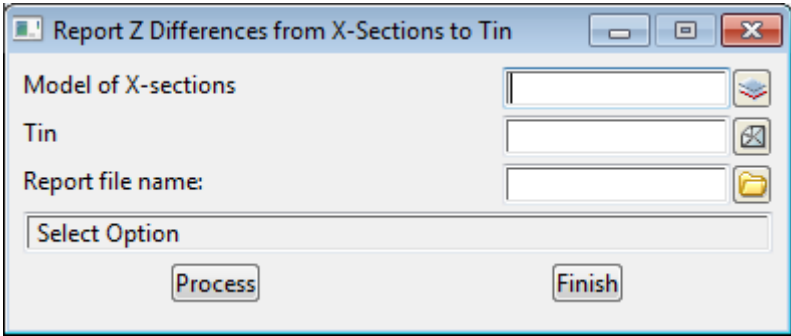
The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Data source <i>Type of data to calculate areas for.</i>	data source	model	model, view
Model/View <i>Data source to calculate the areas and sum by colour.</i>	data source		
Report file <i>Report giving the total plan areas of the strings for each colour.</i>	input box		
Process <i>Run the option</i>	button		

Report Z Differences From X-Sections to a Tin

Position of option on menu: Report =>More =>Diff elev between x-section and tin

This panel is used to report the z differences between the points on cross sections and the corresponding z-values from a tin.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Model of X-Sections <i>model of cross sections to report on.</i>	model box		available models
Tin <i>tin to get z-values from.</i>	tin box		
Report file name <i>name of the report file.</i>	file box		
Process <i>run the option.</i>	button		

Quarter Points Report

Position of option on menu: Report =>More =>Quarter points bubbles and table

This option is used to create bubbles and/or a report for the critical horizontal and vertical points and quarter points (by chord or by chainage) for any arcs in an alignment string.

This option has already been documented as

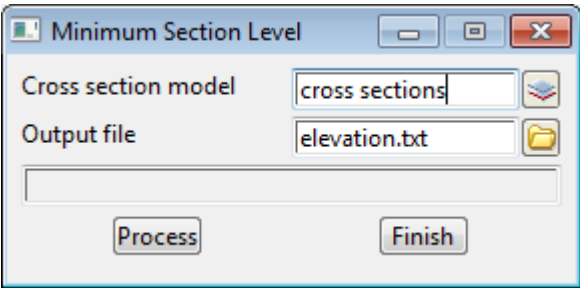
Survey =>Setout =>Setout lip line

in the section [Setout Lip Line](#) in the chapter [Survey](#).

Report Minimums Z-Value on a Cross Section

Position of option on menu: Report =>More =>Report min z

This panel creates a report giving the minimum z-value on a cross section.

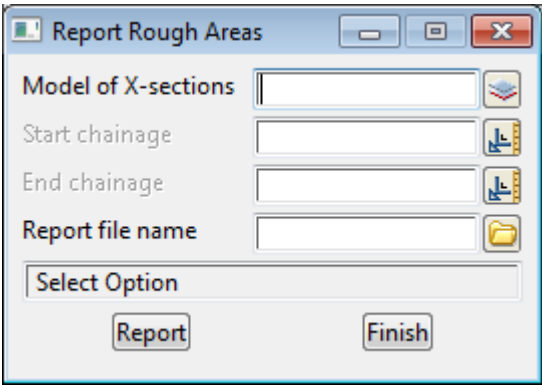


The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Cross section model <i>model of cross sections to report on.</i>	model box		
Output file <i>file to write section names and minimum z-values to.</i>	file box		*.txt files
Process <i>run the option.</i>	button		

Report Rough Areas

Position of option on menu: Report =>More =>Rough areas between sections
This panel is used to



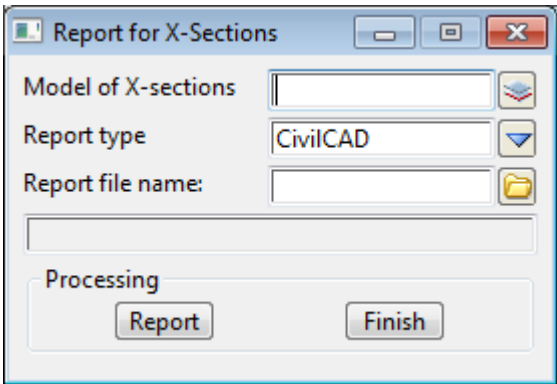
The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Model of x-sections xxxxxx	input box		
Start chainage xxxxxx	input box		
End chainage xxxxxx	input box		
Report file name name of the report file.	input box		
Report run the option.	button		

X-Sections Report

Position of option on menu: Report =>More =>X-section CivilCAD/Moss/QLD MR format

This panel is used to write out cross sections in a variety of formats.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Model of x-sections <i>model of cross sections to write out.</i>	input box		available models
Report type <i>format of the report.</i>	file box	CivilCAD	CivilCAD, Moss MainRoad Qld, Brief
Report file name <i>name of the report file.</i>	input box		
Report <i>run the option.</i>	button		

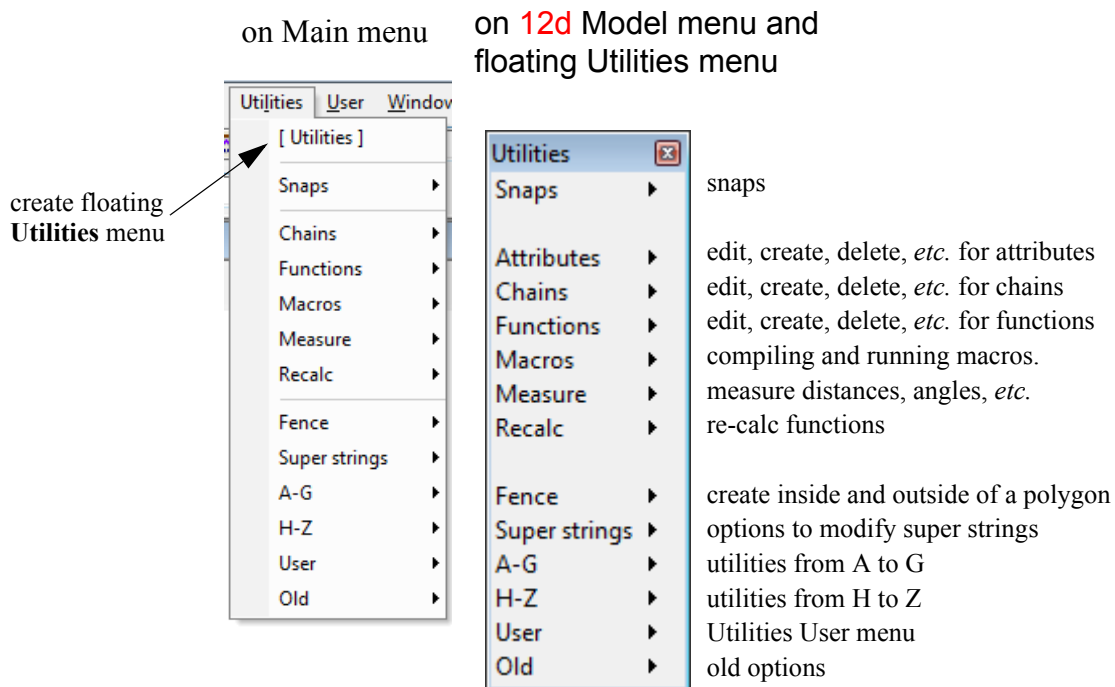


27 Utilities

Position of menu: It is on the main menu as Utilities

The Utilities menus contains a collection of useful operations that don't easily fit under any of the other menus.

For ease of selection, the frequently used utilities are placed on the first level of the menu. All the other utilities are split alphabetically between two walk-right menus - the utilities walk-right menus for A-G and H-Z.



For the option/menu *Snaps*, go to

Attributes

Chains

Functions

Macros

Measure

Recalc

Fence

Super strings

A-G

H-Z

Old

[Snaps](#)

[Attributes](#)

[Chains](#)

[Functions](#)

[Macros](#)

[Measure](#)

[Recalc](#)

[Fence](#)

[Super Strings](#) in the chapter [Strings](#)

[Utilities A-G](#)

[Utilities H-Z](#)

[Old](#)

Utilities A-G

Position on menu: Utilities =>A-G

Utilities A-G	
Add VIP to SA from file	add a vertical intersection point to a super alignment from a file
Affine 2D	perform 2D affine transformation
Affine 2D Orthogonal	perform 2D affine transformation with no skewing of axes
Archive models	save all models matching a specified model mask as 12d-ascii
Cartographic	perform cartographic projections
Change	change string colour
Change string chainage	set the start chainage of selected strings
Check / clash	check breaklines, strings, 3d clashes, polygons
Classify conduits	set attributes on conduit strings
Clear string names	remove string names
Colour sections by xfall range	colour sections using a x-fall colour file
Convert	convert 2d to 3d, 3d to 4d etc
Create centres of string curves	create centres of curves
Create Grid	create a world grid
Cuts	calculate sections by cuts through strings
Delete	delete strings
Draw perpendicular cl to points	draw perpendicular from selected points to centreline
Duplicate	duplicate strings
Explode	explode strings into lines and arcs
Explode (text)	explode text into lines and arcs
Factor	multiply the x,y,z values by factors
Filter	data filters
Grid setout	create vertices from intersection of strings and/or arcs
User	

For Add VIP to SA from file go to

Affine 2D

Affine 2D Orthogonal

Archive models

Cartographic

Change

Change string chainage

Check/clash

Classify conduits

Clear string names

Colour X-Sections by Xfall range

Convert

Create centres of string curves

Create Grid

Cuts

Delete

Draw perpendicular cl to points

Duplicate

Explode

Explode (text)

[Add VIP to SA From File](#)

[2D Affine](#)

[2D Affine - Orthogonal](#)

[Archive Models](#)

[Cartographic Projections](#)

[Change](#)

[Change String Chainage](#)

[Check/Clash](#)

[Classify Conduits](#)

[Clear String Names](#)

[Colour Sections by XFall Range](#)

in the chapter [Design](#)

[Convert](#)

[Create Centre Points for Curves of Strings](#)

in the chapter [Survey](#)

[Create World Grid](#)

[Cuts](#)

[Delete](#)

[Draw a Perpendicular from Centreline to a Point](#)

[Duplicate](#)

[Explode](#)

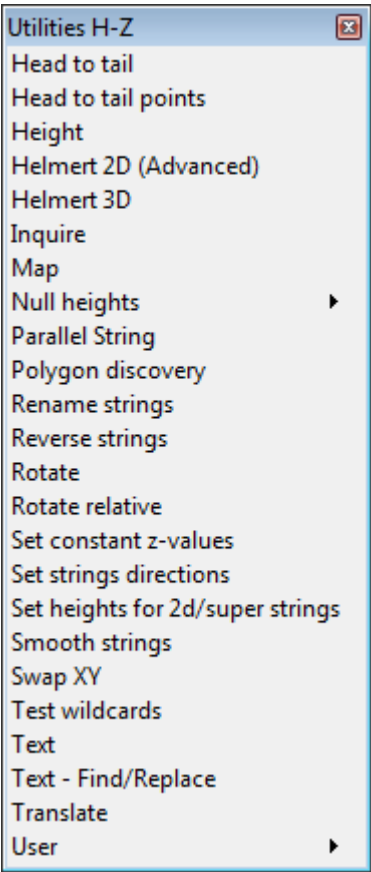
[Explode Text](#)

Factor
Filter
Grid setout

[Factor](#)
[Filter](#)
[Grid setout](#)

Utilities H-Z

Position of menu: Utilities =>H-Z



- join strings with common ends
- join one point strings into multi-point strings
- give strings new height
- 2D Helmert, also allowing fixed scale
- 3D Helmert transformation
- highlight selected strings
- use mapping file on strings
- set heights to null value
- find enclosing polygon from strings surrounding selected point
- rename strings
- reverse string directions
- rotate strings about one point
- various methods of rotating strings
- give strings a constant z value
- give strings same direction as selected string
- set heights for 2d/3d super strings
- smooth strings
- swap X and Y coordinates of strings
- testing pattern and expression matching
- modify text parameters
- find and replace text
- translate strings in model/view

For the option *Head to tail*, go to

Head to tail points

Height

Helmert 2D (Advanced)

Helmert 3D

Inquire

Map

Null heights

Parallel

Polygon discovery

Rename strings

Reverse strings

Rotate

Rotate Relative

Set constant z-values

Set strings directions

Set heights for 2d/super strings

Smooth strings

Swap XY

Test wildcards

Text

[Head to Tail](#)

[Head to Tail Point Strings](#)

[Set Height](#)

[2D Helmert \(Advanced\)](#)

[3D Helmert](#)

[Inquire](#)

[Map](#)

[Null Heights](#)

[Parallel Strings Macro](#)

[Polygon Discovery](#)

[Rename Strings](#)

[Reverse Strings](#)

[Rotate](#)

[Rotate Relative](#)

[Set Constant Z-Values](#)

[Set Strings Directions](#)

[Set Heights for 2d/Super Strings](#)

[Smooth Strings](#)

[Swap XY](#)

[Test Wildcards](#)

[Text](#)

*Text - Find/Replace
Translate*

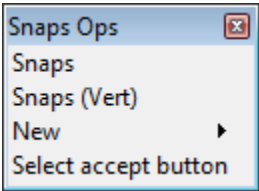
Replace Text in the Chapter Drafting
Translate

Snaps

Position of menu: Utilities =>Snaps

The **snaps** option allows the user to set snapping modes for use during pick operations. The snapping modes have been discussed in detail in the [Snaps](#) section in the chapter [Tools and Concepts](#).

The **Snaps** walk-right menu provides a full snap menu, abbreviated snap menus laid out either horizontally or vertically, and a snaps cogo menu for creating special point positions using co-ordinate geometry commands.



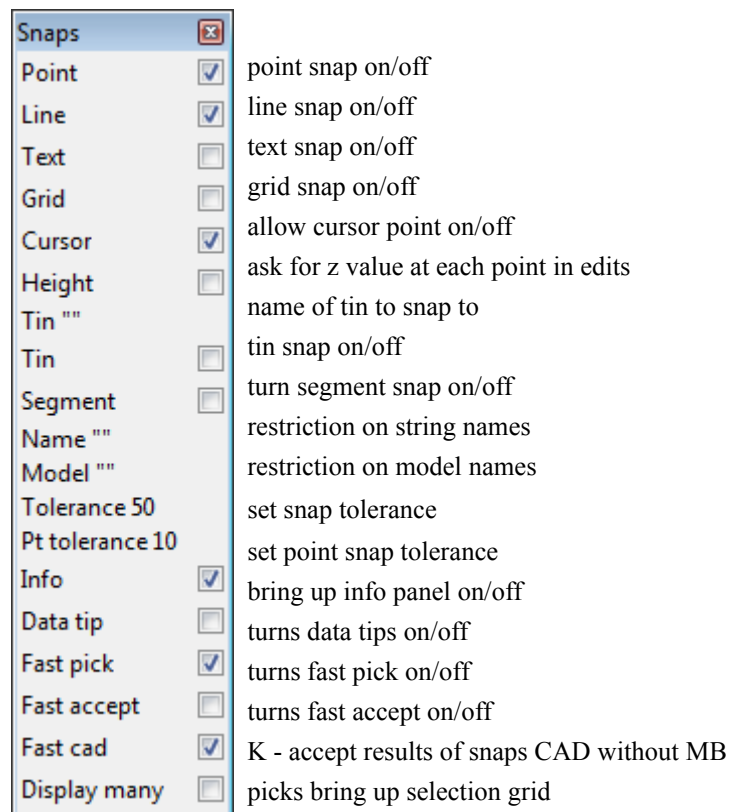
- full snaps menu
- brief snaps laid out vertically
- under development
- equivalent to middle mouse button (accept)

For the option <i>Snaps</i> , go to	Snaps
<i>Snaps (Vert)</i>	Snaps (Vert)
<i>Cogo</i>	Snaps Cogo
<i>New</i>	Snaps New
<i>Select accept button</i>	Select accept button

Snaps

Position of option on menu: Utilities =>Snaps =>Snaps

The **Snaps** menu provides tick boxes to turn the various snap modes on or off and options to set tin, string and model names. Any combination of snap modes and names can be set.



The snaps point, line, grid, cursor, tin and info are all set on or off using the tick boxes.

The *snap tolerance* is displayed on the **Tolerance** line on the menu.

The *point snap tolerance* is displayed on the **Pt tolerance** line on the menu.

For more information on snaps, go to the [Snaps](#) section in the chapter [Tools and Concepts](#).

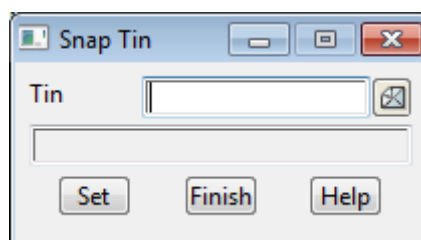
Tin Snap

Tin snap means that when an (x,y) point is selected, the z-value for the point is taken to be the z-value on the tin at the same (x,y) position.

To use tin snap, the name of the tin to snap to must first be set. Then, snapping to that tin is controlled by the state of the tin snap tick box.

If the tick box is **on** (a tick), snapping to the tin is used. If the tick box is **off** (a cross or nothing), no tin snaps are used.

The name of the tin to snap to is set by selecting the tin option and entering the tin name in the **Snap Tin** panel and selecting the **set** button.

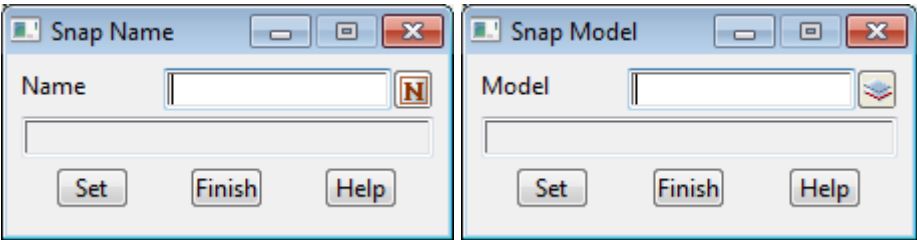


When a name is set, the tin tick box is automatically set to on.

For more information on snaps, go to the [Snaps](#) section in the chapter [Tools and Concepts](#).

Name and Model Snap

The user can restrict the snap to specific strings and/or models by selecting the name or model option. This brings up the **snap name** or **Snap Model** panel. The string name (model name) used to restrict the snap is entered into the name (model) field. The values are then set by selecting the **set** button.



When **12d Model** creates a new project, **line** and **point** snap are set to **on** and all other snaps set off.

For more information on snaps, go to the [Snaps](#) section in the chapter [Tools and Concepts](#).

Point Snap Tolerance

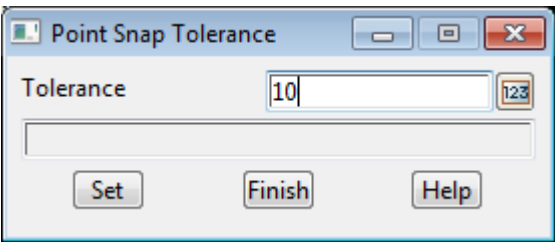
Point snap tolerance is not a tick box but a menu item. The point snap tolerance value is the distance to be used for considering vertices over anything else when point snap is on.

The point snap tolerance distance is given in screen units (pixels). There are one thousand pixels per screen width, hence a point snap tolerance of say 10 means that the point snap distance about a vertex is one hundredth of the screen width.

The *point snap tolerance* is given in terms of screen units rather than world units because it is a distance on the screen, independent of any co-ordinate system being used in a view.

The current point snap tolerance value is displayed as **Pt tolerance** on the *Snap* menu.

The *Point snap tolerance* is modified by selecting the **Pt tolerance** item on the *Snaps* menu to bring up the **Point Snap Tolerance** panel.



The **point snap tolerance** to be used to restrict the point snap is entered into the panel and then the **Set** button selected. The default tolerance is 10.

For more information on snaps, go to the [Snaps](#) section in the chapter [Tools and Concepts](#).

Snap Tolerance

Snap tolerance is not a tick box but a menu item. The snap tolerance value is the distance to be used for considering data when snaps are on.

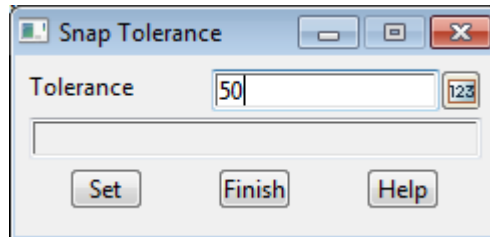
The snap tolerance distance is given in screen units (pixels). There are one thousand pixels per screen width, hence a snap tolerance of say 50 means that the snap distance about a point, line etc. is one twentieth of the screen width.

Snap tolerance is given in terms of screen units rather than world units because it is a distance

on the screen, independent of any co-ordinate system being used in a view.

The current snap tolerance value is displayed as **Tolerance** on the *Snap* menu.

The *Snap tolerance* is modified by selecting the **Tolerance** item on the **Snap** menu to bring up the **Snap Tolerance** panel.



To change the snap tolerance, type a new value into the **Tolerance** panel field and then click LB on the **Set** button.

For more information on snaps, go to the [Snaps](#) section in the chapter [Tools and Concepts](#).

Info Snap

If info snap is set, then the information panel comes up whenever a string is picked.

Summarising, the available snap modes are

- s point - diamond cursor
- s line - square
- s grid - circle
- s cursor - circle
- s tin - squiggles under a line
- s name
- s model
- s info

On starting up a new project, point and line snap are on, all others off and tolerance is set to 50.

When an existing project is saved, the snap settings, snap tolerance and positions of any **snaps** menus on the screen, are also saved.

For more information on snaps, go to the [Snaps](#) section in the chapter [Tools and Concepts](#).

Snaps (Vert)

Position of option on menu: Utilities =>Snaps =>Snaps (Vert)

The Snaps (vert) menu provides the same tick boxes as the Snaps menu to turn the various snap modes on or off, however the snap descriptions are abbreviated to one character to reduce the menu size.

The Snaps and Snaps (vert) menu are

H

P L X G C H T S I D F A K

The Snaps are

P

 Point snap (on)

L

 Line snap (on)

X

 Text snap (off)

G

 Grid snap (off)

C

 Cursor snap (on)

H

 Height snap (off)

T

 Tin snap (off)

S

 Segment snap (off)

I

 Info snap (on)

D

 Data tip (off)

F

 Fast accept (on)

A

 Fast accept (off)

K

 Construction snap (on)

M

 Show selection grid on picks

V

P

L

X

G

C

H

T

S

I

D

F

A

K

M

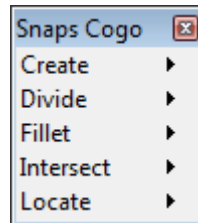
For more information on snaps, go to the [Snaps](#) section in the chapter [Tools and Concepts](#).

Snaps Cogo

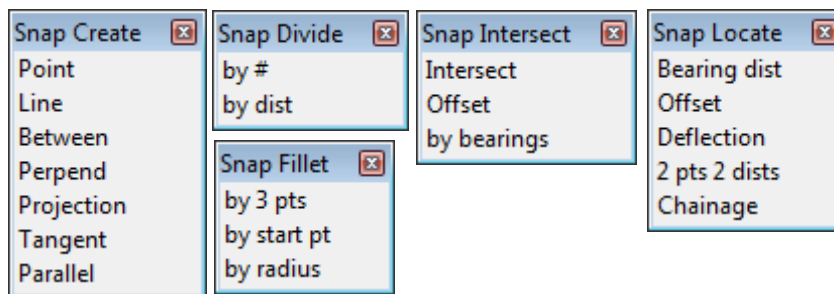
Position of menu: Utilities =>Snaps =>Cogo

The **Snaps cogo** options are used to create the point required for any **12d** Model select operation. For example, selecting the next point in **append** in an editor. The result of the **Snaps cogo** is returned to the **select operation** as the selected point.

Walking right on the **cogo** option brings up the **Snaps cogo** menu



and the walk-right menus for each of the **Snaps cogo** menu items are



Note on Combining Snaps Cogos

When using a snaps cogo option, another select is often required and it is permissible to use other snaps cogo option to create the point for that select.

For example, the required point is the point halfway between two other points **dropped perpendicularly** onto an arc.

Such a combined result can be achieved using **Snaps cogo** however the order of selecting the **snaps cogo** options may at first seem to be the reverse of what is required.

For the above example, the snaps cogo **perpen** must be selected before the **between** option.

This is because when the **perpen** snap cogo option is selected, it asks the user to **select** the point to drop and it is then that the snaps cogo **between** option is used to find the midpoint of two selected point. The result of the **between** then becomes the point to drop for the **perpen**.

If the **between** option had been selected first, the resultant midpoint would have been returned as the selected point and that select completed.

Select accept button

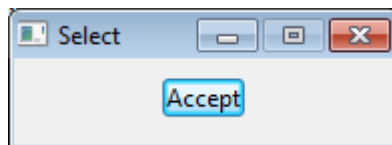
Position of menu: Utilities =>Snaps =>Select accept button

Instead of selecting (MB) to accept a string selection, you can click (LB) on the **Accept** button.

This option is usually used for tablet computers without a middle mouse button.

LB = the left mouse button

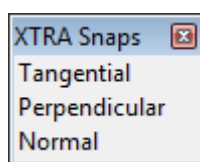
MB = the middle mouse button



Snaps New

Position of menu: Utilities => Snaps => New

The XTRA Snaps menu is currently under development.

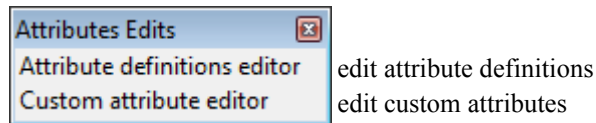


Attributes

Position of menu: Utilities =>Attributes

This section of documentation is a work in progress and will be updated in subsequent releases.

The **Attributes** walk-right menu is:

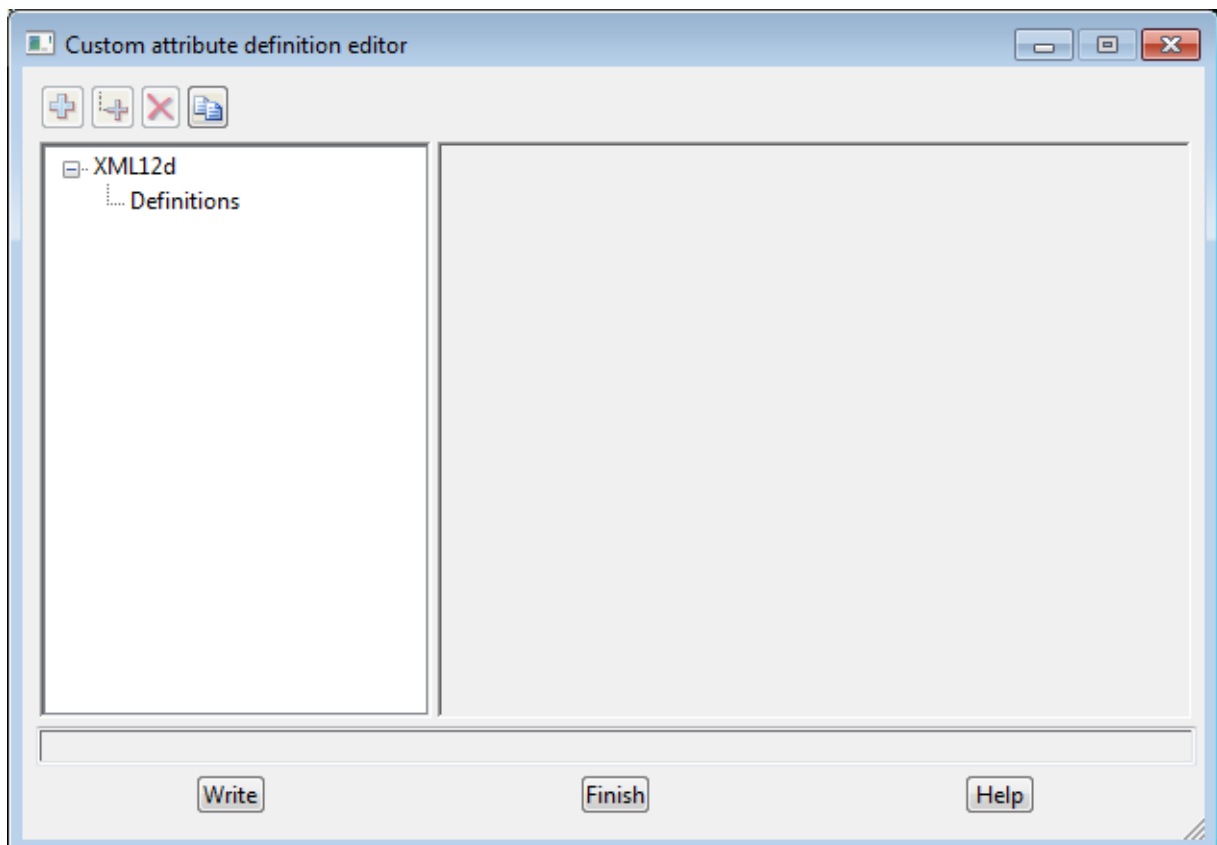


For the option *Attribute definitions editor*, go to [Attribute Definitions Editor](#)
Custom attribute editor [Custom Attribute Editor](#)

Attribute Definitions Editor

Position of option on menu: Utilities =>Attributes =>Attributes Edits =>Attribute definitions editor

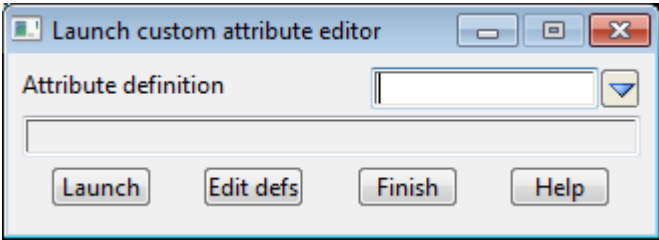
This section of documentation is a work in progress and will be updated in subsequent releases.



Custom Attribute Editor

Position of option on menu: Utilities =>Attributes =>Attributes Edits =>Custom attribute editor

This section of documentation is a work in progress and will be updated in subsequent releases.



Chains

Position of menu: Utilities => Chains

12d Model has many different built in objects, from simple strings, through to complex super alignments with computators, drainage networks, super tins and apply many functions.

However as complex as these objects are, no software can foresee every situation met in surveying and civil design, both now and into the future.

12d Model provides two tools to help users extend the supplied **12d Model** functionality and automate simple and complex tasks within a company. They are the

- (a) the **12d Model Macro Language** - a full programming language so users can write complex tailored options and functions

and

- (b) **chains**.

Chains are a relative simple method for users to be able to combine and run existing **12d Model** functions and options

In its simplest form, a **Chain** is a list of items that are run in the order that they appear in the list. Things that can be run in a **Chain** include:

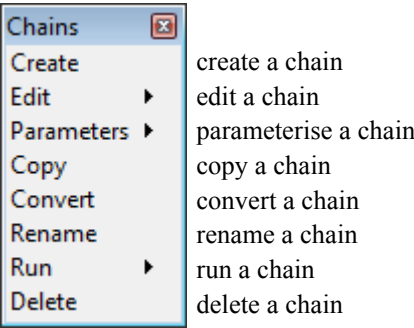
- (a) **12d Model** functions
- (b) other chains
- (c) super alignment resolves
- (d) plot parameter files
- (e) most **12d Model** options
- (f) most screen layout files
- (g) macro that don't have a panel
- (h) an external command line
- (i) some special hardwired chain commands such as delete a tin, delete all tins, delete a model, delete all models, clean a model, delete a file, compare files, redraw all views, comments

For more sophisticated applications, chains can also

- (a) create **12d Model** views and add and remove models from the views
- (b) include flow control using tests, labels and go to's
- (c) be parametrised and run with user supplied parameter values

So a **chain** can be as simple as running a list of functions. or as complex and making decisions inside the chain, thus creating user defined **Super Objects**.

The Chains walk-right menu is

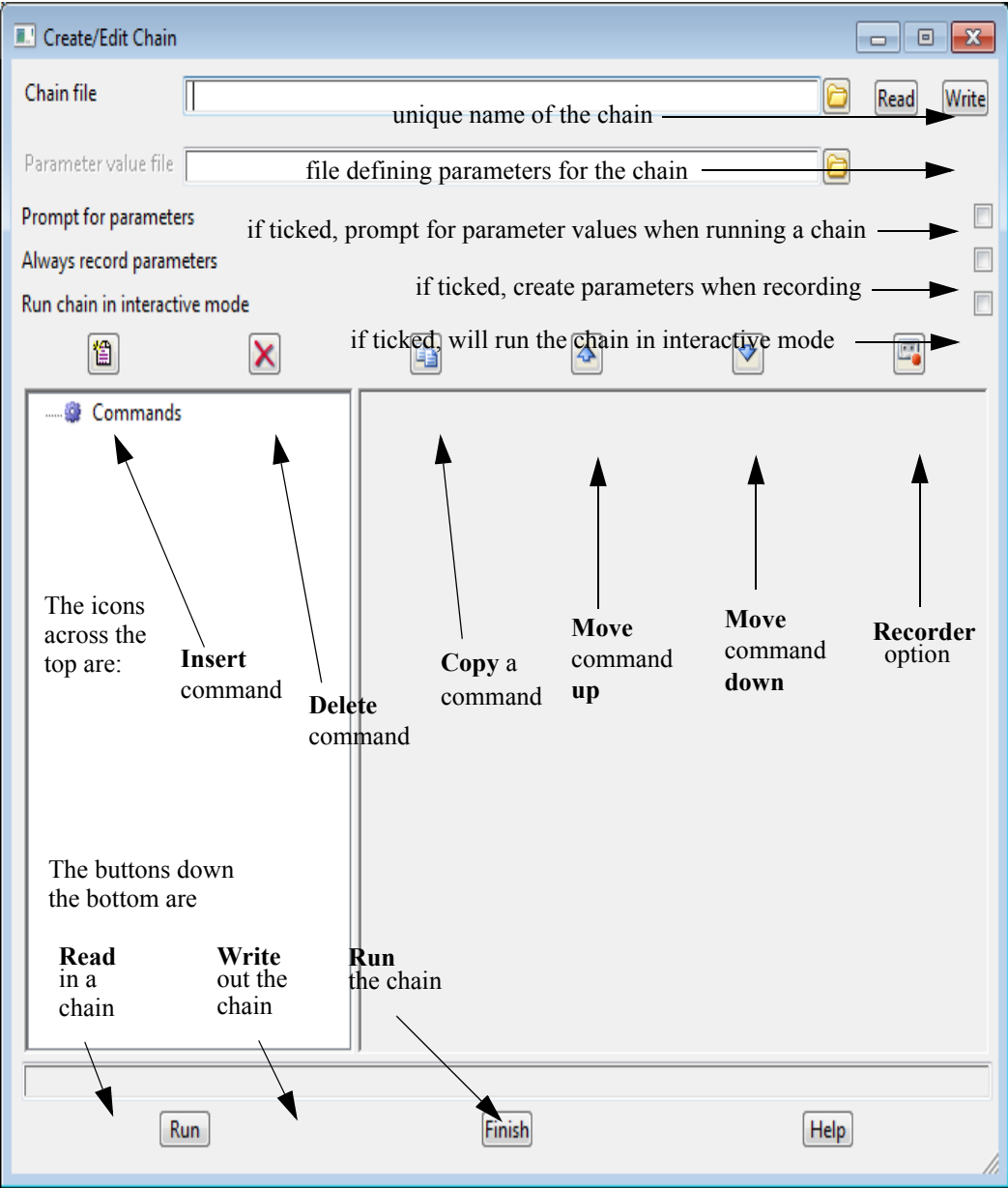


For the option <i>Create</i> , go to	Create/Edit a Chain
<i>Edit</i>	Edit a Chain
<i>Parameters</i>	Parameters
<i>Copy</i>	Copy a Chain
<i>Convert</i>	Chain Conversion
<i>Rename</i>	Rename a Chain
<i>Run</i>	Run a Chain
<i>Delete</i>	Delete a Chain

Create/Edit a Chain

Position of option on menu: Utilities =>Chains =>Create

Selecting **Create** brings up the **Create/Edit Chain** panel which is used to create, edit and run chains.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Chain file <i>name of the file for the chain.</i> <i>To create a new chain, a unique name is typed into the Chain file box and the Write button clicked.</i> <i>To edit an existing chain, enter the name of the existing chain into the Chain file box and then click on the Read button.</i> <i>The chain is then built up by inserting commands using the Insert icon.</i>	file box	blank	existing chains
Parameter value file <i>if non blank, the file to use for mapping parameters and values.</i> <i>If blank, no parameter file is used</i> <i>For more information, go to the section Parameters.</i>	file box	blank	existing parameter files

Prompt for parameters tick box
if ticked, when a chain is run and it has parameters, the table of parameters is displayed on the screen

before running the chain so that any required modifications can be made before the chain is run. If not ticked, any values for parameters are taken from the parameter value file.

Always record parameters tick box

When ticked on, if the user records a panel / option, the recorder will attempt to record parameters.

Run chain in interactive mode tick box

*if ticked, will run the chain in interactive mode (see [Interactive Mode](#))
if not ticked, the chain will run normally*

Insert icon

inserts commands into the chain. For more information on the commands, go to [Inserting a Command](#)

Delete icon

deletes the highlighted command in the chain

Copy icon

copies the highlighted command in the chain to the bottom of the chain

Move up icon

move the highlighted command up one position in the chain

Move down icon

move the highlighted command down one position in the chain

Record icon

record one or more options. For more information on Record, go to [Record Icon](#)

Read button

read in the given chain file

Write button

write out the information to the given chain file

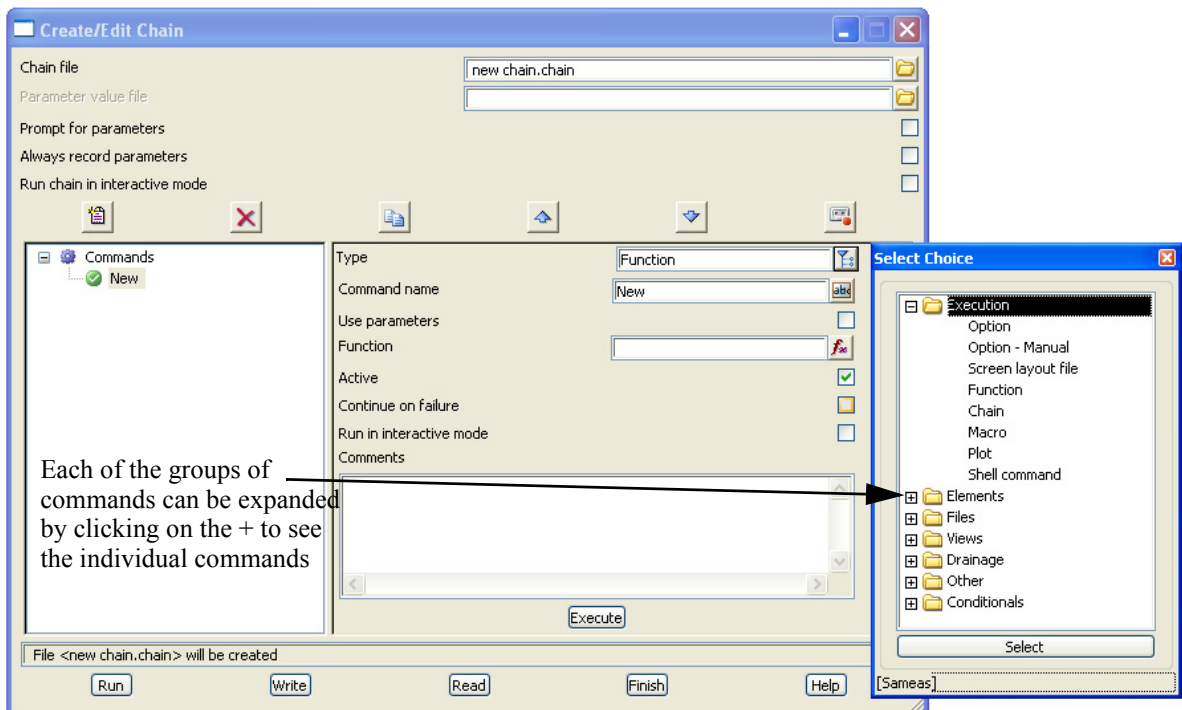
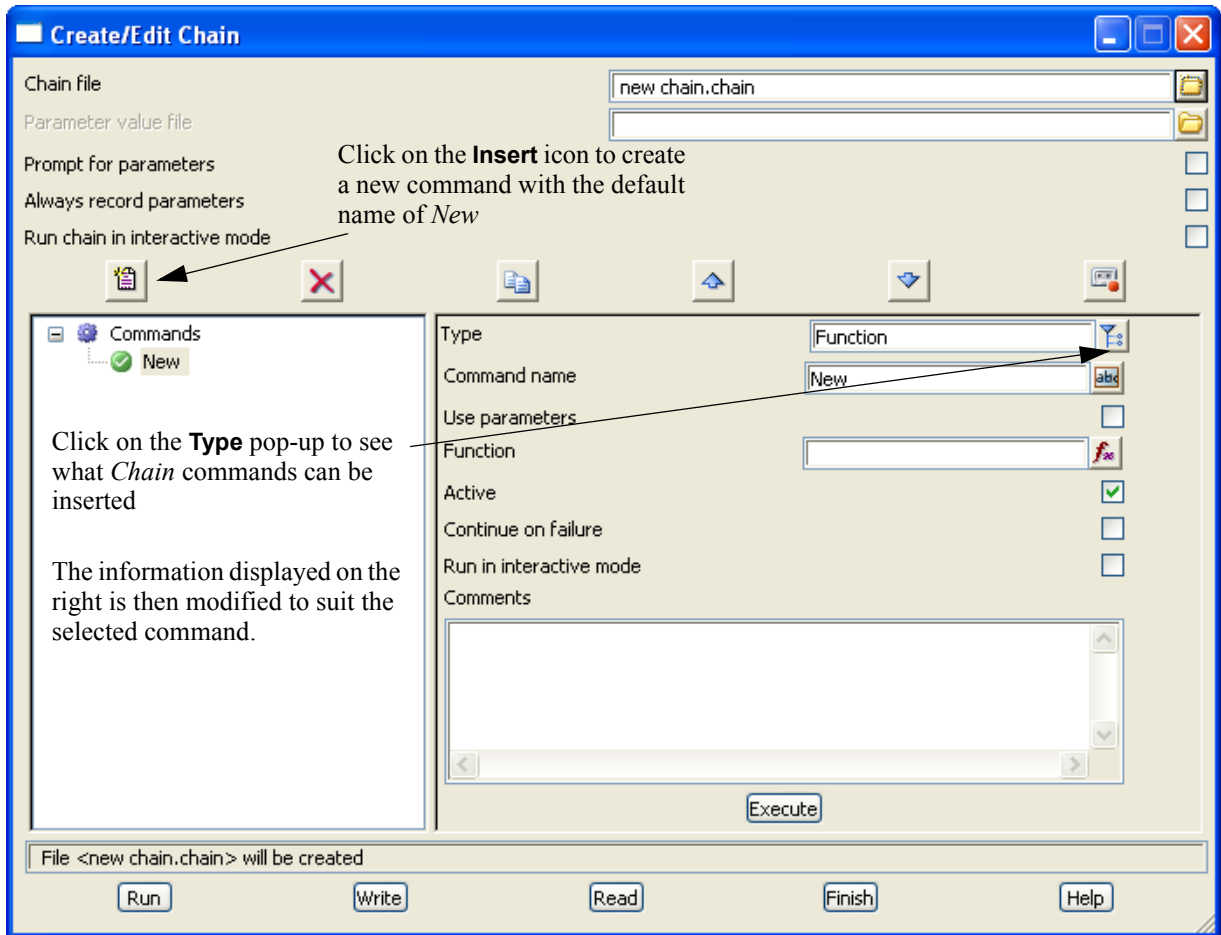
Run button

run the chain

Inserting a Command

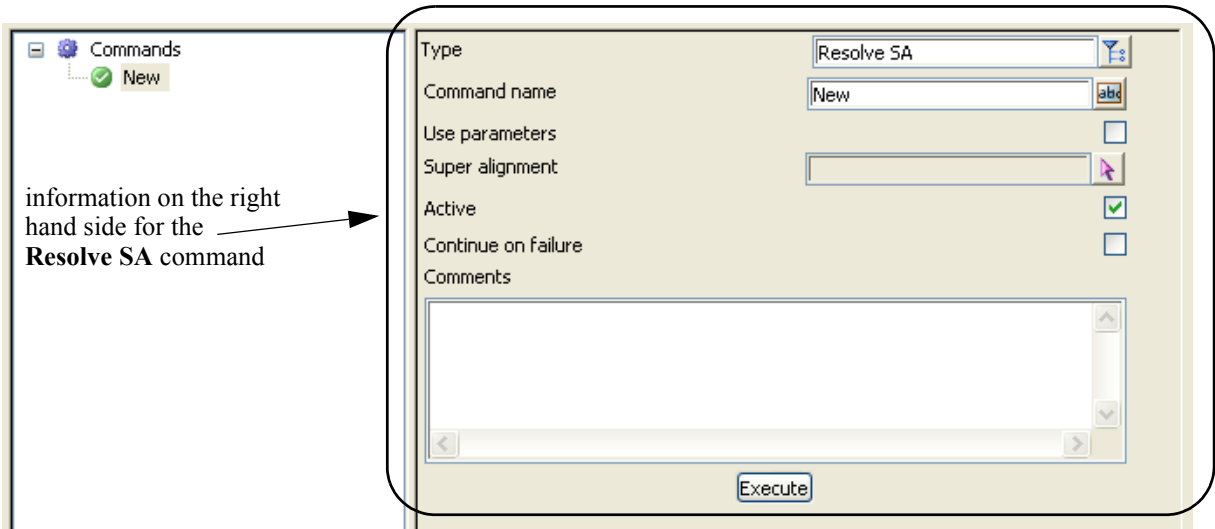
The chain is built up by *inserting commands* using the **Insert** icon.

Clicking on the **Insert** icon inserts a new command with the default name of **New** into the chain. The **Type** of the command is then selected on the right hand side of the panel. The specific information needed for defining that type of new command is then displayed on the right hand side of the panel.



Selecting a command will update the right hand side of the panel with information for that

particular command. For example, for the **Resolve SA** command:



Common Fields in Commands

The common fields used in the right hand side of a chain command.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Use parameters

*some chain commands also have **Use Parameters** tick. This can be turned on to allow the use of parameters within the command.*

Command name

each command is given a default Command name composed of the command and the extra information such as the name of the super alignment. The Command name does not have to be unique and can be changed at any time.

Active

*if ticked on then the command is run when the chain is run.
If not ticked, the command is not run.*

Continue on failure

*if ticked **on**, the chain will continue running if an error occurs with this command.
If not ticked, the chain will stop running if an error occurs in this command.*

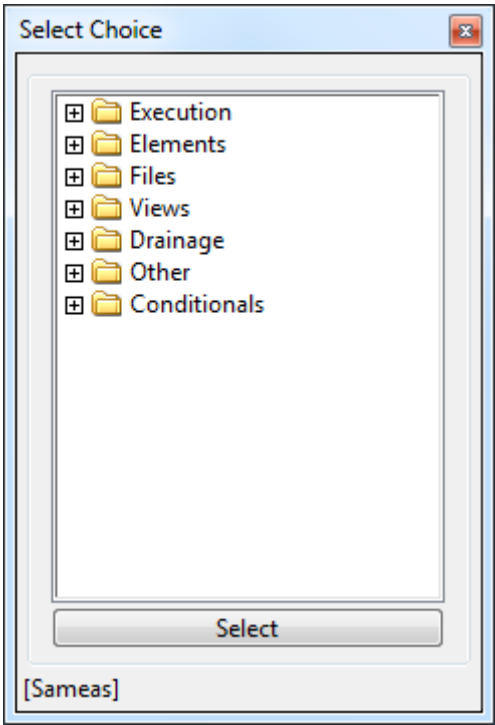
Comments

comments recorded for the options.

When a chain is running, messages and error messages are written to the **Output window**.

Important Note - each time a command is inserted or modified, the **Write** button must be clicked to write out the modified chain.

Types of Chain Commands



For the Chain commands under <i>Execution</i> , go to	Execution
<i>Elements</i>	Elements
<i>Files</i>	Files
<i>Views</i>	Views
<i>Drainage</i>	Drainage
<i>Other</i>	Other
<i>Conditionals</i>	Conditionals

Execution

Option

run a **12d Model** option. Note - not all options can be run in a chain. For more information, go to [Option](#).

Option - Manual

For more information, go to [Option - Manual](#).

Screen layout file

run an existing screen layout file. Note - not all slf's can be run.
For more information, go to [Screen Layout File](#).

Function

recalc a 12d function
For more information, go to [Function](#).

Chain

run an existing chain

Macro

run a **12d Model** macro that doesn't have a panel

For more information, go to [Macro](#).

Plot

run a plot parameter file.

For more information, go to [Plot](#).

Shell command

run an external program, Microsoft command line etc.

Elements

Resolve SA

resolve a selected super alignment

Delete string

delete the selected string

Clean model

clean the selected model

Create model

creates a new model of the specified name

Delete tin

delete the selected tin

Delete model

delete the selected model

Delete all tins

delete all tins in the project

Delete all models

delete all models in the project

Delete all templates

delete all templates in the project

Delete all empty models

delete all empty models in the project

Files

Delete file

deletes the specified file

Compare

compare two text files

Views

Redraw all views

redraws all views

Fit view

do a fit on a view

Create view

creates a new view of the specified name

Delete view

deletes the view of the specified name

Add model to view

adds the specified model to the specified view

Remove model from view

removes the specified model from the specified view

Remove all from view

removes all models from the specified view

Drainage**Drainage analysis**

runs drainage analysis on the specified model

Drainage analysis- dynamic

runs dynamic drainage analysis on the specified model

Set pit details

sets the pit details for the specified model

Regrade pipes

regrades the pipes in the specified model

Other**Comment**

creates a cosmetic comment - no action is performed

Halt

stop running the chain

Prompt

For more information, go to [Prompt](#).

Conditionals**Label**

create a labelled line in the chain

Goto

jump to a labelled line

If Model Is Empty

test if a model is empty

If Model Exists

test if a model exists

If Tin Exists

test if a tin exists

If File Exists

test if a file exists

If View Exists

test if a view exists

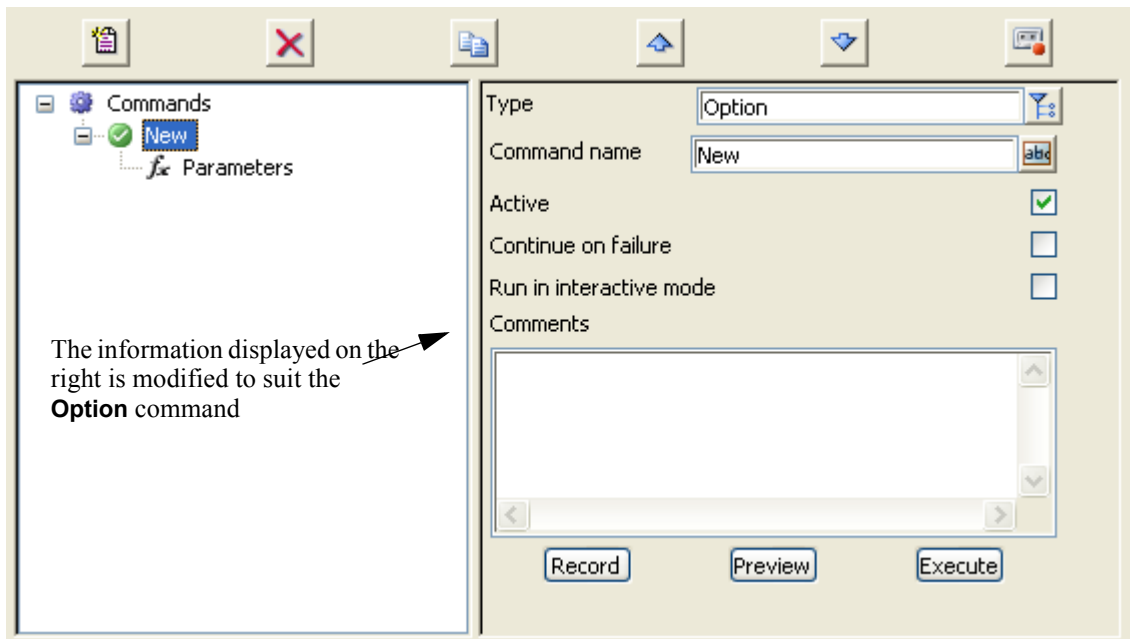
If Parameter Equals

test if a parameter has a certain value

Additional Information on Some Chain Commands

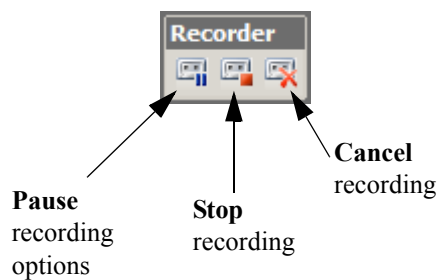
Option

Selecting the **Option** command modifies the information on the right side of the panel to suit the **Option** command. This includes buttons to record a panel, preview or execute a panel that has already been recorded.

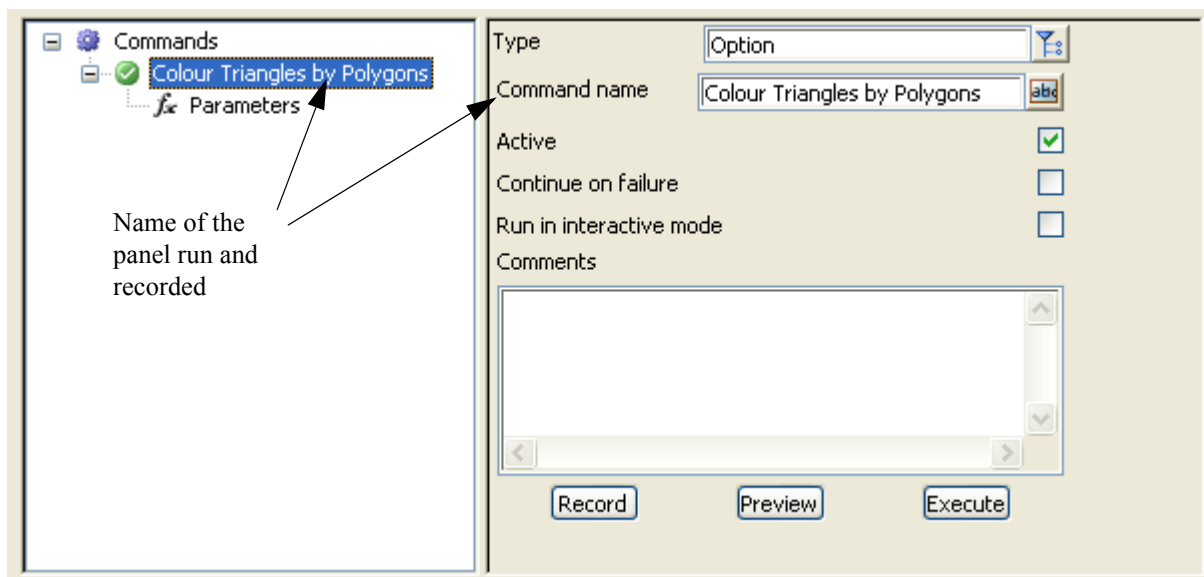


Clicking on the **Record** button starts a “one option” record cycle.

The **Recorder** panel is placed on the screen and you **run** the **12d Model** panel option that you wish to record (note - macros and CAD commands cannot be recorded).



Once the option is run, the **Recorder** panel is automatically removed and the **Option** in the **Create/Edit Chain** panel is given the name of the **12d Model** panel that was run.



Click on the **Write** button at the bottom of the **Create/Edit Chain** panel to update the chain information.

Important Note - the **Preview** button brings up the recorded panel with all the information filled in **that can be validated by the panel fields**. So sometimes **Preview** can not display the recorded information. Also **Preview** is for display only and can't be used to modify **Option**.

Important Note - To quickly change the values in a recorded option, select **Preview** to bring up the recorded panel with all the information filled in. Then hit the **Record** button on the **Option** command, make the changes you want and run the panel. This will record the new information in place of the existing information.

Option Parameters

To define or modify parameters used in an option, click on the **+** beside the option name in the chain (or double click on the option name) and the Parameters node for the option will be displayed.

For more details on option parameters, go to [Modifying / Creating parameters](#).

Special Notes on Recording Options

1. Use Unique String Names for String Selects

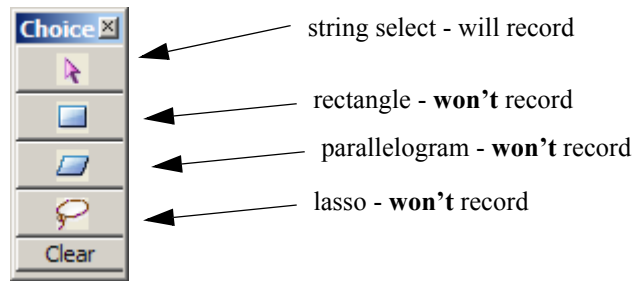
String selects on panels record the id and the name of the string, and the model id and the name of the model containing the string.

When the option is run in the chain, the string is first searched for using the model and string id's but if that fails then a string of the recorded name is searched for in the recorded model name.

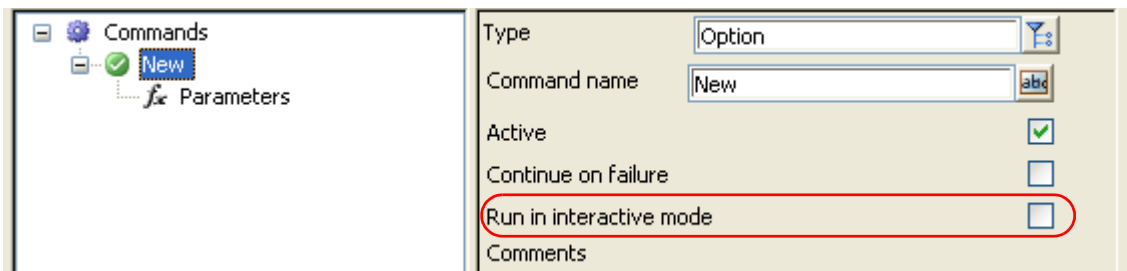
If the string name is unique in the model then the correct string will be selected. If there is more than one string with the same name in the model, then the first string of that name that is found will be used.

2. Polygon Selects

String selects can be recorded for a *Polygon box* but *Rectangle*, *Parallelogram* or *Lasso* can not be recorded.



Run in Interactive mode

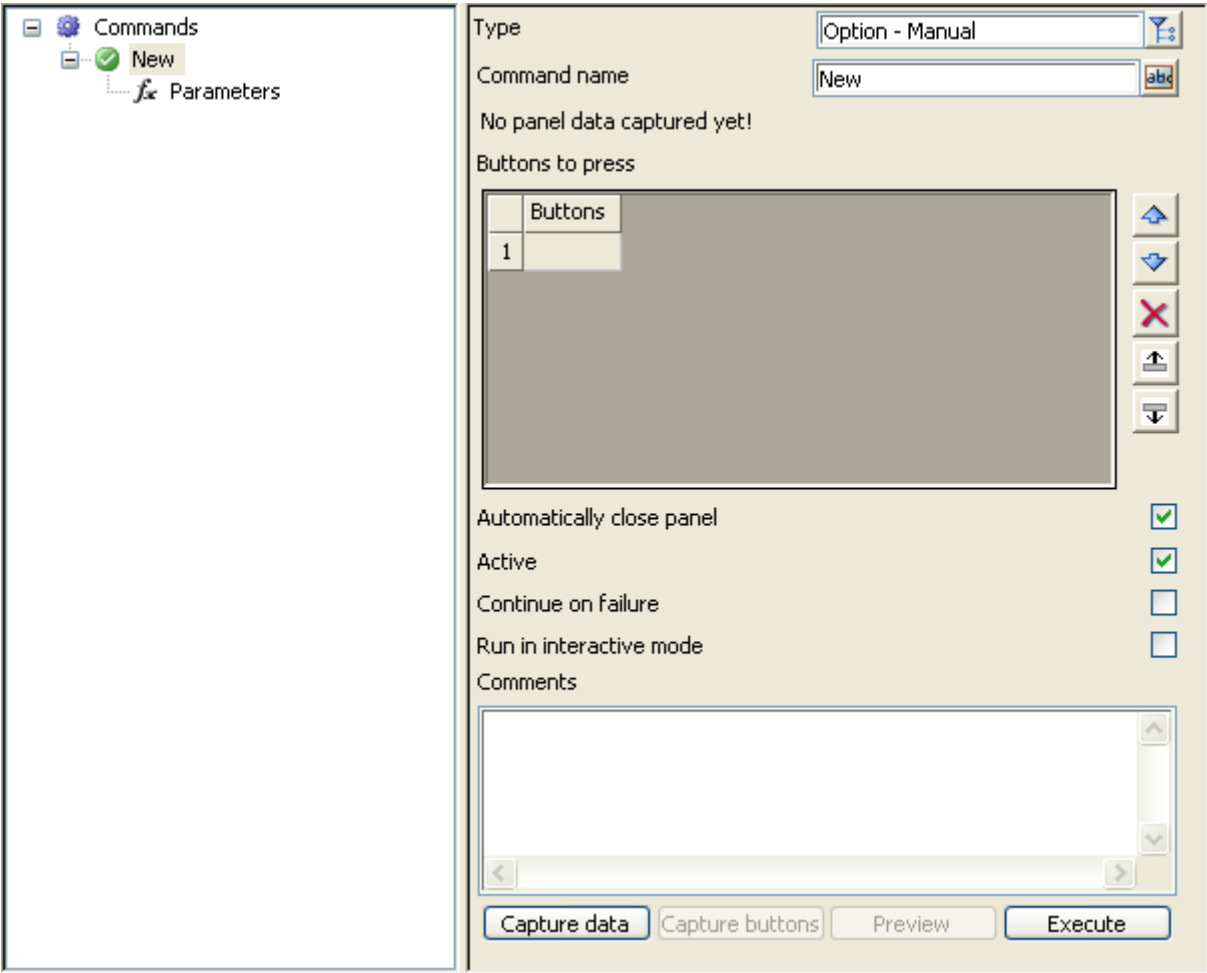


Run in interactive mode tick box

if ticked, when the command runs, the panel will be displayed. All field data may be changed at this point. It is the responsibility of the user to run the option as required. Once the panel is closed, the chain will continue.

if not ticked, the command will run as normal without user interaction.

Option - Manual



This command allows you to manually record an option for playback in a chain by recording it in two parts:

- 1. The data to use
- 2. The buttons to press and the order they should be pressed

This is useful for more complex panels or panels that require multiple button presses. It may also be useful for macro panels.

The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Buttons to press

Displays the list of buttons on the recorded panel

Automatically close panel tick box

*if ticked, the panel will be automatically closed after all buttons are pressed.
if not ticked, the panel will not be automatically closed. If a finish button has not been pressed, the panel will remain open after the command is finished.*

Run in interactive mode tick box

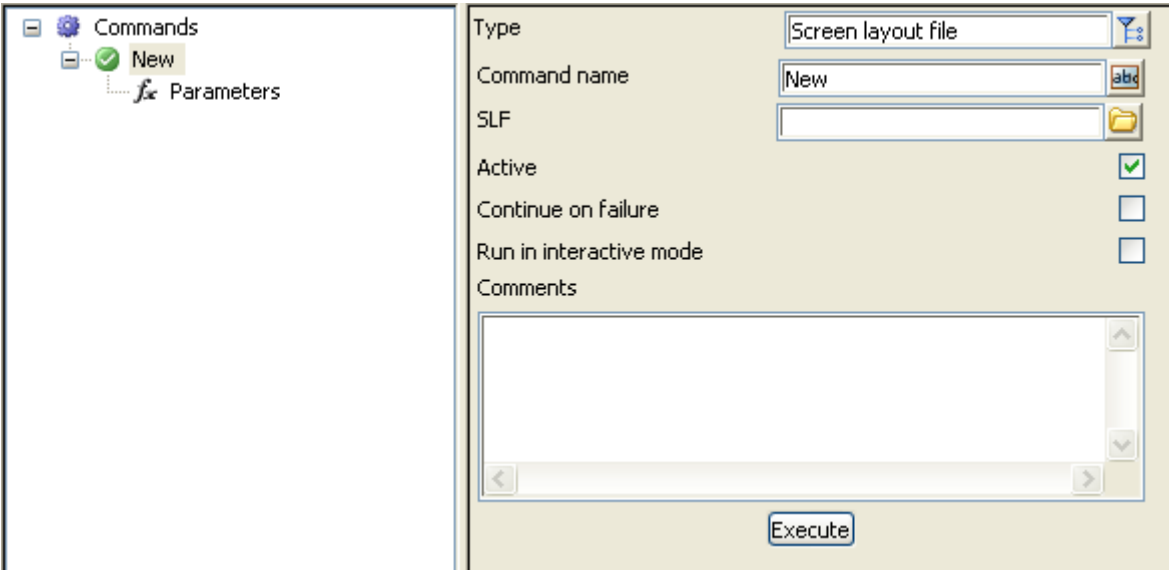
*if ticked, when the command is run, the recorded panel will be displayed. No buttons will be pressed. When the panel is closed, the chain will continue.
If not ticked, the panel will not be displayed and the command will run as normal.*

Capture data button
begins a panel capture. A panel is captured by selecting it.

Capture buttons button
begins capturing the buttons on a panel. The data for the panel must first be selected.

Screen Layout File

The **screen layout file** command displays the first panel stored in an SLF file and runs it by pressing its designated '**run button**'.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

SLF <i>the slf file to run</i>	file		
------------------------------------------	------	--	--

Run in interactive mode <i>if ticked, when the command runs, the panel will be displayed. All field data may be changed at this point. It is the responsibility of the user to run the option as required. Once the panel is closed, the chain will continue.</i>	tick box		
-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	----------	--	--

Function

This command recalcs a pre-existing function.

Commands
New

TypeFunction

Command nameNew

Use parameters☐

Function

Active☒

Continue on failure☐

Run in interactive mode☐

Comments

Execute

If **use parameters** is ticked, the **function parameter** field is displayed. This requires the selection of a function parameter. See [Parameters](#) for more details.

Use parameters☒

Function parameter

If **use parameters** is not ticked, **function** field is displayed. This requires the selection of an existing function to recalc.

Use parameters☐

Function

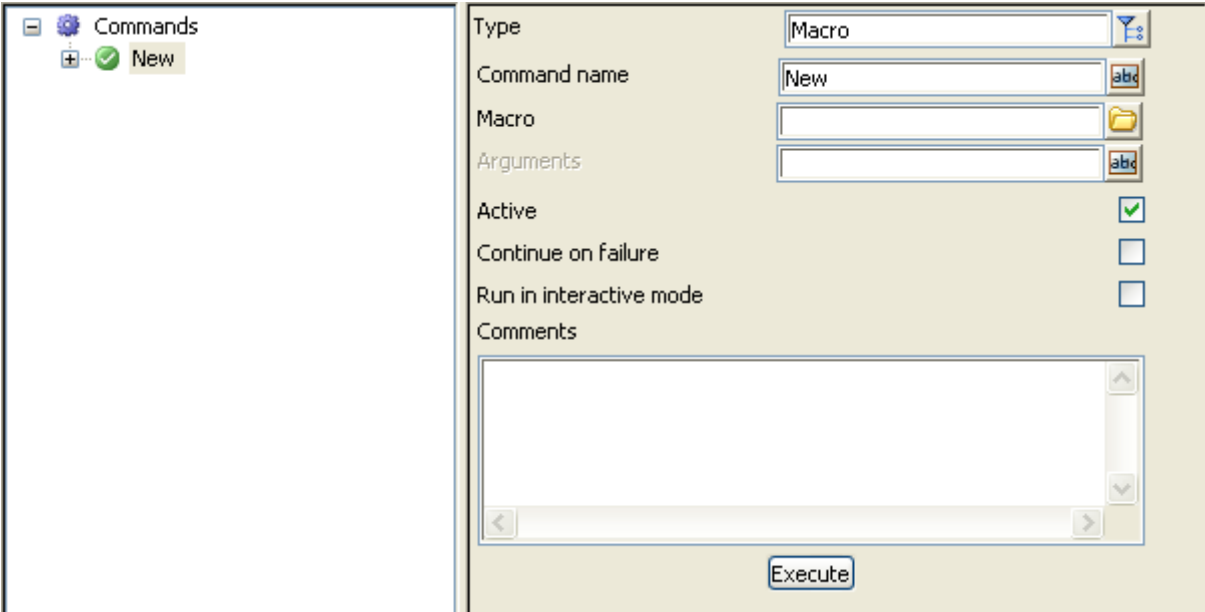
Run in interactive mode tick box

if ticked, the function will not be recalcd. Instead, the editor for the function will be displayed (if one is available). It is the users responsibility to recalcd the function from the editor. Once the editor is closed, the chain will continue as normal.

if not ticked, the function will be recalcd as normal.

Macro

This command runs a macro with a set of optional arguments



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Macro <i>the macro to run</i>	file		
Arguments <i>an optional set of arguments to pass to the macro</i>	input		
Run in interactive mode <i>if the macro creates a panel, it must be run in interactive mode. if ticked, the macro will run in interactive mode and any panels will be displayed. If it is not a panel macro, the macro will run as normal. if not ticked, the macro will run as normal. If the macro creates a panel, the command will generate an error.</i>	tick box		

Prompt

The prompt command is used to display a user defined prompt or panel, with user defined text, optional widgets and buttons. Each button assigns a value to a parameter, which may be used later in the chain to provide flow control or change data.

Commands

New

Type

Prompt

Command name

New

Prompt message

Parameter for result

Widgets to display

	Name	Parameter	Mode	Optional?
1				

Buttons to display

	Button	Value
1		

Active☒

Continue on failure☐

Comments

Execute

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Prompt message <i>the message to display</i>			
--------------------------------------------------------	--	--	--

Parameter result <i>the parameter to store the result in</i>			
------------------------------------------------------------------------	--	--	--

Widgets to display <i>An optional list of widgets to display on the panel, for capturing more information. The widget must be stored in an existing parameter, defined in the chain's PVF file. The type of parameter will determine the type of widget displayed.</i>			
----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--	--	--

Name

the name of the widget

Parameter

the parameter that the widget is created for and will set once the prompt is closed

Mode**Optional?**

*if yes, the widget will be optional and the user will not need to fill it in when the prompt is displayed.
if no or blank, the widget will not be optional and the user will be required to fill in the widget.*

Buttons to display

a set of buttons to display on the panel, each with a name and the value

Name

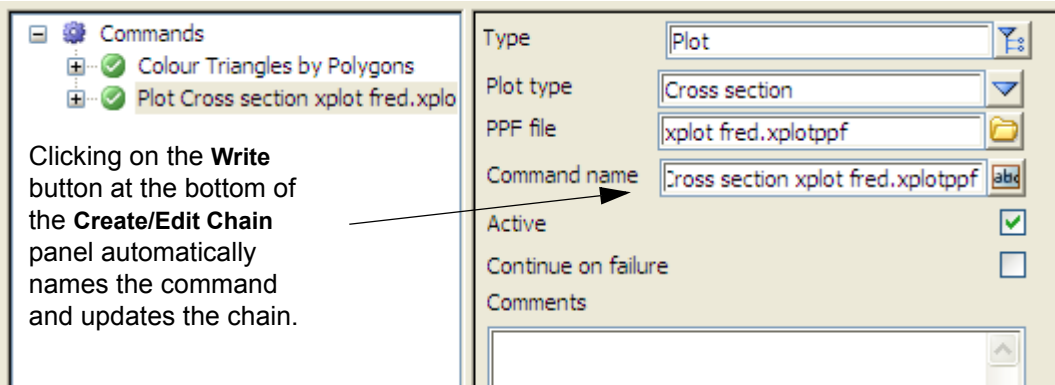
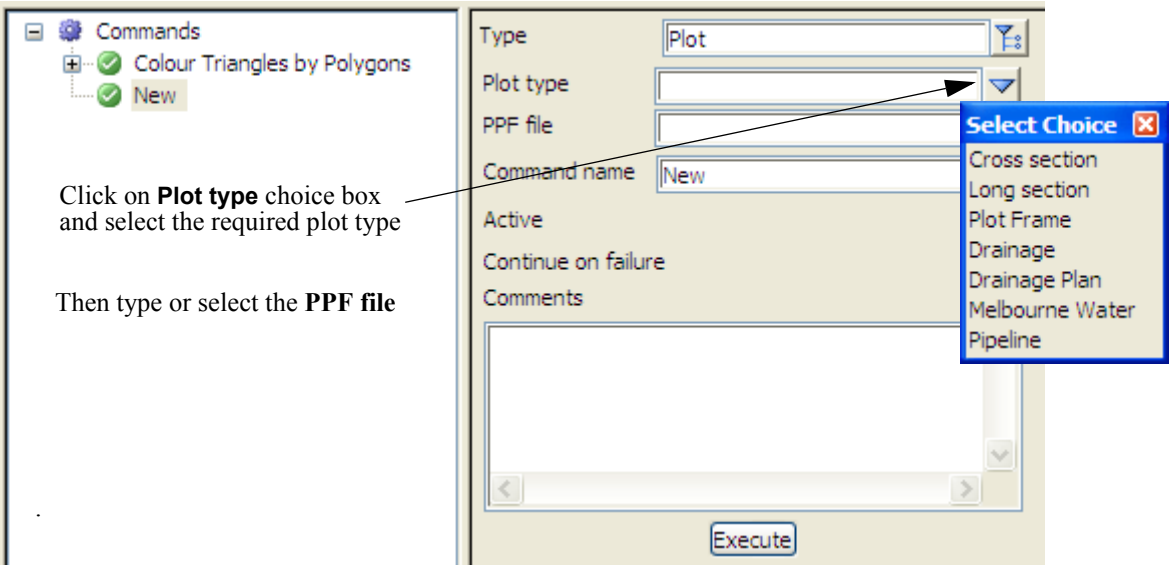
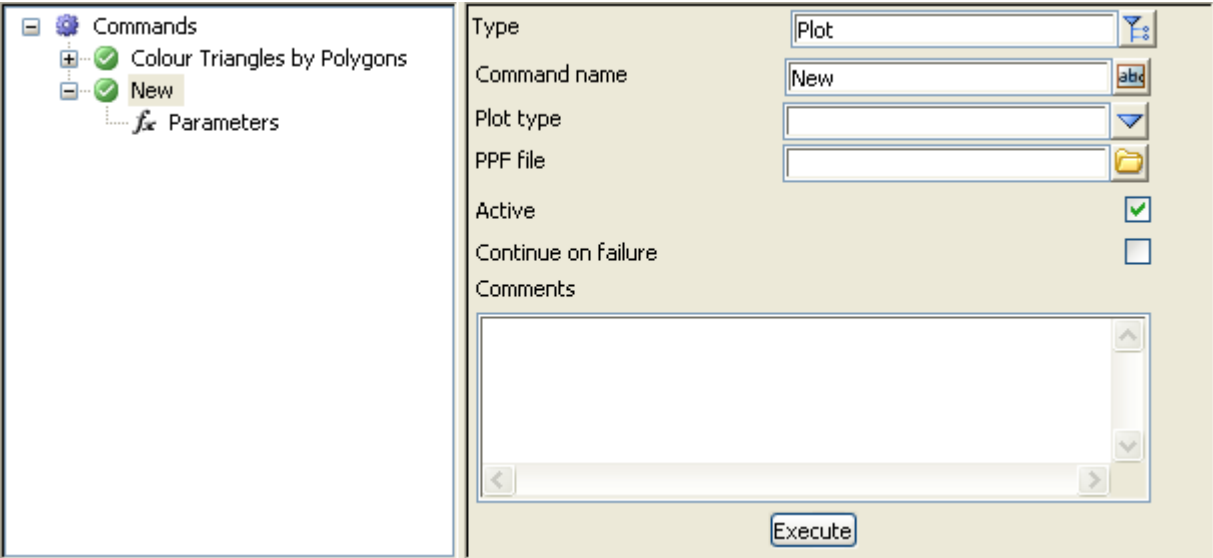
the name of the button

Value

the value to assign to the prompt parameter

Plot

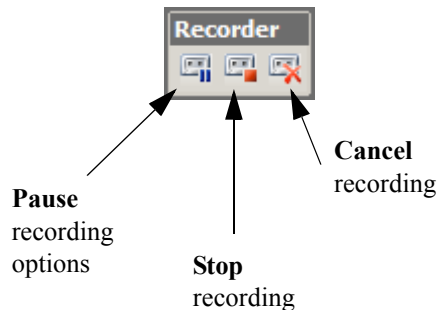
Selecting the **Plot** command modifies the information on the right side of the panel to suit the **Plot** command.



Record Icon

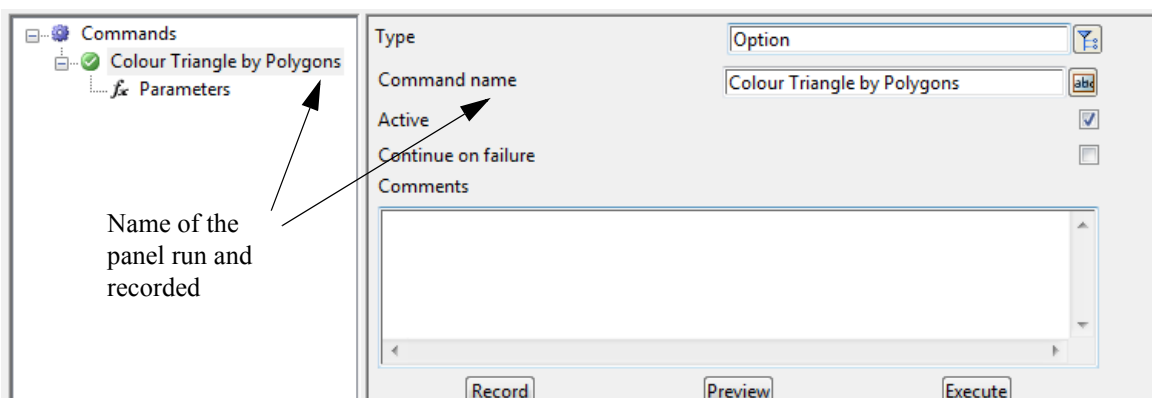
The **Record** option is like the **Macro** option in Word – it records the running of one or more **12d Model** panel options so that they can be replayed. Note that it **can not** record **12d** Macros or CAD commands.

Clicking on the **Record** icon removes the **Create/Edit Chain** panel and brings up the **Recorder** toolbar with icons to **Pause**, **Stop** and **Cancel** the recording.



Record is already recording and you simply **run** the **12d Model** panel options that you wish to record until you hit the **Stop** icon. The **Recorder** panel is then removed and the **Create/Edit Chain** panel returns to the screen with an **Option** command added to the chain *for each option that was recorded*.

Each recorded option is automatically given the name of the **12d Model** panel. The name can be modified by clicking on the command in **Create/Edit Chain** panel and changing the **Command name**. For more information on the command **Option**, go to [Option](#).



Click on the **Write** button at the bottom of the **Create/Edit Chain** panel to update the chain information.

Important Note - the **Preview** button brings up the recorded panel with all the information filled in **that can be validated by the panel fields**. So sometimes **Preview** can not display the recorded information. Also **Preview** is for display only and can't be used to modify **Option**.

Important Note - To quickly change the values in a recorded option, select **Preview** to bring up the recorded panel with all the information filled in. Then hit the **Record** button on the **Option** command, make the changes you want and run the panel. This will record the new information in place of the existing information.

Option Parameters

To define or modify parameters used in an option, click on the + beside the option name in the chain (or double click on the option name) and the Parameters node for the option will be displayed.

For more details on option parameters, go to [Modifying / Creating parameters](#)

Special Notes on Recording Options

1. Use Unique String Names for String Selects

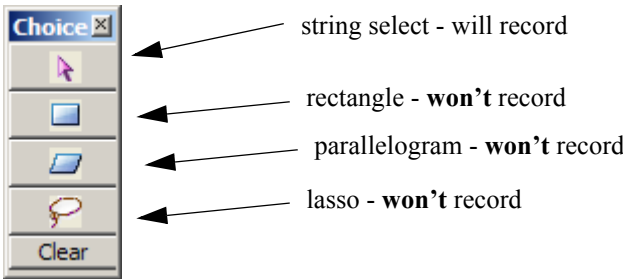
String selects on panels record the id and the name of the string, and the model id and the name of the model containing the string.

When the option is run in the chain, the string is first searched for using the model and string id's but if that fails then a string of the recorded name is searched for in the recorded model name.

If the string name is unique in the model then the correct string will be selected. If there is more than one string with the same name in the model, then the first string of that name that is found will be used.

2. Polygon Selects

String selects can be recorded for a *Polygon box* but *Rectangle*, *Parallelogram* or *Lasso* can not be recorded.



Important Notes

1. Macros or CAD commands **can not** be recorded, and not all 12d panel options can be recorded. For example, if a screen layout file can not be created for an option, then it can't be recorded.
2. When recording, the **12d Model** panel option must be filled in and run. This may restrict what can be done.

Saving a Chain

After each item is added to the chain, click on **Write** to save the chain.

Running a Chain

There is a **Run** button on the **Create/Edit Chain** panel to run a chain.

However a chain can also be run simply by clicking on the **name** of the chain in the list created by walking right on

Recalc =>Run chain

Similarly editing an existing chain can easily be done by clicking on the name of the chain in the list created by walking right on

Recalc =>Edit chain

This brings up the **Create/Edit Chain** panel with the selected chain in the editor.

Interactive Mode

Chains now support an interactive mode, meaning that the user is allowed to influence the flow of commands or the data input into the chain.

There are two types of interactive mode: **Chain Interactive Mode** and **Command Interactive Mode**:

- **Chain Interactive Mode:**
This is toggled via the 'Run chain in interactive mode tick box' on the chain editor panel. When the chain is run, the interactive toolbar will be displayed and the chain will pause for user input. (See [Interactive Toolbar](#) for more details).
- **Command Interactive Mode:**
Several commands now support interactive mode, meaning that instead of running as normal, they will attempt to pause the chain and wait for further input from the user. This applies in the case of panels, functions and macros. In these cases, any panels associated with them, and the data they were recorded with, will be displayed and will wait for user input before continuing.






Interactive Toolbar

When running a chain in **interactive mode**, the chain pauses and waits for user input between each chain command.

The following Interactive Toolbar is seen when interactive mode is running:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Choice box	choice box		
 allows you to choose which command to run next			
Play button	button		
 plays the next command			
Play + i button	button		
 Plays the next command in an interactive way (See Interactive Commands)			
Stop button	button		
 stops the chain			
Fast forward button	button		
 runs the chain to the end			
Fx	button		



Edits the parameters for the current function

Interactive Commands

Running a command interactively will do one of several things, depending on the type of command:

1. If it is a recorded option, the panel will be presented to the user. When the panel is closed, the chain will move to the next command.
2. If it is a function command, the chain will attempt to open the function editor. When the function is closed, the chain will move to the next command.

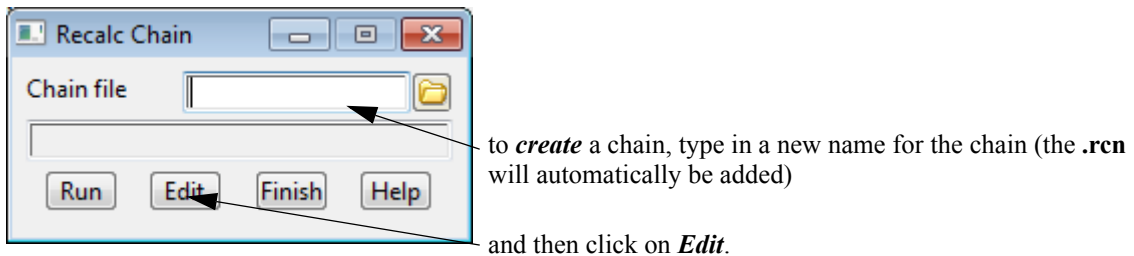
Edit a Chain

Position of option on menu: Utilities =>Chains =>Edit

The **Edit** walk-right menu displays all the chains in the project and double clicking on a chain in the list will bring up the **Create/Edit Chain** panel (see [Create/Edit a Chain](#) for more information).

The Recalc Chain Panel

The **Recalc Chain** panel comes up if you click on **Utilities =>Chains =>Edit** without walking right or **Utilities =>Recalc =>Edit chain** without walking right.



Parameters

The basic usage of chains allows you to record and playback a set of static actions. In many cases, it may make sense to use the same chains across different sets of data. In these cases, parameters can be used to change the values that were used in each command or option that was recorded.

For example, you may wish to run an option such as vehicle path across many different strings. You can set the alignment string to be used as a parameter and change it each time you run the chain.

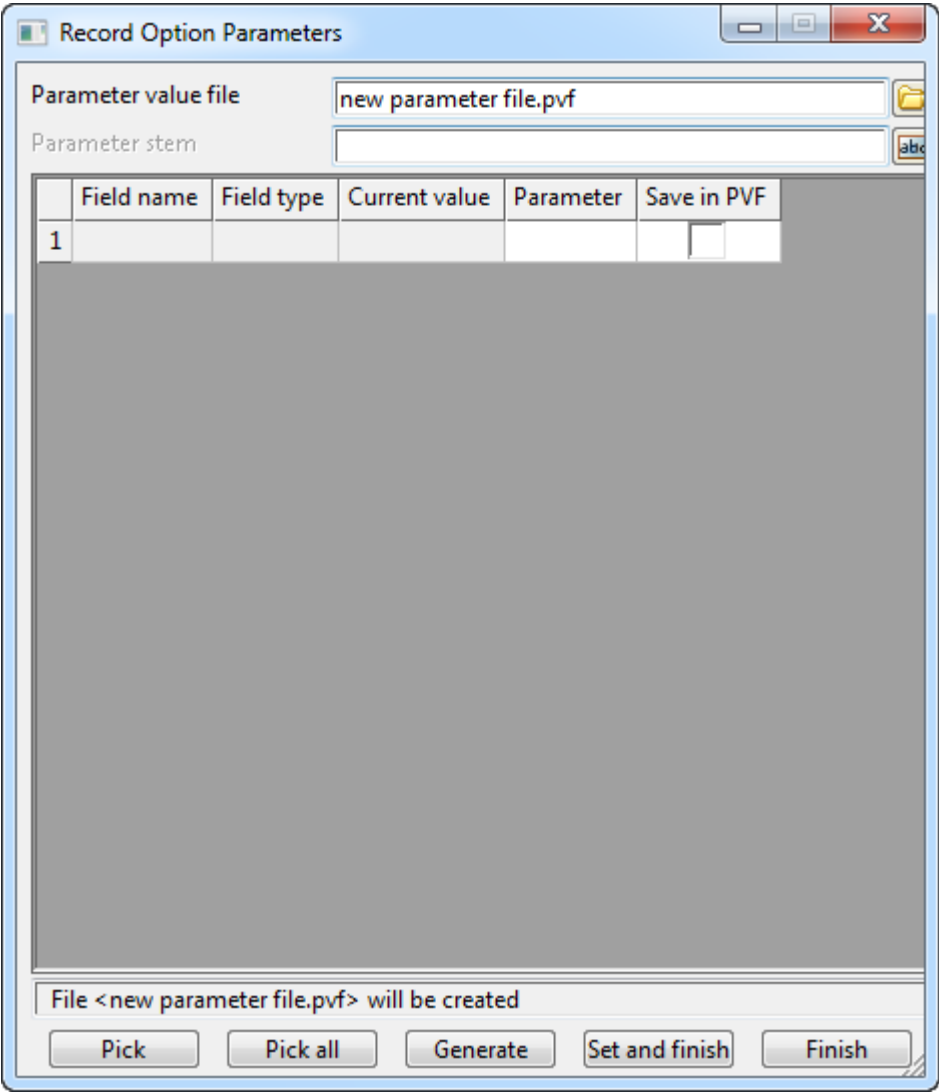
Parameters can be used by most chain commands. Which parameter you wish to use can be defined via the chain parameter. The actual values used are stored in separate files with the extension PVF, or parameter value file. The values of the parameters to be used can be created/edited within the parameter editor.

Option Parameters

Parameters for **Option** Commands can either be defined when recording the option or afterwards, in the chain editor. Parameters within options are defined as *Parameter Mappings*. A parameter mapping maps from a specific field to a named parameter. When an option command runs and fills out a particular field, it will look for the appropriate parameter mapping to use.

Recording parameters

To record parameters, make sure the **Always record parameters** tick is on before starting to record the option. After the option is recorded, the following panel will be displayed.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Field name

the name of the parameterised field. This is read only.

Field type

the type of the parameterised field. This is read only.

Current value

the current value used in the panel at time of recording. This is read only.

Parameter

the name of the parameter

Save in PVF

whether or not to save the Current Value field in the associated parameter value file

Pick

pick a field from the recorded panel to use as a parameter

Pick all

automatically pick all fields to be used as parameters

Generate

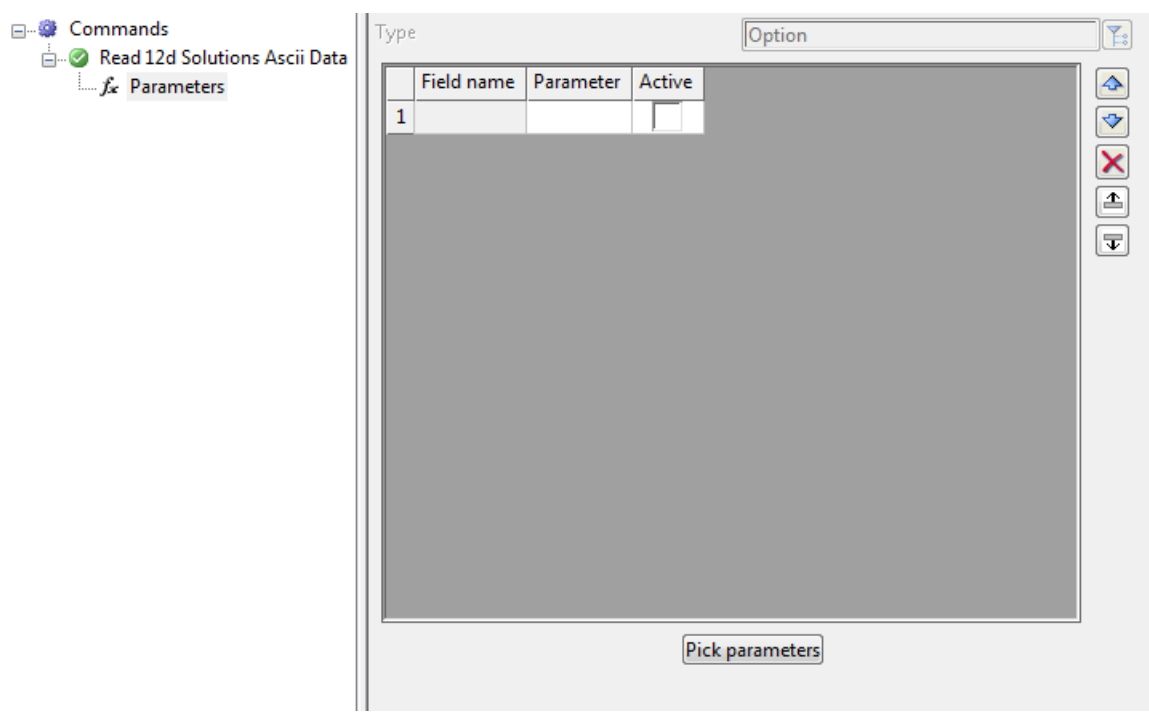
generate names for the parameters, using the optional parameter stem

Set and finish

save the recorded parameters and finish the panel

Modifying / Creating parameters

To create parameters without recording, or modify them, click on the Parameters under the expanded Option command in the chain editor. All the mappings from parameters to the fields they represent will be listed here.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Field name

the name of the field

Parameter

the name of the parameter

Active

*if ticked, the parameter mapping is used (i.e. active).
If not ticked, the parameter mapping is not used (i.e. not active).*

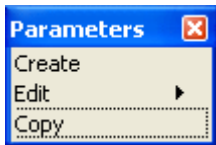
Pick Parameters

can be used to define more parameters for the option.

For information on Creating/Editing parameter files, please go to the next section [Creating/Editing Parameter Value Files](#)

Creating/Editing Parameter Value Files

Position of option on menu: Utilities =>Chains =>Parameters



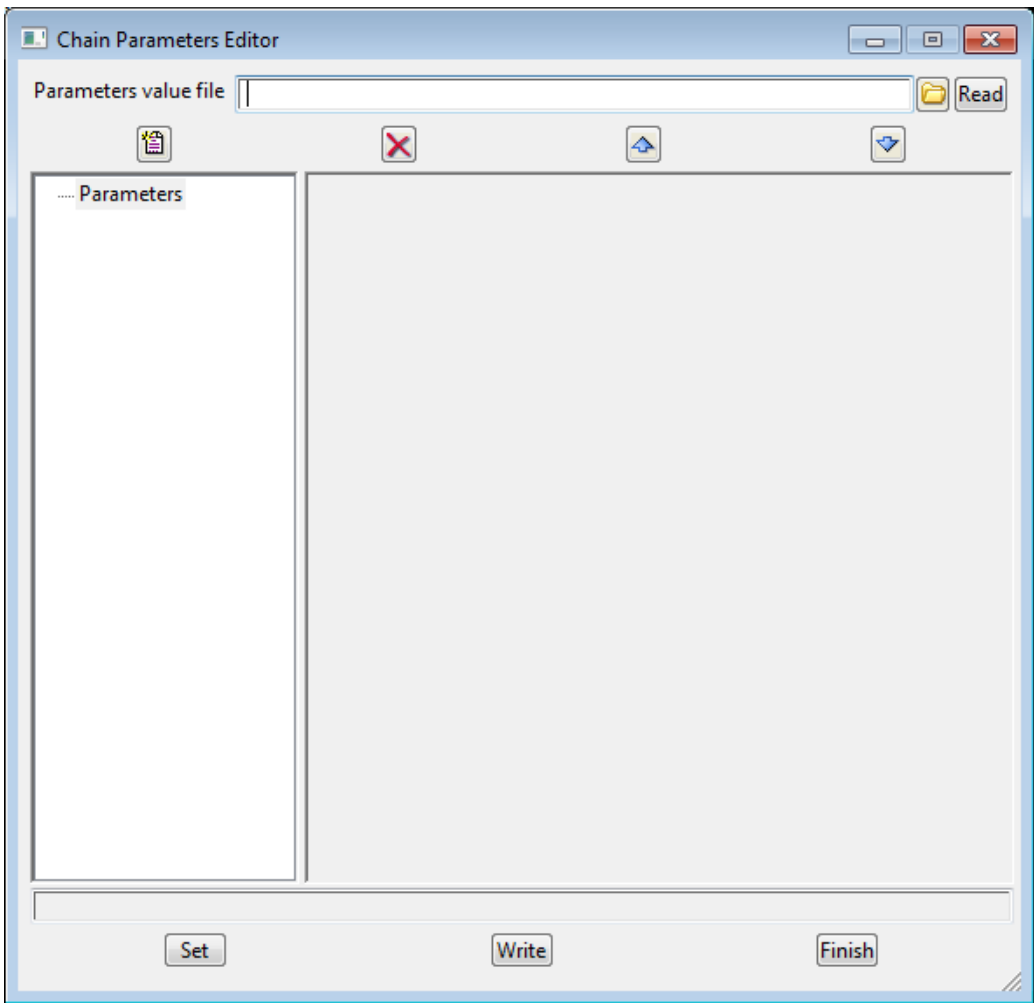
selecting Create opens the parameter editor
walk right on Edit, lists parameter files to edit
used to copy a Chain Parameter Value File from one file to another.

For the option Create, go to	Chain Parameters Editor
Edit	Chain Parameters Editor
Copy	Copy a PVF

Chain Parameters Editor

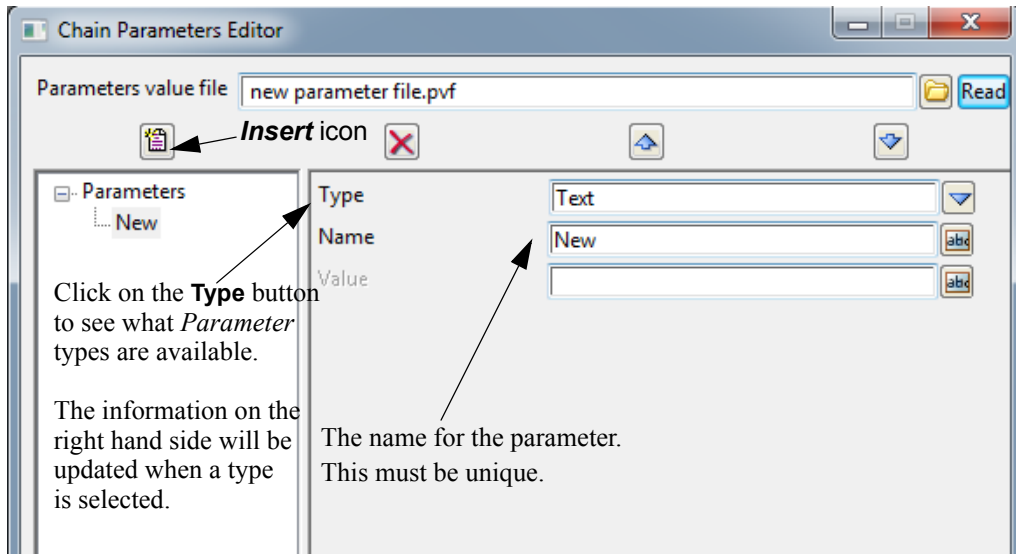
The **Edit** option is a walk-right which lists the existing parameter files. Clicking on a file in this list, brings it up in the **Chain Parameters Editor** panel which is documented below.

Selecting **Create** brings up the **Chain Parameters Editor** panel which is used to create and edit chain parameters.

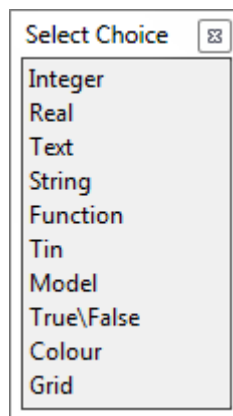


Inserting a Parameter

Clicking on the **Insert** icon insert a new parameter into the parameter value file field and on the right hand side of the panel, has the information for defining the new parameter.



The **value** for each parameter is optional. The type of value will change to reflect the type chosen. The types of parameters available are:



Integer

an integer value

Real

a real value

Text

a text value

String

a string selected from a model

Function

an existing function name

Tin

an existing tin

Model

an existing model

True/False

a true or false answer, used for tick boxes

Colour

a colour value

Grid

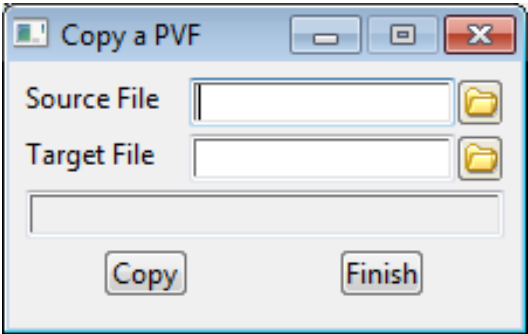
a CSV (comma separated value) file, which defines the values to fill a grid

Copy a PVF

Position of option on menu: Utilities =>Chains =>Parameters=>Copy

Copy a PVF is used to copy a Chain Parameter Value File from one file to another.

On selecting the **Copy** option, the **Copy a PVF** panel is displayed on the screen.

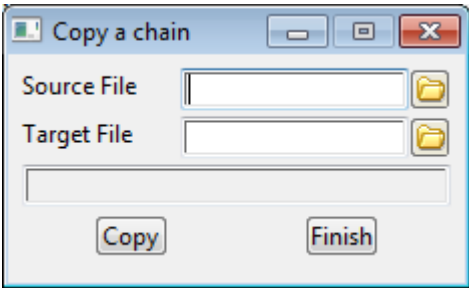


The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Source File <i>the original PVF file</i>	input		Folder*.pvf
Target File <i>the new PVF file to copy to</i>	input		Folder*.pvf
Copy <i>copies the PVF</i>	button		

Copy a Chain

Position of option on menu: Utilities =>Chains =>Copy
On selecting the Copy option, the **Copy a Chain** panel is displayed and it copy chains.

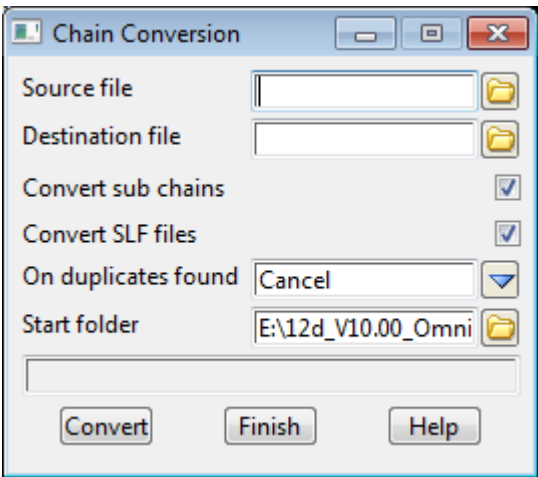


The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Source file <i>chain to be copied</i>	file		available *.rcn files
Target file <i>new destination for the chain</i>	file		
Copy <i>Copy the chain</i>	button		

Chain Conversion

Position of option on menu: Utilities =>Chains =>Convert
This panel converts from pre-v10 chain (rcn) files to the new chain format in v10 and beyond.
Selecting One brings up the Chain Conversion panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Source file	file		Folder *.rcn

the original rcn

Destination file file Folder *.chain
the new formatted file

Convert sub chains tick box
if ticked, all sub chains will be converted.
if not ticked, no sub chains will be converted.

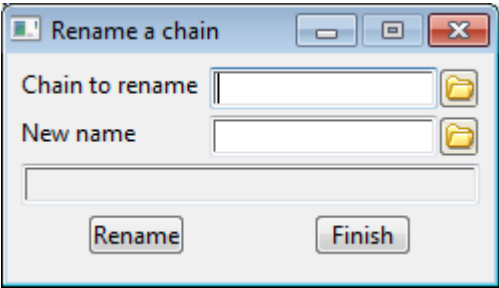
Convert slf files
if ticked, all slf files included in the chain will be converted to the new SLX format.
if not ticked, no slf files will be converted.

Convert button
converts the source rcn into the new .chain file format

Rename a Chain

Position of option on menu: Utilities =>Chains =>Rename

On selecting the **Rename** option, the **Rename a Chain** panel is displayed and is used to change the names of existing chains.



The fields and buttons used in this panel have the following functions.

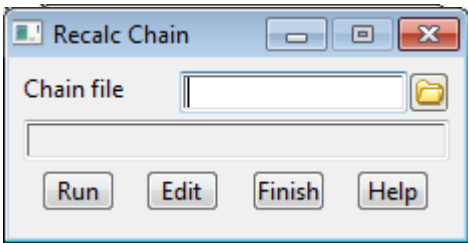
Field Description	Type	Defaults	Pop-Up
Chain to rename <i>chain to be renamed.</i>	folder box		available *.rcn files
New name <i>new name for the chain</i>	input		
Rename <i>Change the name of the chain</i>	button		

Run a Chain

Position of option on menu: Utilities =>Chains =>Run

The **Run** walk-right menu displays all the chains in the project and double clicking on a chain in the list will run the chain.

Clicking on **Run** brings up the **Recalc Chain** panel.

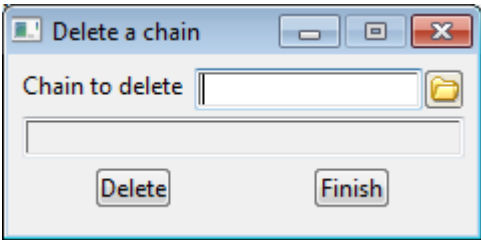


For more information on the **Recalc Chain panel** go to [The Recalc Chain Panel](#)

Delete a Chain

Position of option on menu: Utilities =>Chains =>Delete

On selecting the **Delete** option, the **Delete a Chain** panel is displayed and is used to delete chains.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Chain to delete <i>name of the chain to delete</i>	folder box		available *.rcn files
Delete <i>Delete the chain given in the Chain to delete field.</i>	button		

Functions

Position of menu: Utilities =>Functions

Functions are used in the template and interface options to collect special data together. This allows 12d Model to recognise when some of the data has been modified and that some of the data is no longer valid. It is then possible to re-run the functions (re-calc the functions) and update the modified data.

The **Functions** walk-right menu is

Functions	
Functions	list of functions in the project
Editor	modify an existing function
Lock	lock a function so it won't recalc
Order	modify the recalc order of functions
Recalc	recalculate functions
Rename	rename a function
Change all tins	change the name of tins in functions
Add	add functions to the project
Save	save a functions to disk
User	
Attributes	edit attributes of a function
Delete	delete functions from disk

The **Functions** walk-right simply lists all the functions that have been defined in the project. The other options in this menu will now be described in more detail.

For the option <i>Editor</i> , go to	Editor
<i>Lock</i>	Lock
<i>Order</i>	Order
<i>Recalc</i>	Recalc
<i>Rename</i>	Rename
Change all tins	Rename
<i>Add</i>	Add
<i>Save</i>	Save
<i>Attributes</i>	Attributes
<i>Delete</i>	Delete
<i>Delete many</i>	Delete Many Functions

Editor

On walking right on the **Editor** menu option, a list of defined functions appears.
By selecting the highlighted name of a function to be edited, the appropriate function panel filled with the information from the selected function, is displayed
The information in the selected function can then be modified.

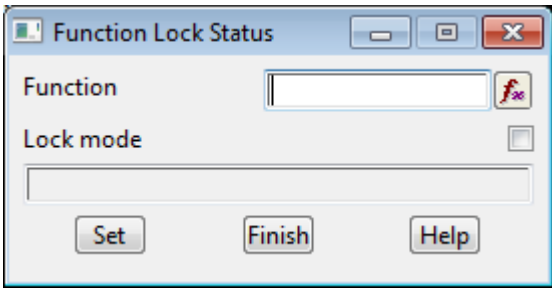
Important Note

The defined functions menu also has a [Same as] option which is used to select the function to be edited by simply picking **any string** that was created by the function.

Lock

Position of option on menu: Utilities =>Functions =>Lock

The function lock option is used to *lock* a function so that it can't be re-calculated.
On selecting the **Lock** option, the **Function Lock Status** panel is displayed.



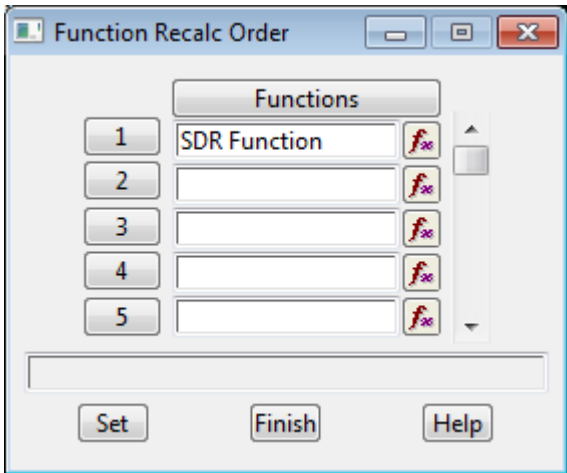
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Function <i>name of the function to lock/unlock.</i>	input		available functions
Lock model <i>display and modifies the lock status for the given function. If ticked, the function is locked an won't re-calculate.</i>	tick box		
Set <i>set the lock mode for the selected function.</i>	button		

Order

Position of option on menu: Utilities =>Functions =>Order

The default recalculation order for functions is the order in which the functions were created.
However, the **Order** option is used to **modify** the function recalc order.
On selecting the **Order** option, the **Function Recalc Order** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Functions <i>list of functions in their recalculation order. Functions should only appear once in the list.</i>	table		available functions
Set <i>record the order of functions in the table.</i>	button		
Note - all functions must still exist somewhere in the re-arranged recalc order.			

Recalc

Position of option on menu: Utilities =>Functions =>Recalc

The **recalc** menu is the same as the menu.

 Utilities =>Recalc

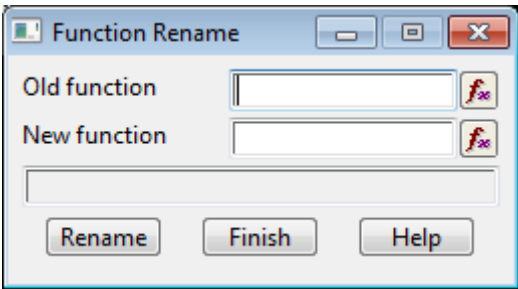
For more information, please go to the section [Recalc](#) in this chapter.

Rename

Position of option on menu: Utilities =>Functions =>Rename

On selecting the **rename** option, the **function rename** panel is displayed.

This panel can be used to change the names of existing functions



The fields and buttons used in this panel have the following functions.

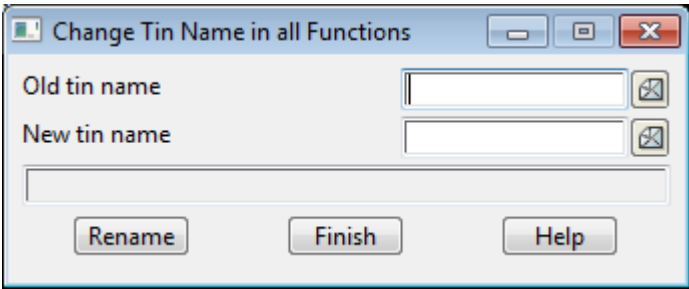
Field Description	Type	Defaults	Pop-Up
Old function <i>name of the function to be renamed.</i>	input		available functions
New function <i>new name for the function</i>	input		
Rename <i>Change the name of the function in the old function field to the name given in the new function field.</i>	button		

Change all Tins

Position of option on menu: Utilities =>Functions =>Change all tins

Selecting the **Change all tins** option, displays the panel **Change Tin Name in All Functions**.

This panel is used to change the name of a tin in all functions to another tin name.



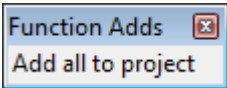
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Old tin name <i>name of the tin to be renamed.</i>	Tin box		available tins
New tin name <i>new name for the tin in all functions.</i>	Tin box		available tins
Rename <i>Change the name of the tin in the Old tin name field in all functions to the name given in the New tin name field.</i>	button		

Add

Position of menu: Utilities =>Functions =>Add

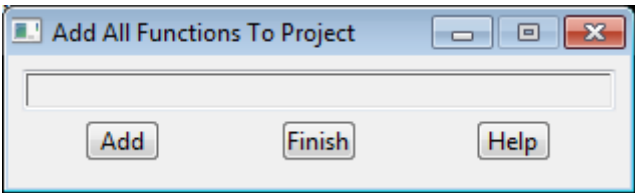
The function add option brings up the walk-right menu, function adds



Position of option on menu: Utilities =>Functions =>Add =>Add all to project

On selecting the Add all to project option, the **Add All Functions To Project** panel is displayed.

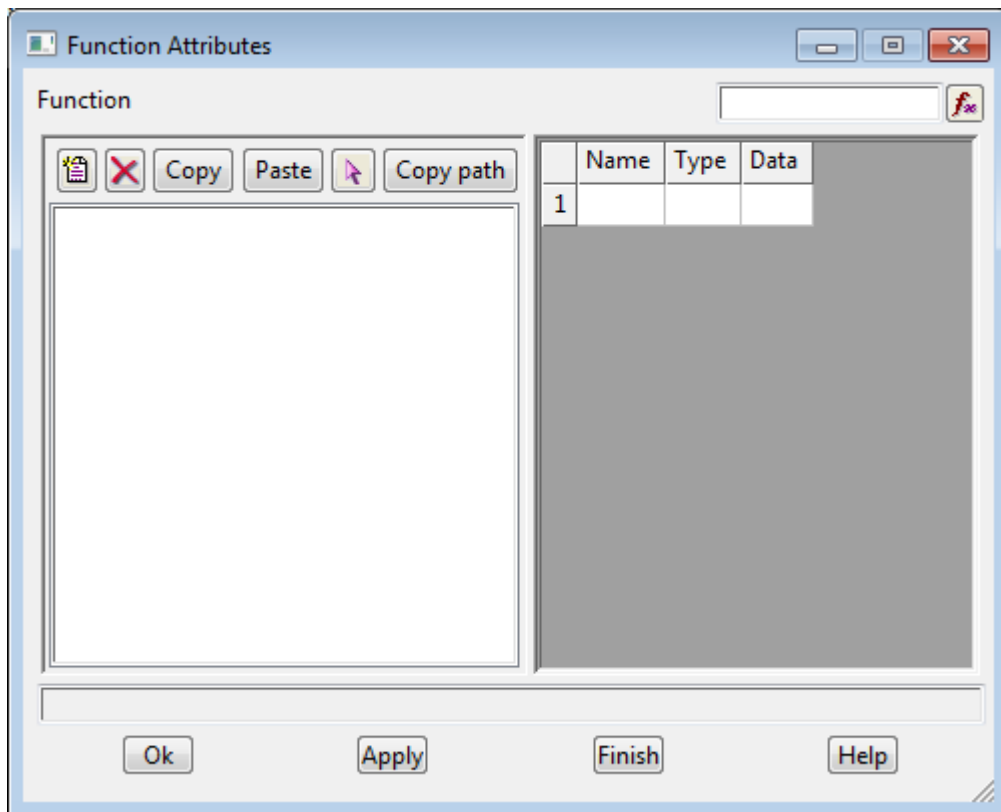
This panel is used to add all removed functions to the project.



Attributes

Position of menu: Utilities => Functions => Attributes

This section of documentation is a work in progress and will be updated in subsequent releases.



Delete

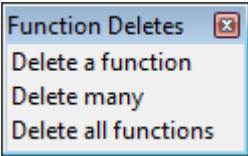
Position of menu: Utilities =>Functions =>Delete

Using the **Delete** option, functions can be deleted from disk so that they no longer can be accessed or take up disk space.

To help protect the user against disasters, when a function is selected for deletion, a **yes-no** pop-up menu is used to confirm that the user did intend deleting the function.

If deletion is confirmed, the selected function is removed from the project and deleted from the disk.

The **Function Delete** walk-right menu is



For the option *Delete a function*, go to
Delete many
Delete all functions

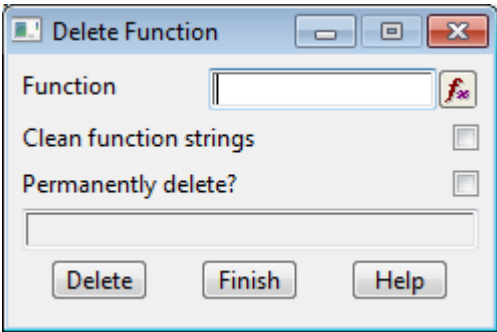
[Delete a Function](#)
[Delete Many Functions](#)
[Delete All Functions](#)

Delete a Function

Position of option on menu: Utilities =>Functions =>Delete =>Delete a function

The **Delete a function** option can be used to delete a function in the working project.

On selecting the **Delete a function** option, the **Delete Function** panel is displayed.



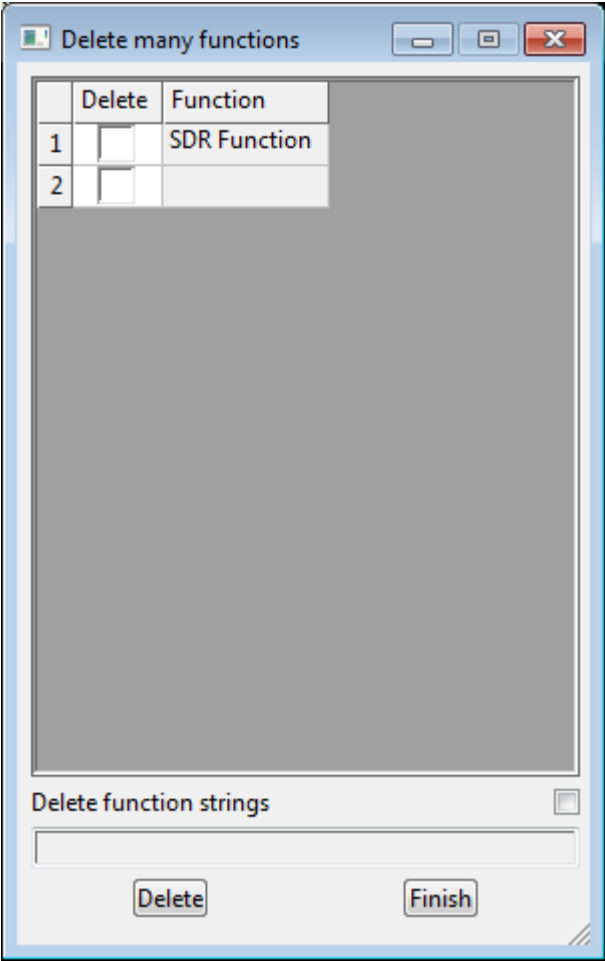
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Function <i>name of the function to be deleted.</i>	function box		all project functions
Clean function strings <i>if ticked, delete all the strings created by the function</i>	tick box		
Delete <i>after selecting this button, the function given in the function field will be deleted from the computer disk. A yes-no pop-up is used to confirm that deletion is required.</i>	button		

Delete Many Functions

Position of menu: Utilities =>Functions =>Delete many

The **Delete many** option deletes one or more functions in the working project. Selecting the **Delete many**, displays the **Delete many functions** panel.



The fields and buttons used in this panel have the following functions.

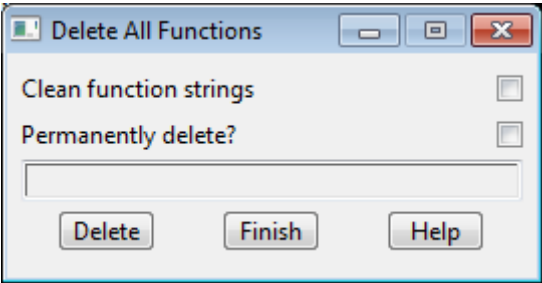
Field Description	Type	Defaults	Pop-Up
Delete	tick box		
<i>if ticked, delete the selected function listed after the tick</i>			
Function	input		all project functions
<i>name of all the functions in the project</i>			
Delete function strings	tick box		
<i>if ticked, delete all the strings created by the selected functions</i>			
Delete	button		
<i>delete all the ticked functions in the function field</i>			

Delete All Functions

Position of option on menu: Utilities =>Functions =>Delete =>Delete all functions

The Delete all functions option will delete all of the functions in the working project.

On selecting the Delete all functions option, the **Delete All Functions** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Clean function strings	tick box		
<i>if ticked, delete all the strings created by all the function</i>			

After selecting the **Delete** button, a yes-no pop-up is used to confirm that deletion is required. If it is, all functions in the working project will be deleted from disk and unless an error occurs, the panel will be removed.

Macros

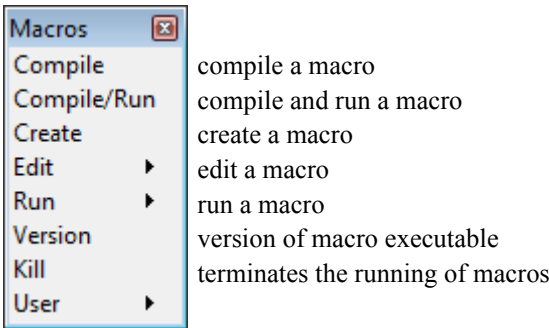
Position of menu: Utilities =>Macros

The 4D Solutions Macro Language (4DML) is a powerful programming language designed to run from within 12d Model. Its main purpose is to allow users to enhance the existing 12d Model package by writing their own programs (4DMLs or macros).

4DMLs can be compiled from within or outside 12d Model but can only be run from within 12d Model.

The macros menu has options to compile macros, compile and run macros or just run macros. A full description of macros is given in the 12d Model Macro Language manual.

The Macros walk- right menu is



For the option <i>Compile</i> , go to	Compile
<i>Compile/run</i>	Compile and Run
<i>Create</i>	Create
<i>Edit</i>	Edit
<i>Run</i>	Run
<i>Version</i>	Version
<i>Kill</i>	Kill

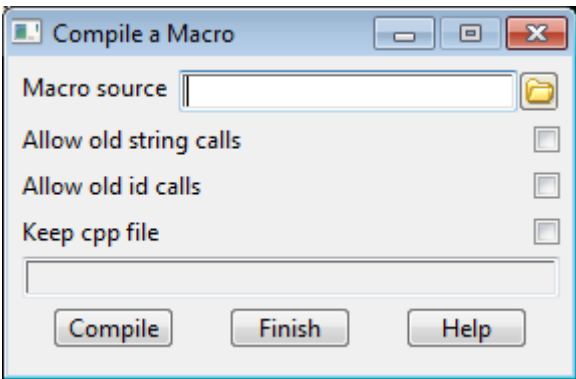
The options will now be described.

Compile

Position of option on menu: Utilities =>Macros =>Compile

The **Compile** option is used to compile the macro source code into a executable program which can then be run from within 12d Model.

On selecting the option, the **Compile a Macro** panel is placed on the screen.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Macro source <i>the name of the macro source file.</i>	input		*.4dm files
Compile <i>compile the code file given in the macro source field.</i>	button		

Compile and Run

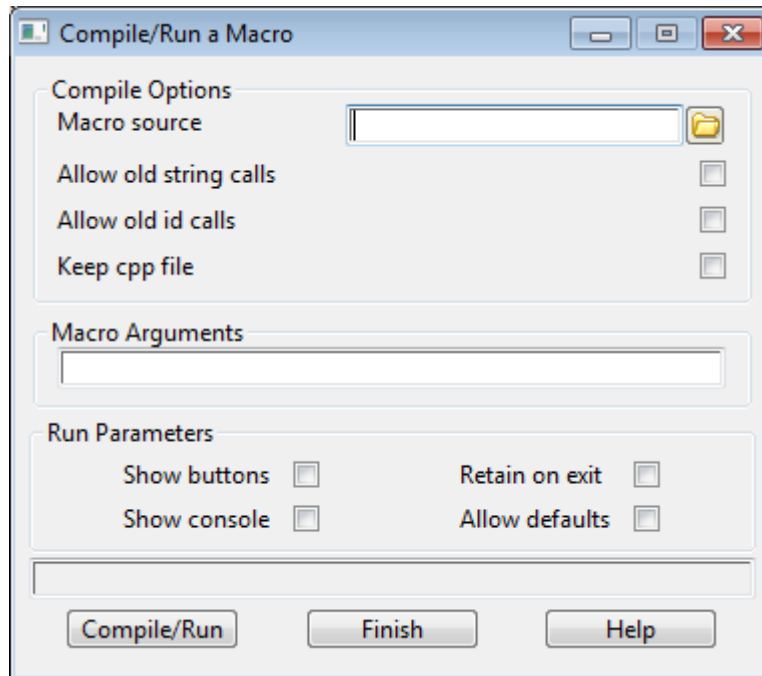
Position of option on menu: Utilities =>Macros =>Compile/Run

The **Compile/Run** option compiles the macro source code into a executable program, and if there are no errors, runs the program.

When a macro is run, a **macro console** panel is placed on the screen to provide an i/o and message area for the macro. It is possible to bring up the macro console with or without the **restart**, **abort** and **finish** buttons.

When the macro finishes, the macro console can be left on the screen or removed.

Selecting the **Compile/Run** menu option, brings up the **Compile/Run a Macro** panel:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Macro source <i>the name of the macro source file.</i>	input		*.4dm files
Macro arguments <i>if non-blank, a text line which is passed to the program as an argument line.</i>	input		
Show buttons <i>if ticked, the macro console panel has abort, restart and finish buttons on it.</i>	tick box		
Retain on exit <i>if ticked, the macro console panel remains on the screen after the macro has finished running.</i>	tick box	tick	
Show console <i>if ticked, the macro console panel is placed on the screen. if not ticked, the macro console panel is not displayed - used mainly with panels.</i>	tick box	tick	
Allow defaults <i>if ticked, the default value for a prompt is displayed in the macro console panel.</i>	tick box		

Compile/Run button

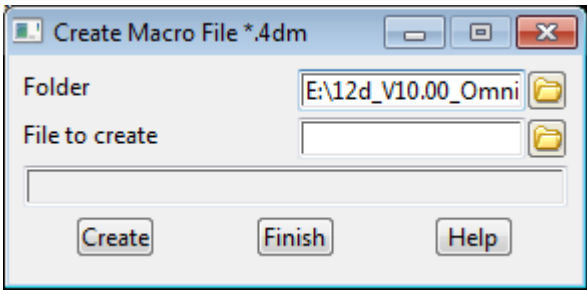
*compile the code file given in the **macro source** field and if the compile is successful, run the program.*

Create

Position of option on menu: Utilities =>Macros =>Create

The **Macros=>Create** option is used to create macro files (*.4dm) with the editor pointed to by the EDIT_4D environment variable.

Selecting **Macros=>Create** brings up the **Create Macro File *.4dm** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Folder <i>name of the folder to create the .4dm file in.</i>	input	current folder	
File to create <i>name of the file, in folder, to create.</i>	input		*.4dm files
Create <i>create the file given by the folder and file to create panel fields. A macro header is set up in the file.</i>	button		

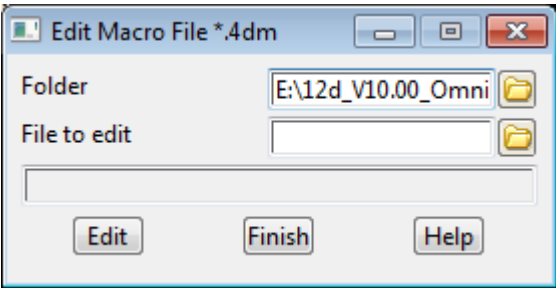
Edit

Position of option on menu: Utilities =>Macros =>Edit

The **Macros=>Edit** option is used to edit macro files (*.4dm) with the editor pointed to by the EDIT_4D environment variable.

The **Macros=>Edit** option has two modes of operation - selecting the **macros=>edit** itself, or by activating the **Macros=>Edit** option's walk-right menu, **folder *.4dm**.

Selecting **Macros=>Edit** itself brings up the **Edit Macro File *.4dm** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Folder <i>name of the folder for the .4dm file.</i>	input	current folder	
File to edit <i>name of the file, in folder, to edit.</i>	input		*.4dm files
Edit <i>edit the file given by the folder and file to edit panel fields. If the file given in the file to edit field does not exist, then a new file is created which already has each of the macro header set up.</i>	button		

The **Macros=>Edit** walk-right menu provides a list all the many template files (files ending in .mtf) in the current folder. When a file is selected from the list, it is automatically loaded into the editor.

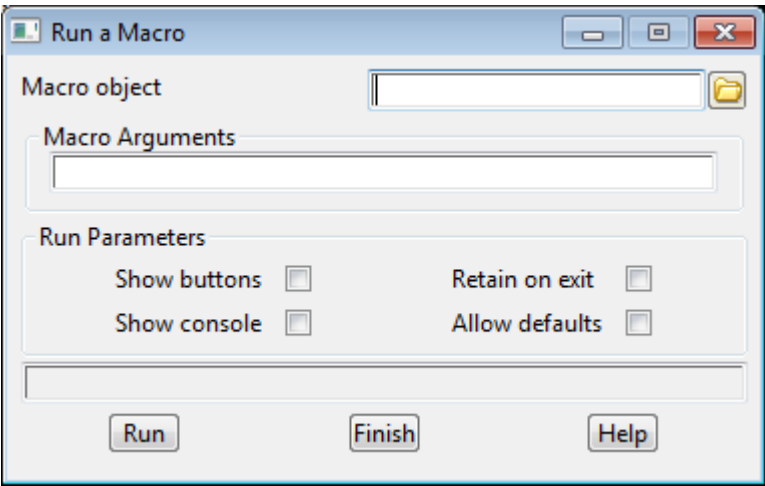
Run

Position of option on menu: Utilities =>Macros =>Run

The **Run** option runs an existing macro executable program (produced by the compile process).

Like the **Compile/Run** option, the Run options can run the macro executable with or without buttons on the macro console, and leave or remove the macro console once the macro has been executed.

Selecting the **Run** menu option brings up the **Run a Macro** panel



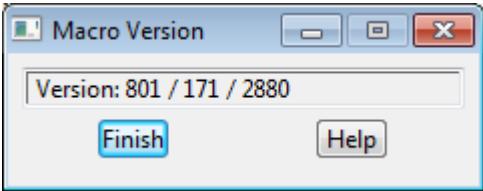
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Macro object <i>the name of the macro object or executable program.</i>	input		*.4dm files
Macro arguments <i>if non-blank, a text line which is passed to the program as an argument line.</i>	input		
Show buttons <i>if ticked, the macro console panel has abort, restart and finish buttons on it.</i>	tick box		
Retain on exit <i>if ticked, the macro console panel remains on the screen after the macro has finished running.</i>	tick box		tick
Show console <i>if ticked, the macro console panel is placed on the screen. if not ticked, the macro console panel is not displayed - used mainly with panels.</i>	tick box	tick	
Allow defaults <i>if ticked, the default value for a prompt is displayed in the macro console panel.</i>	tick box		
Run <i>run the executable given in the macro object field.</i>	button		

Version

Position of option on menu: Utilities =>Macros =>Version

The **Version** option simply brings up a panel giving information about the macro process.



Kill

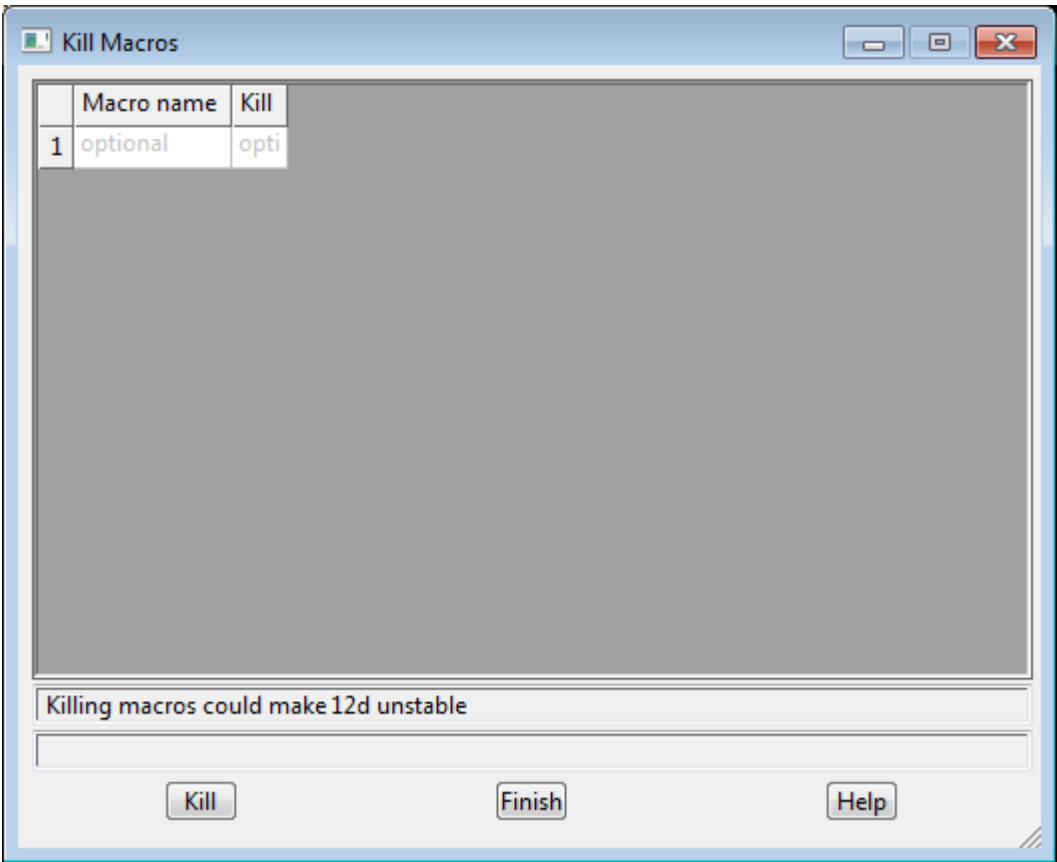
Position of option on menu: Utilities =>Macros =>Kill

The **Kill** option is used to terminate selected running macros.

This option is useful in situations such as when the macro writer has omitted a **Finish** button on the macro or has unintentionally made the macro panel invisible.

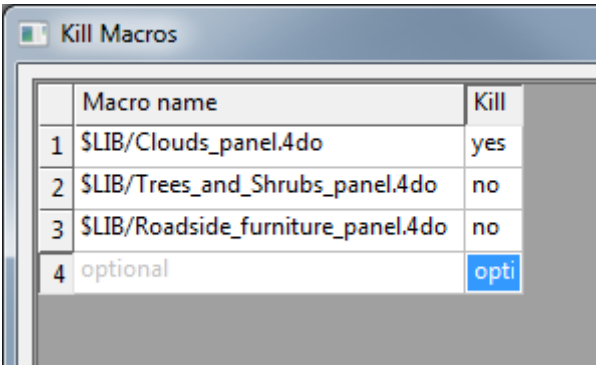
It cannot be used to terminate a macro in an infinite loop because there is no way of getting to the **Kill** option.

On selecting **Kill**, the **Kill Macros** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Macro Grid			
Macro name			
<i>the name of a running macro.</i>			
Kill	choice cell	yes	yes, no
<i>if yes, the macro will be terminated when the Kill button is selected.</i>			



Kill	button
<i>terminates all macros in the grid with yes in the Kill column.</i>	

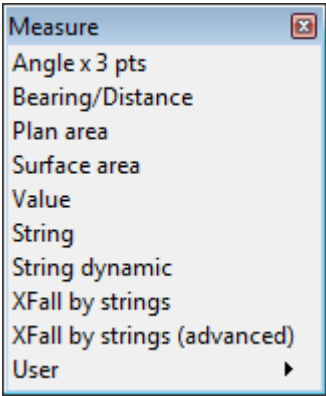
Measure

Position of menu: Utilities =>Measure

The **Measure** menu contains two options to display the
delta x, delta y, horizontal distance, angle and bearing
between points, and for a section view, the
delta chainage, delta height, slope distance and % grade
between points are calculated and displayed.

There are also options to calculate the plan area of polygons, the surface area of a tin within a polygon, run measures and dynamic measures and dynamically calculate and display the x-fall between two strings.

The **Measure** walk- right menu is

	<p>measure angle by 3 points</p> <p>distance/bearing with scale option</p> <p>plan areas</p> <p>surface area for a tin</p> <p>any measures</p> <p>information from a point to a string</p> <p>information from a position to a string</p> <p>x-fall between two strings</p> <p>more information & x-fall between strings</p>
------------------------------------------------------------------------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Note

The **Measure** option has another mode of operation. Rather than moving onto the walk-right arrow, if LB is clicked when the **Measure** button is highlighted on the **12d Model=>utilities** menu, the **distance/bearing** panel is displayed on the screen.

For the option <i>Angle x 3 pts</i> , go to	Angle by 3 Points
<i>Bearing/distance</i>	Bearing and Distance
<i>Plan area</i>	Plan Area
<i>Surface area</i>	Surface Area in the chapter Triangles
<i>Value</i>	Value
<i>String</i>	String
<i>String dynamic</i>	String Dynamic
<i>Xfall by strings</i>	X Fall by Strings
<i>Xfall by strings (advanced)</i>	X Fall by Strings (advanced)

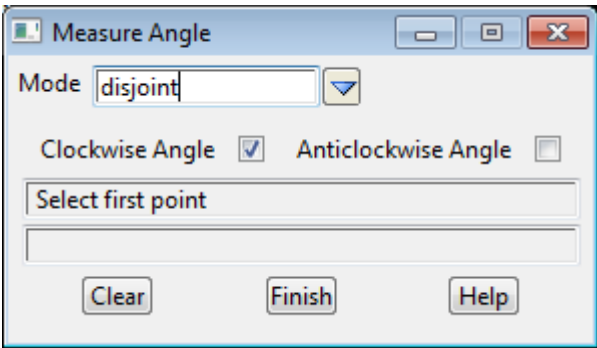
The options in the menu will now be described.

Angle by 3 Points

Position of option on menu: Utilities =>Measure =>Angle x 3 pts

The **Angle by 3 pts** option is used to calculate the angle formed by selected three positions. the angle can be expressed as a clockwise or anti-clockwise angle.

On selecting the **Angle x 3 pts** option, the **Measure Angle** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Mode	input	disjoint	disjoint, continuous
<i>In disjoint mode, only the angle between the three selected positions is reported. After the angle is reported, the user can select the 1st point in the sequence.</i>			
<i>In continuous mode, after the initial reporting of the angle, the user is prompted for the 3rd point of the new angle to be measured. By default, the previous 2nd point becomes the first point and the previous 3rd point becomes the 2nd point. This allows just one point (the third point) to be selected and the angle reported will change accordingly.</i>			
Clockwise angle	tick box	<i>if ticked, then the angle is measured in the clockwise (forward) direction.</i>	
Anti-clockwise angle	tick box	<i>if ticked, then the angle is measured in the anti-clockwise direction.</i>	
Clear	button	<i>when this button is selected, the sequence is re-initialised.</i>	

Note - after two positions are selected, the angle to the cursor position is dynamically calculated and displayed as the cursor moves around the view.

Bearing and Distance

Position of option on menu: Utilities =>Measure =>Bearing/Distance

The Bearing/Distance option is used to calculate

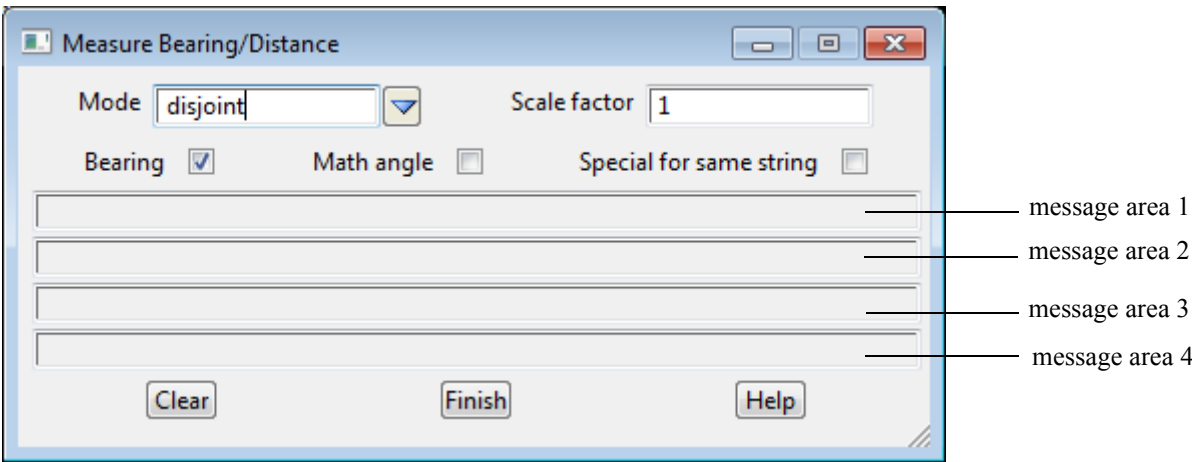
(a) the bearing measured in a clockwise direction between the positive y-axis and the (imaginary) line joining two selected points (when the bearing tick box is selected)

or

the bearing measured in an anticlockwise direction between the positive x-axis and the (imaginary) line joining two selected points (when the **Math angle** tick box is selected)

(b) the distance between two user selected points.

On selecting the **Bearing/Distance** option, the **Measure Bearing/Distance** panel is displayed.



This panel is principally used to display the distances between, and bearing of the line joining, pairs of user selected points.

message area 1 : brg = plane dist = ellipsoid dist =

where brg is the angle measured clockwise from north and is calculated using the coordinate values (Inverse value)

plane dist is the distance calculated using the coordinate values (Inverse value)

ellipsoid dist is the distance calculated by dividing the plane distance by the current scale factor

message area 2: dx = dy = dht = (if applicable)

where dx is the difference in x value between the two coordinates

dy is the difference in y value between the two coordinates

dz is the difference in z value between the two coordinates

If valid height values exist for two consecutive points the grade and slope is also reported

message area 3: grade % = slope =

If the measurement mode is set to continuous, the sum distances will be shown for the route taken

message area 4: Sum plane dist = Sum ellip dist =

where Sum plane dist, is the accumulative length of the route taken calculated using plane distances.

Sum ellip dist, is the Sum plane dist / scale factor.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Mode	input	disjoint	disjoint, continuous
<i>In disjoint mode, only the distance between the two points and the bearing (in degrees, minutes and seconds) of the (imaginary) line connecting the two points are displayed.</i>			
<i>In continuous mode, after the initial reporting of the bearing/distance, the user is prompted to select the next point (2nd point). In this case the previously selected second point becomes the first point.</i>			
Scale	input/output	1.0	
<i>the scale factor which will be used to convert plane distances to ellipsoid distances.</i>			
<i>i.e ellipsoid distance = plane distance / scale factor</i>			
Bearing	tick box	ticked	
<i>if ticked, the measured vectors can be displayed as bearings (angles measured from north, clockwise)</i>			
Math angle	tick box	un-ticked	
<i>if ticked, the measured vectors can be displayed as a mathematical angle (measured from east in a anti-clockwise direction).</i>			
Clear	button		
<i>when this button is selected, the selection sequence is re-initialised.</i>			

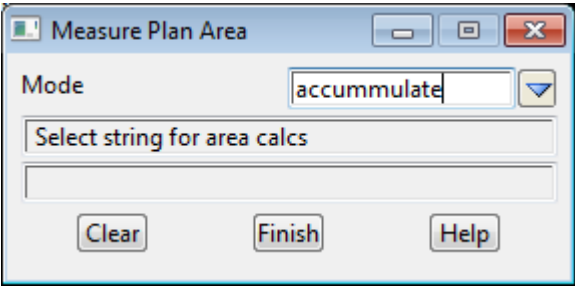
Plan Area

Position of option on menu: Utilities =>Measure =>Plan area

The **Plan area** option is used to calculate the plan areas enclosed by strings.

If a string is not closed, the first and last points are considered to be connected to form a polygon.

On selecting the option, the **Measure Plan Area** panel is placed on the screen.



This panel is principally used to display the plan areas of strings selected by the user.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Mode	input	disjoint	disjoint, continuous
<i>If disjoint, only the area of the selected string is displayed. If continuous, the total of the areas is also displayed.</i>			
Clear	button		
<i>when this button is selected, the total-to-date of the area is reset to zero and the selection sequence begun.</i>			

How to Use the Panel and Panel Messages

The measure area cycle consists is as follows:

- (a) the string is selected with the mouse.

message area 1

message area 2

select string for area calcs

(b) repeat step (a) to find more areas and accumulate them. If the accumulator is to be zeroed, simply select the **clear** button again.

The area of the selected string is displayed in message area 2.

If the mode is set to continuous, the accumulated areas (sum) of the selected strings is also displayed.

message area 1

message area 2

select string for area calcs

area = *value* sum = *value*

The cycle can then be repeated for as many strings as needed without leaving the option.

The accumulated total is reset to zero (cleared) by selecting the **clear** button again.

Surface Area

Position of option on menu: Utilities =>Measure =>Surface area

The **Surface area** option calculates and reports the surface area of a tin restricted to a user specified polygon.

This option has already been documented as **Tins=>Tin analysis=>Surface area**.

See the section [Surface Area](#) n the chapter [Triangles](#).

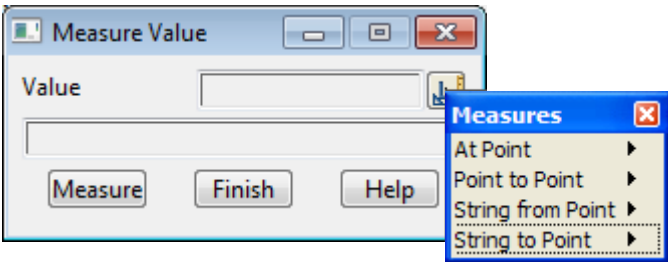
Value

Position of option on menu: Utilities =>Measure =>Value

The **Value** option is used to calculate and display any of the measures available in the **Measures** pop-up menu.

The **Measures** are documented under [Measures](#) in the chapter [Tools and Concepts](#).

On selecting the option, the **Measure Value** panel and the **Measures** menu are placed on the screen.



The fields and buttons used in this panel have the following functions.

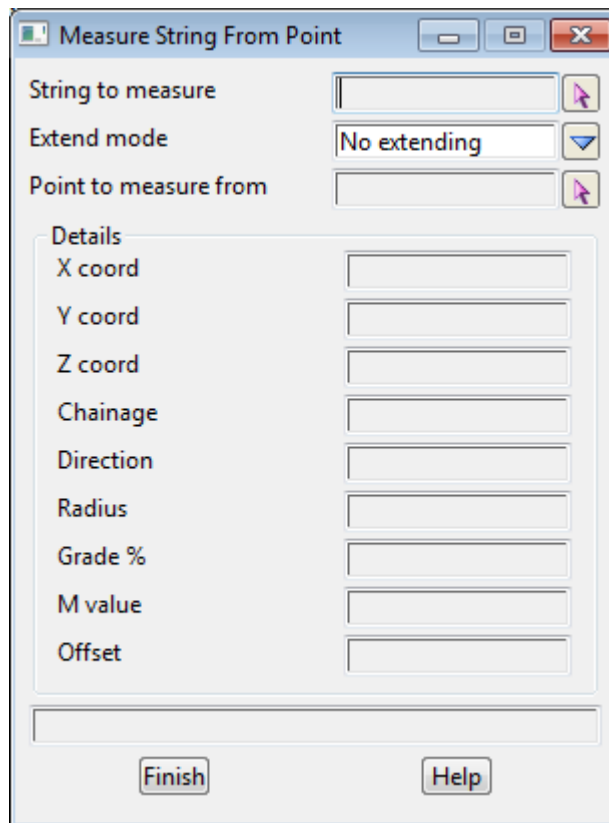
Field Description	Type	Defaults	Pop-Up
Value	output		
<i>the value calculated by the selected measure option.</i>			

String

Position of option on menu: Utilities =>Measure =>String

This section of documentation is a work in progress and will be updated in subsequent releases.

On selecting **String**, the **Measure String From Point** panel is placed on the screen.



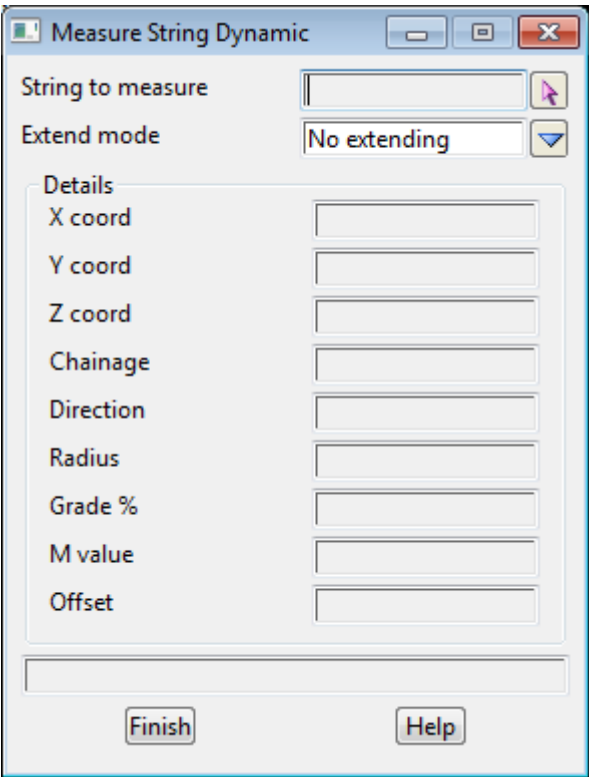
The screenshot shows a Windows-style dialog box titled "Measure String From Point". It has a standard title bar with minimize, maximize, and close buttons. The dialog contains several input fields and a list of details.

- String to measure:** A text input field with a mouse cursor icon to its right.
- Extend mode:** A dropdown menu currently showing "No extending" with a downward arrow icon to its right.
- Point to measure from:** A text input field with a mouse cursor icon to its right.
- Details:** A section containing a list of measurement parameters, each with a corresponding text input field:
 - X coord
 - Y coord
 - Z coord
 - Chainage
 - Direction
 - Radius
 - Grade %
 - M value
 - Offset
- Finish:** A button located at the bottom left of the dialog.
- Help:** A button located at the bottom right of the dialog.

String Dynamic

Position of option on menu: Utilities =>Measure =>String dynamic

This section of documentation is a work in progress and will be updated in subsequent releases.
On selecting **String dynamic**, the **Measure String Dynamic** panel is placed on the screen.



X Fall by Strings

Position of option on menu: Utilities =>Measure =>XFall by strings

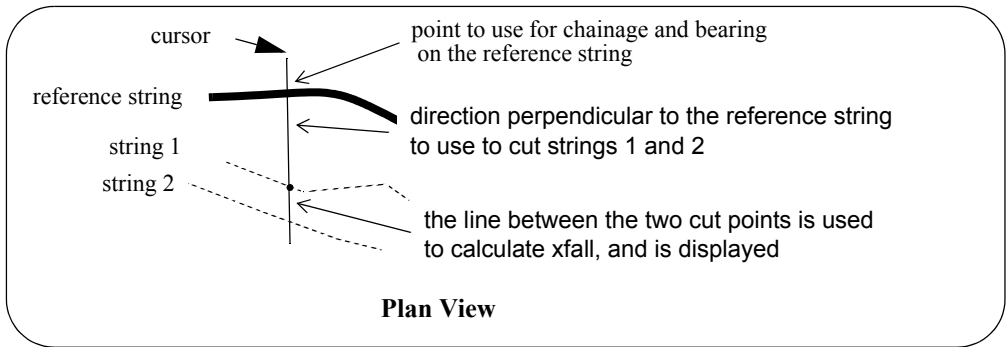
In this option, the user selects a reference string to define what is meant by chainage and right angles, and then selects two strings to calculate the x-fall between.

Once the three strings are selected, as the cursor moves around in a plan view, the cursor position is dropped perpendicularly onto the reference string.

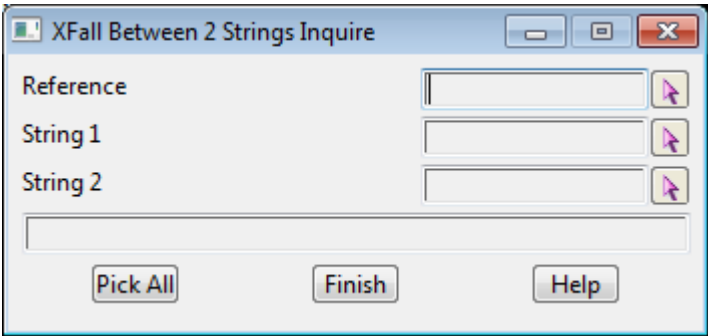
At the dropped chainage, a line is taken at right angles to the reference point and extended until it cuts the two selected strings. The xfall is then calculated between the cut points on the strings.

Then the chainage and the xfall are dynamically displayed in the panel message area.

The line joining the two strings is dynamically displayed on the plan view.



On selecting the Xfall by strings option, the **XFall Between 2 strings Inquire** panel is displayed.



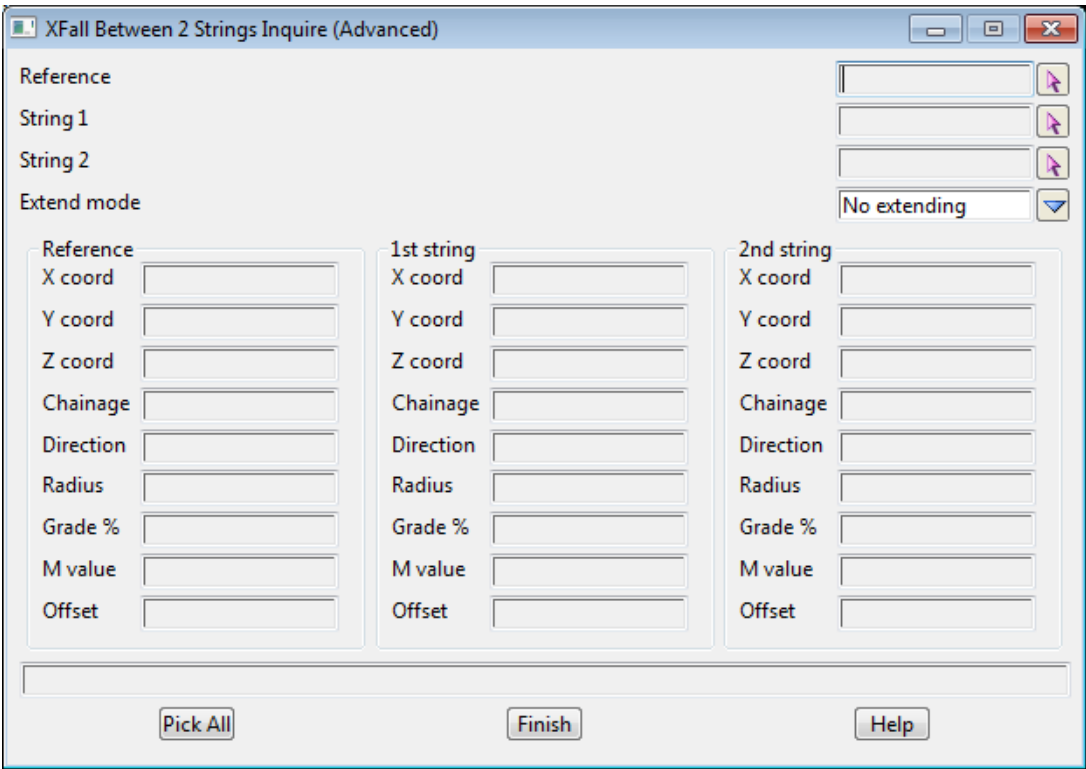
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Reference	string-select		
<i>the selected string is used to defined the meaning of chainage and bearing for the inquire. The cursor is dropped perpendicularly onto the reference string and at the dropped chainage, a line is taken at right angles to the reference point and extended until it cuts string 1 and string 2. The xfall is then calculate and displayed for the two cut points.</i>			
String 1/2	string-select		
<i>the two strings to calculate x-fall between.</i>			
Pick all	button		
<i>if pick all is selected, the user is asked to sequentially select the three strings: reference string, string 1 and string 2. The strings are automatically assigned to the appropriate string-select panel fields.</i>			

X Fall by Strings (advanced)

Position of option on menu: Utilities =>Measure =>XFall by strings (advanced)

This section of documentation is a work in progress and will be updated in subsequent releases.



Recalc

Position of menu: Utilities =>Recalc

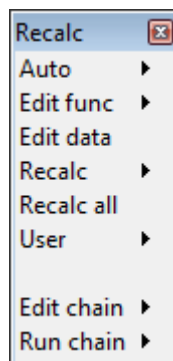
Once a function has been applied, the calculated information is only correct whilst the initial data is not modified in any way. If any modifications are made to the data, then the function must be re-run and all the associated information recalculated and redrawn, and any perspective views associated with the function set with the new eye and target positions, and redrawn.

There are date and time stamps for all string, tin and template information in **12d Model** and this enables **12d Model** to determine what information has been modified since a function was last run and what re-calculations are required.

The **Recalc** option is designed to **re-run** functions

If LB is clicked whilst the **Recalc** menu option is highlighted, all the template functions with **auto recalc** set **on**, and that have had their initial data modified since their last re-run, will be recalculated and all appropriate information updated. The data will be redrawn on any views that is was on before the recalc.

The **Recalc** walk-right menu has four options:



For the option *Auto*, go to

Editor

Edit data

Recalc

Recalc all

Edit chain

Run chain

[Auto](#)

[Editor](#)

[Edit Data from String](#)

[Recalc](#)

[Recalc All](#)

[Edit Chain](#)

[Run Chain](#)

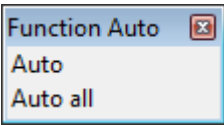
Auto

Position of option on menu: Utilities =>Recalc =>Auto

The **Auto** option allows the user to specify whether a function is automatically recalcd if another function, tin, template or string that it depends upon, is modified or recalcd.

Individual functions or all functions can have auto-recalc mode turned on or off and the default for a new function is **off**.

The **Function Auto** menu is



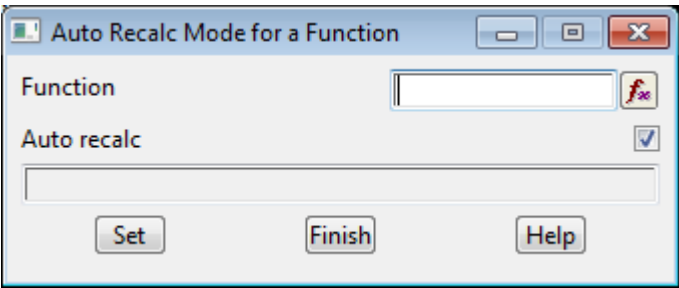
For the option Auto, go to
Auto all

[Auto](#)
[Auto all](#)

Auto

Position of option on menu: Utilities =>Recalc =>Auto =>Auto

Selecting **Auto** displays the **Auto Recalc Mode for a Function** panel.



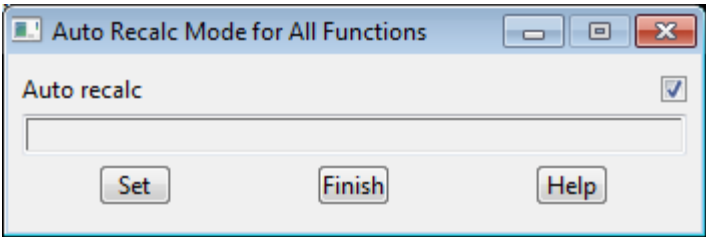
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Function <i>name of the function to be have auto recalc mode set on/off.</i>	input		available functions
Auto recalc <i>If the tick is on, the specified function will have its auto recalc value changed to on. If the tick is off, the specified function will have its auto recalc value changed to off.</i>	tick box	tick	
Set <i>Set the auto recalc mode for the selected function.</i>	button		

Auto all

Position of option on menu: Utilities =>Recalc =>Auto =>Auto all

Selecting **Auto all** displays the **Auto Recalc Mode For All Functions** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Auto recalc	tick box	tick	
<i>If the tick is on, all functions within the project will have their auto recalc value changed to on. If the tick is off, all functions within the project will have their auto recalc value changed to off.</i>			

Note: the tick is not a global setting within 12d. The use of the option changes every function within the project.

Set	button
<i>Set the auto recalc mode for all functions.</i>	

Editor

Position of option on menu: Utilities =>Recalc =>Editor

The Recalc=>Editor option is used to edit functions.

The Recalc=>Editor walk-right menu provides a list all the defined functions in the project.

When a function is selected from the list, it is automatically loaded into the appropriate function panel for the selected function, and displayed

The information in the selected function can then be modified.

Important Note

The defined functions menu also has a [Same as] option which is used to select the function to be edited by simply picking **any string** that was created by the function. This is documented in the next section [Edit Function from String](#).

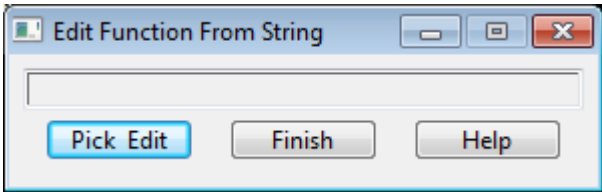
Edit Function from String

Position of option on menu: Utilities =>Recalc =>Editor =>[Same as]

Position of option on menu: Utilities =>Recalc =>Recalc =>[Same as]

The Edit Function from String option allows the user to start up the *Function editor* by simply selecting a string that was created by the function.

On selecting the option, the **Edit Function From String** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick Edit	button		
<i>select data that was created by a function and the appropriate function editor is then opened.</i>			

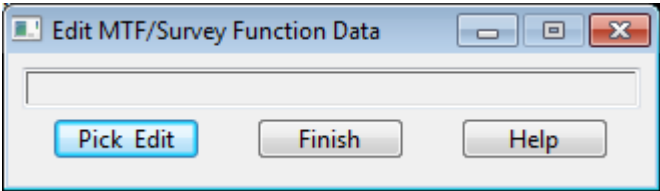
Edit Data from String

Position of option on menu: Utilities =>Recalc =>Edit data

The **Edit data** option allows the user to start up the *MTF editor* by simply selecting a string that was created using an Apply Templates function (and hence an MTF file). The MTF file used in the *Apply Templates* function is automatically loaded into MTF editor (go to [MTF Edit](#)).

Similarly the **Edit data** option also allows the user to start up the *Survey Field Data editor* by simply selecting a string that was created using a *Survey Data Reduction* function. All the data produced by the *Survey Data Reduction* function is automatically loaded into the *Survey Field Data* editor (go to the section [Survey Field Data Editor](#)).

On selecting the **Edit data** option, the **Edit MTF/Survey Function Data** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick Edit	button		
<i>select data that was created by applying an MTF file or a Survey Data Reduction function. The appropriate MTF editor or Survey Field Data editor that created the selected data, is then opened.</i>			

For information on the *Survey Field Data Editor*, go to the section [Survey Field Data Editor](#).

For information on the *MTF Editor*, go to [MTF Edit](#).

Recalc

Position of menu: Utilities =>Recalc =>Recalc

The **Recalc** option is used to recalculate a user selected function, and all functions that depend on the function that have auto recalc set on.

The **Recalc** walk-right menu lists all the existing functions and by selecting a function name, the function will be forced to re-run and all appropriate information and views for that function will be

updated.

The existing functions menu also has a [Changed] option which recalcs all changed functions.

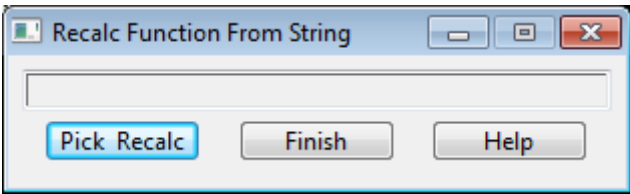
The existing functions menu has a [Same as] option which is used to select the function to be recalcd by simply picking **any string** that was created by the function. This is documented in the next section [Recalc Function from String](#)

Recalc Function from String

Position of option on menu: Utilities =>Recalc =>Recalc =>[Same as]

The **Recalc Function from String** option allows the user to recalcd a function by simply selecting a string that was created by the function.

On selecting the option, the **Recalc Function From String** panel is displayed.



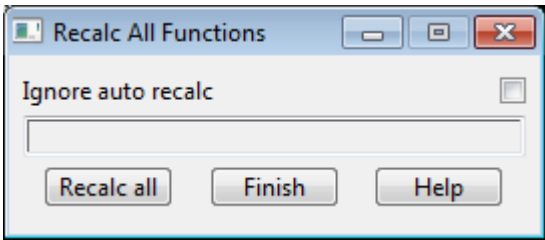
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick Edit	button		
<i>select data that was created by a function and the appropriate function will be recalcd.</i>			

Recalc All

Position of option on menu: Utilities =>Recalc =>Recalc all

The **Recalc all** option re-runs all functions regardless of their date and time stamps.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Ignore auto recalc	tick box		
<i>if not ticked, all functions that have the auto-recalc flag set on are re-calculated.</i>			
<i>If ticked, the auto-recalc flag is ignored and all functions are re-calculated.</i>			

Edit Chain

Position of option on menu: **Utilities =>Recalc =>Edit chain**

The **Recalc=>Edit chain** option is used to edit chains.

The **Recalc=>Edit chain** walk-right menu provides a list all the defined chains in the project.

When a chain is selected from the list, it is automatically loaded into the **Edit/Create Chain** panel ready for editing.

Run Chain

Position of option on menu: **Utilities =>Recalc =>Run chain**

The **Recalc=>Run chain** option is used to run chains.

The **Recalc=>Run chain** walk-right menu provides a list all the defined chains in the project.

When a chain is selected from the list, it is automatically run.

Fence

Position of menu: Utilities => Fence

It is often necessary to divide strings into those parts that are within a certain region and those parts that are outside the region. In 12d Model, the Fence option is the method of achieving this result.

Given a string to be used as a fence, the 12d Model fencing options will process strings in a model/view against the fence and break the strings into the parts inside the fence string and those parts outside the fence string.

Any 2d, 3d or interface line-strings that cut the fence polygon will have points inserted at the intersections with the fence polygon. The z-value at the intersection point will be interpolated from the adjacent points in the line-string.

Point strings do not have any extra points added to them.

Restrictions

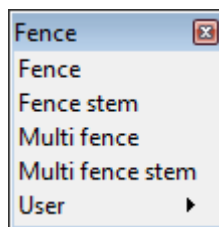
- s only 2d, 3d and interface strings can be split using the fence option.
- s 4d strings are treated as though they were point strings.
- s arcs are considered to be **inside** the fence if the minimum bounding rectangles of the fence and arc overlap.
- s alignment, pipeline, drainage, sewer strings are not processed by the fence option

Notes

1. if the fence string is not closed, the first and last points are joined together to form a closed polygon as the fence.
2. a string may be broken into a number of pieces if it wanders in and out of the fence string.
3. the fence string is not processed against itself even if it is in the model or view being fenced.
4. unpredictable results will occur if any strings being fenced lie on top of the fence. If problems occur, parallel the fence in or out by a millimetre.

The fence options allows the user to choose a single string to be used as the polygon fence or a number of strings to be used as polygons and process the data against all the strings in one operation.

The fence walk-right menu is



For the option *Fence*, go to

Fence stem

Multi fence

Multi fence stem

[Fence](#)

[Fence Stem](#)

[Multi Fence](#)

[Multi Fence Stem](#)

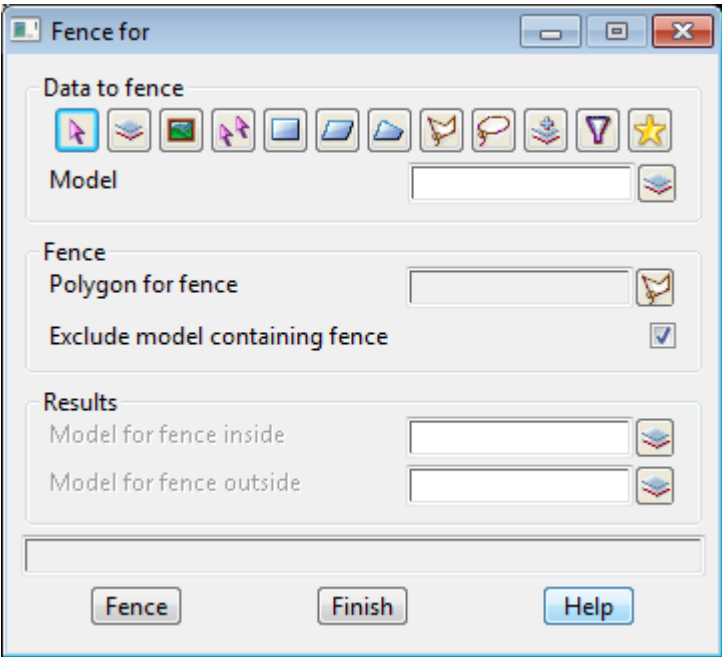
Fence

Position of option on menu: Utilities =>Fence =>Fence

In this option, the user selects a single string to be used as a polygon fence. If the string is not closed, the first and last points are joined together to form a polygon.

The Fence option will process a selected string or all the strings in a model/view/string against this fence and break the strings into the parts inside the fence string and those parts outside the fence string.

On selecting the Fence option and then the appropriate **Data Source** in the panel, the **Fence for** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Data source type				
	data selection type - for a full description go to Data Source in the chapter Tools and Concepts			
Data source				
	data source for strings to fence.			
Polygon for fence		string-select		
	the selected string will be used as the polygon to act as a fence to separate data into an inside and an outside.			
Exclude model containing fence		tick box	ticked	
	if ticked , no data in the model containing the fence string will be fenced. if not ticked , all the appropriate data in the model containing the fence string will be fenced.			
Model for fence inside		input		available models
	if non-blank , name of the model to contain the data inside of the fence string. If blank , then no fence inside will be calculated.			
Model for fence outside		input		available models
	if non-blank , name of the model to contain the data outside of the fence string. If blank , then no fence outside will be calculated.			

Fence button

*on selecting **fence**, the appropriate strings in the data source will be divided by the fence string (selected by the **poly** button) into the parts of the strings inside the fence string and the parts of the string outside the fence string. Any line-strings that cut the fence string will have a point inserted at the intersection with the fence string and the z-value for this point interpolated from the points on either side of it in the line-string.*

How to Use the Panel and Panel Messages

- (a) Select a fence polygon string by choosing **Polygon to fence**
- (b) Fence processing begins on selecting the **Fence** button.

Progress messages - sent to the panel message area

calculating inside-outside

calculating inside

calculating outside

fencing *string name*

Completion message - sent to the panel message area

finished fence

<esc> can be used to abort the fence option.

Fence Stem

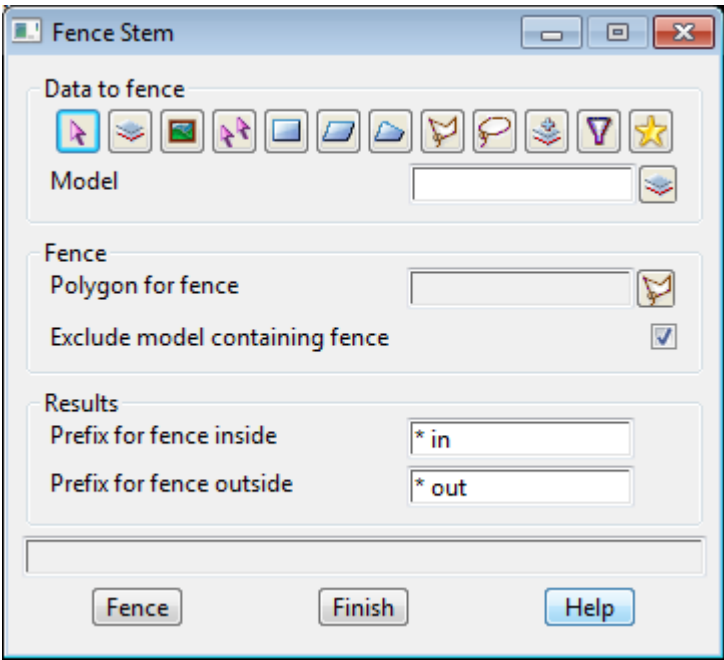
Position of option on menu: Utilities => Fence => Fence stem

As for the **Fence** option, the user selects a single string to be used as a polygon fence. If the string is not closed, the first and last points are joined together to form a polygon.

The **Fence Stem** option will process a selected string or all the strings in a model/view against this fence and break the strings into the parts inside the fence string and those parts outside the fence string. The inside and outside will then be put into models of the same name as the original model modified by a prefix and/or postfix.

This means that unlike the **Fence** option, when fencing a view with the **Fence Stem** option, the inside/outside for each model on the view goes to distinct models using the prefix/postfix for the inside/outside model names.

On selecting the **Fence Stem** option and then the appropriate **Data Source** in the panel, the **Fence Stem** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Data source type			Model	
	data selection type - for a full description go to Data Source in the chapter Tools and Concepts			
Data source	data source for strings to fence.			
Prefix for fence inside		input		available models
	if non-blank , prefix*postfix to adjust the data model name to be the model to contain the data inside of the fence string. If blank , then no fence inside will be calculated.			
Prefix for fence outside		input		available models
	if non-blank , prefix*postfix to adjust the data model name to be the model to contain the data outside of the fence string. If blank , then no fence outside will be calculated.			
Polygon for fence		string-select		
	the selected string will be used as the polygon to act as a fence to separate data into an inside and an outside.			
Exclude model containing fence		tick box	tick	
	if ticked , no data in the model containing the fence string will be fenced. if not ticked , all the appropriate data in the model containing the fence string will be fenced.			
Fence		button		
	on selecting Fence , the appropriate strings in the data source will be divided by the fence string into the parts of the strings inside the fence string and the parts of the string outside the fence string. Any line-strings that cut the fence string will have a point inserted at the intersection with the fence string and the z-value for this point interpolated from the points on either side of it in the line-string.			

<esc> can be used to abort the fence option.

Multi Fence

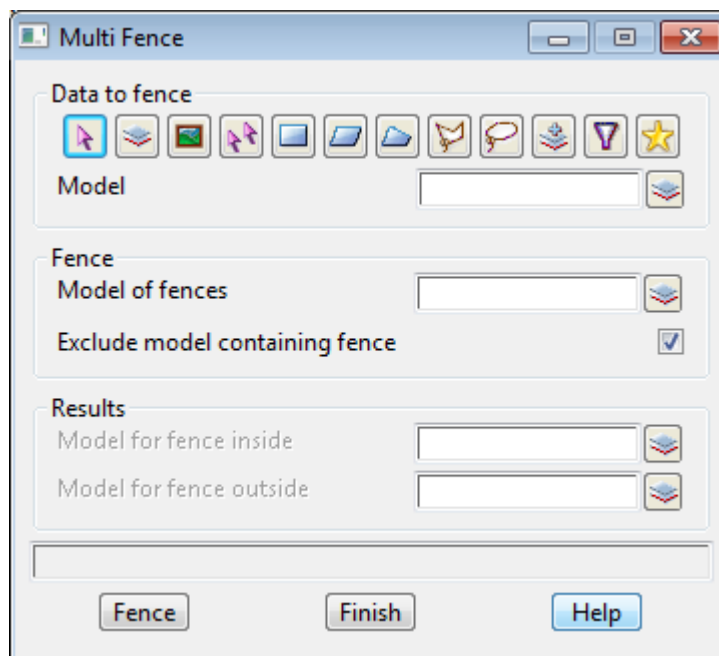
Position of option on menu: Utilities => Fence => Multi fence

It is often necessary to fence data against more than one polygon.

In the **Multi fence** option, the user provides a model containing all the polygons to be used as fences. The **Multi fence** option will process the selected string or all the strings in a model/view against all the polygons in the polygon model.

The data will be clipped and the **outside** is considered to be those bits are **outside all** of the polygons and the inside is the remainder, i.e. the bits **inside any one** of the polygon.

On selecting the **Multi fence** option and then the appropriate **Data Source** in the panel, the **Multi Fence String/Model/View** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source			
<i>data source for strings to fence.</i>			
Model of fences	input		available models
<i>name of the model that contains the polygons to be used as fences.</i>			
Model for fence inside	input		available models
<i>name of the model to contain the data that is inside any one of the fences. If this field is blank, then no fence inside will be calculated.</i>			
Model for fence outside	input		available models
<i>name of the model to contain the data outside all of the fences. If this field is blank, then no fence outside will be calculated.</i>			
Exclude model containing fence	tick box	tick	
<i>if ticked, no data in the model containing the fence string will be fenced.</i>			
<i>if not ticked, all the appropriate data in the model containing the fence string will be fenced.</i>			

Fence

button

the appropriate strings in the data source will be divided by the fence polygons (from the model of fences) into the parts of the strings inside any one fence and the parts of the string outside all of the fences. Any line-strings that cut the fences will have a point inserted at the intersection with each fence and the z-value for this point interpolated from the points on either side of it in the line-string.

<Esc> can be used to abort the multi-fence option.

Multi Fence Stem

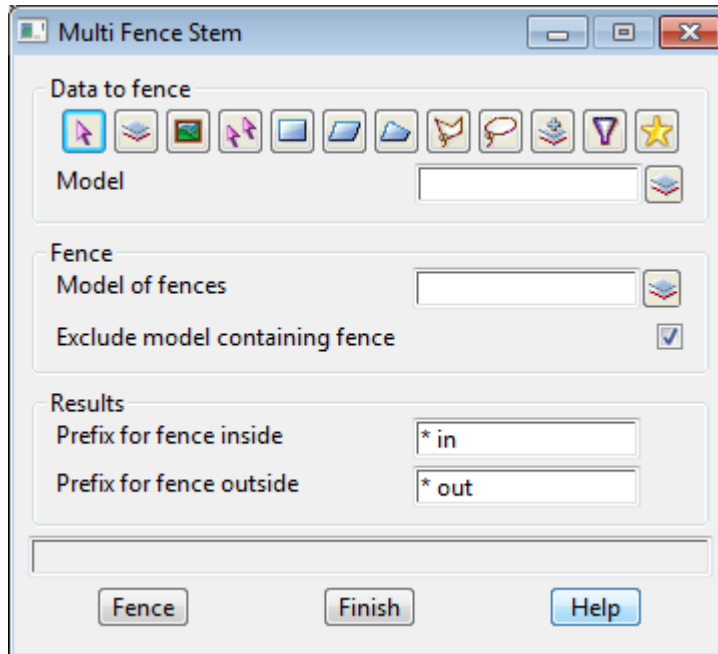
Position of option on menu: Utilities => Fence => Multi fence stem

It is often necessary to fence data against more than one polygon.

In the **Multi fence stem** option, the user provides a model containing all the polygons to be used as fences. The **Multi fence stem** option will process selected strings or all the strings in a model/view against all the polygons in the polygon model.

The data will be clipped and the **outside** is considered to be those bits are **outside all** of the polygons and the **inside** is the remainder, i.e. the bits **inside any one** of the polygon.

On selecting the **Multi fence stem** option and then the appropriate **Data Source** in the panel, the **Multi Fence Stem String/Model/View** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source			
<i>data source for strings to fence.</i>			
Model of fences	input		available models
<i>name of the model that contains the polygons to be used as fences.</i>			
Prefix for fence inside	input		available models
<i>if non-blank, prefix*postfix to adjust the data model name to be the model to contain the data inside of the fence string.</i>			
<i>If blank, then no fence inside will be calculated.</i>			
Prefix for fence outside	input		available models
<i>if non-blank, prefix*postfix to adjust the data model name to be the model to contain the data outside of the fence string.</i>			
<i>If blank, then no fence outside will be calculated.</i>			

Exclude model containing fence tick box tick

*if **ticked**, no data in the model containing the fence string will be fenced.*

*if **not ticked**, all the appropriate data in the model containing the fence string will be fenced.*

Fence button

the appropriate strings in the data source will be divided by the fence polygons (from the model of fences) into the parts of the strings inside any one fence and the parts of the string outside all of the fences. Any line-strings that cut the fences will have a point inserted at the intersection with each fence and the z-value for this point interpolated from the points on either side of it in the line-string.

<Esc> can be used to abort the multi-fence option.

Coordinate Transformations - Helmert and Affine

A **2D Helmert** transformation is a two dimensional linear transformation consisting of a scaling, a rotation (of both the x-axis and y-axis about the vertical axis) and a 2D- translation (shift) of data. Hence there are four parameters to be specified.

A **3D Helmert** transformation is a three dimensional linear transformation consisting of a scaling, three rotations (about the 3 axes), and a 3D-translation (shift) of data. Hence there are 7 parameters to be specified.

A **2D affine transformation** is a two dimensional linear transformation consisting of a 2D-translation (shift) of the data, a scaling of the data in two different directions and rotations of the x-axis (about the vertical axis) and of the y-axis (about the vertical axis). Hence there are six parameters to be specified. Unlike the Helmert transformations, rectangles can be skewed by an affine transformation.

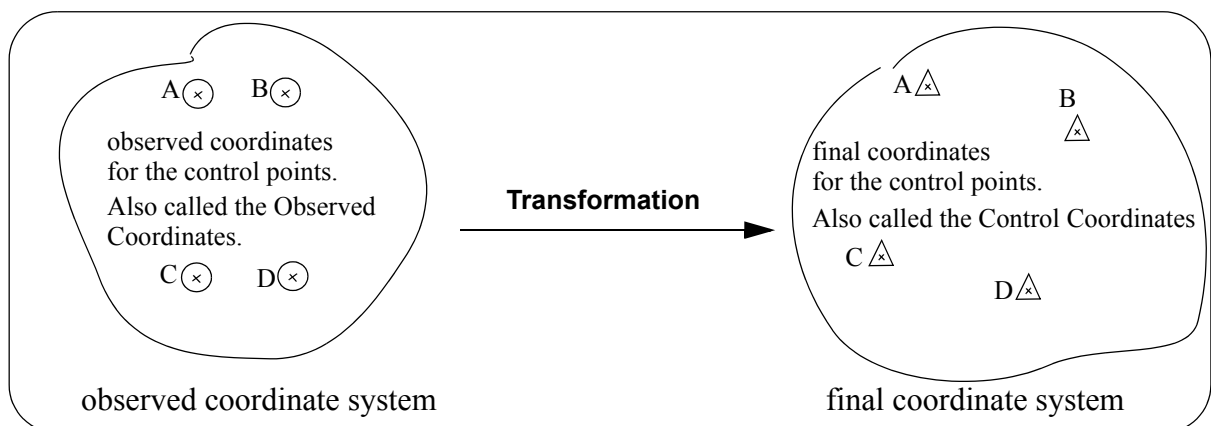
A **2D orthogonal affine transformation** is a two dimensional linear transformation consisting of a 2D-translation (shift) of the data, a scaling of the data in two different directions and the same rotation (of both the x-axis and y-axis like the Helmert). Hence there are five parameters to be specified. Unlike the standard affine transformations, rectangles are not skewed by the orthogonal affine transformation.

These types of transformation are often used in civil projects for converting data between a local coordinate system (observed coordinates) and another coordinate system.

The most frequent method of defining all these transformations is not by explicitly giving the transformation parameters but by having both the observed **and** the final coordinates for three or more points (known as the **control points**) and then trying to calculate the transformation parameters from these sets of coordinates.

If the transformation parameters can be successfully calculated from the observed-final coordinate pairs for the control points, then the transformation parameters are then be used to convert the coordinates of any other object in the observed coordinate system to the new final coordinates.

So for this method, the first step is to select **control points** for which the coordinates are known in the final coordinate system and in the local (observed) coordinate system.



And in the diagram above, the observed coordinates of the control point A are to be mapped by the transformation to the coordinates of the control point A in the final coordinate system. And similarly for the points B, C and D.

Note that A is the same point on the ground - it just has a different coordinate in a different coordinate system and hence will appear in a different place in a diagram for each coordinate

system.

Usually each control point is selected because

- (a) its final coordinates are already known
 - (b) there is a marker on the ground indicating the exact position of the control point
- and
- (c) the control point is the area that is being surveyed (observed).

The control point is then surveyed to get its observed coordinates.

Because the final coordinates of the control points are known in advance, the final coordinates of the control point are referred to as the **Control Coordinates**, or **Control Easting** and **Control Northing** and the control point coordinates often referred to as the **Control Point**. The surveyed coordinates of the control point are called as the **Observed Coordinates** or **Observed Easting** and **Observed Northing** (of the control point).

IMPORTANT NOTE - the control points must be selected so that they are spread throughout the area, and the control points must not all be on the one straight line.

The number of parameters to be determined for the transformation ranges from three in a fixed scale 2D Helmert up to seven for a 3D Helmert so there must be enough control points to provide sufficient independent equations to be able to solve for the parameters. Also all survey measurements have errors in them and it is best to have more than the minimum number of required control points to help control errors.

However when there are four or more control-observed point pairs, the system will be over determined. That is, by taking different subsets of the control-observed point pairs, different transformation parameters will result.

In this situation, **12d Model** uses **Least Squares** to calculate the transformation parameters from the over determined systems.

Once the transformation parameters have been calculated by Least Squares, for each of the control points the transformation can be applied to the observed coordinates of the control point. The difference between the Control Coordinates and the transformed Observed Coordinates for a control point is called the **residuals** for the transformation.

The **residuals** for the least squares solution gives a measure of how good the Least Squares solution was, and for checking purposes, the residuals are displayed in the transformation panel for each of the control-observed point pairs.

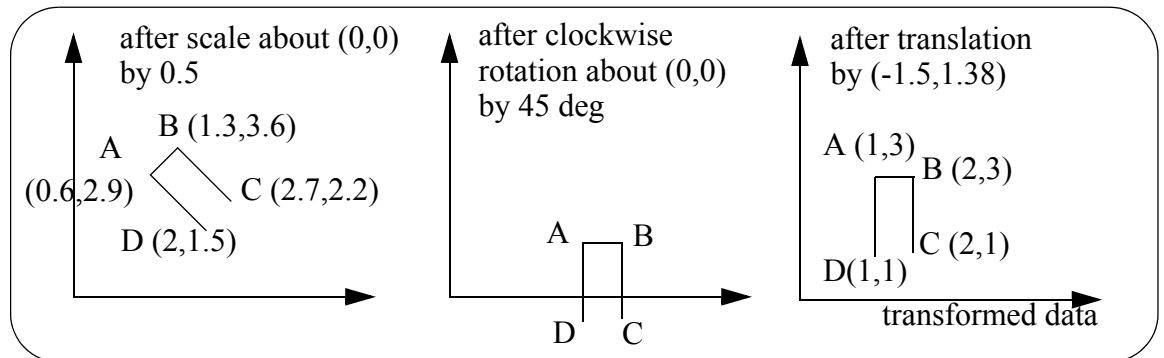
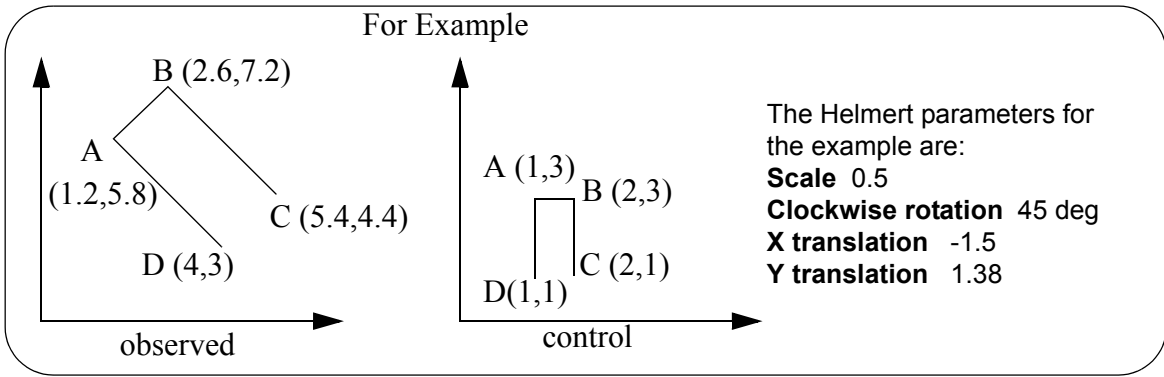
As an example of the meaning of the transformation parameters, we'll look at the 2D Helmert transformation.

The 2D Helmert has four parameters:

- (a) the scale factor for the existing coordinates with respect to the new coordinates
- (b) the (z axis) rotation of the existing coordinates to align it with the new coordinates axis
- (c) the two (x and y) translations of the existing coordinates after the scalings and rotations have been applied

and the operations to be performed on observed coordinates are:

1. Scale the observed coordinates about (0,0) by the *Scale* factor
2. Then rotate the resulting coordinates about (0,0) in a clockwise direction by the *Clockwise rotation* degrees.
3. Then translate the resulting coordinates by ((X translation, Y translation).



For information about how to select control and observed points in the Affine and Helmert panels, go to the next section [Selecting Control and Observed Points for the Helmert and Affine Transformations](#)

Selecting Control and Observed Points for the Helmert and Affine Transformations

For the Affine and Helmert transformations, the parameters can be either typed in or calculated from control-observed point pairs using the method of least squares.

If the **Parameters by** choice box is set to **Pt Selection** then control-observed point pairs are selected by the user and the pairs are written to the grids on the panels.

Parameters by **pt selection** Report file

Clockwise rotation X translation

Scale Y translation

	Use pt	Control Easting	Control Northing	Observed Easting	Observed Northing	Residual Easting	Residual Northing
1	<input checked="" type="checkbox"/>						

Control Calculate

Grid for 2D transformations

Parameters by

Pt selection

Scale

1

Origin method

Pick

Origin X coordinate

0

Origin Y coordinate

0

Origin Z coordinate

0

Report file

Fixed Scale?

☐

X rotation (CW)

0°

Y rotation (CW)

0°

Z rotation (CW)

0°

X translation

0

Y translation

0

Z translation

0

	Use pt	Control Easting	Control Northing	Control Level	Observed Easting	Observed Northing	Observed Level	Residual Easting	Residual Northing	Residual Level
1	<input checked="" type="checkbox"/>									

Control

Calculate

Grid for 3D transformations

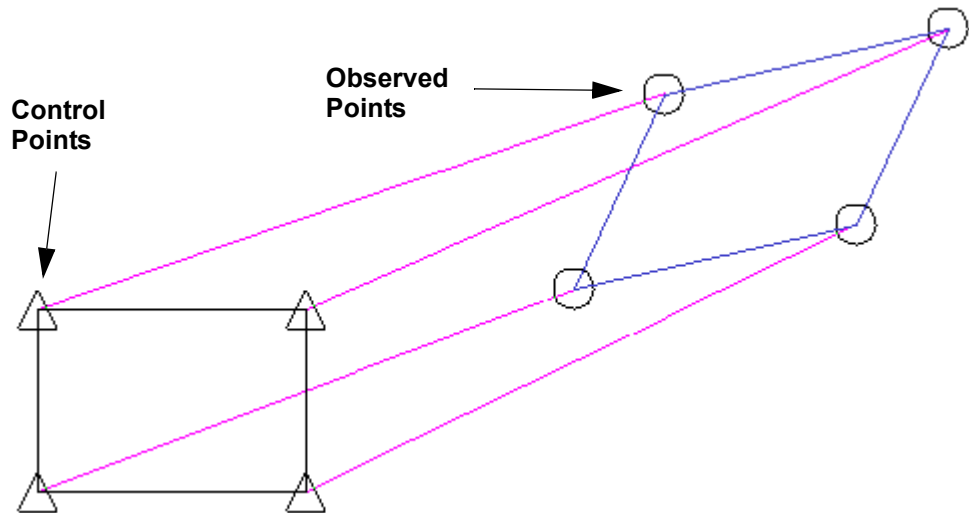
If the **Pt selection** method is chosen, the selection of points is started by selecting the **Control** button.

Note - the default is to select the **Control Point** (the coordinates of the control point in the transformed coordinate system) and then its associated **Observed Point** (the coordinates of the control point in the observed system).

Neither point is accepted until the second point is selected.

However the **order** of selection can be **reversed** by setting the environment variable **PICK_ORDER_OBSERVED_FIRST_4D** (see [env.4d](#) in the chapter [Projects](#)). The order can then be **Observed Point first** and then its associated **control point with Control Coordinates**.

To help reduce errors, after a control point - observed point pair is selected, the position of the Control Point is shown as a triangle and the position of the associated Observed Point as a circle with a line drawn between the control-observed point pair for clarity



After selecting the **Control** button, the selection starts with the Control (Observed) Point,

accepting that point then selecting the corresponding Observed (Control) Point.

After selecting the first pair of points, the second pair is then selected and so on.

The picking is terminated by clicking **RB** and selecting **Cancel** when the next control (observed) point is to be selected.

The coordinates of the Control Points and Observed Points are added to the grid on the selection of two valid points. The **Use pt** field is ticked by default.

Use point column →

	Use pt	Control Easting	Control Northing	Observed Easting	Observed Northing	Residual Easting	Residual Northing
1	<input checked="" type="checkbox"/>	89621.0175	73418.2203	90542.9037	73734.1936		
2	<input checked="" type="checkbox"/>	90014.635	73150.7295	90827.5429	73541.8698		
3	<input checked="" type="checkbox"/>	89621.0175	73150.7295	90409.5592	73446.9901		
4	<input checked="" type="checkbox"/>	90014.635	73418.2203	90960.8874	73829.0734		
5	<input checked="" type="checkbox"/>						

After the selection process is terminated, additional control-observed point pairs can be selected at any time by simply clicking on the **Control** button again. The new control-observed point pairs are added after the existing control-observed point pairs.

If **Use pt** is set to tick, the corresponding control-observed point pair is used in the calculations. If **Use pt** is not ticked, the corresponding control-observed point pair is ignored and not used.

The **Calculate** button calculates the transformation parameters based on all the control-observed point pairs in the grid with the **Use pt** tick box ticked on.

The residuals are placed into the residual columns of the grid and the calculated parameters are placed into the parameters section of the panel.

	Use pt	Control Easting	Control Northing	Observed Easting	Observed Northing	Residual Easting	Residual Northing
1	<input checked="" type="checkbox"/>	89621.0175	73418.2203	90542.9037	73734.1936	76.42145	-51.17784
2	<input checked="" type="checkbox"/>	90014.635	73150.7295	90827.5429	73541.8698	-76.42145	51.1778
3	<input checked="" type="checkbox"/>	89621.0175	73150.7295	90409.5592	73446.9901	-38.60317	-26.98948
4	<input checked="" type="checkbox"/>	90014.635	73418.2203	90960.8874	73829.0734	38.60317	26.98953
5	<input checked="" type="checkbox"/>						

Residuals columns →

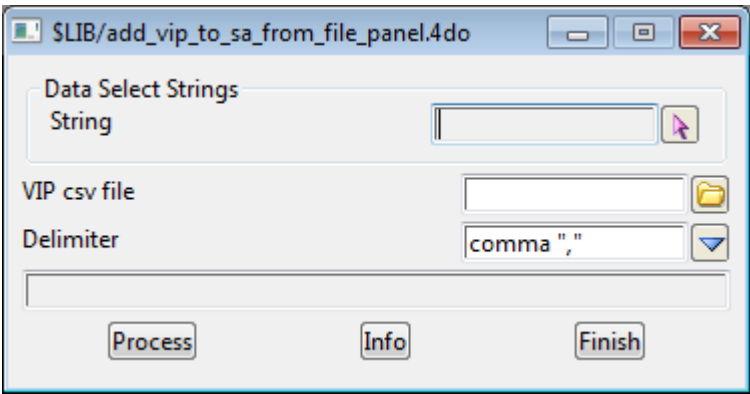
If the **Parameters by** choice box is set to **Direct entry**, the transformation parameters are manually entered into the panel and the grid section is not used.

Add VIP to SA From File

Position of option on menu: Utilities =>A-G =>Add VIP to SA from file

This section of documentation is a work in progress and will be updated in subsequent releases.

On selecting Add VIP to SA from file, the **Add VIP to SA from file** panel is displayed.



2D Affine

Position of option on menu: Utilities =>A-G =>Affine

An affine transformation is a two dimensional linear transformation consisting of a 2D-translation (shift) of the data, a scaling of the data in two perpendicular directions and a rotation of the x-axis and the y-axis. Hence there are six parameters to be specified. Unlike the Helmert transformations, rectangles can be skewed by an affine transformation.

So the affine parameters are

- (a) the x-scale factor for the observed co-ordinates with respect to the control coordinates
- (b) the y-scale factor for the observed co-ordinates with respect to the control coordinates
- (c) the rotation of the x-axis of the observed co-ordinates to align it with the control x co-ordinates axis
- (d) the rotation of the y-axis of the observed co-ordinates to align it with the control y co-ordinates axis
- (e) the x and y translation of the existing co-ordinates after the scalings and rotations have been applied

For information on the affine transformation, please go to the section [Coordinate Transformations - Helmert and Affine](#)

Notes on Transformations applied to Rasters

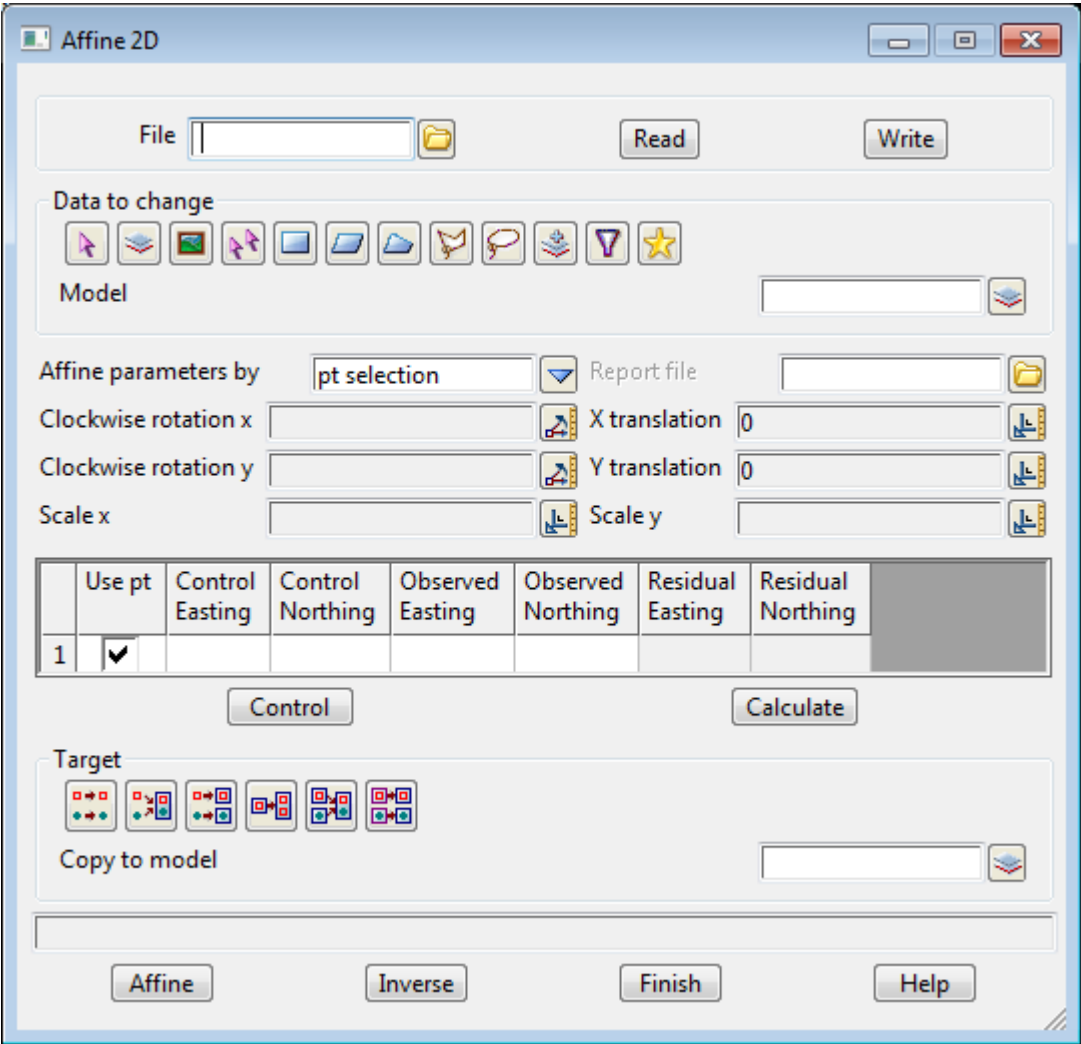
12d Rasters (including ECW rasters) may have transforms applied with any transformation panel with the following constraints:

1. "Replace existing data" is the only output option supported.
2. The set of parameters supplied for the transformation, when applied to the four corners of the original raster, results in a rectangle.
3. The raster cannot be selected as a string to be transformed, it should be placed in a model on its own and the model selected as the '**Data to change**'.

The raster images themselves will not be altered, only the model information which maps them into world coordinates is changed.

For the Affine panel, this means that different x and y scaling factors may be used, however the two axis rotations must be identical.

On selecting **Affine 2D**, the **Affine 2d** panel is displayed.



If the **Parameters by** choice box is set to **Pt Selection** then control-observed point pairs are selected by the user and the pairs are written to the grid on the panel. See the section [Selecting Control and Observed Points for the Helmert and Affine Transformations](#) for information on picking control and observed points.

If the **Parameters by** choice box is set to **Direct entry**, the transformation parameters are manually entered into the panel and the grid section is not used.

The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
File		file box		*.aaf files
	<i>a filename can be specified for reading or writing a file to restore the panel contents for re-use.</i>			
Read		button		
	<i>if a valid file exists, the file contents can be loaded into the panel.</i>			
Write		button		
	<i>if a valid name is specified, the user can write the input data to a file.</i>			

Data to change

Data source type	Model
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>	

Data source input
source of data to be processed.

Affine parameters by choice Pt selection Pt selection
Direct entry

the parameter entry method.

Pt selection - the control points and their matching observed points are selected by the user after clicking the control button.

Direct entry- the transformation parameter fields are used to type in the parameter data.

Report file *.rpt files
if not blank, write a report on the Affine transformation.

Rotation x angle box
the rotation of the x-axes of the existing points with respect to the transformed x-axis.

Rotation y angle box
the rotation of the y-axes of the existing points with respect to the transformed y-axis.

Scale x input/output
the x-scale factor for the existing coordinates with respect to the transformed coordinates

Scale y input/output
the y-scale factor for the existing coordinates with respect to the transformed coordinates

X Translation input/output
the x translation of the existing coordinates with respect to the transformed coordinates

Y Translation input/output
the y translation of the existing coordinates with respect to the transformed coordinates

Control button
starts the selection process for choosing more control points. The process is terminated when the calculate button is used.

Calculate button
calculate the Affine parameters from the selected points shown in the grid.

Target type
Data target type - where to put the processed strings. For a full description go to [Data Target](#) in the chapter [Tools and Concepts](#)

Target info input
extra information required for the target.

Affine button
apply the affine transformation to the data specified in the source box, and put it into the appropriate target area.

2D Affine - Orthogonal

Position of option on menu: Utilities =>A-G =>Affine 2D orthogonal

A **2D orthogonal affine transformation** is a two dimensional linear transformation consisting of a 2D-translation (shift) of the data, a scaling of the data in two different directions and the same rotation of both the x-axis and y-axis (about the z axis, like the Helmert). Hence there are five parameters to be specified. Unlike the standard affine transformations, rectangles can not be skewed by the orthogonal affine transformation.

Hence the orthogonal affine parameters are

- (a) the x-scale factor for the observed co-ordinates with respect to the control coordinates
- (b) the y-scale factor for the observed co-ordinates with respect to the control coordinates
- (c) the same rotation of the x-axis and y-axis of the observed coordinates to align it with the control x and coordinate axis
- (d) the x and y translation of the observed coordinates after the scalings and rotations have been applied

For information on the affine transformation, please go to the section [Coordinate Transformations - Helmert and Affine](#)

Notes on Transformations applied to Rasters

12d Rasters (including ECW rasters) may have transforms applied with any transformation panel with the following constraints:

1. "Replace existing data" is the only output option supported.
2. The set of parameters supplied for the transformation, when applied to the four corners of the original raster, results in a rectangle.
3. The raster cannot be selected as a string to be transformed, it should be placed in a model on its own and the model selected as the '**Data to change**'.

The raster images themselves will not be altered, only the model information which maps them into world coordinates is changed.

For this panel, this means that different x and y scaling factors may be used.

On selecting **Affine 2D orthogonal**, the **Orthogonal Affine** panel is displayed.

If the **Parameters by** choice box is set to **Pt Selection** then control-observed point pairs are selected by the user and the pairs are written to the grids on the panels. See the section [Selecting Control and Observed Points for the Helmert and Affine Transformations](#) for information on picking control and observed points.

If the **Parameters by** choice box is set to **Direct entry**, the transformation parameters are manually entered into the panel and the grid section is not used.

The fields and buttons used in this panel have the following functions.






Field Description	Type	Defaults	Pop-Up
File	file box		*.ortho_aaf files
<i>a filename can be specified for reading or writing a file to restore the panel contents for re-use.</i>			
Read	button		
<i>if a valid file exists, the file contents can be loaded into the panel.</i>			
Write	button		

if a valid name is specified, the user can write the input data to a file.

Data to change

Data source type

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data source	input
<p> </p> <p> </p> <p>  </p> <p> </p> <p>  </p> <p>  </p> <p> </p> <p>  </p> <p>  </p> <p> </p> <p>  </p> <p> </p> <p> </p> <p>  </p> <p> </p> <p> </p> <p>  </p> <p> </p> <p>  </p> <p>  </p> <p> </p> <p>  </p>	<p> </p> <p> </p> <p>  </p> <p> </p> <p>  </p> <p>  </p> <p> </p> <p>  </p> <p>  </p> <p> </p> <p>  </p> <p> </p> <p> </p> <p>  </p> <p> </p> <p> </p> <p>  </p> <p> </p> <p>  </p> <p>  </p> <p> </p> <p>  </p>

source of data to be processed.

Parameters by	choice	Pt selection	Pt selection Direct entry
---------------	--------	--------------	------------------------------

the parameter entry method.

Report file	*.rpt files
--------------------	-------------

if not blank, write a report on the orthogonal affine transformation.

Clockwise rotation angle box

the rotation of both x and y axes of the existing points with respect to the transformed x and y axes.

Fixed scale? ☐ tick box

if ticked, the x and y scales are typed into the X/Y Scale fields and are held fixed when the orthogonal affine parameters are calculated from the selected control-observed point pairs.

Scale x input/output

the x-scale factor for the existing co-ordinates with respect to the transformed coordinates

Scale y input/output

the y-scale factor for the existing coordinates with respect to the transformed coordinates

X Translation input/output

the x translation of the existing coordinates with respect to the transformed coordinates

Y Translation input/output

the y translation of the existing coordinates with respect to the transformed coordinates

Origin method	choice box	Pick	Pick, Obs'd centroid Ctrl centroid
----------------------	------------	------	---------------------------------------

the translation can be reported against another origin than the default (0,0).

Origin X/Y coordinate input

the translation parameters are written out with respect to this origin.

Control button

restarts the selection process for choosing more control points.

Calculate button

calculate the orthogonal affine parameters from the selected points shown in the grid.

Target type

Data target type - where to put the processed strings. For a full description go to [Data Target](#) in the chapter [Tools and Concepts](#)

Target info input

extra information required for the target.

Affine button

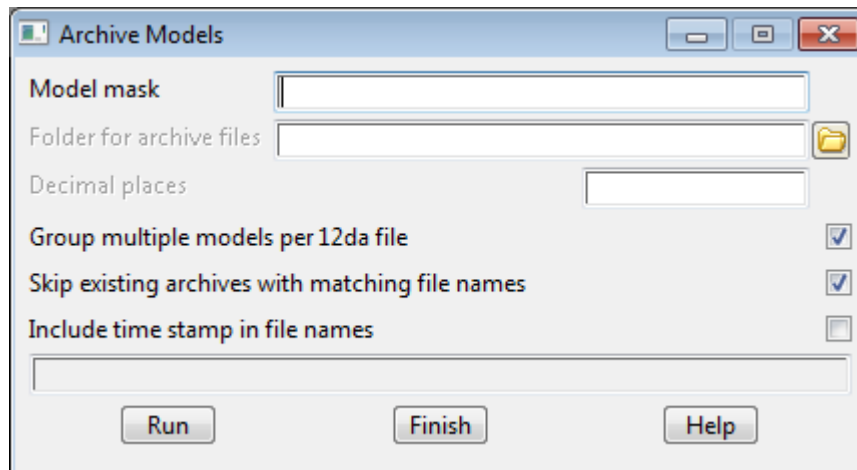
apply the orthogonal affine transformation to the data specified in the source box, and put it into the appropriate target area.

Archive Models

Position of option on menu: Utilities =>A-G =>Archive models

This option saves all models matching a specified model mask, to 12d-ascii files named in the style: <model name/prefix>[YYYYMMDD HHMMSS].12da

On selecting the **Archive models** option, the **Archive models** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults
Model mask	<i>specifies the model(s) to archive. Use '*' and '?' wildcards to specify multiple models.</i>	input text	
Folder for archive files	<i>a pre-existing folder to write the 12da files to. If unspecified, will write to backups.4d or working folder, depending on the environment variable \$USE_BACKUPS_4D_FOLDER_4D.</i>	folder	
Decimal places	<i>Number of decimal places to use when writing the 12da files. If unspecified, 15 decimal places are used.</i>	integer	
Group multiple models per 12da file	<i>if ticked, multiple models may be archived per 12da file, based on the matching first word of each model name. (The first word is the prefix of the model name, before the first space.) If not ticked, one model is archived per 12da file.</i>	tick box	ticked
Skip existing archives with matching file names	<i>if ticked, existing 12da files with matching names are left untouched and not re-archived. If not ticked, existing files are overwritten.</i>	tick box	ticked
Include time stamp in the file names	<i>if ticked, include archive date and time stamp in the file names, in the style: YYYYMMDD HHMMSS</i>	tick box	not ticked
Run	<i>runs the option</i>	button	

Special Note

The **Archive Models** option is a macro, which may optionally be run from a chain via arguments, rather than via an interactive panel. The details of the argument syntax are written to the Output Window, whenever the macro is run without valid arguments, namely:

Output Window

```
=====
12d Macro: "model_archive_panel.4do" started ...

Saves all models matching <model mask> to 12d-ascii files named: "<model name/prefix>[ YYYYMMDD HHMMSS].12da".

Usage with no arguments: macro is run with a panel interface.

Usage with arguments: model_archive_panel <model mask> [-f <folder>] -group -skip -timestamp

Arguments:
<model mask> = Models to be archived. Use "*" and "?" wildcards to specify multiple models.
[-f <folder>] = Existing folder to write 12da files to. If unspecified, will write to backups.4d or working folder, depending on $USE_BACKUPS_4D_FOLDER_4D.
-group = Group multiple models per 12da file, based on matching first word of model name. If unspecified, one model is archived per 12da file.
-skip = Existing 12da files with matching names are left untouched and not re-archived. If unspecified, existing files are overwritten.
-timestamp = Include archive date and time stamp in file names ["YYYYMMDD HHMMSS" format].

eg1: model_archive_panel OJT* -f ".\survey_archive" -group -skip
eg2: model_archive_panel "CONTROL*" -timestamp
```



Cartographic Projections

Position of option on menu: Utilities =>A-G =>Cartographic

The **Cartographic** option is used to transform data based on the same datum between

- (a) two different cartographic projections (based on the same datum)
- (b) longitude and latitude and a cartographic projection (based on the same datum)
- (c) a cartographic projection and longitude and latitude (based on the same datum).

The *Cartographic* option has already been documented in the section [Cartographic](#) in the chapter [Survey](#)

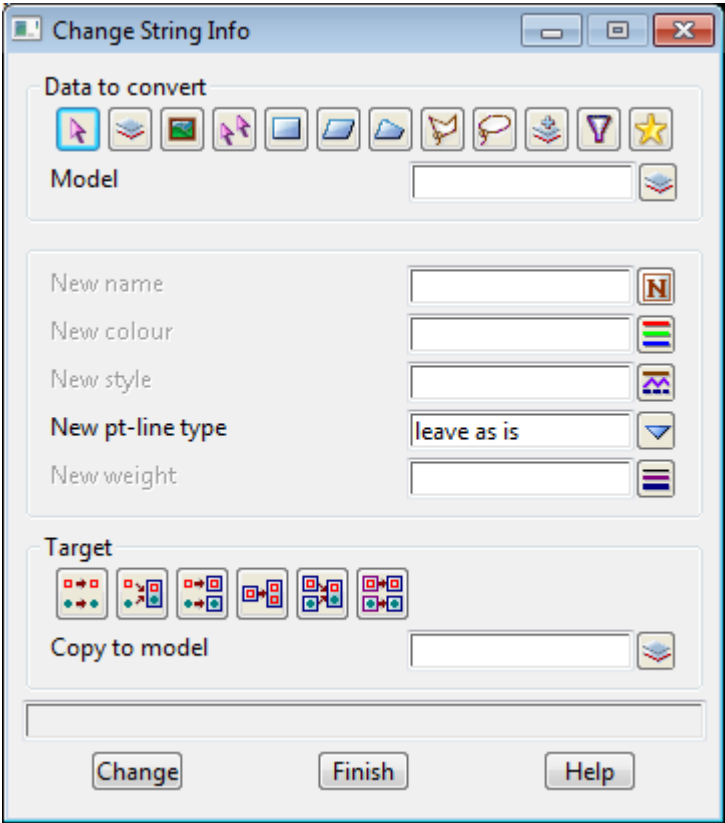
Change

Position of option on menu: Utilities =>A-G =>Change

This **Change** option is similar to the **Change** option from the **Strings** edits menu.

For the selected strings, **Change** can modify the colour, name, breakline type, style and model of each string.

On selecting the **Change** option, the **Change String Info** panel is displayed.



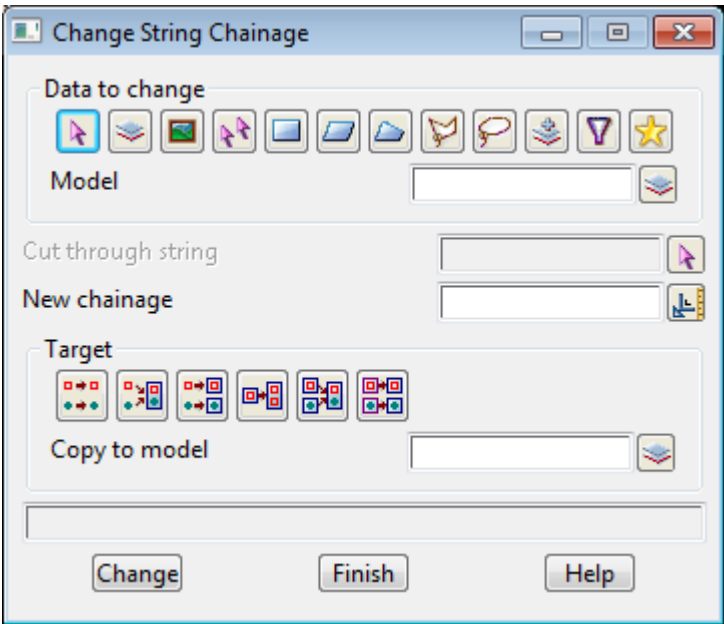
The fields and buttons used in the panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Data source type			Model	
	data selection type - for a full description go to Data Source in the chapter Tools and Concepts			
Data source		input		
	source of data to be changed.			
New name		input		
	if non-blank, then the name of the selected strings will be changed to the name given in the new name field.			
New colour		input		available colours
	if non-blank, then the colour of the selected strings will be changed to the colour given in the new colour field.			
New style		input		
	if non-blank, then the linestyle of the selected strings will be changed to the given in the new style field.			

New pt-line type	input	leave as is	leave as is, point, line
<i>if leave as is, then the point-line type of the selected string will be not be changed.</i>			
<i>If point string or line string, then the point-line type of the selected string will be changed to that type.</i>			
New weight	input	leave as is	leave as is, point, line
<i>if non-blank, then the weight of the selected strings will be changed to the given in the new weight field.</i>			
Target type			
<i>Data target type - where to put the processed strings. For a full description go to Data Target in the chapter Tools and Concepts</i>			
Target info	input		
<i>extra information required for the target.</i>			
Change	button		
<i>process the Data source of selected strings.</i>			

Change String Chainage

Position of option on menu: Utilities =>A-G =>Change string chainage
Change string chainage sets the start chainage of the selected strings to a given chainage value.
Selecting the Change string chainage brings up the **Change string chainage** panel.



The fields and buttons used in the panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Data to change

Data source type			Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>				

Data source	input			
<i>source of data to be processed.</i>				

Cut through string	string select			
---------------------------	---------------	--	--	--

if selected, the position on each string from the "Data to change" source box intersects the selected string will have the chainage from "New Chainage" at that position.

if no string is selected, the field is displayed as optional and the "New Chainage" value becomes the start chainage of each string selected from the source box.

New chainage	input			
<i>value to set the start chainage of all the selected strings to.</i>				

Target type				
<i>Data target type - where to put the processed strings. For a full description go to Data Target in the chapter Tools and Concepts</i>				

Target info	input			
<i>extra information required for the target.</i>				

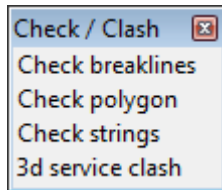
Change	button			
<i>process the selected Data source of strings</i>				

Check/Clash

Position of menu: Utilities =>A-G =>Check/clash

Check/clash options run checks on strings, and clashes between strings.

The Check/Clash walk-right menu is



check for crossing breaklines, duplicate vertices etc

run checks on a polygon

check strings against a mapping file etc

check strings clashing in 3d

For *Check breaklines*, go to

[Check Breaklines, Duplicate Vertices, Identicals](#)
in the chapter [Triangles](#)

Check polygon

[Check Polygon](#)

Check strings

[Check Strings](#)

3d service clash

[Strings Clash in 3d](#)

Check Polygon

Position of option on menu: Utilities =>A-G =>Check/clash =>Check polygon

Check polygon checks to see if a polygon passes the polygon checks performed by a polygon box.

The checks are to try and ensure that the polygon is suitable for use in some **12d** options.

For example, a polygon that crosses over itself, or has duplicate vertices, or has edges partially on top of other edges, or in parts consists of a single line, are not usable in most options requiring a polygon (fence) for calculations.

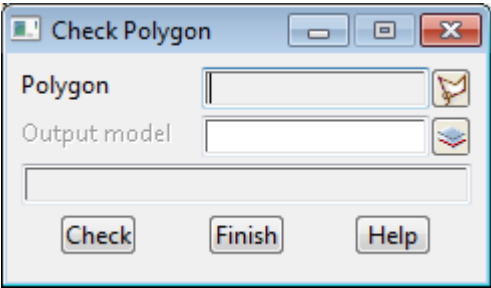
The **Exact Volumes** options in particular are very sensitive to having a well formed polygon whereas other options can use polygons that are unsuitable for *Exact Volumes*.

Some of the things that make a polygon unsuitable (and will produce the message "bad polygon" or "bad poly") are:

- (a) self intersects in the polygon
- (b) multiple vertices at the same (x,y) location
- (c) sides being partially on top of other sides
- (d) corners just touching other sides or vertices
- (e) parts of the polygon that contain no area. For example, a loop at one end and then a line going out from the loop. The line does not enclose any area. This may be created by contouring a surface that contains has a ridge line of constant height.

Errors in the polygon are reported in the **Output Window** with intelligent log lines to help find the section of the polygon with the error.

Selecting **Check polygons** brings up the **Check Polygon** panel



The fields and buttons used in the panel have the following functions.

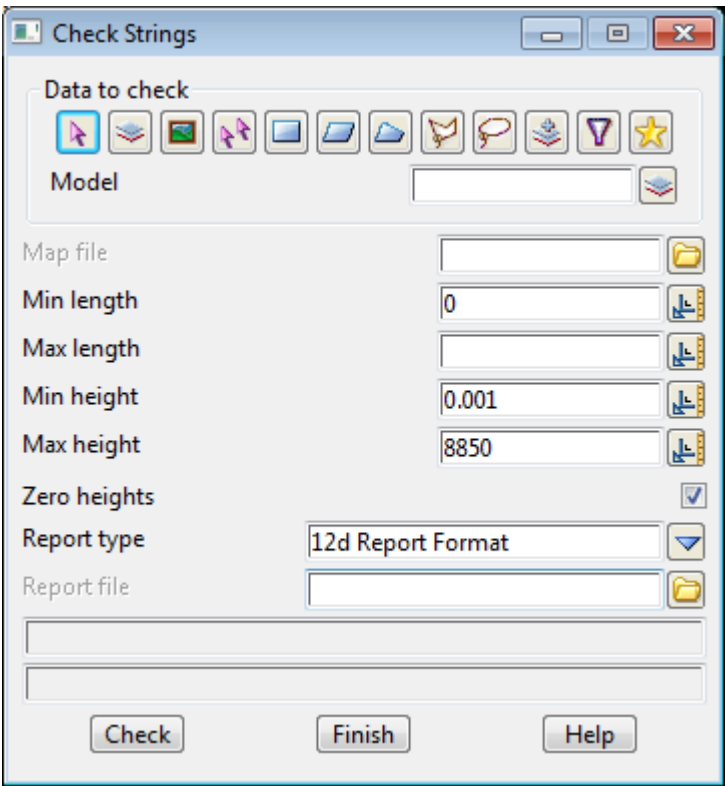
Field	Description	Type	Defaults	Pop-Up
Polygon	<i>select a polygon to check</i>	polygon box		
Output model	<i>if non blank, the resolved polygon is added to this model</i>			
Check	<i>perform the polygon checks. Error messages are written to the Output Window as Intelligent Log Lines to help find the problems.</i>	button		

Check Strings

Position of option on menu: Utilities =>A-G =>Check/clash =>Check strings

Check strings compares selected strings against a mapping file and also checks distances between vertices on strings.

Selecting Check strings brings up the **Check Strings** panel.



The fields and buttons used in the panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Data source type			Model	
	<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source		input		
	<i>source of data to be processed.</i>			
Map file		map file box		
	<i>if a map file is picked then each selected string is compared against the map file keys and if any matches occur, the string attributes must agree with the map file fields of the matched key. Any differences will be reported to the Output window and the Report file.</i>			
Min length		input		
	<i>report if any distance between adjacent vertices in a string is less than Min length.</i>			
Max length		input		
	<i>report if any distance between adjacent vertices in a string is greater than Max length.</i>			
Min height		input		
	<i>report if any vertex height is less than Min height.</i>			
Max height		input		
	<i>report if any vertex height is greater than Max height.</i>			

- Zero heights

tick box

if ticked, any vertex heights equal to 0.0 will be reported. It is vary rare that any height is exactly 0.0
- Report file

*if **non blank**, any failures are reported in this file.*
- Check

button

process the selected strings

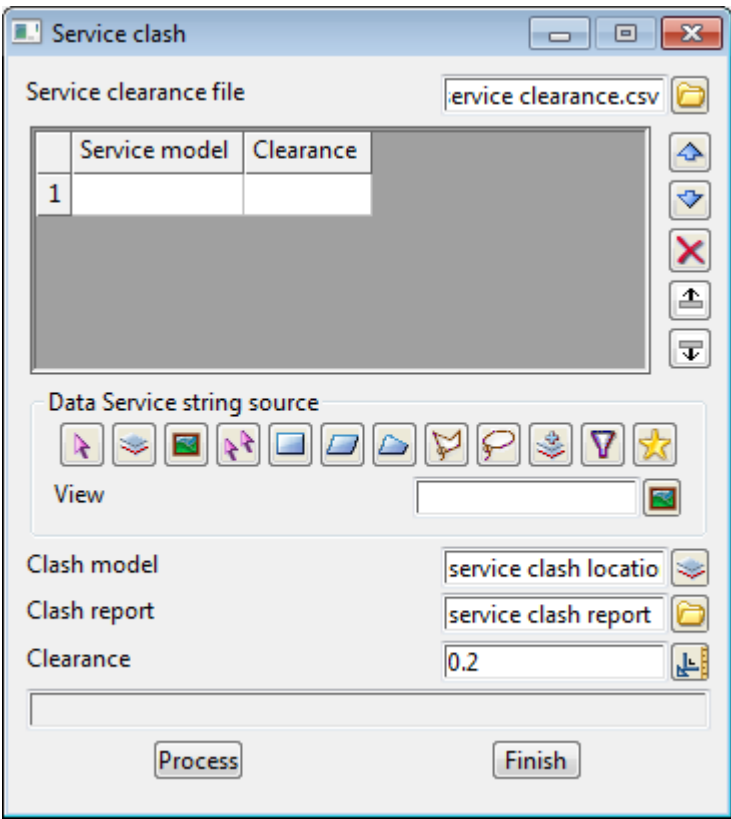


Strings Clash in 3d

Position of option on menu: Utilities =>A-G =>Check/clash =>3d service clash

3d service clash compares selected models of strings and checks to see if they intersect each other.

Selecting 3d service clash brings up the **Service Clash** panel.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Service clearance file	file box		*.csv files

csv file containing a list of model names and clearances. This file is read in as soon as the option starts and fills out the Service and Clearance grid.

Grid - Service model and Clearance

For a row in the grid:

*any string in the model of name **Service model** must have the clearance given in the **Clearance** column. That is, any other string must be at least the **Clearance** distance from the string from the **Service model**.*

*When the option starts, the grid is loaded from the **Service clearance file**. The grid can be modified and whenever the **Process** button is selected, the contents of the grid is written to the file name given by **Service clearance file**.*

Data source type	Model
------------------	-------

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data source	input
-------------	-------

source of data to be processed.

Each string in the data source is processed against all other strings selected by the Data source.

*If a string is from a model listed in the **Service model and Clearance** grid, then the corresponding clearance is used for the string, otherwise the default clearance given in the **Clearance** panel field is used.*

Clash model model box available models
*the lines of clash between any two strings is placed in the **Clash model**.*

Clash report
a report is generated for any clashes

Clearance input
*the default clearance to use for a string that is **not** in any of the Service models given in the **Service model and Clearance** grid*

Process button
process the selected strings and check for clashes

Classify Conduits

Position of option on menu: Utilities =>A-G =>Classify conduits

This option sets attributes on “conduit strings”, *i.e.* strings of the following type only: *Super* (with conduit dimensions), *Drainage*, *Pipeline*, *Pipe*.

String attributes set are:

"justification" (text) on all strings - values set to "invert", "obvert" or "centre".

"pipe size" (text) on constant-size Super string conduits, Pipeline and Pipe strings.

"diameter" (real) on constant-size Super string conduits, Pipeline and Pipe strings.

"width" (real) on constant-size Super string box conduits.

Segment attributes set are:

"pipe size" (text) on all Super string conduit segments.

"diameter" (real) on all Super string conduit segments.

"width" (real) on all Super string box conduit segments.

Notes:

1) *Drainage* and *Pipeline* strings are always invert justified.

2) *Pipeline* and *Pipe* strings are always circular with a constant diameter.

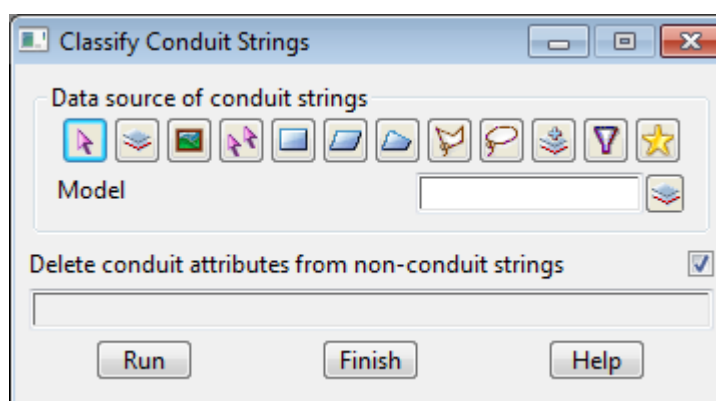
3) *Super* string conduits may be circular or box. *Drainage* strings may be circular, box, vee or trapezoid.

4) For non-circular conduit shapes, attribute "diameter" represents height of conduit.

5) Attribute "pipe size" is in mm (base units x 1000) and supports shapes: circular, box, vee, trapezoid - eg: "600", "1200x600", "V2000x600", "T2000B1200x600".

6) *Drainage* strings already have Pipe attributes "diameter" and "pipe size" (and potentially "width" and/or "top width") set via the *Drainage Network Editor*.

On selecting the **Classify conduits** option, the **Classify Conduit Strings** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
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Data source type		Model	
-------------------------	--	-------	--

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data source of conduit strings	input		
---------------------------------------	-------	--	--

source of data to be processed

Delete conduit attributes from non-conduit strings	tick box	ticked	
-----------------------------------------------------------	----------	--------	--

whether to delete the above mentioned string and segment attributes (if present) from non-conduit

string types

Run

runs the option

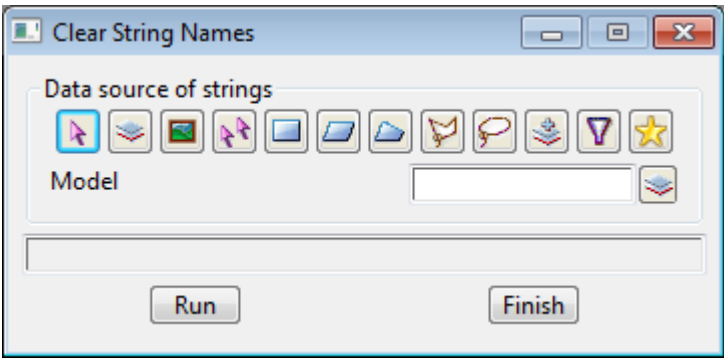
button

Clear String Names

Position of option on menu: Utilities =>A-G =>Clear string names

Clear string names removes the names for all the selected strings.

Selecting Clear string names brings up the **Clear String Names** panel.



The fields and buttons used in the panel have the following functions.

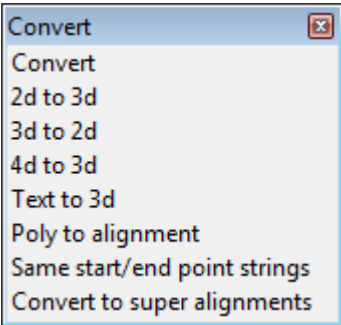
Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source	input		
<i>source of data to be processed.</i>			
Run	button		
<i>remove/delete the string names from the selected strings</i>			

Convert

Position of menu: Utilities =>A-G =>Convert

The **convert** options are designed to convert large numbers of strings between string types. There is also a **global convert** option which will convert even more string types.

The **convert** walk-right menu is



- convert bulk strings
- convert 2d strings to 3d strings
- convert 3d strings to 2d strings
- convert 4d strings to 3d strings
- convert text to 3d points
- convert polylines to alignments
- convert closed strings to closed super strings
- convert strings to super alignments

For the option *Convert*, go to the section

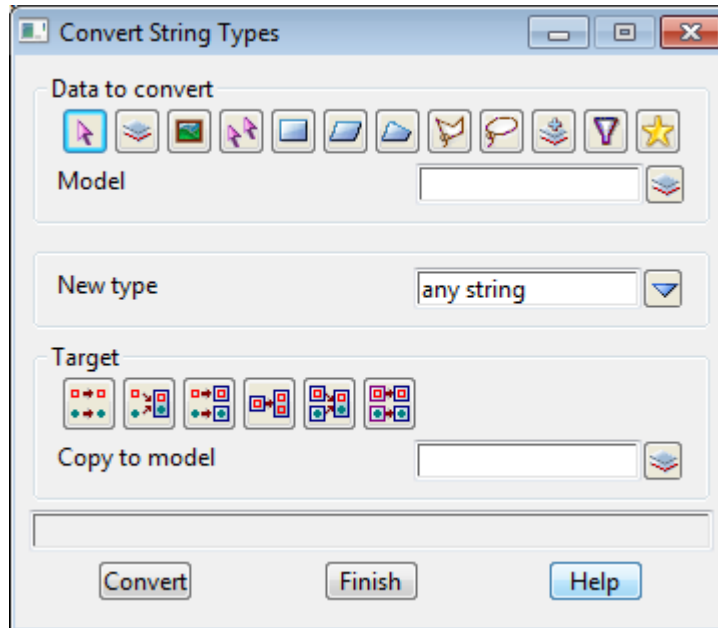
<i>2d to 3d</i>	Convert
<i>3d to 2d</i>	2d to 3d
<i>4d to 3d</i>	3d to 2d
<i>Text to 3d</i>	4d to 3d
<i>Poly to alignment</i>	Text to 3d
<i>Same start/end point strings</i>	Poly to Alignment
<i>Convert to super alignments</i>	Same Start/End Point Strings
	Convert to Super Alignment

Convert

Position of option on menu: Utilities =>A-G =>Convert =>Convert

The **Convert** option converts strings to a selected string type.

On selecting the **Convert** option, the **Convert String Types** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Data source type			Model	
	<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source		input		
	<i>source of data to be processed.</i>			
New type		string type box		all string types
	<i>the type of string to try and convert the data to.</i>			
Target type				
	<i>Data target type - where to put the processed strings. For a full description go to Data Target in the chapter Tools and Concepts</i>			
Target info		input		
	<i>extra information required for the target.</i>			
Convert		button		
	<i>convert all the selected strings to the type given in the New type field.</i>			

2d to 3d

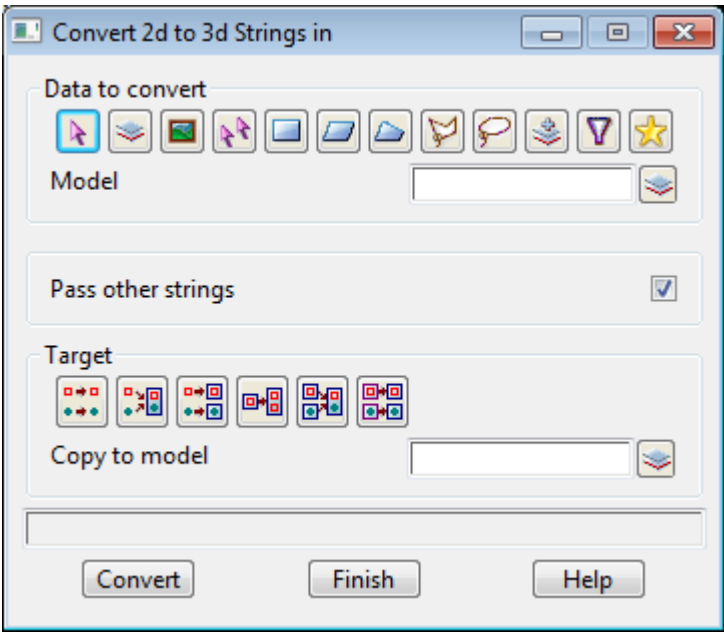
Position of option on menu: Utilities =>A-G =>Convert =>2d to 3d

The main difference between a 2d and a 3d string is that all the points in a 2d string have the same height. Hence to modify the z-values at individual points, a string must be 3d.

The 2d to 3d option is used to turn 2d (contour) strings into 3d strings.

This option is especially useful when a large number of strings have been read in with constant z-values (for example, cadastre) and the user then wants to modify the heights at each point on the string.

On selecting 2d to 3d and then the appropriate **Data Source** in the panel, the **Convert 2d to 3d Strings** in panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source	input		
<i>source of data to be processed.</i>			
Pass other strings	tick box	tick	
<i>if ticked, copies of all other strings are passed through to the model for converted strings</i>			
Target type			
<i>Data target type - where to put the processed strings. For a full description go to Data Target in the chapter Tools and Concepts</i>			
Target info	input		
<i>extra information required for the target.</i>			
Convert	button		
<i>convert all the 2d string in the Data source to 3d strings.</i>			

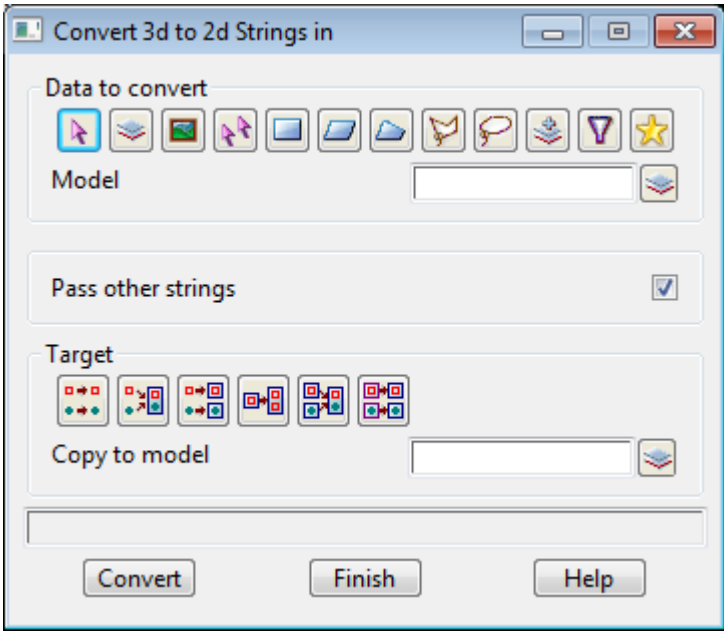
3d to 2d

Position of option on menu: Utilities =>A-G =>Convert =>3d to 2d

The difference between a 3d and a 2d string is that all the points in a 2d string have the same height. The **3d to 2d** option turns 3d string with a constant height into 2d strings. That is, it only converts 3d strings that have the **same** height at each point.

This option is useful when contours strings have come from another system as 3d strings, not 2d strings.

On selecting **3d to 2d** and then the appropriate **Data Source** in the panel, the **Convert 3d to 2d Strings** in panel is displayed.



The fields and buttons used in this panel have the following functions.

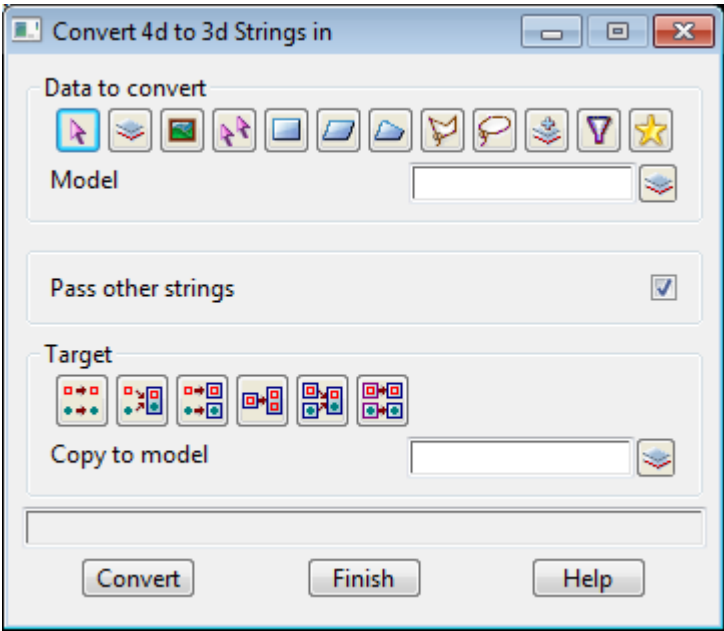
Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source	input		
<i>source of data to be processed.</i>			
Pass other strings	tick box	tick	
<i>if ticked, copies of all other strings are passed through to the model for 2d strings</i>			
Target type			
<i>Data target type - where to put the processed strings. For a full description go to Data Target in the chapter Tools and Concepts</i>			
Target info	input		
<i>extra information required for the target.</i>			
Convert	button		
<i>convert all the 3d strings with constant height in the Data source to 2d strings.</i>			

4d to 3d

Position of option on menu: Utilities =>A-G =>Convert =>4d to 3d

The difference between a 4d and a 3d string is that a 4d string can have a text label at each point on the string. The 4d to 3d option turns 4d string into 3d strings by stripping off the text labels at each point of the 4d string.

On selecting 4d to 3d and then the appropriate **Data Source** in the panel, the **Convert 4d to 3d Strings in** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Data source type			Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>				
Data source		input		
<i>source of data to be processed.</i>				
Pass other strings		tick box	tick	
<i>if ticked, copy all other strings and pass them through to the model for 3d strings</i>				
Target type				
<i>Data target type - where to put the processed strings. For a full description go to Data Target in the chapter Tools and Concepts</i>				
Target info		input		
<i>extra information required for the target.</i>				
Convert		button		
<i>convert all the 4d strings in the Data source to 3d strings.</i>				

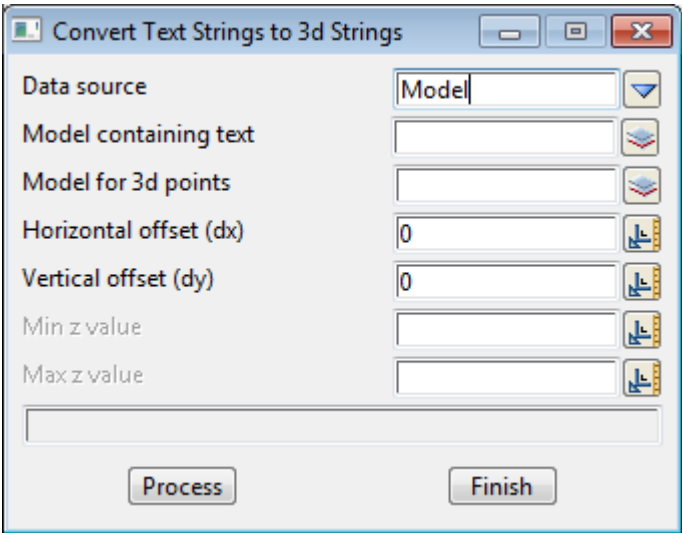
Text to 3d

Position of option on menu: Utilities =>A-G =>Convert =>Text to 3d

Sometimes when data for points is received from a CAD systems, all that is received is the text of the z-value of the point and no actual point.

The *Text to 3d* option will find text representing a z-value and create a new point using the justification point of the text as the (x,y) position and the value of the text as the z-value.

On selecting *Text to 3d*, the **Convert Text Strings to 3d Strings** panel is displayed.



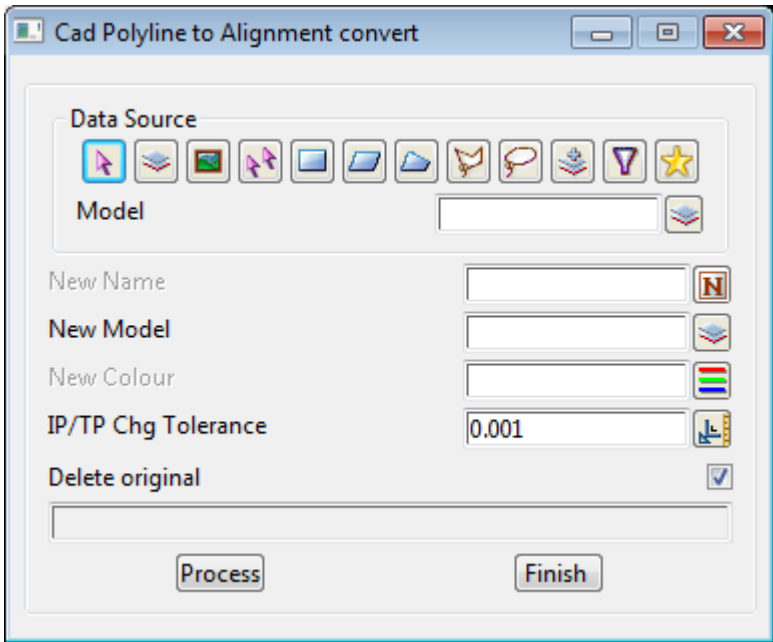
The fields and buttons used in this panel have the following functions

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source	input		
<i>source of data of the text to be processed.</i>			
Model for 3d points	model box		available models
<i>model to place the 3d points in.</i>			
Horizontal offset (dx)	input	0	
<i>the x-value for created point is the text justification point less the horizontal offset.</i>			
Vertical offset (dy)	input	0	
<i>the y-value for created point is the text justification point less the vertical offset.</i>			
Min z value	input		
<i>if non-blank, only convert text with z-value greater than Min z value.</i>			
Max z value	input		
<i>if non-blank, only convert text with z-value less than Max z value.</i>			
Process	button		
<i>convert all the selected text strings to 3d strings.</i>			

Poly to Alignment

Position of option on menu: Utilities =>A-G =>Convert =>Poly to alignment

Selecting Poly to alignment brings up the CAD Polyline to Alignment Convert panel.



The fields and buttons used in this panel have the following functions

Field	Description	Type	Defaults	Pop-Up
Data source type			Model	
	data selection type - for a full description go to Data Source in the chapter Tools and Concepts			
Data source		input		
	source of data of the text to be processed.			
New name		name box		available names
	if non blank , new name for the converted strings			
New model		model box		available models
	new model for the converted strings			
New colour		colour box		available colours
	if non blank , new colour for the converted strings			
IP/TP chg tolerance		input	0.001	
Delete original		tick box		tick
	if ticked , the original strings are deleted.			
Process		button		
	convert all the selected alignments.			

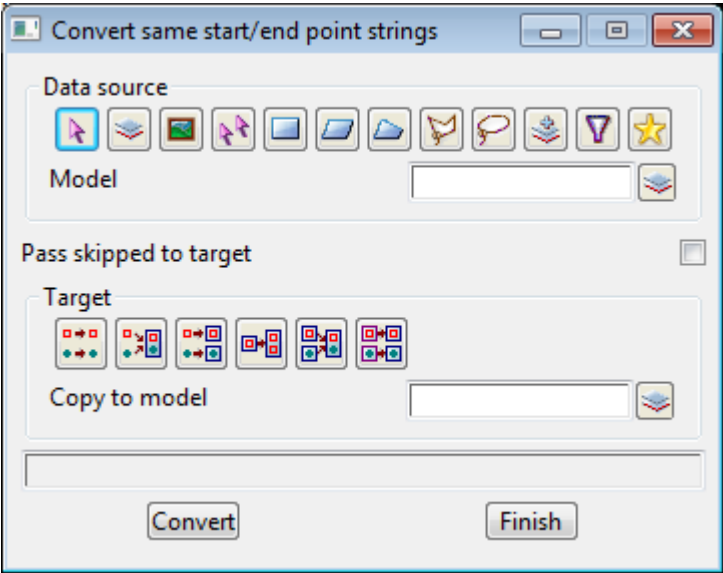
Same Start/End Point Strings

- Position of option on menu:** Strings =>Properties =>Same start/end point strings
- Position of option on menu:** Utilities =>A-G =>Convert =>Same start/end point strings
- Position of option on menu:** Utilities =>Super strings =>Same start/end point strings

When non super string strings are closed, an extra vertex identical to the first vertex is added to the end of the string. For super strings, there is a **closed string** flag and no duplication of the first and last vertices is required.

This options converts closed non super strings to closed super strings and deletes the duplicated vertex.

Selecting Same string/end point strings brings up the **Convert Same Start/End Point Strings** panel.



The fields and buttons used in this panel have the following functions

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source	input		
<i>source of data to be processed.</i>			
Pass other strings	tick	tick	
<i>if ticked, copy all other strings and pass them through to the target model</i>			
Target type			
<i>Data target type - where to put the processed strings. For a full description go to Data Target in the chapter Tools and Concepts</i>			
Target info	input		
<i>extra information required for the target.</i>			
Convert	button		
<i>convert all the closed strings to closed super strings with duplicated end point.</i>			

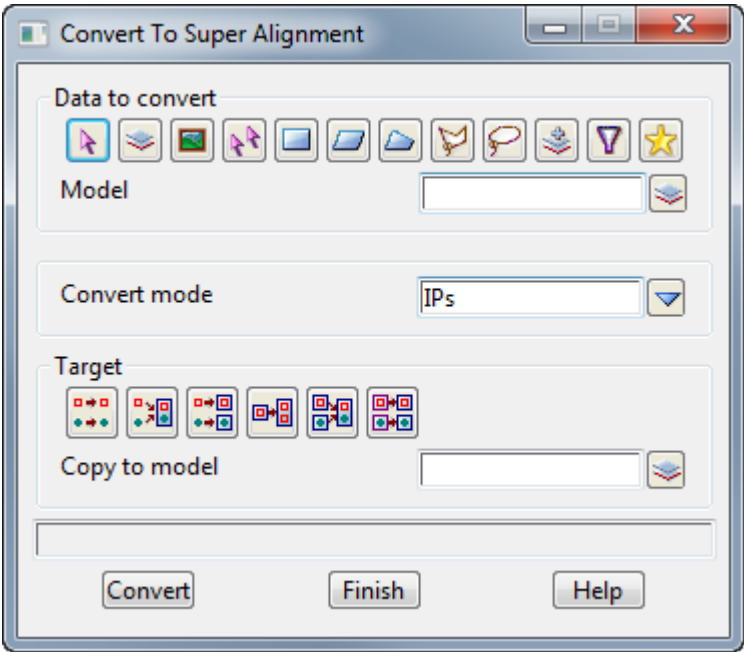
Convert to Super Alignment

Position of option on menu: Utilities =>A-G =>Convert =>Convert to super alignments

The **Convert** option converts strings to super alignments, either with just IPs or using Elements.

Note - conversion to *Elements* is only possible if you have the **Alignment** module.

Selecting **Convert to super alignments** brings up the **Convert to Super Alignment** panel.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Data source type

Model

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data source

input

source of data to be processed.

Convert mode

choice box

IPs, Elements

*if **IPs**, the strings are converted to super alignments with IPs.*

*If **Elements**, the strings are converted to super alignments using Elements.*

*Note - if the user does not have the Alignment module, then the **Convert mode** is automatically set to IPs.*

Target type

Data target type - where to put the processed strings. For a full description go to [Data Target](#) in the chapter [Tools and Concepts](#)

Target info

input

extra information required for the target.

Convert

button

convert all the selected strings to either super alignments with IPs or super alignments with Elements.

Cuts

Position of menu: Utilities =>A-G =>Cuts

Cuts is used to create intersections through string data rather than tins.

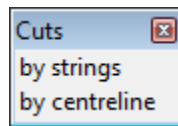
That is, it calculates the cuts that a plan string makes with each of the strings in a model or view, and creates cut points with the z-value from the cut strings.

The cut points that the plan string creates are connected as a 4d string - the x-section of cuts through a model or view - with the z value coming from the cut string, and the text at the point being the name of string that was cut.

There are two methods for generating the cuts x-sections

- (a) by taking sections along selected strings or all the strings in a model or view
- (b) by taking sections at regular intervals and perpendicular to a selected centre line string.

The **Cuts** walk-right menu contains these two methods



For the option *by strings*, go to the section
by centreline

[Cuts by Strings.](#)
[Cuts by Centreline.](#)

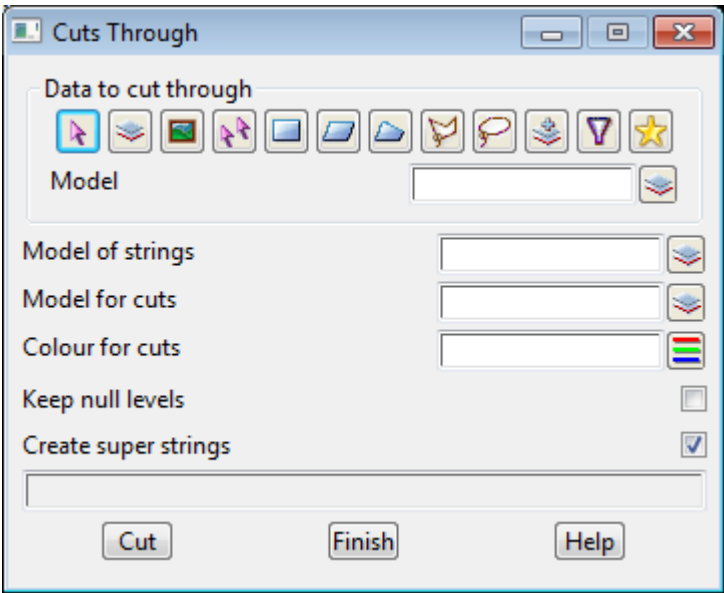
Cuts by Strings

Position of option on menu: Utilities =>A-G =>Cuts =>by strings

by strings generates cuts through a Data source of strings, for all the strings in a user specified model.

For each string in the **Model of strings**, the plan representation of the string is cut through the all the string in **Data to cut through**, to generate cut x-sections.

Selecting by strings displays the **Cuts Through** panel.



The fields and buttons used in this panel have the following functions

Field	Description	Type	Defaults	Pop-Up
Data source type			Model	
	<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source		input		
	<i>source of data to be cut through.</i>			
Model of strings		input		available models
	<i>each string in this model will be processed against all the strings in the Data source Data to cut through.</i>			
Model for cuts		input		available models
	<i>model to place the cut x-sections into.</i>			
Colour for cuts		input		available colours
	<i>colour for the cut x- section strings</i>			
Cut		button		
	<i>each string in the Model of strings is processed against all the strings in the Data source Data to cut through. The 4d strings of cuts are placed in the Model for cuts.</i>			

Cuts by Centreline

Position of option on menu: Utilities =>A-G =>Cuts =>by centreline

For **by centreline**, a centre line string is selected by the user and temporary plan lines are created at regular intervals perpendicular to the selected string.

Cut x-sections are then generated for the temporary plan section lines by taking cuts through the Data source **Data to cut through**.

Selecting **by centreline** displays the **Cuts from CL for** panel.

The fields and buttons used in this panel have the following functions

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type

Model

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data source

input

source of data to be processed.

Section separation

input

10.0

the distance along the selected centre line to generate plan section lines to be used to cut through the data source.

Special chainages input *.spf files
a file containing chainages, one per line, that are also used as chainages to create cross sections at.

Gather vertical points of interest tick box
whether or not to create cuts at vertical points of interests (sags, crests, vertical tangent points etc)

Chord/arc tolerance input default chord/arc tolerance
the chord to arc tolerance to use on the selected string for determining how many plan sections are created around horizontal curves.

Left/Right cut width input 50
the left/right distance to go out from the centre line for creating a section to cut through the strings.

Model for cuts input available models
model to place the cut x-section strings into.

Clean cuts model beforehand tick box
*if **ticked**, the model is cleaned of all data before new sections are created.*

Colour for cuts colour box available colours
colour for the cut section strings

Keep null levels tick box
*if **ticked**, then if a null level exists on the string being cut, then a null level point is created.*

Select cl string-select
the selected cl string is used to create plan section lines at regular intervals and perpendicular to the centre line string. These strings are cut though the model/view of strings.

Start/End chainage input
if non-blank then sections for the cuts are restricted to between the given start and end chainage of the selected cl string.

End Area Calculations

Tin tin box available tins
*if **non-blank**, the cut and fill areas for the section against the tin are calculated and added as attributes to the section.*

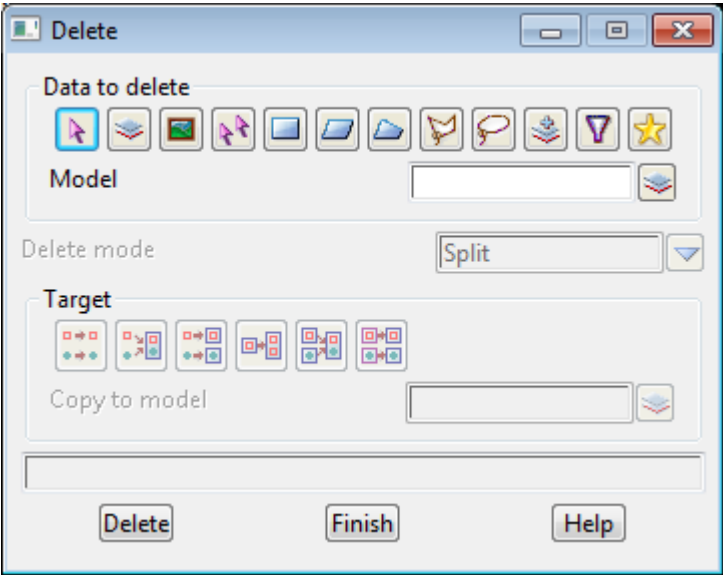
Strip depth input
*if **non-zero**, then a strip depth is removed from the tin before the cut and fill areas for the section against the tin are calculated.*

Cut button
*each plan section line generated down the selected centre line string is processed against all the strings in the Data source. The 4d strings of cuts are placed in the **Model for cuts**.*

Delete

Position of option on menu: Utilities =>A-G =>Delete

The **Delete** option deletes all the selected strings.
On selecting the **Delete** option, the **Delete** panel is displayed.



The fields and buttons used in this panel have the following functions

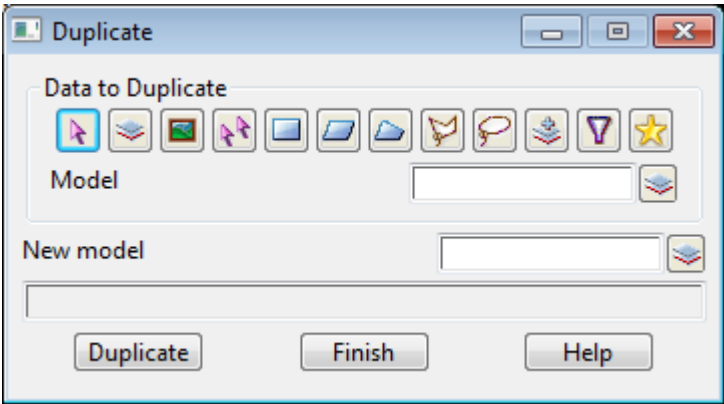
Field	Description	Type	Defaults	Pop-Up
Data source type			Model	
	<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source		input		
	<i>source of data to be processed.</i>			
Delete		button		
	<i>delete the selected strings.</i>			

Duplicate

Position of option on menu: Utilities =>A-G =>Duplicate

Duplicate makes duplicates of strings.

Selecting **Duplicate** displays the **Duplicate** panel.



The fields and buttons used in the panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Data source type	<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>		Model	
Data source	<i>source of data to be processed.</i>	input		
New model	<i>name of the model to place the duplicated strings into.</i>	input		available models
Duplicate	<i>duplicate all the strings in the data source.</i>	button		

<esc> can be used to abort the duplicate option.

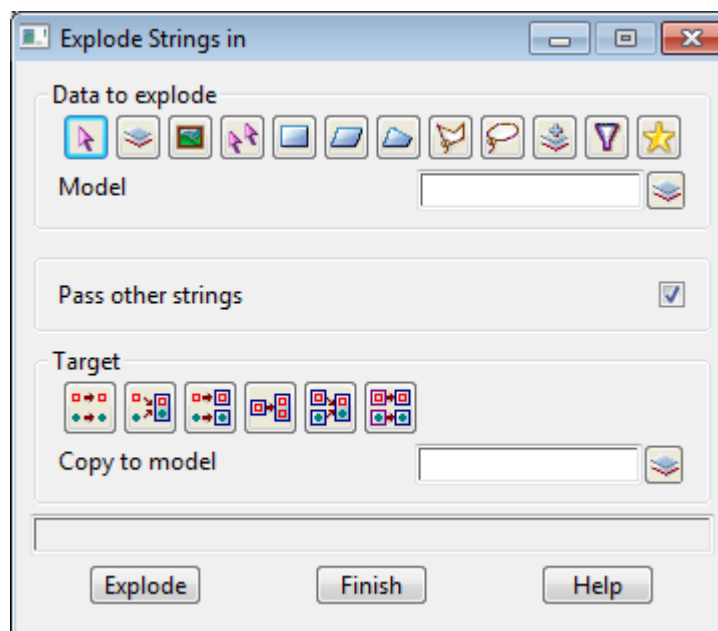
Explode

Position of option on menu: Utilities =>A-G =>Explode

The **Explode** option explodes point strings into individual one vertex strings and line strings into individual segments.

Super alignment, Alignment, pipeline, sewer and drainage strings are not exploded.

On selecting **Explode** and then the appropriate **Data Source** in the panel, the **Explode Strings in** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type

Model

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data source

input

source of data to be processed.

Pass other strings

tick box

tick

*if **ticked**, copies of all other strings and passed through to the exploded model.*

Target type

Data target type - where to put the processed strings. For a full description go to [Data Target](#) in the chapter [Tools and Concepts](#)

Target info

input

extra information required for the target.

Explode

button

explode all the strings in the data source into one vertex strings and segments.

Explode Text

Position of option on menu: Utilities =>A-G =>Explode (text)

Explode (text) explodes text in text strings and the text from 4d strings, into its component arcs and lines. The exploded arcs and lines are placed in one new model.

Selecting **Explode (text)** displays the **Explode Text in** panel.



The fields and buttons used in the panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Data source type			Model	
	<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source		input		
	<i>source of data to be processed.</i>			
Exploded model		input		available models
	<i>name of the model to place the exploded text strings and text of 4d strings into.</i>			
Explode		button		
	<i>explode all the selected text and add them to the model given in the Exploded model field.</i>			

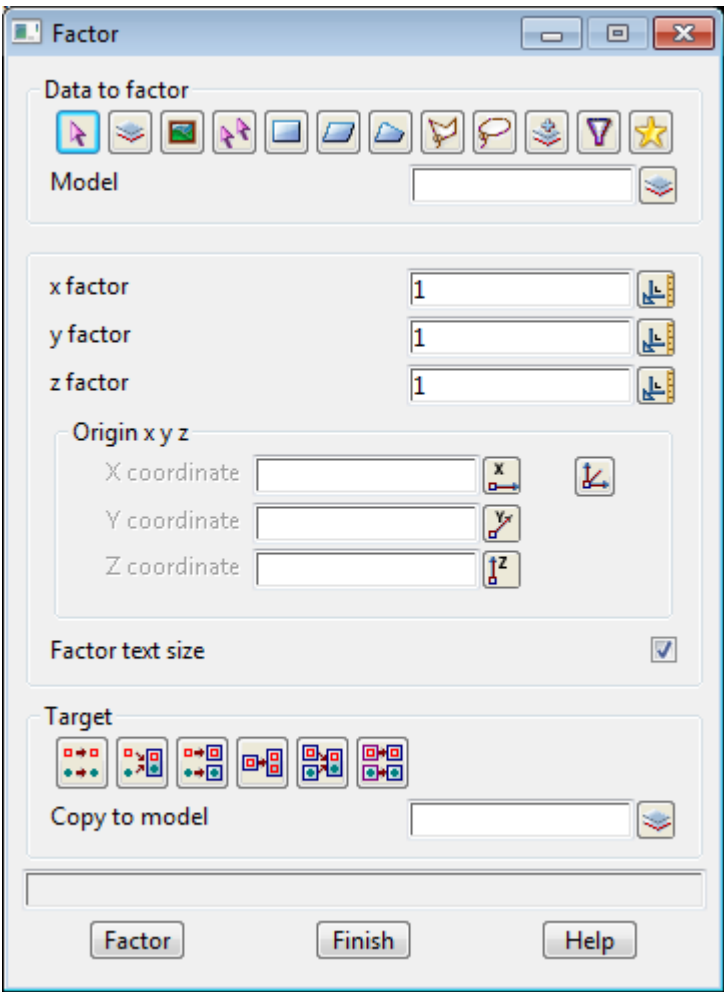
Factor

Position of option on menu: Utilities =>A-G =>Factor

Factor multiplies the x,y and z values of selected strings by user supplied factors.

The option is useful for changing the units of any data in a model (e.g. Imperial to metric).

Selecting Factor displays the Factor panel.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source	input		
<i>source of data to be processed.</i>			
x/y/z factor	input	1.0	
<i>factor to multiply the x/y/z-values of a string by.</i>			
Origin x y z	input		xyz ops menu
<i>field with x y z value to be used as (x,y,z) origin for the factor. if blank, an origin of (0,0,0) is used.</i>			

Factor text size tick box tick
if ticked, the size of text is factored.

Target type
Data target type - where to put the processed strings. For a full description go to [Data Target](#) in the chapter [Tools and Concepts](#)

Target info input
extra information required for the target.

Factor button
multiply the (x,y,z) values of the selected strings by the x,y and z factors given in the appropriate panel fields.

WARNING - if the x factor and y factor are not equal, then arcs in arcs, circles, alignment and polyline strings can not be factored. For these cases, the y factor will be set the x-factor and then applied to the arcs.

Filter

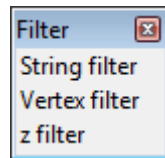
Position of menu: Utilities =>A-G =>Filter

The **Filter** options are used to remove surplus points from strings.

Three types of filters are currently supported in **12d** Model:

- s a string filter, which removes points from 2d and/or 3d line strings that do not deviate by more than a specified offset tolerance from straight lines joining successive string points (in three dimensions for 3d strings)
- s a vertex-filter which removes adjacent vertices closer than a given user defined (x,y) and z distance
- s a z-filter which eliminates points not contained within a specified z-range

The **Filter** walk-right menu is



filter 2d and 3d strings
removes close adjacent vertices
filter z values

For the option *String filter*, go to
Vertex filter
z filter

[String Filter](#)
[Vertex Filter](#)
[Z Filter](#)

String Filter

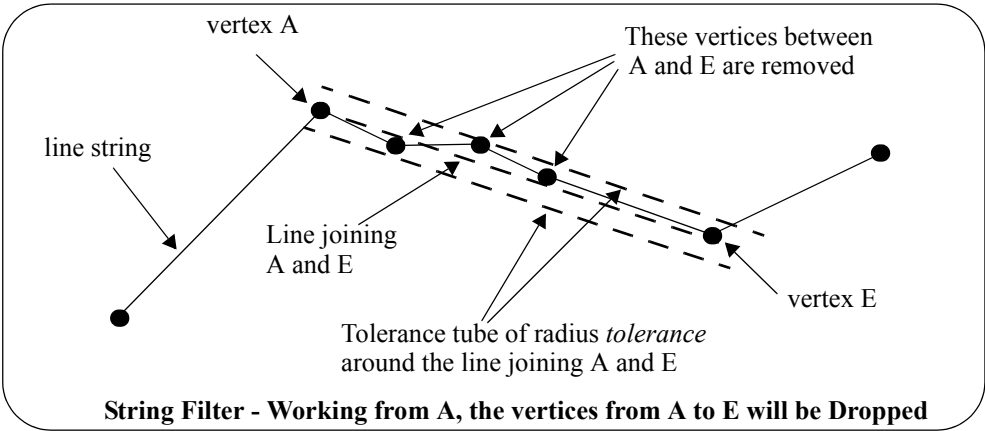
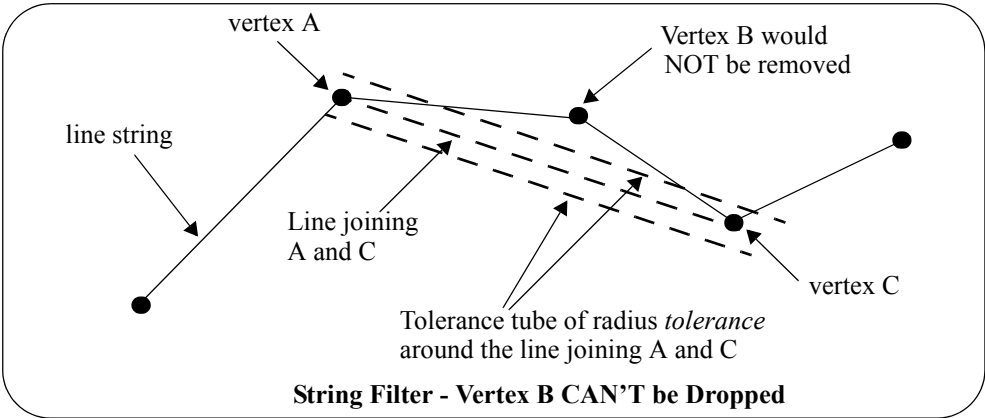
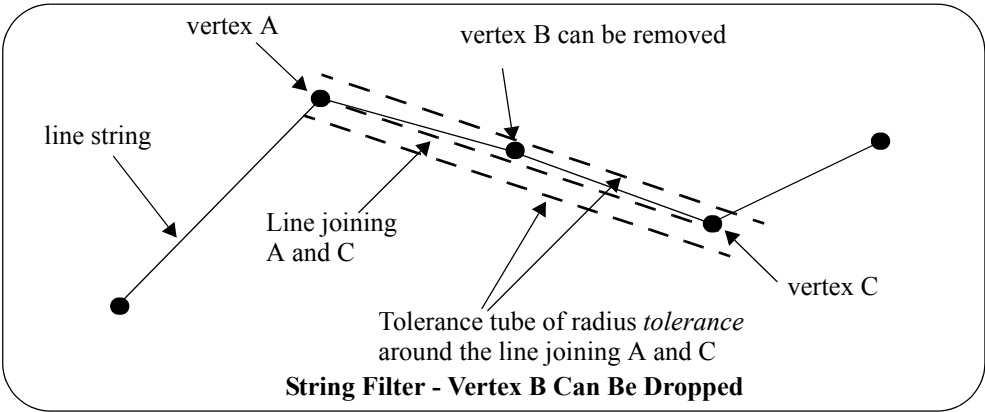
Position of option on menu: Utilities =>A-G =>Filter =>String filter

The String filter option is used to remove surplus vertices from 2d strings (contours) and 3d strings.

The string filter option tries to drop out vertices that if left out, don't make "too much difference".

So for a user defined tolerance:

if you have successive vertices A, B and C, and by leaving out vertex B, then the lines AB and BC don't go outside a tube of radius tolerance around the lines AC, then vertex B is dropped.



The filter starts at the first vertex of the string and looks ahead, dropping out vertices until it finds one that can't be removed. That vertex then become the new second vertex and the process is

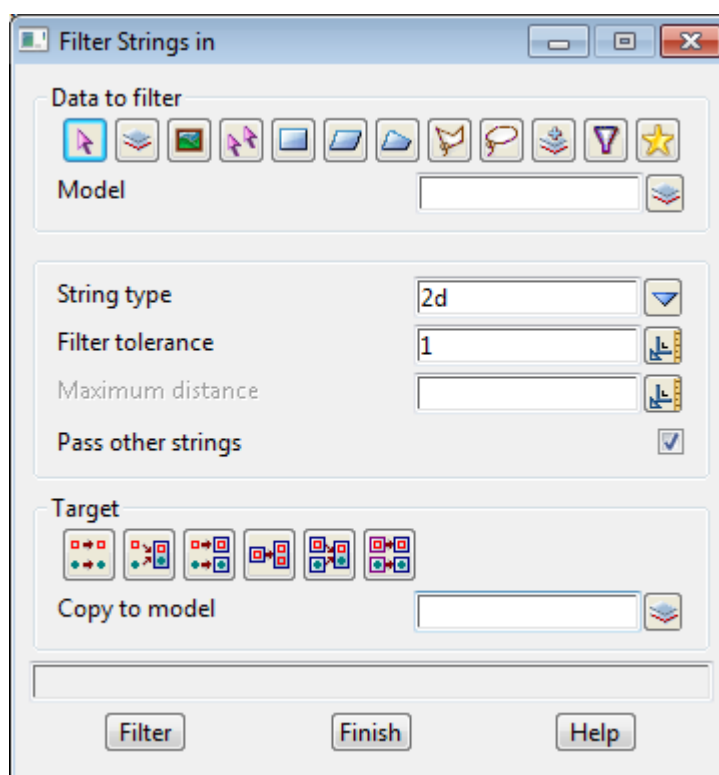
repeated but starting at the new second vertex. This process is repeated for the new third vertex and so on until the end of the string.

The *tolerance* value used normally depends on the data set and the job that the data is being used for.

So the string filter removes vertices from 2d and/or 3d line strings that do not deviate by more than a specified offset tolerance from straight lines joining successive string vertices (in three dimensions for 3d strings).

NOTE - string filter does not apply to point strings.

Selecting **String filter** displays the **Filter Strings in** panel.



The fields and buttons used in this panel have the following function

Field Description	Type	Defaults	Pop-Up
Data source type <i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>		Model	
Data source <i>source of data to be processed.</i>	input		
String type <i>string types to be filtered</i>	input	2d	2d, 2d & 3d
Filter tolerance <i>tolerance to be used in filtering</i>	input	1	
Pass other strings <i>if ticked, pass all other strings through to the model for filtered strings</i>	tick box	tick	
Target type <i>Data target type - where to put the processed strings. For a full description go to Data Target in the</i>			

chapter [Tools and Concepts](#)

Target info input
extra information required for the target.

Filter button
filter all the selected strings.

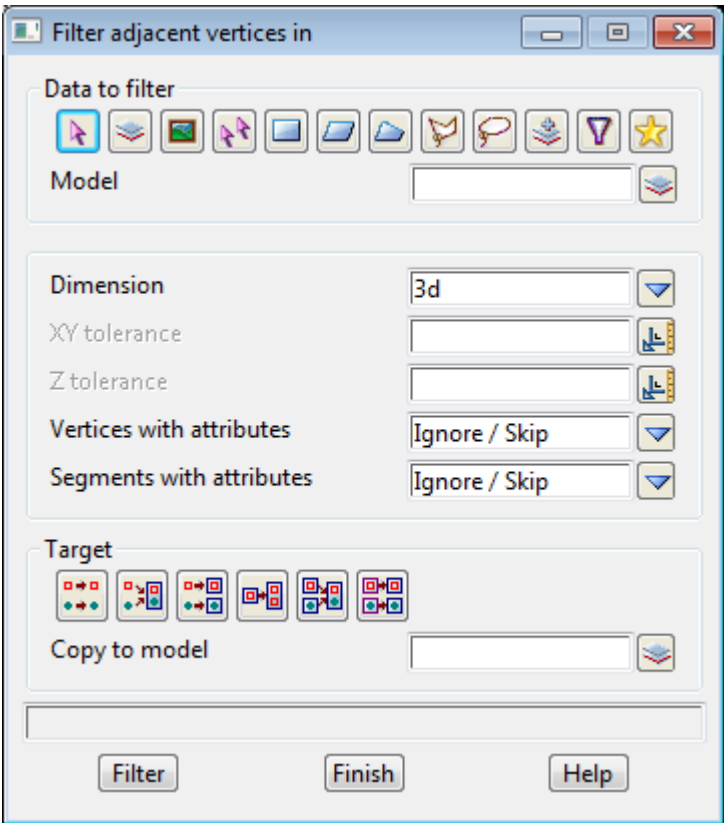
Vertex Filter

Position of option on menu: Utilities =>A-G =>Filter =>Vertex filter

The **Vertex filter** option is used to remove close adjacent vertices from selected strings. The strings can be *point* or *line* strings.

The option can remove adjacent string vertices that are equal to a given tolerance either in plan position only (*i.e.* have similar x and y co-ordinates) or equal to a given tolerance for x, y and z co-ordinates.

Selecting **Vertex filter** displays the **Filter adjacent vertices in** panel.



The fields and buttons used in this panel have the following function

Field	Description	Type	Defaults	Pop-Up
Data source type			Model	
	data selection type - for a full description go to Data Source in the chapter Tools and Concepts			
Data source		input		
	source of data to be processed.			
Dimension		input	2d	2d,3d
	if 2d, adjacent string vertices with equal x and y co-ordinates are filtered. If 3d, adjacent string vertices with equal x, y and z co-ordinates are filtered.			
xy tolerance		input		
	the distance to use for checking if adjacent vertices are too close in (x,y)			
z tolerance		input		
	the delta-z to use for checking if adjacent vertices are too close in z			
Vertices with attributes		choice box	Ignore/skip	Ignore/skip, Merge attributes Lose attributes

filter the selected strings.

Z Filter

Position of option on menu: Utilities =>A-G =>Filter =>Z filter

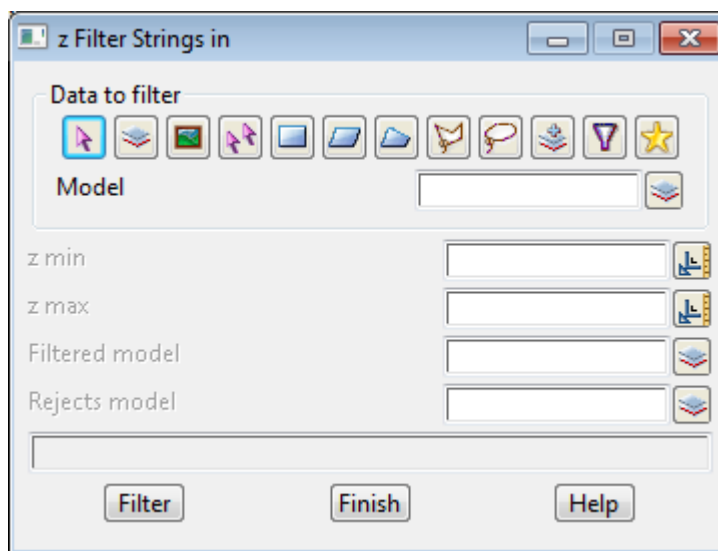
It is often necessary to remove data which is not within a certain z range. For example, all points with z-values below 0.0. The **z filter** option allows the user to define a z-range by specifying a minimum and maximum z value.

Strings of type 2d, 3d and 4d can then be processed against the z-range and new strings created containing only those points that are

- (a) within the z-range - accepted points
- or
- (b) outside the z-range - rejected points

For all other string types, the entire string is accepted if any part of the string is within the z-range, otherwise it is rejected.

Selecting **Z filter** displays the **Z Filter Strings in** panel:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source	input		
<i>source of data to be processed.</i>			
z min	input		
<i>minimum z value to be accepted, If this field is blank, all string z-values pass the minimum test.</i>			
z max	input		
<i>maximum z value to be accepted, If this field is blank, all string z-values pass the maximum test.</i>			
Filtered model	input		available models
<i>if non-blank, the name of the model to place the accepted string points in. The string has the same name as the original string. If blank, the accepted point strings are not saved.</i>			
Rejects model	input		available models
<i>if non-blank, then strings containing the rejected points are placed in this model. The strings of rejected points have the same name as the original strings. If blank, the rejected point strings are not saved.</i>			

Filter button
z filter the selected strings by the z minimum and z maximum values.

Draw a Perpendicular from Centreline to a Point

Position of option on menu: Utilities =>A-G =>Draw perpendicular cl to points

This option creates strings drawn perpendicular from reference alignments to selected points, and output a Special Chainage (SPC) file of the reference chainages that the points are perpendicular to. The user has the choice of either output, or both.

Typical uses are to create a model of cut strings which can be used to for cut labelling on long section plots where features such as property access locations occur along the road corridor, or to write SPC files that can be used to create cross sections through the dropped points when running **Apply Many** functions.

Selecting **Draw perpendicular cl to points** displays the **Draw a Perpendicular from Centreline to a Point** panel.

The fields and buttons used in this panel have the following function

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data Points To Drop

Gathers a list of all the points on the selected strings.

For a full description of data source go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data Reference Strings

Selects the reference strings that the above points will be dropped onto. Reference strings must be of type Alignment or Super Alignment.

For a full description of data source go to [Data Source](#) in the chapter [Tools and Concepts](#)

Drop all points from chosen strings? tick box ☒

The default is to calculate chainages and/or strings from every point in the selected strings. Turning this tick box off will restrict the calculation to the end points only. e.g. It can be used to create cut strings for use with the **paired cuts** functionality in long section plotting.

Offset Tolerance input

Will restrict the search to points that fall within the specified width from the reference string.

Outputs

Name mode choice box From point text From point text, From string names, Typed

For the **From point text** mode, the name of the new string is set by the text attached to the points.
For the **From string names** mode, the name of the new string is set by the selected strings.
For the **Typed** mode, the name is given in the **Name** field.

Name name box names.4d file

This only needs to be filled in when using the **Typed** name mode. This field is not required for the other **Name mode** choices.

Model model box available models

The model to store the new strings on. This field is optional and no strings will be created if left blank. e.g. if you only want Special Chainage Files.

Colour colour box available colours

The colour to draw the new strings with.

Linestyle linestyle box 1 available linestyle

The linestyle to draw the new strings with.

Z value mode choice box 2d from point 2d from point, 2d from reference, 3d reference to point

The method by which z values are assigned to the points on the new string.
For the **2d from point** mode, all points have the same z value as the point being dropped.
For the **2d from reference** mode, all points have the same z value as the reference string.
For the **3d reference to point** mode, the new string is drawn from the z value at the reference to the z value of the dropped point.

Start extension measure box 1 At point, Point to Point, String from Point, String to Point

End extension measure box 1 At point, Point to Point, String from Point, String to Point

Write SPC Files(s)? tick box ☒

The writing of Special Chainage Files is optional.
If ticked, the names of the files are automatically derived from the combination of Model name and Reference string name and a user defined file stem (given in the **SPC file stem** field) may be added to the name.

SPC File Stem text box

An optional user entered text value that is added to the automatically derived file name.

Process

run the option.

button

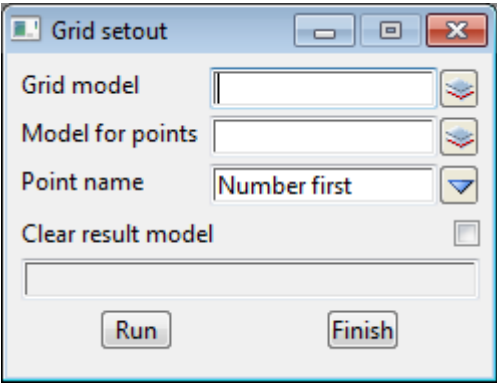
Grid setout

Position of option on menu: Utilities =>A-G =>Grid setout

Grid setout creates a set of points from the intersections of lines and/or arc strings. The strings to intersect normally form a grid.

It is assumed that the strings to intersect are named with letters along one axis of the grid and numbers in the other so that a point may be named in the following manner: 1a or a1.

Selecting **Grid setout** displays the **Grid Setout** panel.



The fields and buttons used in this panel have the following function

Field	Description	Type	Defaults	Pop-Up
Grid model	<i>The model of strings to intersect with each other</i>	model box		Select Model
Model for points	<i>the model to contain the points of intersection for the strings in Grid model.</i>	model box		Select Model
Point name	<i>Method used to determine how to name the created points based on names of the strings being intersected: Number first: use the numbered string first Letter first: use the alphabetical string first Any order: use the order in which the strings are processed</i>	choice box	Number first	Number first, Letter first, Any order
Clear result model	<i>if tick, clean out the Model for points before finding the intersections.</i>	tick box		
Run	<i>run the option.</i>	button		

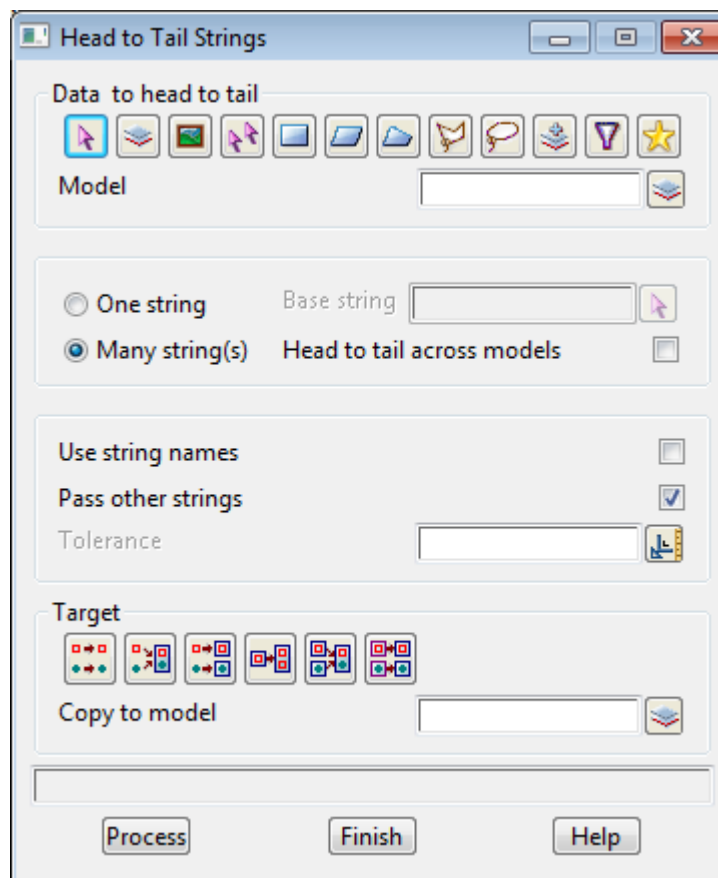
Head to Tail

Position of option on menu: Utilities =>H-Z =>Head to tail

Head to tail is used to join strings with common end points together.

If requested, strings are only joined if they have matching names as well as matching end points.

Selecting **Head to tail**, displays the **Head to Tail Strings** panel.



The fields and buttons used in this panel have the following functions

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type

Model

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data source

input

source of data to be processed.

One string or Many strings radio button

*if **One String** is selected, then a Base string is selected and only the head-to-tailed string containing the Base string is created.*

*If **Many strings** is selected, then head to tailing occurs for all the strings in the Data source.*

Head to tail across models tick box

*if **ticked**, then strings can be created from head to tailing strings from any of the selected models.*

*If **not ticked**, then strings will only be head to tailed with strings from the same model.*

Use string names

tick box

*if **ticked**, the string names must also match for the strings to be joined.*

Pass other strings	tick box	tick
<i>if ticked, any string not joined will also copied to the joined model.</i>		
Tolerance	input	0.0005
<i>If the distance between two end points is less than tolerance, then the points are considered the same and the strings may be joined.</i>		
Target type	<i>Data target type - where to put the processed strings. For a full description go to Data Target in the chapter Tools and Concepts</i>	
Target info	input	
<i>extra information required for the target.</i>		
Process	button	
<i>process all the selected strings</i>		

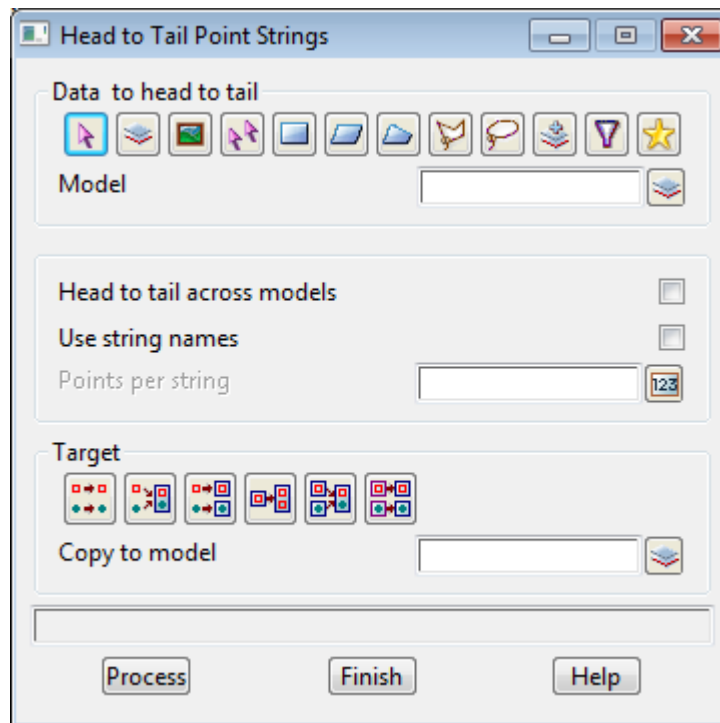
Head to Tail Point Strings

Position of option on menu: Utilities =>H-Z =>Head to tail point strings

Head to tail point string is used to joins point strings into larger point strings. This can speed up drawing and processing when there are large numbers of single point strings.

If requested, strings are only joined if they have matching names as well as being point strings.

Selecting **Head to tail points** displays the **Head to Tail Point Strings** panel.



The fields and buttons used in this panel have the following functions

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source	input		
<i>source of data to be processed.</i>			
Head to tail across models	tick box		
<i>if ticked, then strings can be created from joining point strings from any of the selected models.</i>			
<i>If not ticked, then strings will only joined with strings from the same model.</i>			
Use string names	tick box		
<i>if ticked, the string names must also match for the strings to be joined.</i>			
Points per string	integer box		
<i>the maximum number of vertices to have in the joined strings.</i>			
Target type			
<i>Data target type - where to put the processed strings. For a full description go to Data Target in the chapter Tools and Concepts</i>			
Target info	input		
<i>extra information required for the target.</i>			

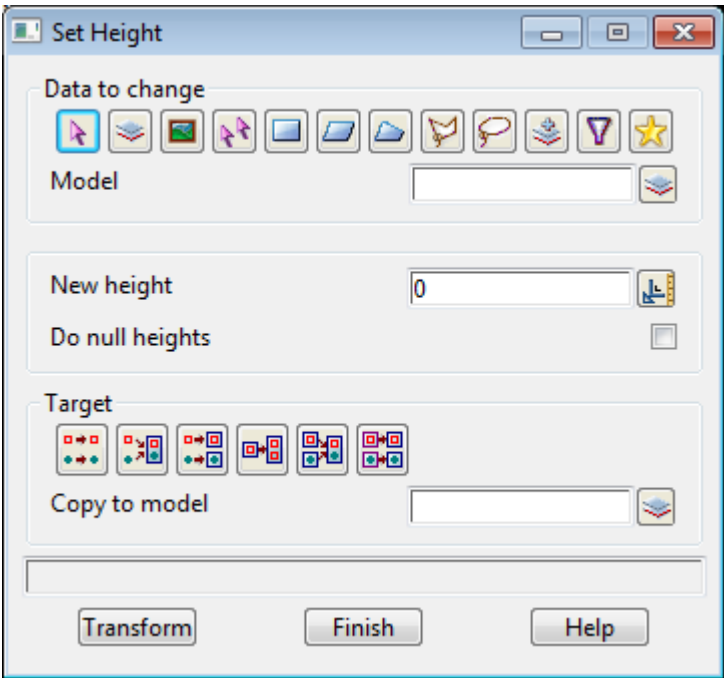
Process button
process all the selected point strings

Set Height

Position of option on menu: Utilities =>H-Z =>Height

For the selected strings, **Height** will set all the z-values to the given height.

Selecting **Height** displays the **Set Height** panel.



The fields and buttons used in the panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Data source type			Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>				
Data source		input		
<i>source of data to be processed.</i>				
New height		input	0	
<i>the new height to set all the z-values in the selected strings to.</i>				
Do null heights		tick box		
<i>if ticked, null heights are set to the new height. If not ticked, null heights are not modified.</i>				
Target type				
<i>Data target type - where to put the processed strings. For a full description go to Data Target in the chapter Tools and Concepts</i>				
Target info		input		
<i>extra information required for the target.</i>				
Set		button		
<i>process the selected string</i>				

Helmert Transformations

2D Helmert (Advanced)

Position of option on menu: Utilities =>H-Z =>Helmert 2D (Advanced)

A **2D Helmert** transformation is a two dimensional linear transformation consisting of a scaling, rotation and a 2D- translation (shift) of data. Hence there are four parameters to be specified.

Hence the 2D Helmert parameters are

- (a) the one scale factor for both the x and y axes
- (b) the same rotation of the x-axis and y-axis of the existing coordinates to align it with the control x and coordinate axis
- (c) the x and y translation of the observed coordinates after the scalings and rotations have been applied

The 2D Helmert (Advanced) option calculated and applied a Helmert transformation, and also allows the user to **fix the scale** for the transformation. That is, the scale is user defined and not determined by the least squared calculations.

For information on the 2D Helmert transformation, please go to the section [Coordinate Transformations - Helmert and Affine](#)

Selecting **2D Helmert (Advanced)** brings up the **Helmert 2D (Advanced)** panel.

If the **Parameters by** choice box is set to **Pt Selection** then control-observed point pairs are selected by the user and the pairs are written to the grids on the panels. See the section [Selecting Control and Observed Points for the Helmert and Affine Transformations](#) for information on picking control and observed points.

If the **Parameters by** choice box is set to **Direct entry**, the transformation parameters are manually entered into the panel and the grid section is not used.

The fields and buttons used in this panel have the following functions

Field Description	Type	Defaults	Pop-Up
File	file box		*.hel_adv, *.hel files
<i>the name of a 2d Helmert parameter file to read in/write out</i>			
Read	button		
<i>read the contents of the *.hel_adv (or *.hel) file given in File and load the parameters saved in the file into the panel fields.</i>			

Note: the *.hel file format is from an earlier Helmert panel that no longer exists in **12d Model**.

Write	button	
<i>write the parameters and data in the panel fields to the file given in File.</i>		

Data source type	Model
-------------------------	-------

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data source	input		
	source of data to be processed.		
Parameters by	choice	Pt selection	Pt selection Direct entry
	the parameter entry method.		
Report file			*.rpt files
	if not blank, write a report on the Helmert transformation.		
Scale	input/output		
	the scale factor for the existing coordinates with respect to the transformed coordinates		
Fixed scale?	tick box		
	if ticked, the scale is entered into the Scale field and it is held fixed when the Helmert parameters are calculated from the selected control-observed point pairs.		
Clockwise rotation	input/output		
	the rotation of the axes of the existing points with respect to the transformed axes.		
Origin method	choice box	Pick	Pick, Obs'd centroid Ctrl centroid
	the translation can be reported against another origin than the default (0,0).		
Origin X/Y coordinate	input		
	the translation parameters are written out with respect to this origin.		
X Translation	input/output		
	the x translation of the existing coordinates with respect to the transformed x coordinates		
Y Translation	input/output		
	the y translation of the existing coordinates with respect to the transformed y coordinates		
Control	button		
	restarts the selection process for choosing more control points.		
Calculate	button		
	calculate the helmert parameters from the selected points shown in the grid.		
Target type			
	Data target type - where to put the processed strings. For a full description go to Data Target in the chapter Tools and Concepts		
Target info	input		
	extra information required for the target.		
Helmert	button		
	apply the helmert transformation to the data specified in the source box, and put it into the appropriate target area.		
Inverse	button		
	applies the inverse transformation to the one defined in the panel.		
Finish	button		
	end the option, remove the panel from the screen.		

3D Helmert

Position of option on menu: Utilities =>H-Z =>Helmert 3D

A **3D Helmert** transformation is a three dimensional linear transformation consisting of a scaling, three rotations, and a 3D-translation (shift) of data. Hence there are 7 parameters to be specified.

For information on the 3D Helmert transformation, please go to the section [Coordinate Transformations - Helmert and Affine](#)

Selecting **Helmert 3D** brings up the 3D Helmert panel.

3D Helmert

File

Data to change

Model

Parameters by Report file

Scale Fixed Scale? ☐

Origin method X rotation (CW)

Origin X coordinate Y rotation (CW)

Origin Y coordinate Z rotation (CW)

Origin Z coordinate X translation

Y translation

Z translation

	Use pt	Control Easting	Control Northing	Control Level	Observed Easting	Observed Northing	Observed Level	Residual Easting	Residual Northing	Residual Level
1	<input checked="" type="checkbox"/>									

Target

Copy to model

If the **Parameters by** choice box is set to **Pt Selection** then control-observed point pairs are selected by the user and the pairs are written to the grids on the panels. See the section

[Selecting Control and Observed Points for the Helmert and Affine Transformations](#) for information on picking control and observed points.

If the **Parameters by** choice box is set to **Direct entry**, the transformation parameters are manually entered into the panel and the grid section is not used.

The fields and buttons in the panel have the following functions

Field Description	Type	Defaults	Pop-Up
File <i>the name of a 3d Helmert parameter file to read in/write out</i>	file box		*.hel_3d
Read <i>read the contents of the *.hel_3d file given in File and load the parameters saved in the file into the panel fields.</i>	button		
Write <i>write the parameters and data in the panel fields to the file given in File.</i>	button		
Data source type <i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>		Model	
Data source <i>source of data to be processed.</i>	input		
Parameters by <i>the parameter entry method.</i>	choice	Pt selection	Pt selection Direct entry
Report file <i>if not blank, write a report on the 3D Helmert transformation.</i>			*.rpt files
Scale <i>the scale factor for the existing coordinates with respect to the transformed coordinates</i>	input/output		
Fixed scale? <i>if ticked, the scale is entered into the Scale field and it is held fixed when the Helmert parameters are calculated from the selected control-observed point pairs.</i>	tick box		
Origin method <i>the translation can be reported against another origin than the default (0,0,0).</i>	choice box	Pick	Pick, Obs'd centroid Ctrl centroid
Origin X/Y/Z coordinate <i>the translation parameters are written out with respect to this origin.</i>	input		
X rotation (Clockwise rotation) <i>the rotation in the (y,z) plan about the x-axis of the axes of the existing points with respect to the transformed axes.</i>			
Y rotation (Clockwise rotation) <i>the rotation in the (z,x) plane of the axes of the existing points with respect to the transformed axes.</i>			
Z rotation (Clockwise rotation) <i>the rotation in the (x,y) plane of the axes of the existing points with respect to the transformed axes.</i>			
X/Y/Z Translation <i>the x/y/z translation of the existing co-ordinate with respect to the transformed x/y/z coordinates</i>	input/output		
Control <i>restarts the selection process for choosing more control points.</i>	button		
Calculate <i>calculate the helmert parameters from the selected points shown in the grid.</i>	button		

Target type

Data target type - where to put the processed strings. For a full description go to [Data Target](#) in the chapter [Tools and Concepts](#)

Target info input

extra information required for the target.

Helmert button

apply the Helmert transformation to the data specified in the source box, and put it into the appropriate target area.

Inverse button

applies the inverse transformation to the one defined in the panel.

Finish button

end the option, remove the panel from the screen.

2D Helmert

Position of option on menu: No longer in **12d Model**

NOTE - this option is no longer available from a **12d Model** menu.

A **2D Helmert** transformation is a two dimensional linear transformation consisting of a scaling, rotation and a 2D- translation (shift) of data. Hence there are four parameters to be specified.

Hence the 2D Helmert parameters are

- (a) the one scale factor for both the x and y axes
- (b) the same rotation of the x-axis and y-axis of the existing coordinates to align it with the control x and coordinate axis
- (c) the x and y translation of the observed coordinates after the scalings and rotations have been applied

For information on the 2D Helmert transformation, please go to the section [Coordinate Transformations - Helmert and Affine](#)

This case of a fixed scale is not allowed in this option but is in the [2D Helmert \(Advanced\)](#) option. Selecting **Helmert** brings up the **Helmert 2D** panel.



If the **Parameters by** choice box is set to **Pt Selection** then control-observed point pairs are selected by the user and the pairs are written to the grids on the panels. See the section [Selecting Control and Observed Points for the Helmert and Affine Transformations](#) for

information on picking control and observed points.

If the **Parameters by** choice box is set to **Direct entry**, the transformation parameters are manually entered into the panel and the grid section is not used.

The fields and buttons used in this panel have the following functions

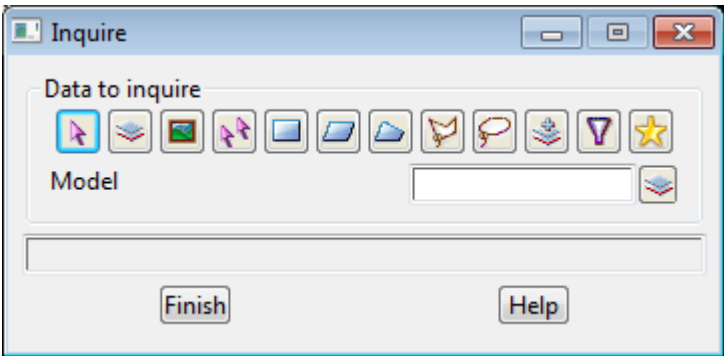
Field Description	Type	Defaults	Pop-Up
File <i>a file name can be specified for reading or writing a file.</i>	file box		*.hel files
Read <i>if a valid file exists, the file contents can be loaded into the panel.</i>	button		
Write <i>if a valid name is specified, the user can write the input data to a file.</i>	button		
Data source type <i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>		Model	
Data source <i>source of data to be processed.</i>	input		
Helmert parameters by <i>the parameter entry method.</i>	choice	Pt selection	Pt selection Direct entry
Report file <i>if not blank, write a report on the Helmert transformation.</i>			*.rpt files
Rotation <i>the rotation of the axes of the existing points with respect to the transformed axes.</i>	input/output		
Scale <i>the scale factor for the existing coordinates with respect to the transformed coordinates</i>	input/output		
X Translation <i>the x translation of the existing coordinates with respect to the transformed x coordinates</i>	input/output		
Y Translation <i>the y translation of the existing coordinates with respect to the transformed y coordinates</i>	input/output		
Control <i>restarts the selection process for choosing more control points.</i>	button		
Calculate <i>calculate the helmert parameters from the selected points shown in the grid.</i>	button		
Target type <i>Data target type - where to put the processed strings. For a full description go to Data Target in the chapter Tools and Concepts</i>			
Target info <i>extra information required for the target.</i>	input		
Helmert <i>apply the helmert transformation to the data specified in the source box, and put it into the appropriate target area.</i>	button		
Inverse <i>applies the inverse transformation to the one defined in the panel.</i>	button		
Finish <i>end the option, remove this panel and the Helmert control points table from the screen.</i>	button		

Inquire

Position of option on menu: Utilities =>H-Z =>Inquire

Inquire highlights all the selected strings.

On selecting the **Inquire** option, the **Inquire** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Data source type			Model	
	<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source		input		
	<i>source of data to be highlighted.</i>			

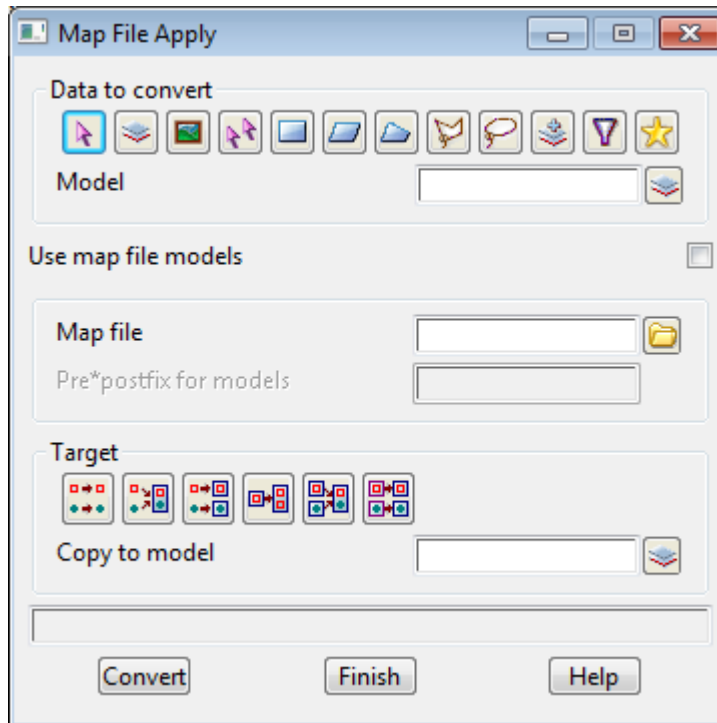
Map

Position of option on menu: Utilities =>H-Z =>Map

Map applies a **12d** Model Map File to the selected strings. The map file can be used to change string attributes such as string names, models, colours, breakline type and style, apply extrudes, apply polygon fills etc.

The layout and operation of a mapping file is described in the section [Create/Edit a Map File](#) in the chapter [File I/O](#).

Selecting **Map** displays the **Map File Apply** panel.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source	input		
<i>source of data to be mapped.</i>			
Use map file models	tick box		
<i>if ticked, use the models from the map file. If not ticked, use the models from the Target.</i>			
Map file	map file box		*.mapfile, *.mf files
<i>the Map File to use.</i>			
Prefix for models	input		available models
<i>If non-blank, the prefix for models field gives the characters to be prepended and appended to the model names given in the mapping file. The prepended and appended characters are entered into the prefix for models field, separated by a *. For example, pre*pos would add pre before each model name and pos after each model name. For prepend only, no * is required. The pre and pos can included spaces.</i>			
Target type			

Data target type - where to put the processed strings. For a full description go to [Data Target](#) in the chapter [Tools and Concepts](#)

Target info	input
<i>extra information required for the target.</i>	
Map	button
<i>run the option - process the selected strings</i>	

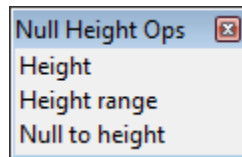


Null Heights

Position of option on menu: Utilities =>H-Z =>Null heights

A null value is used as a z-value (height) when no actual z-value exists at a vertex. That is, the vertex has valid x and y coordinates but no valid z-value.

The **null heights** walk-right menu is



For the option *Height*, go to
Height range
Null to height

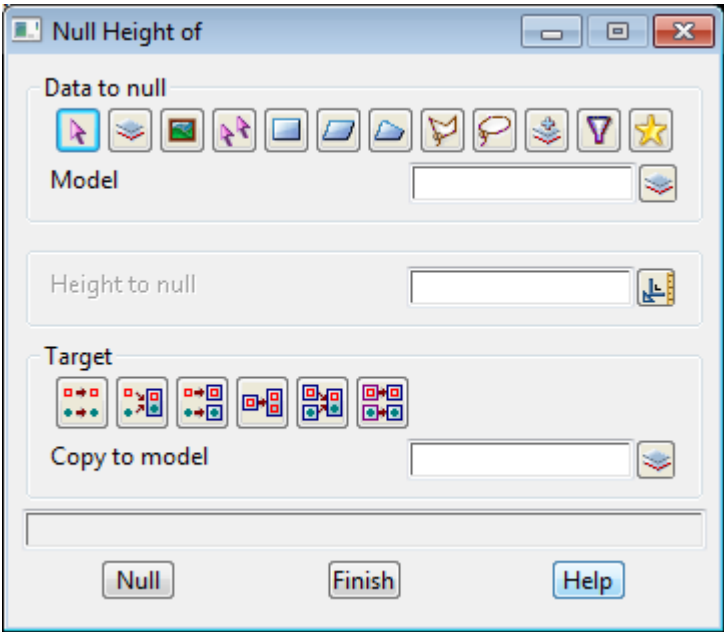
[Heights](#)
[Height Range](#)
[Null to Height](#)

Heights

Position of option on menu: Utilities =>H-Z =>Null heights =>Height

Null heights is used to set vertices with a given z-value to **12d Model's** null value.

Selecting **Heights** displays **Null Height of** panel.



The fields and buttons used in this panel have the following functions.

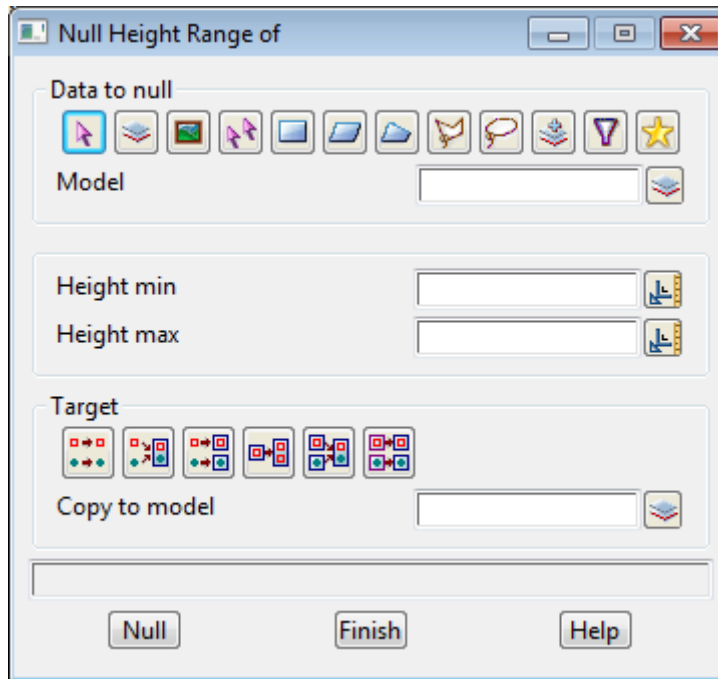
Field	Description	Type	Defaults	Pop-Up
Data source type			Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>				
Data source		input		
<i>source of data to be processed.</i>				
Height to null		input		
<i>height value to set to the null value.</i>				
Target type				
<i>Data target type - where to put the processed strings. For a full description go to Data Target in the chapter Tools and Concepts</i>				
Target info		input		
<i>extra information required for the target.</i>				
Null		button		
<i>test all the z-values in the selected strings and if the value is equal to the Height to null value, set the z-value to null.</i>				

Height Range

Position of option on menu: Utilities =>H-Z =>Null heights =>Null range

Null height range sets the vertices with z-values between a given height minimum and height maximum, to **12d Model's** null value.

Selecting Height range displays the Null Height Range of panel.



The fields and buttons used in this panel have the following functions.

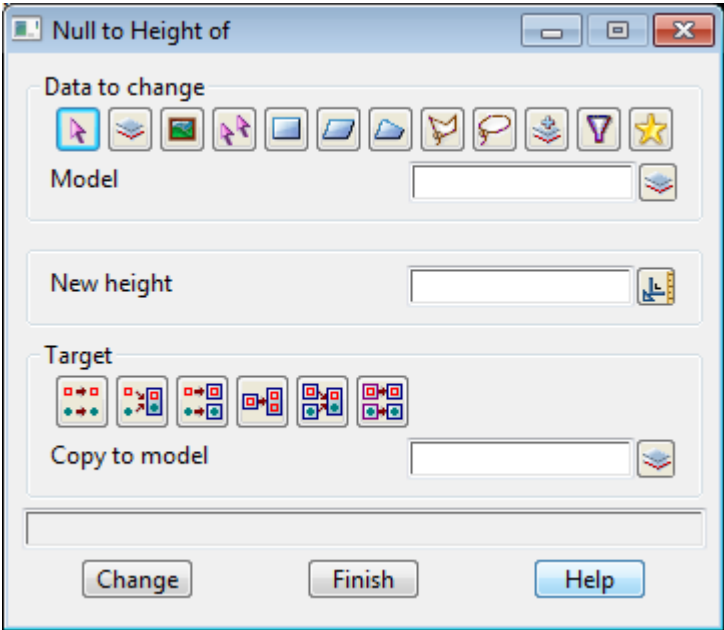
Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source	input		
<i>source of data to be processed.</i>			
Height min	input		
<i>minimum value of the heights to be set as null values.</i>			
Height max	input		
<i>maximum value of the heights to be set as null values.</i>			
Target type			
<i>Data target type - where to put the processed strings. For a full description go to Data Target in the chapter Tools and Concepts</i>			
Target info	input		
<i>extra information required for the target.</i>			
Null	button		
<i>test all the z-values in the selected strings and if the value is between the Height min and Height max value, set the z-value to null.</i>			

Null to Height

Position of option on menu: Utilities =>H-Z =>Null heights =>Null to height

Null to height is used to set vertices with a null z-value to a user given value.

Selecting Null to height range displays the Null to Height of panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source	input		
<i>source of data to be processed.</i>			
New height	input		
<i>height value to change null values to.</i>			
Target type			
<i>Data target type - where to put the processed strings. For a full description go to Data Target in the chapter Tools and Concepts</i>			
Target info	input		
<i>extra information required for the target.</i>			
Change	button		
<i>Change all the null z-values in the selected strings to the value in the New height field.</i>			

Parallel Strings Macro

Position of option on menu: Utilities =>H-Z =>Parallel

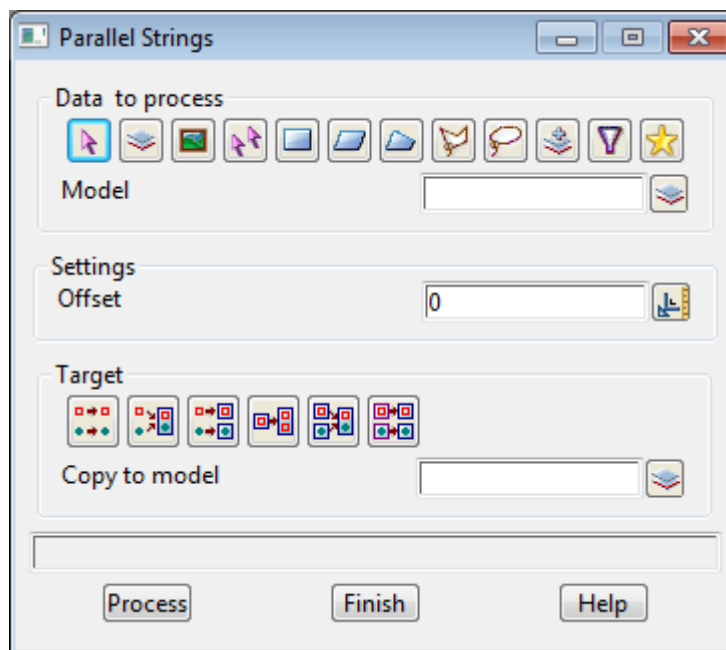
This option parallels horizontally one or more strings (the option Strings =>Strings edit =>Parallel only parallels one string at a time).

It is a macro and runs in two ways:

1. from the menu or
2. via a command line interface that does not require user interaction.

Note: the command line interface is available so that the option can be run in a chain if the macro can not be recorded in a chain. If the macro is called without any command line arguments, then it will assume it is being run in the graphical, interactive manner and will display a panel to the user. Otherwise, the macro will parse the relevant command line arguments and run without user interaction.

Selecting **Parallel** brings up the **Parallel Strings** panel.



The fields and buttons used in the panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Data source type			Model	
	<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source		input		
	<i>source of data to be processed.</i>			
Offset		measure box	0	available measures
	<i>the distance to parallel the source element.</i>			
	<i>The direction of the source string is used to determine the left and right side of the string in the parallel operation. A positive offset parallels the string to the right with respect to the string direction. A negative offset parallels to the left with respect to the string direction.</i>			
Target type				
	<i>Data target type - where to put the processed strings. For a full description go to Data Target in the chapter Tools and Concepts</i>			

Target info	input <i>extra information required for the target.</i>
Process	button <i>processes the selected data.</i>

Note When Using the Option With Command Line Arguments:

When calling the macro using the command line interface, it must be called according to the following format:

parallel_strings_panel.4do "SOURCE MODEL" offset "TARGET MODEL"

The first argument passed must be the name of a model containing the data to process. The source model of data to process must be the first argument provided to the macro.

The second argument must be the offset distance to parallel the source strings. This can be negative or positive, but it must be a valid real number (e.g. 1.234, -567.00, 0).

The third and final argument must be the name of the model in which to place the resultant paralleled strings.

If any of the fields contain spaces, they must be enclosed in quotes
For example: "SOURCE DATA"

When using the command line interface, there must be 3 and only 3 arguments. Any fewer or more will be considered an error and will stop the macro from progressing any further.

Refer to the description of the fields in the Graphical User Interface section for further details, including restrictions on fields and expected behavior.

The macro uses the **Parallel()** function made available through the macro language. As such, the string types supported and behaviour of the macro is dependent on the implementation of that function.

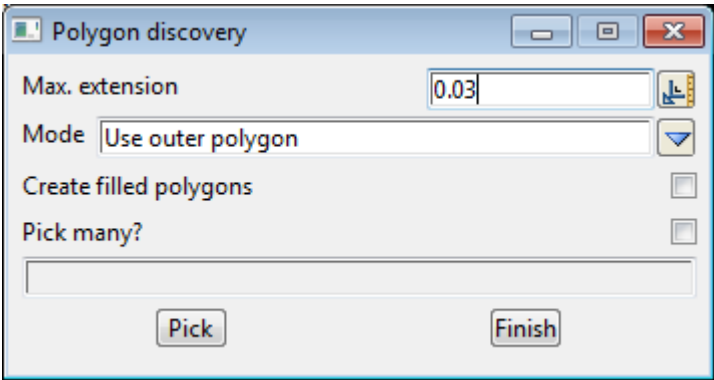
Polygon Discovery

Position of option on menu: Utilities =>H-Z =>Polygon discovery

Polygon discovery takes a selected position/point on a plan view and from the data displayed on the view, finds the polygon enclosing the selected position/point from the line and arc segments in strings around the position/point.

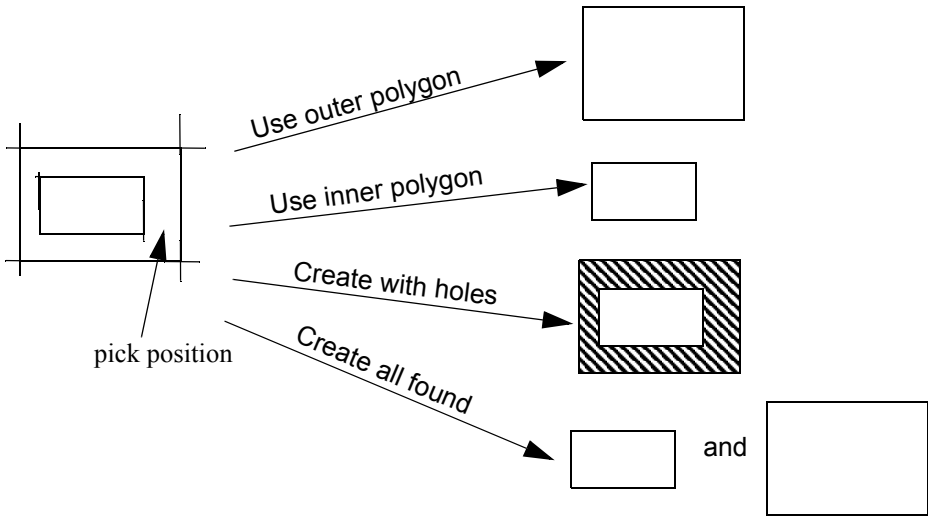
The name, colour and model for the created polygon are taken from the CAD Tool bar.

Selecting **Polygon discovery** brings up the **Polygon Discovery** panel.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Max. extension <i>maximum distance to extend segments to get an intersection to help define the surrounding polygon.</i>	real value box	0.03	measures
Mode ,	choice box	Use outer polygon	Use outer polygon User inner polygon Create with holes Create all found

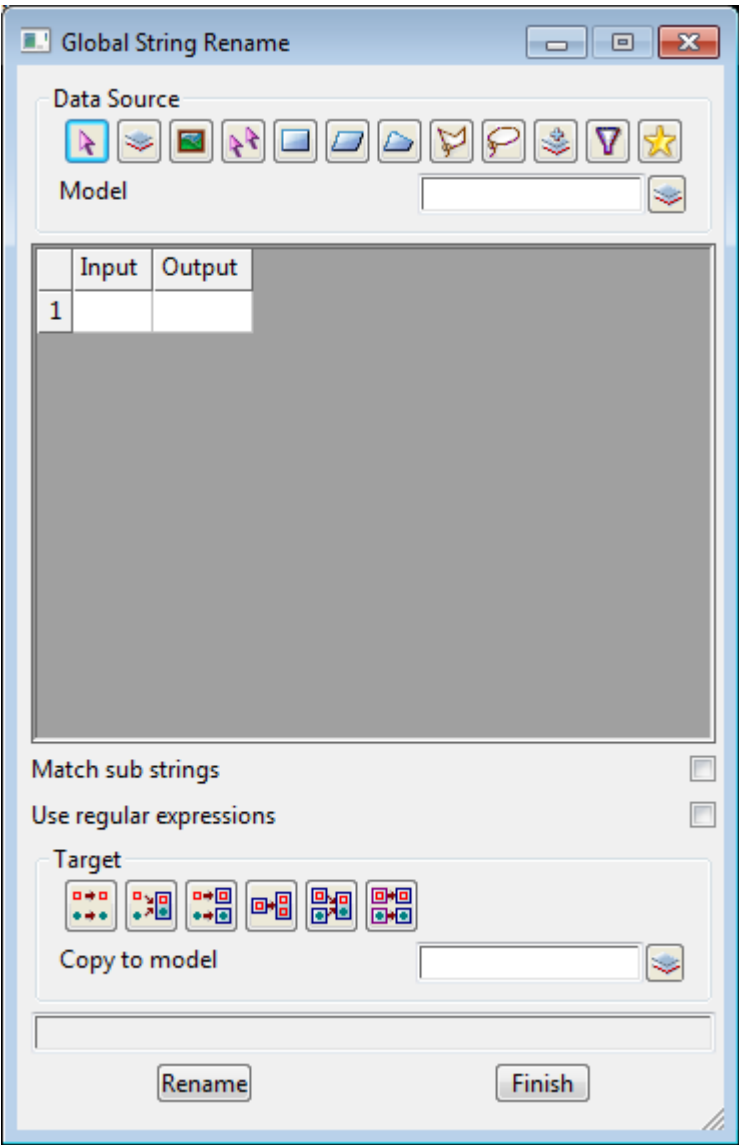


Create filled polygons <i>if ticked, the created polygons are given a fill colour.</i>	tick box
Pick	button

pick the position/point that will be used to find an enclosing polygon for.

Rename Strings

Position of option on menu: Utilities =>H-Z =>Rename strings
Selecting **Rename strings** brings up the **Global String Rename** panel.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type		Model	
-------------------------	--	-------	--

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data source	input		
--------------------	-------	--	--

source of data to be processed.

Input
expression to match the selected string names against.

*If a match occurs then the string name is modified as per the **Output** field.*

Output
*expression for renaming the strings that matched **Input**.*

Match sub strings tick box not ticked
*if ticked, only a part of the string name needs to match the expression in **Input**.*

Use regular expressions tick box not ticked
*if ticked, **Input** is a regular expression.*

Target type
Data target type - where to put the processed strings. For a full description go to [Data Target](#) in the chapter [Tools and Concepts](#)

Target info input
extra information required for the target.

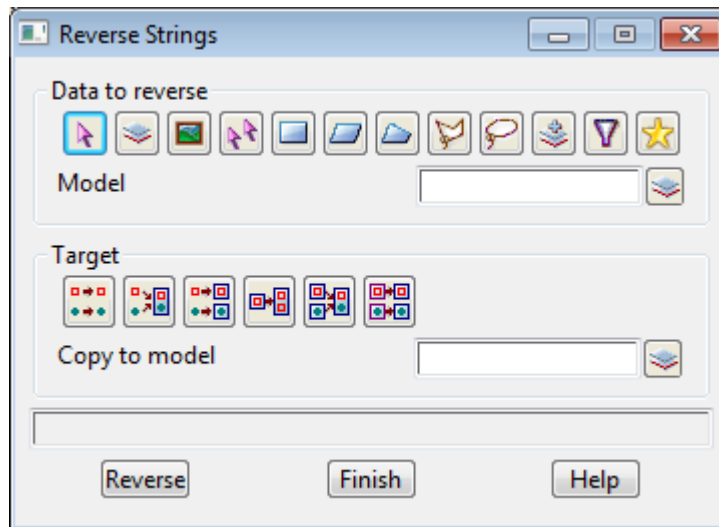
Rename button
rename the selected data.

Reverse Strings

Position of option on menu: Utilities =>H-Z =>Reverse strings

Reverses the direction of the selected strings.

Selecting **Reverse strings** brings up the **Reverse Strings** panel.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type

Model

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data source

input

source of data to be processed.

Target type

Data target type - where to put the processed strings. For a full description go to [Data Target](#) in the chapter [Tools and Concepts](#)

Target info

input

extra information required for the target.

Reverse

button

reverse the direction of the selected strings.

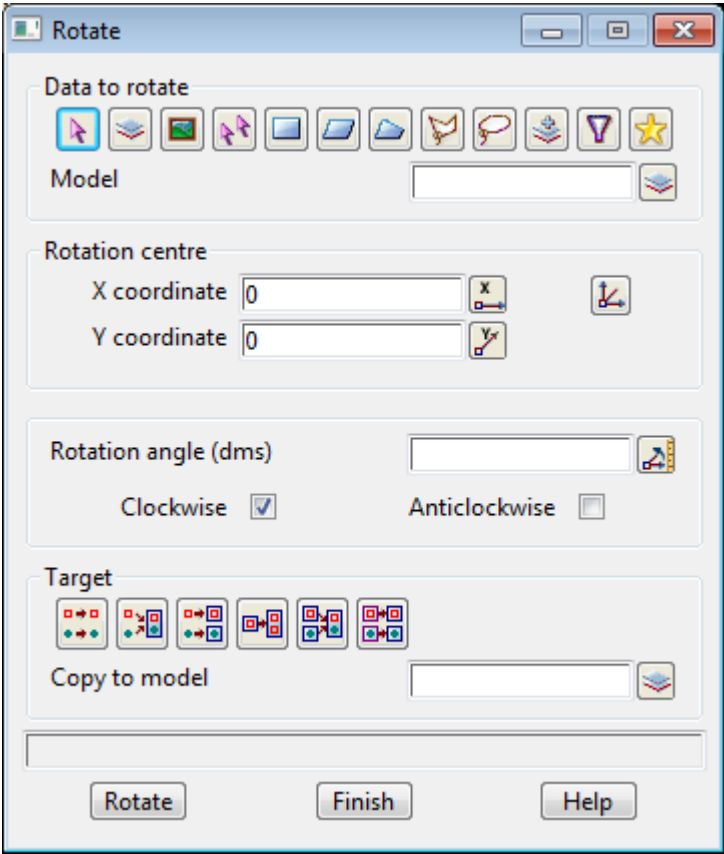
Rotate

Position of option on menu: Utilities =>H-Z =>Rotate

Rotate rotates all the selected strings about a central point (the rotation centre). The strings are rotated through a user supplied angle and can be moved or copied to their new rotated position.

The difference between a copy and a move is that if a string is **copied**, a copy of the string is rotated and the original string left untouched, whereas for a **move**, the actual string is moved from its original position to the new rotated position.

Selecting **Rotate** displays the **Rotate** panel.



The centre of the rotation is defined by selecting the **Centre** button and picking a point as the new centre. The centre can be changed at any time by using the **Centre** button to select another centre.

The fields and buttons used in the panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Data source type			Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>				
Data source		input		
<i>source of data to be processed.</i>				
Rotation centre				xyz ops
<i>select the centre of the rotation. The centre can be changed at any time.</i>				
Rotation angle (dms)		angle box		
<i>the angle in degrees to rotate the string through. The angle is measured about the rotation centre point in either a clockwise or anticlockwise direction.</i>				

Target type

Data target type - where to put the processed strings. For a full description go to [Data Target](#) in the chapter [Tools and Concepts](#)

Target info input

extra information required for the target.

Rotate button

rotate the selected data.

Rotate Relative

Position of option on menu: Utilities =>H-Z =>Rotate relative

Rotate Relative allows multiple strings to be rotated in the XY plane by a user given angle and about various base points (rotation centres).

The simpler Rotate option (Utilities =>H-Z =>Rotate) only rotates the selected strings about a **single** point.

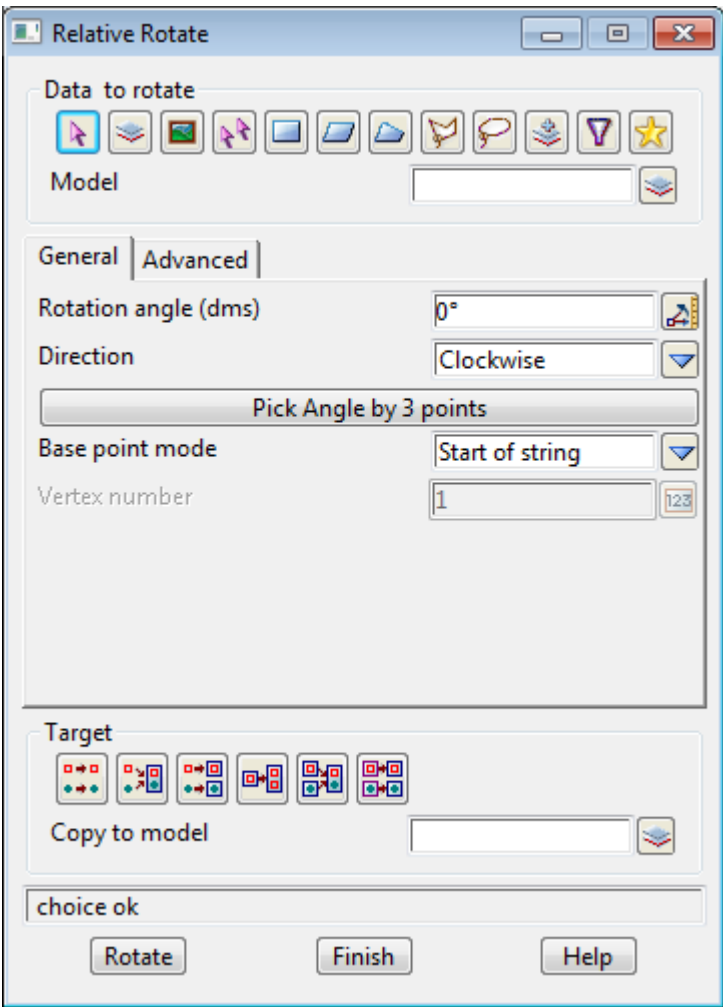
Rotate Relative is more flexible and has many methods for defining the base points (rotation centres), even allowing individual strings to have their own base point. In this case, the base point for rotation is calculated for each string in the Data Source and the rotation applied to each string individually. For example, Relative Rotate can rotate strings where the base point for each string is the start vertex of each string.

Allowing various base point modes allows greater flexibility in rotating many strings at once.

Rotate Relative performs a 2d rotation of strings. That is, the rotation is only in the XY plane.

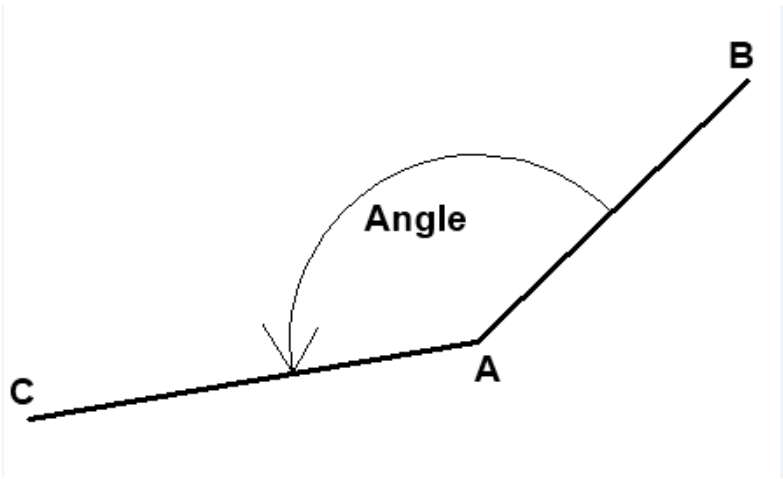
The strings can be **moved** or **copied** to their new rotated position. The difference between a copy and a move is that if a string is copied, a copy of the string is rotated and the original string left untouched, whereas for a move, the actual string is moved from its original position to the new rotated position.

Selecting **Rotate Relative** displays the **Relative Rotate** panel.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type	source box	Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source	input		
<i>source of data is to be processed.</i>			
Rotation angle (dms)	angle box	0°	
<i>the angle in degrees to rotate the string through. The angle is measured about the rotation centre point in either a clockwise or anticlockwise direction.</i>			
Direction	choice box	Clockwise	Clockwise, Counter-clockwise
<i>the direction in which to apply the angle, either clockwise or counter-clockwise.</i>			
Pick Angle by 3 points	button		
<i>allows the user to measure the angle for rotation by picking 3 points on the screen.</i>			



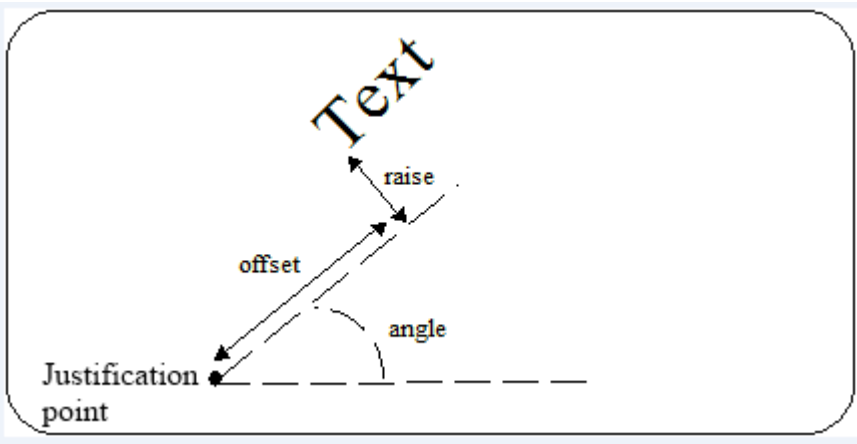
- Upon clicking the button, the user will be asked to pick the:
1. Base point about which the angle is measured (A);
 2. Reference point (B); and
 3. New point (C).

The Rotation angle and Direction will be calculated based on the 3 picked points.

Base point mode	choice box	Start of string	Start of string, End of string, Middle of string, Middle Vertex, Vertex Number, Chainage, Chainage & Offset, Coordinates, Angle by 3 pts Vertex, Justification point (Text only!)
------------------------	------------	-----------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

- allows the user to define how the base point for the rotation is determined for the data. Valid options include:
- Start of string – the base point is the start of each string
 - End of string – the base point is the end of each string
 - Middle of string – the base point is the middle (based on chainage) of each string
 - Middle Vertex – the base point is the middle vertex of each string. In the case of a string with an even number of vertices, the behaviour of this routine can be varied. Refer to the Middle Vertex Mode in the Advanced tab.

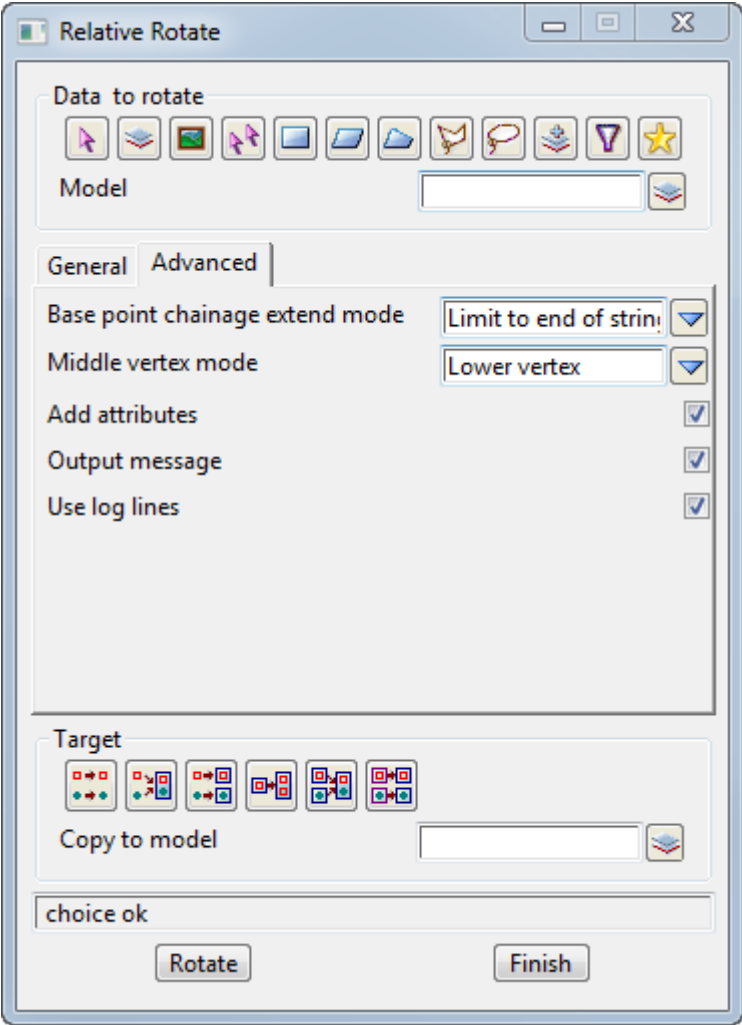
- *Vertex Number* – the base point is a specific vertex of each string, specified by the vertex number. The start vertex is 1, the next vertex 2 and so on for a string with n vertices. The vertex number may also be specified as a negative number to count vertices from the end of the string back towards the start. In this case, for a string with n vertices, a vertex number of -1 is the last vertex (nth vertex), - 2 the 2nd last vertex (n-1), and so on until the first vertex number is -n. If the specified vertex number exceeds the string extents, then an error will be produced and the string skipped.
- *Chainage* – the base point is calculated at a specific chainage along each string. Where the chainage is beyond either end of a string, the behaviour of this routine can be varied. Refer to the Base point chainage extend mode in the Advanced tab.
- *Chainage & Offset* – the base point is calculated at a specific chainage along and offset from each string. The standard convention of a negative offset to the left of the string and positive offset to the right of the string applies.
- *Coordinates* – the base point is specified by a set of coordinates. In this mode, the routine behaves in the same way as the normal Rotate routine- the same base point is used for all strings. The Z coordinate is not optional and must be entered, even if it is zero. The Z coordinate, however, does not affect the rotation.
- *Angle by 3pts Vertex* – the base point is the set of coordinates selected when the Angle by 3 pts was picked. This is the coordinates of point A in the diagram above.
- *Justification point (Text only!)* – the base point is the justification point of a Text object. Note that this only applies to Text objects- all other objects will be skipped in this mode.



The fields displayed on the panel will change depending on the base point mode chosen.

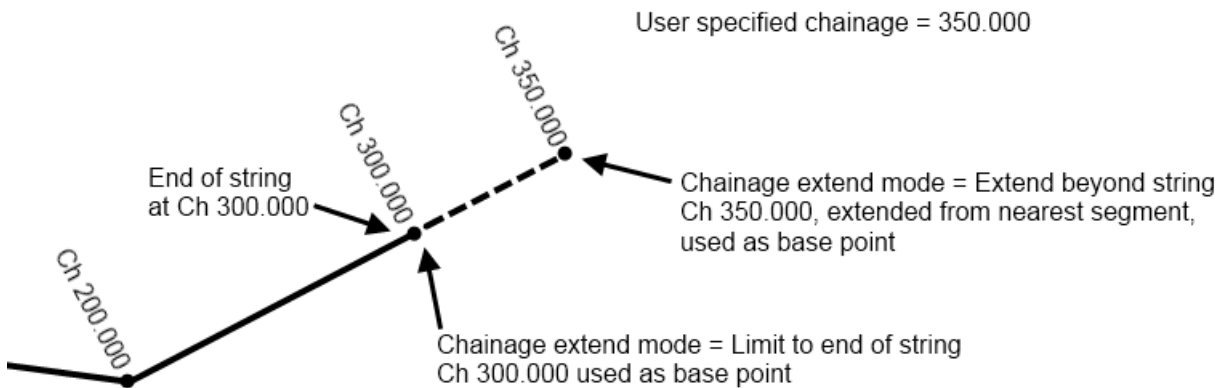
Vertex number	integer box	1	<i>the vertex number to be used as a base point. Enabled for Vertex Number mode only.</i>
Chainage	real box	0	<i>the chainage to be used for calculating the base point. Enabled for Chainage and Chainage & Offset modes only.</i>
Offset	real box	0	<i>the offset to be used for calculating the base point. Enabled for Chainage & Offset mode only.</i>
Base Point	xyz box	0,0,0	<i>the coordinates (X, Y, Z) to be used as the base point. Enabled for Coordinates mode only.</i>

Advanced Tab



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Base point chainage extend mode	choice box	Limit to end of string	Skip with error, Limit to end of string, Extend beyond string
<i>controls the behaviour of the routine when the base point mode is Chainage and the specified chainage is beyond the string extents.</i>			
<ul style="list-style-type: none">• <i>Skip with error</i> – the string will be skipped, with an error written to the output window• <i>Limit to end of string</i> – the base point will use the chainage of the nearest end point• <i>Extend beyond string</i> – the base point will be calculated based on a projection beyond the string to the specified chainage and based on the bearing of the nearest end.			



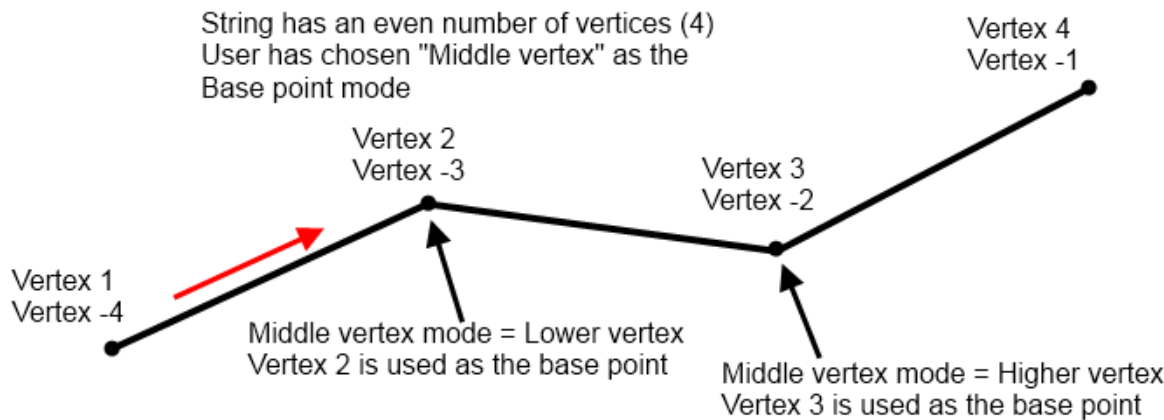
Middle vertex mode choice box Lower vertex Skip with error, Lower vertex < Higher vertex

controls the behaviour of the routine when the base point mode is Middle Vertex and the string has an even number of vertices. Where the string has an even number of vertices, the middle vertex can be one of two possibilities.

Skip with error – the string will be skipped, with an error written to the output window

Lower vertex – the lower-numbered vertex will be used as the middle vertex

Higher vertex – the higher-numbered vertex will be used as the middle vertex



Add attributes tick box ☒

writes the various relative rotate settings to the rotated string as string attributes.

Output messages tick box ☒

writes various output messages when run. If not ticked, no output messages will be produced by the routine, including critical warning and error messages.

Use log lines tick box ☒

use intelligent log lines for the certain output messages. If not ticked and output messages are enabled, the messages will be normal messages.

Target type

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Target info input

extra information required for the target.

Rotate

button

rotate the selected data.

Set Constant Z-Values

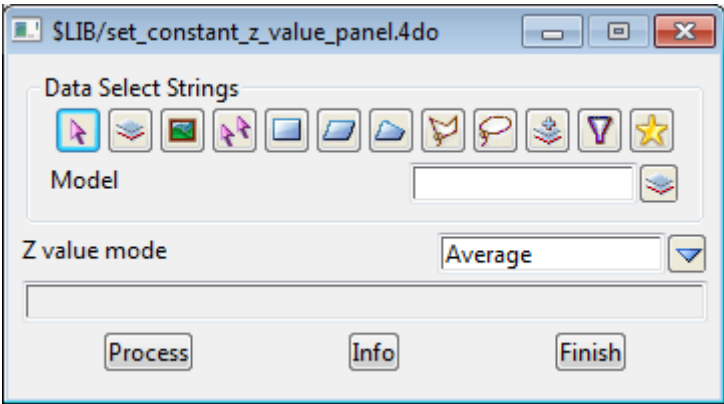
Position of option on menu: Utilities =>H-Z =>Set constant z-values

This option sets all the points on a string to the same elevation - the average, highest, or lowest z-value of each selected string's z-values.

For example, the option can be used to set a starting value for building pads.

The user can drape a string then average the z-values to get close to a volumes balance. Alternatively, the user can opt for the highest z-value calculated by the drape, *i.e.* the entire platform is in fill, or select the lowest z-value so the entire platform is in cut.

Selecting Set constant z-values brings up the Set Constant Z-Value panel.



The fields and buttons used in the panel have the following functions.

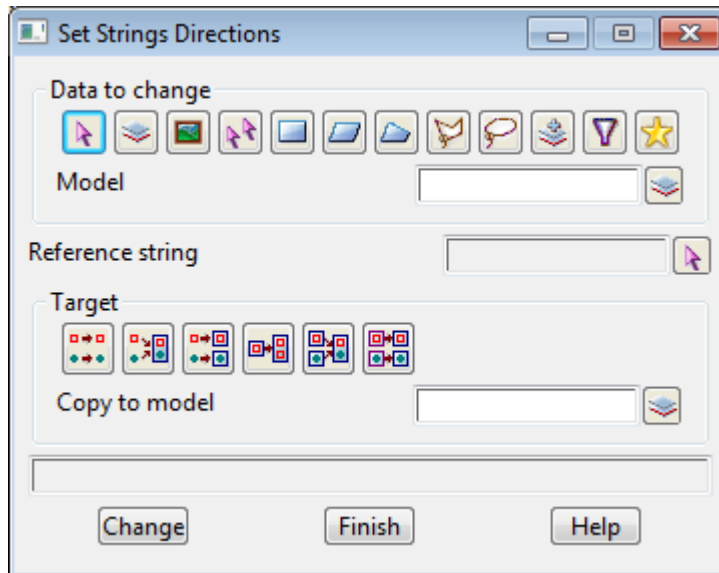
Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source	input		
<i>source of data to be processed.</i>			
Z value mode	choice box	Average	Average, Highest, Lowest
<i>if Average, the string is given the Z value that is the average of all the vertex Z values.</i>			
<i>If Highest, the string is given the Z value that is the highest of all the vertex Z values.</i>			
<i>If Lowest, the string is given the Z value that is the lowest of all the vertex Z values.</i>			
Process	button		
<i>sets the constant z-value for the selected strings.</i>			

Set Strings Directions

Position of option on menu: Utilities =>H-Z =>Set strings directions

Set strings directions attempts to set the direction of select strings to be the same as the direction of a selected reference string.

On selecting Set strings directions, the Set Strings Directions panel is displayed.



The fields and buttons used in the panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Data source type

Model

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data source

input

data source to be select strings to change direction.

Reference string

string select

the string that is used as the reference direction. This is the direction that, if possible, the selected strings are given.

Target type

where to put the processed string - for a full description go to [Data Target](#) in the chapter [Tools and Concepts](#)

Target info

input

extra information required for the target.

Change

button

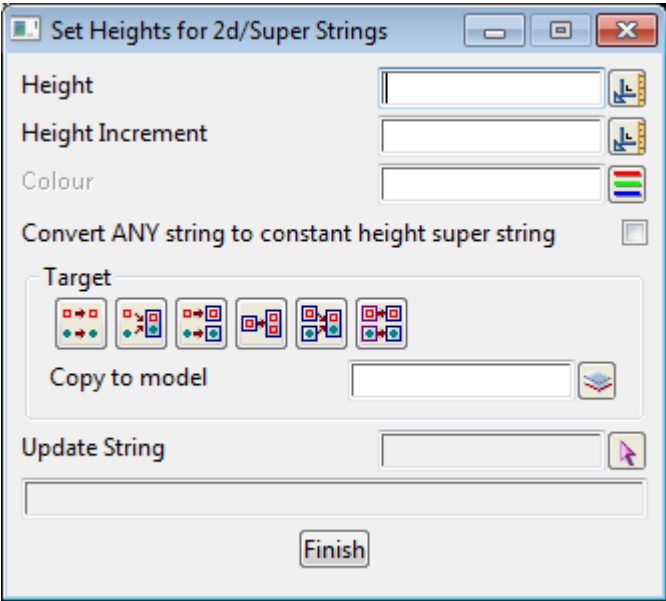
change the direction of the selected strings.

Set Heights for 2d/Super Strings

Position of option on menu: Utilities =>H-Z =>Set heights for 2d/super strings

Set heights for 2d/super strings is used to quickly change the height of selected 2d strings or 2d super strings (super strings with a constant z value). Is is especially useful when you have a lot of contours without z-values and you wish to give them z-values.

An initial height and increment is given and as each string is selected, it is given the current height and the height then incremented for use when picking the next string.



The fields and buttons used in this panel have the following functions:

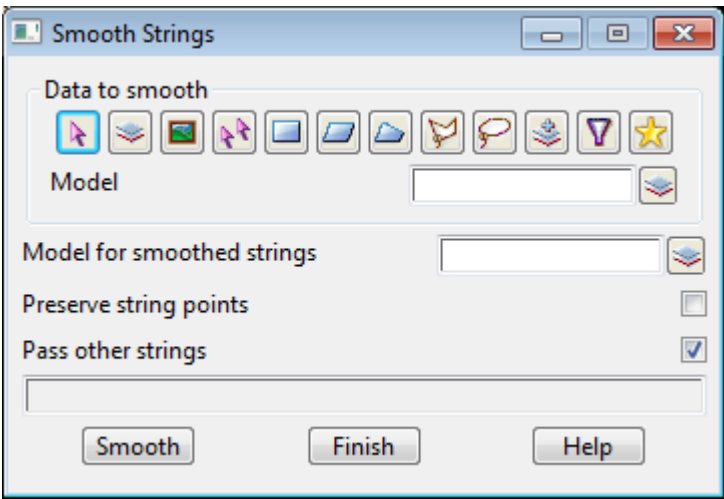
Field	Description	Type	Defaults	Pop-Up
Height	Height to used as the height for the next selected string. This is incremented by the Height increment after each string is accepted.	input		
Height increment	As each string is accepted and given the Height, Height is incremented by this value.	input		
Colour	if not blank, the selected strings are given this colour when their z-value is changed. If blank, the selected strings keep their original colour.	input		available colours
Target type	where to put the processed string - for a full description go to Data Target in the chapter Tools and Concepts			
Target info	extra information required for the target.	input		
Update string	After clicking on the Update string arrow icon, 2d strings are selected and when accepted, have their z-value changed to the value in Height. The height value is then automatically incremented by Height increment. The next string is then selected and accepted (without needing to click on Pick again). This continues until Cancel is selected from the Pick Ops menu.	string select		

Smooth Strings

Position of option on menu: Utilities =>H-Z =>Smooth strings

The **Smooth** options are used to add extra points into 2d or 3d strings to make a smoother string.

Selecting **Smooth strings** displays the **Smooth Strings** panel.



The fields and buttons used in this panel have the following function

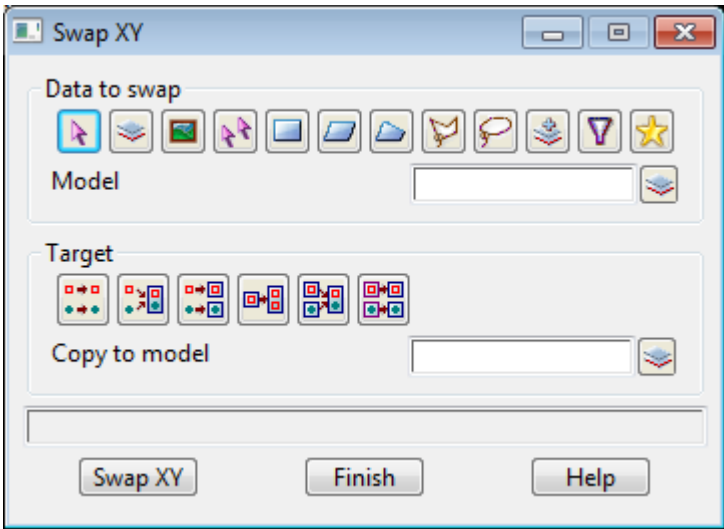
Field	Description	Type	Defaults	Pop-Up
Data source type			Model	
	<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source		input		
	<i>data source to be smoothed.</i>			
Model for smoothed strings		input		available models
	<i>model for the smoothed strings to go to</i>			
Preserve string points		tick box		
	<i>if ticked, the smoothed strings will still contain all the original points.</i>			
	<i>if not ticked, the smoothed strings may deviate from the original string points</i>			
Pass other strings		tick box	tick	
	<i>if ticked, any strings that can't be smoothed are copied and added to the smoothed strings model.</i>			
Smooth		button		
	<i>smooth the selected strings.</i>			

Swap XY

Position of option on menu: Utilities =>H-Z =>Swap XY

The Swap xy option is used to swap the (x,y) coordinates of selected strings.

Selecting Swap XY displays the Swap XY **String/Model/View** panel.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to Data Source in the chapter Tools and Concepts</i>			
Data source	input		
<i>source of data to be have the XY coordinates swapped.</i>			
Target type			
<i>Data target - where to put the processed string. For a full description go to Data Target in the chapter Tools and Concepts</i>			
Target info	input		
<i>extra information required for the target.</i>			
Swap XY	button		
<i>swap the selected strings and add them to the target.</i>			

Test Wildcards

Position of option on menu: Utilities =>H-Z =>Test wildcards

Test wildcards is used to test the effect of pattern expressions and regular expressions on text.

Selecting Test wildcards displays the **Pattern/Regular Expression Tester** panel

The screenshot shows a window titled "Pattern/Regular Expression Tester". It has a "Search/Replace" section with two columns: "Pattern expression" (selected with a radio button) and "Regular expression" (unselected). Each column has "Search" and "Replace" text boxes. There are checkboxes for "Match sub strings" and "Ignore case". Below this is a "Test data" section with a table. The table has columns "Input", "Output", and "Status". The first row has "1" in the "Input" column and "option" in the "Output" column. The "Status" column is empty. At the bottom of the window are "Finish" and "Help" buttons.

	Input	Output	Status
1	option		

The **Search/Replace** criteria and the **Pattern expression** or **Regular expression** are applied to the data in the **Input** column and the results are placed in the **Output** column.

Text

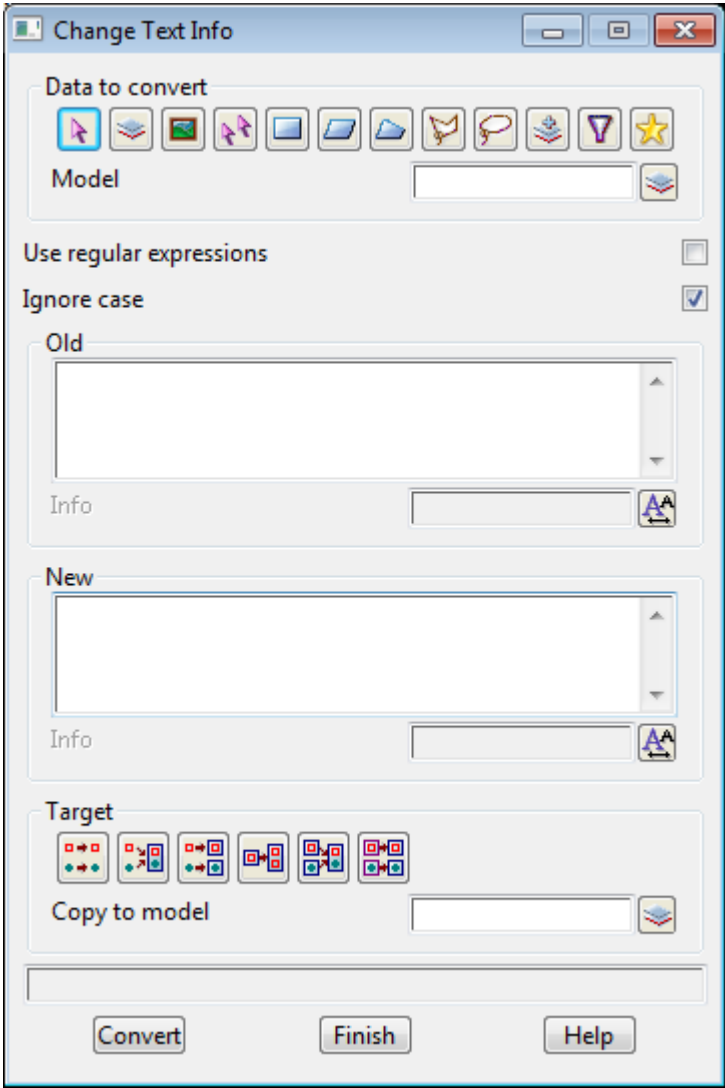
Position of option on menu: Utilities =>H-Z =>Text

The **Text** option is used to change the text style, units, height, offset, justification, angle and text for text, 4d strings and super strings.

For this option the selection process is extended from the standard Data Source.

After the data is selected as defined by the Data Source, the two extra parameters, **Old text** and the Textdata parameters in **Info**, are used to further specify which text is to be selected and modified.

Selecting **Text** displays the **Change Text Info** panel.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Default
Data source type	Model	
Data source	input	
<i>source of data to be processed.</i>		
Use regular expressions	tick box	not ticked

Ignore case	tick box	ticked
Old text	input	
<i>if the Old text field is non-blank, then any text in 4d or text strings will be checked for a match against this value. Wild cards and characters can be used.</i>		
Info	input	
<i>if non-blank, then only strings which match these Textdata parameters will be selected.</i>		
New text	input	
<i>if non-blank, then any selected text the selected strings will be modified to this value. Wild cards and characters can be used.</i>		
Info	input	
<i>if non-blank, then the select text on the selected strings will be given these Textdata parameters.</i>		
Target type		
<i>Data target - where to put the processed strings. For a full description go to Data Target in the chapter Tools and Concepts</i>		
Target info	input	
<i>extra information required for the target.</i>		
Convert	button	
<i>run the option and change the selected text.</i>		

Translate

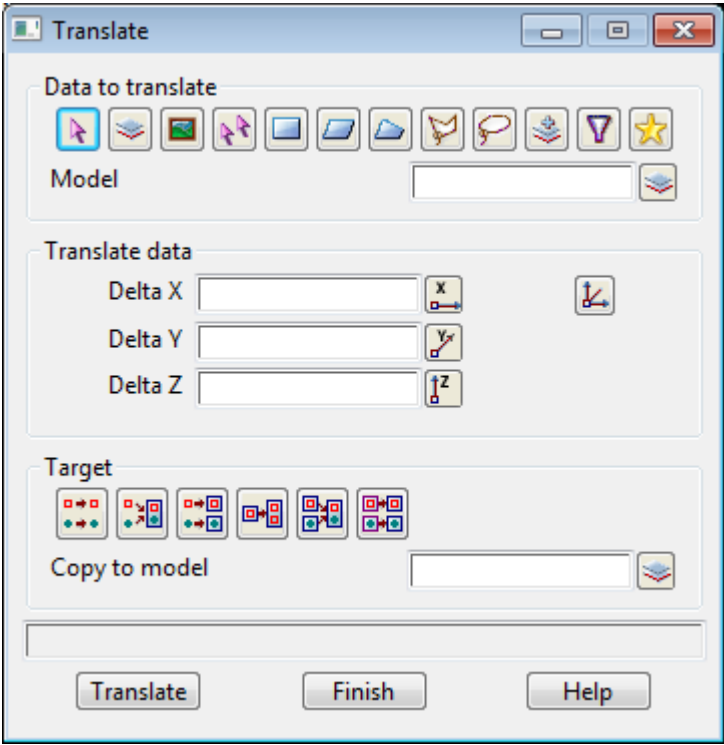
Position of option on menu: Utilities =>H-Z =>Translate

Translate is used to translate the selected strings through a user supplied translation vector (dx,dy,dz).

The strings can be translated in the x,y and z directions and be moved or copied to their new translated positions.

The difference between a **copy** and a **move** is that if a string is copied, a **copy** of the string is translated and the original string left untouched, whereas for a **move**, the actual string is moved from its original position to the new translated position.

Selecting **Translate** displays the **Translate** panel.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Data source type			Model	
-------------------------	--	--	-------	--

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#)

Data source		input		
--------------------	--	-------	--	--

source of data to be processed.

dx dy dz		input		
-----------------	--	-------	--	--

the translation vector (dx,dy,dz). This vector is added to all points in the strings.

*The translation (dx dy dx) can be typing into the **dx dy dz** field or by picking the **dx dy dx** button and then selecting two points with the cursor. When two points are selected, the difference vector of the two selected points is taken as the translation vector (dx,dy,dz). The (dx,dy,dz) value is piped into the **dx dy dz** field.*

Target type				
--------------------	--	--	--	--

Data target - where to put the processed string. For a full description go to [Data Target](#) in the chapter [Tools and Concepts](#)

Target info input
extra information required for the target.

Translate button
translate the selected strings.

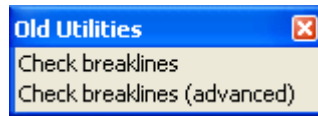
How to Use the Panel

- (a) Enter the **Data source** for the strings are to translated.
- (b) Define the translation vector (dx dy dz) by either typing the value into the **dx dy dz** field or by selecting the **dx dy dz** button and picking two points to define the translation vector. The resulting (dx dy dz) values are piped into the **dx dy dz** field.
- (c) Select the **target** mode.
- (d) Selecting the **Translate** button then does the required translations (moves or copies).

Old

Position of option on menu: Utilities =>Old

The Old Utilities walk-right menu is:



For the option *Check breaklines*, go to

[Check Breaklines](#)

Check breaklines (advanced)

[Check Breaklines \(Advanced\)](#)

Check Breaklines

Position of option on menu: Utilities =>Old=> Check breaklines

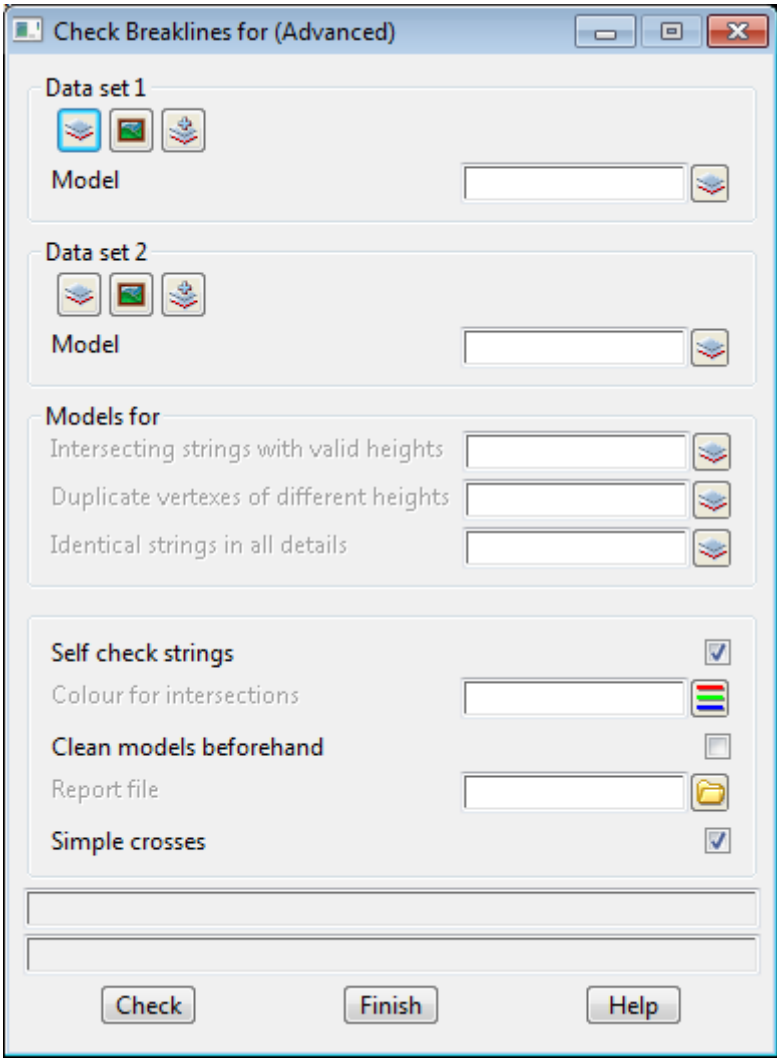
For information on this option please go to the section [Check Breaklines - Old](#) in the Chapter

[Triangles](#)

Check Breaklines (Advanced)

Position of option on menu: Utilities =>Old=> Check breaklines (advanced)

This section of documentation is a work in progress and will be updated in subsequent releases.



The fields and buttons in the panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Data set 1

*if **Data set 2** is ticked **off**, then all the selected strings in Data set 1 are checked against all the other selected strings from Data set 1.*

*If **Data set 2** is ticked **on**, then all the selected strings in Data set 1 are checked against all the selected strings in Data set 2, BUT the strings in Data set 1 are not checked against each other and the strings in Data set 2 are not checked against each other.*

Data set 1 source type	Model
-------------------------------	--------------

data selection type - for a full description go to [Data Source](#) in the chapter [Tools and Concepts](#).

Data set 1 source	input
--------------------------	--------------

data to be processed.

<esc> can be used to abort the checking option.

28 User

12d Model allows options to be placed on User menus.

Go to [User Defined Menus](#)
 [User on the Main Menu](#)
 [Miscellaneous](#)
 [Beta](#)
 [Console](#)
 [Polygon](#)
 [Undocumented User Menus](#)
 [Obsolete Options](#)

User Defined Menus

To help customise **12d Model**, there is a pull down menu **User** on the Main menu and **User** menus on each of the pull down menus on the Main menu.

The **User** menus can run **12d Model** macros, external programs, chains, and bring up **12d Model** screen layout files, panels and menus.

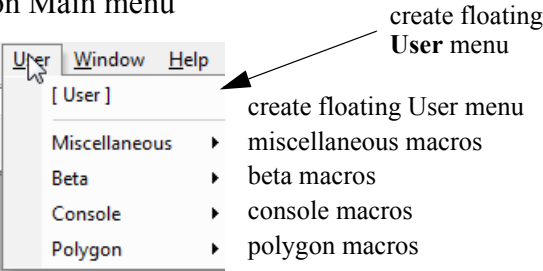
For the full definition and format for user defined menus, see [User Defined Menus](#) in the Appendix [Functions Keys, Menus, Toolbars](#).

User on the Main Menu

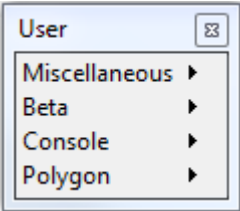
All the options under **User** and **User menus** are either customers own macros or unsupported macros from **12d Solutions** which may not be documented. For more information on defining **User** menus, go to [User Defined Menus](#)

The User walk-right menu on the Main menu is

on Main menu



on 12d Model menu and floating User menu

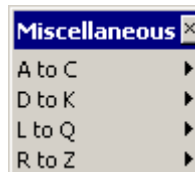


For the option Miscellaneous, go to [Miscellaneous](#)
Beta [Beta](#)
Console [Console](#)
Polygon [Polygon](#)

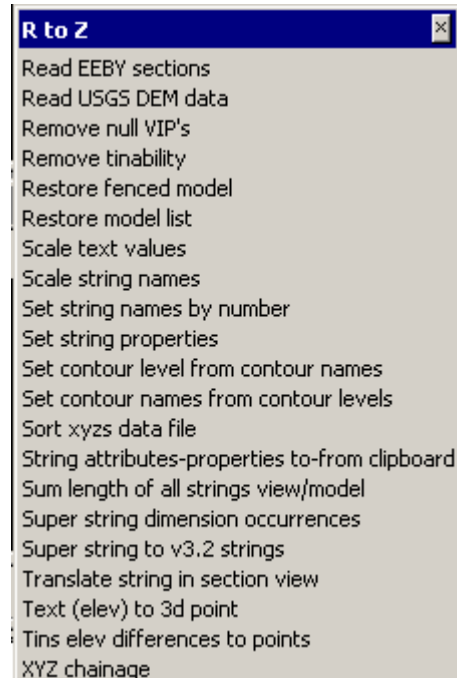
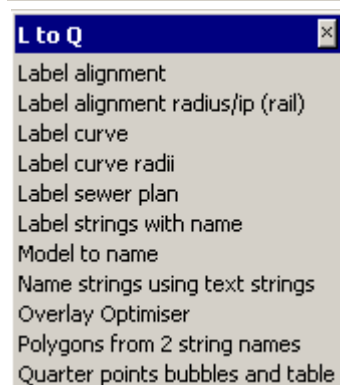
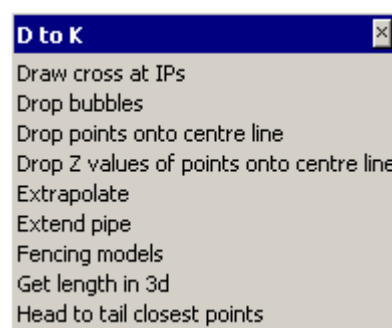
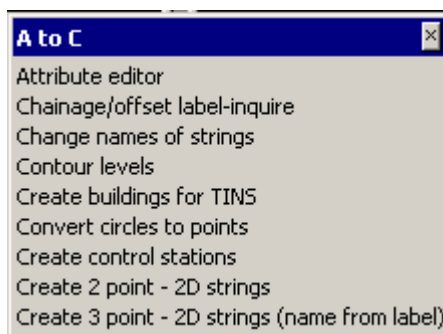
Miscellaneous

All the options under **User** and **User menus** are either customers own macros or unsupported macros from 12D Solutions which may not be documented. For more information on *User* menus, go to [User Defined Menus](#)

The walk rights **User =>Miscellaneous** menu is:



and the walk rights on the **Miscellaneous** menus are:



For *Attribute Editor*, go to the section
Chainage/offset label inquire
Change names of strings
Contour levels
Create buildings for TINS
Create points for circle centres

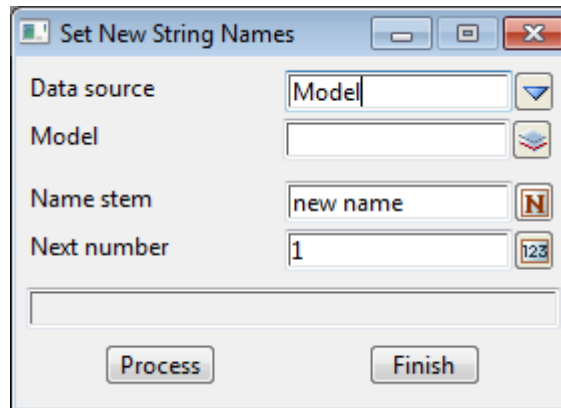
[Attribute Editor](#)
this is a console macro
[XXX New Name](#)
[Set Heights for 2d \(contour\) Strings](#)
[XXX Create Building for a Tin](#)
[Create Points for Centre of Circles](#)

Create control stations	XXX Create Control Stations
Create 2 point - 2D strings	XXX Create 2d String from Two Points
Create 3 point - 2D strings (name from label)	XXX Create 3 Point 2d Strings
Draw cross at IPs	Create Crosses at String Points in the chapter Drafting
Drop bubbles	XXX Drop Bubbles
Drop points onto centreline	XXX Drop Points onto Alignment
Drop Z values of points onto centre lines	XXX Drop z-value onto Centreline
Extrapolate	Extrapolate Point
Extend pipe	XXX Create VicRoad Pipe
Fencing models	XXX Fencing Models
Get length in 3d	Length in 3d
Head to tail closest points	XXX Head to Tail Closest Points
Label alignment	<i>this is a console macro</i>
Label alignment radius/ip (rail)	XXX Label Alignment Radius
Label curve	<i>this is a console macro</i>
Label curve radii	<i>this is a console macro</i>
Label sewer plan	XXX Label Sewer Plan (old)
Label strings with name	XXX Name Strings by Nearby Text
Model to name	XXX Name Strings by Model Name
Name strings using text strings	XXX Name Section Strings by Picking Text
Overlay Optimiser	XXX Overlay Optimiser
Polygon from 2 string names	Polygons from Sections in the chapter Design
Quarter points bubbles and table	Setout Lip Line in the chapter Survey
Read EEBY sections	XXX Read EEBY Sections
Read USGS DEM data	XXX Read USGS DEM Data
Remove null VIPs	Remove Null VIP Points
Remove tinability	XXX Remove Tinability
Restore fenced model	XXX Restore Fenced Model
Restore model list	Models Save/Restore in the chapter View
Scale text values	XXX Scale Text Values
Scale string names	XXX Scale String Names
Set string names by number	XXX Set String Names by Number
Set string properties	XXX String Operations
Set contour levels from contour names	Set Contour Levels from String Names
Set contour names from contour levels	Set Contour Names From Contour Levels
Sort xyzs data file	XXX Sort XYZs Data File
String attributes properties to-from clipboard	String Clipboard
Sum length of all strings model/view	Polygon
Super string dimension occurrences	XXX Super String Dimension Occurrences
Super string to V3.2 strings	XXX Transform V4 to V3.2
Translate string in section view	XXX Section Move
Text (elev) to 3d point	Text to 3d in the chapter Utilities
Tin elev differences to points	Z Differences from Tins in the chapter Triangles
XYZ chainage	XXX Output XYZ and Chainage

XXX New Name

Position of option on menu: User =>Miscellaneous =>A to C =>Change name of strings

Note - This is an unsupported option which may not be fully documented.



The fields and buttons used in this panel have the following functions:

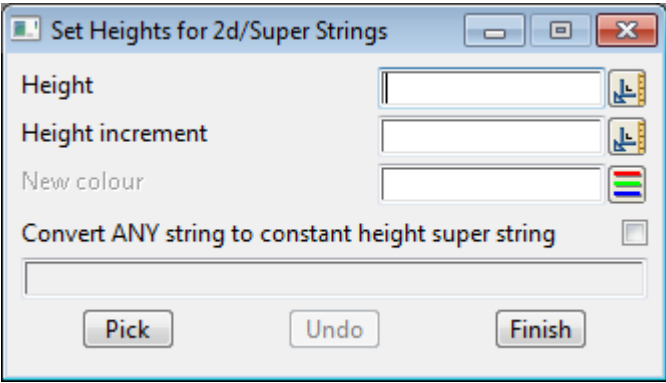
Field Description	Type	Defaults	Pop-Up
Data source		Model	string, model, view
Model/View/String of circles			
<i>type of source of the data to process.</i>			
Model for centres	model box		available models
<i>source of data to process.</i>			
Name stem	input		
Process	button		

Set Heights for 2d (contour) Strings

Position of option on menu: User =>Miscellaneous =>A to C =>Contour levels

Note - This is an unsupported option which may not be fully documented.

This panel is used to quickly change the height of contour strings. An initial height and increment is given. As each string is accepted, it is given the height and the height then incremented.



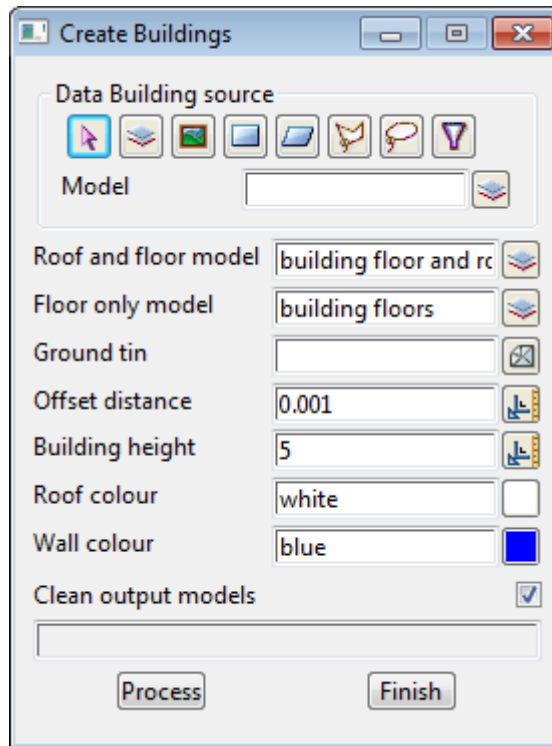
The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Height <i>Height to use for the next selected string. This is incremented by the “Height increment” after each string is accepted.</i>	input		
Height increment <i>As each string is accepted, the “Height” value is incremented by this value.</i>	input		
New colour <i>If non-blank, the selected strings are given this colour when their z-value is changed.</i>	input		available colours
Pick <i>After clicking on Pick, 2d strings are selected and when accepted, have their z-value changed to the value in the Height field. The height value is then automatically incremented. The next string is then selected and accepted (without needing to click on Pick again). This continues until Cancel is selected from the “Pick Ops” menu.</i>	input		
Undo <i>Undo the last height change. This can be selected up to 200 times.</i>	button		

XXX Create Building for a Tin

Position of option on menu: User => Miscellaneous => A to C => Create buildings for tin

Note - This is an unsupported option which may not be fully documented.

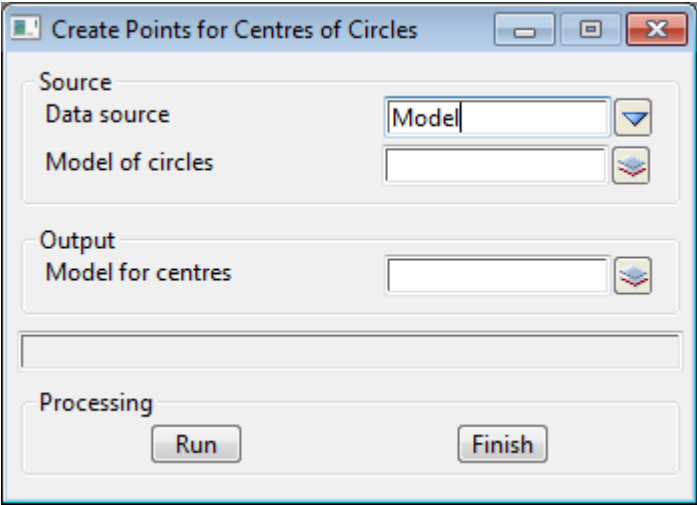


Create Points for Centre of Circles

Position of option on menu: User =>Miscellaneous =>A to C =>Convert circles to points

Note - This is an unsupported option which may not be fully documented.

This options creates points at the centres of circles.



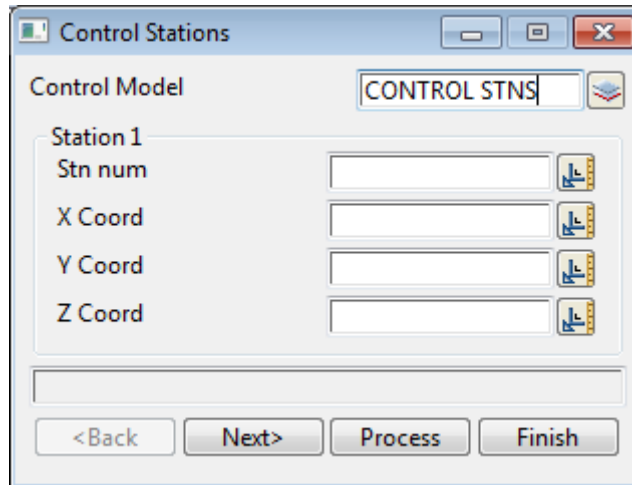
The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Data source		Model	string, model, view
Model/View/string of circles <i>source of the circles to create centre points for.</i>			
Model for centres	model box		available models
<i>model to place the created centre points in.</i>			
Run	button		
<i>run the option.</i>			

XXX Create Control Stations

Position of option on menu: User =>Miscellaneous =>A to C =>Create control stations

Note - This is an unsupported option which may not be fully documented.

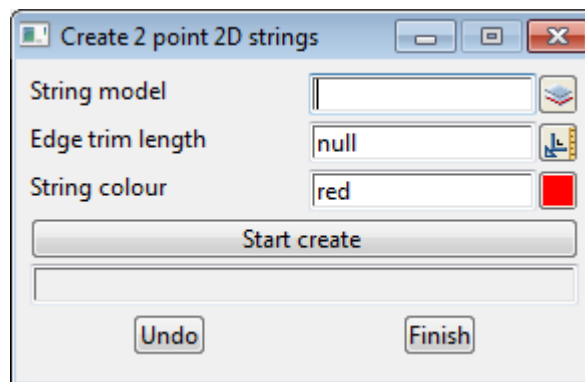


The 'Control Stations' dialog box features a title bar with standard window controls. Below the title bar, the 'Control Model' is set to 'CONTROL STNS'. Under the 'Station 1' section, there are four input fields: 'Stn num', 'X Coord', 'Y Coord', and 'Z Coord', each accompanied by a small icon. At the bottom, there are four buttons: '<Back', 'Next>', 'Process', and 'Finish'.

XXX Create 2d String from Two Points

Position of option on menu: User =>Miscellaneous =>A to C =>Create 2 point - 2d strings

Note - This is an unsupported option which may not be fully documented.

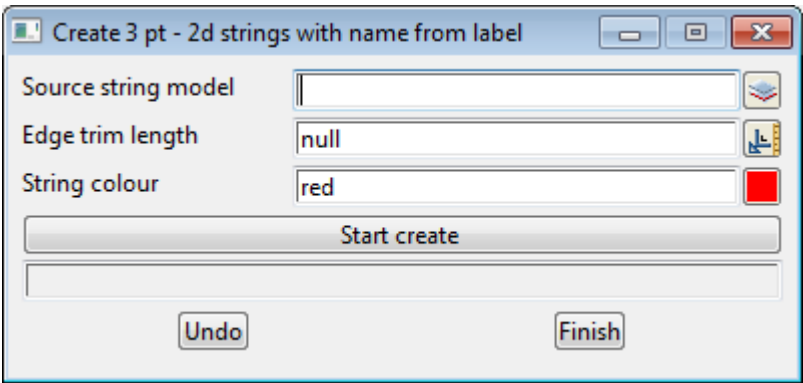


The 'Create 2 point 2D strings' dialog box has a title bar with standard window controls. It contains three input fields: 'String model', 'Edge trim length' (set to 'null'), and 'String colour' (set to 'red' with a red color swatch). Below these fields is a 'Start create' button. At the bottom, there are two buttons: 'Undo' and 'Finish'.

XXX Create 3 Point 2d Strings

Position of option on menu: User =>Miscellaneous =>A to C =>Create 3 point - 2d strings

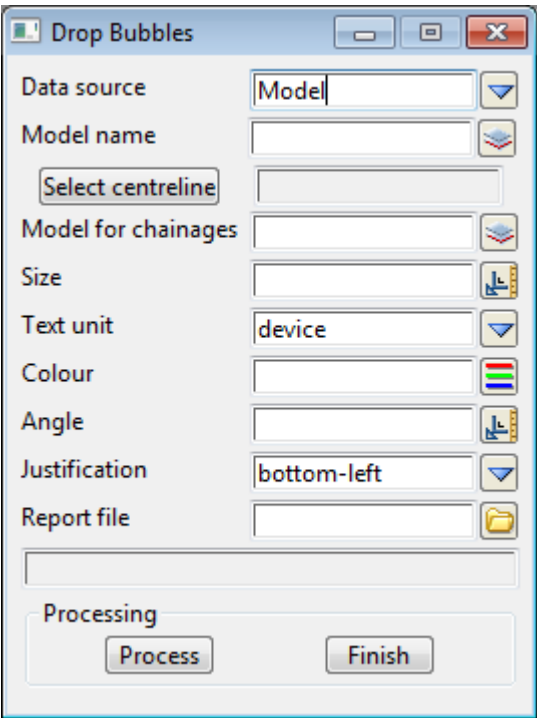
Note - This is an unsupported option which may not be fully documented.



XXX Drop Bubbles

Position of option on menu: User => Miscellaneous => D to K => Drop bubbles

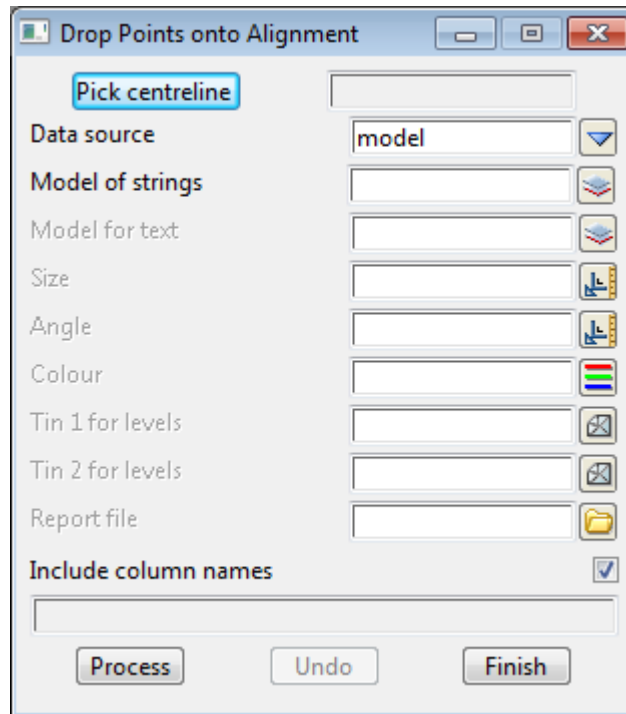
Note - This is an unsupported option which may not be fully documented.



XXX Drop Points onto Alignment

Position of option on menu: User => Miscellaneous => D to K => Drop points onto alignment

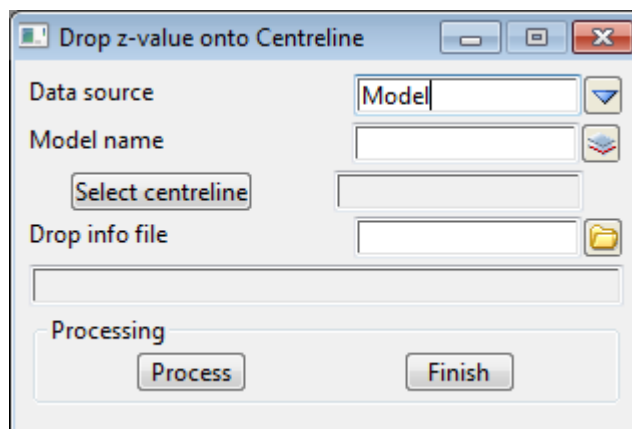
Note - This is an unsupported option which may not be fully documented.



XXX Drop z-value onto Centreline

Position of option on menu: User => Miscellaneous => D to K => Drop points on centreline

Note - This is an unsupported option which may not be fully documented.

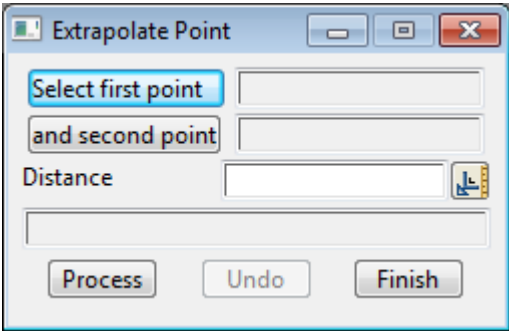


Extrapolate Point

Position of option on menu: User =>Miscellaneous =>D to K =>Extrapolate

Note - This is an unsupported option which may not be fully documented.

This option is used to select two point and then creates a new point a given distance from the second point along the line from the first point to the second point. The z-value for the point is the extrapolated z-value from the two selected points.



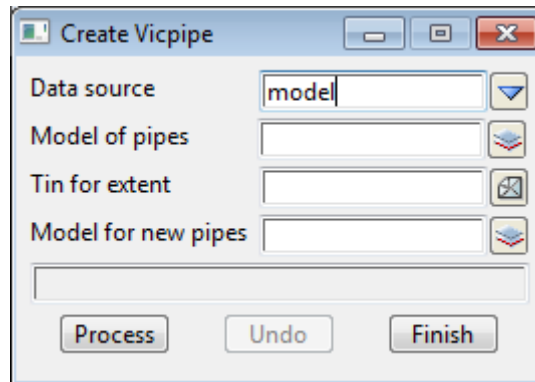
The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Select first point <i>select the first point to use in the extrapolation.</i>	string select		
and second point <i>select the second point to use in the extrapolation.</i>	string select		
Distance <i>distance to project from the second point along the line from the first to the second point.</i>	output box		
Process <i>run the option.</i>	button		
Undo <i>undo the last extrapolated point created since the panel has been up.</i>	button		

XXX Create VicRoad Pipe

Position of option on menu: User =>Miscellaneous =>D to K =>Extend pipe

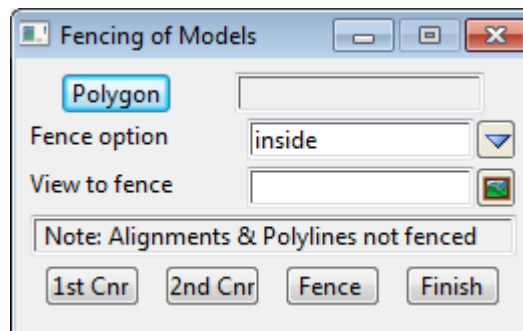
Note - This is an unsupported option which may not be fully documented.



XXX Fencing Models

Position of option on menu: User =>Miscellaneous =>D to K =>Fencing models

Note - This is an unsupported option which may not be fully documented.

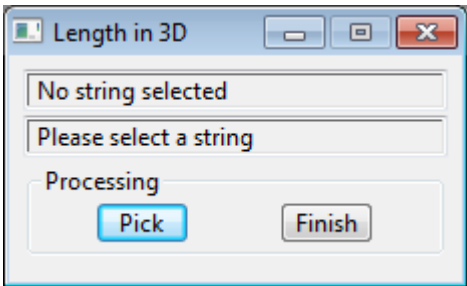


Length in 3d

Position of option on menu: User =>Miscellaneous =>D to K =>Get length in 3d

Note - This is an unsupported option.

This panel is used to calculate the 3d length of a selected string.



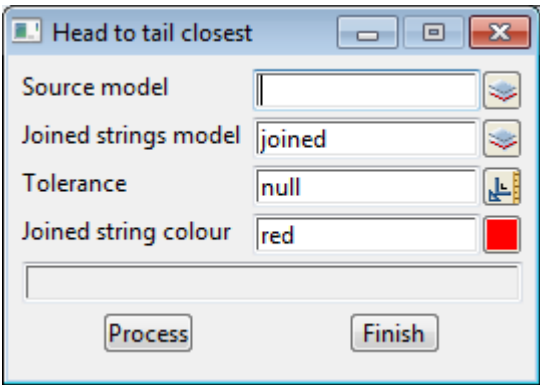
The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Pick	button		
<i>select the string to calculated the 3d length for.</i>			

XXX Head to Tail Closest Points

Position of option on menu: User =>Miscellaneous =>D to K =>Head to tail closest points

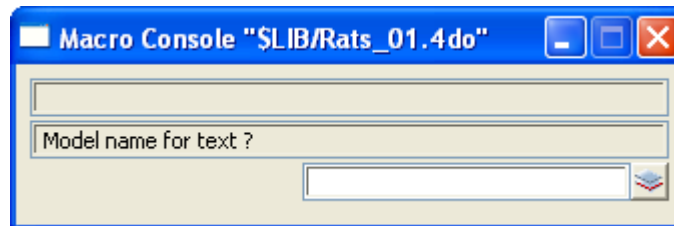
Note - This is an unsupported option which may not be fully documented.



XXX Label Alignment

Position of option on menu: User =>Miscellaneous =>L to Q =>Label alignment

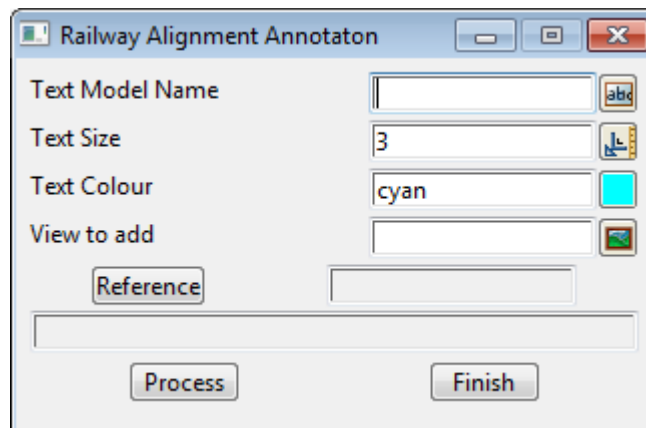
Note - This is an unsupported option which may not be fully documented.



XXX Label Alignment Radius

Position of option on menu: User =>Miscellaneous =>L to Q =>Label alignment radius/ip (rail)

Note - This is an unsupported option which may not be fully documented.

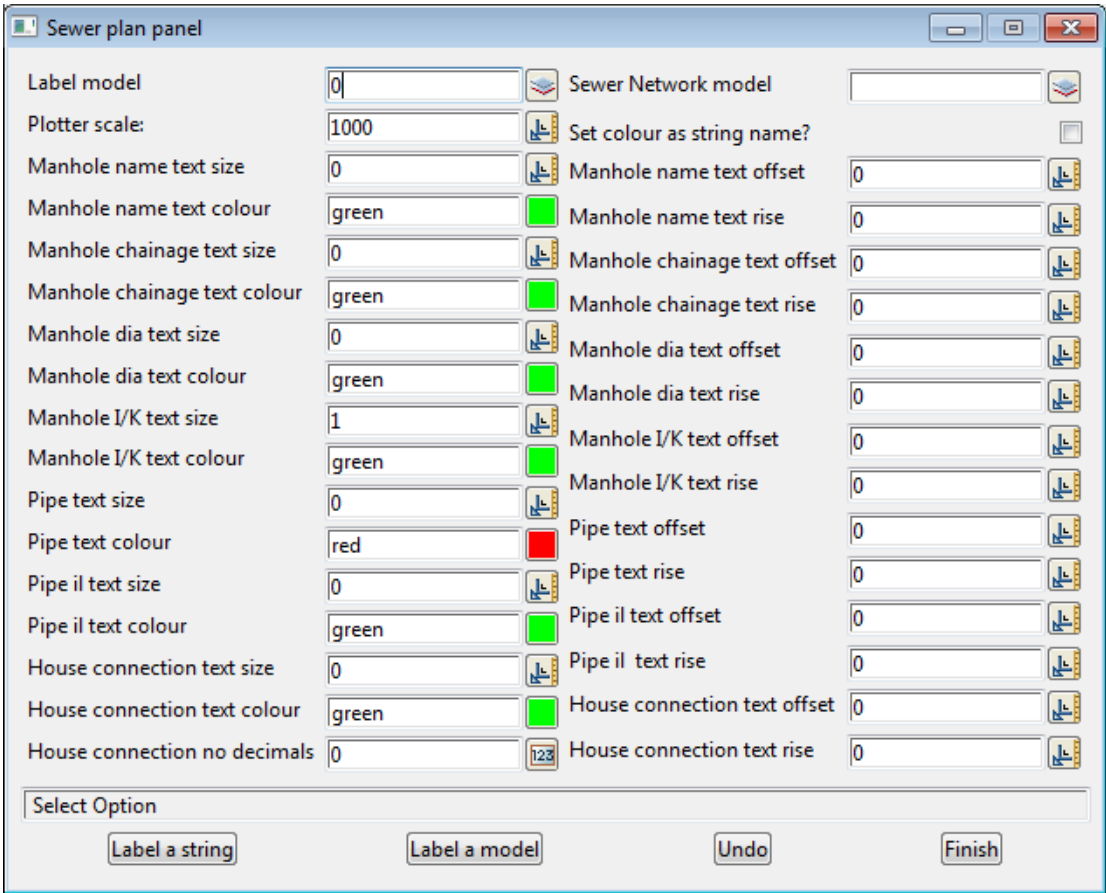


XXX Label Sewer Plan (old)

Position of option on menu: User =>Miscellaneous =>L to Q =>Label sewer plan

Note - This is an unsupported option which may not be fully documented.

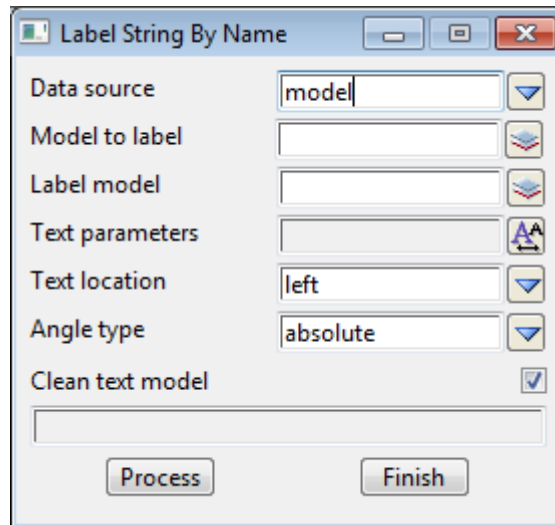
This option has been superseded.



XXX Name Strings by Nearby Text

Position of option on menu: User =>Miscellaneous =>L to Q =>Label strings with name

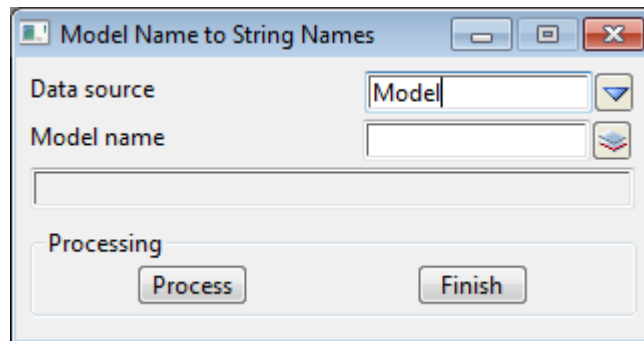
Note - This is an unsupported option which may not be fully documented.



XXX Name Strings by Model Name

Position of option on menu: User =>Miscellaneous =>L to Q =>Model to name

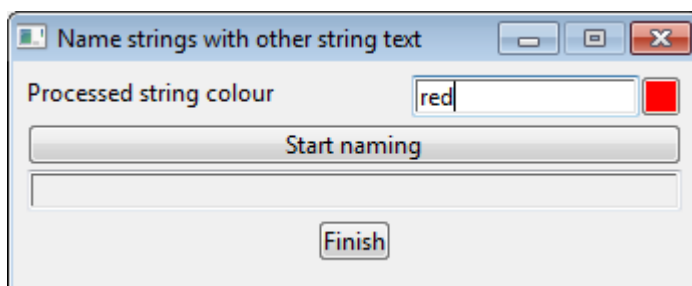
Note - This is an unsupported option which may not be fully documented.



XXX Name Section Strings by Picking Text

Position of option on menu: User =>Miscellaneous =>L to Q =>Name strings using text strings

Note - This is an unsupported option which may not be fully documented.



XXX Overlay Optimiser

Position of option on menu: User =>Miscellaneous =>L to Q =>Overlay optimiser

Note - This is an unsupported option which may not be fully documented.

The screenshot shows the 'Optimal Paver' window with the following fields and options:

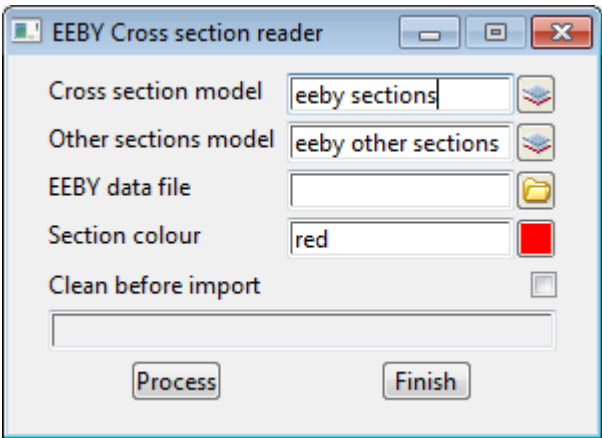
- Input Data**
 - Survey sections model: sections
 - Centre line code: CL
 - Left road edge code: ESL
 - Right road edge code: ESR
- Basic Overlay Data** (selected tab)
 - Overlay Data
 - Min overlay thickness: 0.1
 - Max overlay thickness: 0.2
 - Min crossfall %:
 - Road quality factor:
- Advanced Options** (unselected tab)
- Results**
 - Strings model: result strings
 - Section model: result sections
 - Survey tin: survey
 - Design tin: design
 - Report: results.rep

Buttons at the bottom: Process, Finish

XXX Read EEBY Sections

Position of option on menu: User =>Miscellaneous =>R to Z =>Read EEBY sections

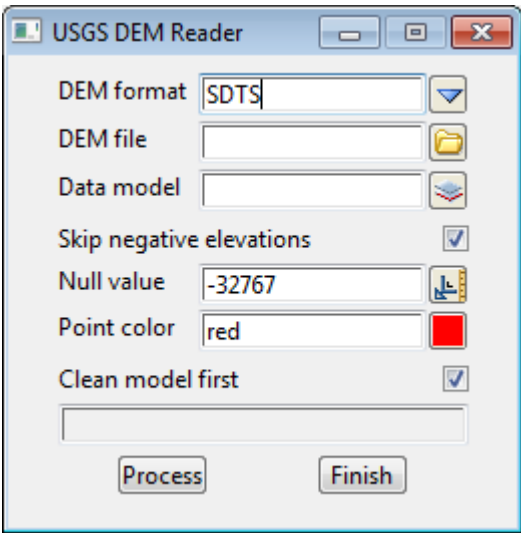
Note - This is an unsupported option which may not be fully documented.



XXX Read USGS DEM Data

Position of option on menu: User =>Miscellaneous =>R to Z =>Read USGS DEM data

Note - This is an unsupported option which may not be fully documented.

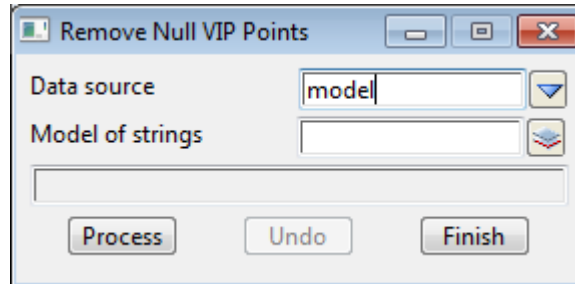


Remove Null VIP Points

Position of option on menu: User =>Miscellaneous =>R to Z =>Remove null VIP's

Note - This is an unsupported option which may not be fully documented.

This option is used to remove any null vertical intersection points from alignment strings.



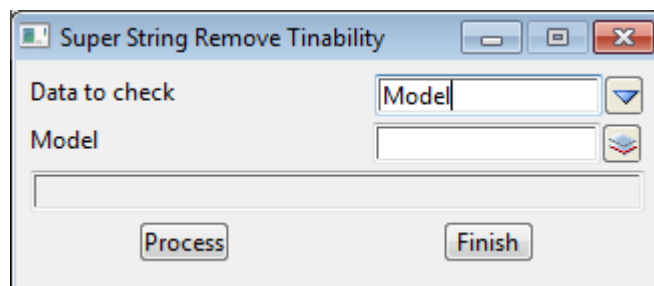
The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Data source <i>Type of data to remove null vips for.</i>	data source	Model	String, Model, View
Model/View/String <i>Data source for all the alignment strings to remove all null vips from.</i>	data source		
Process <i>Run the option.</i>	button		

XXX Remove Tinability

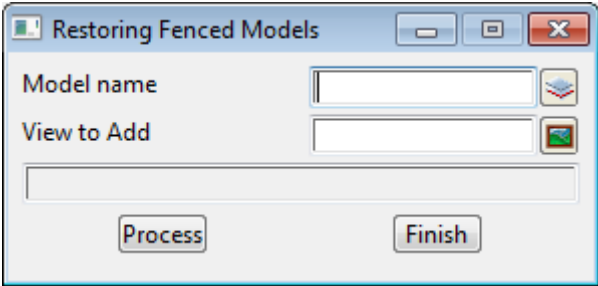
Position of option on menu: User =>Miscellaneous =>R to Z =>Remove tinability

Note - This is an unsupported option which may not be fully documented.



XXX Restore Fenced Model

Position of option on menu: User =>Miscellaneous =>R to Z =>Restore fenced model
Note - This is an unsupported option which may not be fully documented.

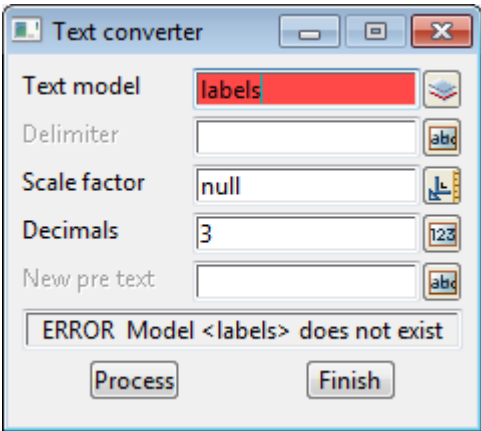


The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
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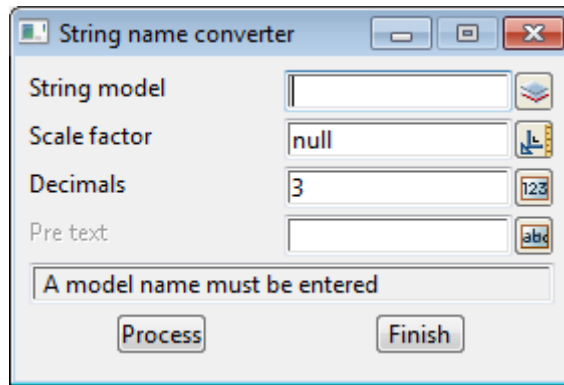
XXX Scale Text Values

Position of option on menu: User =>Miscellaneous =>R to Z=>Scale text values
Note - This is an unsupported option which may not be fully documented.



XXX Scale String Names

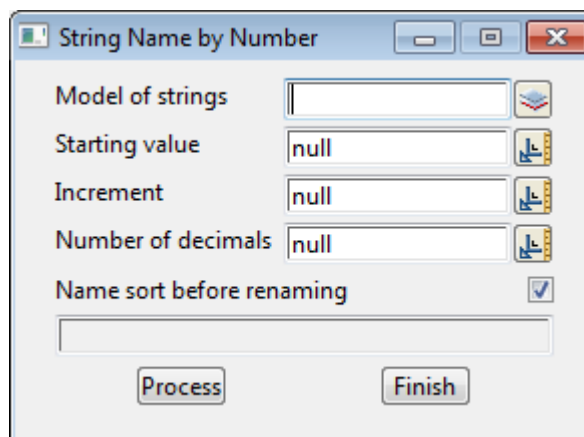
Position of option on menu: User =>Miscellaneous =>R to Z=>Scale string names
Note - This is an unsupported option which may not be fully documented.



XXX Set String Names by Number

Position of option on menu: User => Miscellaneous => R to Z => Set string names by number

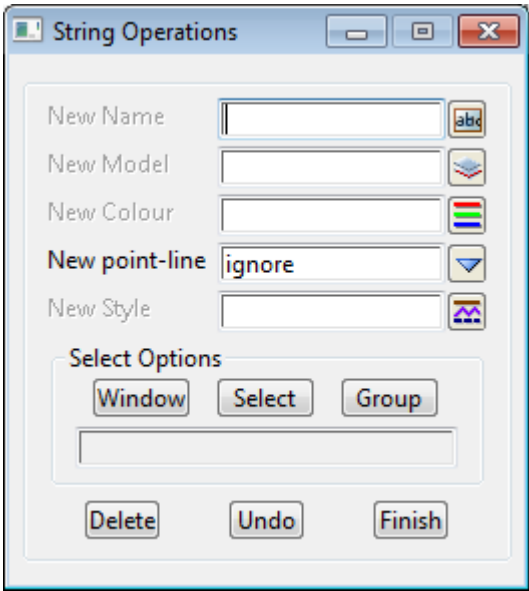
Note - This is an unsupported option which may not be fully documented.



XXX String Operations

Position of option on menu: User =>Miscellaneous =>R to Z=>Set string properties

Note - This is an unsupported option which may not be fully documented.

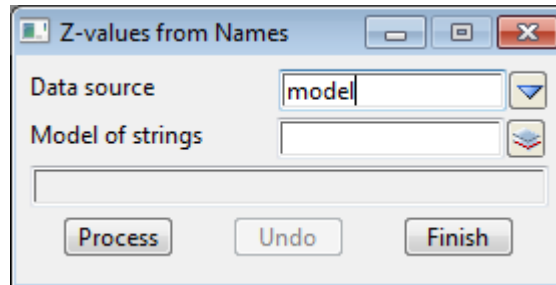


Set Contour Levels from String Names

Position of option on menu: User =>Miscellaneous =>R to Z=>Set contour level from contour name

Note - This is an unsupported option which may not be fully documented.

This operates on contour strings and sets the contour z-value to be the value of the name of the contour string. The z-values may need to be factored to bring them into the correct units.



The fields and buttons used in this panel have the following functions:

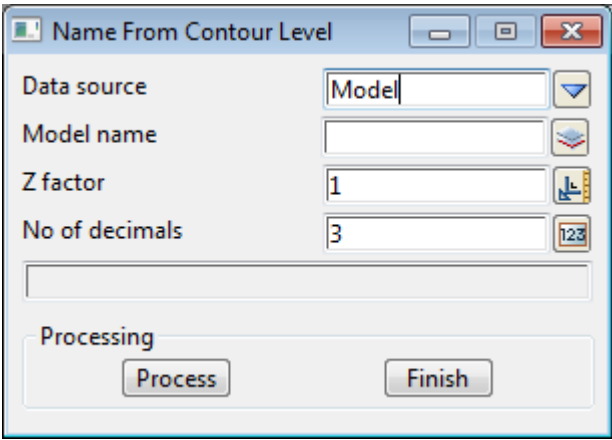
Field Description	Type	Defaults	Pop-Up
Data source <i>Type of data to set contour z-values for.</i>	data source	Model	Model, View
Model/View <i>Data source to of contours to set z-values for.</i>	data source		
Process <i>Run the option</i>	button		
Undo <i>Undo the last set of contours labelled since the panel was up.</i>	button		

Set Contour Names From Contour Levels

Position of option on menu: User =>Miscellaneous =>R to Z=>Set contour names from contour levels

Note - This is an unsupported option which may not be fully documented.

This option operates on contours only and sets the string name to be the contour z value multiplied by the given factor.



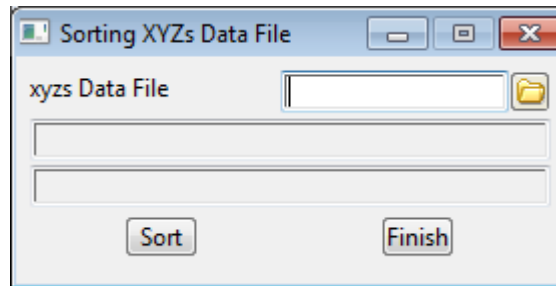
The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Data source <i>Type of data to label contours strings for.</i>	data source	Model	String, Model, View
Model/View/String <i>Data source to calculate label the contours for.</i>	data source		
Z factor <i>Value to multiply the z values by before creating the string name.</i>	input	1	
No of decimals <i>Number of decimals places to use in the string name.</i>	input	3	
Process <i>Run the option.</i>	button		

XXX Sort XYZs Data File

Position of option on menu: User => Miscellaneous => R to Z => Sort xyz data file

Note - This is an unsupported option which may not be fully documented.



String Clipboard

Position of option on menu: User => Miscellaneous => R to Z => String attributes-properties to-from clipboard

Position of option on menu: File I/O => User => String attributes-properties to-from clipboard

Note - This is an unsupported option which may not be fully documented.

On selecting the **String attributes-properties to-from clipboard** option, the **String clipboard** panel is displayed.

This panel can be used to export string properties and attributes to the windows clipboard and import the properties to update the same strings.

The following properties are always exported when **copy** is selected:

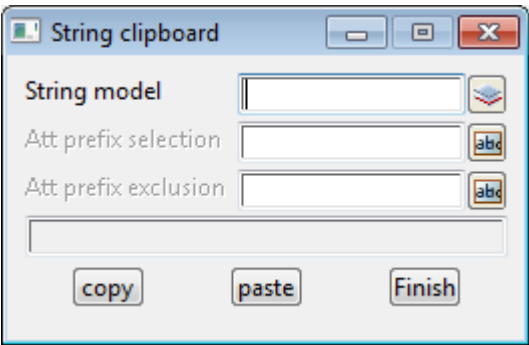
String id	Name	Type	Breakline	Style	Colour	Length
	1	3	3	1	3	1 3
3322187D1		Drainage		1	1	1004 238.358

String id, **Type** and **Length** are for export only and cannot be changed on an import.

Name, **Breakline**, **Style** and **Colour** may be changed to update the string when **paste** is selected. **Style** (linestyle order number from linestylel.4d) and **Colour** (colours.4d) numbers are used.

Starting in the 8th column, all of the string attributes are exported unless the **Att prefix selection** and/or the **Att prefix exclusion** filters are used. The first row is the string attribute name and the second row contains a number indicating the type of attribute. Attribute type numbers are

- 1 integer numbers (no decimals)
- 2 real numbers (decimals allowed)
- 3 text (characters allowed)



The fields and buttons used in this panel have the following functions.

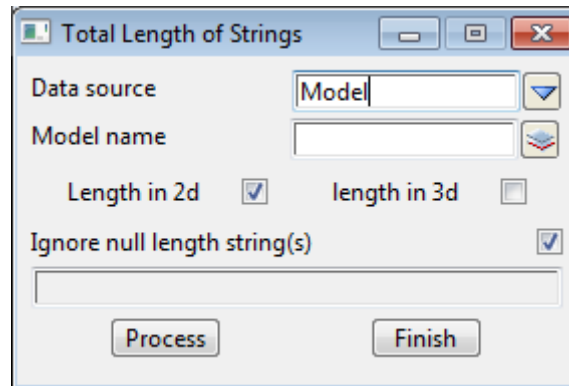
Field	Description	Type	Defaults	Pop-Up
String model	<i>name of the model to select strings from.</i>	model box		
Att prefix selection	<i>(copy only) if blank all attributes will be selected prior to the exclusion. If text is entered then only attributes with this exact text (case sensitive) will be selected prior to the exclusion.</i>	input	last data used	
Att prefix exclusion	<i>(copy only) if blank all attributes matching the selection above will be exported. If text is entered then attributes with this exact text (case sensitive) will be excluded from the export.</i>	input	last data used	
Copy	<i>copies the data from the string to the windows clipboard</i>	button		
Paste	<i>pastes the data from the windows clipboard. The string id is used to locate the string in the given model and then the properties/attributes are created and/or updated. If the attribute name is prefixed by DELETE followed by a space this string attribute will be deleted from all strings listed in the import.</i>	button		

Total Length of Strings

Position of option on menu: User => Miscellaneous => R to Z => Sum length of all strings

Note - This is an unsupported option which may not be fully documented.

This panel is used to calculate the total length of the strings in a selected model or view.

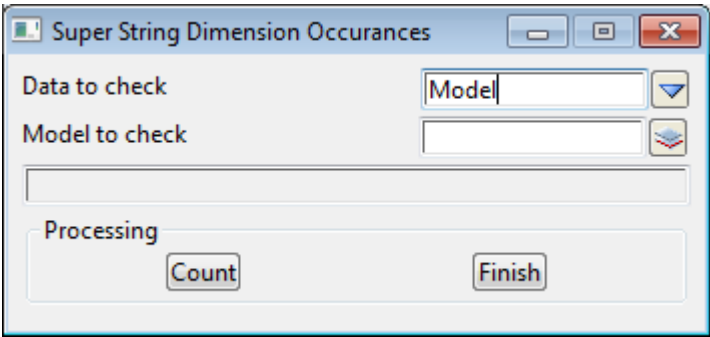


The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Data source <i>data source type</i>			model, view, string
Data source <i>data source to calculate lengths for.</i>			
Length in 2d/3d <i>if 2d, the lengths are only calculated in 2d. If 3d, the lengths are calculated in 3d.</i>	radio button	2d	
Ignore null length string(s) <i>if ticked, strings of null length are ignored in the string count and hence don't affect the average length.</i>	tick box	ticked	
Process <i>run the option</i>	button		

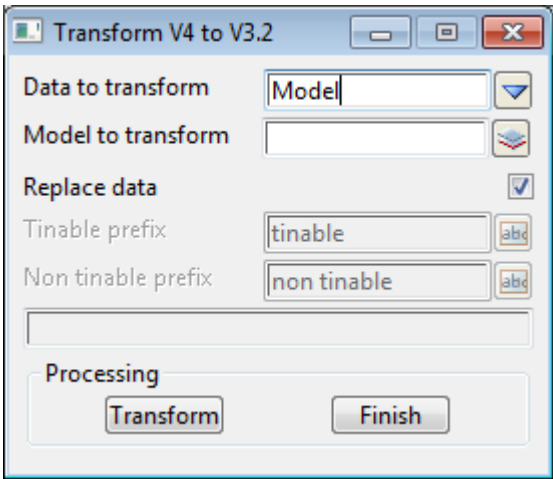
XXX Super String Dimension Occurrences

Position of option on menu: User =>Miscellaneous =>R to Z=>Super string dimension occurrences
Note - This is an unsupported option which may not be fully documented.



XXX Transform V4 to V3.2

Position of option on menu: User =>Miscellaneous =>R to Z=>Super string to V3.2 strings
Note - This is an unsupported option which may not be fully documented.
This panel convert a super string from **12d Model** V4.0 format to V3.2 strings.

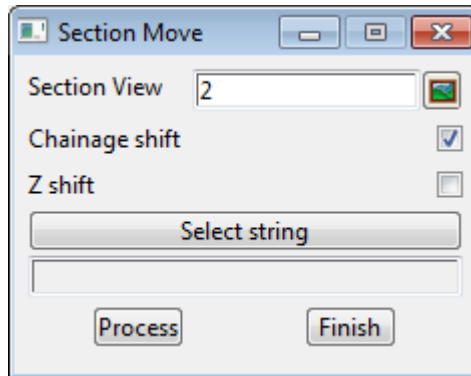


XXX Section Move

Position of option on menu: User =>Miscellaneous =>R to Z=>Translate string in section view

Note - This is an unsupported option which may not be fully documented.

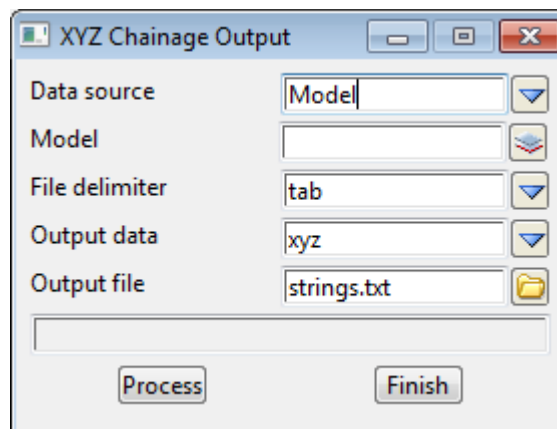
This panel is used to translate a string on a section view.



XXX Output XYZ and Chainage

Position of option on menu: User =>Miscellaneous =>R to Z=>XYZ chainage

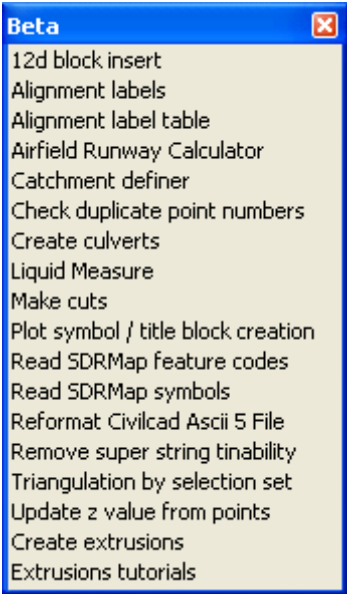
Note - This is an unsupported option which may not be fully documented.



Beta

All the options under **User** and **User menus** are either customers own macros or unsupported macros from 12D Solutions which may not be documented. For more information on *User* menus, go to [User Defined Menus](#)

The walk rights **Beta** menu is:

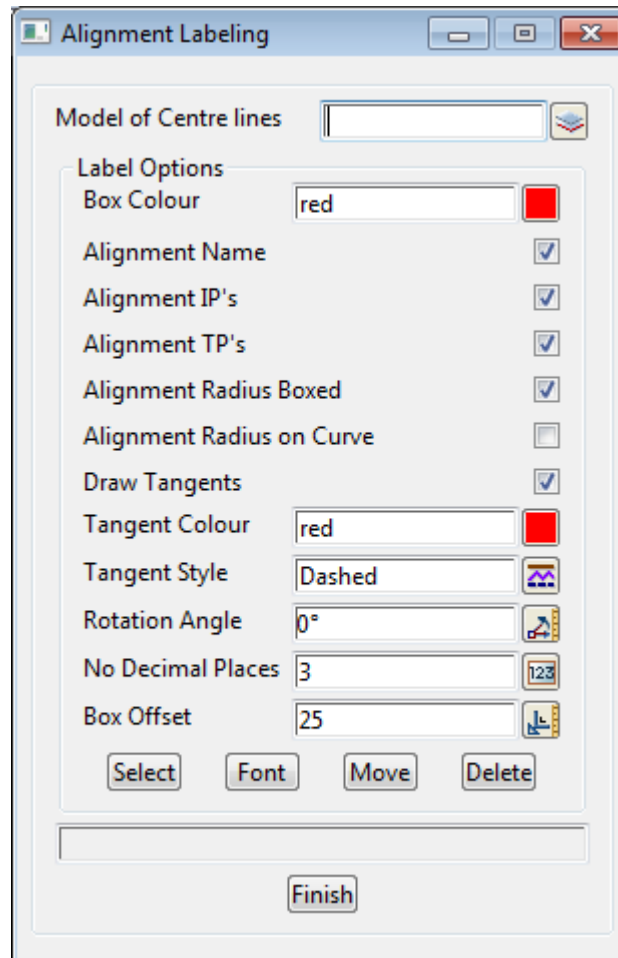


For the option <i>Alignment labels</i> , go to	XXX Alignment Labels
<i>Alignment label table</i>	XXX Table of Alignment Labels
<i>Airfield Runway Calculator</i>	Airfield Runway Calculator
<i>Catchment definer</i>	XXX Catchment Definer
<i>Check duplicate point numbers</i>	XXX Check Duplicate Point Numbers
<i>Create culverts</i>	XXX Create Culvert
<i>Liquid measure</i>	XXX Liquid Measure
<i>Make cuts</i>	XXX Make Cuts Through Strings
<i>Plot symbol/title block</i>	XXX Plot Symbol and Title Block Creation (old)
<i>Read SDRMap feature codes</i>	XXX Read SDRMap Feature Code
<i>Read SDRMap symbols</i>	XXX Read SDRMap Symbols
<i>Reformat CivilCAD Ascii 5 file</i>	XXX Reformat CivilCAD Ascii 5 file
<i>Remove super string tinability</i>	XXX Remove Super String Tinability
<i>Triangulate by selection set</i>	XXX Triangulate by Selection Set
<i>Update z values from points</i>	XXX Update Z Values from Points

XXX Alignment Labels

Position of option on menu: User =>Beta =>Alignment labels

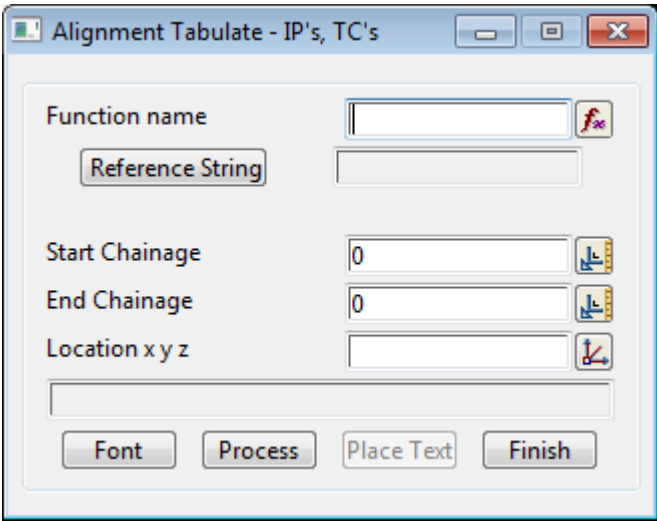
Note - This is an unsupported option which may not be fully documented.



XXX Table of Alignment Labels

Position of option on menu: User =>Beta =>Alignment label table

Note - This is an unsupported option which may not be fully documented.



Airfield Runway Calculator

Position of option on menu: User =>Beta =>Airfield Runway Calculator

This option is under development

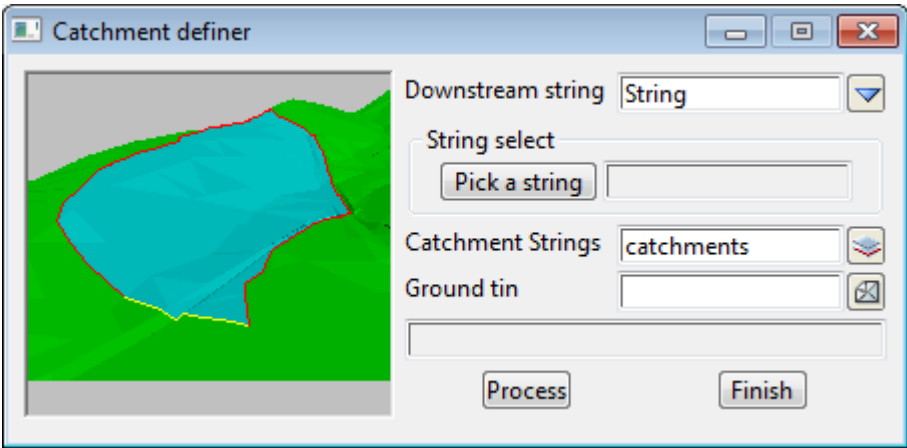
The screenshot shows the 'Airfield Runway Calculator' application window. The title bar reads 'Airfield Runway Calculator'. The interface is divided into several sections:

- Centreline Data:** Contains a 3D 'Model' logo on the left. To its right is a 'Function' text box with a calculator icon. Below this are two dropdown menus for 'Aerodrome Reference Code' (set to '4') and 'E'. Further down are two checkboxes: 'Instrument Approach?' (checked) and 'Precision Approach?' (unchecked). A 'Runway Alignment' button and an empty text box are at the bottom of this section.
- Threshold Data:** A tabbed interface with three tabs: 'Threshold Data', 'Runway Markings', and 'Output'. The 'Threshold Data' tab is active, showing two columns of input fields for 'Threshold 1' and 'Threshold 2'. Each column includes: 'Chainage' (0), 'Use displaced threshold' (unchecked), 'Displacement length' (0), 'RESA length' (90), 'Stopway length' (0), and 'Clearway length' (0). Each input field has a small icon to its right.
- calculations:** A large empty rectangular area with a vertical scrollbar on the right side.
- Finish:** A button located at the bottom left of the window.

XXX Catchment Definer

Position of option on menu: User =>Beta =>Catchment definer

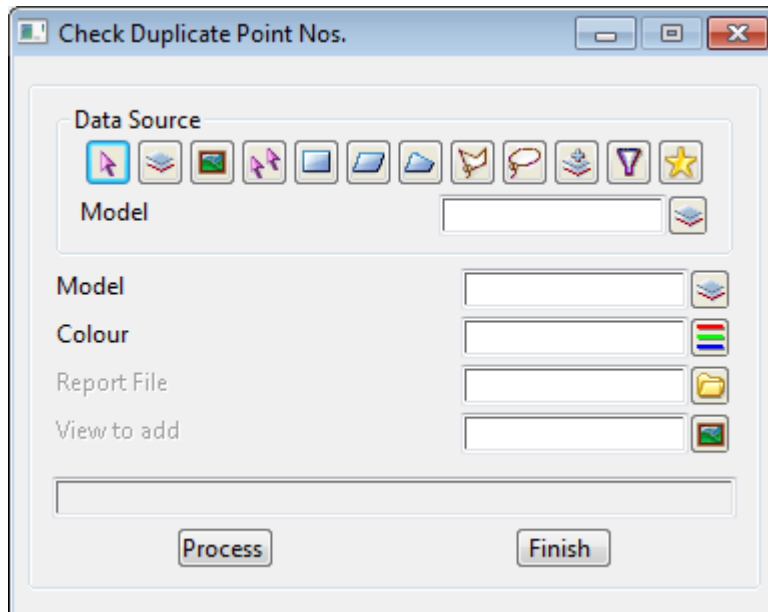
Note - This is an unsupported option which may not be fully documented.



XXX Check Duplicate Point Numbers

Position of option on menu: User =>Beta =>Check duplicate point numbers

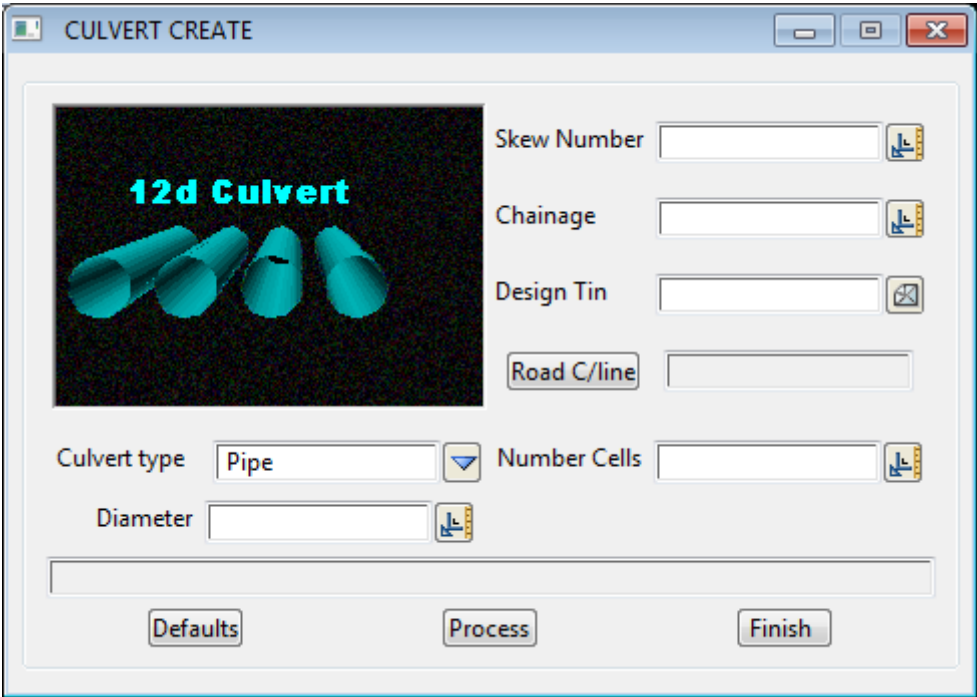
Note - This is an unsupported option which may not be fully documented.



XXX Create Culvert

Position of option on menu: User =>Beta =>Create culvert

Note - This is an unsupported option which may not be fully documented.



XXX Liquid Measure

Position of option on menu: User =>Beta =>Liquid measure

Note - This is an unsupported option which may not be fully documented.

The screenshot shows a software window titled "12D Liquid Measure". It contains three main sections: "Tank geometry", "Survey Reduction", and "Options".

Tank geometry

- Model: [text box]
- Colour: [text box]
- Tank Centre: [text box]
- Circum: [text box] [icon]
- Thickness: [text box] [icon]
- No chords: [text box] [icon]
- No pts: [text box] [icon]
- Dip Plate Staff Reading: [text box] [icon]
- Buttons: Draw, Undo

Survey Reduction

- Dist = 0.000 Level = 0.000
- Vertex number = 0
- Vertex Staff Reading: [text box] [icon]
- Buttons: <= Prev, Next =>

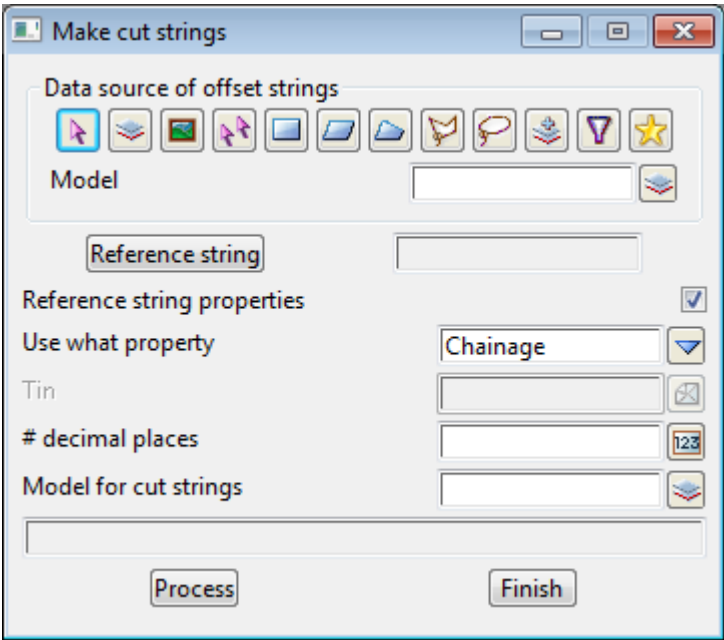
Options

- Output File name: [text box] [icon]
- Buttons: Pick, <-Prev, Next->, Write, Finish
- [Empty text box]

XXX Make Cuts Through Strings

Position of option on menu: User =>Beta =>Make cuts

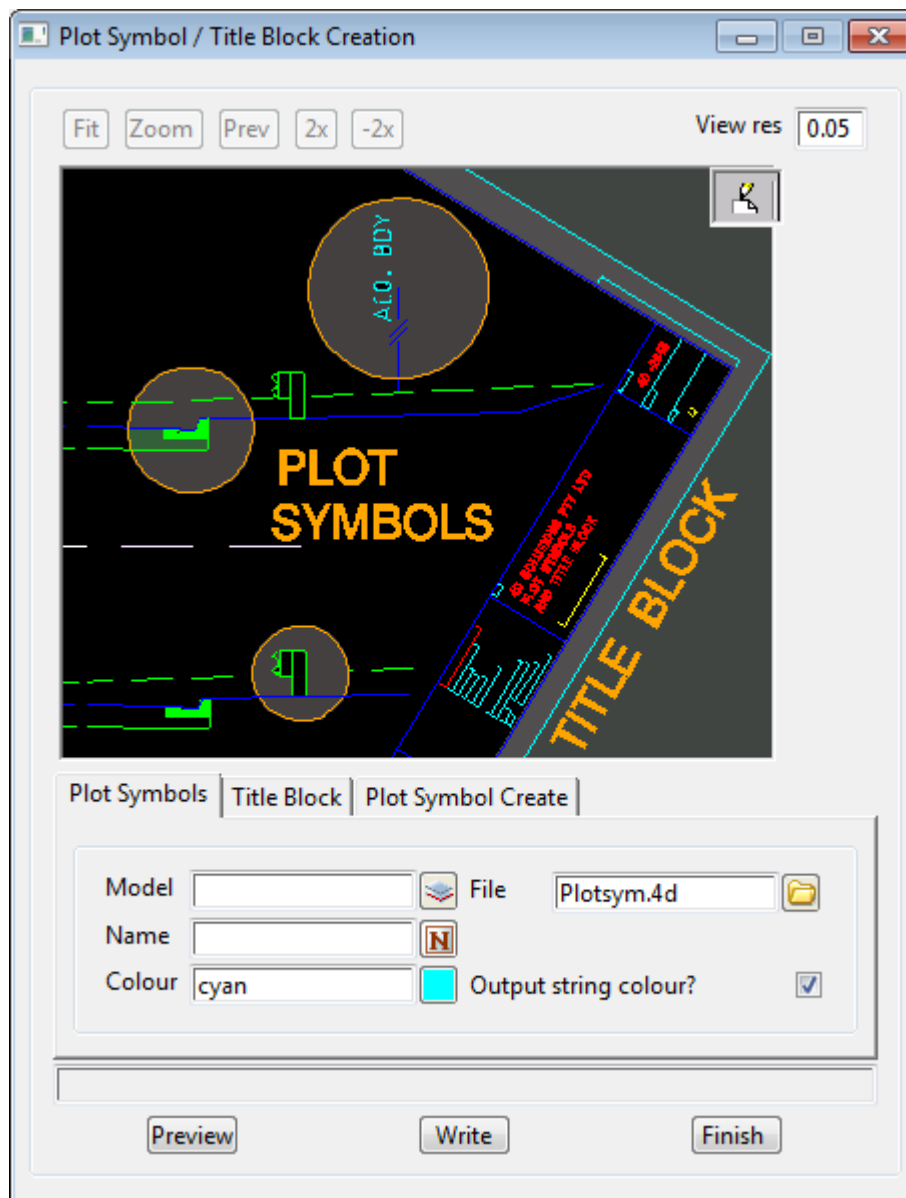
Note - This is an unsupported option which may not be fully documented.



XXX Plot Symbol and Title Block Creation (old)

Position of option on menu: User =>Beta =>Plot symbol/title block creation

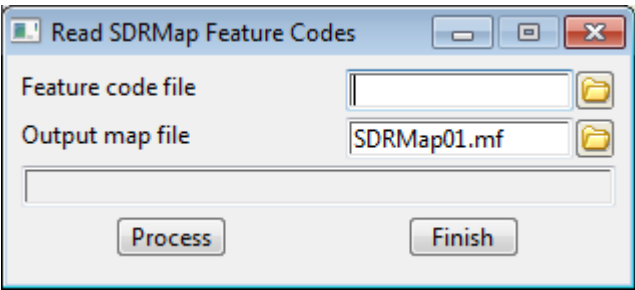
Note - This is an unsupported option which may not be fully documented.



XXX Read SDRMap Feature Code

Position of option on menu: User =>Beta =>Read SDRMap feature codes

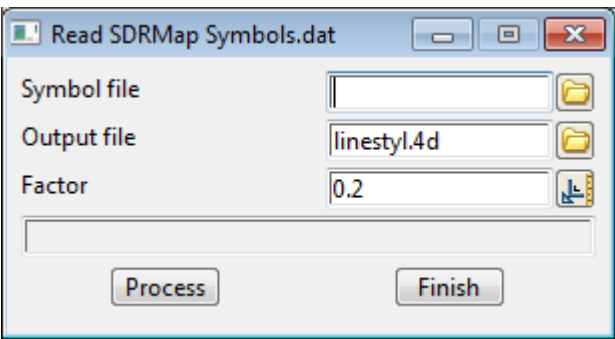
Note - This is an unsupported option which may not be fully documented.



XXX Read SDRMap Symbols

Position of option on menu: User =>Beta =>Read SDRMap symbols

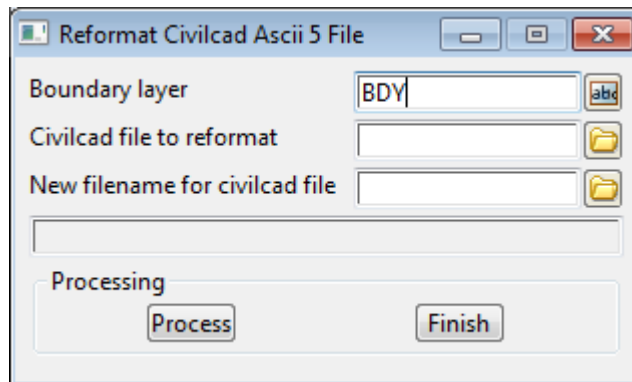
Note - This is an unsupported option which may not be fully documented.



XXX Reformat CivilCAD Ascii 5 file

Position of option on menu: User =>Beta =>Reformat CivilCAD Ascii 5 file

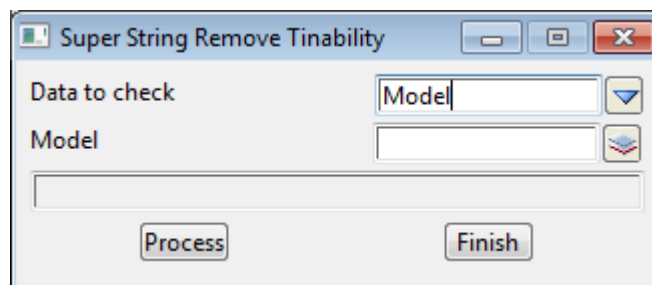
Note - This is an unsupported option which may not be fully documented.



XXX Remove Super String Tinability

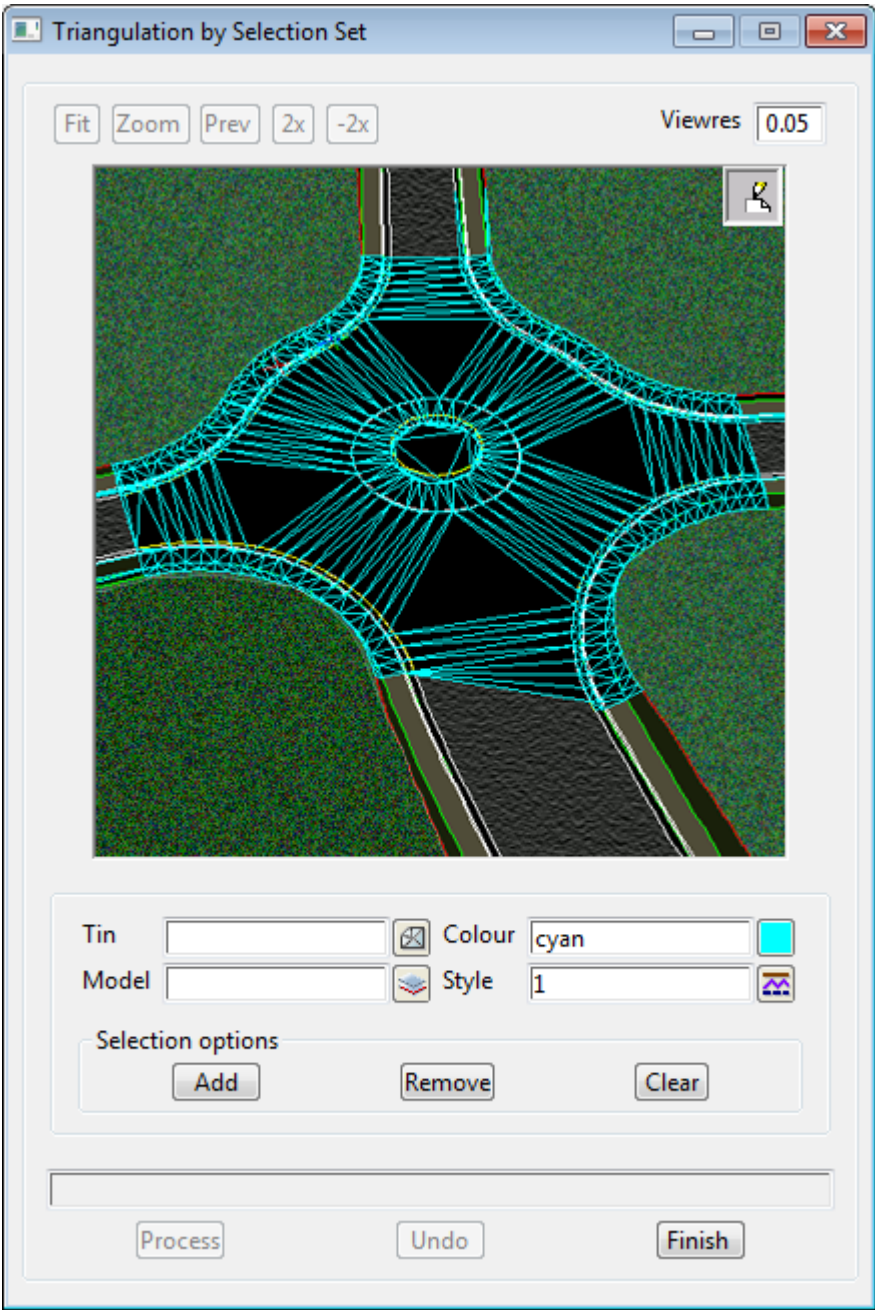
Position of option on menu: User =>Beta =>Remove super string tinability

Note - This is an unsupported option which may not be fully documented.



XXX Triangulate by Selection Set

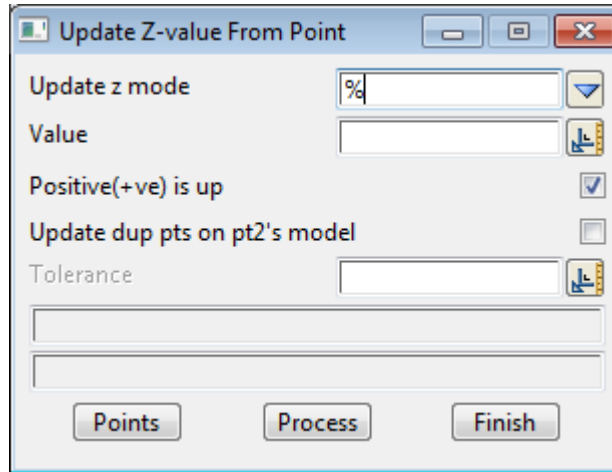
Position of option on menu: User =>Beta =>Triangulation by selection set
Note - This is an unsupported option which may not be fully documented.



XXX Update Z Values from Points

Position of option on menu: User =>Beta =>Update z value from points

Note - This is an unsupported option which may not be fully documented.

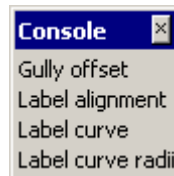


Console

All the options under **User** and **User menus** are either customers own macros or unsupported macros from 12D Solutions which may not be documented. For more information on *User* menus, go to [User Defined Menus](#)

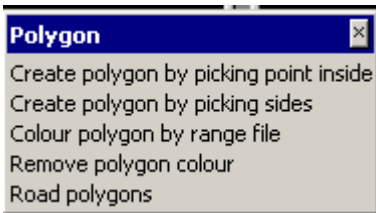
All the macros on the **Console** menu only use the console panel and so do not support a F1 key for help.

The User =>Console rights menu is:



Polygon

The **Polygon** walk-right menu is



create polygon by picking point inside
create polygon by picking sides
colour polygon by range file
remove polygon colour

and each option in this menu will now be discussed.

For *Create polygon by picking point inside area*, go to

[Surrounding Polygon](#) in the chapter [Strings](#)

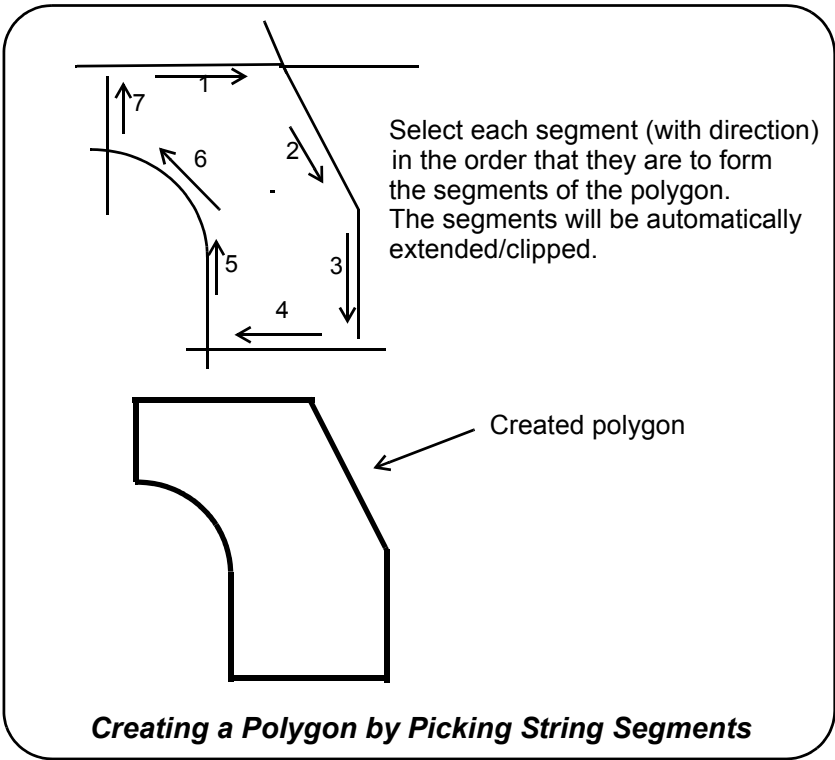
Create polygon by picking sides
Colour polygons from range file
Remove polygon colour
Road polygons

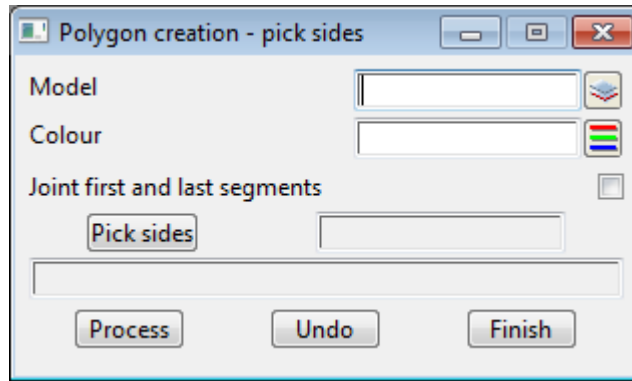
[Create Polygon by Picking Sides](#)
[Colour Polygons by Range File](#)
[Remove Polygon Colour](#)
[Road Polygons](#) in the chapter [Design](#)

Create Polygon by Picking Sides

Position of option on menu: User => Polygon => Create polygon by picking sides

This option creates a polygon by a picking each segment in its order (and with direction) around the polygon. Segments will be automatically extended or clipped to form the polygon.





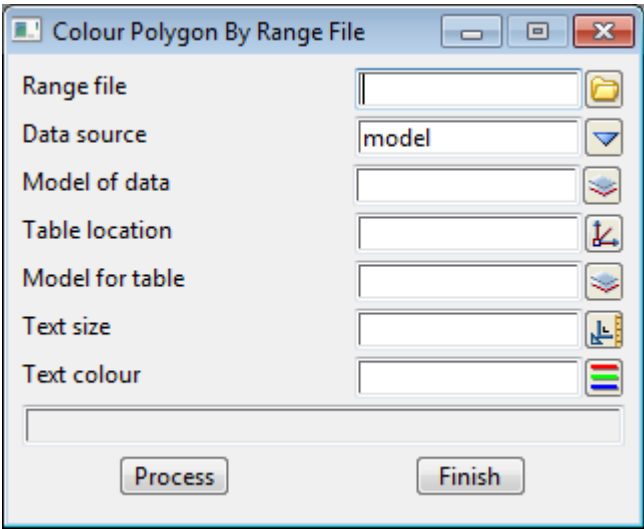
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Model for polygon <i>model for the created polygon</i>	model box		available models
Lot colour <i>colour for the created polygon</i>	colour box		available colours
Join first and last segment tick box <i>if tick, join the end of the last selected segment to the start of the first selected segment to form the final side of the polygon. The segments may be automatically trimmed/extended.</i>			
Pick sides	string select		
<i>pick, with direction, the segments to be joined together to form the sides of the polygon.</i>			
Process	button		
<i>create the polygon from the selected segments.</i>			

Colour Polygons by Range File

Position of option on menu: User =>Polygon =>Colour polygons by range file

This option creates a polygon by a picking each segment in its order (and with direction) around the polygon. Segments will be automatically extended or clipped to form the polygon.



The fields and buttons used in this panel have the following functions.

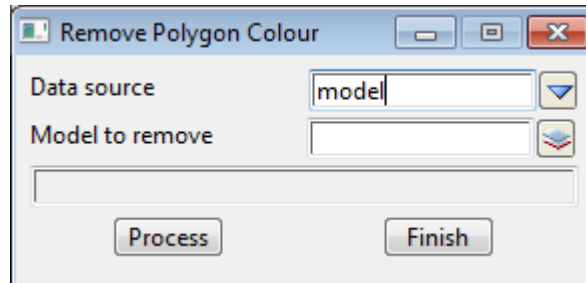
Field Description	Type	Defaults	Pop-Up
Range file <i>range file for colouring polygons.</i>	file box		*.lrf
Data source type <i>data source type.</i>		model	model, view
Data source <i>data source for polygons to be coloured.</i>			
Table location <i>position of the table.</i>	position select box		
Model for table <i>model for the table of statistics on the polygon areas.</i>	model box		available models
Text colour <i>colour of the text.</i>	colour box		available colours
Text size (w) <i>size of the text for the table.</i>	double box		
Process <i>select all the polygons given by the Data source and colour them according to the lot range file.</i>	button		

Remove Polygon Colour

Position of option on menu: Design =>Estate/Lots =>Lot utilities =>Remove polygon colour

Note - This is an unsupported option which may not be fully documented.

This option removes the colour of all the selected polygons.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type <i>data source type.</i>		model	model, view
Data source <i>data source for polygons to have their colour removed.</i>			
Process <i>select all the polygons given by the Data source and remove the polygon colour.</i>	button		

Undocumented User Menus

The options on a **User** menu are either customer's macros or unsupported macros from 12D Solutions and may not be documented.

To return to the start of the documentation on the User menu, click on [User](#).

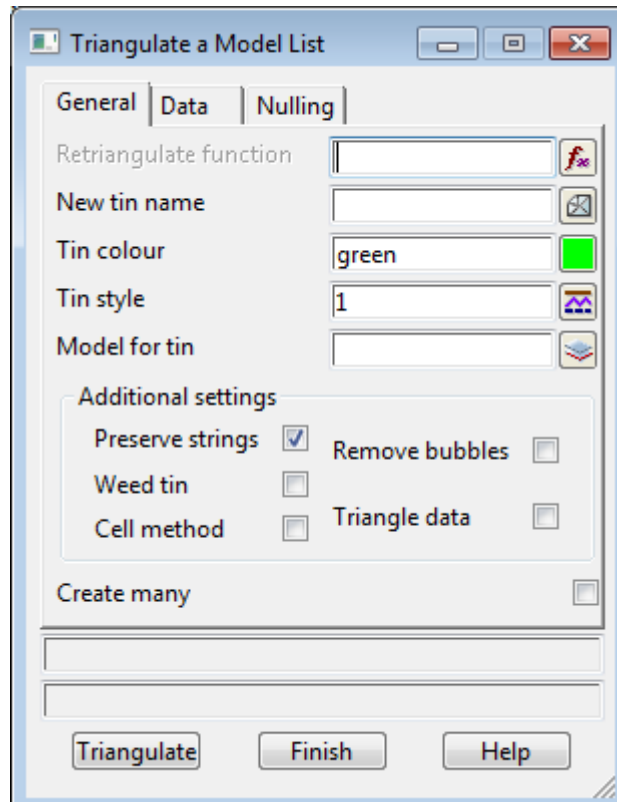
Obsolete Options

These options are now obsolete and may not be documented.

To return to the start of the documentation on the User menu, click on [User](#).

Triangulate a Model List

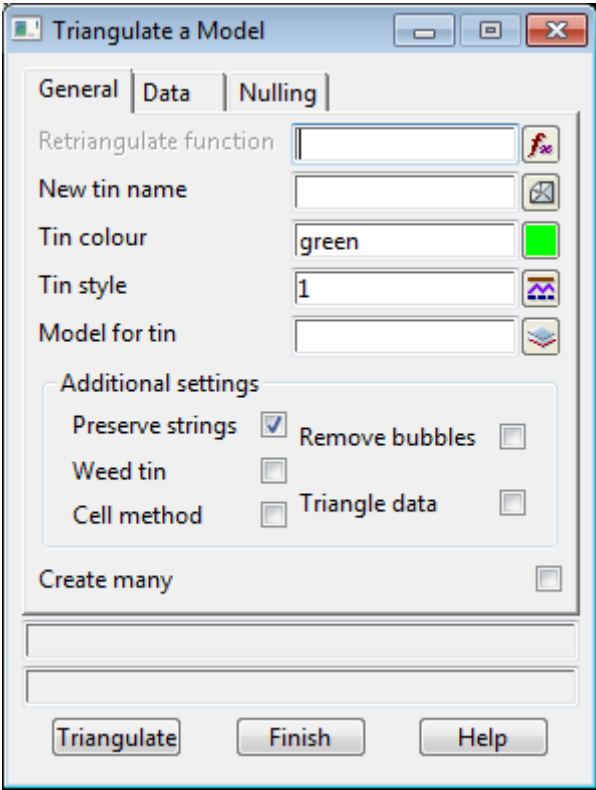
This is an obsolete option which is not documented.



To return to the start of the documentation on the User menu, click on [User](#).

Triangulate a Model

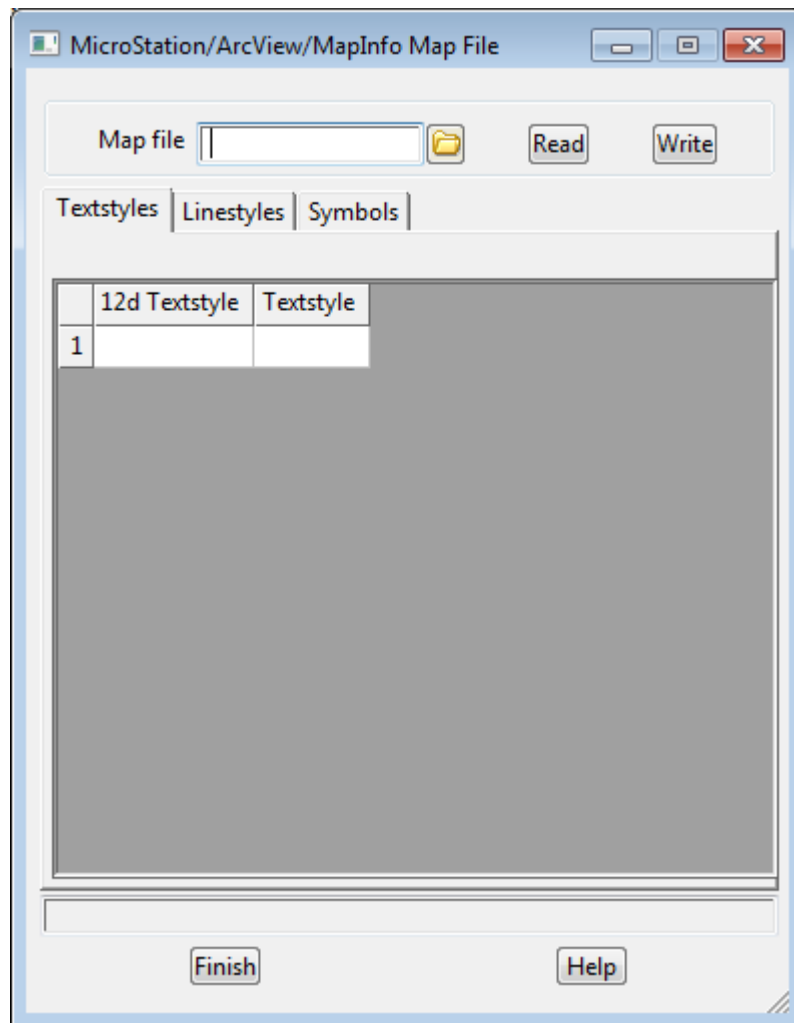
This is an obsolete option which is not documented.



To return to the start of the documentation on the User menu, click on [User](#).

MicroStation/ArcView/MapInfo Map File

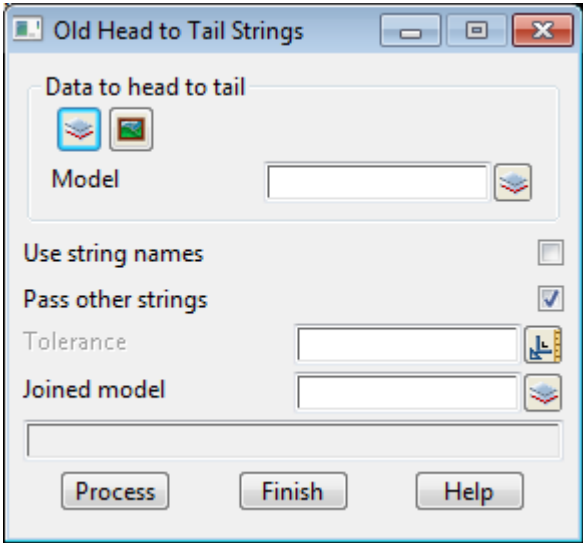
This is an obsolete option which is not documented.



To return to the start of the documentation on the User menu, click on [User](#).

Old Head to Tail Strings

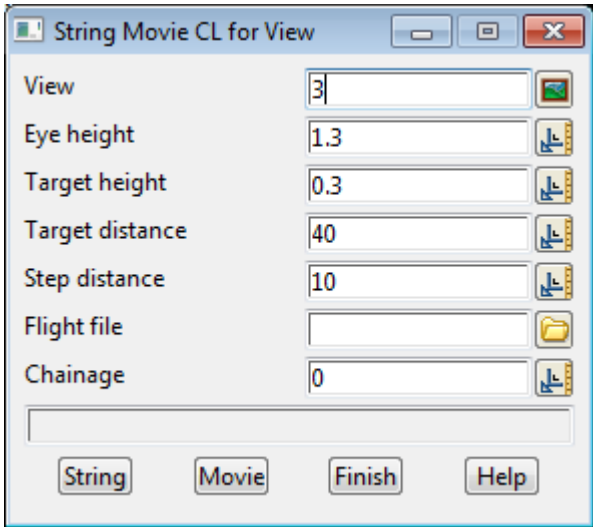
This is an obsolete option which is not documented.



To return to the start of the documentation on the **User** menu, click on [User](#).

String Movie CL for View

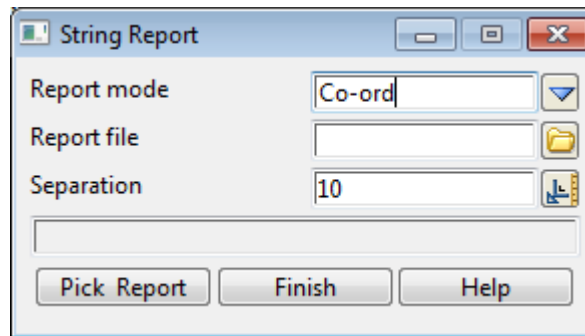
This is an obsolete option which is not documented.



To return to the start of the documentation on the **User** menu, click on [User](#).

String Report

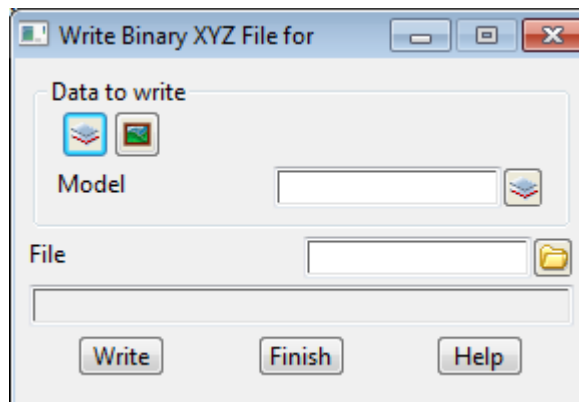
This is an obsolete option which is not documented.



To return to the start of the documentation on the User menu, click on [User](#).

Write Binary XYZ File For

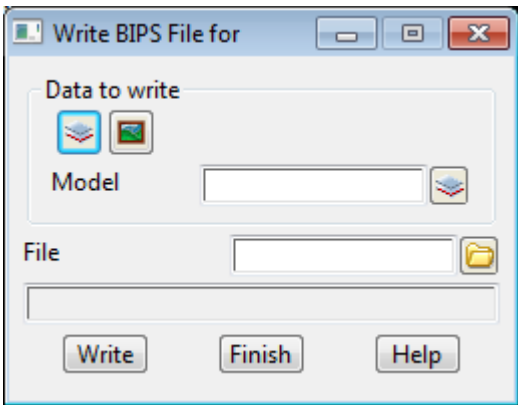
This is an obsolete option which is not documented.



To return to the start of the documentation on the User menu, click on [User](#).

Write BIPS File For

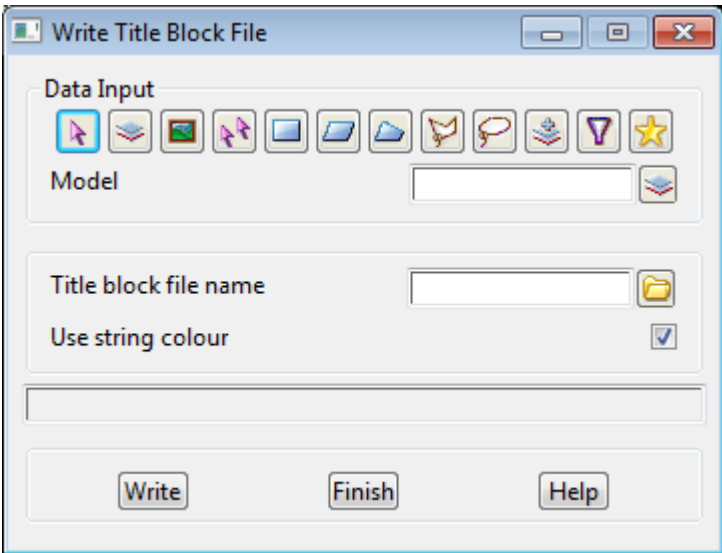
This is an obsolete option which is not documented.



To return to the start of the documentation on the **User** menu, click on [User](#).

Write Title Block File

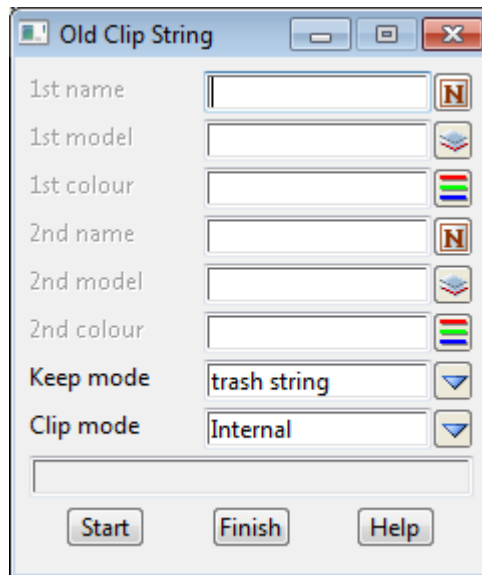
This is an obsolete option which is not documented.




To return to the start of the documentation on the **User** menu, click on [User](#).


Old Clip String


This is an obsolete option which is not documented.





Old Clip String


1st name 


1st model 


1st colour 

2nd name 

2nd model 

2nd colour 

Keep mode 

Clip mode 

To return to the start of the documentation on the User menu, click on [User](#).

Drainage Options

These options are part of the Drainage-Sewer menu.

For the option <i>Downhill strings</i> , go to	Downhill Strings
<i>Raindrop</i>	Raindrop/Teardrop
<i>Aquaplaning risk</i>	Aquaplaning Risk Assessment
<i>Extract sewer controls</i>	Extract Sewer Controls
<i>Convert to pts and lines</i>	Convert to Points and Lines

Downhill Strings

Position of option on menu: **Design=>Drainage-Sewer=>Downhill strings**

This option copies selected Super strings to a target model, where the strings are split at their crests and sags, and set in the downhill direction.

On selecting the **Downhill strings** option, the **Downhill Strings** panel is displayed.

Downhill Strings

Data to process

Source model mask

Source string mask

Name prefix for downhill strings

DL

Colour for downhill strings

blue

Linestyle for downhill strings

FLOW LINE

Levee tolerance

0.025

Discard tolerance

0.1

Join options

Join resultant strings head-to-tail

Head-to-tail tolerance

0.005

Matching number of leading characters in string names

0

Split options

Split resultant strings at drainage inlets

Drainage model

Target

Model of downhill strings

Clean model beforehand

Run

Finish

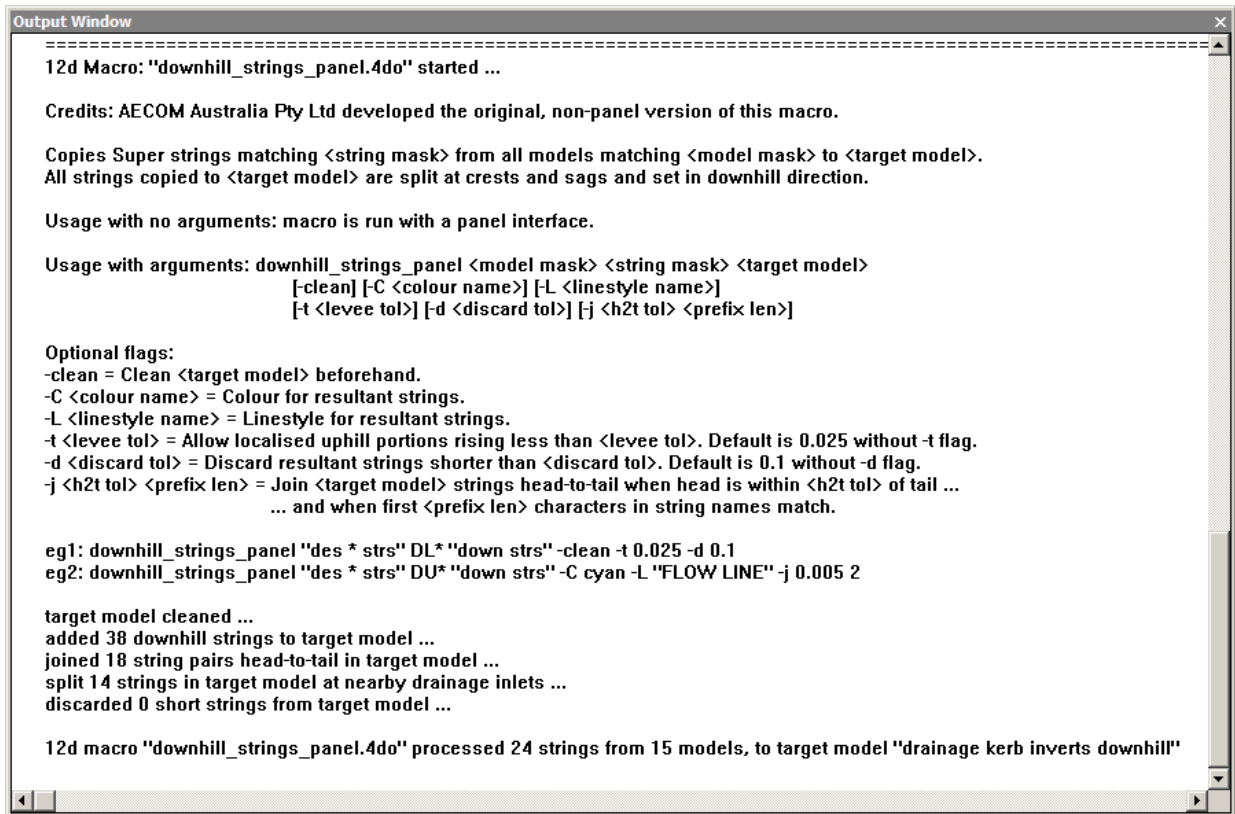
Help

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Source model mask	input text		
<i>Specifies the model(s) from which to select Super strings to process. Use '*' and '?' wildcards to specify multiple models. Note: the target model cannot be specified.</i>			
Source string mask	input text		
<i>Specifies the string name(s) to process from within the selected model(s). Use '*' and '?' wildcards to specify multiple string names. Note: if blank, the option will match all string names in the selected model(s).</i>			
Colour for downhill strings	colour box		available colours
<i>Colour to apply to all strings in the target model (optional).</i>			
Linestyle for downhill strings	linestyle box	"FLOW LINE"	available linestyles
<i>Linestyle to apply to all strings in the target model (optional).</i>			
Levee tolerance	input real	0.025	
<i>Localised uphill portions will be allowed to rise up within this vertical tolerance.</i>			
Discard tolerance	input real	0.1	
<i>Resultant strings shorter than this tolerance will be discarded from the target model.</i>			
Join resultant strings head-to-tail	tick box	ticked	
<i>Whether to join strings in the target model in a head-to-tail fashion.</i>			
Head-to-tail tolerance	input real	0.005	
<i>If joining strings head-to-tail, the head must be within this tolerance of the tail.</i>			
Matching number of leading characters in string names	input integer0		
<i>If joining strings head-to-tail, this number of leading characters in both string names must match.</i>			
Split resultant strings at drainage inlets	tick	not ticked	
<i>Whether to split strings in the target model at nearby drainage inlets.</i>			
Drainage model	model box		available models
<i>If splitting strings at drainage inlets, strings will be split at all nearby drainage inlet pits found in this model. Drainage inlets (i.e. on-grade and sag pits only) must be within one pit diameter of the string, and may not be closer than the Discard tolerance from either end of the string.</i>			
Model of downhill strings	model box		available models
<i>Target model. All matching source strings are copied to and processed in this model.</i>			
Clean model beforehand	tick box	ticked	
<i>Whether to clean the target model beforehand.</i>			
Run	button		
<i>Runs the option.</i>			

Special Note:

The **Downhill Strings** option is a macro, that may optionally be run from a chain via arguments, rather than via a panel. The details of the argument syntax are written to the Output Window, whenever the macro is run without valid arguments, viz:



Output Window

=====

12d Macro: "downhill_strings_panel.4do" started ...

Credits: AECOM Australia Pty Ltd developed the original, non-panel version of this macro.

Copies Super strings matching <string mask> from all models matching <model mask> to <target model>. All strings copied to <target model> are split at crests and sags and set in downhill direction.

Usage with no arguments: macro is run with a panel interface.

Usage with arguments: downhill_strings_panel <model mask> <string mask> <target model>
[-clean] [-C <colour name>] [-L <linestyle name>]
[-t <levee tol>] [-d <discard tol>] [-j <h2t tol> <prefix len>]

Optional flags:

- clean = Clean <target model> beforehand.
- C <colour name> = Colour for resultant strings.
- L <linestyle name> = Linestyle for resultant strings.
- t <levee tol> = Allow localised uphill portions rising less than <levee tol>. Default is 0.025 without -t flag.
- d <discard tol> = Discard resultant strings shorter than <discard tol>. Default is 0.1 without -d flag.
- j <h2t tol> <prefix len> = Join <target model> strings head-to-tail when head is within <h2t tol> of tail ...
... and when first <prefix len> characters in string names match.

eg1: downhill_strings_panel "des * str*" DL* "down str*" -clean -t 0.025 -d 0.1
eg2: downhill_strings_panel "des * str*" DU* "down str*" -C cyan -L "FLOW LINE" -j 0.005 2

target model cleaned ...
added 38 downhill strings to target model ...
joined 18 string pairs head-to-tail in target model ...
split 14 strings in target model at nearby drainage inlets ...
discarded 0 short strings from target model ...

12d macro "downhill_strings_panel.4do" processed 24 strings from 15 models, to target model "drainage kerb inverts downhill"

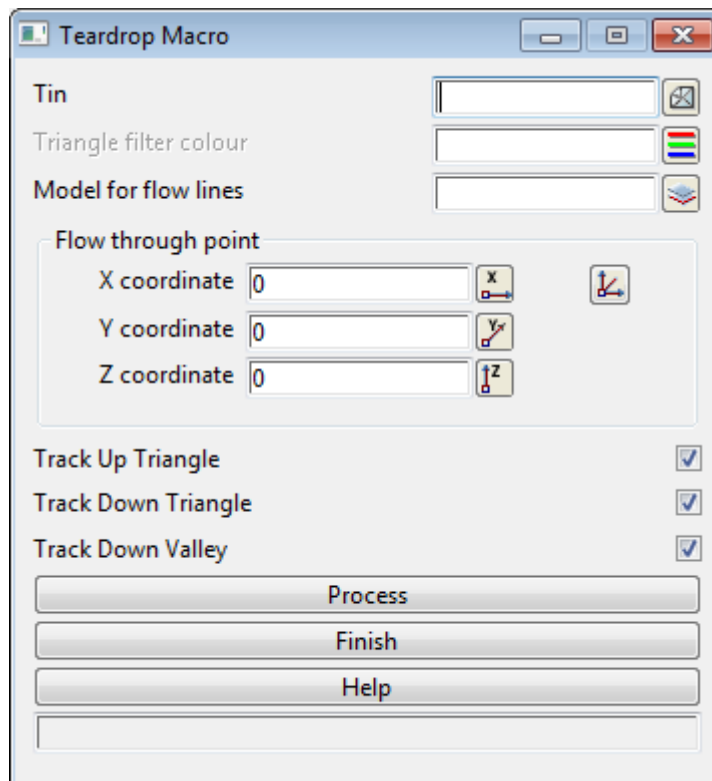
Raindrop/Teardrop

Position of option on menu: **Design=>Drainage-Sewer=>Raindrop**

Position of option on menu: **Tins=>Tin Analysis=>Rain drop**

This section of documentation is a work in progress and will be updated in subsequent releases.

On selecting the **Raindrop** option, the **Teardrop Macro** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin	tin box	GROUND	available tins
Triangle filter colour	colour box		available colours
Model for flow lines	model box	FLOWMODEL	available models
Flow through point			
X coordinate	measure box	0	available measures
Y coordinate	measure box	0	available measures
Z coordinate	measure box	0	available measures
Track Up Triangle	tick box	ticked	
Track Down Triangle	tick box	ticked	
Track Down Valley	tick box	ticked	
Process	button		



Aquaplaning Risk Assessment

Position of option on menu: **Design=>Drainage-Sewer=>Aquaplaning risk**

This option performs an aquaplaning risk assessment using the *Gallaway Equation*. The user need only supply flow path strings as 2d Super strings in the areas of concern on the road pavement tin (typically at the transitions in the road cross-fall). The option then re-creates these flow path strings in 3d, with evenly spaced vertices, then applies the *Gallaway Equation* to determine a water film depth at each vertex (where all parameters considered are set as vertex attributes). It then assesses the risk of aquaplaning at each vertex by associating a risk level and segment colour with the water film depth calculated at each vertex. In addition, a report file is written to the *Windows* clipboard, and optionally to file.

The *Gallaway Equation* is defined as follows:

Gallaway Equation

$$d = \frac{0.103 T^{0.11} L^{0.43} I^{0.59}}{S^{0.42}} - T$$

d = water film depth above top of pavement texture (mm)

L = length of flow path (m)

S = slope of the flow path (%)

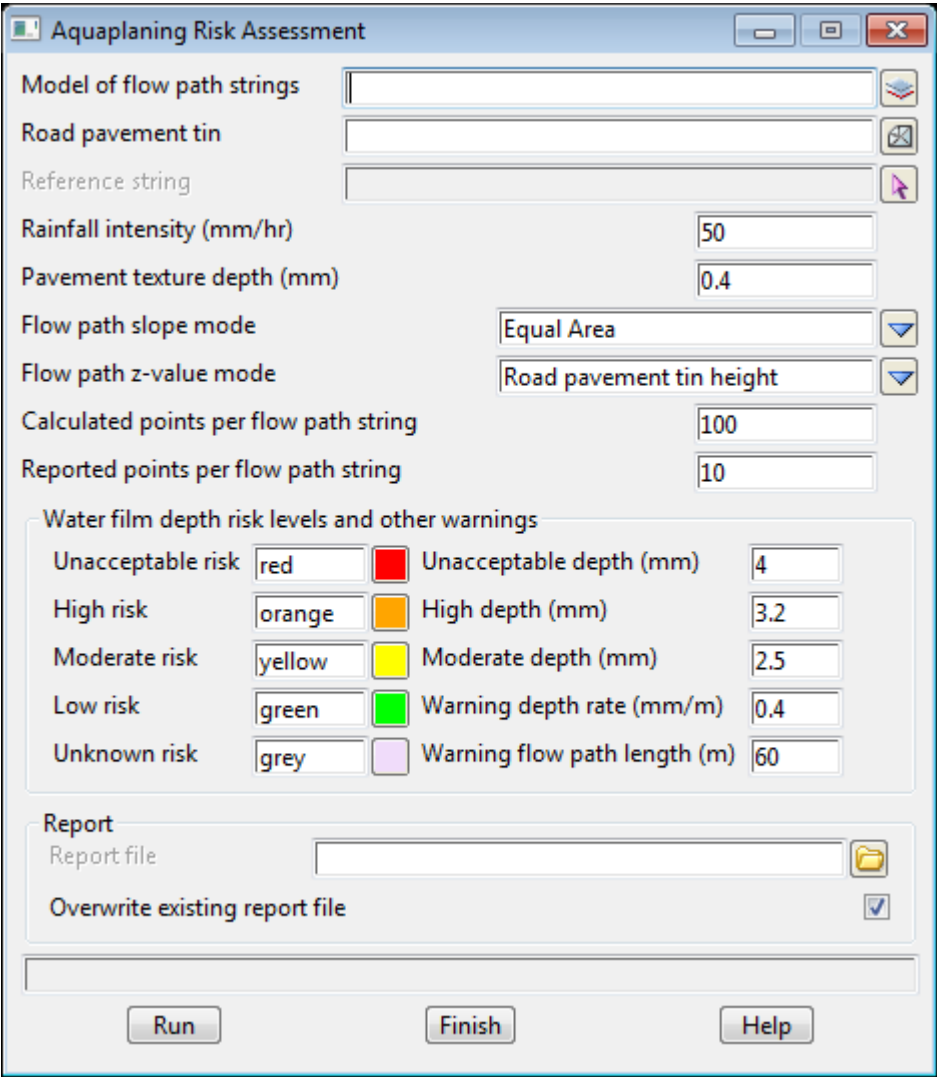
T = average pavement texture depth (mm)

I = rainfall intensity (mm/hr)

Source:

Gallaway, B. M., et. al., "Pavement and Geometric Design Criteria for Minimizing Hydroplaning", *Federal Highway Administration, Report No. FHWARD-79-31, (1979).*

On selecting the **Aquaplaning risk** option, the **Aquaplaning Risk Assessment** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Model of flow path strings	model box		available models
<i>All Super strings in this model will be analysed and updated with results.</i>			
Road pavement tin	tin box		available tins
<i>Used to define the vertical profile of each flow path string.</i>			
Reference string	string select		
<i>Used to locate, identify, rename and sort the flow path strings (optional).</i>			
Rainfall intensity (mm/hr)	input	50	
<i>Typically 50 mm/hr for aquaplaning checks.</i>			
Pavement texture depth (mm)	input	0.4	
<i>Average texture depths can range from about 0.2 to 4 mm for different pavement materials.</i>			
Flow path slope mode	choice box	Equal Area	Equal Area, Average

Determines how the slope of the flow path string is calculated at each vertex. Available modes are "Equal Area" and "Average" slope, from the start of the string to each vertex.

Flow path z-value mode choice box Road pavement tin height Road pavement tin height, Water film depth (mm)

Determines what the z-values of the flow path strings will represent. Available modes are "Road pavement tin height" and "Water film depth (mm)".

Calculated points per flow path string input 100

Number of evenly spaced points along each flow path string at which to calculate water film depths.

Reported points per flow path string input 10

Number of evenly spaced points along each flow path string at which to report water film depths.

Water film depth risk levels and other warnings

Unacceptable risk colour box red available colours

Colour to associate with an unacceptable risk.

Unacceptable depth (mm) input 4

The lowest water film depth associated with an unacceptable risk.

High risk colour box orange available colours

Colour to associate with a high (acceptable) risk.

High depth (mm) input 3.2

The lowest water film depth associated with a high (acceptable) risk.

Moderate risk colour box yellow available colours

Colour to associate with a moderate (acceptable) risk.

Moderate depth (mm) input 2.5

The lowest water film depth associated with a moderate (acceptable) risk.

Low risk colour box green available colours

Colour to associate with a low (acceptable) risk.

Unknown risk colour box grey available colours

Colour for strings that cannot be assessed for risk.

Warning depth rate (mm/m) input 0.4

Warn if <water film depth>/<flow path length> is excessive (optional).

Warning flow path length (m) input 60

Warn if flow path length is excessive (optional).

Report

Report file file box

Report will be written in tab-delimited format to the Windows clipboard, and optionally to this file.

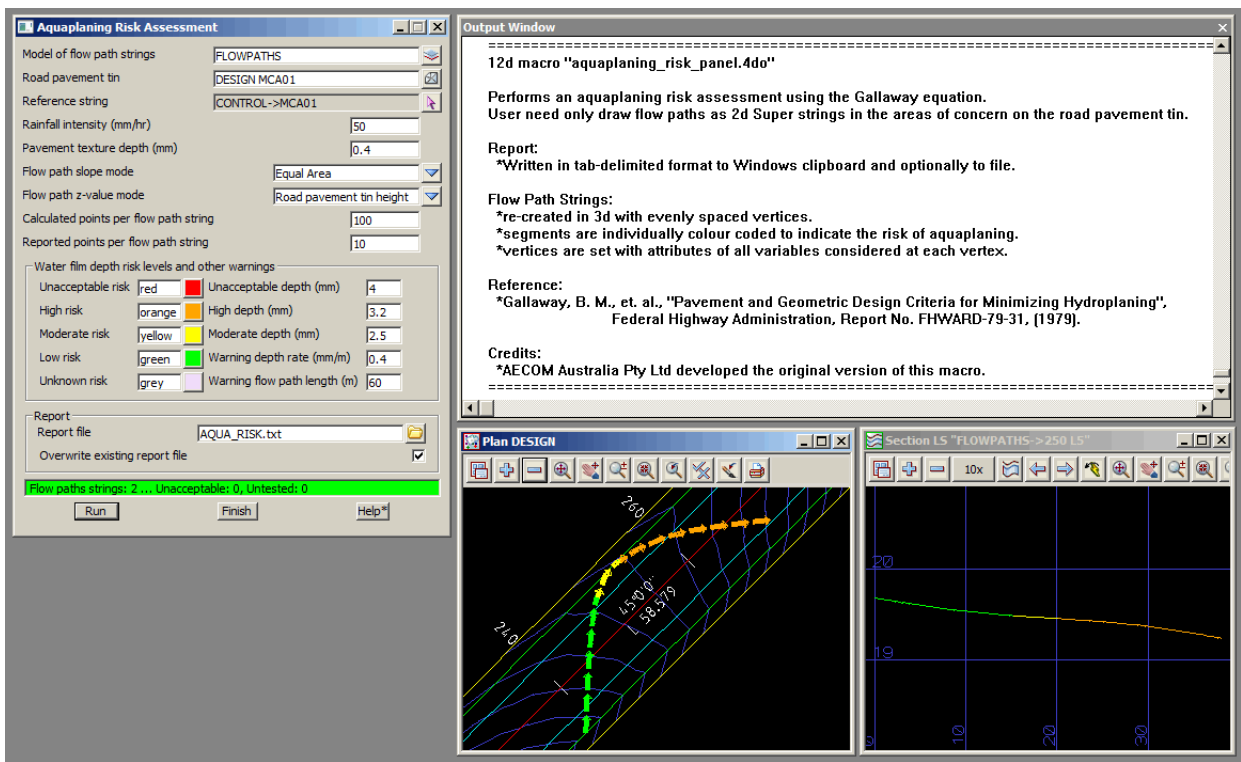
Overwrite existing report file tick box ticked

Whether to overwrite or append to an existing report file.

Run button
Runs the option.

Additional Notes:

1) The **Aquaplaning Risk Assessment** option writes auxiliary help information to the *Output Window* every time it is run, viz:



2) The tab-delimited report is always written to the *Windows* clipboard, even if a report file is not specified. A pre-formatted *Excel* report template is installed and available in the library – **\$LIB\aquaplaning_report_template.xlsx** – and after running the aquaplaning option, the contents of the clipboard may be pasted directly into a copy of this template file, as shown here:

12D AQUAPLANING RISK ASSESSMENT

12D MODEL VERSION 10.0 Beta 9

12D PROJECT: AQUAPLANING
 12D WORKING FOLDER: C:\12d\10.00\Jobs\AQUAPLANING
 DATE: 29-MAR-2012 16:57:38
 ASSESSOR: OWEN THORNTON
 VERIFIER:

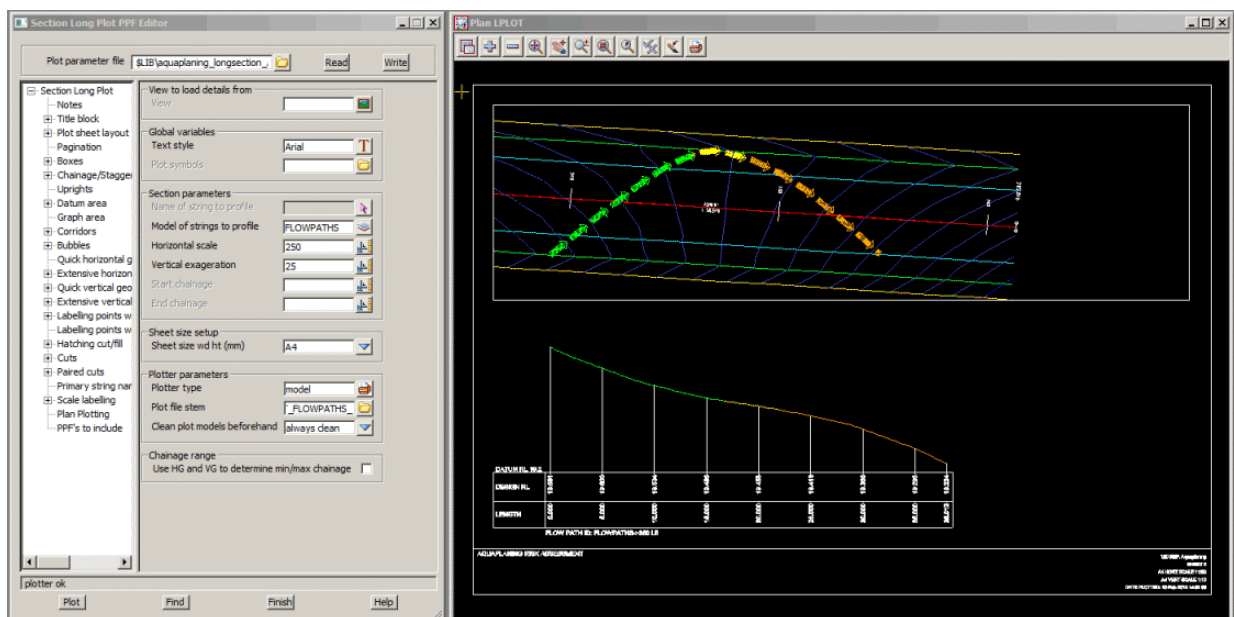
MODEL OF FLOW PATHS: FLOWPATHS
 ROAD PAVEMENT TIN: DESIGN MCA01
 REFERENCE STRING: CONTROL->MCA01
 RAINFALL INTENSITY (mm/hr): 50.0
 PAVEMENT TEXTURE DEPTH (mm): 0.4
 FLOW PATH SLOPE: EQUAL-AREA SLOPE

WATER FILM DEPTH RISKS		
UNACCEPTABLE RISK >=	4.0	mm
HIGH (ACCEPTABLE) RISK >=	3.2	mm
MODERATE (ACCEPTABLE) RISK >=	2.5	mm
LOW (DESIRABLE) RISK <	2.5	mm

WATER FILM DEPTH PREDICTION

FLOW PATH ID	POINT	LENGTH (m)	DESIGN RL (m)	SLOPE (%)	DEPTH (mm)	DEPTH RISK	DEPTH RATE (mm/m)	WARNING
250 L5	1	3.801	19.617	1.59	0.97	LOW	0.26	
250 L5	2	7.602	19.562	1.49	1.49	LOW	0.20	
250 L5	3	11.404	19.519	1.28	2.01	LOW	0.18	
250 L5	4	15.205	19.485	1.11	2.48	LOW	0.16	
250 L5	5	19.006	19.460	0.94	3.00	MODERATE	0.16	
250 L5	6	22.807	19.434	0.87	3.42	HIGH	0.15	
250 L5	7	26.608	19.404	0.85	3.71	HIGH	0.14	
250 L5	8	30.410	19.360	0.92	3.81	HIGH	0.13	
250 L5	9	34.211	19.305	1.03	3.82	HIGH	0.11	
250 L5	10	38.012	19.234	1.19	3.76	HIGH	0.10	

3) Combined plan and profile plots of the analysed flow path strings, for inclusion in reports, may be generated from the **Section Long Plot PPF Editor**. A PPF file set specifically for this purpose is installed and available in the library – \$LIB\aquaplaning_longsection_A4.lplotppf – as shown here:

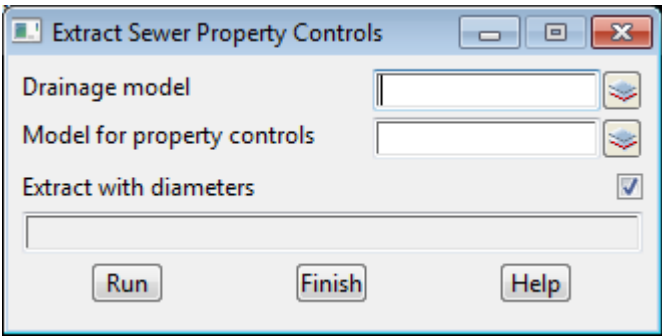


Extract Sewer Controls

Position of option on menu: **Design=>Drainage-Sewer=>Extract sewer controls**

The sewer property control strings are a sub string of the drainage string and therefore may only be profiled using a right mouse click of the profile button. To include these control strings on plots or export to other packages they need to be converted to super strings.

On selecting the **Extract Sewer Controls** option, the **Extract Sewer Property Controls** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Drainage model	model box		available models
<i>All drainage strings in this model will have their property controls strings duplicated as super strings.</i>			
Model for property controls	model box		available models
<i>The super strings for the property controls are placed in this model.</i>			
Extract with diameters	tick box	ticked	
<i>The super strings will have the constant pipe dimension set to the control diameter.</i>			
Run	button		
<i>Create the super strings representing the property controls.</i>			

Convert to Points and Lines

Position of option on menu: **Design=>Drainage-Sewer=>Convert to pts and lines**

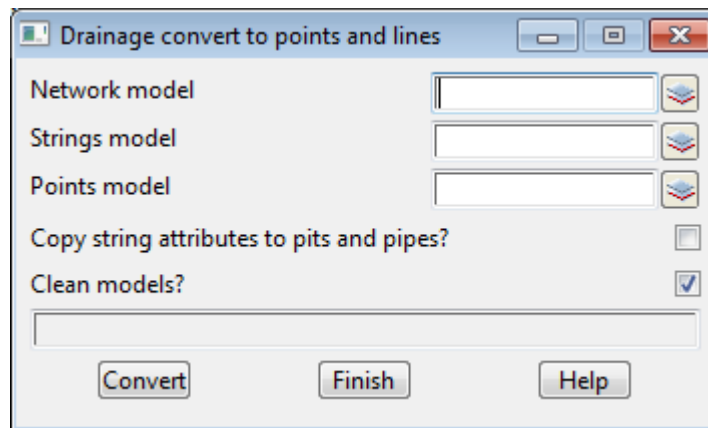
This option converts a drainage network into simple points and lines.

Pits will be created as single point super strings with the pit attributes set as string attributes.

Pipes will be created as single or multiple segment super strings with pipe attributes set as string attributes.

This may be useful for uploading to external GIS systems via the GIS module.

Selecting **Convert to pts and lines** brings up the **Drainage convert to points and lines** panel.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Network model	<i>the source model of the drainage network</i>	model box		available models
Strings model	<i>the model to output pipe strings to</i>	model box		available models
Points model	<i>the model output pit point strings to</i>	model box		available models
Copy string attributes to pits and pipes?	<i>if ticked, the string attributes for points are copied to to pit attributes and string attributes for lines are copied to the pipe attributes. If not ticked, no attributes are copied.</i>	tick box	not ticked	
Clean models	<i>whether or not to clean the models first</i>	tick box	ticked	
Convert	<i>performs the conversion</i>	button		



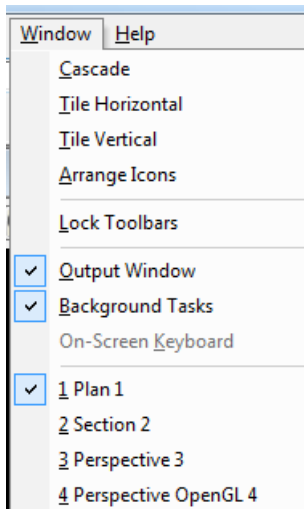
29 Window

The **12d** Model **window** menu contains options to cascade, tile horizontally and vertically.

The **Output window** can also be toggled on and off.

The **Window** on main menu and walk-right menus are

on Main menu



cascade the non-minimized views

horizontally tile the non-minimized views

vertically tile the non-minimized views

place all minimized view icons at the bottom of the views area

lock toolbars so that they can't be moved

toggle the output window on/off

toggle the background tasks window on/off

shows if on-screen keyboard is enabled

list of existing views

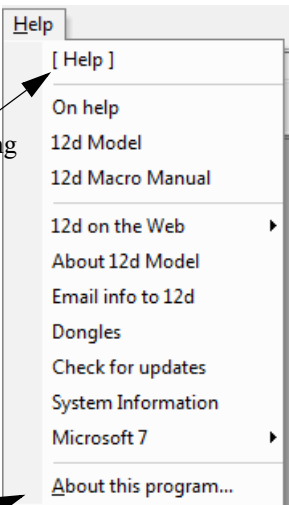
30 Help

Position of menu: It is on the main menu as Help

The **12d Model** help menu contains options to access Microsoft's Help on Microsoft's Help, the **12d Model Help** and the **12d Model Macro Programming Language Help**, plus links to the 12d Solutions web site www.12d.com., information about the option in the current **12d Model** being run, an email information to 12d Solutions, dongle testing routines, checking for updates to the **12d Model** exe, system information and for Windows 7, the download for using WinHlp.

The help on main menu and walk-right menus are

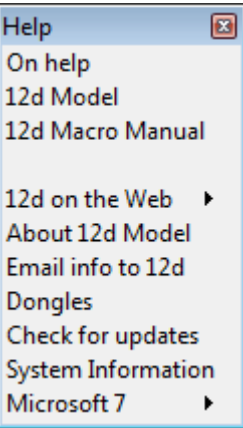
on Main menu



create floating
Help menu

show **12d Model** version and build number

on **12d Model** menu and
floating Help menu



help on Microsoft's help system
contents of **12d Model** help
help on 12d macro programming language
links to www.12d.com.
dongle number, authorised **12d Model** modules
email **12d Model** information to 12d
dongle testing panel
check for updates to the **12d Model** exe
information on your computer system
For Windows 7 - links to the WinHlp32.exe

For the option *On Help*, go to the section
12d Model
12d Macro Manual
12d on the Web
About 12d Model
Email info to 12d
Dongles
Check for updates
Microsoft 7/Vista

[On Help](#)
[12d Model Help](#)
[12d Model Macro Manual](#)
[12d on the Web](#)
[About 12d Model](#)
[Email Info to 12d](#)
[Dongle Testing](#)
[Check for Updates](#)
[Microsoft 7](#)

For documentation on the first item on the **Help** menu, please continue to the next section [On Help](#).

On Help

Position of option on menu: **Help =>On help**

Help on Microsoft's *Help* system.

For documentation on the next item on the **Help** menu, please continue to the next section [12d Model Help](#).

12d Model Help

Position of option on menu: **Help =>12d Model**

12d Model Help is documented in the chapter [12d Model Help](#).

For documentation on the next item on the **Help** menu, please continue to the next section [12d on the Web](#).

12d Model Macro Manual

Position of option on menu: **Help =>12d Macro manual**

12d Model includes a powerful programming language (macro language 4DML).

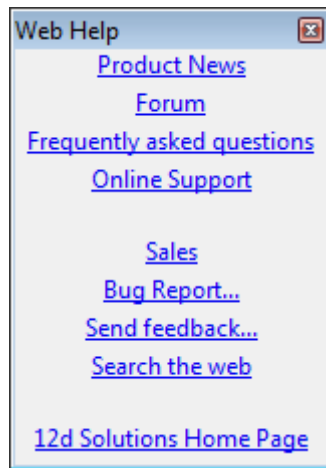
This is the manual for the macro language.

For documentation on the next item on the **Help** menu, please continue to the next section [12d on the Web](#).

12d on the Web

Position of menu: Help =>12d on the web

The 12d on the web walk-right menu contains links to the 12DSolutions web site www.12d.com..



link to "www.12d.com/model"

link to **12d Model** forum

link to FAQs

support contacts

sales contacts

on-line bugs and enhancement form

send email to 12D Solutions

link to *Google*

For documentation on the next item on the **Help** menu, please continue to the next section [About 12d Model](#).

About 12d Model

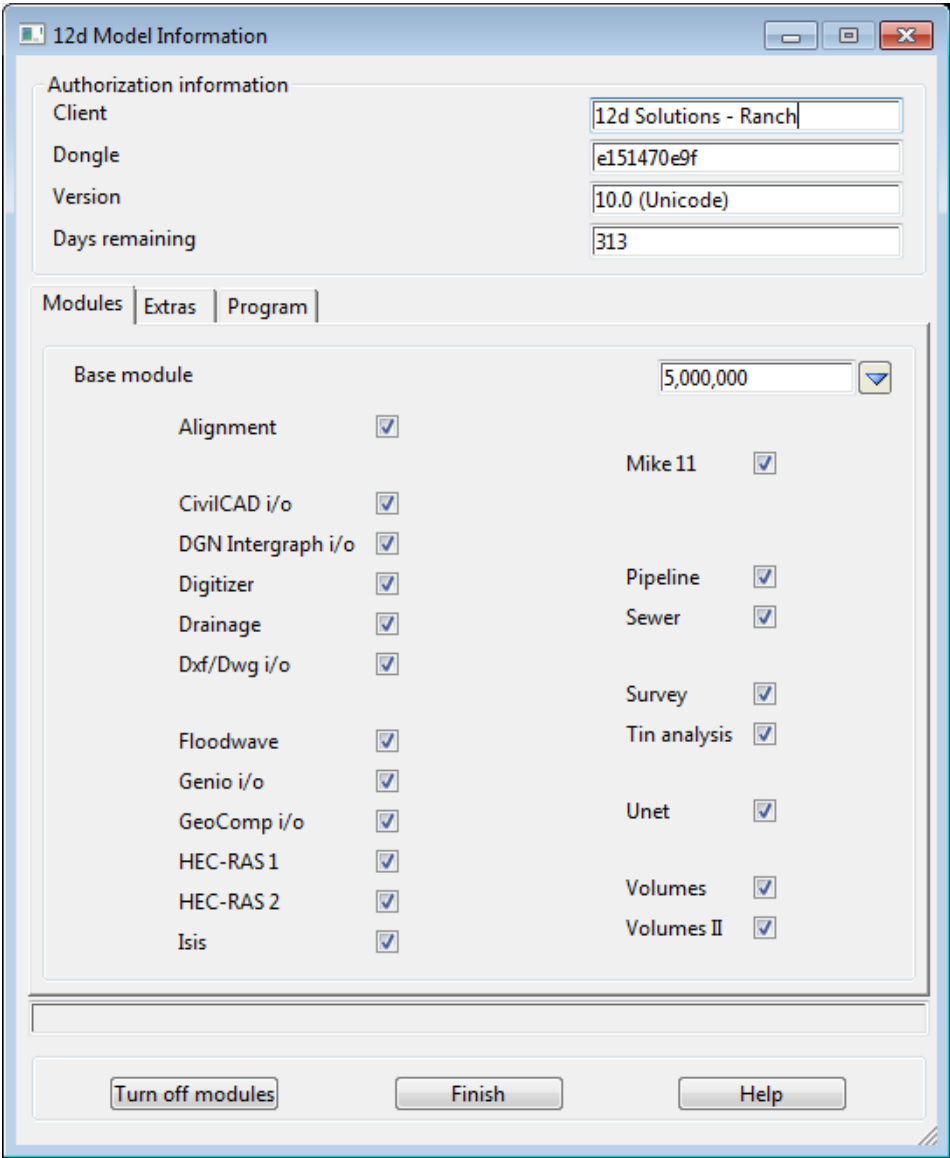
Position of option on menu: **Help =>About 12d Model**

The **About 12d Model** option displays information about the current authorization **12d Model** such as the Client name, dongle number and authorized modules.

The existing 12d Model modules are shown on the **Modules** and **Extras** tabs with a tick indicating that the current licence has the module.

The **Program** tab has extra information about the current 12d Model executable and project.

On selecting the **About 12d Model** option, the **12d Model Information** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Client

name of the authorized client.

Dongle

number of the dongle for this licence.

Version

12d Model version number.

Days remaining

number of days left for the authorisation.

Modules tab**Base module**

number of allowed points in the Base module. If this number is exceeded then the project cannot be saved until enough points are deleted to bring the point count below the allowed number of points.

Alignment, CivilCAD i/o, etc. tick boxes

if ticked, the module is authorized.

Extras tab

12d Model Information

Authorization information

Client: 12d Solutions - Ranch

Dongle: e151470e9f

Version: 10.0 (Unicode)

Days remaining: 313

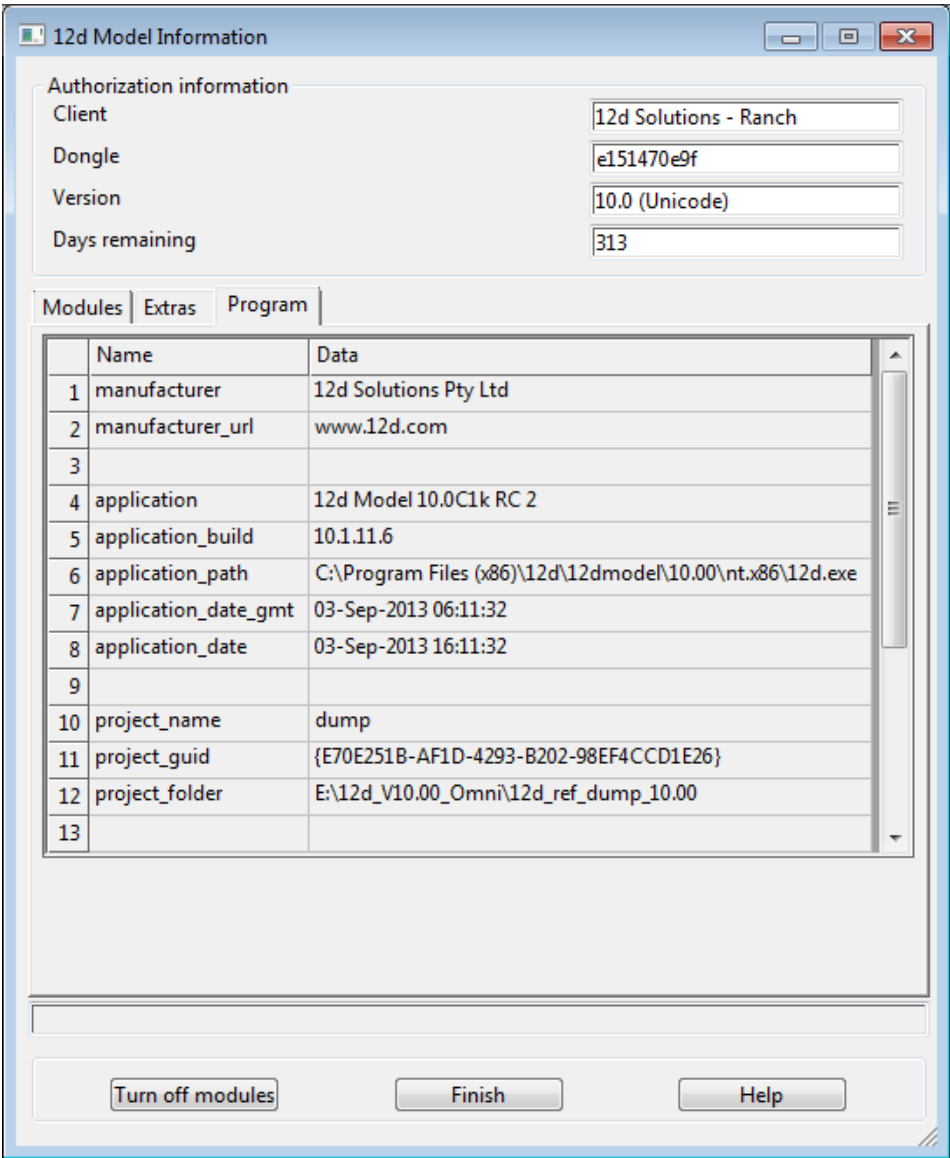
Modules Extras Program

XP SWMM	<input checked="" type="checkbox"/>	ArcView i/o	<input checked="" type="checkbox"/>
GDA	<input checked="" type="checkbox"/>	MapInfo i/o	<input checked="" type="checkbox"/>
Estate lots	<input checked="" type="checkbox"/>	Visualisation	<input checked="" type="checkbox"/>
LandXML i/o	<input checked="" type="checkbox"/>	LINZ XML i/o	<input checked="" type="checkbox"/>
12d Field Pickup	<input checked="" type="checkbox"/>	Drainage analysis	<input checked="" type="checkbox"/>
12d Field Tunnel	<input checked="" type="checkbox"/>	12d Field Setout	<input checked="" type="checkbox"/>
12d Track	<input checked="" type="checkbox"/>	Drainage dynamic	<input checked="" type="checkbox"/>
GIS	<input checked="" type="checkbox"/>	12d Field for Trimble	<input checked="" type="checkbox"/>
Tuflow TCF	<input checked="" type="checkbox"/>	Tuflow 10k	<input checked="" type="checkbox"/>
Tuflow 100k	<input checked="" type="checkbox"/>	Tuflow open	<input checked="" type="checkbox"/>
Tuflow road	<input checked="" type="checkbox"/>		

Turn off modules Finish Help

XP SWMM, GDA, etc. tick boxes
if ticked, the module is authorized.

Program tab



Name, Data grid
information about the 12d Model program and current project.

For documentation on the next item on the **Help** menu, please continue to the next section [Email Info to 12d](#).

Email Info to 12d

Position of option on menu: Help =>Email info to 12d

The **Email info** to 12d option emails information about the current version of **12d Model** to 12d Solutions Pty Ltd. This is usually used for debugging authorization problems.

On selecting the **Email info to 12d** option, the **12d Model Information** panel is displayed.

WARNING!

The 12d Model release version and all documentation is supplied by 12d Solutions Pty Ltd for the use of 12d Model customers and genuine prospects only. The use of 12d Model release version by commercial competitors to 12d Model is strictly prohibited. The Requester hereby acknowledges that they are not using 12d Model for competitive purposes or passing any information on to a third party that is using the information for competitive purposes. The Requester hereby acknowledges 12d Solutions copyright in the 12d Model software and documentation whether or not it has been filed with the copyright office.

Press F1 for help.

First Name	<input type="text"/>	Family Name	<input type="text"/>
Company Name	<input type="text"/>		
Address	<input type="text"/>		
Town/City	<input type="text"/>	Post/Zip Code	<input type="text"/>
State	<input type="text"/>	Country	<input type="text"/>
Phone	<input type="text"/>	Fax	<input type="text"/>
Email Address	<input type="text"/>		
Email System	<input type="text"/>	<input type="button" value="v"/>	

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

First name/Last name/Company name

information about the user and the Company owning the license of **12d Model**.

Email button

try to send an email containing information about **12d Model** and the user to 12d Solutions Pty Ltd.

Save button

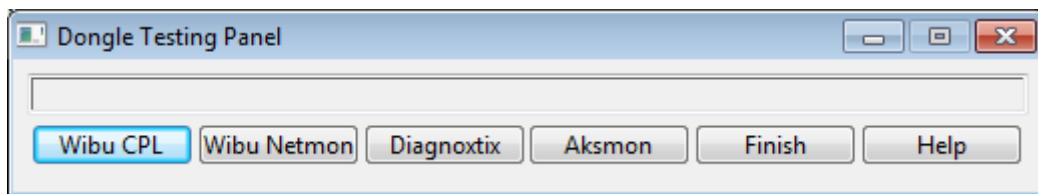
*if the **Email** button does not send an email, the **Save** button can be used to write the information out to a file called **12d_auth.txt**. This file can then be emailed to **support@12d.com**.*

For documentation on the next item on the **Help** menu, please continue to the next section [Dongle Testing](#)

Dongle Testing

Position of option on menu: Help =>Dongles

Selecting **Dongles** brings up the **Dongle Testing Panel** panel.



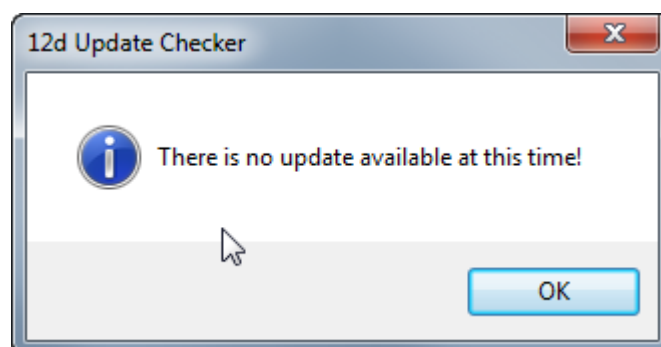
For documentation on the next item on the **Help** menu, please continue to the next section [Check for Updates](#).

Check for Updates

Position of option on menu: Help =>Check for updates

Selecting **Check for updates** will check if there are any newer versions and/or builds of **12d Model** than the one currently being run.

The **12d Update Checker** panel will give a link to the new versions or display the message that there is no update available if the current version and build of **12d Model** is the latest one.



For documentation on the next item on the **Help** menu, please continue to the next section [Microsoft 7](#).

Microsoft 7

Position of option on menu: **Help =>Windows 7**

12d Model has a context sensitive reference help system which can be accessed directly from most menus and panels:

- (a) For most menus in **12d Model**, when the menu is on the screen and has the Windows focus, simply press F1 and the **12d Help** will open automatically at that menu
- (b) For most panels in **12d Model**, when the panel is on the screen and has the Windows focus, simply press F1 and the **12d Help** will open automatically at that panel
- (c) Most panels in **12d Model** have a **Help** button on them and clicking on the **Help** button opens the **12d Help** at that panel
- (d) By clicking on the option **Help =>12d Model**

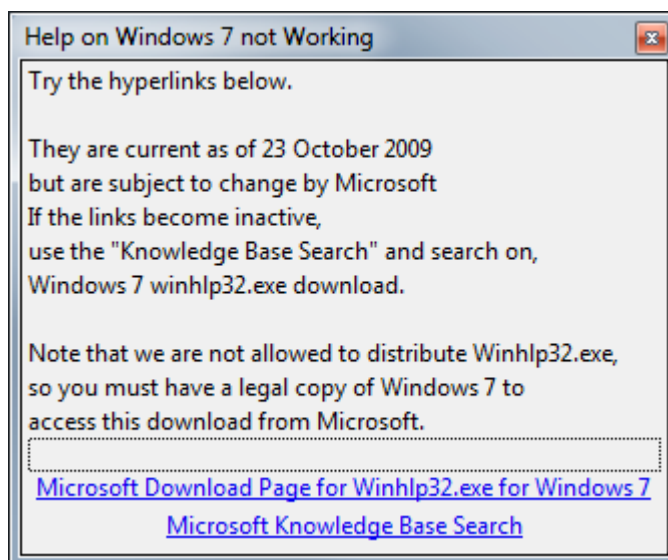
The **12d Model** context sensitive help uses Microsoft's **WinHlp**.

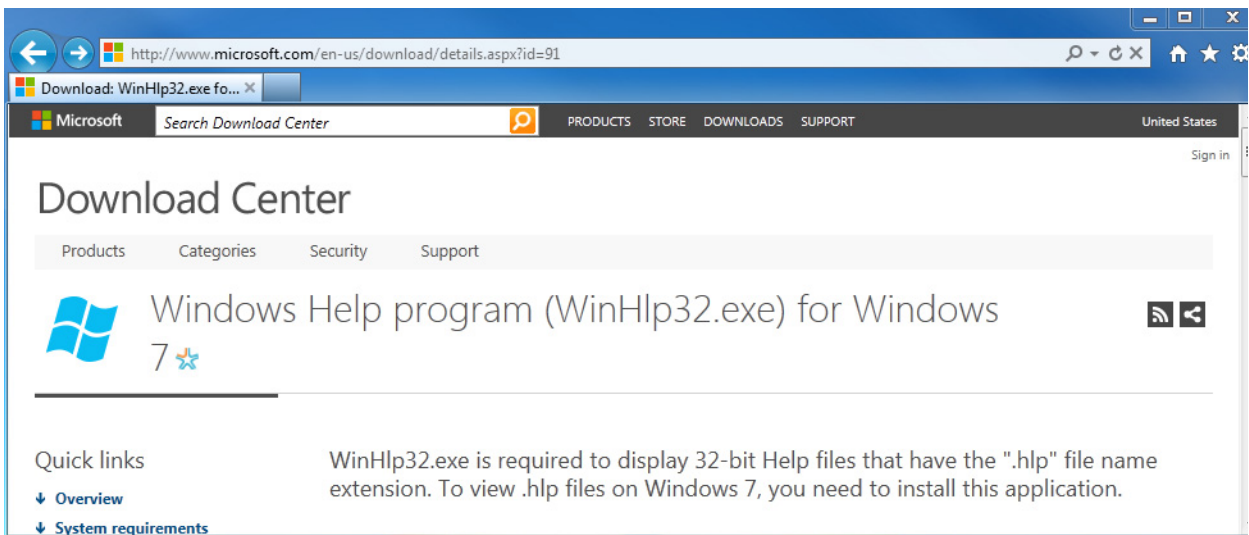
For *Vista* and *Win 7*, Microsoft no longer ships the WinHlp.exe executable and Microsoft will no longer allow it to be installed by the 12d Model installation DVD.

So if you are running Vista or Win 7, you need to download and install WinHlp.exe from Microsoft's website to access the **12d Model Help** files.

The link to the area for the download is

Walking right on **Microsoft 7** displays the **Help on Windows 7 Not Working** panel which has a link to the Microsoft web site to download Winhlp32.exe.

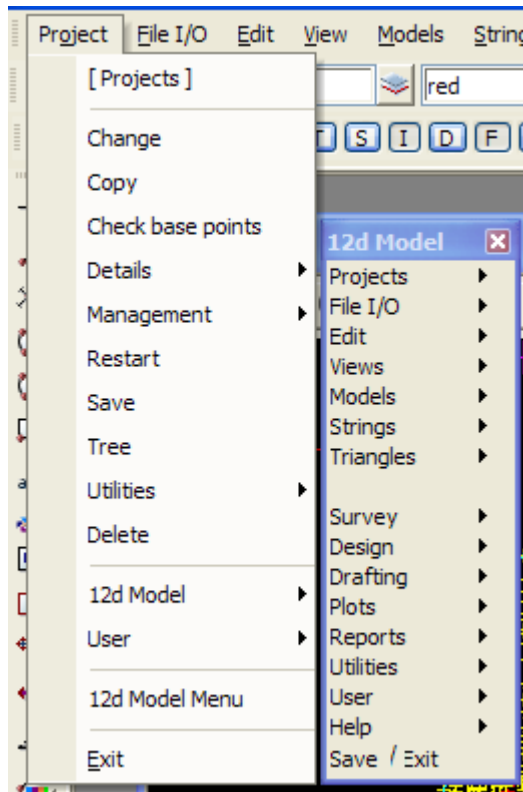




To return to the start of the documentation on the **Help** menu, click on [Help](#).

31 Save and Exit

Save and **Exit** are available from both the Main Menu under Project or on the floating **12d Model** menu.

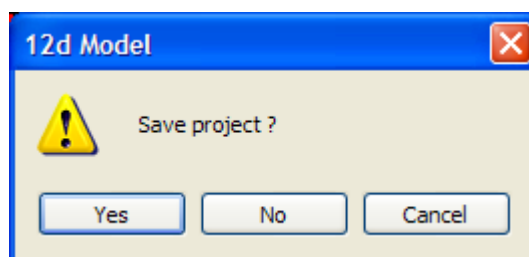


Save and Exit from Main Menu

Selecting **Save** from the **Main Menu=>Projects** menu simply saves all data in the project modified since the last save.

When **Exit** is selected from the bottom of the **Main Menu=>Projects** menu and a save is not needed, **12d Model** exits the project.

If **Exit** is selected from the bottom of the **Main Menu=>Projects** menu and a save is needed, then the **Save Project ?** yes-no panel is placed on the screen.



If **Yes** is selected, then **12d Model** saves the project and exits.

If **No** is selected, then 12d Model does not save the project and exits.

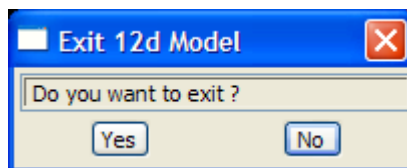
If **Cancel** is selected, then the Exit is aborted and 12d Model stays in the project.

Note: when exiting 12d Model, the user is reminded if any *mtf* files modified by the 12d Model *mtf editor* have not been saved, or any string editors are still running.

Save and Exit from 12d Model Menu

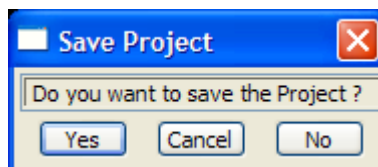
When **Save** is selected from the left hand side of the bottom of the **12d Model** menu (**Save / Exit** menu option), all the information modified since the last save is written to disk.

When **Exit** is selected from the right hand side of the bottom of the 12d Model menu (**Save / Exit** menu option), an **Exit 12d Model** panel is fired up.



Selecting **No** removes the **yes-no** pop-up and leaves the user in **12d Model**.

If **Yes** is selected and a modification to the project has been made since the last project save, a **Save Project** panel is fired up.



If **yes** is selected, the project is **saved** and 12d Model terminates.

If **no** is selected, the project is **not saved** and 12d Model terminates.

If **cancel** is selected, the exit option is **aborted** and the user is left in 12d Model.

Note: When exiting 12d Model, the user is reminded if any *mtf* files modified by the 12d Model *mtf editor* have not been saved, or any string editors are still running.

Selecting **No** removes the **yes-no** pop-up and leaves the user in **12d Model**.

If **Yes** is selected and a modification to the project has been made since the last project save, a **Save Project** panel is fired up.

Appendices





A 12d Ascii File Format

The 12d Ascii file format (called 4D Ascii in Version 4 and earlier) is a text file definition from 12D Solutions which is used for reading and writing out string data from **12d Model**. 12d Ascii files normally end in '.12da'

This document is for the 12d Ascii file format used in **12d Model Version 9**.

For General Comments about 12da, go to the section [General Comments about 12d Ascii File](#)

For the 12da definitions of Attributes go to [Attributes](#)
 Commands [Commands](#)

For the 12da definitions of *each string type* [12d Ascii Definition for each String Type](#)
 tins [12d Ascii Definition for Tins](#)
 12d plot frames [12d Ascii Definition for Plot Frames](#)

For documentation on the first item, continue to the next section [General Comments about 12d Ascii File](#).

General Comments about 12d Ascii File

//

Anything written on a line after // is ignored. This is used to place comments in the file.

Blank lines

Unless they are part of a text string, blank lines are ignored.

Spaces

Unless enclosed in quotes ("), more than one consecutive space or tab is treated as one space. Except when it is the delimiter after a //, an end of line (<enter>) is also considered a space.

Spaces and special characters in text strings

Any text string that includes spaces and any characters other than a to z, A to Z or 0 to 9 (alphanumeric), must be enclosed in double quotes. In text strings, double quotes " and backslash \ must be preceded by a \. For example, \" and \\ define a " and a \ respectively in a text string.

Names of models, tins, styles, colours and attributes

Models, tins, styles (linestyles), colours and attributes can include the characters a to z, A to Z, 0 to 9 (alphanumeric characters) and space. Leading and trailing spaces are ignored. The names can be up to 255 characters in length. If the name includes spaces, the name must be enclosed in double quotes (").

The names for models, tins, styles, colours or attributes can not be blank.

The names for models, tins, styles and colours can contain upper and lower alpha characters

which are stored, but the set of model names, tin names, style names, colour names or attribute names for an object *must be unique when case is ignored*. For example, the model name "Fred" will be stored as "Fred" but "FRED" is considered to be the *same* model name as "Fred".

String names

String names can include the characters a to z, A to Z, 0 to 9 (alphanumeric characters), space, decimal point (.), plus (+), minus (-), comma (,), open and closed round brackets and equals (=). Leading and trailing spaces are ignored. String names can be up to 255 characters in length. If the string name includes anything other than alphanumeric characters, then the name must be enclosed in double quotes (").

String can contain upper and lower alpha characters which are retained but case is ignored when selecting by string name. That is, the string name "Fred" will be stored as "Fred" but "FRED" is not considered to be a different name.

String names do not have to be unique and can be blank.

Please continue to the next section [Attributes](#).

Attributes

Many 12d Model objects (such as individual strings, models and tins) can have an unlimited number of named **attributes** of type integer (numbers), real and text. Within an object, the attribute names must all be different.

The attributes for an object are given inside the curly braces of the **object** definition. The attributes are preceded by the **attributes** keyword followed by the *named attributes* enclosed in curly braces { and }.

The format for each named attribute is

	<code>attribute_type</code>	<code>attribute_name</code>	<code>attribute_value</code>
where	<code>attribute_type</code>	is integer, real or text	
	<code>attribute_name</code>	is the unique attribute name for the object	
and	<code>attribute_value</code>	is the either a number, a real or a text string.	

That is the attributes are defined in a block:

```
attributes {  
  integer      att_name      number  
  real         att_name      value  
  text         att_name      text  
}
```

The *text* for a text attribute can be blank an if so, is defined as "".

An example of defining attributes is:

```
attributes {  
  text      "pole id"      "QMR-37"  
  text      street      "477 Boundary St"  
  real      "pole height"  5.25  
  integer   "pole wires"   3  
}
```

Please continue to the next section [Commands](#).

Commands

Commands consist of a **keyword** followed by a space and then a **value** (a keyword and its value is often referred to as a **keyword pair**). A **value** must always exist.

keyword value // a keyword pair

There can be more than one command keyword pair per line as long as each keyword pair is separated by a space. In fact, the *keyword* can be on one line and the *value* on the next line.

Although the names of commands are only shown in lower case in these notes, commands are case insensitive and all combinations of case are recognised as the same command. That is 'model', 'MODEL' and 'Model' are all recognised as the command 'model'.

The commands in the 12d Ascii file are:

model model_name // system default data

All strings following until the next **model** keyword are placed in the model *model_name*. This can be overridden for a string by a **model** command inside the string definition.

If the model includes attributes, the following *model* definition must be used.

```
model {
  name    model_name
  ...
}
```

All 12d Model *models* can have an unlimited number of named attributes of type integer (numbers), real and text. Within a model, the attribute names must all be different.

The definition for a model with attributes is the **model** keyword followed by information enclosed in curly braces { and }. The keyword *name* followed by the *model_name* **must** be included inside the curly braces.

name model_name

The attributes for the model are also specified inside the curly braces of the **model** definition. As described previously, the attributes are preceded by the **attribute** keyword followed by the named attributes enclosed in curly braces { and }.

Hence the *model* definition with attributes is:

```
model {
  name                      model_name
  attributes {
    attribute_type    attribute_name    attribute_value
    attribute_type    attribute_name    attribute_value
    ...
    attribute_type    attribute_name    attribute_value
  }
}
```

For example:

```
model {
  name                      "telegraph poles"

  attributes {
    text                      "pole id"                      "QMR-37"
    text                      "street"                      "477 Boundary St"
    real                      "pole height"                      5.25
    integer                      "pole wires"                      3
  }
}
```

```

    }

    colour colour_name // system default red

    All strings following until the next colour keyword have colour colour_name. This can be
    overridden for a string by a colour command in the string definition.

    style style_name // system default l

    All strings following until the next style keyword have style style_name. This can be overridden
    for a string by a style command in the string definition.

    breakline point or line // system default line

    All strings following that requires a breakline point-line type until the next breakline keyword,
    have this point-line type. This may be overridden for the string by a breakline in the string
    definition.

    null value // system default -999

    All z-values equal to value in strings following until the next null keyword, are considered to be
    null z-values.

    string string_type {
    ...
    }

```

The *string_type* is compulsory and must be followed by all the string information enclosed in curly braces { and }.

Thus if a string type or possibly information inside the string is not recognised, the 12d Ascii reader has a chance of being able to jump over the string by looking for the end marker }.

Inside the braces are **string commands** as keyword pairs defining some information for the string.

There can be more than one *string command* keyword pair per line as long as each keyword pair is separated by a space. In fact, the *keyword* can be on one line and the *value* on the next line.

Any unrecognised *string commands* are ignored.

The *string command keyword pairs* include **model**, **colour**, **style** and **breakline** which are all *optional* inside the string definition. However if any of them exist inside a string definition, then the *string command keyword* overrides any **model**, **colour**, **style** or **breakline commands** but only for that particular string.

For some string types (e.g. 2d, 3d, pipe) there is more data required than just the *string command* keyword pairs.

This extra data is contained in blocks consisting of a *keyword* followed by the required information enclosed in curly braces { and }. For example attributes for all string types and (x,y) data for a 2d string.

For all string types, if there is not enough recognised information to define the string, the string is ignored.

The definition of each *string type* and the allowed *string commands* and extra data for that string type will be given after the next section on string attributes.

string attributes

All 12d Model strings can have an unlimited number of named **attributes** of type integer (numbers), real and text. Within a string, the attribute names must all be different.

The attributes for a string are given inside the curly braces of the **string** definition. As described previously, the attributes are preceded by the **attributes** keyword followed by the named attributes enclosed in curly braces { and }.

Please continue to the next section [12d Ascii Definition for each String Type](#).

12d Ascii Definition for each String Type

For the 12da definitions of *2d string*, go to

3d string

4d string

alignment string

arc string

circle string

drainage string

face string

feature string

interface string

pipe string

polyline string

super string

super alignment string

text string

[2d String](#)

[3d String](#)

[4d String](#)

[Alignment String](#)

[Arc String](#)

[Drainage String](#)

[Drainage String](#)

[Face String](#)

[Feature String](#)

[Interface String](#)

[Pipe String](#)

[Polyline String](#)

[Super String](#)

[Super Alignment String](#)

[Text String](#)

2d String

```
string 2d {
  z value chainage start_chainage
  model model_name name string_name
  colour colour_name style style_name
  breakline point or line
  data {                                     // keyword
    x-value y-value
    "      "
    "      "
  }
}
```

Please continue to the next section [3d String](#).

3d String

```
string 3d {
  chainage start_chainage
  model model_name name string_name
  colour colour_name style style_name
  breakline point or line
  data {                                     // keyword
    x-value y-value z-value
    "      "      "
    "      "      "
  }
}
```

Please continue to the next section [4d String](#).

4d String

```
string 4d {
  angle value   offset value   raise value
  worldsize value or papersize value or screensize value
  chainage start_chainage
  model model_name   name string_name
  colour colour_name   style style_name
  breakline point or line
  textstyle text slant degrees   xfactor value
  justify    "top|middle|bottom-left|centre|right"
  data {
    x-value   y-value   z-value   text           // keyword
    "          "          "          "           // text can not be blank
    "          "          "          "           // use "" for no text.
  }
}
```

Please continue to the next section [Alignment String](#).

Alignment String

In an alignment string the horizontal and vertical geometry are given separately and both can only be defined by the intersection point method (IP's).

For the horizontal geometry, the (x,y) position of the horizontal intersection points (HIPs) are given in the order that they appear in the string, plus the circular radius and left and right transition lengths on each HIP.

Hence a horizontal intersection point is given by either

```
x-value   y-value   radius           // circular curve, no transition
or
x-value y-value radius spill left-transition-length spill2 right-transition-length
```

radius, *left-transition-length*, *right-transition-length* can be zero (meaning they don't exist).

For the vertical geometry, the (chainage,height) position of the vertical intersection points (VIPs) are given in increasing chainage order, plus either the radius of the circular arc or the length of the parabolic curve on each VIP.

Hence for a vertical intersection point is given by either

```
ch_value   z-value   length   parabola
or
ch_value   z-value   radius   circle
where
```

the word *parabola* is optional. *length* and *radius* can be zero, meaning that the parabola or arc doesn't exist.

```
string alignment {
  model model_name   name string_name
  colour colour_name   style style_name
  chainage start_chainage   interval value
  draw_mode value           // 1 to draw crosses at HIPs and VIPs, 0 don't draw
```



```

spiral_type text // spiral_type covers both spiral and non-spiral transitions.
                // For an alignment string, the supported transition types
                // are clothoid, cubic parabola, westrail-cubic, cubic spiral
                // More transition are supported in the super alignment
                //
hipdata { // some hips must exist and precede the VIP data
    x-value y-value radius // or
    x-value y-value radius spill left-transition-length spill2 right-transition-length
    " " " " " " " "
}
vipdata { // vips optional
    ch_value z-value parabolic-length // or
    ch_value z-value parabolic-length parabola // or
    ch_value z-value radius circle
    " " " "
}
}

```

Please continue to the next section [Arc String](#).

Arc String

```

string arc {
    model model_name name string_name
    colour colour_name style style_name
    chainage start_chainage interval value radius value
    xcentre value ycentre value zcentre value
    xstart value ystart value zstart value
    xend value yend value zend value
}

```

Please continue to the next section [Circle String](#).

Circle String

```

string circle {
    model model_name name string_name
    colour colour_name style style_name
    chainage start_chainage interval value radius value
    zcentre value xcentre value ycentre value
}

```

Please continue to the next section [Drainage String](#).

Drainage String

```

string drainage {
    chainage start_chainage
    model model_name name string_name
    colour colour_name style style_name
}

```

```

breakline point or line
attributes {
  text Tin finished_surface_tin
  text NSTin natural_surface_tin
  integer "_floating" 1|0 // 1 for floating, 0 not floating
}
outfall outfall_value // z-value at the outfall
flow_direction 0|1 // 0 drainage line is defined from downstream
// to upstream

data { // key word - geometry of the drainage string
  x-value y-value z-value radius bulge
  " " "
  " " "
}
pit { // pit/manhole - one pit record for each pit/manhole
// in the order along the string
  name text // pit name
  type text // pit type
  road_name text // road name
  road_chainage chainage // road chainage
  diameter value // pit diameter
  floating yes|no // is pit floating or not
  chainage pit_chainage // internal use only
  ip value // internal use only
  ratio value // internal use only
  x x-value // x-value of top of pit
  y y-value // y-value of top of pit
  z z-value // z-value of top of pit
}
pipe { // one pipe record for each pipe connecting pits/manholes
// in the order they occur along the string
  name text // pipe name
  type text // pipe type
  diameter value // pit diameter
  us_level value //
  ds_level value //
  us_hgl value //
  ds_hgl value //
  flow_velocity value //
  flow_volume value //
}
property_control {
  name text // lot name
  colour colour_name
  grade value // grade of pipe in units of "1v in"
  cover value // cover of the of pipe
  diameter value // diameter of the of pipe
  boundary value // boundary trap value
  chainage chainage // internal use only
  ip value // internal use only
  ratio value // internal use only
  x x-value // x value of where pipe connects to sewer
  y y-value // y value of where pipe connects to sewer
  z z-value // internal use only

  data { // key word - geometry of the property control
    x-value y-value z-value radius bulge

```

```

        "        "        "
        "        "        "
    }
    house_connection { // warning - house connections may change in future versions
        name          text          // house connection name
        hcb            integer       // user given integer
        colour         colour_name
        grade          value         // grade of connection in units of "1v in"
        depth          value
        diameter       value
        side           left or right
        length         value
        type           text          // connection type
        material       text          // material type
        bush           text          // bush type
        level          value
        adopted_level  value
        chainage       chainage      // internal use only
        ip             value         // internal use only
        ratio          value         // internal use only
        x              x-value       // x value of where pipe connects to sewer
        y              y-value       // y value of where pipe connects to sewer
        z              z-value       // internal use only
    }
} // end of drainage-sewer data

```

Please continue to the next section [Face String](#).

Face String

```

string face {
    model  model_name  name  string_name
    colour colour_name  style style_name
    chainage start_chainage  breakline point or line
    hatch_angle value
    hatch_distance value
    hatch_colour colour
    edge_colour colour
    fill_mode 0 or 1
    edge_mode 0 or 1
    data { // keyword
        x-value  y-value  z-value
        "        "        "
    }
}

```

Please continue to the next section [Feature String](#).

Feature String

```

string feature {
    model  model_name  name  string_name

```

```
colour colour_name style style_name
chainage start_chainage interval value radius value
zcentre value xcentre value ycentre value
}
```

Please continue to the next section [Interface String](#).

Interface String

```
string interface {
  chainage start_chainage
  model model_name name string_name
  colour colour_name style style_name
  breakline point or line
  data {                                     // keyword
    x-value y-value z-value mode
    " " " "
    " " " "
  }
  // mode = -1 cut
  // 0 surface
  // 1 fill
}
```

Please continue to the next section [Pipe String](#).

Pipe String

```
string pipe {
  diameter value chainage start_chainage
  model model_name name string_name
  colour colour_name style style_name
  breakline point or line
  data {                                     // keyword
    x-value y-value z-value
    " " "
    " " "
  }
}
```

Please continue to the next section [Pipeline String](#).

Pipeline String

This is the same as an alignment string except that it has the additional keywords

diameter, which gives the diameter of the pipeline in world units

and

length of the typical pipe making up the pipeline (used for deflections).

```
string pipeline {
  model model_name name string_name
  colour colour_name style style_name
```

```

diameter diameter length pipe-length
chainage start_chainage interval value
spiral_type text // spiral_type covers both spiral and non-spiral transitions
// supported by 12d. For an alignment string, the
// supported transition types are clothoid, cubic parabola,
// westrail-cubic, cubic spiral. Other transition types
// are supported in the super alignment
hipdata { // some hips must exist and precede vips
  x-value y-value radius // or
  x-value y-value radius spill left-transition-length spill2 right-transition-length
  " " " " " " " "
}
vipdata { // vips optional
  ch-value z-value parabolic-length // or
  ch-value z-value parabolic-length parabola // or
  ch-value z-value radius circle
  " " " "
}
}

```

Please continue to the next section [Polyline String](#).

Polyline String

The definition of a closed string has been refined for polyline and super strings. For other string types, closing a string simply meant having the first vertex the same as the last vertex. Hence the vertex was duplicated.

For a polyline string, being closed is a property of the string and no extra vertex is needed - the first and the last vertices are not the same and the polyline string knows there is an additional segment from the last vertex back to the first vertex.

In the 12d ascii format, there is a new *closed* flag for the polyline string:

closed *true* or *false*

where *true* can be 1 or T or t or Y or y (or words starting with T, t, Y or y))
and *false* is 0 or F or f or N or n (or words starting with F, f, N or n).

```

string polyline {
  chainage start_chainage
  model model_name name string_name
  colour colour_name style style_name
  breakline point or line
  closed true or false

  data { // keyword
    x-value y-value z-value radius bulge_flag
    " " "
    " " "
  }
}

```

Please continue to the next section [Super String](#).

Super String

Because the super string is so versatile, its 12d Ascii format looks complicated but it is very logical and actually quite simple.

In its most primitive form, the super string is simply a set of (x,y) values as in a 2d string, or (x,y,z) values as in a 3d string, or (x,y,z,radius,bulge_flag) as for a polyline string or even lines, arcs and transitions (spirals and non-spiral transitions).

Additional blocks of information can extend the definition of the super string. For example, text, pipe diameters and visibility.

Some of the properties of the super string extend what were constant properties for the entire string in other string types. For example, *breakline* type for the string extends to *tinability* of *vertices* and *segments*. One colour for the string extends to individual colours for each segment.

Other properties such as vertex id's (point numbers), visibility and culvert data are entirely new.

For user attributes, the super string still has the standard user attributes defined for the entire string, but user attributes for each vertex and segment are also supported.

The definition of a closed string has been refined for polyline and super strings. For other string types, closing a string simply meant having the first vertex the same as the last vertex. Hence the vertex was duplicated.

For a super string, being closed is a property of the string and no extra vertex is needed. That is, the first and the last vertices are not the same for a closed super string and the super string knows there is an additional segment from the last vertex back to the first vertex.

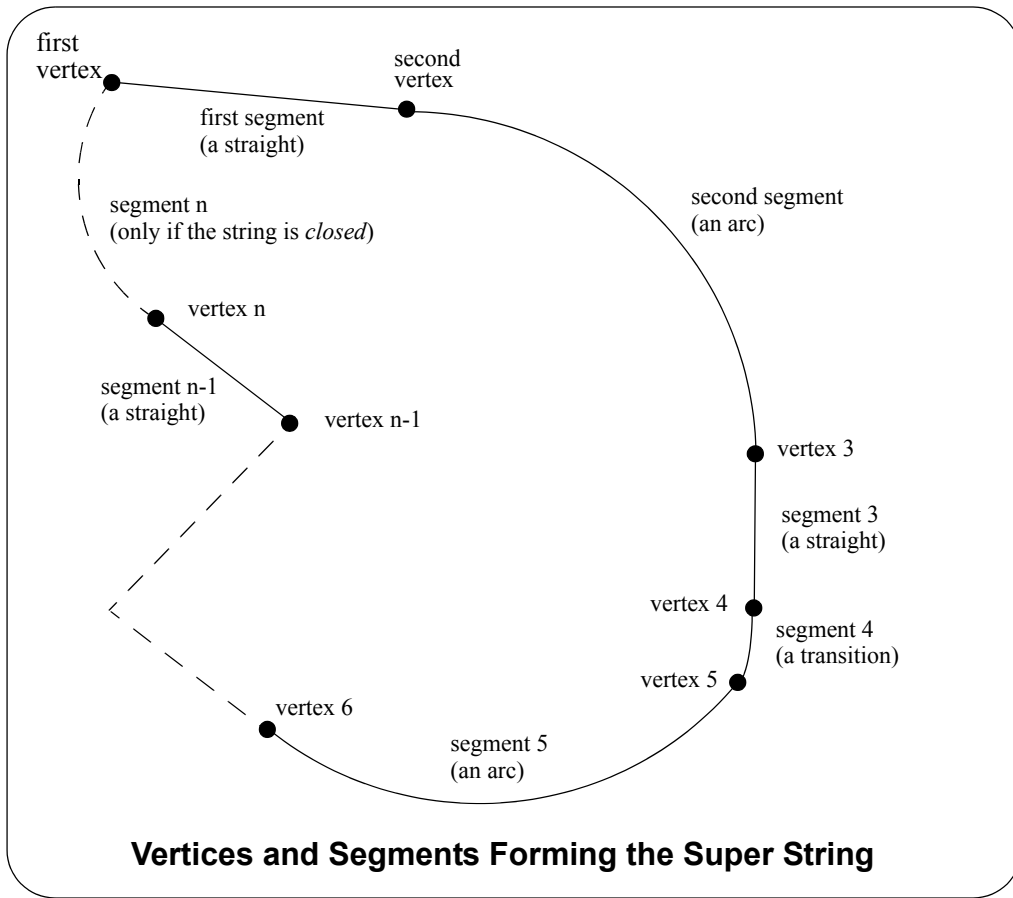
Hence in the 12d ascii format, there is a *closed* flag for the super string:

closed *true* or *false*

where *true* can be 1 or T or t or Y or y (or words starting with T, t, Y or y))
and *false* is 0 or F or f or N or n (or words starting with F, f, N or n).

Thus if a string has n vertices, then an open string has $n-1$ segments joining the vertices and a closed string has n segments since there is an additional segment from the last to the first vertex.

With the additional data for vertices and segments in the super string, the data is in vertex or segment order. So for a string with n vertices, there must be n bits of vertex data. For segments, if the string is open then there only needs to be $n-1$ bits of segment data but for closed strings, there must be n bits of data. For an open string, n bits of segment data can be specified and the n th bit will be read in and stored. If the string is then closed, the n th bit of data will be used for the extra segment.



The full 12d Ascii definition of the super string is:

```
string super {
  chainage start_chainage
  model model_name   name string_name
  colour colour_name style style_name
  breakline point or line
  closed true or false
  interval {
    chord_arc   value           // chord-to-arc tolerance for curves
    distance    value           // chainage interval to break the geometry up
  }

  block of info {
  }
  block of info {
  }
  block of info {
  }
}
```

The blocks of info can be broken up into four types.

(a) blocks defining the position of the vertices in z, y and z

data_2d or data_3d

- (b) blocks defining the geometry of the segments
 - radius_data* and *major_data* or *geometry_data*
- (c) a superseded block defining vertices and segment geometry
 - data*
- (d) extra information for the vertices and/or segments
 - pipe diameters - *diameter_value* or *diameter_data*
 - culvert dimensions - *culvert_value* or *culvert_data*
 - pipe/culvert justification - *justify*
 - colour - *colour* or *colour_data*
 - vertex ids (point numbers) at each vertex- *point_data*
 - tinability - *breakline* or *vertex_tinability_data* and *segment_tinability_data*
 - visibility - *vertex_visible_data* and *segment_visible_data*
 - vertex text and annotation - *vertex_text_data* and *vertex_annotation_data*
 - segment text and annotation - *segment_text_data* and *segment_annotation_data*
 - symbols at vertices - *symbol_value* or *symbol_data*
 - vertex attributes - *vertex_attribute_data*
 - segment attributes - *segment_attribute_data*
 - extrudes
 - image data
 - holes

The definition for the blocks of each type now follows.

(a) Blocks Defining the Position of the Vertices

For (x, y) Values with a Constant z

If there is only (x,y) values at each vertex (like a 2d string):

```
data_2d {                                     // keyword
    x-value  y-value
    "        "
    "        "
}
```

and if there is a non-null constant z for the string

z value

For (x,y,z) Values

If there is (x,y,z) values at each vertex (like a 3d string):

```
data_3d {                                     // keyword
    x-value  y-value  z-value
    "        "        "
    "        "        "
}
```

(b) Blocks Defining the Geometry of the Segments

Straights and Arcs Only for the Segments

If data_2d or data_3d was used, it is possible to add radius and bulge_flag data:

```
radius_data {                                 // keyword
    radius for first segment
    radius for second segment
```



```

        . . .
        radius for last segment
    }

    major_data {                                     // keyword
        bulge flag for first segment
        bulge flag for second segment
        . . .
        bulge flag for last segment
    }

```

Straights, Arcs and Transitions (Spiral and non-Spiral Transitions) for the Segments

If data_2d or data_3d was used, it is possible to specify if the segments are straight, arcs or transitions using a *geometry_data* block.

```

geometry_data {
    segment_info_1 {
        information on the first segment
    }
    segment_info_2 {
        information on the second segment
    }
    " "
    " "
    segment_info_n-1 { // the last segment if it is open
        information on the (n-1) segment
    }
    segment_info_n { // the last segment if it is closed
        information on the n-th segment
    }
}

```

where the *segment_info* blocks are from the following:

(a) Straight

No parameters are needed for defining a straight segment. The *straight* block is simply:

```

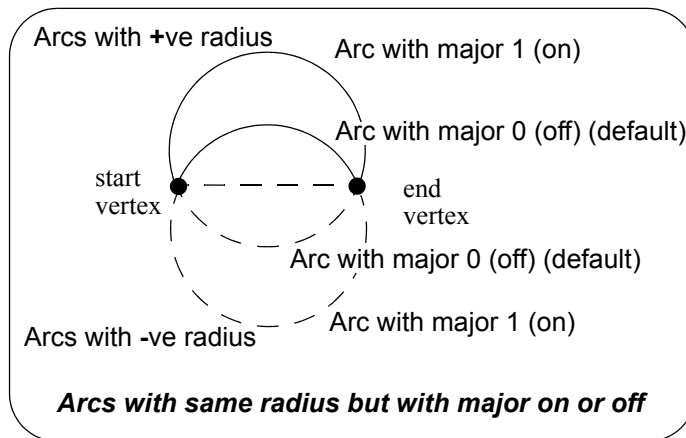
straight {                                     // no parameters are needed for a straight
}

```

(b) Arc

There are four possibilities for an arc of a given radius placed between two vertices.

We use *positive* and *negative* radius, and a flag *major* which can be set to 1 (on) or off (0) to differentiate between the four possibilities.



So the *arc* block is:

```
arc {
  radius value      // radius of the arc (+ve is above the line connecting the vertices)
  major 0 or 1       // 0 is the smaller arc, 1 the larger arc).
}
```

(c) Spiral - this covers both spiral and non-spiral transitions

There can be a partial transition between adjacent vertices. The partial transition is defined by the parameters

- l1** length of the full transition up to the start vertex
- r1** radius of the transition at the start vertex
- a1** angle in decimal degrees of the tangent to the transition at the start vertex
- l2** length of the full transition up to the end vertex
- r2** radius at the end vertex
- a2** angle in decimal degrees of the tangent to the transition at the end vertex

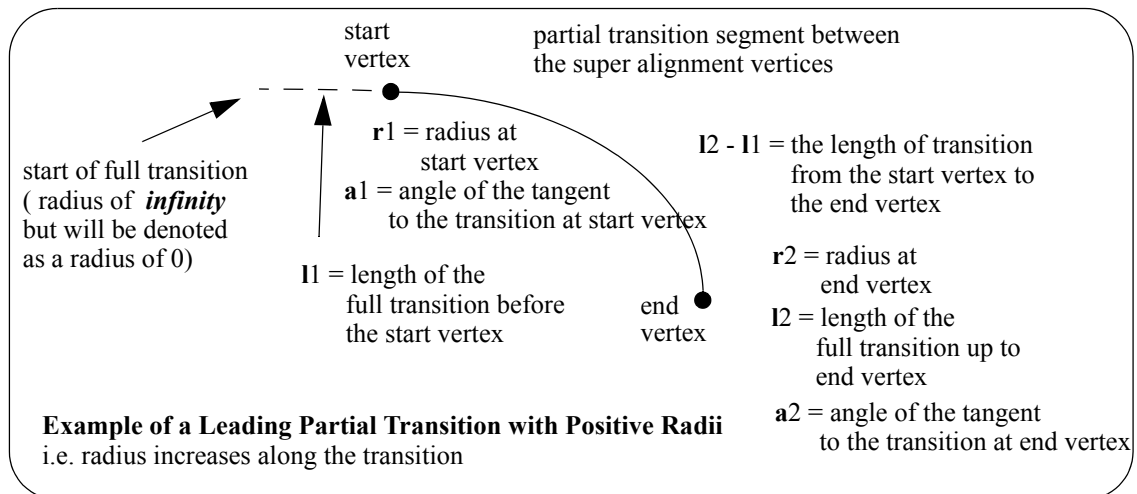
Since a radius can not be zero, a radius of infinity is denoted by *zero*.

The transition is said to be a *leading* transition if the absolute value of the radius is increasing along the direction of the transition (the transition will *tighten*). Otherwise it is a *trailing* transition.

If a leading transition is a full transition then $r1 = 0$ and $l1 = 0$. Similarly if a trailing transition is a full transition then $r2 = 0$ and $l2 = 0$.

For a partial transition, if the coordinates of the start of the full transition are needed then they can be calculated from $l1, r1, a1, l2, r2, a2$ and the co-ordinates of the start and end vertices.

Note that the radii can be positive or negative. If the radii's are positive then a leading transition will curl to the right (and will be above the line joining the start and end vertices).



The parameters for the *spiral* block are:

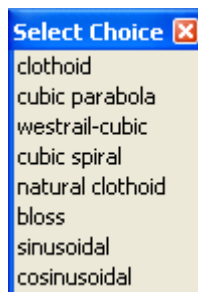
```

spiral {
  type      value           // type can be clothoid, cubic parabola, westrail-cubic,
                             // cubic spiral, natural clothoid, blossom,
                             // blossom, sinusoidal, cosinusoidal
  leading    1 or 0         // 1 denotes a leading transition, 0 a trailing transition
  l1         value          // length of the full transition at start vertex
  r1         value          // radius at the start vertex
  a1         value          // angle in decimal degrees of the tangent to the transition
                             // at the start vertex
  l2         value          // length of the full transition at end vertex
  r2         value          // radius at end vertex
  a2         value          // angle in decimal degrees of the tangent to the transition
                             // at the end vertex
}

```

Notes

1. The *spiral* block covers both spiral and non-spiral transitions.
2. The transitions/spirals supported by **12d Model** are:



Clothoid - spiral approximation used by Australian road authorities and Queensland Rail.

Cubic parabola – special transition curve used by NSW railways. Not a spiral.

Westrail cubic – spiral approximating used by WA railways.

Cubic spiral – low level spiral approximation. Only ever used in surveying textbooks.

Natural Clothoid – the proper Euler spiral. Not used by any authority.

Bloss – special transition used by Deutsche Bahn. Not a spiral.

Sinusoidal - special transition. Not a spiral.

Cosinusoidal - special transition. Not a spiral.

(c) Block Defining the Vertices and Segments

For compatibility with the polyline, the *data* block gives the (x,y,z,radius,bulge) values at each vertex of the string and so defines both the vertices and the geometry of the segments in the one block.

```
data {                                     // keyword
    x-value    y-value    z-value    radius    bulge
    "          "          "          "          "
    "          "          "          "          "
}
```

(d) Other Blocks

Pipe Diameters

There can be one pipe diameter value for the entire super string or the pipe diameter varies for each segment of the super string.

```
diameter_value value
or
diameter_data {                           // keyword
    pipe diameter for first segment
    pipe diameter for second segment
    . . .
    pipe diameter for last segment
}
```

Culvert Dimensions

There can be one culvert width and height for the entire super string or the culvert width and height vary for each segment of the super string.

```
culvert_value {
    width    value
    height   value
}
or
culvert_data { properties {width    value    // width and height for first segment
                          height   value
                          }
               properties {width    value    // width and height for second segment
                          height   value
                          }
               . . .
               properties {width    value    // width and height for last segment
                          height   value
                          }
}
```

Justification for Pipe or Culverts

There can be only one justification for the pipe or culvert for the entire super string.

```
justify justification    // bottom or invert
```

```
// top or obvert
// centre (default)
```

Colour

There can be one colour for the entire super string which is given by the `colour` command at the beginning of the string definitions (before the blocks of information) or the colour varies for each segment of the super string and is specified in a `colour_data` block.

```
colour_data {                                     // keyword
    colour for first segment
    colour for second segment
    ...
    colour for last segment
}
```

Vertex Id's (Point Numbers)

Each vertex can have a vertex id (point number). This is not the order number of the vertex in the string but is a separate id which is usually different for every vertex in every string. The vertex id can be alphanumeric.

```
point_data {                                     // keyword
    vertex id or first vertex                    // alphanumeric
    vertex id for second vertex
    ...
    vertex id for last vertex
}
```

Tinability

For a *super string*, the concept of breakline has been extended to a property called **tinable** which can be set independently for each vertex and each segment of the super string.

If a vertex is tinable, then the vertex is used in triangulations. If the vertex is not tinable, then the vertex is ignored when triangulating.

If a segment is tinable, then the segment is used as a side of a triangle during triangulation. This may not be possible if there are *crossing* tinable segments.

```
vertex_tinable_data {                           // keyword
    tinable flag for first vertex                // 1 for tinable
    tinable flag for second vertex               // 0 for not tinable
    ...
    tinable flag for last vertex

segment_tinable_data {                          // keyword
    tinable flag for first segment               // 1 for tinable
    tinable flag for second segment             // 0 for not tinable
    ...
    tinable flag for last segment
}
```

Note that even if a segment is set to tinable, it can only be used if both its end vertices are also tinable.

Visibility

For a *super string*, the concept of visibility and invisibility for vertices and segments has been

introduced.

```
vertex_visible_data {                                // keyword
    visibility flag for first vertex                // 1 for visible
    visibility flag for second vertex               // 0 for invisible
    ...
    visibility flag for last vertex
}

segment_visible_data {                               // keyword
    visibility flag for first segment               // 1 for visible
    visibility flag for second segment              // 0 for invisible
    ...
    visibility flag for last segment
}
```

Vertex Text and Vertex Annotation

There can be the same piece of text for every vertex in the super string or a different text for each vertex of the super string. How the text is drawn is specified by vertex annotation values. Note that in vertex annotations, all vertices must be either worldsize or all vertices papersize. That is, worldsize and papersize can not be mixed - the first one found is used for all vertices.

```
vertex_text_value      text
or
vertex_text_data {    // keyword
    text for first vertex    // text string, enclose
    text for second vertex   // by " " if there are any
    ...                     // spaces in the text string
    text for last vertex
}

vertex_annotate_value { // keyword
    angle value offset value raise value
    textstyle textstyle_name slant degrees xfactor value
    worldsize value or papersize value or screensize value
    justify "top|middle|bottom-left|centre|right"
    colour colour_name
}
or
vertex_annotate_data { // keyword
    properties { angle value offset value raise value
                  textstyle textstyle slant degrees xfactor value
                  worldsize value or papersize value or screensize value
                  justify "top|middle|bottom-left|centre|right"
                  colour colour_name
    }
    properties { text properties second vertex
    }
    properties { ...
    }
    properties { text properties for last vertex
    }
}
```

Segment Text and Segment Annotation

There can be the same piece of text for every segment in the super string or a different text for

each segment of the super string. How the text is drawn is specified by segment annotation values. Note that in segment annotations, all segments must be either worldsize or all segments papersize. That is, worldsize and papersize can not be mixed - the first one found is used for all segments. However, vertex text and segment text do not both have to be papersize or worldsize.

```

segment_text_value      text
or
segment_text_data {
    text for first segment           // keyword
    text for second segment         // text string, enclose
    ...                               // by " " if there are any
    text for last segment           // spaces in the text string
}

segment_annotate_value {
    angle value offset value raise value           // keyword
    textstyle textstyle slant degrees xfactor value
    worldsize value or papersize value or screensize value
    justify "top|middle|bottom-left|centre|right"
    colour colour_name
}
or
segment_annotate_data {
    properties { angle value offset value raise value
                  textstyle textstyle slant degrees xfactor value
                  worldsize value or papersize value or screensize value
                  justify "top|middle|bottom-left|centre|right"
                  colour colour_name
    }
    properties { text properties second segment
    }
    properties { ...
    }
    properties { text properties for last segment
    }
}

```

Symbols

There can be the same symbol (defined as a linestyle) for every vertex in the super string or a different symbol for each vertex of the super string. If a symbol does not have a colour, then it uses the string colour or the segment colour.

```

symbol_value {
    style linestyle_name colour colour_name size value
    rotation value // in dms
    offset value raise value
}
or
symbol_data {
    properties { style linestyle_name colour colour_name size value
                  style linestyle colour colour size value
                  rotation value // in dms
                  offset value raise value
    }
    properties { symbol and properties for second vertex
    }
}

```

```
        properties { ...
    }
    properties { symbol and properties for last vertex
    }
}
```

Vertex Attributes

Each vertex can have one or more user defined named attributes.

```
vertex_attribute_data { // key word
    attributes { attribute_type attribute_name attribute_value
                attribute_type attribute_name attribute_value
                ...
                attribute_type attribute_name attribute_value
    }
    attributes { named attributes for second vertex
    }
    attributes { ...
    }
    attributes { named attributes for last vertex
    }
}
```

Segment Attributes

Each segment can have one or more user defined named attributes.

```
segment_attribute_data { // keyword
    attributes { attribute_type attribute_name attribute_value
                attribute_type attribute_name attribute_value
                ...
                attribute_type attribute_name attribute_value
    }
    attributes { named attributes for second segment
    }
    attributes { ...
    }
    attributes { named attributes for last segment
    }
}
```

Please continue to the next section [Super Alignment String](#).

Super Alignment String

In an *alignment* string, only the intersection point method (IP's) could be used to construct the horizontal and vertical geometry. The IP definition is actually a *constructive* definition and the tangents points and segments between the tangent points (lines, arcs, transitions etc.) are calculated from the IP definition. For an alignment string, only the IP definitions are included in the 12d ascii file.

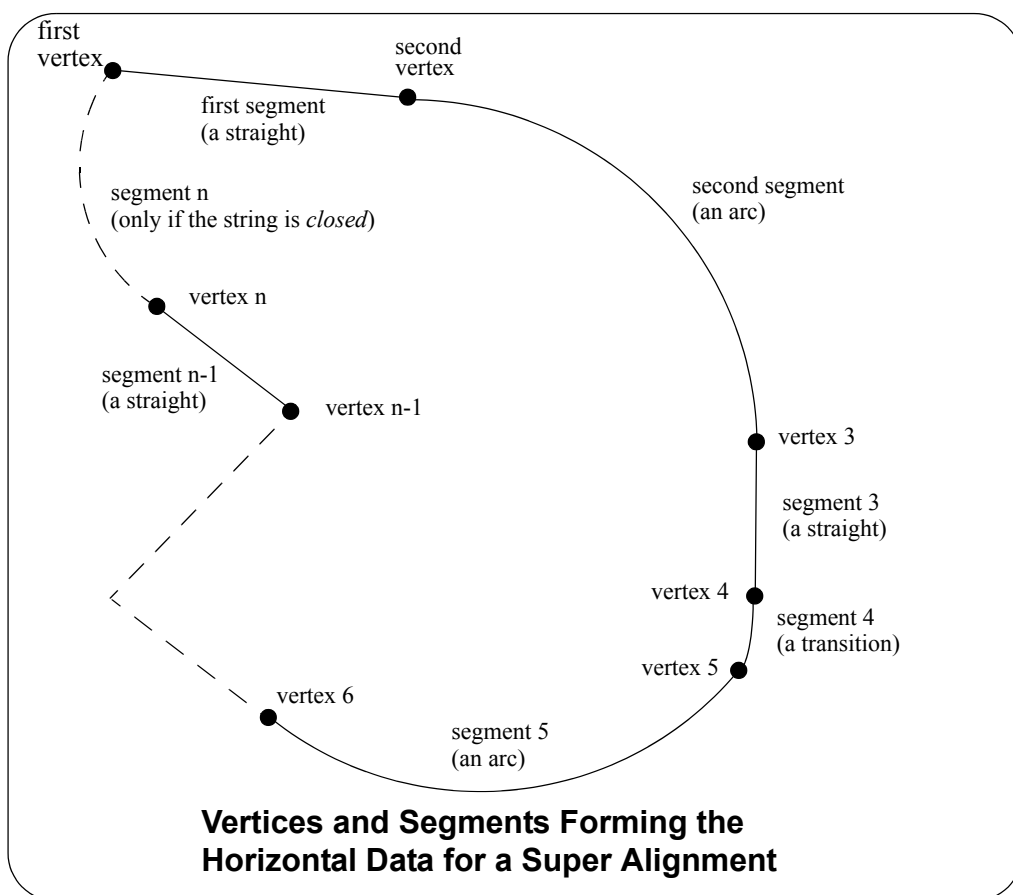
For a **super alignment**, the horizontal and vertical geometry are also defined separately and with construction definitions but the construction definition can be much more complex than just IP's. For example, an arc could be defined as being tangential to two offset elements, or constrained to go through a given point.

If the horizontal construction methods are consistent then the horizontal geometry can be solved, and the horizontal geometry expressed in terms of consecutive segments (lines, arcs, transitions) that are easily understood and drawn.

Similarly if the vertical construction methods are consistent then the vertical geometry can be solved, and the vertical geometry expressed in terms of consecutive segments (lines, arcs, parabolas) that are easily understood and drawn.

Unlike the *alignment*, the *super alignment* stores **both** the **construction methods** (the **parts**) and the resulting **vertices** and **segments** (lines, arcs, transitions etc.) that make up the horizontal and vertical geometry (the **data**).

For many applications such as uploading to survey data collectors or machine control devices, only the **horizontal data** and the **vertical data** are required, not the *construction methods* (i.e. the **horizontal** and **vertical parts**). When reading the 12d Ascii of a *super alignment*, only the **horizontal** and **vertical data** needs to be read in and the constructive methods (the **horizontal** and **vertical parts**) can be skipped over.



Notes

1. Just using the horizontal and vertical data is valid *as long as the super alignment geometry is consistent* (and solves) and the horizontal and vertical parts can be created.

There are flags in the 12d Ascii of the super alignment to say that the horizontal and vertical geometry is consistent and solves.

2. Segments meeting at a common vertex do not have to be tangential although for most road and rail applications, they should be.

The full 12d Ascii definition of the *super alignment* is:

```
string super_alignment {  
  //  
  name          string_name  
  chainage       start_chainage  
  colour         colour_name  
  style          style_name  
  breakline      point or line  
  closed         true or false  
  spiral_type    transition_type           // the spiral_types are clothoid,  
                                           // cubic parabola, westrail-cubic,  
cubic spiral,                             // natural clothoid, blossom, sinusoidal  
and                                         // cosinusoidal. Note that some  
spiral_type's                             // are non-spiral transitions  
  
  valid_horizontal true or false           // if true then the horizontal geometry  
                                           // is consistent and solves  
  valid_vertical   true or false           // if true then the horizontal geometry  
                                           // is consistent and solves  
  
  block of info {  
    }  
  block of info {  
    }  
  block of info {  
    }  
  
}
```

// end of super alignment

where the block of info can be one of more of:

attributes, horizontal_parts, horizontal_data, vertical_parts, vertical_data.

The *attributes* block has been described in the earlier section [Attributes](#).

The structure of the blocks *horizontal_parts*, *horizontal_data* which define the horizontal geometry, and *vertical_parts* and *vertical_data* which define the vertical geometry will now be described in more detail.

For information on *horizontal geometry*, go to
vertical geometry

[Horizontal Geometry](#)
[Vertical Geometry](#)

Horizontal Geometry

The horizontal geometry is described by two blocks - the *horizontal_parts* block and the *horizontal_data* block.

The ***horizontal_parts*** block contains the ***methods*** to construct the horizontal geometry such as float (fillet) an arc of a certain radius between two given lines or create a transition (spiral or non-spiral transition) between a line and an arc.

If the horizontal construction methods are consistent, then they can be solved to form a string made up of lines, arcs and transitions. The ***horizontal_data*** block is simply a list of the vertices and segments (lines, arcs etc.) that make up the ***solved*** geometry.

If the geometry in the *horizontal_parts* can be solved and produces a valid *horizontal_data* block, then the flag *valid_horizontal* in the super_alignment block is set to *true*.

```

    valid_horizontal  true or false  //true if the horizontal geometry can be solved
and
    horizontal_parts {/              // hence create a valid horizontal_data
    ....                          / methods for creating the horizontal geometry
    }
    horizontal_data {                // the horizontal segments that make up the solved
geometry
    ....
    }

```

For information on *horizontal_parts*, go to the section [Horizontal_parts](#)
horizontal_data [Horizontal_data](#)

Horizontal_parts

The *horizontal_parts* block describes the methods used to construct the horizontal geometry of the super alignment. The parts that make up the horizontal geometry are defined in chainage order from the start to the end of the super alignment.

```

horizontal_parts {  // methods for creating the horizontal geometry
    blocks defining the sequential parts
    making up the horizontal geometry
}

```

Apart from the special case of parts defined by horizontal intersection points and their accompanying transitions and arcs, the other parts in the *horizontal_parts* block are not documented.

Horizontal_parts for defined by IP Method Only

For a horizontal intersection point (HIP) with no transitions or arc defined at that HIP, the part is defined by:

```

ip {
    id  value  // part id - a number that is unique for each horizontal and ver-
tical part,
    // and the value of part id is a multiple of 100
    x  value  // x co-ordinate of the horizontal intersection point
    y  value  // y co-ordinate of the horizontal intersection point
}

```

For a horizontal intersection point (HIP) with an arc but no transitions defined at that HIP, the part is defined by

```
arc {
    id value // part id - a number that is unique for each horizontal and ver-
tical part,
                // and the value of part id is a multiple of 100
    r value // radius of the arc at the HIP
    x value // x co-ordinate of the HIP
    y value // y co-ordinate of the HIP
}
```

For a horizontal intersection point (HIP) with an arc and transitions defined at that HIP, the part is defined by

```
spiral {
    id value // part id - a number that is unique for each horizontal and ver-
tical part,
                // and the value of part id is a multiple of 100
    r value // radius of the arc at the HIP
    l1 value // length of the leading transition at the HIP
    l2 value // length of the trailing transition at the HIP
    x value // x co-ordinate of the HIP
    y value // y co-ordinate of the HIP
}
```

Note that the *transition* used in the **spiral** block is given by *spiral_type* in the super_alignment block.

Hence a super alignment with horizontal geometry defined by IP methods only would consist of a horizontal_parts section with only the above ip, arc and spiral blocks in it.

```
horizontal_parts {
    ip_spiral_arc {
        values // values defining the ip_spiral_arc
    }
    "
    values
    }
    ....
    ip_spiral_arc {
        values // values defining the ip_spiral_arc
    }
    "
    values
}
```

For example,



```

horizontal_parts {
  ip {
    id 100
    x 42606.66161172
    y 37239.28824481
  }
  ip {
    id 200
    x 43134.36832349
    y 37330.26705997
  }
  spiral {
    id 300
    r 50
    l1 30
    l2 40
    x 43336.6595
    y 37469.2563
  }
  arc {
    id 400
    r 75
    x 43481.15324268
    y 37331.6431906
  }
  ip {
    id 500
    x 43627.02308964
    y 37544.94343852
  }
}

```

1st HIP
HIP only

Unique Part id
incrementing by 100

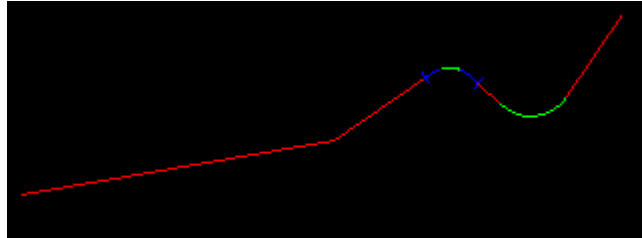
2nd HIP
HIP only

3rd HIP
HIP with arc and
leading and trailing
transitions

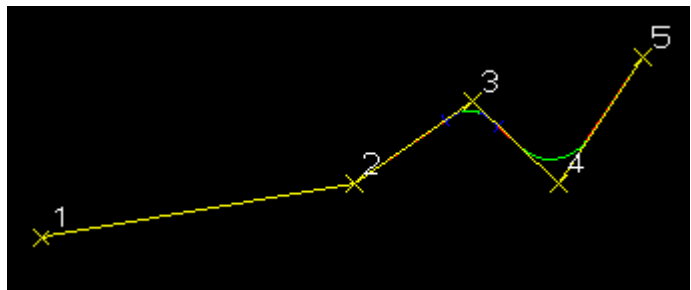
4th HIP
HIP with arc only

5th HIP
HIP only

Plan View of Super Alignment



Super Alignment Being Edited



Horizontal Parts with IP Methods Only

Horizontal_data

The *horizontal_data* block contains the **solved** horizontal geometry of the super alignment.

The *solved horizontal geometry* is made up of a series of (x,y) vertices given in a *data_2d* block followed by a *geometry_data* block specifying the geometry of the segments between adjacent vertices. The segment can be a straight line, an arc, a transition (e.g. a spiral) or a partial transition.

If the horizontal geometry has n vertices, then there will be (n-1) segments for an *open* super alignment or n segments if the super alignment is *closed*.

The format of the *horizontal_data* block is:

```

horizontal_data {
  name      ""
  chainage   value
  breakline  line or point
  colour     colour
  style      linestyle
  closed     0 or 1
}

```

// 0 if the string is open, 1 if it is closed

```

interval {
  chord_arc    value           // chord-to-arc tolerance for curves
  distance     value           // chainage interval to break the geometry up
}

data_2d {
  x1-value    y1-value         // co-ordinates of the first vertex
  x2-value    y2-value         // co-ordinates of the second vertex
  "           "
  "           "
  xn-value    yn-value         // co-ordinates of the n-th vertex
}

geometry_data {
  segment_info_1 {
    information on the first segment
  }
  segment_info_2 {
    information on the second segment
  }
  " "
  " "
  segment_info_n-1 {           // the last segment if it is open
    information on the (n-1) segment
  }
  segment_info_n {             // the last segment if it is closed
    information on the n-th segment
  }
}

```

where the *segment_info* blocks are from the following:

(a) Straight

No parameters are needed for defining a straight segment. The *straight* block is simply:

```

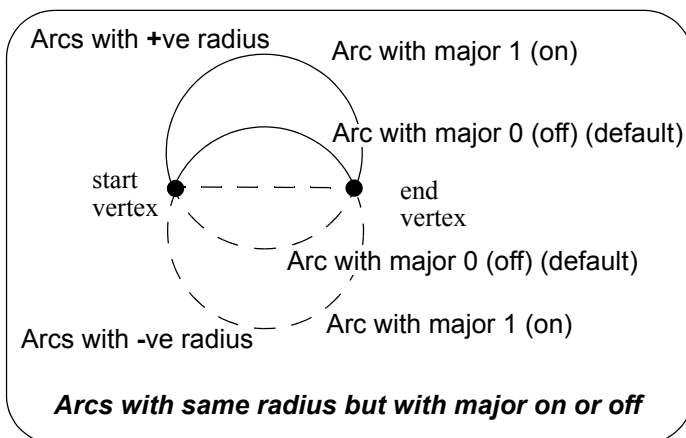
straight {
  // no parameters are needed for a straight
}

```

(b) Arc

There are four possibilities for an arc of a given radius placed between two vertices.

We use *positive* and *negative* radius, and a flag *major* which can be set to 1 (on) or off (0) to differentiate between the four possibilities.



So the *arc* block is:

```
arc {
    radius value      // radius of the arc (+ve is above the line connecting the vertices)
    major 0 or 1      // 0 is the smaller arc, 1 the larger arc).
}
```

(c) Spiral - this covers both spiral and non-spiral transitions

There can be a partial transition between adjacent vertices. The partial transition is defined by the parameters

l1 length of the full transition up to the start vertex
r1 radius of the transition at the start vertex
a1 angle in decimal degrees of the tangent to the transition at the start vertex
l2 length of the full transition up to the end vertex
r2 radius at the end vertex
a2 angle in decimal degrees of the tangent to the transition at the end vertex

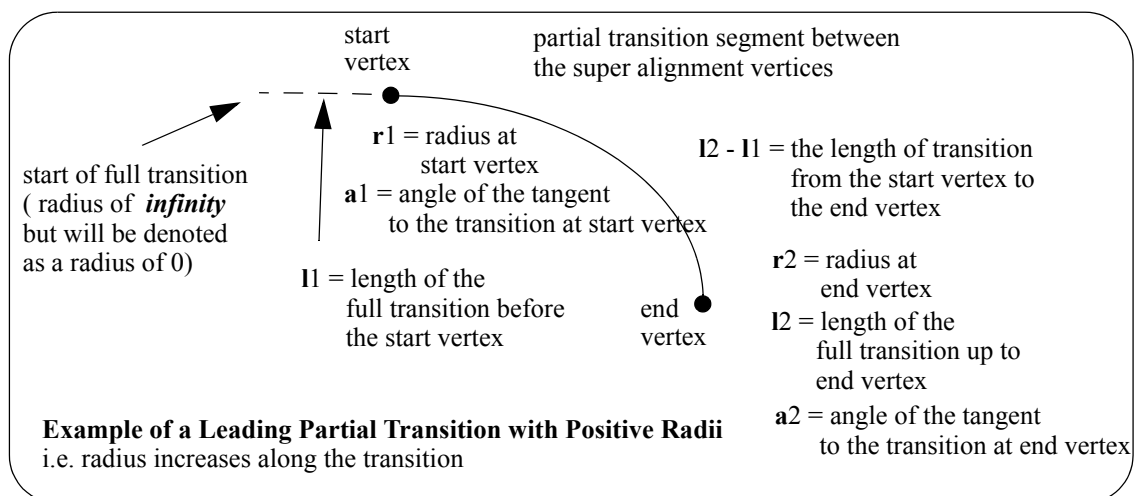
Since a radius can not be zero, a radius of infinity is denoted by *zero*.

The transition is said to be a *leading* transition if the absolute value of the radius is increasing along the direction of the transition (the transition will *tighten*). Otherwise it is a *trailing* transition.

If a leading transition is a full transition then $r1 = 0$ and $l1 = 0$. Similarly if a trailing transition is a full transition then $r2 = 0$ and $l2 = 0$.

For a partial transition, if the coordinates of the start of the full transition are needed then they can be calculated from $l1, r1, a1$, $l2, r2, a2$ and the co-ordinates of the start and end vertices.

Note that the radii can be positive or negative. If the radii's are positive then a leading transition will curl to the right (and will be above the line joining the start and end vertices).



The parameters for the *spiral* block are:

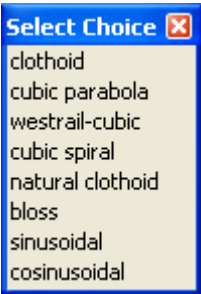
```
spiral {
    type      transition_type      // any of the transitions supported in 12d
    leading    1 or 0                // 1 denotes a leading transition, 0 a trailing transition
    l1         value                  // length of the full transition at start vertex
    r1         value                  // radius at the start vertex
    a1         value                  // angle in decimal degrees of the tangent to the transition
                                         // at the start vertex
    l2         value                  // length of the full transition at end vertex
```

```

    r2      value      // radius at end vertex
    a2      value      // angle in decimal degrees of the tangent to the transition
                        // at the end vertex
}
```

Notes

- 1. The *spiral* block covers both spiral and non-spiral transitions.
- 2. The transitions/spirals supported by **12d Model** are:



Clothoid - spiral approximation used by Australian road authorities and Queensland Rail.

Cubic parabola – special transition curve used by NSW railways. Not a spiral.

Westrail cubic – spiral approximating used by WA railways.

Cubic spiral – low level spiral approximation. Only ever used in surveying textbooks.

Natural Clothoid – the proper Euler spiral. Not used by any authority.

Bloss – special transition used by Deutsche Bahn. Not a spiral.

Sinusoidal - special transition. Not a spiral.

Cosinusoidal - special transition. Not a spiral.

Vertical Geometry

The *vertical* geometry is described by two blocks - the *vertical_parts* block and the *vertical_data* block.

The ***vertical_parts*** block contains the ***methods*** to construct the vertical geometry such as float (fit) a parabola of a certain length between two given lines.

If the vertical construction methods are consistent, then they can be solved to form a string made up of lines, parabolas and arcs. The ***vertical_data*** block is simply a list of the vertices and segments (lines, parabolas and arcs) that make up the *solved* geometry.

If the geometry in the *vertical_parts* can be solved and produces a valid *vertical_data* block, then the flag *valid_vertical* in the *super_alignment* block is set to *true*.

```
valid_vertical  true or false//true if the vertical geometry can be solved and
                                // hence create a valid vertical_data
vertical_parts {                // methods for creating the vertical geometry
    ....
}
vertical_data {                  // the vertical geometry
    ....
}
```

For information on *vertical_parts*, go to the section [Vertical_parts](#)
vertical_data [Vertical_data](#)

Vertical_parts

The *vertical_parts* block describes the methods used to construct the vertical geometry of the super alignment. The parts that make up the vertical geometry are defined in chainage order from the start to the end of the super alignment.

```
vertical_parts {                // methods for creating the vertical geometry
    blocks defining the sequential parts
    making up the vertical geometry
}
```

Apart from the special case of parts defined by vertical intersection points and their accompanying parabolas and arcs, the other parts in the *vertical_parts* block are undocumented.

Vertical_parts for defined by IP Method Only

For a vertical intersection point (VIP) with no parabola or arc defined at that VIP, the part is defined by:

```
ip {
    id  value    // part id - a number that is unique for each horizontal and ver-
    tical part,
                                // and the value of part id is a multiple of 100
    x   value    // chainage co-ordinate of the VIP
    y   value    // height co-ordinate of the VIP
}
```

For a vertical intersection point (VIP) with a parabola defined by a k value at that VIP, the part is defined by

```
kvalue {
    id  value    // part id - a number that is unique for each horizontal and ver-
```

```
    tical part,  
        // and the value of part id is a multiple of 100  
        k    value // k-value of the parabola at the VIP  
        x    value // chainage co-ordinate of the VIP  
        y    value // height co-ordinate of the VIP  
    }
```

For a vertical intersection point (VIP) with a parabola defined by length at that VIP, the part is defined by

```
    length {  
        id    value // part id - a number that is unique for each horizontal and ver-  
    tical part,  
        // and the value of part id is a multiple of 100  
        l    value // length of the parabola at the VIP  
        x    value // chainage co-ordinate of the VIP  
        y    value // height co-ordinate of the VIP  
    }
```

For a vertical intersection point (VIP) with a parabola defined by an effective radius at that VIP, the part is defined by

```
    radius {  
        id    value // part id - a number that is unique for each horizontal and ver-  
    tical part,  
        // and the value of part id is a multiple of 100  
        r    value // effective radius of the parabola at the VIP  
        x    value // chainage co-ordinate of the VIP  
        y    value // height co-ordinate of the VIP  
    }
```

For a vertical intersection point (VIP) with an asymmetric parabola defined by the start and end lengths at that VIP, the part is defined by

```
    length {  
        id    value // part id - a number that is unique for each horizontal and ver-  
    tical part,  
        // and the value of part id is a multiple of 100  
        l1    value // start length of the asymmetric parabola at the VIP  
        l2    value // end length of the asymmetric parabola at the VIP  
        x    value // chainage co-ordinate of the VIP  
        y    value // height co-ordinate of the VIP  
    }
```

For a vertical intersection point (VIP) with an arc defined by a radius at that VIP, the part is defined by

```
    arc {  
        id    value // part id - a number that is unique for each horizontal and ver-  
    tical part,  
        // and the value of part id is a multiple of 100  
        r    value // radius of the arc at the VIP  
        x    value // chainage co-ordinate of the VIP  
        y    value // height co-ordinate of the VIP  
    }
```

Hence a super alignment with vertical geometry defined by IP methods only would consist of a vertical_parts section with only the above ip, parabola and arc blocks in it.

```

vertical_parts {
    ip_parabola_arc {
        values // values defining the ip_parabola_arc
    }
    "
    values
}
....
ip_parabola_arc {
    values // values defining the ip_parabola_arc
}
"
values
}
}

```

For example,

```
vertical_parts {
  ip {
    id 600
    x -50.8459652
    y 159.79764161
  }
  kvalue {
    id 700
    k 1.25
    x 38.4627
    y 179.2126
  }
  length {
    id 800
    l 50
    x 172.61694837
    y 154.72967932
  }
  asymmetric {
    id 900
    l1 25
    l2 75
    x 270.0182
    y 208.1493
  }
  arc {
    id 1000
    r 1000
    x 424.2402
    y 196.5637
  }
  radius {
    id 1100
    r 200
    x 526.7263
    y 201.5302
  }
  ip {
    id 1200
    x 637.69216273
    y 198.71894484
  }
}
```

1st VIP
VIP only

Unique Part id
incrementing by 100

2nd VIP
Parabola defined
by k value

3rd VIP
Parabola defined
by length

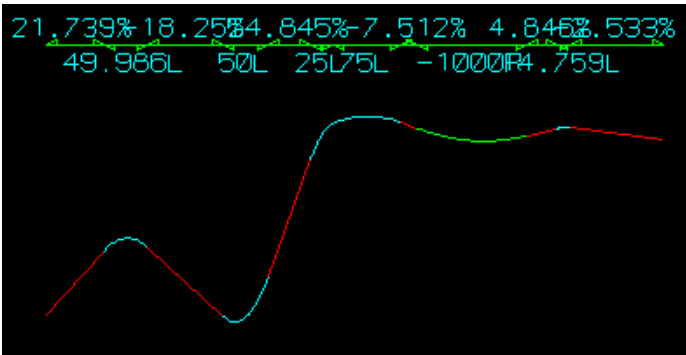
4th VIP
Asymmetric parabola defined
by two lengths

5th VIP
Arc with radius

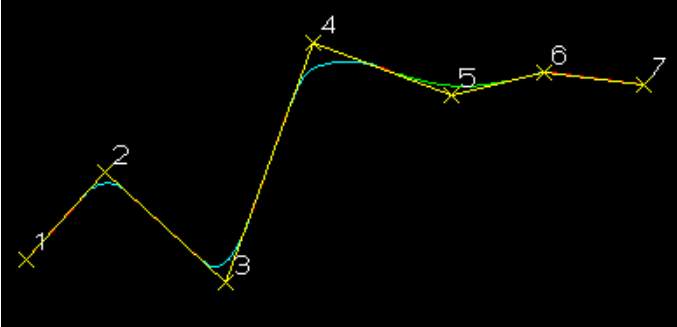
6th VIP
Parabola defined
by effective radius

7th VIP
VIP only

Section View of Super Alignment



Vertical Geometry Being Edited



Vertical Parts with IP Methods Only

Vertical_data

The *vertical_data* block contains the *solved* vertical geometry of the super alignment.

The *solved vertical geometry* is made up of a series of (chainage,height) vertices given in a *data_2d* block followed by a *geometry_data* block specifying the geometry of the segments between adjacent vertices. The segment can be a straight line, a parabola or an arc.

If the vertical geometry has n vertices, then there will be (n-1) segments for an *open* super alignment or n segments if the super alignment is *closed*.

The format of the *vertical_data* block is:

```
vertical_data {
```

```

name      ""
chainage  value
breakline line or point
colour    colour
style     linestyle
closed    0 or 1           // 0 if the string is open, 1 if it is closed
interval {
    chord_arc  value           // chord-to-arc tolerance for curves
    distance   value           // chainage interval to break the geometry up
}

data_2d {
    ch1-value  ht1-value           // co-ordinates of the first vertex
    ch2-value  ht2-value           // co-ordinates of the second vertex
    "          "
    "          "
    chn-value  htn-value           // co-ordinates of the n-th vertex
}

geometry_data {
    segment_info_1 {
        information on the first segment
    }
    segment_info_2 {
        information on the second segment
    }
    "          "
    "          "
    segment_info_n-1 {           // the last segment if it is open
        information on the (n-1) segment
    }
    segment_info_n {           // the last segment if it is closed
        information on the n-th segment
    }
}

```

where the *segment_info* blocks are from the following:

(a) Straight

No parameters are needed for defining a straight segment. The *straight* block is simply:

```

straight {           // no parameters are needed for a straight
}

```

(b) Arc

Since vertical geometry can't go backwards in chainage value, the majors arcs can not be used and hence there are only possibilities for an arc of a given radius placed between two vertices.

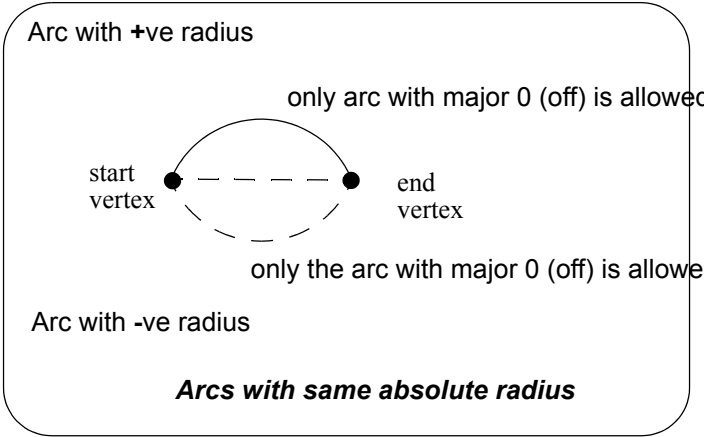
We use *positive* and *negative* radius to differentiate between the four possibilities.

So the *arc* block is:

```

arc {
    radius value       // radius of the arc (+ve is above the line connecting vertices)
    major  value       // this is ignored since only minor arcs are used
}

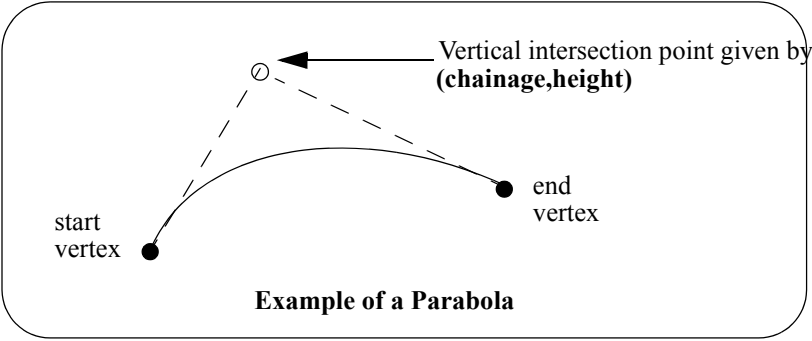
```



(c) Parabola

There can be a parabola between adjacent vertices. The parabola is defined by giving the coordinates of the vertical intersection point for the parabola

chainage chainage of the VIP of the parabola
height height of the VIP of the parabola



The parameters for the *parabola* block are:

```
parabola {  
  chainage    value           // chainage of the VIP of the parabola  
  height      value           // height of the VIP of the parabola  
}
```

Please continue to the next section [Text String](#).

Text String

```
string text {  
  x value y value z value  
  model model_name name string_name colour colour_name  
  text text_value  
  angle value offset value raise value  
  textstyle textstyle_name slant degrees xfactor value  
  worldsize value or papersize value or screensize value  
  justify "top|middle|bottom-left|centre|right"  
}
```

Please continue to the next section [12d Ascii Definition for Tins](#)

12d Ascii Definition for Tins

Tins (*tri*angulated *ir*regular *ne*tworks) and *Super Tins* can be written out and read in from a 12d Ascii file.

For the 12da definitions of *tins* go to the section [Tins](#)
super tins [Super Tins](#)

Tins

```
tin {
    name    tin_name          // MANDATORY name of the tin when created in 12d Model

    time_created text          // optional - time tin first created
    time_updated text          // optional - time tin last modified

// Attributes Block:

// This is mainly information used by 12d Model to create the tin.
// The attributes this block and the Attributes block itself are optional.
// When a tin is read into 12d Model from a 12da file, the style is used
// as the Tin style.

    attributes {
        text "style"          text          // name of line style for the tin
        integer "faces"       0 / 1         // 0 non triangle data, 1 triangle
data
        real "null_length"    value         // values for null by angle/length
        real "null_angle"     value         // angle in radians
        real "null_combined_length" value
        real "null_combined_angle" value    // angle in radians
//          any other attributes
    }                                     // end of attributes block

// Points Block
//
// Co-ordinates of the points at the vertices of the triangles
// The points are implicitly numbered by the order in the list (starting at point 1).
//
// The Points Block is MANDATORY

    points {
        x-value  y-value  -value          // x y z for each point in the tin
        "        "        "              // point 1
        "        "        "              // point 2
    }                                     // end of points block

// Triangles Block
//
// Each triangle is given as a triplet of the point numbers that make up
// the triangle vertices (the point numbers are the implicit position of the points
// given in the Points Block.
```


// The order of the triangles is unimportant

//

// The Triangles Block is MANDATORY

```

triangles {
    T1-1  T1-2  T1-3      // points making up each triangle
    T2-1  T2-2  T-33      // point numbers of the 3 vertices of first triangle.
    "      "      // point numbers of the 3 vertices of second triangle.
    "      "
}
// end of triangles block

```

// Base Colour

// The tin has a base colour that is the default colour for all triangles

```

colour tin_base_colour      // optional - base colour of the tin

```

// Colours Block

//

// Triangles can be given colours other than the base colour by including

// a *colours* block. The colour for each triangle is then individually given

// (-1 means base colour). The order is the same as the order of the triangles in

// the Triangles Block.

//

// If all the triangles are the base colour, then simply omit the Colours Block

```

colours {
    C1    C2    C3      // colour for each triangle given in triangle order
    C4    C5    C6    C7      // colour "-1" means use the base tin colour.
    "      "      "
    "      "      "
}
// end of colours block

```

// Input Block

//

// More information about how the tin was created by **12d Model**.

// None of this information is needed when reading a tin into **12d Model**.

// This block can be omitted

```

input {
    preserve_strings  true/false      // data for reconstructing tin from strings
    remove_bubbles   true/false      // if true, preserve breaklines etc.
    weed_tin          true/false      //
    triangle_data     true/false
    sort_tin          true/false
    cell_method       true/false

    models {
        "model_name_1"      // name of the first model making up the tin
        "model_name_2"      // name of the second model making up the tin
        "      "      "
        "      "      "
    }
}
// end of models block

```

```
    }                                // end of input block
}                                    // end of tin ascii definition
```

Please continue to the next section [Super Tins](#)

Super Tins

```
super_tin {
    name    tin_name    // MANDATORY name of the super tin

    time_created text    // optional - time super tin first created
    time_updated text    // optional - time super tin last modified

// Attributes Block:

// This is mainly information used by 12d Model to create the super tin.
// The attributes in this block and the Attributes block itself are optional.
// When a super tin is read into 12d Model from a 12da file, the style is used
// as the Super Tin style.

    attributes {
        text "style"          text    // name of line style for the tin
//          any other attributes
    }                                // end of attributes block

// Super Tin Colour
// The super tin has a base colour

    colour tin_base_colour    // optional - base colour of the super tin

// Tins Block
//
// This is the list of tins that make up the super tin.
// This block is MANDATORY

    tins {                                // list of tins for the super tin
        "tin_name_1"                // name of the first tin making up the super tin
        "tin_name_2"                // name of the second tin making up the super tin
        " " " "
        " " " "
    }                                // end of tins block
}                                    // end of super tin ascii definition
```

Please continue to the next section [12d Ascii Definition for Plot Frames](#).

12d Ascii Definition for Plot Frames

Plot frames can be written out and read in from a 12d Ascii file.

```
string plot_frame {
    name                frame_name
    title_file          filename
    border              0 or 1
    viewport            0 or 1
    user_title_file     0 or 1
    title_1             text
    title_2             text
    plot_file           filename
    text_size           mm
    sheet_code          text
    width               value
    height              value
    scale               value
    rotation            value
    xorigin             value
    yorigin             value
    left_margin         mm
    right_margin        mm
    top_margin          mm
    bottom_margin       mm
    plotter             text
    colour              colour
    textstyle           textstyle_name
}
```

To return to the beginning of the **12d Ascii** document, click on [12d Ascii File Format](#).



B 12d Survey Guide

The information contained in this appendix outlines the general options, terminology, definitions and methods used by **12d Model** for the purpose of the input, reduction and output of survey information. It is a general guide, with the appendices following relating to specific instruments and the interactions with **12d Model**.

See [Guide to Survey Reduction in 12d Model](#)

[Guide to Survey Coding in 12d Model](#)

[Field Coding](#)

[Field Templates](#)

[Shape field coding](#)

[Traverse coding](#)

[Field Coding for Leica Instruments](#)

[Field Coding for Non Leica Instruments](#)

[Data Collector Definitions](#)

[The 12d Field File Format](#)

[Batch Typed Entry](#)

Please continue to the next section [Guide to Survey Reduction in 12d Model](#).

Guide to Survey Reduction in 12d Model

The **12d Model** survey options are used to reduce electronically recorded survey information and produce **12d Model** strings, a process called **survey reduction**.

In the most general case, there are three steps involved:

1. **12d Model** downloads raw data from a data collector and stores it on the computer.
2. The raw data file is converted to a standard **12d Model** raw field file format, normally with extension of ".fld". For simplicity, the standard **12d Model** raw field file is called the "12d field file".
3. The 12d field file is read into a **12d Model** Survey Reduction function (12d Survey function) and reduced. If errors occur, the field data for 12d Survey function can be interactively and/or graphically edited. The reduction produces **12d Model** super strings in one or many **12d Model** models.

In some circumstances, not all steps are necessary.

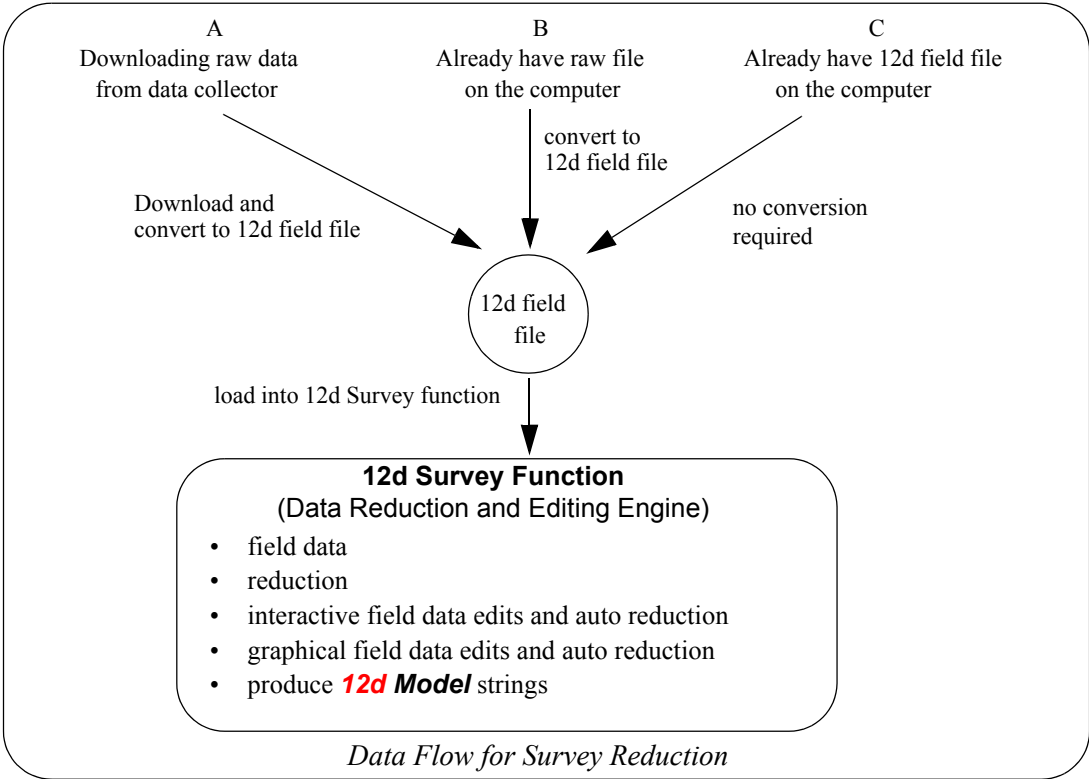
For example, Step 1 is not necessary when the raw data file is already on the computer (and hence doesn't need downloading).

This often occurs when data collectors have PCMCIA cards and PCMCIA card readers on the computer. Another example is when the raw data file has already been downloaded to the computer using another package such as HyperTerminal. Or maybe the raw data file has already been downloaded in a previous **12d Model** session.

Steps 1 and 2 are not necessary when the data is already in the form of a 12d field file.

This occurs when other software packages, such as TP Setout, can produce a 12d field file. Or the 12d field file was created in a previous **12d Model** session, maybe even on a different computer.

A data flow diagram for the survey reduction process is:



Please continue to the next section [Guide to Survey Coding in 12d Model](#).

Guide to Survey Coding in 12d Model

At first the whole process may seem confusing because there are a multitude of methods of setting up coding in the field. Why isn't there just one way of doing things?

Firstly, each brand of survey instrument has a totally different format for recording information. Unfortunately there is no industry standard. In fact, different instruments from the same survey instrument manufacturer can have different formats for recording data.

Secondly, many of our customers were already familiar with another survey package and if possible, wished to continue field coding in the same way. Where possible, **12d Model** has tried to accommodate this wish. Since **12d Model** has replaced a number of survey packages, this led to yet more possible configurations.

12d Model has also been developing its own preferred method of field coding for each instrument. It is not compulsory to use the 12d method but of course it is the only way of taking advantage of features that are not available in other coding systems. For example, defining and using field templates and recording user-defined attributes on points and segments.

So to make help guide you through survey coding section:

- (a) There are field coding concepts used in **12d Model** that are common to all instruments. For example, feature codes and string numbers, offset, close strings etc.
These are described in [Field Coding](#)
- (b) There are template field coding concepts used in **12d Model** that are common to all instruments. These are described in [Field Templates](#)
- (c) There are shape field coding concepts used in **12d Model** that are common to all instruments. These are described in [Shape field coding](#)
- (d) There are traverse field coding concepts used in **12d Model** that are common to all instruments. These are described in [Traverse coding](#)
- (e) For leica instruments, the coding methods are different from most other types. These are described in [Field Coding for Leica Instruments](#)
- (f) For non-leica instruments, the concepts used in coding are similar for each type. These are described in [Field Coding for Non Leica Instruments](#)

Field Coding

EDM equipment is used to make readings of points in the field.

However, rather than just collecting points, it is usually desirable to add extra information by coding the readings in a way that can be interpreted during the data reduction process and produce more valuable information.

Unfortunately, there is no industry standard for this extra coding and it is software specific.

In **12d Model**, the extra information is included in one or both of

- s a *feature code* and *string number*
- s extra commands called *field codes*

How the *feature codes*, *string number* and *field codes* are added in the field depends on the data collector being used and the coding convention set up by the user in **12d Model**.

For example, some surveyors like to enter the *feature code* before the *string number*, others like to enter the *feature code* after the *string number*. Other surveyors don't use string numbers at all but prefer to use a *New String* command to start new strings (mainly ex SDR Map users).

In **12d Model**, a particular *field coding convention* is defined by the user and stored with a **unique** name as a *data collector definition* in the file survey.4d. New data collector definitions can be created and existing ones modified using the *Survey Data Collectors* section of *Project=>Browse*.

12d Model converts all the raw data files from the different survey instruments and data recorders with different coding conventions, into the one **12d Model** standard field file format before being loaded into a **12d Model** Survey Reduction function and reduced. The **12d Model** standard field file will simply be referred to as the **12d** field file or just the field file.

The use of many of the commands allowed in the **12d** field file will now be described. The complete definition of all the 12d field file commands will be described later.

The coding methodology for specific data recorders will be described in separate Sections.

Please continue to the next section [Stringing in the Field](#).

Stringing in the Field

In the coding convention, it is possible to specify that

- (a) *feature codes* and *string numbers* are used
- or
- (b) just feature codes.

Case (a) *feature codes* and *string numbers*

If *feature codes* and *string numbers* are entered with measurements in the field, a coding methodology is used so that strings are automatically created during the reduction process.

To allow this stringing, the **feature code** and **string number** are interpreted in the following manner:

During reduction, **12d Model** connects measurement points with the **same feature code and string number** in the order they are measured in. That is, the feature code **and** string number determines which points are joined together to form the vertices of a super string. At the end of the reduction, the *string number* is dropped and just the *feature code* remains as the *name* for the super string.

Hence the *feature code* and *string number* combination allows any number of different super strings with the same name (feature code) to be produced.

If the *string number* is zero, then the point-line type of the super string is set to *point*. If the *string number* is non-zero, the point-line type of the super string is set to *line*.

Finally, during reduction, the *feature code* can be used as the key to a mapping file to specify the name, model, colour, point-line type, linestyle, tinability and other details for the super string.

Note that the measurements of points with different feature codes and string numbers can be intertwined. That is, *not* all the points in one super string need to be measured before the points in a different super string.

Hence at the end of the reduction, **12d** Model super strings are created for each unique *feature code* and *string number* combination in the input data.

Note - if the *string number* is blank, the *string number* defaults to 0

Case (b) just *feature codes*

If just *feature codes* are used then a *New String* command is used to start a new super string rather than giving a new string number.

During reduction, **12d** Model connects measurement points with the **same** feature code in the order they are measured in until a *New String* command is found. That is, just the feature code determines which points are joined together to form a super string and the *New String* command defines when a new super string begins.

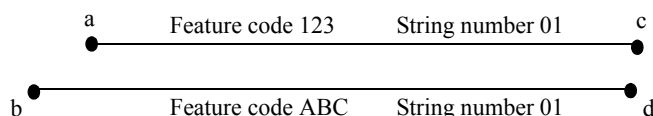
At the end of the reduction, the *feature code* remains as the *name* for the super string.

Also during reduction, the *feature code* can be used as the key to a mapping file to specify the name, model, colour, point-line type, linestyle, tinability and other details for the super string.

Note that the measurements of points with different feature codes can be intertwined. That is, *not* all the points in one super string need to be measured before the points in a different super string.

An Example of Coding to String Points Together

Two super strings are to be created, one joining points **a** and **c**, the other joining points **b** and **d**.



Points may be measured and assigned *feature codes* and *string numbers* as follows:

Measurement to point	Feature code	String Number
a	123	01
b	ABC	01
c	123	01
d	ABC	01

Alternatively, the points could have been measured in the order a, c, b, d as long as the correct *feature codes* and *string numbers* were entered.

Measurement to point	Feature code	String Number
a	123	01
c	123	01

Measurement to point	Feature code	String Number
b	ABC	01
d	ABC	01

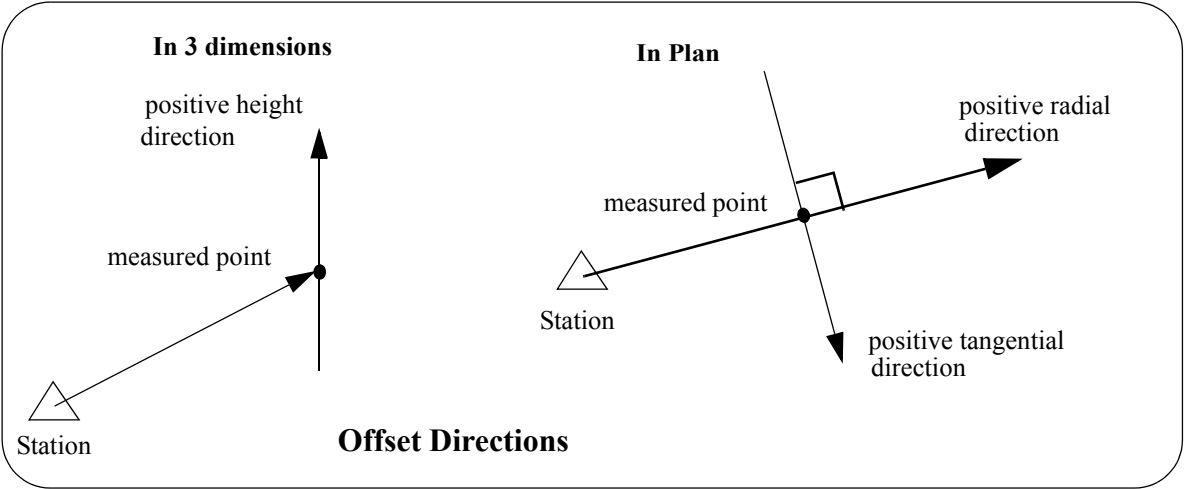
Because the *string numbers* are non-zero, the default *point-line* type for both super strings is *line*. Please continue to the next section [Offsets](#).

Offsets

It is not always possible to measure a point directly but it may be possible to measure a point nearby and then measure an offset to adjust the measured point by and so produce the co-ordinates of the required point.

The three offsets that are allowed in the 12d field file are:

- Height** - The *height offset* adjusts the height of a non-null point. A positive offset adds to the height and a negative offset reduces the height.
- Radial** - The *radial offset* adjusts the position of the specified point by a *plan* distance from the specified points original position, along the plan line joining the current station to the specified point. A positive offset is away from the station and a negative offset is toward the station.
- Tangential** - The *tangential offset* adjusts the position of the specified point by a *plan* distance from the specified points original position, at rights angles to the plan line joining the current station to the specified point. A positive offset is to the right (looking from the station to the point) and a negative offset is to the left.

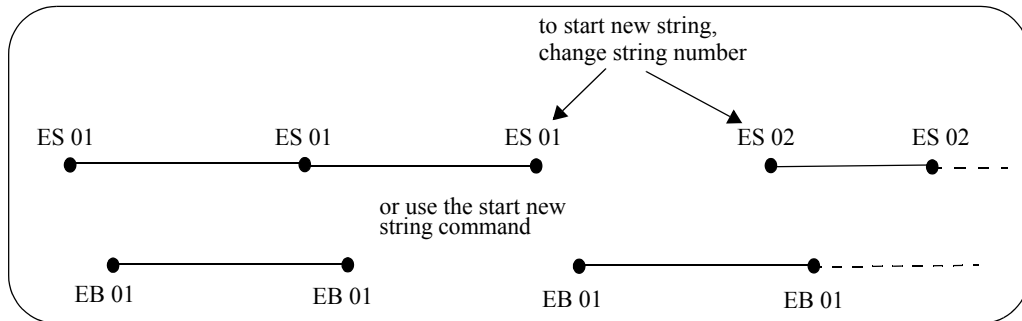


Please continue to the next section [Start New String](#).

Start New String

A new string is automatically started whenever a different string number is used. However there is also a **start new string** command which begins a new super string even if the string number is the same as the string number for previous points.

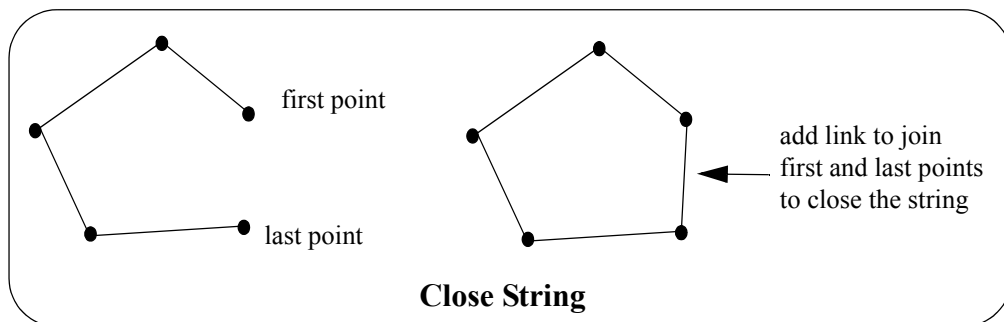
The *New String* command is particularly useful for correcting the field error of forgetting to change the string number.



Please continue to the next section [Close String](#).

Close String

The close string command closes a super string by joining the first and last points of the super string. If a super string is already closed, then the close has no effect. The string closed command can be given at the recording of any point of the string, and the entire string is closed.

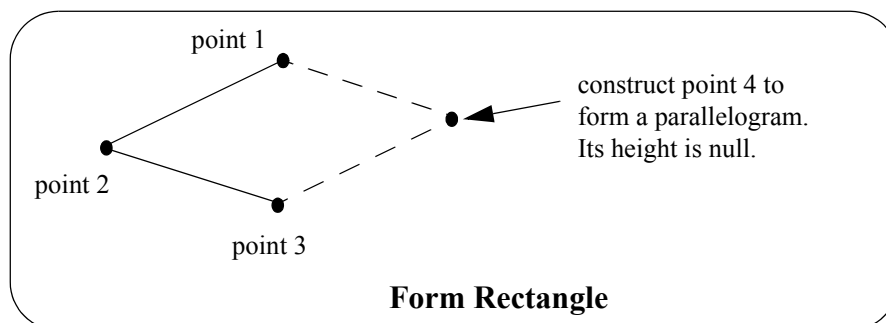


Please continue to the next section [Rectangle](#).

Rectangle

The rectangle command acts on last three points of a string and adds a new point after the last point to form a parallelogram (squashed rectangle). The string is then closed.

The height of the added point is set to null.

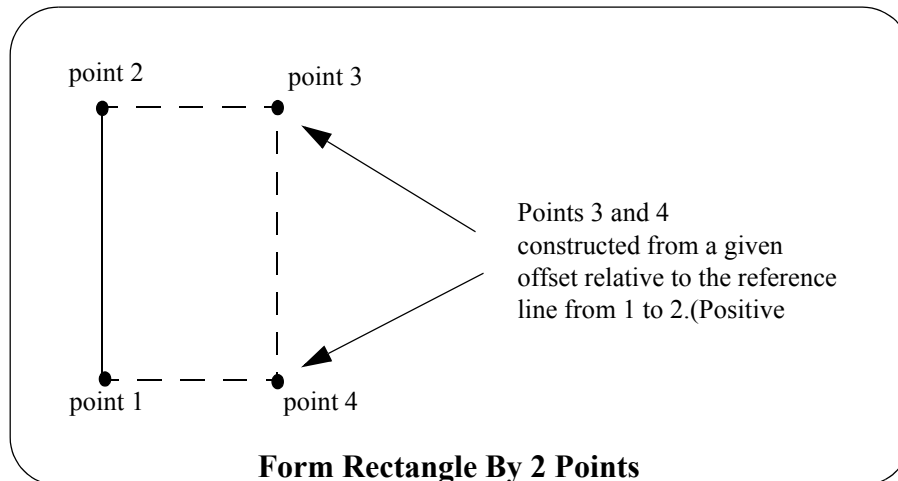


Please continue to the next section [Rectangle by 2 Points](#).

Rectangle by 2 Points

The rectangle by 2 pts command acts on last two points of a string and adds two new points at a given offset after the last point to form a rectangle. The string is then closed.

The height of the added points are set to null.



Please continue to the next section [Feature](#).

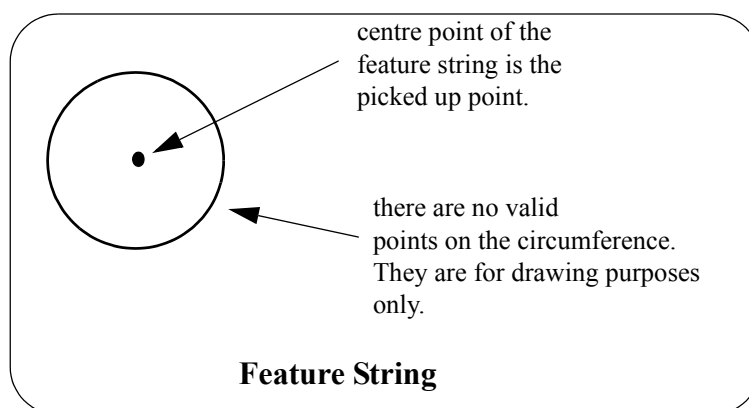
Feature

A *feature string* is a circle with a z-value at the centre but only null values on the circumference of the circle.

The feature commands creates a *feature string* with the picked up point as its centre and the radius/diameter being set by the feature command.

If a feature string is given a **world** line style, then the style is centred on the centre point of the feature string and scaled up to the radius of the feature string.

If a feature string is given a **screen** or **paper** line style, then the style is wrapped around the circumference of the feature string.



Please continue to the next section [Joining Strings](#).

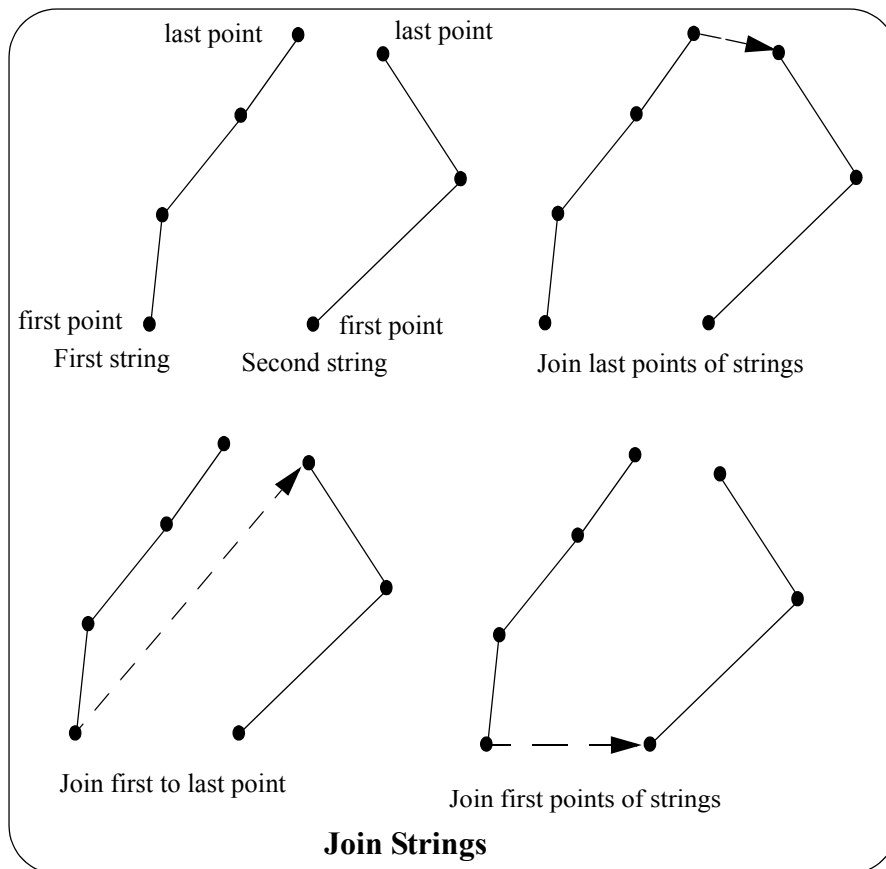
Joining Strings

There are three commands for joining two strings together.

Join last points of strings - the last point of the first string is joined to the last point of the second string. The direction of the final string is along the forward direction of the first string, across to the end of the second string and then in the reversed direction of the second string.

Join first to last points of strings - the first point of the first string is joined to the last point of the second string. The direction of the final string is in the reverse direction of the first string, across to the start of the second string and then in the forward direction of the second string.

Join first points of strings - the first point of the first string is joined to the first point of the second string. The direction of the final string is in the reverse direction of the first string, across to the start of the second string and then in the forward direction of the second string.



Please continue to the next section [Arcs Through Points](#).

Arcs Through Points

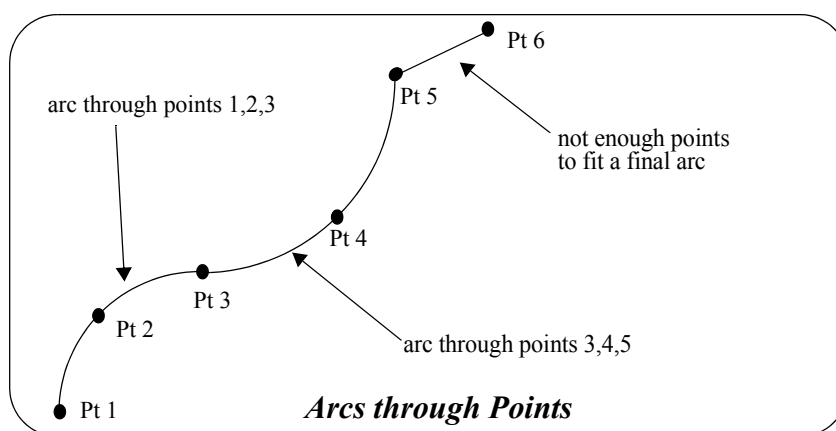
There are a number of commands to fit arcs through sequences of three or more points. Note that this is an **arc** in **plan**, with different z-values at each of the three points. The z-values are linearly interpolated around the arc between the points.

Hence it is a **helix** and **not** a circle in the plane containing the three points. Note that an 3d-arc in a plane not parallel to the x-y plane does **not** project onto an arc in the x-y plane.

There are arc commands to

- (a) fit an arc through the next three points
- (b) fit an arc through the previous three points.
- (c) fit arcs to sets of three points until stopped.

The first two cases need no explanation but in the final case, a arc is fitted to the first three points, and then another arc to points 3, 4 and 5 and then an arc through 5,6 and 7 and so on. If at any stage there is only one point left, then no arc can be fitted and a straight line is drawn to the final point.



Please continue to the next section [Field Templates](#).

Field Templates

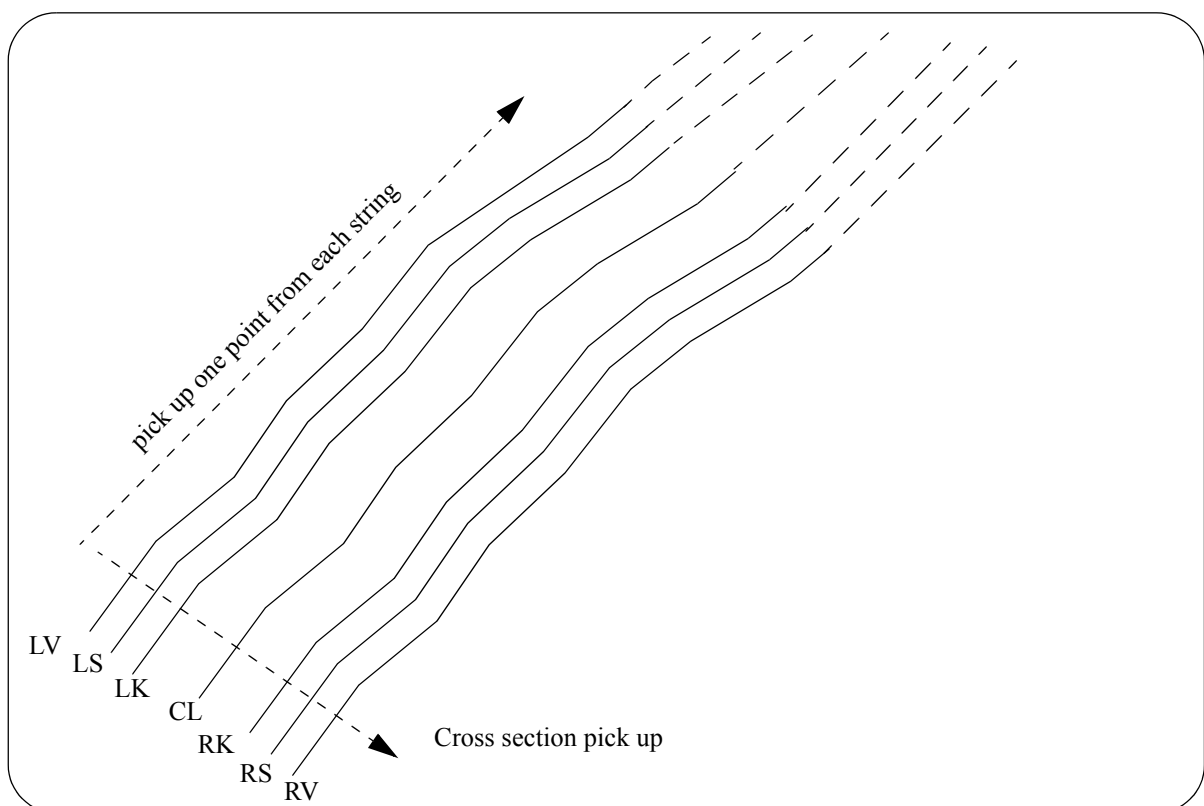
If a series of points are being picked up along the one string then the *feature code* and *string number* only need to be entered once since the default is for a measurement to use the last *feature code* and *string number* if no new ones are given.

However it is often much more efficient to pick up one point from a number of strings before moving onto the next point of each string (this is called a cross section pick up).

For example when picking up a road, it would be preferable to pick up the points for a section across the road and then move onto the next section rather than picking up all of one string at a time.

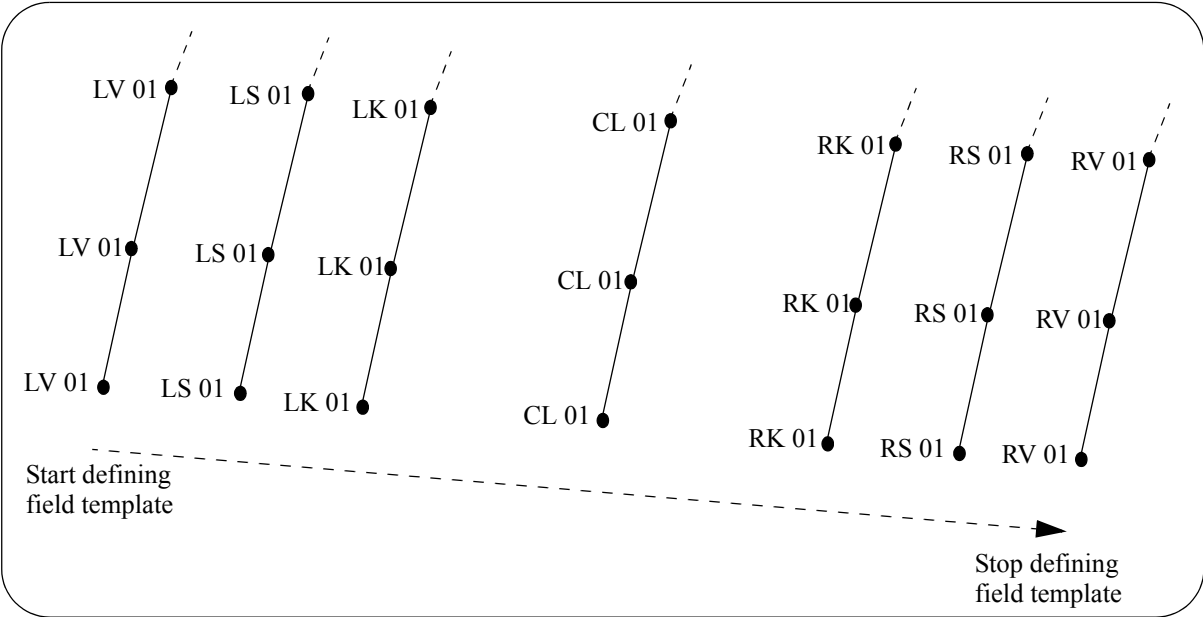
In the diagram below, this means picking up one point from each of the strings LV, LS, LK, CL, RK, RS, RV and then moving onto the next cross section rather than picking up all of LV and then all of LS and so on.

Normally if each measurement is from a different string, then the feature code and string number would need to be re-entered with each measurement which is a very time consuming process. To simplify the coding for section pick up, **12d Model** uses **field templates**.



Basically, a **12d Model** *field template* consists of defining a sequence of *feature codes* and *string numbers* pairs for the field template. The field template can be given a unique name or have no name at all.

When a field template is used, measurements are taken without entering a *feature code* and *string number* and the *feature code* and *string number* for the measurement come from the *field template definition*.



For example, a field template could be defined as the sequence:

LV 01, LS 01, LK 01, CL 01, RK 01, RS 01, RV 01

When the field template is used, measurements are taken without giving a feature code or string number and the measurements will be sequentially given the codes LV 01, LS 01, LK 01 etc.

To define a **12d Model** field template, there is a command to *start recording* the field template.

The *feature codes* and *string numbers* for the next series of measurements until the *stop recording* command is given, are stored as the field template. There are also commands to *insert* and *delete* a point in the template when it is being used for picking up points.

When a field template is used, the feature code and string number from the field template can be used:

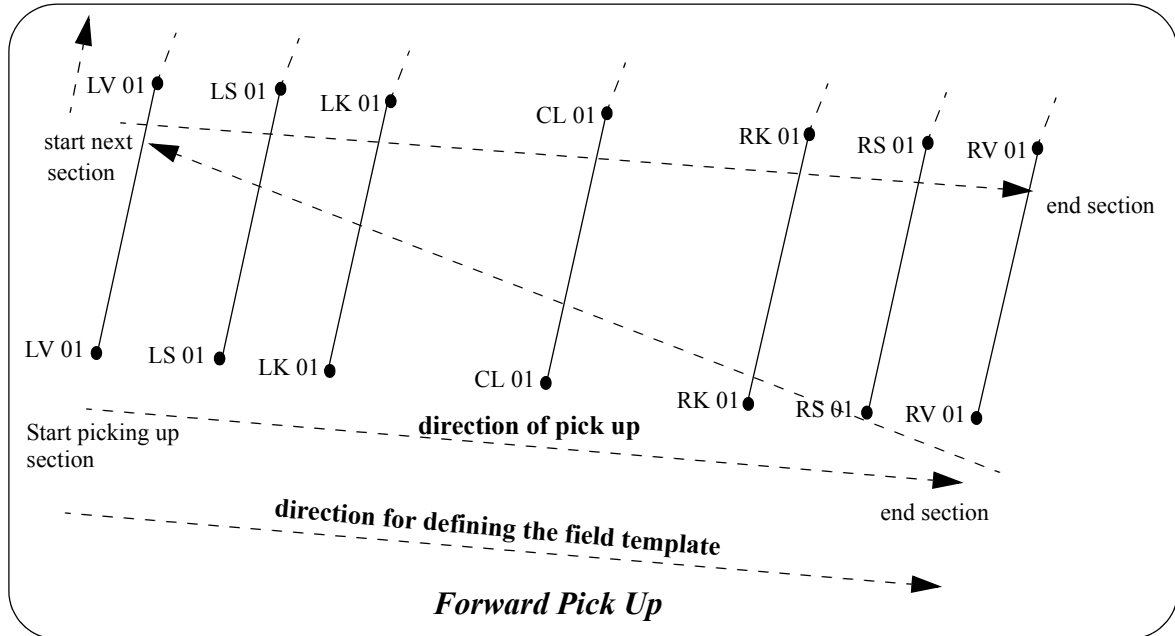
- (a) in the same order as the codes are defined in the field template (forward direction).
- (b) in the opposite order to how the codes are defined in the field template (reverse direction).
- (c) in an alternating same and opposite order that the codes are defined in field template (zig-zag)

These three modes of usage of a field template will be described in the following sections.

Please continue to the next section [Forward Direction](#).

Forward Direction

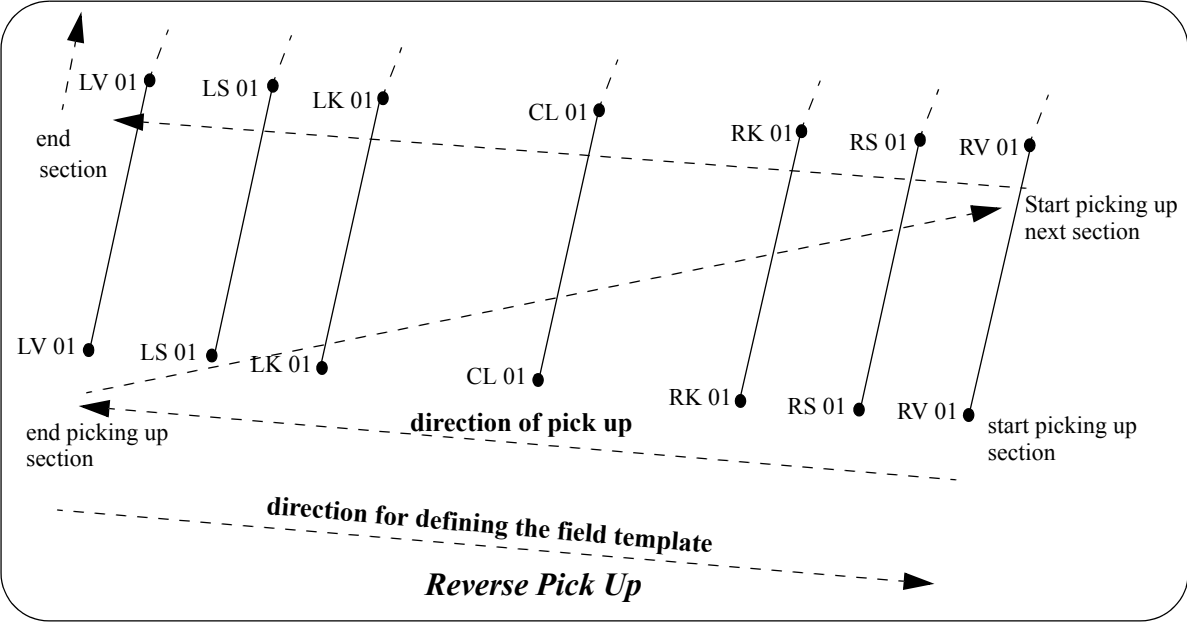
If the field template is used in the *forward* direction, then the feature codes and string numbers are used in the same order that they were defined to be in the field template. Once the end of the field template is reached, the feature codes and string numbers re-start at the beginning of the field template.



Please continue to the next section [Reverse Direction](#).

Reverse Direction

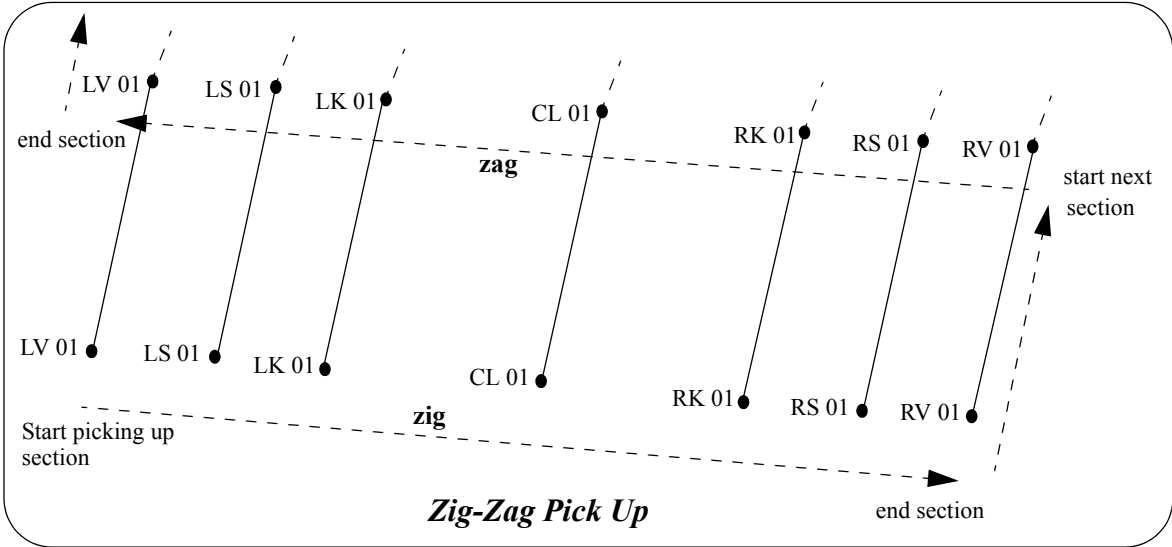
If the field template is used in the *reverse* direction, then the feature codes and string numbers are used in the reverse order to what they were defined to be in the field template. That is the feature codes and string numbers start at the *end* of the field template definition and are used in the reverse order. Once the beginning of the field template is reached, the feature codes and string numbers re-start at the end of the field template and are used in the reverse order.



Please continue to the next section [Zig-Zag](#).

Zig-Zag

When picking up a road in sections, it is often quickest to pick up the first section going from one side of the road to the other side, and then move onto to the next section point on the other side of the road and pick up points coming back across the road. Hence the points for the second section are in the reverse order to those in the first section. This process is known as zig-zagging.



This situation can be covered in two ways. A field template could be defined containing all the points for two sections and the field template used in the forward (or reverse) direction. For example, the field template to be used in the forward mode could be defined as:

LV 01, LS 01 LK 01, CL 01, RK 01, RS 01, RV 01, RV 01, RS 01, RK 01, CL 01, LK 01, LS 01, LV 01

However, in **12d Model** it is only necessary to define the *one* section
LV 01, LS 01 LK 01, CL 01, RK 01, RS 01, RV 01

and when the field template is used, it is specified that it is being used as a *zig-zag* field template starting on either the *zig* (the forward direction of the field template) or the *zag* (the reverse direction of the field template).

Once a *zig* is completed, **12d Model** automatically uses the reverse order of the field template and hence produces a *zag*. Similar, once a *zag* is completed, **12d Model** uses the forward order of the field template and produces a *zig*.

Thus a *zag* automatically follows a *zig* and a *zig* follows a *zag*.

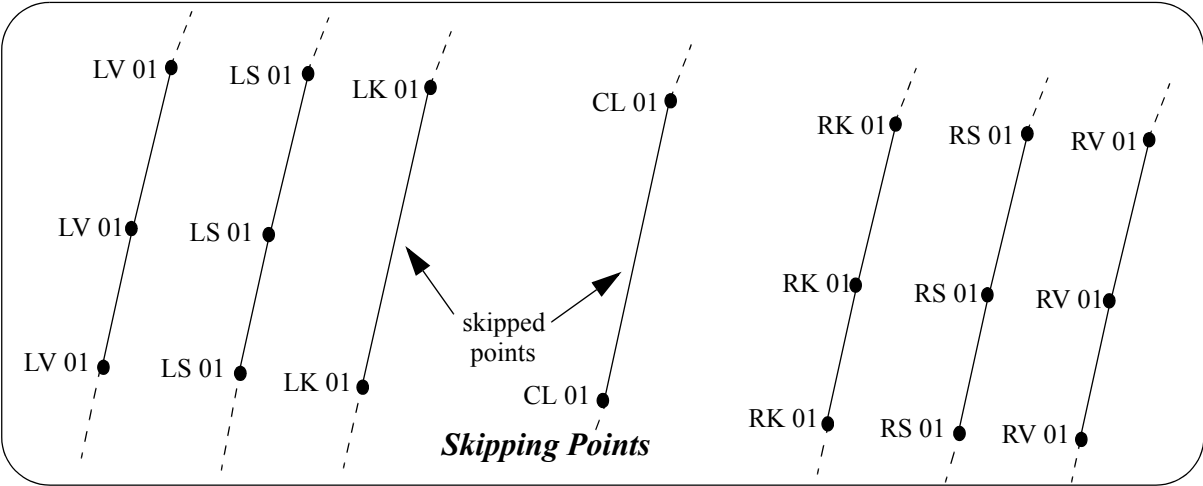
Hence if a field template is used in the zig-zag mode, it can be used as either:

- (a) a zig-zag field template starting on the *zig*
- (b) a zig-zag field template starting on the *zag*.

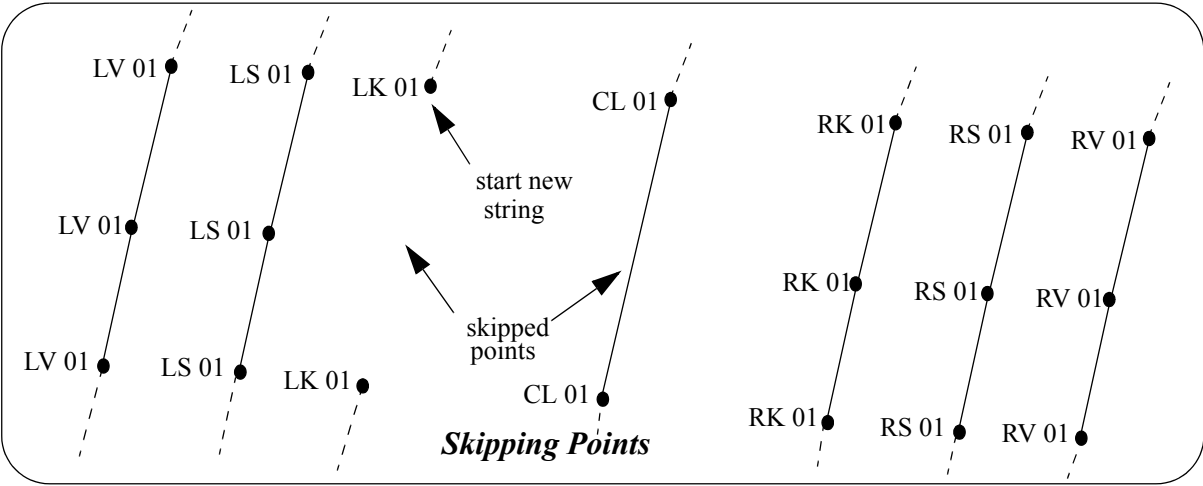
Please continue to the next section [Skipping Field Template Points](#).

Skipping Field Template Points

When picking up points using a field template, **12d Model** allows for one or more points to be skipped. By default, the points on the strings on either side of the skipped points will then be joined together.



By combining skipping points and start new string commands, points can be skipped and new strings started on the other side of the skipped points.



Please continue to the next section [Insert Template Points or Insert Multiple Codes](#).

Insert Template Points or Insert Multiple Codes

When picking up points using a field template, **12d Model** allows for one or more points to be inserted. The inserted points **change** the template from that point onwards so that extra strings can be picked up as they arise.

If the insert point command is given after the last point of a template, a flag can be applied to specify which template pick-up the inserted point is to be added to. That is, add it to the last series of points or the next series. This flag is called the "insert special" flag.

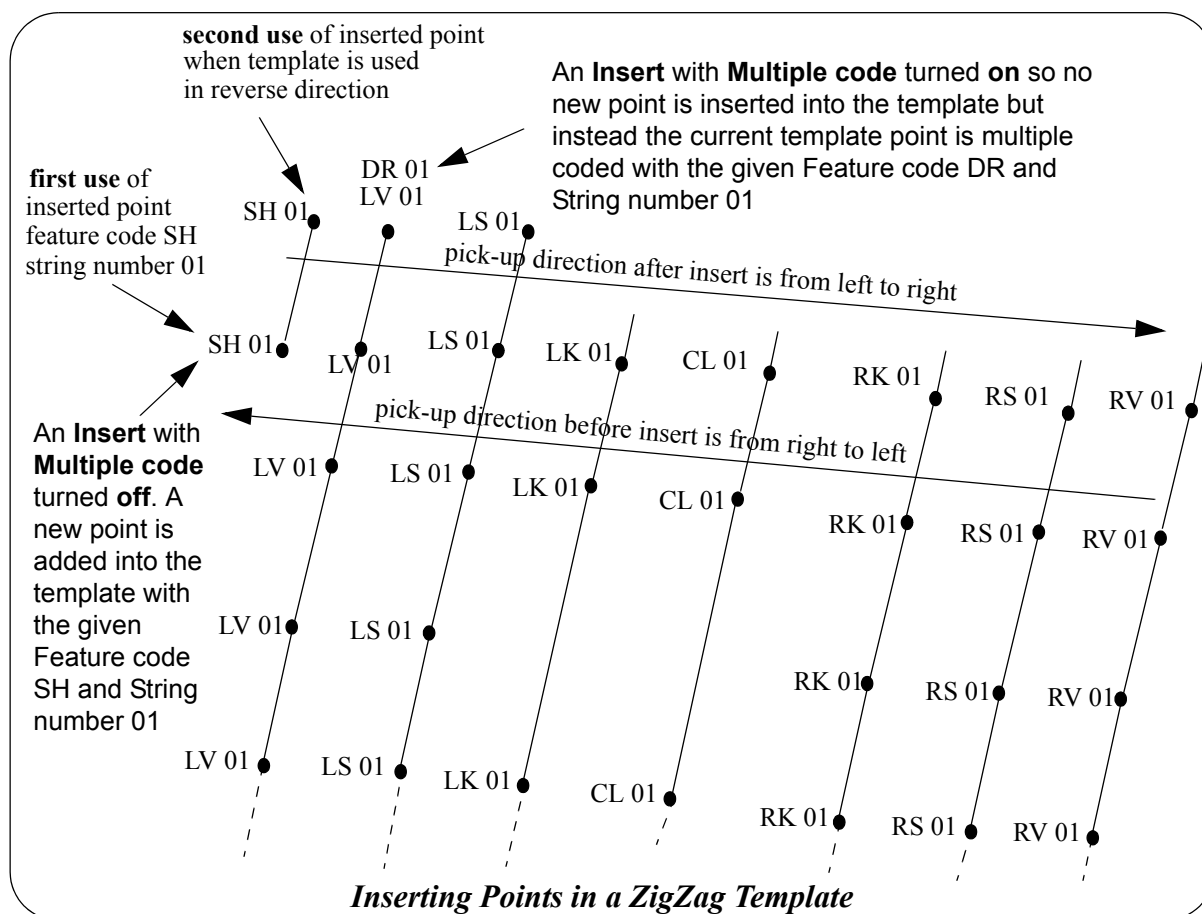
If ticked on in the insert panel, or if the flag given in the offset code is 1, the point will be added to the current series of points in the template being picked up.

In the case shown below where SH 01 is inserted, the insert special flag should be set to on so that the next picked up point will be on the current template. The insert would have been made after the last LV 01 observation in the last pick-up direction. The following pick-up will use the redefined template definition.

Note - in the example below, it is a zig-zag template so SH 01 is then used again straight away as the first point of the pickup when coming from left to right.

With the Insert, rather than insert new template points, it is also possible to give multiple codes to existing points in the template so that more than one code can be assigned to the one pick-up point (insert multiple codes).

In the case shown below, an insert was made on the next pick-up direction after the LV 01 observation. The multiple code tick box or flag was set on so that the last picked up point will be assigned the extra code specified, in this case DR 01. The template will be applied to all subsequent measurements so that the observed LV 01 string will also be coded DR 01.

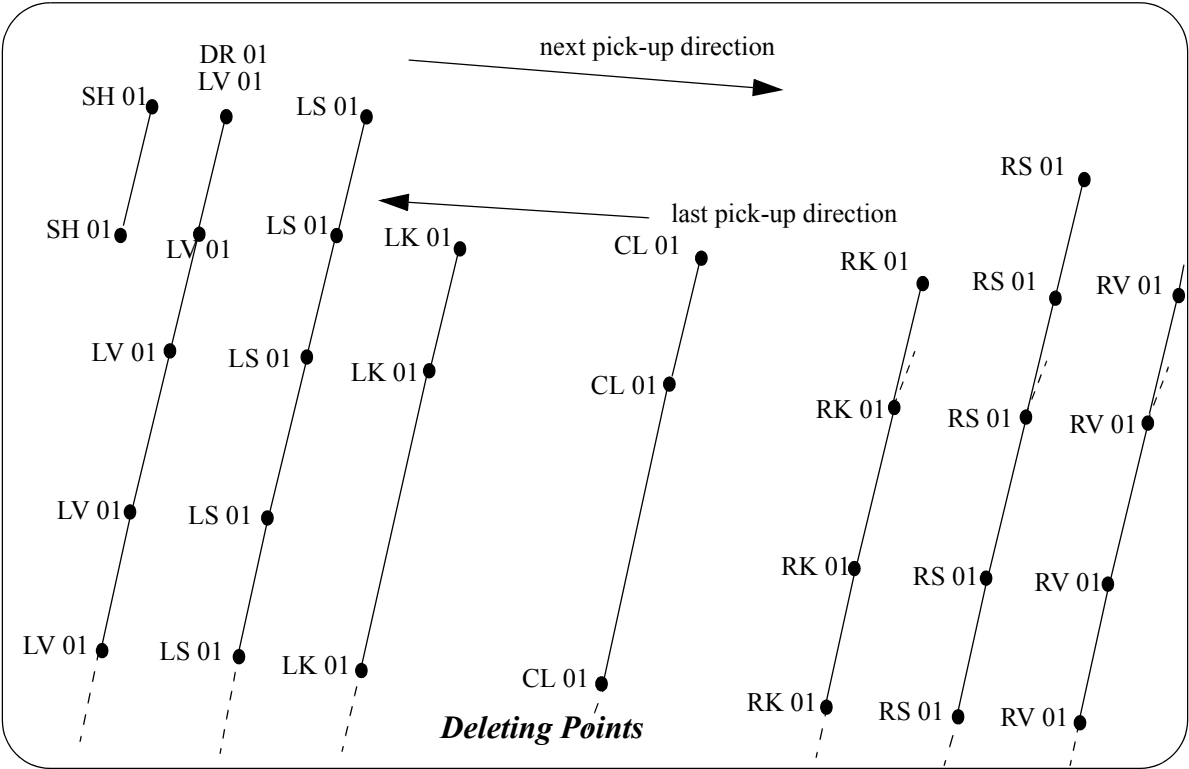


Please continue to the next section [Delete Template Points](#).

Delete Template Points

When picking up points using a field template, **12d Model** allows for one or more points to be deleted. The deleted points change the template from the next specified number of points inclusive of the current point. i.e. They are removed from the template.

If a template delete command was given after the LS 01 string in the next pick-up direction, and the number of specified points were 3, the template will be altered such that the next observed string will be RS 01.



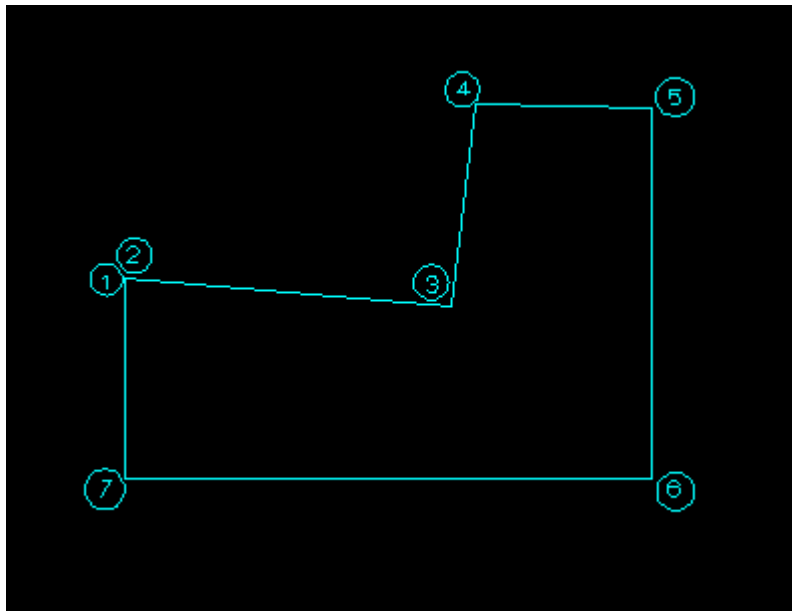
Shape field coding

If a an object of a standard section is to be picked up such as a length of kerb, a shape can be defined and extruded/paralleled along a single pick-up string related to that shape.

For example, a kerb shape can be defined by observing all points on a typical section of the kerb and assigned a shape name. Then when picking up the length of kerb, only one reference string to the shape (defined when recording the shape) has to be picked up e.g. lip of kerb. On reduction, 12d can extrude or parallel the shape such that the strings/shape of the kerb are produced for the entire kerb pick-up.

Normally if each measurement is from a different string e.g back of kerb, lip kerb etc., then the feature code and string number would need to be re-entered with each measurement which is a very time consuming process. To simplify the coding for section pick up, **12d Model** uses *shape field coding*.

Basically, a **12d Model shape** consists of observing a number of points on a given section of an object. The shape can be given a unique name or have no name at all.



For example, a shape can be defined by observations shown in order above

1- being the reference point, 2- 7 being the shape points. In this case, the 1st point of the shape pick-up coincides with the reference point.

To define a **12d Model shape**, there is a command to *start and end the recording* of the shape. The *feature codes* and *string numbers* for the next series of measurements until the *stop recording* command is given, are stored in the final shape.

As the shape is defined, other field codes can be used in conjunction such as offset. In this example an observation may be made at 5 for the position of 6 using a vertical offset. Similarly for point 7 using the observation at a point near point 2. In addition, points 6 and 7 can be made non-tinable so that formation of a tin is constrained to the surface of the kerb.

The next step is to pick up the entire length of the kerb at the reference string position using the same *feature code* and *string number* used for the reference string in the shape pick-up. In this example the lip of kerb.

Once completed, the shape can be extruded or paralleled using the extrude or parallel

commands. The parallel command will create a number of strings according to the number of points on the shape. The extrude will create a super string with a shape defined like a pipe string.

Traverse coding

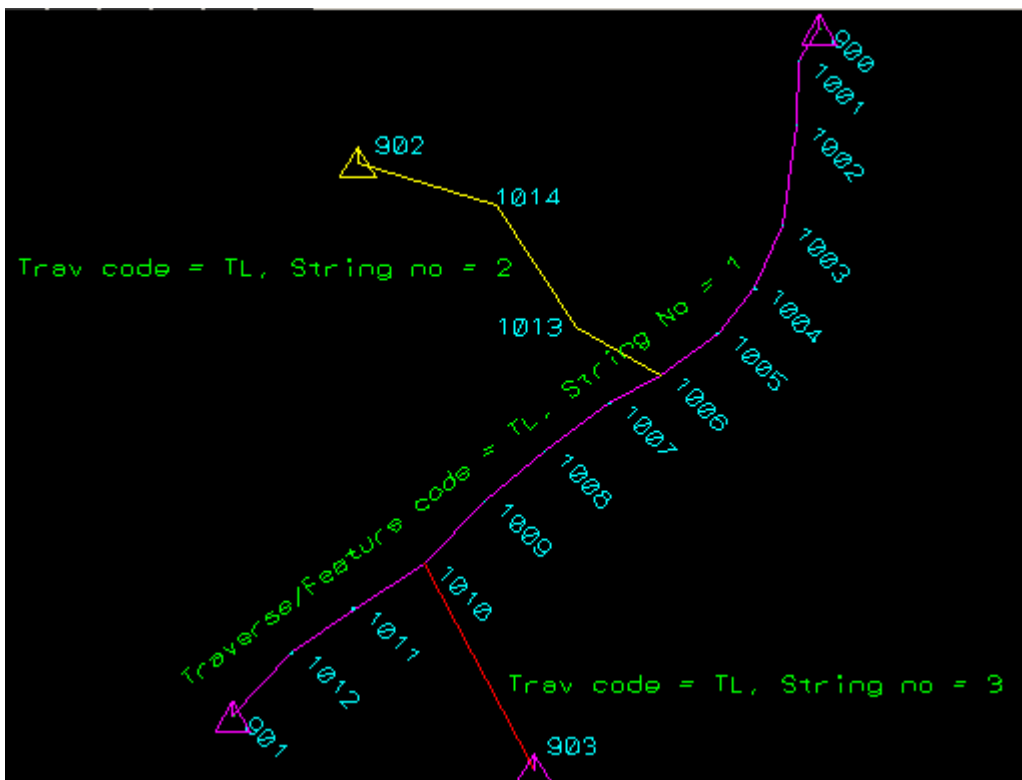
If a traverse is undertaken as part of a survey, a traverse code and string number can be coded so that 12d can extract the traverse information. The specific traverse code can be supplied in the survey reduction panel under the traverse tab. An example is shown below:

Traverse	Geodetics	Others
Do traverse calcs		<input checked="" type="checkbox"/>
Traverse code	TL	+
Adjust method		▼
Network model	traverse string	

In this case, the feature code of TL will be searched in the field file on reduction, so that a traverse string can be extracted. The user is required to nominate the foresight measurement with the TL code in this example. If they also include the TL code in a backsight to a previously defined traverse leg, a reciprocal calculation will be made. It uses the pair of observations (Foresight and Backsight observations of the same line e.g. Foresight 1001 to 1002 and backsight from 1002 to 1001). This reciprocal calculation takes the mean of the distance and vertical angles eliminating the effects of refraction.

A number of separate but interrelated traverses can be extracted using differing string numbers in the field.

The traverse code also allows for adjustments to be made between known stations. This adjustment maybe be chosen in the reduction panel. This field is optional.



Field Coding for Leica Instruments

For Leica instruments, the Leica GSI format breaks lines of data into fixed length 'words' and cannot use the same encoding method as the other instruments. The **12d Model** coding system for the Leica TPS instruments is covered in the section [12d and Leica TPS Instruments](#).

Field Coding for Non Leica Instruments

EDM equipment is used to make readings of points in the field.

Rather than just collecting points, it is usually desirable to add extra information by coding the readings in a way that can be interpreted during the data reduction process and produce more valuable information. Unfortunately, this extra coding is non-standard and software specific.

In **12d Model**, all the raw data files from different data collectors are converted into the one standard field file format (the **12d Model** field file) before being loaded into a **12d Model** Survey Reduction function and reduced. Hence the method for coding information in the data collector in the field needs to be well defined so that it can be sensibly converted into a **12d Model** field file (the section [The 12d Field File Format](#) contains the complete description of the 12d field file).

When a measurement is taken, most data collectors (Sokkia, Geodimeter, Topcon, Nikon etc.) allow the user to enter text which is then output with the measurement data. Depending on the data collector, the total number of characters of text may be strictly limited and may also be restricted to only one line of text. In **12d Model**, a coding system has evolved so the text can be interpreted in a meaningful way.

Blocks and the Block (Command) Delimiter

To allow the one line of text to hold a variety of different information, the line of text is broken up into smaller blocks and each block is processed separately.

The character (or characters) used as the block separator is called the *command delimiter* or *block delimiter*.

Obviously the command delimiter can not appear in any of the commands inside a block.

What is used for the *command delimiter* is user defined in the data collector definition and is found on the *Delimiters* tab of the *Survey.4d Create/Edit* panel in the section [Data Collector Definitions](#).

The default command delimiter is * and this will be used in the examples in this appendix.

Hence using the command delimiter, the text line is broken into separate blocks for processing.

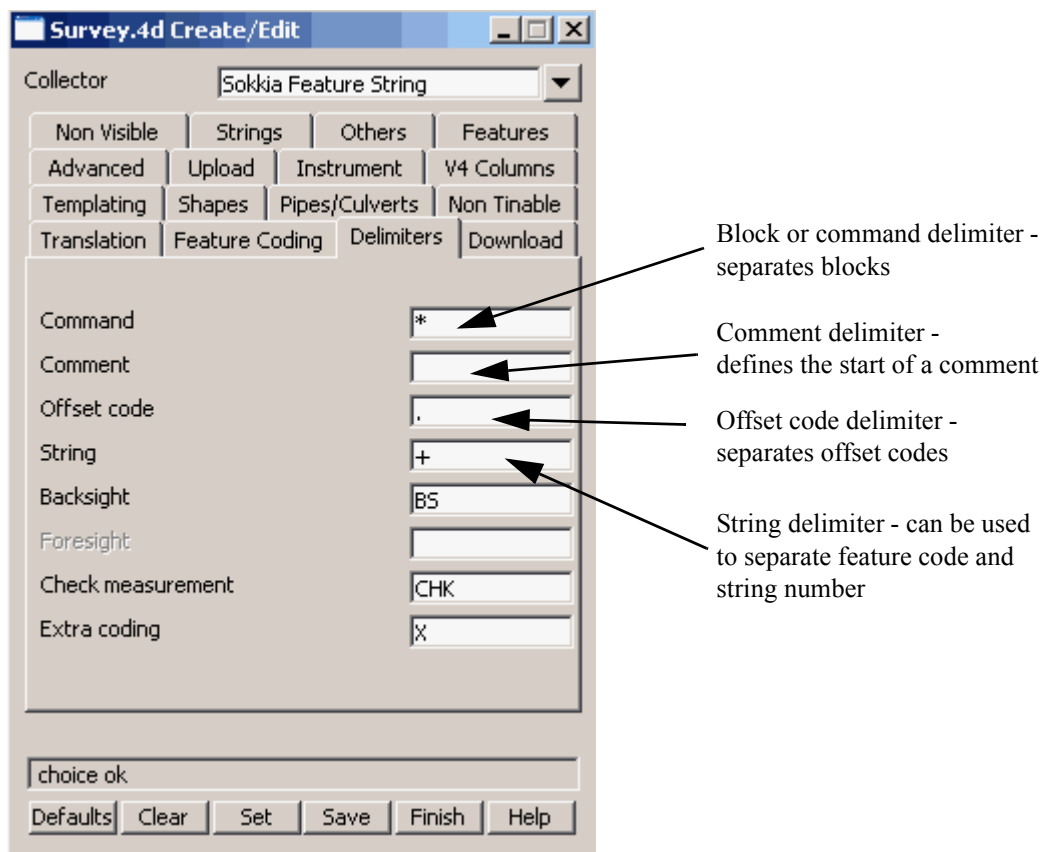
For example, the text string

EB01*XA.road

breaks into the separate blocks.

EB01

XA.road



A block can be either a **control code block** or a **feature code block**.

A **control code block** is any block that start with a valid *control code*.

Valid control codes are simply the one or more characters of text designated in the *Delimiters*, *Features*, *Templating*, *Pipes/Culverts*, *Not Tinable* and *Strings* tabs in the **Survey.4d Create/Edit** panel for the selected data collector definition.

If no control code appears at the start of the block, then the block is taken to be a **feature code block**.

For example, for the *Sokkia Feature String* data collector definition which is installed with **12d Model**, the *valid control codes* are *, dot (.), space, **+**, **BS**, **CHK**, **X**, **C**, **R**, **S**, **E**, **ST**, **XA**, **XB**, **XC**, **XD**, **XE**, **XF**, **NH**, **XP**, **XL**, **XN**, **I**, **O** and **A**

Any block starting with any of above control codes is a **control code block**. Blocks that aren't control code blocks are **feature code blocks**.

Translation	Feature Coding	Delimiters	Download
Command		*	
Comment			
Offset code		.	
String		+	
Backsight		BS	
Foresight			
Check measurement		CHK	
Extra coding		X	

Non Visible	Strings	Others	Features
by radius			
by diameter			

Templating	Shapes	Pipes/Culverts	Non Tinable
Invert			I
Obvert			O
Centre			A

Non Visible	Strings	Others	Features
Close			C
Rectangle			R
Rectangle by 2 pts			
Start arc fitting			S
End arc fitting			E
New string			ST
End string			

Templating	Shapes	Pipes/Culverts	Non Tinable
Record			XA
Start			XB
End			XC
Pause			XD
Pause after			
Continue			XE
Skip			XF
Insert			
Delete			

Templating	Shapes	Pipes/Culverts	Non Tinable
Remove height			NH
Point			XP
Previous segment			XL
Next segment			XN

Tabs on the *Sokkia Feature String* data collector definition which define Control Codes

Blocks can include *comments* and how a comment is specified is given in the next section [Comments in a Block](#).

The feature code block is discussed in the section [Feature Code Blocks](#).

The explanation of each control code is given in the section [Control Code Blocks](#).

Please continue to the next section [Comments in a Block](#).

Comments in a Block

Comments are supported in a block. There is a *Comment* delimiter and all characters after the *comment* delimiter to the **end** of the **block** are treated as a comment.

Comments are attached to the measurement point as **text**.

Hence the *measurement* will create a vertex on a super string and the *comment* will create text at that vertex of the super string.

The default for the *Comment* delimiter is **/** and it is defined by the *Comment* field on the *Delimiters* tab of the *Survey.4d Create/Edit* panel.

For example, if * is the command (block) delimiter and / is the comment delimiter, then in

EB01/first point of a template*XA.road

there are two blocks *EB01/first point of a template* and *XA.road*

and the text "first point of a template" in the first block is a comment and will be added to the super string as vertex text.

Another common character to use as a *comment delimiter* is a space (' '). For example, if * is the command delimiter and space is the comment delimiter, then in

EB01 first point of a template*XA.road

"first point of a template" is a comment.

The *comment* delimiter for the *Sokkia Feature String* data collector is a space

Please continue to the next section [Feature Code Blocks](#).

Feature Code Blocks

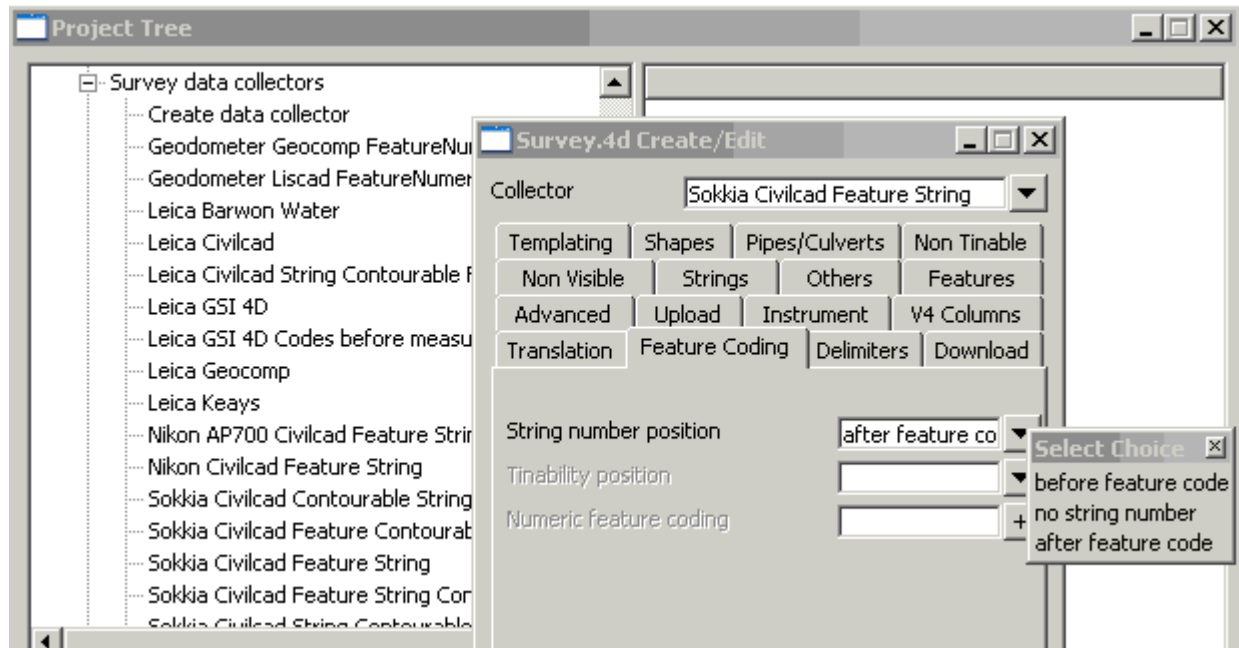
Feature Code, String Number and String Delimiter

In a feature code block, the *feature codes* and *string numbers* are given so that strings are automatically created during the reduction process.

The *feature code* and *string number* appear at the start of the feature code block and can be entered in a variety of ways.

Some surveyors like to enter the *string number* before the *feature code* and other surveyors prefer to enter the *string number after the feature code*. Some surveyors prefer to use *no string numbers* at all (SDRmap users) and use a *new string* control code to start a new string.

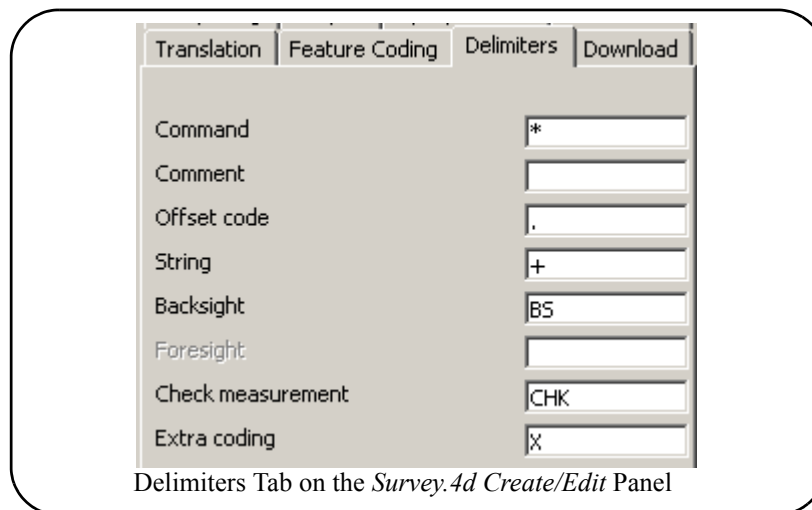
All three methods are supported in 12d. The setting is made on the *String number position* field on the *Feature Coding* tab of the *Survey.4d Create/Edit* panel. The default is 'before feature code'.



If string numbers are going to be used (either *before feature code* or *after feature code*) then there are rules for determining what is the feature code and what is the string number. Note that the *string number* is always *numeric* and can be any length.

Firstly, the *feature code* and *string numbers* can be separated by an **optional String** delimiter given by the *String* field on the *Delimiters* tab of the *Survey.4d Create/Edit* panel. The default character for the *string delimiter* is **+**.

For example, 20+110KVA is interpreted as string number '20' and feature code '110KVA' if the string number comes before the feature code.



Delimiters Tab on the *Survey.4d Create/Edit* Panel

If a String delimiter is not used, then there are **some restrictions** on the feature code so that the feature code and string number can be split apart. Note that the *string number* is always *numeric* and can be any length.

If a string delimiter is not used, then either

- (a) the *feature code* must be *purely alpha* and then the feature code can be of any length.
- or

- (b) the *feature code* is purely numeric. Then the feature code must be the **fixed length** given by the *Numeric feature coding* field on the *Feature Coding* tab of the *Survey.4d Create/Edit* panel. If the *Numeric feature coding* field is not set and the feature code is numeric, then the whole thing is interpreted as a feature code with a string number of 0.

If a *feature code* is a **mixture of alpha and numeric**, then a **string delimiter must be used** to separate the feature code from the string number. Once a string delimiter is used, feature code can be any length.

Tinability as Part of the String Number

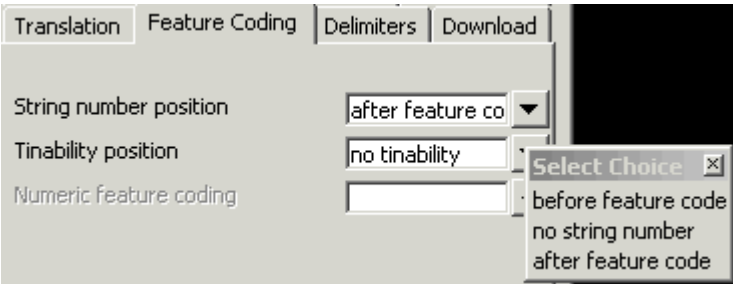
For compatibility with other software coding schemes, the tinability of a point can be included as part of the string number. This is **not normally recommended** since 12d has more flexible methods of defining tinability.

The field *Tinability position* on the *Feature Coding* tab of the *Survey.4d Create/Edit* panel controls whether it is used or not. The default is 'no tinability' as part of the string number.

If tinability is used as part of the string number, then it consists of either a **0** or a **1**.

If *Tinability position* is set to *before string*, the first character of the *string number* is stripped off and taken as the tinability flag. A value of 1 means the point is tinable and 0 is non-tinable.

If *Tinability position* is set to *after string*, the last character of the *string number* is stripped off and taken as the tinability flag. A value of 1 means the point is tinable and 0 is non-tinable.



Offset Codes

It is not always possible to measure a point directly but it may be possible to measure a point nearby and then measure an offset to adjust the measured point by and so produce the co-ordinates of the required point. The three offsets that are allowed in **12d Model** are height, radial and tangential. See the Section [Offsets](#) for more information.

The three offsets height, radial and tangential have the codes H, R and T respectively.

The *offset codes* come after the feature code-string number combination and are separated by the **Offset code** delimiter whose default value is a decimal point (.) and is defined by the *Offset code* field on the *Delimiters* tab of the *Survey.4d Create/Edit* panel.

After the *offset code delimiter*, the offset code is given as either H, R or T and then a real value for the offset (with no spaces in between). The offset can be positive or negative with the sign only being recorded if negative. A second and third offset code (H, R or T) can follow the first but no offset code delimiter is used for the second or third offset codes. The offset code delimiter is only used to separate the field code-point number from the offset codes.

In the example 20+110KVA.H2.1T0.5 there is a horizontal offset of 2.1 and a tangential offset of 0.5.

Multiply Coded Points

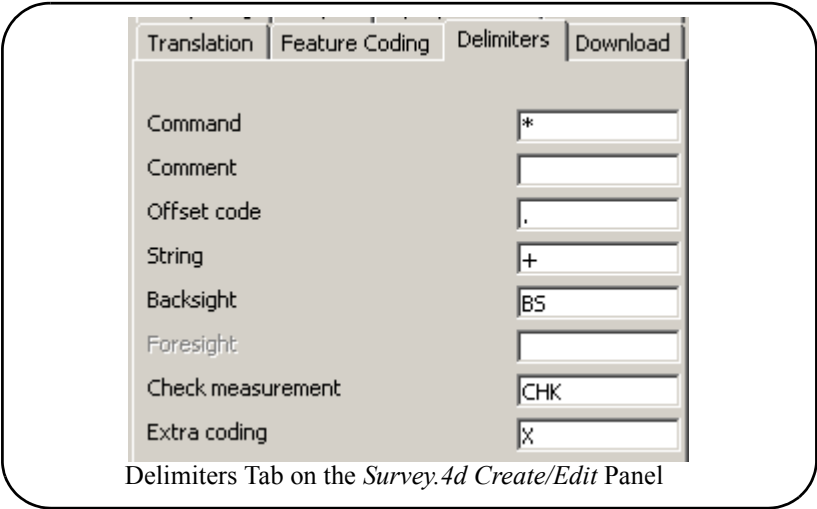
It is possible to have more than one *Feature code block* and this will create a multiply coded point.

For example, if the command delimiter is *, then EB01*PP would have the two feature code blocks 'EB01' and 'PP'.

Please continue to the next section [Control Code Blocks](#).

Control Code Blocks

Control Codes on the Delimiters tab



Extra Coding

This code is only for the instruments supporting the Sokkia SDR format.

The default for the *extra coding* control code is **X** and it is defined by the *Extra coding* field on the *Delimiters* tab of the *Survey.4d* Create/Edit panel.

For some instruments, extra lines of information can be entered after a measurement. For example on a Sokkia by using the note (13NM) to add more information to the previous measurement line (07).

The *extra coding* control code is used to append this additional information to the information on the measurement line. Hence it is then possible to have extra blocks of information on the line (or lines) following the measurement line.

The block containing the *extra coding* control code must be the last block on the measurement line.

For example,

```
EB01/first point of a template*XA.road*X
/ this is some extra info that happens to be a comment
```

is the same as

```
EB01/first point of a template*XA.road*/ this is some extra info that happens to be a comment
```

Note that there must be a feature code block on the measurement line otherwise a point will be created with no name.

Backsight

The default for the *backsight* control code is **BS** and it is defined by the *Backsight* field on the *Delimiters* tab of the *Survey.4d* Create/Edit panel.

The rest of the block after the *backsight control code* is the name of the station that the backsight was to, or the point number that the backsight was to.

For example, if *BS* is the backsight control code

```
BSPSM3
```

would designate a backsight to the station PSM3.

If only the backsight control code exists, the point number from the reading is taken as the point number for the backsight. This may be data collector dependent.

Warning for feature codes starting with the *backsight* control code.

If the feature codes comes before the string number, then feature codes for ordinary measurements **can not** start with the backsight control code because they would be interpreted as backsight measurements and no measurement point would be created.

If the feature codes comes after the string number, then whenever a feature codes for ordinary measurements is used that starts with the backsight control code, a string number (which may be zero for a point string) **must** be used otherwise the feature code will be interpreted as a backsight measurement and no measurement point would be created.

Foresight

There is no default for the *foresight* control code. It is defined by the *Foresight* field on the *Delimiters* tab of the *Survey.4d Create/Edit* panel.

The rest of the block after the *foresight control code* is the name of the station that the foresight was to, or the point number that the foresight was to.

For example, if *FS* is the backsight control code

FSPSM3

would designate a backsight to the station PSM3.

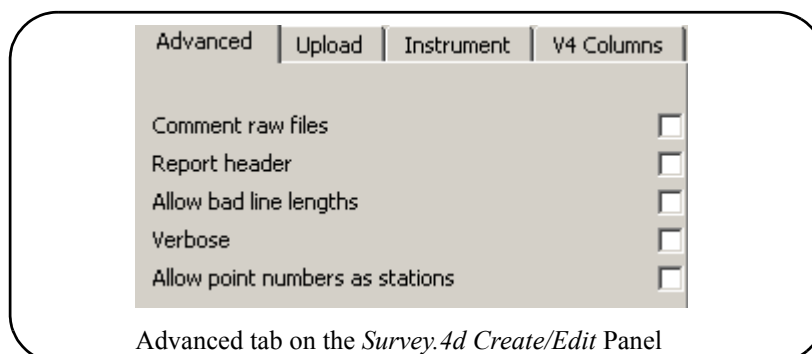
If only the foresight control code exists, the point number from the reading is taken as the point number for the foresight. This may be data collector dependent.

Warning for feature codes starting with the *foresight* control code if the *Allow point numbers as stations* flag is *not* set on the Advanced tab of the *Survey.4d Create/Edit* panel.

If the feature codes comes before the string number, then feature codes for ordinary measurements **can not** start with the foresight control code because they would be interpreted as foresight measurements and no measurement point would be created.

If the feature codes comes after the string number, then whenever a feature codes for ordinary measurements is used that starts with the check measurement control code, a string number (which may be zero for a point string) must be used otherwise the feature code will be interpreted as a foresight measurement.

If the *Allow point numbers as stations* flag is set on, then a point number used as a foresight will create a measurement point for that point number.



Check Measurement

The default for the *check measurement* control code is **CHK** and it is defined by the *Check measurement* field on the *Delimiters* tab of the *Survey.4d Create/Edit* panel.

The rest of the block after the *check measurement control code* is the name of the station that

the check measurement was to, or the point number that the check measurement was to.
For example, if *CHK* is the check measurement control code

CHKPSM3

would designate a check measurement to the station PSM3.

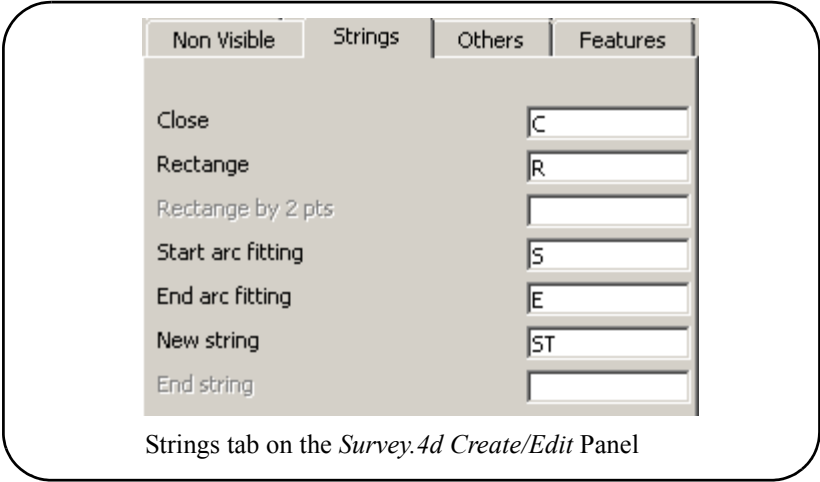
If only the check measurement control code exists, the point number from the reading is taken as the point number that the check measurement is made to. This may be data collector dependent.

Warning for feature codes starting with the *check measurement* control code.

If the feature codes comes before the string number, then feature codes for ordinary measurements **can not** start with the check measurement control code because they would be interpreted as check measurements and no measurement point would be created.

If the feature codes comes after the string number, then whenever a feature codes for ordinary measurements is used that starts with the check measurement control code, a string number (which may be zero for a point string) **must** be used otherwise the feature code will be interpreted as a check measurement and no measurement point would be created.

Control Codes on the Strings tab



Close String

The default for the *close string* control code is **C** and it is defined by the *Close* field on the *Strings* tab of the *Survey.4d Create/Edit* panel.

The *close string* control code closes the string that the measurement is a point of.

See the Section [Close String](#) for more information on closing a string.

Rectangle

The default for the *rectangle* control code is **R** and it is defined by the *Rectangle* field on the *Strings* tab of the *Survey.4d Create/Edit* panel.

The *rectangle* control code uses the current point and the previous two points in the same string (three points total) and creates a new point to form a parallelogram.

See the Section [Rectangle](#) for more information on forming a rectangle.

Rectangle by 2 Pts

A *rectangle_2* control code can be defined by the *Rectangle by 2 pts* field on the *Strings* tab of the *Survey.4d Create/Edit* panel.

The *rectangle_2* control code uses the current point, last point and an offset. The rectangle is

defined by two points (reference side) and a offset.

If a positive offset value is given, two points will be created to the right of the reference side.

If a negative offset value is given, two points will be created to the left of the reference side.

If no Description is given, the two new points will be joined to the given points in a closed rectangular string, and will have the same feature code as the points given.

If the feature code and string number exist, then a search is made for the last occurrence of two points with the same feature code and string number. If found, then these points are used to define the reference side of the rectangle.

If the point number exists, then a search is made for the last occurrence of two points with the same feature code and string number as the point given by the point number. If found, then these points are used to define the reference side of the rectangle.

Two consecutive rectangles are unable to be defined side by side. In other words if the two points given are part of string of greater than two vertices, the command will only work for sets of two points that are exclusively defined. i.e. For a 5 point string, a rectangle can be defined by points 1 and 2, and 4 and 5.

See the Section [Rectangle by 2 Points](#) for more information on forming a rectangle by 2 points.

Start Arc Fitting

The default for the *start arc fitting* control code is **S** and it is defined by the *Start arc fitting* field on the *Strings* tab of the *Survey.4d Create/Edit* panel.

The *start arc fitting* control code starts arc fitting with the current point.

See the Section [Arcs Through Points](#) for more information on arc fitting.

End Arc Fitting

The default for the *end arc fitting* control code is **E** and it is defined by the *End arc fitting* field on the *Strings* tab of the *Survey.4d Create/Edit* panel.

The *end arc fitting* control code ends arc fitting at the current point. That is, the current point is included in the arc fitting but it is the last point used in the arc fitting.

See the Section [Arcs Through Points](#) for more information on arc fitting.

New String

The default for the *new string* control code is **ST** and it is defined by the *New string* field on the *Strings* tab of the *Survey.4d Create/Edit* panel.

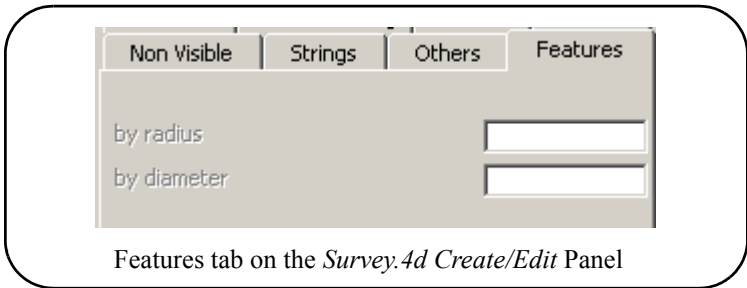
The *new string* control code starts a new string with the current point even if the feature code and string number haven't changed.

See the Section [Start New String](#) for more information on starting a new string.

End String

The *end string* control code ends the current string even if the feature code and string number haven't changed for the next point.

Control Codes on the Features tab



Feature by Radius

There is no default for the *feature by radius* control code. It is defined by the *by radius* field on the *Features* tab of the *Survey.4d Create/Edit* panel.

The *feature by radius* control code denotes that the feature has a given radius. For example, if RA was used then TRE*RA2 would denote a feature code TRE with a radius of 2 units.

See the Section [Feature](#) for more information on feature strings.

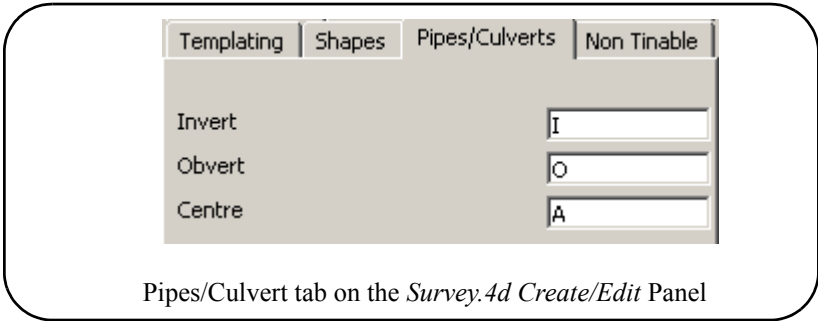
Feature by Diameter

There is no default for the *feature by diameter* control code. It is defined by the *by diameter* field on the *Features* tab of the *Survey.4d Create/Edit* panel.

The *feature by diameter* control code denotes that the feature has a given diameter. For example, if DI was used then TRE*DI2 would denote a feature code TRE with a diameter of 2 units.

See the Section [Feature](#) for more information on feature strings.

Control Codes on the Pipes/Culverts tab



Invert Point for Pipe or Culvert

The default for the *invert level* control code is I and it is defined by the *Invert* field on the *Pipe/Culverts* tab of the *Survey.4d Create/Edit* panel.

The *invert level* control code denotes that the point is an invert level (bottom).

The invert commands can also denote the diameter of a pipe or width and height of a culvert. For example, I.3 denotes the measurement was an invert level and it was a pipe of diameter 0.3 units. I.3x.4 denotes the measurement was an invert level and it was a box culvert of width 0.3 and height 0.4 units.

Obvert Point for Pipe or Culvert

The default for the *obvert level* control code is O and it is defined by the *Obvert* field on the *Pipe/Culverts* tab of the *Survey.4d Create/Edit* panel.

The *obvert level* control code denotes that point is an obvert level (top).

The obvert command can also define the diameter of a pipe or width and height of a culvert. For example, O.3 denotes the measurement was an invert level and it was a pipe of diameter 0.3 units. O.3x.4 denotes the measurement was an invert level and it was a box culvert of width 0.3 and height 0.4 units.

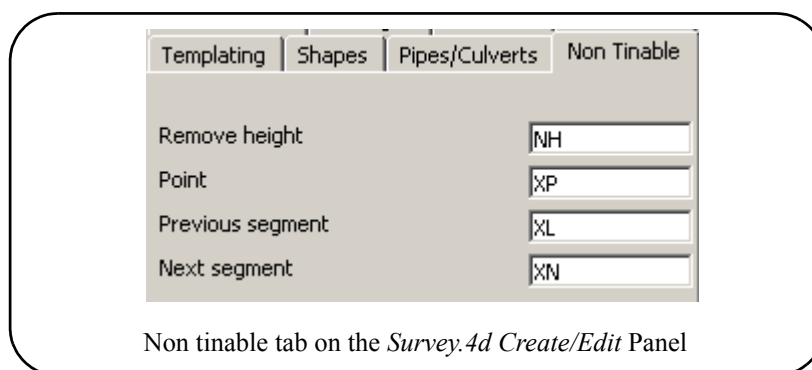
Centre Point for Pipe or Culvert

The default for the *centre level* control code is **A** and it is defined by the *Centre* field on the *Pipe/Culverts* tab of the *Survey.4d Create/Edit* panel.

The *centre level* control code denotes that point is an centre level (axial).

The centre command can also define the diameter of a pipe or width and height of a culvert. For example, A.3 denotes the measurement was an invert level and it was a pipe of diameter 0.3 units. A.3x.4 denotes the measurement was an invert level and it was a box culvert of width 0.3 and height 0.4 units.

Control Codes on the Non Tinable tab



Remove Height

The control code to set the height of the current point to null.

The default for the *remove height from point* control code is **NH** and it is defined by the *Remove height* field on the *Non-Tinable* tab of the *Survey.4d Create/Edit* panel.

Point

The default for the *make point non-tinable* control code is **XP** and it is defined by the *Point* field on the *Non-Tinable* tab of the *Survey.4d Create/Edit* panel.

The *make point non-tinable* control code makes the current point non-tinable. That is, the point is not used in tins (triangulations).

Previous Segment

The default for the *make previous segment non-tinable* control code is **XL** and it is defined by the *Previous segment* field on the *Non-Tinable* tab of the *Survey.4d Create/Edit* panel.

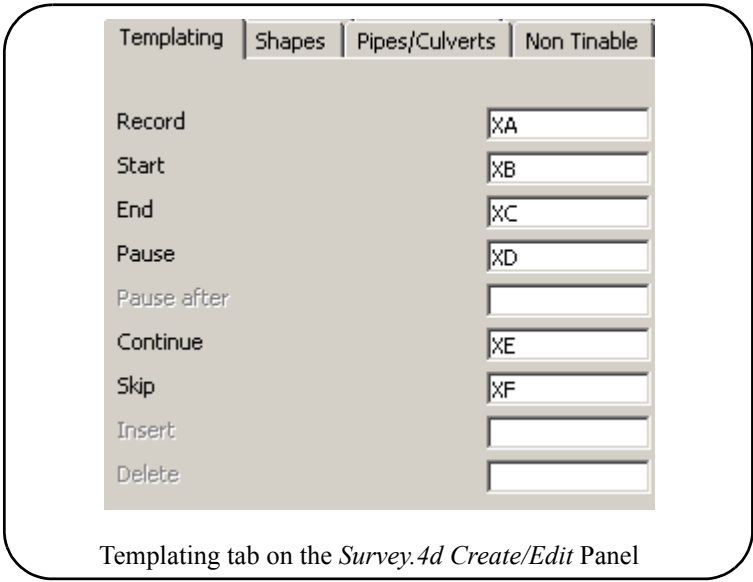
The *make previous segment non-tinable* control code makes the previous segment non-tinable. That is, the segment that the current point is the end of is non-tinable and hence not used as a breakline in tins (triangulations).

Next Segment

The default for the *make next segment non-tinable* control code is **XN** and it is defined by the *Next segment* field on the *Non-Tinable* tab of the *Survey.4d Create/Edit* panel.

The *make next segment non-tinable* control code makes the next segment point non-tinable. That is, the segment that the current point is the start of is non-tinable and hence not used as a breakline in tins (triangulations).

Control Codes on the Templating tab



Record

The control code to denote that this is the first point of a new field template definition. The field template definition continues until the next *stop recording a field template* control code or a *start using a field template* control code.

If the field template is to have a name, then the *start recording* control code is followed by the *offset code* delimiter and then the name for the field template. If no name is given, then the field template defines the default field template.

For example, if XA starts recording for the default template, XA.road starts recording the field template called road

The default for the *start recording a field template* control code is **XA** and it is defined by the *Record* field on the *Templating* tab of the *Survey.4d Create/Edit* panel.

See the Section [Field Templates](#) for more information on field templates.

Start

The control code to denote that a field template is being used. This point takes the feature code and string number from the field template. If it is a named field template, then the control code is followed by the *offset code* delimiter and then the name of the field template.

The field template can also be used as a forward template, a reverse template or as a zig-zag template starting on either a zig or on a zag.

To denote using the field template as a forward template, add the *offset code* delimiter and *for*.

To denote using the field template as a reverse template, add the *offset code* delimiter and *rev*.

To denote zig-zag mode starting on a zig, add the *offset code* delimiter and *zig*.

To denote zig-zag mode starting on a zag, add the *offset code* delimiter and *zag*.

If anything other than 'for', 'rev' or 'zag' is given, the field template is used as a zig-zag template starting on a zig.

For example, if XB starts using the default template, XB.road.zag starts using the field template

called road as a zig-zag field template starting on a zag.

The default for the *start using a template* control code is **XB** and it is defined by the *Start* field on the *Templating* tab of the *Survey.4d Create/Edit* panel.

See the Section [Field Templates](#) for more information on field templates.

End

The control code to end the use of the current field template after the current point. That is, the current point uses the field template but subsequent measurements don't.

The default for the *stop using a template* control code is **XC** and it is defined by the *End* field on the *Templating* tab of the *Survey.4d Create/Edit* panel.

See the Section [Field Templates](#) for more information on field templates.

Pause

The control code to pause using the current field template. The current point does not use the field template.

The default for the *pause using a template* control code is **XD** and it is defined by the *Pause* field on the *Templating* tab of the *Survey.4d Create/Edit* panel.

See the Section [Field Templates](#) for more information on field templates.

Pause after

The control code to pause using the current field template and the current point does use the field template.

There is no default for the *pause after* control code and it is defined by the *Pause after* field on the *Templating* tab of the *Survey.4d Create/Edit* panel.

See the Section [Field Templates](#) for more information on field templates.

Continue

The control code to continue the use of a paused field template. The current point uses the field template.

The default for the *continuing using a field template* control code is **XE** and it is defined by the *Continue* field on the *Templating* tab of the *Survey.4d Create/Edit* panel.

See the Section [Field Templates](#) for more information on field templates.

Skip

The control code to skip point one or more points of the field template. The current point uses the next point *after* the skipped points from field template.

If more than one point is to be skipped then the control code is followed by the *offset code* delimiter and then number of points to be skipped.

For example, if **XF** is the skip points control code, **XF.2** skips two points. Note that just **XF** skips one point and the **'1'** is not required.

The default for the *skipping field template points* control code is **XF** and it is defined by the *Skip* field on the *Templating* tab of the *Survey.4d Create/Edit* panel.

See the Section [Field Templates](#) for more information on field templates.

Insert

A default control code to insert a point in the field template can be added to this field. The point is inserted after the last point.

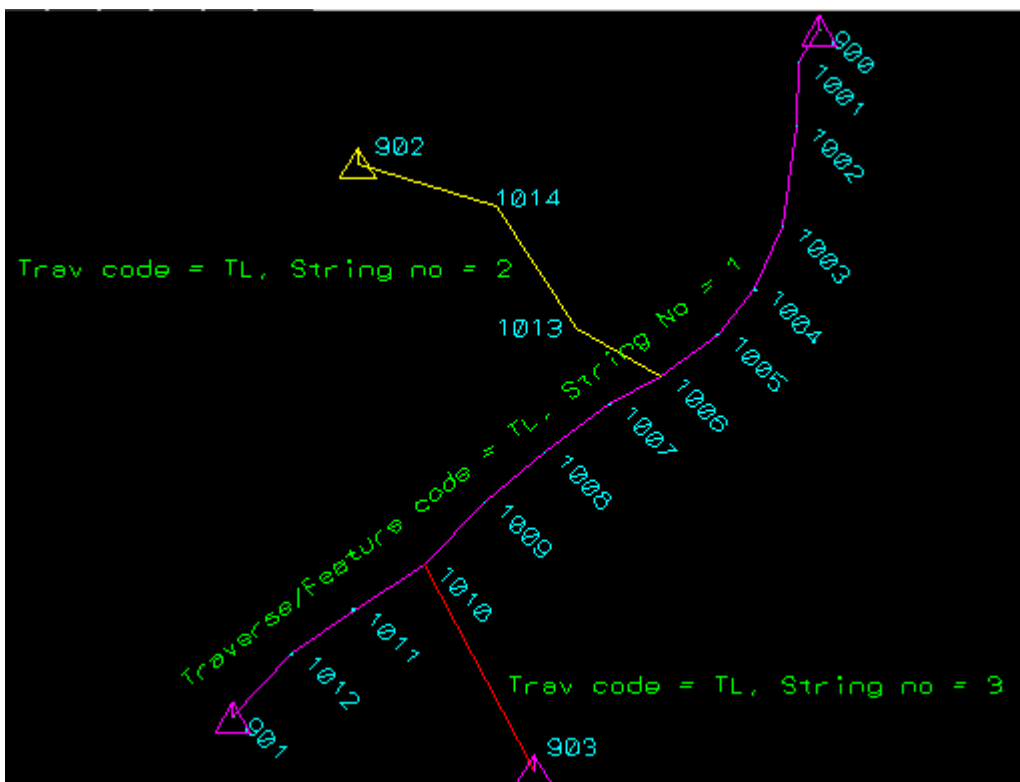
See the Section [Field Templates](#) for more information on field templates.

Delete

A default control code to delete a point in the field template can be added to this field. a number of points can be nominated for deletion.

See the Section [Field Templates](#) for more information on field templates.

Feature coding for traverse extraction (Non- Leica instruments)



In the example shown above, three distinct traverses were observed. The main traverse between stations 900 and 901 were given a feature code of TL and a string number of 1 (TL1). A typical observation description follows:

Setup on station 900. A foresight measurement was taken from 900 to 1001. A typical feature code may be:

TL1 FS1001. Where the block delimiter is a space(" ") breaking the feature code up into TL1 and FS1001. This tells the reduction that the observation was a traverse because it has a feature code of TL as specified in the traverse tab of the reduction panel. The foresight control code may be FS, telling the reduction that the observation is a foresight observation to a named point

Setup on station 1001. A backsight to station 900 was observed. A typical feature code may be:

TL1 BS900. Where BS is the backsight control code

A foresight to 1002 may be coded as:

TL1 FS1002.

And so forth.

The observation to station 1013 may be made at the same time as when observing to station 1007 from the setup station 1006. Simply changing the string number to 2 for the observation to 1013 will ensure that it is treated as a different traverse. i.e. TL2 FS1013.

The second traverse between stations 1006 and 902 were given a feature code of TL and a string number of 2 whilst the traverse between stations 1010 and 903 were given a feature code of TL and a string number of 3.

The feature code/ string number needs to be present for at least the foresight or measured leg of each of the traverse legs. If they are also present for the backsight, then foresight/backsight pairs will be grouped together and reciprocal calculations done for that leg.

Data Collector Definitions

Unfortunately, each brand of data collector has its own method of communicating with a computer and a software package.

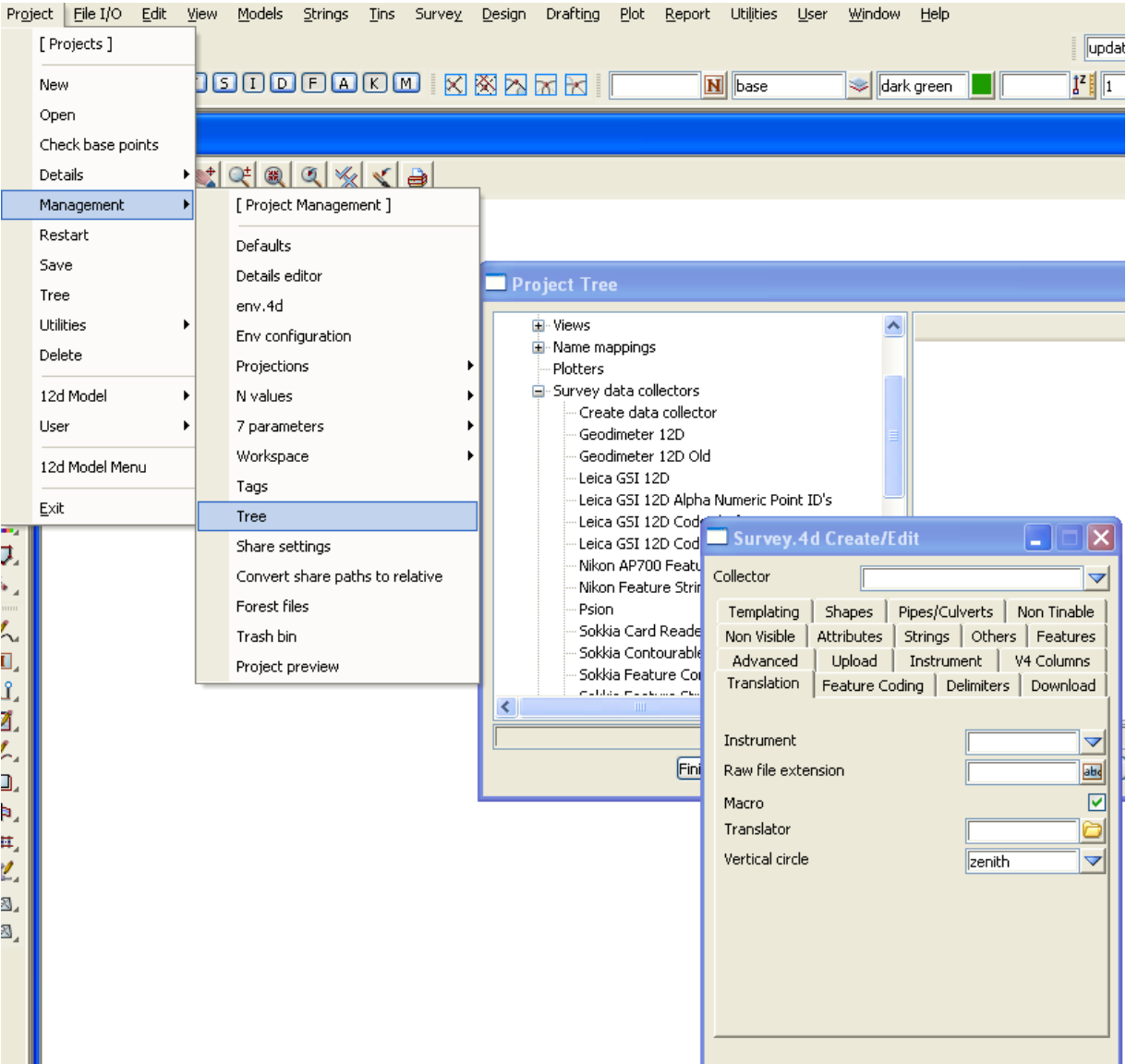
To allow for a variety of data collectors, **12d Model** lets the user create and edit data collector definitions which are simply user defined sets of data collector parameters stored under user specified names.

The set of data collector definitions are stored in a file but are created and edited using the **12d Model** panel *Survey.4d Create/Edit*.

The *Survey.4d Create/Edit* panel is accessed via **Project => Management =>Tree**. First select **Project => Management =>Tree** and then click on the **+** beside the Project name to expand the list of available information for the project. Then click on the **+** beside *Survey data collectors* to see the list of existing 12d data collector definitions.

Double click LB on *Create data collector* to create a new data collector definition, or double click LB on an existing data collector definition to examine and/or modify it.

The **Survey.4d Create/Edit** panel will then appear.



The fields and buttons used in this panel have the following functions.

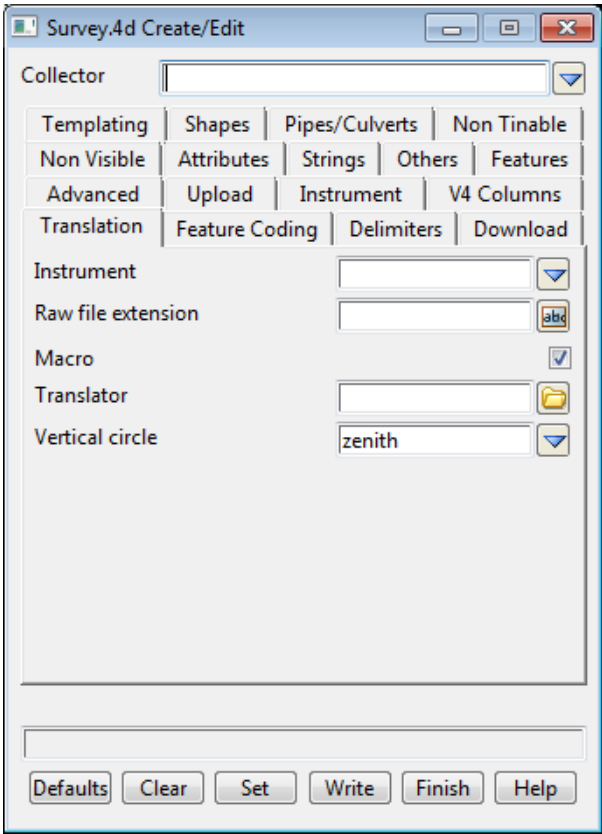
Field Description	Type	Defaults	Pop-Up
Collector <i>name of the data collector to create/edit.</i>	input		available data collectors
Defaults <i>set all the panel fields to default values.</i>	button		
Clear <i>clear the values in the panel fields in all the tabs.</i>	button		
Set <i>set the values in the panel fields for the given data collector for this session of 12d Model.</i> <i>WARNING - Set does not save the changes to the survey.4d file. To save the changes, click on the 'Save' button.</i>	button		
Save <i>store the data collector definitions to the survey.4d file.</i>	button		

For descriptions of each of the tabs on the panel, go to:

<i>Translation</i>	Translation tab
<i>Feature coding</i>	Feature Coding tab
<i>Delimiters</i>	Delimiters tab
<i>Download</i>	Download tab

Advanced	Advanced tab
Upload	Upload tab
Instrument	Instrument tab
V4 Columns	V4 Columns tab
Templating	Templating tab
Shapes	Shapes tab
Pipe/Culverts	Pipes/Culverts tab
Non tinnable	Non Tinnable tab
Non visible	Non visible tab
Attributes	Attributes tab
Strings	Strings tab
Other	Others tab
Features	Features tab

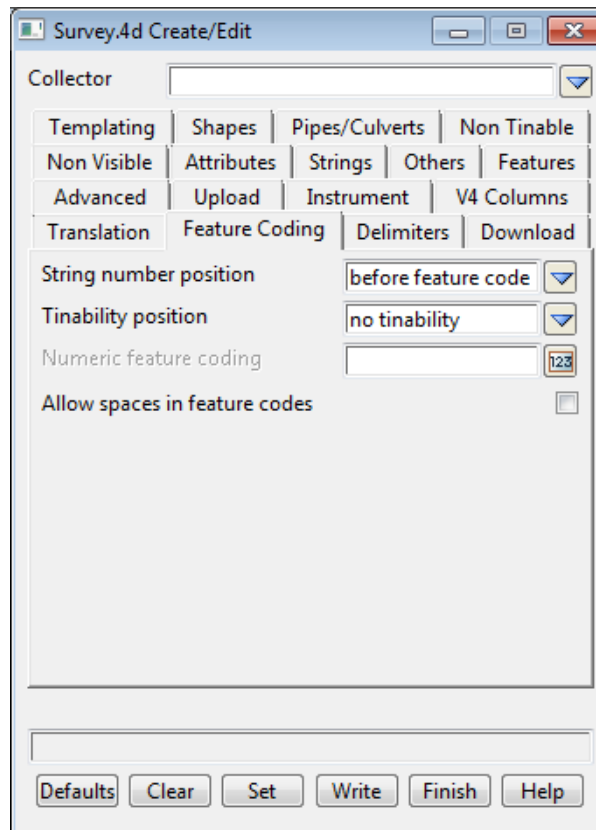
Translation tab



Instrument	input	Geodimeter, Leica Nikon DR1, Nikon AP700, Sokkia 20/33 Topcon GT700, Topcon FC5
		<i>type of data collector format.</i>
Raw file extension	input	
		<i>file ending to use for the raw file when it is downloaded.</i>
Macro	tick box	tick
		<i>if tick, then the Translator pop-up list only shows 12d Model macros. If not ticked, then the Translator pop-up list only shows programs.</i>

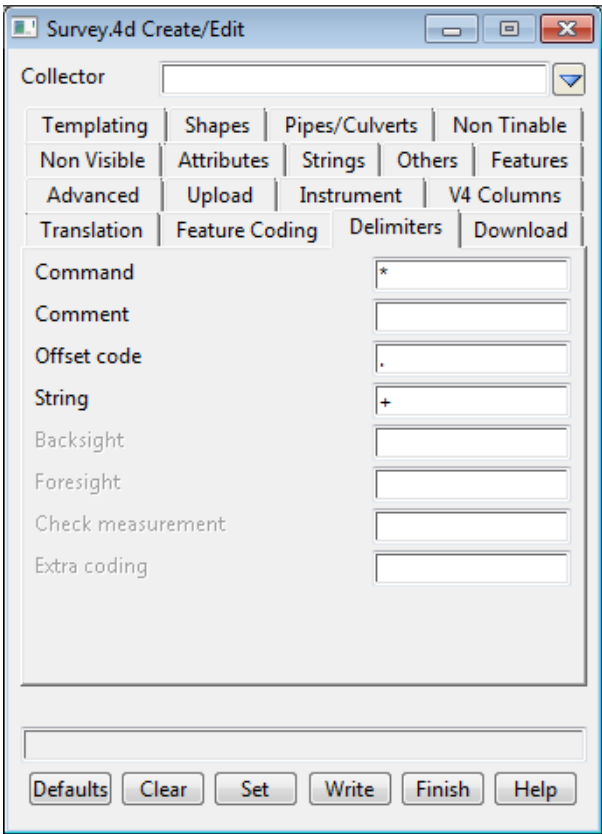
Translator	input	list of translators in library	
<i>name of the macro/program to translate the raw survey file into the 12d field file format.</i>			
Vertical circle	input	zenith	zenith, nadir
<i>define the vertical circle zero.</i>			

Feature Coding tab



String number position	input	before	before feature code no string number after feature code
<i>defines if the string number is before or after the feature code or is not used at all (no string number). When 'no string number' then the New string command is used to start new strings with the same feature code.</i>			
Tinability position	input	no tinability	before string no tinability after string
<i>defines the position or absence, of the tinability flag. This should only be used for compatibility with data coded for other systems such as CivilCAD. 12d has more flexible methods of defining tinability.</i>			
Numeric feature coding	integer		
<i>if 'no string number' is given for String number position then Number feature coding is ignored. If a number is given, then the feature code must be numeric and the given number is the length of the feature code (that is, the number of digits in the feature code). If no number is given, then feature codes are alphabetical characters only except when a String code is used to separate the feature code and string number.</i>			

Delimiters tab



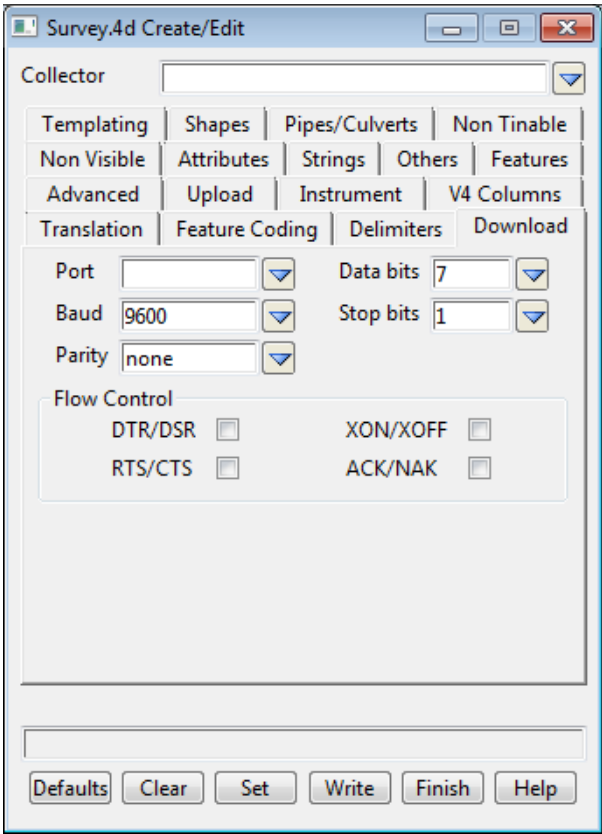
Command	input	*	<i>defines the separator between the feature code/string number and op code commands. The delimiter characters can not be used in any other part of the command line.</i>
Comment	input	/	<i>defines the separator for comments. Note that this can be a space.</i>
Offset code	input	dot (.)	<i>defines the beginning of the offset code block. If the offset code block exists, it must come immediately after the Feature code/string number/tinability block. The offset code used R for radial, T for tangential, H for height.</i>
String	input	+	<i>separates the feature code from the string number. Used when the feature code includes numbers. For example 110KVA+20 would be a feature code of 110KVA and a string number of 20.</i>
Backsight	input	BS	<i>if the feature code is this control code then the measurement is to a backsight and not a point.</i>
Foresight	input		<i>if the feature code is this control code then the measurement is to a foresight and not a point.</i>
Check measurement	input	CHK	<i>if the feature code is this control code then the measurement is a check measurement and not a point.</i>
Extra coding	input	X	<i>denotes that the information following is appended to the previous information for the measurement. This allows extra coding than may be allowed for on the measurement line. Mainly for Sokkia using the</i>

note (13NM) to add more information to the previous measurement line (07).

A feature code block must be on the measurement line or a measurement with no name will be created.

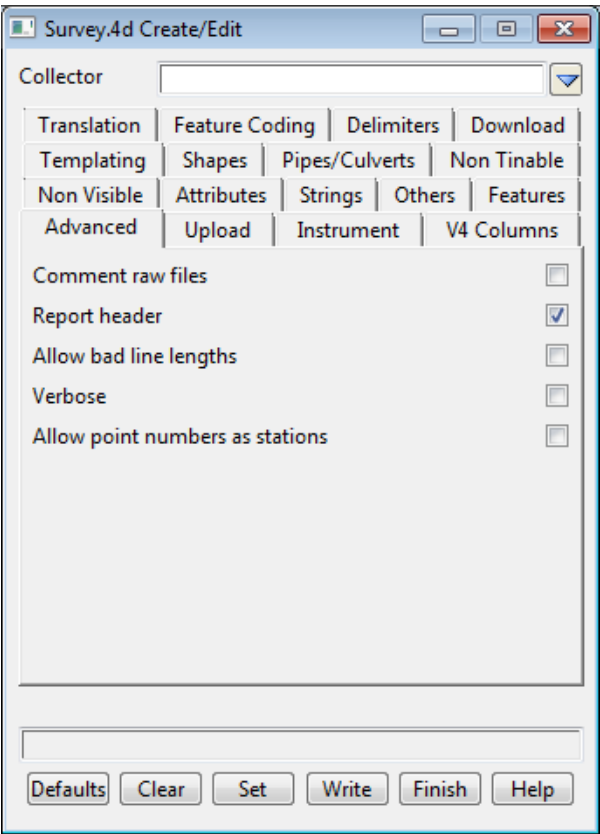
Also a command block can't be split between two lines.

Download tab



Port	input	COM1	COM1 to COM4
<i>port on the computer to use to communicate with the data collector for downloads.</i>			
Baud rate	input	9600	110, 300 ... 256000
<i>baud rate to use for the computer port.</i>			
Data bits	input	7	5, 6, 7, 8
<i>number of data bits to use.</i>			
Stop bits	input	1	0, 1, 1.5, 2
<i>number of stop bits to use.</i>			
Parity	input	none	none, even, odd, mark, space
<i>parity to use.</i>			
DTR/DSR, RTS/CTS, XON/XOFF,ACK/NAK	tick boxes		
<i>flow control settings.</i>			

Advanced tab



Comment raw files tick box

if tick, include the data from the raw survey file as comments in the 12d field file.

Report header tick box

if tick, include some header information as comments in the 12d field file.

Allow bad line lengths tick box

if tick, ignore the fact that the length of the line from the data collector is incorrect. This may lead to other errors so it should be used sparingly.

Verbose tick box

if tick, then extra information is written to the Output window.

Allow point numbers as stations tick box

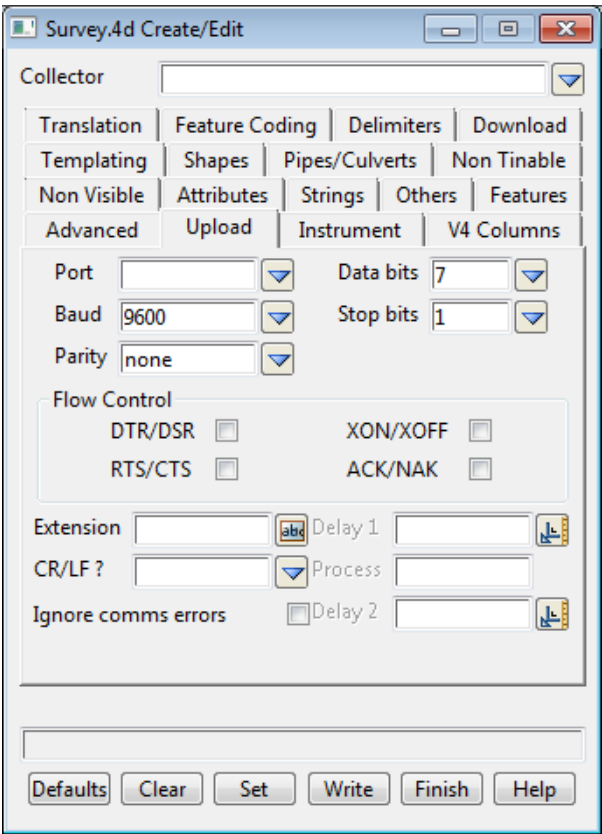
if tick, the point numbers for previous measurements can be used as stations for instrument setups, backsights, foresights and check measurements.

Note

When 12d Model starts up, it checks to see if an environment variable called DATA_COLLECTORS_4D exists and if it does, then the file it points to is used to provide the definitions for the data collectors.

If the environment variable is not set, then 12d Model searches for a file called **survey.4d** (this was **data_collectors_definitions** in V3.0) in the standard 12d Model search sequence for set up files.

Upload tab



Port	input	COM1	COM1 to COM4
<i>port on the computer to use to communicate with the data collector for uploads.</i>			
Baud rate	input	9600	110, 300 ... 256000
<i>baud rate to use for the computer port.</i>			
Data bits	input	7	5, 6, 7, 8
<i>number of data bits to use.</i>			
Stop bits	input	1	0, 1, 1.5, 2
<i>number of stop bits to use.</i>			
Parity space	input	none	none, even, odd, mark,
<i>parity to use.</i>			
DTR/DSR, RTS/CTS, XON/XOFF,ACK/NAK	tick boxes		
<i>flow control settings.</i>			
Extension	input		
<i>ending of the file that will be uploaded. For example, typing in sdr means the file to upload ends in ".sdr"</i>			
CR/LF ?	input	cr, lf, crlf, lfcr,none	
<i>end of line characters - characters needed by the data recorder to denote the end of a line of data being uploaded to the data recorder.</i>			
Delay 1	input		
<i>the time between sending lines of data to the data recorder.</i>			

- Process

input

for some data recorders after a data line is sent, a text string needs to be sent to the data recorder to make it process the data line (e.g. GRE3 used a P).
- Delay 2

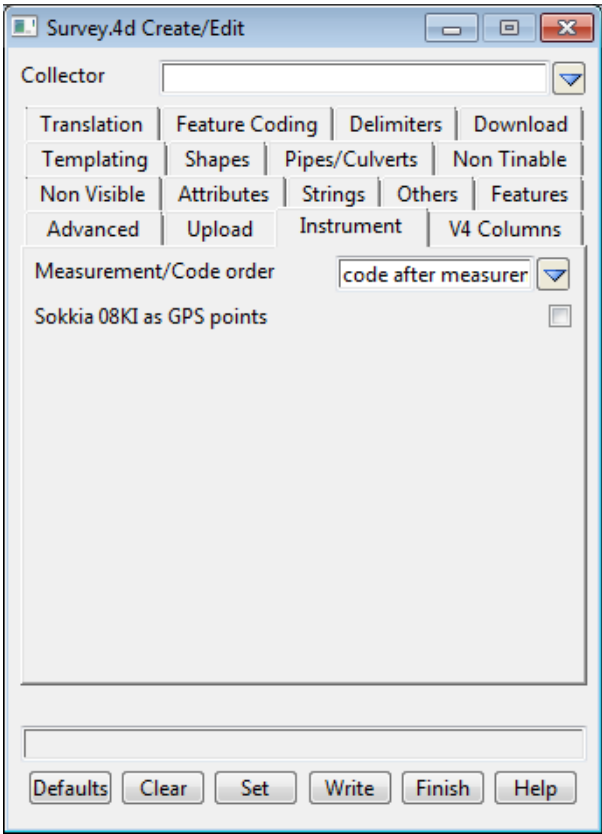
input

the time between sending the process string and sending the next data line.
- Ignore comms errors

tick box

if tick, ignore any communication errors whilst uploading to the data recorder.

Instrument tab



- Measurement/code order

input

after measurementcode before measurementcode after measurement

For Leica only where the feature code/string number record is separate to the measurement record. For all other data recorders the feature code block is in the same record as the measurement. If 'code before measurement', then the feature code/ string number record for a measurement is entered before taking the measurement. If 'code after measurement', then the feature code/ string number record for a measurement is entered after taking the measurement.
- Sokkia 08KI as GPS points

tick box

if tick, when converting reading an Sokkia SDR file, the "08KI" records are treated as points and no directly entered station co-ordinates.

V4 Columns tab

The screenshot shows the 'Survey.4d Create/Edit' dialog box with the 'V4 Columns' tab selected. The 'Collector' field is empty. The 'Columns' section contains five rows of input fields for 'start' and 'end' positions: 'Feature code start/end', 'String number start/end', 'Point name start/end', 'Attribute start/end', and 'Point number start/end'. Below these is a 'Total length' input field. At the bottom are buttons for 'Defaults', 'Clear', 'Set', 'Write', 'Finish', and 'Help'.

The V4 columns tab is for compatibility with **12d Model** V4 field files which were of fixed column widths.

Feature code start/end input 1/6

the start and end column position for the feature code in the field file record.

String number start/end input 7/9

the start and end column position for the string number in the field file record.

Point name/Attribute/Point number start/end input 22/30, 10/16, 17/20

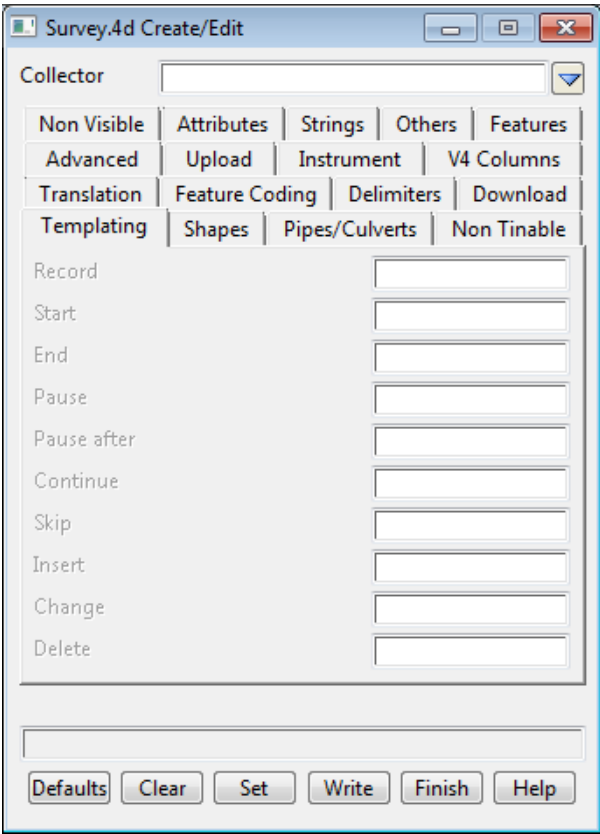
the start and end column position for the point name/Attribute/Point number in the field file record.

Total length input

the total length of line expected.

Templating tab

For information on field templating, see [Field Templates](#).



Record input XA text

characters to denote the start of recording a field template. For example XA starts recording for the default template, XA.road starts recording the field template called road. See [55 Start recording a field template](#).

Start input XB text

characters to denote the start of using a field template. For example XB starts using the blank field template, XB.road starts using the field template called 'road'. XB.road.zig starts using 'road' a zig-zag field template and begins as a zag. See [51 Start using an existing field template](#).

End input XC text

characters to denote stop using the current field template. See [52 Finish using a field template or finish recording a field template](#).

Pause input XD text

characters to denote temporarily stop using the current field template to take other measurements. The current point does not use the field template. See [53 Pause using the current field template](#).

Pause after input XD text

characters to denote temporarily stop using the current field template to take other measurements. The current point does use the field template. See [51 Start using an existing field template](#).

Continue input XE text

characters to denote continuing to use the current field template after a pause. See [54 Continue the current field template](#).

Skip input XF text

characters to denote that template points are to be skipped. For example XF means skip one field

template point, XF.3 means skip three field template points. See [56 Skipping picking up points when using a field template](#).

Insert input XI text

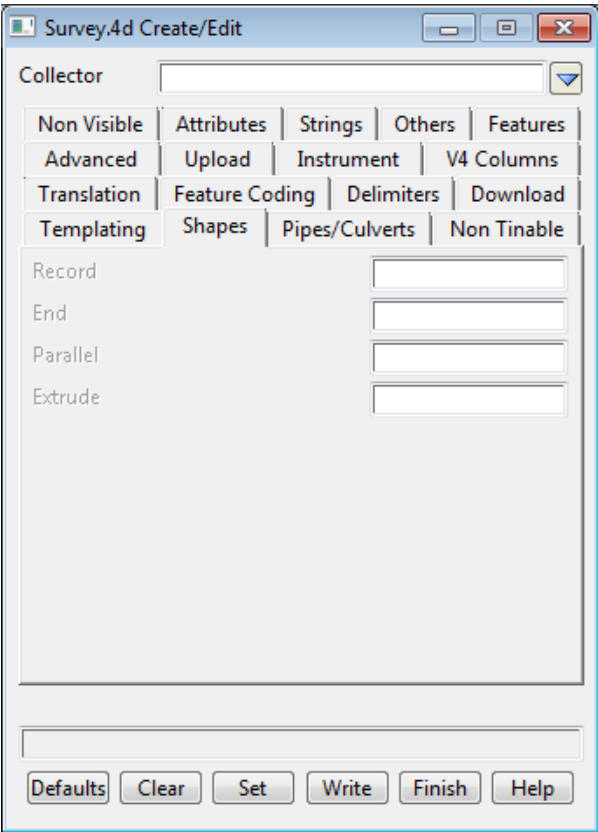
characters to denote that template points are to be inserted. For example XI.FE01 means insert a template point of FE01 into the template after the last measured template point. See [58 Insert points when using a field template - after the measurement of last point](#).

Delete input XQ text

characters to denote that template points are to be deleted. For example XQ.3 means delete the next 3 pts from the template after the last measured template point. See [57 Delete points on a field template - after the measurement of last point](#).

Shapes tab

For information on shapes, see [Shape field coding](#).



Record input text

characters to denote the start of recording a shape. For example if RS was used, the code RS starts recording for the default shape, RS.shape_name defines the recording of a shape of name shape_name. See [83 Start recording a shape - before the measurement](#).

End input text

characters to denote stop using the current shape. See [84 Finish using a shape definition or finish recording a shape - after the measurement](#).

Parallel input text

characters to denote the application of a shape by parallelling to the shape reference string. The code may be LK01*PS.shape_name

Where the Parallel command is PS, the shape reference string is LK01 and the shape name = shape_name. See [85 Shape parallel](#).

Extrude

input

text

characters to denote the application of a shape by extrusion to the shape reference string. The code may be `LK01*ES.shape_name`

Where the Extrusion command is *ES*, the shape reference string is *LK01* and the shape name = *shape_name*. See [86 Shape extrude](#).

Pipes/Culverts tab

Survey4d Create/Edit

Collector

Non Visible | Attributes | Strings | Others | Features

Advanced | Upload | Instrument | V4 Columns

Translation | Feature Coding | Delimiters | Download

Templating | Shapes | Pipes/Culverts | Non Tinnable

Invert

Obvert

Axial

Defaults Clear Set Write Finish Help

Invert

input

1

text

characters to denote that the measurement was the an invert level. See [80 Pipe invert point \(bottom of the pipe\)](#).

Obvert

input

O

text

characters to denote that the measurement was the an obvert level. See [82 Pipe obvert point \(top of the pipe\)](#).

Centre

input

C

text

characters to denote that the measurement was the a centreline (axial) level. See [81 Pipe axial point \(centre of the pipe\)](#).

Note that these commands can also denote the diameter of a pipe or width and height of a culvert. For example, I.3 denotes the measurement was an invert level and it was a pipe of diameter 0.3 units. I.3x.4 denotes the measurement was an invert level and it was a box culvert of width 0.3 and height 0.4 units.

Non Tinable tab

Remove height

characters to denote that the measurement has a null height. See [30 Remove height from a point - that is make it a null height](#).

Point

characters to denote that the measurement is a non-tinable point. See [40 Make a point non-tinable](#)

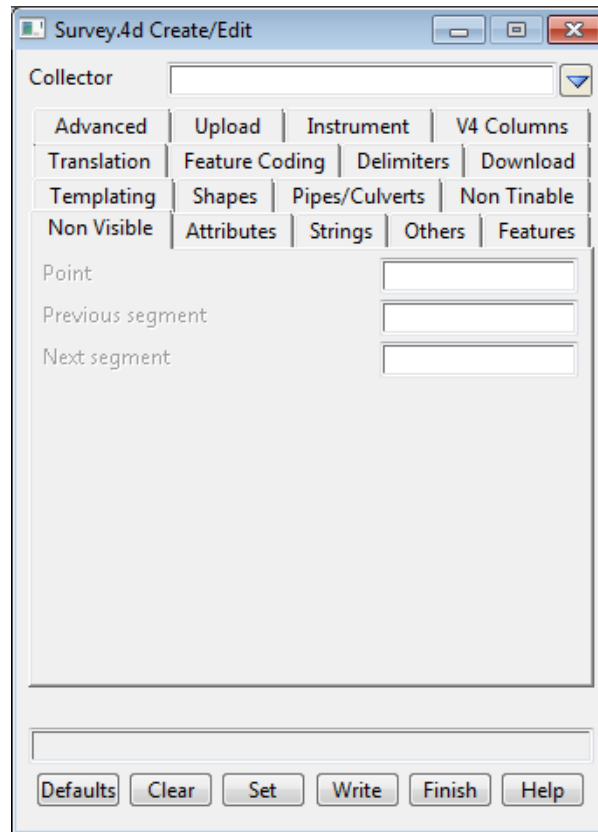
Previous segment

characters to denote that the next segment of the current string is non-tinable. See [38 Make the previous segment non-tinable](#).

Next segment

characters to denote that the previous segment of the current string is non-tinable. See [39 Make the next segment non-tinable](#).

Non visible tab



Point	input	text
-------	-------	------

characters to denote that the measurement is a non-visible point. That is, the point is not visible and is not included in a triangulation. See [109 Make a point invisible - after the measurement](#).

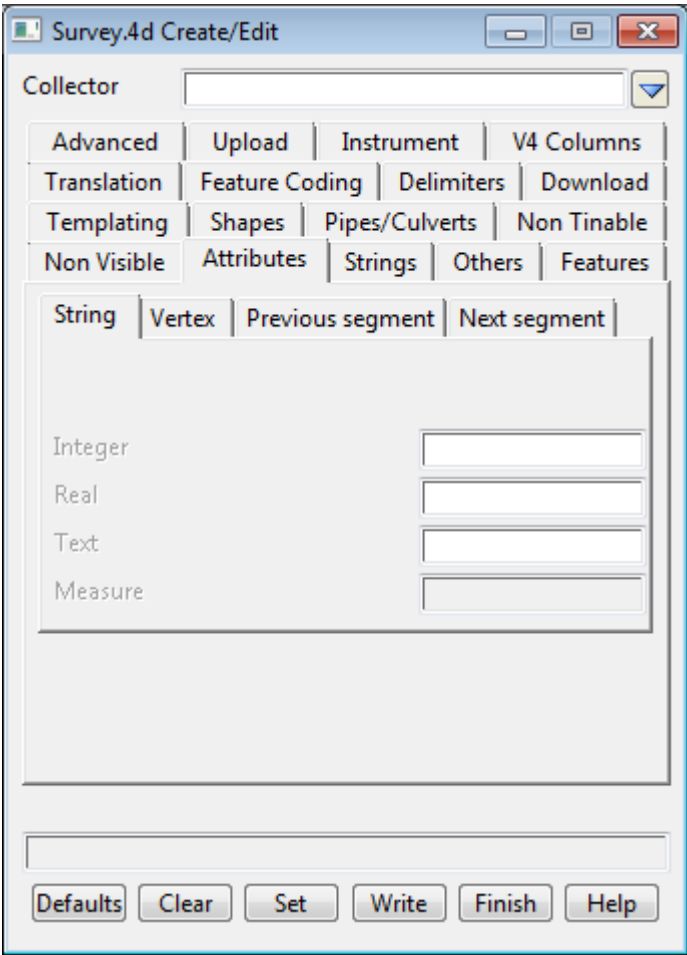
Previous segment input text

characters to denote that the measurement is the end of a non-visible segment. That is, the previous segment is not used as a breakline in a triangulation and it is not visible. See [107 Make the previous segment invisible - after the measurement.](#)

Next segment input text

characters to denote that the measurement is the start of a non-visible segment. That is, the next segment is not used as a breakline in a triangulation and is not visible. See 108 Make the next segment invisible - after the measurement for the first point of the segment.

Attributes tab



String tab (Attributes)

Integer	input	text
<i>characters to denote that the next text is to be taken as a user defined integer attribute of the current string. See 68 Add an integer user defined attribute to the current string.</i>		
Real	input	text
<i>characters to denote that the next text is to be taken as a user defined real attribute of the current string. See 69 Add a real user defined attribute to the current string.</i>		
Text	input	text
<i>characters to denote that the next text is to be taken as a user defined text attribute of the current string. See 70 Add text user defined attribute to the current string.</i>		
Measure	input	text

Vertex tab (Attributes)

Integer	input	text
<i>characters to denote that the next text is to be taken as a user defined integer attribute of the current vertex. See 71 Add integer user defined attribute to the current point.</i>		
Real	input	text
<i>characters to denote that the next text is to be taken as a user defined real attribute of the current vertex. See 72 Add real user defined attribute to the current point.</i>		
Text	input	text

characters to denote that the next text is to be taken as a user defined text attribute of the current vertex. See [73 Add text user defined attribute to the current point](#).

Measure	input	text
---------	-------	------

Previous segment tab (Attributes)

Integer	input	text
---------	-------	------

characters to denote that the next text is to be taken as a user defined integer attribute of the previous segment. See [77 Add integer user defined attribute to the previous segment](#).

Real	input	text
------	-------	------

characters to denote that the next text is to be taken as a user defined real attribute of the previous segment. See [78 Add real user defined attribute for the previous segment](#).

Text	input	text
------	-------	------

characters to denote that the next text is to be taken as a user defined text attribute of the previous segment. See [79 Add text user defined attribute to the previous segment](#).

Measure	input	text
---------	-------	------

Next segment tab (Attributes)

Integer	input	text
---------	-------	------

characters to denote that the next text is to be taken as a user defined integer attribute of the next segment. See [74 Add integer user defined attribute to the next segment](#).

Real	input	text
------	-------	------

characters to denote that the next text is to be taken as a user defined real attribute of the next segment. See [75 Add real user defined attribute to the next segment](#).

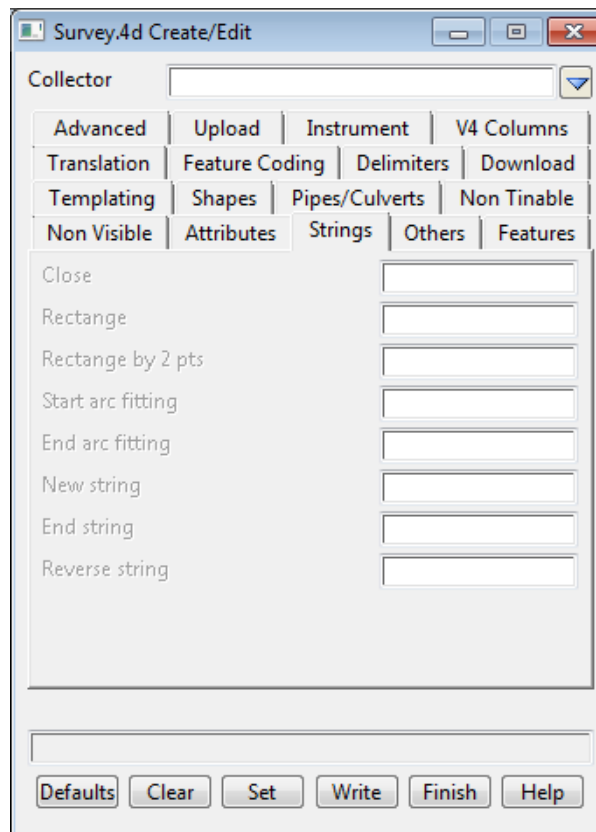
Text	input	text
------	-------	------

characters to denote that the next text is to be taken as a user defined text attribute of the next segment. See [76 Add text user defined attribute to the next segment](#).

Measure	input	text
---------	-------	------

Strings tab

For information on the string commands, see [Field Coding](#).



Close input C text

characters to denote that the string is closed. That is the current measurement is joined to the first point of the string. See [20 Close string](#).

Rectangle input R text

characters to denote that the string is a rectangle. That is the current measurement and the previous two points of the string are three points of a parallelogram and the fourth point is automatically created (and given a null height). See [45 Make a parallelogram from the last three measurement points](#).

Rectangle by 2 pts input text

characters to denote that the string is a rectangle. That is the previous two points of the string define one side and a offset defines the opposite side. Positive being to the right. The created points are given null height. See [37 Rectangle by two points](#).

Start arc fitting input S text

characters to denote the start of arc fitting. See [61 Start of arc through sets of three points until end of string, or a 62 occurs](#).

End arc fitting input E text

characters to denote the end of arc fitting. See [62 End the arcs begun by a 61 command](#).

New string input ST text

characters to denote the that the current measurement is the start of a new string, even if the string number has not changed. See [47 Start a new string using the same feature code and string number](#).

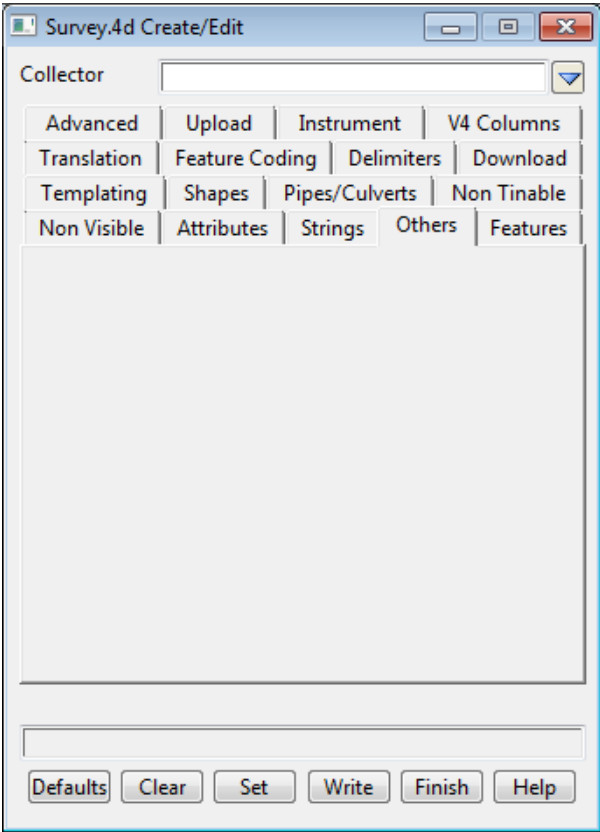
End string input text

characters to denote the that the current measurement is at the end of a string, even if the string

number has not changed on the next measurement. See [48 End a string](#).

Others tab

Under development.



Features tab

For information on Feature string, see [Feature](#).

Survey4d Create/Edit

Collector

Advanced	Upload	Instrument	V4 Columns
Translation	Feature Coding	Delimiters	Download
Templating	Shapes	Pipes/Culverts	Non Tinable
Non Visible	Attributes	Strings	Others
			Features

by radius

by diameter

Defaults Clear Set Write Finish Help

By radius input text

characters to denote that the feature has a given radius. For example, if RA was used then TRE*RA2 would denote a feature code TRE with a radius of 2 units.

There can be more than one set of characters that define 'By radius'. The sets are entered into the By radius field separated by a space. For example

$RA \quad RAD \quad RD$

would specify that RA and RAD and RD can be used to denote that the feature is defined by radius.

By diameter input text

characters to denote that the feature has a given diameter. For example, if DI was used then TRE*DI2 would denote a feature code TRE with a diameter of 2 units.

There can be more than one set of characters that define 'By diameter'. The sets are entered into the By diameter field separated by a space. For example

DI DIA DR

would specify that DI and DIA and DR can be used to denote that the feature is defined by diameter.

The 12d Field File Format

The detailed definition of the standardised 12d Field File will now be given. This is the file that all raw files are converted to before reduction in **12d Model**.

A few definitions will be given, followed by the complete description of the 12d Field File.

The raw data files from different data collectors are all converted to the **12d** field file format.

The 12d field file is ascii and has a name ending in **.fld**

Each line in the 12d field file is called a record and consists of an **operation code** (or *op code* for short) followed by zero or more tabs and pieces of information.

(a) zero fields

What actually follows the fixed header depends on the *op code*.
Hence the 12d field file record is:

op code
99

or

op code	tab	value	...	tab	value
02		abcS			fred

A number of conventions and definitions will be now given, followed by the complete description of the 12d Field File.

Important Note

Op codes are not the same as field codes. *Field codes* are entered by the surveyor in the field and may lead to one or more op codes being created in the 12d field file.

Please continue to the next section [Point Description](#).

Point Description

The *feature codes* and *string numbers* are entered by the surveyor whilst surveying in the field and the *point numbers* are usually automatically created by the surveying instrument but may sometimes be entered into the instrument by the surveyor.

Other information can also be entered by the surveyor using **field codes** and associated information. How each field code and associated information is entered in the field *depends on the data recorder* and the *coding convention* being used. This is set up in the *Data Collector definitions* in **12d Model**.

The data file from the instrument or data collector (raw file) is first converted in **12d Model** to the **12d** field file ready for loading into a **12d Model** Survey Reduction function for reduction.

In most lines of the **12d field file**, a *feature code*, *string number*, *point number*, *point name* and *point text* are given and are stored next to each other separated by tabs.

The **feature code** and **string number** have already been described.

The **point number** is the EDM tacheometry measurement point number which is not normally entered by the user but is written in the raw data file by the data collector. This is stored as the point number for the vertex of the super string.

The **point name** is used to store the name of a station (see the next section on *named measurements*) and is supplied by the user with certain op codes. It is also used by some op codes that do not require an actual point name but have other special information that needs to be stored.

The **point text** is stored as vertex text for that vertex of the super string.

In the 12d field file, the *feature code*, *string number*, *point number*, *point name* and *point text* are given in this order and are separated by tabs. Each can be up to sixty-three characters in length. If the item is missing then a tab is still needed so there may be two or more sequential tabs.

For simplicity in describing the **12d field file**, the feature code, string number, point number, point name and point text are grouped together and called the **point description**.

Hence the **point description** consists of the following pieces of information separated by tabs:

- s feature code (string name)
- s string number
- s point number
- s point name
- s point text

So it is convenient to think of the *point description* record as five columns of information:

feature code	string number	point number	point name	text
abc	01	1002	STN 4	freddie

Please continue to the next section [Measurements and Named Measurements](#).

Measurements and Named Measurements

The **12d** field file allows five types of measurements that create points (vertices) in super strings. They are

- (a) directly entered co-ordinates measurement
- (b) EDM measurement (HA,VA,SD, + point_description.)
- (c) EDM measurement VD (HA,HD,VD + point_description.)
- (d) EDM measurement HT (HA,HD,HT, + point_description.)
- (e) three hair stadia measurement

Each type of measurement creates a new point which is appended to the previous points with the same *feature code* and *string number*.

The last such measurement is referred to as the *current measurement point* or *current point* and the string it is appended to is the *current string*.

If a *point_name* exists in the *point_description* for any of the three types of measurements, then it is called a **named measurement** and a one point super string of name *point_name* is created and mapped using the mapping file. The vertex text for the one point super string is the station prefix followed by *point_name*. The *point_name* is added to an internal list of named points for searching for co-ordinates.

Please continue to the next section [Existing Station Co-ordinates](#).

Existing Station Co-ordinates

When setting up a new instrument, measuring to a backsight, doing a check measurement or manually entering a bearing to use as the bearing datum difference, the *point_name* or point number from the *point_description* is used to specify a point. The (x,y,z) co-ordinates for *point_name* are found by searching in the following order:

The difference between *point names* and *point numbers* is that *point names* are usually given by the user and should be a unique identifier for a point whilst for that same physical point a number of measurements (and hence point numbers) may be assigned (usually by the data collector). This may be particularly true of control station measurements where measurements are made to a given point name but each measurement is given a different point number by the data collector.

In most instances, a measurement to a point has a point number (from the data collector) and 12d automatically gives it the same point name as it is rare to measure a non-control point more than once (the point name can be over ridden by the user).

The names allow the reduction routine to search for the details of that point (e.g. coordinates) to allow for the reduction of further measurements. The order in which this searching takes place is as follows:

First search the Control model (if it exists):

1. A search is made of the control model for a string whose name is the same as the specified *point name*. If a string is found, the first point of the string is used for the (x,y,z) co-ordinates.
2. A search is made of the control model for a vertex of a string whose point number is the same as the specified *point name*. If a vertex is found its (x,y,z) co-ordinates are used.
3. If only a *point number* was specified, a search is made of the control model for a vertex of a string whose point number is the same as the specified *point number*. If a vertex is found its (x,y,z) co-ordinates are used.

Next search the already entered directly entered co-ordinates (DEC) in the field file:

4. A search is made of previously entered directly entered co-ordinates in the field file for a directly entered co-ordinate whose *point name* is the same as the specified *point name*. If a DEC is found, its (x,y,z) co-ordinates are used.
5. A search is made of previously entered directly entered co-ordinates in the field file for a directly entered co-ordinate whose *point number* is the same as the specified *point name*. If a DEC is found, its (x,y,z) co-ordinates are used.
6. A search is made of previously entered directly entered co-ordinates in the field file for a directly entered co-ordinate whose *point number* is the same as the specified *point number*. If a DEC is found, its (x,y,z) co-ordinates are used.

Next search the previous measurements in the field file:

7. A search is made of previous measurements in the field file for a measurement whose *point name* is the same as the specified *point name*. If a measurement is found, its (x,y,z) co-ordinates are used.
8. A search is made of previous measurements in the field file for a measurement whose *point number* is the same as the specified *point name*. If a measurement is found, its (x,y,z) co-ordinates are used.
9. A search is made of previous measurements in the field file for a measurement whose *point number* is the same as the specified *point number*. If a measurement is found, its (x,y,z) co-ordinates are used.
10. or finally, the user is asked to type in the (x,y,z) co-ordinates in a **Survey Data Define Station** panel. If a model is specified in the Add to model field of the panel, then a new one point super string is created with the name *point_name*, and as the vertex text for the point, the Station label prefix field value followed by *point_name*.

For a summary of the **12d Field File Op Codes**, go to the section [Summary of 12d Field File Op Codes](#)

For the full description of the **12d Field File Op Codes**, go to the section [Full Description of 12d Field File Op Codes](#)

Full Description of 12d Field File Op Codes

For a summary of the **12d Field File Op Codes**, go to the section [Summary of 12d Field File Op Codes](#).

The record for each *op code* allowed in the 12d field file will now be described in detail.

For each *op code* record, two lines and a paragraph of description are given:

- s The first line consists of the *op code* and a short description of the purpose of the code.
- s The second line gives the full syntax of the record for that *op code*.
- s The paragraph gives a detailed description of the *op code* record.

Optional information is enclosed in the square brackets []

All **angles** in the 12d field file are given in **decimal** degrees.

Important Note

Op codes are not the same as field codes. *Field codes* are entered by the surveyor in the field and may lead to one or more op codes being created in the 12d field file.

Op Code	Description of Record
1	<p>Four 10 character information blocks</p> <p><i>01 block1 block2 block3 block4</i></p> <p>This information is ignored.</p>
2	<p>Directly entered coordinate measurement</p> <p><i>02 Point_description X Y Z</i></p> <p>A <i>measurement</i> point is created with the <i>feature code</i> and <i>string number</i> from the <i>point_description</i> and given (x, y,z) co-ordinates. No reduction is needed.</p> <p>The <i>point_number</i> and <i>text</i> from the <i>point_description</i> are recorded as the point number and text for that vertex of the super string.</p> <p>If a <i>point_name</i> exists in the <i>point_description</i>, then it is a named measurement and a 4d point string of name <i>point_name</i> is created and mapped using the mapping file. The 4d text is the station prefix followed by <i>point_name</i>. The <i>point_name</i> is added to the internal list of named points for searching for co-ordinates.</p>
3	<p>New instrument point</p> <p><i>03 Point_description instrument_height</i></p> <p>Setting up an instrument at the point with name given in the <i>point_name</i> section of the <i>point_description</i>. The (x,y,z) co-ordinates for <i>point_name</i> are found by first searching the control model, then the list of previously named point in the reduction, point numbers of previous measurements and finally if <i>point_name</i> is still not found, the user is asked to type in the (x,y,z) co-ordinates. A record is written to the report file.</p>
4	<p>Measurement to backsight</p> <p><i>04 Point_description horizontal_circle vertical_circle slope_distance azimuth</i></p> <p>Measurement to a backsight whose name is given in the <i>point_name</i> section of the <i>point_description</i>. If the <i>Display panel for backsights</i> field in the Survey Data Reduce panel is tick, then the Survey Data Bearing Datum Difference panel shows the <i>bearing datum difference</i> and the <i>horizontal distance</i></p>

difference. A record is written to the report file. The units for *horizontal_circle* and *vertical_circle* are decimal degrees. The azimuth may be specified where no coordinate for the backsight point exists in decimal degrees.

5 New target height

05 Target_height

Set a new target height.

6 Check measurement

06 Point_description horizontal_circle vertical_circle slope_distance

A check measurement is made to the station given in the *point_name* section of the *point_description*. A two point super string (with name *point_name*) from the instrument point to the measured point is created in the default model for the check measurement. The instrument point name, the station name and the differences between the measurement point co-ordinates and the station co-ordinates are written as text along the super string. The differences between the measurement and the known point is also written to the report file. The units for *horizontal_circle* and *vertical_circle* are decimal degrees.

7 Measurement - HA, VA, SD

07 Point_description horizontal_circle vertical_circle slope_distance

Measurement made by the instrument. A *measurement* point is created with the *feature code* and *string number* from the *point_description*. The units for *horizontal_circle* and *vertical_circle* are decimal degrees.

The *point_number* and *text* from the *point_description* are recorded as the point number and text for that vertex of the super string.

If a *point_name* exists in the *point_description*, then it is a **named measurement** and a 4d point string of name *point_name* is created and mapped using the mapping file. The 4d text is the station prefix followed by *point_name*. The *point_name* is added to the internal list of named points for searching for co-ordinates.

9 Scale factor for subsequent distances

09 Scale_factor

Scale factor to apply to subsequent slope distances.

10 Three hair stadia measurement

10 Point_description horizontal_circle vertical_circle bottom middle top

Manual measurement. A *measurement* point is created with the *feature code* and *string number* from the *point_description*. The units for *horizontal_circle* and *vertical_circle* are decimal degrees.

The *point_number* and *text* from the *point_description* are recorded as the point number and text for that vertex of the super string.

If a *point_name* exists in the *point_description*, then it is a **named measurement** and a 4d point string of name *point_name* is created and mapped using the mapping file. The 4d text is the station prefix followed by *point_name*. The *point_name* is added to the internal list of named points for searching for co-ordinates.

11 Measurement - HA, HD, Height

11 Point_description horizontal_circle horizontal_distance height

Measurement made by the instrument. A *measurement* point is created with the *feature code* and *string number* from the *point_description*. The unit for *horizontal_circle* is decimal degrees.

The *point_number* and *text* from the *point_description* are recorded as the point number and text for that vertex of the super string.

If a *point_name* exists in the *point_description*, then it is a **named measurement** and a 4d point string of name *point_name* is created and mapped using the mapping file. The 4d text is the station prefix

followed by *point_name*. The *point_name* is added to the internal list of named points for searching for co-ordinates.

12 Measurement - HA, HD, Height difference

11 *Point_description horizontal_circle horizontal_distance height_difference*

Measurement made by the instrument. A *measurement* point is created with the *feature code* and *string number* from the *point_description*. The unit for *horizontal_circle* is decimal degrees.

The *point_number* and *text* from the *point_description* are recorded as the point number and text for that vertex of the super string.

If a *point_name* exists in the *point_description*, then it is a **named measurement** and a 4d point string of name *point_name* is created and mapped using the mapping file. The 4d text is the station prefix followed by *point_name*. The *point_name* is added to the internal list of named points for searching for co-ordinates.

15 Vertical circle correction

09 *Vertical_circle_in_decimal_degrees*

The *vertical_circle_in_decimal_degrees* is **subtracted** from the vertical circle value in any measurements. The units for *vertical_circle_in_decimal_degrees* is decimal degrees.

16 Multiply coded point

16 *Point_description*

Additional coding for the current measurement point created by op codes 02, 07 or 10. A new measurement point is created at the same position as the current measurement point but with the *feature code* and *string number* from the *point_description* for this op code.

The *point_number* and *text* from the *point_description* are recorded as the point number and text for that vertex of the super string.

If a *point_name* exists in the *point_description*, then it is a **named measurement** and a 4d point string of name *point_name* is created and mapped using the mapping file. The 4d text is the station prefix followed by *point_name*. The *point_name* is added to the internal list of named points for searching for co-ordinates.

17 Arc through previous three points

17 [*Point_description*]

If no *point_description* is given, then the current measurement point and the two previous points with the same *feature code* and *string number* as the current measurement point, are joined by an arc. If there is less than three such points, no arc is fitted.

If a *point_description* exists, then either the *feature code* and *string number* or the *point number* section of the *point_description* can be used.

If the *feature code* and *string number* from the *point_description* exist, the last three previous measurement points of the same *feature code* and *string number* are joined by an arc. If the current measurement point has that *feature code* and *string number*, then it is the third of the three points used. If there is less than three points, no arc is fitted.

If *Point_number* exists, then the *feature code* and *string number* are taken from the previous measurement point **with** that point number. That point and the two measurement points previous to the predefined point of the same *feature code* and *string number*, are joined by an arc. If there is less than three points, no arc is fitted

See [Arcs Through Points](#)

18 Circle Feature

18 *Radius*

Creates a feature string with the given radius and centred on the current measurement point.

See [Feature](#)

20 Close string

20 [Point_description]

If no *point_description* is given, the current string is closed.

If a *point_description* exists, then either the *feature code* and *string number* or the *point number* section of the *point_description* can be used.

If the *feature code* and *string number* from the *point_description* exist, the last previous string with that *feature code* and *string number* is closed.

If the *point number* from the *point_description* exists, then the string containing that point number will be closed.

See [Close String](#)

21 Join last points of strings

21 *Feature_code string_number_1 string_number_2*

In the final reduction, the last point of the string with the given *feature_code* and *string_number_1* is joined to the last point of the string with given *feature_code* and *string_number_2*. The created string has the given *feature_code* (no string number is needed since it is the final phase of reduction when the string numbers are dropped).

See [Joining Strings](#)

22 Join first to last point of strings

22 *Feature_code string_number_1 string_number_2*

In the final reduction, the first point of the string with the given *feature_code* and *string_number_1* is joined to the last point of the string with given *feature_code* and *string_number_2*. The created string has the given *feature_code* (no string number is needed since it is the final phase of reduction when the string numbers are dropped).

See [Joining Strings](#)

23 Join first points of strings

23 *Feature code string number_1 string number_2*

In the final reduction, the first point of the string with the given *feature code* and *string number 1* is joined to the first point of the string with given *feature code* and *string number 2*. The created string has the given *feature code* (no string number is needed since it is the final reduction when the string numbers are then dropped).

See [Joining Strings](#)

28 Add text to the string name

28 [Point_description] *Text*

Text is appended to the string name. For example, if 1.200 is entered, "1.200" is appended to the string name.

If no *point_description* is given, *Text* is appended to the string name of the current string.

If a *point_description* exists, then either the *feature code* and *string number* or the *point number* section of the *point_description* can be used.

If the *feature code* and *string number* exist, then the last previous string with that *feature code* and *string number* has *Text* appended to the string name.

If the *point number* exists, then the string containing that point number has *Text* appended to the string name.

29 Note or memo*29 Comments*

Any text may be entered and will be added to the check measurements model at the position of the current measurement point.

30 Remove height from a point - that is make it a null height*30 [Point_description]*

If no *point_description* is given, the height of the current measurement point is set to null.

If a *point_description* exists, then either the *feature code* and *string number* or the *point number* section of the *point_description* can be used.

If the *feature code* and *string number* exist, then the height of the last point of the previous string with that *feature code* and *string number* is set to null.

If the *point number* exists, then the height of the point with that point number is set to null.

37 Rectangle by two points*37 [Point_description] offset_in_metres*

The rectangle is defined by two points (reference side) and a offset.

If a positive offset value is given, two points will be created to the right of the reference side.

If a negative offset value is given, two points will be created to the left of the reference side.

If no *point_description* is given, the two new points will be joined to the given points in a closed rectangular string, and will have the same feature code as the points given.

If the *feature code* and *string number* exist, then a search is made for the last occurrence of two points with the same *feature code* and *string number*. If found, then these points are used to define the reference side of the rectangle.

If the *point number* exists, then a search is made for the last occurrence of two points with the same *feature code* and *string number* as the point given by the point number. If found, then these points are used to define the reference side of the rectangle.

Two consecutive rectangles are unable to be defined side by side. In other words if the two points given are part of string of greater than two vertices, the command will only work for sets of two points that are exclusively defined. i.e. For a 5 point string, a rectangle can be defined by points 1 and 2, and 4 and 5.

See [Rectangle by 2 Points](#)

38 Make the previous segment non-tinable*38 [Point_description]*

If no *point_description* is given, the previous segment containing the current measurement point is set to non-tinable. That is, it will not be treated as a breakline in triangulations.

If a *point_description* exists, then either the *feature code* and *string number* or the *point number* section of the *point_description* can be used.

If the *feature code* and *string number* exist, then the last segment of the previous string with that *feature code* and *string number* is set to non-tinable.

If the *point number* exists, then the segment containing the point with that point number as an end point, is set to non-tinable.

39 Make the next segment non-tinable*39 [Point_description]*

If no *point_description* is given, the next segment containing the current measurement point as a starting point is set to non-tinable. That is, it will not be treated as a breakline in triangulations.

If a *point_description* exists, then either the *feature code* and *string number* or the *point number* section of the *point_description* can be used.

If the *feature code* and *string number* exist, then the segment that is created in the future from the last point of the previous string with that *feature code* and *string number* is set to non-tinable.

If the *point number* exists, then the segment containing the point with that point number as a start point, is set to non-tinable.

40 Make a point non-tinable

40 [*Point_description*]

If no *point_description* is given, the current measurement point is set to non-tinable. That is, it will not be included in triangulations.

If a *point_description* exists, then either the *feature code* and *string number* or the *point number* section of the *point_description* can be used.

If the *feature code* and *string number* exist, then the last point of the previous string with that *feature code* and *string number* is set to non-tinable.

If the *point number* exists, then the point with that point number is set to non-tinable.

41 Add additional text for the current measurement point

41 *Text*

The given *text* is added to the end of any existing text for the current measurement point. Any spaces from column four onwards will be part of the text.

42 Add a radial offset

42 [*Point_description*] *Radial_offset_in_metres*

The *radial_offset_in_metres* is used to adjust the position of the specified point by a plan distance from the specified points original position, along the plan line joining the current station to the specified point. A positive offset is away from the station, negative is toward the station.

If no *point_description* is given, the offset is used to adjust the position of the current measured point.

If a *point_description* exists, then either the *feature code* and *string number* or the *point number* section of the *point_description* can be used.

If the *feature code* and *string number* exist, then the last point of the previous string with that *feature code* and *string number* is adjusted.

If the *point number* exists, then the point with that point number is adjusted.

See [Offsets](#)

43 Add a tangential offset

43 [*Point_description*] *Tangential_offset_in_metres*

The *tangential_offset_in_metres* is used to adjust the position of the specified point by a plan distance from the specified points original position, at rights angles to the plan line joining the current station to the specified point. A negative offset is to the left (looking from the station), and positive is to the right (looking from the station).

If no *point_description* is given, the offset is used to adjust the position of the current measured point.

If a *point_description* exists, then either the *feature code* and *string number* or the *point number* section of the *point_description* can be used.

If the *feature code* and *string number* exist, then the last point of the previous string with that *feature code* and *string number* is adjusted.

If the *point number* exists, then the point with that point number is adjusted.

See [Offsets](#)

44 Add a height offset

44 [*Point_description*] *Height_offset_in_metres*

If the height of the specified point is not null, then the *height_offset_in_metres* adjusts the height of the point. A positive offset adds to the height, a negative offset reduces the height.

If no *point_description* is given, the offset is used to adjust the position of the current measured point.

If a *point_description* exists, then either the *feature code* and *string number* or the *point number* section of the *point_description* can be used.

If the *feature code* and *string number* exist, then the last point of the previous string with that *feature code* and *string number* is adjusted.

If the *point number* exists, then the point with that point number is adjusted.

See [Offsets](#)

45 Make a parallelogram from the last three measurement points

45 [*Point_description*]

If no *point_description* is given, the current measurement point and the two previous points from the current string are used and a fourth point is created to form a parallelogram (squashed rectangle) and the height of the fourth point is set to null. The string is then closed.

If a *point_description* exists, then either the *feature code* and *string number* or the *point number* section of the *point_description* can be used.

If the *feature code* and *string number* exist, the last three points with that *feature code* and *string number* are used and a fourth point is created to form a parallelogram (squashed rectangle) and the height of the fourth point is set to null. The string is then closed.

If the *point number* exists, then the *feature code* and *string number* of the point with that point number are used and processed as above. Note that the point with the point number is not necessarily used.

See [Rectangle](#)

46 Make the string a breakline or not

46 [*Point_description*] [*mode*]

The *point_description* is used to select a string and the *mode* is used specify if the string is a breakline or not.

point_description:

If no *point_description* is given, the current string is selected.

If a *point_description* exists, then either the *feature code* and *string number* or the *point number* section of the *point_description* can be used.

If the *feature code* and *string number* exist, the last string with that *feature code* and *string number* is selected.

If the *point number* exists, then the string containing the point with that point number is selected.

mode:

If no *mode* is given, the selected string is set as a point string (that is, not a breakline).

If *mode* is given, then

if *mode* is 0, the selected string is set to a point string and hence is not a breakline.

if *mode* is 1, the selected string is set to a *line* string and is therefore a breakline

47 Start a new string using the same feature code and string number

47 [*Point_description*]

If no *point_description* is given, the current string is terminated (without including the current

measurement point) and the current measurement point becomes the first point of a new string with the same feature code and string number.

If a *point_description* exists, then either the *feature code* and *string number* or the *point number* section of the *point_description* can be used.

If the *feature code* and *string number* exist, then the last point of the previous string with that feature code and string number becomes the first point of a new string with the same *feature code* and *string number*.

If the *point number* exists, then the previous string containing the point with that point number is terminated *before* the point number point, and the point becomes the first point of a new string with the same *feature code* and *string number*.

See [Start New String](#)

48 End a string

48 [*Point_description*]

If no *Point_description* exists, the current string is terminated (including the current measurement point).

If *Feature_code* and *String_number* exist, then the last point of the previous string with that feature code and string number becomes the last point of that string.

If *Point_number* exists, then the previous string containing the point with that point number is terminated *after* the point number point

50 Specify the bearing to correct for true north - used as the bearing datum difference

50 *Point_description bearing_in_decimal_degrees*

The *bearing_in_decimal_degrees* is used as the bearing datum difference for the current instrument set up. The *point_name* in the *point_description* and the *bearing_in_decimal_degrees* are written to the report file.

51 Start using an existing field template

51 *Template_name zigzag_mode*

Start using the field template *Template_name*. If *Template_name* is blank, the default field template is used.

If *mode* is "for", then the field template is used as a *forward* template.

"rev", then the field template is used as a *reverse* template.

"zig", then the field template is used as a *zigzag* template and is used in the *forward* definition direction first (that is starts on a zig).

"zag", then the template is used as a *zigzag* template and is used in the *reverse* direction first (that is, starts on a zag).

If *mode* is blank, or anything other than "for", "rev", or "zag" then the field template is used as a zigzag template starting on a *zig*.

See [Field Templates](#)

52 Finish using a field template or finish recording a field template

52

Stops using the current field template or stops recording a field template.

See [Field Templates](#)

53 Pause using the current field template

53

Pause using the current field template or defining a field template, until a continue field template (54) or a finish field template (52) code is given.

See [Field Templates](#)

54 Continue the current field template

54

Continue using or defining the current field template, which has been stopped by a *Pause* field template command (53). The *Continue* command only needs to be given once and applies to all following measurements until another *Pause* or *Finish* command is given.

See [Field Templates](#)

55 Start recording a field template

55 [Template_name]

Start recording a field template with the name *Template_name*. If *Template_name* is blank, then it is the default field template that is defined. The *feature_code* and *string_number* of the following measurements until a *Finish* code (52) are stored as the field template. There is no limit to the number of points in a field template.

See [Field Templates](#)

56 Skipping picking up points when using a field template

56 [num_skipped_points]

Allows the user to skip picking up one or more points from the field template currently being used. The next measurement takes the *feature_code* and *string_number* from the next point of the field template definition. If *num_skipped_points* is missing, then only one point is skipped otherwise *num_skipped_points* are skipped.

See [Skipping Field Template Points](#)

57 Delete points on a field template - after the measurement of last point

57 [num_points_to_delete]

Allows the user to delete one or more points from the field template currently being used. The *next measurement* takes the *feature_code* and *string_number* from the next point of the field template definition.

See [Field Templates](#)

58 Insert points when using a field template - after the measurement of last point

58 Feature_code String_number Multiple_code_flag Insert_special_flag

Allows the user to insert points into the field template currently being used, or give an existing point a multiple code.

If the *Multiple_code_flag* = 1, then the feature code will be added to the previous defined template point else if *Multiple_code_flag* = 0 (default), it will be added to the template as a separate point.

If the insert is done at the end of a section and the *Insert_special_flag* = 1 the point will be added to the end of the current template section else it will be at the start of the next section.

The *next measurement* takes the *feature_code* and *string_number* from the next point of the field template definition.

See [Insert Template Points or Insert Multiple Codes](#)

60 Arc through next three points

60 [Point_description]

If no *point_description* is given, an arc is inserted through the current measurement point and the next two measured points with the same feature code and string number as the current measurement point. If there is less than three points, no arc is fitted.

If a *point_description* exists, then either the *feature code* and/or *string number* and/or the *point number* section of the *point_description* can be used.

If the *feature code* or *string number* from the *point_description* exist, a search is made for a previously

defined measurement with the same feature code or string number. An arc is inserted through this previous measurement and the next two measured points following this previous measurement with the same feature code and string number, as given in *point_description*. If the current point has that feature code and string number, then it is the first of the three points. If there is less than three points, no arc is fitted.

If the *point number* exists, then the *feature code* and *string number* are taken from the previous measurement point **with** that point number, and an arc is inserted through that point and the next two measurement points with the same *feature code* and *string number*. If there is less than three points, no arc is fitted

See [Arcs Through Points](#)

61 Start of arc through sets of three points until end of string, or a 62 occurs

61 [Point_description]

If no *point_description* is given, arcs are inserted through the following sets of measurement points with the same feature code and string number as the current measurement point. The current measurement point is the first of the points.

The arcs are fitted as follows - the first arc is fitted through points one, two and three, the next arc through points three, four and five etc. If the current point has that feature code and string number, then it is the first of the points. If there is less than three points, then no arc is fitted.

If a *point_description* exists, then either the *feature code* and *string number* or the *point number* section of the *point_description* can be used.

If the *feature code* and *string number* exist, a search is made for a previously defined measurement with the same feature code or string number. An arc is inserted through the following measured points with the same feature code and string number as given in *point_description*. If the current point has that feature code and string number, then it is the first of the points.

If the *point number* exists, then the *feature code* and *string number* are taken from the previous measurement point **with** that point number, and arcs are inserted through that point and the following measured points with the same *feature code* and *string number*.

See [Arcs Through Points](#)

62 End the arcs begun by a 61 command

62 [Point_description]

If no *point_description* is given, then the fitting of arcs through the points of the current string is stopped. The current measurement point is the last of the points used in the arc fitting.

If a *point_description* exists, then either the *feature code* and *string number* or the *point number* section of the *point_description* can be used.

If the *feature code* and *string number* from the *point_description* exist, then the fitting of arcs through the points of the previous string with the same *feature code* and *string number* is stopped. If the current measurement point has that feature code and string number, then it is the last point used in the arc fitting.

If the *point number* from the *point_description* exists, then the point with that point number is the last point used in the arc fitting.

If **12d Model** encounters an *End Arcs* (62) but no *Start Arcs through sets of three points* (61) command for the string, then a *Start Arcs through sets of three points* (61) is assumed to apply at the beginning of the string and hence arc fitting will be applied to the entire string.

See [Arcs Through Points](#)

There are op codes for adding user defined attributes to:

- (a) the current string being measured (i.e. the string containing the current measurement point)

- (b) the current measurement point
 - (c) the next segment from the current measurement point (i.e. the segment joining the current measurement point and the *next* measured point of the same feature code and string number)
- or
- (d) the previous segment to the current measurement point (i.e. the segment joining the current measurement point to the previous measured point of the same feature code and string number).

If there is no name for the attribute (name is just spaces or a tab), then the attribute is *unnamed*. The attributes are coded in the following way:

68 Add an integer user defined attribute to the current string

68 Name Integer

Add an user defined integer attribute to the current string.

69 Add a real user defined attribute to the current string

69 Name Real

Add a real (floating point) user defined attribute to the current string.

70 Add text user defined attribute to the current string

70 Name Text

Add a text user defined attribute to the current string.

71 Add integer user defined attribute to the current point

71 Name Integer

Add an integer user defined attribute to the current measurement point.

72 Add real user defined attribute to the current point

72 Name Real

Add a real (floating point) user defined attribute to the current measurement point.

73 Add text user defined attribute to the current point

73 Name Text

Add a text user defined attribute to the current measurement point.

74 Add integer user defined attribute to the next segment

74 Name Integer

Add an integer user defined attribute to the next segment from the current measurement point.

75 Add real user defined attribute to the next segment

75 Name Real

Add a real (floating point) user defined attribute to the next segment from the current measurement point.

76 Add text user defined attribute to the next segment

76 Name Text

Add a text user defined attribute to the next segment from the current measurement point.

77 Add integer user defined attribute to the previous segment

77 Name Integer

Add an integer user defined attribute to the previous segment for the current measurement point.

78 Add real user defined attribute for the previous segment*78 Name Real*

Add a real (floating point) user defined attribute to the previous segment for the current measurement point.

79 Add text user defined attribute to the previous segment*79 Name Text*

Add a text user defined attribute to the previous segment for the current measurement point.

In addition, extra codes allow special **12d Model** pipe strings to be coded in the field

80 Pipe invert point (bottom of the pipe)*80 [Point_description]*

If no *point_description* is given, the current measurement point is on the invert (bottom) of a pipe. This is the default for measurements to points on pipe strings. If the point is not part of a pipe string, it is ignored.

If a *point_description* exists, then either the *feature code* and *string number* or the *point number* section of the *point_description* can be used.

If the *feature code* and *string number* exist, the last point of the previous string with the same *feature code* and *string number* as given in *point_description* is on the invert (bottom) of a pipe. If the point is not part of a pipe string, it is ignored.

If the *point number* exists, then the point with that point number is on the invert (bottom) of a pipe. If the point is not part of a pipe string, it is ignored.

81 Pipe axial point (centre of the pipe)*81 [Point_description]*

If no *point_description* is given, the current measurement point is on the axis (centre) of a pipe. If the point is not part of a pipe string, it is ignored.

If a *point_description* exists, then either the *feature code* and *string number* or the *point number* section of the *point_description* can be used.

If the *feature code* and *string number* exist, the last point of the previous string with the same *feature code* and *string number* as given in *point_description* is on the axis (centre) of a pipe. If the point is not part of a pipe string, it is ignored.

If the *point number* exists, then the point with that point number is on the axis (centre) of a pipe. If the point is not part of a pipe string, it is ignored.

82 Pipe obvert point (top of the pipe)*82 [Point_description]*

If no *point_description* is given, the current measurement point is on the obvert (top) of a pipe. If the point is not part of a pipe string, it is ignored.

If a *point_description* exists, then either the *feature code* and *string number* or the *point number* section of the *point_description* can be used.

If the *feature code* and *string number* exist, the last point of the previous string with the same *feature code* and *string number* as given in *point_description* is on the obvert (top) of a pipe. If the point is not part of a pipe string, it is ignored.

If the *point number* exists, then the point with that point number is on the obvert (top) of a pipe. If the point is not part of a pipe string, it is ignored.

83 Start recording a shape - before the measurement*83 [Shape_name]*

Start recording a shape with the name *Shape_name*. If *Shape_name* is non-blank, then the default field Shape is defined by the *feature_code* and *string_number* of the following measurements until a *Finish* code (84) are stored as the shape. There is no limit to the number of points in a shape.

See [Shape field coding](#)

84 Finish using a shape definition or finish recording a shape - after the measurement

Stops using the current shape or stops recording a shape.

See [Shape field coding](#)

85 Shape parallel*85 [Shape_name] [Point_description]*

Takes all the points on the defined shape of *Shape_name* and parallels them the entire length of the string. Once paralleled, a number of strings are created.

If *Feature_code* and *String_number* exist, the last string with the same *feature code* and *string number* has the shape applied to the entire length of the string.

If *Point_number* exists, then the string containing that point number has the shape applied to the entire length of the string.

See [Shape field coding](#)

86 Shape extrude*86 [Shape_name] [Point_description]*

Takes the defined shape of *Shape_name* and extrudes it along the entire length of the string. Once extruded, only one strings is created which contains all the shape information.

If *Feature_code* and *String_number* exist, the last string with the same *feature code* and *string number* has the shape applied to the entire length of the string.

If *Point_number* exists, then the string containing that point number has the shape applied to the entire length of the string.

See [Shape field coding](#)

92 Remove all z-values for a string (i.e. make all z-values null)*92 [Point_description]*

If no *point_description* is given, all z-values for the current string are removed.

If a *point_description* exists, then either the *feature code* and *string number* or the *point number* section of the *point_description* can be used.

If the *feature code* and *string number* exist, the last string with the same *feature code* and *string number* has all its z-values removed.

A *point-line type* can be embedding as a 0 or 1 in the *point name* part of the *point description* field. A zero value specifies a point string, and a non-zero value specifies a line string. If the field was omitted, a line string is assumed.

The point-line type may be overridden by the mapping file.

93 Set the Point-line type*93 [Point_description]*

A *point-line type* can be embedding as a 0 or 1 in the *point name* part of the *point description* field. A zero value specifies a point string, and a non-zero value specifies a line string. If the field was omitted, a line string is assumed.

If no *point_description* is given, the point-line type for the current string is set to *line*.

If a *point_description* exists, then either the *feature code* and *string number* or the *point number* section of the *point_description* can be used.

If the *feature code* and *string number* exist, the point-line type is set for the last previous string with the same *feature code* and *string number*.

If the *point number* exists, then the point-line type is set for the string containing that point number.

The point-line type may be overridden by the mapping file.

94 Use name library file/ mapping file for vertex text on the string - name mapping

94 [*Point_description*]

If this op code exists then during reduction, vertex text is creating using either the name library, or if the name library doesn't exist, the map file. If neither exist then the op code is ignored.

if a name library is used and the feature code of the string is found in the first column of the name library, then the entry from the second column of that row will be used as text for *all* vertices of the string that don't already have vertex text. As a default, the string is set as a point string.

if the map file is used and the feature code of the string is found in the first column of the map file, then the *string name* field of the map file is used as vertex text for all vertices that don't already have text. As a default, the string is set as a point string.

If no *point_description* is given, then name mapping is applied to the current string.

If a *point_description* exists, then either the *feature code* and *string number* or the *point number* section of the *point_description* can be used.

If the *feature code* and *string number* exist, then name mapping is applied to the last previous string with the same *feature code* and *string number*.

If the *point number* from the *point_description* exists, then name mapping is applied to the string containing that point number.

A *point-line type* can be embedding as a 0 or 1 in the *point name* part of the *point description* field. A zero value specifies a point string, and a non-zero value specifies a line string. If the field was omitted, a line string is assumed.

The point-line type may be overridden by the mapping file.

95 Pipe string

95 [*Point_description*] *diameter*

Pipe strings are always line strings and are stored with the justification of the majority of the string points. Individual pipe points are picked up either top (obvert), centre (axial) or bottom (invert) of the pipe using op codes 80, 81 and 82.

If no *point_description* is given, the current string is created as a pipe string with the given diameter.

If a *point_description* exists, then either the *feature code* and *string number* or the *point number* section of the *point_description* can be used.

If the *feature code* and *string number* exist, the last string with the same *feature code* and *string number* is created as a pipe with the given diameter.

If the *point number* exists, then the string containing that point number is created as a pipe string with the given diameter.

96 Culvert string

96 [*Point_description*] *width* *height*

Culvert strings are always line strings and are stored with the justification of the majority of the string points. Individual culvert points are picked up either top (obvert), centre (axial) or bottom (invert) of the culvert using op codes 80, 81 and 82.

If no *point_description* is given, the current string is created as a culvert string with the given width and height.

If a *point_description* exists, then either the *feature code* and *string number* or the *point number* section of the *point_description* can be used.

If the *feature code* and *string number* exist, the last string with the same *feature code* and *string number* is created as a culvert with the given width and height.

If the *point number* exists, then the string containing that point number is created as a culvert string with the given width and height.

99 Terminate processing

99

Stop processing the 12d field file at this line. Useful for debugging errors.

107 Make the previous segment invisible - after the measurement

107 [*Point_description*]

If no *Point_description* exists, the previous segment containing the current measurement point is set to invisible.

If the *Feature_code* and *String_number* exist, then the last segment of the previous string with that *feature code* and *string number* is set to invisible.

If *Point_number* exists, then the segment containing the point with that point number as an end point, is set to invisible.

108 Make the next segment invisible - after the measurement for the first point of the segment

108 [*Point_description*]

If no *Point_description* exists, the next segment containing the current measurement point as a starting point is set to invisible.

If the *Feature_code* and *String_number* exist, then the segment that is created in the future from the last point of the previous string with that *feature code* and *string number* is set to invisible.

If *Point_number* exists, then the segment containing the point with that point number as a start point, is set to invisible.

109 Make a point invisible - after the measurement

109 [*Point_description*]

If no *Point_description* exists, the current measurement point is set to invisible.

If *Feature_code* and *String_number* exist, then the last point of the previous string with that *feature code* and *string number* is set to invisible.

If *Point_number* exists, then the point with that point number is set to invisible.

110 Start buildings face observations - before the measurements

110 [*Building_name*]

Start recording a field template with the name *Building_name*. If *Building_name* is non-blank, then the default building face is defined. The *feature_code* and *string_number* of the following measurements until a *Finish* code (111) are stored as the building face. There is no limit to the number of points in a building face.

111 End building face observations

111 [*Building_name*]

If no *Building_name* exists, the current building face observation set is finished (including the current measurement point).

Notes

1. Arc fitting is applied *after* the Joins are processed. Hence the new joined strings are created and then curve fitting is applied according to the arc codes (start arc, end arc, fit arcs, stop fitting arcs etc.) on any vertex of the string.
2. The *point description* has several pieces of information embedded in it and has been described in the previous section. For some op codes, the *point name* section of the *point description* is used to hold other information.

For a summary of the **12d Field File Op Codes**, go to the section [Summary of 12d Field File Op Codes](#)

Summary of 12d Field File Op Codes

Op Code	Description of Record
-2	Comment
-1	Error
01	Header Information
02	Directly entered coordinate measurement
03	New instrument setup point
04	Measurement to backsight
05	New target height
06	Check measurement
07	Measurement - HA, VA, SD
09	Scale factor for subsequent distances
10	Three hair stadia measurement
11	Measurement - HA, HD, Ht
12	Measurement - HA, HD, Ht diff
15	Vertical circle correction
16	Multiply coded point
17	Arc through previous three points
18	Circle Feature
20	Close string
21	Join last points of strings
22	Join first to last point of strings
23	Join first points of strings
28	Add text to the string name
29	Note or memo
30	Remove height from a point - that is make it a null height
37	Rectangle by two points
38	Make the previous segment non-tinable
39	Make the next segment non-tinable
40	Make a point non-tinable
41	Add additional text for the current measurement point
42	Add a radial offset
43	Add a tangential offset
44	Add a height offset
45	Make a parallelogram from the last three measurement points
46	Make the string a breakline or not
47	Start a new string using the same feature code and string number
48	String end
50	Specify the bearing to correct for true north - used as the bearing datum difference
51	Start using an existing field template
52	Finish a field template or finish recording a field template
53	Pause the current field template until a continue op code (54) or a finish template (52)
54	Continue the current field template
55	Start recording a field template
56	Skip picking up one or more points from a field template
57	Delete one or more points from a field template
58	Insert a point into a field template
60	Arc through next three points
61	Start of arc through sets of three points until end of string, or a 62 occurs
62	End the arcs begun by a 61 command
68	Add an integer user defined attribute to the current string
69	Add a real user defined attribute to the current string
70	Add text user defined attribute to the current string
71	Add integer user defined attribute to the current point
72	Add real user defined attribute to the current point
73	Add text user defined attribute to the current point
74	Add integer user defined attribute to the next segment

- 75 Add real user defined attribute to the next segment
- 76 Add text user defined attribute to the next segment
- 77 Add integer user defined attribute to the previous segment
- 78 Add real user defined attribute for the previous segment
- 79 Add text user defined attribute to the previous segment
- 80 Pipe or culvert invert point (bottom of the pipe or culvert)
- 81 Pipe or culvert axial point (centre of the pipe or culvert)
- 82 Pipe or culvert obvert point (top of the pipe or culvert)
- 83 Start recording/measuring a shape
- 84 End measuring a shape
- 85 Parallel an existing shape
- 86 Extrude an existing shape
- 92 Remove all z-values for a string (i.e. make all z-values null)
- 93 Set the Point-line type
- 94 Use name library file/ mapping file for vertex text on the string - name mapping
- 95 Pipe string
- 96 Culvert string
- 99 Terminate processing
- 107 Last segment of point invisible
- 108 Next segment of point invisible
- 109 Point invisible
- 110 Building face start recording
- 111 Building face end recording

Batch Typed Entry

Typed entry can be used to enter survey data into a 12d Field File and reduced using the Survey data Editor.

12d Model uses the following 12d field file ops code:

Op Code	Description of Record
-2	Comment
-1	Error
01	Header Information
02	Directly entered coordinate measurement
03	New instrument setup point
04	Measurement to backsight
05	New target height
06	Check measurement
07	Measurement - HA, VA, SD
09	Scale factor for subsequent distances
10	Three hair stadia measurement
11	Measurement - HA, HD, Ht
12	Measurement - HA, HD, Ht diff
15	Vertical circle correction
16	Multiply coded point
17	Arc through previous three points
18	Circle Feature
20	Close string
21	Join last points of strings
22	Join first to last point of strings
23	Join first points of strings
28	Add text to the string name
29	Note or memo
30	Remove height from a point - that is make it a null height
37	Rectangle by two points
38	Make the previous segment non-tinable
39	Make the next segment non-tinable
40	Make a point non-tinable
41	Add additional text for the current measurement point
42	Add a radial offset
43	Add a tangential offset
44	Add a height offset
45	Make a parallelogram from the last three measurement points
46	Make the string a breakline or not
47	Start a new string using the same feature code and string number
48	String end
50	Specify the bearing to correct for true north - used as the bearing datum difference
51	Start using an existing field template
52	Finish a field template or finish recording a field template
53	Pause the current field template until a continue op code (54) or a finish template (52)
54	Continue the current field template
55	Start recording a field template
56	Skip picking up one or more points from a field template
57	Delete points from a field template
58	Insert points in a field template
60	Arc through next three points
61	Start of arc through sets of three points until end of string, or a 62 occurs
62	End the arcs begun by a 61 command
68	Add an integer user defined attribute to the current string
69	Add a real user defined attribute to the current string
70	Add text user defined attribute to the current string

- 71 Add integer user defined attribute to the current point
- 72 Add real user defined attribute to the current point
- 73 Add text user defined attribute to the current point
- 74 Add integer user defined attribute to the next segment
- 75 Add real user defined attribute to the next segment
- 76 Add text user defined attribute to the next segment
- 77 Add integer user defined attribute to the previous segment
- 78 Add real user defined attribute for the previous segment
- 79 Add text user defined attribute to the previous segment
- 80 Pipe or culvert invert point (bottom of the pipe or culvert)
- 81 Pipe or culvert axial point (centre of the pipe or culvert)
- 82 Pipe or culvert obvert point (top of the pipe or culvert)
- 83 Start recording/measuring a shape
- 84 End measuring a shape
- 85 Parallel an existing shape
- 86 Extrude an existing shape
- 92 Remove all z-values for a string (i.e. make all z-values null)
- 93 Set the Point-line type
- 94 Use name library file/ mapping file for vertex text on the string - name mapping
- 95 Pipe string
- 96 Culvert string
- 99 Terminate processing
- 107 Last segment of point invisible
- 108 Next segment of point invisible
- 109 Point invisible
- 110 Building face start recording
- 111 Building face end recording

Users can enter text for each measurement (observation 09 record or position 08 record) which is appended to the end of the record and this is used as the text of blocks that are interpreted according to the descriptions given in the earlier section [Field Coding for Non Leica Instruments](#).

The '13' record can also be used after a measurement record to add additional information to the preceding blocks using the *extra coding* control code at the end of the previous line (see [Extra Coding](#) in the section [Control Code Blocks](#))

Strictly speaking the Sokkia SDR20/33 formats use fixed length lines and if the lengths are incorrect, an error message will be written to the Output Window. For example,

'Line 248 line incorrect length. required length is 58. received length is 50.'

These messages often appear after a raw file has been manually edited because most editors remove space padding at the end of a line.

For the full description of the **12d Field File Op Codes**, go to the section [Full Description of 12d Field File Op Codes](#)

C 12d and Sokkia Instruments (SDR Files)

This Section deals with interfacing 12d with Sokkia SDR20/33 data formats specifically with the SDR33 electronic field book (Controller). Other controllers and instruments such as the powerset range of total stations also use these formats.

A large number of instruments support the Sokkia SDR data format including (Trimble Total Station ACU), not just those from Sokkia.

For the topic:

1. Field Coding see the section [Coding For SDR Files](#)
2. Sending raw file from controller to 12d [Downloading SDR File To 12d](#)
3. Converting raw data to field file see the section [Converting SDR Raw File To Field File](#)
4. Creating Points upload file see the section [Creating SDR Point Upload File](#)
5. Creating Road upload file see the section [Creating SDR Roads Upload File](#)
6. Creating Tin upload file see the section [Create Tin Upload File](#)

Also, SDRMap users should also read the section [Special Notes for SDRmap Users](#)

Coding For SDR Files

The Sokkia SDR20/33 data formats are used as raw data files by 12d Model and are converted into a 12d Field File before reduction. 12d Model uses the following Sokkia records:

01	Record header - SDR format
02	Station details
03	Target height
07	Back bearing details
08	Position - directly entered co-ordinates
09	Observation - measurement
13	Comment or continuation of blocks
15	RTK station details
16	RTK observation - measurement
57	RTK antenna height

Users can enter text for each measurement (observation 09 record or position 08 record) which is appended to the end of the record and this is used as the text of blocks that are interpreted according to the descriptions given in the earlier section [Field Coding for Non Leica Instruments](#).

The '13' record can also be used after a measurement record to add additional information to the preceding blocks using the *extra coding* control code at the end of the previous line (see [Extra Coding](#) in the section [Control Code Blocks](#))

Strictly speaking the Sokkia SDR20/33 formats use fixed length lines and if the lengths are incorrect, an error message will be written to the Output Window. For example,

'Line 248 line incorrect length. required length is 58. received length is 50.'

These messages often appear after a raw file has been manually edited because most editors remove space padding at the end of a line.

To ignore such error messages, there is a setting *Allow bad line lengths* on the *Advanced* tab of the

Survey.4d Create/Edit panel. If this is set for a data collector, then lines of incorrect length will not be rejected.

Advanced	Upload	Instrument	V4 Columns
Comment raw files <input type="checkbox"/>			
Report header <input type="checkbox"/>			
Allow bad line lengths <input type="checkbox"/>			
Verbose <input type="checkbox"/>			
Allow point numbers as stations <input type="checkbox"/>			

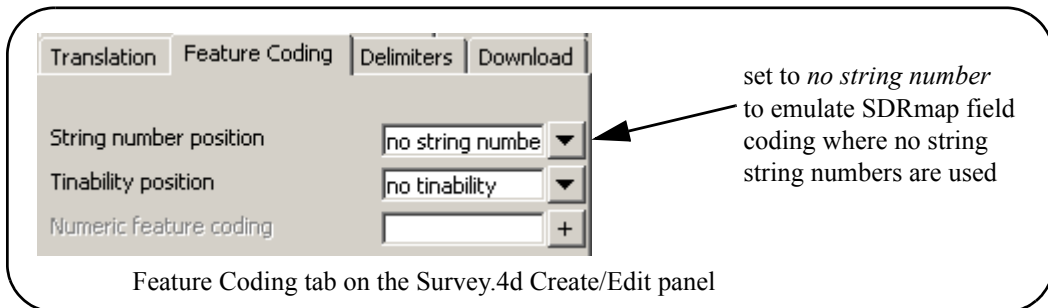
For non SDRmap users, please proceed to the section [Downloading SDR File To 12d](#).

SDRmap users, please continue to the next section [Special Notes for SDRmap Users](#).

Special Notes for SDRmap Users

SDRmap does not use String numbers - only Feature codes are used and a *New String* command to denote the start of a new string.

12d Model supports **only using a Feature code** by setting the *String number position* on the *Feature Coding* tab to **no string number**.



If *no string number* is set for the data collector (and so no string numbers are used in the field), then there is no way of telling from the field data whether the string is a *point* string or a *line* string (setting the pt-line type for the string).

For the *no string number* case, the method of defining the point-line type is to:

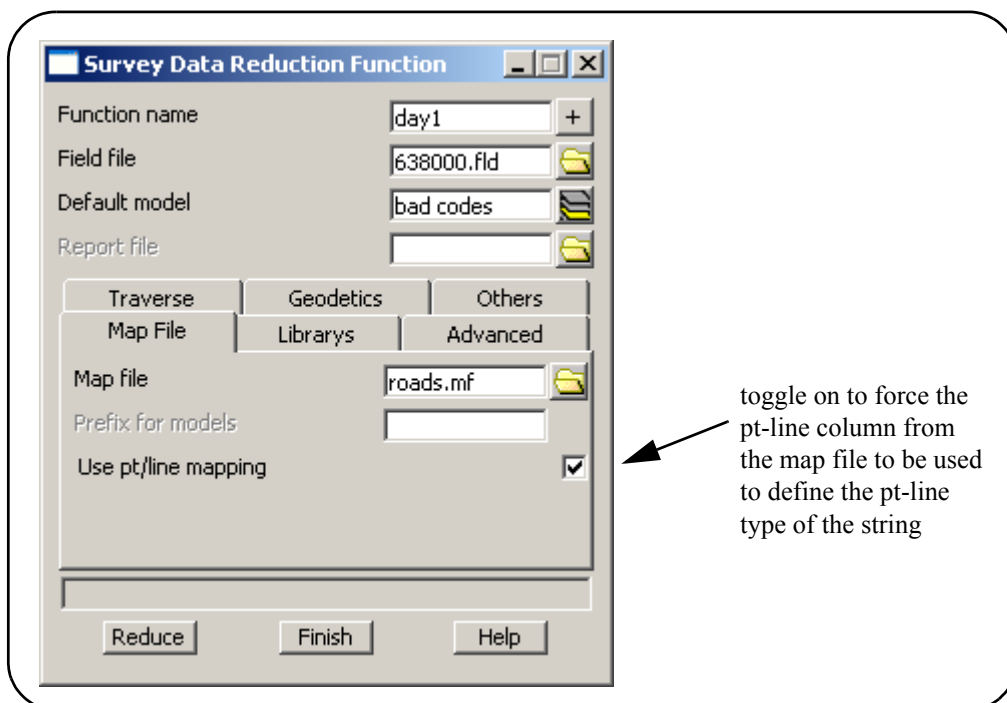
- (a) use a map file during the reduction

and

- (b) have a key in the map file to match the feature code *and* have the pt-line type set for that key. If the *feature code* does not match any key in the map file, the string defaults to a *point string*.

and

- (c) because by default the pt-string column in the map file is *ignored* during reduction (the string number usually defines the pt-line type), the *Use pt/line mapping* tick box in the Survey Data Reduction Function panel must be set to tick to *force* the pt-line column in the mapping file to be used.



Please continue to the next section [Downloading SDR File To 12d](#).

Downloading SDR File To 12d

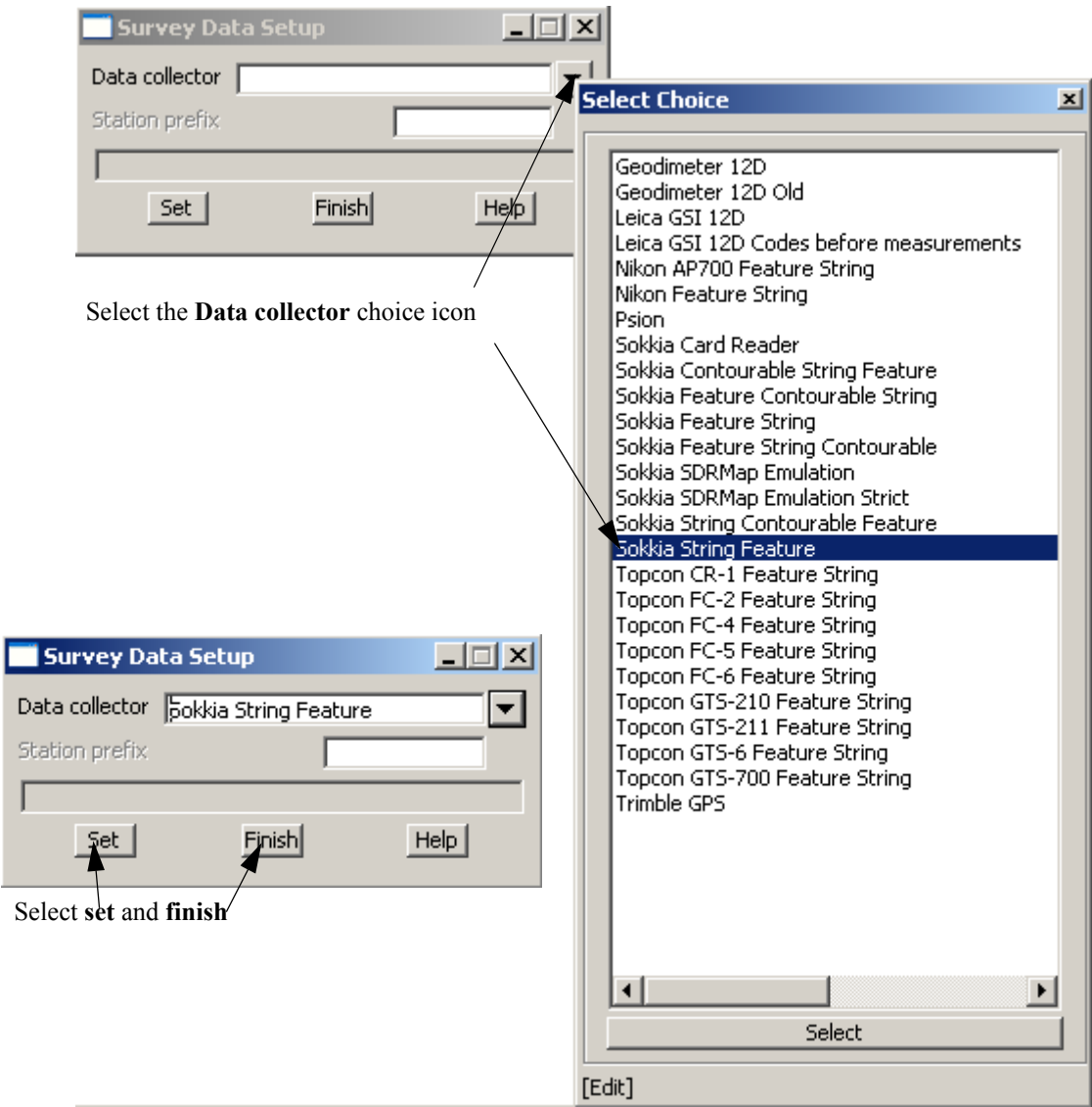
Raw SDR files can be input to 12d for reduction by two basic methods:

- 1. Download directly from the instrument
- 2. Copy the SDR file to the working folder directly from a PCMCIA card or by using a data transfer product such as "HyperTerminal" or "Wincomms". For this method, see the following section [Converting SDR Raw File To Field File](#).

An option exists within 12d to download the raw SDR file from the instrument. This option has the added functionality that is reduces the raw propriety format (SDR file) to a 12d field file format at the same time. This conversion requires that the data collector definition be set before the download of the file is commenced.

Select the data collector type

Select option *Survey=>Setup*



The raw file will be converted to the 12d field file format using the specified translator macro

Survey.4d Create/Edit

Collector: Sokkia String Feature

Templating | Shapes | Pipes/Culverts | Non Tinable
Non Visible | Strings | Others | Features
Advanced | Upload | Instrument | V4 Columns
Translation | Feature Coding | Delimiters | Download

Instrument: Sokkia 20/33
Raw file extension: .sdr
Macro: ☒
Translator: \$LIB/sdr.4do
Vertical circle: zenith

choice ok

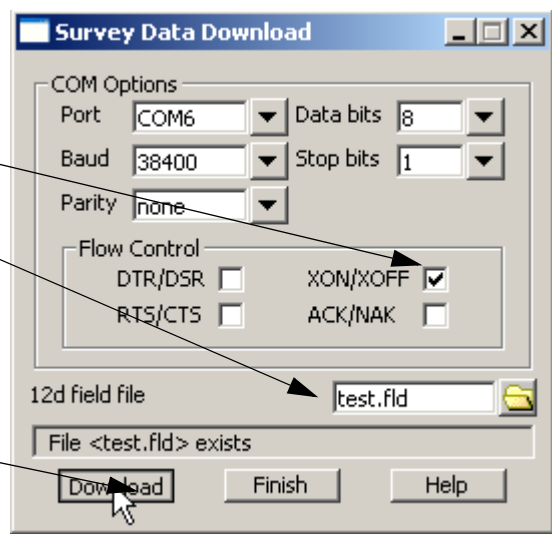
Defaults | Clear | Set | Save | Finish | Help

Select **Survey=>Download**

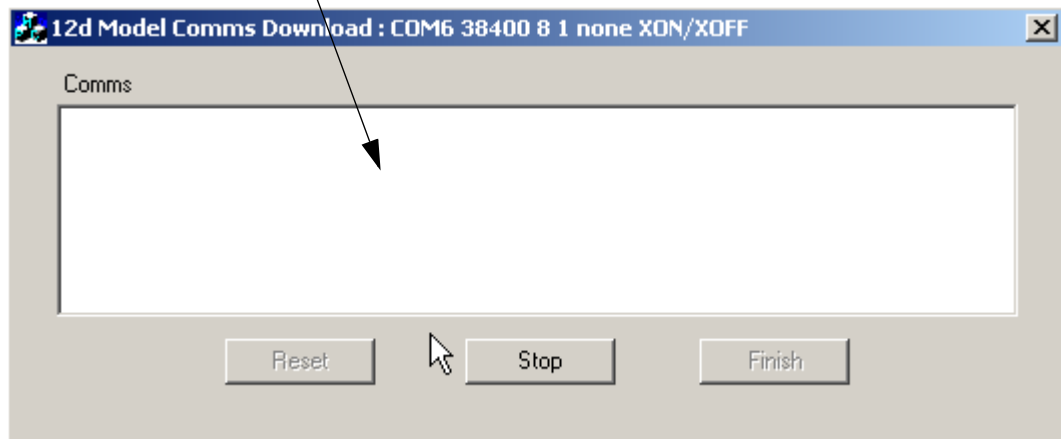
Ensure that the correct values are set for the comms settings i.e. they match the data collector parameters

Enter a name for the field file

Press **download**

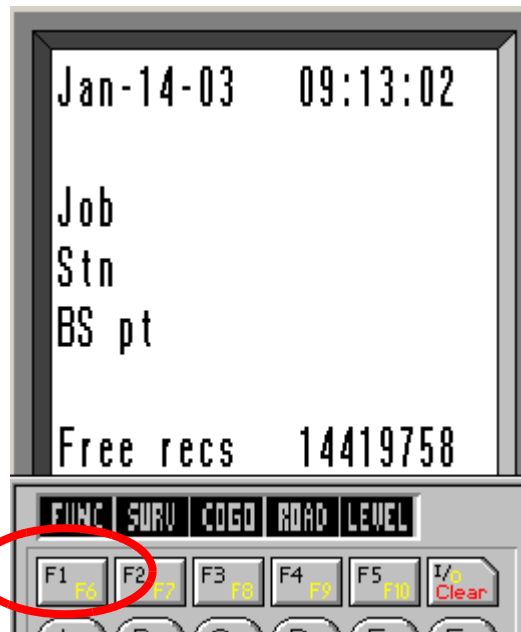


The 12d download window is shown.

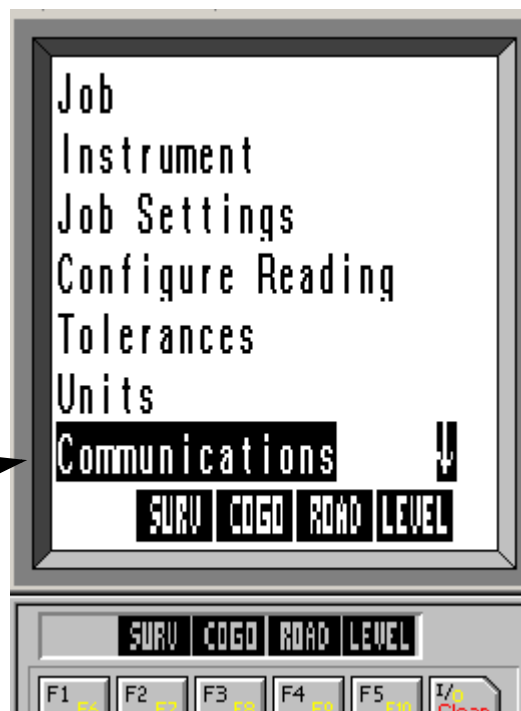


Prepare the data collector for download by connecting to appropriate port, selecting file to download etc.

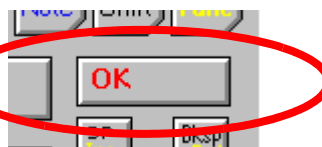
From the Data collector main menu
select the **FUNC** (function) menu



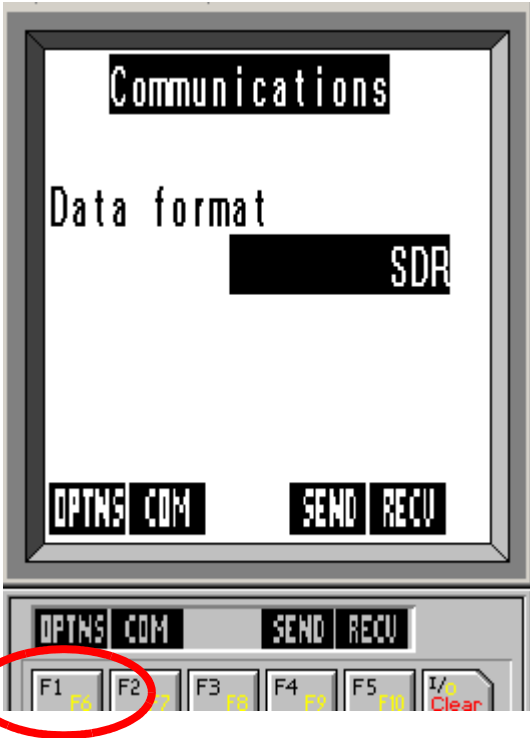
Toggle down to the
Communications menu



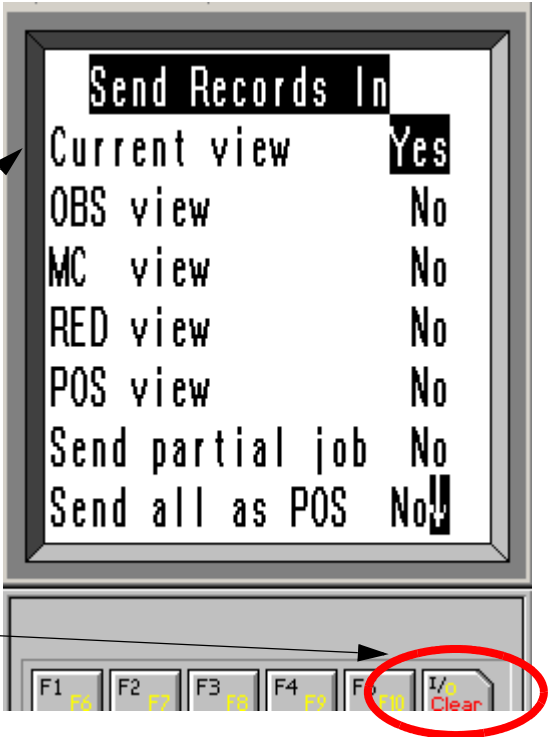
Press **OK** to select
menu



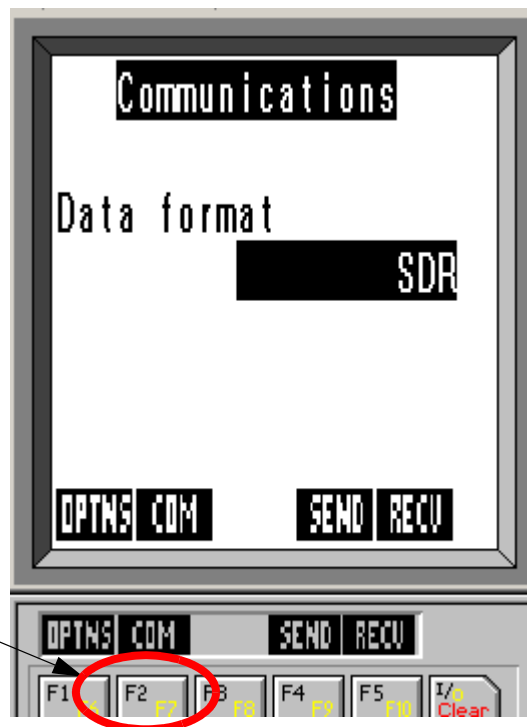
Select the **Options** menu to view the current settings



Select the **Current view** to **Yes** only. If the POS view were set to **Yes** also, the POS points would be sent also and eventually reduced twice in 12d (once from observations and the other from the POS record). Press **Clear** to leave menu

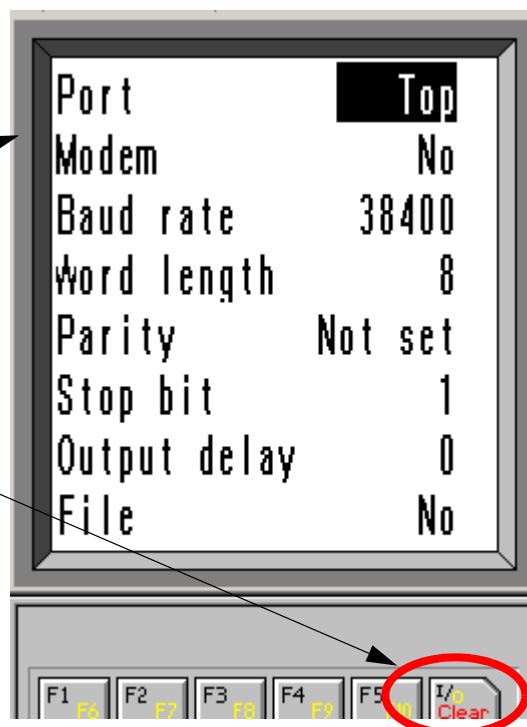


Select the **COM** menu to view the current comms settings

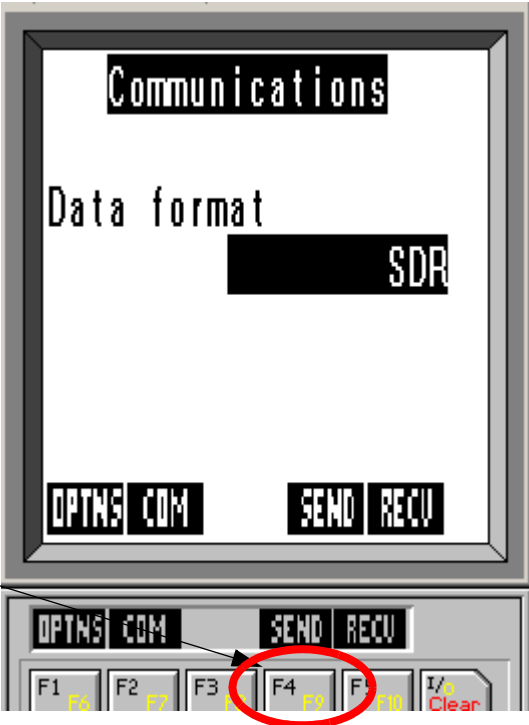


Ensure the comms settings are as per the values set in the 12d download option.

Select **Clear** to leave the menu



Select the **SEND** menu



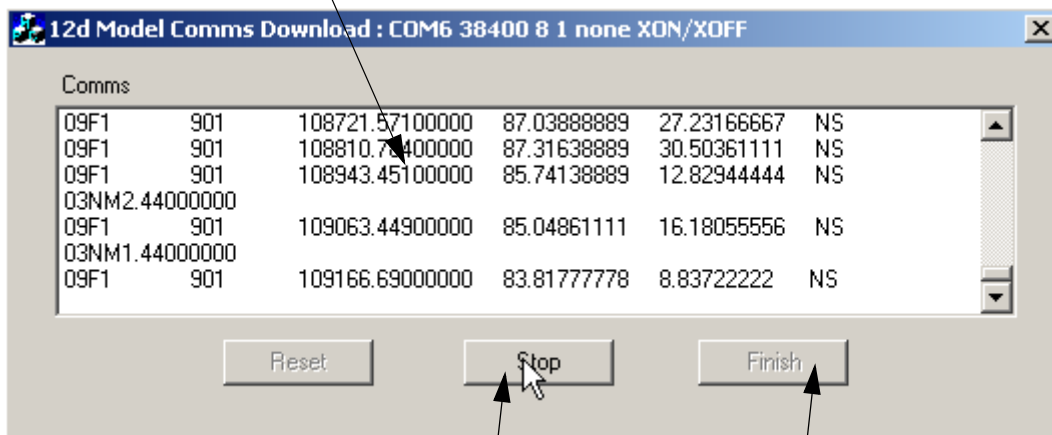
Select the file to download



Press **OK** to send



The file is shown downloading line by line in the 12d download window.



When the download is finished select the **stop** button and then **finish**

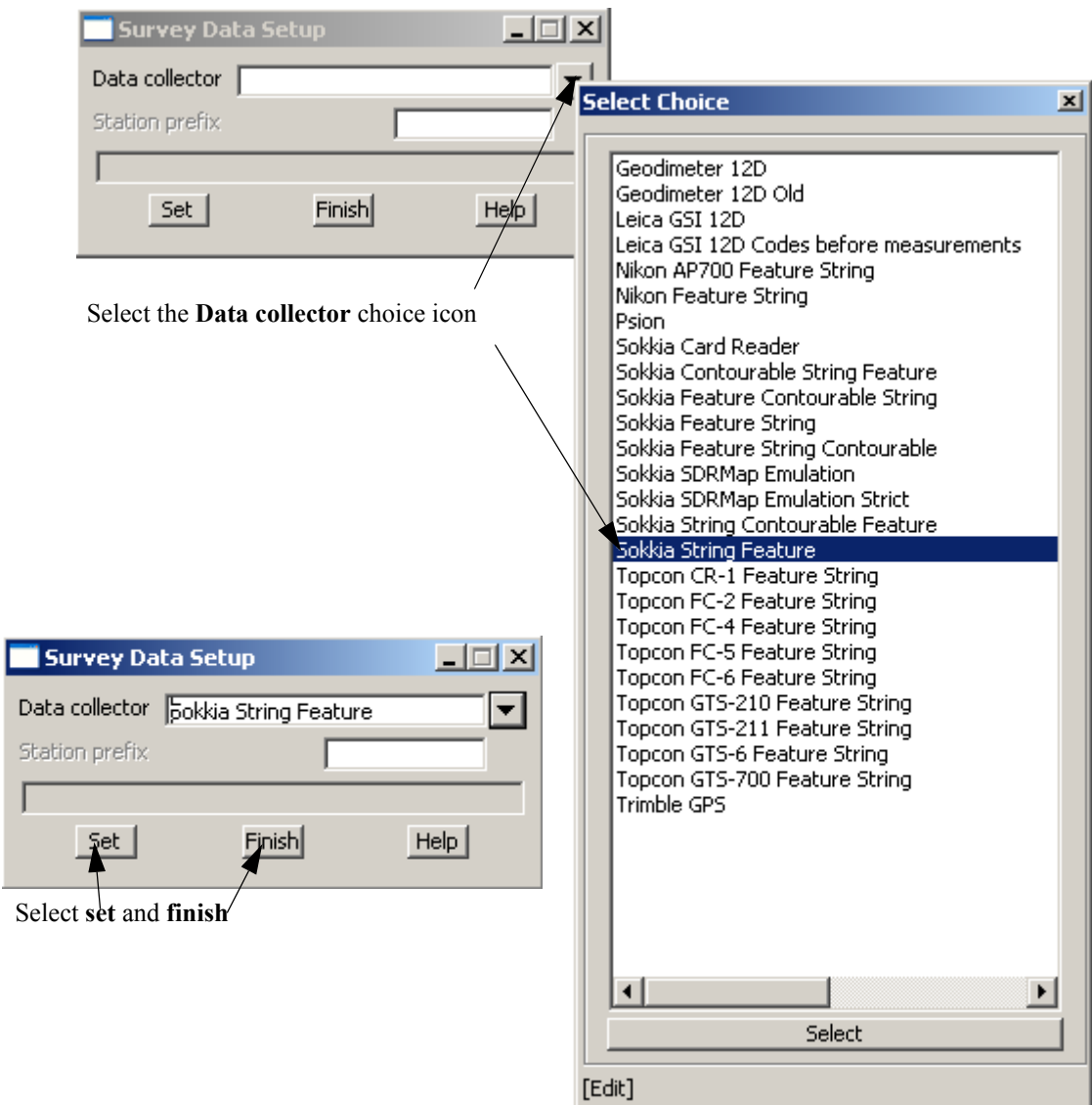
Please continue to the next section [Converting SDR Raw File To Field File](#)

Converting SDR Raw File To Field File

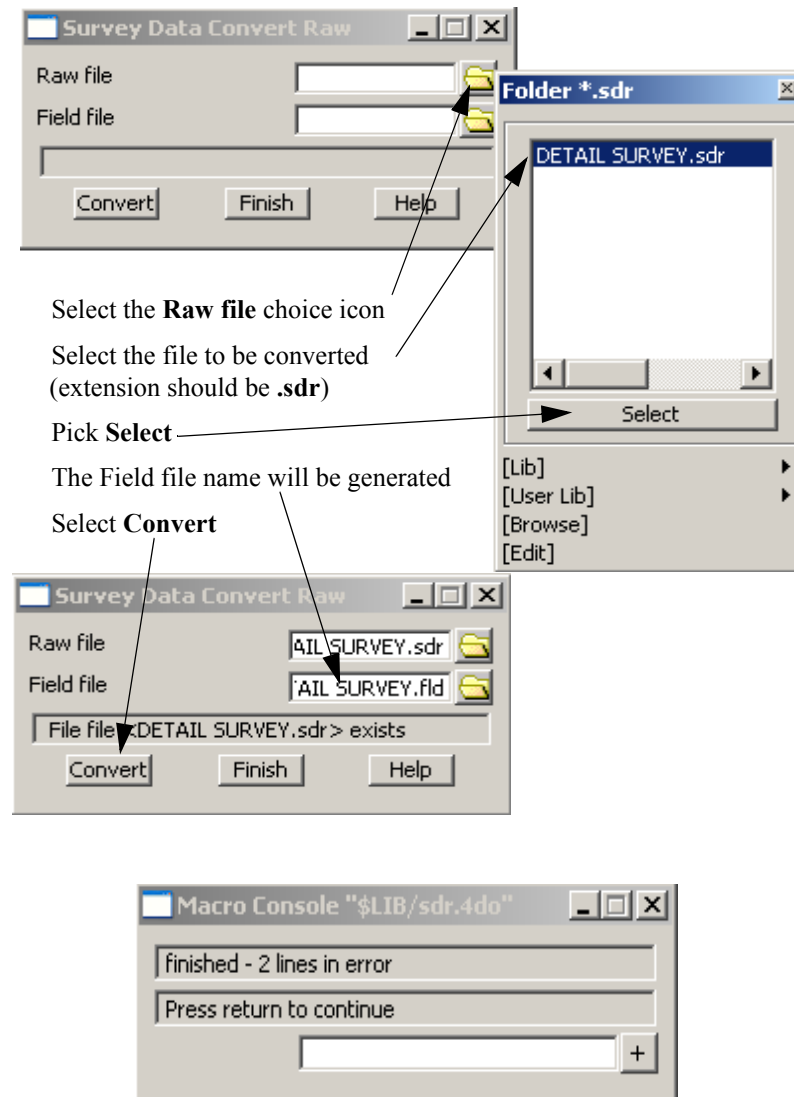
If a raw SDR file is copied to the working folder from a PCMCIA card or other means such as transferring it from a third party software package, it must be converted to a 12d field file for reduction inside 12d.

Select the data collector type

Select option *Survey=>Setup*



Select option *Survey=>Convert raw*



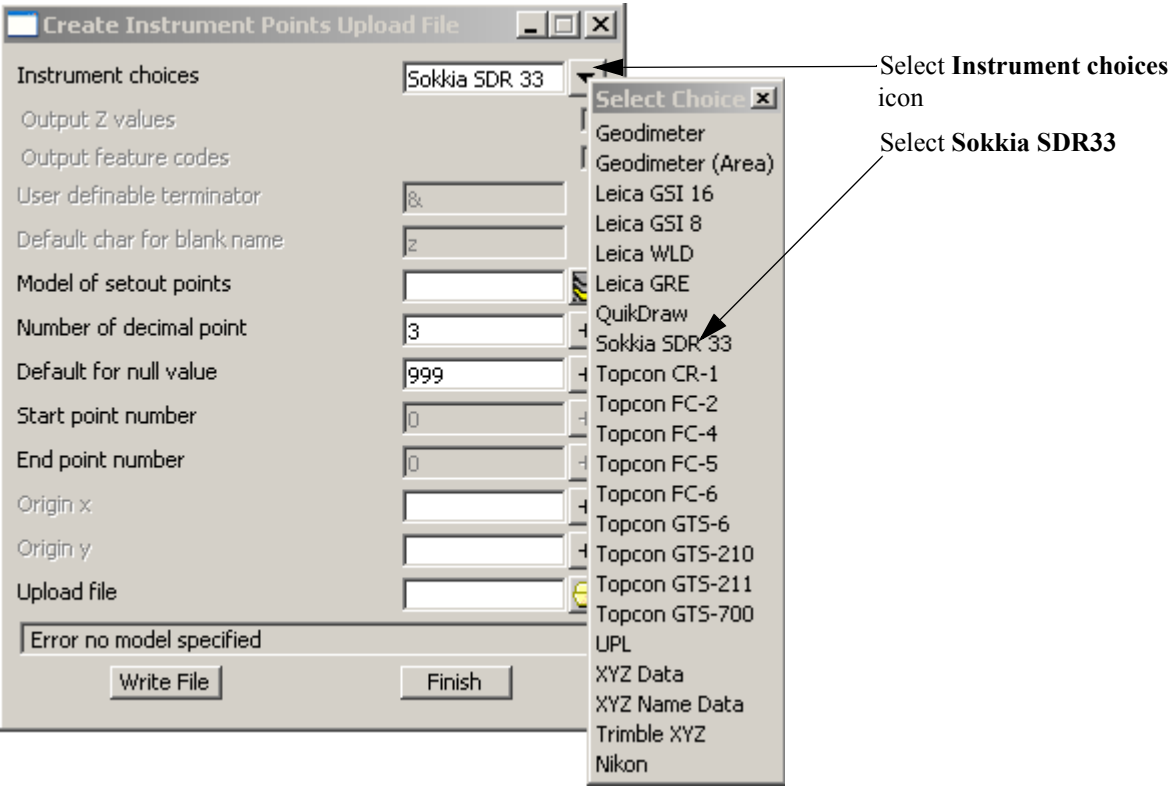
Any errors will be listed in the Output window. If the Output window is not shown, it can be opened using the option **Window=>Output Window**

Creating SDR Point Upload File

Create upload file in 12d

After creating the setout points an upload file can be created for the sdr format

Select option *Survey=>Upload=>Create points upload file*



Fill in the rest of the screen as per normal

Select **Write File**

A SDR33 file is created ready to send to the instrument directly using the upload facility or by copying the file to PCMCIA cards etc.

Loading file into controller using 12d upload facility

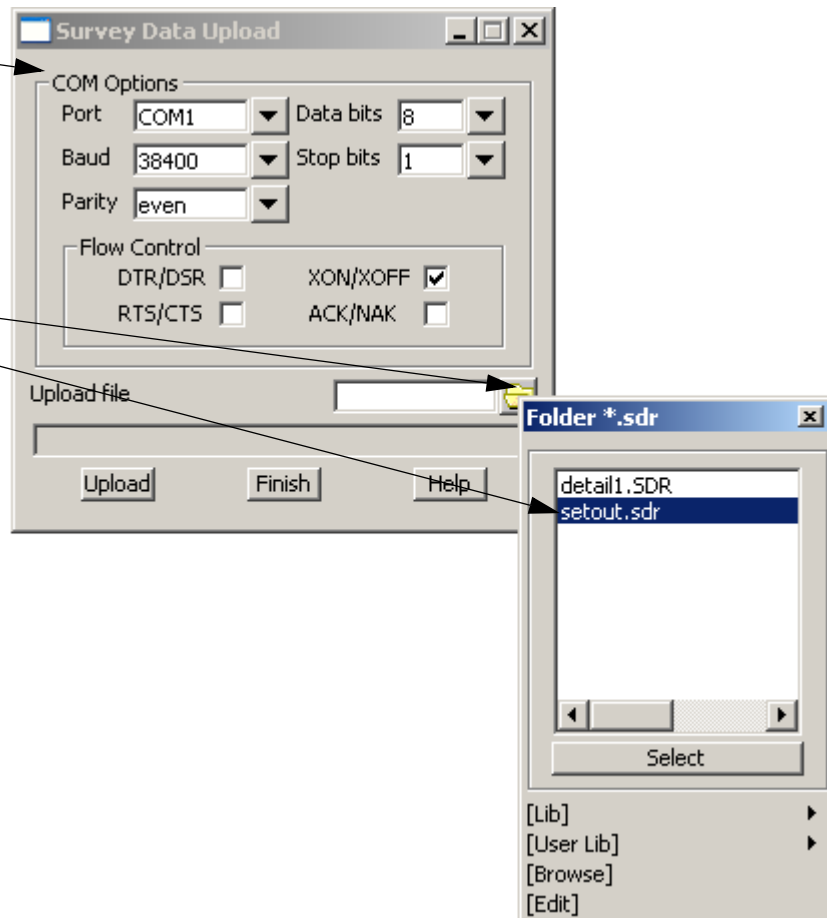
The points upload file can be transferred to the controller for setout using the upload panel.

Connect the controller to the PC

Select option **Survey=>Upload=>Upload**

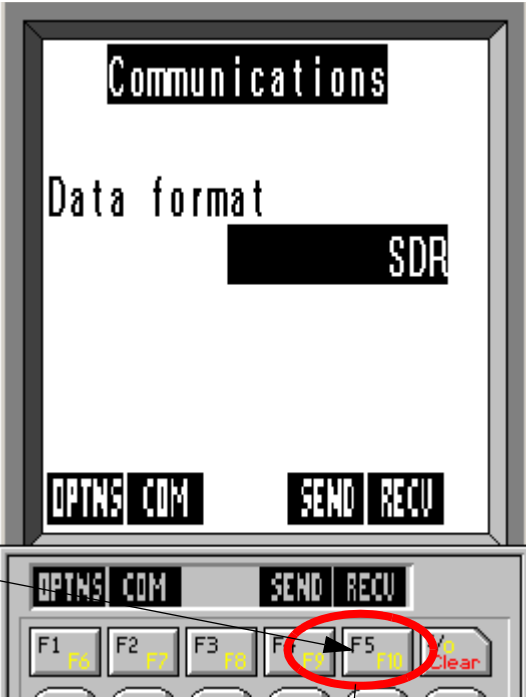
Ensure that the correct values are set for the comms settings i.e. they match the data collector parameters

Select the upload file by selecting the folder icon and selecting the appropriate file

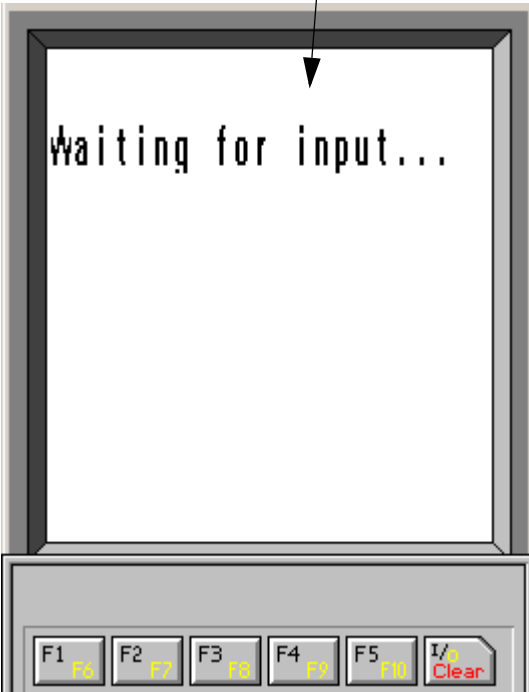


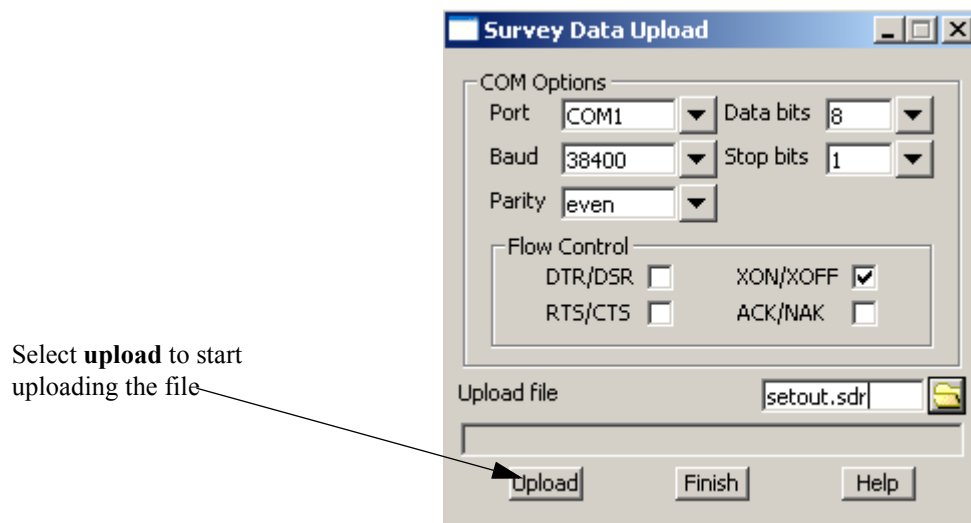
Prepare the data collector for uploading.

From the communication menu, select the receive button



Once the data collector is ready, the data can be sent from 12d



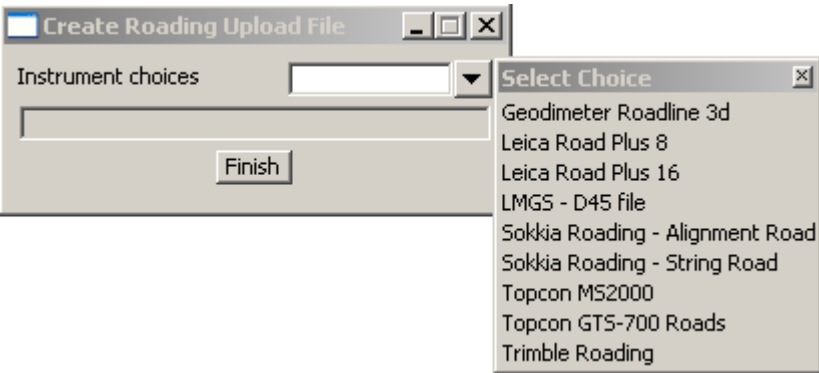


Please continue to the next section [Creating SDR Point Upload File](#)

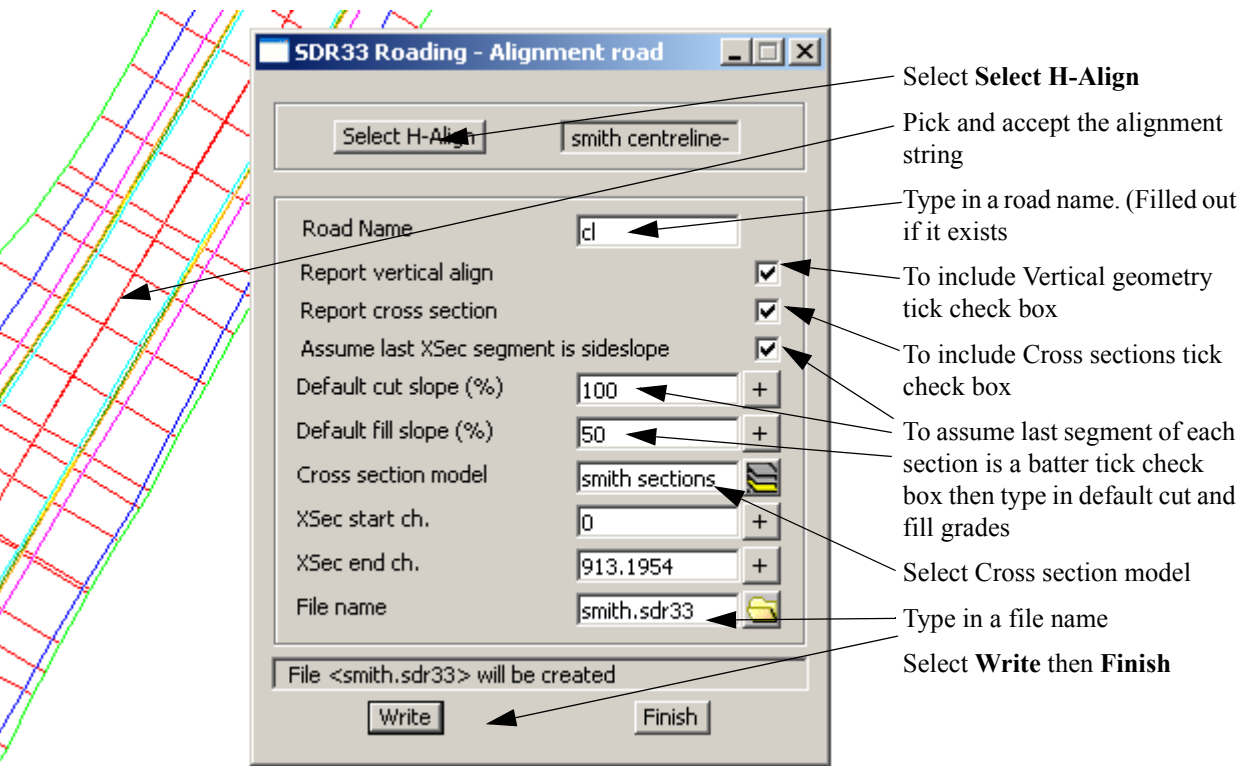
Creating SDR Roads Upload File

Create upload file in 12d

After creating the road alignment an upload file can be created for the SDR33 format
Select option *Survey=>Upload=>Create roads upload file*



Select **Instrument** choice icon
Select **Sokkia Roading - Alignment Road**



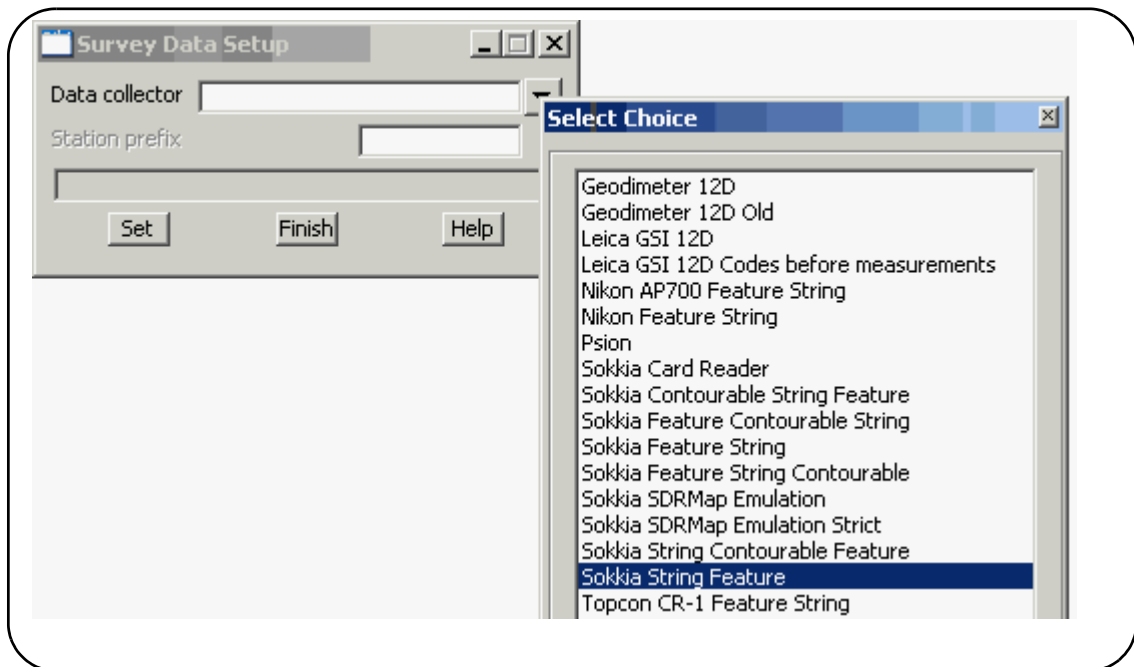
A SDR33 file is created ready to send to the instrument directly using the upload facility or by copying the file to PCMCIA cards etc. The steps involved in uploading the file to the controller using the 12d upload facility can be seen in the previous section [Loading file into controller using 12d upload facility](#).

Please continue to the next section [Example of Sokkia SDR File](#)

Example of Sokkia SDR File

The raw Sokkia SDR file 'detail1.sdr' has been coded in accordance with the data collector definition *Sokkia String Feature* which is shipped with 12d Model.

The data collector *Sokkia String Feature* is set using the option *Survey=>Setup*



TranslationFeature CodingDelimitersDownload

Command*

Comment

Offset code.

String+

BacksightBS

Foresight

Check measurementCHK

Extra codingX

Non VisibleStringsOthersFeatures

CloseC

RectangleR

Rectangle by 2 pts

Start arc fittingS

End arc fittingE

New stringST

End string

Non VisibleStringsOthersFeatures

by radius

by diameter

TemplatingShapesPipes/CulvertsNon Tinable

InvertI

ObvertO

CentreA

TemplatingShapesPipes/CulvertsNon Tinable

RecordXA

StartXB

EndXC

PauseXD

Pause after

ContinueXE

SkipXF

Insert

Delete

TemplatingShapesPipes/CulvertsNon Tinable

Remove heightNH

PointXP

Previous segmentXL

Next segmentXN

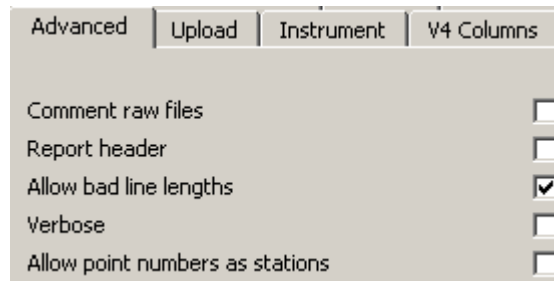
For the *Sokkia String Feature* data collector definition, the *string number* is given before the *feature code*.

Some of the control codes defined for the *Sokkia String Feature* data collector that are used in the example are:

- * is used as the Command (Block) delimiter
- space is used as the comment delimiter
- S and E are used to start arc fitting and end arc fitting respectively
- R is the Rectangle (make a parallelogram) command
- the template commands XA, XB, XC and XD are used
- the invert I and obvert O commands are used.
- XN for the next segment to be non-tinable (that is, not a breakline).

The listing of the raw file 'Detail1.sdr' is now given, followed by a dump of a 12d Model view displaying the job. No mapping file has been used in the reduction so no line styles appear on the view.

WARNING - The raw file 'Detail1.sdr' is in the Survey area of the training data but the file has been manually edited and if read in with the standard *Sokkia String Feature* data collector, will have bad line lengths and the data ignored. To read the file in, the *Allow bad line lengths* on the *Advanced* tab of the *Sokkia String Feature* data collector will need to be set before converting the raw file to a 12d field file.



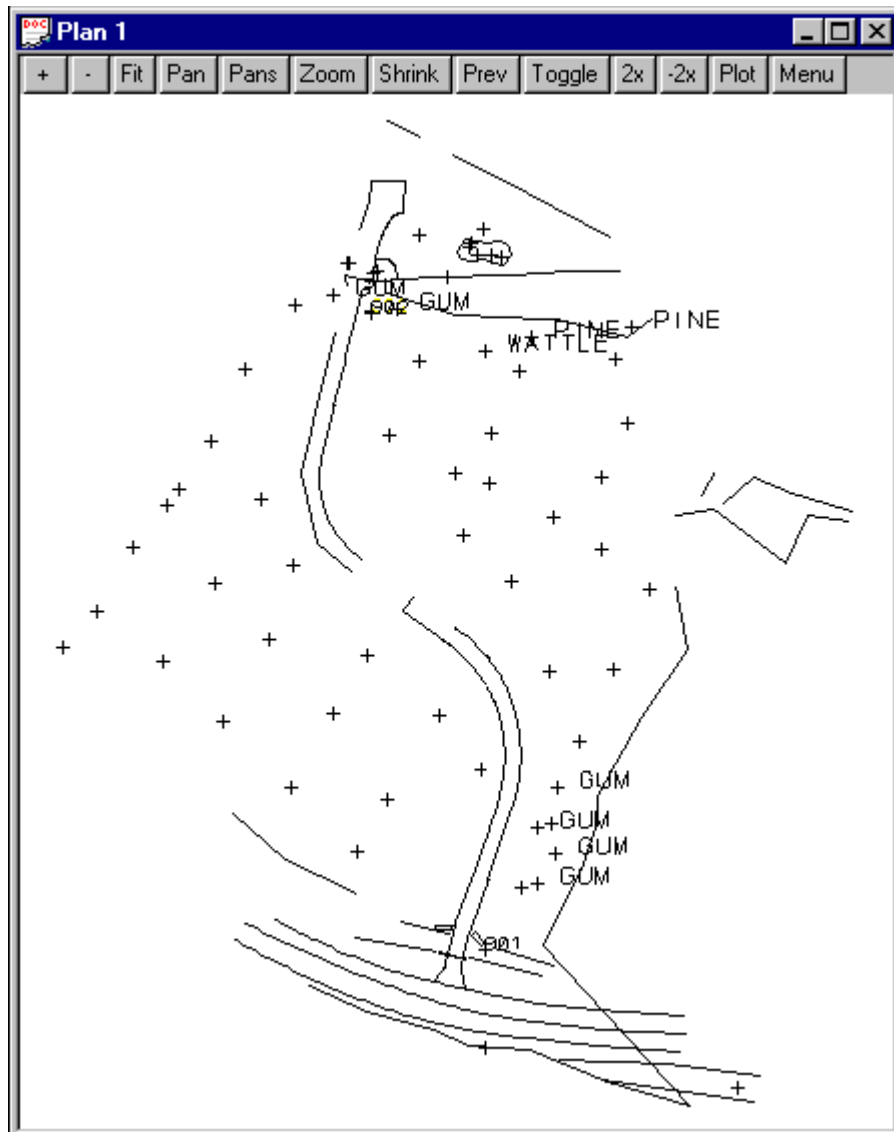
The image shows a screenshot of the 'Advanced' tab in the Sokkia String Feature data collector interface. The tab is selected, and the following options are listed with checkboxes to their right:

Option	Checkbox
Comment raw files	<input type="checkbox"/>
Report header	<input type="checkbox"/>
Allow bad line lengths	<input checked="" type="checkbox"/>
Verbose	<input type="checkbox"/>
Allow point numbers as stations	<input type="checkbox"/>

need to tick on to read in
raw files with invalid
line lengths

Description	Sokkia SDR 20 File
00 - SDR format	00NMSDR20 V03-05 03-Aug-00 09:00 111121 10NM1697 DETAIL 13CPSea level crn: N 13CPC and R crn: N 13CPAtmos crn: N 06NM1.00000000 13OOCurrent view 13TS02-Aug-00 08:23 13JS10000 13TS02-Aug-00 08:25 01NM: 000000 00000031 0.00000000 13PCP.C. mm Applied: 0.000
02 - station details for pt 902	02TP09020982.770005096.700000115.7500001.7400000STN
02 - station details for pt 901	02TP09011000.000005000.000000100.000001.66500000STN
07 - back bearing from pt 901 to 902	07TP09010902349.895000349.895000
03 - target height	03NM1.44000000
check shot from pt 901 to pt 902	09F109011001099.43000081.0180555349.893611CHK902
measurement FC TBL SN 1 Pt 1003	09F109011003046.93700089.5425000119.69972201TBL
FC TBL SN 1 Pt 1003	09F109011004037.34200089.752222125.31527701TBL
	09F109011005026.44500089.9869444138.51611101TBL
FC BB SN 1 Pt 1006	09F109011006045.68200089.8705555114.79527702BB
	09F109011007032.72000090.2769444122.23361102BB
	09F109011008020.06200090.9736111147.16833302BB
FC ES SN 3 Pt 1009 start template	09F109011009033.47400090.0641666118.03777703ES*XA
FC CR SN 4 Pt 1010	09F109011010032.98200089.8936111113.25027704CR
FC ES SN 5 Pt 1011	09F109011011031.88200090.0369444108.80138805ES
start using template in zig mode	09F109011012022.46200090.2811111130.749722XB
using template	09F109011013021.56900090.1400000124.623055
	09F109011014019.30400090.5197222118.459722
	09F109011015011.35800091.0744444136.851388S
	09F109011016013.58000090.5797222144.980000S
	09F109011017015.06100090.5494444154.349722S
	09F109011018012.79200090.7638888201.297500
	09F10901101909.757000091.1033333201.376944
pause template - meas FC PP SN 0	09F109011110043.58500089.6561111118.780000PP*XD
continue with template	09F10901102006.659000092.5538888198.245000XE
start arc through 3 points	09F109011021014.70100091.2202777256.936111S
start arc through 3 points	09F109011022015.55300090.8763888248.602222S
start arc through 3 points	09F109011023018.16300090.6650000240.646111S
	09F109011024027.42900090.5169444260.969444
	09F109011025025.37600090.5413888266.748055
	09F109011026026.05000090.6897222272.995833
end arc through 3 points	09F109011027032.16700090.5105555277.837500E
end arc through 3 points	09F109011028036.58100090.2566666276.025833E
end arc, stop template	09F109011029038.06400090.1986111272.082777E*XC
FC BB SN 6 Pt 1030	09F109011030019.76600091.8072222275.24777706BB
	09F10901103107.245000093.9725000266.13777706BB
FC SWUG SN 7 Pt 1032 obv 0.225 dia	09F10901103207.044000094.6780555265.51250007SWUG*O.225
FC SWUG SN 7 Pt 1033 invert meas	09F10901103303.441000097.8750000242.44805507SWUG*I
FC BB SN 8 Pt 1034	09F10901103402.973000099.2075000239.99916608BB
	09F10901103509.678000092.9816666114.81555508BB
	09F109011036010.50700090.6511111104.50611109TBR
	09F10901103701.155000095.167500082.357777809TBR
	09F10901103805.969000090.5472222291.73500010TBR
	09F109011039013.82100090.8102777288.00027710TBR
FC WA SN 11 Pt 1040	09F10901104008.206000091.0138888290.96333311WA
	09F10901104108.476000091.0427777293.60750011WA

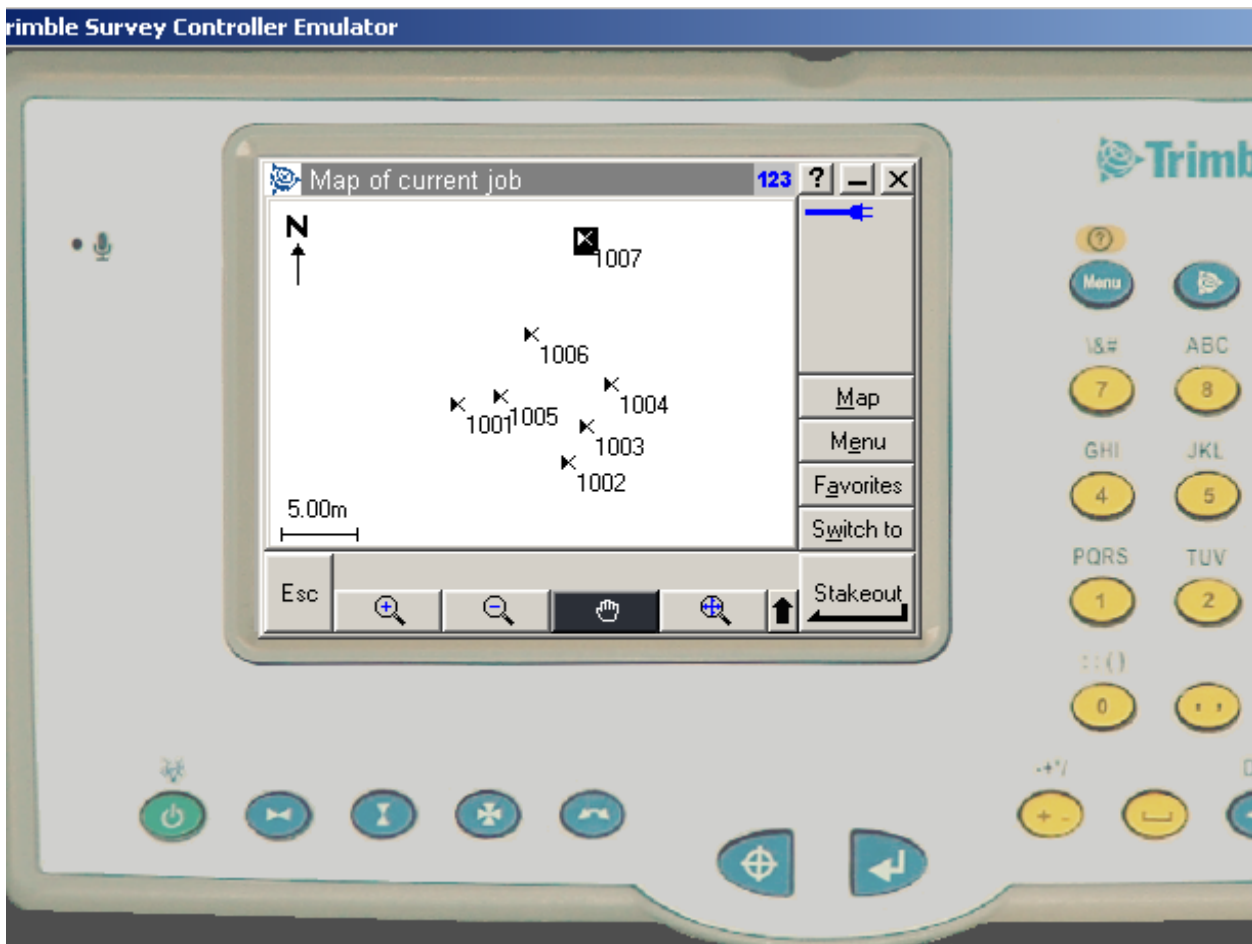
FC WA SN 11 Pt 1042	09F10901104206.213000089.7200000305.83194411WA
FC WA SN 11 Pt 1043- close string	09F10901104306.116000090.3575000300.03777711WA*C
FC WA SN 12 Pt 1044	09F10901104403.100000090.0911111314.07277712WA
FC WA SN 12 Pt 1045	09F10901104502.970000089.6530555327.17166612WA
FC WA SN 12 Pt 1046 - create rect	09F10901104600.760000099.5219444351.28472212WA*R
FC PL SN 13 Pt 1048	09F109011048027.45200090.7930555258.30333313PL
omit part of file	.omit part of file
FC TBL SN 21 Pt 1103	09F109011103021.21900088.8433333293.53222221TBL
FC TR0306 SN 0 - comment GUM	09F109011105012.69000087.209444438.3036111TR0306 GUM
FC TR0309 SN 0 - comment GUM	09F109011106017.95900086.573333336.3436111TR0309 GUM
FC TR0306 SN 0 - comment GUM	09F109011107019.97400086.607777723.2163889TR0306 GUM
FC TR0309 SN 0 - comment GUM	09F109011108026.78400086.450833323.7155556TR0309 GUM
FC TR0308 SN 0 - comment GUM	09F109011109027.38900085.6861111358.734166TR0608 GUM
02 - station details pt 902	02TP09020982.770005096.710000115.7500001.7100000STN
07 - back bearing from pt 902 to 901	07TP090209010169.895000169.895000
03 - target height	03NM1.440000000
check measurement to pt 901	09F109021201099.43000099.2611111169.893611CHK901
FN DW SN 21 Pt 1202	09F109021202038.369000100.2900000182.1266621DW*S
FC DW SN 21 Pt 1203	09F109021203033.80100099.7461111190.31638821DW
omit part of file	.omit part of file
FC FE SN 25 Pt 1346 - non tin segm	09F10902134604.867000085.22555555.8144444025FE*XN
FC FE SN 25 Pt 1347	09F109021347010.66400085.510000060.870277825FE
.omit part of file	.omit part of file
Pt 2135 FC DW SN 25 start arc	09F10902135708.003000085.01361113.5244444027DW*S*28WA
and also FC WA SN 28	
	.omit to end of file



Plan View with of the Reduced Sokkia Data Displayed
Note that no linestyles or symbols have been turned on.

D 12d and the Trimble Total Station ACU

This Section deals with interfacing 12d with the Trimble Total Station ACU unit data formats



These notes are not meant to take the place of the operations manuals for the Trimble ACU but rather to act as a guide for ensuring the correct file types are used between the two systems.

See the sections:

[Coding](#)

[Sending Raw file to 12d](#)

[Creating and Setting Data Collector Type](#)

[Convert Raw File](#)

[Creating Point Upload File](#)

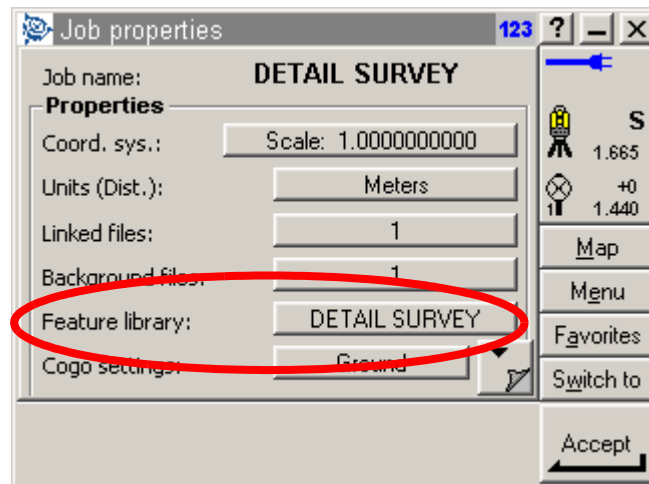
[Create Roads Upload File](#)

[Create Tin Upload File](#)

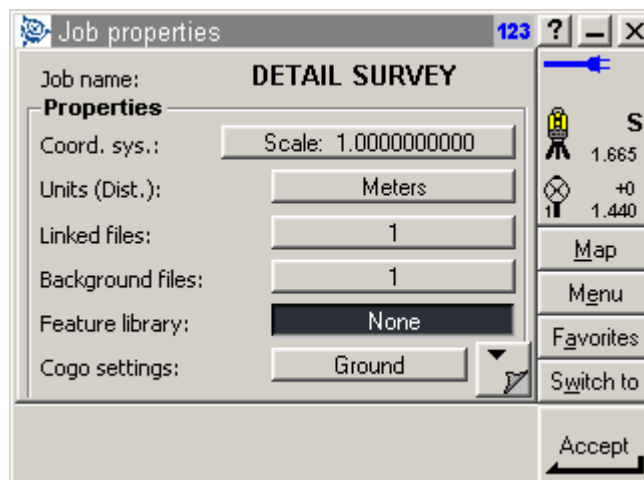
Coding

On the ACU the user can either manually type in a code for field readings or use a code library to pre-define codes which can then be selected from a list

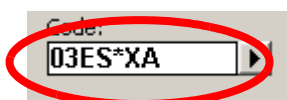
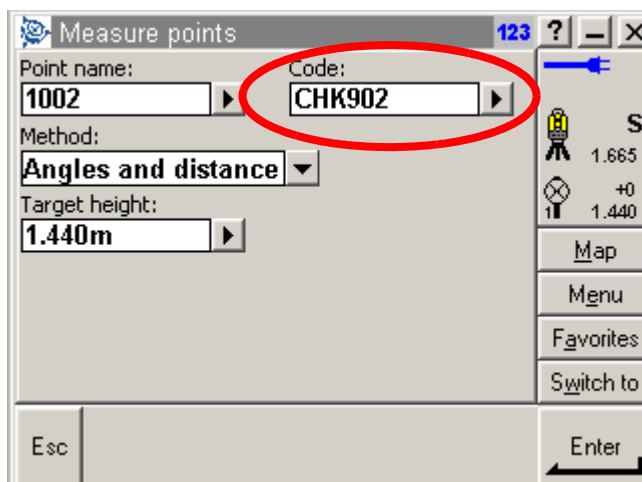
To use a code library the user should select the relevant library when creating the job



If using string numbers the Feature library can be set to *None* and the string number, feature code, field code and delimiters can be manually typed in



Codes are typed in to the ACU in the **MEASURE POINTS** option

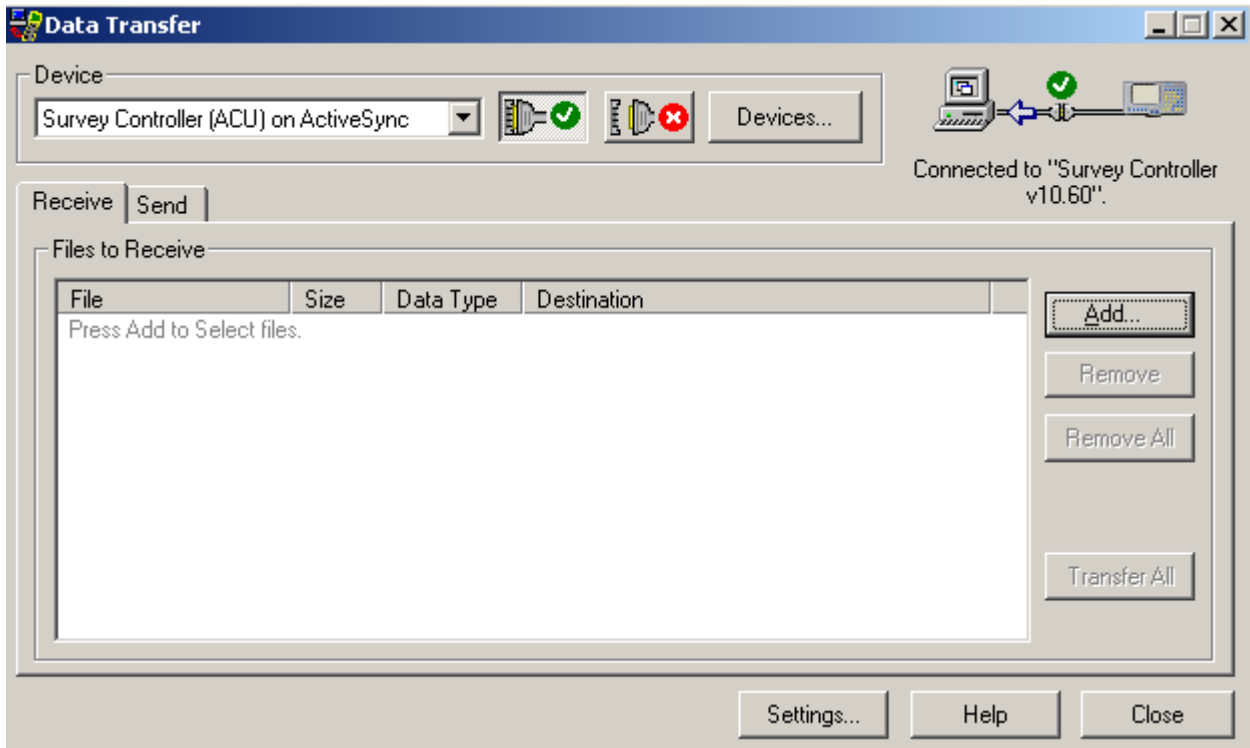


Please continue to the next section [Sending Raw file to 12d](#)

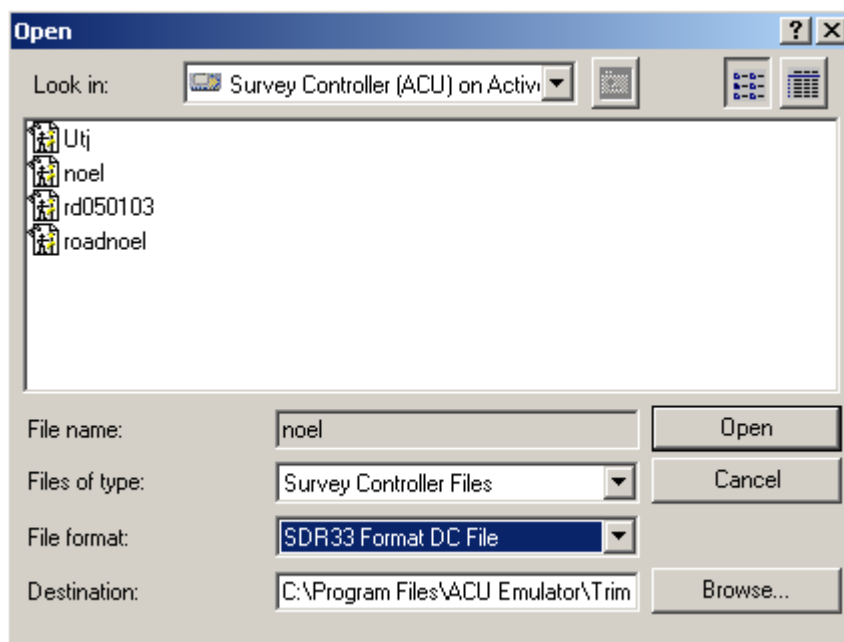
Sending Raw file to 12d

The raw file can be transferred from the ACU as a format similar to the SDR33. This is called the **SDR33 DC** file format.

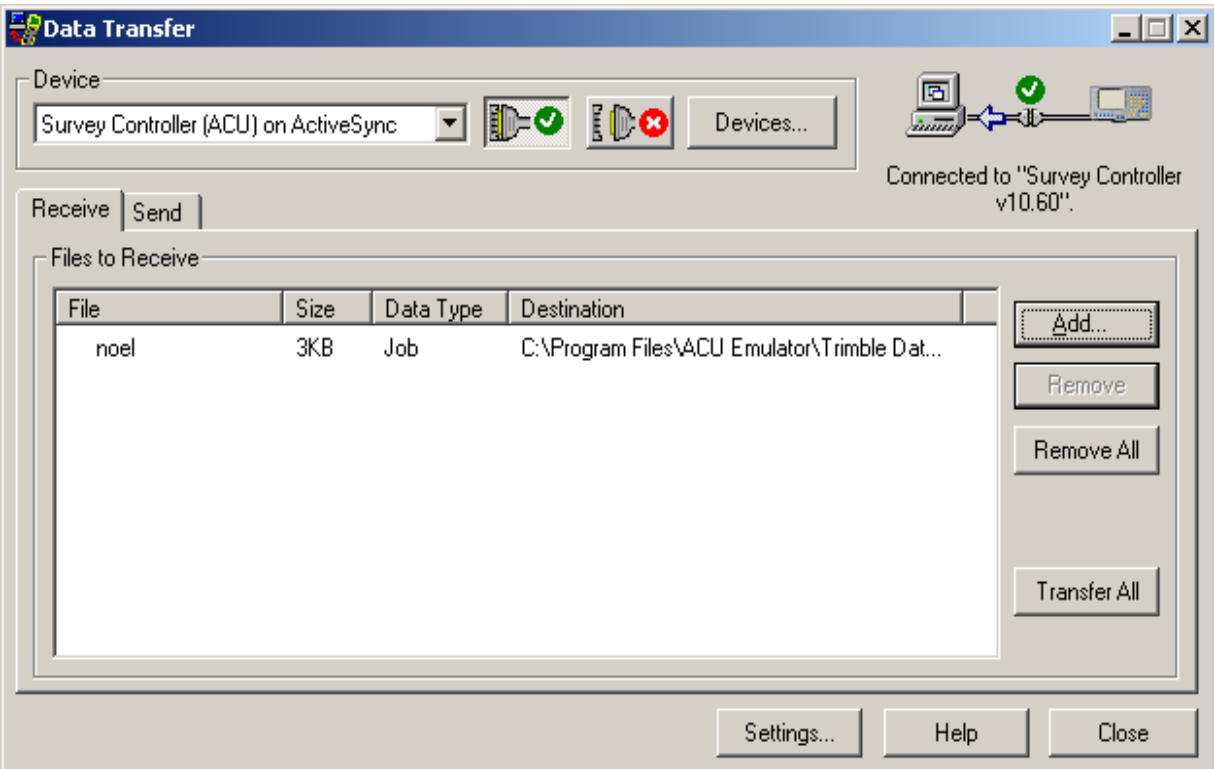
Connect the ACU to the PC using **TRIMBLE DATA TRANSFER**



Select *Receive* tab then select *Add*



Select the Job to download using the format *SDR33 FORMAT DC FILE*



Select *Transfer All* to transfer the file

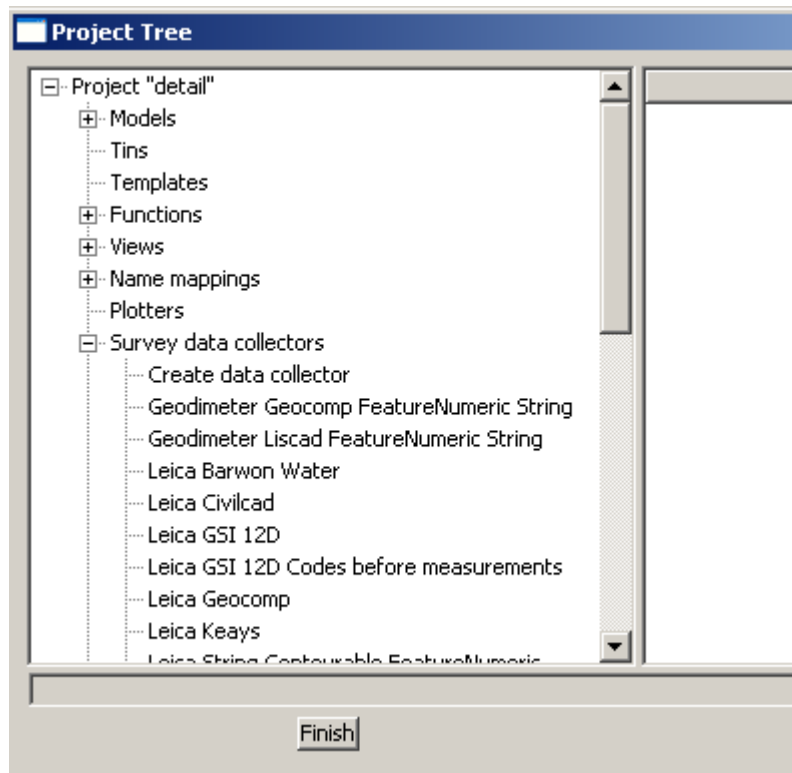
Please continue to the next section [Creating and Setting Data Collector Type](#)

Creating and Setting Data Collector Type

Create new data collector type

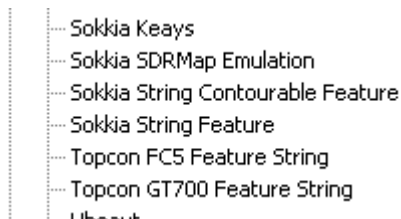
We will create a specific name for the Trimble data collector even though it is similar to the SDR33 format

Select **Project=>Browse**



Select the Survey data collectors branch

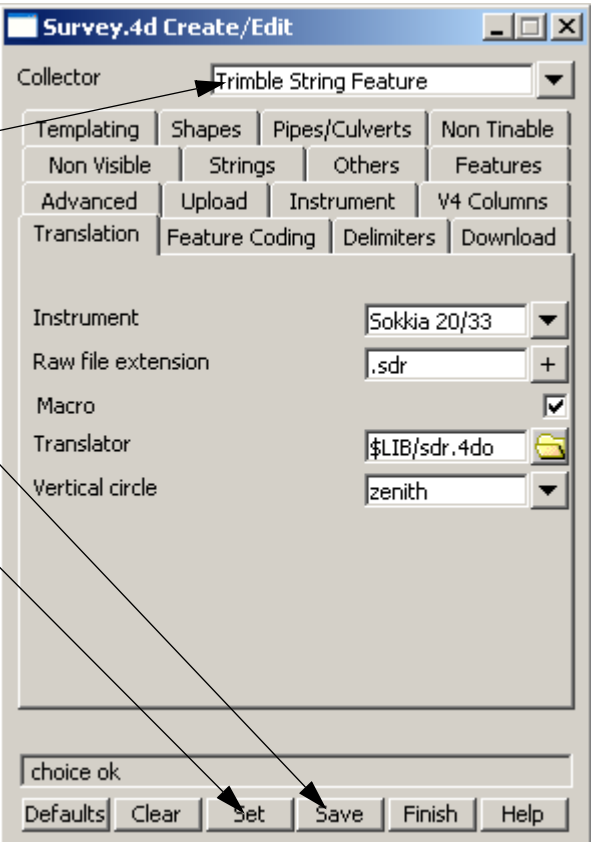
Double click on **Sokkia String Feature**



This loads up the default parameters for the SDR33 format.

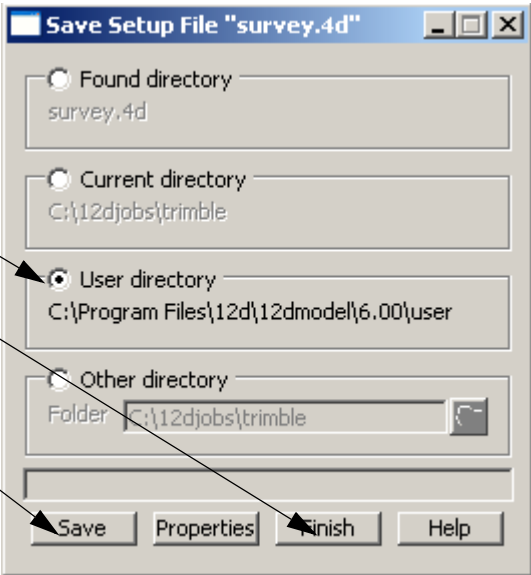
Type in the new name **Trimble String Feature**

Select **Set** then **Save**



Select **User directory**

Select **Save** then **Finish**

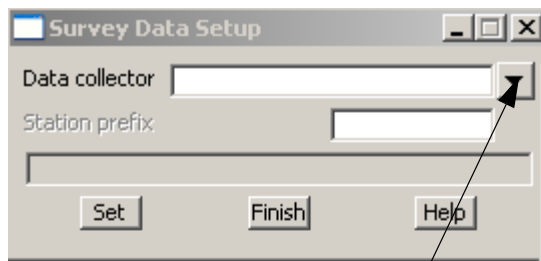


Select **Finish** back in the previous panel

To set the changes the project has to be restarted by selecting **Project=>Restart**

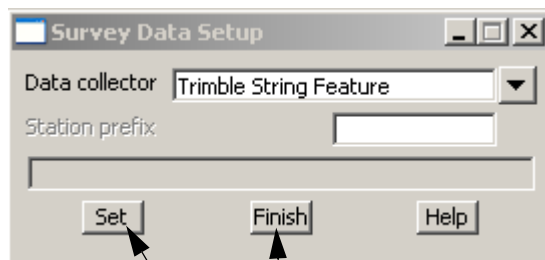
Select the data collector type

Select option ***Survey=>Setup***

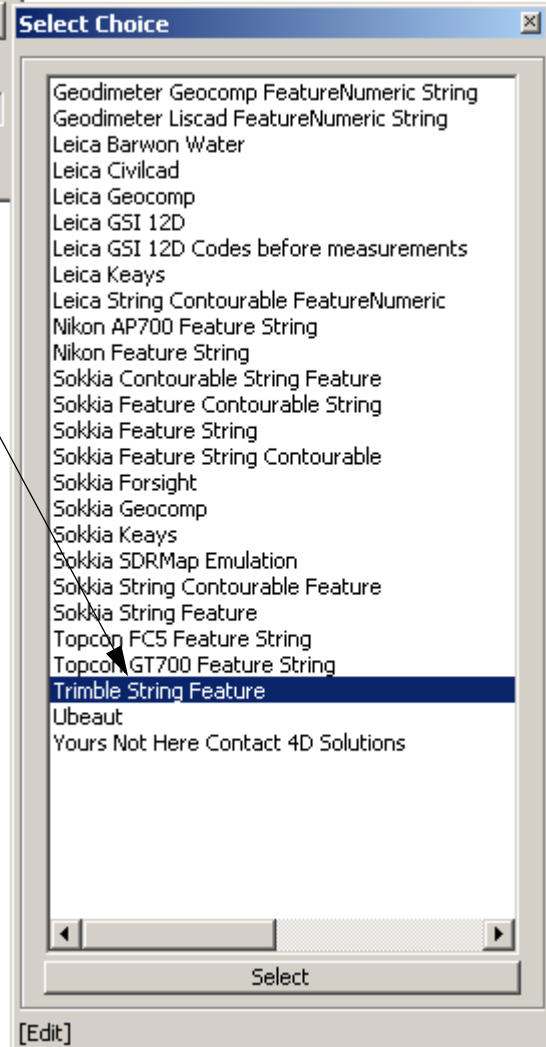


Select the **Data collector** choice icon

Double click on **Trimble String Feature**



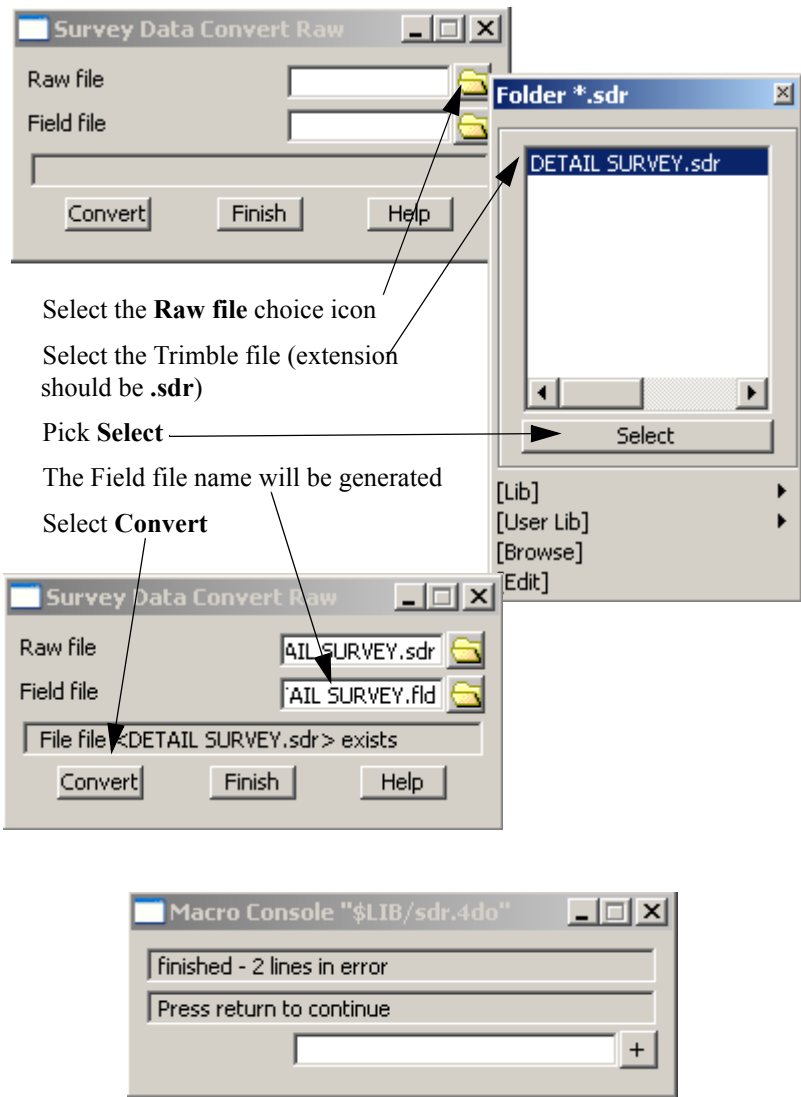
Select **Set** then **Finish**



Please continue to the next section [Convert Raw File](#)

Convert Raw File

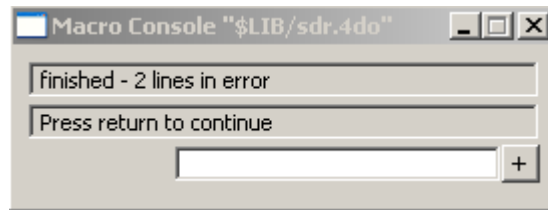
To convert raw file to field file select option *Survey=>Convert raw*



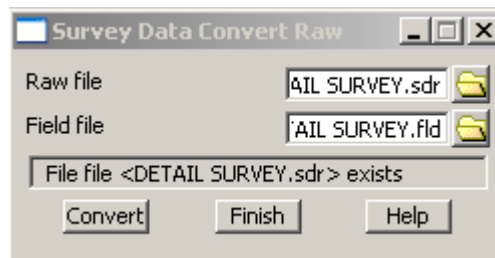
Any errors can be listed by opening the Output window using option *Window=>Output Window*

```
format = sdr33
Line 7 command not implimented <05NM
Line 8 non supported derivation code <02
Line 14 command not implimented <05NM
Line 15 non supported derivation code <02
```

	>	
901	5000.0000000000001000.0000000000010	
	>	
901	5000.0000000000001000.0000000000010	



Close the Error panel



Select **Finish**

The field file can now be reduced in the normal manner

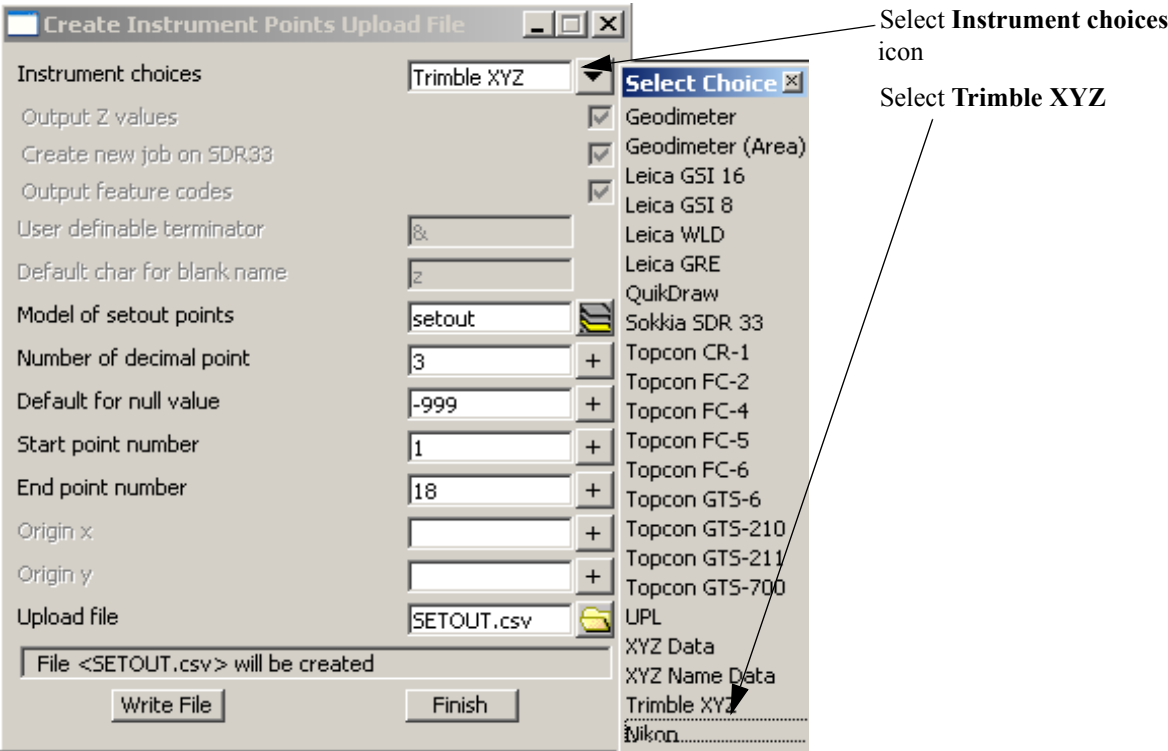
Please continue to the next section [Creating Point Upload File](#)

Creating Point Upload File

Create upload file in 12d

After creating the setout points an upload file has to be created for the trimble format

Select option *Survey=>Upload=>Create points upload file*



Fill in the rest of the screen as per normal

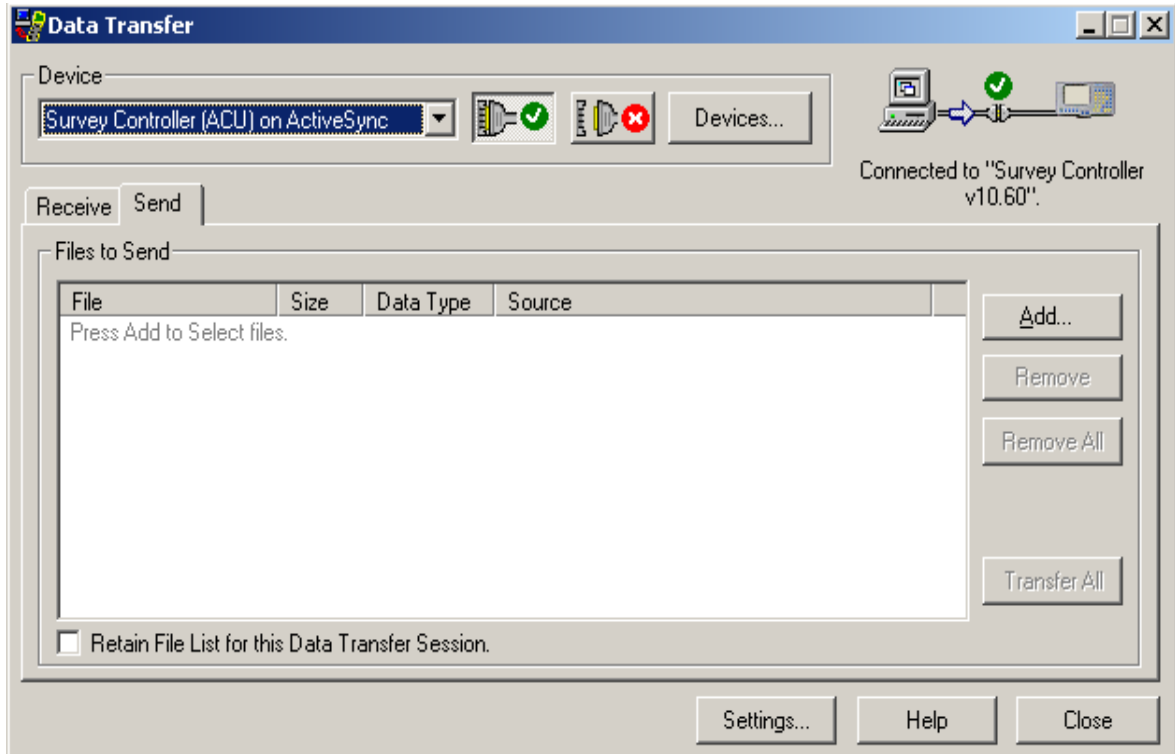
Select **Write File**

A standard comma delimited file is created ready to send to the ACU

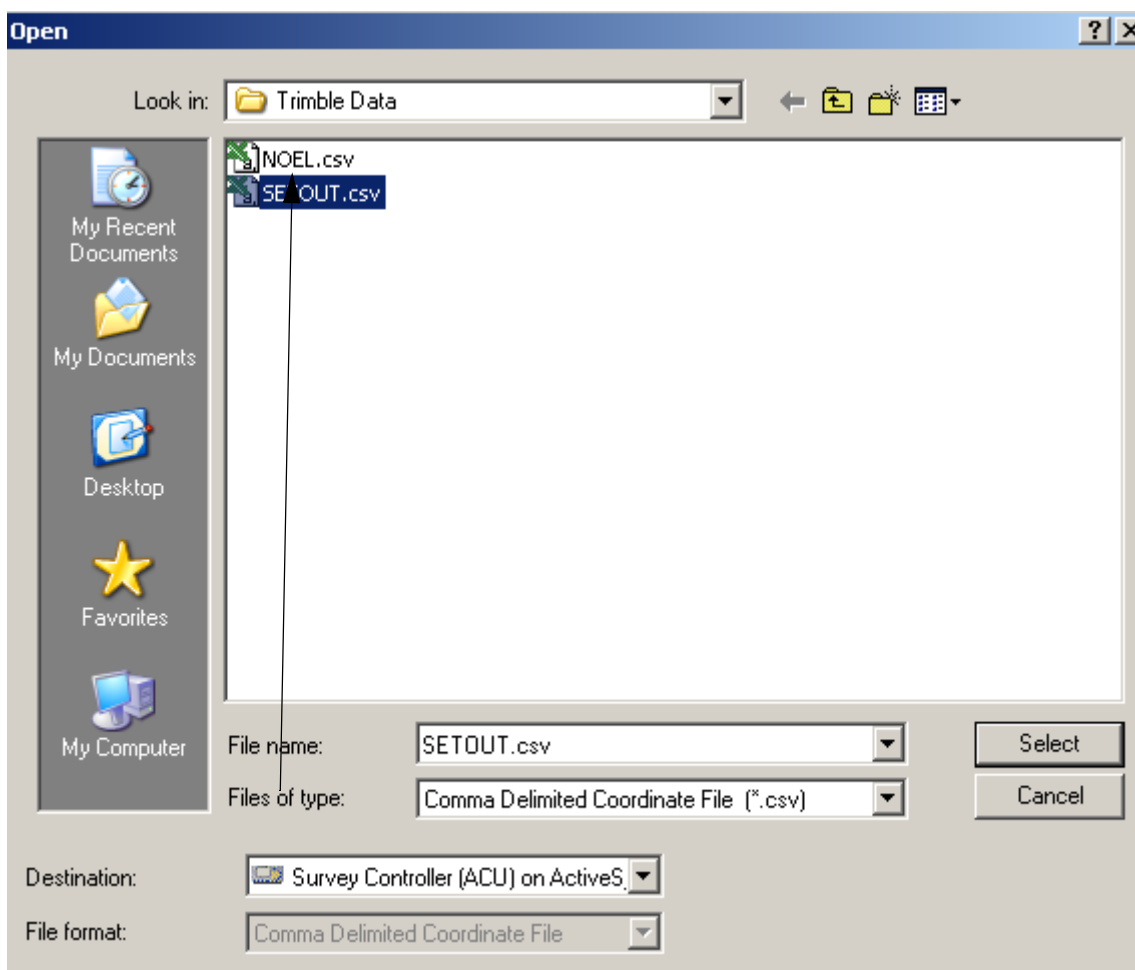
Loading file into job in ACU

The points upload file can be transferred to the ACU for setout.

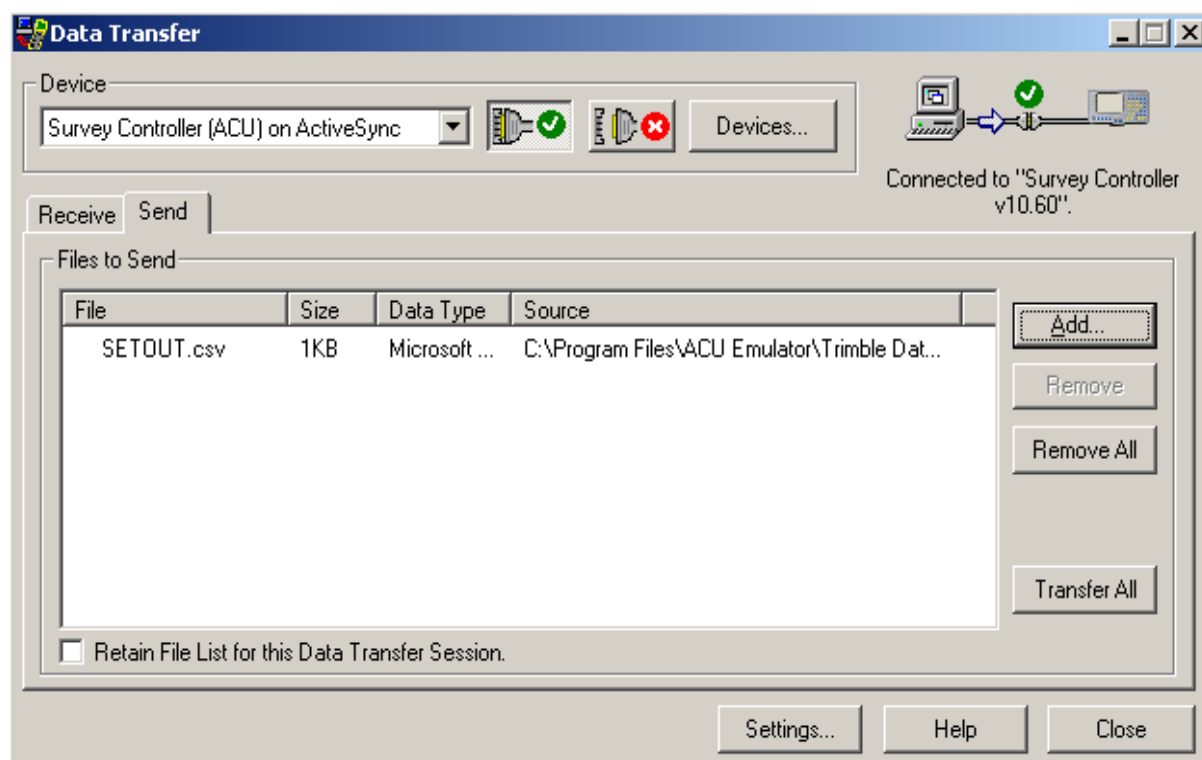
Connect the ACU to the PC using **TRIMBLE DATA TRANSFER**



Select *Send* tab then select *Add*

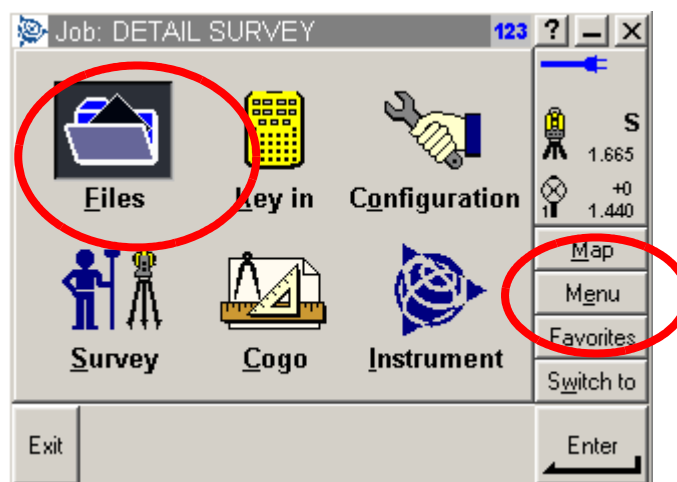


Select the file to upload using format *Comma delimited coordinate file*

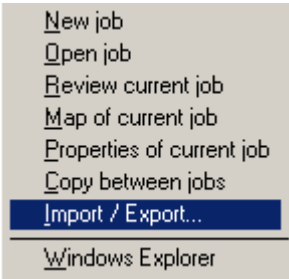


Select **Transfer All** to transfer the file

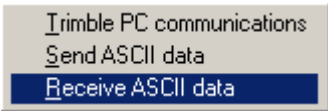
To load the file into the current job on the ACU select **Menu=>Files**



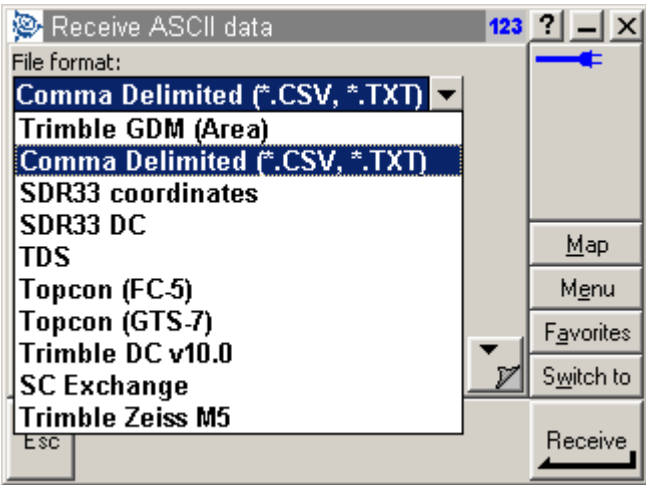
Select **Import / Export**



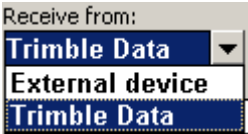
Select **Receive ASCII data**



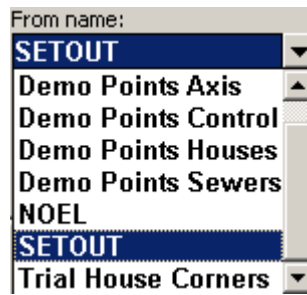
Select **File format** choice icon then pick **Comma Delimited (*.CSV, *.TXT)**



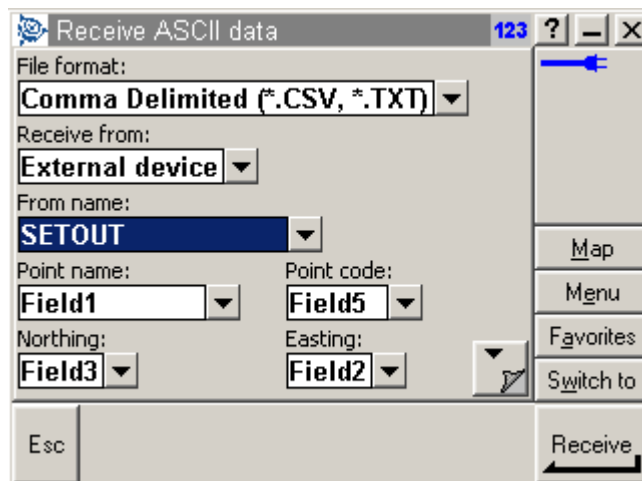
Select **Receive from** choice icon and pick **Trimble Data**



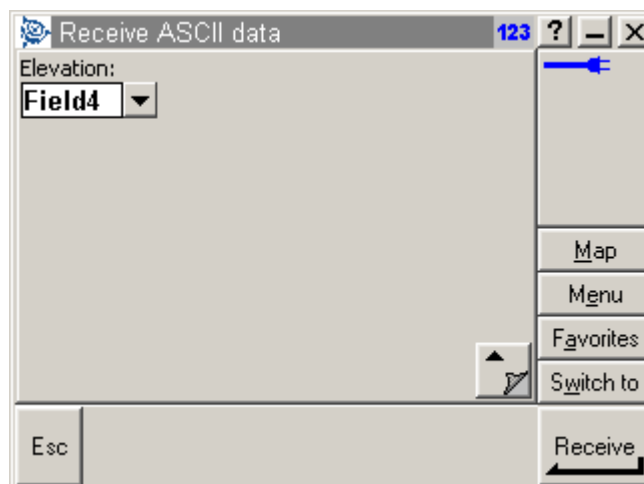
Select **From file** choice icon and select file



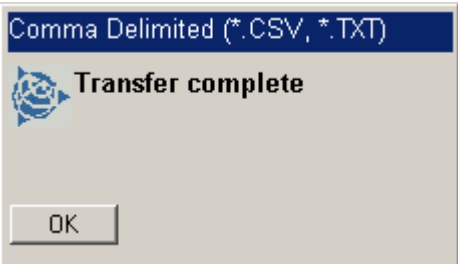
Select the field order for the file as (1) Point number, (2) Easting, (3) Northing, (4) Level and (5) Code



Select the **Next page** icon

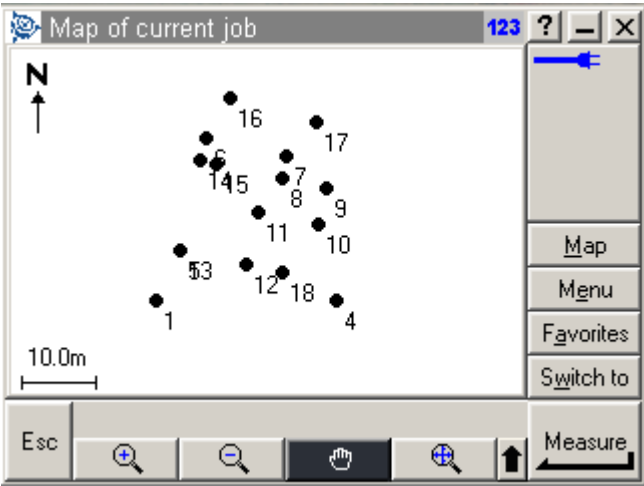


Select **Receive**



Select **OK** to finish

The points can be displayed by selecting **Map** and zooming all of the job



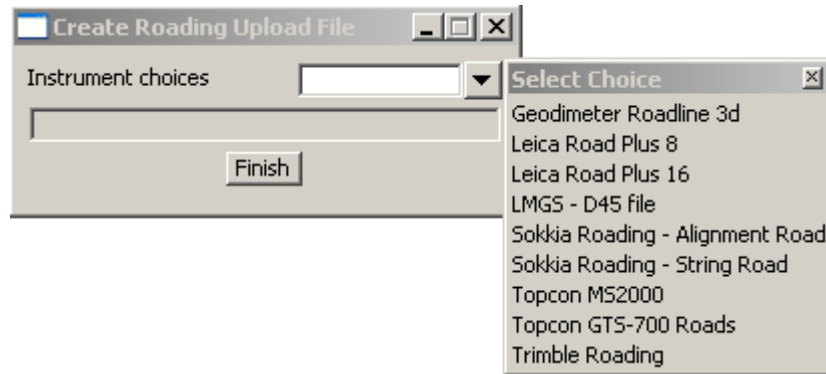
Please continue to the next section [Create Roads Upload File](#)

Create Roads Upload File

Create upload file in 12d

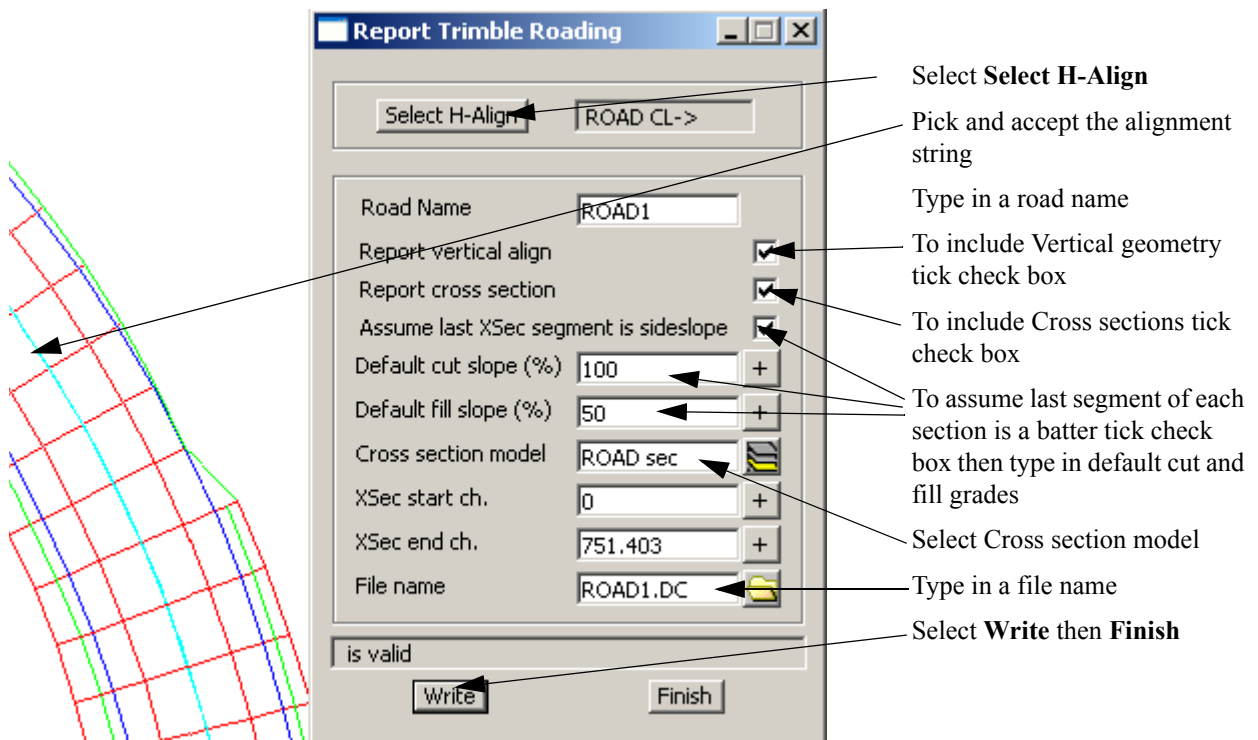
After creating the road alignment an upload file has to be created for the trimble format

Select option ***Survey=>Upload=>Create roads upload file***



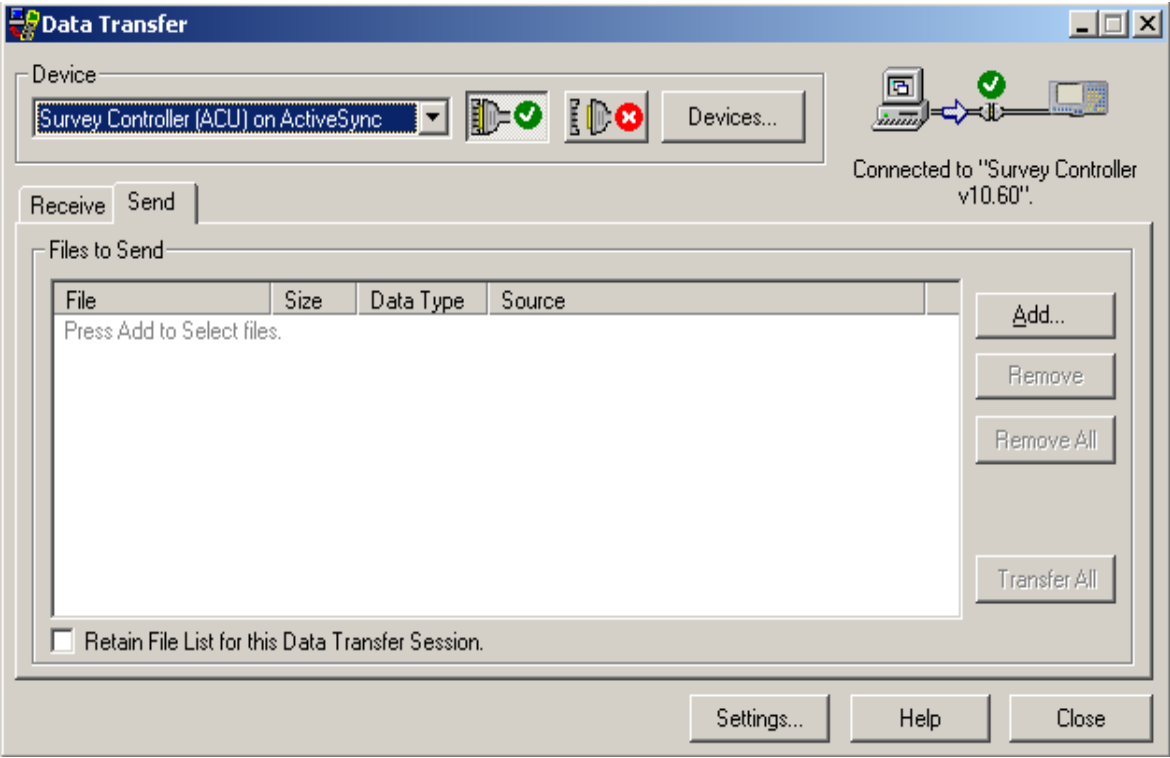
Select **Instrument** choice icon

Select **Trimble Roading**

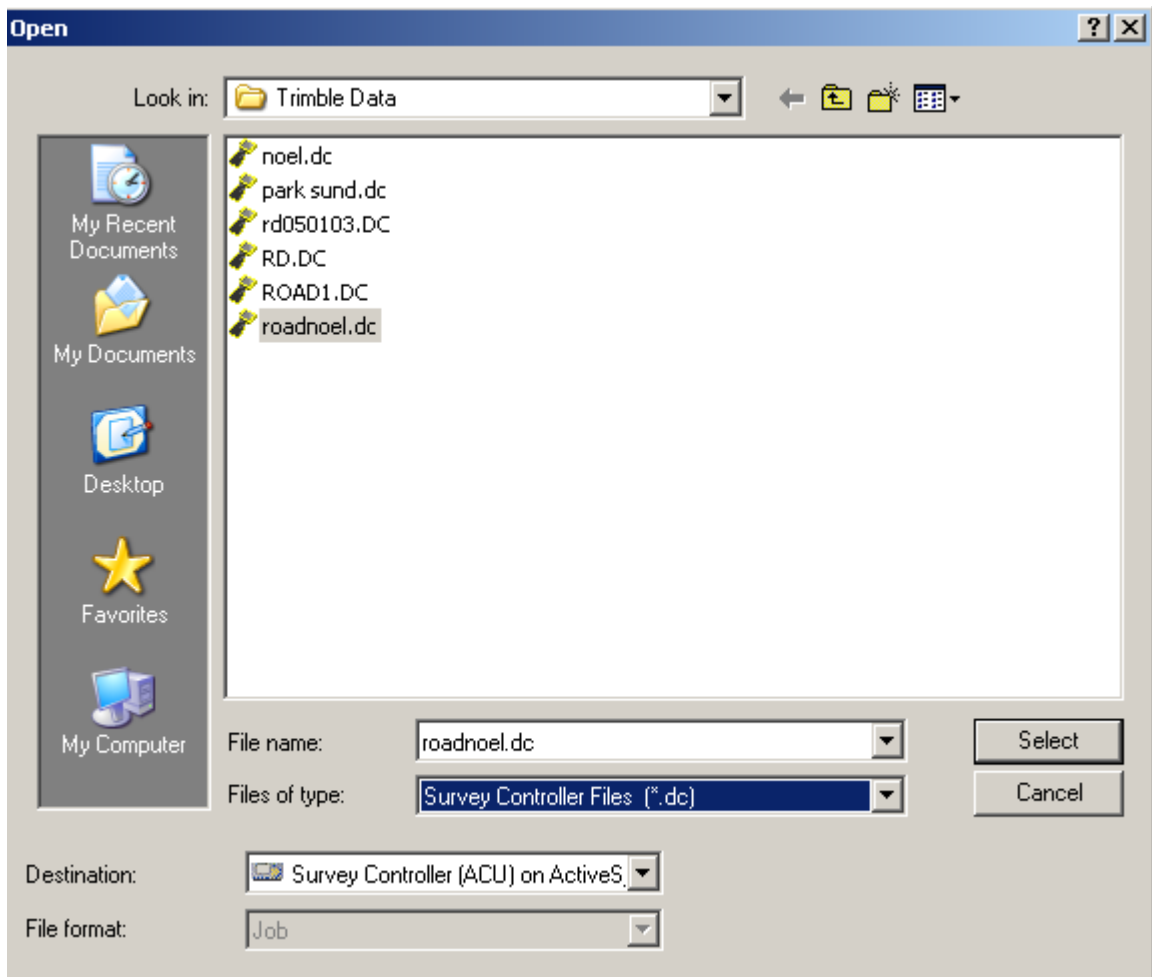


Loading file to the ACU

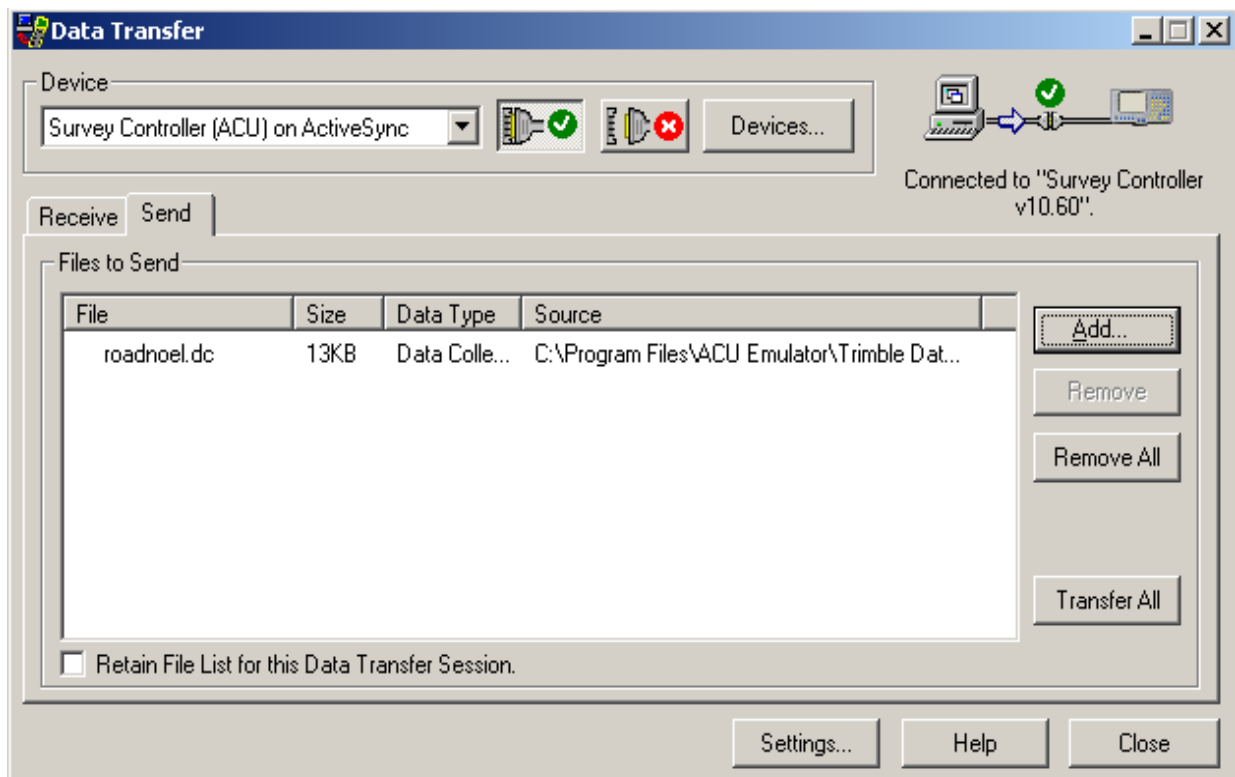
The road upload file can be transferred to the ACU for setout.
Connect the ACU to the PC using **TRIMBLE DATA TRANSFER**



Select *Send* tab then select *Add*

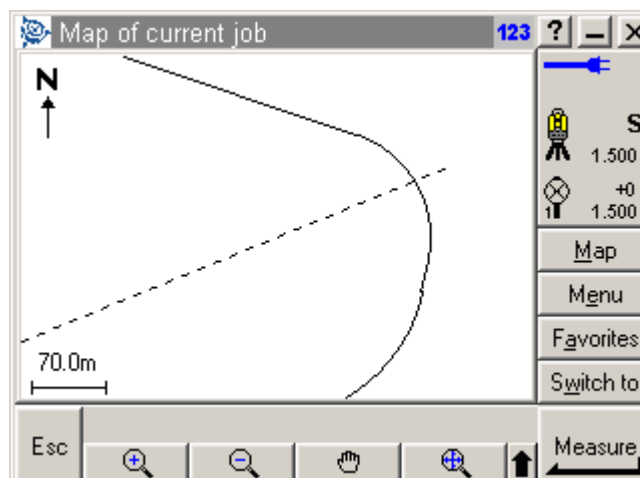


Select the road file to upload using format ***Survey Controller file***



Select **Transfer All** to transfer the file

Once the road file has been copied into the ACU it can be setout using option **Survey=>Stakeout=>Roads**



Stake out road 123 ? - X

Road name: road080103 Code: CL

Stake: Station and offset

Target height: 1.500m

Station: 0+295.000m

Offset (left): 0.000m

Map Menu Favorites Switch to

Esc Sta- Sta+ Offs» Options Start

Stake out road 123 ? - X

0+295.000m CL

0.039m

Go In 0.039m

Go Right 0.000m

V. Dist Cut 1.441m

Go Forward 0.007m

Go Left 0.038m

Map Menu Favorites Switch to

Esc Measure Target Options Accept

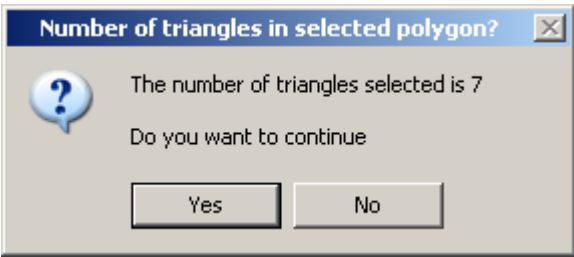
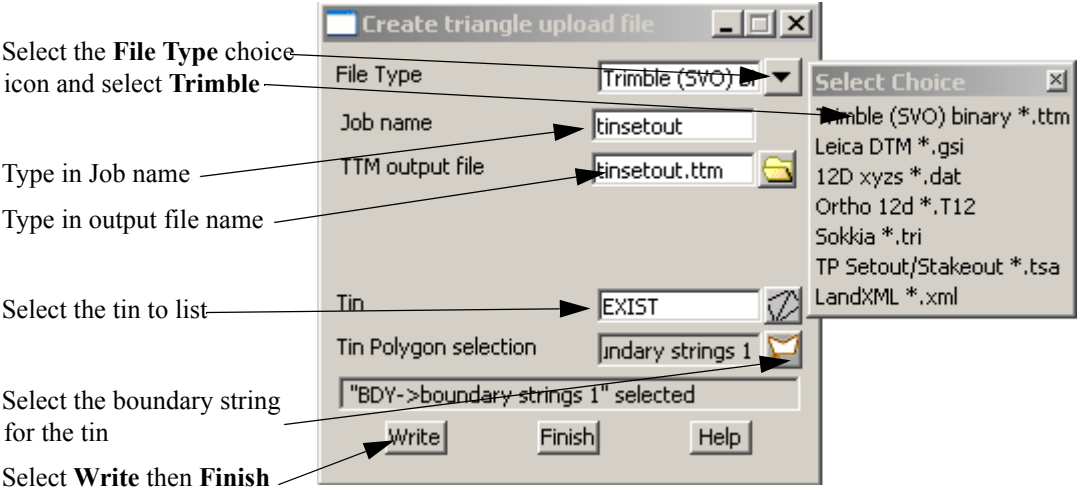
Please continue to the next section [Create Tin Upload File](#)

Create Tin Upload File

Create upload file in 12d

After creating the triangulation an upload file has to be created for the trimble format

Select option *Survey=>Upload=>Create triangle upload file*

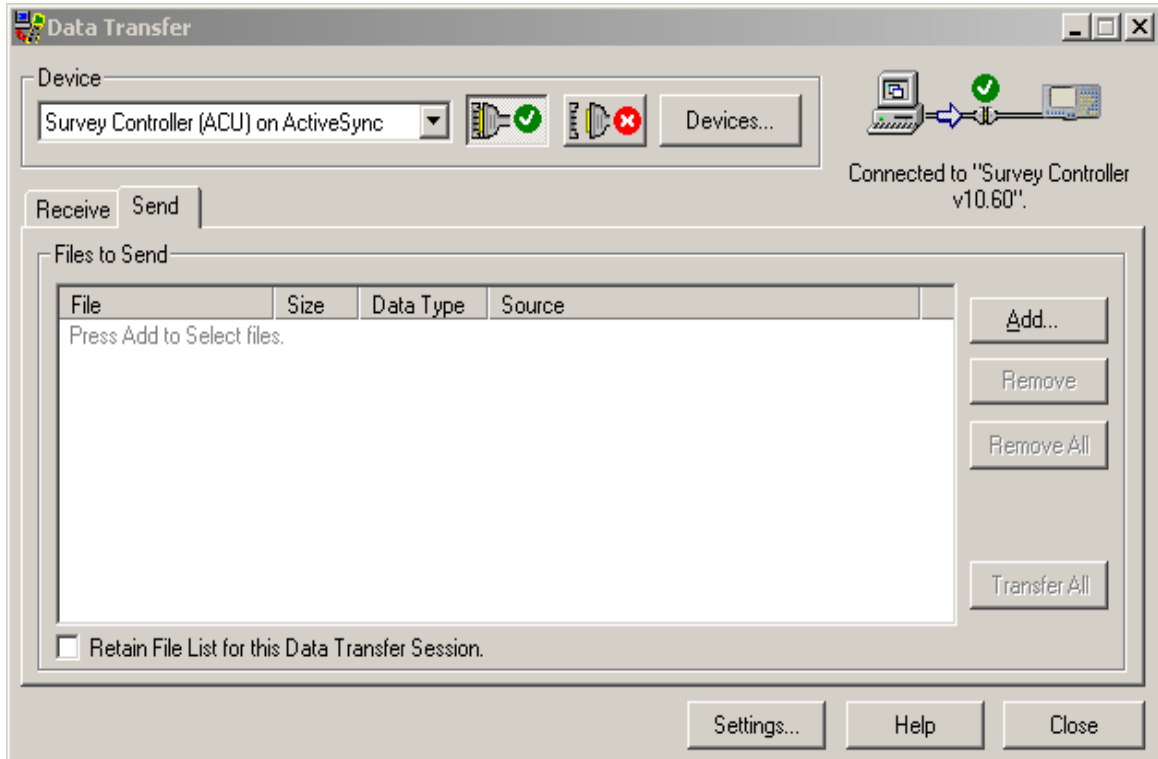


Select **Yes** to create the file

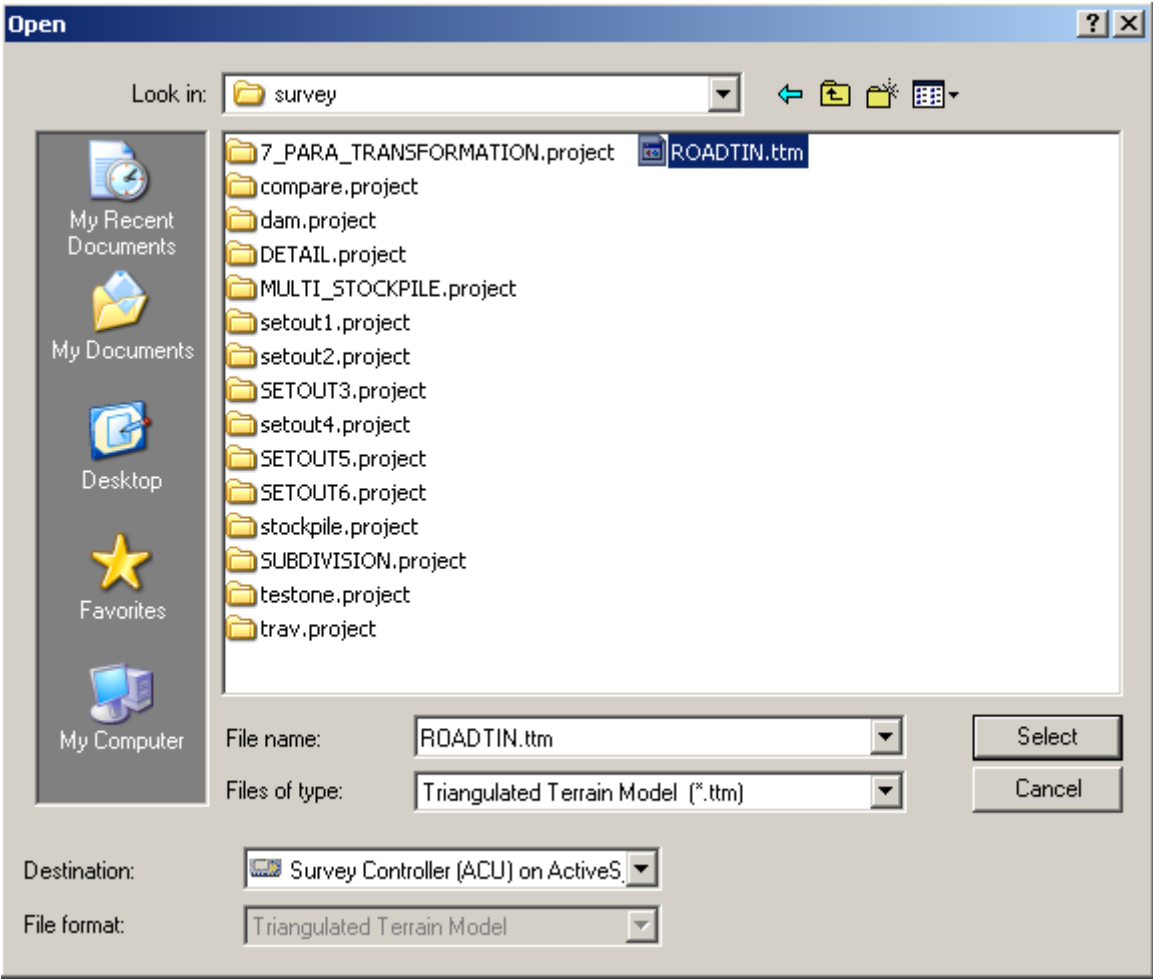
Loading and using the file in the ACU

The tin upload file can be transferred to the ACU for setout.

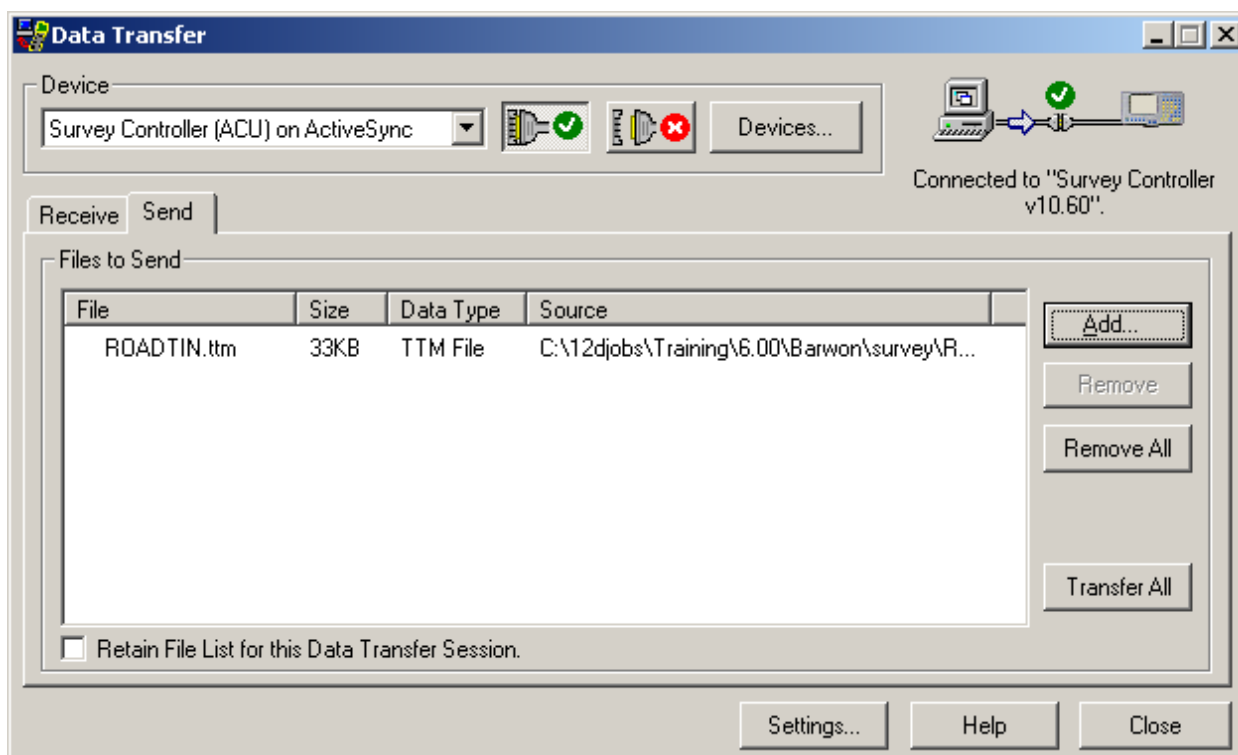
Connect the ACU to the PC using **TRIMBLE DATA TRANSFER**



Select **Send** tab then select **Add**



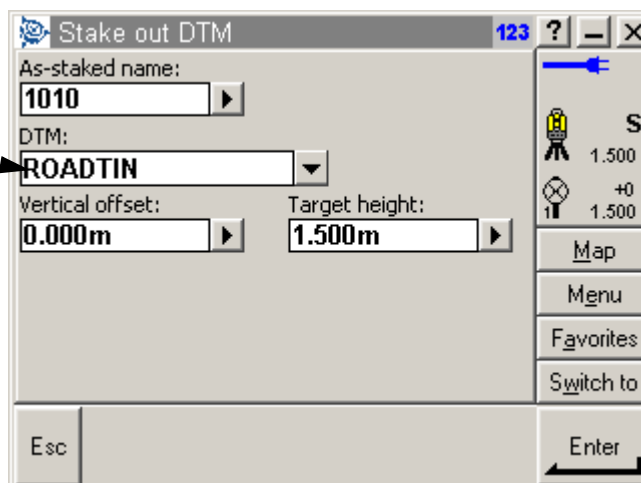
Select the tin file to upload using format *Triangulated Terrain model*

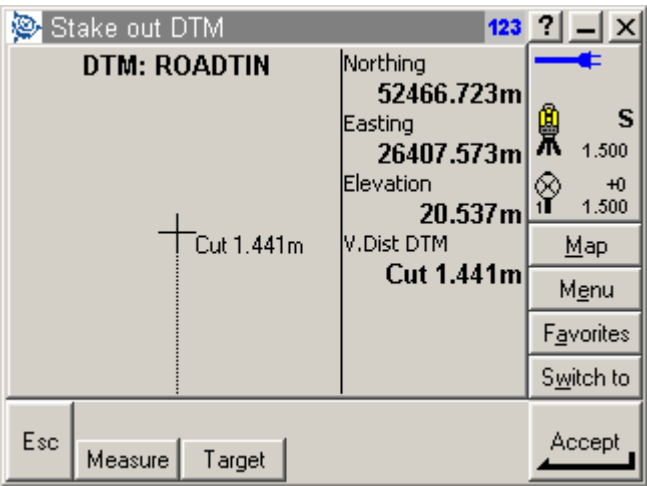


Select ***Transfer All*** to transfer the file

Once the tin has been copied into the ACU it can be called up when using the Stakeout option
Survey=>Stakeout=>DTM

Select the uploaded tin file
to setout





The cut to the tin is calculated and displayed

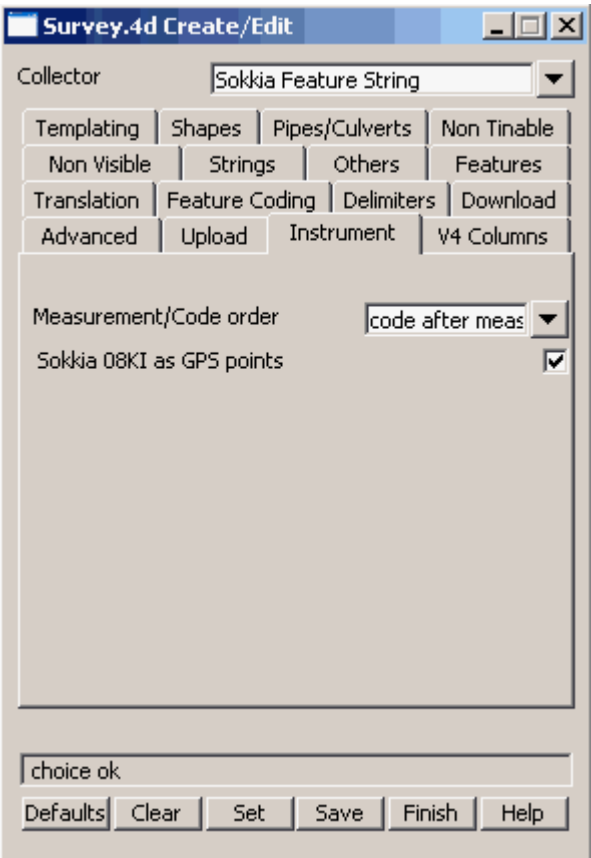
E 12d and Trimble GPS Controllers

The Trimble Geomatics Office software which comes with most Trimble GPS units can produce a Sokkia SDR file which is used by 12d Model as a raw data file.

However, the Trimble software writes out the (x,y,z) co-ordinates of GPS points as a "08KI" record which is normally treated by 12d Model as directly entered co-ordinates for a Station.

To overcome this problem, there is a flag in the data collector definitions to treat the Sokkia 08KI records as GPS points.

So before converting a Sokkia SDR file from a Trimble GPS unit, define a data collector which has a tick for the field *Sokkia 08KI as GPS points* on the *Instrument* tab of the **Survey.4d Create/Edit** panel.



This flag needs to be ticked on for reducing the SDR files created by Trimble GPS units

The code information that is entered on the Trimble in the field is appended the Sokkia 08KI record and is processed as blocks of information as given in the section [Field Coding for Non Leica Instruments](#) and the appendix [12d and Sokkia Instruments \(SDR Files\)](#).

F 12d and Geodimeter Instruments

This appendix deals with interfacing 12d with Geodimeter files.

See the sections:

[12d UDS's](#)

[Using 12d Field Ops Codes on the Geodimeter](#)

[Example of Geodimeter File](#)

12d UDS's

The geodimeter allows the recording of information in a format specified by the user. Data for each label can be prompted for and measurements from the instrument can be registered. The user can assign a certain series of labels to a User Defined Sequence or UDS.

For 12d to reduce files from the geodimeter instruments, the recorded information from the instrument must be in a specific format that 12d can understand. A number of Geodimeter UDS files are supplied on the 12d Model Installation CD in the folder 'Other_Software\Geodimeter'.

For uploading or direct entry of UDS's to your particular instrument see you instrument manual.

*These UDS's have been set up so that 12d can convert the raw files from the instrument in a 12d field file. These UDS's should be installed **prior** to undertaking surveys that are to be reduced by 12d. The standard UDS that 12d supply is as follows:*

UDS 1 - used within UDS 8 to record 12d field op codes.

UDS 2 - prompts for additional data for a 12d field op code.

UDS 5 - job administration at the start of a job

UDS 6 - station co-ordinates entry

UDS 7 - station set up - name and instrument height

UDS 8 - data pick-up

UDS 5 is run at the beginning of the job and it runs UDS 6, which runs UDS 7 which runs UDS 8.

UDS 1 can be run as required from within UDS8 to give 12d field file op codes.

UDS 1 - used within UDS 8 to record 12d field op codes	UDS 5 - job admin at start of day	UDS 7 - station set up - name and instrument height	UDS 8 - data pick-up
-----	-----	-----	-----
42=1	42=5	42=7	42=8
43=OP-CODE-SELECT	43=TCC-ADMIN	43=TCC-STN-ID	43=TCC-DATA-PICKUP
91=1	79=10	79=10	5=4
79=7/2	0=1	3=1	4=8
-----	53=1	95=1	6=8
UDS 2 - used for additional data for 12d field ops codes	51=0	2=1	39=8
-----	79=7/6	4=1	8=0
42=2	-----	1=1	9=0
43=OP-CODE DATA	UDS 6 - station co-ordinates entry	5=2	7=0
92=1	-----	6=2	6=8
79=5	42=6	79=7/8	5=8
	43=TCC-COORD-ENTRY		4=8
	79=10		38=8
	38=1		37=8
	39=1		39=8
	37=1		6=3
	79=7/7		4=3
			1=3
			90=3
			79=5

12d standard UDS's for pick-up with Geodimeter

The Geodimeter data format is used as a raw data file by 12d Model and is converted into a 12d Field File before reduction by potentially 2 different macros:

- 1) geodat4d.4do (default) for use with the 12d standard UDS's.
- 2) geodat_qmrd.4do (Specialised reduction) for use with Queensland MRD UDS's.

For the geodat4d.4do macro (default) 12d Model uses the following Geodimeter labels:

- 0= Information
- 1= Attributes
- 2= Station name or named point
- 3= Instrument height
- 4= Blocks
- 5= Point number
- 6= Target (signal) height
- 7= Horizontal angle
- 8= Vertical angle
- 9= Slope distance
- 37= Northing (X) value
- 38= Easting (Y) value
- 39= Height (Z) value
- 51= Date
- 53= Operator
- 90= End of record, flush buffer
- 91= 12d Model field file op code
- 92= Parameters for the previous 12d op code
- 95=

In particular, the Geodimeter PCode label block (4=) is used as the text of blocks that are interpreted according to the descriptions given in the earlier section [Field Coding for Non Leica Instruments](#).

A new conversion macro for V6.0, geodat_qmrd.4do recognises geodimeter Program 22 and Program 32 commands **if the following setup/procedures are used:**

1. The geodimeter should be set to record program numbers. This is shown by the label **0=Pn** in the raw file, where **n** is the program number and is assigned by the instrument. To set this up on the instrument use MENU 6 1(Switches) and turn Prg_Num on.
2. For 12d to convert raw files using geodimeter programs such as P22 and P32 the data must contain a label **61=n** each time an UDS or onboard program is started (Where **n** is the program number). This allows 12d to be able to determine when one program is finished and another started. Queensland MRD have created there own UDS's which utilise the **61=** label so that it is prompted for within the UDS's. They have also set up a UDS (UDS 6) which is used to place the label at the commencement of an onboard program such as program 22.

Please continue to the next section [Using 12d Field Ops Codes on the Geodimeter](#).

Using 12d Field Ops Codes on the Geodimeter

In addition to the commands accessible from the blocks, most of the 12d field file op codes are accessible directly from the Geodimeter.

The label '91=' label is used to specify a 12d field file op code and any following '92=' labels provide any additional information required by the 12d op code.

The 12d field file ops codes apply to the measurement *before* the op code.

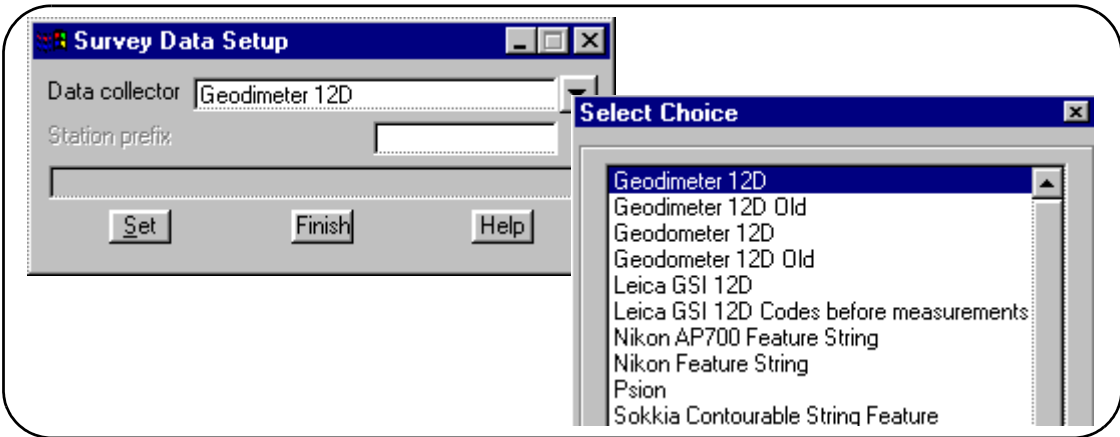
For a complete definition of the 12d Model field file and the 12d Model field file op codes, see the section [The 12d Field File Format](#)

Please continue to the next section [Example of Geodimeter File](#).

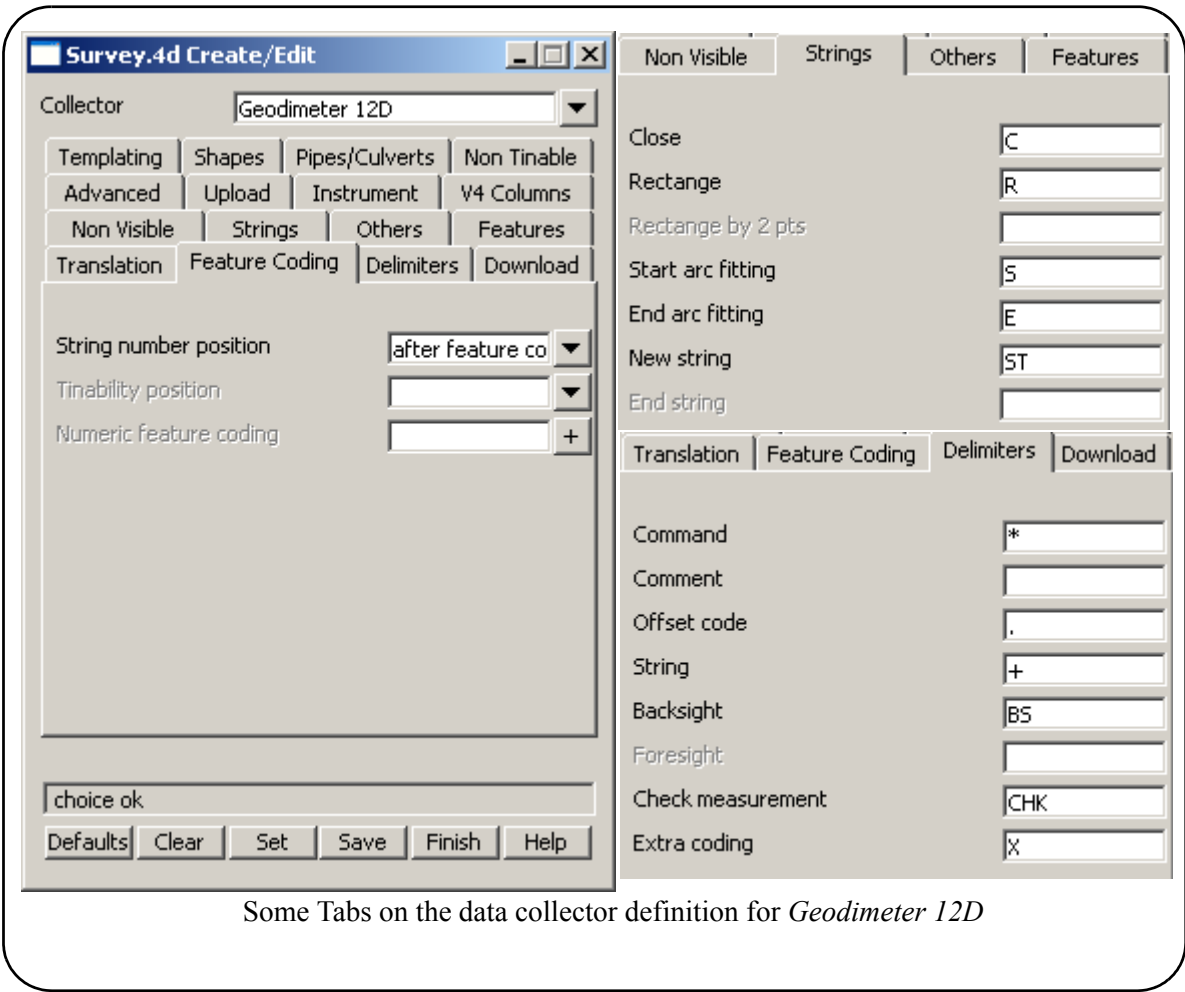
Example of Geodimeter File

The raw file 'Geodimeter.job' has been coded in accordance with the data collector definition *Geodimeter 12D* which is shipped with 12d Model. The 12d Model Geodimeter UDS's were used in the field pick-up.

The data collector *Geodimeter 12D* is set using the option *Survey=>Setup*



Some of the tabs on the *Geodimeter 12D* data collection definition as show below. Note that * is used as the Command (Block) delimiter, the *string number* is given after the *feature code*, S is used to start arc fitting and R is the Rectangle (make a parallelogram) command.



Some Tabs on the data collector definition for *Geodimeter 12D*

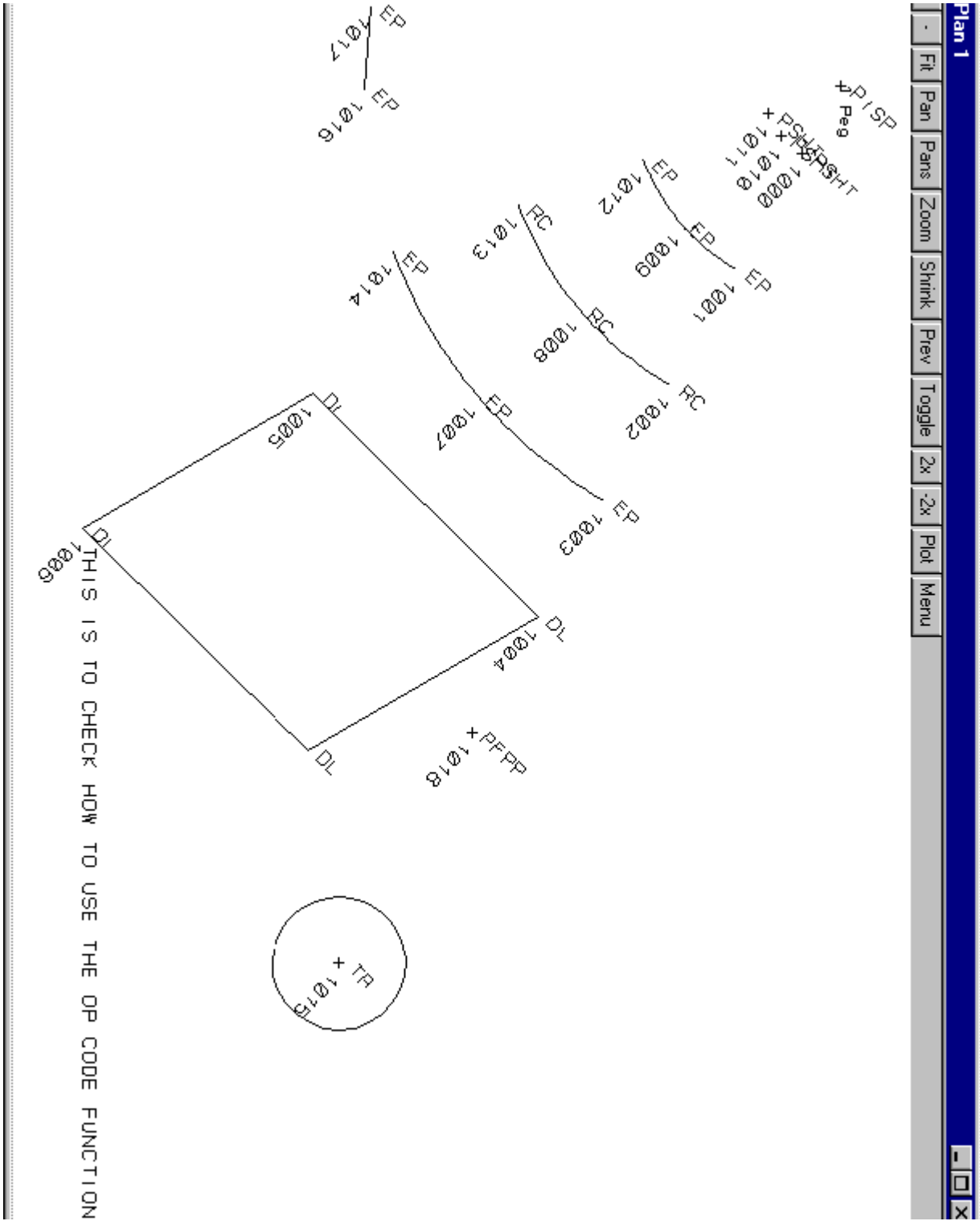
The listing of the raw file is now given, followed by a dump of a 12d Model view displaying the job with string names (feature codes) and point numbers toggled on. The raw file 'Geodimeter.job' is in the Survey

area of the training data. It can be converted into a 12d field file by using the default conversion macro geodat4d.4do.

Description	Geodimeter file	Description	Geodimeter file
run UDS 5 job name	0=OP CODE TEST	point no 1005	5=1005
operator	53=DAD	vertical angle	8=90.1203
date	51=2001.0525	slope distance	9=45.80
UDS 6 station	38=5000.000	horizontal	7=149.4706
co-ordinates	39=10.000	target height	6=1.500
	37=10000.000	FC <i>DL SN I</i>	4=DL1
UDS 7 instrument ht	3=1.654		1=
	95=0		90=0
	2=1	point no 1006	5=1006
Feature code (FC) PISP	4=PISP	vertical angle	8=90.1159
	1=Peg	slope distance	9=65.80
UDS 8 point no 1000	5=1000	horizontal	7=149.4706
vertical angle	8=90.1219	target height	6=1.500
slope distance	9=5.80	FC <i>DL SN I</i>	4=DL1
horizontal	7=119.4705		1=
target (signal) height	6=1.500		90=0
FC PSHT	4=PSHT	UDS 1 12d op code 45	91=45
*note that the string no.	1=	UDS 1 12d op code 41	91=41
(SN) defaults to 0	90=0	UDS 2 parameters	92=THIS IS TO CHECK
point no 1001	5=1001	for op code 45	92= HOW TO USE THE
vertical angle	8=90.1207	(additional text)	92= OP CODE FN
slope distance	9=15.80	UDS 8 point no 1007	5=1007
horizontal	7=119.4708	vertical angle	8=90.1219
target height	6=1.500	slope distance	9=35.80
FC <i>EP SN I start arc</i>	4=EP1*S	horizontal	7=139.4711
	1=	target height	6=1.500
point no 1002	90=0	FC <i>EP SN 2</i>	4=EP2
vertical angle	5=1002		1=
slope distance	8=90.1215		90=0
horizontal	9=25.80	*note that 12d op code 45	5=1008
target height	7=119.4705	is 'make a parallelogram	8=90.1214
FC <i>RC SN I start arc</i>	6=1.500	from the last three points'	9=25.80
	4=RC1*S	and it is applies to the	7=139.4706
	1=	measurement before the	6=1.500
	90=0	command. The rectangle R	4=RC1
	5=1003	could have been instead as	1=
	8=90.1158	part of the feature code	90=0
	9=35.80	block.	5=1009
	7=119.4705	That is " 4=DL1*R" instead	8=90.1211
	6=1.500	of the "91=45"	9=15.80
	4=EP2		7=139.4706
	1=	*Also note that the 12d op	6=1.500
	90=0	code 41 is 'additional text'	4=EP1
	5=1004	and the additional text is	1=
	8=90.1209	given by the "92=" lines.	90=0
	9=45.80	Again the op code applies to	continue on next page
	7=119.4706	the measurement before the	
	6=1.500	command..	
	4=DL1		
	1=		
	90=0		

Description	Geodimeter file	Description	Geodimeter file
point no 1010	5=1010	point no 1015	5=1015
vertical angle	8=90.1209	vertical angle	8=90.1141
slope distance	9=5.80	slope distance	9=75.80
horizontal	7=139.4709	horizontal	7=119.4709
target height	6=1.500	target height	6=1.500
FC <i>PSHT</i> SN 0	4=PSHT	FC <i>TR</i> SN 1	4=TR1
	1=		1=
	90=0		90=0
	5=1011	UDS 1 12d op code 18	91=18
	8=90.1141	UDS 2 Radius 5	92=5
	9=5.80	which is 'circle feature'	5=1016
	7=159.4714	with a radius of 5	8=90.1146
	6=1.500		9=35.80
	4=PSHT		7=179.4713
	1=		6=1.500
	90=0		4=EP2
	5=1012		1=
	8=90.1138		90=0
	9=15.80		91=47
	7=159.4711		5=1017
	6=1.500		8=90.1145
	4=EP1		9=35.80
	1=		7=189.4714
	90=0		6=1.500
	5=1013		4=EP2
	8=90.1141		1=
	9=25.80		90=0
	7=159.4709	point no 1018	5=1018
	6=1.500	vertical angle	8=90.1145
	4=RC1	slope distance	9=55.80
	1=	horizontal	7=119.4713
	90=0	target height	6=1.500
point no 1014	5=1014	FC <i>PFPP</i> SN 1	4=PFPP
vertical angle	8=90.1141		1=
slope distance	9=35.80		90=0
horizontal	7=159.4713	UDS 1 12d op code 40	91=40
target height	6=1.500	which is 'make a point non-	
FC <i>EP</i> SN 2	4=EP2	tinable' This applied to the	
	1=	previous point (1018)	
	90=0		
UDS 1 12d op code 17	91=17		
which is 'arc through	continued in next column		
previous three points'			

Plan View with of the Reduced Geodimeter Data Displayed
with Point Numbers and String Names (Feature Codes) Turned On



The following raw field file has been taken from an QMRD Geodimeter 610 which has the QMRD UDS's installed. The file can be converted into a 12d field file by using the geodat_qmr.d.4do. Note the inclusion of the activity codes (61=) that have been added to the file with the use of the UDS's. It also shows the use program 22 and the traverse extraction facility. For more information on traverse extraction see the section [Traverse coding](#).

Description	Geodimeter file	Description	Geodimeter file
Activity code from UDS	50=030602	4=TL1 ROSTN1	
	61=1	6=1.475	
	6=1.458	7=10.1654	
	54=ROGER-RANGER	8=90.2218	
	STN	9=162.710	
Run UDS 6 to place activity code (61=) before program 22	0=OVERLAY	17=190.1657	
	53=RAF	18=269.3740	
	51=03-06-2002	24=10.1652	
	61=22	25=90.2216	
	0=P22	5=STN3	
foresight to STN1, traverse line(TL), string 1	2=PSM45026 PBMK	4=TL1 FSSTN3	
	3=1.561	6=1.486	
	5=STN1	7=195.4510	
	4=TL1 FSSTN1	8=90.0511	
	6=1.475	9=257.710	
UDS 6 run to label activity code	7=213.0004	17=15.4508	
	8=89.1413	18=269.5452	
	9=98.297	24=195.4513	
	17=33.0014	25=90.0514	
	18=270.4550	61=22	
Backsight(RO) reading, trav line 1 to PSM45026	24=213.0009	0=P22	
	25=89.1417	2=STN3 PISP	
	61=22	3=1.581	
	0=P22	5=STN2	
	2=STN1 PISP	4=TL1 ROSTN2	
foresight to STN2, traverse line(TL), string 1	3=1.570	6=1.448	
	5=PSM45026	7=187.1306	
	4=TL1 ROPSM45026	8=89.5740	
	6=1.468	9=257.710	
	7=32.5955	17=7.1306	
and so forth....	8=90.5246	18=270.0232	
	9=98.300	24=187.1306	
	17=212.5956	25=89.5752	
	18=269.0716	5=STN4	
	24=32.5955	4=TL1 FSSTN4	
	25=90.5249	6=1.400	
	5=STN2	7=23.1437	
	4=TL1 FSSTN2	8=87.3949	
	6=1.448	9=173.958	
	7=182.1037	17=203.1434	
	8=89.4211	18=272.2031	
	9=162.715	24=23.1440	
	17=2.1040	25=87.4008	
	18=270.1759	61=22	
	24=182.1032	0=P22	
	25=89.4221	2=STN4 PISP	
	61=22	3=1.546	
	0=P22	5=STN3	
	2=STN2 PISP	4=TL1 ROSTN3	
	3=1.542	6=1.487	
	5=STN1	continue on next page	

Description	Geodimeter file	Description	Geodimeter file
	7=199.0404		0=P22
	8=92.2432		2=STN6 PISP
	9=173.963		3=1.591
	17=19.0353		5=STN5
	18=267.3552		4=TL1 ROSTN5
	24=199.0414		6=1.458
	25=92.2456		7=179.5456
	5=STN5		8=90.0633
	4=TL1 FSSTN5		9=179.821
	6=1.457		17=359.5457
	7=34.4057		18=269.5333
	8=88.1846		24=179.5456
	9=151.526		25=90.0639
	17=214.4059		5=STN7
	18=271.4140		4=TL1 FSSTN7
	24=34.4055		6=1.453
	25=88.1912		7=7.5532
	61=22		8=91.2051
	0=P22		9=149.687
	2=STN5 PISP		17=187.5533
	3=1.552		18=268.3914
	5=STN4		24=7.5531
	4=TL1 ROSTN4		25=91.2056
	6=1.452		61=22
	7=184.4113		0=P22
	8=91.4601		2=STN7 PISP
	9=151.527		3=1.547
	17=4.4111		5=STN6
	18=268.1402		4=TL1 ROSTN6
	24=184.4114		6=1.496
	25=91.4603		7=196.4115
	5=STN6		8=88.4357
	4=TL1 FSSTN6		9=149.679
	6=1.496		17=16.4116
	7=19.0418		18=271.1600
	8=89.5731		24=196.4115
	9=179.824		25=88.4353
	17=199.0420		5=STN8
	18=270.0229		4=TL1 FSSTN8
	24=19.0416		6=1.478
	25=89.5730		7=8.1420
	61=22		8=91.5307
	continued in next column		9=205.948
			continue on next page

Description	Geodimeter file	Description	Geodimeter file
	17=188.1422		5=STN10
	18=268.0657		4=TL1 FSSTN10
	24=8.1418		6=1.400
	25=91.5310		7=345.0918
	61=22		8=86.2903
	0=P22		9=221.043
	2=STN8 PISP		17=165.0917
	3=1.574		18=273.3103
	5=STN7		24=345.0920
	4=TL1 ROSTN7		25=86.2908
	6=1.453		61=22
	7=181.1643		0=P22
	8=88.1026		2=STN10 PISP
	9=205.939		3=1.583
	17=1.1647		5=STN9
	18=271.4934		4=TL1 ROSTN9
	24=181.1638		6=1.517
	25=88.1026		7=165.4152
	5=STN9		8=93.3413
	4=TL1 FSSTN9		9=221.053
	6=1.517		17=345.4122
	7=359.0523		18=266.2600
	8=89.1311		24=165.4221
	9=199.132		25=93.3425
	17=179.0523		5=STN11
	18=270.4648		4=TL1 FSSTN11
	24=359.0523		6=1.460
	25=89.1310		7=0.2903
	61=22		8=86.1535
	0=P22		9=215.241
	2=STN9 PISP		17=180.2930
	3=1.614		18=273.4438
	5=STN8		24=0.2836
	4=TL1 ROSTN8		25=86.1548
	6=1.478		50=ERICC
	7=173.0014		61=1
	8=90.5031		6=1.443
	9=199.132		54=ROGER-RANGER
	17=353.0017		STN
	18=269.0934		0=A
	24=173.0011		53=ECB
	25=90.5037		51=04-06-2002
	continued in next column		61=22 continue on next page

Description	Geodimeter file	Description	Geodimeter file
	0=P22		9=222.450
	2=STN11 PISP		17=0.1114
	3=1.573		18=270.4942
	5=STN10		24=180.1113
	4=TL1 ROSTN10		25=89.1113
	6=1.520		
	7=131.1633		
	8=93.4738		
	9=215.253		
	17=311.1639		
	18=266.1222		
	24=131.1626		
	25=93.4738		
	5=STN12		
	4=TL1 FSSTN12		
	6=1.465		
	7=307.3035		
	8=87.2924		
	9=191.435		
	17=127.3037		
	18=272.3034		
	24=307.3033		
	25=87.2922		
	61=22		
	0=P22		
	2=STN12 PISP		
	3=1.558		
	5=STN11		
	4=TL1 ROSTN11		
	6=1.477		
	7=11.1452		
	8=92.3416		
	9=191.448		
	17=191.1454		
	18=267.2611		
	24=11.1449		
	25=92.3443		
	5=STN13		
	4=TL1 FSSTN13		
	6=1.443		
	7=180.1114		
	8=89.1045		
	continued in next column		

G 12d and Topcon Instruments

The Topcon data format is used as a raw data file by 12d Model and is converted into a 12d Field File before reduction.

H 12d and Leica TPS Instruments

The Leica GSI data format produced by the Leica TPS is used as a raw data file by 12d Model and is converted into a 12d Field File. The contents of the recorded data can be manipulated by use of the Leica's recording masks. The setup of which is explained in the section [Setup of Leica 1100 instrument for detail pickup and use with 12d](#).

Each line (data block) of the Leica GSI file consists of between 1 and 12 words, with the words containing either 16 (8 characters for data) or 24 (16 characters for data) characters. The two formats will be referred to as the 8 format and 16 format respectively.

Measurement lines in the 8 format start with 11 and code lines start with 41.

For the 16 format, measurement lines start with *11 and code lines start with *41.

For an example of a GSI file in the 8 format, go to the section [Example of Leica GSI File](#).

When using a Leica, the Leica screen can be standard or controlled by using a code.hex file on the 1000 series or a Geobasic program or Leica Codelist (.crf file) on the 1100 series.

12d Solutions provide a basic code.hex, Geobasic program and various Codelists(.crf files) on the 12d Model Installation CD in the folder 'Other_Software\Leica'. These can be customised to your requirements - please contact 12d Solutions for more information.

For an example of a Leica screen with standard set-up, Codelist and Geobasic program, please go to the section [Examples of Leica Screens](#).

See the sections:

[Feature Codes and String Numbers](#)

[Leica Field Codes](#)

[Full Description of Leica Field Codes](#)

[Summary of Leica Field Codes](#)

[Examples of Leica Screens](#)

[Setup of Leica 1100 instrument for detail pickup and use with 12d](#)

[Example of Leica GSI File](#)

Please continue to the next section [Feature Codes and String Numbers](#).

Feature Codes and String Numbers

The *feature code* and *string number* for a measurement are entered in the Leica by giving the *feature code* in the first word and the *string number* as the second word of a code line. The feature codes and string numbers can be alpha or numeric and up to 8 (16) characters long.

For example, the feature code ABC with string number 1 is recorded as:

410003+00000ABC 42....+00000001 for the 8 format

or

*410003+00000000000000ABC 42....+0000000000000001 for the 16 format.

Some surveyors like to define the *feature code* and *string number* **before** they make a measurement. Other surveyors prefer to define the *feature code* and *string number* **after** they make a measurement.

When defining a *Data Collector setup*, 12d Model allows the user to specify whether the feature code comes before or after a measurement:

code before measurement

The given *feature code* and *string number* applies to the **next** measurement and all subsequent measurements until another *feature code* and *string number* is entered.

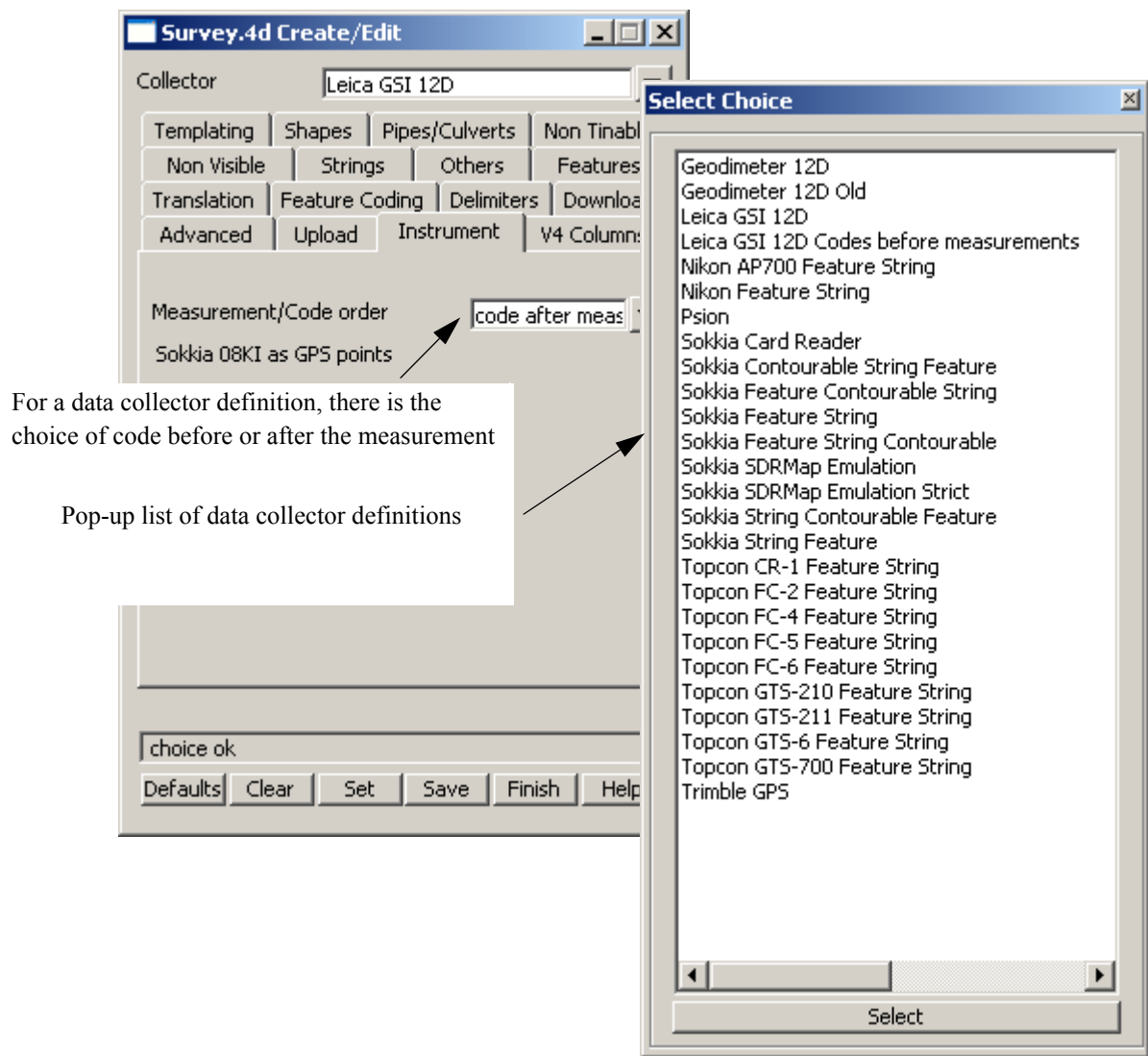
code after measurement

The given *feature code* and *string number* applies to the **last** measurement and all subsequent measurements until another *feature code* and *string number* is entered.

However, for a particular data collector setup, it can be only be defined as one of the two choices. That is you can't change between having feature codes before or after measurements in the one raw file.

Summarising:

Whether feature code definitions come before or after the measurements is defined in the *Survey Data Collector* definition and is set by the *Measurement/Code order* field on the *Instrument* tab of the *Survey.4d Create/Edit* panel.



Please continue to the next section [Leica Field Codes](#).

Leica Field Codes

12d Model also uses code lines to supply extra information using field codes.

All *field codes* are entered as the first word of the code line and to differentiated it from a *feature code*, the *field code* is preceded by a ".". Depending on the field code, more information may be required and it is entered in words 2 and above in the code line.

Each *field code* will now be described in detail.

For each *field code*, two lines and a paragraph of description are given:

- s The first line consists of the *field code* and a short description of the purpose of the code.
- s The second line gives the full syntax of the record for that *field code*.
- s The paragraph gives a detailed description of the *field code*.

A 12d Model code list containing 12d Model field codes is available for the TPS to help coding in the field.

Field Code Conventions

In the syntax for the *field codes*, optional Words or groups of Words are enclosed in the square brackets [].

However, when the Leica TPS creates the Leica GSI format, the data in all Words is right justified and left filled with zeros. Consequently, 12d Model strips leading zeros from all Words before processing the data.

This means that

- (a) an **optional Word** still exists in the file but its data field is simply **filled with zeros**.
- (b) any **text** in a Word **cannot start with a zero**. You would need to start with a space and then a zero.

In the *field code* descriptions, the point just measured is referred to as the *current measurement point*, the *current point* or the *last measurement point*.

The *string* that the current measurement point belongs to is called the *current string*.

For a summary of the Leica Field Codes, go to the section [Summary of Leica Field Codes](#)

For the full description of the Leica Field Codes, go to the section [Full Description of Leica Field Codes](#).

For an example of a raw Leica file, please go to the section [Example of Leica GSI File](#).

Full Description of Leica Field Codes

For a summary of the Leica Field Codes, go to the section [Summary of Leica Field Codes](#)

Field Code	Description of Record
------------	-----------------------

.2 Directly entered coordinates

Word 1 .2 Word 2 X Word 3 Y Word 4 Z Word 5 Feature_code
Word 6 String_number [Word 7 Point_number Word 8 Point_name]

A *measurement* point is created with the given *feature code* and *string number* and given (x, y, z) co-ordinates. No reduction is needed.

If a *Point_name* exists, then it is a **named measurement** and in the reduction, a 4d point string of name *Point_name* is created and mapped using the mapping file. The 4d text is the station prefix followed by *Point_name*. The *Point_name* is added to the internal list of named points for searching for co-ordinates.

Note that the Leica GSI format includes directly entered coordinates in a code line by data blocks with word indices 81, 82, 83 (Easting, Northing and Elevation).

.3 New instrument point - before the measurement

Word 1 .3 Word 2 Point_name Word 3 Instrument_height

Set up an instrument at the point with name *Point_name*. In the reduction, the (x, y, z) co-ordinates for *Point_name* are found by first searching the control model, then the list of previously named points in the reduction, point numbers of previous measurements and finally if *Point_name* is still not found, the user is asked to type in the (x, y, z) co-ordinates.

Note that the Leica GSI format includes setting up on a station in a measurement line by data blocks with word indices 84, 85, 86 (Station easting, Station northing and Station elevation) and 88 (Instrument height).

.4 Next measurement is a backsight - before the measurement

Word 1 .4 Word 2 Station_name [Word 3 Feature_code Word 4 String_number Word 5 Target_height]

The **next** measurement is to a backsight with name *Station_name*.

For traverse reduction, if the traverse code specified in the reduction panel matches the Feature code given in Word 3, the data will be included in a traverse reduction, string number can also be specified. Also the target height to the backsight can be given in the backsight command.

.5 New target height for subsequent measurements - before the measurement

Word 1 .5 Word 2 Target_height

Set a new target height to be used for all subsequent measurement points.

Note that the Leica GSI format can include the target height on each measurement line (word index 97).

.6 Next measurement is a Check measurement - before the measurement

Word 1 .6 Word 2 Station_name

The **next** measurement is a check measurement made to the station *Station_name*.

During reduction a two point super string (with name *Station_name*) from the instrument point to the measured point is created in the default model for the check measurement. The instrument point name, the station name and the differences between the measurement point co-ordinates and station co-ordinates are written as text along the super string. The differences between the measurement and the known point is also written to the report file.

.9 Scale factor for subsequent distances

Word 1 .9 Word 2 Scale_factor

Scale factor to apply to subsequent slope distances.

.11 Next measurement is to a named station - before the measurement

Word 1 .11 Word 2 Station_name [Word 3 Feature_code Word 4 String_number Word 5 Target_height]

This field code gives a name to a measurement so that it can be used in other field codes for setting up an instrument on, backsighting to or doing a check measurement to.

The *next* measurement locates a new instrument station with the name *Station_name*. A point with vertex text of *Station_name* is created. The *Station_name* is added to the internal list of named points for searching for co-ordinates.

If *Feature_code* exists, the point is given that *Feature_code*, otherwise the current feature code is used.

For traverse reduction, if the traverse code specified in the reduction panel matches the Feature code given in Word 3, the data will be included in a traverse reduction, string number can also be specified. Also the target height to the foresight can be given in this command.

.14 Feature code and string number - before or after measurement depends on the data collector definition

Word 1 .14 Word 2 Feature_code Word 3 String_number [Word 5 text Word 6 text] ...

A field code for entering the feature code and string number rather than using the standard method of using word 1 and word 2. This is for use with Leica quick codes which must put out a fixed first word. Any additional *text* is added to the end of any existing vertex text for the current measurement point. Any leading zeros in the text words will be ignored.

This field code is used *always before* or *always after* measurements depending on the *Measurement/code* field on the *Instrument* tab of the **Survey.4d Create/Edit** panel for the selected data collector definition.

.15 Vertical circle correction for subsequent measurements - before the measurement

Word 1 .15 Word 2 Vertical_circle_in_decimal_degrees

The *vertical_circle_in_decimal_degrees* is **subtracted** from the vertical circle value in any subsequent measurements.

.16 Additional code for point (multiply coded point) - after the measurement

Word 1 .16 Word 2 Feature_code Word 3 String_number [Word 4 Point_name] [Word 5 Point_text]

Additional coding for the current measurement point. A new measurement point is created at the same position as the current measurement point but with the *Feature_code* and *String_number* from this field code. The same point number is used as for the current measurement point.

If *Point_text* exists, it is used as the vertex text for that vertex of the super string.

If *Point_name* exists, then it is a **named measurement** and during reduction, a 4d point string of name *Point_name* is created and mapped using the mapping file. The 4d text is the station prefix followed by *Point_name*. The *Point_name* is added to the internal list of named points for searching for co-ordinates.

.17 Arc through previous three points - after the measurement of last point of arc

Word 1 .17 [Word 2 Feature_code Word 3 String_number] [Word 4 Point_number]

If only Word 1 exists, then the current measurement point and the two previous points with the same feature code and string number as the current measurement point, are joined by an arc. If there is less

than three such points, no arc is fitted.

If the *Feature_code* and *String_number* exist, the last three previous three measurement points of the same *feature code* and *string number* are joined by an arc. If the current measurement point has that feature code and string number, then it is the third of the three points used. If there is less than three points, no arc is fitted.

If *Point_number* exists, then the *feature code* and *string number* are taken from the previous measurement point **with** that point number, and that point and the two measurement points previous to the pre-defined point of the same *feature code* and *string number*, are joined by an arc. If there is less than three points, no arc is fitted

See the Section [Arcs Through Points](#) for more information on arc fitting.

.18 Circle Feature - after the measurement

Word 1 .18 Word 2 Radius [Word 2 Radius ...]

Creates a feature string with the given radius and centred on the current measurement point. If there is more than one radius, then separate feature strings are created each with one of the radii.

.20 Close string - after the measurement

Word 1 .20 [Word 2 Feature_code Word 3 String_number] [Word 4 Point_number]

If only Word 1 exists, the current string is closed.

If the *Feature_code* and *String_number* exist, the last previous string with that *feature code* and *string number* is closed.

If *Point_number* exists, then the string containing that point number is closed.

See the Section [Close String](#) for more information on closing a string.

.21 Join last points of strings

Word 1 .21 Word 2 Feature_code Word 3 String_number_1 Word 4 String_number_2

In the final reduction, the last point of the string with the given *Feature_code* and *String_number_1* is joined to the last point of the string with given *Feature_code* and *String_number_2*. The created string has the given *Feature_code* (no string number is needed since it is the final phase of reduction when the string numbers are dropped).

See the Section [Joining Strings](#) for more information on joining strings.

.22 Join first to last point of strings

Word 1 .22 Word 2 Feature_code Word 3 String_number_1 Word 4 String_number_2

In the final reduction, the first point of the string with the given *Feature_code* and *String_number_1* is joined to the last point of the string with given *Feature_code* and *String_number_2*. The created string has the given *Feature_code* (no string number is needed since it is the final phase of reduction when the string numbers are dropped).

See the Section [Joining Strings](#) for more information on joining strings.

.23 Join first points of strings

Word 1 .23 Word 2 Feature_code Word 3 String_number_1 Word 4 String_number_2

In the final reduction, the first point of the string with the given *Feature_code* and *String_number_1* is joined to the first point of the string with given *Feature_code* and *String_number_2*. The created string has the given *Feature_code* (no string number is needed since it is the final reduction when the string numbers are then dropped).

See the Section [Joining Strings](#) for more information on joining strings.

.28 Text appended to a string name

Word 1 .28 Word 2 Text [Word 3 Feature_code Word 4 String_number] [Word 5 Point_number]

Text is appended to the string name. For example, if 1.200 is entered, “ 1.200” is appended to the string name.

If only *Text* is given, *Text* is appended to the string name of the current string.

If the *Feature_code* and *String_number* exist, then the last previous string with that *feature code* and *string number* has *Text* appended to the string name.

If *Point_number* exists, then the string containing that point number has *Text* appended to the string name.

.29 Note or memo - after the measurement

Word 1 .29 [Word 2 text] [Word 3 text] ...

Any text may be entered and will be added to the check measurements model at the position of the current measurement point.

.30 Remove height from a point - that is make it a null height - after the measurement

Word 1 .30 [Word 2 Feature_code Word 3 String_number] [Word 4 Point_number]

If only Word 1 exists, the height of the current measurement point is set to null.

If *Feature_code* and *String_number* exist, then the height of the last point of the previous string with that *feature code* and *string number* is set to null.

If *Point_number* exists, then the height of the point with that point number is set to null.

.37 Rectangle by two points

Word 1 .37 Word 2 offset_in_metres [Word 3 Feature_code Word 4 String_number] [Word 5 Point_number]

The rectangle is defined by two points (reference side) and a offset.

If a positive offset value is given, two points will be created to the right of the reference side.

If a negative offset value is given, two points will be created to the left of the reference side.

If *Feature_code* and *String_number* exist, the last two points with that *feature code* and *string number* are used and a fourth points are created to form a rectangle. The height of the two new points are set to null. The string is then closed.

If *Point_number* exists, then the *feature code* and *string number* of the point with that point number are used and processed as above. Note that the point with the point number is not necessarily used.

Two consecutive rectangles are unable to be defined side by side. In other words if the two points given are part of string of greater than two vertices, the command will only work for sets of two points that are exclusively defined. i.e. For a 5 point string, a rectangle can be defined by points 1 and 2, and 4 and 5.

See the Section [Rectangle](#) for more information.

.38 Make the previous segment non-tinable (not a breakline) - after the measurement

Word 1 .38 [Word 2 Feature_code Word 3 String_number] [Word 4 Point_number]

If only Word 1 exists, the previous segment containing the current measurement point is set to non-tinable. That is, it will not be treated as a breakline in triangulations.

If the *Feature_code* and *String_number* exist, then the last segment of the previous string with that *feature code* and *string number* is set to non-tinable.

If *Point_number* exists, then the segment containing the point with that point number as an end point, is set to non-tinable.

.39 Make the next segment non-tinable (i.e. not a breakline) - after the measurement for the first point of the segment

Word 1 .39 [Word 2 Feature_code Word 3 String_number] [Word 4 Point_number]

If only Word 1 exists, the next segment containing the current measurement point as a starting point is set to non-tinable. That is, it will not be treated as a breakline in triangulations.

If the *Feature_code* and *String_number* exist, then the segment that is created in the future from the last point of the previous string with that *feature code* and *string number* is set to non-tinable.

If *Point_number* exists, then the segment containing the point with that point number as a start point, is set to non-tinable.

.40 Make a point non-tinable - after the measurement

Word 1 .40 [Word 2 *Feature_code* Word 3 *String_number*] [Word 4 *Point_number*]

If only Word 1 exists, the current measurement point is set to non-tinable. That is, it will not be included in triangulations.

If *Feature_code* and *String_number* exist, then the last point of the previous string with that *feature code* and *string number* is set to non-tinable.

If *Point_number* exists, then the point with that point number is set to non-tinable.

.41 Add additional text to the current measurement point - after the measurement

Word 1 .41 Word 2 *text* [Word 3 *text*] ...

The given *text* is added to the end of any existing vertex text for the current measurement point. Any leading zeros in the text words will be ignored.

.42 Add a radial offset - after the measurement

Word 1 .42 Word 2 *Radial_offset_in_metres* [Word 3 *Feature_code* Word 4 *String_number*] [Word 5 *Point_number*]

The *Radial_offset_in_metres* is used to adjust the position of the specified point by a plan distance from the specified points original position, along the plan line joining the current station to the specified point. A positive offset is away from the station, negative is toward the station.

If only Word 1 and 2 exist, the offset is used to adjust the position of the current measured point.

If *Feature_code* and *String_number* exist, then the last point of the previous string with that *feature code* and *string number* is adjusted.

If *Point_number* exists, then the point with that point number is adjusted.

See the Section [Offsets](#) for more information on offsets.

.43 Add a tangential offset - after the measurement

Word 1 .43 Word 2 *Tangential_offset_in_metres* [Word 3 *Feature_code* Word 4 *String_number*] [Word 5 *Point_number*]

The *Tangential_offset_in_metres* is used to adjust the position of the specified point by a plan distance from the specified points original position, at rights angles to the plan line joining the current station to the specified point. A negative offset is to the left (looking from the station), and positive is to the right (looking from the station).

If only Word 1 and 2 exist, the offset is used to adjust the position of the current measured point.

If *Feature_code* and *String_number* exist, then the last point of the previous string with that *feature code* and *string number* is adjusted.

If *Point_number* exists, then the point with that point number is adjusted.

See the Section [Offsets](#) for more information on offsets.

.44 Add a height offset - after the measurement

Word 1 .44 Word 2 *Height_offset_in_metres* [Word 3 *Feature_code* Word 4 *String_number*] [Word 5 *Point_number*]

If the height of the specified point is not null, then the *Height_offset_in_metres* adjusts the height of the point. A positive offset adds to the height, a negative offset reduces the height.

If only Word 1 and 2 *exist*, the offset is used to adjust the position of the current measured point.

If *Feature_code* and *String_number* exist, then the last point of the previous string with that *feature code* and *string number* is adjusted.

If *Point_number* exists, then the point with that point number is adjusted.

See the Section [Offsets](#) for more information on offsets.

.45 Make a parallelogram from the last three measurement points - after the measurement

Word 1 .45 [Word 2 *Feature_code* Word 3 *String_number*] [Word 4 *Point_number*]

If only Word 1 *exists*, the current measurement point and the two previous points from the current string are used and a fourth point is created to form a parallelogram (squashed rectangle) and the height of the fourth point is set to null. The string is then closed.

If *Feature_code* and *String_number* exist, the last three points with that *feature code* and *string number* are used and a fourth point is created to form a parallelogram (squashed rectangle) and the height of the fourth point is set to null. The string is then closed.

If *Point_number* exists, then the *feature code* and *string number* of the point with that point number are used and processed as above. Note that the point with the point number is not necessarily used.

See the Section [Rectangle](#) for more information on forming a parallelogram.

.46 Make the entire string a breakline or not (tinable or non-tinable)

Word 1 .46 [Word 2 *Breakline_type*] [Word 3 *Feature_code* Word 4 *String_number*]
[Word 5 *Point_number*]

Word 2: *Breakline_type*:

If *Breakline_type* is 0, the selected string is set to a point string and hence is not a breakline (non-tinable).

If *Breakline_type* is 1, the selected string is set to a *line* string and is therefore a breakline (tinable).

Words 3, 4, and 5:

If none of Words 3, 4 and 5 exist, the *Breakline_type* is applied to the current string.

If *Feature_code* and *String_number* exist, the *Breakline_type* is applied to the last string with that *feature code* and *string number*.

If *Point_number* exists, then the *Breakline_type* is applied to the string containing the point with that point number.

.47 Start a new string using the same feature code and string number - after the measurement of the first point of the new string

Word 1 .47 [Word 2 *Feature_code* Word 3 *String_number*] [Word 4 *Point_number*]

If only Word 1 *exists*, the current string is terminated (without including the current measurement point) and the current measurement point becomes the first point of a new string with the same feature code and string number.

If *Feature_code* and *String_number* exist, then the last point of the previous string with that feature code and string number becomes the first point of a new string with the same *feature code* and *string number*.

If *Point_number* exists, then the previous string containing the point with that point number is terminated *before* the point number point, and the point becomes the first point of a new string with the same *feature code* and *string number*.

.48 End a string

Word 1 .48 [Word 2 *Feature_code* Word 3 *String_number*] [Word 4 *Point_number*]

If only Word 1 *exists*, the current string is terminated (including the current measurement point).

If *Feature_code* and *String_number* exist, then the last point of the previous string with that feature

code and string number becomes the last point of that string.

If *Point_number* exists, then the previous string containing the point with that point number is terminated *after* the point number point

.50 Specify the bearing to correct for true north - used as the bearing datum difference

Word 1 .50 Word 2 *Bearing_in_decimal_degrees* [Word 3 *Text*]

The *Bearing_in_decimal_degrees* is used as the bearing datum difference for the current instrument set up. The *Text* and the *Bearing_in_decimal_degrees* are written to the reduction report file.

.51 Start using an existing field template - before the measurement

Word 1 .51 Word 2 [*Template_name*] [*mode*]

Start using the template *Template_name*. If *Template_name* is blank, the default template is used. If *mode* is "for", then the field template is used as a *forward* template.

"rev", then the field template is used as a *reverse* template.

"zig", then the field template is used as a *zig_zag* template and is used in the *forward* definition direction first.

"zag", then the field template is used as a *zig_zag* template and is used in the *reverse* direction first

If *mode* is blank, or 0, or anything other than "for", "rev", or "zag", then the field template is used as a *zig-zag* field template starting on a *zig*.

See the Section [Field Templates](#) for more information on field templates.

.52 Finish using a field template or finish recording a field template - after the measurement

Word 1 .52

Stops using the current field template or stops recording a field template.

.53 Pause using the current field template - after the measurement

Word 1 .53

Pause using the current field template or defining a field template, until a continue template (54) or a finish field template (52) code is given.

.54 Continue the current field template - before the measurement

Word 1 .54

Continue using the current field template or defining the current field template, which has been stopped by a *Pause* command (53). The *Continue* command only needs to be given once and applies to all *following* measurements until another *Pause* or *Finish* command is given.

.55 Start recording a field template - before the measurement

Word 1 .55 Word 2 [*Template_name*]

Start recording a field template with the name *Template_name*. If *Template_name* is non-blank, then the default field template is defined. The *feature_code* and *string_number* of the following measurements until a *Finish* code (52) are stored as the field template. There is no limit to the number of points in a field template.

See the Section [Field Templates](#) for more information on field templates.

.56 Skipping picking up points when using a field template - after the measurement of last point before skipping points

Word 1 .56 Word 2 [*num_skipped_points*]

Allows the user to skip picking up one or more points from the field template currently being used. The *next measurement* takes the *feature_code* and *string_number* from the next point of the field template definition. If *num_skipped_points* is missing, then only one point is skipped otherwise *num_skipped_points* are skipped.

.57 Delete points on a field template - after the measurement of last point

Word 1 .57 Word 2 [num_points_to_delete]

Allows the user to delete one or more points from the field template currently being used. The *next measurement* takes the *feature_code* and *string_number* from the next point of the field template definition.

**.58 Insert points when using a field template - after the measurement of last point
before inserting points**

Word 1 .58 Word 2 Feature_code Word 3 String_number Word
4 Multiple_code_flag Word 5 Insert_special_flag

Allows the user to insert points into the field template currently being used. The *next measurement* takes the *feature_code* and *string_number* from the next point of the field template definition.

If the *Multiple_code_flag* = 1, then the *feature code* will be added to the previous defined template point else if *Multiple_code_flag* = 0 (default), it will be added to the template as a separate point.

If the insert is done at the end of a section and the *Insert_special_flag* = 1 the point will be added to the end of the current template section else it will be at the start of the next section.

.60 Start of arc through next three points - after the measurement of the first point of the arc

Word 1 .60 [Word 2 Feature_code Word 3 String_number] [Word 4 Point_number]

If only Word 1 exists, an arc is inserted through the current measurement point and the next two measured points with the same feature code and string number as the current measurement point. If there is less than three points, no arc is fitted.

If *Feature_code* and *String_number* exist, a search is made for a previously defined measurement with the same feature code or string number. An arc is inserted through the previous measurement and the next two measured points following this previous measurement with the same feature code and string number. If the current point has that feature code and string number, then it is the first of the three point. If there is less than three points, no arc is fitted.

If *Point_number* exists, then the *feature code* and *string number* are taken from the previous measurement point **with** that point number, and an arc is inserted through that point and the next two measurement points with the same *feature code* and *string number*. If there is less than three points, no arc is fitted

See the Section [Arcs Through Points](#) for more information on arc fitting.

**.61 Start of arc through sets of three points until end of string, or a 62 occurs - after the
measurement of the first point of the arc**

Word 1 .61 [Word 2 Feature_code Word 3 String_number] [Word 4 Point_number]

The arcs are fitted as follows - the first arc is fitted through points one, two and three, the next arc through points three, four and five etc. If there is less than three points remaining at the end, then no arc is fitted to the end points.

If only Word 1 exists, arcs are inserted through the following sets of measurement points with the same feature code and string number as the current measurement point. The current measurement point is the *first* of the points.

If the current point has that feature code and string number, then it is the first of the points. If there is less than three points, then no arc is fitted.

If the *feature code* and *string number* exist, a search is made for a previously defined measurement with the same feature code or string number. An arc is inserted through the following measured points with the same feature code and string number as given in *point_description*. If the current point has that feature code and string number, then it is the first of the points.

If *Point_number* exists, then the *feature code* and *string number* are taken from the previous measurement point **with** that point number, and arcs are inserted through that point and the following measured points with the same *feature code* and *string number*.

If 12d Model encounters a *Start Arcs through sets of three points* but no *End Arcs* command for the string, then an *End Arcs* is assumed at the end of the string.

See the Section [Arcs Through Points](#) for more information on arc fitting.

.62 End the arcs begun by a 61 command - after the measurement of the last point of the arcs

Word 1 .62 [Word 2 Feature_code Word 3 String_number] [Word 4 Point_number]

If only Word 1 exists, then the fitting of arcs through the points of the current string is stopped. The current measurement point is the *last* of the points used in the arc fitting.

If *Feature_code* and *String_number* exist, then the fitting of arcs through the points of the previous string with the same *feature code* and *string number* is stopped. If the current measurement point has that feature code and string number, then it is the last point used in the arc fitting.

If *Point_number* exists, then the point with that point number is the last point used in the arc fitting.

If 12d Model encounters an *End Arcs* (62) but no *Start Arcs through sets of three points* (61) command for the string, then an *Start Arcs through sets of three points* (61) is assumed to apply at the beginning of the string and hence arc fitting will be applied to the entire string.

See the section [Arcs Through Points](#) for more information on arc fitting.

There are field codes for adding user defined attributes to:

- (a) the current string being measured (i.e. the string containing the current measurement point)
 - (b) the current measurement point
 - (c) the next segment from the current measurement point (i.e. the segment joining the current measurement point and the *next* measured point *of the same feature code and string number*)
- or
- (d) the previous segment to the current measurement point (i.e. the segment joining the current measurement point to the previous measured point *of the same feature code and string number*).

The attributes can be named or unnamed and are coded in the following way:

If Word 2 is missing (i.e. all zeros), then the attribute is an un-named attribute and the rest of the Words on the line is the attribute value. The attribute is given the special name "unnamed attribute n" for n=1, 2,

.68 Add an integer user defined attribute to the current string

Word 1 .68 [Word 2 Name] Word 3 Integer

Add an user defined integer attribute to the current string.

.69 Add a real user defined attribute to the current string

Word 1 .69 [Word 2 Name] Word 3 Real

Add a real (floating point) user defined attribute to the current string.

.70 Add text user defined attribute to the current string

Word 1 .70 [Word 2 Name] Word 3 Text [Word 4 Text] ...

Add a text user defined attribute to the current string.

.71 Add integer user defined attribute to the current point

Word 1 .71 [Word 2 Name] Word 3 Integer

Add an integer user defined attribute to the current measurement point.

.72 Add real user defined attribute to the current point

Word 1 .72 [Word 2 Name] Word 3 Real

Add a real (floating point) user defined attribute to the current measurement point.

.73 Add text user defined attribute to the current point

Word 1 .73 [Word 2 Name] Word 3 Text [Word 4 Text] ...

Add a text user defined attribute to the current measurement point.

.74 Add integer user defined attribute to the next segment

Word 1 .74 [Word 2 Name] Word 3 Integer

Add an integer user defined attribute to the next segment from the current measurement point.

.75 Add real user defined attribute to the next segment

Word 1 .75 [Word 2 Name] Word 3 Real

Add a real (floating point) user defined attribute to the next segment from the current measurement point.

.76 Add text user defined attribute to the next segment

Word 1 .76 [Word 2 Name] Word 3 Text [Word 4 Text] ...

Add a text user defined attribute to the next segment from the current measurement point.

.77 Add integer user defined attribute to the previous segment

Word 1 .77 [Word 2 Name] Word 3 Integer

Add an integer user defined attribute to the previous segment for the current measurement point.

.78 Add real user defined attribute for the previous segment

Word 1 .78 [Word 2 Name] Word 3 Real

Add a real (floating point) user defined attribute to the previous segment for the current measurement point.

.79 Add text user defined attribute to the previous segment

Word 1 .79 [Word 2 Name] Word 3 Text [Word 4 text] ...

Add a text user defined attribute to the previous segment for the current measurement point.

In addition, extra codes allow 12d Model pipe strings to be coded in the field.

.80 Pipe invert point (bottom of the pipe) - after the measurement

Word 1 .80 [Word 2 Feature_code] Word 3 String_number [Word 4 Point_number]

If only Word 1 *exists*, the current measurement point is on the invert (bottom) of a pipe. This is the default for measurements to points on pipe strings. If the point is not part of a pipe string, it is ignored.

If *Feature_code* and *String_number* exist, the last point of the previous string with the same *feature code* and *string number* is on the invert (bottom) of a pipe. If the point is not part of a pipe string, it is ignored.

If *Point_number* exists, then the point with that point number is on the invert (bottom) of a pipe. If the point is not part of a pipe string, it is ignored.

.81 Pipe axial point (centre of the pipe) - after the measurement

Word 1 .81 [Word 2 Feature_code] Word 3 String_number [Word 4 Point_number]

If only Word 1 *exists*, the current measurement point is on the axis (centre) of a pipe. If the point is not

part of a pipe string, it is ignored.

If *Feature_code* and *String_number* exist, the last point of the previous string with the same *feature code* and *string number* is on the axis (centre) of a pipe. If the point is not part of a pipe string, it is ignored.

If *Point_number* exists, then the point with that point number is on the axis (centre) of a pipe. If the point is not part of a pipe string, it is ignored.

.82 Pipe obvert point (top of the pipe) - after the measurement

Word 1 .82 [Word 2 *Feature_code* Word 3 *String_number*] [Word 4 *Point_number*]

If only Word 1 exists, the current measurement point is on the obvert (top) of a pipe. If the point is not part of a pipe string, it is ignored.

If *Feature_code* and *String_number* exist, the last point of the previous string with the same *feature code* and *string number* is on the obvert (top) of a pipe. If the point is not part of a pipe string, it is ignored.

If *Point_number* exists, then the point with that point number is on the obvert (top) of a pipe. If the point is not part of a pipe string, it is ignored.

.83 Start recording a shape - before the measurement

Word 1 .83 [Word 2 *Shape_name*]

Start recording a shape with the name *Shape_name*. If *Shape_name* is non-blank, then the default field Shape is defined by the *feature_code* and *string_number* of the following measurements until a *Finish* code (84) are stored as the shape. There is no limit to the number of points in a shape.

See the Section [Field Templates](#) for more information on field templates.

.84 Finish using a shape definition or finish recording a shape - after the measurement

Word 1 .84

Stops using the current shape or stops recording a shape.

.85 Shape parallel

Word 1 .85 Word 2 *Shape_name* [Word 3 *Feature_code* Word 4 *String_number*] [Word 5 *Point_number*]

If *Feature_code* and *String_number* exist, the last string with the same *feature code* and *string number* has the shape applied to the entire length of the string.

If *Point_number* exists, then the string containing that point number has the shape applied to the entire length of the string.

Parallelling the shape will produce separate strings for each point of the shape.

.86 Shape extrude

Word 1 .86

Word 1 .85 Word 2 *Shape_name* [Word 3 *Feature_code* Word 4 *String_number*] [Word 5 *Point_number*]

If *Feature_code* and *String_number* exist, the last string with the same *feature code* and *string number* has the shape applied to the entire length of the string.

If *Point_number* exists, then the string containing that point number has the shape applied to the entire length of the string.

Extruding the shape will produce a single string for the shape.

.92 Remove all z-values for a string (i.e. make all z-values null) - after the measurement

Word 1 .92 [Word 2 *Point_line_type*] [Word 3 *Feature_code* Word

4 *String_number*] [*Word 5 Point_number*]

If only *Word 1* exists, all z-values for the current string are removed.

If *Feature_code* and *String_number* exist, the last string with the same *feature code* and *string number* has all its z-values removed.

If *Point_number* exists, then the string containing that point number has all its z-values removed.

If *Point_line_type* is 0, the selected string is set to a point string.

If *Point_line_type* is 1, the selected string is set to a *line* string.

.93 Set the Point-line type - after the measurement

Word 1 .93 [*Word 2 Point_line_type*] [*Word 3 Feature_code Word 4 String_number*] [*Word 5 Point_number*]

If only *Word 1* exists, the current string is created as a point string.

If *Feature_code* and *String_number* exist, the last previous string with the same *feature code* and *string number* has its point-line type modified.

If the *point number* exists, then the string containing that point number has its point-line type modified.

If *Point_line_type* is 0, the selected string is set to a point string.

If *Point_line_type* is 1, the selected string is set to a *line* string.

.94 Use name library/mapping file for vertex text on the string - name mapping - after the measurement

Word 1 .94 [*Word 2 Point_line_type*] [*Word 3 Feature_code Word 4 String_number*] [*Word 5 Point_number*]

If this field code exists then during reduction, vertex text is creating using either the name library, or if the name library doesn't exist, the map file. If neither exist then the field code is ignored.

if a name library is used and the feature code of the string is found in the first column of the name library, then the entry from the second column of that row will be used as text for *all* vertices of the string that don't already have vertex text. As a default, the string is set as a point string.

if the map file is used and the feature code of the string is found in the first column of the map file, then the *string name* field of the map file is used as vertex text for all vertices that don't already have text. As a default, the string is set as a point string.

If only *Word 1* exists, then name mapping is applied to the current string.

If *Feature_code* and *String_number* exist, then name mapping is applied to the last previous string with the same *feature code* and *string number*.

If *Point_number* exists, then name mapping is applied to the string containing that point number.

If *Point_line_type* is 0, the selected string is set to a point string.

If *Point_line_type* is 1, the selected string is set to a *line* string.

.95 Circular Pipe string - after the measurement

Word 1 .95 Word 2 Diameter [*Word 3 Feature_code Word 4 String_number*] [*Word 5 Point_number*]

Pipe strings are always line strings and are stored with the justification of the majority of the string points. Individual pipe points are picked up either top (obvert), centre (axial) or bottom (invert) of the pipe using field codes 80, 81 and 82.

If only *Word 1* and *2* exists, the current string is created as a pipe string with the given diameter.

If *Feature_code* and *String_number* exist, the last string with the same *feature code* and *string number* is created as a pipe with the given diameter.

If *Point_number* exists, then the string containing that point number is created as a pipe string with the given diameter.

.96 Box Culvert string - after the measurement

Word 1 .95 Word 2 Width Word 3 Height [Word 4 Feature_code Word 5 String_number] [Word 6 Point_number]

Culvert strings are always line strings and are stored with the justification of the majority of the string points. Individual culvert points are picked up either top (obvert), centre (axial) or bottom (invert) of the culvert using field codes 80, 81 and 82.

If only Word 1, 2 and 3 *exists*, the current string is created as a culvert string with the given width and height.

If *Feature_code* and *String_number* exist, the last string with the same *feature code* and *string number* is created as a culvert with the given width and height.

If *Point_number* exists, then the string containing that point number is created as a culvert string with the given width and height.

.99 Terminate processing

Word 1 .99

Stop processing the field file at this line. Useful for debugging errors.

.107 Make the previous segment invisible - after the measurement

Word 1 .107 [Word 2 Feature_code Word 3 String_number] [Word 4 Point_number]

If only Word 1 exists, the previous segment containing the current measurement point is set to invisible.

If the *Feature_code* and *String_number* exist, then the last segment of the previous string with that *feature code* and *string number* is set to invisible.

If *Point_number* exists, then the segment containing the point with that point number as an end point, is set to invisible.

.108 Make the next segment invisible - after the measurement for the first point of the segment

Word 1 .108 [Word 2 Feature_code Word 3 String_number] [Word 4 Point_number]

If only Word 1 exists, the next segment containing the current measurement point as a starting point is set to invisible.

If the *Feature_code* and *String_number* exist, then the segment that is created in the future from the last point of the previous string with that *feature code* and *string number* is set to invisible.

If *Point_number* exists, then the segment containing the point with that point number as a start point, is set to invisible.

.109 Make a point invisible - after the measurement

Word 1 .109 [Word 2 Feature_code Word 3 String_number] [Word 4 Point_number]

If only Word 1 exists, the current measurement point is set to invisible.

If *Feature_code* and *String_number* exist, then the last point of the previous string with that *feature code* and *string number* is set to invisible.

If *Point_number* exists, then the point with that point number is set to invisible.

.110 Start buildings face observations - before the measurements

Word 1 .110 Word 2 [Building_name]

Start recording a field template with the name *Building_name*. If *Building_name* is non-blank, then the default building face is defined. The *feature code* and *string number* of the following measurements until a *Finish* code (111) are stored as the building face. There is no limit to the number of points in a building face.

.111 End building face observations

Word 1 .111 *Word 2* [*Building_name*]

If only Word 1 *exists*, the current building face observation set is finished (including the current measurement point).

Notes

1. Arc fitting is applied *after* the Joins are processed. Hence the new joined strings are created and then curve fitting is applied according to the arc codes (start arc, end arc, fit arcs, stop fitting arcs etc.) on any vertex of the string.

For a summary of the Leica Field Codes, go to the section [Summary of Leica Field Codes](#)

Summary of Leica Field Codes

Most of the field codes are entered after the measurement is taken and they will have a (AM) after the description. Some of the field codes are entered before the measurement is taken (mainly set up codes) and will have a (BM) after the description.

Field Code Description of Record

- .2 Directly entered coordinate measurement
- .3 New instrument setup point (BM)
- .4 Measurement to backsight (BM)
- .5 New target height (BM)
- .6 Check measurement (BM)
- .9 Scale factor for subsequent distances (BM)
- .10 Three hair stadia measurement
- .11 Measurement to a named station (BM)
- .15 Vertical circle correction (BM)
- .14 A field code for entering Feature code and String number - BM or AM depends on data collector definition
- .16 Multiply coded point (AM)
- .17 Arc through previous three points (AM of last point of arc)
- .18 Circle Feature (AM)
- .20 Close string (AM)
- .21 Join last points of strings
- .22 Join first to last point of strings
- .23 Join first points of strings
- .28 Add text to the string name (AM)
- .29 Note or memo (AM)
- .30 Remove height from a point - that is make it a null height (AM)
- .37 Rectangle by two points
- .38 Make the previous segment non-tinable (AM of end point of segment)
- .39 Make the next segment non-tinable (AM of first point of segment)
- .40 Make a point non-tinable (AM)
- .41 Add additional text (AM)
- .42 Add a radial offset (AM)
- .43 Add a tangential offset (AM)
- .44 Add a height offset (AM)
- .45 Make a parallelogram from the last three measurement points (AM)
- .46 Make the string a breakline or not
- .47 Start a new string using the same feature code and string number (AM of first point of new string).
- .48 End a string -
- .50 Specify the bearing to correct for true north - used as the bearing datum difference
- .51 Start using an existing field template (BM)
- .52 Finish using a field template or finish recording a field template (AM)
- .53 Pause the current field template until a continue op code (54) or a finish template (52)
- .54 Continue the current field template (BM)
- .55 Start recording a field template (BM)
- .56 Skip picking up one or more points from a field template (AM of last point before skipping)
- .57 Delete one or more points from a field template (AM)
- .58 Insert a point into a field template (BM)
- .60 Arc through next three points (AM of first point of arc)
- .61 Start of arc through sets of three points until end of string, or a 62 occurs (AM of first point of arc)
- .62 End the arcs begun by a 61 command (AM of last point of arcs)
- .68 Add an integer user defined attribute to the current string (AM of any point of the string)
- .69 Add a real user defined attribute to the current string (AM of any point of the string)
- .70 Add text user defined attribute to the current string (AM of any point of the string)
- .71 Add integer user defined attribute to the current point (AM)
- .72 Add real user defined attribute to the current point (AM)
- .73 Add text user defined attribute to the current point (AM)

- .74 Add integer user defined attribute to the next segment (AM of first point of the segment)
- .75 Add real user defined attribute to the next segment (AM of first point of the segment)
- .76 Add text user defined attribute to the next segment (AM of first point of the segment)
- .77 Add integer user defined attribute to the previous segment (AM of last point of the segment)
- .78 Add real user defined attribute for the previous segment (AM of last point of the segment)
- .79 Add text user defined attribute to the previous segment (AM of last point of the segment)
- .80 Pipe invert point (bottom of the pipe) (AM)
- .81 Pipe axial point (centre of the pipe) (AM)
- .82 Pipe obvert point (top of the pipe) (AM)
- .83 Start recording a shape - before the measurement
- .84 Finish using a shape definition or finish recording a shape - after the measurement
- .85 Shape parallel
- .86 Shape extrude
- .92 Remove all z-values for a string (i.e. make all z-values null) (AM of point of the string)
- .93 Set the Point-line type
- .94 Use name library file/ mapping file for vertex text on the string - name mapping
- .95 Circular pipe string with diameter (AM)
- .96 Box culvert string with dimensions (AM)
- .99 Terminate processing
- .107 Make the previous segment invisible - after the measurement
- .108 Make the next segment invisible - after the measurement for the first
point of the segment
- .109 Make a point invisible - after the measurement
- .110 Start buildings face observations - before the measurements
- .111 End building face observations

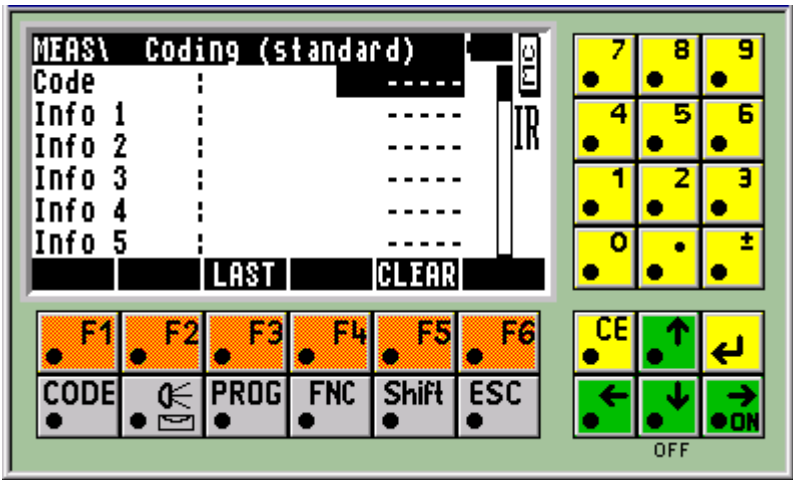
For a full description of the Leica codes, please go to the section [Full Description of Leica Field Codes](#).

For an example of a raw Leica file, please go to the section [Example of Leica GSI File](#).

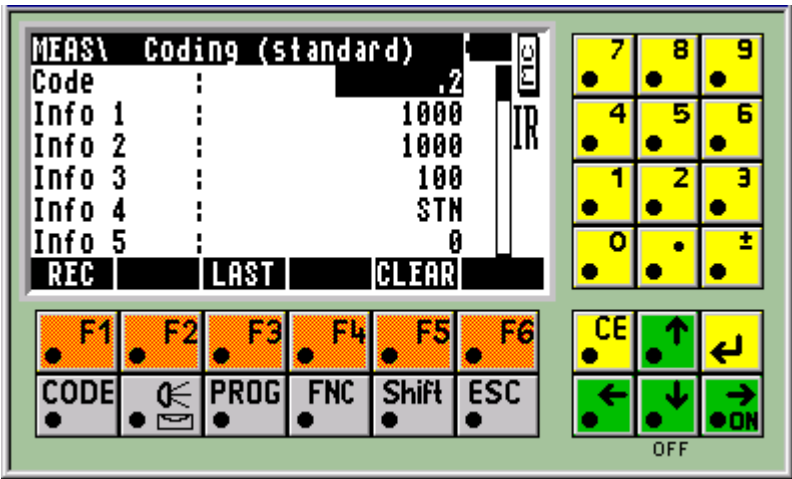
Examples of Leica Screens

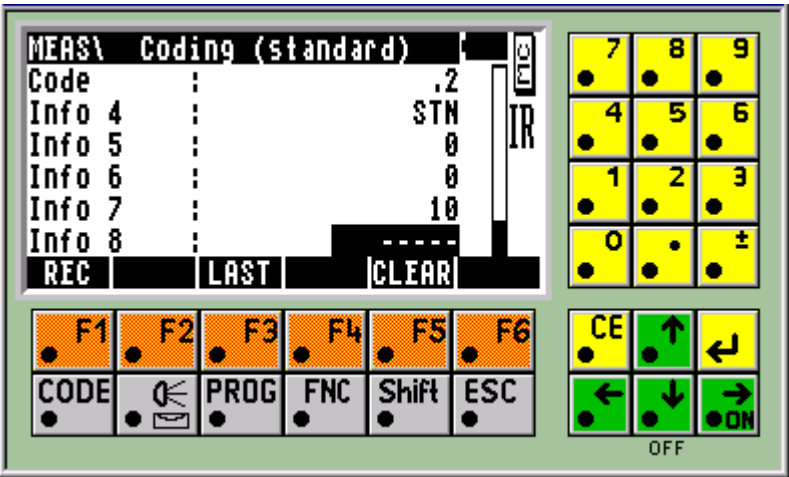
Standard Screen

When using a Leica instrument with no code.hex on the 1000 series, or Geobasic program or Codelist (.crf file) on the 1100 series, hitting the *Code* button brings up the standard Leica screen:

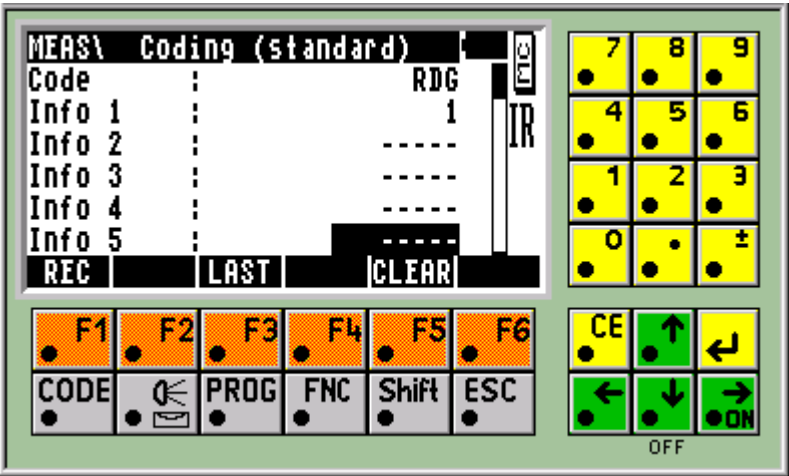


The information entered in *Code* goes to Word 1 of the line written to the Leica GSI file.
The information in *Info 1* to *Info 8* go to Word 2 to Word 9 respectively of the line written to the GSI file.
As an example, to enter a *directly entered co-ordinate* (the 2 field code),
".2" is entered in the *Code* field
X, Y and Z in *Info 1*, *Info 2* and *Info 3* respectively.
the feature code (STN) is entered into *Info 4*
the station name "10" is entered into *Info 7*





To enter a *feature code* and *string number* to be used for measurements
the feature code is entered into the *Code* field
the string number is entered into *Info 1*.



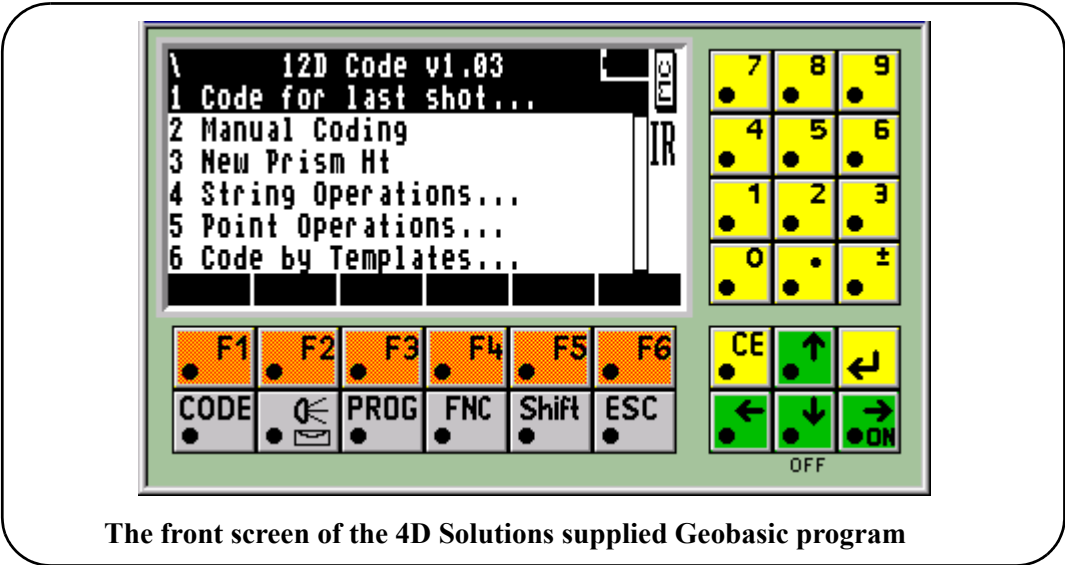
Leica Geobasic Program

A Leica Geobasic program gives the programmer full control over the Leica screen.

WARNING

Only one Geobasic program can exist on the Leica at any one time. Loading a Geobasic program will over write the existing Geobasic program on the instrument. Make sure you have a backup copy of the existing Geobasic program on your computer before loading a new one onto the instrument.

If you do not have a backup copy of the existing Geobasic program, do not load a new one.



The front screen of the 4D Solutions supplied Geobasic program

Leica Codelist

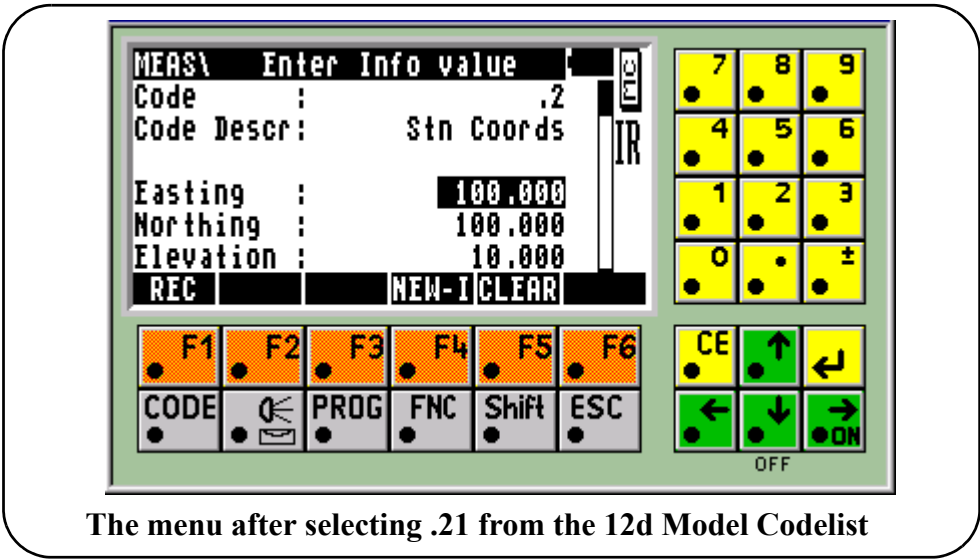
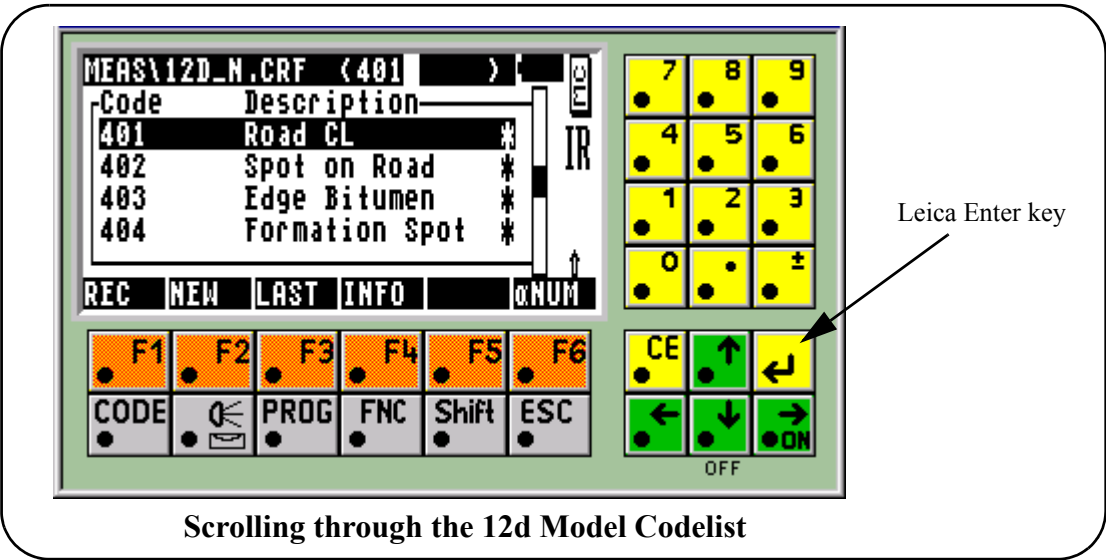
A Leica Codelist (.crf file) controls what is displayed and validated on the Leica screen and what values are recorded whenever the *Code* button is selected. For example, when using the 4D Solutions supplied Codelists , a list of defined feature codes and descriptions are displayed.

The Codelist controls what codes are displayed and whenever a code is selected, what information is required for that code. The Codelist also specifies what information is written out to the GSI file for that code.

After hitting the *Code* button, the list of codes from the Codelist is displayed in alphanumeric order. Because the 12d Model field codes start with a ".", they will appear at the top of the list.

A code can be typed in or the list can be scrolled through using the arrow keys.

The highlighted code is selected by pressing the Leica Enter Key. The menu for the selected code then appears. The line of data is written out to the GSI file when the F1 (REC) button is selected.



Setup of Leica 1100 instrument for detail pickup and use with 12d

The following relates to the setup of a Leica 1100 series instrument for topographic/detail pickup and use with 12d.

Setting up the Instrument

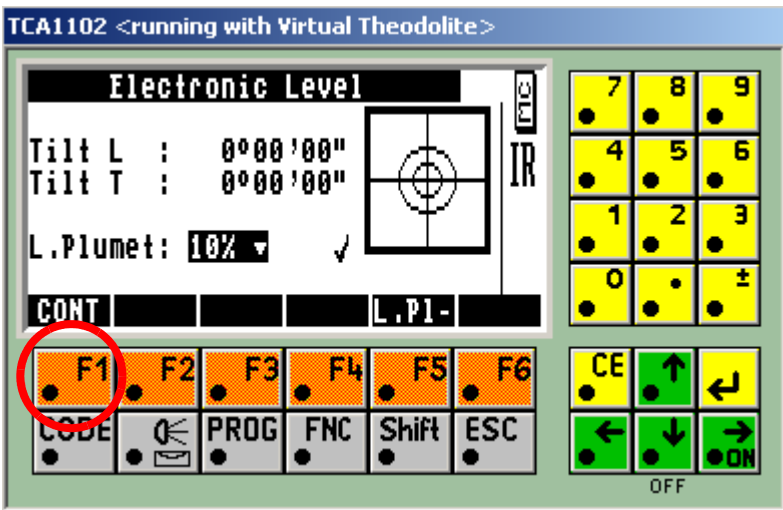
Copying the CRF file

A number of example .crf files are include on the installation CD. These can be found in the directory Other_Software\Leica\ . For the purpose of this documentation, we will use the file **12D_DS.CRF** which is designed for detail pickup. This file should be copied from the 12d CD to the folder “Code” on the Leica card.

This file contains all of the field codes used in 12d model along with a sample code listing

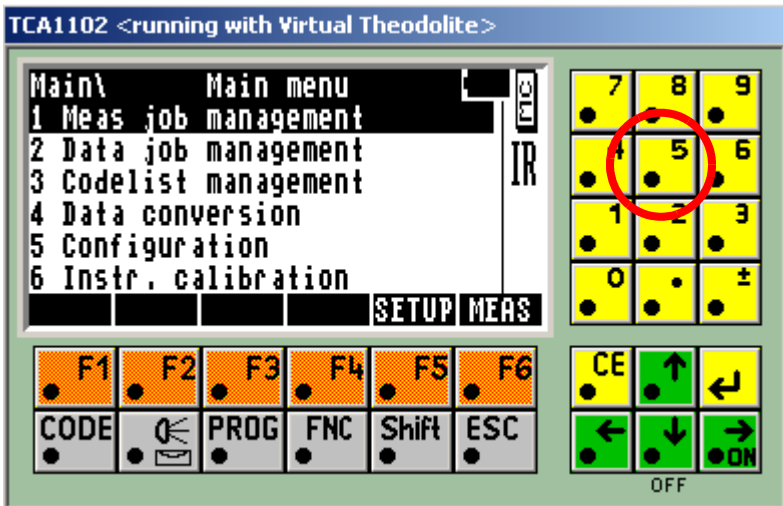
Set up the display and record masks

Turn on and level instrument

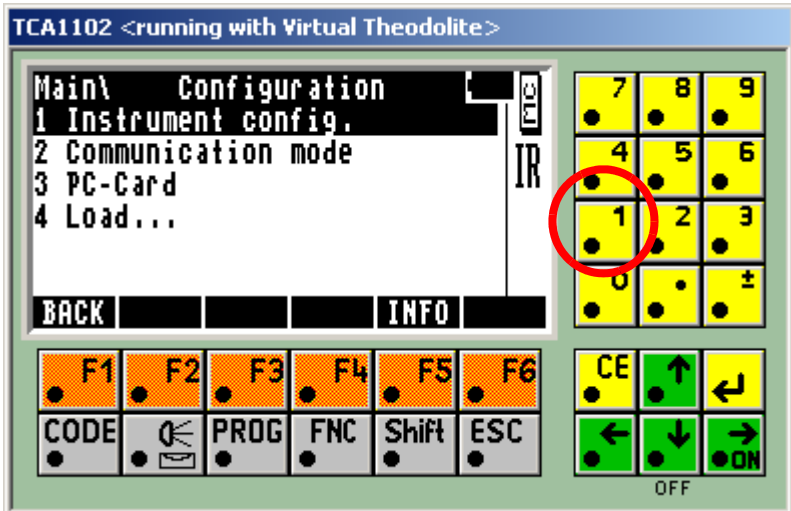


Press F1 to Continue

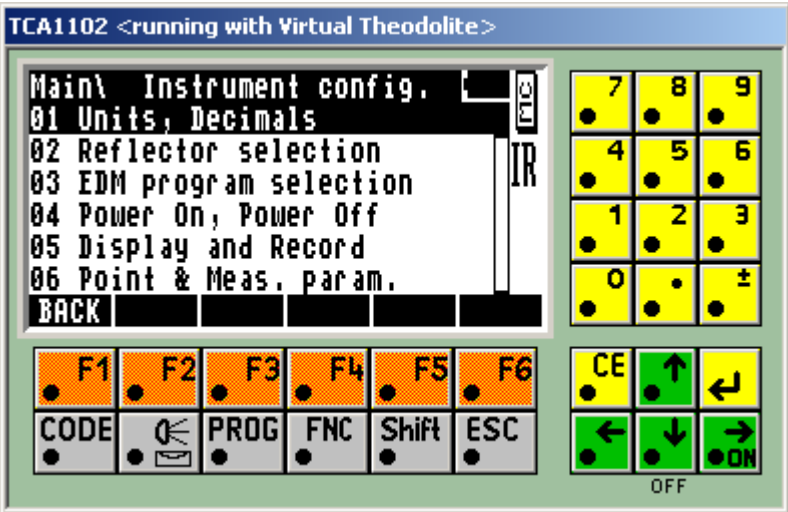
Press 5 to configure the instrument



Press 1 for instrument configuration

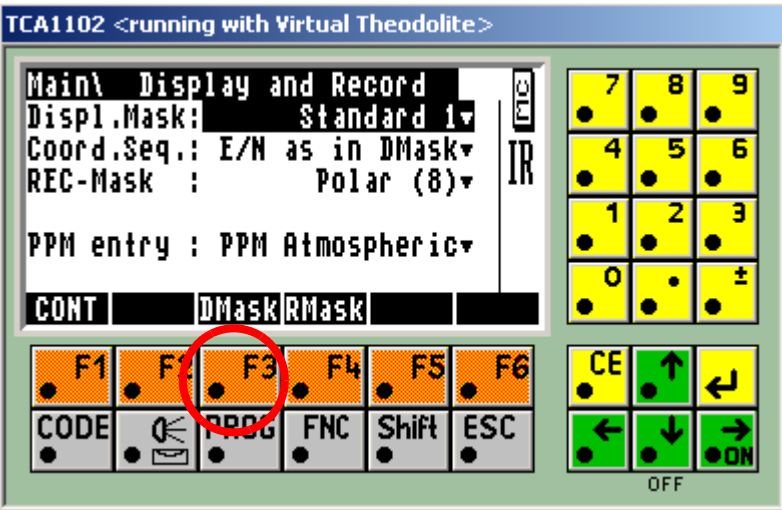


Press 05 for Display and Record mask setup

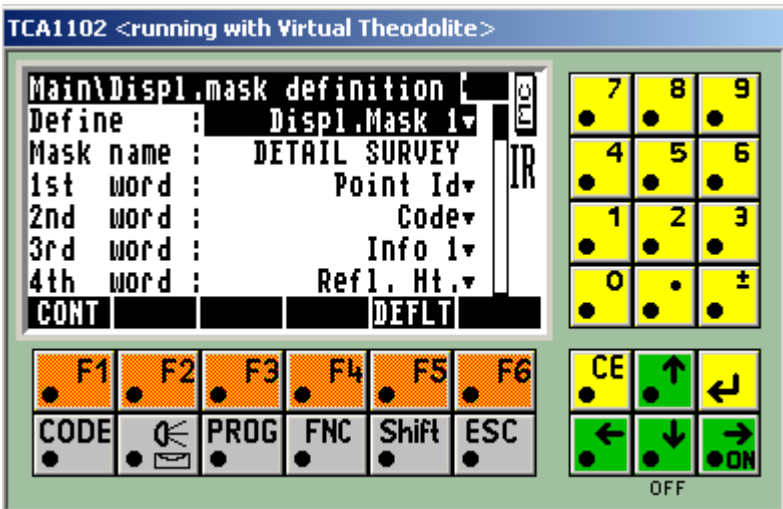


Display mask:

Press F3 to set up display mask

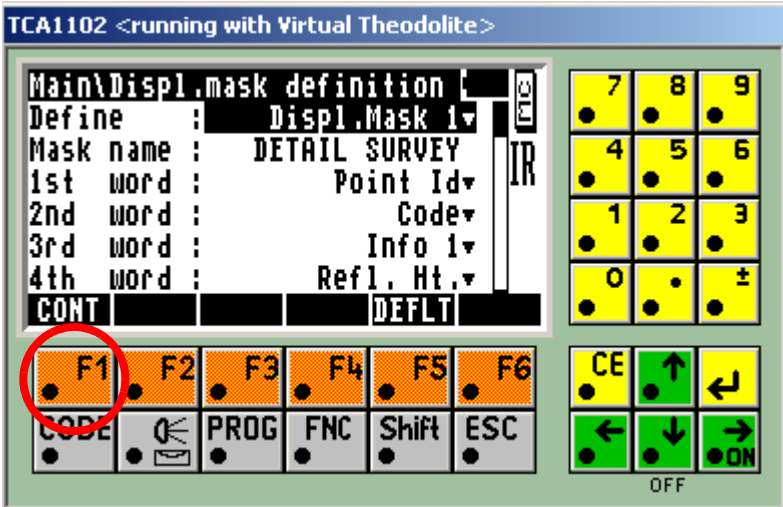


Type in the description DETAIL SURVEY for the Mask name



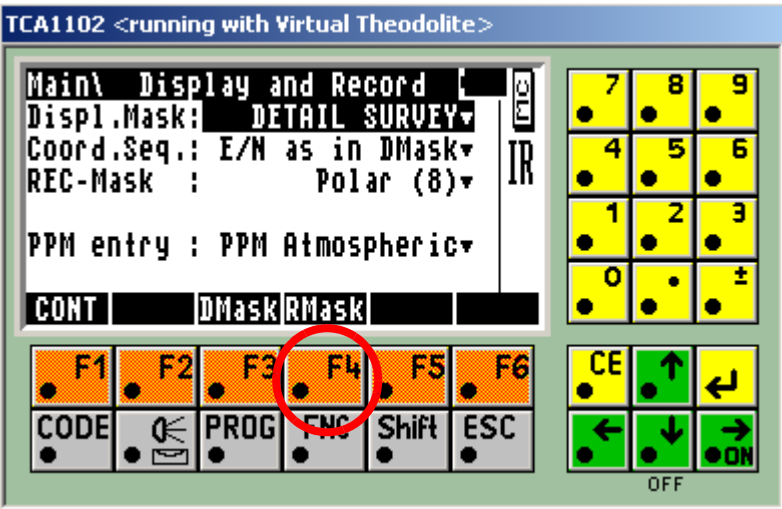
Select the following settings:

- 1st Word.....Point Id
 - 2nd Word.....Code
 - 3rd Word.....Info 1
 - 4th Word.....Ref1. Ht.
 - 5th Word.....Hz
 - 6th Word.....Horiz. Dist
 - 7th Word.....East
 - 8th Word.....North
 - 9th Word.....Elev
- Press F1

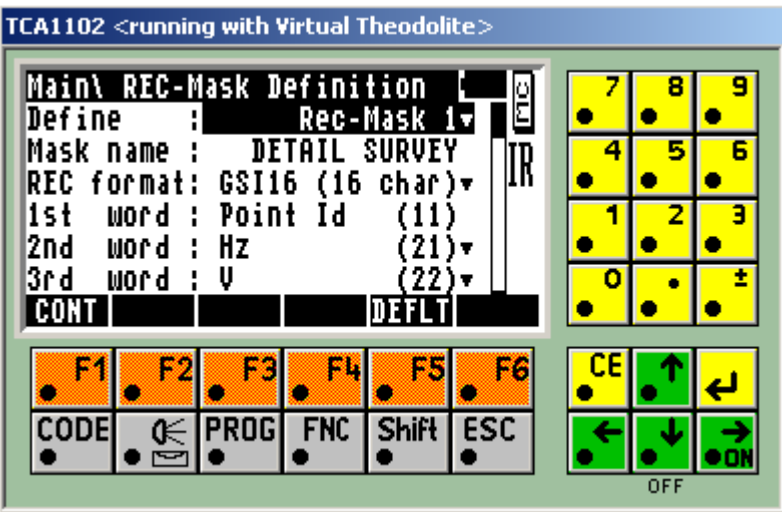


Record mask:

Press F4 to set up record mask



Type in the description DETAIL SURVEY for the Mask name

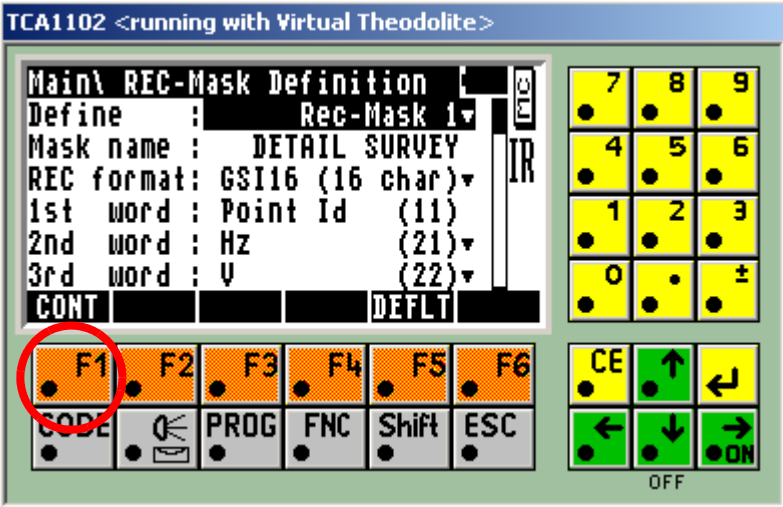


Select the following settings:

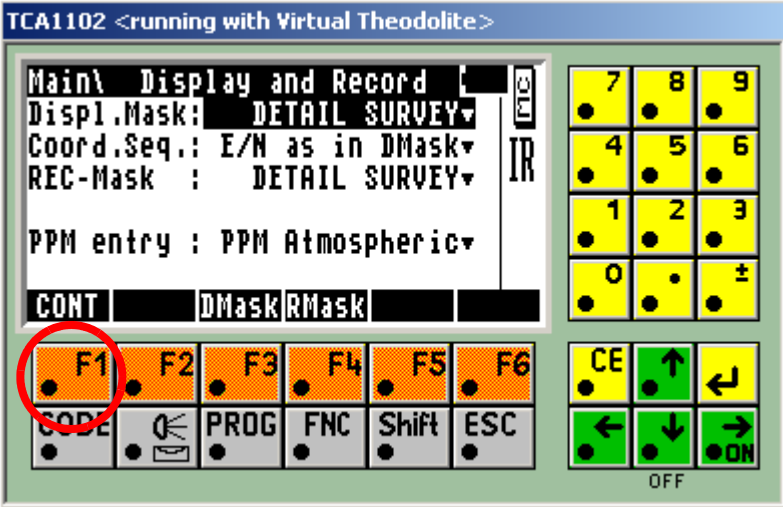
- REC format....GSI16 (16 char)
- 1st Word.....Point Id (11)
- 2nd Word.....Hz (21)
- 3rd Word.....V (22)
- 4th Word.....Slope Dist (31)
- 5th Word.....Ref. Ht. (87)
- 6th Word.....East (81)
- 7th Word.....North (82)

8th Word.....Elev (83)

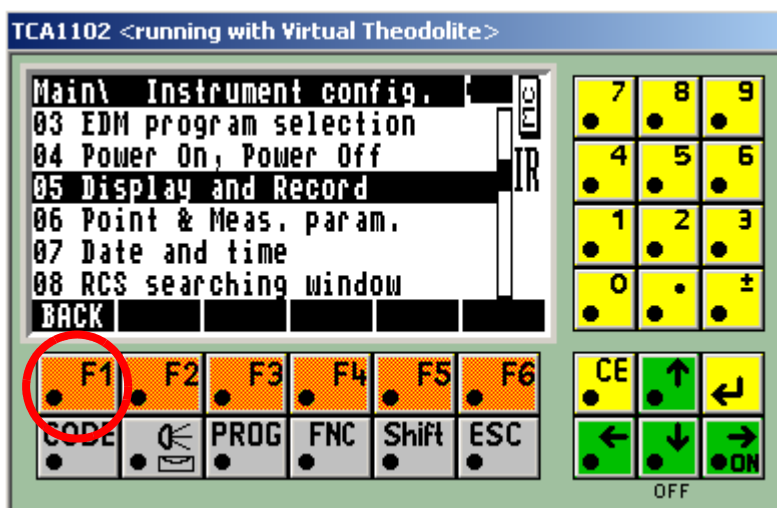
Press F1



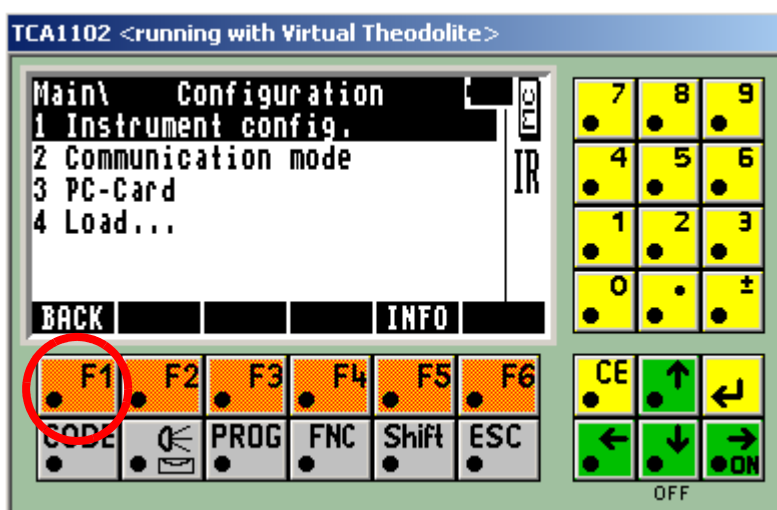
Press F1



Press F1 to exit menu



Press F1 to exit menu



Leica field codes

It is important to know when the code is entered into the instrument as some codes should precede a reading (BM) and some come after (AM). In this manual if a code is related to the current string then it is placed before the reading.

Below is a list of the commonly used codes to be used

- | | |
|----|------------------------------|
| .2 | Directly entered coordinates |
| .3 | New instrument station |
| .4 | Backsight reading (BM) |
| .5 | Height of target (BM) |
| .6 | Check measurement (BM) |

.9	Scale factor (BM)
.11	Foresight station (BM)
.14	Feature code and string number (Use for Leica quick codes only)
.15	Vertical circle correction (d.dddd) (BM)
.16	Additional code for point (AM)
.17	Arc thru last 3 points (AM)
.18	Circle (AM)
.20	Close string (AM)
.29	Note (AM)
.30	Remove height from point (AM)
.37	Rectangle by two points (AM)
.38	Make last segment non tinable (AM)
.39	Make next segment non tinable (AM)
.40	Make point non tinable (AM)
.42	Add radial offset (AM)
.43	Add tangential offset (AM)
.44	Add height offset (AM)
.45	Create parallelogram from last three points (AM)
.47	Start new string with same code and string no. as previous string (AM)
.48	End string (AM)....Not generally used

Templates

.51	Start template readings (BM)
.52	Finish template readings (AM)
.53	Pause template (AM)
.54	Continue a template (BM)
.55	Start recording template (BM)
.56	Skip points on template (BM)

Arcs

.60	Arc thru next 3 points (AM).....See also .17
.61	Arc through sets of 3 points until .62 code entered (BM)
.62	End of arc from .61 (AM)

Pipes

.80	Reading taken to invert level of pipe (AM)
.81	Reading taken to centre of pipe (AM)
.82	Reading taken to obvert level of pipe (AM)
.95	Circular pipe diameter (AM)
.96	Box culvert dimensions (AM)

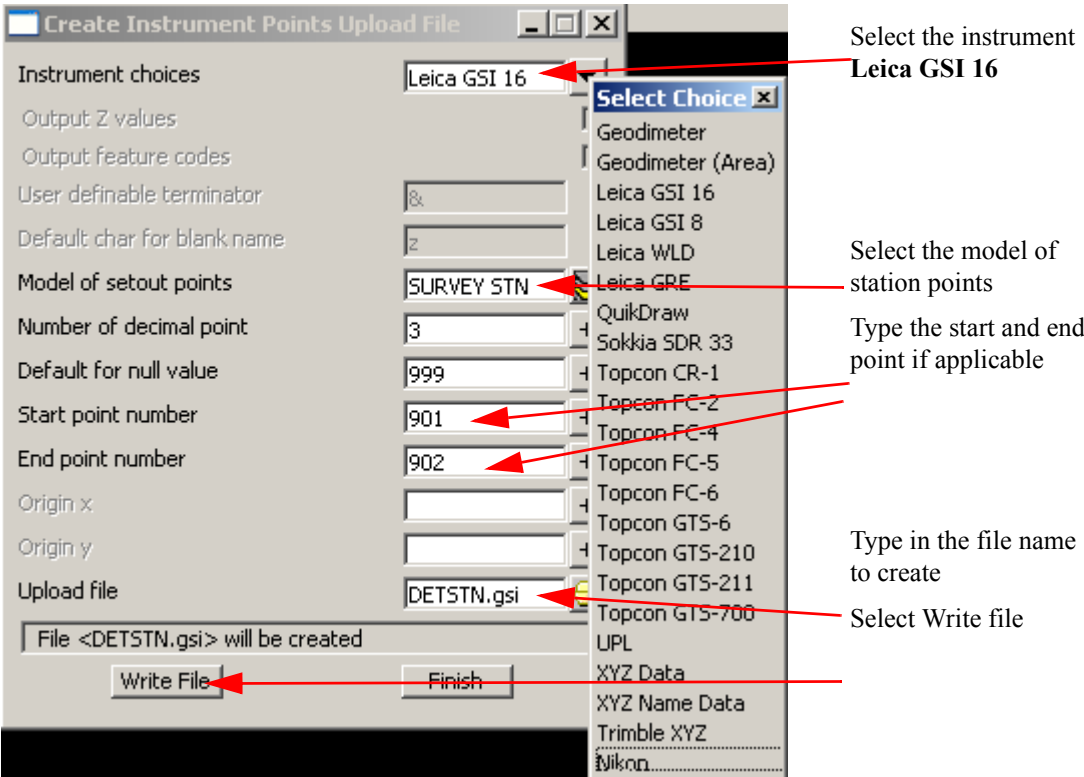
- .92 Remove heights from string (AM)
- .107 Make previous segment invisible (AM)
- .108 Make next segment invisible (AM)

Setting up files

The existing station coordinates for a pickup can be entered into the Leica by hand or they can be uploaded using 12d. The 12d upload sequence will be described here.

Uploading coordinate file

Select option Survey=>Upload=>Create points upload file

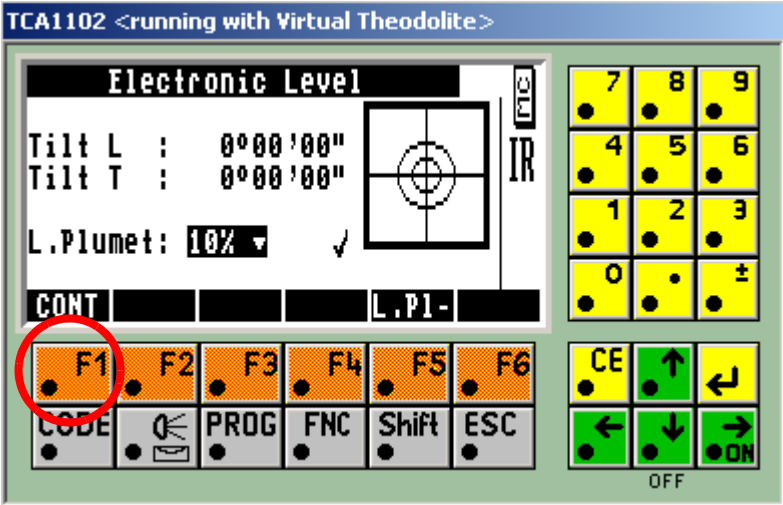


Copy the upload file

The file upload file should be copied to the folder “GSI” on the Leica card

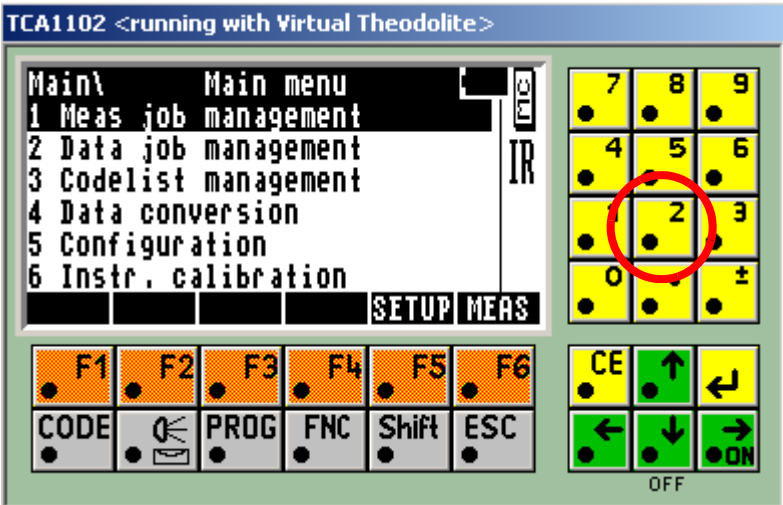
Data file setup

Turn on and level instrument



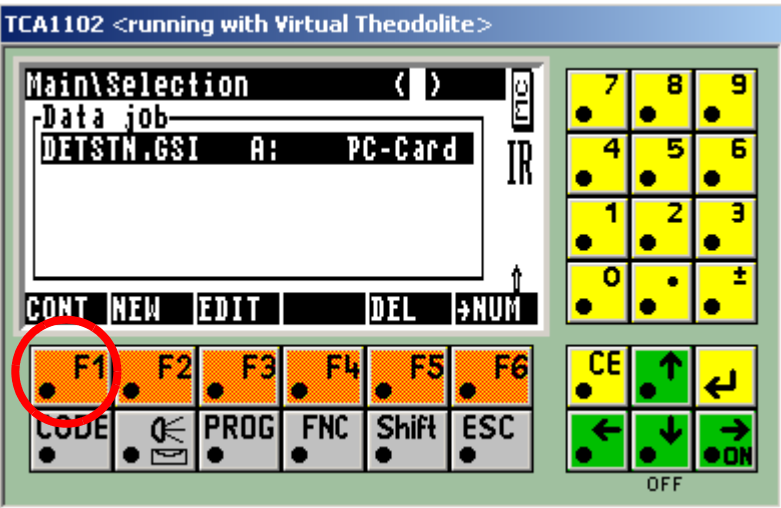
Press F1 to Continue

Press 2 to select Data job file.



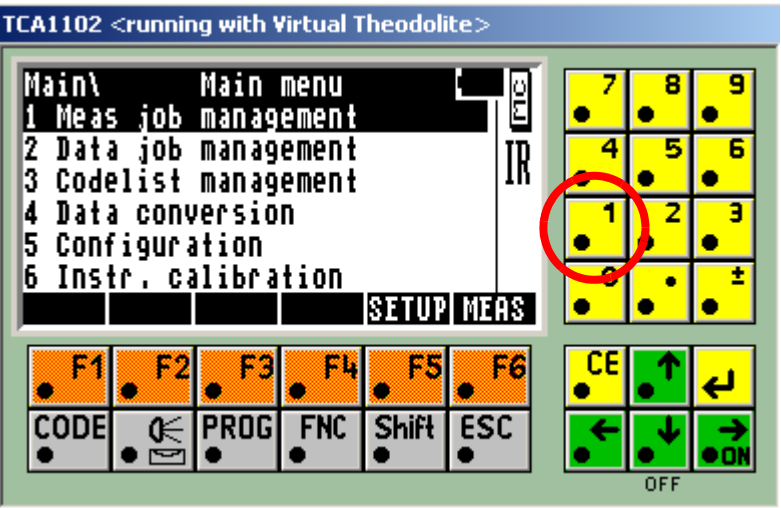
This is the file containing the control points if uploaded or if entered during the survey. Keep the file name separate from the measured data file name

Select the file to use followed by the F1 key or press F2 to create a new file



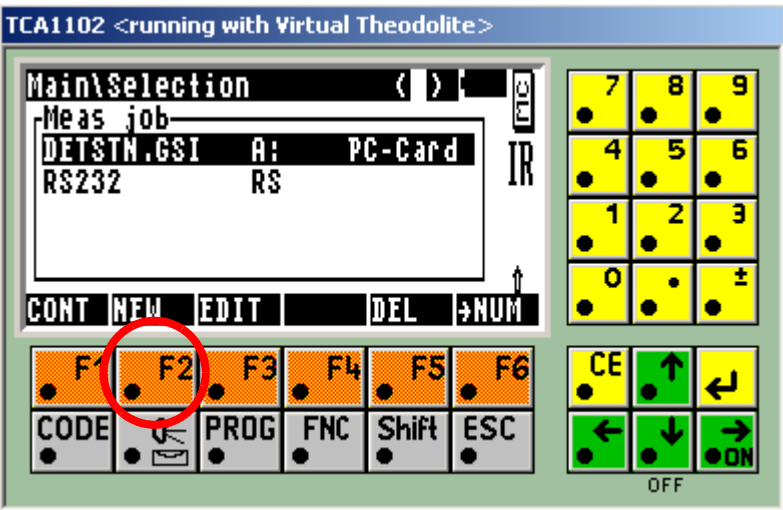
Press F1 to continue

Measured file setup

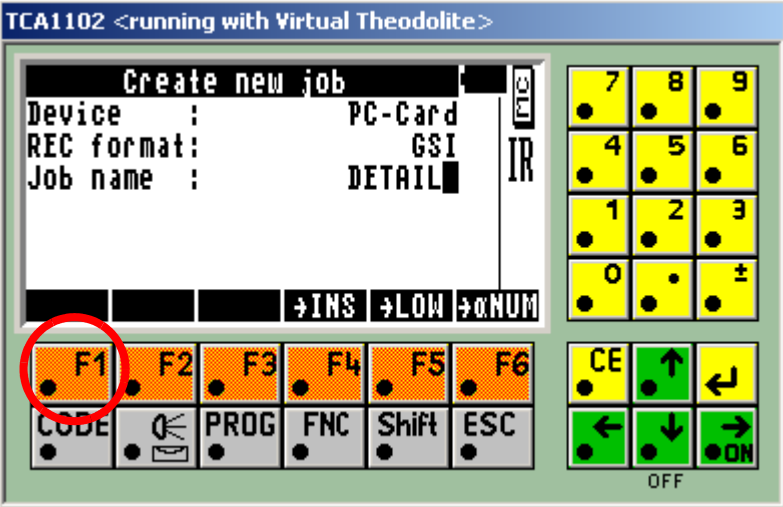


Select 1 to set up Measured job file. This is the file that will contain the detail survey readings

Select F2 to create new file

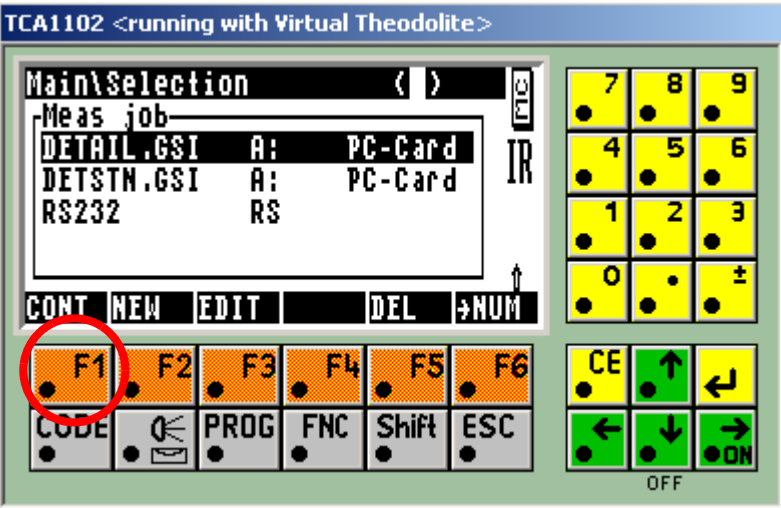


Type in new job name



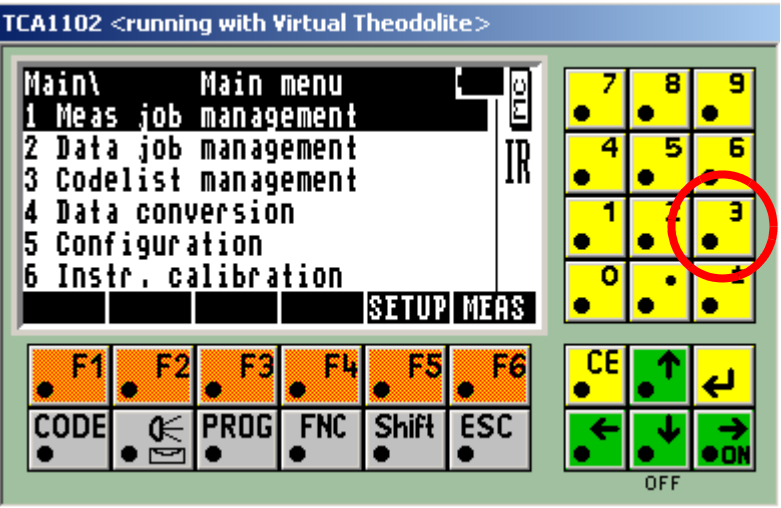
Press F1 to continue

Press F1 to continue

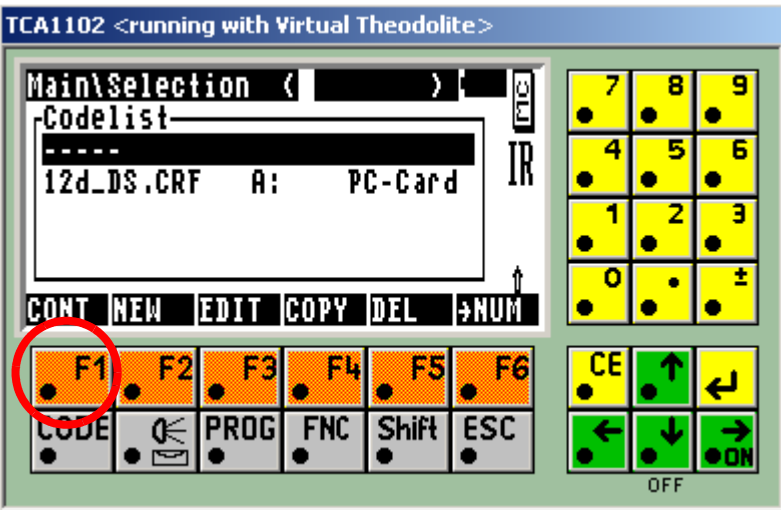


Code list selection

Press 3 to select code list



Select the code list 12D_DS.CRF



Press F1 to continue

Station setup

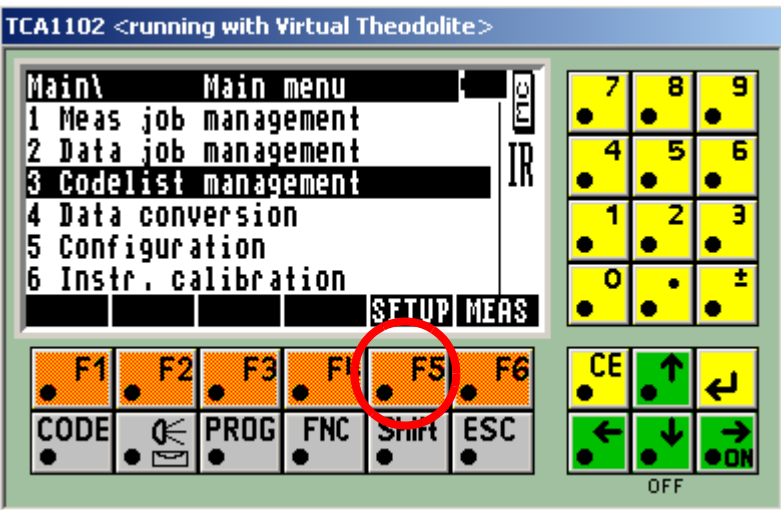
We can use Quick set (See the section [Setup using Quick set \(QSET\)](#)) for the station setup or manually select the Station

The following notes assume that the data file contains station coordinates

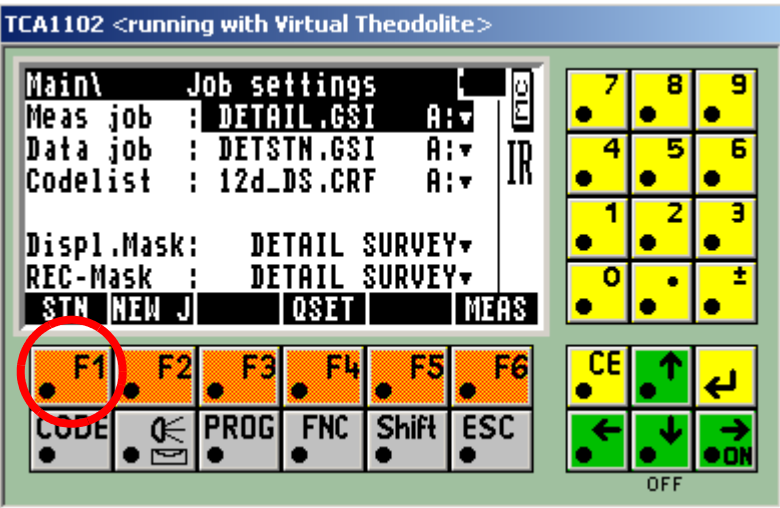
If not the user will have to follow prompts to insert the coordinates

Manual setup

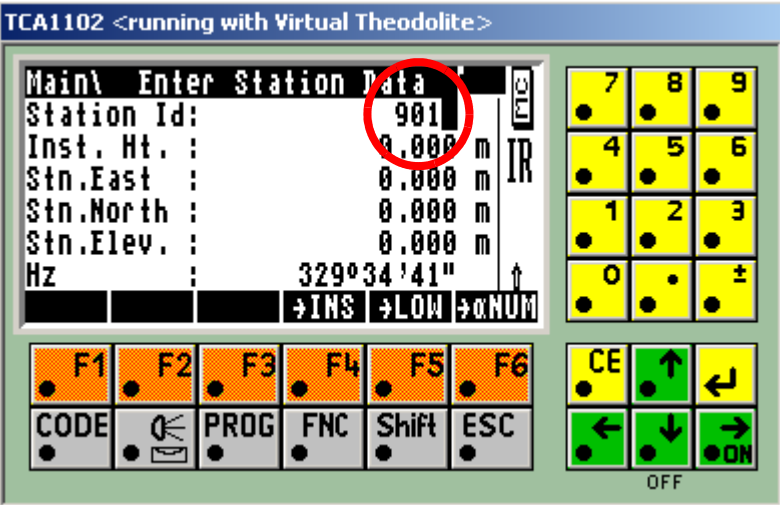
Press F5 for set up



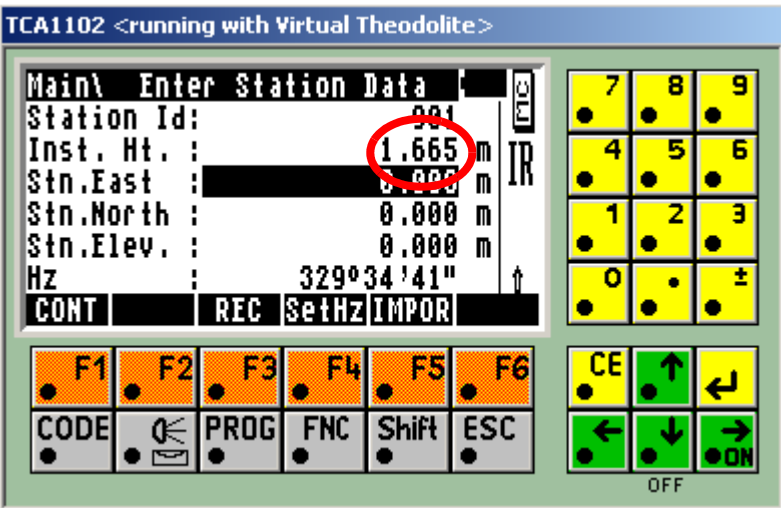
Press F1 to select station



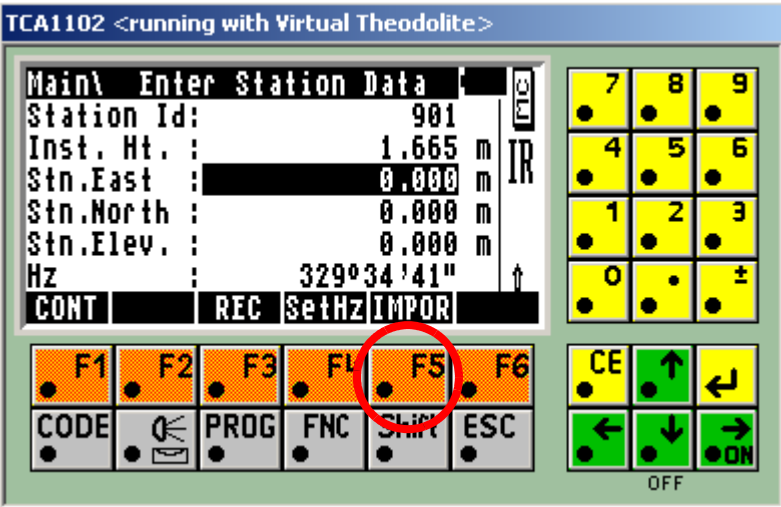
Type in setup station number



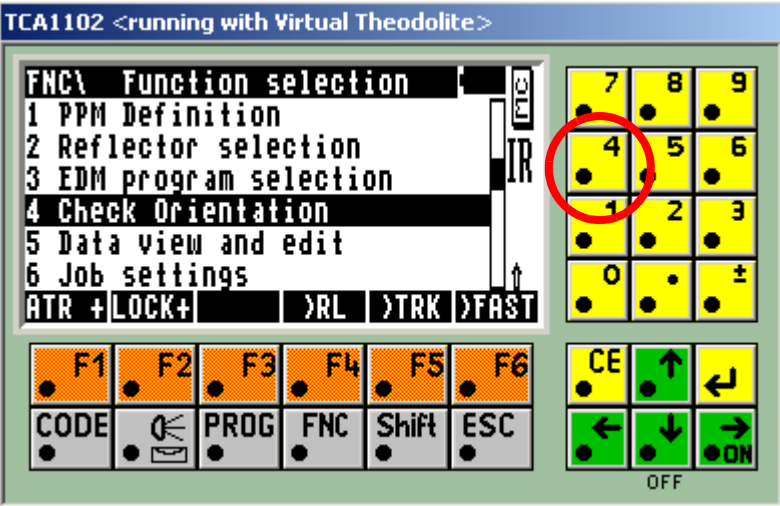
Type in the instrument height



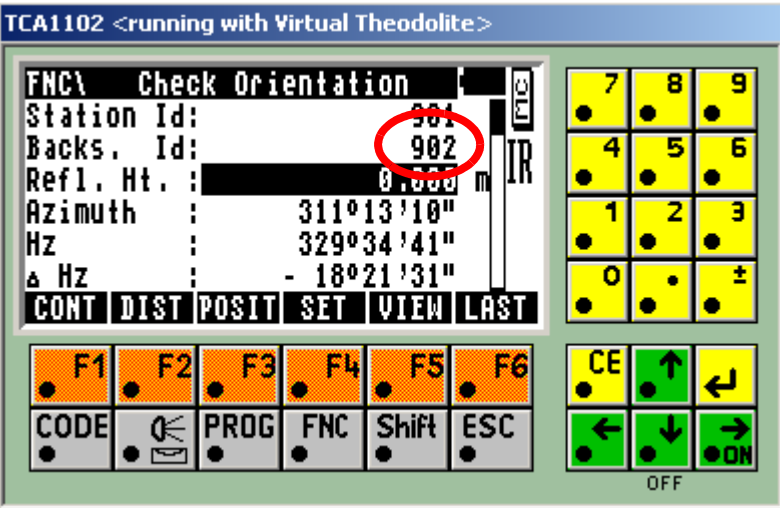
Press F5 to read the coordinates from the data file



To view the bearing between the setup station and backsight station select FNC
Press 4 to check orientation

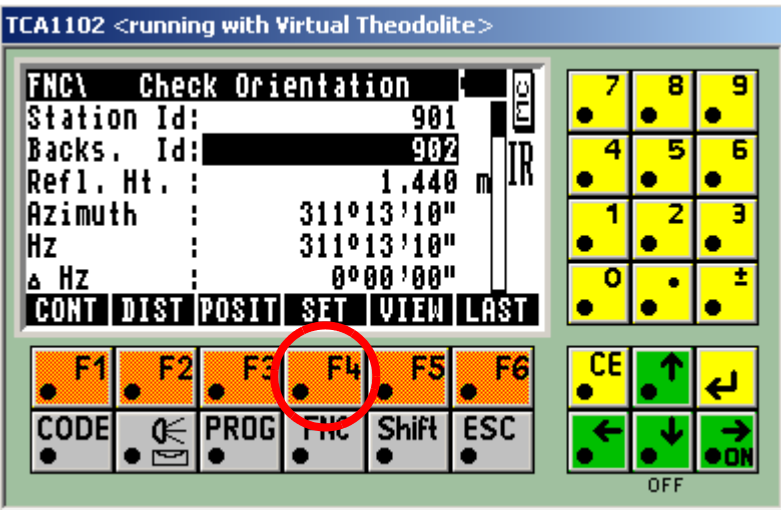


Type in the backsight station number

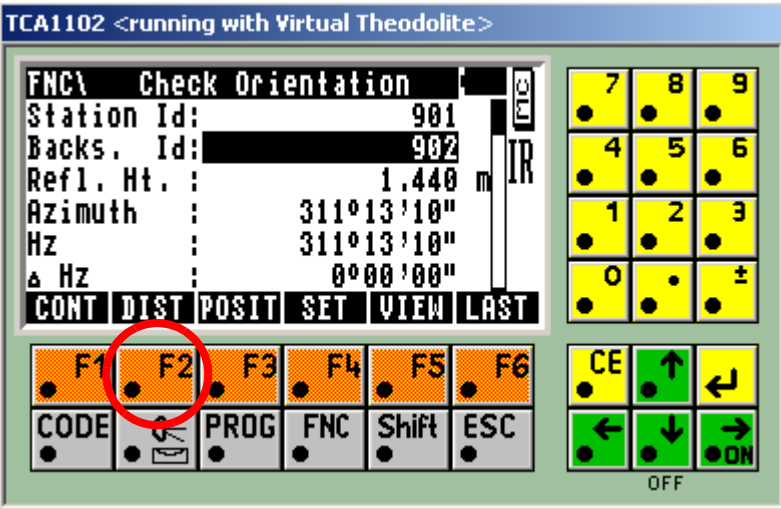


The Azimuth is displayed
Type in the reflector height of the backsight

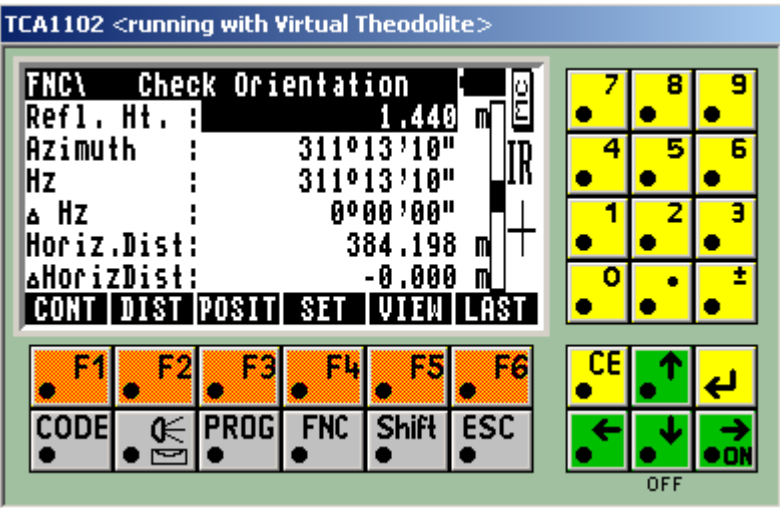
Sight to the backsight station and press F4 to set the bearing



The Bearing is set. Notice that the Azimuth and HZ values are set to the same value.
Press F2 to take a distance to the backsight station

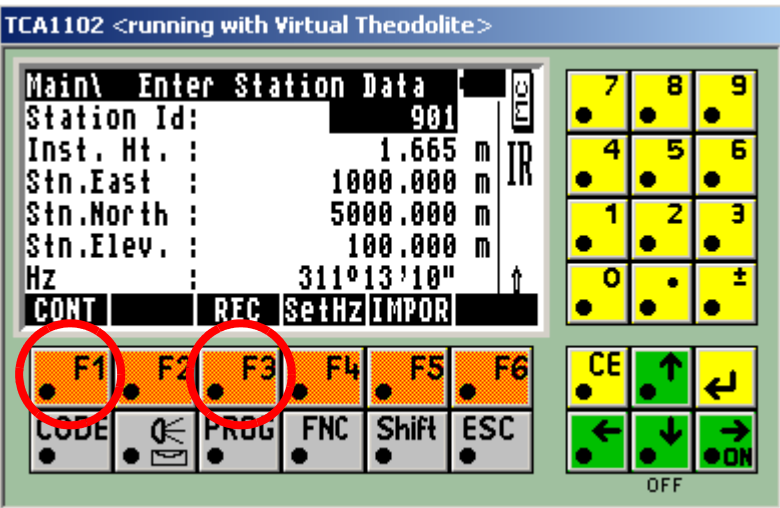


Arrow down to view the distance error



If acceptable press F1 to continue

To save the station information press F3 then F1 to continue

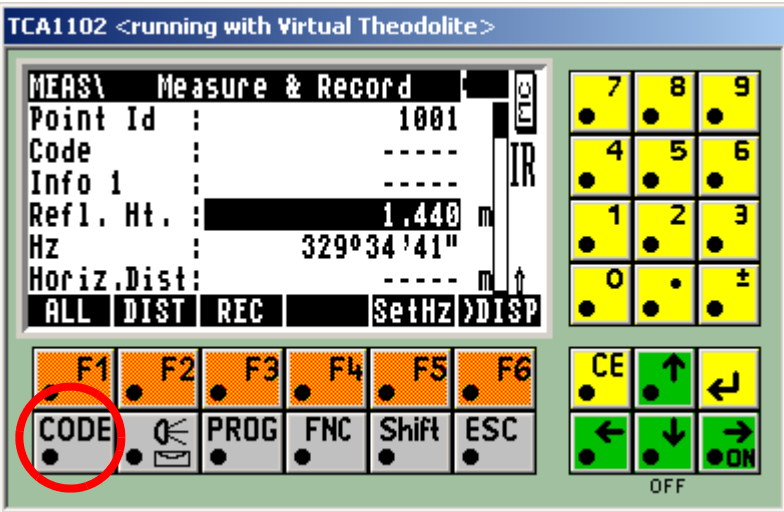


Take Backsight reading:

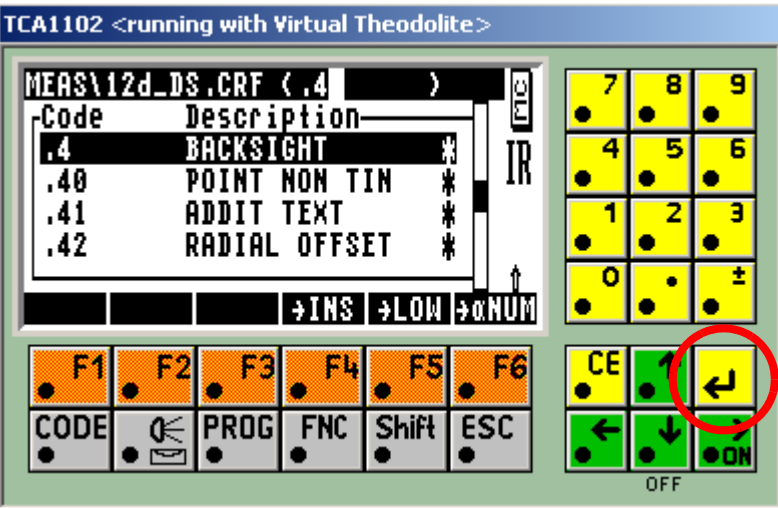
Type in the start point number of the survey

Type in the reflector height. This can also be done as part of the backsight measurement as shown below.

Select CODE

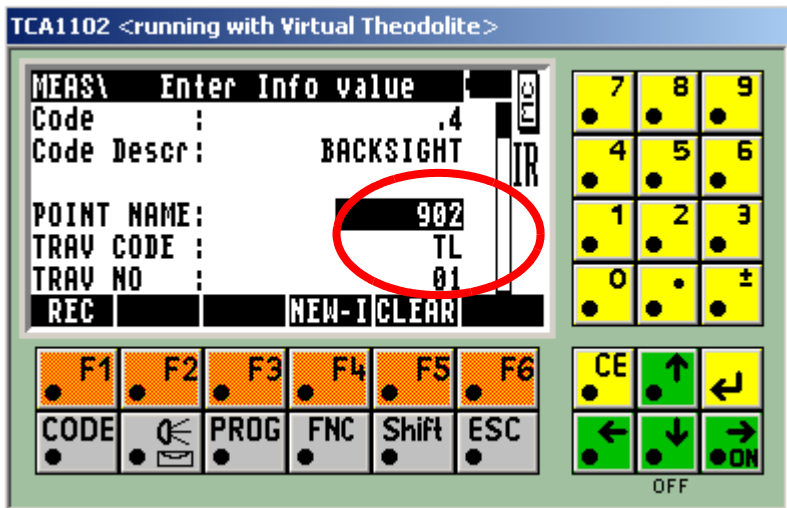


Type in .4 for backsight code followed by the enter key

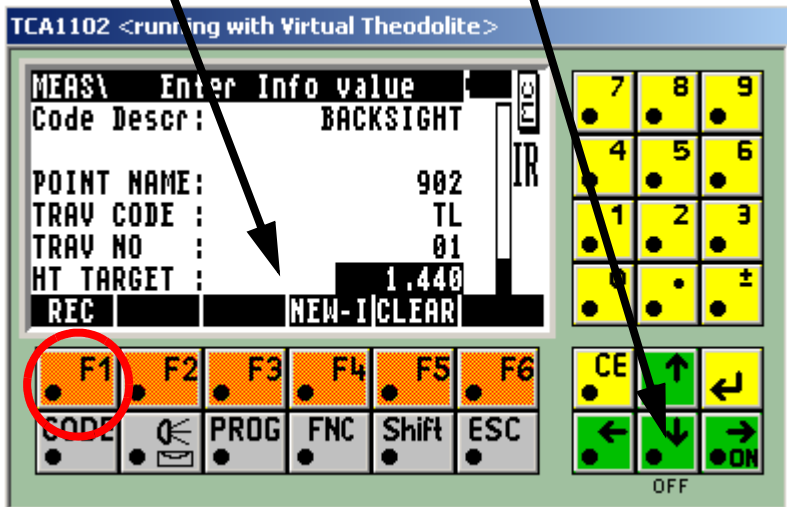


Type in backsight station number

Type in traverse code and traverse no. string number if using traverse coding. For more information about traverse coding see the section [Traverse coding](#).

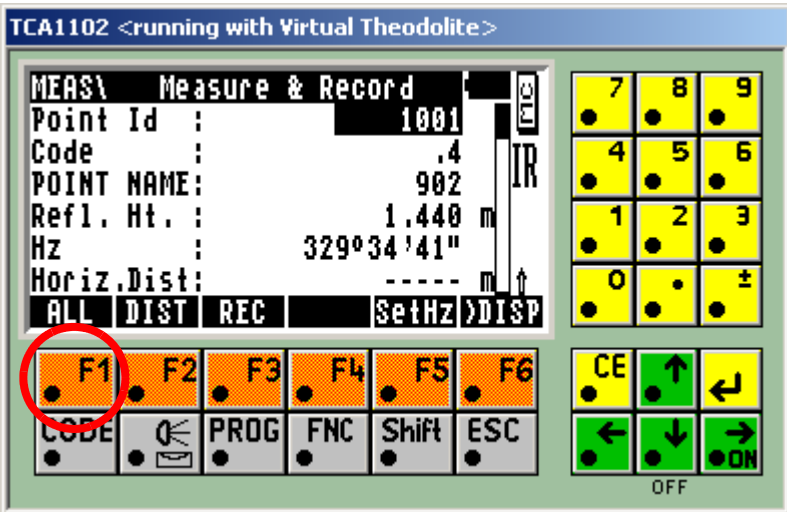


Scroll down using the arrow keys to show other parameters



Press F1 to record the code

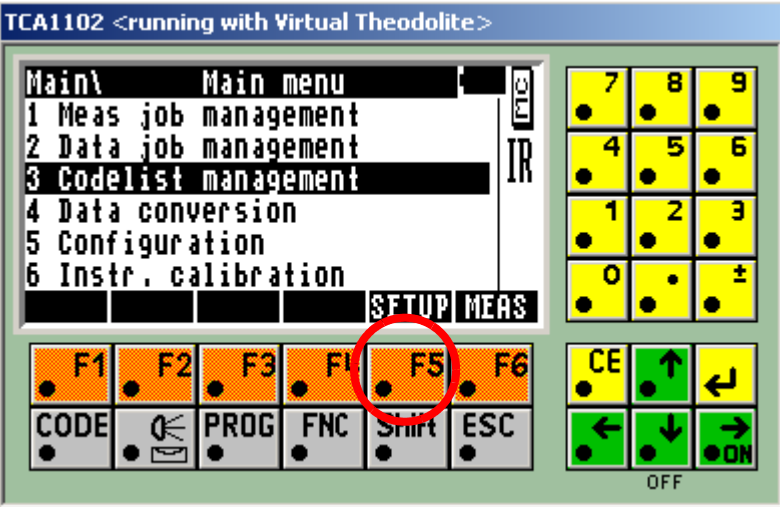
Point to backsight station and press F1 to take and record reading



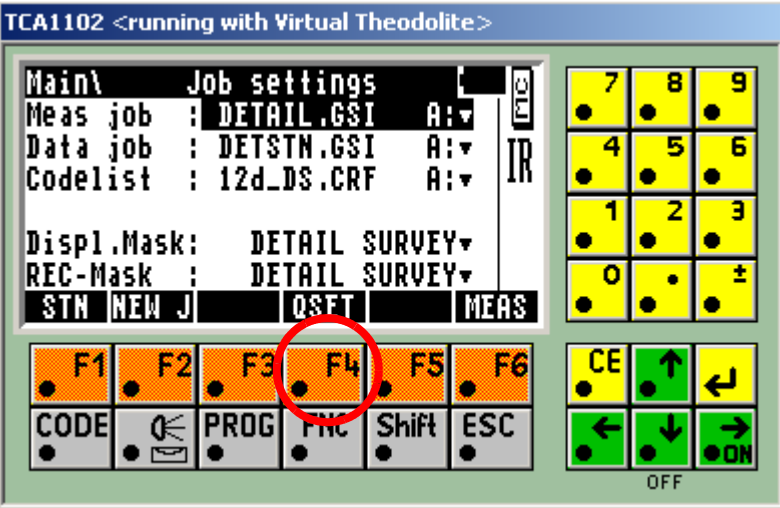
Setup using Quick set (QSET)

IMPORTANT NOTE: If using QSET, you MUST take a check reading to your backsight station as described below.

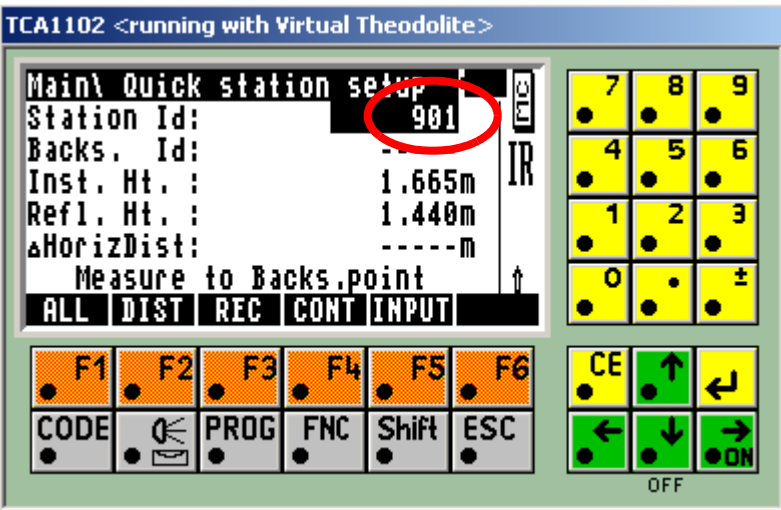
Press F5 for set up



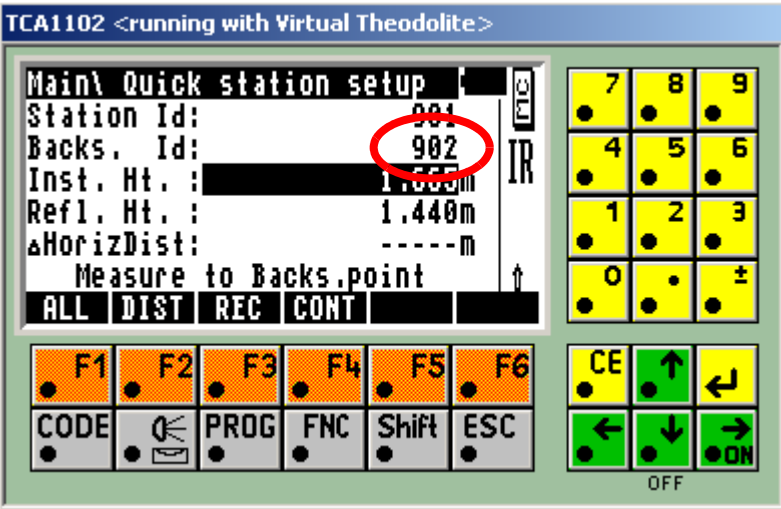
Press F4 for Quick set



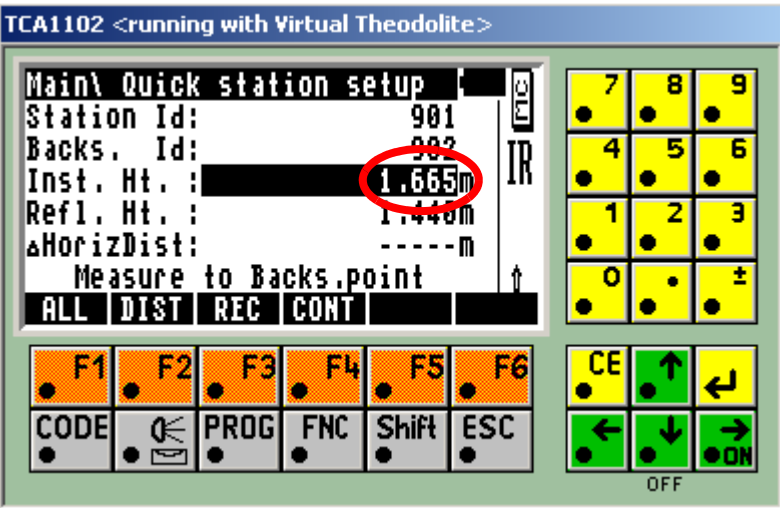
Type in setup station number



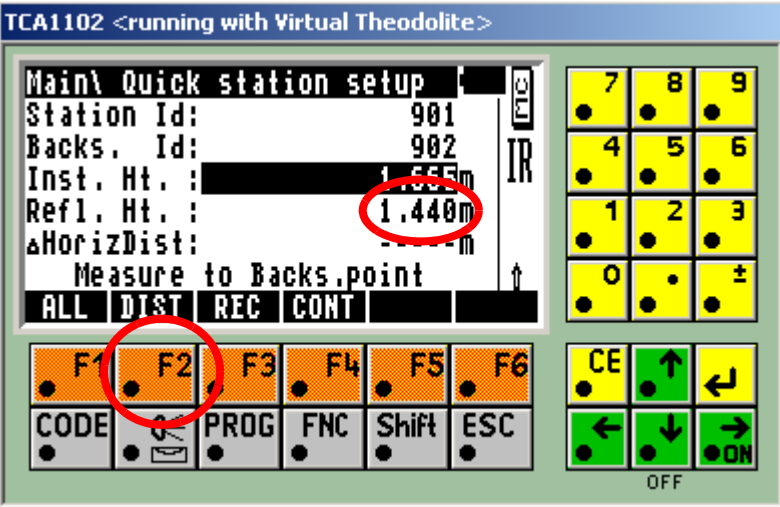
Type in the backsight station number



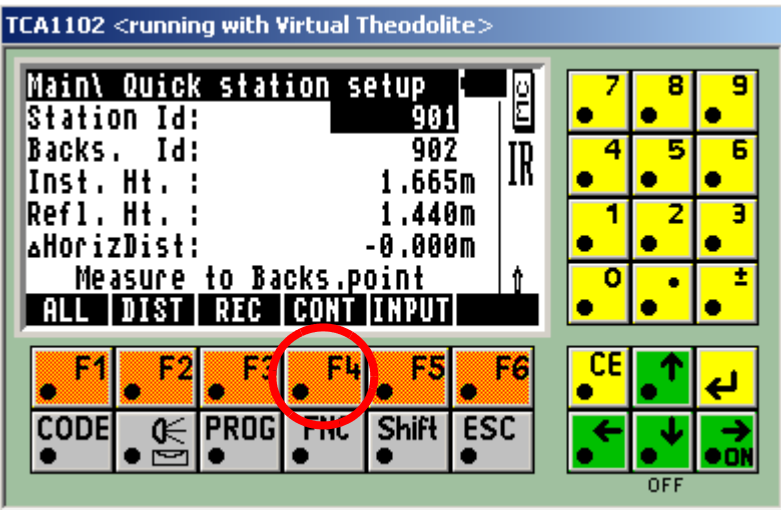
Type in instrument height



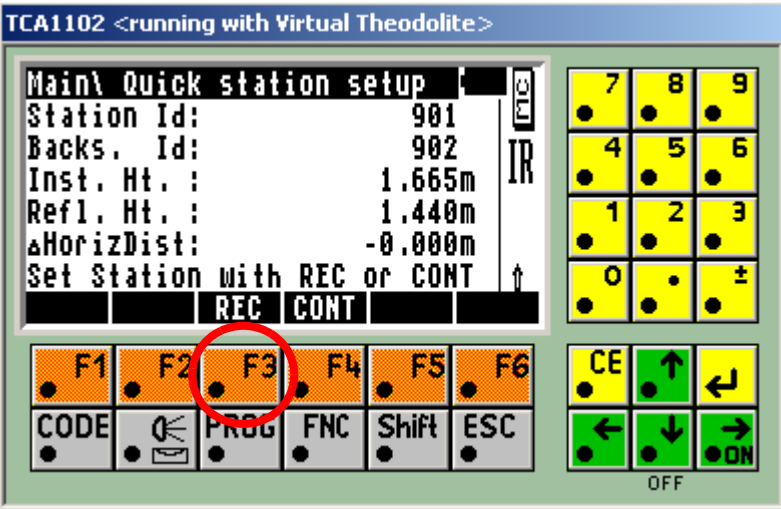
Type in height of target then Press F2 to take reading to backsight to initialise the QSET function.



Press F4 to continue



Press F3 to record the station setup information.

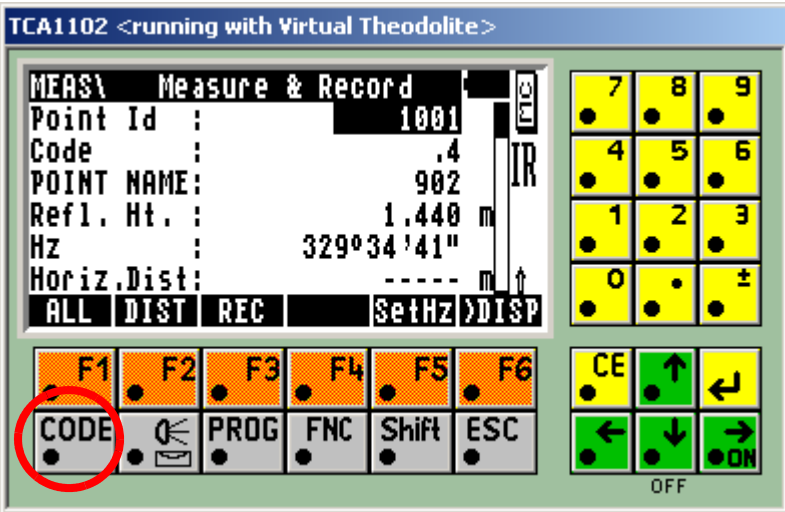


IMPORTANT NOTE: If using QSET, you MUST take a check reading to your backsight station as described below.

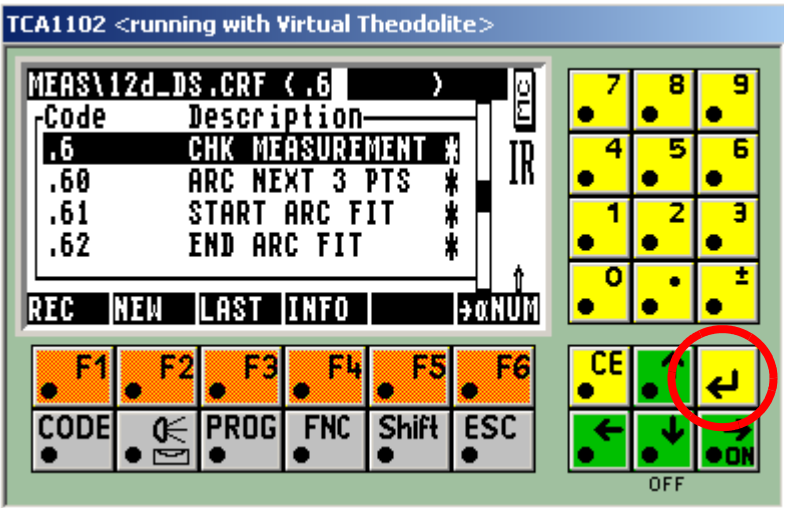
Take Check reading (Mandatory):

Type in reflector height

Select CODE

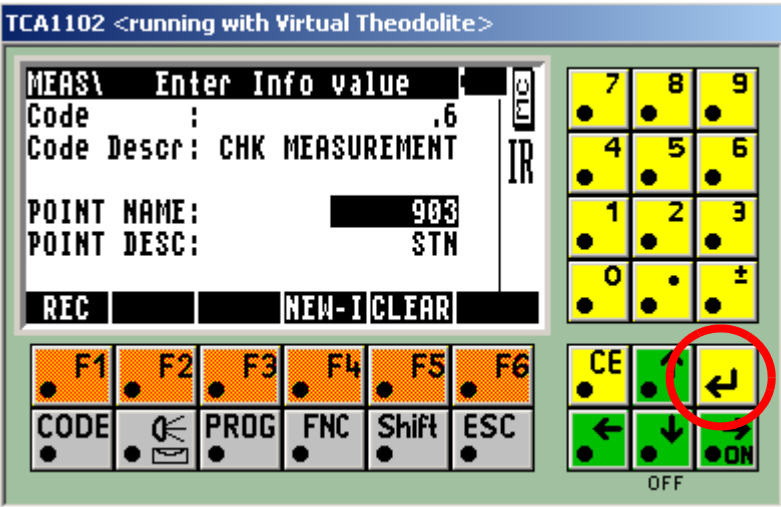


Type in .6 for check measurement code followed by the enter key

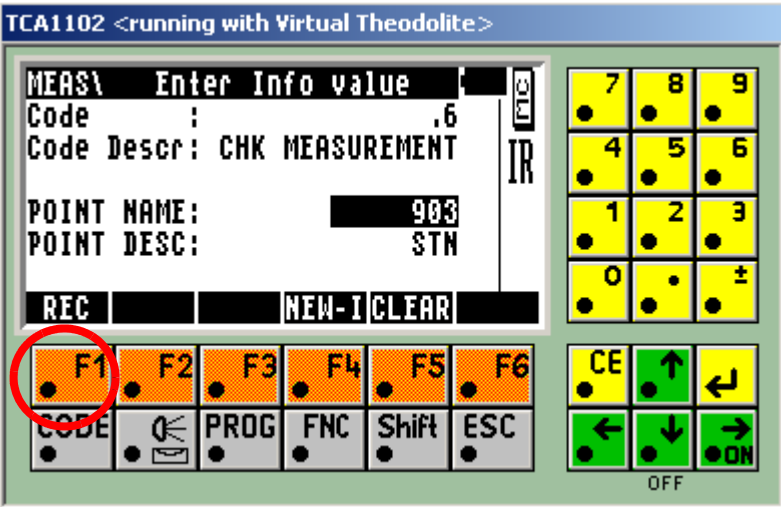


Type in the check station number

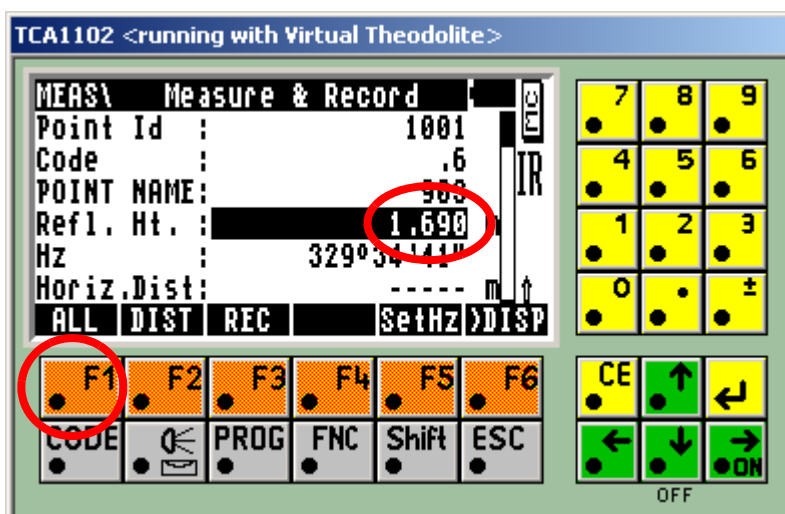
Type in the description



Press F1 to record code



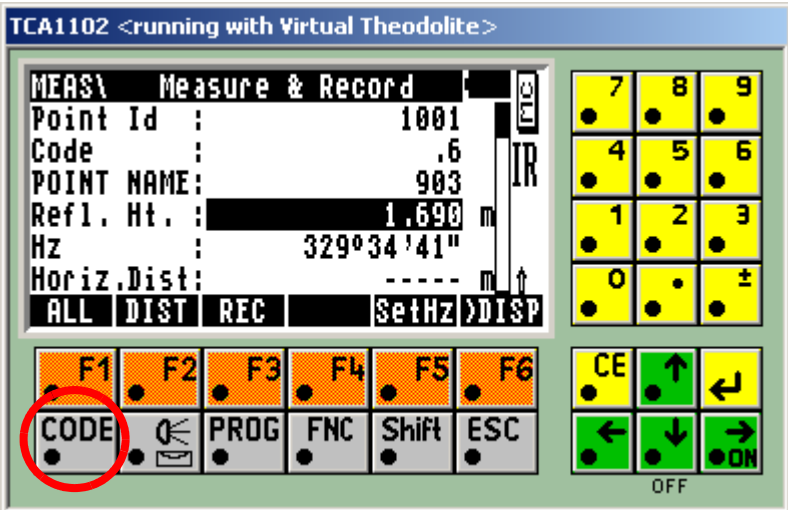
Type in the reflector height



Select F1 to take reading

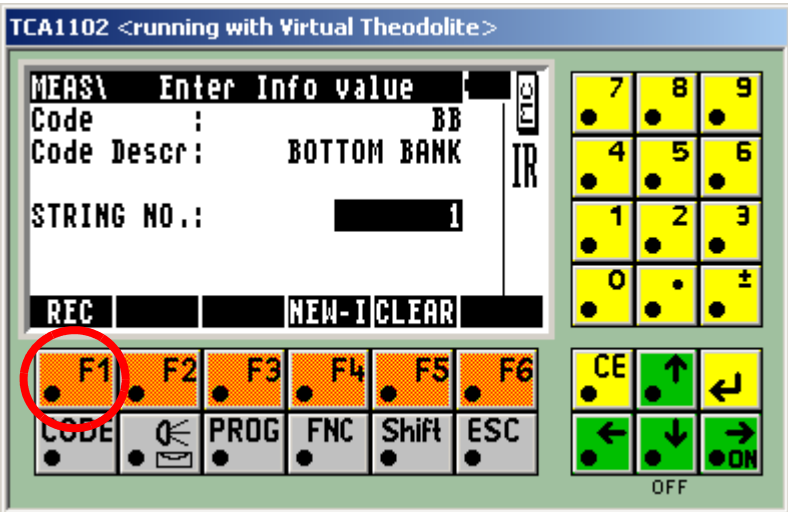
Normal readings

Always change the code prior to starting a new feature and ensure the reflector height is correct



Select Code

Type in the required code and string number

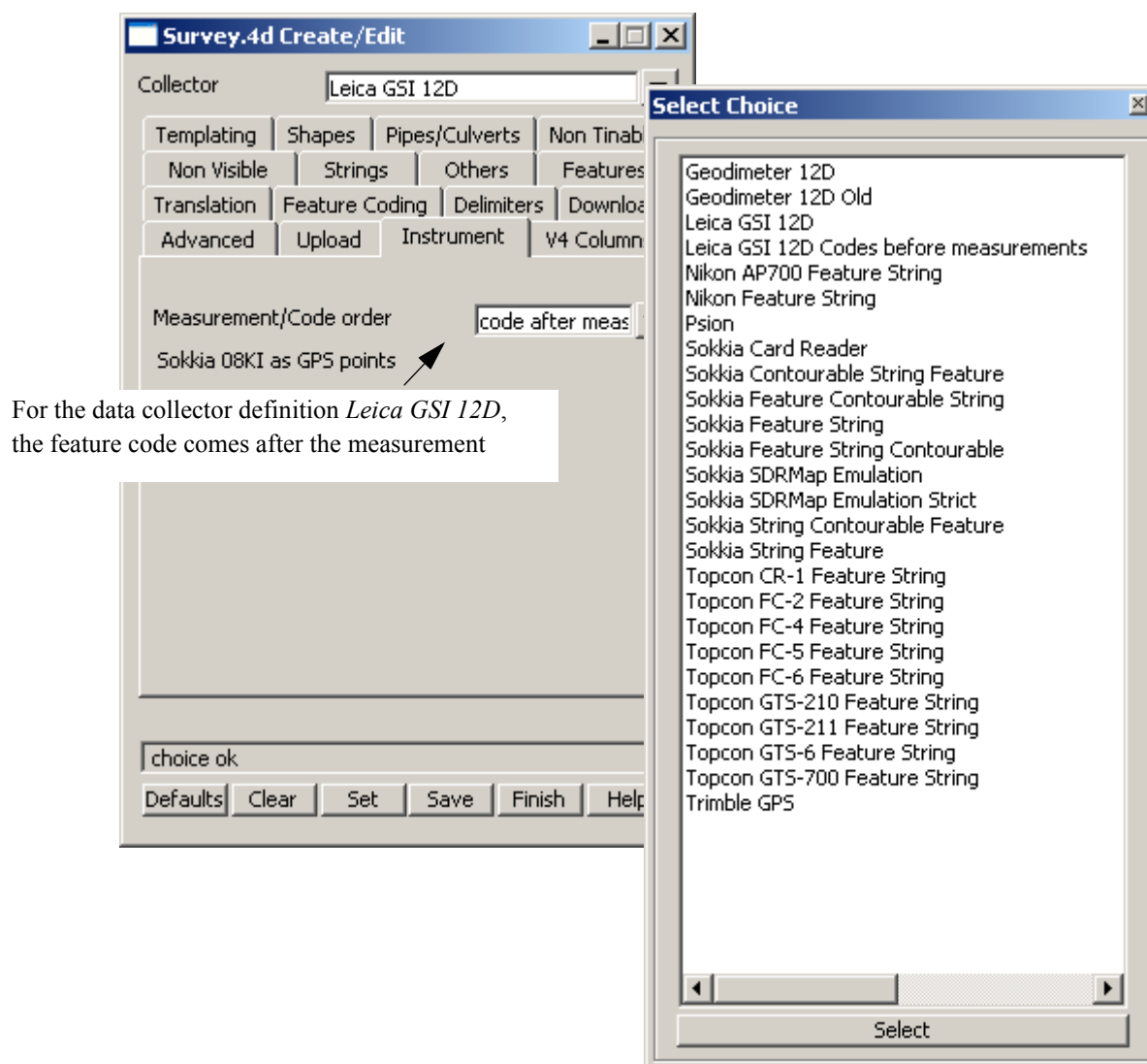


Press F1

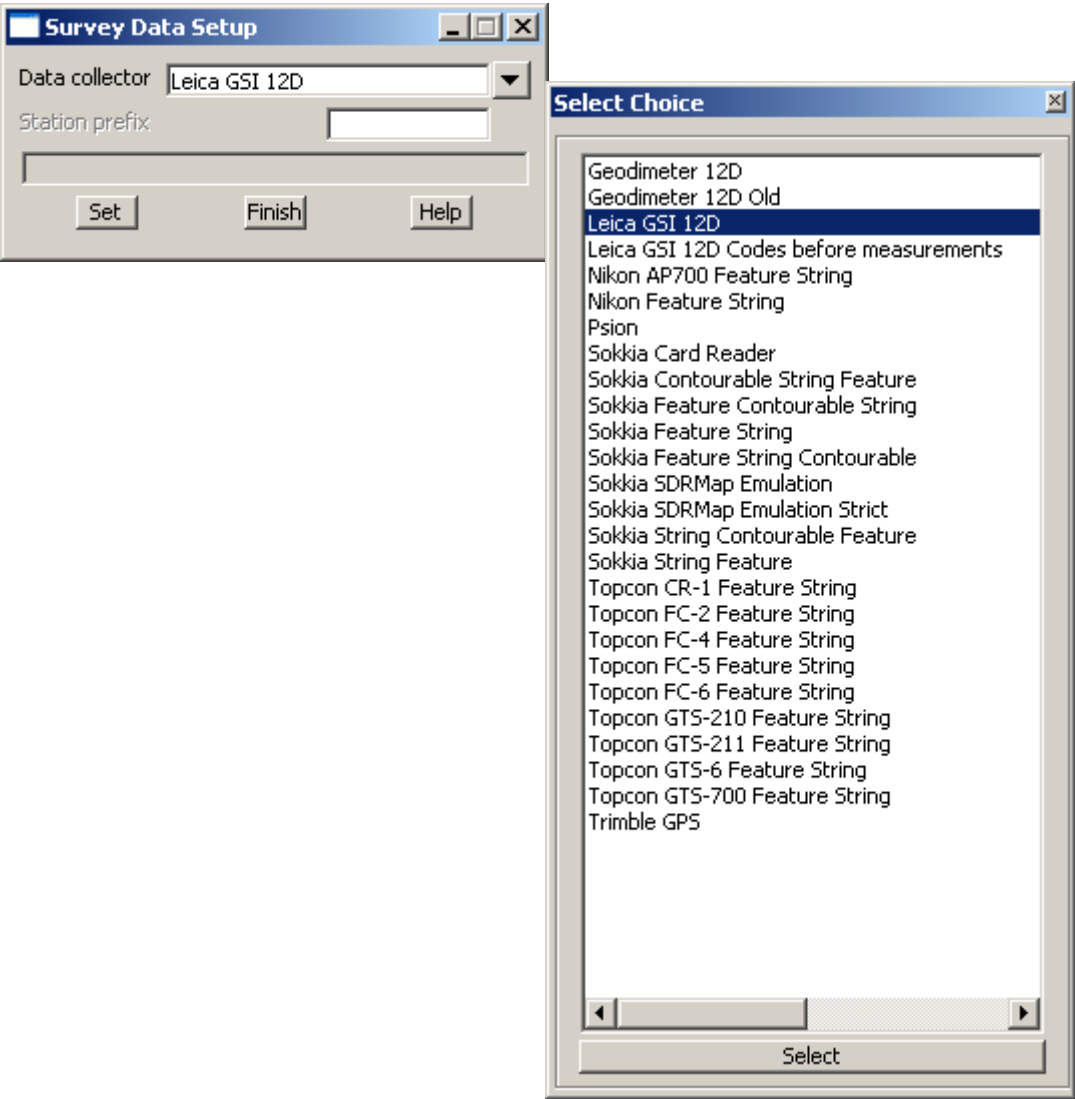
Example of Leica GSI File

The following GSI file has been coded with the Feature Code being recorded after the measurement. The Feature code definition is then applied to all subsequent measurements until another measurement with a following Feature Code definition is found.

The data collector definition *Leica GSI 12D* which is shipped with 12d Model, is an appropriate data collector definition for converting the example GSI file to a 12d Field File ready for processing.



The data collector definition *Leica 12D* which is shipped with 12d Model is selected using the option *Survey=>Setup*



Description

Leica GSI File in 8 Format using 12d Model Field Coding and Giving Feature Codes After a Measurement

Directly entered co-ords for station 10	410001+000000.2 42...+10000000 43...+10000000 44...+00010000 45...+00000STN 46...+00000000 47...+00000000 48...+00000010
Instrument set-up on 10 with instrument height of 1.715	410002+000000.3 42...+00000010 43...+0001.715
Next measurement is backsight to 931	410003+000000.4 42...+000000931
Measurement to backsight - has point number 1765	110004+00001765 21.324+19135130 22.324+09010170 31.00+00091100 51.1.+0007+000
New target height of 1.338	410005+000000.5 42...+0001.338
Measurement FC DHW SN 0 - Pt no 1766 (the FC and SN is given on the next line)	110006+00001766 21.324+19316250 22.324+08955240 31.00+00074468 51.1.+0007+000
Set feature code DHW string number 0	410007+00000DHW 42...+000000000
Measurement - FC RDG SN 1 has point number 1767	110008+00001767 21.324+21458540 22.324+09150580 31.00+00019501 51.1.+0007+000
Set feature code RDG string number 1	410009+00000RDG 42...+00000001
Measurement - FC RDG SN 1 has point number 1768	110010+00001768 21.324+21820190 22.324+09137140 31.00+00020397 51.1.+0007+000
Measurement - FC RDG SN 1 has point number 1769	110011+00001769 21.324+22104470 22.324+09155360 31.00+00019241 51.1.+0007+000
Measurement - FC RDG SN 1 has point number 1770	110012+00001770 21.324+21747290 22.324+09208580 31.00+00018299 51.1.+0007+000
Close the previous string RDG	410013+00000.20

I Geodetics Summary

Various options in **12d** Model version 7.0 and above, use geodetic calculations to present and change data. These options use terminology that are common to the field of geodetics, which will be defined here.

Most of the terminology adopted follows definitions given in the Australian “**GDA Technical Manual**” which is published by the Intergovernmental Committee on Surveying and Mapping (ICSM). This publication is a valuable reference document and the reader is encouraged to obtain a copy for a full understanding of the topic. The document can be accessed on the internet at the following address <http://www.anzlic.org.au/icsm/gdatm/>

Please continue to the next section [Shape Of The Earth](#).

Shape Of The Earth

The determination of the Earth’s shape is a science known as **Geodesy**. Today, it is widely accepted that the Earth’s shape best approximates an **ellipsoid** that has been revolved around the Earth’s polar axis. Put another way, the shape is a sphere that has been squashed at the north and south poles. The non-spherical shape is due to gravity.

A number of ellipsoids have been calculated to best approximate the Earth’s shape at local locations and the earth as a whole. The best fit is concerned with matching the Earth’s equipotential gravity field (the **Geoid** that is best approximated by Mean Sea Level), to a geometric ellipsoid shape. As such, there a wide number of definitions.

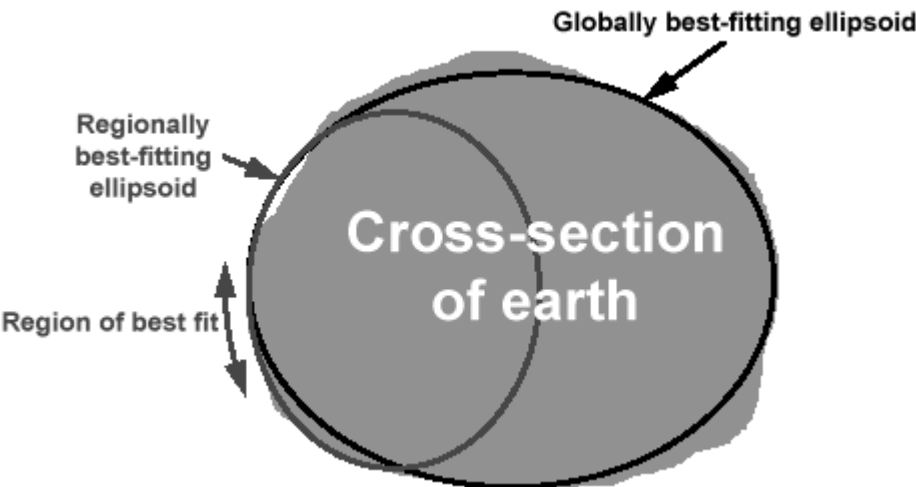
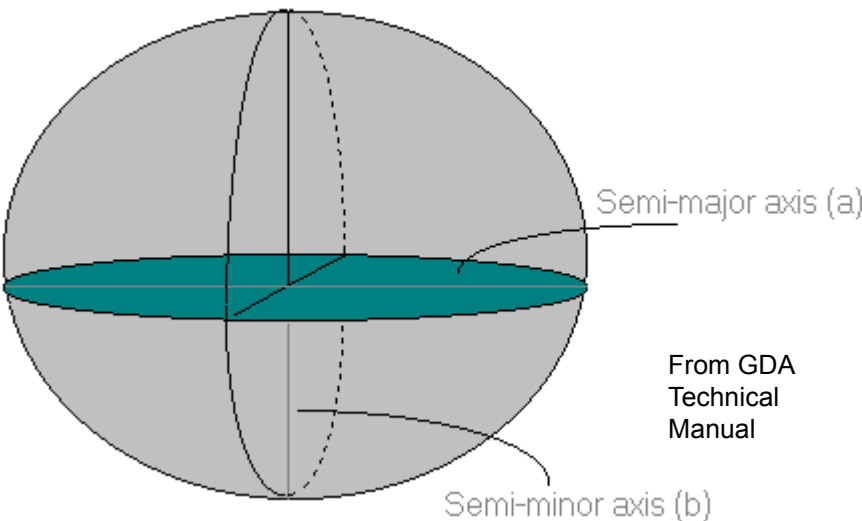


Diagram from: A guide to coordinate systems in Great Britain.
See <http://www.gps.gov.uk/guidecontents.asp>

The most common way of defining an ellipsoid is by describing the **semi-major axis** value and an **inverse flattening** value (this parameter describes the “squashing” of the ellipse).



Some commonly used ellipsoids are:

Ellipsoid	Semi-major axis	Inverse flattening
GRS80	6,378,137.0	298.257222101

This ellipsoid is used for Australia's GDA definition (Geocentric Datum of Australia GDA 94) used for MGA (Map Grid of Australia) calculations, New Zealand's NZGD2000 datum as well as other geocentric earth model datums around the world.

Ellipsoid	Semi-major axis	Inverse flattening
ANS	638160	298.25

This was the ellipsoid used to define the Australian Geodetic datum (AGD 84) used for AMG (Australian Map Grid) calculations and ISG (Integrated Survey Grid) co-ordinates.

Ellipsoid	Semi-major axis	Inverse flattening
NZ Geodetic 49	6378399.065	297.0

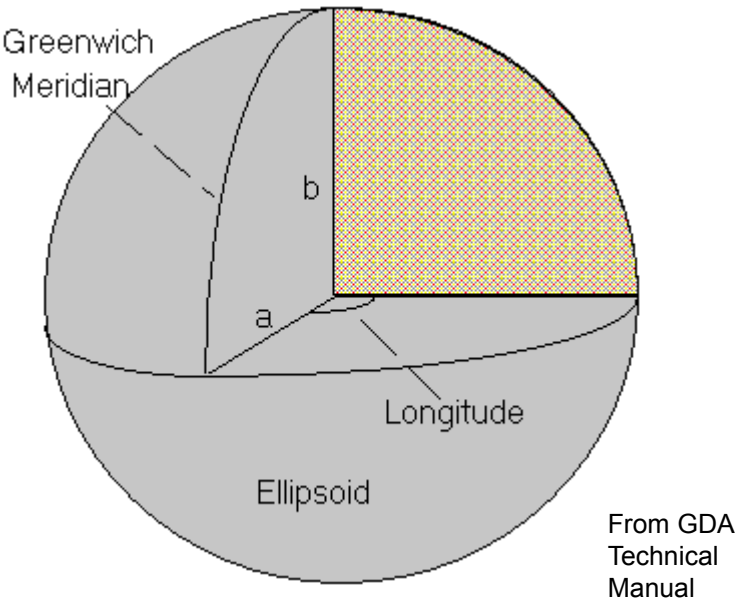
This was the ellipsoid used to define the NZ 1949 Geodetic datum. The semi-major axis given here has been adjusted to compensate for errors in units conversion from links to meters.

Please continue to the next section [Geodetic Coordinates](#).

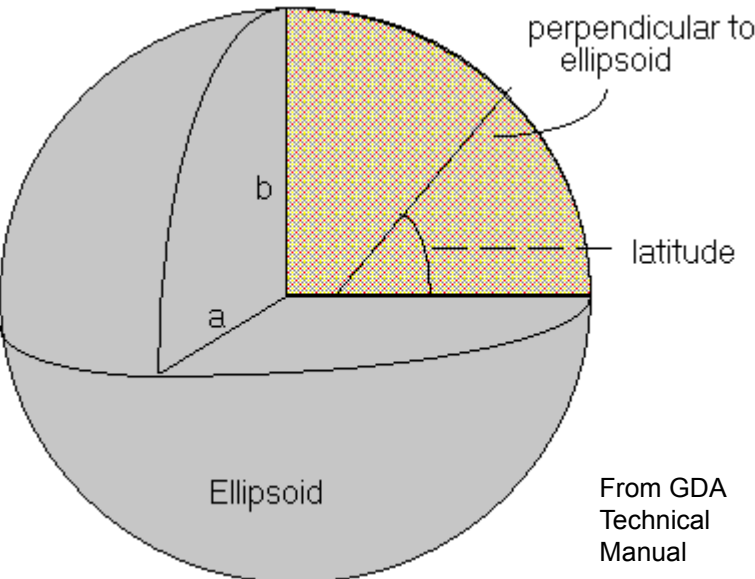
Geodetic Coordinates

Once an ellipsoid or **Geodetic Datum** is defined, a position on the earths surface can be described in terms of Geodetic coordinates. These coordinates are **Longitude**, **Latitude** and **Ellipsoid height**.

Longitude is a angular quantity measured from the Greenwich meridian. It is most commonly described in terms of degrees, minutes, seconds East or west of the Greenwich meridian.



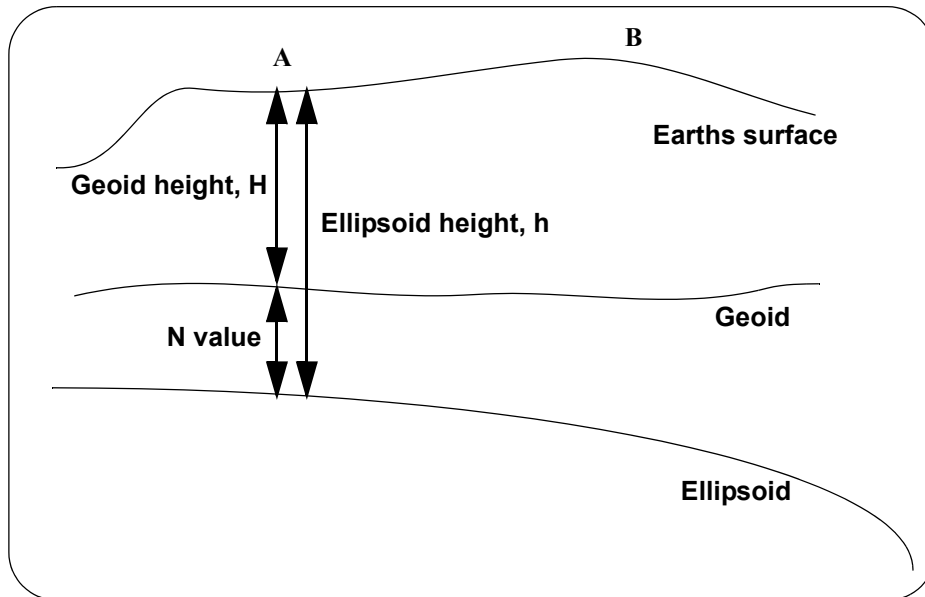
Latitude is a angular quantity measured from the equatorial plane, to the plane defined by the point position and the plumb line to the ellipsoid surface. It is most commonly described in terms of degrees, minutes, seconds South or North to the equator.



The **ellipsoid height**, h is the height above the reference ellipsoid.

Most height datums are not based on ellipsoid height but are based on the **geoid**. e.g. AHD in Australia.

As such, levels from GPS observations (which are *ellipsoid* heights) need to be corrected to a geoidal or orthometric height. To do this, we require the separation or gap distance between the two different surfaces. This separation is known as the **N value**.



The Ellipsoid height = Geoid height + N value, or

$$h = H + N$$

N values can be defined in a geoidal model such as Ausgeoid98 which represents grids of N values over all of Australia. For a given Geodetic coordinate, an N value can be interpolated from the model and applied to the ellipsoid height to give a geoidal height. Similarly, the N value can be used to convert a geoidal height to an ellipsoid height.

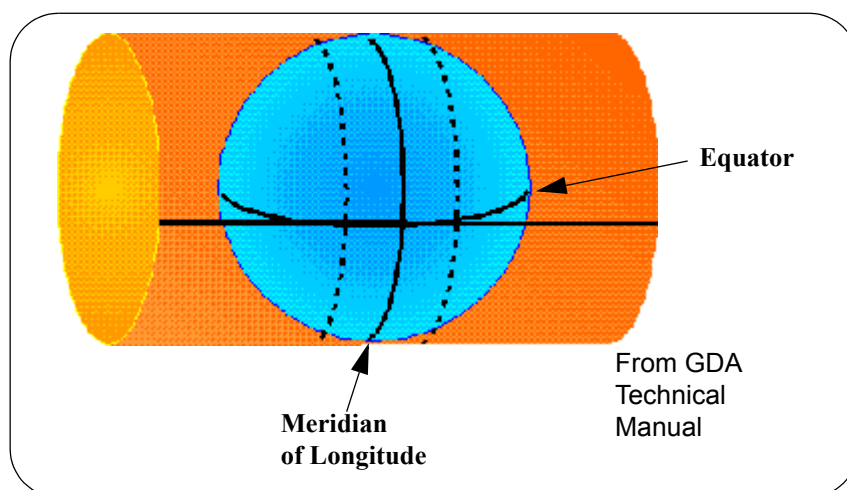
Since most geodetic calculations are made on the ellipsoid, the **ellipsoid height** is required for precise calculations.

Please continue to the next section [Projections](#).

Projections

In order to represent ellipsoid data on a flat surface for mapping, it is necessary to use a projection. A projection enables points on the earth's surface to be mathematically projected onto an imaginary developable surface. This surface can then be developed or “rolled flat”. Typically, this surface is a cylinder or cone.

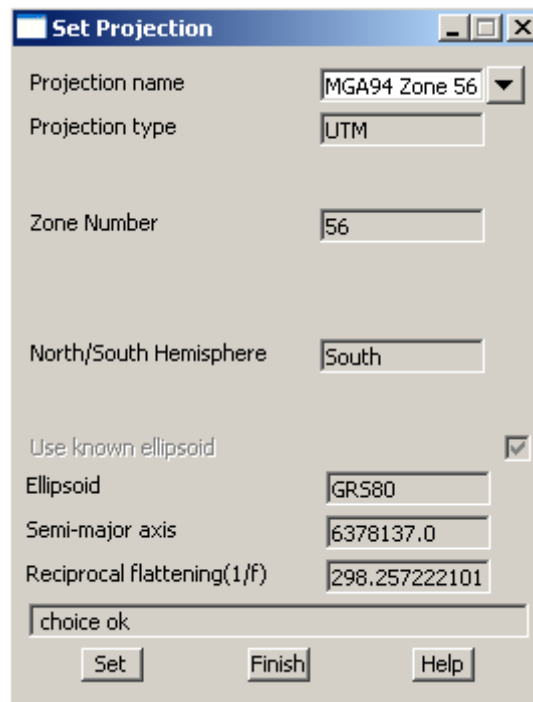
The Transverse Mercator system (TM) projects coordinates onto a cylinder that is tangent to the equator and the entire length of a meridian of Longitude.



12d Model version 6.0 and above, allows a number of projections to be specified including, Universal Transverse Mercator (UTM), Transverse Mercator (TM) and Rectified Skew Orthomorphic (RSO). There are many more available using the **General** type.

Within 12d Model, a projection can be defined that specifies both the **reference ellipsoid** and **projection type**. This then can be used for geodetic calculations.

A projection has various parameters that define it. These are specific to the projection and are clearly defined for major mapping systems. For example MGA94 zone 56 projection is defined as follows:



The image shows a 'Set Projection' dialog box with the following fields and controls:

- Projection name:** A dropdown menu showing 'MGA94 Zone 56'.
- Projection type:** A text box containing 'UTM'.
- Zone Number:** A text box containing '56'.
- North/South Hemisphere:** A text box containing 'South'.
- Use known ellipsoid:** A checkbox that is checked.
- Ellipsoid:** A text box containing 'GRS80'.
- Semi-major axis:** A text box containing '6378137.0'.
- Reciprocal flattening(1/f):** A text box containing '298.257222101'.
- choice ok:** A text box.
- Buttons:** 'Set', 'Finish', and 'Help' buttons at the bottom.

Please continue to the next section [Terminology](#).

Terminology

The various geodetic options in 12d Model mostly use standard geodetic terminology as defined in the Australian GDA technical manual. For clarity, they will be defined again here. For some options it is important to note that some terminology used in Australia has quite a differing meaning in other countries.

Ellipsoid Distance

The **ellipsoid distance** is the reduced distance along the *surface* of the ellipsoid. Standard survey measurements are reduced to the horizontal but require a correction due to the height above the ellipsoid. This is usually done by a **height scale factor** which takes into account the ellipsoid height at each end of the measured line. i.e.

$$\text{HeightScaleFactor} = 1 - \frac{h_M}{R + h_M}$$

Where:

h_M = Mean terrain height (mean of the two ellipsoid heights at either end of the measured line)

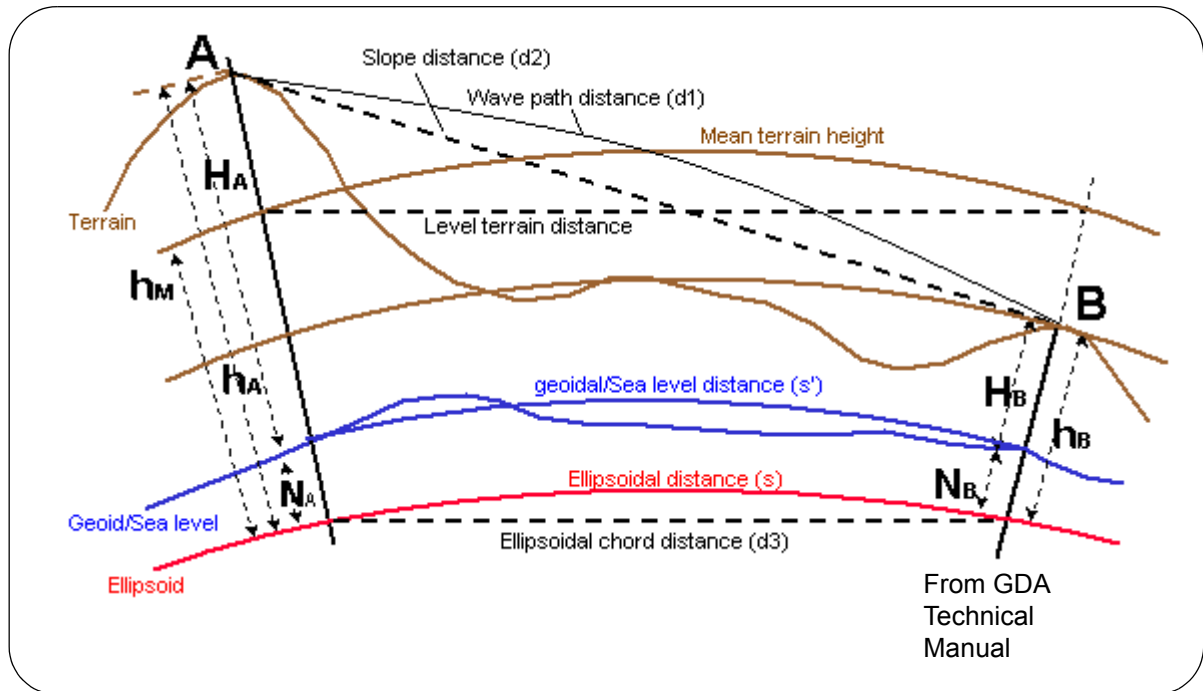
R = Radius of the earth in the azimuth of the line.

Note: An error of 60 meters in the value of **h_M** will introduce an error of 10 ppm in the reduced ellipsoid distance. With the introduction of the Australian Geocentric datums, the N values have increased markedly over Australia. So even if a survey is undertaken at sea level (Geoid height approximately 0.0), the ellipsoid heights may very well be greater than 60 meters. As The Ellipsoid height = Geoid height + N value, N values should be considered when reducing measured distances to these datums.

For older Australian ellipsoids, Mean seal level approximated the surface of the ellipsoid (i.e. N value approximately 0.0), so corrections could use geoidal heights to bring the distances down onto the reference surface.

The ellipsoid distance can be calculated using the calculated height factor:

Ellipsoid Distance = Reduced Horizontal Distance x height scale factor.



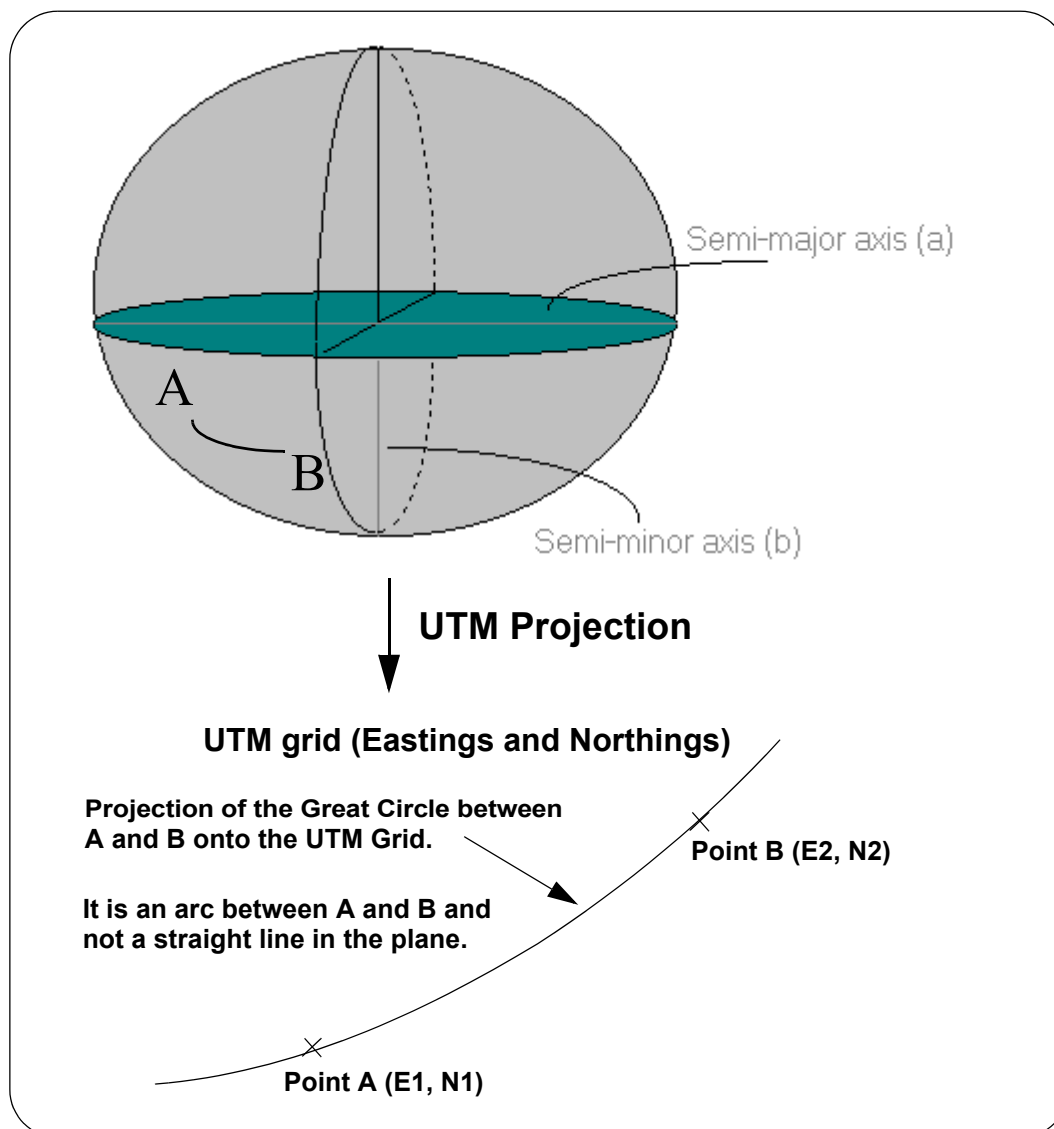
Bearings and Distances - Plane and Grid

If you have a point on an ellipsoid and a Transverse Mercator projection (such as UTM), the projection co-ordinates are known as the grid co-ordinates of the point (Easting and Northing).

On an *ellipsoid*, the **straight line** joining two points is the **Great circle** between the two points. If each point along the Great circle is projected onto the grid, the path that is traced out is an **arc** between the points.

That is, the *straight lines* on an ellipsoid project onto the TM grid as arcs.

In the diagram below, the Great circle arc through points A and B on the ellipse projects onto the arc shown through Points A and B in grid co-ordinates.



So the *straight line* joining the two points in the **plane** is *different* from the projection of the great circle (straight line on the ellipse) joining the two points on the ellipse.

Plane Bearing, Projection Bearing

If a straight line is drawn in the plane between two points on a grid, the angle between grid north and this line is equal to the **plane bearing**.

In other words, if the two point's coordinates are known, standard plane trigonometry can be used to calculate the bearing of the line.

$$\tan(\text{plane bearing}) = (E2 - E1) / (N2 - N1)$$

Projection bearing and plane bearing is used interchangeably in 12d Model.

Australian Grid Bearing, Ellipsoid Bearing

In Australia, the **grid bearing** is the angle between grid north and the *tangent* to arc at a point on the arc. e.g Point A. The grid bearing at point A is **not** equal to the reverse grid bearing from point B.

This term is also known as the **ellipsoid bearing** in some countries.

Warning: In some countries, including New Zealand and the US, the term **Grid bearing** is used for the previously defined term **Plane bearing**. However, as defined in the Australian GDA technical manual, the definition of Grid bearing is different to that of a plane bearing.

To avoid confusion, we will use the term **ellipsoid bearing**.

Plane Distance

The **plane distance** is the length in the plane of the straight line joining two points on a grid - that is, the standard distance between two points in a plane

$$\text{plane distance} = \text{square root} [(E2-E1)*(E2-E1) + (N2-N1)*(N2-N1)]$$

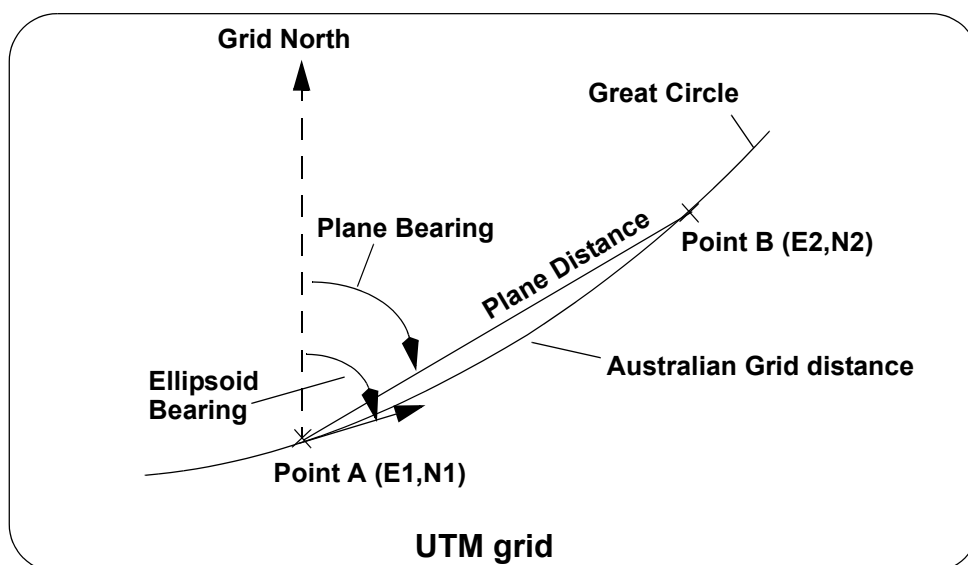
Australian Grid Distance

On an ellipsoid, the *straight line* joining two points on the ellipsoid is the Great circle between the two points. The *straight lines* on an ellipsoid project onto the UTM grid as arcs. In the diagram below, the arc shown through points A and B is the projection of the Great circle arc through points A and B on the ellipse.

In Australia, the **grid distance** is the distance on this *arc* from point A to B.

The difference between the plane distance and the grid distance is usually negligible.

Warning: In some countries, the term *grid distance* is used for the definition of plane distance here.



Datum

Within the Geodetic sections of 12d Model, the term **datum** relates to the reference ellipsoid adopted by countries/organisations for mapping projects.

For example AGD is the Australian Geodetic Datum, using the ANS ellipsoid parameters. GDA refers to the Geodetic Datum of australia, using the GRS80 ellipsoid as the basis for defining geodetic coordinates.

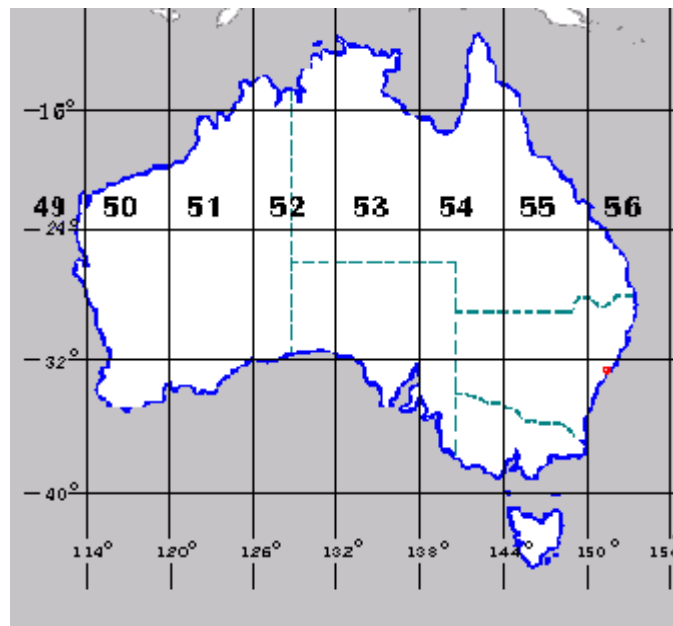
In New Zealand, the NZGD49 datum refers to the NZ Geodetic 49 ellipsoid. The NZGD2000 datum is the New Zealand geodetic datum which again refers to the GRS80 ellipsoid.

Zone

The meaning of **zone** is specific to the UTM projection type which is commonly used around the world as a mapping projection. This includes AMG and MGA in Australia.

The Universal Transverse Mercator projection splits the world into 60 zones of 6 degrees of longitude. The zone numbering starts at 180 degrees West, longitude. Each zone has a specific central meridian and range of longitude that defines it. As such, by supplying a zone number, a number of parameters about a projection can be deduced.

For example, Australia is covered by the UTM zones 49 to 56.



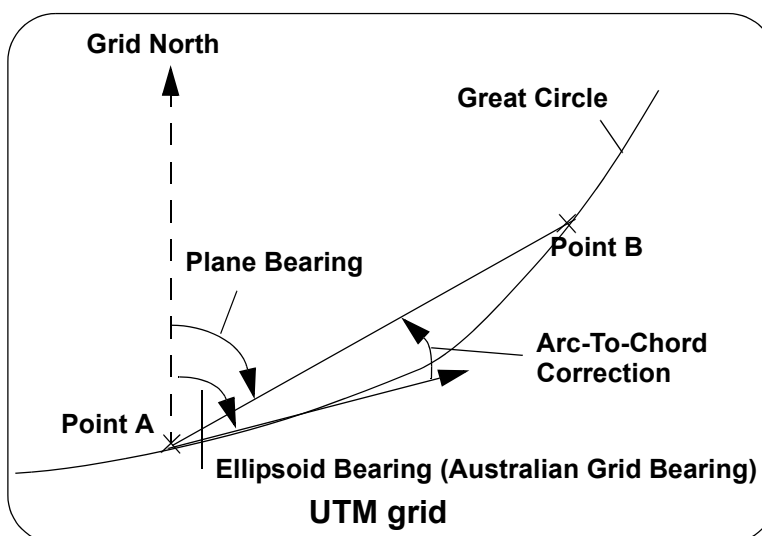
Arc-to-Chord Correction (t-T correction)

The **arc-to-chord** correction is the quantity to be added algebraically to a ellipsoid bearing (Australian grid bearing) to obtain a plane bearing.

Plane Bearing = Ellipsoid Bearing + Arc-To-Chord Correction

Plane Bearing = Australian Grid Bearing + Arc-To-Chord Correction

This correction is only really applicable for lines over 10 km but it is included in calculations for completeness. The correction shown in the example below is negative in sign but it can also be positive.



Point Scale Factor

The **point scale factor** is the ratio of an infinitesimal plan distance at a point on a grid to a corresponding ellipsoid distance.

It can be used as an approximation to convert (factor) measured ellipsoid distances to plane distances.

Line Scale Factor

The **line scale factor** is the ratio of the plane distance on a grid to a corresponding ellipsoid distance. i.e.

$$\text{LineScaleFactor} = \frac{\text{PlanDist}}{\text{EllipsoidDist}}$$

This factor can be used to calculate either the plane or ellipsoid distance given the Line Scale Factor and the other distance. i.e.

Plane distance = Ellipsoid distance x Line scale factor,

Similarly,

Ellipsoid distance = Plane distance / Line scale factor.

Combined Point Scale Factor

The **combined point scale factor** is the product of the point scale factor and the height scale factor. i.e.

$$\text{Combined Scale Factor} = \text{Point Scale Factor} \times \text{Height Scale Factor}.$$

Azimuth and Convergence

Azimuth is the horizontal angle measured from an *ellipsoidal meridian clockwise from north* and the great circle between measured points.

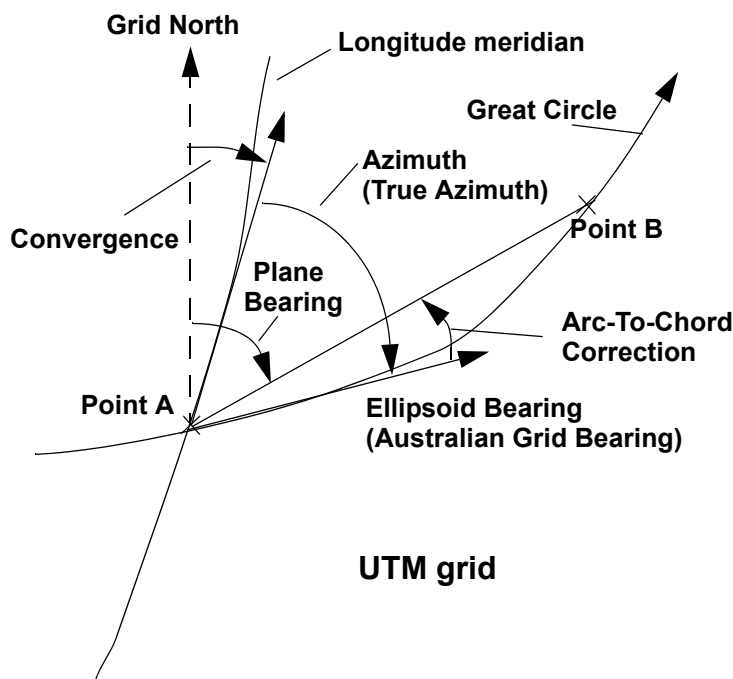
It is also known as the **True Azimuth**. In general, this value will be calculated internally in **12d** Model.

Convergence or **Grid Convergence** is the angular quantity to be added algebraically to an *Azimuth* to obtain an ellipsoid bearing (Australian grid bearing). i.e.

$$\text{Ellipsoid Bearing} = \text{Azimuth} + \text{Grid Convergence}$$

$$\text{Australian Grid Bearing} = \text{Azimuth} + \text{Grid Convergence}$$

Warning: In some countries, the *Grid Convergence* has the opposite sign.



Combining

$$\text{Ellipsoid Bearing} = \text{Azimuth} + \text{Grid Convergence}$$

$$\text{Australian Grid Bearing} = \text{Azimuth} + \text{Grid Convergence}$$

and

$$\text{Plane Bearing} = \text{Ellipsoid Bearing} + \text{Arc-To-Chord Correction}$$

$$\text{Plane Bearing} = \text{Australian Grid Bearing} + \text{Arc-To-Chord Correction}$$

produces the equation

$$\text{Plane Bearing} = \text{Azimuth} + \text{Grid Convergence} + \text{Arc-To-Chord Correction}$$

or

$$\text{Azimuth} = \text{Plane Bearing} - \text{Grid Convergence} - \text{Arc-To-Chord Correction}$$

$$\text{True Azimuth} = \text{Plane Bearing} - \text{Grid Convergence} - \text{Arc-To-Chord Correction}$$

Warning: In some countries, the *Grid Convergence* has the opposite sign.

Please continue to the next section [Converting Between AMG, ISG and MGA](#).

Converting Between AMG, ISG and MGA

In Australia the ellipsoid used to represent the shape of the earth used to be defined by AGD 84 but it has now been changed to an ellipsoid that has its centre at the centre of mass of the earth (geocentric - GDA 94). See [Shape Of The Earth](#).

This is to fit in with GPS because satellites orbits are centred on the centre of mass.

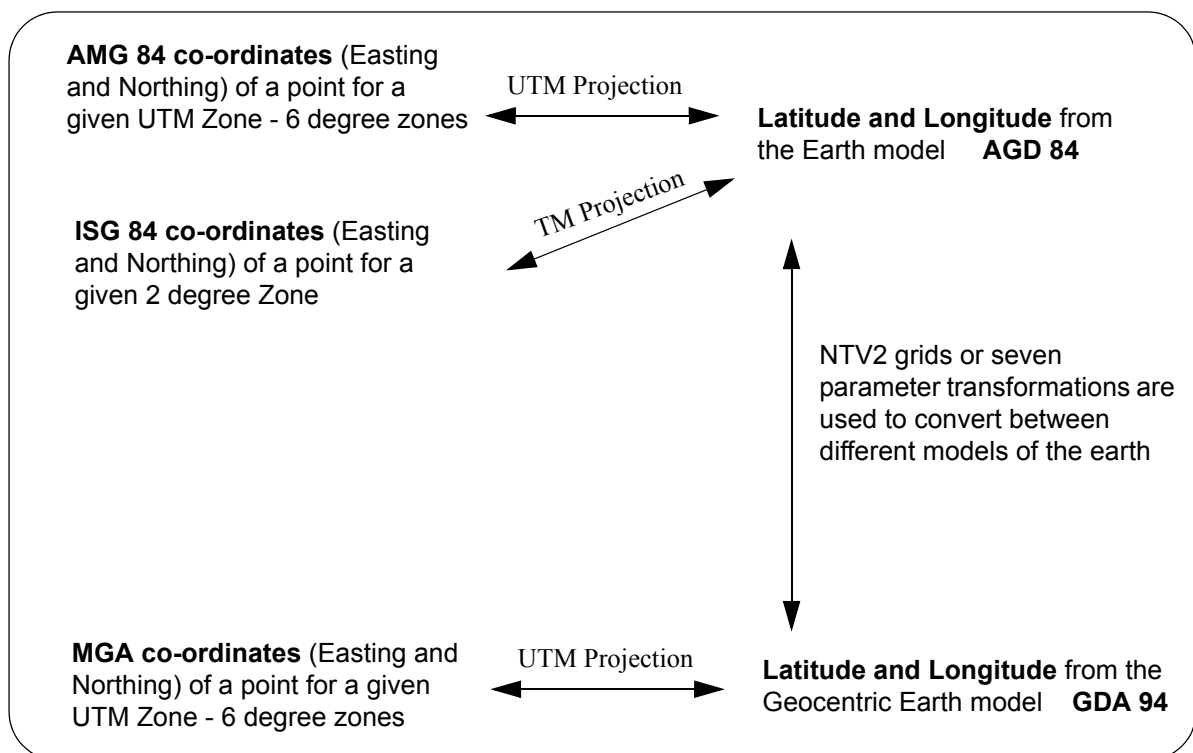
This means that the Latitude and Longitude of every point has changed.

The use of UTM projections (Universal Transverse Mercator - see [Projections](#)) and Zones still apply but because the latitude and longitude of each point has change, its Easting and Northing for a UTM zone has also changed.

AMG 84 Zones are the co-ordinates for the UTM Projections defined for six degree zones using the ellipsoid defined by AGD 84.

MGA 94 Zones are the co-ordinates for the UTM Projections defined for six degree zones using ellipsoid define by GDA 94.

Note - ISG 84 Zones are the co-ordinates for the TM Projections defined for two degree zones using the ellipsoid defined by AGD 84.



For converting between the *different datums* AGD66/84 and GDA94 (i.e. AMG, ISG, Long Lat <-> MGA, Long Lat), use the option

Survey =>Conversions =>AGD66/84 <-> GDA94 (see [AGD66/84 <---> GDA94](#) in the chapter [Survey](#))

For converting between different AMG Zones (AMG <->AMG) or different MGA Zones (MGA<->MGA) use the option

Survey =>Conversions =>Australian conversions see [Australian Conversions](#)

in the chapter [Survey](#)).

For converting between different ISG/AMG Zones (AMG,ISG <->AMG, ISG)

Survey =>Conversions =>Cartographic see [Cartographic](#)

in the chapter [Survey](#)).

J Setting Up and Configuring 12d

This appendix contains information about files used for setting up and configuring **12d Model**.

Go to [Folder Structure Installed by 12d Model](#)
[Set Up Files](#)
[Writing Set Up Files](#)
[Library, User Library, Customer Library](#)
[Environment Variables](#)
[Setups File](#)
[Colours File](#)
[Defaults File](#)
[GUI](#)
[Sheet Sizes File](#)
[Transitions and Spirals File](#)
[12d Model Options Map](#)
[Monitoring 12d Model Usage](#)

For documentation on the first item, continue to the next section [Folder Structure Installed by 12d Model](#).

Folder Structure Installed by 12d Model

12d Model has Set Up files to define how new projects are created, define colours, linestyles, symbols etc. and control many other aspects of **12d Model**.

12d Model comes with defaults for these things but most users wish to customise many of the settings, share them between groups of users across a network etc.

To make customisation easier, all the **12d Model** customisation files (called Set Up files) have default names and on installation, are stored in a folder called **Set_ups**.

To customise **12d Model**, users only need to which file to modify for that particular customisation.

When *12d Model 10* is installed on a *Windows* computer, the major components are installed in the Microsoft preferred installation folder **Program Files**, in the sub folders **12d\12dmodel\10.00**.

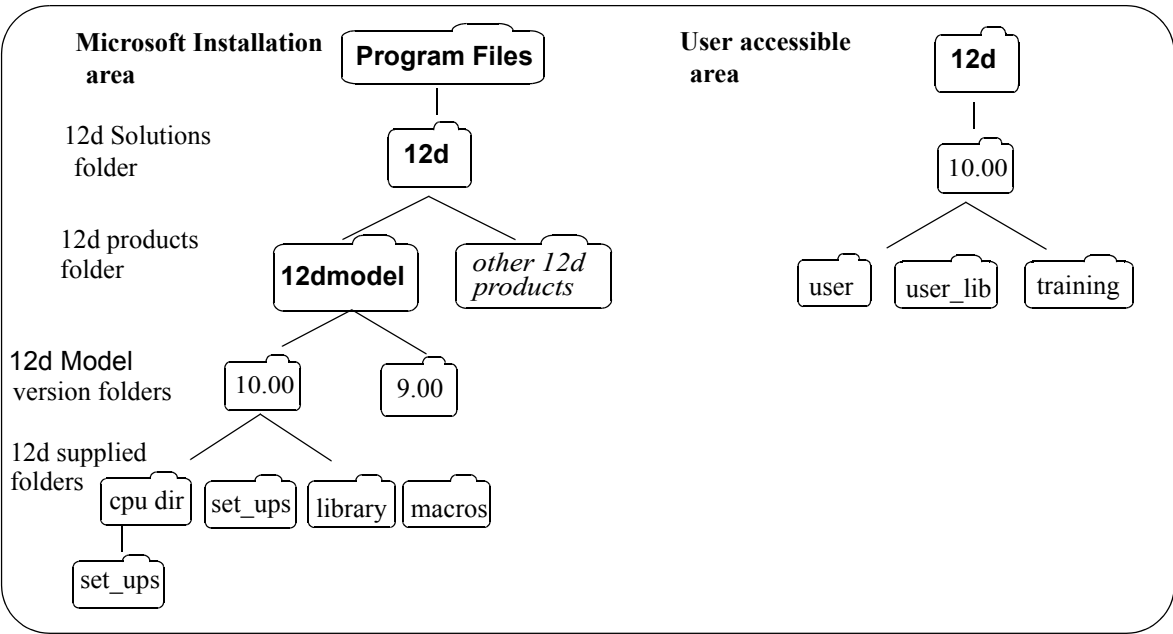
That is, the software and associated files are installed in **Program Files\12d\12dmodel\10.00**
However, without *Administrator* privilege, users do not have write access to **Program Files**.

To allow non-administrator users access to Set Up areas that users can store modified files, *12d Model 10* also installs extra folders in an area that could be accessed by the user. The default folder structure for this area is **C:\12d\10.00**

So the customisation system allows the use of both the areas
Program Files\12d\12dmodel\10.00

and

C:\12d\10.00 for storing Set Up and other files necessary for the tailoring and running of **12d Model**.



Please continue to the next section [Set Up Files](#).

Set Up Files

When *12d Model* fires up, it looks for special files (called Set Up files) to define many of its features. Hence the *Set Up* files can be used to customize *12d Model* for a site, a client or even a user.

When **12d Model** creates a new project, or changes to another project, then for each Set Up file

EITHER

- (a) an environment variable for the Set Up file exists, and the value of the environment variable is taken as the full path name of the file to be used as that Set Up file.

OR if the environment variable does not exist for the Set Up file

- (b) a file with the default Set Up file name is searched for in specially named folders, in a fully defined order.

The search for **each Set Up file** is independent of any other Set Up file. That is, for each Set Up file, the folders are searched in the specific order until that file is first found and the searching stops for that Set Up file. and then the search is begun again for the next Set Up file.

Consequently the Set Up files do not all have to be in the same folder. This greatly increases the tailorability of **12d Model**.

The description, default name and any environment variable for each Set up file are given in the sections [Set Up Files Only Used for a New Project](#), [Set Up Files Only Used for an Existing Project](#) and [Set Up Files Used for New and Existing Projects](#).

The folders searched for Set Up, and the folder search order, is described in the section [Folders Searched for Set Up Files](#).

Set Up Files Only Used for a New Project

The two Set Up files, **setups.4d** and **defaults.4d**, are only used when creating a NEW 12d Model project, and after the project is created, the information supplied in these two Set Up files is **stored within the 12d Model project** and is then modified from within **12d Model** when in that project.

Similarly the file **macros.4d** is a file of macros or chains (one per line) that are only run when a **new** project is created (**project_macros.4d** is a run when an **existing** project is opened).

defaults.4d // define the defaults for a **new** project
 (Defaults panel from the **Utilities => Defaults** option).
 Once a project is created, the defaults can be modified inside 12d Model.
 The defaults are then saved with the project.

The environment variable is [DEFAULTS_4D](#).

For more information go to the section [Defaults File](#)

setups.4d // define the layout of views on the screen for a **new** project. Once a project is created, the view layout can be modified inside **12d Model**.
 The view layout is then saved with the project.

The environment variable is [SETUPS_FILE_4D](#).

For more information go to the section [Setups File](#)

macros.4d // a file of macros and/or chains (one per line) that are run when a **new** project

is created (see [Running Macros and Chains on Start Up](#)).

The environment variable is [RUN_MACROS_FILE_4D](#).

Set Up Files Only Used for an Existing Project

The file **project_macros.4d** is a file of macros or chains (one per line) that are only run when an **existing** project is opened. So project_macros.4d is modified between accesses to the project then the modified version of the file is used for the project.

project_macros.4d // a file of macros (one per line) that are run when an **existing** project is opened (see [Running Macros and Chains on Start Up](#)).

The environment variable is [RUN_PROJECT_MACROS_FILE_4D](#).

Set Up Files Used for New and Existing Projects

The other Set Up files are searched for **each time a project is created or opened**. So if these files are modified between accesses to the project then the modified versions of the files are used for the project.

The Set Up files that **12d Model** searches for each time a project is opened are:

colours.4d // sets the colour names and red, green, blue mix; also defines the default pens that the colours map to (as displayed in the panel **colours to pens**). See [Colours File](#).

The environment variable is [COLOURS_4D](#).

digitize.4d // list and defines the digitizers available in **12d Model**. See [Digitizer Definitions File](#).

The environment variable is [DIGITIZERS_4D](#).

env.4d // contains values for environment variables See [Environment Variables](#).

The environment variable is [ENVIRONMENT_4D](#).

fonts.4d // defines the fonts used in text styles. See [Textstyles and Fonts](#).

The environment variable is [FONTS_4D](#).

gui.4d // define the fonts and colours used in panels and menus, spacing between items in panels and menus and the maximum pop-up length. See [GUI](#).

The environment variable is [GUI_4D](#).

layout.4d // a file containing the screen layout file information (slx/slf) for placing menus or panels on the screen. The layout file is used every time a project is opened. The layout file can have most menus and panels in it. See [Screen Layout File](#) in the appendix [Special File Formats](#).

The environment variable is [LAYOUT_FILE_4D](#).

linestyl.4d // defines the line styles (linestyles, worldstyles, groupstyles and twoptstyles). See [Line Styles](#).

The environment variable is [LINESTYLES_4D](#).

names.4d // a special mapping file which is used to define for given string names, information such as colours, model etc. This is used in some panels to fill out other panels fields after entering the string names in the panel.

The environment variable is [NAME_MAPPINGS_4D](#).

plotters.4d // defines the plotters that appear in the pop-up for the plotter type panel field. See [User Defined Plotters](#).

The environment variable is [PLOTTERS_4D](#).

pmf.4d // plotter mapping file for defining mapping of 12d Model colours to pens with

thicknesses, and the rgb for the pens See [Plotter Mapping File](#)
The environment variable is [PLOTTER_MAPPING_4D](#).

sheets.4d // gives sheet sizes and names used in the pop-up for the sheet size panel field.
See [Sheet Sizes File](#)
The environment variable is [SHEET_SIZES_4D](#).

survey.4d // lists and defines the data collectors available in 12d Model See [Survey Data Collectors](#)
The environment variable is [DATA_COLLECTORS_4D](#).

symbols.4d // defines the symbols. See [Symbols](#)
The environment variable is [SYMBOLS_4D](#).

textstyl.4d // defines the text styles. See [Textstyles and Fonts](#).
The environment variable is [TEXTSTYLES_4D](#).

textstyle_names.4d // defines the textstyle favourites
The environment variable is [TEXTSTYLE_MAPPINGS_4D](#).

toolbars.4d // defines the toolbars See [User Defined Toolbars](#)
The environment variable is [TOOLBARS_4D](#).

userkeys.4d // defines the action of function keys. See [User Defined Function Keys](#)
The environment variable is [FUNCTION_KEYS_4D](#).

usermenu.4d // defines the user defined walk-right menus for User on 12d Model menus. See [User Defined Menus](#).
The environment variable is [USER_OPTIONS_4D](#).

xtramenu.4d // defines the 12d Solutions defined walk-right menus for User on 12d Model menus. See [User Defined Menus](#).
The environment variable is [EXTRA_OPTIONS_4D](#).

The folders searched for Set Up, and the folder search order, is described in the next section [Folders Searched for Set Up Files](#).

Folders Searched for Set Up Files

When *12d Model 10* is installed on a *Windows* computer the major components installed by **12d Solutions** are under the Microsoft preferred installation folder **Program Files**, in the sub folders **12d\12dmodel\10.00**. That is **Program Files\12d\12dmodel\10.00**

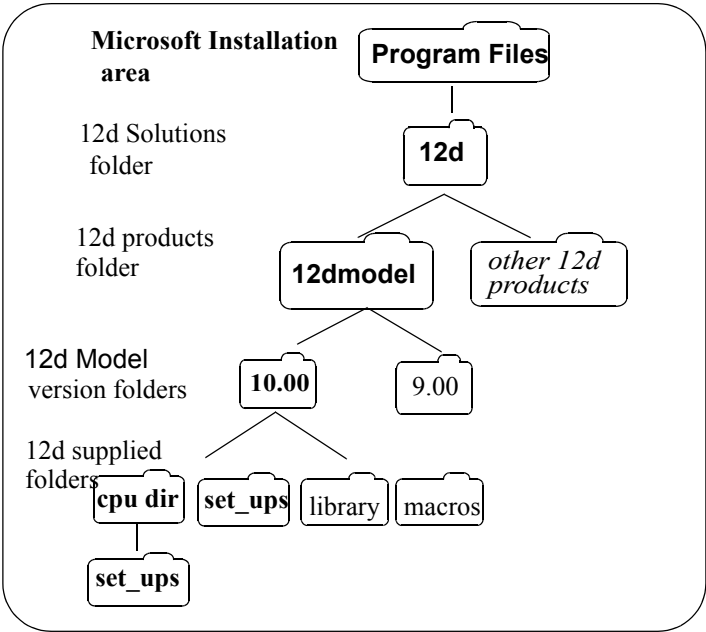
Without Administrator privilege, users do no have access to this area.

Other information that can be accessed and modified by the user, will be installed in the sub folders **C:\12d\10.00** in an area that the user has access to.

The structure of the Set Up folders **Set_ups** and **User** and how the various folders are searched for Set Up files will be described in the following sections.

Set_Ups

The *12d Model* installation creates a number of specific folders such as the operating system-cpu specific folder (for example **nt.x86** for *Windows NT* on *Intel* chips), and areas for **set up files**: namely an o/s-cpu specific **set_ups** under the o/s-specific folder and a **set_ups** under **Program files\12d\12dmodel\10.00**.



It is also possible to move the Set Up folder **Program files\12d\12dmodel\10.00\set_ups** to another location, and even give it another name, by defining an environment variable **SET_UPS_4D** which gives the path of the moved folder

SET_UPS_4D folder // 12d supplied folder of Set Up files

User and Customer_User

Users usually want to customise **12d Model** by modify one or more of the Set Up files but most users do not have written access to the **Program Files** folder, and **Program files\12d\12dmodel\10.00\set_ups**. Also, any files in the **Set_ups** folders may be overwritten by future **12d Model** installations.

To overcome these two problem, there are two special folders (reserved for customers) that are searched **before set_ups** for any Set Up files.

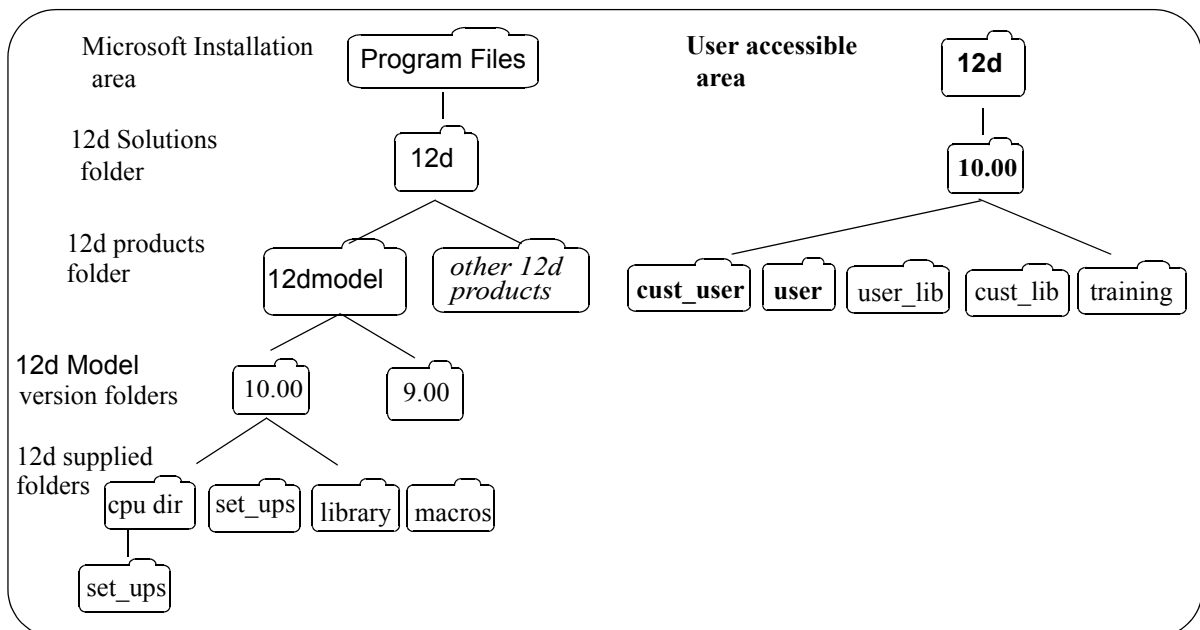
One folder is only looked for when it has been created by a user and is pointed to by the environment variable **CUSTOMER_USER_4D**. It has no default name but is whatever name has been set up for it. We will call it as **Cust_user**.

The other folder has the default name **User**.

The folders **Cust_user** and **User** should **NOT** be under **Program Files** but in **12d\10.0** which at installation time, the installer should have placed in an area that the **12d Model** user has been given read/write access to. The default folder to contain **User** and **Cust_user** is **C:\12d\10.0**

During the **12d Model** installation, if **User** does not exist, an empty **User** folder is created.

The folder **Cust_user** is not created and if required, must be created by the user and the environment variable **CUSTOMER_USER_4D** set up to point to it.



To find a Set Up file, the folder **Cust_user** will be searched for before **User**, and **User** is searched for before **Set_Ups**.

Consequently any modified Set Up files should be placed in **Cust_user** or **User** and then they will be found before the file of the same name in **Set_ups** (**User** may contain o/s-cpu specific folders).

When a new **12d Model** version is issued (e.g. 10), the contents of **Cust_user** and **User** from the previous version of 12d Model (e.g. V9) need to be copied over to the new **Cust_user** and **User** area. This is **NOT** done automatically during the installation in case there are files that need to be modified for the newer version.

There is also an **environment variable USER_4D** which can be set to point to another user defined folder which will be searched for Set Up files **before** the default **User** is searched.

USER_4D

folder

// users own folder for Set Up info

This is a common method for having all users on a network share the same Set Up files. The common files are placed on a disk drive accessible by all the users and the environment variable `USER_4D` defined to point to that folder.

Note - both **User** and the folder pointed to by `USER_4D` can exist.

Current and Home

The folder that a project is in (the **current** folder) and the users **home** folder are also searched for Set Up files.

Searching Order for Set Up Files

When **12d Model** creates a new project, or changes to another project, it searches folders for the Set Up files in a well defined order.

Each Set Up file has a default name, and unless there is an environment variable for that specific Set Up file defining its exact name and path, folders are searched in a specific order until the file is found. The search is begun afresh for each Set Up file so different Set Up files may come from different folders.

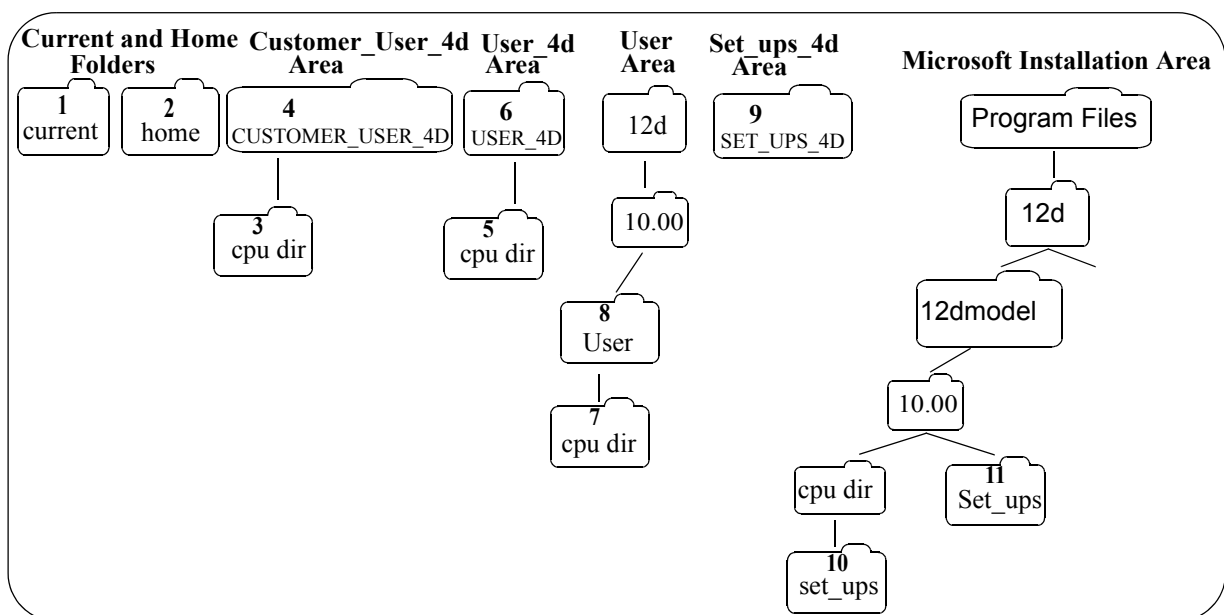
The fixed search order for any Set Up files is

1. check for the appropriate environment variable defining the full path to the **specific** Set Up file.

If the environment variable is not defined, or the file pointed to does not exist, then the folders are searched for in the following order for the specific Set Up file with its default name (e.g. colours.4d)

2. the projects current folder
3. the users home folder
4. specific cpu folder in CUSTOMER_USER_4D
5. file folder defined by CUSTOMER_USER_4D
6. specific cpu folder in USER_4D e.g. nt.x86 for Intel
7. file folder defined by USER_4D
8. specific cpu folder in **User** under **C:\12d\10.00**
9. **User** under **C:\12d\10.00**
10. the folder defined by SET_UPS_4D
11. **Set_ups** folder under the specific cpu folder under **Program Files\12d\12dmodel\10.0**
12. **Set_ups** folder under **Program Files\12d\12dmodel\10.00**

Once the appropriate Set Up file is found, the search is terminated and that, and only that file, is used.



Note

- (a) When an **existing** project is opened by *12d Model*, the Set Up files **setups.4d** and **defaults.4d** are not used. These files are only used for defining a NEW project.
- (b) A Set Up file such as **colours.4d** may exist in one or more of the above folder. However, only the first occurrence of the file found when using the above search order, is used.

Please continue to the next section [Writing Set Up Files](#).

Writing Set Up Files

Most of the Set Up files can be created and edited within 12d Model using panels such as **Defaults** which is accessed via the **Utilities => Defaults** option.

When the **Write** button is selected on these panels, a **Write Setup File** panel comes up to specify where the file is to be written out to.

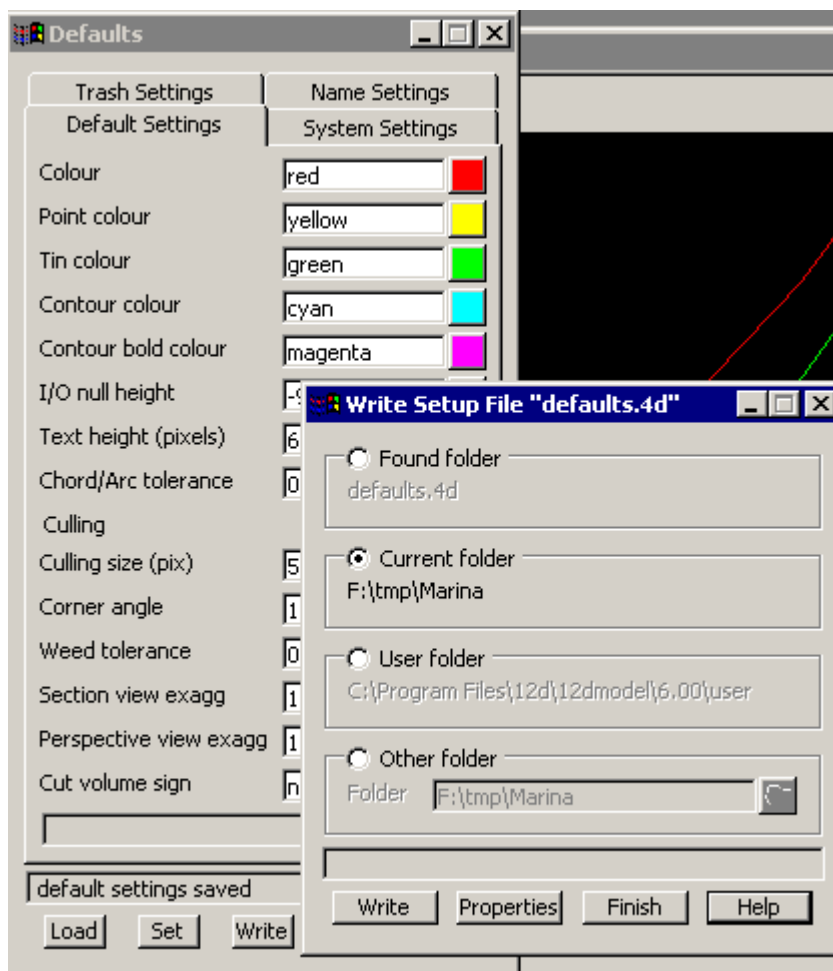
The choices on the panel allow the file to be written out to:

Found folder - the folder where the file currently being used by 12d Model resides. This will be unavailable (greyed out) if the user doesn't have access to the folder.

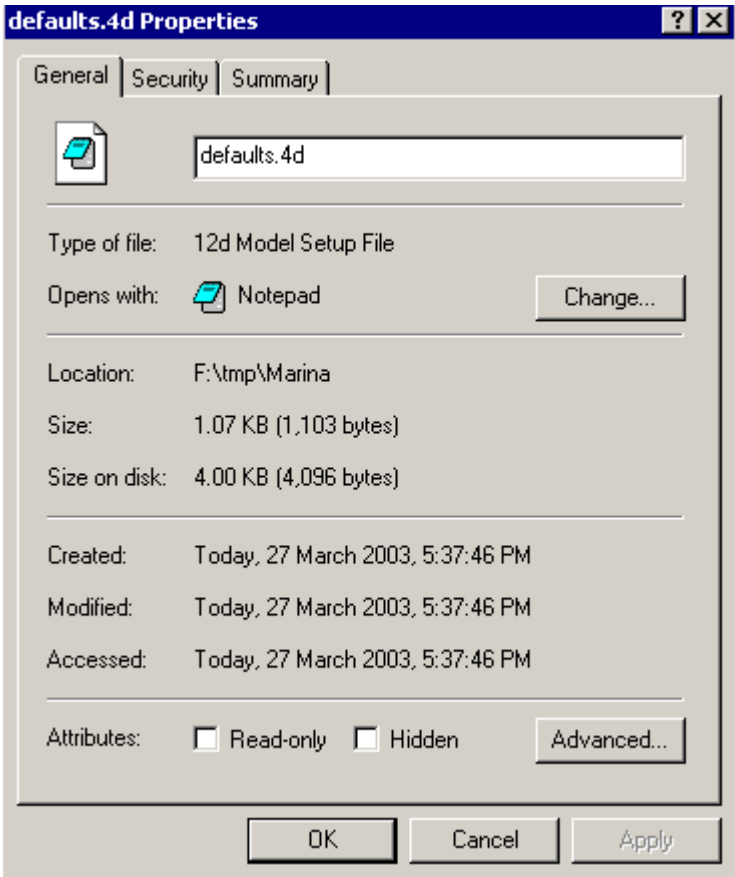
Current folder - the folder where the project currently being used by 12d Model resides. This will be unavailable (greyed out) if the user doesn't have access to the folder.

User folder - the User folder. This will be unavailable (greyed out) if the user doesn't have access to the folder.

Other folder - any folder can be selected.



If you are having problems writing to the file, click on the **Properties** button to bring up the **Properties** panel for the selected file (if it exists) and check the **Security** for the file.



Please continue to the next section [Library, User Library, Customer Library](#).

Library, User Library, Customer Library

Apart from Set Up files which are only accessed when a project is opened or first created, there are two or three special library areas that are searched for files with the appropriate file ending whenever the folder icon at the end of a panel file field is selected. For example, clicking on the folder icon for a **mapping file** panel field would display a list of files ending in **.mf**.

One folder, **Library**, is supplied by *12d Solutions Pty Ltd* and is installed by **12d Model**, and two other folders, **User_Lib** and **Customer_Lib** are not touched in an install and only contains files placed there by users.

Library

In a manner similar to the Set Up folders, the location of **Library** can be modified defining the environment variable

LIB_4D

If the environment variable LIB_4D doesn't exist, or the folder it points to doesn't exist, then the folder **Library** installed by 12d as **Program files\12d\12dmodel\10.00\Library** is used.

The files of the required ending in **library** are listed under the **[Lib]** walk right of pop-ups.

User Library

Because most users do not have write access to **Program files\12d\12dmodel\10.00\Library** and any files in that area may be overwritten by future **12d Model** installation, there is a special user library folder called **User_lib** where user library files should be placed.

The user library, is also a folder and is pointed to by the environment variable

USER_LIB_4D

or if the environment variable USER_LIB_4D or the folder that it points to doesn't exist, in a folder called **User_lib** directly under the user accessible area **C:\12d\10.00**

The files from the User library are listed under the **[User Lib]** walk right of the pop-up.

So unlike the setup files, files in the **12d** supplied area **Library** and the user file in **User_lib**, are all displayed.

Customer Library

There is one more folder that is only looked for when it has been created by a user and is pointed to by the environment variable CUSTOMER_LIB_4D. It has no default name but is whatever name has been set up for it. We will call it as **Customer_lib**.

So the customer library, is also a folder and is pointed to by the environment variable

CUSTOMER_LIB_4D

If the environment variable CUSTOMER_LIB_4D or the folder that it points to doesn't exist, then no Customer Library is used.

The files from the Customer library are listed under the **[Customer Lib]** walk right of the pop-up.

So unlike the setup files, files in the **12d** supplied area **Library** and the users files in **User_lib** and **Customer_lib**, are all displayed.

Note

1. The list of special endings for files is given in the Appendix, Special File Formats.

2. A full list of environment variables is given in the later section [Environment Variables](#).

Please continue to the next section [Environment Variables](#).

Environment Variables

When **12d** Model is invoked for a new or existing project, it uses environment variables to tailor the system.

In Windows, environment variables can be set for each User from the Control Panel, but a much easier method to set the environment variables used by **12d** Model is to include them in a special file which is read in each time a project (new or existing) is opened by **12d** Model.

The environment variables that **12d** Model recognises can be broken into two types - one type where the environment variable is only a flag setting a mode, and a second type which point to a file, program or folder. For the environment variables of the second type, a default file/program is often searched for if the environment variable is not defined.

The folder search order for the default files for the type group of environment variables is given in the previous sections.

The list of environment variables will just be given in alphabetical order but it will be obvious from the documentation which type the environment variable is.

Alphabetical Environmental Variables List

For environment variables that simply set a flag or value is (the default value is shown in bold) the documentation will be:

Variable Name	Value	Description	Default
---------------	-------	-------------	---------

For environment variables that point to a file, program or folder, and their associated default files/programs, the documentation will be:

Environment Variable Name	Type	Default
---------------------------	------	---------

ACAD_SEEDFILES_4D

ACAD_SEEDFILES_4D	folder	no default
-------------------	--------	------------

if non blank, the full path name of the folder holding Autocad template files.

ALIGNMENT_CORRIDOR_FIXUP_4D

ALIGNMENT_CORRIDOR_FIXUP_4D	value 0 or 1	default 1
-----------------------------	--------------	------------------

if non zero, alignment corridor calculations introduced in V8 are used.

If zero, the V7 alignment corridor calculations are used.

ALLOW_ANONYMOUS_FUNCTIONS_4D

ALLOW_ANONYMOUS_FUNCTIONS_4D	value 0 or 1	
------------------------------	--------------	--

if tick, when a file is read with a File input option, a function is automatically created and named. This function must exist to allow data to be added to a view after it is read in, to be able to delete all the data read in at a later time, and to re-run the function to reread the data file and replace the data read in last time.

ALLOW_SUPER_TINS_EXACT_CALCS_4D

ALLOW_SUPER_TINS_EXACT_CALCS_4D	value 0 or 1	
---------------------------------	--------------	--

Options using tins are split into two categories:

- (1) options that require sections through tins
- (2) options that require the triangles of the tin

if ticked, this allows super tins to be used in options where triangles are required for calculations. if not ticked, this prevents super tins to be used in options where triangles are required for

calculations.

Note: ticking this option requires super tins to be updated when a tin within the super tin changes, so there is a time, storage, and memory cost. It was found that some projects only ever required options that used sections (not triangles), so for these type of projects, there is an efficiency gain by turning off this option.

ALLOW_OLD_PLOTTING_4D

ALLOW_OLD_PLOTTING_4D value 0 or 1

If non zero, then a menu **Plot =>Old plotting** is included which has all the old Ascii ppf options.

ALWAYS_VALIDATE_PROJECT_DETAILS_4D

ALWAYS_VALIDATE_PROJECT_DETAILS_4D value 0 or 1

if ALLOW_ANONYMOUS_FUNCTIONS_4D is set to 1, then when a file is read with a File input option, a function is automatically created and named. This function can be used to delete all the data at a later time, to allow the data to be added to a view after it is read in, and to re-run the function to reread in the data file.

AUTHORIZATION_4D

AUTHORIZATION_4D full path name to nodes.4d

The authorization file is normally called **nodes.4d**, and is under the folder c:\12d\12d model\version_number. However, the file name and path can be set by the user with the AUTHORIZATION_4D environment variable.

The full path-name of the file is given.

AUTO_DELETE_WALKRIGHTS_4D

AUTO_DELETE_WALKRIGHTS_4D	0	Use old method from V3.1	32
	<i>pixels</i>	Distance in pixels to move past the end of the last menu before the cascade collapses	

If non zero, the environment variable AUTO_DELETE_WALKRIGHTS_4D sets the distance in pixels that is used to collapse the cascade of walk-right menus when the cursor moves that distance past the end of the last walk-right menu.

The default value is 32.

AUTO_HIDE_PANEL_SELECTS_4D

AUTO_HIDE_PANEL_SELECTS_4D value 0 or 1 *default 1*

if non zero, when the string select icon is picked on a panel, the panel minimises until a string is selected is accepted.

This mode was introduced so that the panel was not in the way when selecting a string. It is particularly useful on tablets with limited screen area.

AUTO_MODEL_SYNC_4D

AUTO_MODEL_SYNC_4D	0	Don't auto sync models	<i>default 0</i>
	1	Auto sync models	

if auto-model sync is set to on, the server projects for any shared models added to this project are checked to see if they have been modified (checked every SHARE_CHECK_INTERVAL seconds). If any models have been modified, they are re-copied to this project.

AUTO_PAN_SELECT_4D

AUTO_PAN_SELECT_4D value 0 or 1 *default 1*

if non zero, if you have accepted but not accepted a string and are zoomed in on the strings and

type **ch value** where the position at that chainage is off the view, the view will autopan so that the new selection point (at chainage value) is on the view. This applies for all typed selects.

AUTO_RESET_SELECT_4D

AUTO_RESET_SELECT_4D	0	Don't use auto-reset reselect
	1	Use auto-reset reselect

The reset mechanism for picking has ben modified for V5.0 and above. Reset is now done automatically if the cursor is moved a user specified distance (given by AUTO_RESET_TOLERANCE_4D) after a pick (without accepting), and a separate user specified distance (given by AUTO_RESET_DRAG_TOLERANCE_4D) after a directional pick (without accepting).

The default value is 1.

AUTO_RESET_SELECT_DRAG_TOLERANCE_4D

AUTO_RESET_SELECT_DRAG_TOLERANCE_4D *value*

Reset distance for directional picks.

If AUTO_RESET_SELECT_4D is non zero, then AUTO_RESET_SELECT_DRAG_TOLERANCE_4D is the distance in pixels to move the cursor to reset the picking rejection list for a directional pick.

The default value is 50.

AUTO_RESET_TOLERANCE_4D

AUTO_RESET_TOLERANCE_4D *value*

Reset distance for non-directional picks.

If AUTO_RESET_SELECT_4D is non zero, then AUTO_RESET_TOLERANCE_4D is the distance in pixels to move the cursor to reset the picking rejection list for a non-directional pick.

The default value is 5.

AUTO_TIN_SYNC_4D

AUTO_TIN_SYNC_4D	0	Don't auto sync tins	<i>default 0</i>
	1	Auto sync tins	

if auto-tin sync is set to on, the server projects for any shared tins added to this project are checked to see if they have been modified (checked every SHARE_CHECK_INTERVAL seconds). If any tins have been modified, they are re-copied to this project.

AUTOCAD_PATTERNS_4D

AUTOCAD_PATTERNS_4D folder no default

if non blank, the full path name of the AutoCAD patterns file.

BISECTORS_4D

BISECTORS_4D	0	Don't use bisector section	<i>default 0</i>
		use two sections instead.	
	1	Use bisector section	

When applying templates to a horizontal intersection point with a sharp change of direction, (that is, it is not an end point and the HIP has no curve on it and there is a change of direction at the HIP), either two sections can be applied at the HIP point (applied perpendicular to the line on either side of the HIP point) or just a single bisector section applied to the bisector of the change of angle through the HIP.

The default value is 0.

BOXING_CONTINUE_ON_FAIL_4D

BOXING_CONTINUE_ON_FAILURE_4D value **0** or 1 *default 0*

if non zero, the boxing stops if there is an error such as not being able to intersect with a tin.
If zero, the boxing stops when an error is found.

BOXING_RULES_COLOUR_4D

BOXING_RULES_COLOUR_4D *colour* *default blue*

the colour of the text in the Type column in the Boxing Rules panel for all Boxing command other than Comment, Decision, Goto and Labels.

BOXING_COMMENT_COLOUR_4D

BOXING_COMMENT_COLOUR_4D *colour* *default yellow*

background colour for the Comment boxing command grid row in the Boxing Rules panel. The text in the grid row is black.

BOXING_DECISION_GOTO_COLOUR_4D

BOXING_DECISION_GOTO_COLOUR_4D *colour* *default mauve*

the colour of the text in the Type column for the Decision and Goto commands in the Boxing Rules panel.

BOXING_LABEL_COLOUR_4D

BOXING_LABEL_COLOUR_4D *colour* *default light red*

the colour of the text in the Type column for the Label command in the Boxing Rules panel.

BOXING_WALL_OFFSET_4D

BOXING_WALL_OFFSET_4D *real* *default 0.000001*

when boxing automatically creates a vertical wall, this is the offset distance between the top and bottom of the vertical wall.

CIVILCAD_PATH_4D

CIVILCAD_PATH_4D folder no default

if non blank, the full path name of the folder holding CivilCAD files.

There is no default.

COLOURS_4D

COLOURS_4D filename default colours.4d

file of colour rgb definitions and names. See [Colours File](#).

The default is colours.4d.

CONSTRUCTION_SNAP_MODEL_4D

CONSTRUCTION_SNAP_MODEL_4D model name

If non blank, the model to use for objects created during construction snaps.

CUBED_CHARACTER_4D

CUBED_CHARACTER_4D *integer (base 10)* *default 179*

The integer (base 10) value of the character to use as the cubed symbol.

CUSTOMER_LIB_4D

CUSTOMER_LIB_4D folder name no default name

if the environment variable exists and the folder exists, then the folder is available when selecting a library file (see [Library](#), [User Library](#), [Customer Library](#)).

There is no default folder name.

CUSTOMER_USER_4D

CUSTOMER_USER_4D folder name no default name

if the environment variable exists and the folder exists, then the folder is part of the search for locating setup files (see [Set Up Files](#)).

There is no default folder name.

CUT_HEIGHT_ZONE_COLOUR_4D

CUT_HEIGHT_ZONE_COLOUR_4D colour default dark red

the colour of the text in the *Type* column for the *Cut* commands involving height, in the *Modifiers* section of the *Left/Right Template Modifiers panel*.

CUT_WIDTH_ZONE_COLOUR_4D

CUT_WIDTH_ZONE_COLOUR_4D colour default light red

the colour of the text in the *Type* column for the *Cut* commands involving width, in the *Modifiers* section of the *Left/Right Template Modifiers panel*.

CUT_SLOPE_ZONE_COLOUR_4D

CUT_SLOPE_ZONE_COLOUR_4D colour default dark red

the colour of the text in the *Type* column for the *Cut* commands involving slope, in the *Modifiers* section of the *Left/Right Template Modifiers panel*.

CUT_ZONE_COLOUR_4D

CUT_ZONE_COLOUR_4D colour default red

the colour of the text in the *Type* column for the *Cut* commands (other than those involving width, height or slope) in the *Modifiers* section of the *Left/Right Template Modifiers panel*.

DATA_COLLECTOR_4D

DATA_COLLECTOR_4D data collect name

the data collector that is used if no data collector is set for a project.

There is no default.

DATA_COLLECTORS_4D

DATA_COLLECTORS_4D filename default survey.4d

file of definitions of available data collectors

The default is survey.4d.

DATA_TIPS_4D

DATA_TIPS_4D	0	Don't show data tips
	1	Show data tips

When non zero, data tips are displayed when the cursor moves over vertices in a plan view.

The default value is 0.

DECISION_ZONE_COLOUR_4D

DECISION_ZONE_COLOUR_4D colour default green

the colour of the text in the *Type* column for the *Decision* commands in the *Modifiers* section of the *Left/Right Template Modifiers panel*.

DEBUG_DONGLE_ACCESS_4D

DEBUG_DONGLE_ACCESS_4D positive integer
time between searches for a dongle

DEFAULTS_4D

DEFAULTS_4D filename default defaults.4d
file of defaults - only used for new project
The default is defaults.4d. See [Defaults File](#).

DEFAULT_PLAN_PLOT_SCALE_4D

DEFAULT_PLAN_PLOT_SCALE_4D *value*
value is the scale (1:*value*) for new plan views
If a value is given, then it is used the default scale for any new plan view created in a project.
Note that the scale is used in the plan view for displaying text, linestyles and symbols that have been defined in paper units.

DEFAULT_RASTER_DPI_4D

DEFAULT_RASTER_DPI_4D *real_dots_per_inch*
default dots per inch to use for plotting rasters
The default value is 150.0

DEFAULT_TABLE_WIDTH_4D

DEFAULT_TABLE_WIDTH_4D *number_of_characters* *default 32*
Gives the number of characters displayed in tables such as decisionals and mtf editor.
The default value is 32.

DEFAULT_VIEW_COLOUR_4D

DEFAULT_VIEW_COLOUR_4D *colour_number* *default 0*
The default background colour for views.

DEGREES_CHARACTER_4D

DEGREES_CHARACTER_4D *integer (base 10)* *default 176*
The integer (base 10) value of the character to use as the degrees symbol.

DGN_PLOT_SEED_FILE_4D

DGN_PLOT_SEED_FILE_4D filename
if non blank, the full path name of the file to use as a seed file for Microstation plots.

DIAMETER_LARGE_CHARACTER_4D

DIAMETER_LARGE_CHARACTER_4D *integer (base 10)* *default 216*
The integer (base 10) value of the character to use as the large diameter symbol.

DIAMETER_SMALL_CHARACTER_4D

DIAMETER_SMALL_CHARACTER_4D *integer (base 10)* *default 248*
The integer (base 10) value of the character to use as the small diameter symbol.

DIGITIZERS_4D

DIGITIZERS_4D filename *default digitize.4d*
file of digitizer definitions
The default is digitize.4d. See [Digitizer Definitions File](#).

DISABLE_MTF_WARNINGS_4D

DISABLE_MTF_WARNINGS_4D	0	Display the mtf warnings in the text editor
	1	Write mtf warnings to the background window

Controls whether the mtf warnings go to a file or to the output window.

If non zero, write mtf warnings to the background window

If zero, display the mtf warnings in the text editor.

The default value is 0.

DONGLE_4D

The environment variable can have a number of parameters to control the use of Hardlock network and stand alone dongles.

(a) DONGLE_4D -local OR -no_local

usually used when there is a network dongle and need to know if any stand alone Hardlock dongle is to be looked for on the computer that the user is on.

if **-local**, then a stand alone Hardlock dongle is looked for on the computer the user is on.

If **-no local**, then no stand alone Hardlock dongle is looked for on the computer the user is on.

For example DONGLE_4D - local or -no local

(b) DONGLE_4D -no network OR -network first OR -network last

need to specify if any network Hardlock network dongle is to be looked for.

if **-no network**, then no Hardlock network dongle is looked for.

If **-network first**, then a Hardlock network dongle is looked for before a stand alone local dongle.

If **-network last**, then a Hardlock network dongle is looked for after looking for a stand alone local dongle.

For example DONGLE_4D -no_network or - network_first or -network_last

(c) DONGLE_4D -login_retries number of retries to find a Hardlock dongle

the number **nn** of retries to make when searching for a Hardlock dongle and it is not found.

For example DONGLE_4D -login_retries 3

(d) DONGLE_4D -login_wait ss

the number of seconds **ss** to wait between retries to find a network Hardlock dongle.

For example DONGLE_4D -login_wait 5

(e) DONGLE_4D -no_dongle

if the parameter -no_dongle is found, then no search is made for a Hardlock dongle.

For example DONGLE_4D -no_dongle

(f) DONGLE_4D -debug

if the parameter -debug is found, then Hardlock dongle debug information is written to the

For example DONGLE_4D -debug

See the separate notes on installing a network dongle for more details.

DONGLE_ORDER_4D

DONGLE_ORDER_4D choice box Hardlock/Wibu, Wibu/Hardlock

the order to search for network dongles.

If **Wibu/Hardlock**, then Wibu networks dongles are searched for before any Hardlock dongles.

If **Hardlock/Wibu**, then Hardlock networks dongles are searched for before any Wibu dongles.

All new dongles are Wibu so most **12d Model** sites now only have Wibu dongles.

DOUBLE_CONFIRM_DELETE_4D

DOUBLE_CONFIRM_DELETE_4D	0	Confirm deletes/cleans without undos once
	1	Confirm deletes/cleans without undos twice

Controls whether or not the user is asked once or twice to confirm that deletes and cleans that do not have undos are to be done.

If non zero, the user is asked twice to confirm for deletes and cleans.

If zero, the user is asked once to confirm for deletes and cleans.

The default value is 1.

DRAINAGE_4D

DRAINAGE_4D	filename	default drainage.4d
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file of definitions for the drainage option

The default is drainage.4d.

DRAINAGE_PPF_4D

DRAINAGE_PPF_4D	<i>full path name of .ppf file</i>	no default
-----------------	------------------------------------	------------

Points to the file used as the default plot parameter file (.ppf) for the panel **New Plot Drainage Network**.

The path name to the .ppf file can contain \$LIB which expands out to the path of the library area. For example, **\$LIB/drainage.ppf** points to the file drainage.ppf in the area defined by \$LIB_4D.

DRAINAGE_FLOW_DIR_4D

DRAINAGE_FLOW_DIR_4D	0	Flow direction is opposite to the string direction
	1	Flow direction is the same as string direction

Defines the default flow direction used in the creating a drainage string.

The environment variable DRAINAGE_FLOW_DIR_4D specified whether the default flow direction that appears in the **Create Drainage String** panel is that the flow direction in the line is in the same direction as the direction of the drainage string (ascending chainage) or that the flow direction in the drainage line is in the opposite direction to the direction of the drainage string (descending chainage).

If non zero, the drainage flow direction is the same as the string direction.

If zero, the drainage flow direction is in the opposite direction to the string direction.

The default value is 0.

DWG_PLOT_SEED_FILE_4D

DWG_PLOT_SEED_FILE_4D	filename
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if non blank, the full path name of the file to use as a template file for AutoCAD plots.

DWG_PLOT_UNIT_FILE_4D

DWG_PLOT_UNIT_FILE_4D	English OR Metric
-----------------------	-------------------

if non blank, the units to use for AutoCAD files.

EDIT_BOX_WIDTH_IN_CHARACTERS_4D

EDIT_BOX_WIDTH_IN_CHARACTERS_4D	<i>number</i>	<i>default 10</i>
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if non blank, the number of characters to make the width of an Edit Box on a panel.

EDITOR_4D

EDITOR_4D	script/program	10.00\cpu_area\te
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the script or program that is fired up when a report is created. It usually points to an editor.

The default is **10.00\cpu_area\te.**

ENVIRONMENT_

It is possible to set all the environment variables from a file normally called **env.4d**. The environment variable file is searched for in the standard Set Up areas (local, USER_4D, user, set_ups) or is set by the environment variable ENVIRONMENT_4D.

The format of the environment variable file is given in the section [Setting Environment Variables](#).

EXTRA_OPTIONS_

The default is xtramenu.4d. See [User Defined Menus](#)

EXTRA_START_EXTRA_END_

The default value is 1.

EXTRUSIONS

The default is `extrusions.4d`.

FAST ACCEPT

FAST CONSTRUCTION SNAP

The default value is 0.

FLD IGNORE EXTERA WORDs 4

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If non zero, trailing tabs are not considered words in a field file. Mainly for Leica when it is writing a format file which can't suppress trailing tabs when writing a 12d Field file.

The default value is 0.

FILE_READ_ADD_TO_VIEW_4D

FILE_READ_ADD_TO_VIEW_4D choice box

if anonymous function are set, the data created by the File input option can be added to a view. The choices are:

Do nothing - don't add the data read in to any view

Add to current view - add the data read in to the current view (the current view is the view that highlighted)

Add to new view - automatically create a new view and add the data read in to that view

Add to named view - add the data read in to the view given by

FILE_READ_ADD_TO_VIEW_NAME_4D

FILE_READ_ADD_TO_VIEW_NAME_4D

FILE_READ_ADD_TO_VIEW_NAME_4D text box

name of the view to use if FILE_READ_ADD_TO_VIEW_4D is set to **Add to named view**.

If the view does not exist then it is created.

FILL_HEIGHT_ZONE_COLOUR_4D

FILL_HEIGHT_ZONE_COLOUR_4D colour default dark green

the colour of the text in the *Type* column for the *Fill* commands involving height, in the *Modifiers* section of the *Left/Right Template Modifiers panel*.

FILL_WIDTH_ZONE_COLOUR_4D

FILL_WIDTH_ZONE_COLOUR_4D colour default light green

the colour of the text in the *Type* column for the *Fill* commands involving width, in the *Modifiers* section of the *Left/Right Template Modifiers panel*.

FILL_SLOPE_ZONE_COLOUR_4D

FILL_SLOPE_ZONE_COLOUR_4D colour default dark green

the colour of the text in the *Type* column for the *Fill* commands involving slope, in the *Modifiers* section of the *Left/Right Template Modifiers panel*.

FILL_ZONE_COLOUR_4D

FILL_ZONE_COLOUR_4D colour default green

the colour of the text in the *Type* column for the *Fill* commands (other than those involving width, height or slope) in the *Modifiers* section of the *Left/Right Template Modifiers panel*.

FINAL_CUT_SLOPE_ZONE_COLOUR_4D

FINAL_CUT_SLOPE_ZONE_COLOUR_4D colour default black

the colour of the text in the *Type* column for the *Final* command for Final Cut slope, in the *Modifiers* section of the *Left/Right Template Modifiers panel*.

FINAL_FILL_SLOPE_ZONE_COLOUR_4D

FINAL_FILL_SLOPE_ZONE_COLOUR_4D colour default black

the colour of the text in the *Type* column for the *Final* command for Final Fill slope, in the *Modifiers* section of the *Left/Right Template Modifiers panel*.

FINAL_NO_CUT_SLOPE_ZONE_COLOUR_4D

FINAL_NO_CUT_SLOPE_ZONE_COLOUR_4D colour default black

the colour of the text in the *Type* column for the *Final* command for No Cut slope, in the *Modifiers* section of the *Left/Right Template Modifiers* panel.

FINAL_NO_CUT_FILL_SLOPE_ZONE_COLOUR_4D

FINAL_NO_CUT_FILL_SLOPE_ZONE_COLOUR_4D colour default dark brown

the colour of the text in the *Type* column for the *Final* commands for No cut/fill, in the *Modifiers* section of the *Left/Right Template Modifiers* panel.

FINAL_NO_FILL_SLOPE_ZONE_COLOUR_4D

FINAL_NO_FILL_SLOPE_ZONE_COLOUR_4D colour default black

the colour of the text in the *Type* column for the *Final* command for No Fill slope, in the *Modifiers* section of the *Left/Right Template Modifiers* panel.

FINAL_WIDTH_ZONE_COLOUR_4D

FINAL_WIDTH_ZONE_COLOUR_4D colour default light brown

the colour of the text in the *Type* column for the *Final* commands involving width, in the *Modifiers* section of the *Left/Right Template Modifiers* panel.

FINAL_ZONE_COLOUR_4D

FINAL_ZONE_COLOUR_4D colour default brown

the colour of the text in the *Type* column for the *Final* commands (other than those involving width or slope) in the *Modifiers* section of the *Left/Right Template Modifiers* panel.

FIXED_HEIGHT_ZONE_COLOUR_4D

FIXED_HEIGHT_ZONE_COLOUR_4D colour default dark blue

the colour of the text in the *Type* column for the *Fixed* commands involving height, in the *Modifiers* section of the *Left/Right Template Modifiers* panel.

FIXED_WIDTH_ZONE_COLOUR_4D

FIXED_WIDTH_ZONE_COLOUR_4D colour default light blue

the colour of the text in the *Type* column for the *Fixed* commands involving width, in the *Modifiers* section of the *Left/Right Template Modifiers* panel.

FIXED_XFALL_ZONE_COLOUR_4D

FIXED_XFALL_ZONE_COLOUR_4D colour default dark blue

the colour of the text in the *Type* column for the *Fixed* commands involving xfall, in the *Modifiers* section of the *Left/Right Template Modifiers* panel.

FIXED_ZONE_COLOUR_4D

FIXED_ZONE_COLOUR_4D colour default blue

the colour of the text in the *Type* column for the *Fixed* commands in the *Modifiers* section of the *Left/Right Template Modifiers* panel.

FONTS_4D

FONTS_4D filename default fonts.4d

font definitions

The default is fonts.4d. See [Textstyles and Fonts](#)

FULL_HYDRAULIC_REPORT_4D

FULL_HYDRAULIC_REPORT_4D 0, 1 default 0

The rational hydraulic report contains hydrology data.

If non zero, the hydrology calculations for each catchment set (1 to 3) are written to the hydraulic report.

FUNCTION_KEYS_4D

FUNCTION_KEYS_4D filename default userkeys.4d

function key definitions

The default is userkeys.4d. See [User Defined Function Keys](#)

GENIO_WILDCARD_4D

GENIO_WILDCARD_4D text default *.mos

Sets the ending of the files selected for the pop-up list for the **File** field in the **Read Genio Data** panel.

The default value is "*.mos".

GUI_4D

GUI_4D **Standard** default Standard

Non Standard

Defines the mouse button usage within 12d Model.

The default value is *Standard*.

GUI_COLOURS_4D

GUI_COLOURS_4D filename default gui.4d

file of colour definitions used in the GUI

The default is gui.4d. See [GUI](#)

HARDLOCK_4D

HARDLOCK_4D 1, 0

if non zero, search for 12d Hardlock dongles.

If zero, don't search for Hardlock dongles

HARDWARE_ARCS_4D

HARDWARE_ARCS_4D 1 Use hardware arcs default 1

0 Hardware arcs are not used

if non zero, use computer hardware to draw arcs (rather than software).

If zero, draw arcs in software

The default value is 1.

HEIGHT_MAX_DEFAULT_4D

HEIGHT_MAX_DEFAULT_4D integer (world units) default 0

set the default value to use in Plan Settings panels that have a **Height max (w)** field.

HELP_4D

HELP_4D folder default 10.00\help

folder containing the 12d Model help files.

The default is **10.00\help**.

HELP_BUTTONS_4D

HELP_BUTTONS_4D 0 Disable help buttons on panels

1 Enable help buttons on panels.

If non zero, **Help** buttons are added to panels.

The default value is 0.

HIMETRIC_4D

HIMETRIC_4D	0	Printer resolution of 0.04 mm - for Win 95,98,ME	default 0
	1	Printer resolution of 0.01 mm - for Win NT, 2000, XP	

For Windows 95, 98 and ME, the printer resolution can only be 0.04 mm when covering an A0 sheet.

Under Windows NT, 2000 and XP, no such restriction exists and the full resolution of 0.01 mm can be used so the environment variable HIMETRIC_4D allows access to the higher resolution for Windows NT, 2000 and XP.

The default value is 0.

See also [WINDOWS_PRINTERS_4D](#) for enabling access to Windows printers.

HLS_IPADDR

HLS_IPADDR list of IP addresses and/or computer names

if **non blank**, a list of IP addresses and/or computer names to search for a 12d Hardlock network dongle. The items in the list are separated by commas

If **blank**, search the entire network for a 12d Hardlock network dongle

HOME_4D

HOME_4D	folder	three folder levels up from where 12d.exe is
---------	--------	-------------------------------------------------

12d Model home folder

INTERPRET_DMS_INPUT_OLD_4D

INTERPRET_DMS_INPUT_OLD_4D	0, 1
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if non zero, the special case of 0.mms is interpreted as mm minutes and s seconds. That is, 0.123 is interpreted as 12 minutes and 3 seconds.

If zero, the special case of 0.mms is interpreted as mm minutes and 10 x s seconds. That is, 0.123 is interpreted as 12 minutes and 30 seconds.

LABEL_PVC_150_PIPES_4D

LABEL_PVC_150_PIPES_4D	0, 1	default 1
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If non zero, the 150 PVC pipes are labelled on the drainage long section.

If zero, the 150 PVC pipes are not labelled on the drainage long section.

LAYOUT_FILE_4D

LAYOUT_FILE_4D	filename	default layout.4d
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a file containing the screen layout file information (slx/slf) for placing menus or panels on the screen. The layout file is used each time a project is opened to place the menus and panels in it on the screen. See [Screen Layout File](#) in the appendix [Special File Formats](#).

The default is layout.4d.

LIB_4D

LIB_4D	folder	HOME_4D\10.00\library
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12D Solutions library folder for input files such as mapping, template and macros (4DML's).

The default is **HOME_4D\10.00\library**.

LINESTYLE_BOX_HEIGHT_4D

LINESTYLE_BOX_HEIGHT_4D *value*

If non blank, the pixel height of the linestyle and symbol scrolling pop-ups.

The default is 512

LINESTYLE_BOX_WIDTH_4D

LINESTYLE_BOX_WIDTH_4D *value*

If non blank, the pixel width of the linestyle and symbol scrolling pop-ups.

The default is 256

LINESTYLE_DUPLICATE_MODE_4D

LINESTYLE_DUPLICATE_MODE_4D choice box

This environment variable manages what to do if symbols or linestyles with the same name are read from the symbols.4d or linstyle.4d file

Do nothing - accept all instances of symbols/linestyles of the same name

Take first - accept only the first instance of the symbol/linestyle

Take last - accept only the last instance of the symbol/linestyle

LINESTYLES_4D

LINESTYLES_4D filename default linestyl.4d

file of linestyle definitions

The default is linestyl.4d. See [Line Styles](#)

LIST_POPUPS_4D

LIST_POPUPS_4D	1	Pop-up lists as scrolling lists
	0	Pop-up lists as menus (as in versions up to V3.2)

Defines the look of pop-up lists.

If non zero, the popup lists are scrolling lists.

If zero, the pop-ups are menus which turn into walk-right menus when the list is too long.

The default value is 1.

LOOK3D_4D	1	3D look and greenish background	default 1
	0	Original 12d gui colours	

The default value is 1.

LOG_DIR_4D

LOG_DIR_4D folder-path-name default is local folder

An error log file is created each time 12d Model is invoked. The error log name automatically created by 12d Model and has the form:

log?????.4de

where ?????? is a hashed number using your login name, process id & the current time.

The **folder** that the error log file is created in is given by the environment variable LOG_DIR_4D. The full path-name of the folder is given.

If LOG_DIR_4D is not used, 12d Model tries to create the log file in the current folder, the HOME folder, the TMP folder and the TEMP folder.

If creating an error log file fails in all these ares, 12d Model does not create an error log file.

LONG_SECTION_PPF_4D

This environment points to the file used as the default plot parameter file (.ppf) for the panel **section long plot**.

ACRO_INPUT_MODE_4D

Controls whether or not the value passed down in the variable to receive the answer for any macro prompt, is actually placed into the console panel as the default answer so that it can be accepted by just typing <enter> into the console panel.

MAXIMUM_TRASH_SIZE_4D

the maximum number of Mb that the size of the trash file can be.

If the value is 0, the Trash Bin is **not** limited in size.

DDLE DOT CHARACTER 4D

The integer (base 10) value of the character to use as the squared symbol.

MODEL_FOR_TIN_PREFIX_4D

This environment variable is used to customize the default model for the tin in the panels for creating triangulations. Text can be defined for prepending and/or appending to tin name to create a default model name from the tin name.

The text for prefixing and postfixing is given in a special form: **pre-text*post-text**

If pretext only, just give the text. If post text is required, precede it by a "*".

MODEL_VIEW_WALKRIGHTS_4D

Defines whether the Data source field is used instead of model/view walk-rights used in V3.2.

MOVIE_4D

X-Windows only - program for running perspective movie

S_SEEDFILES_4D

if non blank, the full path name of the folder of Microstation seed files.

TF_TMP_4D

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If defined, then the temporary files for mtf calculations go to the Windows temp folder. This is to get over a bug in Novell under Windows 95.

MULTI_LINE_TEXT_4D

MULTI_LINE_TEXT_4D *value 0 or 1* *default 0*

If non zero, a Text Edit Box is used instead of the Input Box and more than one line of text can be typed into the Text Edit Box.

NAME_MAPPINGS_4D

NAME_MAPPINGS_4D *filename* *default names.4d*

A mapping file can be specified which is used to fill out information such as colour, model etc. for given string names.

The mapping works in two ways. After typing part or all of a string name,

- (a) if <enter> is entered, the map file is searched for a match in the first column.
If a match is found, the name, colour, model, style etc. from the other columns in the mapping file are used to fill out the panel fields.
- (b) if a <tab> is entered, the second column is searched for a list of completions (if a * is found, the first column is used for that check) which are displayed in a pop-up. When an entry is selected from the completion list, the name, colour, model, style etc. from the columns in the mapping file are used to fill out the panel fields.
- (c) mapping file are used to fill out the panel fields.

NEVER_SNAP_ITSELF_4D

NEVER_SNAP_ITSELF_4D **1** try to stop a string snapping to itself during editing
 0 let a string snap to itself - behaviour in V3.2

Tries to stop a string snapping to itself during editing.

The default value is 1.

NEW_DRAINAGE_PPF_4D

NEW_DRAINAGE_PPF_4D *full path name of binary ppf file* no default

Points to the file used as the default binary plot parameter file (.drainppf) for the long section plot produced by the panel **Drainage Plot PPF Editor**.

The path name to the binary ppf file can contain \$LIB which expands out to the path of the library area. For example, **\$LIB/drainage_long.drainppf** points to the file drainage_long.drainppf in the area defined by \$LIB_4D.

NEW_DRAINAGE_MELB_PPF_4D

NEW_DRAINAGE_MELB_PPF_4D *full path name of binary ppf file* no default

Points to the file used as the default binary plot parameter file (.melbppf) for the long section plot produced by the panel **Sewer Plot Melbourne Water PPF Editor**.

The path name to the binary ppf file can contain \$LIB which expands out to the path of the library area. For example, **\$LIB/melb_water.melbppf** points to the file melb_water.melbppf in the area defined by \$LIB_4D.

NEW_DRAINAGE_PLAN_PPF_4D

NEW_DRAINAGE_PLAN_PPF_4D *full path name of binary ppf file* no default

Points to the file used as the default binary parameter file (.drainplanppf) for the plan annotation produced by the panel **Drainage Plan Plot PPF Editor**.

The path name to the binary ppf file can contain \$LIB which expands out to the path of the library area. For example, **\$LIB/drainage_plan.drainplanppf** points to the file drainage_plan.drainplanppf in the area defined by \$LIB_4D.

NEW_LONG_SECTION_PPF_4D

NEW_LONG_SECTION_PPF_4D *full path name of binary ppf file* no default

Points to the file used as the default binary plot parameter file (.lplotppf) for the long section plot produced by the panel **Section Long Plot PPF Editor**.

The path name to the binary ppf file can contain \$LIB which expands out to the path of the library area. For example, **\$LIB/long_section.lplotppf** points to the file long_section.lplotppf in the area defined by \$LIB_4D.

NEW_MTF_EDITOR_AUTOPAN_DEFAULT_4D

NEW_MTF_EDITOR_ZOOM_BUFFER_4D 0, 1 *default 1*

if non zero, the default for Autopan is **on** for the MTF **Left/Right Template Modifiers** panel.

if zero, the default for Autopan is **off** for the MTF **Left/Right Template Modifiers** panel.

NEW_MTF_EDITOR_DEFAULT_HEIGHT_4D

NEW_MTF_EDITOR_DEFAULT_HEIGHT_4D *real_value*

real_value is the height in pixels of the MTF **Left/Right Template Modifiers** panel.

The default value is 250

NEW_MTF_EDITOR_DEFAULT_WIDTH_4D

NEW_MTF_EDITOR_DEFAULT_WIDTH_4D *real_value*

real_value is the width in pixels of the MTF **Left/Right Template Modifiers** panel.

The default value is 750

NEW_MTF_EDITOR_ZOOM_BUFFER_4D

NEW_MTF_EDITOR_ZOOM_BUFFER_4D *real_value*

real_value is a percentage.

if *Autopan* is on for the MTF **Left/Right Template Modifiers** panel, then when a command is clicked on in the panel and the region to pan into is not displayed on the view, then the extent displayed is the required amount increased by the *real_value* percentage.

The default value is 5

NEW_PIPELINE_PPF_4D

NEW_PIPELINE_PPF_4D *full path name of binary ppf file* no default

Points to the file used as the default binary pipeline plot parameter file (.pipelineppf) for the long section plot produced by the panel **Pipeline Plot PPF Editor**.

The path name to the binary ppf file can contain \$LIB which expands out to the path of the library area. For example, **\$LIB/pipeline_long_section.pipelineppf** points to the file pipeline_long_section.pipelineppf in the area defined by \$LIB_4D.

NEW_PLOT_FRAME_PPF_4D

NEW_PLOT_FRAME_PPF_4D *full path name of binary ppf file* no default

Points to the file used as the default binary parameter file (.plotframeppf) for the plan plot produced by the panel **Plot Frame PPF Editor**.

The path name to the binary ppf file can contain \$LIB which expands out to the path of the library area. For example, **\$LIB/plot_frame.plotframeppf** points to the file plot_frame.plotframeppf in the area defined by \$LIB_4D.

NEW_TOOLBARS_VISIBLE_4D

NEW_TOOLBARS_VISIBLE_4D 1, 0 *default*

if non zero, when a project starts up, all the toolbars are checked to see if they are listed in the workspace (visible or invisible) and if the toolbar does not exist, then the toolbar will be displayed.

This is to allow any new toolbars added to toolbars.4d to be automatically displayed so that the user knows that it exists.

if zero, then new toolbars are not displayed. That is, only toolbars listed in the workspace (visible) are displayed.

NEW_X_SECTION_PPF_4D

NEW_X_SECTION_PPF_4D *full path name of binary ppf file* *no default*

Points to the file used as the default binary plot parameter file (.xplotppf) for the cross section plots produced by the panel **Section X Plot PPF Editor**.

The path name to the binary ppf file can contain \$LIB which expands out to the path of the library area. For example, **\$LIB/cross_section.xplotppf** points to the file cross_section.xplotppf in the area defined by \$LIB_4D.

NVALUES_4D

NVALUES_4D filename default nvalues.4d

This points to the file which is used as the file of n value definitions. These are described in [N values](#) and the editing of the n values file is documented in [Create/Edit N-Values](#).

The default is nvalues.4d.

OPENGL_CACHE_4D

OPENGL_CACHE_4D *value 0 or 1* *default 1*

If non zero, rasters and textures are cached in the graphics card memory for potential speed ups. More memory in the graphics card allows more caching and usually more performance gains.

OPENGL_CACHE_TINS_4D

OPENGL_CACHE_TINS_4D *value 0 or 1* *default 0*

If non zero, tins are cached in the graphics card memory for potential speed ups. More memory in the graphics card allows more caching and usually more performance gains.

OPENGL_MIPMAP_4D

OPENGL_MIPMAP_4D *value 0 or 1*

If ticked, the graphics card down samples for rasters when the image is further away.

Default value is 1.

OPENGL_MIPMAP_BILLBOARDS_4D

OPENGL_MIPMAP_BILLBOARDS_4D *value 0 or 1*

If ticked, the graphics card down samples for billboards when the image is further away.

OPENGL_MIPMAP_PLAN_IMAGES_4D

OPENGL_MIPMAP_PLAN_IMAGES_4D *value 0 or 1* *default 1*

If ticked, the graphics card down samples plan images when draped onto a tin.

OPENGL_MIPMAP_PROJECTOR_IMAGES_4D

OPENGL_MIPMAP_PROJECTOR_IMAGES_4D *value 0 or 1* *default 1*

If ticked, the graphics card down samples projector images (a projector is for the "hidden" perspective image data object of a super string).

OPENGL_OFFSET_4D

OPENGL_OFFSET_4D value 0 or 1 default 1

If non zero, the coordinates are localised for OpenGL calls. This is to work around problems with some graphics cards that can't handle large coordinates.

OPENGL_VIEW_BACKING_STORE_4D

OPENGL_VIEW_BACKING_STORE_4D value 0 or 1

if 1, a backing store is used.

if 0, a backing store is not used.

For Window Vista/Windows 7, the default is 1. Otherwise the default is 0.

ONSCREEN_KEYBOARD_4D

ONSCREEN_KEYBOARD_4D value 0, 1 or 2

if 0, then no onscreen keyboard comes up when you double click in a panel field.

if 1, when you double click in a panel field that takes typed input, then a dockable onscreen keyboard come up for the user to type the data for the panel field into.

if 2, when you double click in a panel field that takes typed input, then a full screen onscreen keyboard come up for the user to type the data for the panel field into.

The default is 0.

ONSCREEN_KEYBOARD_FONT_SIZE_4D

ONSCREEN_KEYBOARD_FONT_SIZE_4D *number*

if non blank, the pixel size of the font for the onscreen keyboard.

If blank, it defaults to the normal system font size.

The default is the normal system font size.

ONSCREEN_KEYBOARD_LAYOUT_4D

ONSCREEN_KEYBOARD_LAYOUT_4D value 0, or 1

if 0, then when there is an onscreen keyboard, it comes up with a full keyboard.

if 1, then when there is an onscreen keyboard, it comes up with just a numeric keyboard.

The default is 0.

OVERFLOWING_TRASH_MODE_4D

OVERFLOWING_TRASH_MODE_4D choice box *default* Auto manage

the action to take when the trash bin exceeds the maximum trash bin size.

If **Auto manage**, the oldest files in the trash bin are deleted until the new item can fit in the trash bin.

if **Auto empty**, files in the trash bin are deleted.

Note - if a large model or tin is deleted and it is bigger than the maximum trash bin size, the user is alerted and asked to decide if they want the element to go in the trash bin anyway, or if they want to permanently delete it.

The default value is Auto manage.

PAN_MODE_4D

PAN_MODE_4D	0	Use standard pan for pan, pans on views
	1	Use pan deltas for pan, pans on views

Sets whether pan or pan delta is used for the pan and pans buttons on views.

The default value is **0**.

PDF995_TIME_LIMIT_4D

PDF995_TIME_LIMIT_4D *number*

the number of seconds to wait for PDF995 to finish producing the current PDF file.

PLAN_TABLE_SETTINGS_4D

PLAN_TABLE_SETTINGS_4D	0	Don't allow setting by model
	1	Allow setting by model

Trial only - allow the drawing of z-values, vertices etc. on the plan view to be set by individual models rather than for all models on the view.

The default value is 0.

PLOTTER_4D

PLOTTER_4D script/program no default

This environment variable points to a script/program which can be fired up whenever a plot is generated. The name of the plot is given as the first script parameter of the script.

If the parameter **Send plots** on the 'System Settings' tab of the menu option **Utilities => Defaults** is set to **yes**, the plotter script is run as each plot is created.

If more than one plot is created by an option (e.g. x plot) then the script is called separately for each of the plots.

An example of a script to send the plot to port lpt1 for Windows NT would be

```
@echo off
copy %1 lpt1
```

An example for Windows NT which looks for hp files is

```
@echo off
echo.
echo -----
:next_file
if "%1" == "" goto done
echo %1 | find /I ".hp" > nul
if ERRORLEVEL 0 if not ERRORLEVEL 1 goto hp_plotter
echo Plotting file %1
shift
goto next_file
:hp_plotter
echo Plotting %1 to HP plotter
shift
goto next_file
:done
echo -----
```

PLOTTER_MAPPING_4D

PLOTTER_MAPPING_4D filename default pmf.4d

This points to the file which is used as the default plotter mapping file. The format for the plotter mapping file is described in the section [Mapping Colours to Plotter Pens](#) in the Appendix [Setting Up and Configuring 12d](#).

The default is pmf.4d.

PLOTTERS_4D

PLOTTERS_4D filename default plotters.4d

This points to the file which contains user defined plotters. The format for the file of user defined plotters is described in the section [User Defined Plotters](#) in the Appendix [Setting Up and](#)

[Configuring 12d.](#)

The default is plotters.4d.

PLOT_SYMBOLS_4D

PLOT_SYMBOLS_4D filename default plotsymb.4d

Points to the file used to define the symbols used in long and cross section plots.

The default is plotsymb.4d.

POLYPOLYLINES_4D

POLYPOLYLINES_4D	0	Don't use speed ups	<i>default 2</i>
	1	Intermediate speed ups	
	2	Faster speed ups.	

A few experimental techniques are available for speeding up the drawing on the screen.

For some specific things such as fast contours, fast mesh and point crosses, the techniques can result in some redraws being up to three times faster.

The default env.4d shipped with **12d Model** has this set to 2.

PREVIEW_VIEW_4D

PREVIEW_VIEW_4D *text*

if non blank, the name of the view whose image is dumped on exiting the project. The image is used as the project preview.

If blank then the last active view is used.

PRINTER_4D

PRINTER_4D script/program no default

Points to a script or program which can be fired up whenever a report is generated. The name of the report is given as the first parameter of the script.

If the parameter **Print reports** on the 'System Settings' tab on the menu option **Utilities => Defaults** is set to **yes**, the printer script is run as each report is created.

PROJECT_DETAILS_4D

PROJECT_DETAILS_4D file name

If non blank, the full path name of the file of project details file to use for new projects.

PROJECT_NAMES_4D

PROJECT_NAMES_4D	0	Use long filenames for internal files	<i>default</i>
	1	Use short names (8.3 format)	

The use of long or short extension names for internal 12d Model files for items such as models, tins, templates etc. is controlled by the environment variable PROJECT_NAMES_4D.

Opening a new project with the short name format, project-name.4dp, will automatically create a short name project (i.e. a project using the short extension names - 3 characters after the .).

The default value is 0.

PROJECTIONS_4D

PROJECTIONS_4D filename default carto.4d

This points to the file which is used as the file of projections. These are described in [Projections](#) and the editing of the projections file is documented in [Create/Edit Projection](#).

The default is carto.4d.

PROMPT_ON_VIEW_CLOSE_4D

PROMPT_ON_VIEW_CLOSE_4D 0, 1

If non zero, when a view is closed/deleted, a prompt asks for a confirmation of deleting/closing.
If zero, no confirmation is requested when a view is closed/deleted.
The default is 0.

PURGE_TRASH_DAYS_4D

PURGE_TRASH_DAYS_4D *number_of_days* *default 0*

number_of_days is a positive integer and is the number of days before the Trash Bin is automatically purged of tins and models.
If *number_of_days* is zero, the Trash Bin is **not** purged.
The default value is 0.

RECENT_PROJECTS_4D

RECENT_PROJECTS_4D positive integer default 20

The maximum number of accessed projects displayed in the Projects list when 12d Model starts up.

REPORT_HEADER_4D

REPORT_HEADER_4D	0	Report files have no header page
	1	Some header information is used
	2	A full header page is produced. <i>default 2</i>

Controls the amount of header information in reports.
For the cases 1 and 2, the header information includes

- (a) the 12d Model Project
 - (b) the name of the user
 - (c) the organization
 - (d) the current date
 - (e) the current report file name
- The default value is 2.

RUN_MACROS_FILE_4D

RUN_MACROS_FILE_4D filename default macros.4d

if non blank, the full pathname of the file of macros (one per line) that are run when a new project is created.
Note: This is only run for new projects. RUN_PROJECT_MACROS_FILE_4D is run when opening an existing project.
The default is macros.4d

RUN_PROJECT_MACROS_FILE_4D

RUN_PROJECT_MACROS_FILE_4D filename default project_macros.4d

if non blank, the full path name of the file of macros (one per line) that are run when an existing project is opened.
Note: This is only run when opening existing projects. RUN_MACROS_FILE_4D is run when creating a new project.
The default is project_macros.4d

SETUPS_FILE_4D

SETUPS_FILE_4D filename default setups.4d

file setting up the initial screen layout for new projects. This is not to be confused with SET_UPS_4D which is where the standard Set Up files are installed. See [SETUPS_FILE_4D](#).

The default is setups.4d. See [Setups File](#).

SET_UPS_4D

SET_UPS_4D folder HOME_4D\10.00\set_ups

folder for storing the standard Set Up files installed by 12D Solutions.

The default is **HOME_4D\10.00\set_ups**.

SEWER_PPF_4D

SEWER_PPF_4D path name to .ppf file no default

points to the file used as the default plot parameter file (.ppf) for the panel **new plot sewer network**.

SHARE_CHECK_INTERVAL_4D

SHARE_CHECK_INTERVAL_4D positive integer *default 0*

if non zero, the number of seconds between checks to see if any of the shared tins or models added to the project have been modified.

SHARED_ELEMENT_COLOUR_4D

SHARED_ELEMENT_COLOUR_4D colour default blue

the colour to use in a list of tins/models for showing shared tins/models. That is, the tins/models that have been added to the project as shared tins/models are shown in this colour.

Setting the colour to black will disable this feature.

SHARING_ELEMENT_COLOUR_4D

SHARING_ELEMENT_COLOUR_4D colour default rgb 255,165,0

the colour to use in a list of tins/models for showing the tins/models in the project that you are allowing to be shared. That is, those tins/models in the project that the user has allowed others to share are shown in this colour.

Setting the colour to black will disable this feature.

SHARE_LOCKS_FOLDER_4D

SHARE_LOCKS_FOLDER_4D folder default no folder

if non blank, the full path name of the folder used to keep lock files for shares.

If no folder is given, the locking files are stored inside the project.

SHARE_MAP_FILE_4D

SHARE_MAP_FILE_4D filename default blank

if non blank, the full path name of the map file to be applied to shared models.

SHEET_SIZES_4D

SHEET_SIZES_4D filename default sheets.4d

For plot frames, long and x plots, the overall size of the plot sheet can be given by a pop-up containing defined sheet size.

The sheet size name and width and heights can be specified by the user in a file named sheets.4d which is in the normal Set Up areas, or is pointed to by the environment variable SHEET_SIZES_4D.

The default is sheets.4d. See [Sheet Sizes File](#).

The default value is 1.

SYMBOLS_4D

SYMBOLS_4D filename default symbols.4d

Points to the file used to define the symbols used for super strings.

The default is symbols.4d.

SYSTEM_NAMES_4D

SYSTEM_NAMES_4D	1	Only use the longer names
	2	Only use the 8.3 file names
	3	Use short names first then look for a long name.

For file name compatibility with DOS 8.3 format, the default names for all Set Up files can be restricted to just short names (8.3), long names, or short and then long.

The default value is 3.

TRANSFORMATIONS_4D

TRANSFORMATIONS_4D filename default 7params.4d

This points to the file which is used as the file of seven parameter transformations. These are described in [7 Parameters](#) and the editing of the transformations file is documented in [Create/Edit 7 Parameters](#).

The default is 7params.4d.

TEXTSTYLE_MAPPINGS_4D

TEXTSTYLE_MAPPINGS_4D filename default textstyle_names.4d

file of textstyles favourites definitions

The default is textstyle_names.4d

TEXTSTYLES_4D

TEXTSTYLES_4D filename default textstyl.4d

file of textstyles definitions

The default is textstyl.4d. See [Textstyles and Fonts](#).

TEXTURE_MAP_4D

TEXTURE_MAP_4D filename default texture_map.4d

This points to the file which defines the tables of texture mappings. These are described in [Texture Map Edit](#).

The default is texture_map.4d.

TICK_DRAW_CROSS_4D

TICK_DRAW_CROSS_4D	0	Nothing for off
	1	Cross for off

The default value is 0.

TIN_VIEWPORT_CLIP_4D

TIN_VIEWPORT_CLIP_4D	0	Drawing tins, fast contours as per V3.1
	1	A speed up for drawing tins, fast contours

Use some experimental techniques for speeding up the drawing of tins, fast contours.

The env.4d file shipped with **12d Model** has this set to 1.

TOOLBAR_DUPLICATE_MODE_4D

TOOLBAR_DUPLICATE_MODE_4D choice box

This environment variable manages what to do if toolbars with the same name are read from a *toolbars.4d* file. The choices are

Do nothing - accept all toolbars of the same name

Take first - accept only the first instance of the toolbar

Take last - accept only the last instance of the toolbar

TOOLBARS_4D

TOOLBARS_4D filename default toolbars.4d

file of toolbar definitions and names

The default is toolbars.4d. See [User Defined Toolbars](#)

TP_STAKEOUT_PATH_4D

TP_STAKEOUT_PATH_4D folder no default

if non blank, the full path name of the folder of TP Stakeout files.

TYPED_UNITS_MODE_4D

TYPED_UNITS_MODE_4D	0	International units only e.g. f and F are both International fee
	1	USA units only e.g. f and F are both US feet
	2	Mixed e.g. f is International feet and F is US feet.

Controls the typed input units for feet - international and/or US

The default value is 0.

UNDO_4D

UNDO_4D	0	Don't allow undo's	
	1	Allow undo/redos	default 1

Undo and Redo is available for most operations from 12d Model V3.1 onwards. The availability of Undo/Redo facility is controlled by the environment variable:

The default value is 1.

USE_BACKUPS_4D_FOLDER_4D

USE_BACKUPS_4D_FOLDER_4D 0, 1 default 1

If non-zero: in the places where 12d Model creates a backup file when a new file is created (using the file endings 1, 2, ... for the old file) then the backup file is placed in the folder *backups.4d*.

Backups are created for options such as env.4d editor, mtf editor, boxing editor, survey.4d editor, whenever the "Write Setup File(s)" is displayed, plus the macro calls *Backup_version_file* and *Restore_version_file*.

The *backups.4d* folder is created in the project working folder (that is, in the folder containing the *.project* folder).

USE_DENSITY_CHECKS_4D

USE_DENSITY_CHECKS_4D	0	Don't do density checks	
	1	Do density checks	default 1

If non zero then for a new project, the default for **Use density drawing** in the **Defaults** panel is **tick**.

If zero then for a new project, the default for **Use density drawing** in the **Defaults** panel is **no tick**.

For more information on **density drawing**, see [Use density drawing tick box](#) in the chapter [Projects](#).

Note: This setting is only applicable to the 250M version of **12d Model**.

USE_NEW_LINestyle_LIST_BOX_4D

USE_NEW_LINestyle_LIST_BOX_4D value 0, 1

If non zero, the linestyle and symbol pop-up lists are in scrolling boxes so they don't run over the bottom of the screen. The list of linestyles/symbols is displayed in a tree structure with the Groups as the nodes of the tree.

If zero, the linestyle and symbols lists are one long list with each Groups being an item in the list. The list may get too long to fit on the screen.

The default value is 1.

USAGE_LOG_4D

USAGE_LOG_4D folder *no default*

when set, log files of the form

<log file folder>\(<dongle> <user> <computer> <time stamp> <process ID>).log)

will be created in the given folder.

That is, the log files will all be in the one folder.

USAGE_LOGS_4D

USAGE_LOGS_4D folder *no default*

when set, log files of the form

<log file folder>\<dongle>\<user>\<computer>\(<time stamp> <process ID>).log)

will be created in the given folder.

That is, the log files will be in subfolders \dongle\<user>\<computer>.

USE_ALL_USERS_PROFILE_4D

USE_ALL_USERS_PROFILE_4D 0, 1

If no-zero then the file env.4d and the folders user and user_lib are looked for in **Documents and Setting\All Users**.

USE_TRASH_BIN_4D

USE_TRASH_BIN_4D	0	Don't use the Trash Bin	<i>default 1</i>
	1	Use the Trash Bin	

The Trash Bin is used to store copies of deleted tins and models, and cleaned models. The items can be retrieved from the Trash Bin. The Trash Bin is automatically purged of contents after PURGE_TRASH_DAYS_4D.

The default value is 1.

USE_VALIDATION_COLOURS_4D

USE_VALIDATION_COLOURS_4D *value 0 or 1* default 1

If 1, when a panel field fails to validate, the panel field is filled with the colour given by

USER_4D

USER_4D folder HOME_4D\10.00\user

user folder containing Set Up files

The default is **HOME_4D\10.00\user**.

USER_LIB_4D

USER_LIB_4D folder HOME_4D\10.00\user_lib

user library folder for input files such as mapping, template and macros (4DML's).

The default is **HOME_4D\10.00\user_lib**.

USER_OPTIONS_4D

USER_OPTIONS_4D file default usermenu.4d

To help customise 12d Model, the walk-right menu **User** on the main 12d Model menu, can be user defined. The text for each button of **User**, plus the action taken when the button is selected is user specified. Any of the buttons can include further walk-right menus.

The definitions for the menus on **User**'s is given in the file *usermenu.4d* which is searched for in the standard Set Up areas (local, USER_4D, user, set_ups) or set by the environment variable USER_OPTIONS_4D.

if USER_OPTIONS_4D is blank, usermenu.4d is searched for in the standard search path for *User* files.

if USER_OPTIONS_4D is not blank, then it is used as the full path name of the user supplied file of definitions for user defined menus.

The default is usermenu.4d. See [User Defined Menus](#)

V7_TITLE_BLOCKS_4D

V7_TITLE_BLOCKS_4D value 0 or 1 default 1

if non zero, the title block file is in 12d Ascii format.

If zero, the title block is in the pre V7 title block .tf format

VALIDATION_FAIL_COLOUR_4D

VALIDATION_FAIL_COLOUR_4D text

If not blank, the colour to fill the panel field with when there is a validation error for the field. The *text* is either a colour name, a colour number or RGB(x,y,z).

This is only used if USE_VALIDATION_COLOURS_4D is non zero (or at least not set to zero since the default is one).

If blank, the default colour is RGB(255,72,72),

VEHICLE_PATH_4D

VEHICLE_PATH_4D folder no default

The DOS Version of Vpath is no longer supported.

The environment variable VEHICLE_PATH_4D points to the folder where the Dos version of the Vpath executable is located. Note that WINDOWS_VEHICLE_PATH_4D points to the Windows version.

VIEW_BITMAP_BUTTONS_4D

VIEW_BITMAP_BUTTONS_4D	0	User text for view buttons
	1	Use icons for view buttons

The default value is 1

VIEW_BUTTONS_4D

VIEW_BUTTONS_4D	0	No view buttons are displayed
	1	The view buttons are displayed

If non zero, then menu items (view buttons) are displayed on the views (as icons or text).

If zero, menu items (view buttons) are not displayed on the views.

The default value is 1

Note: displaying *view buttons* as icons or text is controlled by VIEW_BITMAP_BUTTONS_4D

WARP_CURSOR_HIDE_4D

WARP_CURSOR_HIDE_4D	0	Don't hide the cursor before moving it
	1	Hides the cursor before moving it

Controls whether the cursor is hidden before moving - only needed on some computers.

If non zero, don't hide the cursor before moving it.

If zero, hides the cursor before moving it.

The default value is 0.

WEB_SEARCH_4D

WEB_SEARCH_4D	search engine web address	www.google.com
---------------	---------------------------	----------------

web address of the search engine that is fired up from the 12d option

Help =>12d on the Web =>Search the web.

WEED_TOLERANCE_4D

WEED_TOLERANCE_4D	0	Don't weed
	real	Weed tolerance

used in Alignment and Super strings so that when arcs have been chord-to-arc'd, the resulting points are weeded so that no point is closer than the weed tolerance. Is is also used in Apply and Apply Many so that no cross sections are closer than the weed tolerance.

WIBU_4D

WIBU_4D	1, 0
---------	------

if non zero, search for 12d Wibu dongles.

If zero, don't search for Wibu dongles

WIBU_DONGLE_4D

The environment variable can have a number of parameters to control the use of Wibu network and stand alone dongles.

(a) WIBU_DONGLE_4D -local OR -no_local

usually used when there is a network dongle and need to know if any stand alone Wibu dongle is to be looked for on the computer that the user is on.

if **-local**, then a stand alone Wibu dongle is looked for on the computer the user is on.

If **-no local**, then no stand alone Wibu dongle is looked for on the computer the user is on.

For example WIBU_DONGLE_4D - local or -no local

(b) WIBU_DONGLE_4D -no network OR -network first OR -network last

need to specify if any network Wibu network dongle is to be looked for.

if **-no network**, then no Wibu network dongle is looked for.

If **-network first**, then a Wibu network dongle is looked for before a stand alone local dongle.

If **-network last**, then a Wibu network dongle is looked for after looking for a stand alone local dongle.

For example WIBU_DONGLE_4D -no_network or - network_first or -network_last

(c) WIBU_DONGLE_4D -login_retries number of retries to find a Wibu dongle

the number **nn** of retries to make when searching for a Wibu dongle and it is not found.

For example WIBU_DONGLE_4D -login_retries 3

(d) WIBU_DONGLE_4D -login_wait ss

the number of seconds **ss** to wait between retries to find a network Wibu dongle.

For example WIBU_DONGLE_4D -login_wait 5

(e) WIBU_DONGLE_4D -no_dongle

if the parameter -no_dongle is found, then no search is made for a Wibu dongle.

For example WIBU_DONGLE_4D -no_dongle

(f) WIBU_DONGLE_4D -debug

if the parameter -debug is found, then Wibu dongle debug information is written to the

For example WIBU_DONGLE_4D -debug

See the separate notes on installing a network dongle for more details.

WIBU_IPADDR

WIBU_IPADDR list of IP addresses and/or computer names

if **non blank**, a list of IP addresses and/or computer names to search for a 12d Wibu network dongle. The items in the list are separated by commas

If **blank**, search the entire network for a 12d Wibu network dongle

WINDOWS_PRINT_MODE_4D

WINDOWS_PRINT_MODE_4D value

value is an integer representing "bit mask".

If **bit 1** set (contributes 1 to value): Windows 2000/XP print dialog means PrintDlgEx otherwise if bit 1 is not set, then PrintDlg.

if **bit 2** set (contributes 2 to value): Use exclusive access to the printer to force direct printing to the printer (may need Printer admin access)

if **bit 3** set (contributes 4 to value): Use an intermediate print file so that printing is first done to a file and then that file is submitted to the printer

So the legal values are from 0 to 7

WINDOWS_PRINTERS_4D

WINDOWS_PRINTERS_4D	0	Don't allow Windows printers
	1	Enable Windows printers

The default value is 1.

WINDOWS_VEHICLE_PATH_4D

WINDOWS_VEHICLE_PATH_4D folder no default

if non blank, the full path name of the folder where the Windows program Vpath is located.

Note - Vpath is the Vehicle Turning Path program written by Queensland Department of Transport and Main Roads that is provided free of charge.

WINTER_4D

WINTER_4D path name to WINTER program

12d Model no longer uses the external Winter program and so this environment variable is no longer used.

Points to the WINTER program for calculation N-values for Australia.

WINTER_DATA_4D

WINTER_DATA_4D folder no default

Folder containing the Winter data of N-values for Australia.

WINTER_USE_NEW_METHOD_4D

WINTER_USE_NEW_METHOD_4D value 0, 1 default 1

if tick, re-reading the Winter data is avoided and this speeds up the calculation for the Winter interpolations.

WORKSPACE_FILE_4D

WORKSPACE_FILE_4D path name

if non blank, the full path name of the workspace file for new projects.

WRITE_ALL_PLOT_PARAMETERS_4D

WRITE_ALL_PLOT_PARAMETERS_4D 0 Only write out the plot parameters
that are used in the ppf.
1 Write out all plot parameters to a ppf file

Controls whether all plot parameters are written out to a ppf file or just those that have been used in the ppf file.

The default value is 1.

X_SECTION_PPF_4D

X_SECTION_PPF_4D path name to .ppf file no default

points to the file used as the default plot parameter file (.ppf) for the panel **section X** plot.

The path name to the .ppf file can contain \$LIB which expands out to the path of the library area. For example, **\$LIB/cross.ppf** points to the file cross.ppf in the area defined by \$LIB_4D.

ZOOM_ORIGIN_DYNAMIC_4D

ZOOM_ORIGIN_DYNAMIC_4D 0 The centre of the view is the zoom centre point
1 The point you pick is the zoom centre point

Controls the origin of the dynamic zoom.

If non zero then the point selected in the view to indicate which view to dynamically zoom (and to be the zoom-in, zoom-out definition point) becomes the point to dynamically zoom about. Whilst the dynamic zoom is running, another point can be selected to become the new zoom origin.

The default value is 0.

ZOOM_PAN_DYNAMIC_4D

ZOOM_PAN_DYNAMIC_4D 0 Dynamic pan is not the default
1 Dynamic pan is the default for pan

If non zero then **dynamic pan** is the default for the pan options. The middle mouse button (or 'd') is not required to place the pan option in dynamic mode. In fact, it would then toggle it off.

The default value is 0.

Notes

- If any of the environment variables (pointing to files) are not set, or the file pointed to does not exist, then 12d Model searches for the default files in a number of locations. The search order is given at the beginning of this Appendix.
- The eagle pen mapping file, **eagleplt.emf** is also searched for in the same order as the default files.
- When an **existing** project is opened by 12d Model, the setups.4d and defaults.4d are not used.

Please continue to the next section [Setting Environment Variables](#).

Setting Environment Variables

The simplest method for setting the required environment used in 12d Model is to place them into a file, called the environmental file (default name env.4d).

Environment Variables File

It is possible to define a file which sets the value for one or more environment variables.

The file format consists of one line for each environment variable being set and each line contains the environment variable name, followed by one or more spaces and then the value for the environment variable:

```
environment_variable_name      value
```

The value of any environment variable given in the environment variable file **overrides** any other definition for that environment variable.

The file used as the environmental variable file is checked for in the following order - as soon as a file is found, the search terminates and that file is used:

1. as a command line argument when 12d Model is fired up. The syntax is

```
12d -env path_name
```

where path_name is the full path name of the file

2. pointed to by the environment variable ENVIRONMENT_4D

```
ENVIRONMENT_4D      file           // file of environment variables
                                // default env.4d
```

3. a file called **env.4d** which is searched for in the standard Set Up areas (local, USER_4D, user, set_ups).

An example of an environment variable file is

```
EDITOR_4D           te           // set the text editor used
SHOW_PATHS_4D       1           // show file names set by environment variables
SHEET_SIZES_4D      c:\standards\shfile
```

Setting Environment Variables not in a File

Environment variables can be set in **Windows NT** for a user from the *Environment* tab on the *System Properties* panel brought up by clicking on the *System* icon in the *Control Panel* of Windows.

To bring up the *Control Panel*, click on *Start* in the Windows Task bar, walk right on *Settings* and then click on *Control Panel*.

Please continue to the next section [Setups File](#).

Setups File

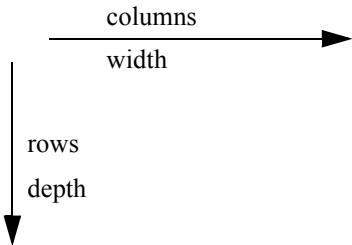
The St Up file, **setups.4d**, is used to define the initial screen set-ups. It can be used for

- s the system font used for text
- s the size of the initial window
- s the position of the main menu, header menu, function menu, function recalc menu, snaps menu, volumes menu, geometry menu, sewer menu, pipeline menu
- s the position of the screen message box, xyz message box
- s the position of the **save project** panel (now redundant)
- s the position, size, name and viewing parameters for the initial views

The co-ordinate system used for specifying the position of the left hand top corner of items on the screen is by column and row. For items which include an area of the screen (such as the window and views), a width and depth are also specified.

The column value is measured from the left hand size of the screen and the row value is measured from the top of the screen.

The units for row, column, width and depth are screen pixels.



Note - If any views are defined in the set_up_file, then the position of the **screen message box** must be also be defined and it must be **before** the definition of any view.

The format of the commands in the file setups.4d is

WINDOW	<i>column_value</i>	<i>row_value</i>	<i>width</i>	<i>depth</i>	// main window
MAIN MENU		<i>column_value</i>		<i>row_value</i>	
FUNCTION MENU		<i>column_value</i>		<i>row_value</i>	
FUNCTION RECALC MENU		<i>column_value</i>		<i>row_value</i>	
GEOMETRY MENU		<i>column_value</i>		<i>row_value</i>	
PIPELINE MENU		<i>column_value</i>		<i>row_value</i>	
SEWER MENU		<i>column_value</i>		<i>row_value</i>	
SURVEY MENU		<i>column_value</i>		<i>row_value</i>	
VOLUMES MENU		<i>column_value</i>		<i>row_value</i>	
SNAPS MENU		<i>column_value</i>		<i>row_value</i>	
SNAPS BUTTONS HORIZONTAL		<i>column_value</i>		<i>row_value</i>	
SNAPS BUTTONS VERTICAL		<i>column_value</i>		<i>row_value</i>	
PROJECT SAVE PANEL		<i>column_value</i>		<i>row_value</i>	
// Views					
PLAN VIEW	<i>column_value</i>	<i>row_value</i>	<i>width</i>	<i>depth</i>	<i>name</i>

SECTION VIEW	<i>column_value</i>	<i>row_value</i>	<i>width</i>	<i>depth</i>	<i>name</i>
PERSPECTIVE VIEW	<i>column_value</i>	<i>row_value</i>	<i>width</i>	<i>depth</i>	<i>name</i>
reference point	0.0	750.0	120.0	// x y z	
view plane normal	1.0	0.0	0.0	// dx dy dz	
view up vector	0.0	0.0	1.0	// dx dy dz	
view distance	10.0			// distance	
PERSPECTIVE OPENGL VIEW	<i>column_value</i>	<i>row_value</i>	<i>width</i>	<i>depth</i>	<i>name</i>
reference point	0.0	750.0	120.0	// x y z	
view plane normal	1.0	0.0	0.0	// dx dy dz	
view up vector	0.0	0.0	1.0	// dx dy dz	
view distance	10.0			// distance	

The following parameters were used for V5.00 but are ignored for V5.0 onward:

SCREEN MESSAGE BOX	<i>column_value</i>	<i>row_value</i>
XYZ MESSAGE BOX	<i>column_value</i>	<i>row_value</i>

Please continue to the next section [Colours File](#).

Colours File

12d Model allows the use of up to 10,240 distinct colours for drawing in any view.

The colours are numbered from 0 to 10,239 and the user defines the red, green and blue mix (RGB) for each colour and what name is used throughout the program when referring to the colour.

The colour names and RGB mix associated with each colour number is defined in the file **colours.4d**.

The format for each line of the *colours.4d* file is:

red_value green_value blue_value pen_num col_name col_num pop-up_num col_group

Each colour is defined in terms of its red, green and blue intensity (RGB). The intensity value is between 0 and 255, where 0 represents no colour and 255 full colour. The RGB values for the colour are *red_value*, *green_value* and *blue_value*.

When plotting, the **default plotter pen number** used to plot a colour is given in the file as *pen_num*. The pen number is an integer that is positive or zero.

The actual **colour name** used to describe the colour is given in quotes after the default plotter pen number - *col_name*. Colour names can be alphanumeric although upper and lower case are considered the same. Each colour must have a unique colour name. If an underscore "_" is used in a colour name in the *colours.4d* file then a space is inserted in 12d Model. The colour name must be enclosed within quotes. For example, "dark red".

The **colour number** is what is actually stored in 12d Model and it is given after the colour name - *col_num*. A colour number is an integer that is positive or zero. Colour numbers can only occur once in the *colours.4d* file but there can be gaps in the colour numbers.

The **colour pop-up number**, *pop-up_num* is the next item in the *colours.4d* file.

The colour pop-up number is an integer that can be negative, zero or positive. Colour pop-up numbers can only occur once in the *colours.4d* file but there can be gaps in the colour pop-up numbers.

The *colour pop-up number* is used to decide which colours are should in the Colour box. If *Display colours* is set to *n* in *Utilities => Defaults*, then the colours with the *n* smallest pop-up numbers are displayed in the Colour box pop-up. So the order that the colours are chosen to appear in the colour pop-up is independent of the colour number.

The **colour group**, *col_group*, is the last item in the *colours.4d* file. The colour group is simply text and does not have to be unique. The colour group is enclosed in quotes. For example, "vis".

The colour group is not currently used in 12d Model but is expected to be used to group colours together in a colours pop-up.

The *colours.4d* file is displayed and modified by using the **Edit Colours** panel brought up from the [Edit] item on the colours pop-up, *Select Colour*. For more information, go to the section [Colours](#) in the Chapter [Tools and Concepts](#).

Please continue to the next section [Defaults File](#).

Defaults File

The **defaults** file, **defaults.4d**, defines the initial default settings used in the 12d Model **default** and the **systems defaults** panels.

The **defaults** file can contain:

```
// general defaults

DEFAULT COLOUR                      red
DEFAULT POINT COLOUR                yellow
DEFAULT TIN COLOUR                  brown
DEFAULT CONTOUR COLOUR              cyan
DEFAULT CONTOUR INDEX COLOUR        magenta
DEFAULT TEXT SIZE                    8

// view settings

DEFAULT CULLING OFF/ON
DEFAULT CULLING SIZE                1.0
DEFAULT SECTION VIEW EXAGGERATION    10.0
DEFAULT PERSPECTIVE VIEW EXAGGERATION 1.0

DEFAULT FAST TEXT CULL SIZE          4.5    // if not specified assumes 4.5
DEFAULT NONE TEXT CULL SIZE          2.0    // if not specified assumes 2.0

// highlighting

DEFAULT ANGLE MODE                   BEARINGS/DEGREES
DEFAULT HIGHLIGHT COLOUR             white
DEFAULT HIGHLIGHT CROSS COLOUR       yellow
DEFAULT HIGHLIGHT CROSS SIZE         2.0

// drawing points

DEFAULT CHORD ARC TOLERANCE          0.1
DEFAULT POINT CROSS SIZE MMS         2.0
DEFAULT POINT CROSS SIZE PIXELS      3

// trash model and mode

DEFAULT TRASH MODEL                  model_name    // model for trash
DEFAULT TRASH MODE                   trash string  // send used strings to trash
                                      delete string // delete used strings
                                      keep string   // keep used strings

// miscellaneous

DEFAULT NAME SETTINGS                file_name    // names.4d file

The information panel for each editor can be toggled on/off and the initial state when a new edit
operation is begun is given by

DEFAULT EDIT INFORMATION              1           // show info panel on editor start-up
                                      0           // don't show info panel
```

When output report are created, the scripts/programs pointed to by **EDITOR_4D** and **PRINTER_4D** will be run depending on the values of the defaults **display reports** and **print reports**.

DEFAULT DISPLAY REPORT FILES	1	// run EDITOR_4D
	0	// don't run "
DEFAULT PRINT REPORT FILES	1	// run PRINTER_4D
	0	// don't run "

Similarly when plots are created, the script/program pointed to by PLOTTER_4D and will be run depending on the value of the default **send plots**.

DEFAULT SEND PLOT FILES	1	// run PLOTTER_4D
	0	// don't run "

The number of minutes between displays of the **save project** yes-no box is given by

DEFAULT SAVE INTERVAL	minutes	// 0 for never
-----------------------	---------	----------------

The file defining string colours can have up to 10,240 colours in it however this number is usually inconvenient to display in the standard colour pop-up so there is a setting to set how many colours are displayed from the list.

DEFAULT POPUP COLOURS	number_of_colours	// default 16
-----------------------	-------------------	---------------

The precision for displaying real numbers in the information panel and in boxes and panel fields can be set.

DEFAULT PRECISION	integer	// info panel - default 3
DEFAULT BOX PRECISION	integer	// boxes & panels -default 4

The sign for cut areas and volumes can be positive or negative (fill is the opposite) and is given by

DEFAULT CUT VOLUME SIGN	-1	// negative for cut (default)
	1	// positive for cut

Text in text string, 4d strings and linestyles may be in pixels and must be given a millimetre size for plotting. Pixel text is multiplied by a factor to convert it to a millimetre size. The pixels to mm plot

DEFAULT PIXELS TO MM PLOT FACTOR	real	// default 1.0
----------------------------------	------	----------------

Please continue to the next section [GUI](#).

GUI

Note - this section is only for versions earlier than V4.0

The file **gui.4d** defined the colours used for screen objects (the graphical user interface objects), screen fonts, maximum pop-up length, and spacing in the menus and panels.

The gui.4d file is read every time a project (new or old) is opened.

GUI Colours

The colours associated with each screen object are given in terms of intensity values of red, green and blue. The intensity values are between 0 and 255, where 0 represents no colour and 255 full colour.

The layout for screen colours in the gui.4d file is:

// object	RGB values- red	green	blue	
VIEW BACKGROUND COLOUR	0	0	0	// black
VIEW BORDER COLOUR	255	255	0	// yellow
BUTTON HIGHLIGHT COLOUR	255	255	0	// yellow
BUTTON TEXT COLOUR	127	127	127	// grey
BUTTON BACKGROUND COLOUR	60	60	200	// dark blue
MENU BACKGROUND COLOUR	150	90	0	// brown
MENU BORDER COLOUR	255	255	0	// yellow
PANEL BACKGROUND COLOUR	150	90	0	// brown
PANEL BORDER COLOUR	255	255	0	// yellow
FRONT SCREEN LOGO COLOUR	255	255	0	// yellow
FRONT SCREEN TEXT COLOUR	0	255	0	// green
FRONT SCREEN BACKGROUND COLOUR	60	60	200	// dark blue
WINDOW BACKGROUND COLOUR 1	64	128	0	// half green
WINDOW BACKGROUND COLOUR 2	0	128	196	// cyan

Maximum Pop-Up Length

The maximum number of items in a pop-up list before splitting into walk-right pop-ups is given by (necessary when using VGA screens on PC's)

POPUP LENGTH integer //maximum number of items in a pop-up

Fonts for Menus and Panels

A font can be defined for use in the menu and panel titles areas and a separate font for the rest of the text in the menus and panels.

The fonts are defined in the gui.4d file as:

SYSTEM TITLE FONT	font_name	// font for titles
SYSTEM FONT	font_name	// font used elsewhere

For X-Windows, the font_name is the name of the required font from the font list given by the

command xlsfonts.

For Windows NT, the font_name is made up of the Windows font name plus zero or more parameter values for the font.

The font name and parameter values are given as one text name, font_name, by concatenating the font name and values with only a minus separating them.

If the font name consists of more than one word, the font name is enclosed in double quotes(").

Hence for NT, an example of defining fonts is:

Parameter	Possible Values
Font	font name (less than 32 characters)
Height	number
italic	
underline	
strikeout	
Weight	thin extralight light normal medium semibold bold extrabold heavy
Quality	draft proof
Pitch	default_pitch fixed_pitch variable_pitch
Family	decorative modern roman script swiss

Defaults

Height	14
Weights	fw_dontcare (family weight don't care)
Pitch	font default pitch
Family	ff_dontcare (font family don't care)
Quality	default_quality
italic	false
underline	false
strikeout	false

For example

Arial-14-bold-italic is the fond Arial, of height 14 and bold and italic
"Courier New"-16-italic is the font Courier New, of height 16 and bold.

Under NT, if the font is not properly defined or doesn't exist, then the system font is used.

Under X-Windows, if the font does not exist, the font fixed is tried. If fixed does not exist, 12d Model will not start up.

Spacing for Borders and Panels

There are parameter to control the amount of space in border, between items etc. for menus and borders. These are normally set by 12D Solutions and should not need to be modified.

SCREEN TEXT BORDER X	pixels
SCREEN TEXT BORDER Y	pixels
SCREEN TEXT EXTRA X	pixels
SCREEN TEXT EXTRA Y	pixels
EDIT BOX BORDER X	pixels
EDIT BOX BORDER Y	pixels

PANEL BORDER X	pixels
PANEL BORDER Y	pixels
PANEL GAP Y	pixels
VERTICAL BORDER X	pixels
VERTICAL BORDER Y	pixels
VERTICAL GAP Y	pixels
HORIZONTAL BORDER X	pixels
HORIZONTAL BORDER Y	pixels
HORIZONTAL GAP Y	pixels
INPUT BOX BORDER X	pixels
INPUT BOX BORDER Y	pixels

Please continue to the next section [Sheet Sizes File](#).

Sheet Sizes File

For plot frames, long and x plots, the overall size of the plot sheet can be given by a pop-up containing defined sheet size.

The sheet size names, width and heights can be specified by the user in a file named **sheets.4d** which is in the normal Set Up areas, or is pointed to by the environment variable

```
SHEET_SIZES_4D      file           // file of plotter sheets sizes
```

The layout of the sheet sizes file is

```
// User definition file for sheets sizes in 12d Model
// Heights and widths are in mm.
```

//	sheet name	width	height
	A0	1189	841
	A1	841	594
	A2	594	420
	A3	420	297
	A4	297	210
	B1	1000	707

Please continue to the next section [Transitions and Spirals File](#).



Transitions and Spirals File

A transition is a means of easing from a straight to a curve (full transition) or from one radius curve to another radius curve (partial transition).

There is often confusion between the words spirals and transition curves come in a variety of formulae and spiral is just one type of transition curve.

Spirals

A spiral curve (Euler spiral) is a special type of transition where the radius of curvature is proportional to the length along the curve.

That is

Radius of curvature at a point x length from start of spiral to that point = Constant

$$r/l = K$$

Although the above definition fully defines a spiral (or Euler curve), spiral calculations are difficult by hand and so no authority uses the full definition but uses an approximation to the Euler spiral.

A Euler spiral can be uniquely defined in terms of a start tangent vector, a final radius of curvature (R) and a total spiral length (L).

The equation for this spiral can be given in terms of a local co-ordinate system where the origin is at the start of the spiral and the x-direction (abscissa) is along the tangent vector at the start of the spiral. The y-direction (ordinate) is given as the offset from the x-axis of the point on the spiral.

Formulae for the local co-ordinates of a point on the spiral can then be derived in terms of the distance of the point along the spiral (the spiral length to the point) and the given constants L (the total spiral length) and R (the final radius of curvature of the spiral).

These formulae for the local co-ordinates of a point on the spiral are **polynomial series** in terms of the spiral length to that point.

For use in calculations, the local co-ordinates can be **approximated** by restricting the polynomial series for the abscissa and the offset to a fixed number of terms.

So for example, the so called **clothoid** spiral used by Australian road authorities is defined as using exactly 5 terms for the abscissa (x) polynomial and exactly 4 terms of the offset (y) polynomial.

Note that a spiral is a transition but not all transitions are spirals.

Left/Right, Leading/Trailing Transitions

The radius of curvature **R** (or simply the radius) of a transition is allowed to be positive or negative.

To agree convention of going to the left or right when travelling along a road and the sign of the curve radius, the radius of curvature **R** of a transition is allowed to be positive or negative.

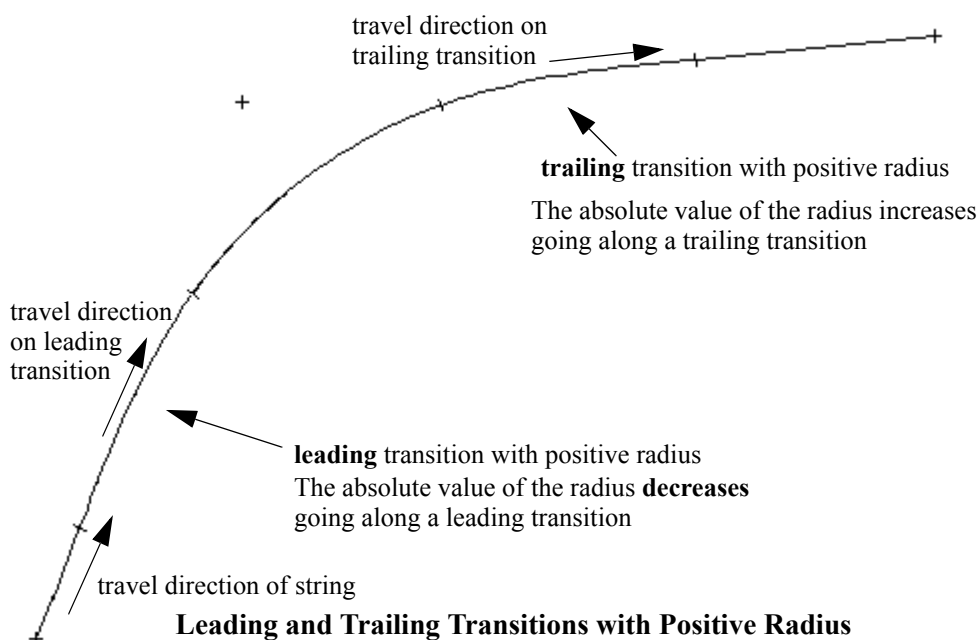
If **R** is **positive**, the transition will then curve to the **right**

If **R** is **negative**, the transition will then curve to the **left**

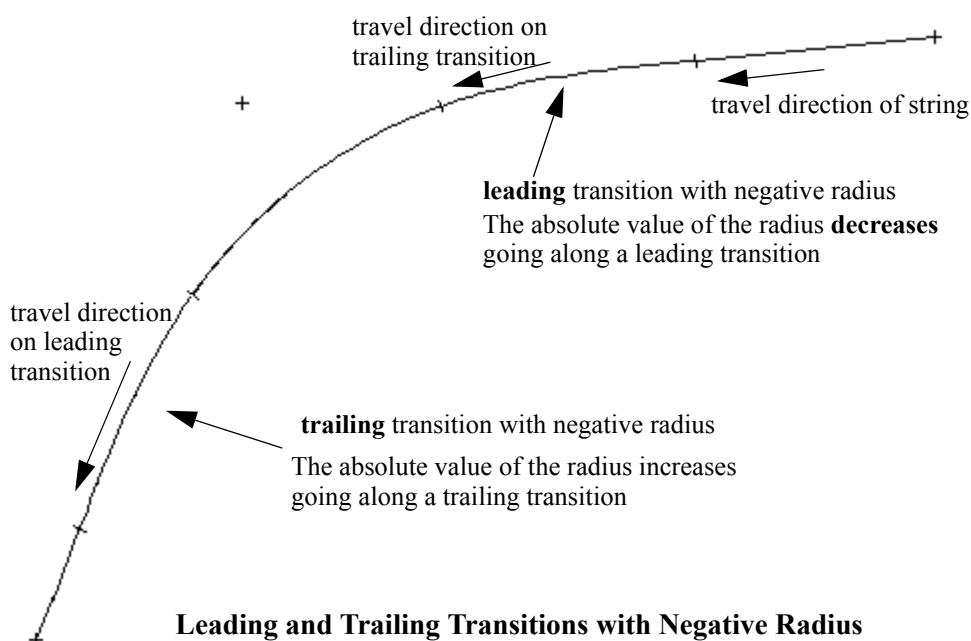
Also depending on the direction of travel along a transition, the absolute radius of curvature will be increasing or decreasing going along the transition.

If the radius is decreasing along the transition, it is called a **leading** transition.

If the radius is increasing along the transition, it is called a **trailing** transition.



If the direction of the travel along the string is reversed, the radius of the transitions, and the arc, will be negative and the leading transition become trailing transition and the trailing transition becomes a leading transition.



Transitions/Spirals Supported by 12d Model

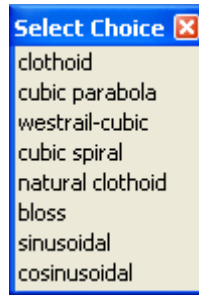
Users must be aware of the exact transition definitions that are to be used in their work.

In Australia, totally different transitions are used by NSW Rail, Queensland Rail and WA Rail.

Luckily all the road authorities in Australia use the same spiral approximation, and that is the same spiral approximation used by Queensland Rail.

So if work is being done in Western Australia or New South Wales, a different transition type is needed in the road alignments from that used in any rail alignments.

The transitions/spirals supported by 12d Model are:



Clothoid - spiral approximation used by Australian road authorities and Queensland Rail.

Cubic parabola – special transition curve used by NSW railways. Not a spiral.

Westrail cubic – spiral approximating used by WA railways.

Cubic spiral – low level spiral approximation. Only ever used in surveying textbooks.

Natural Clothoid – the proper Euler spiral. Not used by any authority.

Bloss – special transition used by Deutsche Bahn. Not a spiral.

Sinusoidal - special transition. Not a spiral.

Cosinusoidal - special transition. Not a spiral.

Please continue to the next section [12d Model Options Map](#).

12d Model Options Map

The **12d Model** menu map shows the menu structure for all the sub-menus on the main 12d Model menu and the menus on the views.

The map is designed to be printed out for users who wish to affix it to a wall.

The PDF file of the menu map on the 12d Model Installation CD in the folder

Documentation\12d Model menu map

Or in the *Updates* section of the web site www.12d.com.

Please continue to the next section [Monitoring 12d Model Usage](#).

Monitoring 12d Model Usage

Overview

12d Model usage can be monitored for single-user and network licenses (or a mix of both), whether installed on a single computer, a local-area network, or a wide-area network across different time zones.

Monitoring the usage is a 3 stage procedure:

1. Generating individual .log files for each 12d Model session run.
2. Consolidating all the completed .log files into a CSV file.
3. Reporting the usage details, using the CSV file as input.

The 1st stage is achieved by setting an environment variable in your env.4d file(s).

The last 2 stages are achieved by running the supplied program: 12d_usage.exe.

Generating the .log files

By setting one of two possible environment variables in the env.4d file(s) used for your 12d Model sessions, uniquely named .log files can be generated in a specified folder on your network.

For example, by adding the lines:

```
usage_log_4d F:\12d model usage
```

or

```
usage_logs_4d F:\12d model usage
```

to your env.4d file(s), then each time a 12d Model session is run, a .log file will be created in the “F:\12d model usage” folder. This folder, referred to as the <log file folder>, can be anywhere on your network and can have any name, **but it must be created beforehand**, and all 12d Model users must have write-access to it.

In the first case, using variable “usage_log_4d”, log files will be generated in the form:

```
<log file folder>\(<dongle> <user> <computer> <time stamp> <process ID>).log
```

In the second case, using variable “usage_logs_4d”, log files will be generated within sub-folders of the form:

```
<log file folder>\<dongle>\<user>\<computer>\(<time stamp> <process ID>).log
```

Note that the <time stamp> represents the start time of the 12d Model session in GMT (also known as UTC or Zulu Time).

It does not matter which variable you decide to use, and you can even use a mix of the variables, if you have more than one env.4d file. However, regardless of which variable you use, it is recommended that the <log file folder> is the same for all 12d Model users on your network so that all 12d Model sessions can be easily included in the reports.

The **.log** file generated in the <log file folder> for each individual 12d Model session run on your network, contains all the information required about that session. While the session is still running, the log file will be updated at a minimum of every 75 seconds, with the time that the session has been active. At the close of the 12d Model session, the log file is again updated and is set as “completed”.

Installing 12d_usage.exe

You can put the 12d_usage.exe program wherever you like on your network. Then, simply create a shortcut to the program on your desktop, making sure the shortcut properties are set as follows:

Target:	<path to program location>\12d_usage.exe
Start in:	<path to Working Folder>

The Working Folder is the folder that you run the 12d_usage.exe program from (it does not have to be the same as the location of the 12d_usage.exe file). After running the program for the first time, a file named 12d_usage.defaults will be created in the Working Folder. This file is used to save your settings from the last run of the program and to load your settings for the next run of the program. In addition, you might also wish to use the Working Folder to store your 12d Model Usage report files (although you are free to store them elsewhere).

Running 12d_usage.exe

To run the 12d_usage program, simply double-click on the shortcut icon you created at install time. This will open up a DOS window from where the program's keyboard-driven menu system can be run.

From the Main menu within the 12d_usage program, your keyboard-driven menu options are:

C	Bring up the Consolidate menu
R	Bring up the Report menu
Q	Exit (quit) the 12d_usage program

Consolidating the .log files

After a while, you should notice that a lot of .log files are being generated in your specified <log file folder>. To consolidate all these .log files into a single Comma-Separated-Variable (CSV) file, you will need to run the 12d_usage.exe program, and press the "C" key to bring up the Consolidate menu.

From the Consolidate menu, your keyboard-driven menu options are:

F	Specify the <log file folder>
O	Specify the output CSV file name
T	Toggle whether to delete or rename consolidated log files
C	Consolidate 12d Model session log files
Q	Exit the Consolidate menu and return to the Main menu

When specifying the name of the CSV file you wish to consolidate your log files to (using the "O" key), if you want a .csv file extension (to allow the file to be easily loaded into MS?Excel for your own custom reports, for example), you must include the .csv in the file name. It is recommended that all users of the 12d_usage program consolidate log files to the same CSV file every time. Newly consolidated logs are always appended to an existing CSV file. If there is to be more than one user of the 12d_usage program, it might be a good idea to specify the CSV file to be in the <log file folder> or the Working Folder (or at least, some folder that all 12d_usage users can access).

You also need to specify how to tidy up the log files, after they have been consolidated, so that they are not consolidated more than once. Your options here are to rename or to delete the log files (the "T" key toggles between rename and delete). If you choose to rename them, they will be renamed with a .logc extension. If you choose to delete them, they will be lost forever, and the only record you will have of your consolidated sessions will be contained in the CSV file. As such, you should be very careful not to delete your CSV file.

Pressing the “C” key will then go ahead and consolidate the log files. Note that consolidation will only take place on “completed” log files (or on log files that have not been updated for more than 24 hours - to handle the case of a power failure, for instance).

Reporting on 12d Model Usage

After creating or adding to your consolidated CSV file, you can press the “R” key from the Main menu, in order to bring up the Report menu.

From the Report menu, your keyboard-driven menu options are:

I	Specify the input CSV file name (generated from the Consolidate menu)
O	Specify the output report file name
M	Toggle whether to overwrite or append to existing report file
D	Add/Remove Dongle constraints
C	Add/Remove Computer constraints
U	Add/Remove User constraints
F	Add/Remove Folder constraints
P	Add/Remove Project constraints
E	Add/Remove Program constraints
V	Add/Remove Version constraints
T	Specify Start and End times for report (in Local Time of 12d_usage User*)
S	Specify which summary tables you want in the report
R	Generate the 12d Model Usage report
Q	Exit the Report menu and return to the Main menu

After generating the report (using the “R” key), you will be asked if you want to view the report file. If you answer yes (using the “Y” key), the report file will be opened using Notepad.exe as the default file editor. If you would prefer to use a different file editor, you can specify it by manually editing the 12d_usage.defaults file (see Installing 12d_usage.exe), and replacing the word “notepad” (last line of the file), with the command to start your preferred editor.

***Note:** In general, if reporting on 12d Model sessions running on a WAN across different time zones, *Local Time of 12d Model User* and *Local Time of 12d_usage User* may be different.

To return to the beginning of this appendix, click on [Setting Up and Configuring 12d](#).



K Line styles, Symbols and Textstyles

This appendix contains information about how linestyles, symbols and text is defined and used in *12d Model*.

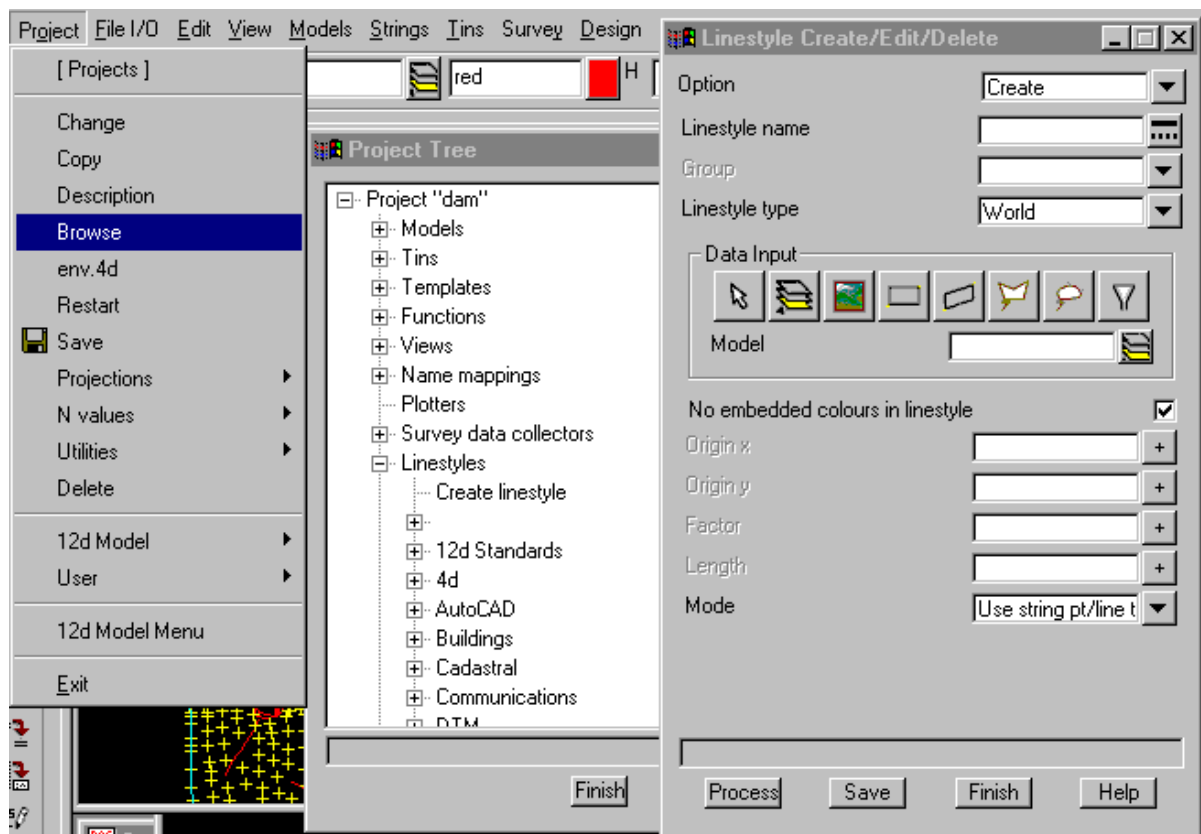
Go to [Line Styles](#)
[Line Style Definitions](#)
[Symbols](#)
[Symbol Definition](#)
[Textstyles and Fonts](#)

For documentation on the first item, continue to the next section [Line Styles](#).

Line Styles

Users can define their own line styles to use when drawing **12d** Model strings. The definition of linestyles are stored in a file called **linestyl.4d**.

Linestyles in the file can be created/edited/deleted using the **Linestyle Create/Edit/Delete** panel which is brought up by double clicking on *Create linestyle* in the *Linestyles* expansion of the *Project Tree* (see [Linestyles](#) in the chapter [Projects](#)) brought up by the **Project=>Browse** option.



The **Linestyle Create/Edit/Delete** panel acts as an interactive editor to a text file which contains the linestyle definitions.

The user defined line styles can be

- (a) applied at each vertex of the string - vertex mode
- (b) repeated along the string - continuous mode
- (c) stretched between adjacent vertices of the string
- (d) any combination of the above.

Each line style can be made up of lines, arcs, circles and text.

For cases (a) and (b), the units for the line style can be in pixels, millimetres or world units.

The line style with one origin is called a

linestyle if the definition of the style is given in pixel units

paperstyle if the definition of the style is given in paper units

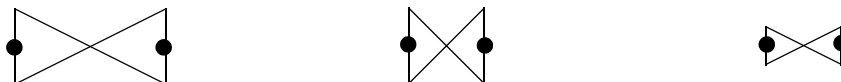
worldstyle if the definition of the style is given in world units

and line style with two origins is called a **twopstyle**.



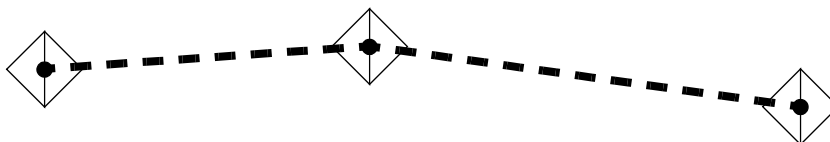
A linestyle, worldstyle or paperstyle can be drawn at each point or repeated along the string

For case (c) the style is stretched between two adjacent points and is called a **twopstyle** style.



A twopstyle stretches between two points in one or both directions.

Finally, case (d) is called a **groupstyle** and is a combined style made up of one or more linestyle, paperstyle, worldstyle or twopstyle.



A groupstyle made up of a vertex and a continuous line style.

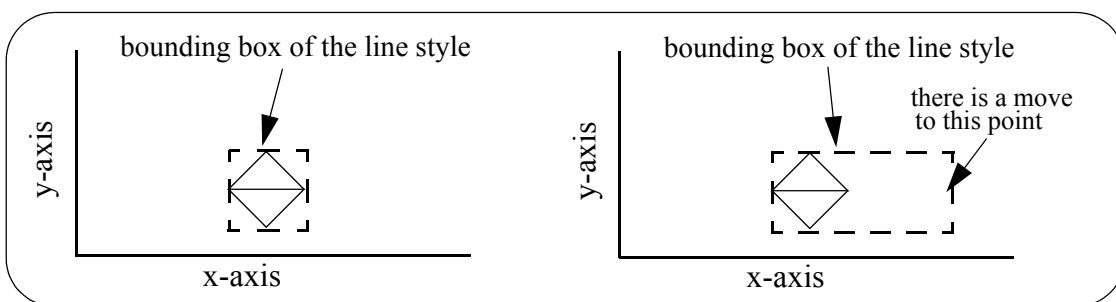
Note:

The words **linestyle** or **line style** are often used in the manual to refer to either a linestyle, paperstyle, worldstyle, twopstyle or groupstyle.

Defining Line Styles

A *line style* is defined in a (x,y) co-ordinate system as a series of moves, drawn, arcs, circles and text commands.

The bounding box of the line style is the smallest rectangle parallel to the (x,y) axis which contains all the moves, draws, circles and arcs of the line style. Note that moves are included in the bounding box even if a line isn't drawn to the point.

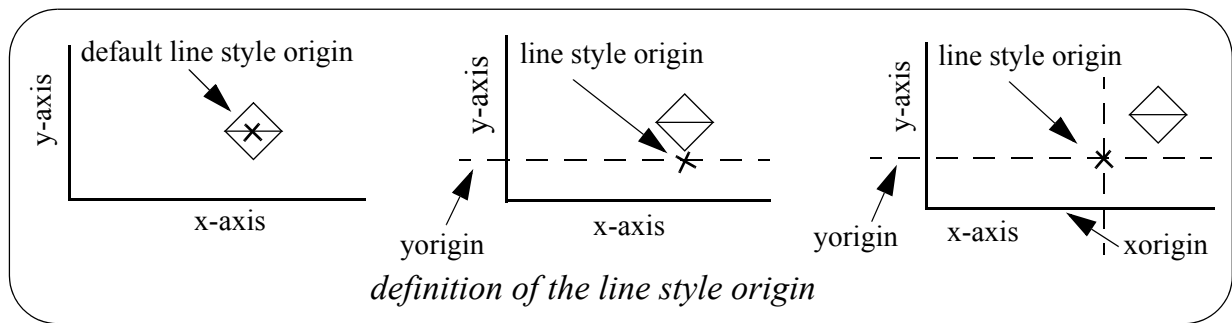


The default **origin of the line style** is defined to be the midpoint of the bounding box surrounding the line style. The bounding box includes the points moved to and drawn to, but does not automatically include (0,0). Hence the calculated origin may not be (0,0).

There are **xorigin** and **yorigin** commands to override the default origin of the line style.

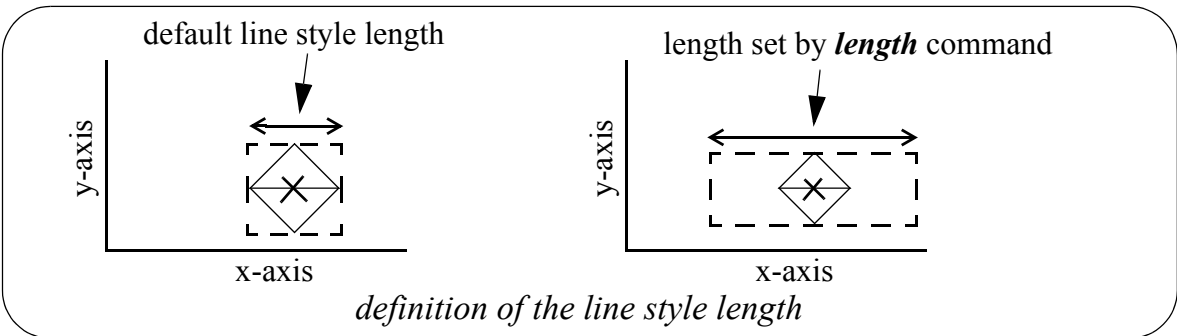
If a **yorigin** is set, then it is used as the y-coordinate of the line style. If the **xorigin** isn't given, then the **xorigin** is the midpoint of the x-extent of the bounding box of the line style.

Similarly, if a **xorigin** is set, then it is used as the x-coordinate of the line style. If the **yorigin** isn't given, then the **yorigin** is the midpoint of the y-extent of the bounding box of the line style.



The default **length** of the line style is the *horizontal size* of the bounding box.

There is a **length** commands to override the default length of the line style. The *length* must always be positive but it can be larger or smaller than the line styles's calculated horizontal length.

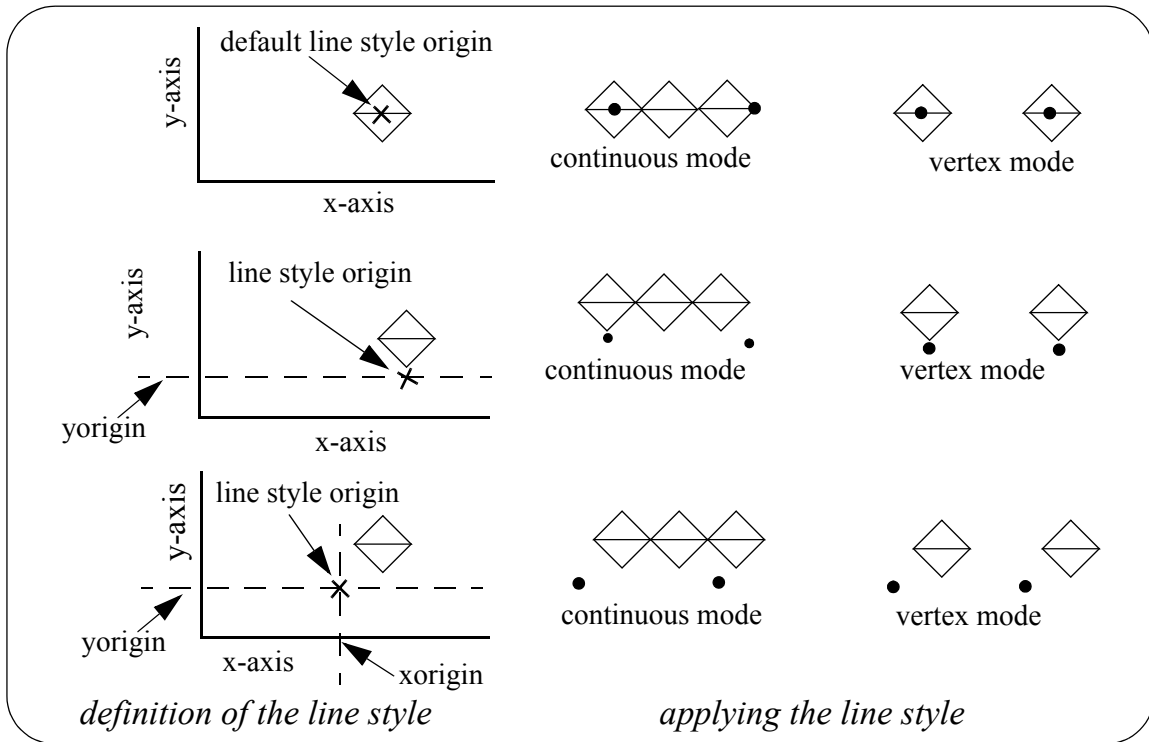


The *origin* and the *length* of the line style are both used in positioning and redrawing the line style.

For *vertex mode*, the **origin** of the line style is placed at each point of the string and the line style drawn around the **origin**.

For *continuous mode*, the **origin** of the line style is initially placed at a distance of half of the **length** of the line style along the first link in the string, and then moved the distance **length** along the string and redrawn. This is repeated along the string until the end of the string is reached.

Hence for *continuous mode*, the style is continually repeated along the string.



Linestyl.4d

The definitions for the available line styles are normally stored in a file called **linestyl.4d** which is read in each time 12d Model opens an existing project or creates a new project. *Linestyl.4d* is searched for in the standard set up paths, or is pointed to by the environment variable

LINESTYLES_4D *filename*

The definition of the line styles will be given in the following section [Line Style Definitions](#).

Line Style Definitions

Linestyles, Paperstyles and Worldstyles

The line style with one origin is called a

linestyle if the definition of the style is given in *pixel* units

paperstyle if the definition of the style is given in *paper* units

worldstyle if the definition of the style is given in *world* units

and line style with two origins is called a **twoptstyle**.

The line style can be drawn at each point of a string (**vertex mode**) or redrawn regularly along the lines joining string points (**continuous mode**).

The definition of a **linestyle** of a given name *name* is

```
linestyle name {  
    set_up_commands  
    draw_commands  
}
```

a **paperstyle** is

```
paperstyle name {  
    set_up_commands  
    draw_commands  
}
```

and a **worldstyle** is

```
worldstyle name {  
    set_up_commands  
    draw_commands  
}
```

where the `set_up_commands` **must** be before the `draw_commands`.

The linestyle/paper/worldstyle must have a name and if the name includes imbedded spaces, it must be enclosed in double quotes “.”.

The line style itself is defined inside the braces where there can be zero or more `set_up_commands` from the list

```
length    value  
group     name  
mode      value  
factor    value  
xorigin   value  
yorigin   value
```

followed by zero or more **draw_commands** from the list

```
move      x-value    y-value  
draw      x-value    y-value  
rmove     dx-value   dy-value  
rdraw     dx-value   dy-value  
colour    colour_name  
circle    radius  
arc       radius     start-angle  end-angle
```

```

text      "text"      angle  height  "justification"
text      "text"      angle  height  "justification"  "textstyle"
text "text" angle height "justification" "textstyle" xfactor slant offset _width offset_height
repeat num_repeats{  repeat_commands repeat_draw_commands}

```

The **repeat** command is a positive integer *num_repeats*

and zero or more *repeat_commands* from the list

```

xpos      x-value
ypos      y-value
rfactor   value

```

and zero or more *repeat_draw_commands* where *repeat_draw_commands* include all the *draw_commands* except **repeat**.

The **set_up** commands for linestyle, paperstyles and worldstyles will now be described. The **draw_commands** will be described after the definition of a groupstyle since they are the same for linestyle, paperstyles, worldstyles and twoptstyles.

set_up_commands for Linestyles, Paperstyles and Worldstyles

group

The **group** is used to associate line styles in pop-up menus.

If the group is not defined, the style is placed in a default (blank) group.

If the group name includes imbedded spaces, then it must be enclosed in double quotes ".

mode

mode specifies whether the linestyle, paperstyle or worldstyle is drawn at the individual points on a string (vertex mode) or it is to be redrawn regularly along the lines joining the points on the string (continuous mode).

If the **mode** is not specified, the mode used for a string depends on the breakline type of the string and the number of points on the string.

Breakline Type	Number of Points	mode: vertex	mode: continuous	mode: not-given
point	1	vertex	cross	vertex
	>1	vertex	continuous	vertex
line	1	vertex	cross	vertex
	>1	vertex	continuous	continuous

NOTE: in early versions of 12d Model, **mode** was known as **pointline** and had the values **point** instead of *vertex*, and **line** instead of *continuous*.

factor

This command factors up/down the drawing co-ordinates, heights and radii.

xorigin, yorigin

The default **origin of the line style** is defined to be the midpoint of the bounding box of the line style. The bounding box includes the points moved to and drawn to but does not automatically include (0,0). Hence the calculated origin may not be (0,0).

The **xorigin** and **yorigin** commands are used to override the default origin of the line style.

length

If **length** is omitted, then **length** is taken to be the horizontal size of the calculated bounding box of the style.

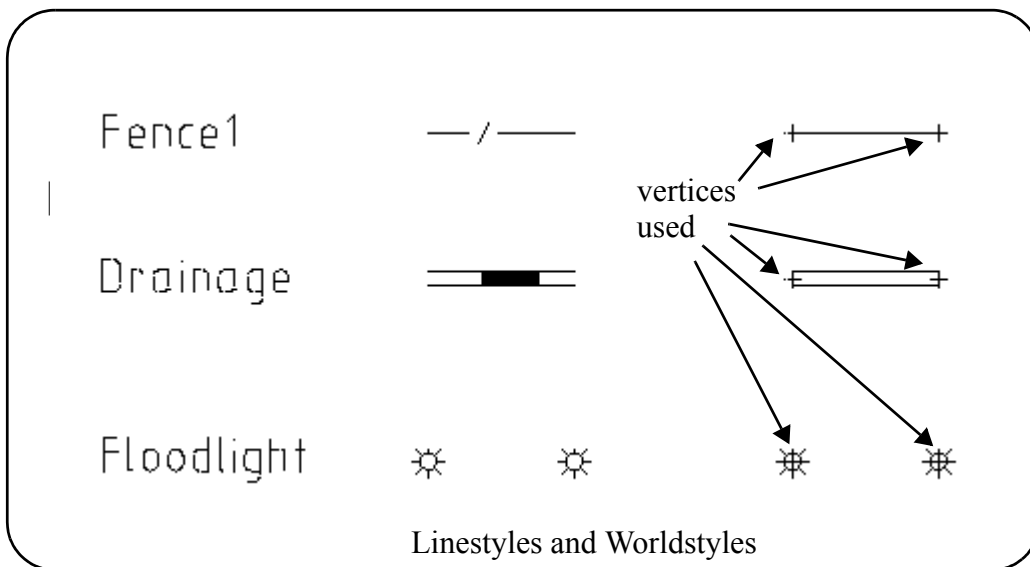
The **length** must always be positive but it can be larger or smaller than the line style's calculated horizontal size.

The origin of the line style and the length are both used in positioning and redrawing the line style.

In **vertex** mode, the origin of the line style is placed at the string points.

In **continuous** mode, the origin is initially placed at a distance of half of **length** along the first line in the string, and then moved the distance **length** along the string for each redraw.

Examples



```
// Fence1
worldstyle "FENCE1"{
  group SWCS
  factor 20
  move 0 0
  rdraw 1 0
  rmove 0.25 -0.25
  rdraw 0.25 0.50
  rmove 0.25 -0.25
  rdraw 1 0
}

// Drainage
worldstyle drainage {
  group "4d"
  factor 0.1
  colour green

  move 0.0 -2.0  draw 30 -2.0

  move 30 -1.5  draw 15 -1.5
  move 15 -1.0  draw 30 -1.0
  move 30 -0.5  draw 15 -0.5
```



```

    move 15 0.0  draw 30 0.0

    move 30  0.5  draw 15  0.5
    move 15  1.0  draw 30  1.0
    move 30  1.5  draw 15  1.5

    move 30  2.0  draw  0  2.0
}
// Floodlight
worldstyle FLOODLIGHT {
  group "Energex"
  mode vertex
  xorigin 0
  yorigin 0
  colour "yellow"
  circle 0.225
  move -.45 0
  draw -0.225 0
  move 0.45 0
  draw 0.225 0
  move 0 -.45
  draw 0 -0.225
  move 0 0.45
  draw 0 0.225
  move -.159 0.159
  draw -0.318 0.318
  move 0.159 0.159
  draw 0.318 0.318
  move 0.159 -0.159
  draw 0.318 -0.318
  move -0.159 -0.159
  draw -0.318 -0.318
  move 0 0.8
  text "FL" 0 0.5 "centre-middle"
}

```

Twoptstyles

A **twoptstyle** is a line style which is stretched so that one cycle fits between consecutive points on a string (line or arc segments). This is achieved by defining **two origins** for the twoptstyle and the first and second origins are mapped to the consecutive points on the string.

Hence the mapping of the two origins defines the final size of the size in world units.

The *twoptstyle* can stretch in just the direction along the string, or both along and perpendicular to the direction of the string.

Also the *twoptstyle* can be drawn for each line/arc on the string, or for every second line/arc of the string.

For a feature/circle string, the first origin is placed at the centre of the feature/circle and the second origin is placed on the circumference of the feature/circle. Hence the size of the *twoptstyle* is determined by the radius of the feature/circle string.

The definition of a **twoptstyle** of a given name is

```

twoptstyle name {
  set_up_commands
  draw_commands
}

```

where the `set_up_commands` **must** be before the `draw_commands`.

The *twoptstyle* must have a name and if the name includes imbedded spaces, it must be enclosed in double quotes “ ”.

The *twoptstyle* itself is defined inside the braces where there can be zero or more `set_up_commands` from the list

<code>group</code>	<i>name</i>
<code>stretch_mode</code>	<i>value</i>
<code>cycle_mode</code>	<i>value</i>
<code>xorigin1</code>	<i>value</i>
<code>yorigin1</code>	<i>value</i>
<code>xorigin2</code>	<i>value</i>
<code>yorigin2</code>	<i>value</i>

followed by zero or more `draw_commands` from the list

<code>move</code>	<i>x-value</i>	<i>y-value</i>
<code>draw</code>	<i>x-value</i>	<i>y-value</i>
<code>rmove</code>	<i>dx-value</i>	<i>dy-value</i>
<code>rdraw</code>	<i>dx-value</i>	<i>dy-value</i>
<code>colour</code>	<i>colour_name</i>	
<code>circle</code>	<i>radius</i>	
<code>arc</code>	<i>radius</i>	<i>start-angle</i> <i>end-angle</i>
<code>text</code>	<i>"text"</i>	<i>angle</i> <i>height</i> <i>"justification"</i>
<code>text</code>	<i>"text"</i>	<i>angle</i> <i>height</i> <i>"justification"</i> <i>"textstyle"</i>
<code>text</code>	<i>"text"</i>	<i>angle</i> <i>height</i> <i>"justification"</i> <i>"textstyle"</i> <i>xfactor</i> <i>slant</i> <i>offset</i> <i>width</i> <i>offset_height</i>
<code>repeat</code>	<i>num_repeats</i>	{ <i>repeat_commands</i> <i>repeat_draw_commands</i> }

The `repeat` command is a positive integer *num_repeats* and zero or more *repeat_commands* from the list

<code>xpos</code>	<i>x-value</i>
<code>ypos</code>	<i>y-value</i>
<code>rfactor</code>	<i>value</i>

and zero or more *repeat_draw_commands* where *repeat_draw_commands* include all the *draw_commands* except `repeat`.

The `set_up` commands for a *twoptstyle* will now be described. The *draw_commands* will be described after the definition of a **groupstyle** since they are the same for *linestyles*, *paperstyles*, *worldstyles* and *twoptstyles*.

set_up_commands for Twoptstyles

group

The **group** is used to associate line styles in pop-up menus.

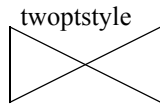
If the group is not defined, the line style is placed in a default (blank) group.

If the group name includes imbedded spaces, then it must be enclosed in double quotes “ ”.

stretch_mode

stretch_mode controls whether the symbol stretches in just the direction along the string, or both along and perpendicular to the direction of the string

stretch_mode	1	// stretch in one direction only (default)
	2	// stretch in both directions



stretch in one direction



stretch in both directions



A twoptstyle stretches between two points in one or both directions.

cycle_mode

cycle_mode controls whether the symbol is drawn for each line/arc on the string, or for every second line/arc of the string.

cycle_mode

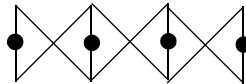
1

// draws on every line/arc (default)

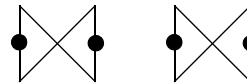
2

// draws every second line/arc

draw on every line/arc



draw on every second line/arc



A twoptstyle draws on each line/arc or every second line/arc

xorigin1, yorigin1

The point (xorigin1, yorigin1) is mapped to the first point that the *twoptstyle* is being applied to.

The default **first point of origin of the twoptstyle** is defined to be the minimum x value and the average of the minimum and maximum y values ($x_{\min}, (y_{\min} + y_{\max})/2$).

The **xorigin1** and **yorigin1** commands are used to override the default first origin of the *twoptstyle*.

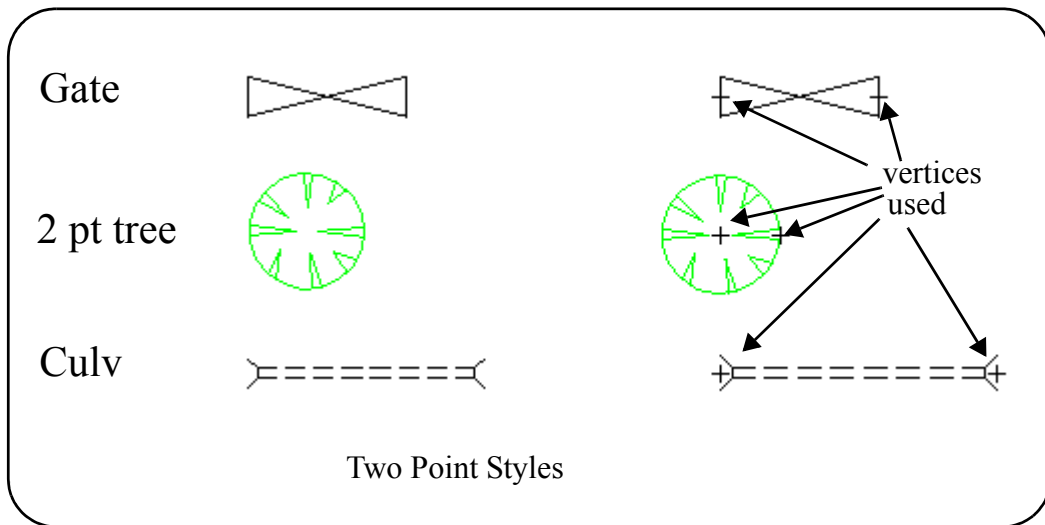
xorigin2, yorigin2

The point (xorigin2, yorigin2) is mapped to the second point that the *twoptstyle* is being applied to.

The default **second point of origin of the twoptstyle** is defined to be the maximum x value and the average of the minimum and maximum y values ($x_{\max}, (y_{\min} + y_{\max})/2$).

The **xorigin2** and **yorigin2** commands are used to override the default second origin of the *twoptstyle*.

Examples



```
// Gate
twoptstyle GATE {
  group "Two Points"
  stretch_mode 2
  cycle_mode 2
  colour red
  move 100 105
  draw 140 95
  draw 140 105
  draw 100 95
  draw 100 105
}

// two point tree
twoptstyle 2PT_TREE {
  group "4d_standards"
  stretch_mode 2
  cycle_mode 2
  xorigin10
  yorigin10
  // xorigin22.5
  // yorigin2 1.25

  colour "green"
  move 0 0
  circle 2.5
  move 2.48 0.2
  draw 0.5 0
  draw 2.48 -0.2
  move 2.2 -1.2
  draw 1.2 -0.9
  draw 1.8 -1.7
  move 0.7 -2.4
  draw 0.2 -1
  draw 0.3 -2.45
  move -0.2 2.45
  draw 0 1
  draw 0.2 2.45
  move 1.2 2.2
```

```

draw 0.9 1.2
draw 1.7 1.8
move -2.48 0.2
draw -0.5 0
draw -2.48 -0.2
move -1.8 1.6
draw -0.8 0.6
draw -2.1 1.3
move -1.6 -1.9
draw -1.1 -0.8
draw -1.3 -2.1
}
// Culvert
twoptstyle CULV {
  group "Two Points"
  stretch_mode 2
  cycle_mode 2

  move 8 12
  draw 10 10
  draw 14 10
  move 16 10
  draw 20 10
  move 22 10
  draw 26 10
  move 28 10
  draw 32 10
  move 34 10
  draw 38 10
  move 40 10
  draw 44 10
  move 46 10
  draw 50 10
  move 52 10
  draw 56 10
  draw 58 12
  move 58 6
  draw 56 8
  draw 56 10
  move 10 10
  draw 10 8
  draw 8 6
  move 10 8
  draw 14 8
  move 16 8
  draw 20 8
  move 22 8
  draw 26 8
  move 28 8
  draw 32 8
  move 34 8
  draw 38 8
  move 40 8
  draw 44 8
  move 46 8
  draw 50 8
  move 52 8
  draw 56 8

```

}

Groupstyles

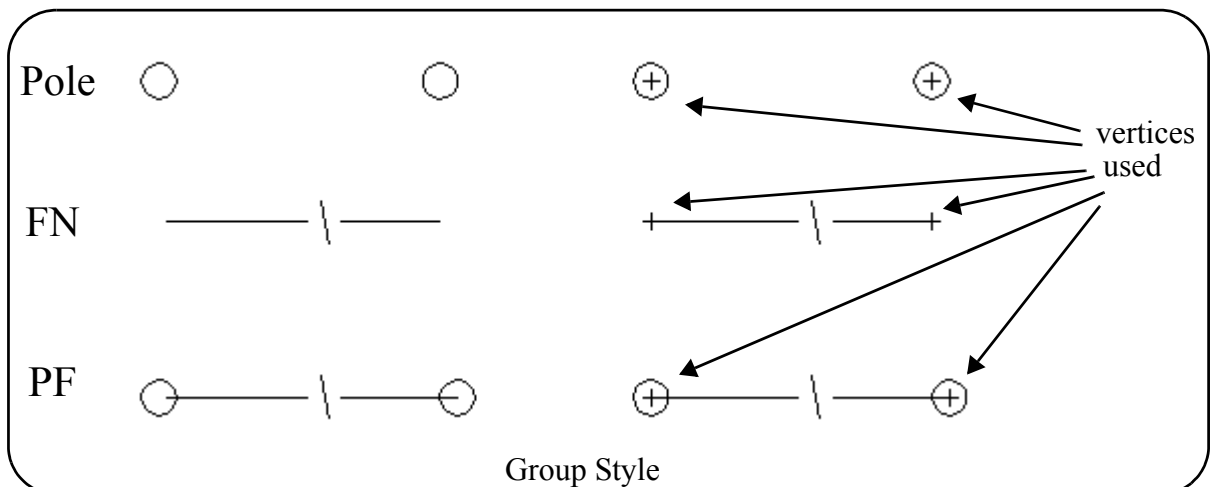
A **groupstyle** is a combined line style which is made up of one or more *linestyles*, *paperstyles*, *worldstyles* and/or *twoptstyles*.

The definition of a **groupstyle** is simply an optional **group** for the line style to belong to, and a list of linestyle, paperstyles, worldstyle and twoptstyle names which must have already been defined in the file.

```
groupstyle name {
    group    name
    style_name_1
    style_name_2
    ...
}
```

If the *groupstyle* name contains spaces, then it must be enclosed in double quotes ". For example, "style 1".

Example



```
// POLE
worldstyle POLE {
    group "Electricity"
    mode vertex
    circle 0.5
}
// FN
worldstyle FN {
    group "Fences"
    length 5
    draw 4 0
    move 4.4 0.6
    draw 4.6 -0.6
}
// PF
}groupstyle "PF" {
    group "Miscellaneous"
    "POLE"
    "FN"
}
```

Description of the draw_commands

move *x-value* *y-value*

move the pen from the current pen position to the new position (x-value, y-value).

draw *x-value* *y-value*

draw from the current pen position to the new position (x-value, y-value)

rmove *dx-value* *dy-value*

move relative from the current pen position through the distance (dx-value, dy-value)

rdraw *dx-value* *dy-value*

draw relative from the current pen position through the distance (dx-value, dy-value)

colour *colour-name*

change colour (line styles can contains more than one colour).

If colour is not defined, the line style is drawn in the colour of the string that the line style is applied to. If the colour-name includes imbedded spaces, then it must be enclosed within double quotes "".

circle *radius*

draw a circle of the given radius at the current pen position.

After drawing a circle, the current pen position is left at the centre of the circle.

arc *radius* *start-angle* *end-angle*

draw an arc of the given radius from the start angle to the end angle. A positive radius denotes that the arc is drawn in a clockwise direction, a negative radius means anti-clockwise. Angles are given in degrees, minutes and seconds in the ddd.mmssfff format.

After drawing an arc, the current pen position is left at the centre of the arc.

text *text* *angle* *height* "*justification*"
text *text* *angle* *height* "*justification*" *textstyle*
or

text *text* *angle* *height* "*justification*" *textstyle* *xfactor* *slant* *offset_width* *offset_height*

the characters *text* are drawn at the current pen position with the given angle, height, justification and possibly *textstyle*, *xfactor*, *slant*, *offset_width* and *offset_height*. Angle and slant are given in degrees, minutes and seconds in the ddd.mmssfff format. Slant is between -45 and 45 degrees.

The allowed justifications are

top-left	top-centre	top-right
middle-left	middle-centre	middle-right
bottom-left	bottom-centre	bottom-right

and the value is enclosed inside double quotes (").

After drawing text, the current pen position is left where it was before the text was drawn.

repeat num_repeats { repeat_commands repeat_draw_commands }

The **repeat** command allows the set of *repeat_draw_commands* inside the braces (the repeat-style) to be re-drawn a number of times (*num_repeats*), and with each redraw, the size of the repeat-style is modified.

In the definition of repeat, there can be zero or more *repeat_commands* from the list

xpos *x-value*

ypos	<i>y-value</i>
rfactor	<i>value</i>

and zero or repeat_draw_commands where repeat_draw_commands include all draw_commands except **repeat**.

Unlike style, the repeat-style is defined in terms of a local origin at (0,0). The repeat-style is actually drawn with this origin at the position given by the values of **xpos** and **ypos**.

The repeat-style is drawn *num_repeats* times and on each redraw, the distances, heights and radii are factored by the amount

$$\text{repeat_factor} = (1 - i * \text{rfactor})$$

where $i = 0, 1, \dots, \text{num_repeats} - 1$

If rfactor is not specified, it is given the default value of $1/\text{num_repeats}$. The factor is then

$$\text{repeat_factor} = (\text{num_repeats} - i) / \text{num_repeats}$$

where $i = 0, 1, \dots, \text{num_repeats} - 1$

Examples of the Repeat Command

1. To produce circles of radius 10,9,8,...1 about the origin.

```
repeat 10 { circle 10 }
```
2. To produce circles of radius 10,9.5,9,...5.5 about the origin

```
repeat 10 { rfactor 0.05 circle 10 }
```

More Examples of Line, Paper and World Styles

1. draw a circle of radius 20. The origin of the style is (0,0)

```
worldstyle "circle" {
  move 0 0
  circle 20
}
```
2. draw a circle of radius 20. The origin of the style is (100,100)

```
paperstyle "circle" {
  move 100 100
  circle 20
}
```
3. draw a circle of radius 20. The origin of the style is (0,0)

```
linestyle "circle" {
  xorigin 0
  yorigin 0
  move 100 100
  circle 20
}
```
4. draw a gate symbol as a twoptstyle.

```
worldstyle "circle" {
  group "fences"
  stretch_mode 1           // one direction stretch
  cycle_mode 2             // draw every second line

  move 0 0
```

```
draw 0 0.1
draw 1 0
draw 1 0.1
draw 0 0
}
```

5. draw concentric circles of centre (0,0) inside a box

```
linestyle "dot" {
  xorigin 0
  yorigin 0
  move -5 -5
  draw -5 25
  draw 25 25
  draw 25 -5
  draw -5 -5
  repeat 10 {
    move 0 0
    circle 10
  }
}
```

6. draw an arc of absolute radius 10 in the clockwise direction from the angle 45 to the angle -45.

```
linestyle "arc" {
  move 0 0
  arc 10 45 -45
}
```

7. draw an arc of absolute radius 10 in the anti-clockwise direction from the angle 45 to the angle -45.

```
worldstyle "arc 1" {
  move 0 0
  arc -10 45 -45
}
```

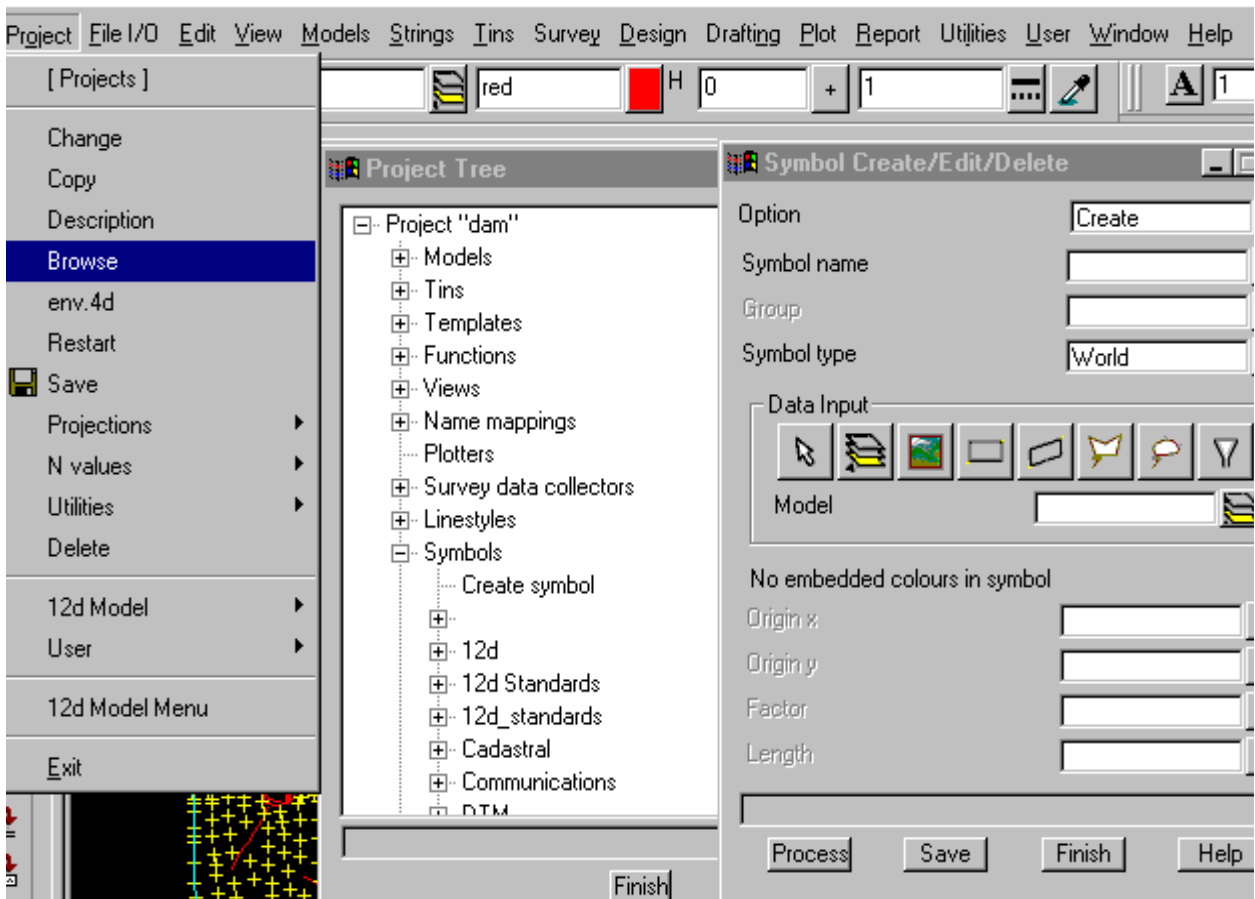
8. top-left justified text with a circle centred on the actual text position

```
linestyle "top-left" {
  group text
  move 0 0
  circle 4
  text "<top left>" 0 10 "top-left"
}
```

Symbols

Users can define their own symbols to draw at vertices of 12d Model strings. The definition of symbols are stored in a file called **symbols.4d**.

Symbols in the file can be created/edited using the **Symbols Create/Edit/Delete** panel which is brought up by double clicking on *Create symbol* in the *Symbols* expansion of the *Project Tree* (see [Symbols](#) in the chapter [Projects](#)) brought up by the **Project=>Browse** option.



The **Symbol Create/Edit/Delete** panel acts as an interactive editor to a text file which contains the symbol definitions.

The user defined symbols can be applied to each vertex of a string. Each symbol can be made up of lines, arcs, circles and text.



A symbol applied to vertices.

The units for the symbol can be in pixels, millimetres or world units. The symbol is called a

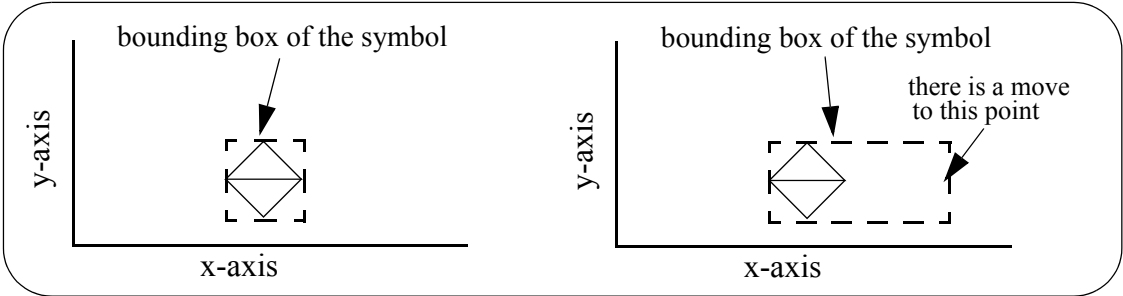
paperstyle if the definition of the symbol is given in paper units

worldstyle if the definition of the symbol is given in world units

Defining Symbols

A *symbol* is defined in a (x,y) co-ordinate system as a series of moves, drawn, arcs, circles and text commands.

The bounding box of the line style is the smallest rectangle parallel to the (x,y) axis which contains all the moves, draws, circles and arcs of the line style. Note that moves are included in the bounding box even if a line isn't drawn to the point.

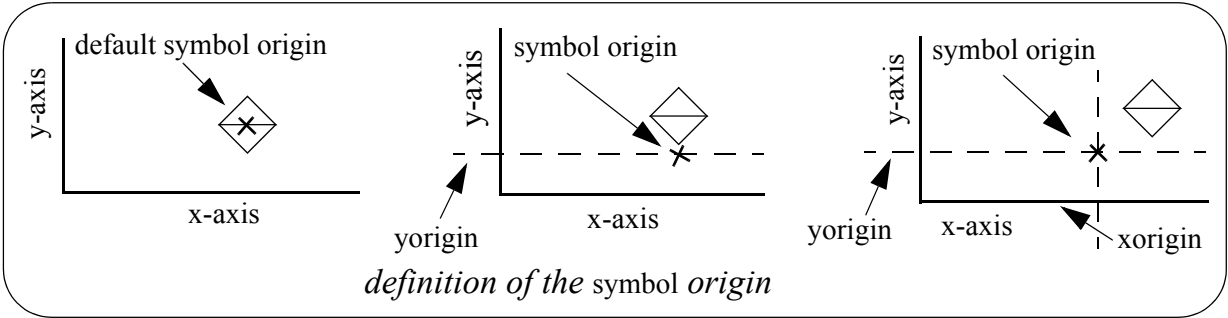


The default **origin of the symbol** is defined to be the midpoint of the bounding box surrounding the symbol. The bounding box includes the points moved to and drawn to, but does not automatically include (0,0). Hence the calculated origin may not be (0,0).

There are **xorigin** and **yorigin** commands to override the default origin of the symbol.

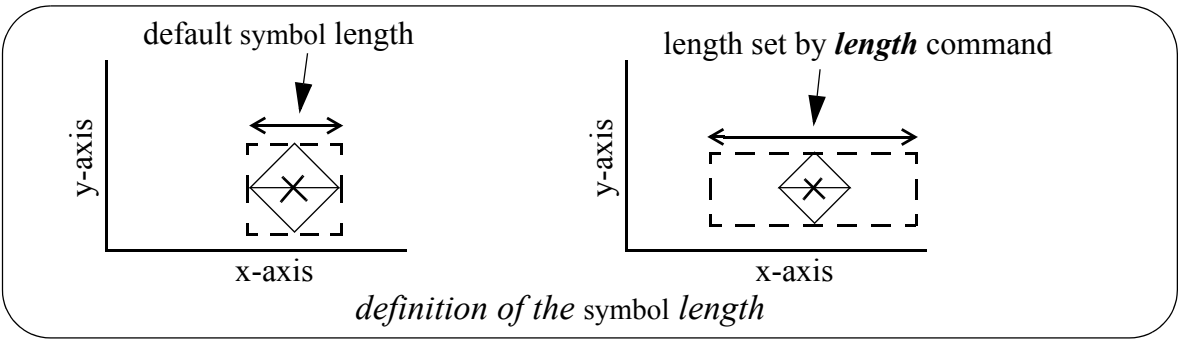
If a **yorigin** is set, then it is used as the y-coordinate of the symbol. If the *xorigin* isn't given, then the *xorigin* is the midpoint of the x-extent of the bounding box of the symbol.

Similarly, if a **xorigin** is set, then it is used as the x-coordinate of the symbol. If the *yorigin* isn't given, then the *yorigin* is the midpoint of the y-extent of the bounding box of the symbol.



The default **length** of the line style is the *horizontal* size of the bounding box.

There is a **length** commands to override the default length of the symbol. The *length* must always be positive but it can be larger or smaller than the symbols calculated horizontal length.



The *origin* and the *length* of the symbol are both used in positioning and sizing the symbol.

Symbol.4d

The definitions for the available symbols are normally stored in a file called **symbols.4d** which is read in each time 12d Model opens an existing project or creates a new project. *Symbol.4d* is searched for in the standard set up paths, or is pointed to by the environment variable

SYMBOLS_4D *filename*

The definition of the symbols will be given in the following section [Symbol Definition](#).

Symbol Definition

The definition of a worldstyle **symbol** of a given name *name* is

```
worldstyle name {
    set_up_commands
    draw_commands
}
```

where the set_up_commands **must** be before the draw_commands.

The linestyle/paper/worldstyle must have a name and if the name includes imbedded spaces, it must be enclosed in double quotes “.”.

The symbol itself is defined inside the braces where there can be zero or more set_up_commands from the list

```
length    value
group     name
factor    value
xorigin   value
yorigin   value
```

followed by zero or more **draw_commands** from the list

```
move      x-value    y-value
draw      x-value    y-value
rmove     dx-value   dy-value
rdraw     dx-value   dy-value
colour    colour_name
circle    radius
arc       radius     start-angle end-angle
text      "text"     angle    height  "justification"
text      "text"     angle    height  "justification" "textstyle"
text      "text"    angle    height  "justification" "textstyle" xfactor slant offset_width offset_height
repeat   num_repeats { repeat_commands repeat_draw_commands }
```

The **repeat** command is a positive integer *num_repeats*

and zero or more repeat_commands from the list

```
xpos      x-value
ypos      y-value
rfactor    value
```

and zero or more repeat_draw_commands where repeat_draw_commands include all the draw_commands except **repeat**.

The **set_up** commands for symbols will now be described followed by the **draw_commands**.

set_up_commands for symbols

group

The **group** is used to associate symbols in pop-up menus.

If the group is not defined, the symbol is placed in a default (blank) group.

If the group name includes imbedded spaces, then it must be enclosed in double quotes “.”.

factor

This command factors up/down the drawing co-ordinates, heights and radii.

xorigin, yorigin

The default **origin of the symbol** is defined to be the midpoint of the bounding box of the line style. The bounding box includes the points moved to and drawn to but does not automatically include (0,0). Hence the calculated origin may not be (0,0).

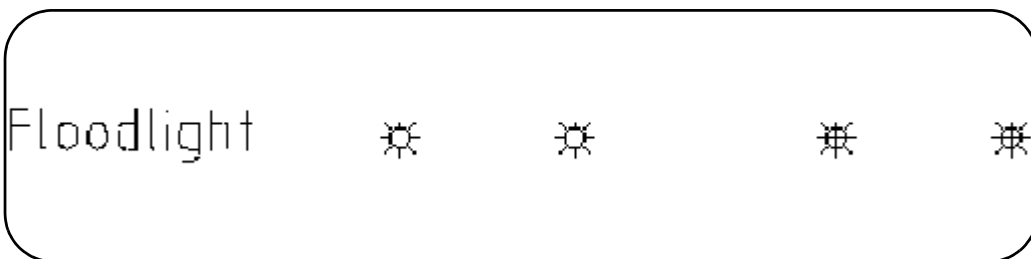
The **xorigin** and **yorigin** commands are used to override the default origin of the symbol.

length

If length is omitted, then **length** is taken to be the horizontal size of the calculated bounding box of the symbol.

The **length** must always be positive but it can be larger or smaller than the symbols calculated horizontal size.

The origin of the symbol and the length are both used in positioning and sizing of the symbol.

Examples

```
// Floodlight
worldstyle FLOODLIGHT {
  group "Energex"
  mode vertex
  xorigin 0
  yorigin 0
  colour "yellow"
  circle 0.225
  move -.45 0
  draw -0.225 0
  move 0.45 0
  draw 0.225 0
  move 0 -.45
  draw -0.225
  move 0 0.45
  draw 0 0.225
  move -.159 0.159
  draw -0.318 0.318
  move 0.159 0.159
  draw 0.318 0.318
  move 0.159 -0.159
  draw 0.318 -0.318
  move -0.159 -0.159
  draw -0.318 -0.318
  move 0 0.8
  text "FL" 0 0.5 "centre-middle"
}
```

Description of the draw_commands

move *x-value* *y-value*

move the pen from the current pen position to the new position (x-value, y-value).

draw *x-value* *y-value*

draw from the current pen position to the new position (x-value, y-value)

rmove *dx-value* *dy-value*

move relative from the current pen position through the distance (dx-value, dy-value)

rdraw *dx-value* *dy-value*

draw relative from the current pen position through the distance (dx-value, dy-value)

colour *colour-name*

change colour (line styles can contains more than one colour).

If colour is not defined, the symbol is drawn in the colour of the string that the symbol is applied to. If the colour-name includes imbedded spaces, then it must be enclosed within double quotes " ".

circle *radius*

draw a circle of the given radius at the current pen position.

After drawing a circle, the current pen position is left at the centre of the circle.

arc *radius* *start-angle* *end-angle*

draw an arc of the given radius from the start angle to the end angle. A positive radius denotes that the arc is drawn in a clockwise direction, a negative radius means anti-clockwise. Angles are given in degrees, minutes and seconds in the ddd.mmssfff format.

After drawing an arc, the current pen position is left at the centre of the arc.

text *text* *angle* *height* "*justification*"
text *text* *angle* *height* "*justification*" *textstyle*
or

text *text* *angle* *height* "*justification*" *textstyle* *xfactor* *slant* *offset_width* *offset_height*

the characters *text* are drawn at the current pen position with the given angle, height, justification and possibly *textstyle*, *xfactor*, *slant*, *offset_width* and *offset_height*. Angle and slant are given in degrees, minutes and seconds in the ddd.mmssfff format. Slant is between -45 and 45 degrees.

The allowed justifications are

top-left	top-centre	top-right
middle-left	middle-centre	middle-right
bottom-left	bottom-centre	bottom-right

and the value is enclosed inside double quotes (").

After drawing text, the current pen position is left where it was before the text was drawn.

repeat *num_repeats* { *repeat_commands* *repeat_draw_commands* }

The **repeat** command allows the set of *repeat_draw_commands* inside the braces (the repeat-style) to be re-drawn a number of times (*num_repeats*), and with each redraw, the size of the repeat-style is modified.

In the definition of repeat, there can be zero or more *repeat_commands* from the list

<i>xpos</i>	<i>x-value</i>
<i>ypos</i>	<i>y-value</i>
<i>rfactor</i>	<i>value</i>



and zero or `repeat_draw_commands` where `repeat_draw_commands` include all `draw_commands` except `repeat`.

Unlike `symbol`, the `repeat-style` is defined in terms of a local origin at (0,0). The `repeat-style` is actually drawn with this origin at the position given by the values of **xpos** and **ypos**.

The `repeat-style` is drawn *num_repeats* times and on each redraw, the distances, heights and radii are factored by the amount

$$\text{repeat_factor} = (1 - i * \text{rfactor})$$

where $i = 0, 1, \dots, \text{num_repeats} - 1$

If `rfactor` is not specified, it is given the default value of $1/\text{num_repeats}$. The factor is then

$$\text{repeat_factor} = (\text{num_repeats} - i) / \text{num_repeats}$$

where $i = 0, 1, \dots, \text{num_repeats} - 1$

Examples of the Repeat Command

1. To produce circles of radius 10,9,8,...1 about the origin.

```
repeat 10 { circle 10 }
```
2. To produce circles of radius 10,9.5,9,...5.5 about the origin

```
repeat 10 { rfactor 0.05 circle 10 }
```

More Examples of World Styles

1. draw a circle of radius 20. The origin of the style is (0,0)

```
worldstyle "circle" {
  move 0 0
  circle 20
}
```
2. draw a circle of radius 20. The origin of the style is (100,100)

```
worldstyle "circle" {
  move 100 100
  circle 20
}
```
3. draw a circle of radius 20. The origin of the style is (0,0)

```
worldstyle "circle" {
  xorigin 0
  yorigin 0
  move 100 100
  circle 20
}
```
4. draw concentric circles of centre (0,0) inside a box

```
worldstyle "dot" {
  xorigin 0
  yorigin 0
  move -5 -5
  draw -5 25
  draw 25 25
  draw 25 -5
  draw -5 -5
}
```

```
repeat 10 {  
  move 0 0  
  circle 10  
}
```

5. draw an arc of absolute radius 10 in the clockwise direction from the angle 45 to the angle -45.

```
worldstyle "arc" {  
  move 0 0  
  arc 10 45 -45  
}
```

6. draw an arc of absolute radius 10 in the anti-clockwise direction from the angle 45 to the angle -45.

```
worldstyle "arc 1" {  
  move 0 0  
  arc -10 45 -45  
}
```

7. top-left justified text with a circle centred on the actual text position

```
worldstyle "top-left" {  
  group text  
  move 0 0  
  circle 4  
  text "<top left>" 0 10 "top-left"  
}
```

Textstyles and Fonts

Users can define any number of textstyles and specify how they are mapped to AutoCAD style names or Microstation (DGN, Intergraph) font numbers.

There is one fixed spaced textstyle called "1" (the default) which is identical to the textstyle used in earlier versions of 12d Model.

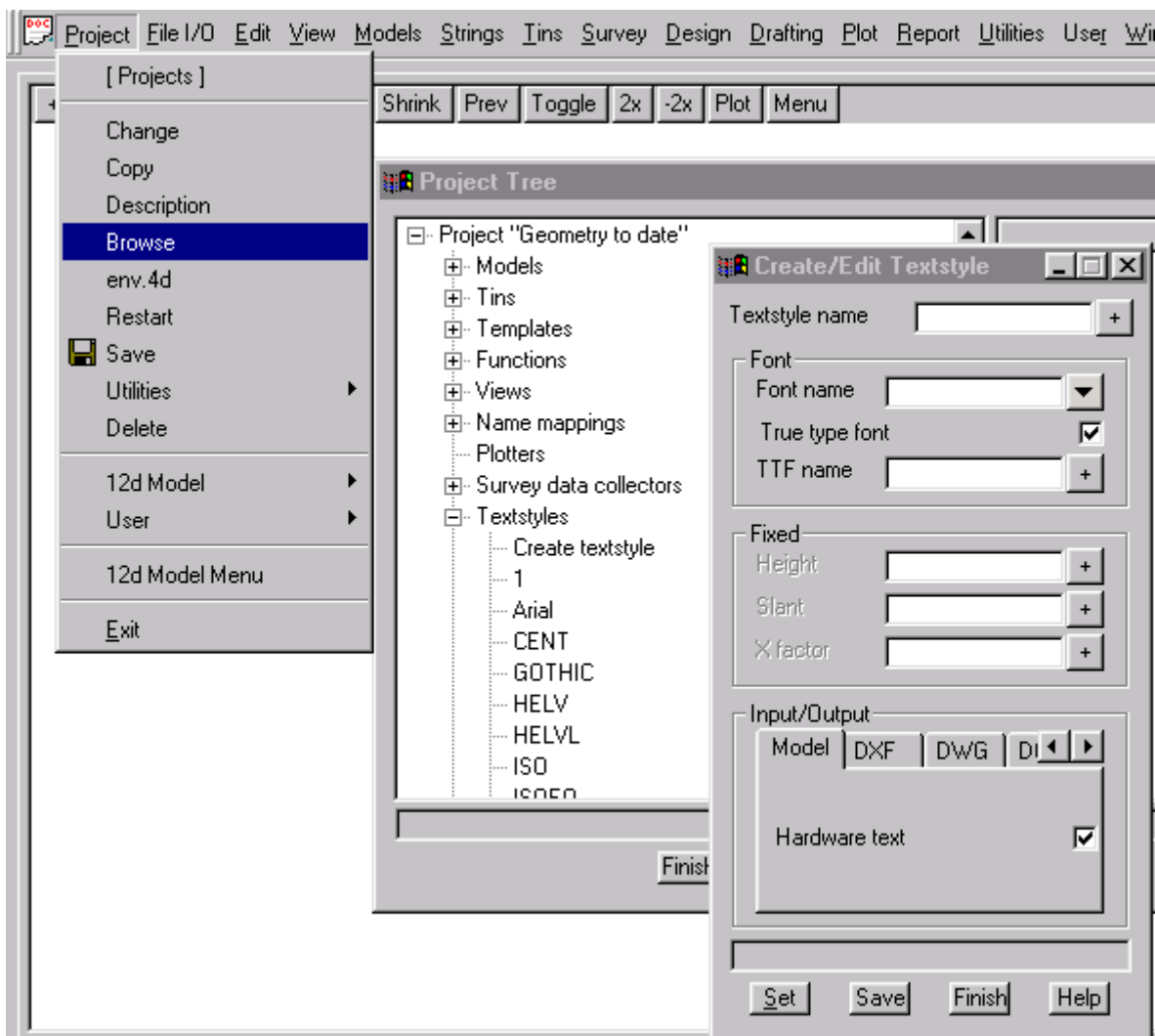
Each textstyle has a font definition (or font 1 as the default) which defines the stroking for each character in the font. True Type fonts are supported and most AutoCAD SHP files can be used to define the fonts.

Textstyles using True Type fonts or shape file which do not use arcs in their font definition, can also have a slant and a x_factor.

Textstyles can be used in text strings, 4d strings, super strings, linestyles, plots and user defined title blocks.

Textstyles Definitions File

Textstyles can be created/edited using the **Create/Edit Textstyle** panel which is brought up by double clicking on *Create textstyle* in the *Textstyles* expansion of the *Project Tree* (see [Textstyles](#) in the chapter [Projects](#)) brought up by the **Project=>Browse** option.



The **Create/Edit Textstyle** panel acts as an interactive editor to a text file which contains the textstyle definitions. The full description of the text file will now be given.

The definitions for the available textstyles are normally stored in a file called **textstyl.4d** which is read in each time 12d Model opens an existing project or created a new project. *Textstyl.4d* is searched for in the standard set up paths, or is pointed to by the environment variable

TEXTSTYLES_4D filename

Inside textstyl.4d, a textstyle of a given name is defined by

```
textstyle  textstyle_name  {  
                                textstyle commands  
}
```

Each textstyle must have a **name** and if the name includes imbedded spaces, it must be enclosed in double quotes "".

The textstyle itself is defined inside the braces where there can be zero or textstyle commands from the list

	font_name	text
or	hardware_text_dxf stroked_text_dxf	
	output_name_dxf	text
	input_name_dxf	text
or	hardware_text_dgn stroked_text_dgn	
	output_name_dgn	integer
	input_name_dgn	integer
or	hardware_text_model stroked_text_model	
or	stroked_text hardware_text	
	fixed_height	value
	variable_height	
	fixed_slant	value
	variable_slant	
	fixed_xfactor	value
	variable_xfactor	

The description of each command is

font_name text

Name of the font to be used to draw the characters of the textstyle. The stroking of the font characters can be defined in the file fonts.4d. If no font_name is given, or the stroking is not given in the font file, then the standard 12d Model font is used ("1").

hardware_text_dxf or **stroked_text_dxf**

If stroked_text_dxf appears, then any text in this textstyle written out to dxf will be stroked - that is, broken into straights, lines and curves.

If hardware_text_dxf is in the file, then any text in this textstyle sent to dxf will be given as actual dxf text (not stroked).

output_name_dxf dxf_style_name

If text is sent to dxf as hardware text, the dxf style of the text will be dxf_style_name.

input_name_dxf dxf_style_name

When reading in dxf files, any text of style dxf_style_name will be given the 12d Model textstyle name textstyle_name.

The commands for reading and writing dgn files are similar to those for dxf except that dgn has font numbers.

hardware_text_dgn or **software_text_dgn**

output_name_dgn dgn_font_number

input_name_dgn dgn_font_number

hardware_text_model or **stroked_text_model**

Similarly, when writing out to a 12d Model model. For hardware_text_model, text will be sent to text with the same textstyle.

stroked_text or **hardware_text**

If stroked_text appears in the definition and there is no other hardware_text flag set, then the text will be stroked - that is, broken into straights, lines and curves.

If hardware_text appears in the definition, then the text is written out as hardware text.

By default, the height, slant and xfactor for the text can be set when text is defined however it is possible to set each of height, slant and xfactor to a fixed value.

or **fixed_height** value
 variable_height

If fixed_height and a value are specified, then all text in this textstyle is drawn at a fixed height. If fixed_height is missing or variable_height (the default) appears, then each text string in the textstyle has its own height.

or **fixed_slant** value
 variable_slant

If fixed_slant and a value are specified, then all text in this textstyle is drawn at a fixed slant. If fixed_slant is missing or variable_slant (the default) appears, then each text string in the textstyle has its own slant. Slant is given in degrees, minutes and seconds in the ddd.mmssfff format and must be between -45 and 45 degrees.

or **fixed_xfactor** value
 variable_xfactor

If fixed_xfactor and a value are specified, then all text in this textstyle is drawn at a fixed xfactor. If fixed_xfactor is missing or variable_xfactor (the default) appears, then each text string in the textstyle has its own xfactor.

Example of a Textstyle File

```
textstyle "1" {                      // DGN FONT 0                      ACAD FONT STANDARD
    output_name_dxf                  STANDARD
    input_name_dxf                  STANDARD
    input_name_dgn                  "0"
    output_name_dgn                  "0"
    stroked_text
    hardware_text_model
    hardware_text_dgn
    hardware_text_dxf
}
```

```
textstyle ISO {           // DGN FONT 1           ACAD FONT ISO

    font_name             ISO
    input_name_dxf         ISO
    output_name_dxf        ISO
    input_name_dgn         "1"
    output_name_dgn        "1"
    stroked_text
    hardware_text_model
    hardware_text_dgn
    hardware_text_dxf
}

textstyle MONO {          // DGN FONT 2           ACAD FONT MONO

    font_name             MONO
    output_name_dxf        MONOTXT
    input_name_dxf         MONOTXT
    input_name_dgn         "2"
    output_name_dgn        "2"
    stroked_text
    hardware_text_model
    hardware_text_dgn
    hardware_text_dxf
}

textstyle SCRIPT {        // DGN FONT 3           ACAD FONT SCRIPTC

    font_name             SCRIPT
    output_name_dxf        SCRIPTC
    input_name_dxf         SRCIPTC
    input_name_dgn         "3"
    output_name_dgn        "3"
    stroked_text
    hardware_text_model
    hardware_text_dgn
    hardware_text_dxf
}
```

Please see the next section [Fonts Definitions File](#) for a description of the fonts file.

Fonts Definitions File

The definition of any fonts referred to in the **textstyl.4d** file are given in the **fonts.4d** file which is searched for in the standard 12d Model set up paths, or is pointed to by the environment variable

```

    FONTS_4D           filename
```

The stroking for each character in the font (which is used when drawing the text on the screen and when required, stroking the text for outputs and plots) can be given in a separate file in the Autocad shape file format.

Inside **fonts.4d**, a font of a given name is defined by

```
font    font_name {
        font commands
    }
```

Each font must have a name and if the name includes imbedded spaces, it must be enclosed in



double quotes "".

The font itself is defined inside the braces where there can be zero or more font commands from the list

```

        stroke_file      filename
        proportional
or       fixed

```

The description of each command is

stroke_file stroke_file_name

The name of the file containing the stroking for each character in the font in Autocad ascii shape file format (.shp). The stroke_file_name is searched for in the standard 12d Model set up paths.

If the stroking for a character is not defined, the standard 12d Model character is used instead.

proportional or **fixed**

If a stroke file is not given, then the font could be a fixed (mono) or proportional font.

Example of a Font File

```

font  ISO {
        proportional
        stroke_file "ISO"
}
font  GOTHIC {
        proportional
        stroke_file "GOTHICE.SHP"
}
font  MONO {
        proportional
        stroke_file "MONOTXT.SHP"
}

```

To return to the beginning of this appendix, click on [Line styles, Symbols and Textstyles](#).



L Functions Keys, Menus, Toolbars

This appendix contains information about how user defined function keys, menus and toolbars are defined and used in *12d Model*.

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[User Defined Menus](#)
[User Defined Toolbars](#)

For documentation on the first item, continue to the next section [User Defined Function Keys](#).

User Defined Function Keys

The user can define function keys (with possible modifiers) to be used to

- (a) bring up most **12d** Model menus or panels
- (b) toggle certain snaps on or off.
- (c) start some geometry snaps
- (d) read a layout file
- (e) execute a batch file or a program (system call).
- (f) run users **12d** Model macros

The function key definitions are given in the file

userkeys.4d

which is searched for in the standard set up areas (local, USER_4D, user, set_ups etc.) or is pointed to by the environment variable

FUNCTION_KEYS_4D file // function key definitions

The format of the function_keys file is simply a list of function key definitions with only one per line. Blank lines in the file are ignored and anything on a line after a // is a comment.

The function key definition is

MODIFIERS FUNCTION_KEY OPERATION

where MODIFIERS can be totally missing or any combination of

 shift
 control
or alt

FUNCTION_KEY is one of

f1, f2,...f12 (**f7 should be avoided since it is used in 12d Model for typed input**,
f1 & f10 should be avoided since they are reserved by Windows NT)

and OPERATION is one of

menu	menu_name	// raise a menu
panel	panel_name	// raise a panel
snap	toggle_snap	// list of toggle_snaps given below
snap	cogo_snap	// list of cogo_snaps given below

```

                                cogog_command           // list of cogog_commands given below
                                layout                   layout_file_name // run a screen layout file
                                system                   batch_file         // run a batch file
                                system                   program             // run a program
or for macros
                                macro      options      user_macro_name      macro_arguments
where the macros options are:
```

```

                                -no_console             // don't display macro console
                                -close_on_exit           // remove console when macro terminates
                                -buttons                 // have buttons for finish, restart and quit on console
                                -allow_defaults          // allow default answers for console questions
```

The default when there are no macro options is to run the macro with a console but without buttons, and to leave the macro console on the screen when the macro terminates.

Menus and Panels

Menus and panels can be programmed by functions keys by simply giving the name of the menu and panel after the menu and panel command respectively.

For example,

```

                                f5      panel      "String Inquire"
                                f6      menu      "String Create"
```

View Menus and Panels

Menus and panels for views can be programmed by functions keys by substituting the text \$PLAN_VIEW, \$SECTION_VIEW or \$PERSPECTIVE_VIEW in place of the view name in the panel name or menu name.

For example,

```

                                f9      panel      "Plan Plot $PLAN_VIEW".
```

A panel for each view type can be programmed for the same modifier and function key combination. If the cursor is over the appropriate view type when the function key is selected, then the panel is fired up.

For example, the three definitions for f5

```

                                f5      panel      "Section Plot $SECTION_VIEW"
                                f5      panel      "Plan Plot $PLAN_VIEW"
                                f5      panel      "Perspective Plot $PERSPECTIVE_VIEW"
```

means that a panel will come up when f5 is selected over any of the three view types.

View Toggle Menus

The **toggle menus** available on each view can be set to a function key by

```

MODIFIERS  FUNCTION_KEY  menu      "Toggle $PLAN_VIEW"
MODIFIERS  FUNCTION_KEY  menu      "Toggle $SECTION_VIEW"
MODIFIERS  FUNCTION_KEY  menu      "Toggle $PERSPECTIVE_VIEW"
```

As for the view menus, the cursor must be over the appropriate view type when the function key is selected.

For example,

```

                                shift f8 menu "Toggle $PLAN_VIEW"
```

brings up the plan view toggle menu if shift f8 is selected when in a plan view.

Available Snaps to be Toggled

```

                                toggle_point_snap
                                toggle_line_snap
```

toggle_grid_snap
 toggle_cursor_snap
 toggle_tin_snap
 toggle_input_height_snap
 toggle_show_information

For example,

control f2 toggle_point_snap

Available Cogo Snaps

snap create_edit
 snap line_create_edit
 snap tangent_items_edit
 snap fillet_3_points_edit
 snap fillet_item_item_cp_edit
 snap fillet_item_item_radius_cp_edit
 snap locate_divide_edit
 snap locate_divide_distance_edit
 snap parallel_edit
 snap intersect_edit
 snap intersect_offset_edit
 snap bearings_intersect_edit
 snap between_points_edit
 snap locate_edit
 snap locate_chainage_edit
 snap locate_offset_edit
 snap locate_deflection_edit
 snap locate_drop_perpendicular_edit
 snap locate_projection_edit
 snap locate_two_point_distances_edit

For example,

shift f1 snap locate_chainage_edit

Available Cogo Commands

All the new cogo commands can be activated by a function key.

create_edit
 line_create_edit
 tangent_items_edit
 fillet_3_points_edit
 fillet_item_item_cp_edit
 fillet_item_item_radius_cp_edit
 locate_divide_edit
 locate_divide_distance_edit
 parallel_edit
 intersect_edit
 intersect_offset_edit
 bearings_intersect_edit
 between_points_edit
 locate_edit
 locate_chainage_edit
 locate_offset_edit
 locate_deflection_edit
 locate_drop_perpendicular_edit
 locate_projection_edit
 locate_two_point_distances_edit

For example,

f2 between_points_edit

Layout Files

Layout files can be called up using the **layout** command.
For example,

```
f8          layout      "/temp/contours.slf"
```

System Calls

Programs and batch files can be called up using the **system** command. The directories defined by the environment variables \$LIB_4D and \$USER_4D are included in the PATH environment variables so that any batch files or executables in these areas will be accessible without including any path name in the system call.

For example,

```
f4          system      special.exe      // run the program special.exe
shift f4    system      batch.bat        // run a batch file
control f4  system      "start cmd /k dir" // do a dir in a command shell
```

Macros

User macros can be run and the macros brought up with or without buttons, and with leaving or removing the macro console when the macro has finished.

The macro command structure and options are:

```
macro      options      user_macro_name      macro_arguments
```

where the macros options are:

```
-no_console      // don't display macro console
-close_on_exit   // remove console when macro terminates
-buttons         // have buttons for finish, restart and quit on console
-allow_defaults  // allow default answers for console questions
```

The default when there are no macro options is to run the macro with a console but without buttons, and to leave the macro console on the screen when the macro terminates.

For example,

```
f8    macro -no_console -close_on_exit"/area/drape_align.4do"
f9    macro  -buttons"/games/lots.4do"
```

For compatibility with earlier versions of 12d Model, the following macro commands are also supported:

```
macro          user_macro_name      // run macro without buttons,
                                         // leave console panel on exit
macro_2        user_macro_name      // run macro without buttons,
                                         // remove console panel on exit
macro_with_buttons user_macro_name  // run macro with buttons,
                                         // leave console panel on exit
macro_with_buttons_2 user_macro_name // run macro with buttons,
                                         // remove console panel on exit
```

\$LIB and \$USER_LIB

The variable \$LIB and \$USER_LIB can be used as part of the layout_file_name and user_macro_name to pick up files from either the library or user library.

For example,

```
f7          macro      "$LIB/drape_align.4do"
f8          macro      "$USER_LIB/lots.4do"
f9          layout      "$LIB/contours.slf"
```

Note - if \$LIB_4D is not defined, then 12dmodel/6.00/library is used. If \$USER_LIB_4D is not

defined, then 12dmodel/6.00/user_lib is used

Example of a User Function Key File

```
// File to define function key usage
// Note: f1, f6 & f10 are reserved by Windows NT
// f7 is reserved by 4D Solutions for typed input
// Available function key modifiers are

//          shift control alt

// Note: some alt key combinations are reserved by Windows NT
// Some sample lines may be

// f5          toggle_point_snap
// shift f5     toggle_line_snap
// control shift f7 toggle_input_height_snap

// Note that all function key modifiers must come before the function key itself.
// -----

// snaps

f3    toggle_point_snap
f4    toggle_line_snap
f5    toggle_grid_snap
f5    toggle_cursor_snap
f8    toggle_input_height_snap
// snaps cog

f9    snap intersect_offset_edit
f11   snap locate_chainage_edit
f12   snap locate_drop_perpendicular_edit

// panels

f2    panel "String Inquire"

shift f1 panel "Edit String"
shift f2 panel "String Delete"
shift f3 panel "Clean Model"
shift f4 panel "Delete Model"
shift f5 panel "Strings Edit Ops"
shift f6 panel "Points Edit Ops"
shift f7 panel "String Attributes"
shift f8 panel "Toggle $PLAN_VIEW"

// layout files

control f4 layout "$LIB/tri_contour_clean.slf"

// user macros

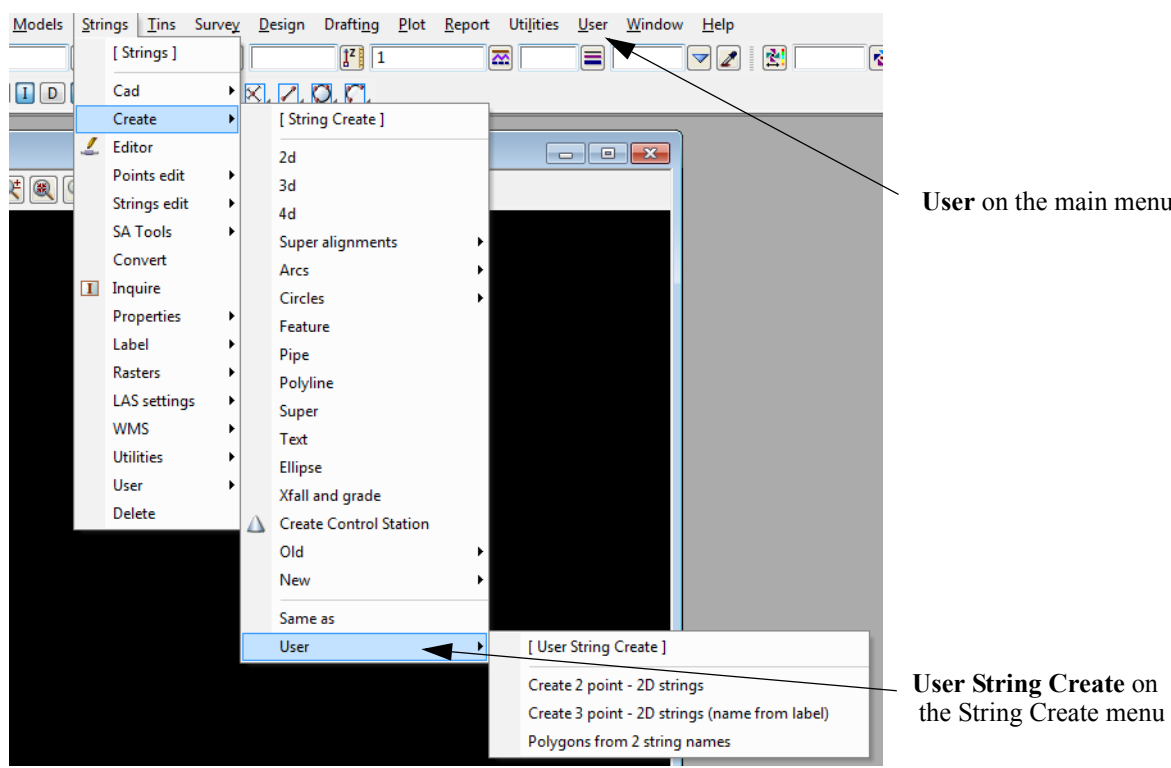
control f5 macro -no_console -close_on_exit "$LIB/Culd.4do"

// -----
```

Please continue to the next section [User Defined Menus](#).

User Defined Menus

To help customise **12d Model**, there is a pull down menu **User** on the Main menu and **User** menus on each of the pull down menus on the Main menu, and some other Menus.



The **User** menus can run **12d Model** macros, external programs, chains, and bring up **12d Model** screen layout files, panels and menus.

User menus can have walk-right menus, and any walk-right menus can have further walk-right menus so **User** menus can be used to build sophisticated tailored additions to **12d Model**. Each of the **User Defined** menus are also floating (tear away) menus just like standard **12d Model** menus.

All the **User** menus are defined in the two files: *Usermenu.4d*, which is created by the user, and *Xtramenu.4d*, which is supplied by **12d Solutions**.

When displayed, each **User** menu is divided into two sections with menu options supplied by **12d Solutions** in the file *Xtramenu.4d* on the top, and any options supplied by the user (in the file *Usermenu.4d*) underneath.

The default name for the **User Defined** Menu definition file is

usermenu.4d

which is searched for in the standard set up areas (local, USER_4D, user, set_ups etc.) or set by the environment variable

USER_OPTIONS_4D file // Customers User menu definition

The default name for the **12D Solutions** definition file which includes some macro for **User** is

xtramenu.4d

which is also searched for in the standard set up areas (local, USER_4D, user, set_ups etc.) or set by the environment variable

EXTRA_OPTIONS_4D file // 12D Solutions User menu definitions

The format for the User Defined Menu's file s given in the next section [Full Definition of User Menus](#).

Important Note

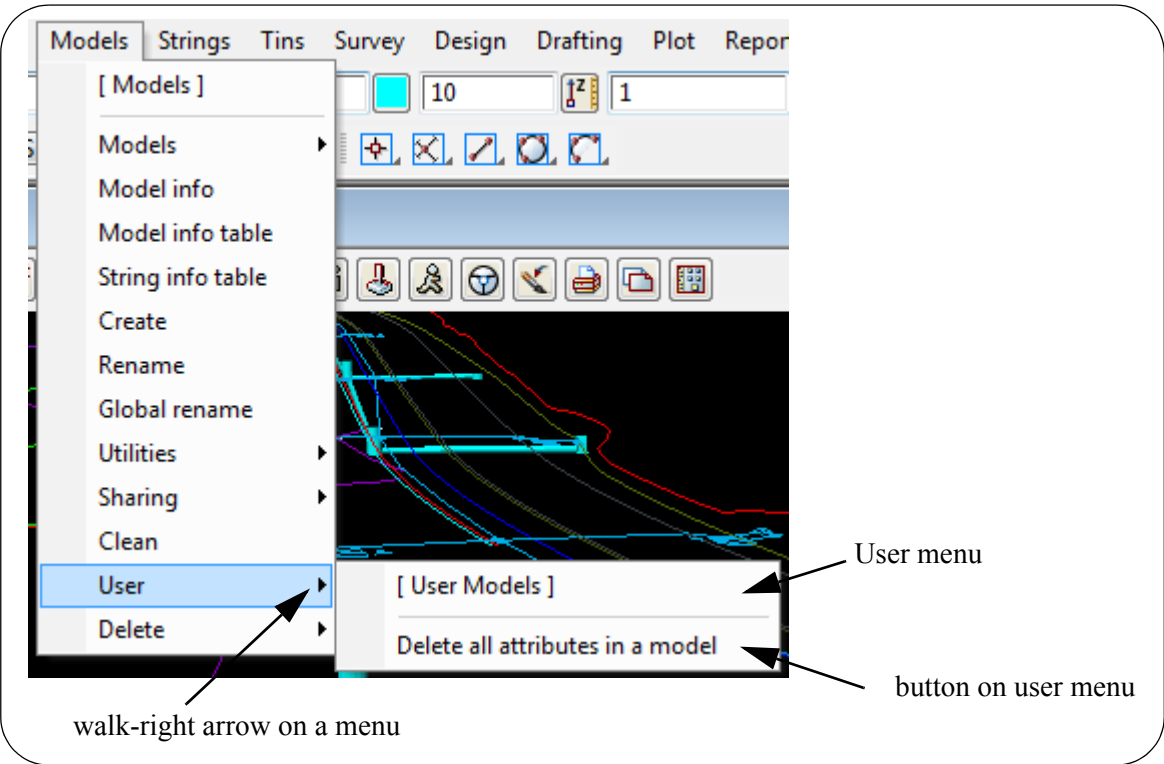
The file *xtramenu.4d* is for use by **12d Solutions** only. Please do not modify it because it may be over written in future updates. The file *usermenu.4d* is for Customer use.

Go to [Full Definition of User Menus](#)
 [Using \\$LIB and \\$USER_LIB in User Menus](#)
 [Placing User Defined Menus on User and Other 12d Menus](#)
 [Example of a User Defined Menu](#)

Full Definition of User Menu

The **User Defined Menus** are made up of *buttons* which have text on them and when the left hand mouse button (LB) is pushed down and released on a button, a *command* is executed.

A button can also have a walk-right menu which appears when the left hand mouse button (LB) is moved over the arrow on the right had side of the button. Walk-right menus can have walk-right menus.



The **text** for each button in the **User** menus, plus the action taken when the button is selected, is user specified. Any of the buttons can include further walk-right menus.

When a button is **selected**, the action can be to

- (a) run a 12d Model macro
- (a) run a 12d Model chain
- (b) bring up a 12d Model menu or User Defined menu
- (c) bring up a 12d Model panel
- (d) read a screen layout file
- (e) execute a batch file or program (system call)

In the *Usermenu.4d* file, a menu is defined by:

```
Menu menu_name {  
    button_1  
    button_2  
    ...  
    button_n  
}
```


where a button can include one or both of the keywords *Command* and *Walk_Right*, and the syntax for a button is

```
Button button_name {
    Walk_Right          menu_name_1
and/or    Command      command_name
}
```

The *text* displayed on the button is ***button_name*** and the definitions of the *Walk_Right* and *Command* commands are:

Walk_Right Menu for Buttons

The ***Walk_Right*** keyword specifies that there *is* a walk-right menu for the button and gives the *name* of the menu that is displayed when LB is moved over the walk-right arrow on the button.

The *Walk_Right* command consists of the word *Walk_Right* followed by one or more spaces and then the name of the menu that is displayed when over the walk-right arrow.

```
Walk_Right          menu_name
```

where *menu_name* is the name of another menu **defined elsewhere** in the *usermenu.4d* file.

When the *Walk_Right* keyword exists, a walk-right arrow is created on the button.

If there is no *Walk_Right* keyword, then there is no walk right arrow on the button.

A *Walk_Right* line is optional.

NOTE - walk-right menus *can* contain walk-right menus.

Commands for Buttons

The ***Command*** keyword defines what action occurs if **LB is clicked on the button**.

The *Command* consists of the word *Command* followed by one or more spaces and then the name of the command and any arguments it requires.

```
Command "command_name command_arguments"
```

The ***command_name*** and ***command_arguments*** can do any of:

(a) Run a User Defined or 12d Supplied **12d** Model Macro

```
Command "macro macro_options user_macro_name macro_parameters" // run macro
```

where the *macros_options* are:

```
-no_console          // don't display macro console
-close_on_exit       // remove console when macro terminates
-buttons             // have buttons for finish, restart and quit on console
-allow_defaults      // allow default answers for console questions
```

The default when there are no macro options is to run the macro with a console but without buttons, and to leave the macro console on the screen when the macro terminates.

For example

```
Button "Write Levels" {
    Command "macro Tival.4do"
}
Button "ADAC - show attributed/not attributed" {
    Command "macro -no_console -close_on_exit Adac_show_panel.4do"
```

```
}
```

(b) Run a chain

Command "**chain** chain_file_name"

For example

```
Button "Survey to ADAC 41 chain" {  
    Command "chain Survey_to_adac_data_41.chain"  
}
```

(c) Bring up a 12d Model menu and/or a User Defined Menu

Command "12d_model_menu_name"

or

Command "user_defined_menu_name"

The *12d_model_menu_name* is simply the name on the top of the **12d Model** menu.

The *user_defined_menu_name* is the name of a User Defined menu that is defined further down in the *usermenu.4d* file.

For example, for the menu called "Model Utilities", the

```
Button "Bring up the Model Utilities menu" {  
    Command "Model Utilities"  
}
```

Notice that for a menu, only the menu name in quotes follows the keyword *Command*.

Note: - this works because all the names must be unique amongst the **12d Model** menus, **12d Model** panels and *User Defined* menus.

A menu can occur as a *Walk_Right* menu and/or as a *Command*.

(d) Bring up a 12d Model panel

Command "12d_model_panel_name"

Every **12d Model** menu and panel has a unique name and the *12d_model_panel_name* is simply the name on the top of the panel.

For example, for the menu called "Test Helmert 2d (Advanced) panel", the

```
Button "Bring up a Helmert panel" {  
    Command "Test Helmert 2d (Advanced)"  
}
```

Notice that for a panel, only the panel name in quotes follows the keyword *Command*.

Note: - this works because all the names must be unique amongst the **12d Model** menus, **12d Model** panels and *User Defined* menus.

(e) Run a User Defined screen layout file

Command "**layout** layout_file_name"

For example

```
Button "Generate ADAC Tree Spreadsheet" {  
    Command "layout ADAC_Tree_Report.slx"  
}
```

(f) Execute a batch file or program

Command "**system** program_or_batch_file_name"

A Command line is optional.

Notes

1. A button can have both a **Walk_Right** and a **Command** defined for it.
2. If there is only a *Walk_Right* menu and no *Command*, clicking on the button will bring up the **Walk_Right** menu.
3. Both *Walk_Right* and *Command* can be left out.

For example

```
Button "-----" {
}
Button "" {
}
```

will create a button with the text "-----" on it and a button with no text on it.

4. in the *usermenu.4d* file, blank lines are ignored and anything on a line after a *//* is a comment

Continue to the next section [Using \\$LIB and \\$USER_LIB in User Menus](#) or return to [User Defined Menus](#).

Using \$LIB and \$USER_LIB in User Menus

The variable \$LIB and \$USER_LIB can be used in Commands as part of the user_macro_name, chain_file_name, layout_file_name and programe_or_batch_file_name to pick up files from either the *12d Library* or the *User library*.

Note

If \$LIB_4D is not defined, then 12dmodel/version_number.00/library is used.

If \$USER_LIB_4D is not defined, then 12dmodel/version_number.00/user_lib is used

For example, the definition of a menu called "Lots" could be:

```
Menu "Lots" {  
  Button "Create lots" {                                // button called "Create lots" which  
    Command "macro -close_on_exit $USER_LIB/subdiv.4do" // fires up a 12d Model macro  
  }  
  Button "Roads" {                                       // button with walk-right menu "Roads" and layout file  
    Walk_Right "Roads"                                   // walk-right menu "Roads"  
    Command "layout $USER_LIB/road.slx"                 // button invokes a layout file if selected  
  }  
}
```

Continue to the next section [Placing User Defined Menus on User and Other 12d Menus](#) or return to [User Defined Menus](#).

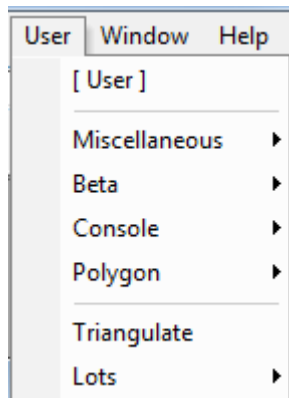
Placing User Defined Menus on User and Other 12d Menus

User Defined Buttons on Main User Menu

The place buttons or menus in the bottom of the **User** menu on the Main menu, put the buttons in a menu called **User** in the `usermenu.4d` file.

For example

```
Menu "User" {
  Button "Triangulate" {           // button called Triangulate which brings up
    Command "Triangulate a View"   // the "Triangulate a View" panel
  }
  Button "Lots" {                 // button called Lots with its
    Walk_Right "Lots"             // own walk-right menu called Lots
    Command "Triangulate a View"   // plus clicking on the button brings up the
  }                               // the "Triangulate a View" pane
}
```



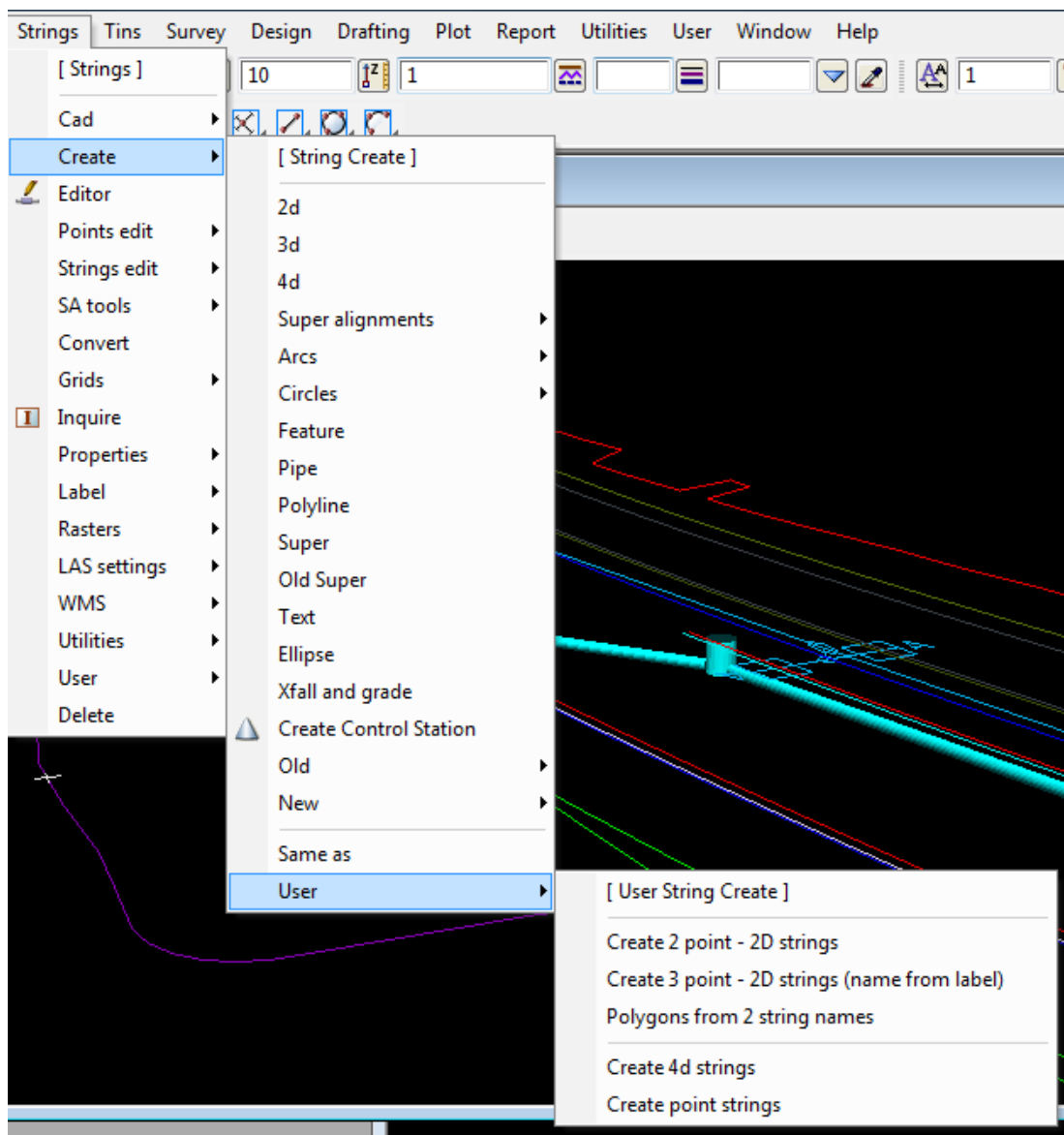
User Defined Menus on Other 12d Menus

It is also possible to define a **User** submenu on any **12d Model** menus or submenu.

In **12d Model**, all menus and sub-menus on the **Main** menu have a unique name. So a **User** menu is defined for any of them by simply having a menu called "User menu_name" in the `usermenu.4d` file.

For example, the menu for the option *Strings=>Create* is called **String Create** (String not Strings) so a **User** menu for *Strings=>Create* would be called "User String Create":

```
Menu "User String Create" {
  Button "Create 4d strings" {
    Command "macro -close_on_exit $USER_LIB/ref_points.4do"
  }
  Button "Create point strings" {
    Command "macro -close_on_exit $USER_LIB/x_sects.4do"
  }
}
```



Names for User Defined Menus

Apart from the names of the special User menus just mentioned, all other menu names in *usermenu.4d* are user defined so they can be easily used in user defined walk-right menus.

And menu referred to in the file *usermenu.4d* that is not one of the special *User menus*, ***must be must be defined*** somewhere in the *usermenu.4d* file.

And remember, all the names must be unique amongst the **12d Model** menus, **12d Model** panels, special User menu and *user named User Defined* menus.

Continue to the next section [Example of a User Defined Menu](#) or return to [User Defined Menus](#).

Example of a User Defined Menu

// the definition of buttons to go on the Main menu option "User"

```
Menu "User" {                                     // User menu on Main menu
  Button "Triangulate" {                           // button called Triangulate which brings up
    Command "Triangulate a View"                   // the "Triangulate a View" panel
  }
  Button "Lots" {                                  // button called Lots with its
    Walk_Right "Lots"                              // own walk-right menu called Lots
  }
  Button "Roads" {                                 // button with walk-right menu "Roads"
    Walk_Right "Roads"
    Command "layout $LIB/road.slf"                 // button invokes a layout file if selected
  }
}
```

// the definition of the walk-right menu Lots

```
Menu "Lots" {
  Button "Create lots" {
    Command "macro $LIB/subdiv9.4do"
  }
  Button "Label lots" {
    Command "macro $LIB/subnum3.4do"
  }
  Button "Write Lot Levels" {
    Command "macro $LIB/Tinval.4do"
  }
}
```

// the definition of the walk-right menu Roads

```
Menu "Roads" {
  Button "Roundabout" {
    Command "macro $LIB/Round.4do"
  }
  Button "Culdesac bulb" {
    Command "macro $LIB/Culd.4do"
  }
  Button "Drape alignment string" {
    Command "macro $LIB/Drape_al.4do"
  }
  Button "Create Table drain" {
    Command "macro $LIB/Table_dr.4do"
  }
}
```

// the definition of User on the Main menu option Strings=>Create"

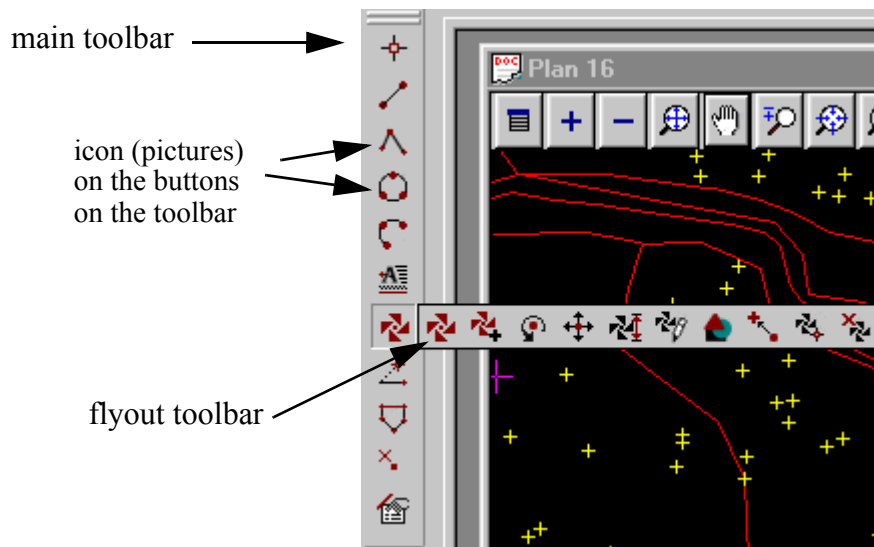
```
Menu "User String Create" {                       // User menu on option Strings=>Create
  Button "Create ref points" {
    Command "macro -close_on_exit $LIB/ref_points.4do"
  }
  Button "Create X-sections" {
    Command "macro -close_on_exit $LIB/x-Sects.4do"
  }
}
```

Continue to the next section [User Defined Toolbars](#) or return to [User Defined Menus](#).

User Defined Toolbars

A **toolbar** is made up of buttons which can have a picture on them (icons) and when the left hand mouse button (LB) is pushed down and released on the button, a command is executed.

A button can also have a *flyout* toolbar which appears when the left hand mouse button (LB) is held down on the button (note that there can only be one level of flyouts).



The definitions for *toolbars* in 12d Model are stored in a file called *toolbars.4d*. When 12d Model is installed, *toolbars.4d* is installed in the 12d Model folder *Set_Ups*.

To customise 12d Model toolbars, a user can modify *toolbars.4d* and save the modified version in the folder *Users*.

The icon for each button on a toolbar, plus the action taken when the button is selected is user specified. A button can include a fly-out toolbar but flyouts can only be to one level (i.e. no flyouts on flyouts).

When a button is **selected**, the action can be to

- (a) run a 12d Model macro
- (b) bring up a 12d Model menu
- (c) bring up a 12d Model panel
- (d) read a layout file
- (e) execute a batch file or program (system call)

When 12d Model starts up, any toolbars defined in *toolbars.4d* that are *not* called as flyouts by another toolbar in *toolbars.4d*, are displayed in the *main toolbar* on the left hand side of the 12d Model screen.

For 12d Model V6.0, toolbars can be moved around but the new positions are not saved with the project. Also there is no way within 12d Model to select which toolbars are used for a project - all the ones defined in *toolbars.4d* are used whenever a new or existing project is loaded into 12d Model V6.0.

Full Definition of Toolbars

The definition for **Toolbars** is given in a file called

Toolbars.4d

which is searched for in the standard set up areas (local, USER_4D, user, set_ups etc.) or set by the environment variable

```
TOOLBARS_4D                                file           // Toolbars definition
```

In the *toolbars.4d* file, a **toolbar** is defined by:

```
Toolbar toolbar_name {  
    button_1  
    button_2  
    ...  
    button_n  
}
```

where a button can include none or more the commands *Icon*, *Command* and *Flyout*, and the syntax for button is:

```
Button button_name {  
    Icon      icon_name_1  
    Command   command_name_1  
    Flyout    toolbar_name_1           // only used if a flyout toolbar is required  
}
```

The definitions of the *Icon*, *Command* and *Flyout* commands are:

Icons for Toolbars

The **Icon** command defines the bitmap that is displayed for the button in the toolbar. The format of the bitmap is a bmp file (.bmp) of size 16x16. The *Icon* command consists of the word *Icon* followed by one or more spaces and then the name of the bitmap, *icon_name*.

```
Icon icon_name
```

The *icon_name* can include a pathname but if no pathname is present, the bitmap is searched for in the folder *Images* under the folders *User* or *Set_Ups*.

If the *Icon* command is missing then a default *Icon* command is used with the *icon_name* **button_name.bmp**

```
Icon button_name.bmp
```

Command for Toolbars

The **Command** command defines what action occurs if LB is clicked on the button. The *Command* command consists of the word *Command* followed by one or more spaces and then the name of the command and any arguments it requires.

```
Command command_name
```

The Commands are the same as those for a User Defined menu. See [Commands for Buttons](#)

If the *Command* command is missing then a default *Command* is used with the command name **button_name** with no arguments

```
Command button_name
```

Flyout for Toolbars

The ***Flyout*** command defines what toolbar is displayed when LB is help down on the button. The *Flyout* command consists of the word *Flyout* followed by one or more spaces and then the name of the toolbar that is displayed.

Flyout *flyout_toolbar_name*

where *flyout_toolbar_name* is the name of another toolbar defined elsewhere in the toolbars file.

When the *Flyout* command exists, *Icon* and *Command* are not required and if they are present, are ignored.

The icon on the *Flyout* button is the *Icon* from the first button in the flyout toolbar.

The command executed if LB is pressed and released on the *Flyout* button is the *Command* from the first button in the flyout toolbar.

NOTE - flyouts *can not* be nested so the toolbar *flyout_toolbar_name* can not contain a *Flyout* command.

NOTE - when 12d Model starts up, any toolbars defined in *toolbars.4d* that are *not* called as flyouts by another toolbar in *toolbars.4d*, are displayed in the *main toolbar* on the left hand side of the 12d Model screen.

Example of a User Defined Toolbar

```
// -----
// WARNING: you cannot have the same command using different icons
// ALSO: when using a flyout, the Command & Icon are ignored
//      and the details are taken from the first button
//      on the flyout
// -----

Toolbar "Cad" {
  Button "Points" {
    Command "Create Point"           // this is ignore since it is a flyout
    Icon   "Create Point.bmp"       // this is ignore since it is a flyout
    Flyout "Cad Points"
  }
  Button "Change String" {
    Flyout "Change String"
  }
}

Toolbar "Cad Points" {               // used as a flyout toolbar
  Button "Create Point" {
    Command "Create Point"
    Icon   "Create Point.bmp"
  }
  Button "Chainage" {
    Command "Locate Chainage"
    Icon   "Chainage.bmp"
  }
} // end of "Cad Points" toolbar

Toolbar "Change String" {           // used as a flyout toolbar
  Button "String Close" {
    Command "String Close"
    Icon   "String Close.bmp"
  }
  Button "String Reverse" {
    Command "String Reverse"
    Icon   "String Reverse.bmp"
  }
  Button "String Trim" {
```

```
        Command "String Trim"
        Icon   "String Trim.bmp"
    }
} // end of "Change String" toolbar
```

\$LIB and \$USER_LIB

As they were for Commands in User Defined menus, the variables \$LIB and \$USER_LIB can be used in Commands as part of the user_macro_name, chain_file_name, layout_file_name and programe_or_batch_file_name to pick up files from either the *12d Library* or the *User* library. See [Using \\$LIB and \\$USER_LIB in User Menus](#).

For example, the definition of a toolbar called "Lots" could be:

```
Toolbar "Lots" {
    Button "Create lots" {                                // button called "Create lots" which
        Command "macro -close_on_exit $USER_LIB/subdiv.4do" // fires up a 12d Model macro
    }
    Button "Roads" {                                     // button with walk-right menu "Roads" and layout file
        Walk_Right "Roads"                               // walk-right menu "Roads"
        Command "layout $USER_LIB/road.slf"               // button invokes a layout file if selected
    }
}
```

Notes

- (a) The variables \$LIB and \$USER_LIB can be used as part of the layout_file_name and user_macro_name to pick up files from either of the libraries.
- (b) blank lines in the toolbars file are ignored and anything on a line after a // is a comment

Another Example of a Toolbar

```
Toolbar "Cogo" {
// in this case, the Command is assumed to be "Create Line"
// the icon is "Create Line.bmp"
// Command is normally the name of the panel/menu
    Button "Create Line" {
    }
// this is a spacer
    Button "" {
    }
// this is a command and also has a flyout capability
// calling the toolbar called Flyout
// flyouts cannot be nested
    Button "Create Fillet by radius" {
        Command "Create Fillet by radius"
        Icon   "Create Fillet by radius.bmp"
        Flyout "Flyout"
    }
}
```

```
// The flyout toolbar for above (and a normal toolbar as well)
Toolbar "Flyout" {
  Button "Create Line" {
  }
  Button "" {
  }
  Button "Create Arc by Centre Radius" {
    Command "Create Arc by Centre Radius End Points"
    Icon "Create Arc by Centre Radius End Points.bmp"
  }
  Button "Create Fillet by radius" {
    Command "Create Fillet by radius"
    Icon "Create Fillet by radius.bmp"
  }
}
```

To return to the beginning of this appendix, click on [Functions Keys, Menus, Toolbars](#).



M Special File Formats

Default File Ending

In any panel pop-up requiring a file name to be displayed, default file endings are used to restrict the **names** of the files selected from the current folder and if they exist, from the library and user library areas.

Whilst a panel is up, the extension being searched for can be changed by typing say "*.xyz" into the panel field requiring a file name, and then pressing <enter>. The list of files ending in **.xyz** will be displayed and clicking B3 in the panel field will also bring up a list of all files ending in **".xyz"**. When a new panel is created, the panel fields revert to the default file ending.

A list of the **default** files used in **12d** Model pop-ups and their endings is:

File Type	Default Ending	
Miscellaneous Files		
affine 2d	.aaf	see 2D Affine
affine 2d orthogonal	.ortho_aff	see 2D Affine - Orthogonal
chains (V10 onwards)	.chain	see Chains
chains (pre V10)	.rcn	see Chains
boxing definitions file	.bf	
digitizer registration	.aff	see Register Plan
eagle mapping	.emf	
Helmert 2d - no forced scale	.hel	No longer used
Helmert 2d - allow forced scale	.hel_adv	see 2D Helmert (Advanced)
Helmert 3d	.hel_3d	see 3D Helmert
label map file (pre V10)	.lmf	
label map file (V10 onwards)	.label_mapfile	
many templates	.mtf	see Advanced Design
mapping file (pre V10)	.mf	see Create/Edit a Map File
mapping file (V10 onwards)	.mapfile	see Create/Edit a Map File
panel defaults file (pre V10)	.ddf	see Panel Defaults - ddx Files
panel defaults file(V10 onwards)	.ddx	see Panel Defaults - ddx Files
reports	.rpt	
screen layout file (pre V10)	.slf	
screen layout file(V10 onwards)	.slx	
templates	.tpl	
textstyle file	.tsf	
Survey Files		
12d Model field file	.fld	
reduction history	.rh	
12d field - Helmert 2.5	.tdf_hel	see GPS Localisation
Input/Output Files		
4d ascii	.4da	
12d ascii	.12da	
AutoCAD	.dxf	
BCC Epson dat files	.dat	
BCC Epson sur files	.sur	
CivilCad V4	.asc	

CivilCad V5	.as5
Eagle command	.cmd
Eagle binary	.mod
Geocomp	.pts
Keays	.trf
Microstation, Intergraph binary	.dgn
MX, Moss	.mos
TP Setout	.pta
xyzs data	.dat

Range Files

aspect range	.arf
depth range	.drf
height range	.hrf
slope range	.srf

Plot Parameter Files

Drainage long section	.drainppf	see Drainage Plot PPF Editor
Drainage plan	.drainplanppf	see Drainage Plan Plot PPF Editor
Long section	.lplotppf	see Long Plot PPF Editor
Melbourne Water) sewer long section	.melbppf	see Melbourne Water Plot PPF Editor
Plot frame	.plotframeppf	see Plot Frame and PPF Editor
Pipeline long section	.pipelineppf	see Pipeline Plot PPF Editor
Xsection	.xplotppf	see X Plot PPF Editor
Pre V7 plot parameter files	.ppf	

Plot Format Files

AutoCAD	.dxf
CalComp	.cal
DGN (Microstation,Intergraph)	.dgn
Dogs	.par
Eagle	.mod
Frame maker	.mif
HP GL	.hp
HP 7475	.hpa
HP GL 7600	.hpm
HP GL 2 (colour)	.hpc
pcl5	.pcl5
PostScript	.ps

Display Files - dumps, movies

gif	.gif
jpeg	.jpg
jpeg 2000	.j2k
PDF	.pdf
PNG	.png
PostScript	.ps
Targa	.tga
Tiff	.tif
Windows bitmap	.bmp
XPS	.xps

4DML's - 12d Solutions programming/macro language

macro source file	.4dm
macro object/executable	.4do
macro listing	.4dl

Note

This list is for the default files used in 12d Model panel fields. It does not include 12d Model setup files which are given in the appendix [Setting Up and Configuring 12d](#).

Special 12d Solutions File Formats

12d Solutions has a number of special file formats, most of which have already been specified. The remaining formats will now be given.

In any of the files, blank lines ignored and any information after // until the end of that line is ignored. Hence **comments** can easily be inserted into the files by preceding them by //. Unless enclosed in quotes ("), more than one consecutive space or tab are treated as one space.

Eagle Map File

An eagle map file is a user created file consisting of a list of 12d Model colours and the Eagle pen, dash style, pen thickness and frag to be used for the colour. The map file is set out with one 12d Model colour per line. The line begins with the 12d Model colour followed by the Eagle pen number, dash style, thickness and frag to be used for the 12d Model colour. Each item is separated by one or more spaces.

For example, if the 12d Model colour red is to be mapped to Eagle pen 3, dash style 4, thickness 2 and frag 1, then the line in the eagle map file would be

red 3 4 2 1

An eagle map file can be used for writing out three dimensional data to Eagle, or when producing plots in Eagle format. For plotting, the map file must be called eagleplt.emf.

When writing three dimensional data out to Eagle, a user specified file name is allowed. In the output case, as each string is written out, the map file is searched sequentially until a colour match is made. If no match is found, the colour of the string is used as a pen number and default values used for dash, thickness and frag.

Comments can be included in the map file by preceding the comment with a double forward slash (i.e. //). Anything on the line following the // will be ignored.

An example of an Eagle map file is,

```
//12d Model colour to Eagle mapping file
//
//12d Model colour eagle pen dash thickness frag

black 0 1 1 1
red 2 0 1 5
green 4 1 1 1
blue 4 2 1 11
cyan 5 1 1 1
yellow 6 1 1 1
magenta 7 1 1 1
white 1 1 1 1
orange 15 1 1 1
purple 14 1 1 1
grey 13 1 1 1
"dark green" 12 1 1 1
"dark red" 11 1 1 1
"off yellow" 4 1 1 1
"dark blue" 8 1 1 1
brown 11 1 1 1
```

Template File

The 12d Solutions Template file format is a simple ascii file definition for reading and writing out template definitions for use in the apply options in **12d Model**.

The template definition begins with the key word **template** followed by the template name and then the definitions of

fixed, cut, fill and final parts of the template

or fixed and decision parts

all enclosed within curly braces { }.

```

template fred {
    fixed {
        ...
    }
    cut {
        ...
    }
    fill {
        ...
    }
    final {
        ...
    }
}

template fred {
    fixed {
        ...
    }
    decisional {
        ...
    }
}

```

The definition of the **fixed** part of the template begins with the key word **fixed** followed by a list of the links enclosed in curly braces {}.

The links are defined one per line in order from the centre-line. Each link begins with the keyword **link** followed by the width, percent cross-fall, colour and name for each link. For the percent cross-fall, positive means up, negative is down and zero horizontal.

For example,

```

fixed {
    link    3.5    -3    cyan    kerb
    link    1      -4    magenta shoulder
    link    2      -5    blue    verge
}

```

describes a fixed template with three links, the first of width 3.5 with a 3% cross-fall downwards, the next link of width 1 with 4% cross-fall downwards and the third link of width 2 and 5% cross-fall downwards.

The definition of the **cut** part of the template begins with the key word **cut** followed by a list of the links enclosed in curly braces {}.

The links are defined one per line in order from the end of the fixed template (or centre-line if no fixed part exists). Each link begins with the keyword **link** followed by the width, one in slope, colour and name for each link. For cut, the **one in** slope is positive for up, negative for down, and zero for horizontal.

For example,

```
cut {
  link    3      2      yellow  a
  link    2      0      magenta  b
  link    3     -1      yellow  c
  link    2      0      magenta  d
}
```

describes a cut template with four links, the first of width 3 with 1:2 slope upwards, the next link of width 2 horizontally, the third link of width 3 and 1:1 slope downwards and width 2 horizontally.

The definition of the **fill** part of the template begins with the key word **fill** followed by a list of the links enclosed in curly braces {}.

The links are defined one per line in order from the end of the fixed template (or centre-line if no fixed part exists). Each link begins with the keyword **link** followed by the width, one in slope, colour and name for each link. For fill, the **one in** slope is positive for down, negative for up, and zero for horizontal. Please note that this is the opposite to **cut**.

For example,

```
fill {
  link    5      2      yellow  e
  link    1      0      magenta  f
  link   10     -1      yellow  g
}
```

describes a fill template with three links, the first of width 5 with 1:2 slope downwards, the next link of width 1 horizontally, and the third link of width 10 and 1:1 slope upwards.

The definition of the **final** part of the template begins with the key word **final** followed the cut slope, fill slope and search distance enclosed in curly braces {}. The key words for the three values are **cut_slope**, **fill_slope** and **search_distance**.

For example,

```
final {
  cut_slope  1  fill_slope  2  search_distance  100
}
```

describes a final cut slope of 1:1 (upwards), fill slope of 1:2 downwards and template with three links, the first of width 5 with 1:2 slope downwards, both going for a maximum distance of 100.

The definition of the **decisions** part of the template begins with the key word **decisional** followed by a list of the decision commands enclosed in curly braces {}.

The decision commands are defined one per line and have the format:

Fixed Xfall Width *value* Height *value* XFall *value* Name *text* Colour *colour*

Fixed Slope Width *value* Height *value* Slope *value* Name *text* Colour *colour*

Tin Width *tin_name* Strip *value* width *value* Name *text* Colour *colour*

String Offset *string_name* Strip *value* Offset *value* Name *text* Colour *colour*

Batter *tin_name* Strip *value* Width *value* Height *value* Slope *value* Name *text*
Colour *colour* Goto *label*

Tin Decision *tin_name* Offset *value* Min *value* Max *value* Goto *label*

Label *label_name*

Goto *label_name*

End

For example,

```
template "std" {
  fixed {
    link 3 unknown -3 cyan "kerb"
    link 1 unknown -4 magenta "shoulder"
    link 2 unknown -5 purple "verge"
  }
  decisional {
    Tin_Decision "rock" 0 0 1000 "cut_rock"
    Tin_Decision "shale" 0 0 1000 "cut_shale"
    Tin_Decision "terrain" 0 0 1000 "cut_terrain"
    Label "fill_terrain"
    Batter "terrain" 0 8 unknown -3 "f1" blue "alldone"
    Batter "terrain" 0 1 unknown 0 "f2" "dark green" "alldone"
    Goto "fill_terrain"
    Label "cut_rock"
    Tin_Decision "rock" 0 0 0.3 "cut_rock_done"
    Batter "rock" 0.3 5 unknown 0.5 "r1" cyan "cut_rock_done"
    Batter "rock" 0 2.5 unknown 0 "r2" yellow "cut_rock_done"
    Goto "cut_rock"
    Label "cut_rock_done"
    Tin_Decision "shale" 0 0 1000 "cut_shale"
    Goto "cut_shale_done"
    Label "cut_shale"
    Tin_Decision "shale" 0 0 0.6 "cut_shale_done"
    Batter "shale" 0.6 6 unknown 1 "s1" magenta "cut_shale_done"
    Batter "shale" 0 3 unknown 0 "s2" "dark red" "cut_shale_done"
    Goto "cut_shale"
    Label "cut_shale_done"
    Tin_Decision "terrain" 0 0 1000 "cut_terrain"
    Goto "alldone"
    Label "cut_terrain"
    Batter "terrain" 0 3 unknown 1.5 "t1" red "alldone"
    Batter "terrain" 0 2 unknown 0 "t2" green "alldone"
    Goto "cut_terrain"
    Label "alldone"
  }
}
```

Notes

1. spaces in text - any text string that includes spaces or only numbers, must be enclosed in double quotes.
2. comments - anything after // until the end of the line is ignored.
3. blank lines - blank lines are ignored

Screen Layout File

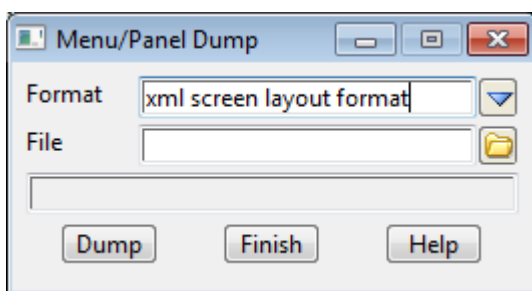
The 12d Model **screen layout file** contains a simple text file definition for 12d Model panels and menus in either the pre-V10 format (slf) or the V10 XML format (slx).

The definition includes a screen position for the panel or menu, and for panels, values for any of the panel fields.

At any time, the layout of the menus and panels on the screen in a 12d Model session can be written out using the menu option

File i/o=>Layouts =>Layout output

Also, the layout for an individual panel or menu can be created by clicking RB in the menu/view title area and selecting the dump option to bring up the **Menu/Panel Dump** panel.



Note: If a screen layout file is created and added to the *layout.4d* file (by selecting *layout.4d* as the file name and selecting **Append**), then the menu/panel will appear whenever a project is opened. See [layout.4d](#)

A screen layout file can be read in using the menu options

File i/o=>Layouts =>Layout input Or File i/o=>Layouts =>Layout input files

Also when a project starts up, the layout file **layout.4d** is read in and any menus and panels described in the file are placed on the screen (see [Set Up Files Used for New and Existing Projects](#)).

An example of a screen layout file for 'Read x y z s Data' in the V10 format is:

```
<?xml version="1.0"?>
<xml12d xmlns="http://www.12d.com/schema/xml12d-10.0" xmlns:xsi="http://www.w3.org/
2001/XMLSchema-instance" language="English" version="1.0" date="2013-04-03"
time="12:22:55" xsi:schemaLocation="http://www.12d.com/schema/xml12d-10.0 http://
www.12d.com/schema/xml12d-10.0/xml12d.xsd">
  <meta_data>
    <units>
      <metric>
        <linear>metre</linear>
        <area>square metre</area>
        <volume>cubic metre</volume>
        <temperature>celsius</temperature>
        <pressure>millibars</pressure>
        <angular>decimal degrees</angular>
        <direction>decimal degrees</direction>
      </metric>
    </units>
    <application>
      <name>12d Model</name>
      <manufacturer>12d Solutions Pty Ltd</manufacturer>
      <manufacturer_url>www.12d.com</manufacturer_url>
      <application>12d Model 10.0C1i Doco - Not For Production</application>
    </application>
  </meta_data>
</xml12d>
```

```

    <application_build>10.1.9.7</application_build>
    <application_path>C:\Program Files (x86)\12d\12dmodel\10.00\nt.x86\12d.exe</
application_path>
    <application_date_gmt>11-Mar-2013 01:48:06</application_date_gmt>
    <application_date>11-Mar-2013 12:48:06</application_date>
  </application>
</meta_data>
<screen_layout>
  <version>1.0</version>
  <panel>
    <name>Read x y z s Data</name>
    <x>2393</x>
    <y>215</y>
    <files_box>
      <name>File</name>
      <tick_box>
        <name>Advanced</name>
        <value>>false</value>
      </tick_box>
      <file_box>
        <name>File to read</name>
        <value>faces.dat</value>
      </file_box>
    </files_box>
    <file_box>
      <name>Map file</name>
      <value/>
    </file_box>
    <input_box>
      <name>Pre*postfix for models</name>
      <value/>
    </input_box>
    <input_box>
      <name>Default line colour</name>
      <value>magenta</value>
    </input_box>
    <input_box>
      <name>Default point colour</name>
      <value>yellow</value>
    </input_box>
    <input_box>
      <name>Default model for data</name>
      <value>faces</value>
    </input_box>
    <tick_box>
      <name>Use super strings</name>
      <value>>false</value>
    </tick_box>
    <input_box>
      <name>Add to view</name>
      <value>1</value>
    </input_box>
    <run_button>
      <name>&Read</name>
    </run_button>
  </panel>
</screen_layout>
</xml12d>

```



Map File for 12d Model V4.0

Up to 12d Model V4.0, the map file format consisted of one or more lines. Each line begins with a key (entity-mask) followed by a string name, model name, colour, breakline type (point or line), and line style separated by one or more spaces. The key can contain wild cards (*) and wild characters (?).

When a string is read in and satisfies a key, the key's corresponding string name, model, colour, breakline type and style is used for that string.

For example, any entity name beginning with 31 can be created as a 12d Model string with the name picket, colour cyan, breakline type line, line style 1 and model fences by the map file line

31*	picket	fences	cyan	line	1
-----	--------	--------	------	------	---

If a map file is used, as each entity is read in, the map file is searched sequentially until a match with a key is made and the key's name, colour etc. used. If no match is found, the default colours and model (given in the read panel) are used.

Notes

- 1. If the entity-name is to be used as the new string name, use an asterisk (*) in place of the string name. For example,

fred	*	fences	cyan	line	1
------	---	--------	------	------	---
- 2. If the default model for the reader is to be used as the model name, use an asterisk in place of the model name. For example,

31	31	*	cyan	line	1
----	----	---	------	------	---
- 3. A * for colour, breakline type and linestyle means that if the entity has a colour, breakline style or line-style, then it is used rather than be mapped to another one.
- 4. All model names used in the map file can be given an extra (common) prefix by typing the prefix into the prefix for models field in the read panel.
- 5. If any information includes a space, then it must be enclosed in quotes ". For example, the model name may be "trial 1" or a style "large tanks".
- 6. Comments can be included in the map file by preceding them with a double forward slash //. Anything on the line after the // is ignored.

An example of a 12d Model map file is

```
// 12d Model map file
// key      name      model      colour      pt-line      linestyle

102      break      breaks      red      line      solid
305      fence      caddast      green      point      dash
998      bdry      bound      cyan      line      solid
spots      *      spot      yellow      point      1
PS*      *      *      yellow      point      1
```

Map File for 12d Model V5.0 and Above

For 12d Model V5.0, the map file was extended to allow for defining properties such as tinability, symbols at vertices, vertex and segment text and pipe and culverts.

To allow for all the different type of mapping in the one file, the map file is broken up into sections (one section for each tab of the map file editor) and each section begins with a header record which is the section name enclosed in braces ({ }). For example, the symbols section has the

header

{symbol_data}

Inside each section, the data is similar to the V4.0 map file with lines consisting of a key (entity-mask) followed by the data required for that section. The key can contain wild cards (*) and wild characters (?).

The exact format for the map file is not required since they are created and edited from within 12d Model by the option

File i/o => Map file

12d Patterns File

This section of documentation is a work in progress and will be updated in subsequent releases.

N Plotters and Plotting

The method of creating plots and sending them to a plotter or a Cad system such as AutoCad or Microstation, varies from site to site.

12d Model provides an array of set ups and options to enable the user to tailor the plotting system.

Since the plotting set ups and options are scattered throughout **12d** Model, the rationale behind the plotting set ups will be summarized in this chapter.

Go to [Supported Plotters](#)
[Sending Plots to a Plotter](#)
[Mapping Colours to Plotter Pens](#)
[User Defined Plotters](#)
[Microstation \(DGN\) Plot Seed File](#)
[Sheet Sizes](#)
[Hardware Arcs](#)
[Interface Colours](#)
[Text Units](#)
[Pixels to mm](#)

For documentation on the first item, continue to the next section [Supported Plotters](#).

Supported Plotters

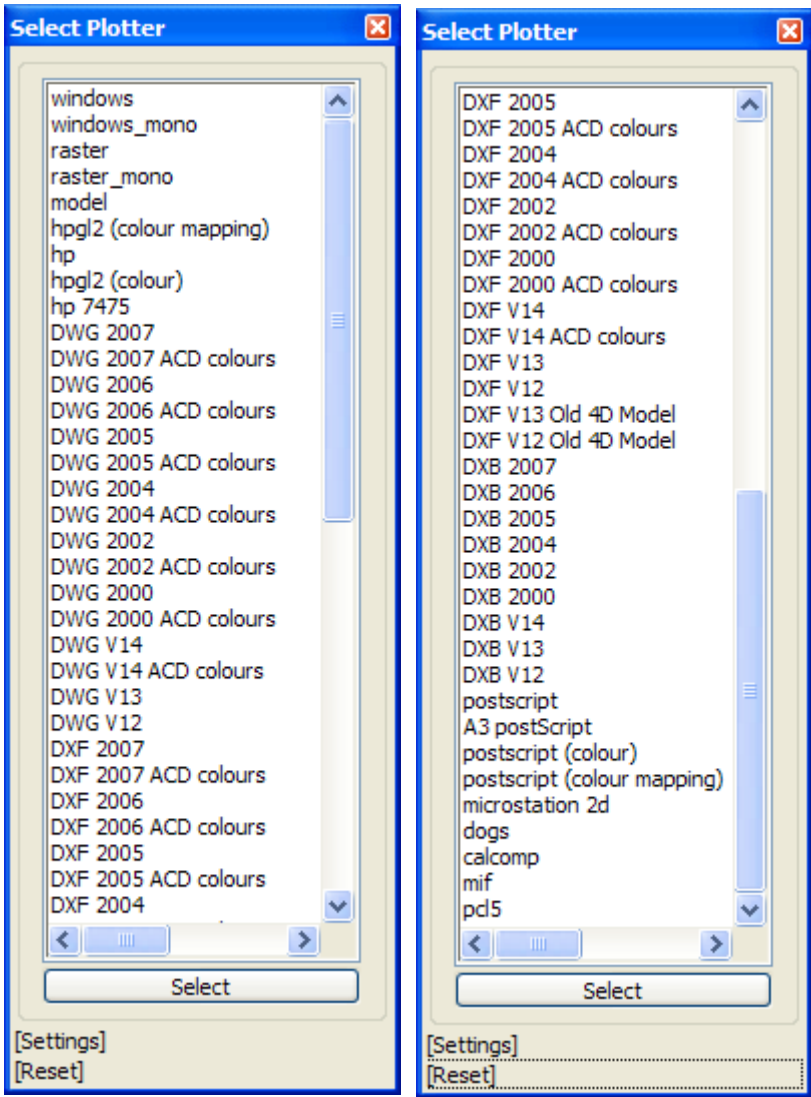
When creating a **plot**, **12d** Model can either use a Windows printer driver to plot directly, or instead of driving the plotter directly, create a computer disk file (the plot file) containing the relevant plotter instructions for producing the plot (which is then sent to the plotter), or in the case of the plotter type **model**, create a **12d** Model model.

The **plot file** can be written in a variety of formats including

windows	Windows colour printer, or grey scale on mono printers
windows_mono	Windows mono printer - uses black, not grey scale
raster	raster - used when images are part of plot
raster_mono	raster - used when images are part of plot
hp	standard HPGL with all of one pen being plotted before the next pen is used
hp (no sort)	standard HPGL with no pen sorting
hp 7475	small HP plotter, common hp emulation mode for lasers
hpgl 2 7600	HPGL 2 for HP 7600 mono plotter
hpgl 2 (colour)	standard HPGL 2 for colour plotters
hpgl 2 (colour mapping)	standard HPGL 2 for colour plotters using a plotter mapping file
dxg	2d DXF file
dwg	2d DWG file
pcl5	pcl5 format
eagle single	Eagle single precision binary model (not in the base module)
eagle double	Eagle double precision binary model (not in the base module)
postscript	Postscript format (generally for laser printers)

postscript (colour)	colour postscript format (generally for laser printers)
postscript (colour mapping)	colour postscript format using a plotter mapping file
dgn 2d	Intergraph/Microstation binary model (.dgn file)
dogs	Dogs parametric format
calcomp	Calcomp plot format
mif	frame maker interface format.
model	creates a 12d Model model

By default, this list of plotters appears when RB is clicked in a **plotter panel field**



However, a user defined list of available plotters, with user definable names and properties, can be set up and used instead of the default list. User defined plotters will be documented later in the section [User Defined Plotters](#).

Please continue to the next section [Sending Plots to a Plotter](#).

Sending Plots to a Plotter

When plots are created, **12d** Model can fire up a user supplied script/program with the plot file as the first argument. By checking the plot name suffix, the script could for example, decide which plotter the plot must be sent to.

The environment variable

PLOTTER_4D *points_to_script/program*

points to the script/program which can be fired up whenever a plot is generated. The name of the plot is given as the first script parameter of the script.

If the tick box **Send plots** in the panel tab **System Settings** of the panel **Defaults** (given by the menu option **Utilities => Default**) is set to **on**, the plotter script is run as each plot is created.

If more than one plot is created by an option (e.g. x plot) then the script is called separately for each of the plots.

An example of a script to send the plot to port lpt1 for Windows NT would be

```
@echo off
copy %1 lpt1
```

An example for Windows NT which looks for hp files is

```
@echo off
echo.
echo -----
:next_file
if "%1" == "" goto done
echo %1 | find /I ".hp" > nul
if ERRORLEVEL 0 if not ERRORLEVEL 1 goto hp_plotter
echo Plotting file %1
shift
goto next_file
:hp_plotter
echo Plotting %1 to HP plotter
copy %1 \\server_name\printer_name
shift
goto next_file
:done
echo -----
```

Environment variables are fully defined in the section [Environment Variables](#) in the Appendix [Setting Up and Configuring 12d](#)

Please continue to the next section [Mapping Colours to Plotter Pens](#).

Mapping Colours to Plotter Pens

12d Model uses up to 10,240 different colours and when it comes to plotting, it must be decided how these colours are mapped for the particular plotter being used.

For some plotters, colours may be used whereas for mono plotters, line thickness and linestyles may be needed.

When plotting to CAD systems such as AutoCad and Microstation, no physical plot is created but the plot image may need to be send to special colours, layers and styles in the Cad system.

For plotting to actual plotters, there are two methods of specifying the colour to pen mappings.

- (a) **pen mapping** - a simple colour to pen mapping, mainly used for pen plotters
- (b) **plotter mapping** - a colour to pen mapping plus the red, green, blue definition for colours used on the plotter. This is mainly for electrostatic, inkjet and bubblejet plotters.

Plotter mapping is an extension of pen mapping and only one of the two is used for a plot.

Pen Mapping

For all plotters types except Eagle, the **Plots=>Pen mapping** option can be used to define the correspondence between **12d** Model colours and plotter pens for the first sixteen colours.

The other colours are given in the **colours.4d** file. For Eagle plots, the **eagleplt.pmf** file is used to map colours to pens.

The pen mapping option is only used if a plotter mapping is **not** being used (see next section).

When starting a new project or entering an existing project, the default pen mapping table is defined by the **colours.4d** file.

Once inside the project, any pen number in the table can be modified by changing the appropriate pen field and then selecting the **set** button. The modified table is stored until **12d** Model is quit or the user changes to another project.

The pen mappings for colours above sixteen are given in the **colours.4d** file but can not be displayed or modified by the **colour to pens** panel.

Whenever a plot is created using non-eagle plotter types, the colours are mapped to the pen numbers given in the **colours to pen** table before writing out the plot file.

For Eagle plots, the **eagle_plotter.emf** file is used to map colours to pens.

Note - when **12d** Model is started up again or the user changes to a new project, the table reverts to its default settings as given in the **colours.4d** file.

Colours.4d

The **colours.4d** file defines the distinct colours for drawing in any **12d** Model view.

The **colours.4d** file is also used to define the **default plotter pen** associated with the colour.

See [Colours File](#) in the Appendix [Setting Up and Configuring 12d](#)

Plotter Mapping

The **plotter mapping file** can be used use with pen plotters but is more specifically designed for electrostatic and inject plotters and allows the user to

- (a) map **12d** Model colours to particular plotter pens and also specify a width (or weight) to be used for PCL5, HPGL2, postscript and all Windows plotters.
- (b) specify the red, green and blue mix for pens on HPGL2, colour postscript and all Windows plotters

The plotter mapping file to be used can be set using

- (a) the option **Plots=>Plotter mapping**
- (b) set by the environment variable PLOTTER_MAPPING_4D, or the file pmf.4d
- (c) defined for a particular plotter in the user defined plotters file.

There are also two special formats of the plotter mapping file which are used for plotting to Auto-cad dxf and Intergraph dgn. The special mapping files use the **12d Model colour** as a key to tables which control how the information is passed to DXF and DGN.

- (d) .tbl file used with plotting to Intergraph dgn
- (e) .amf used with plotting to Autocad dxf

The plotter mapping file to be used can be set using

- (a) the option **Plots=>Plotter mapping**
- (b) set by the environment variable PLOTTER_MAPPING_4D, or the file pmf.4d
- (c) defined for a particular plotter in the user defined plotters file.

Plotter Mapping File

The plotter mapping file (.pmf) consists of two sections:

- (a) pen_mapping table to define the which pen a **12d Model colour** is mapped to, and the weight for the pen.
- (b) pen_colour table which defines the red, green and blue values to be used for the pens on the plotter.

The format of the plotter mapping file (.pmf) is

```

pen_mapping {                                // pen mapping and weight table

//          12d          plotter          weight
//          colour       pen no           for pen

          0             1             0.15
          1             2             0.25
          3             1             0.5
//          etc.
}
pen_colours {                                // pen colours table

// plotter
// pen      red          green          blue          values 0-255
    0        0           0           0           // pen 0 is black
    1       255          0           0           // pen 1 is red
//          etc.
}

```

The **colour n** and **pen n** and the **default weight** for n=0,1...255 is used to initially fill up the 10,240 positions of the **pen_mapping** weight table.

The **pen n** and the **rgb** of the **default colour** (take its rgb from the colour_map.def file) for n=0,1...10,240 is used to fill up the 0,240 rgb positions of the **pen_colours** table before the plotter mapping file is used.

If the **Plots=>Plotter mapping** option is used, and the **merge colours.4d** flag is set, the rgb columns from the colours.4d file are used to define the pen_colours (first row is pen 0, second row is pen 1 etc.), and the pen mapping number is used to construct the pen_mapping table.

The plotter mapping file is then processed and overwrites any of the above initial mapping values.

If the plotter type is **dgn** and the map file is a table file with the extension of .tbl, the plotter will use the colour being plotted as the key in the table file and so allows the mapping from the plot colour directly into dgn level, weight, style and colour. See the next section for an example of a table file.

If the plotter type is **dxf** and the map file is an AutoCAD mapping file with the extension of .amf, the plotter will use the colour being plotted as the key in the mapping file and so allows the mapping from plot colour directly into layer name, Autocad colour and linestyle. Note that if Autocad colour or linetype is BYLAYER, then 12d Model uses the correct values in Autocad. The * character means that the field is ignored. See the next section for an example of an Autocad mapping file.

Please continue to the next section [User Defined Plotters](#).

User Defined Plotters

A file can be set up to define the plotters that appear in the **plotter type** panel field, and the properties of the plotters.

It is possible to customize:

- (a) the name of the plotter
- (b) the start and end sequence that is sent to the plotter
- (c) for each plotter, whether pen or plotter mapping occurs.

The full set of user defined plotters is given in a file called **plotters.4d** which is searched for in the standard set up paths, or is pointed to by the environment variable

PLOTTERS_4D filename

In the plotter file, the definition of a **plotter** of a given name *plotter_name* is set out as:

```
plotter plotter_name {
    set_up_commands
}
```

plotter_name must not be blank and if it includes imbedded spaces, it must be enclosed in double quotes “.”

The plotter itself is defined inside the braces where there can be zero or more plotter set up commands from the list:

```
colours
engine
extension
footer
header
map_file
map_pens
output_cmd
```

Description of the Plotter Set Up Commands

engine windows|dxf_4d|dxf_12|dxf_13|dxf_14|dxf_2000|
 dwg_4d|dwg_12|dwg_13|dwg_14|dwg_2000
 dgn|dgn|hpgl|hpgl2|hpgl_7475|
 calcomp|model|mif|postscript

extension ".???"

extension added to the file name used for the plot file written out by this plotter.

map_file *plotter_mapping_file_name*

points to a plotter mapping file which is used to redirect colours for any plotter. For hpgl2 and postscript, it also defines the pen weights (widths).

If map_file is not set and a global mapping file is specified, then it will be used as the plotter mapping file. Otherwise the pen mapping table is used.

If the **engine** is **dgn** and the **map_file** is a table file with the extension of .tbl, the plotter will use the colour being plotted as the key in the table file. This allows the mapping from the plot colour directly into dgn level, weight, style and colour.

If the **engine** is **dxf** and the **map_file** is an Autocad mapping file with the extension of .amf, the plotter will use the colour being plotted as the key in the mapping file. This allows the mapping from plot colour directly into layer name, Autocad colour and linestyle. Note that if Autocad colour or linetype is BYLAYER, then 12d Model uses the correct values in Autocad. The * character means that the field is ignored.

map_pens true|false

if true, it uses the specified map_file, or if map_file is false, it doesn't use any mappings (map_file, global plotter mapping file or pen mapping table). It leaves the pen number untouched. This was used in the hpgl2 colour and postscript colour - the screen colours were preserved. This can now be done for any plotter.

This is ignored when the map_file is used as a tbl file (plotter engine is dgn and the map_file has an extension of .dgn - any mapping is occurring via the tbl file where colour is the key).

This is ignored when the map_file is used as a amf file (plotter engine is dxf and the map_file has an extension of .dxf - any mapping is occurring via the .dxf file where colour is the key).

output_cmd path to a *script* or *program*

for this plotter, the given script or program is used on the created plot file. This replaces the PLOTTER_4D definition of script or program for this plotter.

colour true|false

used in hpgl2 and postscript.

If false, then for postscript don't send the rgb for colours and for hpgl2, it doesn't send down the block of information with the number of pens and the rgb for each pen. That is, if false, it stops hpgl2 and postscript writing out the colour definition commands.

header and footer

The **header** information is placed in the plot file before any plot commands and the **footer** information is placed at the end of plot file after all the plot commands.

The format for the **header** or **footer** is:

```
header {     // this information is placed in the plot file before any plot commands
            lines of text which can include plotter variables
}
```

or

```
footer {     // this information is placed at the end of the plot file, after the plot commands
```

```

    lines of text which can include plotter variables
}

```

Each line of text is surrounded by quotes. For example, "this is some stuff".

The *plotter_variables* used in the **header** or **footer** are:

```

username
filename
date
time
sheet_width
sheet_height
page_number - not used
minimum_x, minimum_y // plotter dependent
maximum_x, maximum_y// plotter dependent

```

and are included in the text by preceding them by a + and also following them by a cross if more text follows. For example:

```
"the user is " + username+"of 4D Solutions"
```

The appropriate information is substituted for the *plotter_variables* when a plot is created.

Hence

```
"the user is "+ username+" of 4D Solutions"
```

would give

```
"the user is fred of 4D Solutions"
```

A *plotter_variable* may not be appropriate for a particular plotter and if a *plotter_variable* is specified but not used for a plotter, it is substituted by *blank*.

If **header** or **footer** is not specified, then appropriate default information for the plotter is used.

The **header** and **footer** *set_up_commands* are not used by all plotters. If they are not used for a particular plotter, the **header** or **footer** command is ignored.

At present, only the plotters hpgl, hpgl2, postscript and dxf use **header** and **footer**.

minimum_x etc for postscript, it is the extent of the plot in mm

sheet_width, sheet_height for postscript in mm

For hpgl2

```
sheet_width, sheet_height          in mm/40.
```

Example of a Plotters.4d File

An example of a plotters.4d file is:

```
// -----
// File:      plotters.4d
// Date:      25 January 1997
// Use:      User definable plotter names
// -----

plotter "Windows" {                                // Windows printer drivers
  engine windows
  colour true
  map_pens true
  map_file "windows_colour.pmf"
}
plotter "Windows mono" {                          // Windows printer drivers
  engine windows
  colour false
  map_pens true
  map_file "windows_mono.pmf"
}
plotter "HP Colour" {                             // hp plotter using hpgl2
  engine hpgl2
  colour true
  map_pens true
  map_file "jetcolor.pmf"
  output_cmd "print -s://melba/jet_design"
  extension ".hp2"
}

plotter "HPGL Pen plotter" {                      // hp pen plotter using hpgl
  engine hpgl
  map_file "jetcolor.pmf"
  output_cmd "print -s://melba/devel_hp4v"
  extension ".hp"
}

plotter "Model" {                                 // plot to a 12d Model model
  engine model
  extension ""
  map_pens false                                // don't map colours
}

plotter "DGN" {                                   // output to a Microstation dgn file
  engine dgn
  extension ".dgn"
}

plotter "DGN with tbl" { // define a dgn plotter using an output table file
  engine dgn
  extension ".dgn"
  map_pens true // ignored where the map_file is used as a tbl file
  map_file "vicplot.tbl"
}
```

```
plotter "DXF 2000" {           // output to a dxf file
    engine dxf_2000
    extension ".dxf"
}
plotter "DXF 2000 with amf" { // output to a dxf file using an autocad map file
    engine dxf_2000
    extension ".dxf_2000"
    map_file "acadplot.amf"
}
```

Definition and Example of a .tbl File

An example of an output mapping file for use with an Microstation (Intergraph) dgn plotter:

```
// -----
// File: vicplot.tbl
// -----
// column 1 12d colour name          (any length - but only 1st four characters passed)
// column 2 Vic roads code           (only 1st four characters passed)
// column 3 AS2482 feature code
// column 4 description              (any length but if embedded spaces then must be quoted)
// column 5 line level                (between 1 and 64)
// column 6 line colour              (between 1 and 256)
// column 7 line weight              (between 1 and ?)
// column 8 line style
//
// notes: if column 2 is a * then the 12d name is transmitted (up to 4 characters that is)
//        columns 9 through 16 are only used for point strings which map into characters

1 PM  38010000 "Permanent Survey Mark  " 49 0 1 0
2 BM  38020000 "Bench Mark              " 49 0 1 0
3 TPEG 31000001 "Title peg               " 50 0 1 0
4 STN  38100000 "Instrument Station      " 50 0 1 0
5 SM   38000000 "Survey mark (general)   " 50 0 1 0
6 PCON 38040001 "Photo control point     " 50 0 1 0
7 CHEK 38000001 "Check profile/point     " 52 10 3 0
8 TRIG 38010000 "Trigonometric Station  " 50 0 3 0
9 BMQS 38020001 "Bench Mark QS-1        " 49 11 1 0
10 BMS  38020002 "Bench Mark S-2         " 49 11 1 0
11 BMSH 38020003 "Bench Mark SH-1        " 49 11 1 0
12 RM   38000001 "Reference Mark - General " 50 11 1 0
* ROD  38000002 "Reference Mark - Rod    " 50 11 1 0 // everything else
```

Definition and Example of a .amf File

An example of an AutoCad output mapping file for use with an Autocad plotter:

```
// -----
// File: acadplot.amf
// -----
// column 1 match colour - can include wild cards * and wild characters ?
// column 2 new name      - not output to DXF
// column 3 ACD layer     -
// column 4 ACD colour    - * for 12d Model colour (mapped to ACD),
//                          BYLAYER for ACD BYLAYER
// column 5 ACD line type- * for 12d Model linestyle,
//                          BYLAYER for ACD BYLAYER
// column 6 ACD text style- not yet used, * for 12d Model text style
//
// Notes:
// 1. column 5 (ACD colour) can only be a number between 0 and 256, or * or BYLAYER
// 2. The DXF file produced needs to be loaded into an existing Autocad drawing
//    which has the ACD layers and linestyles defined.
// column 1      2      3      4      5      6
//
// 1  CONT  ljpg1  1      1      *
// 2  TOP   ljpg2  2      CONTINUOUS  *
// 3  TOP   *      3      *          *
// 4  TOP   ljpg4  *      BYLAYER    *
// 5  TOP   ljpg5  BYLAYER  DASH      *
```

Please continue to the next section [Microstation \(DGN\) Plot Seed File.](#)

Microstation (DGN) Plot Seed File

When creating dgn plot files in Microstation (Intergraph) DGN format, a Microstation (Intergraph) DGN seed file can be used.

The folder containing the seed files can be pointed to with the environment variable `MS_SEEDFILES_4D`:

MS SEEDFILES 4D folder

The Microstation seed file is set by the **Plots=>DGN plot seed file** option.

Please continue to the next section **Sheet Sizes**.

Sheet Sizes

For plot frames, long and x plots, the overall size of the plot sheet can be given by a pop-up containing defined sheet size.

The sheet size names, width and heights can be specified by the user in a file named **sheets.4d** which is in the normal set up areas, or is pointed to by the environment variable

SHEET SIZES 4D file // file of plotter sheets sizes

The layout of the sheet sizes file is given in the section [Sheet Sizes File](#) in the Appendix [Setting Up and Configuring 12d](#)

Environment variables are fully defined in the section [Environment Variables](#) in the Appendix [Setting Up and Configuring 12d](#)

Please continue to the next section [Hardware Arcs](#).

Hardware Arcs

When plotting arcs, the arc can either be broken into a series of straight lines within 12d Model, or plotted using the arc command (if it exists) for the relevant plotter.

The initial default for hardware arcs is set by the environment variable `HARDWARE_ARCS_4D`:

HARDWARE_ARCS_4D	1	use hardware arcs	default
	0	hardware arcs are not used	

but this can be overridden by the option **Plots=>Hardware arcs**.

Environment variables are fully defined in the section [Environment Variables](#) in the Appendix [Setting Up and Configuring 12d](#)

Please continue to the next section [Interface Colours](#).

Interface Colours

When drawing interface strings in 12d Model, cut areas are denoted in red, fill areas in green and sections on the surface in yellow.

However, when plotting it is convenient to be able to map the interface colours to other colours.

This panel is used to define new colours for the interface colours, and the new colours are then mapped to pens using the pen mapping table or plotter mapping file.

The colours used for plotting the interface colours is set from the option **plots=>interface colours**

Please continue to the next section [Text Units](#).

Text Units

Text occurs in 12d Model plots in a number of ways -

- s plotting **text strings** and **4d strings**
- s automatic text such as grid values, x-section and long-section plot annotation.
- s text within linestyles.

The most difficult thing about text is that because of the different uses of text, there needs to be more than one systems of **units** to define text heights.

The height of text for a given textstyle is defined to be the height of a capital A. However, in 12d Model, there are three methods of defining the units for measuring this height.

- s world units - the units used for data
- s screen units - pixels (the screen is 1000 pixels wide)
- s plot paper units - millimetres.

World Units

World units are the units of user data. For most users, the base unit for user data is metres. However 12d Model is a dimensionless system and the base unit is totally dependent on the user.

The height of world text when displayed in a view depends upon on the text height and the scale of the view.

When plotted, the height that world text appears on a plot sheet is the same as for any data defined in world units - the height depends on the **scale** used for the plot.

Text heights that are only given in world units have (**w**) after them.

For some text, the choice of units is either world or pixels. The text parameters then have a **(u)** after them.

Screen Units - pixels

When screen units (pixels) are used, the text is a fixed height on the screen. If the user zooms in on text given in pixels, the text remains the same height.

To have a height on a plot, screen unit text needs a height defined in millimetres.

For some screen text, both a pixel and a millimetre height is supplied when the text is defined.

For text with only a pixel height, there is a plotting multiplication parameter called **pixels-to-millimetres** which is used to convert pixel heights to plot paper heights. The value of pixels-to-millimetres is set using the **plots=>pixels to mm** option and is stored for the project.

Text heights that are only given in pixels have a **(pix)** or **(p)** after them.

For some text, the choice of units is either world or pixels. These text parameters then have a **(u)** after them.

Plot Paper Units - millimetres

Text defined in plot paper units (millimetres) has a well defined height on a plot sheet.

Text heights that are only given in millimetres have **(mm)** after them.

Pixels to mm

To allow text and linestyles with only a pixel size to be plotted, a factor to convert pixels to millimetres is used.

When plotting, any text and linestyle defined **only** in pixel units is **multiplied** by the pixels-to-millimetre factor to determine its size in the plot.

For a new project, the initial value is loaded from the **defaults** file and is defined in this file by

PIXELS TO MM PLOT FACTOR value

See [Defaults File](#) in the Appendix [Setting Up and Configuring 12d](#)

The pixels-to-mm factor can be modified by the **Plots=>Pixel to mm** option.

The pixel-to-millimetres value is stored for the project

Environment variables are fully defined in the section [Environment Variables](#) in the Appendix [Setting Up and Configuring 12d](#)

To return to the beginning of this appendix, click on [Plotters and Plotting](#).



O Plot Parameters

This appendix contains information about the definitions in the Ascii versions of the plot parameter files. The Ascii plot parameter files are not normally seen by users because the *Plot Parameter* editors create binary plot parameter files.

For 12d Model users, Ascii PPFs were replaced by the PPF editors and the definition of the Ascii PPFs has not been upgraded since *12d Model 7*. For the plot parameter editors, go to [PPF Editors](#).

Go to [Plot Frame Plot Parameter File](#)
[Cross Section Plot Parameter File](#)
[Long Section Plot Parameter File](#)
[#Include in Plot Parameter Files](#)

For documentation on the first item, continue to the next section [Plot Frame Plot Parameter File](#)

Plot Frame Plot Parameter File

The plot frame section plot parameters are placed in a file with ending **.ppf**

Each parameter consists of a parameter name followed by one or more spaces and then the parameter value. There is only one parameter per line.

Anything on a line after a double forward slash **//** is considered to be a comment.

The set of all parameters for the plot frame plot is enclosed within a set of curly brackets **{ }** with the header

```
plot_frame_plot "plot set name"
```

before the curly brackets.

That is,

```
plot_frame_plot "plot set name" {
    plot parameters
    one per line
}
```

If there is more than one `plot_frame_plot` parameter set in the file, only the first set is used.

There may also be parameter sets for other plot types such as `section_long_plot` in the same file. The other sets will be ignored when doing plot frame plots.

The only parameters not connected with title block file are

<code>view_name</code>	<code>view_name</code>	// name of view used for information // on the plot
<code>single_frames</code>	<code>frame_name</code>	// name of plot frame to be plotted
<code>model_of_frames</code>	<code>model_name</code>	// model of plot frames which may be // plotted as a group

Both these parameters exist in the **plot frames plot** panel and when the parameter file is first read, if either of these parameters exist in the plot parameter file then they will be used to replace the

corresponding parameters in the panel.

However, if the parameters are subsequently modified in the panel, the new panel value will be the value used for plotting.

Title Block Information

A plot frame plot can have a standard **12d** Model title block or a user defined title block.

For a user defined title block, the title block drawing commands are kept in a file whose name is given by the user when setting up the plot frame. The title block drawing commands are almost identical to the linestyle drawing commands.

If a user defined title block has been set for the plot frame, plot frame parameters can be used to pass information though to the title block.

User Title Block

Some of the plot parameters are used to pass information down to variables in a user defined title block specified in the plot frame.

The parameters are:

<code>time_format</code>	<i>text</i>	// format for \$time
<code>title_1</code>	<i>text</i>	// passed down to \$title_1
<code>title_2</code>	<i>text</i>	// passed down to \$title_2
 <code>user_text_n</code>	 <i>text</i>	 // where n = 1,2,... 1000 // passed down to \$user_text_n
<code>start_page_number</code>	<i>integer</i>	// used as the starting value for \$page_number. // if missing, \$page_number starts at 1.
<code>start_drawing_number</code>	<i>integer</i>	// added to \$drawing_number in title block file // if missing, \$drawing_number starts at 1.
<code>drawing_number_prefix</code>	<i>text</i>	// passed down to \$drawing_number_prefix
<code>drawing_number_postfix</code>	<i>text</i>	// passed down to \$drawing_number_postfix

Notes

1. A warning is given if the keyword in a plot parameter file does not exist.
2. A warning is also given if the key word pair is defined more than once in a ppf.

Please continue to the next section [Cross Section Plot Parameter File](#).

Cross Section Plot Parameter File

The cross section plot parameters are placed in a file with ending **.ppf**

Each parameter consists of a parameter name followed by one or more spaces and then the parameter value. There is only one parameter per line.

Anything on a line after a double forward slash **//** is considered to be a comment.

The set of all parameters for the cross section plot is enclosed within a set of curly brackets **{ }** with the header

```
section_x_plot    "plot set name"
```

before the curly brackets.

That is,

```
section_x_plot    "plot set name" {  
    plot parameters  
    one per line  
}
```

If there is more than one `section_x_plot` parameter set in the file, only the first set is used.

There may also be parameter sets for other plot types such as `section_long_plot` in the same file. The other sets will be ignored when doing cross section plots.

The plot parameters are documented in following groups:

For the *Plot Sheet layout*, please continue to the section [Plot Sheet Layout](#).

Boxes and datum area, please continue to the section [Boxes and Datum Area](#).

Only for the Centre line case:

Datum area, please continue to the section [Datum Line](#).

Labelling the centreline, style etc., please continue to the section [Labelling the Centreline Chainage](#).

Only for the Boxes case:

Datum area, please continue to the section [Datum Line](#).

Labelling the centreline chainages, please continue to the section [Labelling the Centreline Chainage](#).

Defining boxes and what is labelled in them, please continue to the section [Defining Boxes](#).

For Both the Centre Line and Boxes case:

Graph area parameters, please continue to the section [Graph Area](#).

Grade labelling, please continue to the section [Grade Labelling](#).

Labelling points on x-sections, please continue to the section [Labelling Points of the X-Sections](#)

Labelling cuts, please continue to the section [Labelling Cuts of X-Sections Through Strings in a Model](#).

Hatching cut/fill, please continue to the section [Hatching Cut and Fill Areas](#).

Drawing extra x-sections, please continue to the section [Extra Models of X-Sections](#).

Sorting x-sections, please continue to the section [Sorting X-Sections by Chainage](#).

Title block information, please continue to the section [Title Block Information](#).

Panel modifying parameters, please continue to the section [Parameters that Modify Fields In the Cross Plot Panel](#).

Example, please continue to the section [Example of a Cross Section Plot Parameter File](#).

Plot Sheet Layout

X-sections are normally generated at chainages along a given centreline. This centreline chainage is stored with each x-section string.

The chainages of the actual x-sections are referred to as **offsets** from the centreline position rather than x-section chainages. The offsets of the x-section are set up so that the zero offset occurs where the x-section crossed the centreline string.

The x-sections along the centreline are stored in the one model (the primary model) which is then used to generate the cross section plot.

```
model_to_plot          text          // name of the model of x-sections
```

Each x-section from the primary model of x-sections generates its own sub-plot for which the x-section is the primary string. Hence the cross section plot consists of many individual plots drawn on one or more plot sheets.

Each plot sheet is considered to have only positive co-ordinates with the origin (0,0) in the left hand corner. The units for the plot are millimetres.

The overall size of the plot sheet is given by either a defined sheet size, or by the width and height of the plot given in millimetres and separated by one or more spaces.

```
sheet_size            text          // sheet name, or
                      "mm  mm"      // sheet size: width height
```

The sheet size name, width and heights can be specified by the user in a file named **sheets.4d** which is in the normal set up areas, or is pointed to by the environment variable

```
SHEET_SIZES_4D        file          // file of plotter sheets sizes
```

The plotting area is restricted to within the plot sheet by giving margins which are:

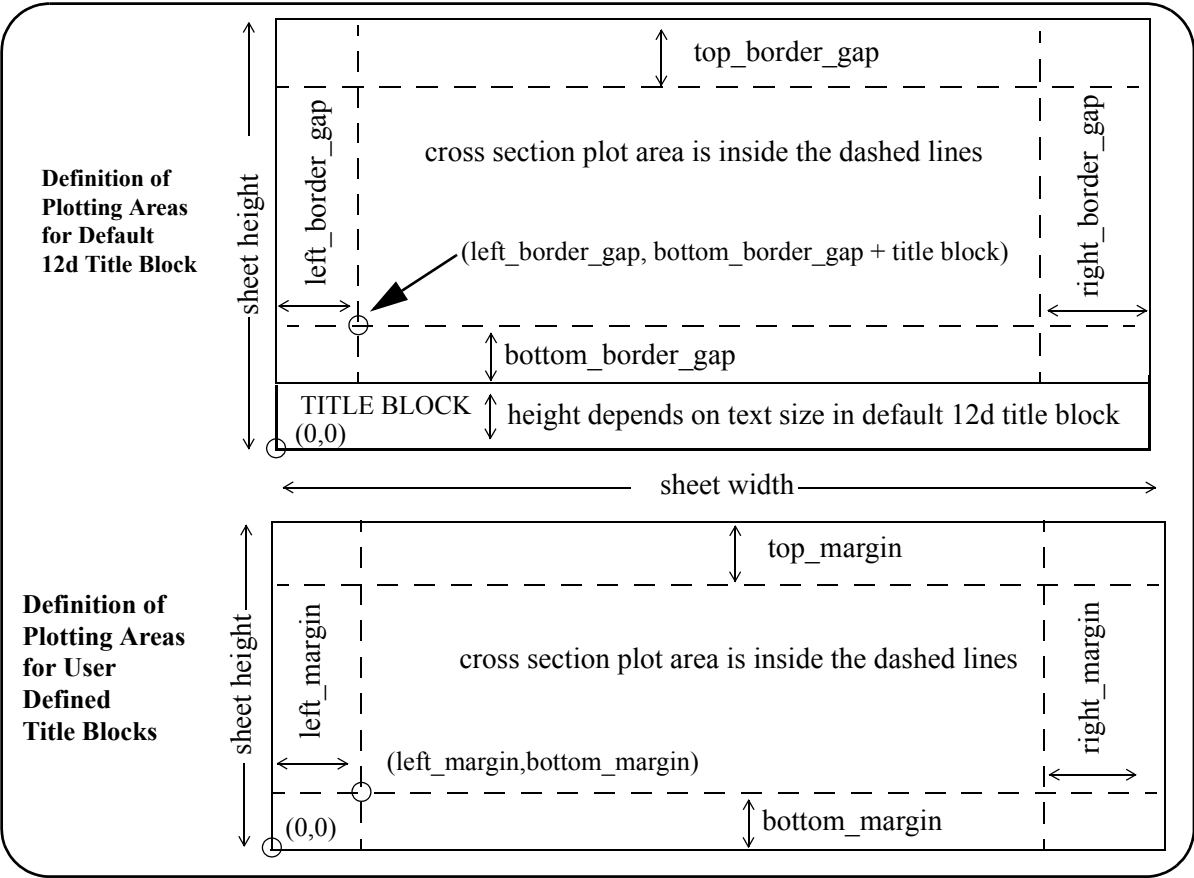
If a *User Defined Title Block* is used:

```
left_margin           mm
right_margin          mm
top_margin             mm
bottom_margin         mm
```

If the *default 12d title block* is used, then the size of the bottom of title block depends on the text size. The following parameters are used in the default title block case and the *bottom_border_gap* is added to the calculated height of the bottom of the title block.

```
left_border_gap       mm
right_border_gap      mm
top_border_gap        mm
bottom_border_gap     mm
```

Because the user can easily select from the plotting panel whether a User Defined Title Block or the default 12d title block is used, both sets of margin and gap parameters can exist in the one plot parameter file.



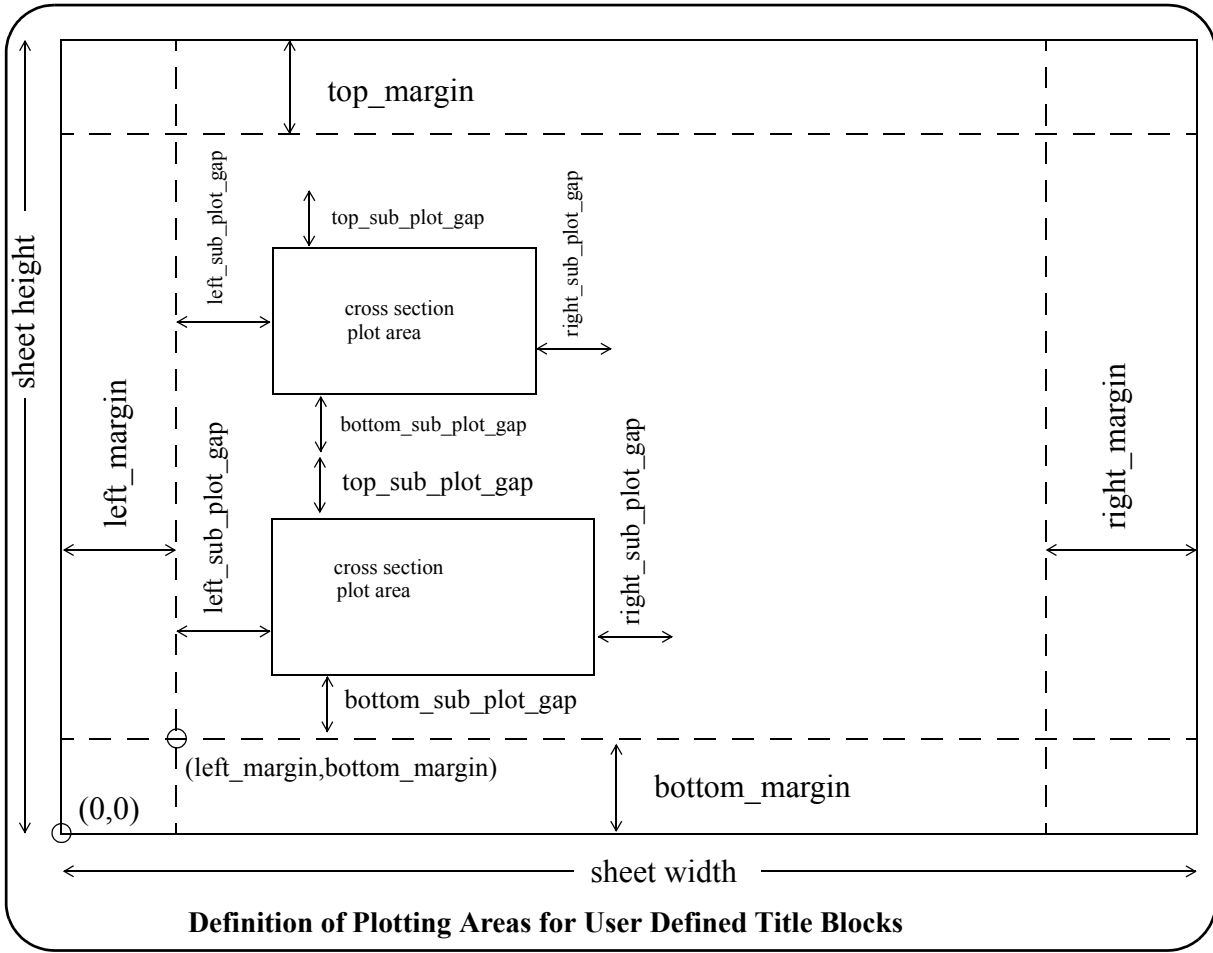
The x-sections are plotted in the order they occur in the x-section model and start being plotted at the bottom left hand corner of the cross section plotting area.

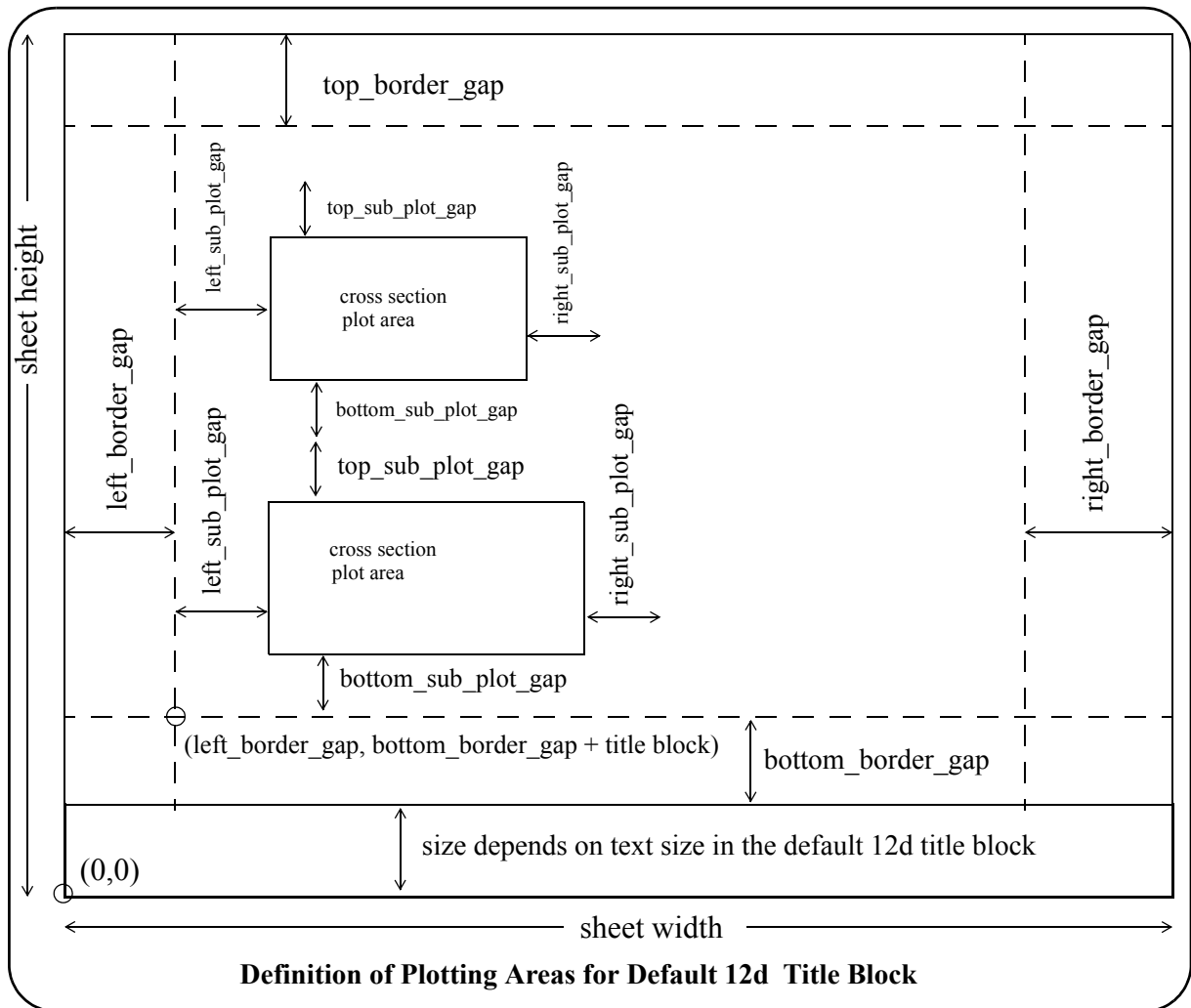
The individual x-section plots are then drawn going up the column, and when the column is full, start from the bottom of the next column.

When a sheet is full, a follow on sheet is created.

Each individual x-section sub-plot is positioned with the surrounding gaps:

<code>left_sub_plot_gap</code>	<i>mm</i>
<code>right_sub_plot_gap</code>	<i>mm</i>
<code>top_sub_plot_gap</code>	<i>mm</i>
<code>bottom_sub_plot_gap</code>	<i>mm</i>





If required, all the sub-plots in a column can be automatically positioned up so that the zero offsets (the centrelines) of each x-section line up.

```
line_up_cl          yes/no          // yes - line up zero offsets
```

The width of the plot can be a fixed distance left or right of the centre line (zero offset) or for the full section plus an extra left and right distance:

```
absolute_extensions      yes           // The section goes from the
                           // left_extension offset on the left to the
                           // right_extension offset on the right.
                           no           // The section goes for the entire section
                           // length plus the left and right extension
                           // distances.
```

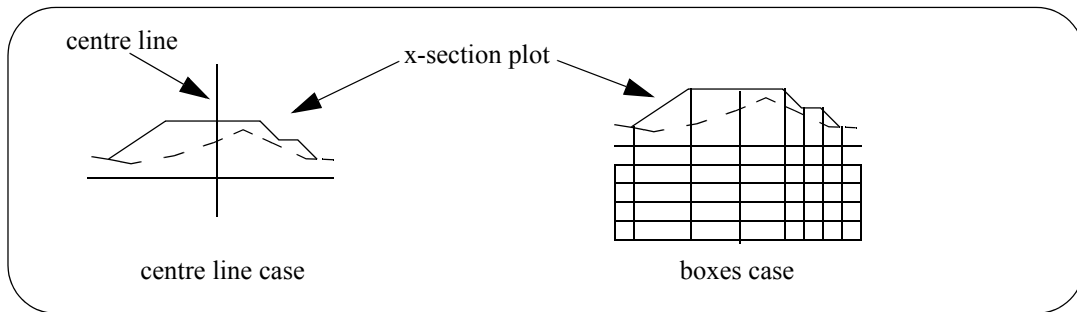
```

left_extension      world-units      // left extension value
right_extension     world-units      // right extension value

```

The x-section can be drawn and labelled with either

- centreline case - the x-section is plotted and an upright, and the offset and height value at the zero offset (normally the centre line position)
- boxes case - the x-section is plotted and the heights of the x-section and the tins at all the x-section points are labelled in boxes under the plot of the x-section.

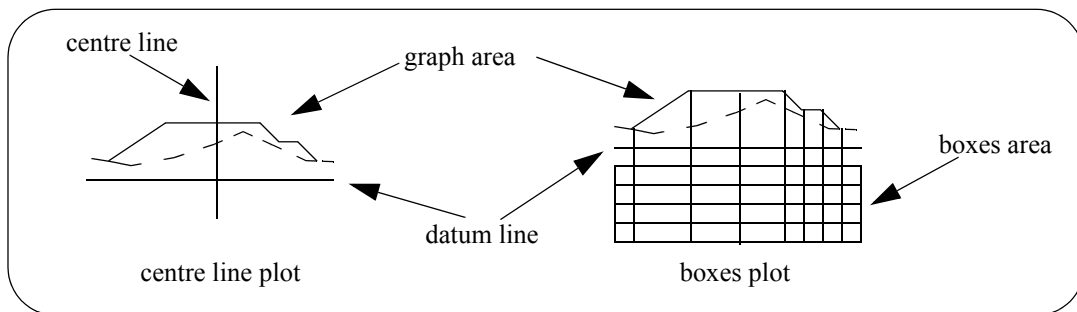


The x-section sub-plot itself consists of the three regions - graph, datum and boxes.

The **graph area** is the area where the actual plots of the strings are drawn. This exists for both the centreline and boxes case.

The **datum area** is the region between graph area and the datum line. This exists for both the centreline and boxes cases.

The **boxes area** is where the offset values and the heights for the strings drawn on the x-section plot are labelled. This only exists for the boxes case.



For both cases, the x-section sub-plot can be labelled with other information such as

- (a) grades across the x-section
- (b) points across the x- section
- (c) cuts the x-section makes through strings
- (d) cut and fill areas

All the required parameters will be described in the following sections.

Please continue to the next section [Boxes and Datum Area](#).

Boxes and Datum Area

The x-section can be labelled with either

- (a) an upright, and the offset and height value at the zero offset (normally the centre line position)
- (b) the heights of the x-section and the tins at all the x-section points.

The choice is given by the parameter **label_type**:

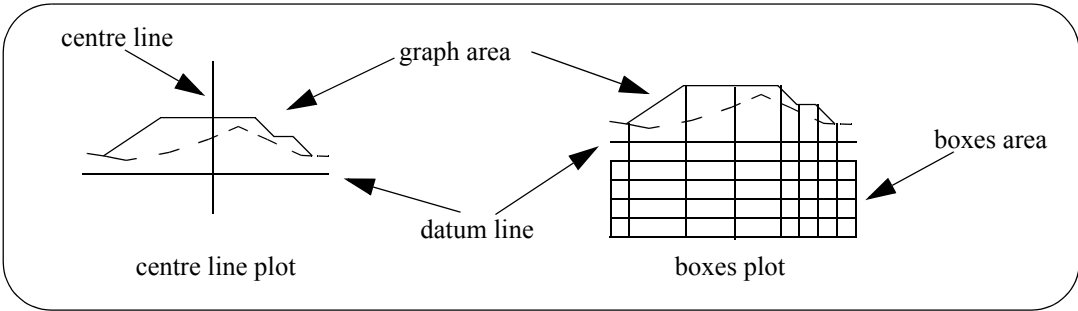
```
label_type          "centre line"          // type (a)
                   boxes                    // type (b)
```

A datum line exists for both cases.

For the boxes case, a box area for the offset and heights is created below the datum line. The available parameters for tailoring the box area will be given after describing the datum line parameters.

For the centre line case, the centre line and offset and height of the centre line are shown.

In both cases, the actual cross section plot is drawn above the datum line in the graph area.



Please continue to the next section [Centre Line Case](#) for the centre line parameters.

Please continue to the section [Boxes Case](#) for the boxes parameters.

Centre Line Case

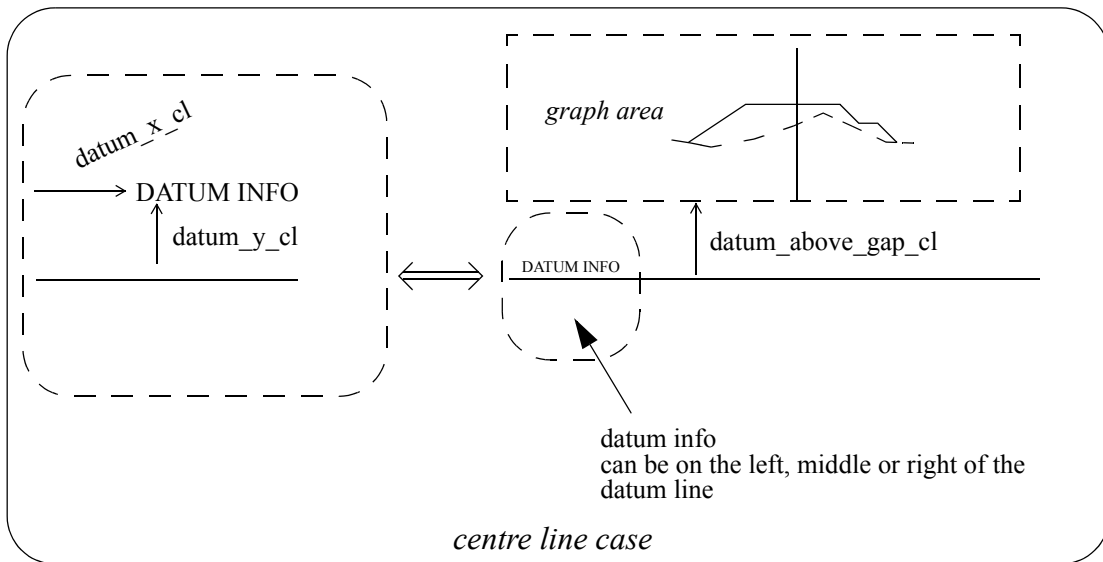
Datum Line

Each x-section sub-plot can be labelled with the datum value for the plot of the x-section string.

This DATUM INFO label is made up of the text strings:

"datum_name" followed by the *datum-value*

and is above the datum line.



For the centreline case, the graph area is positioned the distance **datum_above_gap_cl** above the datum line.

datum_above_gap_cl	<i>mm</i>	// dist from datum line to bottom of the
		// graph area

The **datum_above_gap_cl** can be zero or positive.

The roundoff for the datum value is specified by the user (default 1.0) and the datum is automatically calculated for each sub-plot, and labelled.

The datum value can be placed on the left, centre or right side of the datum line.

datum_roundoff	<i>1.0</i>	// value to roundoff the datum value to
		// e.g. 0.5, 0.2, 1.0 (default 1.0)
datum_decimals	<i>integer</i>	// number of decimal places to display
		// the datum value (default 1).
		// If > 0, trailing zeros are removed after
		// the decimal point.
		// If < 0, the absolute value is taken as the
		// number of decimal places to report
		// i.e. no trailing zeros are removed
datum_side_cl	<i>0</i>	// datum text in middle of datum line
	<i>1</i>	// " " " left of datum line (default)
	<i>2</i>	// " " " right of datum line
datum_linestyle	<i>linestyle</i>	// datum line linestyle (default solid)
datum_name	<i>text</i>	// text to write before the datum value
datum_textstyle	<i>text</i>	// textstyle for datum information
datum_text_size	<i>mm</i>	// size of datum text and value
datum_colour	<i>colour</i>	// colour of the datum text
datum_line_colour	<i>colour</i>	// colour of the datum line
datum_text_justification_cl	<i>just</i>	// justification for datum text
		// NOTE - this is not normally required since
		// by default the text justification is set to
		// match datum_side_cl
datum_x_cl	<i>mm</i>	// distance to move the datum text
		// along the datum line
datum_y_cl	<i>mm</i>	// distance to raise the datum text
		// above the datum line (used to be
		// called datum_offset)

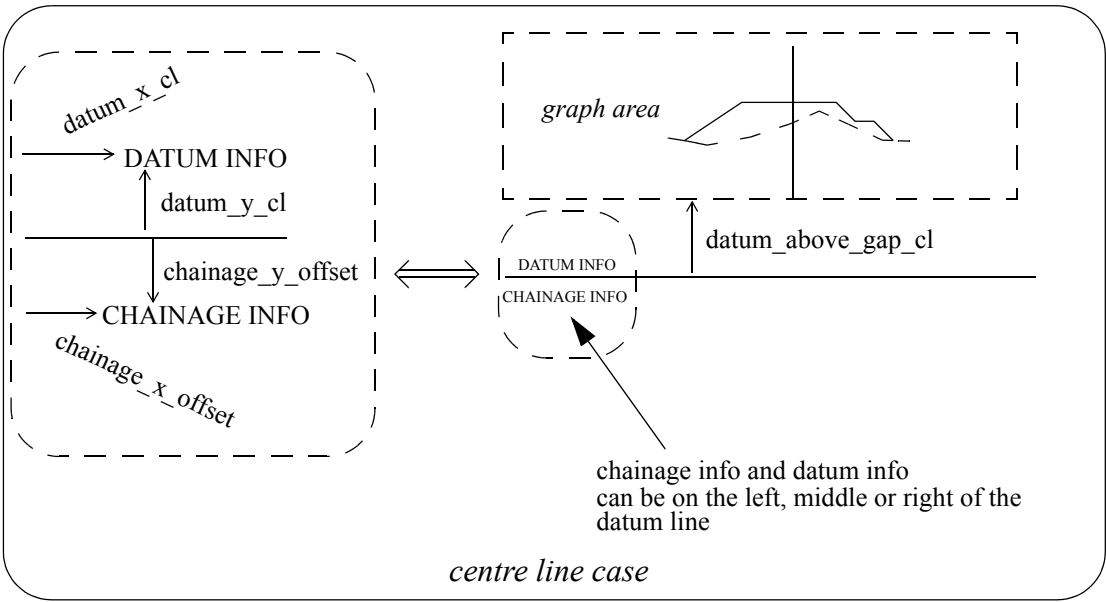
The **datum_x_cl** and **datum_y_cl** can be positive, zero or negative.

Labelling the Centreline Chainage

Each x-section sub-plot can be labelled with the centreline chainage of the x-section string.

This CHAINAGE INFO label is made up of the text strings:

"chainage_title" followed by the *chainage-value*
 and is drawn under the datum line.



The chainage value can be placed on the left, centre or right side of the datum line.

chainage_side_cl	0	// text in middle of datum line (default)
	1	// " " " left of datum line
	2	// " " " right of datum line

The parameters controlling the labelling are:

chainage_label	0/1	// 1 = label sub-plot with centreline // chainage, 0 don't label.
chainage_title	text	// text before the chainage value
chainage_decimals	integer	// number of decimals in the chainage // value. If <0, the absolute value // is taken as the number of decimal // places i.e. no trailing zeros are // removed for the values in the // chainage values.

chainage_colour	colour	// colour of the text
chainage_size	mm	// size of the text
chainage_textstyle	colour	// textstyle for the chainage label
chainage_text_justification_cl	just	// justification of the chainage text
chainage_x_offset	mm	// x position of text
chainage_y_offset	mm	// y position of text

The *chainage_x_offset* is measured from the beginning of the datum line.

The *chainage_y_offset* is measured from the bottom of the datum line with positive being **down**.

Centre Line Linestyle

The upright at the centre line position can have its own linestyle.

cl_linestyle *linestyle* //linestyle for centreline



Labelling the Design Height, X and Y Co-ordinates and Tin Heights at Offset Zero

The values of the height and X and Y co-ordinates of the **primary string** (usually the design cross section) at the zero offset can be labelled. Note that zero offset is normally where the alignment string cuts the cross section.

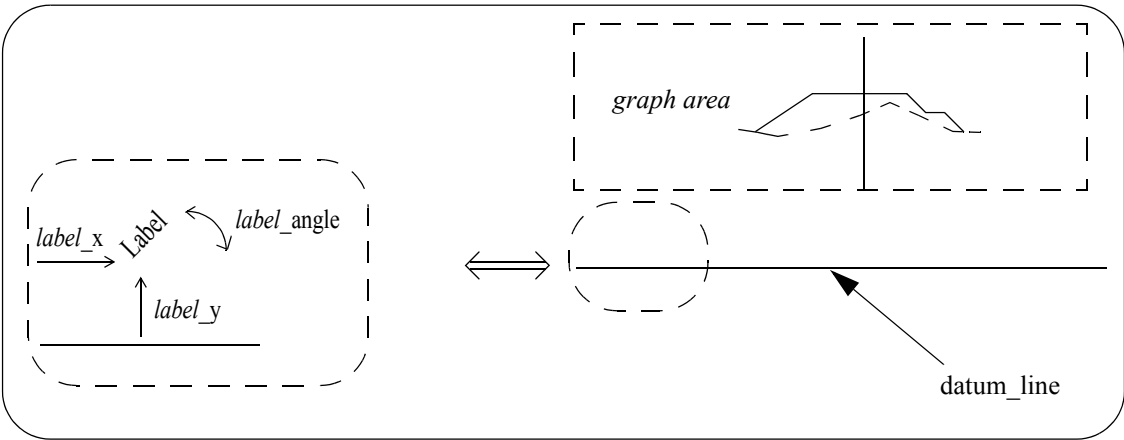
The heights of any tins (such as the natural surface) at the zero offset can also be labelled.

The labels are made up of:

pre_text value post_text

where *value* is either a height or a co-ordinate.

The label is positioned at either the left, right or middle of the datum line, with an x and y adjustment and a rotation.



Parameters for labelling the X Co-ordinate at Zero Offset:

primary_x0_draw_mode	0	// don't draw the label -default
	1	// draw the label
primary_x0_position	0	// label in middle of datum line (default)
	1	// " " " " left of datum line
	2	// " " " " right of datum line
primary_x0_pre_text	text	// pre-text for label - def " "
primary_x0_post_text	text	// post-text for label - def " "
primary_x0_decimals	integer	// number of decimal places to display - def 1
		// If > 0, trailing zeros are removed after
		// the decimal point
		// If < 0, the absolute value is taken as the
		// number of decimal places to report
		// i.e. no trailing zeros are removed
primary_x0_x	mm	// x adjustment to position of label - def 0
primary_x0_y	mm	// y adjustment to position of label - def 0
primary_x0_angle	degrees	// angle of the label - def 0
primary_x0_colour	colour	// colour of the label
primary_x0_size	mm	// size (in mm) of the label
primary_x0_textstyle	textstyle	// textstyle of the label
primary_x0_justify	just	// justification for text

Parameters for Labelling the Y Co-ordinate at Zero Offset:

primary_y0_draw_mode	0	// don't draw the label -default
	1	// draw the label
primary_y0_position	0	// label in middle of datum line (default)
	1	// " " " " left of datum line

	2	// " " " " right of datum line
primary_y0_pre_text	text	// pre-text for label - def " "
primary_y0_post_text	text	// post-text for label - def " "
primary_y0_decimals	integer	// number of decimal places to display - def 1
		// If > 0, trailing zeros are removed after
		// the decimal point
		// If < 0, the absolute value is taken as the
		// number of decimal places to report
		// i.e. no trailing zeros are removed
primary_y0_x	mm	// x adjustment to position of label - def 0
primary_y0_y	mm	// y adjustment to position of label - def 0
primary_y0_angle	degrees	// angle of the label - def 0
primary_y0_colour	colour	// colour of the label
primary_y0_size	mm	// size (in mm) of the label
primary_y0_textstyle	textstyle	// textstyle of the label
primary_y0_justify	just	// justification for text

Parameters for Labelling the Height of Primary String at Zero Offset:

primary_height_draw_mode	0	// don't draw the label -default
	1	// draw the label
primary_height_position	0	// label in middle of datum line (default)
	1	// " " " " left of datum line
	2	// " " " " right of datum line
primary_height_pre_text	text	// pre-text for label - def " "
primary_height_post_text	text	// post-text for label - def " "
primary_height_decimals	integer	// number of decimal places to display - def 1
		// If > 0, trailing zeros are removed after
		// the decimal point
		// If < 0, the absolute value is taken as the
		// number of decimal places to report
		// i.e. no trailing zeros are removed
primary_height_x	mm	// x adjustment to position of label - def 0
primary_height_y	mm	// y adjustment to position of label - def 0
primary_height_angle	degrees	// angle of the label - def 0
primary_height_colour	colour	// colour of the label
primary_height_size	mm	// size (in mm) of the label
primary_height_textstyle	textstyle	// textstyle of the label
primary_height_justify	just	// justification for text

Parameters for Placing Some Text:

extra_text_draw_mode	0	// don't draw the label -default
	1	// draw the label
extra_text_position	0	// label in middle of datum line (default)
	1	// " " " " left of datum line
	2	// " " " " right of datum line
extra_text	text	// text for label - def " "
extra_text_x	mm	// x adjustment to position of label - def 0
extra_text_y	mm	// y adjustment to position of label - def 0
extra_text_angle	degrees	// angle of the label - def 0
extra_text_colour	colour	// colour of the label
extra_text_size	mm	// size (in mm) of the label
extra_text_textstyle	textstyle	// textstyle of the label
extra_text_justify	just	// justification for text

Parameters for Labelling the Height of a Tin at Zero Offset:

A section along the primary string through each tin on the section view is automatically drawn on

the cross section plot but the user can specify whether the tin height at the zero offset is labelled or not.

Hence although there may be a number of tins drawn on the section plot, not all of them need to have their height at zero offset labelled.

The default order for labelling the tins is the order that they were added to the view but it is possible to specify which tin is used for labelling by giving the tin name rather than just using the tin on the section view.

In fact, it is possible to use **any tin** in the project **to label** the height at zero offset, **not just those drawn** on the section view.

tin_n_name	text	// n=1, ... no of tins on the section view.
		// use the tin called <i>text</i> to label the nth
		// row of tin heights.

If a tin of the name given by **tin_n_name** does not exist, then the plot is not produced and an error message is given.

The parameters for labelling the height of the tin at zero offset are:

tin_n_height_draw_mode	0	// don't draw the label -default
	1	// draw the label
tin_n_height_position	0	// label in middle of datum line (default)
	1	// " " " left of datum line
	2	// " " " right of datum line
tin_n_height_pre_text	text	// pre-text for label - def " "
tin_n_height_post_text	text	// post-text for label - def " "
tin_n_height_decimals	integer	// number of decimal places to display - def 1
		// If > 0, trailing zeros are removed after
		// the decimal point
		// If < 0, the absolute value is taken as the
		// number of decimal places to report
		// i.e. no trailing zeros are removed
tin_n_height_x	mm	// x adjustment to position of label - def 0
tin_n_height_y	mm	// y adjustment to position of label - def 0
tin_n_height_angle	degrees	// angle of the label - def 0
tin_n_height_colour	colour	// colour of the label
tin_n_height_size	mm	// size (in mm) of the label
tin_n_height_textstyle	textstyle	// textstyle of the label

Labelling the Centre Line Offset and Height

In the centre line case, the value of the height of the **primary string** (usually the design cross section) at the zero offset can be labelled. This is normally where the alignment string cuts the cross section.

The label is made up of the texts:

primary_title offset_title offset_value height_text height_value

NOTE: These parameters have now been superseded. The parameters for labelling the height of the primary string at zero offset covers this case. To use the zero offset parameters instead, the *primary_height_pre_text* would include all text required for the Primary_title, offset_title, offset_value and height_text (offset_value is always 0.0).

The parameter *primary_mode_cl* controls whether the **primary_title** is included in the label.

primary_mode_cl	0	// don't include primary_title, primary_value
	1	// incl. primary_title, primary_value default

The parameter *height_mode_cl* controls whether the **height_title** and **height_value** are included in the label.

height_mode_cl	0	// don't include height_title, height_value
	1	// include height_title, height_value default

The parameter *offset_mode_cl* controls whether the **offset_title** and **offset_value** are included in the label.

offset_mode_cl	0	// don't include offset_title, offset_value
	1	// include offset_title, offset_value default

The label can be placed on the left, centre of right side of the datum line.

offset_height_side_cl	0	// text in middle of datum line (default)
	1	// " " " " left of datum line
	2	// " " " " right of datum line

The size, colour, text justification and text style for the label is given by:

primary_title	text	//primary title
offset_title	text	// offset label (default "Offset")
height_text	text	// height text label (default "Height")
primary_textstyle	textstyle	// textstyle used for offset and height
		// label
primary_colour	colour	//colour for offset and height label
primary_size	mm	//size of the offset and height label
offset_height_text_justification_cl	justif	// text justification
		// NOTE - this is not normally required since
		// by default the text justification is set to
		// match offset_height_side_cl

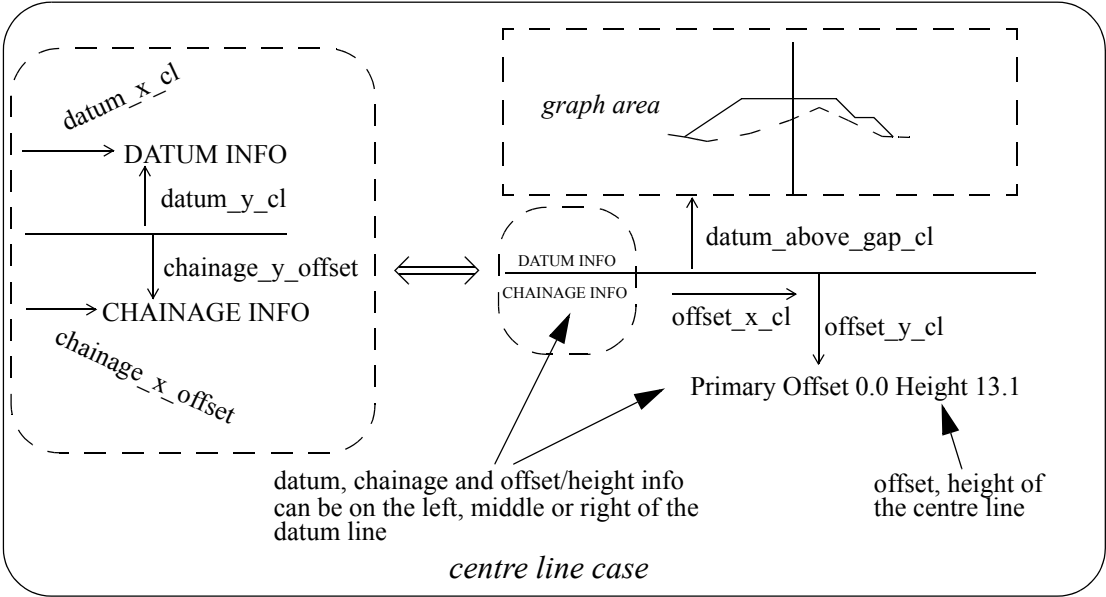
The number of decimals in the offset-value and height-value is controlled by:

number_of_decimals	integer	// number of decimal places in the offset,
		// height boxes. If <0, the absolute value
		// is taken as the number of decimal
		// places i.e. no trailing zeros are
		// removed for the values in the offset,
		// heights area.

The label is placed an distance *offset_x_cl* along the datum line and a distance *offset_y_cl* below the datum line of the plot.

offset_x_cl	mm	// distance to move the text along the
		// datum line
offset_y_cl	mm	// distance to shift the text below the
		// datum line

The `offset_y_cl` is measured from the datum line with positive being **down**.



Please continue to the next section [Boxes Case](#) for the boxes parameters.

Please continue to the section [Graph Area](#) if you are not using boxes parameters.

Boxes Case

Datum Line

For the boxes case, the **datum line** is positioned the distance ***datum_below_gap*** above the top of the boxes area and the graph area is then positioned the distance ***datum_above_gap*** above the datum line.

Hence the graph area is distance (*datum_below_gap* + *datum_above_gap*) above the top of the boxes area.

<i>datum_above_gap</i>	<i>mm</i>	// dist from datum line to bottom of the // graph area
<i>datum_below_gap</i>	<i>mm</i>	// dist from datum line to the top of the // boxes
<i>datum_linestyle</i>	<i>linestyle</i>	//linestyle for the datum line

The *datum_below_gap* and *datum_above_gap* can be zero or positive.

The roundoff for the datum value is specified by the user (default 1.0) and the datum is automatically calculated for each sub-plot, and labelled.

<i>datum_roundoff</i>	<i>1.0</i>	// value to roundoff the datum value to // e.g. 0.5, 0.2, 1.0 (default 1.0)
<i>datum_decimals</i>	<i>integer</i>	// number of decimal places to display // the datum value (default 1). // If > 0, trailing zeros are removed after // the decimal point. // If <0, the absolute value is taken as the // number of decimal places to report // i.e. no trailing zeros are removed
<i>datum_name</i>	<i>text</i>	// text to write before the datum value
<i>datum_textstyle</i>	<i>text</i>	// textstyle for datum information
<i>datum_text_size</i>	<i>mm</i>	// size of datum text and value
<i>datum_colour</i>	<i>colour</i>	// colour of the datum text
<i>datum_line_colour</i>	<i>colour</i>	// colour of the datum line
<i>datum_x</i>	<i>mm</i>	// distance to move the datum text // along the datum line
<i>datum_y</i>	<i>mm</i>	// distance to raise the datum text // above the datum line (used to be // called <i>datum_offset</i>)

The *datum_x* and *datum_y* can be positive, zero or negative.

Labelling the Centreline Chainage

Each x-section sub-plot can be labelled with the centreline chainage of the x-section string.

This CHAINAGE INFO label is made up of the text strings:

"chainage_title" followed by the *chainage-value*
and is drawn under the boxes area.

The parameters controlling the labelling are:

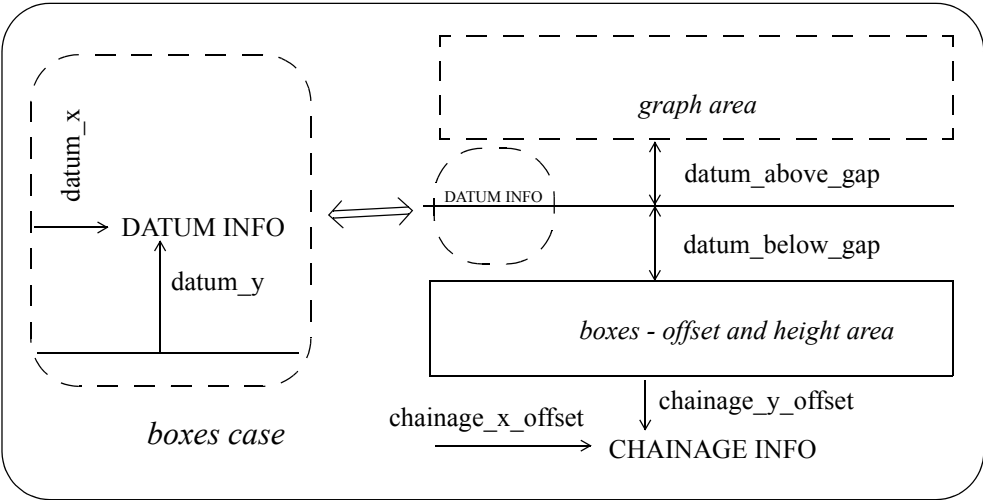
<i>chainage_label</i>	<i>0/1</i>	// 1 = label sub-plot with centreline // chainage, 0 don't label.
<i>chainage_title</i>	<i>text</i>	// text before the chainage value
<i>chainage_decimals</i>	<i>integer</i>	// number of decimals in the chainage // value. If <0, the absolute value // is taken as the number of decimal // places i.e. no trailing zeros are // removed for the values in the

		// chainage values.
chainage_size	mm	// size of the text
chainage_textstyle	colour	// textstyle for the chainage label
chainage_text_justification	just	// justification of the chainage text
chainage_colour	colour	// colour of the text
chainage_x_offset	mm	// x position of text
chainage_y_offset	mm	// y position of text

The *chainage_x_offset* is measured from the beginning of the height boxes.

If *chainage_x_offset* is omitted, the text is centred on heights area.

The *chainage_y_offset* is measured from the bottom of the box area with positive being **down**.



Defining Boxes

When **boxes** is selected for *label_type*, the primary string (usually the design cross section) and each tin in the x-section sub-plot can be labelled with one or two lines of title, and the height at the offset position for each point in the primary string.

The **title** for the strings, is drawn in the **title area** of the **boxes area**.

The offsets/heights are drawn in the **heights area** of the **boxes area**.

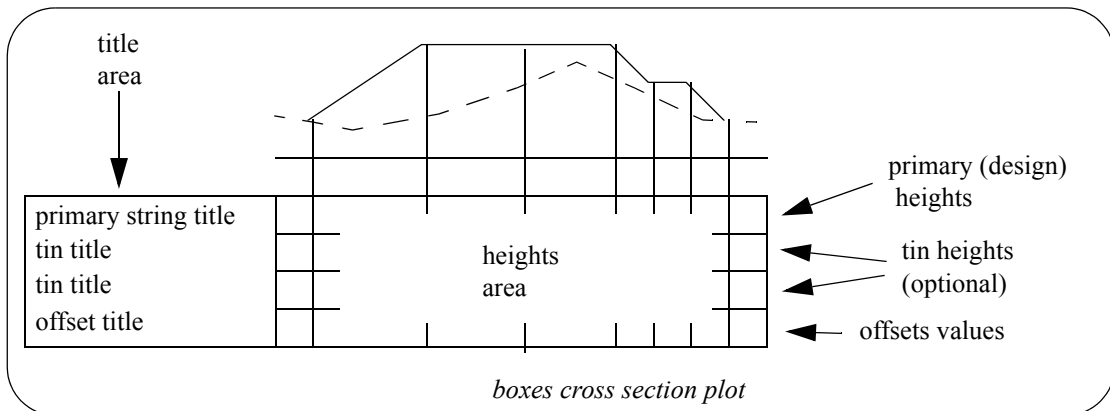
Consequently the boxes area is made up of rows of text consisting of:

string/tin titles followed by the **offset/height values** across the string/tin.

Each row is surrounded by lines to form a box.

The default order of the boxes from the bottom up is

- (a) offset title and values
- (b) tin title and heights - natural surface etc. (optional)
- (c) primary string title and heights - design x-section (optional)



The **title area** starts at the relative position (`left_sub_plot_gap`,`bottom_sub_plot_gap`).

The size of the title text is given by the **`title_box_text_size`** parameter.

The width of the title area is either given by the **`space_for_titles`** parameter, or if omitted, the required width is automatically calculated.

<code>title_box_text_size</code>	<i>mm</i>	// size of the titles in the boxes
<code>space_for_titles</code>	<i>mm</i>	// calculated if omitted

There can be two lines of title text and the title text, textstyle and colour can be set independently for the primary string and each tin.

The x position of the title text is the same for all the lines of title text and can be set to be a fixed distance from the left hand side of the boxes.

<code>box_titles_x</code>	<i>mm</i>	// distance to move the title text from the // left hand side of the boxes
---------------------------	-----------	-------------------------------------------------------------------------------

The **heights area** starts at the end of the title area.

The height text is written at right angles to the bottom of the boxes. It can be either top or bottom justified with respect to the box (**`box_text_justification`**).

The number of decimal places and the size of the heights text can also be specified.

The height of each individual box area is either given by the **`horizontal_line_spacing`** parameter, or if omitted, the required height is automatically calculated.

<code>number_of_decimals</code>	<i>integer</i>	// number of decimal places in the // height boxes. If <0, the absolute value // is taken as the number of decimal // places i.e. no trailing zeros are // removed for the values in the heights // area.
<code>text_size</code>	<i>mm</i>	// size of the height values
<code>offset_textstyle</code>	<i>textstyle</i>	// textstyle for height text
<code>offset_colour</code>	<i>colour</i>	// colour of height text
<code>box_text_justification</code>	0	// bottom of individual boxes
	1	// top of individual boxes
<code>horizontal_line_spacing</code>	<i>mm</i>	// calculated if omitted

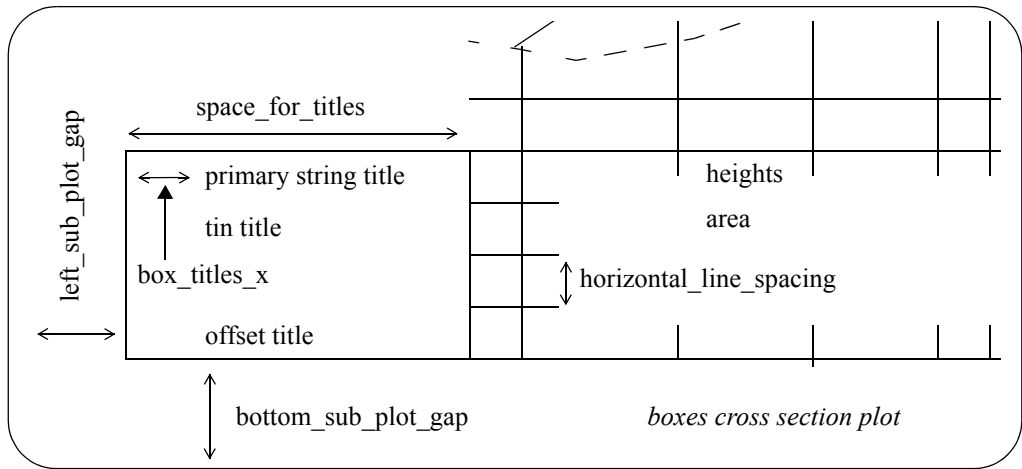
The total height of the boxes area is simply given by number of boxes drawn multiplied by the height of one box (they all have the same height).

The **width** of the heights area is determined by the number of chainages to be labelled and whether the values are staggered to prevent over writing.

Hence the total width of the boxes area is the width of the labels area plus the width of the

heights area.

Many distance definitions in the plot parameter file are given in terms of distance above the **top** of the boxes area.



The text in the title area is the same for each cross section plot on the sheet so it is possible to restrict the title area to be only on the first cross section on the sheet or the first column of cross sections.

label_first_only	0	//title area on all x-sections (default)
	1	// title area on first x-sect of page only
	2	// title area on x-sects in first column

The drawing of the box line work is user defined. This has been extended from V3.1 although *draw_box_mode* has been left in for upward compatibility.

draw_box_mode	0	// don't draw box lines
	1	// draw box lines around heights area
		// only
	2	// draw box lines around title and
		// heights areas
	3	// use draw_box_side_n,
		// box_line_draw_mode and
		// box_line_mode_n

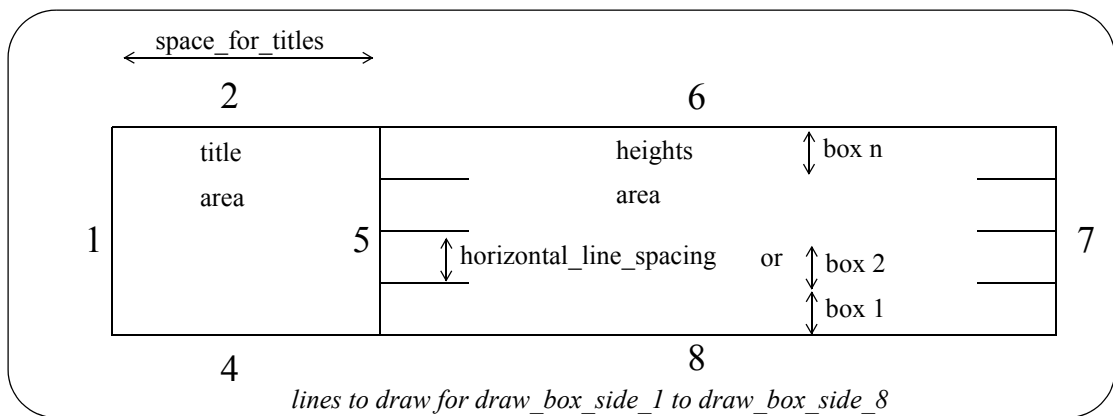
box_colour	colour	// colour of the boxes
------------	--------	------------------------

For V3.2, the line work for the outside of the title and heights boxes is controlled by the parameters *draw_box_side_n* and *box_side_colour_n*, and the separation lines inside the boxes are controlled by the parameters *box_line_draw_mode* and *box_line_mode_n* where the box numbering, n, starts from the bottom box.

Note: The following parameters are only used if *draw_box_mode* is set to 3.

draw_box_side_1	1	// draw the left side of the title area (def)
	0	// don't draw the left side
box_side_colour_1	colour	// colour to draw left side of title area
		// default box_colour
draw_box_side_2	1	// draw top of the title area (default)
	0	// don't draw the top
box_side_colour_2	colour	// colour to draw top of title area
		// default box_colour
draw_box_side_4	1	// draw bottom of the title area (default)

	0	// don't draw the bottom
box_side_colour_4	colour	// colour to draw bottom of title area
		// default box_colour
draw_box_side_5	1	// draw left side of the heights area (def)
	0	// don't draw the left side
box_side_colour_5	colour	// colour to draw left side of heights area
		// default box_colour
draw_box_side_6	1	// draw top of the heights area (default)
	0	// don't draw the top
box_side_colour_6	colour	// colour to draw top of heights area
		// default box_colour
draw_box_side_7	1	// draw right side of the heights area def
	0	// don't draw the right side
box_side_colour_7	colour	// colour for right side of heights area
		// default box_colour
draw_box_side_8	1	// draw bottom of the heights area (def)
	0	// don't draw the bottom
box_side_colour_8	colour	// colour for bottom of heights area
		// default box_colour



The lines at the top of the individual boxes inside the title area and heights area (separation lines) are controlled by the parameters *box_line_draw_mode* and *box_line_mode_n*.

The separation lines can be drawn just in the title area, just in the heights area or in both areas.

The parameter *box_line_draw_mode* can be set to control all the separation lines but there are additional parameters, *box_line_mode_n*, which override *box_line_draw_mode* for each of the individual boxes where *n* = 1, ... number of boxes -1.

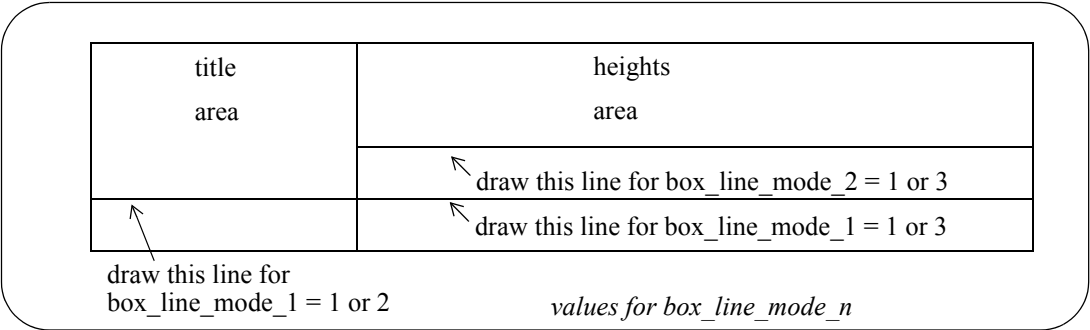
The top of the top box is not controlled by *box_line_mode_n* but is controlled by the parameters *draw_box_side_2* and *draw_box_side_6*.

box_line_draw_mode	0	// don't draw any separation lines inside
		// the title and heights areas
	1	// draw the separation lines inside the
		// title and heights areas (default)
	2	// draw the separation lines inside the
		// title area only
	3	// draw the separation lines inside the
		// heights area only
box_line_mode_n	0	// for the nth box, don't draw any
		// line at the top of the box for either
		// the title or the heights areas
	1	// for the nth box, draw the line at the
		// top of the box for both the

2

3

// title and heights areas
// for the nth box, draw the line at the
// top of the box for the title area only
// for the nth box, draw the line at the
// top of the box for the heights area only



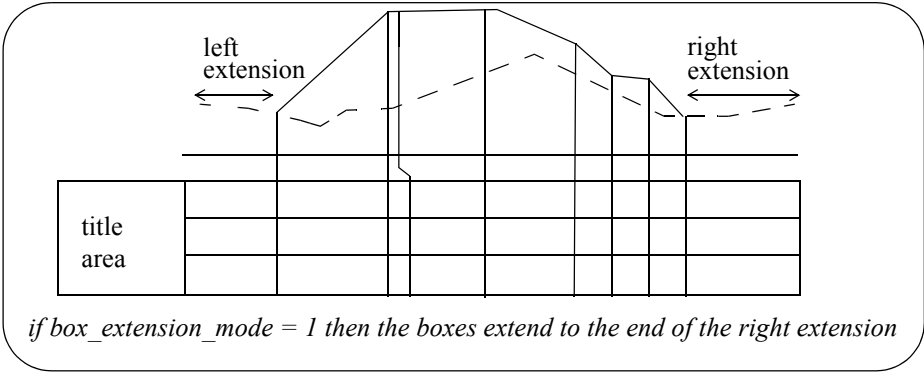
Finally, the right hand end of the boxes can stop at the end of the design x-section or extend to the end of the *right_extension* distance.

box_extension_mode

0

1

// default - stop right end of boxes at the
// end of design x-section
// extend right end of boxes to the end of
// the right_extension distance.



Offset Titles and Values

If the **label_type** is set to boxes, the offsets of the points across the primary string (usually the design cross section) are always labelled.

offset_title	<i>text</i>	// first line of offset title (def offsets)
offset_title_2	<i>text</i>	// second line of offset title
offset_title_textstyle	<i>textstyle</i>	// textstyle for offset title
offset_title_colour	<i>colour</i>	// offset title text colour
offset_title_size	<i>mm</i>	// offset title text size
offset_colour	<i>colour</i>	// colour of offset values
offset_textstyle	<i>textstyle</i>	// textstyle for offset values
offset_size	<i>mm</i>	// size for offset values

Example of Offset Titles Parameters

```
// offset titles and values
```

```
offset_title      "Offset"
offset_title_2    "metres"
offset_title_colour grey
```

Primary String Titles and Heights

Sometimes the primary string (the design cross section) is only required to define the offset positions to label and the section line for the tin sections. In this case, the primary string would not be drawn on the cross section plot.

The drawing or not drawing of the primary string on each cross section plot is controlled by the parameter *primary_string*.

If the primary string is drawn, by default a row of labelling is included in the boxes area with up to two lines of title information and heights for each point across the cross section.

primary_string	<i>yes</i>	// draw and label the primary string
	<i>no</i>	// don't draw or label the primary string
primary_title	<i>text</i>	// first line of string title
primary_title_2	<i>text</i>	// second line of string title
primary_title_textstyle	<i>textstyle</i>	// textstyle for primary string titles
primary_title_colour	<i>colour</i>	// colour of the string titles
primary_title_size	<i>mm</i>	// primary title text size
primary_textstyle	<i>textstyle</i>	// textstyle for primary string heights
primary_title_y_pos	<i>mm</i>	// if set, the height in mm above the // bottom of all the boxes that the // primary title text is drawn. // If not set, then the text is placed at a // height that puts it inside the default // box for the primary title.
primary_colour	<i>colour</i>	// colour of the primary string heights
primary_size	<i>mm</i>	// primary text size
primary_y_pos	<i>mm</i>	// if set, the height in mm above the // bottom of all the boxes that the // primary height text is drawn. // If not set, then the text is placed at a // height that puts it inside the default // box for the primary height text.
primary_decimals	<i>integer</i>	// number of dec places in primary height // < 0 to keep all trailing zeros

Example of Labelling Primary String Titles

primary_title	“Design”	
// primary_title_2	“primary2”	// not being used - commented out
primary_colour	“purple”	
primary_title_colour	“red”	

Tin Titles, Heights and Depths

A section along the primary string through each tin on the section view is automatically drawn on the cross section plot, but the user can specify whether the tin heights and depths are labelled or not in the boxes area.

Hence although there may be a number of tins drawn on the section plot, not all of them need to be labelled or have their depths labelled.

The default order for labelling the tins and depths is the order that they were added to the view but it is possible to specify which tin is used for labelling each row of tin heights and depths by giving the tin name rather than just using the tin order on the section view.

In fact, it is possible to use **any tin** in the project **to label** a row, **not just those drawn** on the section view.

tin_n_name	text	// n=1, ... no of tins on the section view. // use the tin called <i>text</i> to label the nth // row of tin heights.
------------	------	-----------------------------------------------------------------------------------------------------------------------------

If a tin of the name given by **tin_n_name** does not exist, then the plot is not produced and an error message is given.

For the following parameters, n takes the value 1 to 100 and specifies that the parameter set applies to the *n*th tin on the section view or if *tin_n_name* is set, by the tin specified by *tin_n_name*.

tin_n_draw_mode	1	// draw the nth tin (default))
	0	// don't draw the nth tin
tin_n_draw_colour	colour	// colour to draw the nth tin // if omitted then use the tin colour
tin_n_label	1	// label the nth tin (default)
	0	// don't label the nth tin
tin_n_title	text	// first line of nth tin title
tin_n_title_2	text	// second line of nth tin title
tin_n_title_textstyle	textstyle	// textstyle for nth tin titles
tin_n_title_colour	colour	// colour for nth tin titles
tin_n_title_size	mm	// size for nth tin titles
tin_n_title_y_pos	mm	// if set, the height in mm above the // bottom of all the boxes that the // tin title text is drawn. // If not set, then the text is placed at a // height that puts it inside the default // box for the tin heights.
tin_n_decimals	integer	// number of dec places in tin height // < 0 to keep all trailing zeros
tin_n_textstyle	textstyle	// textstyle of the tin heights
tin_n_colour	colour	// colour for heights and depths
tin_n_size	mm	// default nth tin's title size
tin_n_y_pos	mm	//if set, the height in mm above the //bottom of all the boxes that the // tin height text is drawn. //If not set, then the text is placed at a //height that puts it inside the default // box for the tin heights.
tin_n_depth_label	1/0	// 1 to label, 0 don't label depths
tin_n_depth_title	text	// first line of tin depth title
tin_n_depth_title_2	text	// second line of tin depth title
tin_n_depth_title_textstyle	textstyle	// textstyle of the tin depth titles
tin_n_depth_title_colour	colour	// colour for titles of depths

tin_n_depth_title_size	mm	// size for title of depths
tin_n_depth_title_y_pos	mm	// if set, the height in mm above the // bottom of all the boxes that the // tin depth title text is drawn. // If not set, then the text is placed at a // height that puts it inside the default // box for the tin heights.
tin_n_depth_decimals	integer	// number of dec places in tin height // < 0 to keep all trailing zeros
tin_n_depth_textstyle	textstyle	// textstyle of the tin depths
tin_n_depth_colour	colour	// colour for depths
tin_n_depth_size	mm	// size for depths
tin_n_depth_y_pos	mm	// if set, the height in mm above the // bottom of all the boxes that the // tin depth text is drawn. // If not set, then the text is placed at a // height that puts it inside the default // box for the tin heights.

Definition of Depth to a Tin or to Offset Strings

The depth from the primary string to a tin, at a particular offset is defined as

depth = tin height value - height of the primary string

That is, the depth that the primary string is **below** the tin.

Before plotting, the value of depth is multiplied by either the *depth_positive_factor* or *depth_negative_factor*.

```
if (depth >= 0)  plotted_depth_value = depth * depth_positive_factor
if (depth < 0)   plotted_depth_value = depth * depth_negative_factor
```

Hence the definition of depth can be modified by the parameters:

depth_positive_factor	value	// multiplier for positive depths
depth_negative_factor	value	// multiplier for negative depths

For example, if the opposite sign is required for depth, that is,

depth = height of the primary string - tin height value

simply set

```
depth_positive_factor  -1
depth_negative_factor- 1
```

Example of Labelling Tins

```
// tin label 1 for on
//           0 for off

tin_1_label      1
tin_1_title      "Natural"
// tin_1_title_2  "Surface"
tin_1_colour     grey
tin_1_title_colour red
```

tin_2_label	1
tin_2_title	“Water table”
tin_2_colour	grey
tin_2_title_colour	red

Labelling the Design Height, X and Y Co-ordinates and Tin Heights at Offset Zero

The values of the height and X and Y co-ordinates of the **primary string** (usually the design cross section) at the zero offset can be labelled. Note that zero offset is normally where the alignment string cuts the cross section.

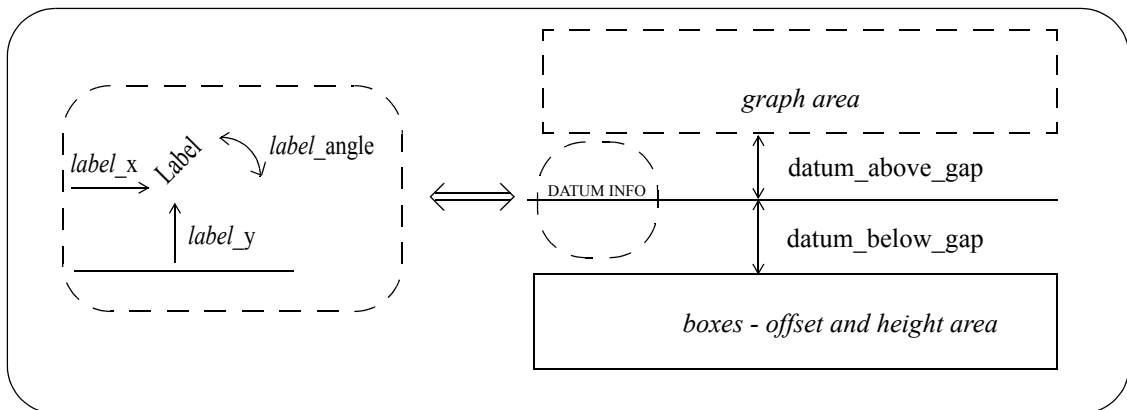
The heights of any tins (such as the natural surface) at the zero offset can also be labelled.

The labels are made up of:

```
pre_text  value  post_text
```

where *value* is either a height or a co-ordinate.

The label is positioned at either the left, right or middle of the datum line, with an x and y adjustment and a rotation.



Parameters for labelling the X Co-ordinate at Zero Offset:

primary_x0_draw_mode	<i>0</i>	// don't draw the label -default
	<i>1</i>	// draw the label
primary_x0_pre_text	<i>text</i>	// pre-text for label - def " "
primary_x0_post_text	<i>text</i>	// post-text for label - def " "
primary_x0_decimals	<i>integer</i>	// number of decimal places to display - def 1
		// If > 0, trailing zeros are removed after
		// the decimal point
		// If < 0, the absolute value is taken as the
		// number of decimal places to report
		// i.e. no trailing zeros are removed
primary_x0_x	<i>mm</i>	// x adjustment to position of label - def 0
primary_x0_y	<i>mm</i>	// y adjustment to position of label - def 0
primary_x0_angle	<i>degrees</i>	// angle of the label - def 0
primary_x0_colour	<i>colour</i>	// colour of the label
primary_x0_size	<i>mm</i>	// size (in mm) of the label
primary_x0_textstyle	<i>textstyle</i>	// textstyle of the label
primary_x0_justify	<i>just</i>	// justification for text

Parameters for Labelling the Y Co-ordinate at Zero Offset:

primary_y0_draw_mode	<i>0</i>	// don't draw the label -default
	<i>1</i>	// draw the label
primary y0 pre text	<i>text</i>	// pre-text for label - def " "

primary_y0_post_text	<i>text</i>	// post-text for label - def " "
primary_y0_decimals	<i>integer</i>	// number of decimal places to display - def 1
		// If > 0, trailing zeros are removed after
		// the decimal point
		// If < 0, the absolute value is taken as the
		// number of decimal places to report
		// i.e. no trailing zeros are removed
primary_y0_x	<i>mm</i>	// x adjustment to position of label - def 0
primary_y0_y	<i>mm</i>	// y adjustment to position of label - def 0
primary_y0_angle	<i>degrees</i>	// angle of the label - def 0
primary_y0_colour	<i>colour</i>	// colour of the label
primary_y0_size	<i>mm</i>	// size (in mm) of the label
primary_y0_textstyle	<i>textstyle</i>	// textstyle of the label
primary_y0_justify	<i>just</i>	// justification for text

Parameters for Labelling the Height of Primary String at Zero Offset:

primary_height_draw_mode	<i>0</i>	// don't draw the label -default
	<i>1</i>	// draw the label
primary_height_pre_text	<i>text</i>	// pre-text for label - def " "
primary_height_post_text	<i>text</i>	// post-text for label - def " "
primary_height_decimals	<i>integer</i>	// number of decimal places to display - def 1
		// If > 0, trailing zeros are removed after
		// the decimal point
		// If < 0, the absolute value is taken as the
		// number of decimal places to report
		// i.e. no trailing zeros are removed
primary_height_x	<i>mm</i>	// x adjustment to position of label - def 0
primary_height_y	<i>mm</i>	// y adjustment to position of label - def 0
primary_height_angle	<i>degrees</i>	// angle of the label - def 0
primary_height_colour	<i>colour</i>	// colour of the label
primary_height_size	<i>mm</i>	// size (in mm) of the label
primary_height_textstyle	<i>textstyle</i>	// textstyle of the label
primary_height_justify	<i>just</i>	// justification for text

Parameters for Placing Some Text:

extra_text_draw_mode	<i>0</i>	// don't draw the label -default
	<i>1</i>	// draw the label
extra_text_pre_text	<i>text</i>	// pre-text for label - def " "
extra_text_post_text	<i>text</i>	// post-text for label - def " "
extra_text_decimals	<i>integer</i>	// number of decimal places to display - def 1
		// If > 0, trailing zeros are removed after
		// the decimal point
		// If < 0, the absolute value is taken as the
		// number of decimal places to report
		// i.e. no trailing zeros are removed
extra_text_x	<i>mm</i>	// x adjustment to position of label - def 0
extra_text_y	<i>mm</i>	// y adjustment to position of label - def 0
extra_text_angle	<i>degrees</i>	// angle of the label - def 0
extra_text_colour	<i>colour</i>	// colour of the label
extra_text_size	<i>mm</i>	// size (in mm) of the label
extra_text_textstyle	<i>textstyle</i>	// textstyle of the label
extra_text_justify	<i>just</i>	// justification for text

Offset Selection for Uprights and Staggering of Heights

For each sub-plot, the offsets of the points across the x-section string (primary string) are used for positioning uprights (leader lines), and the offset and height labels for the uprights.

By default, there is an upright at each point across the primary string.

However, if the primary string is a 4d string, then the text at the points on the 4d string can be used as a key to **suppress** the labelling and upright at that point.

The parameters to **stop** labelling and uprights are:

mask_name_n *4d_string_point_text* where n=1,100

Note -the text `4d_string_point_text` can include wild cards (*) and characters (?).

After any *name masks* have been applied, it is often desirable to weed out offset values that are too close together before doing any labelling.

[illegible]

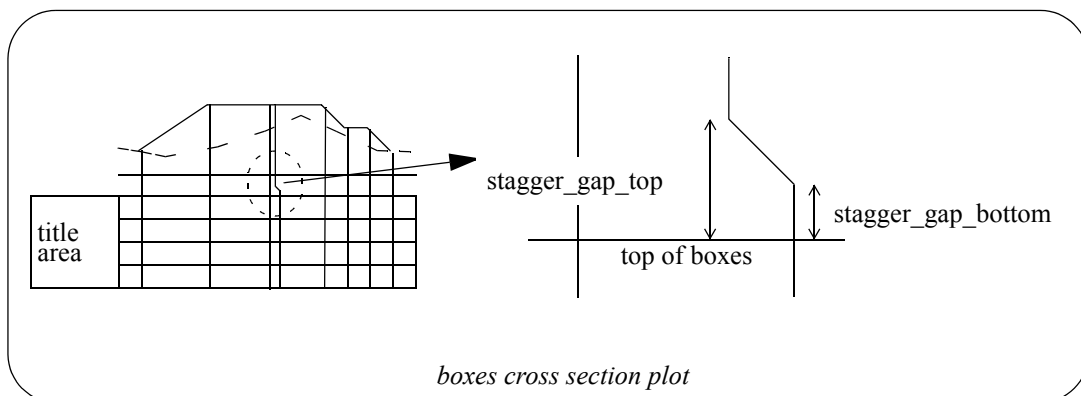
If the real offset position is used for the horizontal position of the offset/height text, text over writing can easily occur. To prevent over writing, the text is automatically **staggered**.

When staggering occurs, the real offset position is then indicated by the offset markers which are drawn at the top of the text boxes from the staggered text position back to the actual offset position of the text.

The size and position of the staggers are given by:

stagger_gap_top	<i>mm</i>	// distance from boxes to top of stagger
stagger_gap_bottom	<i>mm</i>	// distance from boxes to bottom of stagger
		// stagger
stagger_gap_factor	<i>value</i>	// distance between staggers is box text size * stagger gap factor

When staggering occurs, it is possible for the heights area to be wider than the graph area.

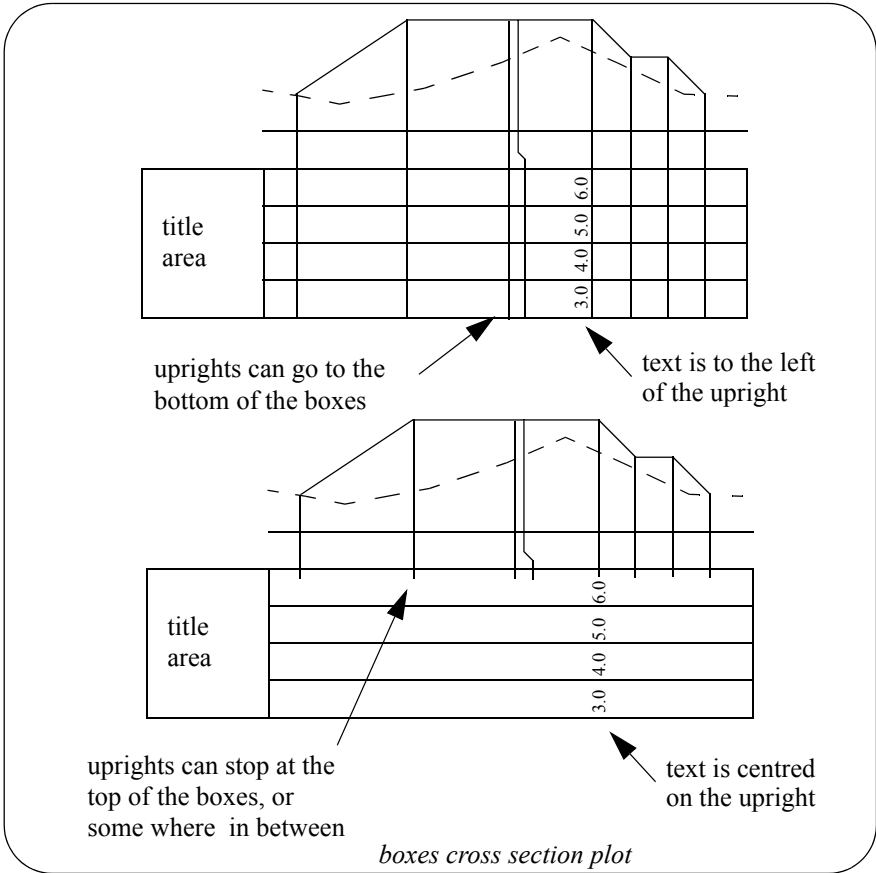


Uprights

Uprights (leader lines) can be drawn from the top of the staggers to strings drawn on the plot.
The height of the uprights is given by the ***uprights_draw_mode***:

uprights_draw_mode	0	// none
	1	// to maximum string height at that // chainage
	2	// ticks, to stagger height
	3	// to uprights_y above the boxes
	100	// to the primary string
	101-500	// to tin1 or tin2 etc.
uprights_y	mm	// distance to draw the uprights for // mode 3
uprights_colour	colour	// uprights colour (def boxes colour)
The uprights can go below the top of the boxes.		
uprights_bottom_mode	0	// stop at top of boxes (default)
	1	// draw to bottom of boxes
	2	// draw to uprights_bottom_y below the // top of the boxes
	3	// draw to uprights_bottom_y above the // bottom of the boxes
	4	// ticks at chainage
uprights_bottom_y	mm	//distance
uprights_text_offset_factor	value	// move the text by this factor*size

When uprights go below the top of the boxes, the height and offset text is moved to the left so that the upright does not go through the text. The left hand side of the heights boxes also moves to the left to leave room for the height text.



Please continue to the next section [Graph Area](#).

Graph Area

The **graph area** for each section sub-plot is the area where the actual plot of the x-section string is drawn.

The **width** of the graph area is determined by the width of the x-section string being plotted, the left and right extensions and horizontal scale (scale) given by parameters or in the **section x plot** panel, and the vertical exaggeration given by the section view or a parameter.

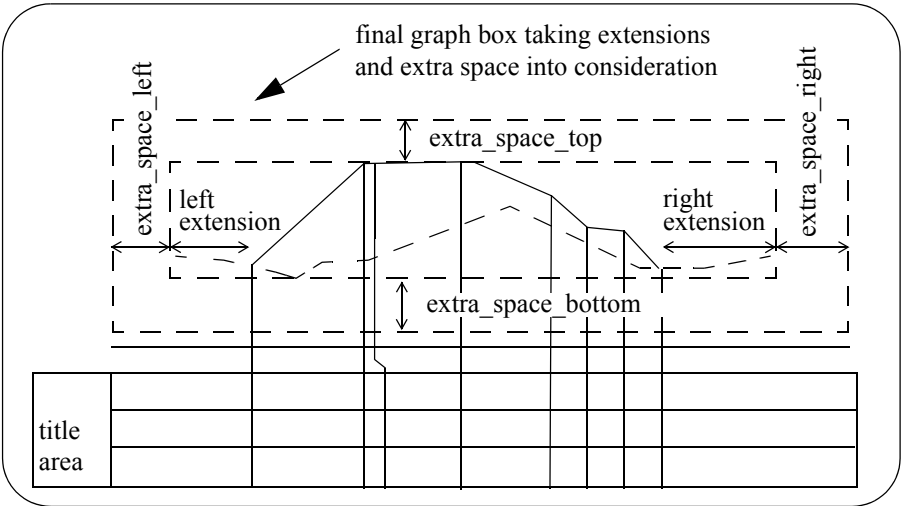
view_name	text	// default is section view in panel.
vertical_exaggeration	value	// default is vertical exag for view
scale	value	// 1:value - horizontal scale, default is
		// scale 1: in panel.
left_extension	world-units	// left extension value
right_extension	world-units	// right extension value

The vertical scale is determined by the horizontal scale and the vertical exaggeration.

The **height** of the graph area is determined by the vertical scale (given by the horizontal scale and the vertical exaggeration) and the minimum and maximum values of the data being plotted. Hence the graph height is a calculated rather than a given value.

The size of the graph area can also be extended to allow for symbols by the parameters:

extra_space_units	0	// extra space values are world units - default
	1	// " " " are millimetres on plot page
extra_space_left	units	// subtract from left of plot area, def 0
extra_space_right	units	// add to right of plot area, default 0
extra_space_top	units	// add to top of plot area, default 0
extra_space_bottom	units	// subtract from bottom of plot area,
		// default 0



The types of strings that are drawn in the graph area of a cross section plot are:

- (a) **primary string** the x-section string from the x-section model that is being drawn.
Called the primary string and is usually the design x-section.
- (b) **tins** sections of the primary string through any tins either in models on the section view or in corridor models.
- (c) **services** parts of strings (from either models on the section view or in corridor models) that cut the defined corridor.

The **colour** of the strings in the plot is the actual string colour for cases (a) and (c), and the colour of the tin used for the section in case (b).

Although all the strings are plotted, the plot parameter file can be used to select which ones are

labelled with heights.

Primary String (Design Cross Section)

The primary string (the design cross section) is used to define

- (a) the design cross section
- (b) the chainage of the section
- (c) the offset positions for labelling heights and drawing uprights
- (d) the section line used for sectioning through tins
- (e) the section line for defining the corridor for services

Although the primary string is used to set up most of the information for the cross section plot, it doesn't have to be drawn on the cross section.

The drawing or not drawing of the primary string on each cross section plot is controlled by the parameter *primary_string* which was described earlier.

The **colour** of the primary string in the plot is the actual primary string colour.

Tins

A section along the primary string through each tin on the specified section view is automatically drawn on the cross section plot.

The **colour** and **linestyle** of the tin section in the plot is the actual tin colour and tin linestyle.

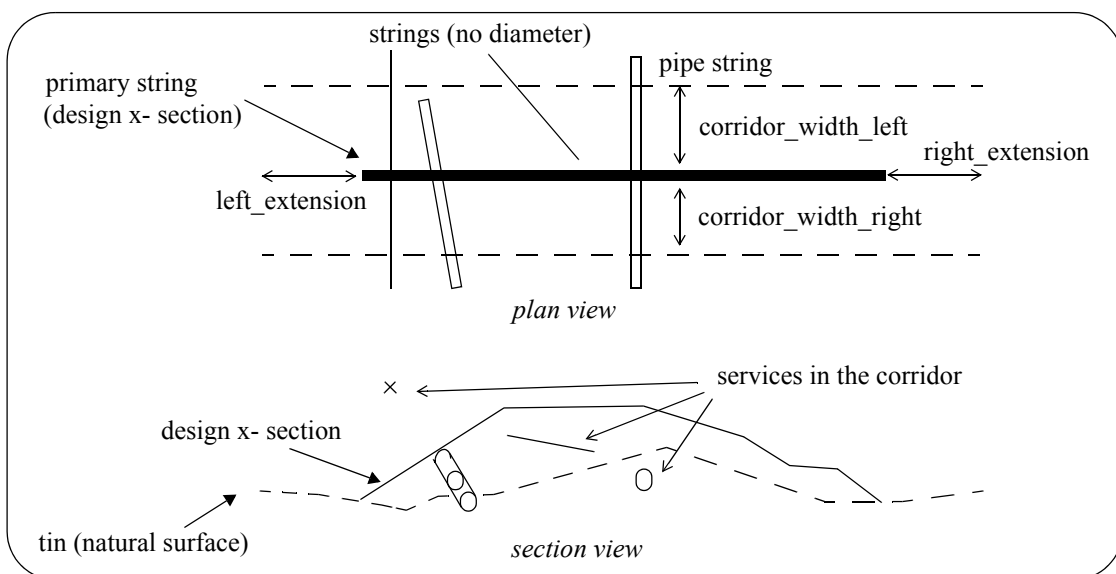
Whether the tin heights are labelled or not in the boxes area is controlled by parameters and has been described earlier

Corridor and Services

A corridor around the primary string is defined by giving a left and right corridor width and a left and right extension.

Any string in a model added to the section view is checked to see if it appears in the corridor, and if it does, then it is drawn on the cross section plot.

Strings do not have to cross the primary string, but just be in the corridor.



The corridor defining parameters are

left_extension	world-units	// left extension value
right_extension	world-units	// right extension value
corridor_width_left	world-units	// corridor left and right widths
corridor_width_right	world-units	// defaults are the section view values
corridor_overlap_left	world-units	// corridor left and right overlaps.
corridor_overlap_right	world-units	// defaults are the section view values
corridor_chord_arc	world-units	// chord-arc tolerance used to // approximate arcs in the corridor. // default is the section view value

The models containing tins for sectioning and strings for services are taken from the section view or given by the parameters

corridor_model_n	model	// n = 1, 2 ... 100 // models containing tins and service // strings to be drawn on the view.
------------------	-------	-----------------------------------------------------------------------------------------------------

If any *corridor_model_n* parameters are defined, then only the models given by the parameters are used. If no *corridor_model_n* parameters are set, then the models added to the given section view are used.

That is, either the *corridor_model_n* parameters are used or if none exist, then the models added to the section view are used for tins and service strings.

The **colour** and **diameter** of the service strings drawn in the plot are the actual strings colour and diameter.

Please continue to the next section [Grade Labelling](#).

Grade Labelling

The plot of the x-section string is made up of straight lines joining the individual points of the x-section.

The **grades** of these lines can be labelled:

grade_label	0	// don't label grades (default)
	1	// label grades

Either the individual lines can be used as the segments to be labelled for grade, or adjacent lines of the same grade can be considered to be just one segment and labelled only once.

Hence the segments to be labelled for grade can be the individual lines of the x-section, or the segments defined by changes of grade.

grade_change_only	0	// label individual lines
	1	// label change of grade segments

It is also possible to ignore segments smaller than a given minimum width on the plot.

grade_minimum_width	mm	// segments smaller are not labelled
---------------------	----	--------------------------------------

The grade labels are drawn parallel to the segment, centred about the segments end points, and a distance *grade_offset* above the segment. The size, colour and number of decimal places can all be set.

grade_decimals	integer	// number of decimal places in grade
grade_size	mm	// size of the grade label
grade_textstyle	text	// textstyle of the grade label
grade_colour	colour	// colour of the grade label
grade_offset	mm	// distance above the segment for label
grade_signed	yes	// default - grades are signed
	no	// absolute value of grades

The grade can be labelled as percent cross-fall, 1 in slope, m/m or VicRoads x:1.

Also a threshold value can be set and any grades whose absolute value are below the threshold

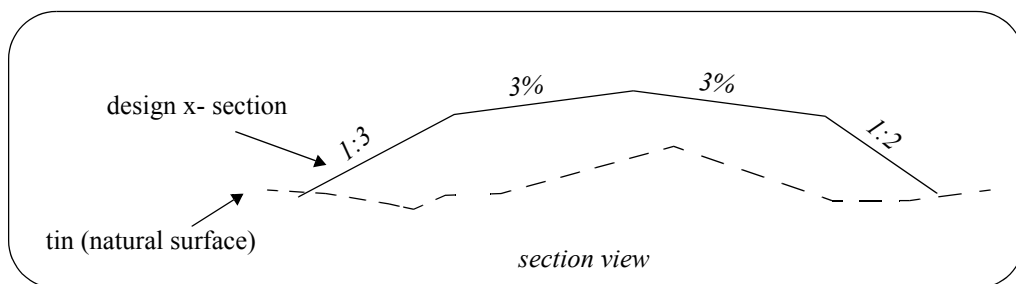
can be labelled in one way, and those above the threshold labelled a different way.

Hence, if the absolute value of the grade is less than or equal to the absolute value of *grade_threshold*, then **grade_mode** is used, otherwise **grade_upper_mode** is used.

```

grade_mode          0          // % grade
                    1          // 1 in
                    2          // m/m
                    3          // VicRoads x:1
grade_threshold      value      // grade threshold for type of grade
                                // labelling
grade_threshold_mode 0-3        // type of grade value given in
                                // grade_threshold types are the same as
                                // grade_mode
grade_upper_mode     0          // % grade
                    1          // 1 in
                    2          // m/m
                    3          // VicRoads x:1
grade_upper_decimals integer    // number dec places in grades above
                                // threshold value

```



Example of Grade Labelling

```

grade_label          1          // turn grade labels on
grade_mode            0          // percent grade
grade_decimals        1          // one decimal place, no trailing zeros
grade_change_only     1          // only label when change of grade
// text size for grade annotations
grade_size            2
grade_colour           yellow
// how far the annotation is (perpendicularly)
// from the string itself
grade_offset           1
// label all annotations separated by more than
// the minimum width in plot units
grade_minimum_width    0
// threshold and threshold mode describe the value
// at which the grade labelling changes
// mode to grade_upper_mode
grade_threshold        7          // change labelling when over 7%
grade_threshold_mode    0          // units for threshold - %
grade_upper_mode       1          // label as 1:x

```

Please continue to the next section [Labelling Points of the X-Sections](#).

Labelling Points of the X-Sections

The points across each x-section can be automatically labelled on the x-section plots.

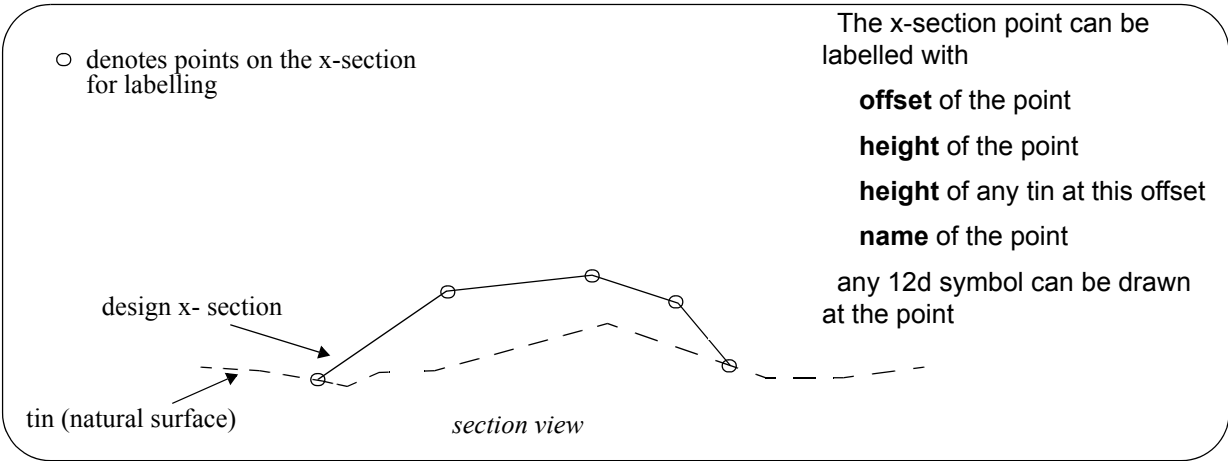
The **height**, **offset** and **name** of the point can be labelled as well as a **symbol** drawn. The height of tins at the same offset value can also be labelled.

The offset position for the labelling is the offset of the point.

The height position for the labelling can be specified as the

- (a) top of the boxes for the x-section
- (b) above the maximum height of the strings on the plot
- (c) height of the point on the x-section string (primary string)
- (d) height of a tin.

The actual position of the label is defined relative to the above point.



Note:

Only case (b) involves the actual height of the point on the cross section string. For all other cases, only the offset of the cut string is used.

Other heights, for example, the height of the tin at that offset can be used as the height (case (d)).

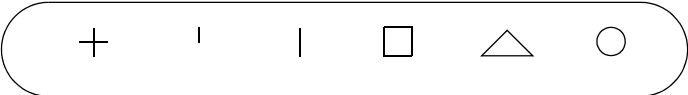
Text justification refers to the actual position and is given by

“top-left”	“top-centre”	“top-right”
“middle-left”	“middle-centre”	“middle-right”
“bottom-left”	“bottom-centre”	“bottom-right”

A choice of six special symbols and/or or any of the 12d symbols can be drawn at the cut point.

The special **12d** Model symbols of size one millimetre are drawn in a square box centred on (0,0) with sides of length two millimetres. That is, the box co-ordinates are (-1,-1), (1,1), (1,-1), (-1,-1).

The six special shapes are



Up to twenty five (25) separate sets of points can be labelled.

Parameters for Labelling Points of X-Sections

The points of the x-section to be for labelled for the nth set of parameters is restricted to all the points whose name satisfying the *points_n_mask*:

`points_n_mask` *point_names* // points to be labelled

where *point_names* is a text string containing the name masks, each separated by one or more spaces, to test the point name against. Each mast can include wild cards and wild characters.

For example

`points_1_mask` "ke*"
or `points_1_mask` "?bank*"
or, if both masks are required,
`points_1_mask` "ke* ?bank*"

The parameters for drawing a **symbol** are

<code>points_symbol_n_mode</code>	0	// cross
	1	// up from centre of box
	2	// up and down from centre of box
	3	// square
	4	// triangle, base at bottom
	5	// circle
	6	// use a 12d symbol

0 + 1 | 2 | 3 □ 4 △ 5 ○
predefined symbols for

If *points_symbol_n_mode* is 6, then the plot symbol is given by

`points_symbol_n_style` *plotsymbol* // name of the 12d symbol to draw at point

Important Note

The plot symbol of name *plotsymbol* is defined in the file given by:

- (a) the parameter *plot_symbols* in the ppf file

`plot_symbols` *filename*

or if *plot_symbols* is not defined, then

- (b) in the file pointed to by the environment variable `PLOT_SYMBOLS_4D`

`PLOT_SYMBOLS_4D` *filename* // default *plotsym.4d*

or if *PLOT_SYMBOLS_4D* is not defined, then

- (c) in the file *plotsym.4d*

which is searched for in the standard set up file sequence

If none of the above files are defined, or if the symbol does not exist in the above files, then it will be searched for in the standard 12d symbols file which is:

- (d) either pointed to by the environment variable `SYMBOLS_4D`

`SYMBOLS_4D` *filename* // default *symbols.4d*

or if the environment variable `SYMBOLS_4D` does not exist, in the file, *symbols.4d*

The position of the symbol is given by:

points_symbol_n_position	1	// above point height value
	3	// above top of boxes
	4	// above top of graph area but not including
		// the extra_space_top
	100	// to primary string (same as 1)
	101-500	// to tin1 or tin2 etc.

The symbol can be adjusted by the parameters:

points_symbol_n_x	<i>mm</i>	// offset adjustment to position
points_symbol_n_y	<i>mm</i>	// height adjustment to position
points_symbol_n_angle	<i>degrees</i>	// rotation about point
points_symbol_n_colour	<i>colour</i>	// colour of symbol

and for all values of *points_symbol_n_mode* **other** than 6:

points_symbol_n_size	<i>mm</i>	// size of symbol, 0 don't draw
----------------------	-----------	---------------------------------

The value of the **offset** of the point can be labelled using the parameters

points_offset_n_position	1	// above point height value
	3	// above top of boxes
	4	// above top of graph area but not including
		// the extra_space_top
	100	// to primary string
	101-500	// to tin1 or tin2 etc.
points_offset_n_x	<i>mm</i>	// offset adjustment to position
points_offset_n_y	<i>mm</i>	// height adjustment to position
points_offset_n_angle	<i>degrees</i>	// rotation about point
points_offset_n_size	<i>mm</i>	// size of text, 0 don't label
points_offset_n_colour	<i>colour</i>	// colour of text
points_offset_n_textstyle	<i>textstyle</i>	// textstyle to use for points offset text.
points_offset_n_pre_text	<i>text</i>	// text before the offset value
points_offset_n_post_text	<i>text</i>	// text after the offset value
points_offset_n_justification	<i>justification</i>	// justification of the text
points_offset_n_no_decimals	<i>integer</i>	// number of decimals in offset

The value of a **height** at the offset of the point can be calculated and labelled using the parameters

points_height_n_mode	1	// use height of point itself
	3	// use real world height of position
		// above boxes
	100	// height of primary string (same as 1)
	101-500	// use height of to tin1 or tin2 etc.
points_height_n_position	1	// at points position
	3	// above top of boxes
	4	// above top of graph area but not including
		// the extra_space_top
	100	// to primary string (same as 1)
	101-500	// to tin1 or tin2 etc.
points_height_n_x	<i>mm</i>	// offset adjustment to position
points_height_n_y	<i>mm</i>	// height adjustment to position
points_height_n_angle	<i>degrees</i>	// rotation about point
points_height_n_size	<i>mm</i>	// size of text, 0 don't label
points_height_n_colour	<i>colour</i>	// colour of text
points_height_n_textstyle	<i>textstyle</i>	// textstyle to use for points height text.

points_height_n_pre_text	<i>text</i>	// text before the height value
points_height_n_post_text	<i>text</i>	// text after the height value
points_height_n_justification	<i>justification</i>	// justification of the text
points_height_n_no_decimals	<i>integer</i>	// number of decimals in height

A **label** which can include the **name** of the point is drawn by using the parameters

points_label_n_position	<i>1</i>	// at the points position
	<i>3</i>	// above top of boxes
	<i>4</i>	// above top of graph area but not including // the extra_space_top
	<i>100</i>	// to primary string (same as 1)
	<i>101-500</i>	// to tin1 or tin2 etc.
points_label_n_mode	<i>0</i>	// don't include point name
	<i>1</i>	// include point name in label
points_label_n_x	<i>mm</i>	// offset adjustment to position
points_label_n_y	<i>mm</i>	// height adjustment to position
points_label_n_angle	<i>degrees</i>	// rotation about point
points_label_n_size	<i>mm</i>	// size of text, 0 don't label
points_label_n_colour	<i>colour</i>	// colour of text
points_label_n_textstyle	<i>textstyle</i>	// textstyle to use for points label text.
points_label_n_pre_text	<i>text</i>	// text before the point name
points_label_n_post_text	<i>text</i>	// text after the point name
points_label_n_justification	<i>justification</i>	// justification of the text

Please continue to the next section [Labelling Cuts of X-Sections Through Strings in a Model.](#)

Labelling Cuts of X-Sections Through Strings in a Model

The cuts that each x-section string makes through any strings in user given models can be automatically labelled on the x-section plots.

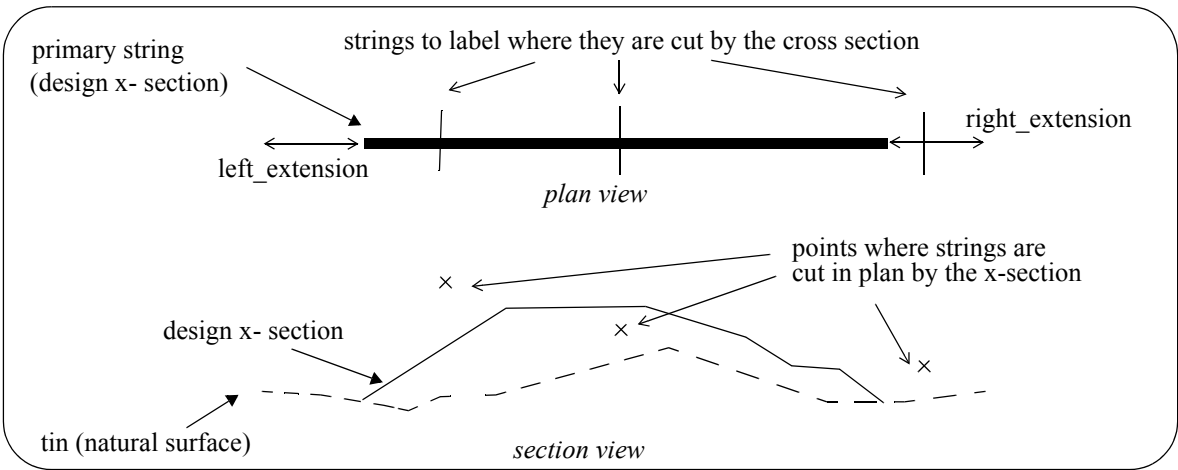
The **height**, **offset** and **name** of the cut string can be labelled as well as a **symbol** drawn. The height of tins at the same offset value can also be labelled.

The offset position for the labelling is the offset of the cut string.

The height position for the labelling can be specified as the

- (a) top of the boxes on the x-section
- (b) above the maximum height of the strings on the plot
- (c) height value of the cut string
- (d) height of the x-section string (the primary string)
- (e) height of a tin.

The actual position of the label is defined relative to the above point.



Note:

Only case (b) involves the actual height of the cut string. For all other cases, only the offset of the cut string is used. Hence for all cases except (b), the string does need to have a sensible height to be used for cuts through strings.

For example, a boundary string may have null heights but only the offset is required and the height of the tin at that offset can be used as the height (case (d)).

Text justification refers to the actual position and is given by

"top-left"	"top-centre"	"top-right"
"middle-left"	"middle-centre"	"middle-right"
"bottom-left"	"bottom-centre"	"bottom-right"

A choice of six special symbols and/or or any 12d symbols can be drawn at the cut point.

The special 12d Model symbols of size one millimetre are drawn in a square box centred on (0,0) with sides of length two millimetres. That is, the box co-ordinates are (-1,-1), (1,1), (1,-1), (-1,-1).

The six special shapes are



Up to twenty five (25) separate models of strings can be cut and labelled.

Parameters for Labelling Cuts of X-Sections Through Strings in a Model

The method for specifying which strings are to be checked for cuts is by first specifying the **model** which contains the strings, and then a **name mask** which is used to restrict the strings in the model to only those whose name matches the name mask.

Up to twenty five different sets of models and name masks can be used so that different cut sets can be labelled in different ways.

The parameters for selecting and labelling the *n*th set (where *n* can be from 1 to 25) of cuts of the x-sections with the strings in the model are given by:

```
cuts_n_model          model_name          // model of strings to be cut
```

The selection of the strings from the model *model_name* whose cut points are to be labelled is all the strings whose name satisfies the name mask *cuts_n_mask*:

```
cuts_n_mask          name_mask          // strings to check for cuts
                                     // and if a cut occurs,
                                     // parameters show how to
                                     // label the cut
```

where *name_mask* is a text string containing the name masks, each separated by one or more spaces, to test the string name against. Each mask can include wild cards and wild characters.

For example

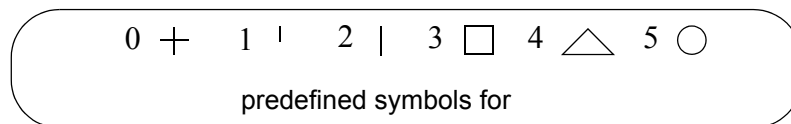
```
cuts_1_mask          "ke*"
or
cuts_1_mask          "?bank*"
or, if both masks are required,
cuts_1_mask          "ke* ?bank*"
```

If *cuts_n_mask* is missing, then all strings in the model are used. This is equivalent to *name_mask* being *"*"*.

All strings in the model *cuts_n_model* whose name satisfy the name mask *cuts_n_mask* are then checked for cuts with the x-sections, and if a cut occurs, the cut point will be labelled according to the rest of the parameters in the *n*th set.

The parameters for drawing a **symbol** at the cut points are:

```
cuts_symbol_n_mode    0          // cross
                      1          // up from centre of box
                      2          // up and down from centre of box
                      3          // square
                      4          // triangle, base at bottom
                      5          // circle
                      6          // use a 12d symbol
```



If *cuts_symbol_n_mode* is 6, then the plot symbol is given by

```
cuts_symbol_n_style    plotsymbol        // 12d symbol to draw at cut
```

Important Note

The plot symbol of name *plotsymbol* is defined in the file given by:

(a) the parameter *plot_symbols* in the ppf file

```
plot_symbols          filename
```

or if `plot_symbols` is not defined, then

- (b) in the file pointed to by the environment variable `PLOT_SYMBOLS_4D`
`PLOT_SYMBOLS_4D filename // default plotsym.4d`

or if `PLOT_SYMBOLS_4D` is not defined, then

- (c) in the file `plotsym.4d`
 which is searched for in the standard set up file sequence

If none of the above files are defined, or if the symbol does not exist in the above files, then it will be searched for in the standard 12d symbols file which is:

- (d) either pointed to by the environment variable `SYMBOLS_4D`
`SYMBOLS_4D filename // default symbols.4d`
 or if the environment variable `SYMBOLS_4D` does not exist, in the file, `symbols.4d`

The position of the symbol is given by:

<code>cuts_symbol_n_position</code>	1	// above point height value
	3	// above top of boxes
	4	// above top of graph area but not including
		// the <code>extra_space_top</code>
	100	// to primary string
	101-500	// to tin1 or tin2 etc.

The symbol can be adjusted by the parameters:

<code>cuts_symbol_n_x</code>	<i>mm</i>	// offset adjustment to position
<code>cuts_symbol_n_y</code>	<i>mm</i>	// height adjustment to position
<code>cuts_symbol_n_angle</code>	<i>degrees</i>	// rotation about point
<code>cuts_symbol_n_colour</code>	<i>colour</i>	// colour of symbol

and for all values of `cuts_symbol_n_mode` **other** than 6:

<code>cuts_symbol_n_size</code>	<i>mm</i>	// size of symbol, 0 don't draw
---------------------------------	-----------	---------------------------------

The value of the **offset** of the cut string can be labelled using the parameters

<code>cuts_offset_n_position</code>	1	// above cut strings height value
	3	// above top of boxes
	4	// above top of graph area but not including
		// the <code>extra_space_top</code>
	100	// to primary string
	101-500	// to tin1 or tin2 etc.
<code>cuts_offset_n_x</code>	<i>mm</i>	// offset adjustment to position
<code>cuts_offset_n_y</code>	<i>mm</i>	// height adjustment to position
<code>cuts_offset_n_angle</code>	<i>degrees</i>	// rotation about point
<code>cuts_offset_n_size</code>	<i>mm</i>	// size of text, 0 don't label
<code>cuts_offset_n_colour</code>	<i>colour</i>	// colour of text
<code>cuts_offset_n_textstyle</code>	<i>textstyle</i>	// textstyle to use for cuts offset text.
<code>cuts_offset_n_pre_text</code>	<i>text</i>	// text before the offset value
<code>cuts_offset_n_post_text</code>	<i>text</i>	// text after the offset value
<code>cuts_offset_n_justification</code>	<i>justification</i>	// justification of the text
<code>cuts_offset_n_no_decimals</code>	<i>integer</i>	// number of decimals in offset

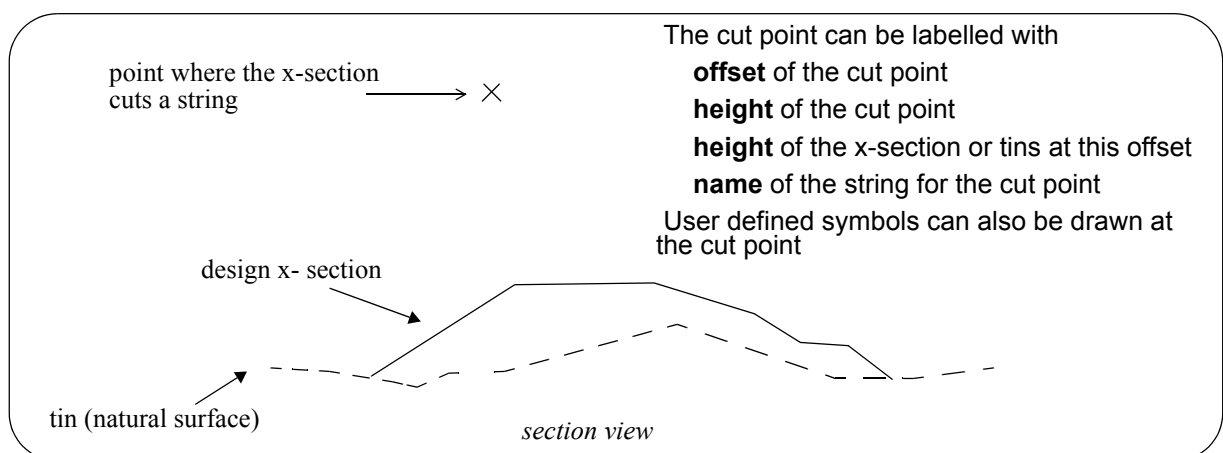
The value of a **height** at the offset of the point can be calculated and labelled using the parameters

<code>cuts_height_n_mode</code>	1	// use height of cut point itself
	3	// use real world height of position
		// above boxes

	100	// height of primary string
	101-500	// use height of to tin1 or tin2 etc.
cuts_height_n_position	1	// at points position
	3	// above top of boxes
	4	// above top of graph area but not including
		// the extra_space_top
	100	// to primary string
	101-500	// to tin1 or tin2 etc.
cuts_height_n_x	mm	// offset adjustment to position
cuts_height_n_y	mm	// height adjustment to position
cuts_height_n_angle	degrees	// rotation about point
cuts_height_n_size	mm	// size of text, 0 don't label
cuts_height_n_colour	colour	// colour of text
cuts_height_n_textstyle	textstyle	// textstyle to use for cuts heights text.
cuts_height_n_pre_text	text	// text before the height value
cuts_height_n_post_text	text	// text after the height value
cuts_height_n_justification	justification	// justification of the text
cuts_height_n_no_decimals	integer	// number of decimals in height

A **label** which can include the **name** of the cut string is drawn by using the parameters:

cuts_label_n_position	1	// above cut strings height value
	3	// above top of boxes
	4	// above top of graph area but not including
		// the extra_space_top
	100	// to primary string
	101-500	// to tin1 or tin2 etc.
cuts_label_n_mode	0	// don't include cut string name
	1	// include cut string name in label
cuts_label_n_x	mm	// offset adjustment to position
cuts_label_n_y	mm	// height adjustment to position
cuts_label_n_angle	degrees	// rotation about point
cuts_label_n_size	mm	// size of text, 0 don't label
cuts_label_n_colour	colour	// colour of text
cuts_label_n_textstyle	textstyle	// textstyle to use for cuts label text.
cuts_label_n_pre_text	text	// text before the string name
cuts_label_n_post_text	text	// text after the string name
cuts_label_n_justification	justification	// justification of the text



Please continue to the next section [Hatching Cut and Fill Areas](#).

Hatching Cut and Fill Areas

This option is used to hatch cut and/or fill areas between sets of tins.

For each set, the name of the two tins, the hatch linestyle, colour and separation and whether cut and/or fill regions are required are all user definable.

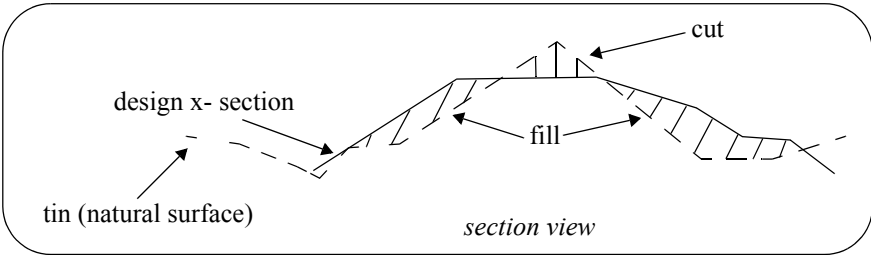
Up to twenty (20) separate sets of tins be hatched.

The parameters for labelling cuts and/or fill regions between tins are given by:

<code>hatch_original_tin_n</code>	<i>tin_name</i>	// tin_name for original surface
<code>hatch_new_tin_n</code>	<i>tin_name</i>	// tin_name for final surface
<code>hatch_cut_separation_n</code>	<i>mm</i>	// distance between cut hatch lines
	0	// don't do cut hatching
<code>hatch_cut_angle_n</code>	<i>degrees</i>	// angle in degrees of cut hatching
<code>hatch_cut_colour_n</code>	<i>colour</i>	// colour of the cut hatching
<code>hatch_cut_linestyle_n</code>	<i>linestyle</i>	// linestyle for cut hatching
<code>hatch_cut_draw_sides_n</code>	1/0	// 1 = draw sides of cut regions
<code>hatch_cut_draw_original_n</code>	1/0	// 1 = draw original tin in cut regions
<code>hatch_cut_draw_new_n</code>	1/0	// 1 = draw new tin in cut regions
<code>hatch_fill_separation_n</code>	<i>mm</i>	// distance between fill hatch line
	0	// don't do fill hatching
<code>hatch_fill_angle_n</code>	<i>degrees</i>	// angle in degrees of fill hatching
<code>hatch_fill_colour_n</code>	<i>colour</i>	// colour of the fill hatching
<code>hatch_fill_linestyle_n</code>	<i>linestyle</i>	// linestyle for fill hatching
<code>hatch_fill_draw_sides_n</code>	1/0	// 1 = draw sides of fill regions
<code>hatch_fill_draw_original_n</code>	1/0	// 1 = draw original tin in fill regions
<code>hatch_fill_draw_new_n</code>	1/0	// 1 = draw new tin in fill regions

Notes

- (a) cut is when the new tin is below the original tin.
fill is when the new tin is above the original tin.
- (b) cut hatching is turned off by setting `hatch_cut_separation_n` to 0.0.
fill hatching is turned off by setting `hatch_fill_separation_n` to 0.0.



Please continue to the next section [Extra Models of X-Sections](#).

Extra Models of X-Sections

The order and centreline chainages of the x-section subplots for the x-section plot are defined by the sections from the primary model of cross sections.

The sections through any specified triangulations and service models, and offsets for labelling are fully defined by these primary x-sections.

However it is also possible to plot extra x-sections on each of the sub-plots by supplying extra models of x-sections which are at the same plan positions as the primary x-section strings.

Only those x-sections from the extra models that are within a user specified tolerance of a primary x-section are plotted.

The extra models of x-sections and the plan tolerance for checking that the extra cross-sections are the same position as the primary x-sections are

```
extra_model_tolerance_1      value                // tolerance in 12d Model units
extra_model_n                model_name           // where n=1, ... 100
                                   // extra models of x-sections
```

The actual colour of the extra x-sections is used as their plotting colour.

Please continue to the next section [Sorting X-Sections by Chainage](#).

Sorting X-Sections by Chainage

The chainage on the design string that the x-section is created at is stored with the cross-section.

When the x-sections are created by the apply functions, they are created in the order of increasing chainage and added to the *model for sections* in that order.

Hence if the cross sections are plotted, the natural order would be in increasing chainage order.

However, it is possible to upset the order in the model by manually adding in extra sections.

Hence there is a parameter in both the **section x plot** panel and the plot parameter file to ensure that the cross sections are sorted in increasing chainage order before they are plotted.

```
sort_sections                1                // sort sections by design chainage
                              0                // use order of sections in model
```

Please continue to the next section [Title Block Information](#).

Title Block Information

The plot can have a standard 12d Model title block or a user defined title block.

The standard title block consists of a simple border around the plot and two lines of text in a box underneath the plot. For a user defined title block, all the line work and text is defined by the user.

Standard Title Block

For the standard 12d Model title block, there are extra parameters for two lines of text and text size and colour. The standard title block is turned on or off by the parameter *plot_border*.

<i>plot_border</i>	<i>yes/no</i>	<i>// yes plots a standard title block</i> <i>// default yes</i>
<i>title_1</i>	<i>text</i>	
<i>title_2</i>	<i>text</i>	
<i>title_text_size</i>	<i>value</i>	
<i>title_colour</i>	<i>colour</i>	

User Title Block

For the user defined title block, the title block drawing commands are kept in a file whose name is supplied by the user. The title block drawing commands are almost identical to the linestyle drawing commands and is given at the beginning of this chapter.

Hence for a user defined title block, there are just two parameters - one to say a title block file is being used and the other to give the name of the title block file. The *plot_border* parameter should also be set to *no* so that the standard title block is not also drawn.

<i>use_title_file</i>	<i>yes/no</i>	<i>// yes draws the title block given in title_file</i> <i>// default no</i>
<i>title_file</i>	<i>filename</i>	
<i>plot_border</i>	<i>no</i>	<i>// turn off standard title block</i>

Some special plot parameters are used to pass information down to variables in a user defined title block. For example, inside the title block file it is possible to have runtime user defined text variables. The actual text values for these text variables are passed down to the title block file from the plot parameter file via the parameters *user_text_n* (n = 1,2,... 1000)

<i>user_text_n</i>	<i>text</i>
--------------------	-------------

The special plot parameters are:

<i>time_format</i>	<i>text</i>	<i>// format for \$time</i>
<i>user_text_n</i>	<i>text</i>	<i>// where n = 1,2,... 1000</i> <i>// passed down to \$user_text_n</i>
<i>title_1</i>	<i>text</i>	<i>// passed down to \$title_1</i>
<i>title_2</i>	<i>text</i>	<i>// passed down to \$title_2</i>
<i>start_page_number</i>	<i>integer</i>	<i>// used as the starting value for</i> <i>// \$page_number. If missing,</i> <i>// \$page_number starts at 1.</i>
<i>start_drawing_number</i>	<i>integer</i>	<i>// added to \$drawing_number in title</i> <i>// block file. If missing,</i> <i>// \$drawing_number starts at 1.</i>
<i>drawing_number_prefix</i>	<i>text</i>	<i>// passed down to</i> <i>// \$drawing_number_prefix</i>
<i>drawing_number_postfix</i>	<i>text</i>	<i>// passed down to</i> <i>// \$drawing_number_postfix</i>

Please continue to the next section [Parameters that Modify Fields In the Cross Plot Panel](#).

Parameters that Modify Fields In the Cross Plot Panel

A number of parameters match those in the **section x plot** panel.

When the plot parameter file is first read, any parameters in the panel will be replaced by the values of any corresponding parameters in the parameter file.

However, if the parameter is subsequently modified in the panel, the panel value will be the value used for any plots.

The plot parameters that also occur in the **section x plot** panel are:

view_name	text
plotter_type	text
model_to_plot	text
plot_stem	text
start_chainage	chainage
end_chainage	chainage
sheet_size	text or "width height"
scale	value
absolute_extensions	yes/no
left_extension	world-units
right_extension	world-units
line_up_cl	yes/no
primary_string	yes/no
label_type	yes/no
box_colour	colour
text_size	mm
sort_sections	yes/no
use_title_file	yes/no
title_file	filename
plot_border	yes/no
title_1	text
title_2	text
title_text_size	value
title_colour	colour
global_textstyle	textstyle

Please continue to the next section [Generating Cross Section Plots Without a View](#).

Generating Cross Section Plots Without a View

The cross section plot parameters are comprehensive enough that it is possible to completely generate a cross section plot without referencing a section view, or even using the **section X plot** panel.

Such a ppf can be run using the **plots=>plot a ppf** option or from the 4D Solutions programming language, 4DL.

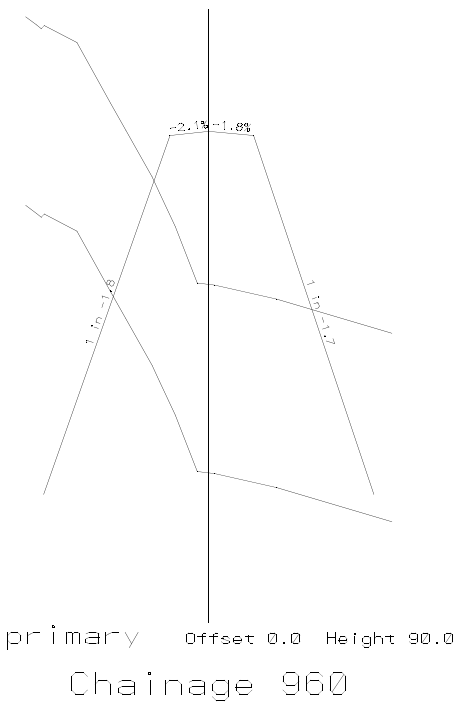
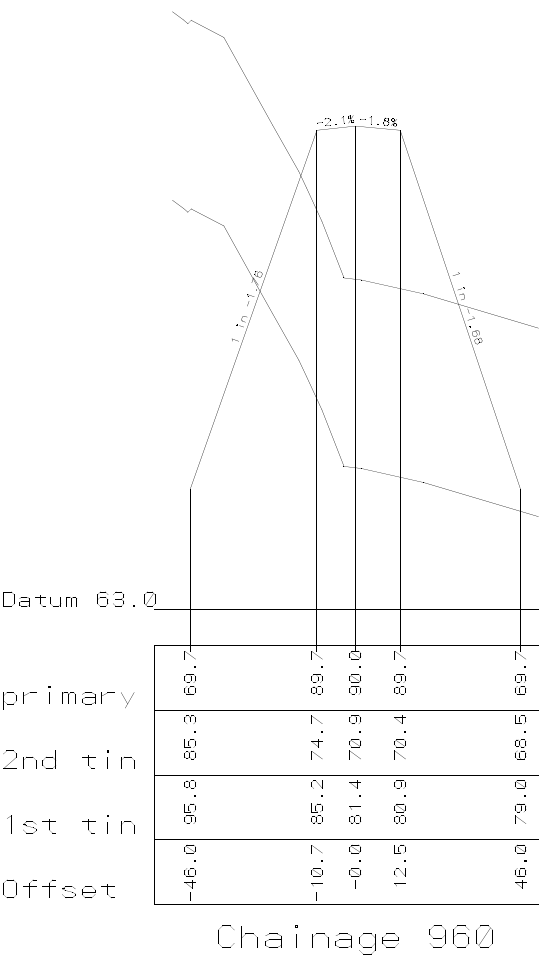
When generating a cross section plot using the **section X plot** panel, a plot parameter file containing all the parameters needed to regenerate the plot using **plots=>plot a ppf** can be written out by simply giving a name for the ppf file in the plot parameters write field of the **section X plot** panel.

Notes

1. A warning is given if the keyword in a plot parameter file does not exist.
2. A warning is also given if the key word pair is defined more than once in a ppf.

Please continue to the next section [Example of a Cross Section Plot Parameter File](#).

Example of a Cross Section Plot Parameter File



```

// ppf file to generate x-section example
section_x_plot "plot 2" {

// plot margins
left_margin      0.0
right_margin     0.0
top_margin       0.0
bottom_margin    0.0

// white space surrounding each cross section
left_sub_plot_gap    20.0
right_sub_plot_gap   20.0
top_sub_plot_gap     20.0
bottom_sub_plot_gap  20.0

// these are only used with title boxes
left_border_gap      10.0
right_border_gap     10.0
top_border_gap       10.0
bottom_border_gap    10.0

// annotation for boxes area
// height text on centre line plot
height_text          "Height"

// mode for drawing boxes around
// 0 = none
// 1 = heights area
// 2 = heights and labels area

draw_box_mode        1
box_line_draw_mode    3
box_colour            grey

// size of title text in title box
title_box_text_size   5

// title text box size - automatically calculated if missing
// space_for_titles    30
// horizontal_line_spacing  15

// number of decimal places for height and offset values
number_of_decimals    1

// 0 for bottom justification of values
// 1 for top justification of values
box_text_justification  1

// offset titles and values
offset_title          "Offset"
// offset_title_2      "Offset 2"
// offset_colour        brown    // also in panel
offset_title_colour    grey

// primary string titles and heights
// defaults to string name and colour
primary_title          "primary"
// primary_title_2      "primary2"
primary_colour          "purple"
primary_title_colour    "red"

```

```
// tin titles and heights
// tin label 1 for on
//      0 for off
// tin text is the annotation text for that tin
// tin colour is the annotation colour for that tin
// range from tin_1_X to tin_100_X

tin_1_label          1
tin_1_title          "1st tin"
// tin_1_title_2      "1st tin 2"
tin_1_colour         grey
tin_1_title_colour   red

tin_2_label          1
tin_2_title          "2nd tin"
tin_2_colour         grey
tin_2_title_colour   red

// staggers definitions
stagger_gap_factor   1.3
stagger_gap_top      5.0
stagger_gap_bottom   2.0

// uprights definitions
// mode 0 = none
//      1 = full
//      2 = ticks
//      3 = height above boxes
//      100 = primary
//      101 = 1st tin
//      102 = 2nd tin
//...
//      500 = 400th tin

uprights_colour       red
uprights_draw_mode    100
uprights_y            100

// datum area
datum_name            "Datum"
datum_colour          orange
datum_text_size       4
datum_below_gap       10.0

// gap above datum to graph area for box and
// centre line plots
datum_above_gap       20
datum_above_gap_cl    20

// grade_label of 0 turns the labels off
//      1 turns it on
grade_label           1

// mode 0 for percent grade,
//      1 for one in x,
//      2 for grade in m/m
grade_mode            0
```

```

// grade decimal places
grade_decimals          1
// text size for grade annotations
grade_size              2
grade_colour            yellow
// how far the annotation is (perpendicularly)
//   from the string itself
grade_offset            1
// label all annotations separated by more than
// the minimum width in plot units
grade_minimum_width     0
// threshold and threshold mode describe the value
// at which the grade labelling changes
// mode to grade_upper_mode
grade_threshold         0.2
grade_threshold_mode    2
grade_upper_mode        1
grade_change_only       1
// labelling of sub-plots
// centreline chainage: 1 for on, 0 for off
chainage_label          1
// distance below box to print annotation
chainage_y_offset       12
// distance from start of string to label - default centred
// chainage_x_offset     10
// chainage text label parameters
chainage_text           "Chainage"
chainage_size           6
chainage_colour         cyan
chainage_decimals       2

// ***** panel data *****

view_name               "4"

plotter_type            "model"
model_to_plot           "single xsec"
plot_stem               "pp"

sheet_size              "1000 800"
scale                   1000.0

absolute_extensions     "no"
left_extension          5
right_extension         5

line_up_cl              "yes"
primary_string          "yes"
label_type              "boxes"
offset_colour           "cyan"
text_size               3.0

```

```
use_title_file      "no"
title_file          "titles.tf"
plot_border        "no"
title_1            ""
title_2            ""
title_text_size     4.0
title_colour        magenta
}
```

Please continue to the next section [Long Section Plot Parameter File](#).

Long Section Plot Parameter File

The long section plot parameters are placed in a file with ending **.ppf**

Each parameter consists of a parameter name followed by one or more spaces and then the parameter value. There is only one parameter per line.

Anything on a line after a double forward slash **//** is considered to be a comment.

The set of all parameters for the long section plot is enclosed within a set of curly brackets **{ }** with the header

```
section_long_plot    "plot set name"
```

before the curly brackets.

That is,

```
section_long_plot "plot set name" {
    plot parameters
    one per line
}
```

If there is more than one `section_long_plot` parameter set in the file, only the first set is used.

There may also be parameter sets for other plot types such as `section_x_plot` in the same file. The other sets will be ignored when doing a long section plot.

The plot parameters are documented in following groups:

For *Defining chainage range*, go to the section [Possible Chainage Range](#).

Breaking the plot into pages, go to the section [Pagination](#).

Plot Sheet layout, go to the section [Plot Sheet Layout](#).

Boxes area, go to the section [Boxes Area](#).

Defining chainages and staggering, go to the section [Chainage Selection and Staggering](#).

Defining uprights, go to the section [Uprights](#).

Datum area, go to the section [Datum Area](#).

Graph (drawing) area, go to the section [Graph Area](#).

Defining bubbles, go to the section [Bubbles Definitions](#).

Quick HG, go to the section [Quick Horizontal Geometry Labelling](#).

Extensive HG, go to the section [Extensive Horizontal Geometry Labelling](#).

Quick VG, go to the section [Quick Vertical Geometry Labelling](#).

Extensive VG, go to the section [Extensive Vertical Geometry Labelling](#).

Labelling heights, go to the section [Labelling Chainages and Heights in the Graph Area](#).

Symbols, go to the section [Labelling With Symbols](#).

Hatching cut/fill, go to the section [Hatching Cut and Fill Areas](#).

Labelling cuts, go to the section [Labelling Cuts of Design Through Strings in a Model](#).

Labelling string name, go to the section [Labelling the Primary String Name on the Plot](#).

Labelling with scale, go to the section [Labelling the Scale on the Plot](#).

Title block information, please continue to the section [Title Block Information](#).

Panel modifying parameters, please continue to the section [Parameters that Modify Fields In the Long Plot Panel](#).

Example, please continue to the section [Example of a Long Section Plot Parameter File](#).

Possible Chainage Range

In the panel, the field **Use HG VG for min, max** determines whether the horizontal geometry (HG) and the vertical geometry (VG) are both used to determine the minimum and maximum chainages for drawing. This allows the vertical geometry to be plotted when it is outside the horizontal geometry (e.g. kerb returns).

The equivalent parameter in the ppf is

use_vg_hg_for_min_max	<i>1</i>	// the chainage range available for plotting // is from the minimum of the horizontal // geometry (HG) and the vertical geometry // (VG) to the maximum of the HG and VG. // This is useful for kerb returns
	<i>0</i>	// the chainage range available for // plotting is from the minimum of the // horizontal geometry (HG) to the // maximum of the HG.

Pagination

If the long section plot is too long to fit on one page, it can be broken into a number of pages (sheets).

The parameter, *pagination_length*, controls the amount of new chainage length on each plot page. Each page of the long section plot can also included a set chainage amount from the end of the **previous** plot.

Hence apart from the first page and possibly the last page, the plot will have a chainage length given by the sum of the *pagination_length* and *pagination_overlap*.

pagination	<i>yes/no</i>	// if yes, then break the plot into pages
pagination_mode	<i>chainage</i>	// length and overlap in chainage units
	<i>millimetre</i>	// length and overlap in millimetres
pagination_length	<i>chainage or</i>	
	<i>millimetres</i>	// new chainage range on each page
pagination_overlap	<i>chainage or</i>	
	<i>millimetres</i>	// overlap between pages

Note

The *pagination_length* and *pagination_overlap* are given in chainage units **or** millimetres. The user must choose values which will fit on the selected sheet size or the end of each plot will be truncated by the sheet.

Plot Sheet Layout

The plot **page** or **sheet** is considered to have only positive co-ordinates with the origin (0,0) in the left hand corner. The units for the plot are millimetres.

The overall size of the plot sheet is given by either a defined sheet size, or by the width and height of the plot given in millimetres and separated by one or more spaces.

sheet_size	<i>text</i>	// sheet name, or
	<i>“mm mm”</i>	// sheet size: width height

The sheet size name and width and heights can be specified by the user in a file named sheets.4d which is in the normal set up areas, or is pointed to by the environment variable

SHEET_SIZES_4D	<i>file</i>	// file of plotter sheets sizes
----------------	-------------	---------------------------------

The plotting area is restricted to within the plot sheet by giving margins which are:

If a *User Defined Title Block* is used:

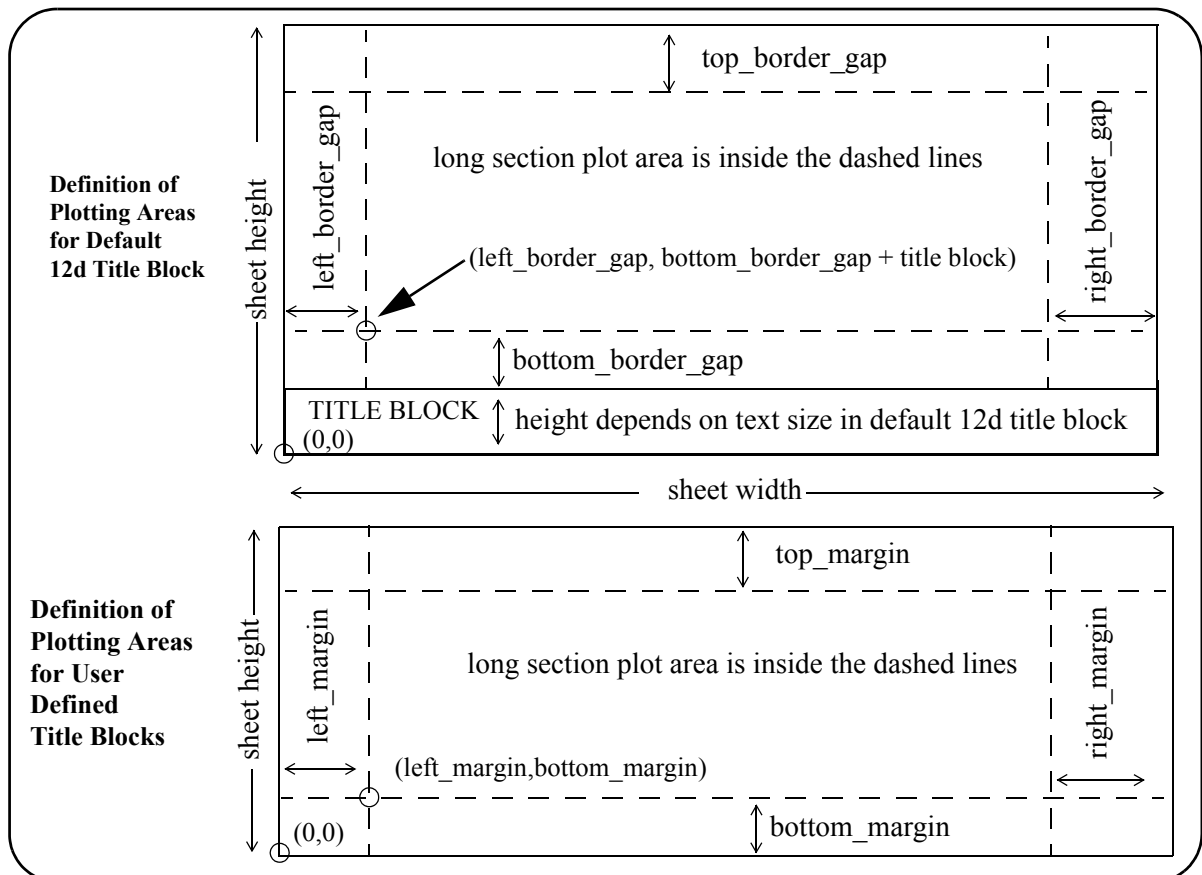
left_margin	<i>mm</i>
right_margin	<i>mm</i>
top_margin	<i>mm</i>

bottom_margin mm

If the *default 12d title block* is used, then the size of the bottom of title block depends on the text size. The following parameters are used in the default title block case and the *bottom_border_gap* is added to the calculated height of the bottom of the title block.

left_border_gap	mm
right_border_gap	mm
top_border_gap	mm
bottom_border_gap	mm

Because the user can easily select from the plotting panel whether a User Defined Title Block or the default 12d title block is used, both sets of margins and gap parameters can exist in the one plot parameter file.



The long plot itself consists of the three regions - boxes, datum and graph areas.

The **boxes area** is where the titles and the chainage values and the heights/depths for the strings drawn on the long plot are labelled.

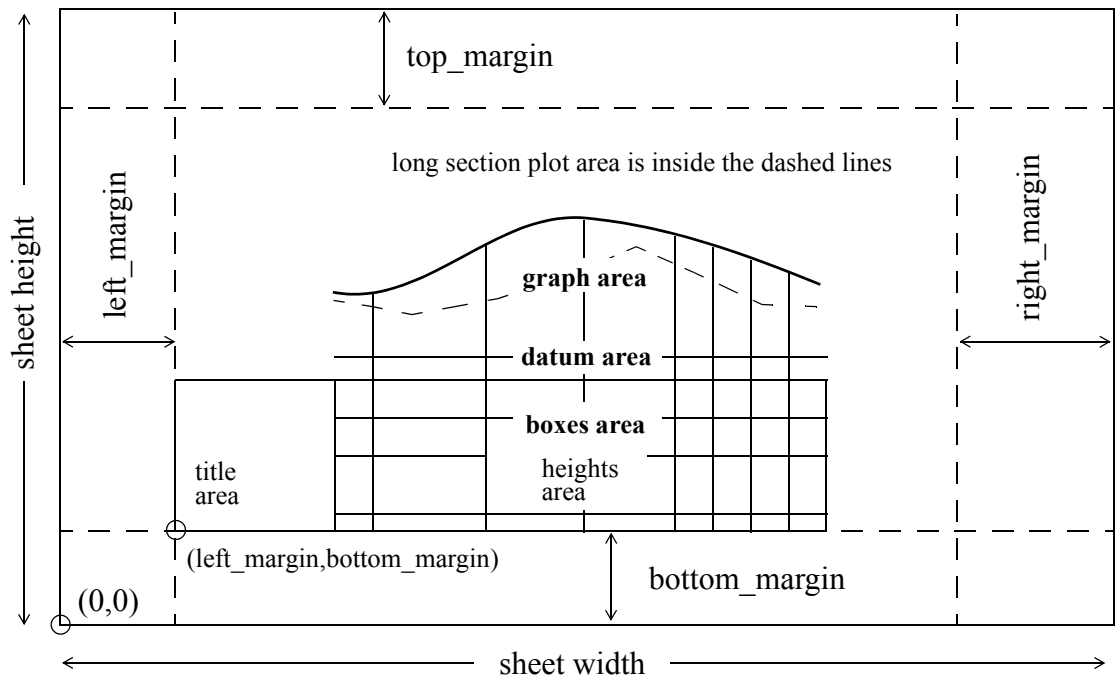
The **datum area** is the region between the boxes area and the graph area.

The **graph area** is the area where the actual plots of the strings are drawn.

Apart from information labelled in the boxes area, the long section plot can label other information such as

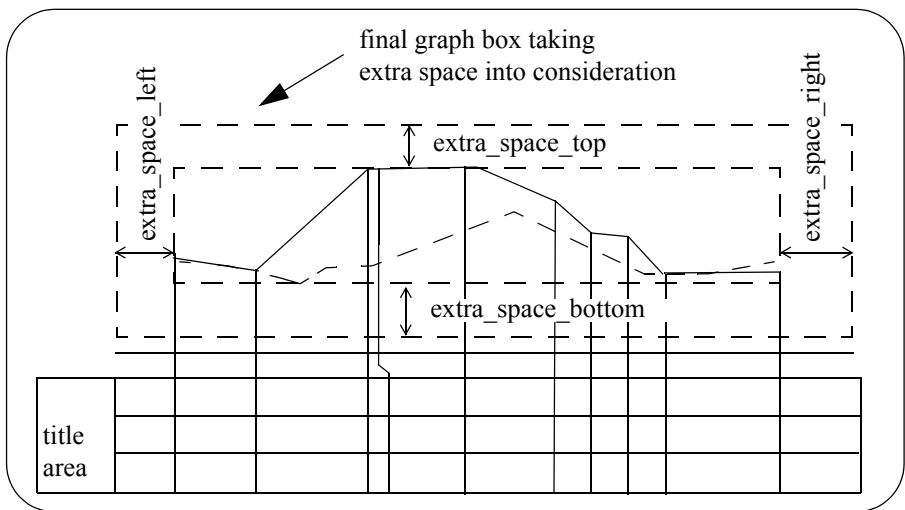
- (a) horizontal geometry
- (b) vertical geometry
- (c) chainage, heights at special points

- (d) symbols at special points
- (e) bubbles at special chainages
- (f) cuts the design string makes through strings
- (g) cut and fill areas



The size of the graph area can also be extended to allow for plot symbols by the parameters:

extra_space_units	0	// extra space values are world units - default
	1	// " " " are millimetres on plot page
extra_space_left	units	// subtract from left of plot area, def 0
extra_space_right	units	// add to right of plot area, default 0
extra_space_top	units	// add to top of plot area, default 0
extra_space_bottom	units	// subtract from bottom of plot area, default 0



Please continue to the next section [Boxes Area](#).

Boxes Area

Each string in the long section plot can be labelled with one or two lines of title, and the chainages/heights/depths at the user specified chainages for the strings.

The **title** for the strings, is drawn in the **title area** of the **boxes area**.

The **chainages/heights/depths** are drawn in the **heights area** of the **boxes area**.

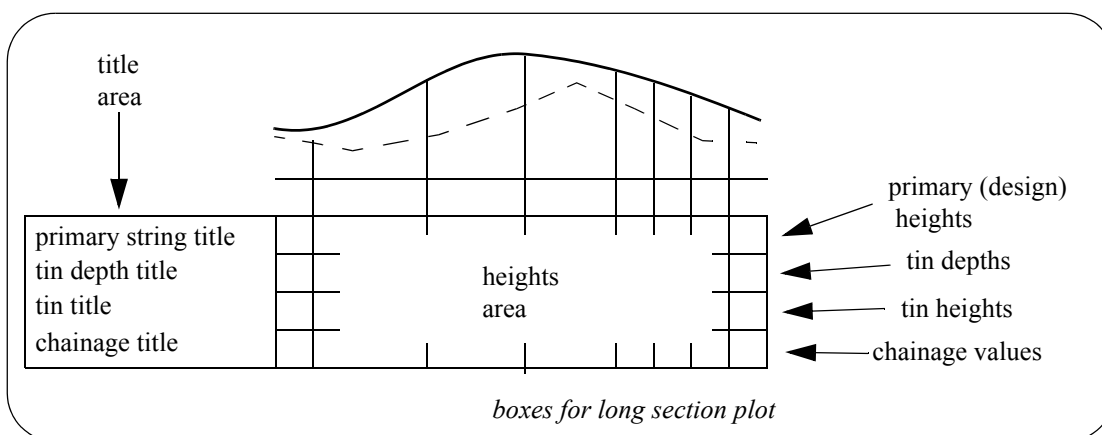
Consequently the boxes area is made up of rows of text consisting of:

string/tin titles followed by the **chainage/height/depth** values along the string.

Each row is surrounded by lines to form a box.

The default order of the boxes from the bottom up is

- (a) optional super-elevation diagram
- (b) chainage values
- (c) can be primary string heights - user choice
- (d) tin heights and depths
- (e) offset heights and depths
- (f) optional volumes or earth works
- (g) can be primary string heights - user choice
- (h) zero or more blank boxes



The blank boxes are used to place other information in (such as horizontal or vertical geometry) or for other user supplied information.

Placing the primary string label before the bank boxes or just after the chainage box is controlled by the parameter *primary_label_mode*.

<code>number_of_blank_boxes</code>	<i>integer</i>	// integer > 0
<code>primary_label_mode</code>	0	//put primary string labels in last box
		// before blank boxes
	1	// or first box above the chainages

Although the order of the boxes may appear to be fixed, in practice they can be in any order. This is possible because for each box, there is a parameter to set the height in millimetres from the bottom of all the boxes that the text in the box is drawn at (the *_y_pos* parameters).

The **title area** starts at the co-ordinate (left_margin,bottom_margin).

The size of the title text is given by the **title_box_text_size** parameter.

The **width** of the title area is either given by the *space_for_titles* parameter, or if omitted, the required width is automatically calculated.

title_box_text_size	mm	// size of the title text for boxes
space_for_titles	mm	// calculated if omitted

There can be two lines of title text and the title text, textstyle and colour can be set independently for each box.

The x position of the title text is the same for all the lines of title text and can be set to be a fixed distance from the left hand side of the boxes.

box_titles_x	mm	// distance to move the title text from the // left hand side of the boxes
--------------	----	-------------------------------------------------------------------------------

The y position of the title text can be set separately for each type of title. The parameters are given later under each of the title types (e.g. chainages, primary string, tins, depths etc.).

After the title area there can be a user defined gap, followed by the heights area

box_gap	mm	// blank area between the title area // and the heights area default 0
---------	----	---------------------------------------------------------------------------

The **heights area** starts at the end of the title area.

The height text is written at right angles to the bottom of the boxes. It can be either top or bottom justified with respect to the box (*box_text_justification*).

The number of decimal places (*number_of_decimals*), and the size of the heights text (*box_text_size*) can be specified globally but there is a parameter for each box which overrides these defaults for each box of heights.

box_text_justification	0	// bottom of individual boxes
	1	// top of individual boxes
number_of_decimals	integer	// number of decimal places in the // height boxes. If <0, the absolute value // is taken as the number of decimal // places i.e. no trailing zeros are // removed for the values in the heights // area.
box_text_size	mm	// size of the height text values

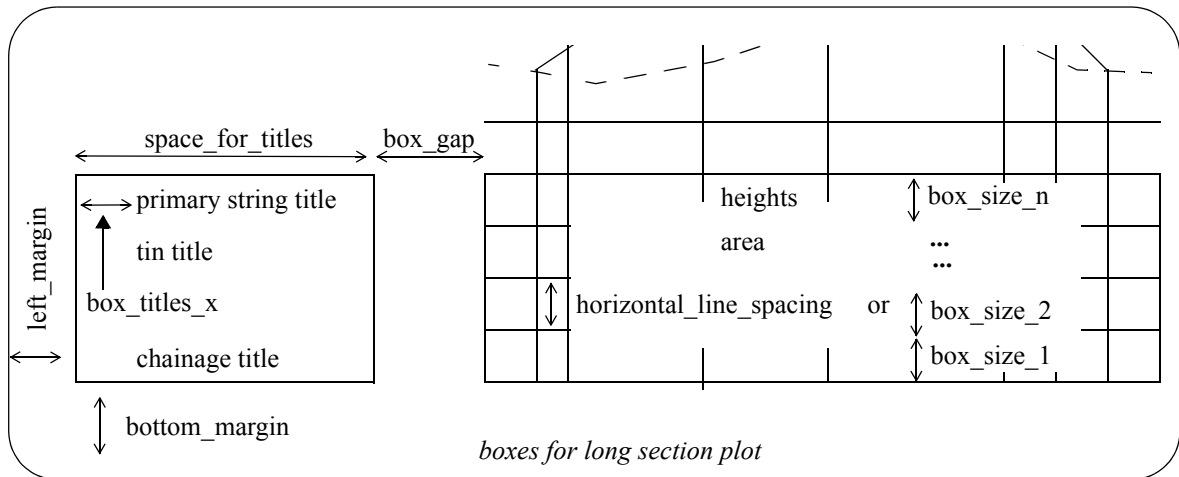
A global height for the individual boxes is either given by the *horizontal_line_spacing* parameter, or if omitted, a height to fit the largest height or depth value is calculated and used as the default box height.

horizontal_line_spacing	mm	// calculated if omitted
-------------------------	----	--------------------------

However, the height of each box can be individually set by parameters *box_size_n* where the boxing numbering, n, starts from the bottom box. The value of *horizontal_line_spacing* is used for any of the *box_size_n* parameters not specified.

box_size_n	mm	// height of the nth box, numbered from // bottom up.
------------	----	----------------------------------------------------------

The total height of the boxes area is simply given by the sum of the heights of each box.



The **width** of the **heights area** is determined by the number of chainages to be labelled and whether the values are staggered to prevent over writing.

Hence the total width of the boxes area is the width of the **title area** plus `box_gap`, plus the width of the **heights area**.

Many distance definitions in the plot parameter file are given in terms of distance above the **top** of the boxes area so that the distances are independent of the number of boxes and box sizes.

The drawing of the box line work, the box colour, the position of the primary string labels and the number of blank boxes are all set by parameters.

First, all the line work for the box itself is user defined. This has been extended from V3.1 although `draw_box_mode` has been left in for upward compatibility.

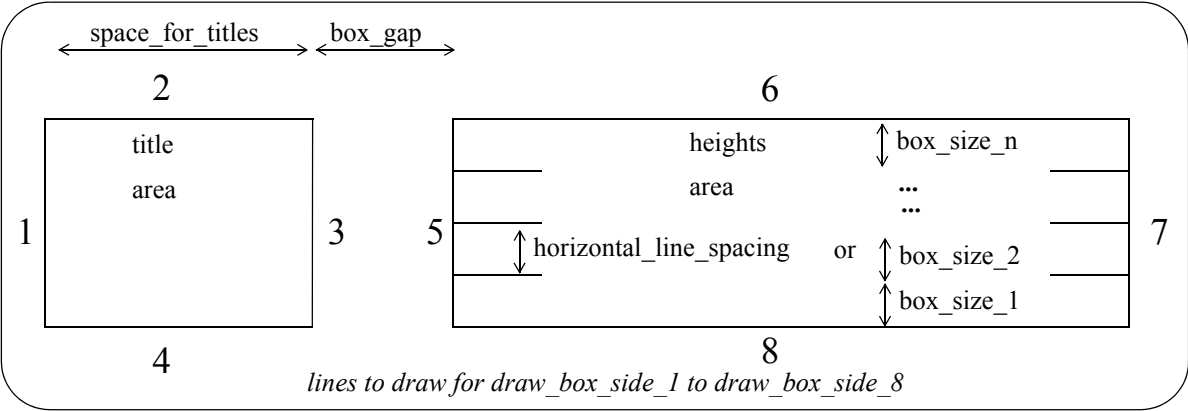
<code>draw_box_mode</code>	<code>0</code>	// don't draw box lines
	<code>1</code>	// draw box lines around heights area
		// only
	<code>2</code>	// draw box lines around title and
		// heights areas
	<code>3</code>	// use <code>draw_box_side_n</code> ,
		// <code>box_line_draw_mode</code> and
		// <code>box_line_mode_n</code>
<code>box_colour</code>	<code>colour</code>	// colour of the boxes

For V3.2, the line work for the outside of the title and heights boxes is controlled by the parameters `draw_box_side_n` and `box_side_colour_n`, and the separation lines inside the boxes are controlled by the parameters `box_line_draw_mode` and `box_line_mode_n` where the box numbering, `n`, starts from the bottom box.

Note: The following parameters are only used if `draw_box_mode` is set to **3**.

<code>draw_box_side_1</code>	<code>1</code>	// draw the left side of the title area (def)
	<code>0</code>	// don't draw the left side
<code>box_side_colour_1</code>	<code>colour</code>	// colour to draw left side of title area
		// default <code>box_colour</code>
<code>draw_box_side_2</code>	<code>1</code>	// draw top of the title area (default)
	<code>0</code>	// don't draw the top
<code>box_side_colour_2</code>	<code>colour</code>	// colour to draw top of title area
		// default <code>box_colour</code>
<code>draw_box_side_3</code>	<code>1</code>	// draw right side of the title area

		// (default if box_gap is non-zero)
	0	// don't draw the right side
		// (default if box_gap is zero)
box_side_colour_3	colour	// colour to draw right side of title area
		// default box_colour
draw_box_side_4	1	// draw bottom of the title area (default)
	0	// don't draw the bottom
box_side_colour_4	colour	// colour to draw bottom of title area
		// default box_colour
draw_box_side_5	1	// draw left side of the heights area (def)
	0	// don't draw the left side
box_side_colour_5	colour	// colour to draw left side of heights area
		// default box_colour
draw_box_side_6	1	// draw top of the heights area (default)
	0	// don't draw the top
box_side_colour_6	colour	// colour to draw top of heights area
		// default box_colour
draw_box_side_7	1	// draw right side of the heights area def
	0	// don't draw the right side
box_side_colour_7	colour	// colour for right side of heights area
		// default box_colour
draw_box_side_8	1	// draw bottom of the heights area (def)
	0	// don't draw the bottom
box_side_colour_8	colour	// colour for bottom of heights area
		// default box_colour



The lines at the top of the individual boxes inside the title area and heights area (separation lines) are controlled by the parameters *box_line_draw_mode* and *box_line_mode_n*.

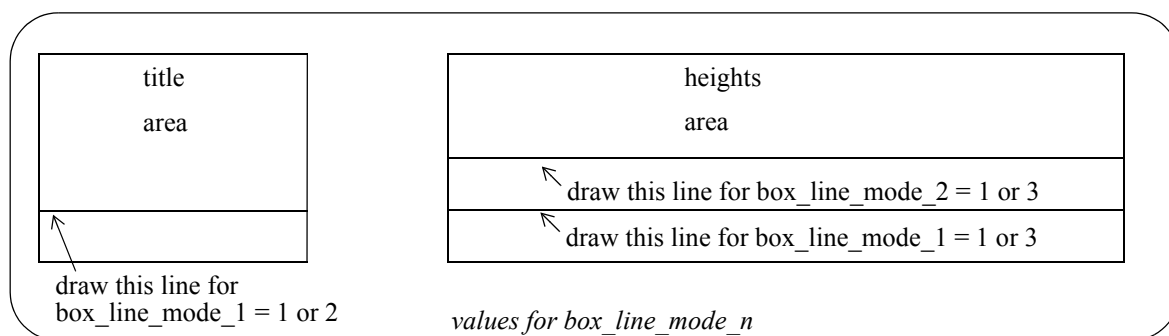
The separation lines can be drawn in just the title area, just the heights area or in both areas.

The parameter *box_line_draw_mode* can be set to control all the separation lines but there are additional parameters, *box_line_mode_n*, which override *box_line_draw_mode* for each of the individual boxes where n = 1, ... number of boxes -1.

The top of the top box is not controlled by *box_line_mode_n* but is controlled by the parameters *draw_box_side_2* and *draw_box_side_6*.

box_line_draw_mode	0	// don't draw any separation lines inside
		// the title and heights areas
	1	// draw the separation lines inside the
		// title and heights areas (default)
	2	// draw the separation lines inside the
		// title area only

	3	// draw the separation lines inside the // heights area only
box_line_mode_n	0	// for the nth box, don't draw any // line at the top of the box for either // the title or the heights areas
	1	// for the nth box, draw the line at the // top of the box for both the // title and heights areas
	2	// for the nth box, draw the line at the // top of the box for the title area only
	3	// for the nth box, draw the line at the // top of the box for the heights area only



Chainage Titles and Values

The chainages are always labelled

chainage_title	text	// first line of chainage title // (default chainages)
chainage_title_2	text	// second line of chainage title
chainage_title_textstyle	textstyle	// textstyle of the chainage titles
chainage_title_colour	colour	// default chainage title colour
chainage_title_size	mm	// default chainage title size
chainage_title_y_pos	mm	// if set, the height in mm above the // bottom of all the boxes that the // chainage title text is drawn. // If not set, then the text is placed at a // height that puts it inside the default // box for the chainage.
chainage_decimals	integer	// number of decim places for chainages
chainage_textstyle	textstyle	// textstyle of the chainage values
chainage_colour	colour	// colour of chainages, def is box_colour
chainage_size	mm	// size of chainages, def is box_text_size
chainage_y_pos	mm	// if set, the height in mm above the // bottom of all the boxes that the // chainage values text is drawn. // If not set, then the text is placed at a // height that puts it inside the default // box for the chainage.

Example of Chainage Titles

chainage_title	"DESIGN"
chainage_title_2	"CHAINAGE"

chainage_title_colour	“yellow”	
chainage_colour	“grey”	// colour of chainage text
chainage_decimals	-3	// 3 decimal places - leave trailing zeros

Primary String Title and Heights

Sometimes the primary string is only required to define chainages or the horizontal path for tin sections. In this case, the primary string would not be drawn on the long section plot.

If the primary string is drawn, it is automatically labelled.

Also the drawing of crosses at the vertical intersection points can be controlled from the ppf file.

primary_draw_vips	<i>1</i>	// draw crosses at VIPS (default)
	<i>0</i>	// don't draw VIP crosses

The position of the primary string label box can be either straight after the chainage box, or after the tin and offset boxes but before the blank boxes.

primary_string	<i>yes</i>	// draw and label the primary string
	<i>no</i>	// don't draw or label the primary string
primary_label_mode	<i>0</i>	// last box before blank boxes
	<i>1</i>	// first box above the chainages
primary_title	<i>text</i>	// first line of string title
primary_title_2	<i>text</i>	// second line of string title, default is
		// the primary string name.
primary_title_textstyle	<i>textstyle</i>	// textstyle of the primary string titles
primary_title_colour	<i>colour</i>	// colour of the string titles
primary_title_size	<i>mm</i>	// default primary title size
primary_title_y_pos	<i>mm</i>	// if set, the height in mm above the
		// bottom of all the boxes that the
		// primary string title text is drawn.
		// If not set, then the text is placed at a
		// height that puts it inside the default
		// box for the primary string.
primary_decimals	<i>integer</i>	// number of decimal places
primary_textstyle	<i>textstyle</i>	// textstyle of the primary string heights
primary_colour	<i>colour</i>	// colour of the heights
primary_size	<i>mm</i>	// default primary value size
primary_y_pos	<i>mm</i>	// if set, the height in mm above the
		// bottom of all the boxes that the
		// primary string height text is drawn.
		// If not set, then the text is placed at a
		// height that puts it inside the default
		// box for the primary string.
primary_ch_tolerance	<i>mm</i>	// for a given chainage, if no z value exists,
		// this distance is added to/subtracted from the
		// chainage to search for a valid z value.

Example of Primary String Titles

primary_title	"DESIGN"	
primary_title_2	"CENTRELINE"	
primary_title_colour	"yellow"	
primary_colour	"grey"	// colour of height text
primary_decimals	-2	// 2 decimal places - leave trailing zeros

Tin Titles and Heights

A section along the primary string through each tin on the section view can be automatically drawn on the long plot, and the user can specify whether the tin heights and depths are labelled or not in the boxes area. Hence although there may be a number of tins drawn on the section plot, not all of them need to be labelled or have their depths labelled.

The default order for labelling the tins and depths is the order that the tins were added to the view however it is possible to specify which tin is used for labelling each row of tin heights and depths by giving the tin name rather than just using the tin order on the section view.

In fact, it is possible to use **any tin** in the project to **label** a row, **not just those drawn** on the section view.

The parameter to define the nth tin by name is *tin_n_name*:

<i>tin_n_name</i>	<i>text</i>	// n=1, ... no of tins on the section view. // use the tin named <i>text</i> to label the nth // row of tin heights and depths.
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If a tin of the name ***tin_n_name*** does not exist, then the plot is not produced and an error message is given.

For the following parameters, n takes the value 1 to 100 and specifies that the parameter set applies to the nth tin on the section view, or if *tin_n_name* is set, for the tin specified by *tin_n_name*.

<i>tin_n_draw_mode</i>	1 0	// draw the nth tin (default) // don't draw the nth tin
<i>tin_n_draw_colour</i>	<i>colour</i>	// colour to draw the nth tin. // If omitted, then use the tin colour
<i>tin_n_label</i>	1 0	//label the tin's heights (default) // don't label the tin's heights
<i>tin_n_title</i>	<i>text</i>	// first line of tin title
<i>tin_n_title_2</i>	<i>text</i>	// second line of tin title
<i>tin_n_title_textstyle</i>	<i>textstyle</i>	// textstyle of the tin titles
<i>tin_n_title_colour</i>	<i>colour</i>	// colour for titles of heights
<i>tin_n_title_size</i>	<i>mm</i>	// default nth tin's title size
<i>tin_n_title_y_pos</i>	<i>mm</i>	// if set, the height in mm above the // bottom of all the boxes that the // tin title text is drawn. // If not set, then the text is placed at a // height that puts it inside the default // box for the tin heights.
<i>tin_n_decimals</i>	<i>integer</i>	// number of dec places in tin height
<i>tin_n_textstyle</i>	<i>textstyle</i>	// textstyle of the tin heights
<i>tin_n_colour</i>	<i>colour</i>	// colour for heights and depths
<i>tin_n_size</i>	<i>mm</i>	// default nth tin's title size
<i>tin_n_y_pos</i>	<i>mm</i>	//if set, the height in mm above the //bottom of all the boxes that the // tin height text is drawn. //If not set, then the text is placed at a //height that puts it inside the default // box for the tin heights.
<i>tin_n_depth_label</i>	1/0	// 1 to label, 0 don't label depths
<i>tin_n_depth_title</i>	<i>text</i>	// first line of tin depth title
<i>tin_n_depth_title_2</i>	<i>text</i>	// second line of tin depth title
<i>tin_n_depth_title_textstyle</i>	<i>textstyle</i>	// textstyle of the tin depth titles
<i>tin_n_depth_title_colour</i>	<i>colour</i>	// colour for titles of depths
<i>tin_n_depth_title_size</i>	<i>colour</i>	// size for title of depths

tin_n_depth_title_y_pos	mm	// if set, the height in mm above the // bottom of all the boxes that the // tin depth title text is drawn. // If not set, then the text is placed at a // height that puts it inside the default // box for the tin depths.
tin_n_depth_decimals	integer	// number of dec places in tin depth
tin_n_depth_textstyle	textstyle	// textstyle of the tin depths
tin_n_depth_colour	colour	// colour for depths
tin_n_depth_size	mm	// size for depths
tin_n_depth_y_pos	mm	// if set, the height in mm above the // bottom of all the boxes that the // tin depth text is drawn. // If not set, then the text is placed at a // height that puts it inside the default // box for the tin depths.

Offset Model Titles and Heights

For **12d Model V3.2**, Each string in the offset model given in the **section long plot** panel can be automatically projected onto the primary string and drawn on the long section plot.

For **12d Model V4.0**, the idea of an offset model has been modified to allow strings to be projected onto the primary string to be specified by model and name, rather than just projecting all the strings in a given model. The string can also be labelled with either the string name, its model name or both.

The string is specified by

offset_n_mask "*model_name->string_name*"

For each n, a set of plot parameters determine if the string's heights and/or depths from the primary string are labelled in the boxes area.

If only the *string_name* is given, then the model given in the Offset model field of the **Section Long Plot** panel.

If there is **more than one string** with the given model and name, then it will be considered to be one string and at any primary string chainage, the closest of the strings will be the part used for projecting. For example, strings of the same name on either side of a road intersection will be considered to be the one string for projecting.

If any *offset_n_mask* is used, then the Offset option expects all the strings to be specified by an *offset_n_mask*. Then if no mask exists for any value of n, then that parameter set is ignored and no string projected.

If no offset masks are used (that is, no *offset_n_mask*'s are used), then the Offset option works as it did in **12d Model V3.0**. That is, plot parameters determine whether each string in the offset model is drawn, and if the string's heights and depths from the primary string are labelled in the boxes area. The order that the strings are then plotted and labelled is the same as the order of the strings in the Offset model.

For the following sets of parameters, n takes the value 1 to 100 and specifies that the parameter set applies to the nth string given by *offset_n_mask* or, if no offset masks are given, the nth string in the *Offset model*.

offset_n_mask	<i>"model_name->string_name"</i>	
offset_n_draw_mode	1	// draw the nth offset string (default)
	0	// don't draw the nth offset string
offset_n_lw	value	// default 1000. Distance to search to the left // of the primary string for the offset string.

		// If 0, don't search to the left.
offset_n_rw	<i>value</i>	// default 1000. Distance to search to the right // of the primary string for the offset string. // If 0, don't search to the right.
offset_n_draw_colour	<i>colour</i>	// colour to draw the nth offset string. // If omitted, then use the string colour
offset_n_label	<i>1</i>	//label the string's heights (default)
	<i>0</i>	// don't label the string's heights

The default title for each set each parameter set, is the string name but this can be changed to just the model name or the model and string name:

offset_title_mode	<i>0</i>	// label with string name (default)
	<i>1</i>	// label with model name
	<i>2</i>	// label with model->string as name

or, for any set, the *offset_title_mode* can be replaced by two lines of user defined title:

offset_n_title	<i>text</i>	// first line of title
offset_n_title_2	<i>text</i>	// second line of title
offset_n_title_textstyle	<i>textstyle</i>	// textstyle of the offset titles

The rest of the parameters for the set are:

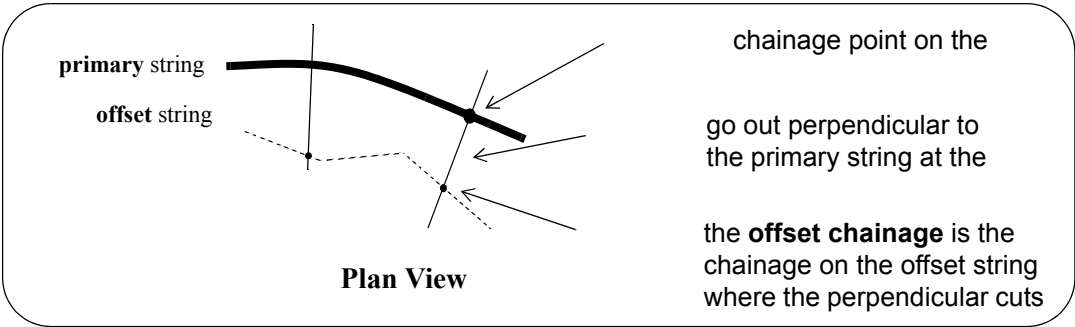
offset_n_title_colour	<i>colour</i>	// colour for titles of heights
offset_n_title_size	<i>size</i>	// colour for titles of heights
offset_n_title_y_pos	<i>mm</i>	// if set, the height in mm above the // bottom of all the boxes that the // offset title text is drawn. // If not set, then the text is placed at a // height that puts it inside the default // box for the offset heights.
offset_n_decimals	<i>integer</i>	// number of dec places in offset height
offset_n_textstyle	<i>textstyle</i>	// textstyle of the offset heights
offset_n_colour	<i>colour</i>	// colour for heights
offset_n_size	<i>size</i>	// size for heights
offset_n_y_pos	<i>mm</i>	// if set, the height in mm above the // bottom of all the boxes that the // offset height text is drawn. // If not set, then the text is placed at a // height that puts it inside the default // box for the offset heights.
offset_n_depth_label	<i>1/0</i>	// 1 to label, 0 don't label depths
offset_n_depth_title	<i>text</i>	// first line of offset depth title
offset_n_depth_title_2	<i>text</i>	// second line of offset depth title
offset_n_depth_title_textstyle	<i>textstyle</i>	// textstyle of the offset depth titles
offset_n_depth_title_colour	<i>colour</i>	// colour for titles of depths
offset_n_depth_title_size	<i>mm</i>	// size for titles of depths
offset_n_depth_title_y_pos	<i>mm</i>	// if set, the height in mm above the // bottom of all the boxes that the // offset depth title text is drawn. // If not set, then the text is placed at a // height that puts it inside the default // box for the offset depths.
offset_n_depth_decimals	<i>integer</i>	// number of dec places in offset depth
offset_n_depth_textstyle	<i>textstyle</i>	// textstyle of the offset depths

offset_n_depth_colour	<i>colour</i>	// colour for depths
offset_n_size	<i>size</i>	// size for depths
offset_n_depth_y_pos	<i>mm</i>	// if set, the height in mm above the // bottom of all the boxes that the // offset depth text is drawn. // If not set, then the text is placed at a // height that puts it inside the default // box for the offset depths.

Chainages of Offset Strings - Offset Chainages

For a string other than the primary string, it is possible to label the chainages that are obtained *from the other string* by going out perpendicular to the primary string at a chainage, cutting the other string and then calculating the *chainage from the other string* at the cut point.

The other string is known as an **offset** string and the chainage from the offset string corresponding to a primary chainage is called the *offset chainage*.



Up to twenty sets of offset chainages can be labelled - each is defined by its own set of parameters:

Note no box is automatically created for the offset chainages. An empty box must be defined and the appropriate values set for *chainage_n_title_y_pos* and *chainage_n_y_pos*

chainage_n_offset_mode	tick box	// if ticked, use nth offset string for calculations
chainage_n_offset_string	"model_name->string_name"	// string to calculate offset chainages for
chainage_n_title	text	// first line of offset chainage title
chainage_n_title_2	text	// second line of offset chainage title
chainage_n_title_textstyle	textstyle	// textstyle of the offset chainage titles
chainage_n_title_colour	colour	// offset chainage title colour
chainage_n_title_size	mm	// offset chainage title size
chainage_n_title_y_pos	mm	// the height in mm above the bottom of all the boxes that the offset chainage title text is drawn.
chainage_n_decimals	integer	// number of decim places for offset chainages
chainage_n_textstyle	textstyle	// textstyle of the offset chainage values
chainage_n_colour	colour	// colour of offset chainages
chainage_n_size	mm	// size of offset chainages
chainage_n_y_pos	mm	// the height in mm above the bottom of all the boxes that the chainage values text is drawn.

Example of Offset Chainage and Titles

chainage_1_offset_string	"Design->RKERB"	
chainage_1_title	"RIGHT KERB"	
chainage_1_title_2	"CHAINAGE"	
chainage_1_title_colour	"yellow"	
chainage_1_colour	"grey"	// colour of offset chainage text
chainage_1_decimals	-3	// 3 decimal places - leave trailing zeros

Definition of Depth to a Tin or to Offset Strings

The depth from the primary string to a tin or to a string from the offset model, at a particular chainage is defined as

$$\text{depth} = \text{tin height value} - \text{height of the primary string}$$

or

$$\text{depth} = \text{offset string height value} - \text{height of the primary string}$$

That is, the depth that the primary string is **below** the tin or a string from the offset model.

Before plotting, the value of depth is multiplied by either the *depth_positive_factor* or *depth_negative_factor*.

if (depth >= 0) plotted_depth_value = depth * depth_positive_factor

if (depth < 0) plotted_depth_value = depth * depth_negative_factor

Hence the definition of depth can be modified by the parameters:

depth_positive_factor	value	// multiplier for positive depths
depth_negative_factor	value	// multiplier for negative depths

For example, if the opposite sign is required for depth, that is,

$$\text{depth} = \text{height of the primary string} - \text{tin/offset string height value}$$

simply set

depth_positive_factor	-1
depth_negative_factor	-1

Super-Elevation Diagram

The optional *super-elevation diagram* draws the values of the cross-fall (x-fall) between two strings using the primary string as the reference string. The cross-fall at a given chainage on the primary string is calculated by sectioning perpendicular to the reference string at that chainage and cutting the two strings. The cross-fall is defined as the cross-fall between the two cuts points on the strings.

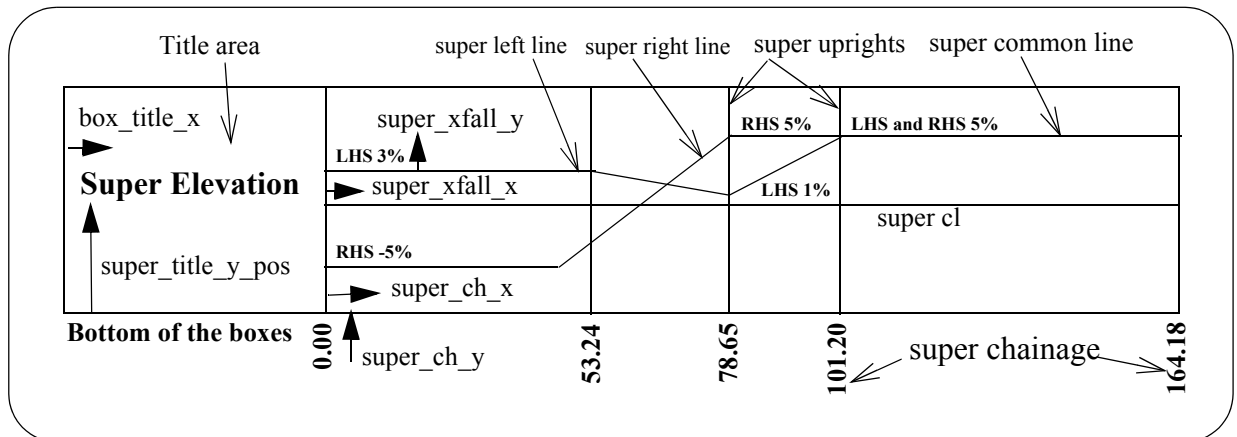
The diagram has levels for the cross fall for a pair of strings on the left of the primary string, and a pair of strings on the right of the primary string. The diagram also has uprights in the super-elevation box with chainage values at the change of super values.

For the left hand side, the cross-fall is calculated at right angles to the primary string between the user given left hinge string and the left edge string.

There are plot parameters to control all aspects of the super diagram.

super_draw_mode	0	// default, don't draw a super diagram
	1	// draw super using <i>super_sample_interval</i>
	2	// sample super using chainages of x-sections
	3	// sample super using chainages from a string
super_sample_interval	value	// if super_draw_mode = 1, default 20
		// chainage distance to sample x-fall
super_sample_name	model_name	// if super_draw_mode = 2
	model_name->string_name	// if super_draw_mode = 3
super_tolerance	value	// If super_draw_mode is 1, the change
		// of super is greater than super_tolerance,
		// draw uprights
super_title	text	// first line of super title
		// def <i>Super elevation</i>
super_title_textstyle	textstyle	// textstyle of the super titles
super_title_colour	colour	// super title colour, def box_colour
super_title_size	mm	// super title size, def label_text_size
super_title_y_pos	mm	// if set, the height in mm above the
		// bottom of all the boxes that the
		// super title text is drawn.
		// If not set, then the text is placed at a
		// height that puts it inside the default
		// box for the super.
super_xfall_textstyle	textstyle	// textstyle of the super x-fall labels
super_xfall_colour	colour	// super x-fall colour, def box_colour
super_xfall_size	mm	// super x-fall size, def label_text_size
super_xfall_x	mm	// def 0
super_xfall_y	mm	// def 0.5
super_ch_textstyle	textstyle	// textstyle of the super chainages
super_ch_colour	colour	// super chainage colour, def box_colour
super_ch_size	mm	// super chainage size, def label_text_size
super_ch_x	mm	// def 0
super_ch_y	mm	// def -1
super_ch_decimals	integer	// number decimal places in chainage
		// def number_of_decimals
super_hinge_name_left	model_name->string_name	// left hinge string
super_edge_name_left	model_name->string_name	// left edge string
super_left_linestyle	linestyle	// default DASHED
super_left_line_colour	colour	// default box_colour
super_left_decimals	integer	// number decimal places in left x-fall
		//def 0
super_left_pre	text	// text before left x-fall value
super_left_post	text	// text after left x-fall value
super_hinge_name_right	model_name->string_name	// right hinge string

super_edge_name_right	<i>model_name->string_name</i>	// right edge string
super_right_linestyle	<i>linestyle</i>	// default DASHED2
super_right_line_colour	<i>colour</i>	// default box_colour
super_right_decimals	<i>integer</i>	// number decimal places in right x-fall
		//def 0
super_right_pre	<i>text</i>	// text before right x-fall value
super_right_post	<i>text</i>	// text after right x-fall value
super_cl_linestyle	<i>linestyle</i>	// default 1
super_cl_line_colour	<i>colour</i>	// default box_colour
super_common_pre	<i>text</i>	// text before common x-fall value
super_common_post	<i>text</i>	// text after common x-fall value
super_common_linestyle	<i>linestyle</i>	// default 1
super_common_line_colour	<i>colour</i>	// default box_colour
super_common_decimals	<i>integer</i>	// number decimal places in common xfall
		//def 0
super_upright_mode	0	// uprights for left string only (default)
	1	// right
	2	// left and right
super_upright_colour	<i>colour</i>	// default box_colour



Example of Super

super_hinge_name_left	"super->lkerb"
super_edge_name_left	"super->lshoulder"
super_hinge_name_right	"super->rkerb"
super_edge_name_right	"super->rshoulder"
super_draw_mode	3
super_sample_interval	10
super_sample_name	"super->lkerb"
super_title_size	5
super_title_colour	ORANGE
super_title_textstyle	GOTHIC
super_title_y_pos	10
super_title	"Super EL"
super_xfall_size	1.5
super_xfall_colour	GREY
super_xfall_textstyle	HELV

// super_xfall_y	0.5
// super_xfall_x	2
super_ch_size	3
super_ch_colour	YELLOW
super_ch_textstyle	ISO
super_ch_y	-2
super_ch_x	-0.5
super_ch_decimals	-2
super_left_linestyle	DIVIDE
super_right_linestyle	PHANTOM2
super_cl_linestyle	PHANTOM
// super_common_linestyle	thick
super_left_line_colour	RED
super_right_line_colour	YELLOW
super_cl_line_colour	CYAN
super_common_line_colour	MAGENTA
super_upright_colour	BLUE
// super_common_pre	"Pre "
// super_common_post	"% Post"
// super_common_decimals	-1
super_right_decimals	1
super_left_decimals	1

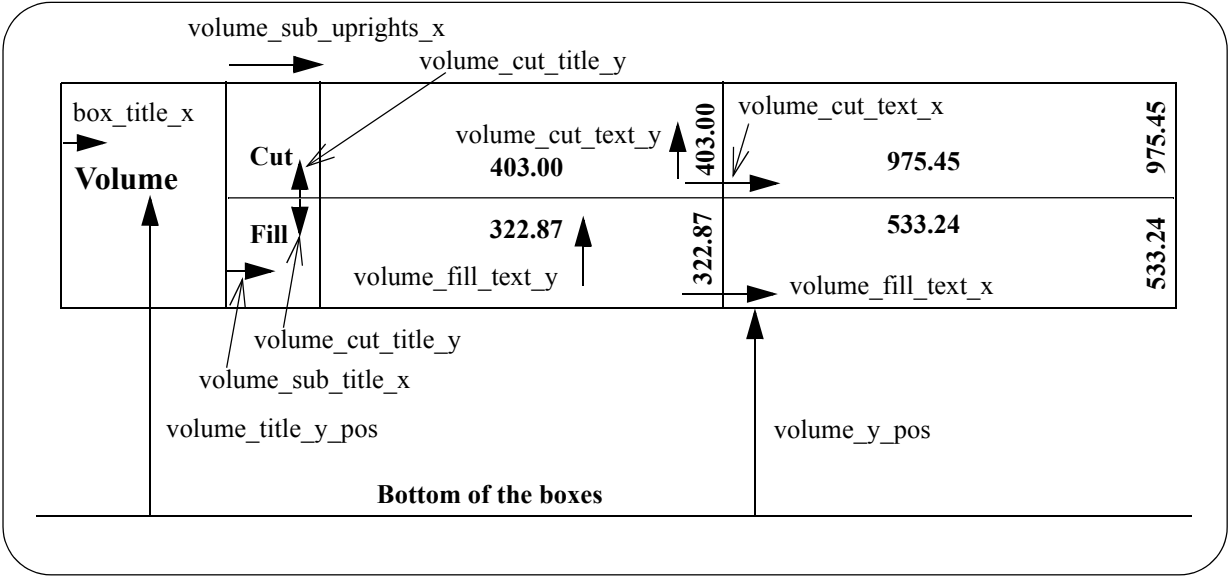
Volume Cut and Fill Values

The values of calculated cut and fill volumes (cut and fill earth works) can be read from a file and then interpolated to produce cut and fill volumes for a given interval along the primary string.

There are plot parameters to control all aspects of the volume diagram.

volume_draw_mode	0	// default, don't draw a volume diagram
	1	// draw a volume diagram
volume_text_centre_mode	0	// default, the text of cut and fill are labelled // along the uprights
	1	// the text are centred in between the uprights
volume_sample_interval	value	// interval to display volumes, default 20
volume_file_name	file_name	// the volumes report file
volume_y_pos	mm	// if set, the volume box is positioned at this // height from the bottom of the first box
volume_box_size	mm	// if set, the uprights and volume and titles // are plotted in accordance with this heights
volume_title	text	// first line of volume title // default <i>Earthworks</i>
volume_title_textstyle	textstyle	// textstyle of the volume titles
volume_title_colour	colour	// volume title colour, def box_colour
volume_title_size	mm	// volume title size, def label_text_size
volume_title_y_pos	mm	// if set, the height in mm above the // bottom of all the boxes that the // volume title text is drawn. // If not set, then the text is placed at a // height that puts it inside the default // box for the volumes.
volume_cut_title	text	// first line of volume sub title // default <i>cut</i>
volume_cut_title_textstyle	textstyle	// textstyle of the cut volume titles
volume_cut_title_colour	colour	// cut volume title colour, def box_colour
volume_cut_title_size	mm	// cut volume title size, def label_text_size
volume_cut_title_y	mm	// if set, the height in mm above the // default position. // If not set, then the text is placed at a // height that puts it inside the default // box for the cut volumes.
volume_fill_title	text	// first line of volume sub title // default <i>fill</i>
volume_fill_title_textstyle	textstyle	// textstyle of the fill volume titles
volume_fill_title_colour	colour	// fill volume title colour, def box_colour
volume_fill_title_size	mm	// fill volume title size, def label_text_size
volume_fill_title_y	mm	// if set, the height in mm above the // default position. // If not set, then the text is placed at a // height that puts it inside the default // box for the fill volumes.
volume_cut_textstyle	textstyle	// textstyle of the cut values
volume_cut_text_colour	colour	// cut value colour, def box_colour
volume_cut_text_size	mm	// cut value size, def label_text_size
volume_cut_text_x	mm	// the x distance to move the cut text from the // default cut text position, def 0, it is not used // if volume_text_centre_mode=1
volume_cut_text_y	mm	// the y distance to move the cut text from the // default cut text position, def 0
volume_cut_decimals	integer	// number decimal places in cut values // def number_of_decimals

volume_fill_textstyle	textstyle	// textstyle of the fill values
volume_fill_text_colour	colour	// fill value colour, def box_colour
volume_fill_text_size	mm	// fill value size, def label_text_size
volume_fill_text_x	mm	// the x distance to move the fill text from the // default fill text position, def 0, it is not used // if volume_text_centre_mode=1
volume_fill_text_y	mm	// the y distance to move the fill text from the // default fill text position, def 0
volume_fill_decimals	integer	// number decimal places in fill values //def number_of_decimals
volume_cl_linestyle	linestyle	// linestyle of horizontal cut/fill dividing line
volume_cl_line_colour	colour	// colour of horizontal cut/fill dividing line
volume_uprights_draw_mode	0	// default, don't draw cut/fill uprights
	1	// draw cut/fill uprights
volume_uprights_line_colour	colour	// colour of uprights
volume_sub_upright_colour	colour	// colour of sub uprights line
volume_sub_uprights_x	mm	// the distance to move from the default // sub uprights position, def 0
volume_sub_title_x	mm	// the distance to move the sub title text // from the volume sub uprights



Example of Volumes

volume_draw_mode	1
volume_sample_interval	25
volume_file_name	"volume.rpt"
volume_text_centre_mode	0
volume_y_pos	150
volume_box_size	40
volume_title	"Volumes"
volume_title_size	5
volume_title_colour	grey

```

//      volume_title_textstyle
//      volume_title_y_pos      165

//      volume_cut_title      "cut"
//      volume_cut_title_size
//      volume_cut_title_colour
//      volume_cut_title_textstyle
//      volume_cut_title_y      3

//      volume_fill_title      "fill"
//      volume_fill_title_text_size
//      volume_fill_title_text_colour
//      volume_fill_title_textstyle
//      volume_fill_title_y      -3

//      volume_cut_text_size      3
//      volume_cut_text_colour
//      volume_cut_textstyle
//      volume_cut_text_y      5
//      volume_cut_text_x
//      volume_cut_decimals      0
//      volume_fill_text_size      3
//      volume_fill_text_colour
//      volume_fill_textstyle
//      volume_fill_text_y      245
//      volume_fill_text_x
//      volume_fill_decimals      0

//      volume_cl_linestyle      "PHANTOM"
//      volume_cl_line_colour      red

//      volume_uprights_draw_mode      1
//      volume_uprights_line_colour      "purple"

//      volume_sub_upright_colour      23
//      volume_sub_uprights_x      10

//      volume_sub_title_x      3

```

X,Y Values

The values of the X and Y coordinate for selected chainages can be labelled as separate boxes. The chainages specified are limited to the base set of chainages already defined in the chainage selection and staggering section. i.e. an upright must exist for the X and Y value to be labelled. Not all of the uprights have to be labelled, just those specified in this section.

There are plot parameters to control all aspects of the X and Y labelling.

Chainages are used for positioning X and Y labels.

The chainages for the long section plot relate to the primary string and are controlled by a set of parameters.

xy_order	0	// 0 = X on bottom, Y on top
	1	// 1 = Y on bottom, X on top
xy_chord_arc	0	// don't use chord/arc chainages
	1	// include chainages for chord/arc
xy_start_chainage	<i>value</i>	// start chainage of labelling range
xy_end_chainage	<i>value</i>	// end chainage of labelling range
xy_interval	<i>value</i>	// regular interval (0 = no regulars)
xy_label_hcp	0/1	// 1 = include tangents, spirals
xy_label_hip	0/1	// 1 = include hip points
xy_label_vip	0/1	// 1 = include vip points
xy_label_vtp	0/1	// 1 = include tangent points
xy_label_crest	0/1	// 1 = include crest points
xy_label_sag	0/1	// 1 = include sag points
xy_label_grade_change	0/1	// 1 = include change of vertical grade
xy_special_n_file	<i>filename</i>	// n = 1 to 20 - include chainages from the file (one chainage per line)
xy_label_tolerance	<i>value</i>	// > 0 use as weeding tolerance
		// <= 0, don't weed

For X parameters:

x_label	0/1	// 0 = Don't label X values/titles
		// 1 = Label X values/titles
x_title	<i>text</i>	// first line of X title
		// (default "Easting")
x_title_2	<i>text</i>	// second line of X title
x_title_textstyle	<i>textstyle</i>	// textstyle of the X titles
x_title_colour	<i>colour</i>	// default X title colour
x_title_size	<i>mm</i>	// default X title size
x_title_y_pos	<i>mm</i>	// if set, the height in mm above the
		// bottom of all the boxes that the
		// X title text is drawn.
		// If not set, then the text is placed at a
		// height that puts it inside the default
		// box for the X.
x_label_decimals	<i>integer</i>	// number of decim places for X values
x_label_textstyle	<i>textstyle</i>	// textstyle of the X values
x_label_colour	<i>colour</i>	// colour of X values, def is box_colour
x_label_size	<i>mm</i>	// size of X values, def is box_text_size
x_label_y_pos	<i>mm</i>	// if set, the height in mm above the
		// bottom of all the boxes that the
		// X value text is drawn.
		// If not set, then the text is placed at a
		// height that puts it inside the default
		// box for the X value.

For Y parameters:

y_label	0/1	// 0 = Don't label Y values/titles // 1 = Label Y values/titles
y_title	text	// first line of Y title // (default "Easting")
y_title_2	text	// second line of Y title
y_title_textstyle	textstyle	// textstyle of the Y titles
y_title_colour	colour	// default Y title colour
y_title_size	mm	// default Y title size
y_title_y_pos	mm	// if set, the height in mm above the // bottom of all the boxes that the // Y title text is drawn. // If not set, then the text is placed at a // height that puts it inside the default // box for the Y.
y_label_decimals	integer	// number of decim places for Y values
y_label_textstyle	textstyle	// textstyle of the Y values
y_label_colour	colour	// colour of Y values, def is box_colour
y_label_size	mm	// size of Y values, def is box_text_size
y_label_y_pos	mm	// if set, the height in mm above the // bottom of all the boxes that the // Y value text is drawn. // If not set, then the text is placed at a // height that puts it inside the default // box for the Y value.

Please continue to the next section [Chainage Selection and Staggering](#).

Chainage Selection and Staggering

Chainages are used for positioning height labels, uprights (leader lines) and bubbles.

The chainages for the long section plot relate to the primary string and are controlled by a set of parameters.

chord_arc	0	// don't use chord/arc chainages
	1	// include chainages for chord/arc
chainage_interval	value	// regular interval (0 = no regulars)
chainage_label_ends	0/1	// 1 = include start and end chainages
chainage_label_hcp	0/1	// 1 = include tangents, spirals
chainage_label_hip	0/1	// 1 = include hip points
chainage_label_vip	0/1	// 1 = include vip points
chainage_label_vtp	0/1	// 1 = include tangent points
chainage_label_crest	0/1	// 1 = include crest points
chainage_label_sag	0/1	// 1 = include sag points
chainage_label_grade_change	0/1	// 1 = include change of vertical grade
chainage_special_n_file	filename	// n = 1 to 20 - include chainages from // the file (one chainage per line)
chainage_label_tolerance	value	// > 0 use as weeding tolerance // <= 0, don't weed
chainage_merge_bubbles	0/1	// 1 = merge in the bubble chainages
chainage_merge_tolerance	value	// > 0, weeding tol after bubble merge // <= 0, don't weed after merge

Default values

chainage_label_tolerance = 1.0 exp -4 (world units)
chainage_merge_tolerance = 1.0 exp -8 (world units)

If a tolerance is zero or negative, no weeding is performed.

The format of a chainage special file is simply a list of chainage values, one value per lines. Blank lines in the file are ignored and anything on a line after a // is a comment.

If the real chainage position is used for the horizontal position of the chainage/height/depth text, text over writing can easily occur.

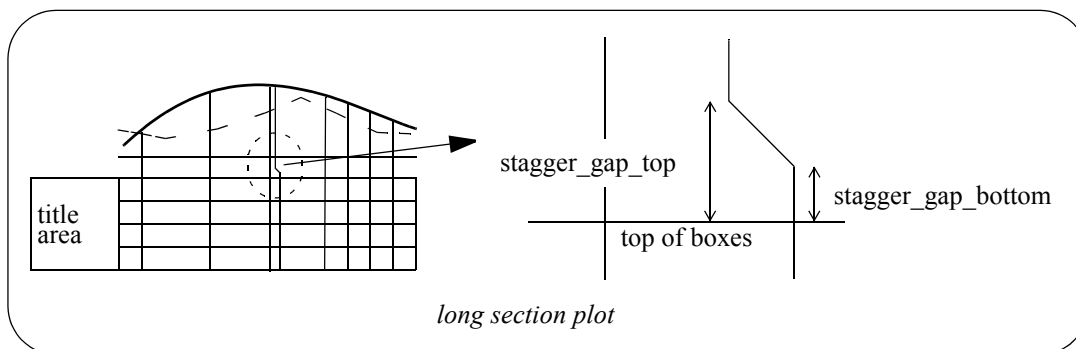
To prevent over writing, the text can be **staggered**.

If the **stagger_mode** parameter is set to 1, the text position is adjusted so that the text does not over write.

The real chainage position is then indicated by the chainage markers which are drawn at the top of the text boxes from the staggered text position back to the actual chainage position of the text.

stagger_mode	0	// no staggering, allow over writing
	1	// stagger text to prevent over writing
stagger_gap_top	mm	// distance from boxes to top of stagger
stagger_gap_bottom	mm	// distance from boxes to bottom of // stagger
stagger_gap_factor	value	// distance between staggers is // box_text_size * stagger_gap_factor

When staggering occurs, it is possible for the heights area to be longer than the graph area.



Please continue to the next section [Uprights](#).

Uprights

Uprights, or leader lines, can be drawn from the top of the staggers to the strings drawn on the plot.

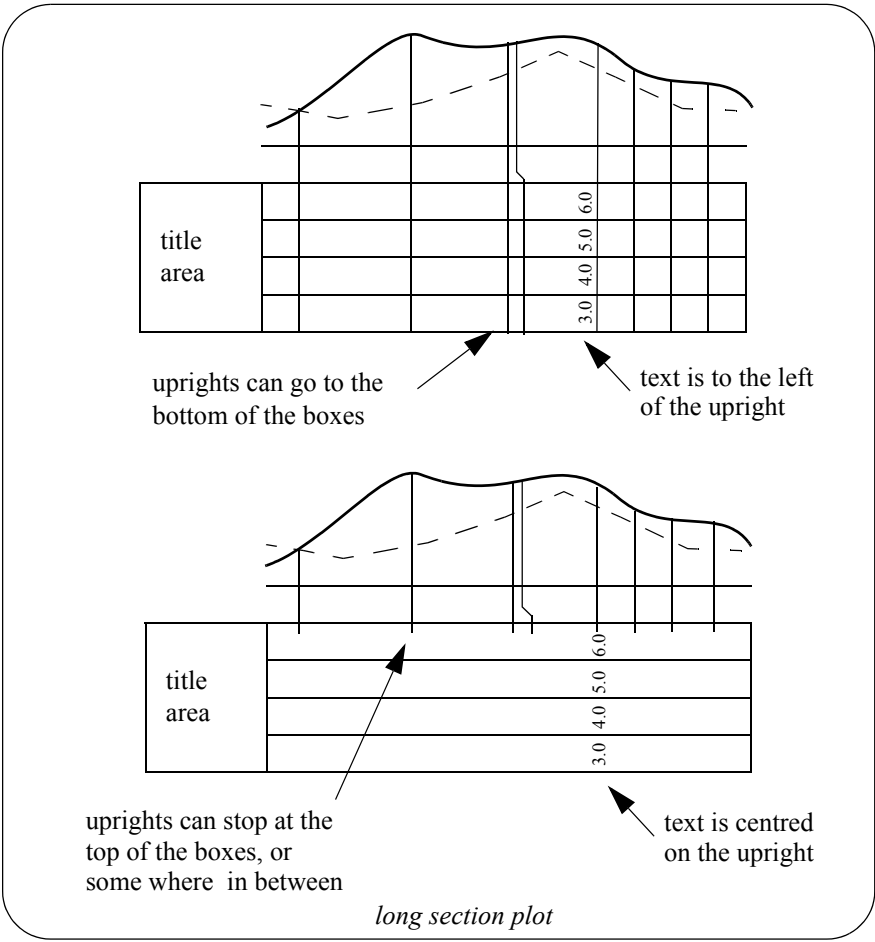
The height of the uprights is given by the `uprights_draw_mode`:

<code>uprights_draw_mode</code>	0	// none
	1	// to maximum string height at that chainage
	2	// ticks, to stagger height
	3	// to <code>uprights_y</code> above the boxes
	100	// to the primary string
	101-500	// to tin1 or tin2 etc.
	501-900	// to offset1 or offset2 etc.
<code>uprights_y</code>	<i>mm</i>	// distance to draw the uprights for mode 3
<code>uprights_colour</code>	<i>colour</i>	// uprights colour (default <code>boxes_colour</code>)

The uprights can go below the top of the boxes.

<code>uprights_bottom_mode</code>	0	// stop at top of boxes (default)
	1	// draw to bottom of boxes
	2	// draw to <code>uprights_bottom_y</code> below the top of the boxes
	3	// draw to <code>uprights_bottom_y</code> above the bottom of the boxes
	4	// ticks at chainage
<code>uprights_bottom_y</code>	<i>mm</i>	// distance
<code>uprights_text_offset_factor</code>	<i>value</i>	// move the text by this factor*size

When uprights go below the top of the boxes, the height and offset text is moved to the left so that the upright does not go through the text. The left hand side of the heights boxes also moves to the left to leave room for the height text.



Please continue to the next section [Datum Area](#).

Datum Area

The **datum area** is the region between the boxes area and the graph area.

The **datum line** is positioned the distance ***datum_below_gap*** above the top of the boxes area and the graph area is positioned the distance ***datum_above_gap*** above the datum line.

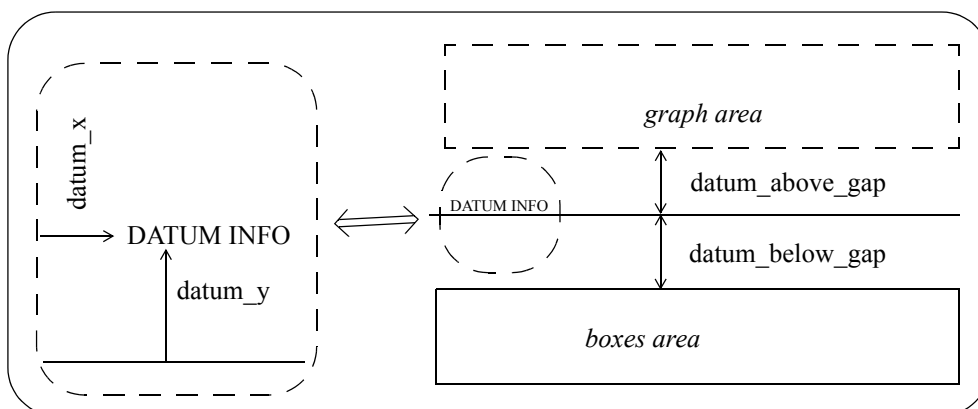
Hence the graph area is distance (*datum_below_gap* + *datum_above_gap*) above the top of the boxes area.

<i>datum_above_gap</i>	<i>mm</i>	// distance from datum line to the // bottom of the graph area
<i>datum_below_gap</i>	<i>mm</i>	// distance from datum line to the top of // the boxes
<i>datum_linestyle</i>	<i>linestyle</i>	// linestyle for datum line (default solid)

The *datum_below_gap* and *datum_above_gap* can be zero or positive.

A value for the datum can be specified by the parameter ***datum_value*** or if the *datum_value* is not set, a datum value is automatically calculated for the long section using a roundoff specified by the user (default 1.0).

<i>datum_value</i>	<i>value</i>	// if set, the value to use for datum. // If not set, the datum is automatically // calculated (using <i>datum_roundoff</i>)
<i>datum_roundoff</i>	<i>1.0</i>	// value to roundoff the datum value to // e.g. 0.5, 0.2, 1.0 (default 1.0)
<i>datum_decimals</i>	<i>integer</i>	// number of decimal places to display // the datum value (default 1). // If > 0, trailing zeros are removed after // the decimal point. // If < 0, the absolute value is taken as the // number of decimal places to report // i.e. no trailing zeros are removed
<i>datum_name</i>	<i>text</i>	// text to write before the datum value
<i>datum_textstyle</i>	<i>textstyle</i>	// textstyle for the datum text
<i>datum_text_size</i>	<i>mm</i>	// size of datum text and value
<i>datum_colour</i>	<i>colour</i>	// colour of the datum text and line
<i>datum_x</i>	<i>mm</i>	// distance to move the datum text // along the datum line
<i>datum_y</i>	<i>mm</i>	// distance to raise the datum text // above the datum line (used to be // called <i>datum_offset</i>)



Please continue to the next section [Graph Area](#).

Graph Area

The **graph area** is the area where the actual plots of the strings are drawn.

The string used to define the horizontal position and chainage of the plot is called the **primary string** and is either

(a) the string being profiled on the given section view
or

(b) the string given by the parameter

```
string_to_plot          "model->string_name"    // name of string to profile
```

When the primary string is being written out to a plot parameter file by 12d Model, a *string_to_plot* parameter and special parameters recording the internal id's for the string and it's model are all written out.

```
primary_model_id        integer                // internal 12d Model parameter
primary_string_id       integer                // internal 12d Model parameter
```

The **length** of the graph area is determined by the length of the primary string being plotted (restricted to the specified start and end chainages) and the horizontal scale (scale) given by parameters or in the **section long plot** panel, and the vertical exaggeration given by the section view or a parameter.

```
view_name               text                  // default is section view in panel.
vertical_exaggeration   value                // default is vertical exag for the view
scale                   value                // 1:value - horizontal scale, default is
                                          // scale 1: in panel
start_chainage          value                // " " means use start of primary string
end_chainage            value                // " " means use end of primary string
```

The vertical scale is determined by the horizontal scale and the vertical exaggeration.

The **height** of the graph area is determined by the vertical scale (given by the horizontal scale and the vertical exaggeration) and the minimum and maximum values of the data being plotted. Hence the graph height is a calculated rather than a given value.

The types of strings that can be drawn in the graph area of a long section plot are:

- (a) primary string the string being profiled (usually the design string).
- (b) tins sections of the primary string through any tins either in models on the section view or in corridor models.
- (c) offset strings strings in the **offset model** that are projected back onto the primary string
- (d) services parts of strings (from either models on the section view or in corridor models) that cut the defined corridor.

The **colour** of the strings in the plot is the actual string colour for cases (a), (c) and (d), and the colour of the tin used for the section in case (b).

Although all the strings are plotted, the plot parameter file can be used to select which ones are labelled with heights and/or depths.

Primary String (Design String)

The primary string (the design string) is used to define

- (a) the design long section
- (b) the chainage positions for labelling heights and drawing uprights
- (c) the section line used for sectioning through tins
- (d) the section line for defining the corridor for services

Although the primary string is used to set up most of the information for the long section plot, it doesn't have to be drawn on the long section.

The drawing or not drawing of the primary string on each cross section plot is controlled by the parameter *primary_string* which was described earlier.

The **colour** of the primary string in the plot is the actual primary string colour.

Tins

A section along the primary string through each tin on the specified section view is automatically drawn on the cross section plot.

The **colour** and **linestyle** of the tin section in the plot is the actual tin colour and tin linestyle.

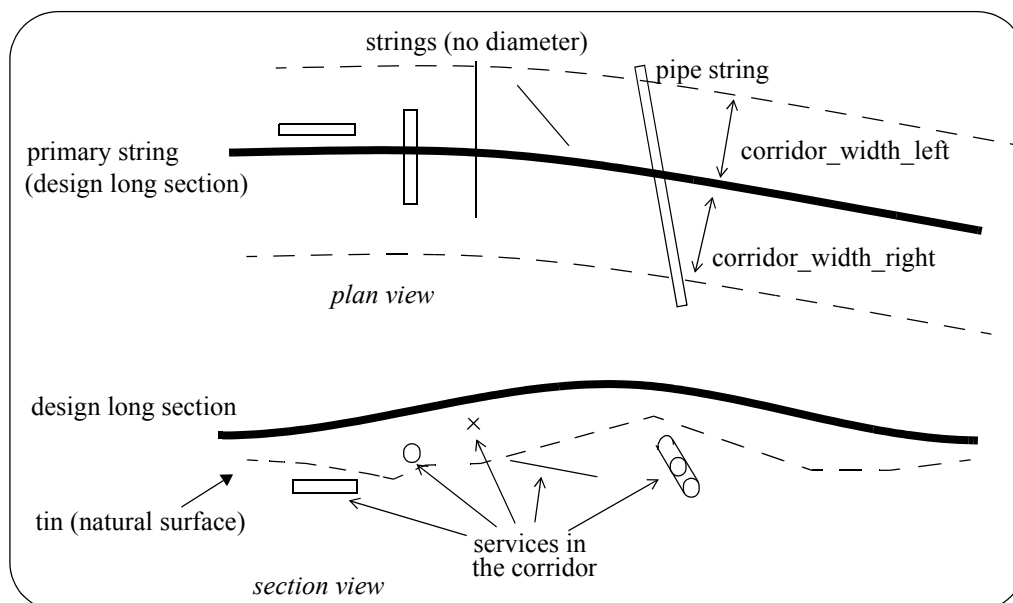
Whether the tin heights are labelled or not in the boxes area is controlled by parameters and has been described earlier

Corridor and Services

A corridor around the primary string is defined by giving a left and right corridor width.

Any string in a model added to the section view is checked to see if it appears in the corridor, and if it does, then it is drawn on the long section plot.

To be drawn, strings do not have to cross the primary string, but just be in the corridor.



The corridor defining parameters are

corridor_width_left	world-units	// corridor left and right widths
corridor_width_right	world-units	// defaults are the section view values
corridor_overlap_left	world-units	// corridor left and right overlaps.
corridor_overlap_right	world-units	// defaults are the section view values
corridor_chord_arc	world-units	// chord-arc tolerance used to
		// approximate arcs in the corridor.
		// default is the section view value

The models containing tins for sectioning and strings for services are taken from the section view or given by the parameters

corridor_model_n	model	// n = 1, 2 ... 100
		// models containing tins and service
		// strings to be drawn on the view.

If any *corridor_model_n* parameters are defined, then only the models given by the parameters are used. If no *corridor_model_n* parameters are set, then the models added to the given section

view are used.

That is, either the *corridor_model_n* parameters are used or if none exist, then the models added to the section view are used for tins and service strings.

The **colour** and **diameter** of the service strings drawn in the plot are the actual strings colour and diameter.

The graph area sits on top of the boxes and datum areas, so there may not be enough room left on the sheet for the full plot height. In this case, the plot will be truncated at the top of the allowed graph area.

Please continue to the next section [Bubbles Definitions](#).

Bubbles Definitions

Circles with the string name and a unique number (**bubbles**) can be drawn on the long section plot. Bubbles are normally used for lip profiles.

The chainages used for the bubbles are given by a set of parameters similar to the chainage parameters. The resulting set of bubbles are sequentially numbered (starting with one) in chainage order.

Although many bubbles can be defined by the bubble parameters, a bubble is only drawn on the plot if there is a labelled chainage to draw it above.

Hence not all bubbles given by the bubble chainage parameters are drawn but for the ones that are drawn, the bubble number is taken from the full bubble set.

chainage_bubbles	0	// don't drawn bubbles
	1	// draw bubbles
bubble_radius	<i>mm</i>	// radius of the bubbles
bubble_colour	<i>colour</i>	// colour for the bubbles
bubble_text_string_name_mode	0	// do not label with string name
	1	// label string name
	2	// label with <i>model->string name</i>
bubble_pre_text	<i>text</i>	
bubble_post_text	<i>text</i>	
bubble_textstyle	<i>textstyle</i>	
bubble_text_size	<i>mm</i>	
bubble_text_colour	<i>colour</i>	
bubble_text_offset	<i>mm</i>	
bubble_upright_distance	<i>mm</i>	// distance bubbles are above boxes/uprights
bubble_mode	0	// bubble_upright_distance is above boxes
	1	// bubble_upright_distance is above
		// uprights
bubble_draw_upright	0/1	// 1 = draw extra upright if
		// bubble_mode = 1
bubble_start_chainage	<i>value</i>	// start chainage for bubbles
bubble_end_chainage	<i>value</i>	// end chainage for bubbles
bubble_chord_arc	0/1	// 1 = use chord-arc chainages
bubble_interval	<i>value</i>	// include regular interval
		// (0 = no regulars)
bubble_label_ends	0/1	// 1 = include start and end chainages
bubble_label_hcp	0/1	// 1 = include tangents, spirals
bubble_label_hip	0/1	// 1 = include hip points
bubble_label_vip	0/1	// 1 = include vip points
bubble_label_vtp	0/1	// 1 = include tangent points
bubble_label_crest	0/1	// 1 = include crests
bubble_label_sag	0/1	// 1 = include sags
bubble_label_grade_change	0/1	// 1 = include change of grade
bubble_special_n_file	<i>filename</i>	// n = 1 to 20 include chainages from the
		// file
bubble_label_tolerance	<i>value</i>	// > 0 use as weeding tolerance
		// <= 0, don't weed

Defaults

bubble_label_tolerance = 1.0 exp -4 (world units)

If a tolerance is zero or negative, no weeding is performed.

The format of a bubble special file is simply a list of chainage values, one value per lines. Blank lines in the file are ignored and anything on a line after a *//* is a comment.

Please continue to the next section [Quick Horizontal Geometry Labelling](#).

Quick Horizontal Geometry Labelling

The standard horizontal geometry arrows can be drawn at a given distance above the top of the boxes area.

horizontal_geometry_y'	<i>mm</i>	// dist above boxes // 0 = don't draw
horizontal_geometry_arrow_text_colour	<i>colour</i>	
horizontal_geometry_arrow_textstyle	<i>textstyle</i>	
horizontal_geometry_arrow_text_size	<i>mm</i>	
horizontal_geometry_arrow_colour	<i>colour</i>	
horizontal_geometry_arrow_height	<i>mm</i>	
horizontal_geometry_label_text	<i>text</i>	
horizontal_geometry_label_textstyle	<i>textstyle</i>	
horizontal_geometry_label_text_colour	<i>colour</i>	
horizontal_geometry_label_text_size	<i>mm</i>	
horizontal_geometry_label_decimals	<i>number</i>	

Please continue to the next section [Extensive Horizontal Geometry Labelling](#).

Extensive Horizontal Geometry Labelling

For complicated horizontal geometry labelling, there are sets of horizontal geometry labelling parameters which give tight control over the position and types of labels.

It is also possible to label the horizontal geometry of **alignment** strings other than the primary string. To plot such a string on the same plot, the chainage position of the horizontal geometry for the non-primary alignment strings is *projected* onto the primary string to give a primary string chainage for plotting. The values of the horizontal geometry (such as radius and spiral length) that are plotted are taken from the other string. Independently graded offset strings (such as a left and right kerbs) are the type of additional alignment strings that may need to be plotted on the same long section plot as the reference string (primary string).

For plotting horizontal geometry, the user can give up to twenty sets of these labels and they can be used to label spirals, curves and tangent information for the primary string and/or additional alignment strings.

Each label set consists of three parts:

- (a) a text label on the left hand side of the plot
- (b) an arrow
- (c) text on the arrows.

For the following parameters, n takes the value 1 to 20 and specifies the nth parameter set.

h_g_n_type	0	// label spirals
	1	// label horizontal curves
	2	// label horizontal tangents

If *h_g_n_type* is missing, then the set is ignored.

h_g_n_value_mode		
for spiral labelling	0	// nothing
	1	// length
for curve labelling	0	// nothing
	1	// length
	2	// radius
for tangent labelling	0	// nothing

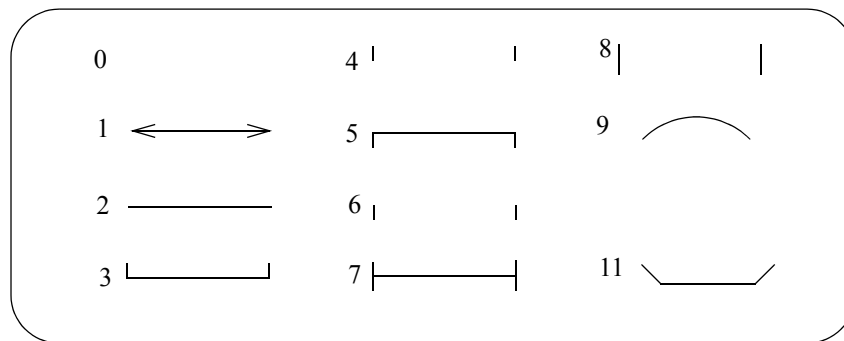
	1	// length
for spiral labelling	0	// nothing
	1	// length
	2	// radius*length
h_g_n_label_y	mm	// distance of arrow line above the top of // the boxes

Parameters for the left hand label of the line of the horizontal geometry arrows:

h_g_n_label_x	mm	// distance from the left hand side of the // labels area
h_g_n_label_offset	mm	// distance to raise the label_text above // arrow line
h_g_n_label_text_size	mm	
h_g_n_label_text_colour	colour	
h_g_n_label_text	text	
h_g_n_label_textstyle	textstyle	// textstyle used

Parameters for arrow type

h_g_n_draw_mode	0	// no arrow
	1	// arrow
	2	// line
	3	// line with uprights at ends
	4	// uprights, no line
	5	// line with downrights
	6	// downrights, no line
	7	// line with up and downrights at ends
	8	// up and downrights, no line
	9	// draw curve
	11	// radius*length curve



h_g_n_left_gap	mm	// size of gap for left side of arrow
h_g_n_right_gap	mm	// size of gap for right side of arrow
h_g_n_colour	colour	// colour of the arrow
h_g_n_height	mm	// height of the arrow
h_g_n_gap	0	// no gap
	1	// leave gap in arrow for text

Parameters for text on the arrows

h_g_n_text_colour	colour	// colour of the text
h_g_n_text_size	mm	// size of the text
h_g_n_text_offset	mm	// distance to raise the text above the // arrow line
h_g_n_pre_text	text	// text before the arrow text
h_g_n_post_text	text	// text after the arrow text
h_g_n_textstyle	textstyle	// textstyle used

h_g_n_no_decimals	integer	// number of decimal places in arrow // text. // If > 0, all trailing zeros after the // decimal place are removed. // If < 0, the absolute value is taken as // the number of decimal places and no // trailing zeros are removed after the // decimal point.
h_g_n_rotate	mm	// if ticked, the text on the arrows will be rotated to fit.

If the set of parameters is to apply to the horizontal geometry of an alignment string *other* than the primary string, then simply add the following parameter to define the other alignment string

h_g_n_offset_string	"model->string_name"
or	
h_g_n_offset_string	"string_name"

and the model is the *Offsets model* from the **Section Long Plot** panel.

If the *h_g_n_offset_string* parameter does not exist, then the set of horizontal geometry parameters is applied to the primary string.

Example of Extensive Horizontal Geometry

```
// Parameter to stop the drawing of the quick horizontal geometry
horizontal_geometry_y      0

// Set 1 - Extensive Horizontal Geometry Labelling - label the horizontal curve radius
h_g_1_type                 1                // label horizontal curve
                                // if this param is missing then set is ignored
h_g_1_value_mode           2                // label curve radius
h_g_1_label_y              45
h_g_1_label_x              0
h_g_1_label_offset         2
h_g_1_label_text_size      4
h_g_1_label_text_colour    YELLOW
h_g_1_label_text           "Horiz Curve Data"

// Parameters for arrow type
h_g_1_draw_mode            1
h_g_1_colour               "white"
h_g_1_height               1.5
h_g_1_gap                  0

// Parameters for text on the arrows
h_g_1_text_colour          YELLOW
h_g_1_text_size            3.5
h_g_1_text_offset          2.5
h_g_1_pre_text             "R"
h_g_1_post_text            "m"
h_g_1_no_decimals          2
```

Example of Extensive Horizontal Geometry for use with a Non-primary Alignment String



// Set 2 labels the horizontal curves radii of the kerb string projected onto primary stings

h_g_2_offset_string	"left offsets->kerb"	// non-primary string to do VG of
h_g_2_type	1	// label horizontal curve // if this param is missing then set is ignored
h_g_2_value_mode	2	// label curve radius
h_g_2_label_y	55	
h_g_2_label_x	0	
h_g_2_label_offset	2	
h_g_2_label_text_size	4	
h_g_2_label_text_colour	GREEN	
h_g_2_label_text	"Left Kerb - Horiz Curve Data"	

// Parameters for arrow type

h_g_2_draw_mode	1
h_g_2_colour	"white"
h_g_2_height	1.5
h_g_2_gap	0

// Parameters for text on the arrows

h_g_2_text_colour	GREEN
h_g_2_text_size	3.5
h_g_2_text_offset	2.5
h_g_2_pre_text	"R"
h_g_2_post_text	"m"
h_g_2_no_decimals	2

Please continue to the next section [Quick Vertical Geometry Labelling](#).

Quick Vertical Geometry Labelling

The standard vertical geometry arrows can be drawn at a given distance above the top of the boxes area.

vertical_geometry_grade_y	mm	// dist above boxes // 0 = don't draw
vertical_geometry_grade_mode	0 1	// % // 1 in
vertical_geometry_label_grade_text	text	
vertical_geometry_label_grade_textstyle	textstyle	// textstyle to use
vertical_geometry_label_grade_text_colour	colour	
vertical_geometry_label_grade_text_size	mm	
vertical_geometry_label_grade_decimals	number	
vertical_geometry_length_y	mm	// dist above boxes // 0 = don't draw
vertical_geometry_length_mode	0 1 2 3	// length // radius // k value // mixed - length for parabolic // radius for circular
vertical_geometry_label_length_text	text	
vertical_geometry_label_length_textstyle	textstyle	// textstyle to use
vertical_geometry_label_length_text_colour	colour	
vertical_geometry_label_length_text_size	mm	
vertical_geometry_label_length_decimals	number	
vertical_geometry_arrow_mode	0 1	// ticks // arrows
vertical_geometry_arrow_grade_textstyle	textstyle	// textstyle to use
vertical_geometry_arrow_grade_text_colour	colour	
vertical_geometry_arrowl_grade_text_size	mm	
vertical_geometry_arrow_length_textstyle	textstyle	// textstyle to use
vertical_geometry_arrow_length_text_colour	colour	
vertical_geometry_arrow_length_text_size	mm	
vertical_geometry_arrow_colour	colour	
vertical_geometry_arrow_height	mm	

Please continue to the next section [Extensive Vertical Geometry Labelling](#).

Extensive Vertical Geometry Labelling

For complicated vertical geometry labelling of the *primary alignment* string, there are sets of vertical geometry labelling parameters which give tight control over the position and types of labels.

It is also possible to label the vertical geometry of **alignment** strings other than the primary string. To plot such a string on the same plot, the chainage position of the vertical geometry for the non-primary alignment strings is *projected* onto the primary string to give a primary string chainage for plotting. The values of the vertical geometry (such as grade and curve length) that are plotted are taken from the other string. Independently graded offset strings (such as a left and right kerbs) are the type of additional alignment strings that may need to be plotted on the same long section plot as the reference string (primary string).

For plotting vertical geometry, the user can give up to twenty sets of these labels and they can be used to label grades or vertical curve information for the primary string and/or additional alignment strings.

Each label set consists of three parts:

- (a) a text label on the left hand side of the plot
- (b) an arrow
- (c) text on the arrows.

For the following parameters, *n* takes the value 1 to 20 and specifies the *n*th parameter set.

<i>v_g_n_type</i>	0	// labelling grades
	1	// labelling vg curve information

If *v_g_n_type* is missing, then the entire *n*th set is ignored.

The interpretation of the value of the

parameter *v_g_n_value_mode* depends on whether the set is being used for grade labelling or curve labelling:

for grade labelling	<i>v_g_n_value_mode</i>	0	// nothing
		1	// % grade
		2	// 1 in grade
		3	// m/m grade
		4	// chainage length between vertical curve points
for curve labelling		5	// per chord - Queensland Rail
		0	// nothing
		1	// length - chainage for parabolic vc's
			// arc length for circular vc's
		2	// radius
		3	// K value
		5	// curve constant - Queensland Rail

Vertical curve points to draw the arrows between (for grade labelling only)

<i>v_g_n_between_mode</i>	0	// between chainages at the vip's
	1	// between chainages at the vtp's

Position of the Arrow Line

<i>v_g_n_label_y</i>	<i>mm</i>	// distance of arrow line above the top of // the boxes this can be negative
----------------------	-----------	---------------------------------------------------------------------------------

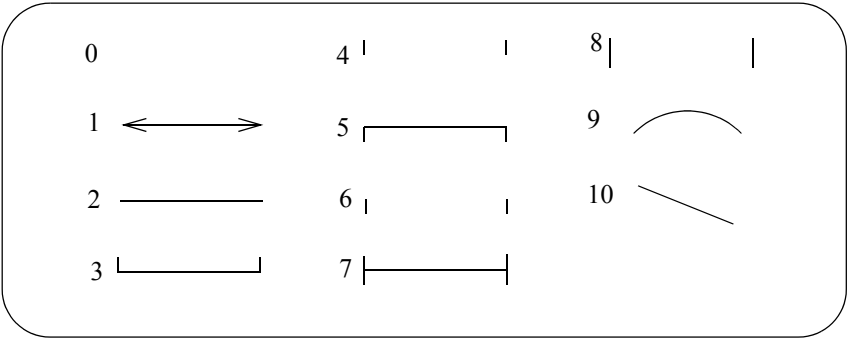
Parameters for the left hand label of the whole line of the vg arrows:

<i>v_g_n_label_x</i>	<i>mm</i>	// distance from the left hand side of the // labels area
<i>v_g_n_label_offset</i>	<i>mm</i>	// distance to raise the label_text above // arrow line
<i>v_g_n_label_text</i>	<i>text</i>	
<i>v_g_n_label_textstyle</i>	<i>textstyle</i>	
<i>v_g_n_label_text_size</i>	<i>mm</i>	
<i>v_g_n_label_text_colour</i>	<i>colour</i>	

Parameters for arrow type

<i>v_g_n_draw_mode</i>	0	// no arrow
	1	// arrow
	2	// line
	3	// line with uprights at ends
	4	// uprights, no line
	5	// line with downrights
	6	// downrights, no line

7	// line with up and downrights at ends
8	// up and down rights, no line
9	// draw curve
10	// draw grade



v_g_n_left_gap	mm	// size of gap for left side of arrow
v_g_n_right_gap	mm	// size of gap for right side of arrow
v_g_n_colour	colour	// colour of the arrow
v_g_n_height	mm	// height of the arrow
v_g_n_gap	0	// no gap
	1	// leave gap in arrow for text

Parameters for text on the arrows

v_g_n_text_colour	colour	// colour of the text
v_g_n_text_size	mm	// size of the text
v_g_n_text_offset	mm	// distance to raise the text above the // arrow line
v_g_n_pre_text	text	// text before the arrow text
v_g_n_post_text	text	// text after the arrow text
v_g_n_textstyle	textstyle	// textstyle used
v_g_n_no_decimals	integer	// number of decimal places in arrow // text. // If > 0, all trailing zeros after the // decimal place are removed. // If < 0, the absolute value is taken as // the number of decimal places and no // trailing zeros are removed after the // decimal point.
v_g_n_rotate	mm	// if ticked, the text on the arrows will be // rotated to fit.

If the set of parameters is to apply to the vertical geometry of an alignment string *other* than the primary string, then simply add the following parameter to define the other alignment string

v_g_n_offset_string "model->string_name"
or
v_g_n_offset_string "string_name"

and the model is the *Offsets model* from the **Section Long Plot** panel.

If the v_g_n_offset_string parameter does not exist, then the set of vertical geometry parameters is applied to the primary string.

Example of Extensive Vertical Geometry

```
// Parameter to not to draw the quick vertical geometry
vertical_geometry_grade_y    0

// Set 1 labels the vertical curves with length
v_g_1_type                  1 // curve
v_g_1_value_mode            1 // chainage length

v_g_1_label_y               45
v_g_1_height                4
v_g_1_label_offset          -2
v_g_1_label_text            "VG Curves"
v_g_1_text_offset           2
v_g_1_label_text_size       6
v_g_1_pre_text              ""
v_g_1_post_text             "L"
v_g_1_gap                   0
v_g_1_draw_mode             8
v_g_1_text_size             4
```

```
// Set 2 labels the vertical curves with K value
v_g_2_type                  1 // curve
v_g_2_value_mode            3 // K value

v_g_2_label_y               45
v_g_2_height                1.5
v_g_2_label_text            ""
v_g_2_text_offset           -5
v_g_2_pre_text              ""
v_g_2_post_text             "K"
v_g_2_gap                   0
v_g_2_draw_mode             1
v_g_2_text_size             4
```

Example of Extensive Vertical Geometry for use with a Non-primary Alignment String

```
// Set 3 labels the vertical curves with length with the kerb string projected onto primary strings
v_g_3_offset_string         "left offsets->kerb" // non-primary string to do VG of
v_g_3_type                  1 // curve
v_g_3_value_mode            1 // chainage length

v_g_3_label_y               55
v_g_3_height                4
v_g_3_label_offset          -2
v_g_3_label_text            "Left kerb - VG Curves"
v_g_3_text_offset           2
v_g_3_label_text_size       6
v_g_3_pre_text              ""
v_g_3_post_text             "L"
v_g_3_gap                   0
v_g_3_draw_mode             8
v_g_3_text_size             4
```

Please continue to the next section [Labelling Chainages and Heights in the Graph Area](#).

Labelling Chainages and Heights in the Graph Area

The chainage and/or height values for certain points (given by *label_n_type*) can be labelled.

Up to twenty sets of chainage/height labels can be done.

label_n_type	0	// chainage of vip, height of vip
	1	// chainage of vip, height of primary
	2	// crest
	3	// sag
	4	// vtp
	5	// hcp
	6	// change of grade
	7	// mid-ordinate of the vertical curve

If *label_n_type* is missing, then the set is ignored.

label_n_y_mode	0	// height in mm above boxes
	1	// above height value (default)
	2	// above primary height
label_n_y	<i>mm</i>	// distance above point
label_n_angle	<i>degrees</i>	// rotation about point
label_n_x	<i>mm</i>	// distance along from point
label_n_offset	<i>mm</i>	// text raise height
label_n_justification	0	// left end
	1	// middle
	2	// end
label_n_size	<i>mm</i>	
label_n_colour	<i>size</i>	
label_n_textstyle	<i>textstyle</i>	
label_n_value_mode	0	// no values labelled
	1	// val 1 = chainage
	2	// val 1 = height
	3	// val 1 = chainage, val 2 = height
	4	// val 1 = height, val 2 = chainage
label_n_pre_text	<i>text</i>	
label_n_mid_text	<i>text</i>	
label_n_post_text	<i>text</i>	
label_n_textstyle	<i>textstyle</i>	// textstyle to use
label_n_no_decimals_1	<i>integer</i>	// number of decimal places in val 1
label_n_no_decimals_2	<i>integer</i>	// number of decimal places in val 2

If the **number of decimal places is greater than zero (> 0)**, then any trailing zeros after the decimal point are removed.

If the **number of decimal places is less than zero (< 0)**, the absolute value is taken as the number of decimal places and **no** trailing zeros after the decimal point are removed.

Example of Labelling Chainage and Heights

```
// label the crests with chainage on one line
// and height (elevation) on the next

label_1_type      2 // crest
label_1_y_mode    2 // above string
label_1_y         10
label_1_angle     0
label_1_justification 1 // centre
label_1_size      4
label_1_colour    red
label_1_value_mode 1 // chainage
```

```
label_1_pre_text      "CH "  
label_1_no_decimals_1 1  
  
label_2_type          2 // crest  
label_2_y_mode        2 // above string  
label_2_y             2  
label_2_angle         0  
label_2_justification 1 // centre  
label_2_size          4  
label_2_colour        red  
label_2_value_mode    2 // height  
label_2_pre_text      "EL "  
label_2_no_decimals_1 1
```

Please continue to the next section [Labelling With Symbols](#).

Labelling With Symbols

Symbols can be placed at certain points given by *symbol_n_type*.

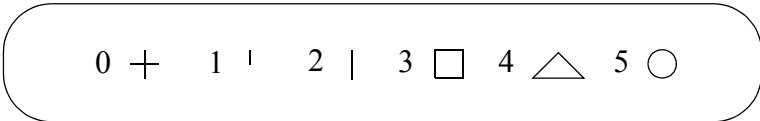
The symbol is drawn in a square box centred on (0,0) with sides of length two millimetres. That is, the box co-ordinates are (-1,-1), (1,1), (1,-1), (-1,-1).

Up to twenty sets of symbol labelling can be done.

```
symbol_n_type      0 // chainage of vip, height of vip  
                  1 // chainage of vip, height of primary  
                  2 // crest  
                  3 // sag  
                  4 // vtp  
                  5 // hcp  
                  6 // change of grade
```

If *symbol_n_type* is missing, then the set is ignored.

```
symbol_n_y_mode    0 // height in mm above boxes  
                  1 //   above height value (default)  
                  2 //   above primary height  
  
symbol_n_y         mm // distance above point given by mode  
symbol_n_angle     degrees // rotation about point  
symbol_n_x         mm // distance along from point  
symbol_n_size      mm //  
symbol_n_colour    colour // colour of symbol  
  
symbol_n_draw_mode 0 // cross  
                  1 // upright from centre of box  
                  2 // up and downright from centre of box  
                  3 // square  
                  4 // triangle, base at bottom  
                  5 // circle
```



Example of Labelling with Symbols

```
// draw a triangle symbol at the crest  
symbol_1_type      2 // crest
```

```

symbol_1_y_mode      2 // above string
symbol_1_y           0
symbol_1_angle       0
symbol_1_size        2
symbol_1_colour      red
symbol_1_draw_mode   4 // triangle

```

Please continue to the next section [Hatching Cut and Fill Areas](#).

Hatching Cut and Fill Areas

This option is used to hatch cut and/or fill areas between sets of tins.

For each set, the name of the two tins, the hatch linestyle, colour and separation and whether cut and/or fill regions are required are all user definable.

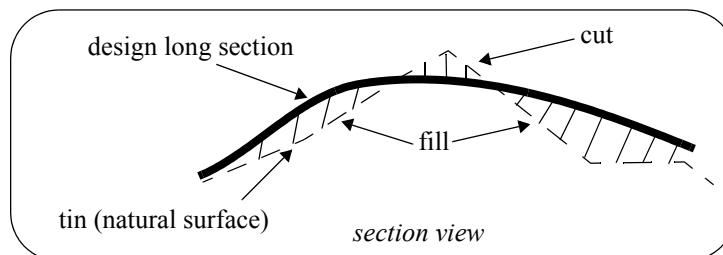
Up to twenty (20) separate sets of tins be hatched.

The parameters for labelling cuts and/or fill regions between tins are given by:

<code>hatch_original_tin_n</code>	<i>tin_name</i>	// tin_name for original surface
<code>hatch_new_tin_n</code>	<i>tin_name</i>	// tin_name for final surface
<code>hatch_cut_separation_n</code>	<i>mm</i>	// distance between cut hatch lines
	0	// don't do cut hatching
<code>hatch_cut_angle_n</code>	<i>degrees</i>	// angle in degrees of cut hatching
<code>hatch_cut_colour_n</code>	<i>colour</i>	// colour of the cut hatching
<code>hatch_cut_linestyle_n</code>	<i>linestyle</i>	// linestyle for cut hatching
<code>hatch_cut_draw_sides_n</code>	1/0	// 1 = draw sides of cut regions
<code>hatch_cut_draw_original_n</code>	1/0	// 1 = draw original tin in cut regions
<code>hatch_cut_draw_new_n</code>	1/0	// 1 = draw new tin in cut regions
<code>hatch_fill_separation_n</code>	<i>mm</i>	// distance between fill hatch line
	0	// don't do fill hatching
<code>hatch_fill_angle_n</code>	<i>degrees</i>	// angle in degrees of fill hatching
<code>hatch_fill_colour_n</code>	<i>colour</i>	// colour of the fill hatching
<code>hatch_fill_linestyle_n</code>	<i>linestyle</i>	// linestyle for fill hatching
<code>hatch_fill_draw_sides_n</code>	1/0	// 1 = draw sides of fill regions
<code>hatch_fill_draw_original_n</code>	1/0	// 1 = draw original tin in fill regions
<code>hatch_fill_draw_new_n</code>	1/0	// 1 = draw new tin in fill regions

Notes

- cut is when the new tin is below the original tin.
fill is when the new tin is above the original tin.
- cut hatching is turned off by setting `hatch_cut_separation_n` to 0.0.
fill hatching is turned off by setting `hatch_fill_separation_n` to 0.0.



Please continue to the next section [Labelling Cuts of Design Through Strings in a Model](#).

Labelling Cuts of Design Through Strings in a Model

The cuts that the primary string (design line) makes through any strings in user given models can be automatically labelled on the long section plots.

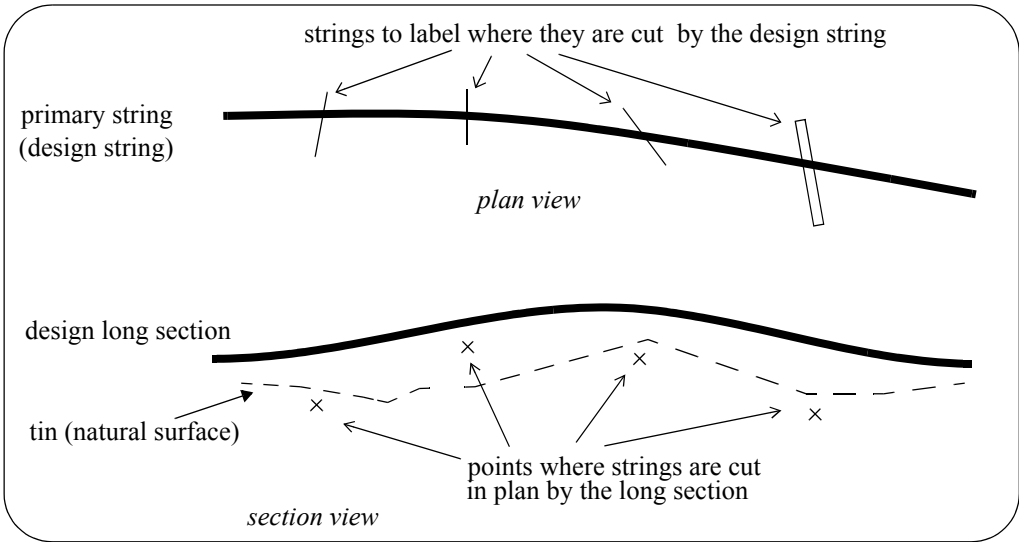
The **height**, **chainage** and **name** of the cut string can be labelled as well as a **symbol**. The height of tins at the same offset value can also be labelled.

The chainage position for the labelling is the chainage of the cut string.

The height position for the labelling can be specified as the

- (a) top of the boxes on the long section
- (b) height value of the cut string
- (c) height of the primary string
- (d) height of a tin.

The actual position of the label is defined relative to the above point.



Note:

Only case (b) involves the actual height of the cut string. For all other cases, only the chainage of the cut string is used. Hence for all cases except (b), the string does need to have a sensible height to be used for cuts through strings.

For example, a boundary string may have null heights but only the chainage is required and the height of the tin at that chainage can be used as the height (case (d)).

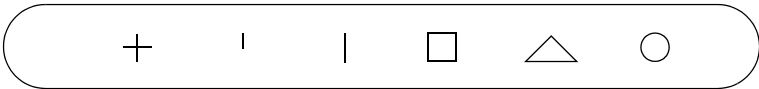
Text justification refers to the actual position and is given by

"top-left"	"top-centre"	"top-right"
"middle-left"	"middle-centre"	"middle-right"
"bottom-left"	"bottom-centre"	"bottom-right"

A choice of six special symbols and/or any 12d symbols can be drawn at the cut point.

The special 12d Model symbols of size one millimetre are drawn in a square box centred on (0,0) with sides of length two millimetres. That is, the box co-ordinates are (-1,-1), (1,1), (1,-1), (-1,-1).

The six special shapes are



Up to twenty five (25) separate models of strings can be cut and labelled.

Parameters for Labelling Where the Design Cuts Strings in a Model

The method for specifying which strings are to be checked for cuts is by first specifying the **model** which contains the strings, and then a **name mask** which is used to restrict the strings in the model to only those whose name matches the name mask.

Up to twenty five different sets of models and name masks can be used so that different cut sets can be labelled in different ways.

The parameters for selecting and labelling the *nth* set (where *n* can be from 1 to 25) of cuts of the design string with the strings in the model are given by:

```
cuts_n_model          model_name          // model of strings to be cut
```

The selection of the strings from the model *model_name* whose cut points are to be labelled is all the strings whose name satisfies the name mask *cuts_n_mask*:

```
cuts_n_mask          name_mask          // strings to check for cuts
                                     // and if a cut occurs,
                                     // parameters show how to
                                     // label the cut
```

where *name_mask* is a text string containing the name masks, each separated by one or more spaces, to test the string name against. Each mask can include wild cards and wild characters.

For example

```
or          cuts_1_mask          "ke*"
           cuts_1_mask          "?bank*"
```

or, if both masks are required,

```
           cuts_1_mask          "ke*  ?bank*"
```

If *cuts_n_mask* is missing, then all strings in the model are used. This is equivalent to *name_mask* being *"*"*.

All strings in the model *cuts_n_model* whose name satisfy the name mask *cuts_n_mask* are then checked for cuts with the design string, and if a cut occurs, the cut point will be labelled according to the rest of the parameters in the *nth* set.

The parameters for drawing a **symbol** at the cut points are

```
cuts_symbol_n_mode    0          // cross
                     1          // up from centre of box
                     2          // up and down from centre of box
                     3          // square
                     4          // triangle, base at bottom
                     5          // circle
                     6          // use a 12d symbol
```

0 + 1 | 2 | 3 □ 4 △ 5 ○

predefined symbols for

If *cuts_symbol_n_mode* is 6, then the 12d symbol is given by

```
cuts_symbol_n_style    plotsymbol    // plot symbol to draw at cut
```

Important Note

The plot symbol of name *plotsymbol* is defined in the file given by:

- (a) the parameter *plot_symbols* in the ppf file

plot_symbols filename

or if plot_symbols is not defined, then

(b) in the file pointed to by the environment variable PLOT_SYMBOLS_4D
PLOT_SYMBOLS_4D filename // default plotsym.4d

or if PLOT_SYMBOLS_4D is not defined, then

(c) in the file plotsym.4d
which is searched for in the standard set up file sequence

If none of the above files are defined, or if the symbol does not exist in the above files, then it will be searched for in the standard 12d symbols file which is:

(d) either pointed to by the environment variable SYMBOLS_4D
SYMBOLS_4D filename // default symbols.4d
or if the environment variable SYMBOLS_4D does not exist, in the file, symbols.4d

The position of the symbol is given by:

cuts_symbol_n_position	1	// above point height value
	3	// above top of boxes
	100	// to primary string
	101-500	// to tin1 or tin2 etc.

The symbol can be adjusted by the parameters:

cuts_symbol_n_x	mm	// offset adjustment to position
cuts_symbol_n_y	mm	// height adjustment to position
cuts_symbol_n_angle	degrees	// rotation about point
cuts_symbol_n_colour	colour	// colour of symbol

and for all values of cuts_symbol_n_mode **other** than 6:

cuts_symbol_n_size	mm	// size of symbol, 0 don't draw
--------------------	----	---------------------------------

The value of the **chainage** of the cut string can be labelled using the parameters

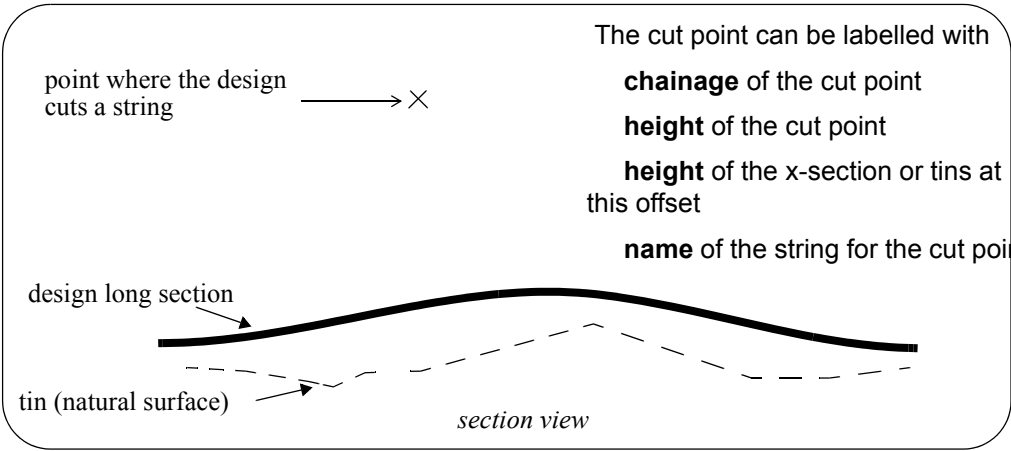
cuts_chainage_n_position	1	// above cut strings height value
	3	// above top of boxes
	100	// to primary string
	101-500	// to tin1 or tin2 etc.
cuts_chainage_n_x	mm	// chainage adjustment to position
cuts_chainage_n_y	mm	// height adjustment to position
cuts_chainage_n_angle	degrees	// rotation about point
cuts_chainage_n_size	mm	// size of text, 0 don't label
cuts_chainage_n_colour	colour	// colour of text
cuts_chainage_n_textstyle	text	// textstyle of text chainage
cuts_chainage_n_pre_text	text	// text before the chainage value
cuts_chainage_n_post_text	text	// text after the chainage value
cuts_chainage_n_justification	justification	// justification of the text
cuts_chainage_n_no_decimals	integer	// number of decimals in chainage

The value of a **height** at the chainage of the point can be calculated and labelled using the parameters

cuts_height_n_mode	1	// use height of cut point itself
	3	// use real world height of the position
	100	// of the label above the boxes
	101-500	// height of primary string
cuts_height_n_position	1	// use height of to tin1 or tin2 etc.
	3	// at points position
	100	// above top of boxes
	101-500	// to primary string
cuts_height_n_x	mm	// to tin1 or tin2 etc.
cuts_height_n_y	mm	// chainage adjustment to position
cuts_height_n_angle	degrees	// height adjustment to position
cuts_height_n_size	mm	// rotation about point
cuts_height_n_colour	colour	// size of text, 0 don't label
cuts_height_n_textstyle	text	// colour of text
cuts_height_n_pre_text	text	// textstyle of text height
cuts_height_n_post_text	text	// text before the height value
cuts_height_n_justification	justification	// text after the height value
cuts_height_n_no_decimals	integer	// justification of the text
		// number of decimals in height

A **label** which can include the **name** of the cut string is drawn by using the parameters

cuts_label_n_position	1	// above cut strings height value
	3	// above top of boxes
	100	// to primary string
	101-500	// to tin1 or tin2 etc.
cuts_label_n_mode	0	// don't include cut string name
	1	// include cut string name in label
cuts_label_n_x	mm	// chainage adjustment to position
cuts_label_n_y	mm	// height adjustment to position
cuts_label_n_angle	degrees	// rotation about point
cuts_label_n_size	mm	// size of text, 0 don't label
cuts_label_n_colour	colour	// colour of text
cuts_label_n_textstyle	text	// textstyle of text label
cuts_label_n_pre_text	text	// text before the string name
cuts_label_n_post_text	text	// text after the string name
cuts_label_n_justification	justification	// justification of the text



Please continue to the next section [Labelling the Primary String Name on the Plot](#).

Labelling the Primary String Name on the Plot

The plot can be labelled with a name under the boxes area.

The name is made up of concatenation the text strings:

```
plot_name_pre_text      primary-string-name      plot_name_post_text
```

The plot name is positioned under the boxes.

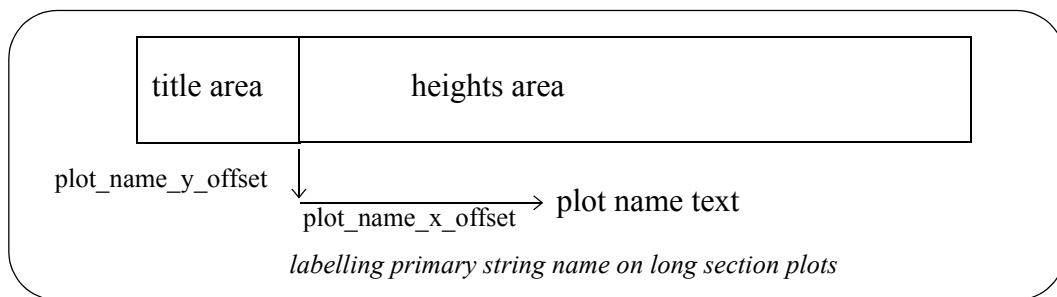
```
plot_name_string_name      0      // don't use the primary string name
                           1      // use primary string name
                           2      // use model->string name

plot_name_pre_text         text
plot_name_post_text        text
plot_name_textstyle        textstyle
plot_name_size             mm
plot_name_colour           colour
plot_name_x_offset         mm
plot_name_y_offset         mm
```

The *plot_name_x_offset* is measured from the beginning of the height boxes.

The default for *plot_name_x_offset* is centred on heights area.

The *plot_name_y_offset* is measured from the bottom of the box area with positive being **down**.



Example of Labelling Primary String Name

```
plot_name_pre_text      "Long Section Plot for String"
plot_name_post_text     ""
plot_name_size          15
plot_name_colour        red
plot_name_string_name   1
plot_name_y_offset      30
```

Please continue to the next section [Labelling the Scale on the Plot](#).

Labelling the Scale on the Plot

The plot can be labelled with the horizontal and vertical scale under the boxes area.

The scale label is made up of concatenation the text strings:

scale_horizontal_pre_text horizontal scale value scale_horizontal_post_text

and

scale_vertical_pre_text vertical scale value scale_vertical_post_text

The horizontal scale value is the value given by the scale parameter.

The vertical scale value is calculated from the horizontal scale and the vertical exaggeration for the section view.

The scales are positioned under the boxes.

scale_horizontal_pre_text	<i>text</i>
scale_horizontal_post_text	<i>text</i>
scale_horizontal_textstyle	<i>textstyle</i>
scale_horizontal_size	<i>mm</i>
scale_horizontal_colour	<i>colour</i>
scale_horizontal_x_offset	<i>mm</i>
scale_horizontal_y_offset	<i>mm</i>
scale_horizontal_decimals	<i>integer</i>
scale_vertical_pre_text	<i>text</i>
scale_vertical_post_text	<i>text</i>
scale_vertical_textstyle	<i>textstyle</i>
scale_vertical_size	<i>mm</i>
scale_vertical_colour	<i>colour</i>
scale_vertical_x_offset	<i>mm</i>
scale_vertical_y_offset	<i>mm</i>
scale_vertical_decimals	<i>integer</i>

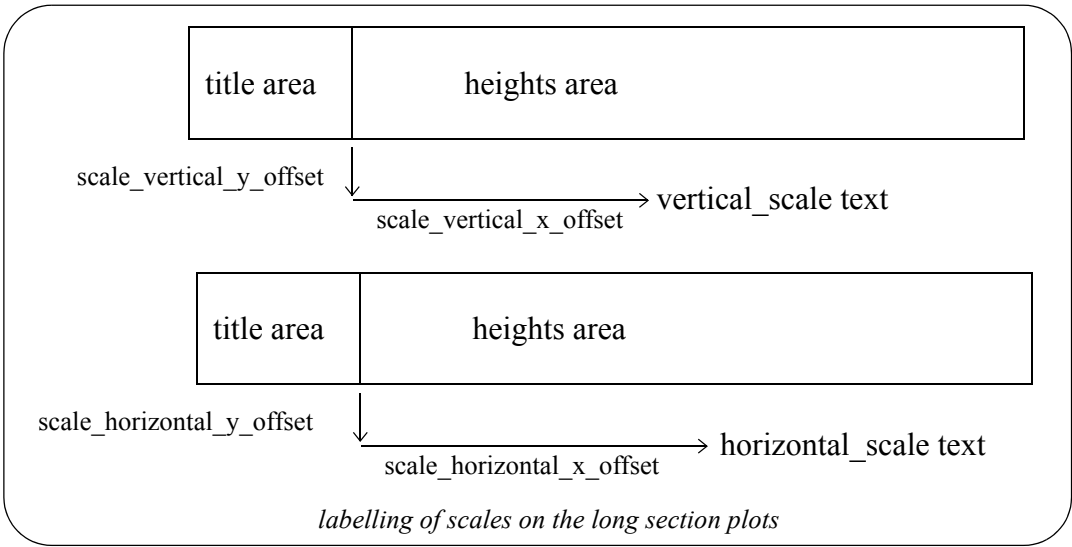
The *scale_vertical_x_offset* and *scale_horizontal_x_offset* are measured from the beginning of the heights area.

The default for *scale_vertical_x_offset* and *scale_horizontal_x_offset* are centred on the heights area.

The *scale_vertical_y_offset* and *scale_horizontal_y_offset* are measured from the bottom of the box area with positive being **down**.

If the **number of decimal places is greater than zero (> 0)**, then any trailing zeros after the decimal point are removed.

If the **number of decimal places is less than zero (< 0)**, the absolute value is taken as the number of decimal places and **no** trailing zeros after the decimal point are removed.



Example of Labelling Horizontal and Vertical Scales

scale_horizontal_pre_text	"Horizontal Scale 1:"
scale_horizontal_post_text	""
scale_horizontal_size	15
scale_horizontal_colour	yellow
scale_horizontal_y_offset	60
scale_vertical_pre_text	"Vertical Scale 1:"
scale_vertical_post_text	""
scale_vertical_size	15
scale_vertical_colour	green
scale_vertical_y_offset	90

Please continue to the next section [Title Block Information](#).

Title Block Information

The plot can have a standard 12d Model title block or a user defined title block.

The standard title block consists of a simple border around the plot and two lines of text in a box underneath the plot. For a user defined title block, all the line work and text is defined by the user.

Standard Title Block

For the standard 12d Model title block, there are extra parameters for two lines of text and text size and colour. The standard title block is turned on or off by the parameter *plot_border*.

plot_border	yes/no	// yes plots a standard title block // default yes
title_1	text	
title_2	text	
title_text_size	value	
title_colour	colour	

User Title Block

For the user defined title block, the title block drawing commands are kept in a file whose name is supplied by the user. The title block drawing commands are almost identical to the linestyle drawing commands and is given at the beginning of this chapter.

Hence for a user defined title block, there are just two parameters - one to say a title block file is being used and the other to give the name of the title block file. The *plot_border* parameter should also be set to *no* so that the standard title block is not also drawn.

use_title_file	yes/no	// yes draws the title block given in title_file // default no
title_file	filename	
plot_border	no	// turn off standard title block

Some special plot parameters are used to pass information down to variables in a user defined title block. For example, inside the title block file it is possible to have runtime user defined text variables. The actual text values for these text variables are passed down to the title block file from the plot parameter file via the parameters *user_text_n* (n = 1,2,... 1000)

user_text_n	text
-------------	------

The special plot parameters are:

time_format	text	// format for \$time
user_text_n	text	// where n = 1,2,... 1000 // passed down to \$user_text_n
title_1	text	// passed down to \$title_1
title_2	text	// passed down to \$title_2
start_page_number	integer	// used as the starting value for // \$page_number. If missing, // \$page_number starts at 1.
start_drawing_number	integer	// added to \$drawing_number in title // block file. If missing, // \$drawing_number starts at 1.
drawing_number_prefix	text	// passed down to // \$drawing_number_prefix
drawing_number_postfix	text	// passed down to // \$drawing_number_postfix

Please continue to the next section [Parameters that Modify Fields In the Long Plot Panel](#).

Parameters that Modify Fields In the Long Plot Panel

A number of parameters match those in the **section long plot** panel.

When the plot parameter file is first read, any parameters in the panel will be replaced by the values of any corresponding parameters from the parameter file.

However, if the parameter is subsequently modified in the panel, the panel value will be the value used for any plots.

The plot parameters that also occur in the **section long plot** panel are:

scale	<i>value</i>
start_chainage	<i>value</i>
end_chainage	<i>value</i>
chainage_interval	<i>value</i>
chord_arc	0/1
plotter_type	<i>text</i>
plot_file	<i>text</i>
view_name	<i>text</i>
offset_model	<i>text</i>
plot_border	<i>yes/no</i>
label_depths	<i>yes/no</i>
primary_string	<i>yes/no</i>
datum_value	<i>value</i>
sheet_size	<i>text</i> or “width height”
box_text_size	<i>mm</i>
box_colour	<i>colour</i>
use_title_file	<i>yes/no</i>
title_file	<i>filename</i>
plot_border	<i>yes/no</i>
title_1	<i>text</i>
title_2	<i>text</i>
title_text_size	<i>value</i>
title_colour	<i>colour</i>
pagination	<i>yes/no</i>
pagination_length	<i>value</i>
pagination_overlap	<i>value</i>
global_textstyle	<i>textstyle</i>

Please continue to the next section [Generating Long Section Plots Without a View](#).

Generating Long Section Plots Without a View

The long section plot parameters are comprehensive enough that it is possible to completely generate a long section plot without referencing a section view, or even using the **section long plot** panel.

Such a ppf can be run using the **plots=>plot a ppf** option or from the 4D Solutions programming language, 4DML.

When a long section plot is being generated entirely from a file, an extra parameter is needed to specify whether the datum value is calculated or the *datum_value* parameter is used.

```
manual_datum      1          // use the datum_value parameter for
                        // the datum
                        0          // ignore the datum_value and let
                        // 12d Model calculate the datum.
```

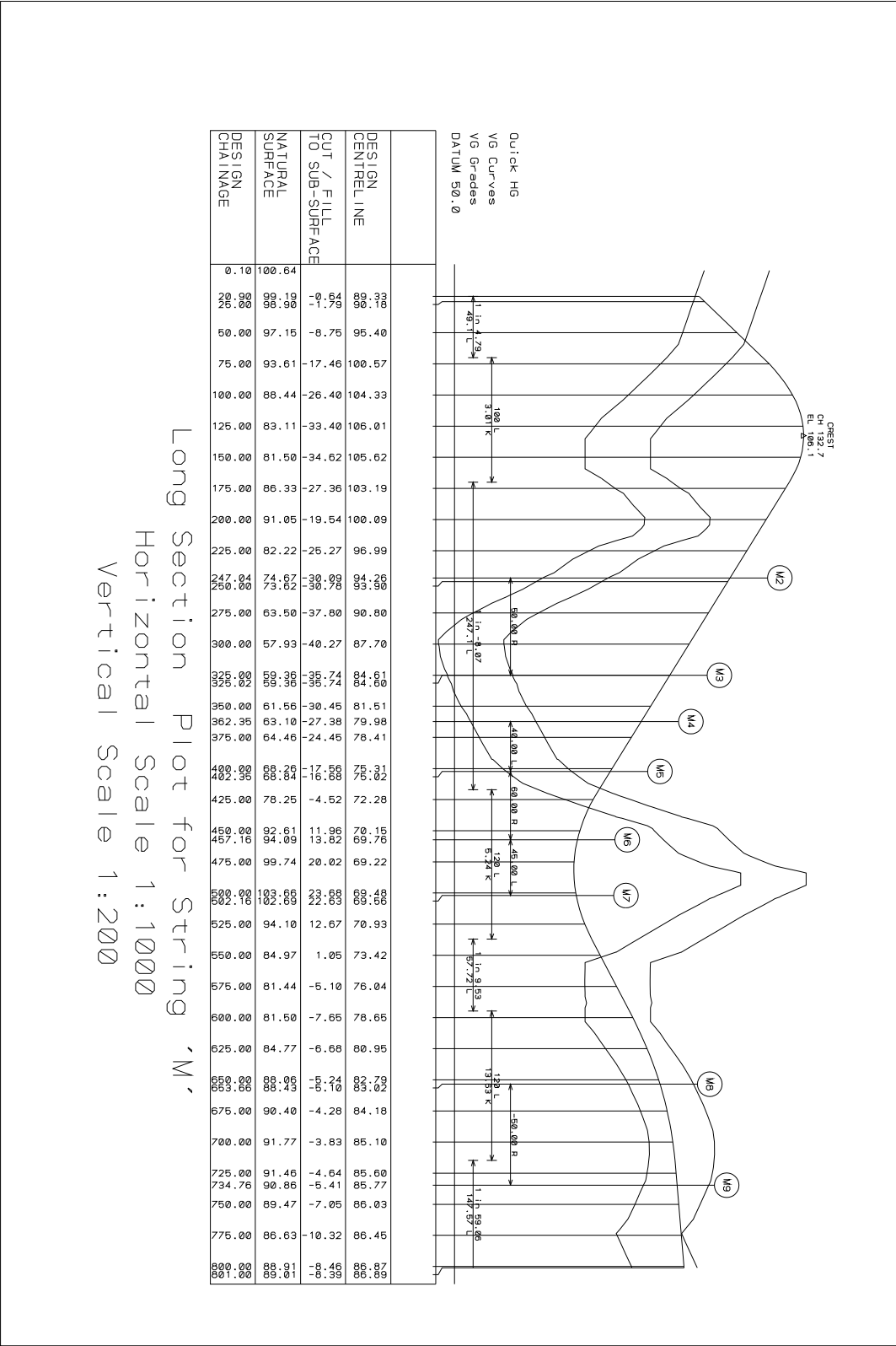
When generating a long section plot using the **section long plot** panel, a plot parameter file containing all the parameters needed to regenerate the plot using **plots=>plot a ppf** can be written out by simply giving a name for the ppf file in the plot parameters write field of the **section long plot** panel.

Notes

- 1. A warning is given if the keyword in a plot parameter file does not exist.
- 2. A warning is also given if the key word pair is defined more than once in a ppf.

Please continue to the next section [Example of a Long Section Plot Parameter File](#).

Example of a Long Section Plot Parameter File



```
// ppf file to generate longsection example
section_long_plot  "diag2" {
// plot margins
left_margin        0
right_margin       0
top_margin         0
bottom_margin      30
  number_of_decimals 2 // no dec places for heights
  title_box_text_size 7
// annotation for title text and heights etc.
// chainages
chainage_title      "DESIGN"
chainage_title_2    "CHAINAGE"
chainage_colour     "red"
// primary string
primary_title       "DESIGN"
primary_title_2     "CENTRELINE"
primary_colour      "grey"
primary_title_colour "yellow"
// primary label modes are
// 0 - last box before blank boxes
// 1 - after chainage annotations
primary_label_mode  0
// uprights
uprights_colour     "yellow"
//uprights_draw_mode 0 // none
uprights_draw_mode 100 // to primary
uprights_y          200
// gap factor for staggering
stagger_gap_factor  1.3
stagger_gap_top     5.0
stagger_gap_bottom  2.0
stagger_mode        1
// datum parameters
datum_text_size     6
datum_colour        brown
datum_name          "DATUM"
datum_above_gap     15
datum_below_gap     15
datum_y             -2
// 0 for bottom text justification
// 1 for top justification
box_text_justification 1
// draw lines around annotation at bottom of plot
// 0 - don't draw them
// 1 - do draw
// 2 - draw box around label text as well
// plus many others
draw_box_mode       2
```

```

// tin titles and depth labels
// label = 0 for no label, 1 for label

tin_1_label      1      // label natural surface
tin_1_title      "NATURAL"
tin_1_title_2    "SURFACE"
tin_1_title_colour yellow
tin_1_colour      "green"
tin_1_depth_label 0      // don't label depth to natural surface
tin_1_depth_title "CUT / FILL"

tin_2_label      0      // don't label sub-surface
tin_2_depth_label 1      // label depth to sub-surface
tin_2_title      "SUB"
tin_2_title_2    "SURFACE"
tin_2_title_colour yellow
tin_2_colour      "green"
tin_2_depth_title "CUT / FILL"
tin_2_depth_title_2 "TO SUB-SURFACE"

// number of blank boxes at the top
// of the plot for user annotations
number_of_blank_boxes 1

// chainages to include for heights labelling
// 0 don't use, 1 use

// include the chord-arc points?
chord_arc 0

// include the horizontal critical points?
chainage_label_hcp 1

// include horizontal ip's with no curves?
chainage_label_hip 0

// include the vertical tangent points?
chainage_label_vtp 0

// include the vips?
chainage_label_vip 0

// include the crests?
chainage_label_crest 0

// include the sags?
chainage_label_sag 0

// include change of grade
chainage_label_grade_change 0

// don't include bubble chainages
chainage_merge_bubbles 0

```

```
// Quick geometry - by default the geometry annotation
// are those of the view
// if they are zero no annotations are performed
```

```
horizontal_geometry_y          60
horizontal_geometry_arrow_text_size  4
horizontal_geometry_arrow_height   3
horizontal_geometry_arrow_colour   red
horizontal_geometry_label_text     "Quick HG"
horizontal_geometry_label_text_colour green
horizontal_geometry_label_text_size 6
```

```
vertical_geometry_grade_y      0
vertical_geometry_length_y      0
```

```
// Extensive vertical geometry annotations
```

```
v_g_1_type          1 // curve
v_g_1_value_mode    1 // chainage length
```

```
v_g_1_label_y      45
v_g_1_height        4
v_g_1_label_offset  -2
v_g_1_label_text    "VG Curves"
v_g_1_text_offset   2
v_g_1_label_text_size 6
v_g_1_pre_text      ""
v_g_1_post_text     "L"
v_g_1_gap           0
v_g_1_draw_mode     8
v_g_1_text_size     4
```

```
v_g_2_type          1 // curve
v_g_2_value_mode    3 // K value
```

```
v_g_2_label_y      45
v_g_2_height        1.5
v_g_2_label_text    ""
v_g_2_text_offset   -5
v_g_2_pre_text      ""
v_g_2_post_text     "K"
v_g_2_gap           0
v_g_2_draw_mode     1
v_g_2_text_size     4
```

```
v_g_3_type          0 // grade
v_g_3_value_mode    2 // 1 in grade
v_g_3_between_mode  1 // between vtp's
```

```
v_g_3_label_y      30
v_g_3_height        4
v_g_3_label_offset  -2
v_g_3_label_text    "VG Grades"
v_g_3_label_text_size 6
v_g_3_text_offset   2
v_g_3_pre_text     "1 in "
v_g_3_post_text     ""
v_g_3_gap           0
v_g_3_draw_mode     8
v_g_3_text_size     4
```

```

v_g_4_type          0  // grade
v_g_4_value_mode     4  // chainage length
v_g_4_between_mode   1  // between vtp's

v_g_4_label_y        30
v_g_4_height          1.5
v_g_4_label_text      ""
v_g_4_text_offset     -5
v_g_4_pre_text        ""
v_g_4_post_text       "L"
v_g_4_gap             0
v_g_4_draw_mode       1
v_g_4_text_size       4

// label the crests with chainage on one line
// and height (elevation) on the next

label_1_type          2  // crest
label_1_y_mode         2  // above string
label_1_y              10
label_1_angle          0
label_1_justification  1  // centre
label_1_size           4
label_1_colour         red
label_1_value_mode     1  // chainage
label_1_pre_text       "CH "
label_1_no_decimals_1  1

label_2_type           2  // crest
label_2_y_mode          2  // above string
label_2_y               2
label_2_angle           0
label_2_justification   1  // centre
label_2_size            4
label_2_colour          red
label_2_value_mode      2  // height
label_2_pre_text        "EL "
label_2_no_decimals_1   1

label_3_type            2  // crest
label_3_y_mode           2  // above string
label_3_y               18
label_3_angle            0
label_3_justification    1  // centre
label_3_size             4
label_3_colour           red
label_3_value_mode       0  // no values
label_3_pre_text         CREST

```

```
// Draw bubbles at the horizontal critical points:
// chainages to include for bubbles numbering
// 0 don't use, 1 use

chainage_bubbles          1
bubble_label_hcp          1
bubble_label_hip          0
bubble_label_vtp          0
bubble_label_vip          0
bubble_label_crest        0
bubble_label_sag          0
bubble_label_grade_change 0

bubble_radius             10
bubble_colour             cyan
bubble_text_size          5
bubble_text_colour        red

bubble_upright_distance   30
bubble_mode               1
bubble_draw_upright       1

plot_name_pre_text        "Long Section Plot for String"
plot_name_post_text       ""
plot_name_size            15
plot_name_colour          red
plot_name_string_name     1
plot_name_y_offset        30

scale_horizontal_pre_text  "Horizontal Scale 1:"
scale_horizontal_post_text ""
scale_horizontal_size      15
scale_horizontal_colour    yellow
scale_horizontal_y_offset  60

scale_vertical_pre_text   "Vertical Scale 1:"
scale_vertical_post_text  ""
scale_vertical_size       15
scale_vertical_colour     green
scale_vertical_y_offset   90

// ***** panel data *****

view_name          4

plotter_type       model
plot_file          "diag2"

start_chainage     0
end_chainage       801

chainage_interval   25

sheet_size         "1000 800"
scale              1000.0

primary_string     yes
label_depths      no
```

```
box_text_size      5
box_colour         green

datum_value        50
offset_model       ""

plot_border        "no"
title_1            "Title 1"
title_2            "Title 2"
title_text_size     2.5
title_colour       "magenta"
}
```

Please continue to the next section [#Include in Plot Parameter Files](#).

#Include in Plot Parameter Files

The plot parameter file also recognizes the CCCP preprocessor rules including #include which can be used to include other files in the plot parameter file.

The format of the #include command is:

#include *file_name*

Hence a block of plot parameters can be set up in a file and included in another file using #include rather than typing them all in again.

Any number of #include's can be placed in the plot parameter file.

To return to the beginning of this appendix, click on [Plot Parameters](#).

P Glossary

Glossary of Common Terms

Arc

Part of the circumference of a circle.

Affine Transformation 2D

A two dimensional transformation where one set of points is fitted to another. The transformation is a six parameter transformation, i.e., x displacement, y displacement, x scale factor, y scale factor, a x-rotation and y-rotation. If more variables exist than degrees of freedom, i.e., more than three control points are used, a least squares solution is calculated.

AGD

Australian Geodetic Datum.

AGD66

Australian Geodetic Datum 1966.

AGD84

Australian Geodetic Datum 1984.

AMG

Australian Map Grid.

Angle, Cartesian Angle, Mathematical Angle

The angle of a point is the counter-clockwise angle from the x-axis (horizontal or East line) to the line joining the point to the origin.

The angle of a line is the counter-clockwise angle measured from the x-axis to the line.

Batter

A steeply sloping surface (usually the wall of an earth bank).

Bearing

The bearing of a point is the clockwise angle from the y-axis (vertical or North line) to the line joining the point to the origin.

The bearing of a line is the clockwise angle measured from the y-axis to the line.

Blend

Use to define how opaque/translucent/transparent the fill of a polygon, face or tin is.

The value of blend is between 0 and 1.

0 means the fill is totally transparent (and hence invisible) and 1 means that the fill is opaque (non-translucent) and can't be seen through at all.

Breakline

A line on a surface joining a series of points on a common change-of-grade line. For example, the ridge top or spur, top or toe of batter, creek bank. See also *tinable segment*.

Cartesian Angle

See Angle.

Chainage

Chainage is a measure of the plan length along a string. The chainage at a point on a string is the start chainage of the string plus the plan length of the string from the beginning of the string to that point.

Circular Curve

Curves defined as an arc.

Cross Fall

The lateral grade or slope of a surface (particularly of a road pavement); usually expressed as a percentage of the proportion of metres vertically to metres horizontally.

End Chainage

The chainage of the last point of a string.

Eye-Point

For a perspective view, it is the point where the observer of the perspective view looks from.

GDA

Geocentric Datum of Australia.

GDA94

Geocentric Datum of Australia 1994.

GPS

Global Positioning System.

Grade

The longitudinal slope of a surface (particularly of road pavement). Usually expressed as a cross fall percentage or as a ratio of one unit vertically to a number of units horizontally. For example, 3% or 1:10.

GRS80

Geocentric Reference System 1980.

Helmert Transformation 2D

A two dimensional transformation where one set of points is fitted to another. The transformation is a four parameter transformation, i.e., x displacement, y displacement, scale factor and rotation. If more variables exist than degrees of freedom, i.e., more than two control points are used, a least squares solution is calculated.

Helmert Transformation 3D

A three dimensional transformation where one set of points is fitted to another. The transformation is a seven parameter transformation, i.e., x displacement, y displacement, z displacement, scale factor and three rotations. If more variables exist than degrees of freedom, i.e., more than two control points are used, a least squares solution is calculated.

Hidden Line

Lines that are hidden between protruding landforms, etc. in perspective views.

Horizontal Alignment

The plan position of an alignment string (centre line) defined by intersection points, spirals and arcs.

Intersection Point (IP)

The point where two lines intersect. Usually horizontal intersection points (HIP) or vertical intersection points (VIP)

Invert

The lower inner surface of a drain or sewer pipe.

ISG

Integrated Survey Grid (NSW Australia).

MGA, MGA94

Map Grid of Australia 1994.

NTv2

National Transform Version 2. Special grid file format used in Australia, NZ and Canada for converting longitude and latitude.

Null Value

In three dimensional data, it is possible that a point can have a valid plan position but an undefined height. In **12d** Model, there is a special **null** value which is used internally when height is undefined (-9.9e29).

Obvert

The upper inner surface of a drain or sewer pipe.

Parabolic Curve

Curves defined as a parabola.

Plot File

A file of plotting instructions in a format to suit a particular plotter. In 12d Model, HPGL is the default format for plot files.

Polygon

A string where the first point and the last point have the same plan co-ordinate. That is, the string closes on itself.

Screen Units

The unit of resolution for the computer screen - usually called pixels.

Shade

For a shade for a perspective view, the colour of all triangle faces are adjusted depending on the angle they make with a specified light source.

Slope

The inclination or grade of a surface or line, usually expressed as a ratio between one unit vertically to a number of units horizontally. For example, 1:10.

Snapping

A process where the element to be selected does not have to be exactly located. A tolerance is specified (the snap tolerance) and if the cursor is placed within the tolerance distance of the element then the cursor is moved directly ("snaps") to the element.

Different snap settings determine what parts of the element are considered for snapping to. For example, points on the string (point snap), drop perpendicular on the lines of an element (line snap) and grid points (grid snap).

Spiral

The special type of curve used for transitioning between straights and arcs in an alignment string (centre line). Also known as a transition curve or transition spiral.

Start Chainage

The chainage of the first point of a string.

String

A string is an ordered series of points.

Apart from the first and last point in a string, each point in a string has a unique next point (successor) and a unique previous point (predecessor). The previous and next points for a point are called its string neighbours. The lines joining a point with its neighbours are called string links.

A string which has the same first and last point is called a closed string otherwise a string is said to be open.

Strings are very useful in the modelling of terrain and design surfaces. 12d Model uses a number of different **types** of strings which as defined in the chapter **Tools and Concepts**.

Sweep Angle

For an arc, the sweep angle is the angle, measured in the *clockwise* direction, between the line joining the arc start point to the arc centre and the line joining the arc end point to the arc centre.

Tangent Point

A point at which a curve touches a line or another curve such that the tangent vector at that point is the same for the two touching items.

Target-Point

For a perspective view, it is the point that the observer is looking at.

Template

Standardized cross-section which is applied to a string at defined chainage points.

Template Modifiers

12d Model commands which modify the definition of a template. Template modifiers are used in preference to defining hundreds of different templates.

TIN

Triangulated Irregular Network. A TIN is a set of triangles which do not non-overlap in plan. Each vertex of a triangle has a z-value so that the TIN represents a surface in three dimensional space made up of triangular faces. When a TIN is created from a data set, the triangles are formed so that all non-null points are vertices of triangles. If breaklines are preserved in the TIN, then triangles are constrained so that any link from a breakline string is a side of a triangle.

Tinable vertex or point

If a vertex or point is tinable, then the vertex/point is included in triangulations. If the vertex/point is not tinable, then the vertex/point is ignored when triangulating.

Tinable segment or line

If a segment or line is tinable (and both the vertices at the ends of the segment/line are tinable and the z-values not null), then the segment/line is used as a side of a triangle during triangulation. This may not be possible if there are *crossing* tinable segments/lines.

A tinable segment is also known as a *breakline*.

Note that for a segment/line to be used as a side of a triangle, then its end vertices must be tinable and the z-values not null.

Triangulation

A set triangles, which do not overlap in a plan view, created from a set of data points. See TIN.

UTM

Universal Transverse Mercator.

View

The area in 12d Model used for displaying (drawing) graphical information. In 12d Model there are three types of views - plan, section and perspective.

Vertical Alignment

The long section position of an alignment string (centre line) defined by vertical intersection points (VIP's) and parabolic or circular curves.

WGS84

World Geodetic System 1984.

World Units

The fundamental units used in 12d Model - usually metres.

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